



DRINKING WATER OZONE SYSTEM

Winnipeg Water Treatment Program

OZONE SYSTEM SUBMITTAL

Fuji Electric Project No. WPMB-1105

Vol. 1 of 3

Fuji Electric Corp. of America

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DRINKING WATER OZONE SYSTEM

For Winnipeg Water Treatment Program

**The City of Winnipeg
Manitoba, Canada**

OZONE SYSTEM SUBMITTAL

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**OZONE SYSTEM
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- **OZONE EQUIPMENT DRAWINGS**
 - OZONE GENERATOR DRAWING
 - OZONE GENERATOR/COOLING WATER SKID DRAWING
 - OZONE DESTRUCT SKID DRAWING
 - DISSOLVED OZONE MONITORING PANEL DRAWING
 - SUPPLEMENTAL AIR/NITROGEN SUPPLY UNIT DRAWING
 - OZONE DIFFUSION LAYOUT DRAWING
- **WIRING REQUIREMENT LIST**
- **POWER SUPPLY UNIT & LOCAL CONTROL PANEL DRAWINGS**
- **OZONE MASTER PLC PANEL (OSCP) DRAWINGS**
- **OZONE DESTRUCT PANEL DRAWINGS**



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FUJI OZONE SYSTEM SUBMITTAL

DEVIATIONS AND CLARIFICATIONS



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FUJI OZONE SYSTEM SUBMITTAL

DEVIATIONS AND CLARIFICATIONS

GENERAL COMMENT

- I. Equipment and components that provided by Fuji Electric shall be those as presented in this submittal. Fuji Electric has used our experience and the experience of our vendors to provide equipment and components proven to provide desired service and results for Winnipeg Water Treatment Program.
- II. Items that deviating from the specification and requiring clarifications are highlighted in the following section, SPECIFICS.

SPECIFICS

1. Section 11210-00, "Ozone System General", 2.1.7 (page 10 of 19)
"Mount all skid mounted equipment using Type 316 stainless steel unistruts, Ttype 316 stainless steel hardwares, etc."
Fuji would like to use Structural Shape Carbon Steel or Type 304 stainless steel for construction of skid frame, pipe supports within skid, etc. If the C.S. members are used, they will be painted to Fuji blue.
2. Section 11210-00, "Ozone System General", 2.6.2 (page 15 of 19)
Butterfly valves:
Fuji would like to use Contromatics Series QF, High Performance Butterfly Valves for Off-gas Service.
Fuji would like to use Contromatics Series BG, Resilient Seated Wafer Style Butterfly Valves for Cooling Water Service.
3. Section 11210-00, "Ozone System General", 2.6.3 (page 15 of 19)
Ball Valves:
Fuji would like to use Contromatics Series 2801, High Performance Ball Valves for Oxygen and Ozone Gas Services.
4. Section 11210-00, "Ozone System General", 2.6.4 (page 15 of 19)
Ball Valves:
Fuji would like to use Contromatics Apollo 76-100 Series Ball Valves for Ozonated Water Sampling Service.



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FUJI OZONE SYSTEME SUBMITTAL

5. Section 11210-00, "Ozone System General", 2.6.6 (page 16 Of 19)

Check Valves:

Fuji would like to use Techno Stainless Steel Metal Hinge Design Check Valve for Oxygen Gas, Ozone Gas and Cooling Water Services.

6. Section 17212, "Transmitters and Indicators", 2.1.7.1 (page 1 Of 2)

Magnetic Flowmeters:

Fuji would like to use Yamatake MagneW Two-wire Plus Wafer Style Magnetic Flowmeter for Open Loop Cooling Water Service (Plant Water).

Fuji would like to use Signet 8512 Integral Sensor with Transmitter Flowmeter for Closed Loop DI Cooling Water Service.

Note: For DI Water Service, No Magnetic Flowmeters will operate properly.

7. Section 11210-04, "Nitrogen Boost Skid", 2.4 (page 5 of 10)

Accessories:

All accessories to be mounted on Supplemental Air Supply System Skid will be vendor standard items.

Note:

All above mentioned items are incorporated in this submittal.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FUJI OZONE SYSTEM SUBMITTAL

FUJI SCOPE OF SUPPLY

- I. ITEMS TO BE SHIPPED LOOSE**

- II. ITEMS TO BE MOUNTED ON SKIDS**

Fuji Supply Parts List (Loose Items)

for Winnipeg Project (Project No. WPMB-1105)

As of 1/09/06

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
GOX System					
1		HV-O030C	Manual Valve	Valve	WPMB-PID-003
2		HV-O030D	Manual Valve	Valve	WPMB-PID-003
3		GF-O030A	Particulate Filter	Filter	WPMB-PID-003
4		PT-O030A	Pressure Differential Transmitter	Transmitter	WPMB-PID-003
5		HV-O031C	Manual Valve	Valve	WPMB-PID-003
6		HV-O031D	Manual Valve	Valve	WPMB-PID-003
7		GF-O031A	Particulate Filter	Filter	WPMB-PID-003
8		PT-O031A	Pressure Differential Transmitter	Transmitter	WPMB-PID-003
9		HV-O032C	Manual Valve	Valve	WPMB-PID-003
10		HV-O032E	Manual Valve	Valve	WPMB-PID-003
11		HV-O032G	Manual Valve	Valve	WPMB-PID-003
12		HV-O032I	Manual Valve	Valve	WPMB-PID-003
13		PRV-O032A	Pressure Regulating Valve	Valve	WPMB-PID-003
14		PRV-O032B	Pressure Regulating Valve	Valve	WPMB-PID-003
15		PRV-O032C	Pressure Regulating Valve	Valve	WPMB-PID-003
16		PRV-O032D	Pressure Regulating Valve	Valve	WPMB-PID-003
17		HV-O032D	Manual Valve	Valve	WPMB-PID-003
18		HV-O032F	Manual Valve	Valve	WPMB-PID-003
19		HV-O032H	Manual Valve	Valve	WPMB-PID-003
20		HV-O032J	Manual Valve	Valve	WPMB-PID-003
21		PSV-O032A	Pressure Relief Valve	Valve	WPMB-PID-003
22		AT-O032A	Dew Point Indicator/Analyzer	Monitor	WPMB-PID-003
Nitrogen Boost System					
1		Skid	Nitrogen Boost System Skid	Skid	WPMB-PID-004
2		PRV-O051A	Pressure Regulating Valve	Valve	WPMB-PID-004
3		HV-O051B	Manual Valve	Valve	WPMB-PID-004
4		PI-O051A	Pressure Indicator	Gauge	WPMB-PID-004
5		FV-O051A	Solenoid Valve	Valve	WPMB-PID-004
6		FS-O051A	Flow Indicator/Signal	Gauge	WPMB-PID-004
7		HV-O051C	Manual Valve	Valve	WPMB-PID-004
8		AT-O051A	Dew Point Indicator/Analyzer	Monitor	WPMB-PID-004
9		CV-O051A	Check Valve	Valve	WPMB-PID-004
10		HV-O051D	Manual Valve	Valve	WPMB-PID-004

Item No	Fuji Tag No	Customer Tag No	Description	Category	P & ID No.
Ozone Generation System (Generator #1)					
1		HV-O119B	Manual Valve	Valve	WPMB-PID-005
2		FV-O119A	Motorized Valve	Valve	WPMB-PID-005
3		PT-O110A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-005
4		HV-O110A	Manual Valve	Valve	WPMB-PID-005
5		TT-O110A	Temperature Transmitter	Transmitter	WPMB-PID-005
6		HV-O110B	Manual Valve	Valve	WPMB-PID-005
7		HV-O115A	Manual Valve	Valve	WPMB-PID-005
8		FM-O115A	Orifice Flange and Plate	Orifice	WPMB-PID-005
9		HV-O115B	Manual Valve	Valve	WPMB-PID-005
10		CV-O110A	Check Valve	Valve	WPMB-PID-005
11		PSV-O110A	Pressure Relief Valve	Valve	WPMB-PID-005
12		Skid #1	Cooling Water/Generator Skid	Skid	WPMB-PID-005
13		HV-O112A	Manual Valve	Valve	WPMB-PID-005
14		PT-O112A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-005
15		TT-O112A	Temperature Transmitter	Transmitter	WPMB-PID-005
16		FT-O112A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-005
17		FCV-O112A	Flow Control Valve	Valve	WPMB-PID-005
18		HV-O112B	Manual Valve	Valve	WPMB-PID-005
19		AT-O112A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-005
20		FV-O112A	Motorized Valve	Valve	WPMB-PID-005
21		AT-O110A	Ambient Ozone Monitor	Monitor	WPMB-PID-005
22		AT-O110B	Ambient Oxygen Monitor	Monitor	WPMB-PID-005
Ozone Generation System (Generator #2)					
1		HV-O139B	Manual Valve	Valve	WPMB-PID-006
2		FV-O139A	Motorized Valve	Valve	WPMB-PID-006
3		PT-O130A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-006
4		HV-O130A	Manual Valve	Valve	WPMB-PID-006
5		TT-O130A	Temperature Transmitter	Transmitter	WPMB-PID-006
6		HV-O130A	Manual Valve	Valve	WPMB-PID-006
7		HV-O135A	Manual Valve	Valve	WPMB-PID-006
8		FM-O135A	Orifice Flange and Plate	Orifice	WPMB-PID-006
9		HV-O135B	Manual Valve	Valve	WPMB-PID-006
10		CV-O130A	Check Valve	Valve	WPMB-PID-006
11		PSV-O130A	Pressure Relief Valve	Valve	WPMB-PID-006
12		Skid #2	Cooling Water/Generator Skid	Skid	WPMB-PID-006
13		HV-O132A	Manual Valve	Valve	WPMB-PID-006
14		PT-O132A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-006
15		TT-O132A	Temperature Transmitter	Transmitter	WPMB-PID-006
16		FT-O132A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-006
17		FCV-O132A	Flow Control Valve	Valve	WPMB-PID-006
18		HV-O132B	Manual Valve	Valve	WPMB-PID-006
19		AT-O132A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-006

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P. & ID No.
20		FV-O132A	Motorized Valve	Valve	WPMB-PID-006
21		AT-O130A	Ambient Ozone Monitor	Monitor	WPMB-PID-006
22		AT-O130B	Ambient Oxygen Monitor	Monitor	WPMB-PID-006
Ozone Generation System (Generator #3)					
1		HV-O159B	Manual Valve	Valve	WPMB-PID-007
2		FV-O159A	Motorized Valve	Valve	WPMB-PID-007
3		PT-O150A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-007
4		HV-O150A	Manual Valve	Valve	WPMB-PID-007
5		TT-O150A	Temperature Transmitter	Transmitter	WPMB-PID-007
6		HV-O150A	Manual Valve	Valve	WPMB-PID-007
7		HV-O155A	Manual Valve	Valve	WPMB-PID-007
8		FM-O155A	Orifice Flange and Plate	Orifice	WPMB-PID-007
9		HV-O155B	Manual Valve	Valve	WPMB-PID-007
10		CV-O150A	Check Valve	Valve	WPMB-PID-007
11		PSV-O150A	Pressure Relief Valve	Valve	WPMB-PID-007
12		Skid #3	Cooling Water/Generator Skid	Skid	WPMB-PID-007
13		HV-O152A	Manual Valve	Valve	WPMB-PID-007
14		PT-O152A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-007
15		TT-O152A	Temperature Transmitter	Transmitter	WPMB-PID-007
16		FT-O152A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-007
17		FCV-O152A	Flow Control Valve	Valve	WPMB-PID-007
18		HV-O152B	Manual Valve	Valve	WPMB-PID-007
19		AT-O152A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-007
20		FV-O152A	Motorized Valve	Valve	WPMB-PID-007
21		AT-O150A	Ambient Ozone Monitor	Monitor	WPMB-PID-007
Flow Control System					
1		FV-O201A	Motorized Valve	Valve	WPMB-PID-008
2		FV-O202A	Motorized Valve	Valve	WPMB-PID-008
3		HV-O200A	Manual Valve	Valve	WPMB-PID-008
4		FT-O216A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008
5		FT-O217A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008
6		FT-O218A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008
7		FCV-O216A	Flow Control Valve	Valve	WPMB-PID-008
8		FCV-O217A	Flow Control Valve	Valve	WPMB-PID-008
9		FCV-O218A	Flow Control Valve	Valve	WPMB-PID-008
10		HV-O203A	Manual Valve	Valve	WPMB-PID-009
11		FT-O236A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009
12		FT-O237A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009
13		FT-O238A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009
14		FCV-O236A	Flow Control Valve	Valve	WPMB-PID-009
15		FCV-O237A	Flow Control Valve	Valve	WPMB-PID-009
16		FCV-O238A	Flow Control Valve	Valve	WPMB-PID-009

Item No	Fuji Tag No	Customer Tag No	Description	Category	P & ID No.
Disolution System					
1			Diffuser #1		WPMB-PID-010
2			Diffuser #2		WPMB-PID-011
Off-gas Line					
1		PSV-O210A	Pressure Vacuum Relief Valve	Valve	WPMB-PID-010
2		PT-O501A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-012
3		PT-O501B	Pressure Differential Transmitter	Transmitter	WPMB-PID-012
4		DEM-O501A	Mist Eliminator	Demister	WPMB-PID-012
5		AT-O501A	Off-gas Analyzer/Transmitter	Monitor	WPMB-PID-012
6		PSV-O501A	Pressure Vacuum Relief Valve	Valve	WPMB-PID-012
7		FV-O521A	Motorized Valve	Valve	WPMB-PID-012
8		Skid #1	Ozone Destruct Unit Skid #1	Skid	WPMB-PID-012
9		Skid #2	Ozone Destruct Unit Skid #2	Skid	WPMB-PID-013
10		ATO520B	Ambient Ozone Montor	Monitor	WPMB-PID-013
11		PSV-O230A	Pressure Vacuum Relief Valve	Valve	WPMB-PID-011
12		PT-O505A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-014
13		PT-O505B	Pressure Differential Transmitter	Transmitter	WPMB-PID-014
14		DEM-O505A	Mist Eliminator	Demister	WPMB-PID-014
15		AT-O505A	Off-gas Analyzer/Transmitter	Monitor	WPMB-PID-014
16		PSV-O505A	Pressure Vacuum Relief Valve	Valve	WPMB-PID-014
17		FV-O523A	Motorized Valve	Valve	WPMB-PID-014
18		Skid #3	Ozone Destruct Unit Skid #3	Skid	WPMB-PID-014
Cooling Water System					
1			Skid #1	Pump	WPMB-PID-016
2			Skid #2	Pump	WPMB-PID-017
3			Skid #3	Pump	WPMB-PID-018
Power Supply Unit					
1		HV-O310A	Manual Valve	Valve	WPMB-PID-019
2		FI-O310A	Flow Indicator	Gauge	WPMB-PID-019
3			Power Supply Unit # 1		WPMB-PID-019
4		HV-O310C	Manual Valve	Valve	WPMB-PID-019
5		HV-O320A	Manual Valve	Valve	WPMB-PID-020
6		FI-O320A	Flow Indicator	Gauge	WPMB-PID-020
7			Power Supply Unit # 2		WPMB-PID-020
8		HV-O320C	Manual Valve	Valve	WPMB-PID-020
9		HV-O330A	Manual Valve	Valve	WPMB-PID-021
10		FI-O330A	Flow Indicator	Gauge	WPMB-PID-021
11			Power Supply Unit # 3		WPMB-PID-021
12		HV-O330C	Manual Valve	Valve	WPMB-PID-021

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
Residual Ozone System					
1		SP-O220A	Sample Pump #1	Pump	WPMB-PID-022
2		SP-O225A	Sample Pump #2	Pump	WPMB-PID-022
3			Residual Ozone Panel	Panel	WPMB-PID-022
4		SP-O240A	Sample Pump #3	Pump	WPMB-PID-023
5		SP-O245A	Sample Pump #4	Pump	WPMB-PID-023
6			Residual Ozone Panel	Panel	WPMB-PID-023

Fuji Supply Parts List (Skid Mounted Items)

for Winnipeg Project (Project No. WPMB-1105)

As of 1/09/06

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
Cooling Water/Generator Skid #1					
1		LS-O110A	Level Switch	Switch	WPMB-PID-005
2		LS-O112A	Level Switch	Switch	WPMB-PID-005
3		HV-O410A	Manual Valve	Valve	WPMB-PID-016
4		FV-O410A	Motorized Butterfly Valve	Valve	WPMB-PID-016
5		HV-O410B	Manual Valve	Valve	WPMB-PID-016
6		PI-O410A	Pressure Indicator	Gauge	WPMB-PID-016
7		TT-O410A	Temperature Transmitter	Transmitter	WPMB-PID-016
8		FT-O410A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-016
9		HV-O410C	Manual Valve	Valve	WPMB-PID-016
10		HEX-O410A	Heat Exchanger # 1	H/E	WPMB-PID-016
11		HV-O410D	Manual Valve	Valve	WPMB-PID-016
12		PI-O410B	Pressure Indicator	Gauge	WPMB-PID-016
13		TT-O410B	Temperature Transmitter	Transmitter	WPMB-PID-016
14		HV-O410E	Manual Valve	Valve	WPMB-PID-016
15		HV-O111A	Manual Valve	Valve	WPMB-PID-016
16		FV-O111A	Motorized Butterfly Valve	Valve	WPMB-PID-016
17		FT-O111A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-016
18		PT-O111A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-016
19		HV-O111B	Manual Valve	Valve	WPMB-PID-016
20		HV-O411A	Manual Valve	Valve	WPMB-PID-016
21		P-O411A	Closed Loop C.W. Pump # 1	Pump	WPMB-PID-016
22		CV-O411A	Check Valve	Valve	WPMB-PID-016
23		PI-O411A	Pressure Indicator	Gauge	WPMB-PID-016
24		HV-O411B	Manual Valve	Valve	WPMB-PID-016
25		TT-O411A	Temperature Transmitter	Transmitter	WPMB-PID-016
26		FCV-O411A	Flow Control Valve	Valve	WPMB-PID-016
27		SOL-O411A	Solenoid Valve	Valve	WPMB-PID-016
28		RB-O411A	Resin Bottle	Bottle	WPMB-PID-016
29		DIF-O411A	Filter	Filter	WPMB-PID-016
30		TK-O411A	DI Water Tank	Tank	WPMB-PID-016
31		HV-O411F	Manual Valve	Valve	WPMB-PID-016
32		CT-O411A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-016
33		HV-O411C	Manual Valve	Valve	WPMB-PID-016
34		HV-O412A	Manual Valve	Valve	WPMB-PID-016
35		TT-O411B	Temperature Transmitter	Transmitter	WPMB-PID-016
36		HV-O411A	Manual Valve	Valve	WPMB-PID-016
37		PI-O411B	Pressure Indicator	Gauge	WPMB-PID-016
38		HV-O411E	Manual Valve	Valve	WPMB-PID-016
39		CV-O411B	Check Valve	Valve	WPMB-PID-016

Item No.	Fuji Tag No	Customer Tag No	Description	Category	P & ID No.
Cooling Water/Generator Skid #2					
1		LS-O130A	Level Switch	Switch	WPMB-PID-006
2		LS-O132A	Level Switch	Switch	WPMB-PID-006
3		HV-O420A	Manual Valve	Valve	WPMB-PID-017
4		FV-O420A	Motorized Butterfly Valve	Valve	WPMB-PID-017
5		HV-O420B	Manual Valve	Valve	WPMB-PID-017
6		PI-O420A	Pressure Indicator	Gauge	WPMB-PID-017
7		TT-O420A	Temperature Transmitter	Transmitter	WPMB-PID-017
8		FT-O420A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-017
9		HV-O420C	Manual Valve	Valve	WPMB-PID-017
10		HEX-O420A	Heat Exchanger # 2	H/E	WPMB-PID-017
11		HV-O420D	Manual Valve	Valve	WPMB-PID-017
12		PI-O420B	Pressure Indicator	Gauge	WPMB-PID-017
13		TT-O420B	Temperature Transmitter	Transmitter	WPMB-PID-017
14		HV-O420E	Manual Valve	Valve	WPMB-PID-017
15		HV-O131A	Manual Valve	Valve	WPMB-PID-017
16		FV-O131A	Motorized Butterfly Valve	Valve	WPMB-PID-017
17		FT-O131A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-017
18		PT-O131A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-017
19		HV-O131B	Manual Valve	Valve	WPMB-PID-017
20		HV-O421A	Manual Valve	Valve	WPMB-PID-017
21		P-O421A	Closed Loop C.W. Pump # 2	Pump	WPMB-PID-017
22		CV-O421A	Check Valve	Valve	WPMB-PID-017
23		PI-O421A	Pressure Indicator	Gauge	WPMB-PID-017
24		HV-O421B	Manual Valve	Valve	WPMB-PID-017
25		TT-O421A	Temperature Transmitter	Transmitter	WPMB-PID-017
26		FCV-O421A	Flow Control Valve	Valve	WPMB-PID-017
27		SOL-O421A	Solenoid Valve	Valve	WPMB-PID-017
28		RB-O421A	Resin Bottle	Bottle	WPMB-PID-017
29		DIF-O421A	Filter	Filter	WPMB-PID-017
30		TK-O421A	DI Water Tank	Tank	WPMB-PID-017
31		HV-O421F	Manual Valve	Valve	WPMB-PID-017
32		CT-O421A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-017
33		HV-O421C	Manual Valve	Valve	WPMB-PID-017
34		HV-O422A	Manual Valve	Valve	WPMB-PID-017
35		TT-O421B	Temperature Transmitter	Transmitter	WPMB-PID-017
36		HV-O421D	Manual Valve	Valve	WPMB-PID-017
37		PI-O421B	Pressure Indicator	Gauge	WPMB-PID-017
38		HV-O421E	Manual Valve	Valve	WPMB-PID-017
39		CV-O421B	Check Valve	Valve	WPMB-PID-017

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
Cooling Water/Generator Skid #3					
1		LS-O150A	Level Switch	Switch	WPMB-PID-007
2		LS-O152A	Level Switch	Switch	WPMB-PID-007
3		HV-O430A	Manual Valve	Valve	WPMB-PID-018
4		FV-O430A	Motorized Butterfly Valve	Valve	WPMB-PID-018
5		HV-O430B	Manual Valve	Valve	WPMB-PID-018
6		PI-O430A	Pressure Indicator	Gauge	WPMB-PID-018
7		TT-O430A	Temperature Transmitter	Transmitter	WPMB-PID-018
8		FT-O430A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-018
9		HV-O430C	Manual Valve	Valve	WPMB-PID-018
10		HEX-O430A	Heat Exchanger # 3	H/E	WPMB-PID-018
11		HV-O430D	Manual Valve	Valve	WPMB-PID-018
12		PI-O430B	Pressure Indicator	Gauge	WPMB-PID-018
13		TT-O430B	Temperature Transmitter	Transmitter	WPMB-PID-018
14		HV-O430E	Manual Valve	Valve	WPMB-PID-018
15		HV-O151A	Manual Valve	Valve	WPMB-PID-018
16		FV-O151A	Motorized Butterfly Valve	Valve	WPMB-PID-018
17		FT-O151A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-018
18		PT-O151A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-018
19		HV-O151B	Manual Valve	Valve	WPMB-PID-018
20		HV-O431A	Manual Valve	Valve	WPMB-PID-018
21		P-O431A	Closed Loop C.W. Pump # 3	Pump	WPMB-PID-018
22		CV-O431A	Check Valve	Valve	WPMB-PID-018
23		PI-O431A	Pressure Indicator	Gauge	WPMB-PID-018
24		HV-O431B	Manual Valve	Valve	WPMB-PID-018
25		TT-O431A	Temperature Transmitter	Transmitter	WPMB-PID-018
26		FCV-O431A	Flow Control Valve	Valve	WPMB-PID-018
27		FV-O431A	Solenoid Valve	Valve	WPMB-PID-018
28		RB-O431A	Resin Bottle	Bottle	WPMB-PID-018
29		DIF-O431A	Filter	Filter	WPMB-PID-018
30		TK-O431A	DI Water Tank	Tank	WPMB-PID-018
31		HV-O431F	Manual Valve	Valve	WPMB-PID-018
32		CT-O431A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-018
33		HV-O431C	Manual Valve	Valve	WPMB-PID-018
34		HV-O432A	Manual Valve	Valve	WPMB-PID-018
35		TT-O431B	Temperature Transmitter	Transmitter	WPMB-PID-018
36		HV-O431D	Manual Valve	Valve	WPMB-PID-018
37		PI-O431B	Pressure Indicator	Gauge	WPMB-PID-018
38		HV-O431E	Manual Valve	Valve	WPMB-PID-018
39		CV-O4314B	Check Valve	Valve	WPMB-PID-018

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
Nitrogen Boost System Skid					
1		CF-O052A	Particulate Filter	Filter	WPMB-PID-004
2		CF-O053A	Particulate Filter	Filter	WPMB-PID-004
3		CMP-O052A	Compressor # 1	Compressor	WPMB-PID-004
4		CMP-O053A	Compressor # 2	Compressor	WPMB-PID-004
5		CC-O050A	After Cooler	Cooler	WPMB-PID-004
6		PV-O050A	Air Receiver	Tank	WPMB-PID-004
7		HV-O050A	Manual Valve	Valve	WPMB-PID-004
8		PI-O050A	Pressure Indicator	Gauge	WPMB-PID-004
9		PSV-O050A	Pressure Relief Valve	Valve	WPMB-PID-004
10		HV-O050B	Manual Valve	Valve	WPMB-PID-004
11		PS-O050A	Pressure Switch	Switch	WPMB-PID-004
12		BV-O050A	Automatic Drain Valve	Valve	WPMB-PID-004
13		HV-O051A	Manual Valve	Valve	WPMB-PID-004
14		DES-O051A	Desiccant Dryer/Particulate Filters	Dryer/Filter	WPMB-PID-004
Ozone Destruct Unit Skid #1					
1		HV-O510A	Manual Valve	Valve	WPMB-PID-012
2		FCV-O510A	Motorized Valve	Valve	WPMB-PID-012
3		TT-O510A	Temperature Transmitter	Transmitter	WPMB-PID-012
4		HTR-O510A	Preheater	Heater	WPMB-PID-012
5		HV-O510B	Manual Valve	Valve	WPMB-PID-012
6		TT-O510B	Temperature Transmitter	Transmitter	WPMB-PID-012
7		CDU-O510A	Destruct Vessel	Vessel	WPMB-PID-012
8		HV-O510D	Manual Valve	Valve	WPMB-PID-012
9		PT-O510A	Differential Pressure Transmitter	Transmitter	WPMB-PID-012
10		HV-O510E	Manual Valve	Valve	WPMB-PID-012
11		HV-O510C	Manual Valve	Valve	WPMB-PID-012
12		TT-O510C	Temperature Transmitter	Transmitter	WPMB-PID-012
13		EJ-O510A	Expansion Joint	Joint	WPMB-PID-012
14		HV-O510F	Manual Valve	Valve	WPMB-PID-012
15		PT-O510B	Differential Pressure Transmitter	Transmitter	WPMB-PID-012
16		HV-O510G	Manual Valve	Valve	WPMB-PID-012
17		BLW-O510A	Blower	Motor	WPMB-PID-012
18		CV-O510A	Check Valve	Valve	WPMB-PID-012
19		HV-O510H	Manual Valve	Valve	WPMB-PID-012
20		AT-O510A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-012
21		SLR-O510A	Silensor	Silensor	WPMB-PID-012
22		HV-O510J	Manual Valve	Valve	WPMB-PID-012

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
Ozone Destruct Unit Skid #2					
1		HV-O520A	Manual Valve	Valve	WPMB-PID-013
2		FCV-O520A	Motorized Valve	Valve	WPMB-PID-013
3		TT-O520A	Temperature Transmitter	Transmitter	WPMB-PID-013
4		HTR-O520A	Preheater	Heater	WPMB-PID-013
5		HV-O520B	Manual Valve	Valve	WPMB-PID-013
6		TT-O520B	Temperature Transmitter	Transmitter	WPMB-PID-013
7		CDU-O520A	Destruct Vessel	Vessel	WPMB-PID-013
8		HV-O520D	Manual Valve	Valve	WPMB-PID-013
9		PT-O520A	Differential Pressure Transmitter	Transmitter	WPMB-PID-013
10		HV-O520E	Manual Valve	Valve	WPMB-PID-013
11		HV-O520C	Manual Valve	Valve	WPMB-PID-013
12		TT-O520C	Temperature Transmitter	Transmitter	WPMB-PID-013
13		EJ-O520A	Expansion Joint	Joint	WPMB-PID-013
14		HV-O520F	Manual Valve	Valve	WPMB-PID-013
15		PT-O520B	Differential Pressure Transmitter	Transmitter	WPMB-PID-013
16		HV-O520G	Manual Valve	Valve	WPMB-PID-013
17		BLW-O520A	Blower	Motor	WPMB-PID-013
18		CV-O520A	Check Valve	Valve	WPMB-PID-013
19		HV-O520H	Manual Valve	Valve	WPMB-PID-013
20		AT-O520A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-013
21		SLR-O520A	Silensor	Silensor	WPMB-PID-013
22		HV-O520J	Manual Valve	Valve	WPMB-PID-013
23		AT-O520B	Ambient Ozone Monitor	Monitor	WPMB-PID-013
Ozone Destruct Unit Skid #3					
1		HV-O530A	Manual Valve	Valve	WPMB-PID-014
2		FCV-O530A	Motorized Valve	Valve	WPMB-PID-014
3		TT-O530A	Temperature Transmitter	Transmitter	WPMB-PID-014
4		HTR-O530A	Preheater	Heater	WPMB-PID-014
5		HV-O530B	Manual Valve	Valve	WPMB-PID-014
6		TT-O530B	Temperature Transmitter	Transmitter	WPMB-PID-014
7		CDU-O530A	Destruct Vessel	Vessel	WPMB-PID-014
8		HV-O530D	Manual Valve	Valve	WPMB-PID-014
9		PT-O530A	Differential Pressure Transmitter	Transmitter	WPMB-PID-014
10		HV-O530E	Manual Valve	Valve	WPMB-PID-014
11		HV-O530C	Manual Valve	Valve	WPMB-PID-014
12		TT-O530C	Temperature Transmitter	Transmitter	WPMB-PID-014
13		EJ-O530A	Expansion Joint	Joint	WPMB-PID-014
14		HV-O530F	Manual Valve	Valve	WPMB-PID-014
15		PT-O530B	Differential Pressure Transmitter	Transmitter	WPMB-PID-014
16		HV-O530G	Manual Valve	Valve	WPMB-PID-014
17		BLW-O530A	Blower	Motor	WPMB-PID-014
18		CV-O530A	Check Valve	Valve	WPMB-PID-014
19		HV-O530H	Manual Valve	Valve	WPMB-PID-014

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.
20		AT-O530A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-014
21		SLR-O530A	Silensor	Silensor	WPMB-PID-014
22		HV-O530J	Manual Valve	Valve	WPMB-PID-014
Power Supply Unit Cooling Water #1					
1		FV-O310A	Solenoid Valve	Valve	WPMB-PID-019
2		TS-O310A	Temperature Switch	Switch	WPMB-PID-019
Power Supply Unit Cooling Water #2					
1		FV-O320A	Solenoid Valve	Valve	WPMB-PID-020
2		TS-O320A	Temperature Switch	Switch	WPMB-PID-020
Power Supply Unit Cooling Water #3					
1		FV-O330A	Solenoid Valve	Valve	WPMB-PID-021
2		TS-O330A	Temperature Switch	Switch	WPMB-PID-021
Residual Ozone Monitoring Panel #1					
1		HV-O221A	Manual Valve	Valve	WPMB-PID-022
2		FT-O220A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022
3		AT-O221A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022
4		HV-O221B	Manual Valve	Valve	WPMB-PID-022
5		HV-O226A	Manual Valve	Valve	WPMB-PID-022
6		FT-O225A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022
7		AT-O226A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022
8		HV-O226B	Manual Valve	Valve	WPMB-PID-022
Residual Ozone Monitoring Panel #2					
1		HV-O241A	Manual Valve	Valve	WPMB-PID-022
2		FT-O240A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022
3		AT-O241A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022
4		HV-O241B	Manual Valve	Valve	WPMB-PID-022
5		HV-O246A	Manual Valve	Valve	WPMB-PID-022
6		FT-O245A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022
7		AT-O246A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022
8		HV-O246B	Manual Valve	Valve	WPMB-PID-022



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FUJI OZONE SYSTEM SUBMITTAL

SPARE PARTS

Spare Parts List for Winnipeg Water Treatment Program

for Winnipeg Project (Project No. WPMB-1105)

Description	Quantity
Ozone Generator	
Dielectric Tube	3
Glass and Gasket for Sight Glass	1 set
Gasket for Generator Vessel	2 sets
Cleaning Dam	1
Cooling Water	
Gasket for Heat Exchanger Plate	7
Compression Bolt and Nut for H/E	2 sets
Mechanical Seal for Cooling Water Pump	3 sets
Power Supply Unit	
PSU Relay and Timer	1 (each size and type)
PSU Fuse and Light Bulb	2 sets
Control Transformer and Amplifier	1 (each size and type)
PSU Circuit Board	1 (field replaceable)
Ozone Destruct Unit	
Gasket for Ozone Destruct Vessel	1 set
Bearing for Blower	1 set
Spare Preheater	1
Fuse for Panel	1 set
Catalyst	3 full charge
Supplemental Air Supply System	
Air Compressor V-Belt	1
Air Intake Particulate Filter Element	2
Pre-Particulate Filter Element (by Desiccant)	1
Post Particulate Filter Element (by Desiccant)	1
Ozone Dissolution System	
Diffuser Assembly	6 sets
Gasket and Bolt	6 sets



Fuji Electric Corporation of America

Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

GOX SUPPLY SYSTEM

After the ambient air vaporizers and trim heaters, the liquefied oxygen becomes gaseous (GOX) and then it goes through Particulate Filter Unit which eliminates any particulates greater than 0.1 micron. The maximum design flow rate is 282 scfm (7.43 Nm³/min.) for two (2) generators. The line pressure will be reduced after the gas goes through the filter from 60 psig ~ 70 psig (413.7 kPa ~ 482.6 kPa) to 12 psig ~ 15 psig (82.7 kPa ~ 103.4 kPa) by using Pressure Regulating Valve.

The "dryness" of the GOX is very important for the equipment to operate properly and it is continuously monitored by the Dewpoint Monitor. Preferred dewpoint value is -76° F (-60° C) or lower and should be attained prior to energizing the ozone generator. The gas with higher dewpoint may reduce efficiency of the ozone generation.

In the event there is an oxygen leak in the pipeline, the ambient oxygen monitor will provide an alarm signal when the ambient oxygen concentration exceeds 23%.

WE SHOULD HAVE
A HIGH ALARM LEVEL
AND THEN A HIGH HIGH
NORMAL OXYGEN LEVEL
IS 20.8% SO AN
ALARM AT 22% AND
23% WOULD BE
OK.

Earth Tech (Canada) Inc.	
Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the client.	
Responsible for construction and coordination of field work. The contractor shall be responsible for all details of the work including the Contractor.	
REVIEWED	_____
REVIEWED AS MODIFIED	_____ ✓
REUSE AND RE-SUBMIT	_____
REVIEWED	_____
Project No.	79538-C14-16
Date	24/1/06
By:	<i>M. Pulso</i>



Fuji Electric Corporation of America

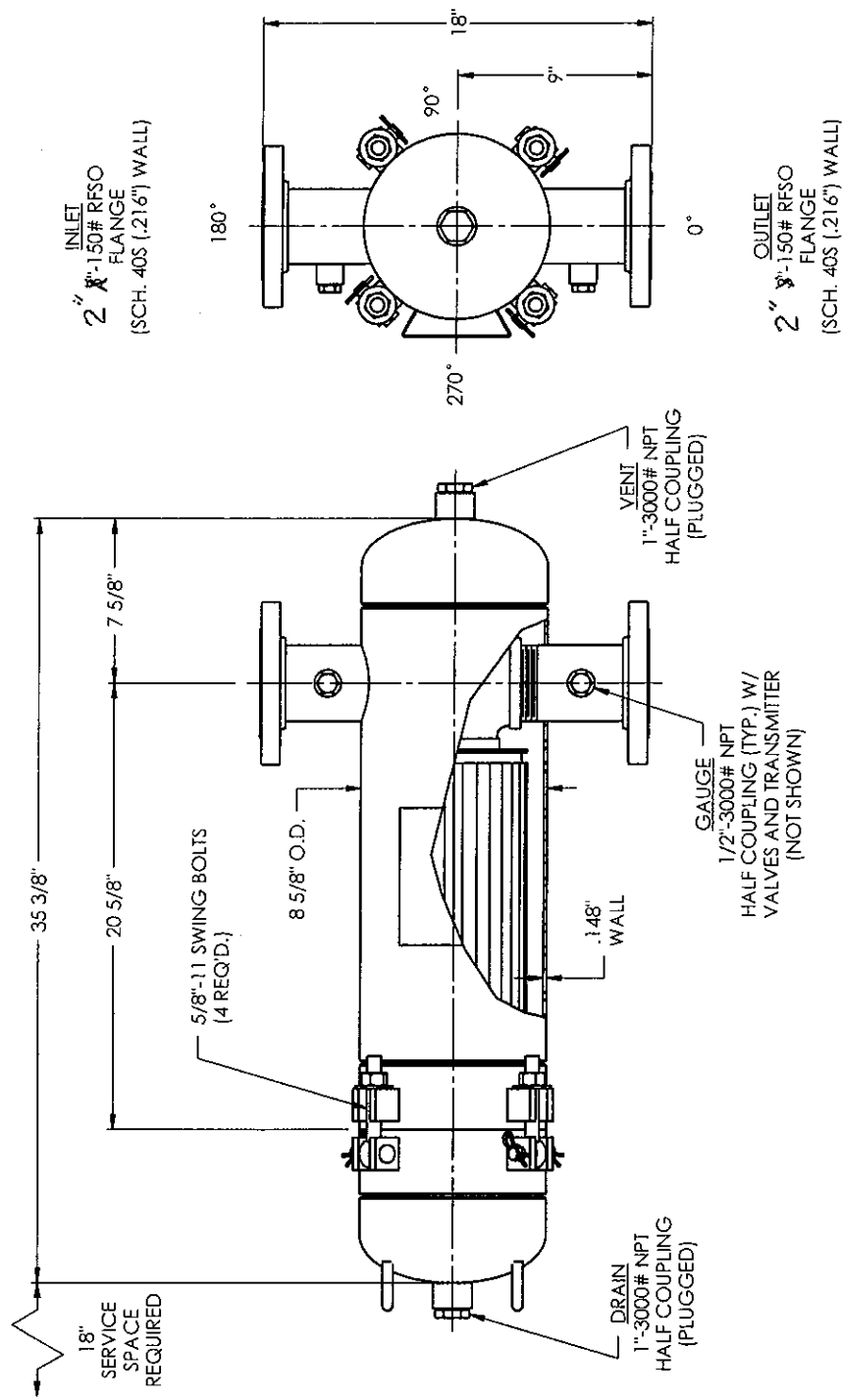
Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**


GOX SUPPLY SYSTEM

OXYGEN GAS PARTICULATE FILTER

MANUFACTURER : GRAVER TECHNOLOGIES
MODEL : YCP-120-020FL/0207-U
SERVICE : OXYGEN GAS
MATERIAL OF CONSTRUCTION
BODY : TYPE 316L STAINLESS STEEL
GASKET : TEFLON
CONNECTION : 2" (50 mm) CLASS 150# FLANGE
LINE SIZE : 2" (50 mm)
DESIGN PRESSURE : 150 PSIG (1.03 MPa) @ -150 ~ 115° F (-101 ~ 45° C)
OPERATING PRESSURE : 60 ~ 70 PSIG (413.7 ~ 482.6 kPa)
OPERATING FLOW : 180 SCFM (4.75 Nm³/min)
MAX. DESIGN FLOW : 423 SCFM (11.15 Nm³/min)
FILTER ELEMENT (SUITABLE FOR OXYGEN SERVICE - ONE ELEMENT PER HOUSING)
TYPE : PARTICULATE
EFFICIENCY : 98 % @ 0.1 MICRON AND 99.99 % @ 0.4 MICRON
PARTICLES
ELEMENT REMOVAL : TOP
ACCESSORIES : (2) 1/2" NPT (12.7 mm) VENT & DRAIN (PLUGGED)
SPECIAL REQUIREMENT : FILTER HOUSING AND ACCESSORIES TO BE CLEANED
AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 2
CUSTOMER TAG NO. : GF-O030A / GF-O031A



NOTES:
 DESIGNED, CONSTRUCTED, & STAMPED TO ASME SECTION VIII, DIVISION I, 2004 EDITION
 MATERIALS OF CONSTRUCTION: 316 S.S. W/ 304 S.S. SWING BOLTS, HEX NUTS, AND EXTERNAL ATTACHMENTS
 DESIGN PRESSURE: 150 PSIG
 DESIGN TEMPERATURE: -50°F TO 150°F
 WELDED TO: ASME SECTION IX
 FLANGE BOLT HOLES TO STRADDLE THE VESSEL CENTERLINES
 HYDROTEST TO: 195 PSIG
 CLEAN PER: CSC-004 (CLEAN FOR OXYGEN SERVICE)
 PAINT PER: NONE PROVIDED. EXTERNAL SURFACES TO BE GLASS-BEAD BLASTED.
 REPLACEMENT FILTER ELEMENT NO.: 23127 (1 REQ'D.)
 CLOSURE GASKET P/N: 6024TO2
 APPROX. WEIGHT: 105 LBS.

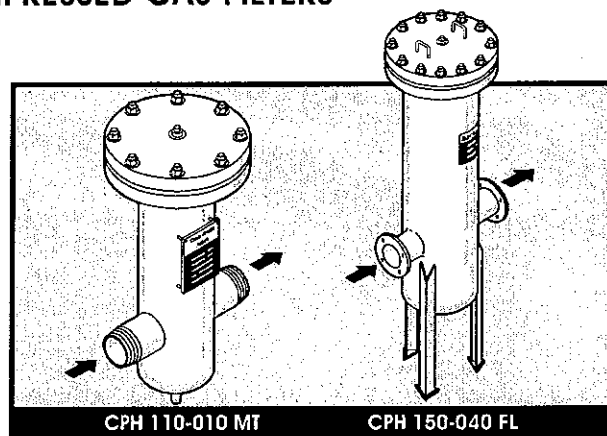
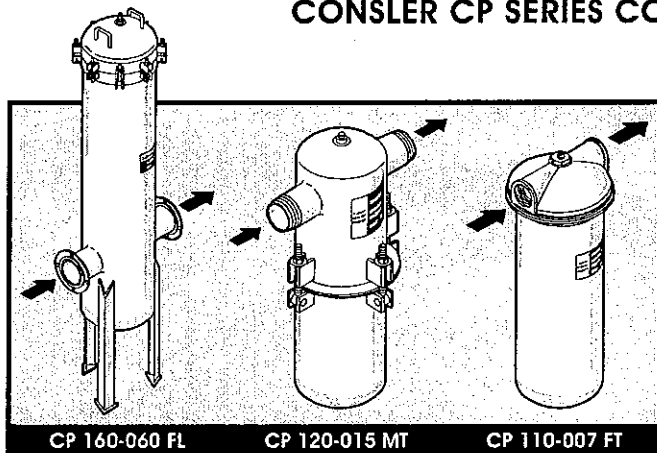
LTR	DESCRIPTION	DATE	APPRVD
ALL REVISIONS ARE TO BE MADE ON COMPUTER GRAPHICS SYSTEM NO MANUAL REVISIONS ALLOWED			
 Graver Technologies Convel Filtration Products 300 W. Main St., Hancock Falls, NY 14472 1-800-321-4789			
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES			
FRACTIONS ±1/4	TOLERANCES DECIMALS .XX ±.03 .XXX ±.010	ANGLES ±2	
APPROVED	R.W.	DATE	9/21/05
DRAWN BY	J.M.	DATE	9/19/05
SCALE			NONE
YCP 140-030FL/0207-U			
DRAWING NO.	B534686		REV.



Graver Technologies

CONSLER® FILTRATION PRODUCTS

CONSLER CP SERIES COMPRESSED GAS FILTERS



Features

- ASME Code designed and constructed
- Low pressure drop—low energy loss
- High flow rate capability
- Maximum filter area and dirt holding capacity
- Cleanable, reusable filter element
- In line connections
- Modified and custom designs available
- Design Pressures from 180 psi to 740 psi
- Contact Factory for higher pressure applications

Applications:

- Efficient removal of dust, dirt, pipescale, and other solid contaminants from compressed air and gas pipelines.
- Effective filtering of high pressure process gas streams to remove product or byproduct solids.
- Filtering of solid particles ranging from 0.3 to 750 microns.
- Positive protection of pneumatic controls, meters, and other pipeline equipment.
- Low pressure applications where pressure loss is critical.
- Filter efficiencies to 99.97 %.

Element Design & Construction

The CP Series filter offers a replaceable, cleanable element that incorporates a pleated or "radial fin" cartridge design. The element offers maximum filter area in a compact filter assembly, and provides positive gasket sealing to prevent by-pass of unfiltered gasses. Long filter life, low pressure drop, large dirt holding capacity and efficient filtration are assured. Most models employ only one filter element to permit quick and simple cartridge change out.

Standard models, CP 115 and larger, are furnished with a cleanable, sewn-end constructed element which can be reconditioned before replacement is necessary. Following several field cleanings this unique element style can be returned to the factory for recovery and reconditioning.

Element Materials

Standard elements are furnished with a polyester filter medium providing nominal efficiency on 10 micron solid particles. CP

Series elements are also supplied in many alternate materials offering a particle retention range from 0.3 to 750 microns. Optional filter materials available include nylon, fiberglass, cotton, polypropylene, NOMEX*, rayon, wool, DACRON*, TEFLON*, and wire cloth providing an application range from sub-zero temperatures to 1000°F.

Standard elements are furnished with a carbon steel center core and corrosion resistant steel support frame. 304 Stainless Steel and other materials are available.

Housing Design and Construction

Materials of construction include carbon steel, 304 and 316 Stainless Steel as well as other alloys. Housings are designed and constructed in accordance with ASME Code Section VIII, Division I requirements for unfired pressure vessels 5 1/4" diameter and above and are available with "U" Stamp registration and certification. Inlet/outlet connections are furnished in a horizontal in-line configuration. All models can be quickly serviced without breaking pipe connections.

Standard Model Features

- Leg Supports
 - CP 160 and larger
 - CPH 130 and Larger
 - CPHH 130 and larger
- Closure Assembly
 - CP 180 thru 200 – hinged closure assembly
 - CP 210 and larger – swing away cover devices
 - CPH 160 and larger – swing away cover devices
 - CPHH 150 and larger – swing away cover devices
- 1/4" NPT Gauge Connections on Inlet/Outlet Nozzles
 - CP 115 and larger
 - CPH 120 and larger
 - CPHH 120 and larger

* DuPont registered trademark

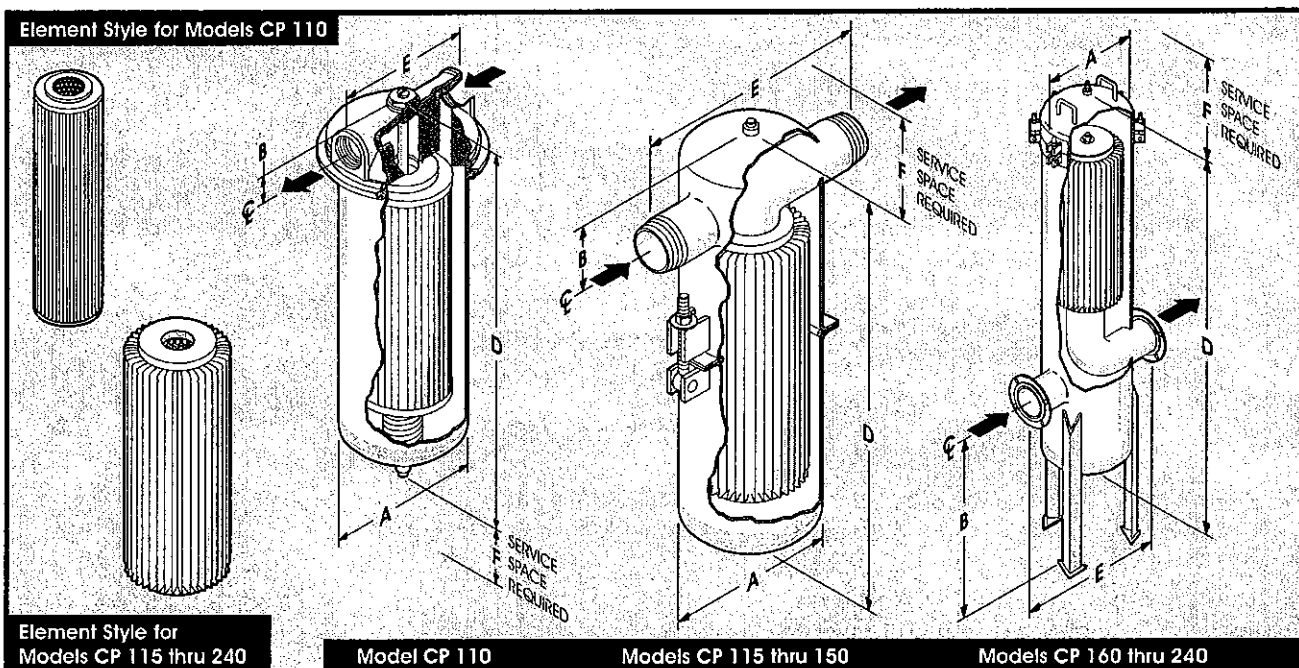
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CP Series Specifications

Model No.	Conn.		Dimensions-Inches ¹					Housing Gasket Part No.	Element			Approx. Weight Lbs.
	Size	Style	A	B	D	E	F		Part No.	No Req'd.	Total filter Area Sq. Ft.	
CP 110-005 FT	1/2	FPT	3 5/8	7/8	12 3/4	4 5/8	10 3/4	40313	10824K5	1	1.8	7
CP 110-007 FT	3/4	FPT	3 5/8	7/8	12 3/4	4 5/8	10 3/4	40313	10824K5	1	1.8	7
CP 110-010 FT	1	FPT	3 5/8	7/8	12 3/4	4 5/8	10 3/4	40313	10824K5	1	1.8	7
CP 115-015 MT	1 1/2	MPT	5 1/4	3	17	11	10	6003N04	19583K5 ²	1	2.2	20
CP 120-015 MT	1 1/2	MPT	6 1/4	3	19	12	12	6004N04	19584K5 ²	1	3.9	30
CP 130-020 MT	2	MPT	8 1/4	4 1/2	20	18	12	6005N04	19585K5 ²	1	6.6	45
CP 140-030 MT	3	MPT	8 1/4	4 1/2	27 1/4	18	17	6005N04	19586K5 ²	1	9.8	50
CP 150-040 MT	4	MPT	10 1/4	5 1/2	35 1/4	20	21	6006N04	19587K5 ²	1	15.4	80
CP 150-040 FL	4	FLG	10 1/4	5 1/2	35 1/4	20	21	6006N04	19587K5 ²	1	15.4	90
CP 160-060 FL	6	FLG	12 3/4	29 1/2	59	22 3/4	26	6007N03	19794K5 ²	2	33.5	330
CP 180-080 FL	8	FLG	16	31	77	26	26	6008N03	19571K5 ²	2	62.6	434
CP 190-100 FL	10	FLG	20	33 1/2	84	32	26	6009N03	19758K5	2	95.0	768
CP 200-120 FL	12	FLG	24	35 1/2	90	36	26	6010N03	19572K5	2	136.0	1025
CP 210-140 FL	14	FLG	28	37 1/2	93	44	26	6011N03	19759K5	2	223.0	1235
CP 220-160 FL	16	FLG	30	39	110	50	26	6012N03	19560K5	3	321.0	1610
CP 230-200 FL	20	FLG	36	43	132	54	26	6013N03	19761K5	3	442.0	2452
CP 240-240 FL	24	FLG	42	46	142	62	26	6017N03	19592K5	3	526.0	3344

1. All dimensions are approximate. 2. See optional elements, pg. 8.

- Standard filters are supplied with a 10 micron polyester filter medium (200° F) and a NEOPRENE* closure gasket (300° F). Contact your Conser representative for other available materials.
- Models CP 110 have a maximum design of 150 psig at 100° F.
- Models CP 115 thru 240 have 1/4" NPT plugged gauge connections.
- Models CP 115 thru 150 have 1/2" drain and vent connections.
- Models CP 160 thru 200 have 1" drain and vent connections.
- Model CP 160 has two (2) handles for closure removal. Models CP 180 thru 200 have a hinged closure with one (1) handle. Models CP 210 thru 240 have a swing away closure device and one (1) handle.
- Models CP 160 thru 200 have three (3) leg supports with a length of 18" from bottom of vessel to grade. CP 210 thru 240 have special vessel supports that are supplied to suit the application.
- Flanged end models have 150# ANSI, R.F.S.O. Flanges.



CP Flow Rate Capability Charts¹

Capacity (SCFM) vs. Differential Pressure (psi)
At 60° F—Specific Gravity 1.0 (Air)²

Inlet Press.	CP Model	Inches WC Δ p				psi Δ p			Inlet Press.	CP Model	Inches WC Δ p				psi Δ p		
		0.5"	1"	5"	10"	0.5	1	2			0.5"	1"	5"	10"	0.5	1	2
50 psig	110-005 FT	7.6	10	24	34	40	56	80	150 psig	110-005 FT	12	17	38	54	64	90	128
	110-007 FT	13	18	40	58	68	96	137		110-007 FT	21	28	66	92	110	155	220
	110-010 FT	22	32	74	100	118	168	240		110-010 FT	35	50	110	160	186	268	370
	115-015 MT	53	75	168	238	280	400	560		115-015 MT	84	120	265	374	440	630	890
	120-015 MT	53	75	168	238	280	400	560		120-015 MT	84	120	265	374	440	630	890
	130-020 MT	88	120	278	386	460	650	920		130-020 MT	138	195	440	615	730	1030	1440
	140-030 MT	200	280	630	890	1050	1450	2000		140-030 MT	318	440	1000	1420	1680	2380	3370
	150-040 MT	350	500	1120	1580	1875	2580	3420		150-040 MT	562	800	1800	2500	3000	4200	5950
	160-060 FL	920	1300	2920	4150	4900	6600	8700		160-060 FL	1390	1950	4400	6200	7400	10350	13890
	180-180 FL	1500	2100	4800	6800	8000	10700	14000		180-180 FL	2430	3400	7600	10700	12800	18000	25500
	190-100 FL	2280	3200	7100	10100	11950	16900	22000		190-100 FL	3590	5000	11400	15900	19000	27000	38000
	200-120 FL	3600	5000	11350	16000	19000	26500	37800		200-120 FL	5700	8000	18000	25500	30000	42400	58500
	210-140 FL	3800	5200	11700	16800	19800	28000	40000		210-140 FL	5980	8200	18900	27000	31800	44900	62000
	220-160 FL	5700	8000	18000	25500	30000	43000	61500		220-160 FL	9000	12800	29000	40000	48000	68000	95000
230-200 FL	9600	13700	30000	43500	51000	73000	104000	230-200 FL	15500	22000	49000	69500	81000	116000	162000		
240-240 FL	13700	19000	43000	60000	72000	102000	145000	240-240 FL	22000	31000	69000	98000	11500	164000	234000		
100 psig	110-005 FT	10	14	32	46	54	76	108									
	110-007 FT	17	24	54	76	90	128	180									
	110-010 FT	30	42	93	132	156	220	312									
	115-015 MT	70	100	224	320	370	530	740									
	120-015 MT	70	100	224	320	370	530	740									
	130-020 MT	114	160	358	510	600	850	1200									
	140-030 MT	268	380	840	1190	1400	2000	3100									
	150-040 MT	468	660	1490	2080	2480	3500	5200									
	160-060 FL	1140	1600	3600	5120	6000	8500	12000									
	180-180 FL	2000	2800	6300	9000	10550	15000	21600									
	190-100 FL	3000	4300	9600	13900	16000	22900	32000									
	200-120 FL	4780	6600	15000	21000	25000	35750	50500									
	210-140 FL	5000	7000	15800	22000	26000	37000	52200									
	220-160 FL	7400	10400	23600	33000	39000	55250	78000									
230-200 FL	12900	18000	40000	57500	68000	95000	135000										
240-240 FL	18000	26000	57000	80000	95000	136000	195000										

1. Values are based on actual test results or empirical calculations.
2. To determine proper filter sizing for gases other than air, multiply pressure drop by the correction factor for the appropriate gas from chart on back cover. For temperatures greater than 60° F, multiply pressure drop by the absolute temperature factor: $\frac{460 + (°F)}{520}$

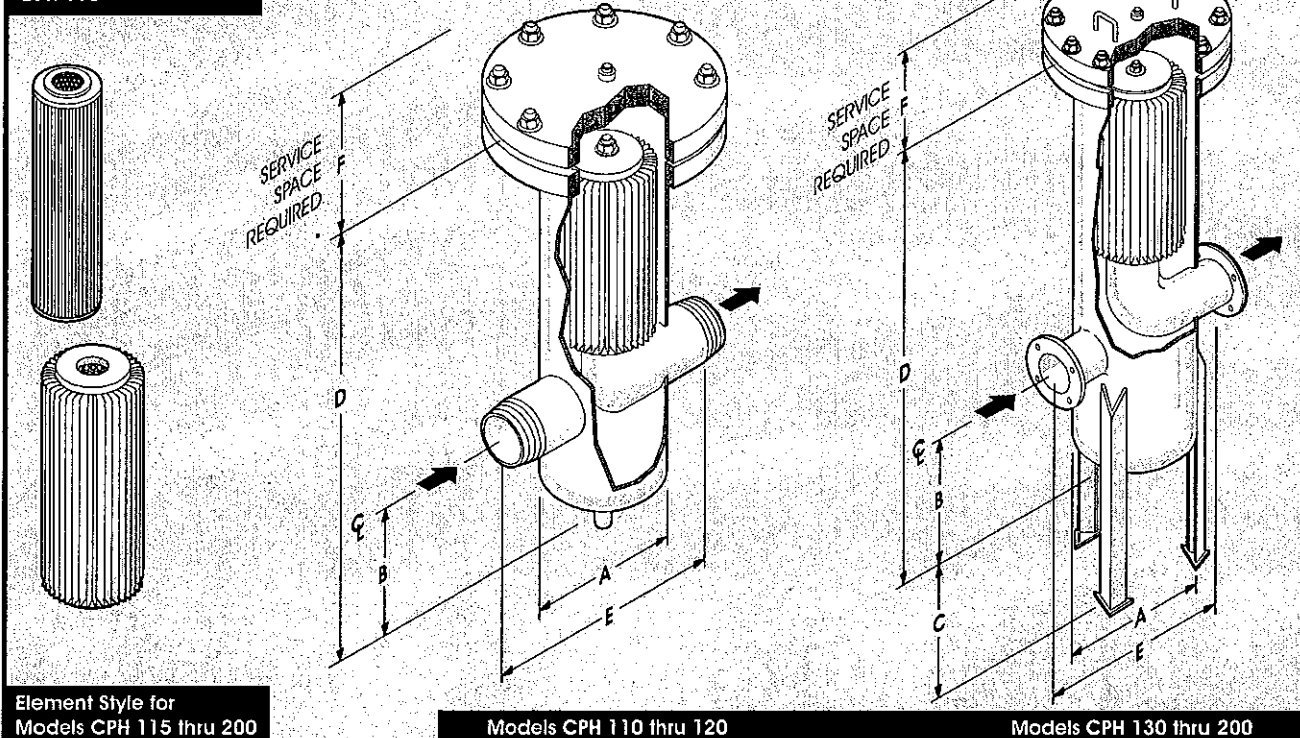
CPH Specifications

Model No.	Connection		Dimensions - Inches ¹					Housing Gasket Part No.	Element			Approx. Weight Lbs.
	Size	Style	A	B	D	E	F		Part No.	No Req'd.	Total filter Area Sq. Ft.	
CPH 110-005 MT	1/2	MPT	4 1/2	4	15 3/4	10	10	6015PSO	10824K5	1	1.8	55
CPH 110-007 MT	3/4	MPT	4 1/2	4	15 3/4	10	10	6015PSO	10824K5	1	1.8	55
CPH 110-010 MT	1	MPT	4 1/2	4	15 3/4	10	10	6015PSO	10824K5	1	1.8	55
CPH 120-015 MT	1 1/2	MPT	6 5/8	5 3/4	23 1/4	13 1/2	12	6016PSO	19583K5 ²	1	3.9	95
CPH 130-020 FL	2	FLG	8 5/8	7 1/4	23 1/4	18	12	6017PSO	19585K5 ²	1	6.3	180
CPH 140-030 FL	3	FLG	8 5/8	7 3/4	30 1/2	18	17	6017PSO	19586K5 ²	1	7.2	185
CPH 150-040 FL	4	FLG	10 3/4	9 1/4	37 3/4	20	21	6018PSO	19587K5 ²	1	12.7	300
CPH 160-060 FL	6	FLG	12 3/4	11 1/2	47	22 3/4	26	6019PSO	19794K5 ²	2	33.5	450
CPH 180-080 FL	8	FLG	16	13	77	26	26	6020PSO	19571K5 ²	2	62.6	880
CPH 190-100 FL	10	FLG	20	15 1/2	80	32	26	6021PSO	19758K5	2	95.0	1250
CPH 200-120 FL	12	FLG	24	17 1/2	86	36	26	6022PSO	19572K5	2	136.0	1725

1. All dimensions are approximate. 2. See optional elements, pg. 8.

- Standard filters are supplied with 10 micron polyester filter medium (200° F). Contact your Consler representative for other available materials.
- Models CPH 120 thru 200 have 1/4" NPT plugged gauge connections.
- Models CPH 110 thru 150 have 1/2" NPT plugged drain and vent connections.
- Models CPH 160 thru 200 have 1" NPT plugged drain and vent connections.
- Models CPH 130 thru 200 have three (3) leg supports with length of 18" from bottom of vessel to grade.
- Models CPH 130 thru 150 have two (2) handles for closure removal.
- Models CPH 160 thru 200 have a swing away davit device and one (1) handle.
- Flanged models have 150# ANSI, R.F. flanges.
- CPH Series standard gasket material is a CG style spiral wound, with 304 Stainless Steel compression ring and graphite filler.

Element Style for Models CPH 110



Element Style for Models CPH 115 thru 200

Models CPH 110 thru 120

Models CPH 130 thru 200

CPH Series Flow Capacities¹

Capacity (SCFM) vs. Differential Pressure (psi)
At 60° F—Specific Gravity 1.0 (Air)²

INLET PRESS	CPH MODEL	psi Δ p				
		0.25	0.5	1.0	2.0	3.0
200 psig	110-005 MT	52	74	104	146	178
	110-007 MT	88	124	175	246	305
	110-010 MT	152	215	300	420	520
	120-015 MT	360	510	710	1000	1220
	130-020 FL	590	840	1180	1660	2020
	140-030 FL	1400	1950	2750	3850	4700
	150-040 FL	2350	3350	4700	6600	8100
	160-060 FL	5200	7300	10200	14500	17700
	180-080 FL	8900	12600	17800	25000	30500
	190-100 FL	14500	20500	28800	40800	49000
200-120 FL	21500	30000	42000	60000	72000	

INLET PRESS	CPH MODEL	psi Δ p				
		0.25	0.5	1.0	2.0	3.0
250 psig	110-005 MT	58	82	115	162	200
	110-007 MT	98	138	195	276	335
	110-010 MT	168	238	332	470	570
	120-015 MT	400	560	800	1120	1380
	130-020 FL	660	930	1320	1850	2250
	140-030 FL	1530	2170	3050	4300	5200
	150-040 FL	2600	3700	5200	7300	8900
	160-060 FL	5700	8000	11200	15800	19200
	180-080 FL	9900	14000	19500	27500	34000
	190-100 FL	16000	22800	32000	45000	54800
200-120 FL	23800	33500	47000	66000	80000	

1. Values are based on actual test data or empirical calculations.

2. To determine proper filter sizing for gases other than air, multiply pressure drop by the correction factor for the appropriate gas from chart on back cover. For temperatures greater than 60° F, multiply pressure drop by the absolute temperature factor:

$$\frac{460 + (^{\circ}\text{F})}{520}$$

3. For inlet pressures less than 200 PSIG, refer to previous flow charts

(Continued from page 1)

For model CP 120 a less expensive V-band closure is available in place of the standard swing bolt style. The V-band makes the filters lighter in weight and quicker to service. The optional V-band is not suitable for applications requiring vessels built to ASME code requirements. All models provide a large volume sump area for collection of contaminants below the filter element.

Standard filter housing may also be modified and customized to meet unique or special applications needs. Typical design modifications include:

- Special leg lengths and skirts
- End connection types
- Inlet/Outlet orientations
- Horizontal vessel designs
- Cover lifting devices
- Special controls and accessories.

Filter Materials and Ratings

- Housings – Carbon Steel Standard
Available: 304SS, 316SS, 316LSS, Hastelloy

- Pressure/Temperature Ratings

CP Series

- CP 110: 150 psig at 100° F max.
- CP 115 & larger, threaded connections: 180 psig at 650° F max.
- CP 115 & larger, flanged connections: 180 psig at 466° F max.

CPH Series

All models: 285 psig at 100° F max.

CPHH Series

All models: 740 psig at 100° F max.

- Closure Gasket

CP Series: NEOPRENE, 300° F max.

CPH Series: spiral wound, 650° F max.

CPHH Series: spiral wound, 650° F max.

- Standard Element - "K5"

CP Series

CP 110: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable.

CP 115 & larger: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable and recoverable.

CPH Series

CP 110: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable.

CP 120 & larger: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable and recoverable.

CPHH Series

CP 110: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable.

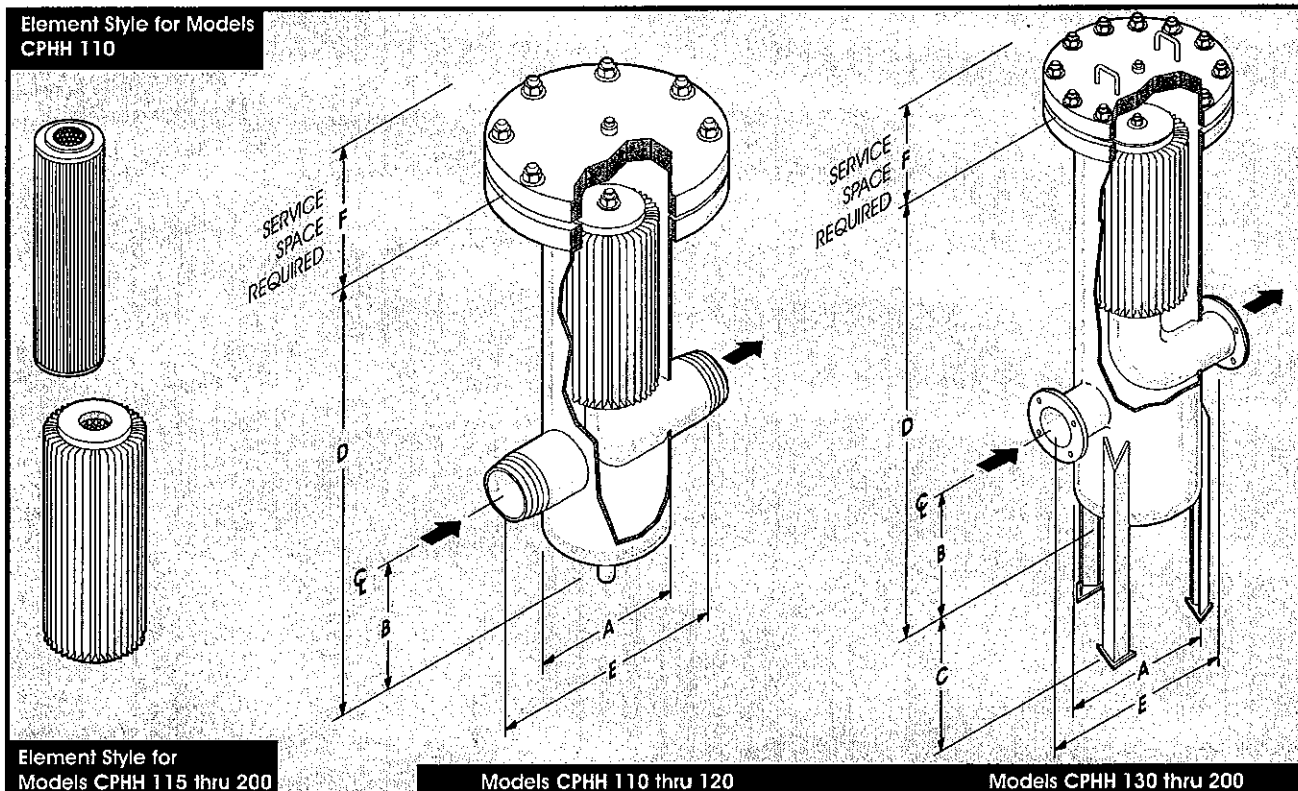
CP 120 & larger: Polyester media, wool gaskets; 10 micron nominal retention, 200° F max.; cleanable and recoverable.

CPHH Series Specifications

Model No.	Conn.		Dimensions-Inches ¹					Housing Gasket Part No.	Element			Approx. Weight Lbs.
	Size	Style	A	B	D	E	F		Part No.	No Req'd.	Total filter Area Sq. Ft.	
CPHH 110-005 MT	1/2	MPT	4 1/2	4	15 3/4	10	10	6034PSO	10824K5	1	1.8	75
CPHH 110-007 MT	3/4	MPT	4 1/2	4	15 3/4	10	10	6034PSO	10824K5	1	1.8	75
CPHH 110-010 MT	1	MPT	4 1/2	4	15 3/4	10	10	6034PSO	10824K5	1	1.8	75
CPHH 120-015 MT	1 1/2	MPT	6 5/8	5 3/4	23 1/4	13 1/2	12	6035PSO	19584K5 ²	1	3.9	130
CPHH 130-020 FL	2	FLG	8 5/8	7 1/4	23 1/4	18	12	6036PSO	19585K5 ²	1	6.6	270
CPHH 140-030 FL	3	FLG	8 5/8	7 3/4	30 1/2	18	17	6036PSO	19586K5 ²	1	9.8	290
CPHH 150-040 FL	4	FLG	10 3/4	9 1/4	37 3/4	20	21	6037PSO	19587K5 ²	1	15.4	475
CPHH 160-060 FL	6	FLG	12 3/4	11 1/2	47	22 3/4	26	6038PSO	19794K5 ²	2	33.5	800
CPHH 180-080 FL	8	FLG	16	13	77	26	26	6039PSQ	19571K5 ²	2	62.6	1490
CPHH 190-100 FL	10	FLG	20	15 1/2	80	32	26	6040PSO	19758K5	2	95.0	2250
CPHH 200-120 FL	12	FLG	24	17 1/2	86	36	27	6041PSO	19572K5	2	136.0	3405

1. All dimensions are approximate. 2. See optional elements, pg. 8.

- Standard filters are supplied with 10 micron polyester filter medium. Contact your Consler representative for other available materials.
- Models CPHH 120 thru 200 have 1/4" NPT plugged gauge connections.
- Models CPHH 110 thru 150 have 1/2" NPT plugged drain and vent connections.
- Models CPHH 160 thru 200 have 1" NPT plugged drain and vent connections.
- Models CPHH 130 thru 190 have three (3) leg supports with length of 18" from bottom of vessel to grade.
- Model CPHH 200 has four (4) leg supports with length of 18" from bottom of vessel to grade.
- Models CPHH 120 thru 140 have two (2) handles for closure removal.
- Models CPHH 150 thru 200 have a swing away davit device and one (1) handle.
- Flanged models have 300# ANSI, R.F. flanges.
- Models CPHH 110 thru 120 available with flanges.
- CPHH Series standard gasket material is a CG style spiral wound, with 304 Stainless Steel compression ring and graphite filler.



Element Style for Models CPHH 110

Element Style for Models CPHH 115 thru 200

Models CPHH 110 thru 120

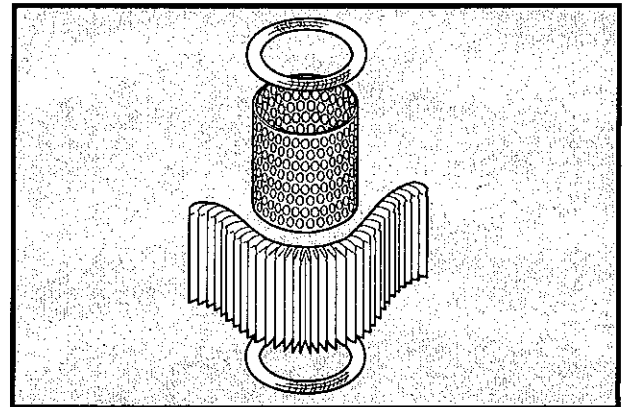
Models CPHH 130 thru 200

CPHH Flow Rate Capability Charts¹

Capacity (SCFM) vs. Differential Pressure (psi)
At 60° F-Specific Gravity 1.0 (Air)²

Inlet Press	CPHH Model	psi Δ p						Inlet Press	CPHH Model	psi Δ p					
		0.5	1.0	2.0	3.0	4.0	5.0			0.5	1.0	2.0	3.0	4.0	5.0
300 psig	110-005 MT	90	128	180	220	255	285	600 psig	110-005 MT	123	175	250	305	350	390
	110-007 MT	152	218	305	380	430	480		110-007 MT	205	290	410	500	580	650
	110-010 MT	265	375	530	650	750	840		110-010 MT	355	500	710	860	1000	1110
	120-015 MT	620	880	1240	1520	1750	1950		120-015 MT	840	1180	1680	2050	2380	2650
	130-020 MT	1010	1450	2050	2500	2900	3200		130-020 MT	1400	2000	2800	3430	3980	4400
	140-030 MT	2380	3350	4780	5800	6700	7500		140-030 MT	3250	4600	6460	7900	9200	10200
	150-040 MT	3640	5150	7300	8900	10300	11400		150-040 MT	5060	7100	10200	12400	13400	16000
	160-060 MT	7980	11200	15900	19500	22500	25000		160-060 MT	10900	15500	22000	27000	31000	34600
	180-080 MT	14500	21000	29300	36000	41800	46200		180-080 MT	20200	28700	40800	50000	58000	64200
	190-100 MT	22000	31000	44000	54000	62000	69000		190-100 MT	31000	43800	62000	76000	88000	98000
200-120 MT	32000	46000	64000	78000	91000	101000	200-120 MT	45000	64000	90000	110000	127000	142000		
400 psig	110-005 MT	103	145	205	250	290	325	720 psig	110-005 MT	138	192	272	335	385	430
	110-007 MT	175	250	350	430	500	560		110-007 MT	230	325	460	560	660	730
	110-010 MT	295	420	590	720	840	950		110-010 MT	400	570	810	1000	1150	1280
	120-015 MT	700	990	1400	1720	2000	2200		120-015 MT	940	1320	1880	2300	2650	2950
	130-020 MT	1150	1620	2300	2800	3270	3650		130-020 MT	1550	2200	3130	3850	4450	4900
	140-030 MT	2700	3800	5400	6600	7600	8500		140-030 MT	3640	5150	7300	8900	10300	11400
	150-040 MT	4100	5830	8270	10100	11700	13000		150-040 MT	5500	7760	11000	13500	15600	17400
	160-060 MT	8980	12700	18000	22000	25500	28300		160-060 MT	12200	17200	24500	29800	34200	38300
	180-080 MT	17000	24000	33800	41600	48000	53000		180-080 MT	22500	32000	45700	55800	64000	71800
	190-100 MT	25200	36000	50500	62000	72000	80000		190-100 MT	33800	48000	67500	82000	95000	106000
200-120 MT	37000	52000	74000	90000	105000	116000	200-120 MT	49000	70000	100000	120000	140000	155000		
500 psig	110-005 MT	113	160	228	280	320	360								
	110-007 MT	188	270	385	470	540	600								
	110-010 MT	325	460	660	800	930	1030								
	120-015 MT	770	1100	1550	1900	2200	2450								
	130-020 MT	1280	1820	2580	3200	3680	4100								
	140-030 MT	3000	4220	6000	7400	8500	9500								
	150-040 MT	4600	6500	9100	11200	12900	14400								
	160-060 MT	10000	14200	20200	24700	28500	32000								
	180-080 MT	19000	27000	38000	46200	54000	60000								
	190-100 MT	28000	39500	56000	68000	79000	88000								
200-120 MT	41000	58000	82000	100000	11500	130000									

1. Values are based on actual test data or empirical calculations.
2. To determine proper filter sizing for gases other than air, multiply pressure drop by the correction factor for the appropriate gas from chart on back cover. For temperatures greater than 60° F, multiply pressure drop by the absolute temperature factor: $\frac{460 + (°F)}{520}$



Consler Recovery Service

Consler Filtration Products provides a factory Recovery Service that will extend the life of a filter element, saving the user up to 65% of the cost of a new element.

Most standard vessels are equipped with a cleanable sewn-end element. After several cleanings in the field, used elements can be returned to the factory for recovery. The element frame is stripped of its filter medium, cleaned, inspected for mechanical integrity, and repaired if necessary. The element frame is then covered with new filter media identical to the original, and promptly returned to the user. It is essentially the same as a new filter element. For details, contact your Consler representative or Consler Filtration Products.

△ P Correction Factors

(Specific Gravity Relative to Air)

Gas	Chem. Formula	Molecular Weight	△ P Correction Factor
Acetylene	C ₂ H ₂	26.00	0.897
Air	---	28.96	1.000
Ammonia	NH ₃	17.03	0.587
Argon	A	39.94	1.377
Bromine	Br ₂	159.83	5.519
Butane	C ₄ H ₁₀	58.12	2.007
Carbon Dioxide	CO ₂	44.01	1.520
Chlorine	Cl ₂	70.91	2.446
Ethane	C ₂ H ₆	30.07	1.039
Ethylene	C ₂ H ₄	28.05	0.967
Fluorine	F ₂	38.00	1.312
Helium	He	4.00	0.138
Hydrogen	H ₂	2.02	0.069
Methane	CH ₄	16.04	0.554
Natural Gas	---	---	0.610
Nitrogen	N ₂	28.02	0.967
Oxygen	O ₂	32.00	1.103
Propane	C ₃ H ₈	44.10	1.523
Propylene	C ₃ H ₆	42.08	1.453
Sulfur Dioxide	SO ₂	64.07	2.208
Vinyl Chloride	CH ₂ CHCl	62.50	2.158

(Reference: Mechanical Engineers' Handbook by L.S. Marks, copyright May 1954; McGraw-Hill Book Co., Inc.)
For correction factors for gases other than those listed above, contact Consler.

Optional Molded End Elements

Less expensive PVC molded-end style elements may be substituted for the standard sewn-end elements for some applications. Principal use would be for air, nitrogen, carbon dioxide or natural gas service, at temperatures from -20° F to 200° F. Molded elements should not be used in oxygen or hazardous applications, and they are not recoverable.

Graver Technologies also manufactures these types of Consler brand filtration products:

- Air Intake Filters
- Air Intake Filter/Silencers
- Air/Gas Pressure Filters
- Vacuum Filters
- Liquid Filters/Strainers
- Smoke/Oil Mist Eliminators
- Filter Separators (Pressure Service)
- Special and Custom-Designed Filters and Filter Elements
- Lube Oil Filters and Filter Elements

Graver Technologies has representatives in major cities of the United States, Mexico and Canada. Representatives are also located in many countries around the world.

Graver's manufacturing plant is located in Honeoye Falls, NY. Consler is a registered trade mark of Graver Technologies.

For more detailed information about Consler brand filters, contact your Consler representative or Graver Technologies. Graver has a policy of continued product improvement and reserves the right to change specifications without notice.

Visit our web site at www.gravertech.com



Graver Technologies

Industrial Filtration Products 300 West Main St. Honeoye Falls, NY 14472
800-321-4789 585-624-1330 Fax 585-624-1205





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

DIFFERENTIAL PRESSURE INDICATOR/TRANSMITTER

MANUFACTURER : ORANGE RESEARCH
 MODEL : 1833DGT-1-C-2.5-B-T1-0-50" W.C.
 SERVICE : OXYGEN GAS PRESSURE DROP ACROSS PARTICULATE
 FILTER
 RANGE : 0 ~ 50" W.C. (0 ~ 1,270 mm W.C.) DIFFERENTIAL
 DIAL SIZE : 2 1/2" (64 mm)
 ACCURACY : ± 2 % OF FULL SCALE
 MATERIAL
 BODY : TYPE 316 STAINLESS STEEL
 SEAL : VITON
 CONNECTION : 1/4" (6.35 mm) NPT
 OUTPUT : 4 ~ 20 mA
 CERTIFICATION : NEMA 4X
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
 QUANTITY : 2 (1 PER PARTICULATE FILTER)
 TAG NO. :

CUSTOMER TAG NO. :

PT-0030A / PTO031A
Earth Tech (Canada) Inc.

*PLEASE PROVIDE
A SUITABLE ROSEMOUNT
MODEL AS PER
SPECIFICATION.*

Reviewed for general compliance with design intent.
Responsibility for design is retained in the shop drawings
submitted to the contractor.

esigment, and any other information or correlation of field
measurements to the design. The contractor is responsible for
verification of all dimensions and conditions of all
parts of the work with the contractor.

REVIEWED _____

APPROVED AS NOTED _____

DATE AND RE-SUBMIT _____ ✓

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 24/1/06

By: [Signature]

INSTRUCTIONS

Series 1833

DIFFERENTIAL PRESSURE INSTRUMENTS

Your new Orange Research Differential Pressure Instrument is a rugged instrument featuring simplicity of design to provide dependable and efficient service. Because it is an instrument it should be handled with care. Read all instructions carefully before attempting to install the instrument.

CAUTION: Do not exceed nameplate maximum operating pressure. Use only fluids compatible with wetted parts.

HOW IT WORKS

The instrument operates on the difference between two pressures (delta-P). The sensing element is a spring biased diaphragm which moves linearly in proportion to the difference between two basic pressures. A magnet on the LO pressure side of the piston assembly moves with the diaphragm and rotates a follower magnet located adjacent to the pressure cavity. The gauge pointer is located at the end of the rotary magnet shaft and rotates with the magnet to provide gauge readings proportional to differential pressure variations. There are no mechanical seals between the pressure side of the instrument and the gauge mechanism side. This is accomplished by coupling the forces between two adjacent magnets through a solid wall.

Note: This instrument will provide $\pm 2\%$ accuracy full scale.

INSTALLATION

Check instrument & identify **HI** and **LO** markings. **HI** identifies the high pressure port; **LO** the low pressure port. If instrument is installed backwards, it will neither operate nor be damaged. Reverse connections if installed backwards. The instrument can be line mounted, bracket mounted or panel mounted depending upon the model purchased.

Under normal conditions Series 1833 instruments are designed for line pressure to 150 psig (for S.S. models & 100 psig for alum. models) and can sustain a continuous forward or reverse overpressure equal to the line pressure.

It's recommended that the instrument be located above the pressure source to allow drainage of the unit.

IMPORTANT: Because of the magnetic movement, this instrument should never be mounted in direct contact with a steel surface. Otherwise a calibration shift will occur. Mount the instrument so that the pressure body is at least 1" away from metal surfaces with non-magnetic spacers or an aluminum-mounting bracket. Flush panel mounted instruments will not be affected by contact with aluminum panels. However, 2" and 2½" gauges flush mounted in a steel panel may require resetting of the pointer at zero. (this should be done at time of manufacture but can be reset in the field with a small loss of accuracy.)

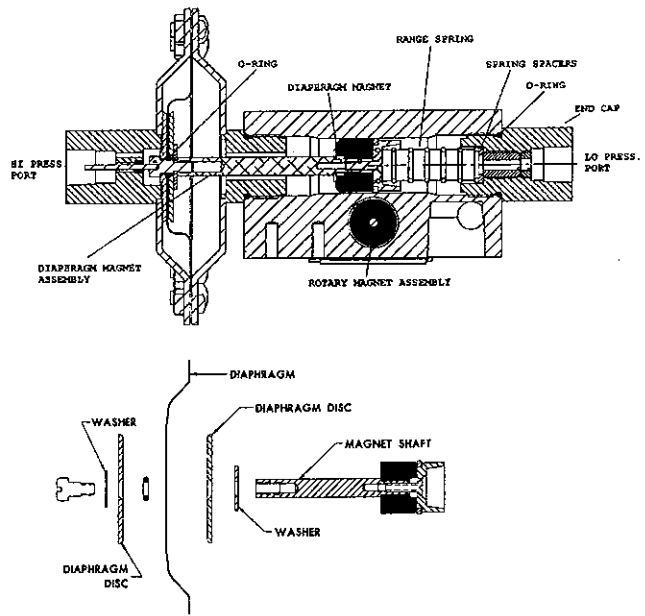
MAINTENANCE

Other than replacing broken lens there is only one area where this instrument may need attention. Erratic pointer or switch action may indicate that cleaning is required. For cleaning:



Orange Research Inc.

140 Cascade Boulevard, Milford, Connecticut 06460
203 877-5657 800 989-5657 Fax: 203 783-9546
www.orangeresearch.com



1. Remove the unit from service.
2. Remove the low pressure end cap with a 1" spanner wrench.
3. Remove the range spring and the spacers at the bottom of the spring pocket. **BE CAREFUL NOT TO LOSE STACKING SPACERS, IF ANY.**
4. Remove the 16 #10-32 pan head screws and separate the body parts. Remove the diaphragm assembly.
5. To replace the diaphragm, remove the screw at the top of the diaphragm disc to separate the assembly. **NOTE:** Do not remove the screw in the magnet assembly.
6. Clean parts in a solvent solution after removing the "o"-ring seals since some solvents will attack the seal material.

To reassemble:

1. Place washer & diaphragm disc on shoulder screw with the chamfer facing away from screw head. Place new diaphragm over screw with the convolution of the diaphragm oriented as shown. Place the "o"-ring in the center of the diaphragm. Place the second disc over diaphragm so that center chamfer faces the diaphragm "o"-ring.
2. Place the 2nd washer over the end of the shoulder screw and tighten to finish assembly.
3. Place the diaphragm assembly back into the diaphragm pocket with the magnet end of the assembly at the **LO** pressure side.
4. Reassemble both body parts with the 16 #10-32 pan head screws.
5. Insert the spacers and the range spring into the spring pocket of the end cap. While holding the instrument with the low pressure port down, insert the end cap back into the low pressure side of the body.
6. Tighten the **LO** end cap and the instrument is now ready for service.

SWITCH UNITS: On switch and indicating switch models, reed switches are located adjacent to the pressure chamber and are actuated when the diaphragm magnet field interacts at a preset

point with the reed switch armature. Reed switch set points are adjustable.

LENS REPLACEMENT: To replace a broken lens, check to see if the lens is held on by a bezel or a snap-ring. To remove a bezel, which is a pressed on cover, either twist off by hand (watch out for the broken glass) or pry off with a screwdriver. To remove a snap-ring, pry out the ring with a small screwdriver. Remove all glass chips, insert new lens and re-insert the bezel or snap. With snap-rings, locate the ring joint at the bottom of the gauge.

POINTER REPLACEMENT: (Probably damaged when lens was broken). Remove bezel or snap-ring as previously described and clean out glass chips. Remove old pointer with pointer puller or two small screwdrivers opposite each other under pointer hub. Pry off evenly being careful not to bend the pointer shaft. Install new pointer dead on zero. Re-install lens, as described under lens replacement.

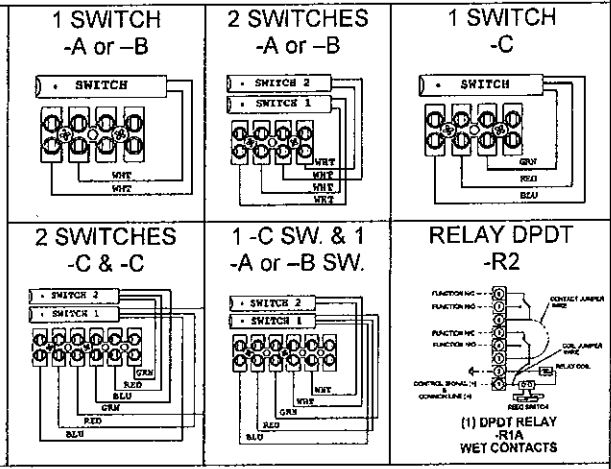
SWITCH ADJUSTMENT

Reed switch set points are field adjustable. On Indicating Switches, the reed switches can be adjusted over the top 80% of the gauge range. On Switch models the reed switches can be adjusted over the range shown on the nameplates.

To change the reed switch setting, a source of pressure will be needed with the instrument. Remove the switch enclosure and loosen the set screw on the switch bracket. To increase the set point, slide the switch tube toward the LO port. To decrease the set point, slide the switch tube toward the HI port. Repeat as required until new setting is reached. Recheck the new actuation point. Re-tighten set screw.

SWITCH WIRE COLOR

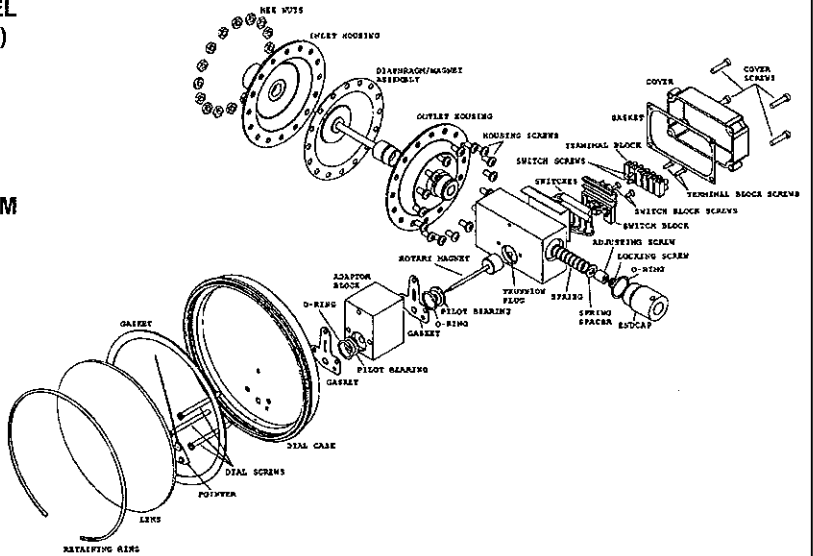
- A SPST white and white
- B SPST green(N/C); blue(common)
- C SPDT green(N/C); red(N/O); blue(common)



REPLACEMENT PARTS

GAUGE DIA.	GLASS LENS	PLASTIC LENS	POINTER	SST BEZEL (press-fit)
2"	GG1-1	GG2-1	AF15-1	M1-5
2 1/2"	GG1-2	GG2-2	AF15-2	M2-5
3 1/2"	GG1-3	GG2-3	AF15-3	M4-5
4 1/2"	GG1-4	GG2-4	AF15-4	M5-5
6"	GG1-5	GG2-5	AF15-5	---

	END CAP "O"-RING	DIAPHRAGM "O"-RING	DIAPHRAGM
Buna N	BB1-1A	BB1-11A	AE7-A
Viton	BB1-1B	BB1-11B	AE7-B
Teflon	BB1-1F	BB1-11F	---
EPDM	BB1-1E	BB1-11E	AE7-F
Fluorosilicone	BB1-1C	BB1-11C	AE7-C



RECALIBRATION

Recalibration of this instrument is not required. However, if the range spring is damaged or a new dial is required, the instrument must be returned to the factory for the parts and recalibration.

NOTE: When ordering replacement parts, identify instrument SO# or WO# from the nameplate. Identify parts required and quantity.



Product specifications for model 1833

Product Specifications, with reed switches or relays

sensor type	diaphragm
functions	gauge/switch, switch
min. range	0-5 in. H ₂ O
max. range	0-8 psid (221.44 in. H ₂ O)
max. line pressure	100 psig for aluminum units, 150 psig for stainless steel units
min. burst pressure	200 psig (alum), 250 psig (SS); tested hydrostatically
standard maximum temperature	gauge: 200°F standard, 150°F (plastic lens) gauge/switch: 176°F standard, 150°F (plastic lens) switch: 176°F standard, 140°F relay
high temp. construction	N/A
minimum temperature	-40°F
calibration accuracy**	±2% of full scale ascending after rap at room temperature <i>**Calibration accuracy is affected by temperature, and also by liquid-filling and follower-pointer options.</i>
repeatability	±1% of full scale
switches/relay	1 or 2 hermetically sealed reed switches or 1 relay in weatherproof enclosure
switch adjustability	upper 80% of full scale ascending (70% for B & C form switches in SST)
switch dead band	5-20% full scale
certification	CSA Class I, DIV. 2, Groups A, B, C & D; Class II, DIV. 2, Groups F & G (File 152872) (switches only) NEMA 4X, IP65, CE

Standard configuration options, with reed switches or relays

configuration	unless otherwise specified	standard options available
porting size	1/4" NPT	1/8" NPT, 1/2" NPT
porting orientation	in-line	N/A
direction of pressure	left to right	right to left (reverse porting)
calibration medium	air	N/A
switches & relays	(must be specified)	-A SPST N/O (120VAC, 0.7A, 70VA; 200VDC, 1.0A, 50W) -B SPST N/C (120VAC, 0.25A, 5VA; 175VDC, 0.25A, 5W) -C SPDT (120VAC, 0.25A, 5VA; 175VDC, 0.25A, 5W) -R2 DPDT relay (contacts: 120VAC, 28VDC, 10A coil: 6 to 240VAC, 6 to 110VDC)
switch/relay setting	set at top of range ascending	other set points within adjustability ascending or descending
primary wetted parts	(must be specified)	aluminum, 316SS
secondary wetted parts	range spring: 302SS magnet: ceramic	Teflon-coated spring and magnet
static seals	buna-N, except Viton for high temp.	Viton, Teflon, EPDM, fluorosilicone, silicone
diaphragm	buna-N, except Viton for high temp.	Viton, EPDM, fluorosilicone, silicone
lens	glass	plastic
dial sizes	(must be specified)	3.5", 4.5", 6"
dial case styles*	(must be specified)	"B" Basic Case (c-clamp not available) "F" Flanged Case (w/holes for panel mounting)
starting mark on dial	approximately 10% of full scale	N/A



Product specifications for model 1833

Product Specifications, with transducer

sensor type	diaphragm
functions	gauge/transducer, transducer
min. range	0-5 in. H ₂ O
max. range	0-8 psid (221.44 in. H ₂ O)
max. line pressure	100 psig for aluminum units, 150 psig for stainless steel units
min. burst pressure	200 psig (alum), 250 psig (SS); tested hydrostatically
standard maximum temperature	gauge/transducer: 200°F standard, 150°F (plastic lens) transducer: 200°F
high temp. construction	N/A
minimum temperature	32°F
calibration accuracy**	±3 of full scale ascending after rap at room temperature <i>**Calibration accuracy is compensated for temperature effects between 32°F - 200°F</i>
repeatability	±2% of full scale
transducer enclosure	weatherproof
relay adjustability	upper 90% of full range ascending, or lower 90% of full range descending
relay dead band***	***Consult Factory
certification	NEMA 4X, IP65

Standard configuration options, with transducer

configuration	unless otherwise specified	standard options available
porting size	1/4" NPT	1/8" NPT, 1/2" NPT
porting orientation	in-line	N/A
direction of pressure	left to right	right to left (upside down orientation with arc on bottom)
calibration medium	air	N/A
relays	2 SPDT relays: 2A/30W/60VDC 2A/60VA/120VAC	N/A
electronic outputs	analog outputs: 0-5 VDC 4-20 mA 0-1000 Hz digital outputs: RS232 formatted to full range	analog outputs: 1-5 VDC digital outputs: RS 232 customized
primary wetted parts	(must be specified)	aluminum, 316SS
secondary wetted parts	range spring: 302SS magnet: ceramic	Teflon-coated spring and magnet
static seals	buna-N	Viton, Teflon, EPDM, fluorosilicone, silicone
diaphragm	buna-N	Viton, EPDM, fluorosilicone, silicone
lens	glass	plastic
dial sizes	(must be specified)	3.5", 4.5", 6"
dial case styles†	(must be specified)	"B" Basic Case (c-clamp not available) "F" Flanged Case (w/holes for panel mounting)
starting mark on dial	approximately 10% of full scale	N/A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

BALL VALVE (FOR INSTRUMENT ISOLATION)

MANUFACTURER : APOLLO
MODEL : 76-101-57
SERVICE : INSTRUMENT ISOLATION
CONNECTION : 1/4" (6.35 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
QUANTITY : 4 (2 PER PARTICULATE FILTER)
CUSTOMER TAG NO. : HV-0030C / HV-0030D
 HV-0031C / HV-0031D

Apollo 76-100 Series

Stainless Steel Ball Valve

Threaded, 1/4" to 1" 2000 psig WOG, 1-1/4" to 2" 1500 psig WOG, 2-1/2" to 3" 1000 psig WOG. (See referenced P/T chart)
Cold Non-Shock. 150 psig Saturated Steam, Vacuum Service to 29 inches Hg.

Federal Specification: WW-V-35C, Type: II, Composition: SS, Style: 3.

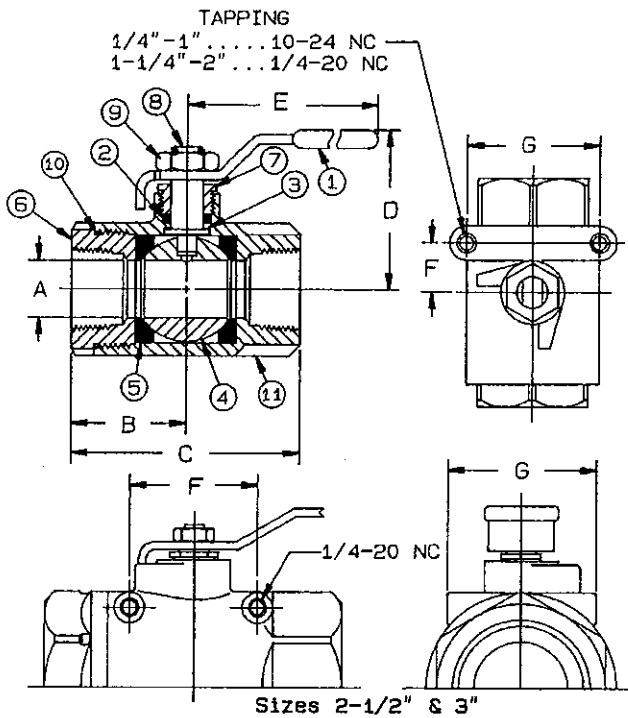
MSS SP-110; Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

FEATURES

- Investment cast components
- RPTFE seats and stuffing box ring
- Mounting pad for easy actuator mounting
- Blow-out-proof stem design
- Adjustable packing gland
- Meets NACE MR-01-75
- SS lever and nut
- (-24) 1/4" to 2" Certified to API 607, 4th Edition, Class 600 burn

STANDARD MATERIAL LIST

1. Lever and grip	304 SS w/vinyl	7. Gland nut	A276-316
2. Stem packing	RPTFE	8. Stem	A276-316
3. Stem bearing	RPTFE	9. Lever nut	18-8 SS
4. Ball	A276-316	10. Body seal	PTFE
5. Seat (2)	RPTFE	(1-1/4" to 3")	
6. Retainer	A276-316 (1/4" to 1") A351-CF8M (1-1/4" to 3")	11. Body	A351-CF8M



OPTIONS AVAILABLE:

(SUFFIX)	OPTION	SIZES
-02-	Stem Grounded	1/4" to 3"
-03-	1-1/4" CS Stem Extension	1/4" to 3"
-04-	2-1/4" CS Stem Extension	1/4" to 3"
-07-	Steel Tee Handle	1/4" to 2"
-08-	90° Reversed Stem	1/4" to 3"
-14-	Side Vented Ball (Uni-Directional)	1/4" to 2"
-15-	Wheel Handle, Steel	1/4" to 2"
-16-	Chain Lever - Vertical	3/4" to 2"
-19-	Lock Plate	1/4" to 2"
-21-	UHMWPE Trim (Non-PTFE)	1/4" to 3"
-24-	Graphite Packing	1/4" to 3"
-27-	SS Latch-Lock Lever & Nut	1/4" to 3"
-30-	Cam-Lock and Grounded	1/4" to 2"
-32-	SS Tee Handle & Nut	1/4" to 2"
-35-	VTFE Trim	1/4" to 3"
-39-	SS Hi-Rise Locking Wheel Handle, SS Nut	1/4" to 2"
-40-	Cyl-Loc and Grounded	1/4" to 2"
-44-	Seal Welded	1/4" to 2"
-45-	Less Lever & Nut	1/4" to 3"
-46-	Latch Lock Lever - Lock in Closed Position Only	1/4" to 3"
-47-	SS Latch Lock Oval Handle	1/4" to 1"
-48-	SS Oval Handle (No Latch) & Nut	1/4" to 2"
-49-	Assembled Dry	1/4" to 3"
-50-	2-1/4" CS Locking Stem Extension	1/4" to 3"
-57-	Oxygen Cleaned	1/4" to 3"
-58-	Chain Lever - Horizontal	3/4" to 2"
-60-	Static Grounded Ball & Stem	1/4" to 3"
-64-	250# Steam Trim	1/4" to 3"
-P01-	BSPP (Parallel) Thread Connection	1/4" to 3"
-T01-	BSPT (Tapered) Thread Connection	1/4" to 3"

STAINLESS STEEL BALL VALVE

NUMBER	SIZE	A	B	C	D	E	F	G	Wt.
76-101-01	1/4"	.37	1.03	2.06	1.75	3.87	.50	1.12	.58
76-102-01	3/8"	.37	1.03	2.06	1.75	3.87	.50	1.12	.54
76-103-01	1/2"	.50	1.12	2.25	1.81	3.87	.50	1.12	.63
76-104-01	3/4"	.68	1.50	3.00	2.12	4.87	.87	1.37	1.27
76-105-01	1"	.87	1.68	3.37	2.25	4.87	.87	1.37	1.63
76-106-01	1-1/4"	1.00	2.00	4.00	2.62	5.50	.93	1.50	3.06
76-107-01	1-1/2"	1.25	2.18	4.37	3.05	8.00	.93	1.50	4.04
76-108-01	2"	1.50	2.75	5.50	3.24	8.00	.93	1.50	6.05
76-109-01	2-1/2"	2.50	3.37	6.75	4.12	8.00	2.75	3.37	15.57
76-100-01	3"	2.50	3.37	6.75	4.12	8.00	2.75	3.37	16.79

**For Pressure/Temperature Ratings,
Refer to Page M-12, Graph No. 14
(1/4" to 1")
Refer to Page M-11, Graph No. 12
(1-1/4" to 2")
Refer to Page M-10, Graph No. 8
(2-1/2" to 3")**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

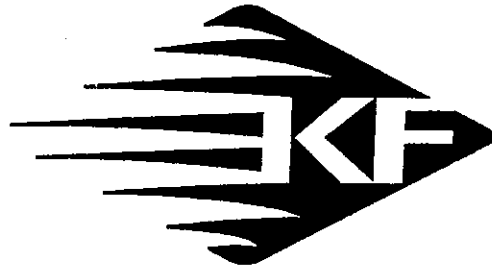
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

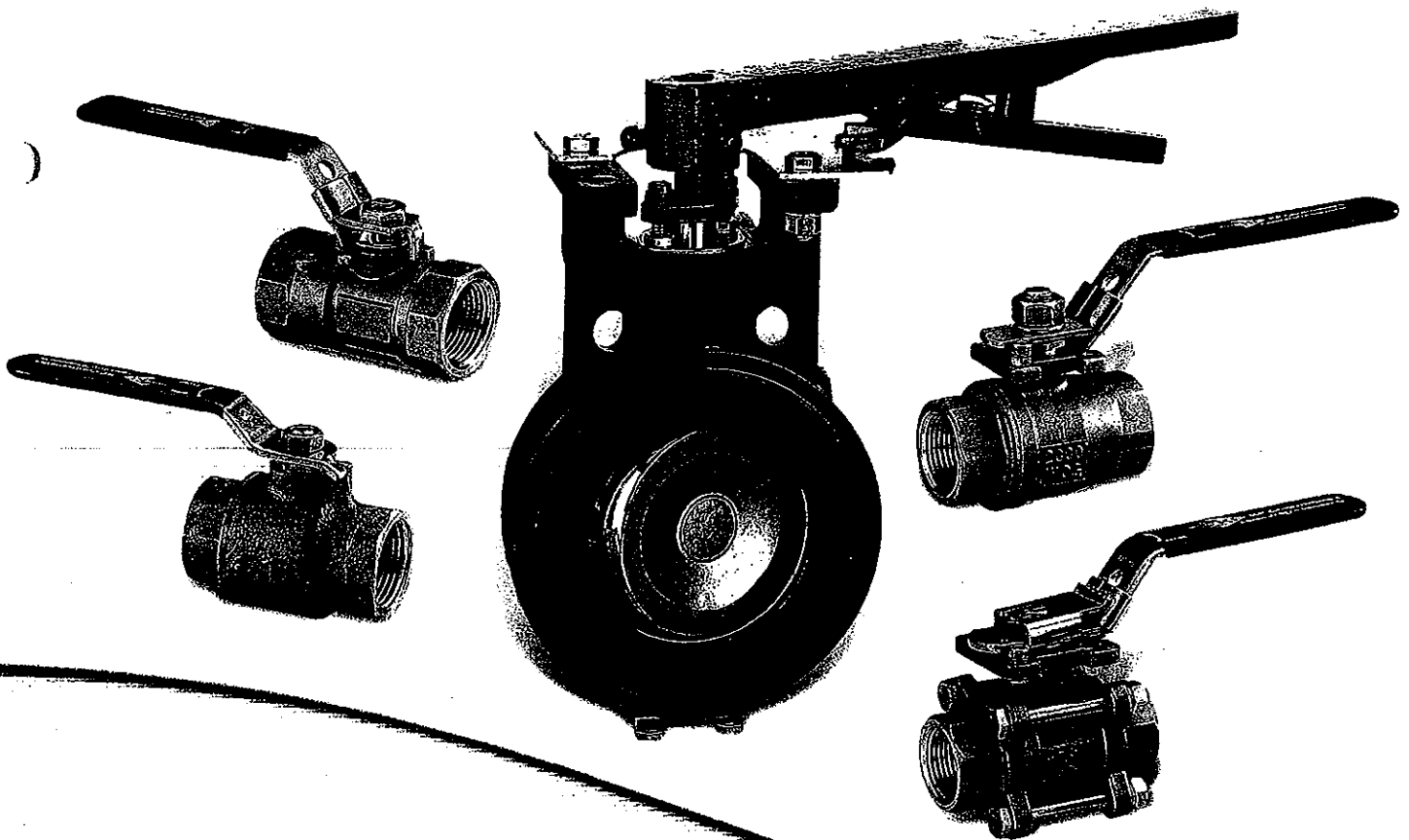
BALL VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES 2801
STYLE : FLANGED END FULL PORT BALL VALVE
SERVICE : OXYGEN GAS
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
STEM : TYPE 316 S.S.
BALL : TYPE 316 S.S.
SEAT : PTFE
PRESSURE RATING : 275 PSIG (1.90 MPa)
OPERATION : OPEN / CLOSE WITH HANDLE PIPE
CONNECTION : 2" 150# FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 8 (2 PER PRESSURE REGULATING VALVE)
CUSTOMER TAG NO. : HV-0032C / HV-0032D / HV-0032E / HV-0032F
HV-0032G / HV-0032H / HV-0032I / HV-0032J

KF Contromatics Product Summary



KF Contromatics Industrial Products



Superior Fluid Control Products for the Petrochemical and Industrial Markets

A division of CIRCOR International, Inc.

Our Quality Commitment

We strive to continually improve our management system and processes to provide critical technologies that help customers worldwide use fluids safely and efficiently while improving everyday life.

Our mission is to create and deliver fluid control solutions by focusing the considerable talents of our employees to meet diverse customer and regulatory requirements worldwide.

Ask your KF Contromatics Representative about our complete line of technically superior flow control products.

Specifications Conformance

KF Contromatics products are designed, manufactured, tested and certified to the exacting requirements of various product design industry standards and regulatory agencies including: (where applicable)

ANSI • American National Standard Institute

B1.20.1	Pipe threads, general purpose
B1.20.3	Dryseal pipe threads
B16.10	Face-to-face and end-to-end dimensions of ferrous valves
B16.11	Forged fittings, socket-welding & threaded
B16.25	Butt welding ends
B16.34	Steel valves-flanged and butt welding ends
B16.5	Steel pipe flanges and flanged fittings

API • American Petroleum Institute

Spec. 6D	Specification for pipeline valves
Spec. 6FA	Specification for fire testing of valves
Spec. 594	Check valves: wafer, wafer lug & double flanged type
Std. 598	Valve inspection and test
Std. 607	Fire test for soft seated quarter-turn valves
Spec. 608	Metal ball valves; flanged, threaded & welding ends
Spec. 609	Butterfly valves; double flanged, lug & wafer type
Spec. Q1	Quality program

ASME • American Society of Mechanical Engineers

B31.1	Power piping
B31.3	Process piping

BS • British Standard

BS 6755 Part 2	Testing of valves
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Coast Guard

Coast Guard 46 CFR, Cat. A, B & Positive Shutoff

CRN • Canadian Registration No. • OC 7841.50126789

CSA • Canadian Standard Association • CGA 3.16 & 6.5

DOT • Department of Transportation • DOT 192 Cl. 3

FM • Factory Mutual

MSS • Manufacturers Standardization Society

MSS-SP-6	Standard finishes for contact faces of pipe flanges and connecting-end flanges of valves and fittings.
MSS-SP-25	Standard marking system for valves, fittings, flanges and unions.
MSS-SP-55	Quality standard for steel castings.
MSS-SP-64	Butterfly valves
MSS-SP-72	Ball valves with flanged or butt-welding ends for general service
MSS-SP-110	Ball valves: Threaded, socket-weld, solder, joint, grooved & flared ends

NACE • National Association of Corrosion Engineers

NACE MR01-75	Sulfide stress cracking resistant metallic materials for oil field equipment.
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EC • European Community

Pressure Equipment Directive, 97/23/EC (CE marked)

ISO • International Organization for Standardization

ISO 9001	Quality systems-model for quality assurance in design, development, production, installation and servicing.
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Ball Valves

Series 1800 & 2800

1801/1803-WCB Body/Stainless Steel Trim
2801/2803-CF8M Body/Stainless Steel Trim
1"-10", ANSI Class 150, Flanged End, Full Port
1"-8" ANSI Class 300, Flanged End, Full Port

Features

Full Port
Blow-Out Proof Grounded Stem
Two-Piece Body Design
for Ease of Maintenance
Adjustable Stem Packing
for Extended Life
Fully Machined
Actuator Mounting Pad
Optional Materials Include
Alloy
Monel
Hastelloy
Nickel Aluminum Bronze
Locking Handle

Specifications

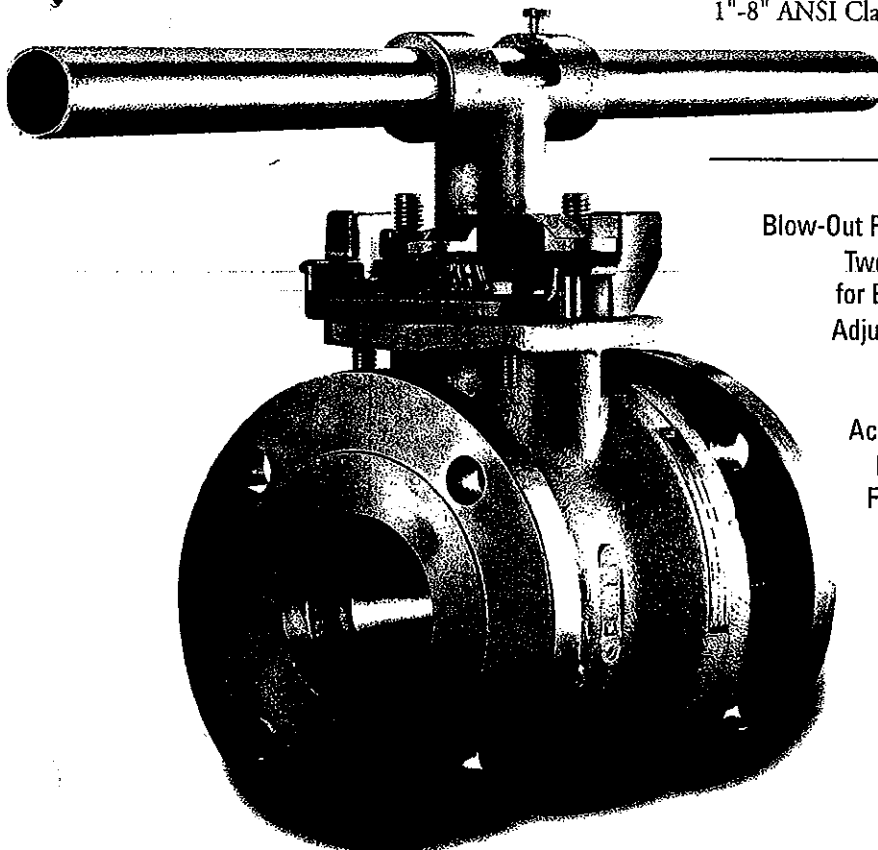
ANSI B16.34
ANSI B16.5
ANSI B16.10
API 598
API 607 4th Edition
ASME B31.1

Certified

NACE MR01-75
CE Mark
CRN# OC 7841.50126789

Series CF1800-SKVC Series SF2800-SKVC

CF1800-Carbon Steel Body/316 Stainless Steel Trim
SF2800-Stainless Body/316 Stainless Steel Trim
1"-12", ANSI Class 150, Flanged End, Full Port
1"-8" ANSI Class 300, Flanged End, Full Port



Features

Full Port
Blow-Out Proof Grounded Stem
Two-Piece Body Design
for Ease of Maintenance
Adjustable Stem Packing
for Extended Life
Fully Machined
Actuator Mounting Pad
Domestic Repair Kits
Fully Interchangeable
Locking Handle

Specifications

ANSI B16.34
ANSI B16.5
ANSI B16.10
API 598
API 607 4th Edition
ASME B31.1

Certified

CRN# OC 7841.50126789
NACE MR01-75



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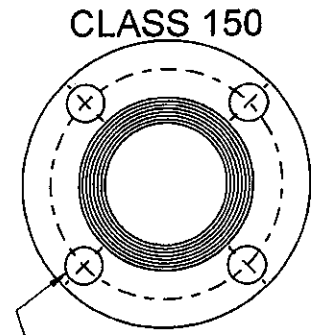
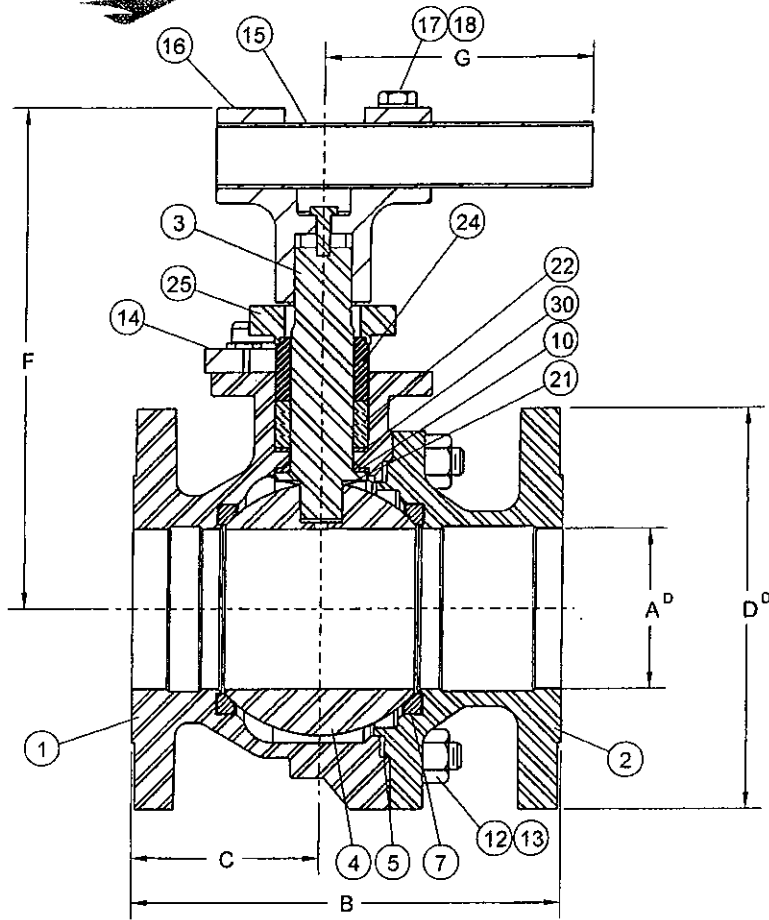
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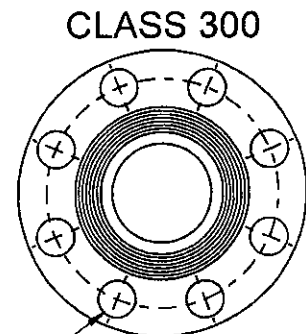
SERIES 1801 / 2801 / 1803 / 2803

1-1/2" through 6"
FLANGED END FULL PORT

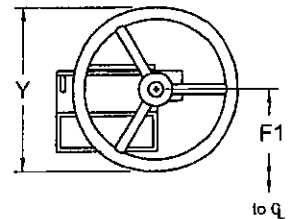
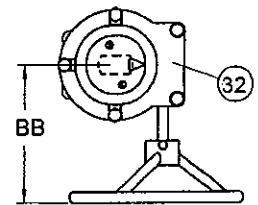
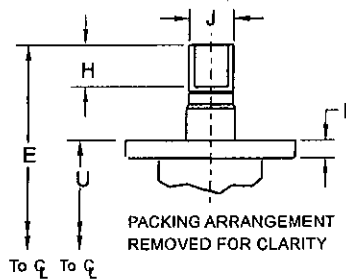
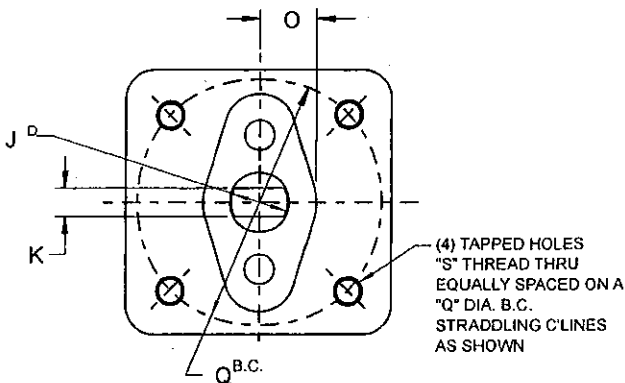
DB-509
Sheet 1 of 2
7-01-2005



V - Holes
W - Hole Dia.
X - Bolt Circle



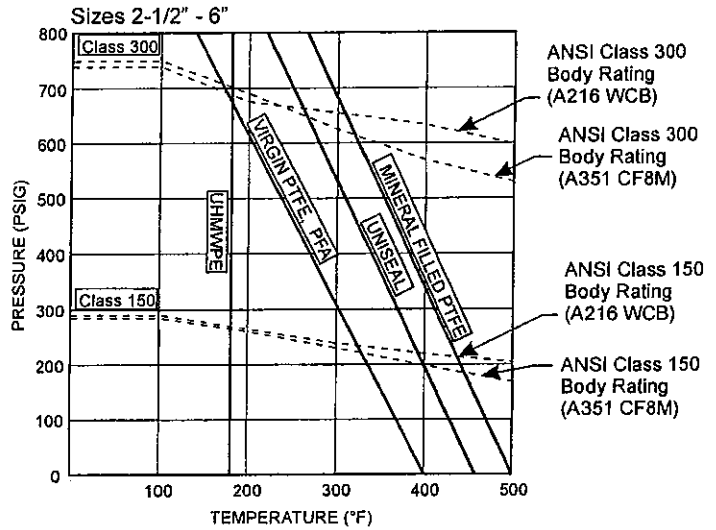
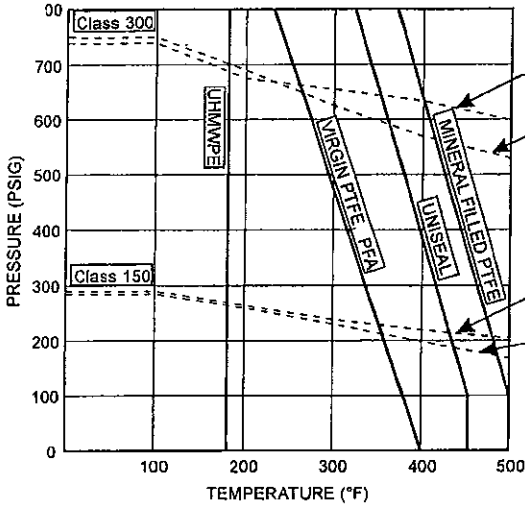
V - Holes
W - Hole Dia.
X - Bolt Circle



CLASS 150																						
VALVE	A	B	C	D	E	F	F1	G	H	J	K	L	O	Q	S	U	V	W	X	Y	BB	WEIGHT
1-1/2"	1.50	6.50	2.96	5.00	3.89	5.75	7.37	15.50	.640	.710/.700	.376/.373	.38	.76	3.25	3/8-16 UNC	2.31	4	.63	3.88	6.00	6.50	12.8
2"	2.00	7.00	3.02	6.00	4.51	6.56	8.20	15.50	.640	.710/.700	.376/.373	.44	.76	3.25	3/8-16 UNC	3.14	4	.75	4.75	6.00	6.50	17.6
3"	3.00	8.00	3.50	7.50	6.81	10.25	11.63	20.00	1.28	1.067/1.062	.674/.670	.44	1.36	4.13	3/8-16 UNC	4.43	4	.75	6.00	6.00	6.50	31.5
4"	4.00	9.00	4.00	9.00	8.40	11.00	13.08	20.00	1.28	1.321/1.316	.865/.861	.62	1.36	4.41	1/2-13 UNC	5.88	8	.75	7.50	8.00	9.00	54.2
6"	6.00	15.50	7.75	11.00	10.81	11.12	15.63	20.00	1.45	1.515/1.510	1.065/1.061	.75	1.36	5.13	5/8-11 UNC	8.00	8	.88	9.50	8.00	9.50	137.0

CLASS 300																						
VALVE	A	B	C	D	E	F	F1	G	H	J	K	L	O	Q	S	U	V	W	X	Y	BB	WEIGHT
1-1/2"	1.50	7.50	3.53	6.13	3.89	5.75	7.37	15.50	.640	.710/.700	.376/.373	.38	.76	3.25	3/8-16 UNC	2.31	4	.88	4.50	6.00	6.50	20.0
2"	2.00	8.50	4.25	6.50	4.51	6.56	8.20	15.50	.640	.710/.700	.376/.373	.44	.76	3.25	3/8-16 UNC	3.14	4	.75	5.00	6.00	6.50	26.0
3"	3.00	11.13	5.82	8.25	6.81	10.25	11.63	20.00	1.28	1.067/1.062	.674/.670	.44	1.36	4.13	3/8-16 UNC	4.43	8	.88	6.63	6.00	6.50	46.0
4"	4.00	12.00	6.00	10.00	8.40	11.00	13.08	20.00	1.28	1.321/1.316	.865/.861	.62	1.36	4.41	1/2-13 UNC	5.88	8	.88	7.88	8.00	9.00	70.0
6"	6.00	15.88	7.94	12.50	12.75	14.00	15.63	48.00	2.27	1.950/1.945	1.249/1.245	.62	1.58	5.13	5/8-11 UNC	8.12	12	.88	10.63	12.00	9.50	157.0

Seat Rating
Sizes 1-1/2" and 2"



ITEM No.	QTY.	DESCRIPTION	MATERIAL
1	1	BODY	A216 Gr. WCB or A351 Gr. CF8M
2	1	ADAPTER	A216 Gr. WCB or A351 Gr. CF8M
3	1	STEM	316 SS
4	1	BALL	316 SS
5	1	BODY GASKET	GRAPHITE / SS
7	2	SEAT	UNISEAL, Mineral Filled PTFE, UHMWPE, PFA
8	1	STOP PLATE SCREW	300 SERIES SS
10	1	THRUST WASHER	TEFLON (UNISEAL)
12	--	NUT, BODY	A19 Gr.2H (CS) or A194 Gr. 8 (SS)
13	--	STUD, BODY	A193 Gr. B7 (CS) or A193 Gr. B8 (SS)
14	1	LOCK STOP PLATE	A351 Gr. CF8M
15	1	HANDLE PIPE	CARBON STEEL
16	1	LOCKING T-HANDLE	A351 Gr. CF8M
17	1	LOCKWASHER, HANDLE	400 SERIES SS
18	1	SCREW, HANDLE	300 SERIES SS
20	1	LOCK PLATE	300 SERIES SS
21	1	GROUNDING SPRING	316 SS
22	1	GLAND PACKING	GRAPHITE, PTFE
24	1	GLAND FOLLOWER	316 SS (XYLAN COATED)
25	1	PACKING GLAND RETAINER	A351 Gr. CF8M
26	2	STUD, PACKING	A193 Gr. B7 (CS) or A193 Gr. B8 (SS)
28	2	NUT, PACKING	A194 Gr. 2H (CS) or A194 Gr. 8 (SS)
30	1	STEM WASHER	316 SS (3" through 10")
32	1	GEAR OPERATOR	CAST IRON CASE

Size	Cv Rating		Operating Torque Seat Materials	
	Cl. 150	Cl. 300	02	04
1 1/2"	265	280	280 / 280	340 / 340
2"	470	500	440 / 500	530 / 600
3"	1240	1000	600 / 1000	720 / 1200
4"	2470	2500	1440 / 2500	1750 / 3000
6"	5249	7000	5000 / 7000	6000 / 8400

Torque in inch-pounds @ Full Rated Pressure.

Temperature Rating

Maximum Temperature Rating for Seats @ 0 PSIG

- Virgin PTFE 400°F
- Uniseal™ 450°F
- Mineral Filled TFE 500°F
- UHMW Polyethylene 180°F
- PFA 400°F

Steam Rating (Saturated)

- Uniseal™ - 150 WSP
- Mineral-Filled TFE - 250 WSP

Vacuum Rating

10 Micron of Hg

Pressure Rating

Material	ANSI Class 150	ANSI Class 300
Alloy 20 (CN7M)	230	600
Carbon Steel (WCB)	285	740
Stainless Steel (CF8M)	275	720
Monel (M-35-1)	230	600
Hastelloy C (CW-12MW)	290	750

Maximum Pressure Rating @ 100°F (WOG)



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TEL: (405) 631-1533 FAX: (405) 631-5034



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

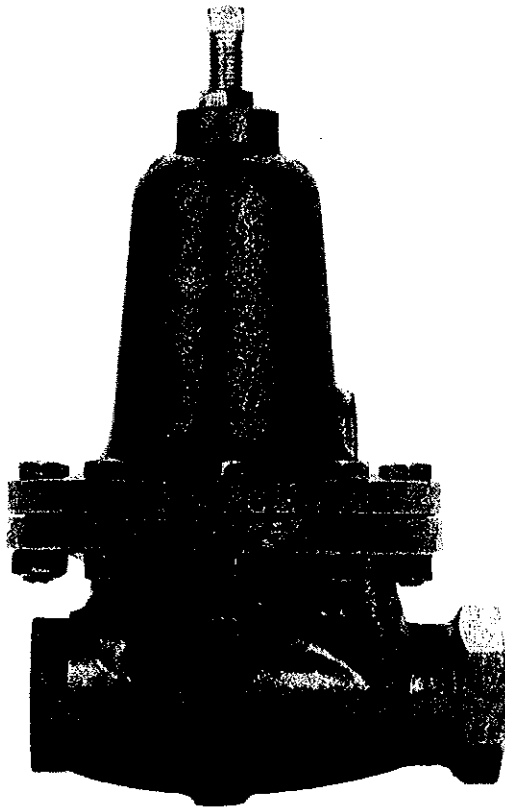
PRESSURE REGULATING VALVE (HIGH FLOW)

MANUFACTURER	:	CASHCO
MODEL	:	MODEL 1000HP
MODEL NO.	:	BD8-AS57-120M000A
TYPE	:	SELF-CONTAINED PRESSURE REDUCING REGULATOR
SERVICE	:	OXYGEN GAS
MATERIAL	:	
BODY	:	STAINLESS STEEL
CYLINDER	:	CF8M
PLUG	:	TYPE 416 STAINLESS STEEL
FLOW RATE	:	
MINIMUM	:	14.4 SFCM (0.380 Nm ³ /min)
MAXIMUM	:	282 SCFM (7.43 Nm ³ /min)
PRESSURE	:	
OPERATING INLET	:	60 ~ 70 PSIG (413.7 ~ 482.6 kPa)
OPERATING OUTLET	:	12 ~ 15 PSIG (82.7 ~ 103.4 kPa)
CONNECTION	:	
INLET	:	1 1/2" (38 mm) FNPT
OUTLET	:	1 1/2" (38 mm) FNPT
LINE SIZE	:	2" (50 mm)
SPRING RANGE	:	10 ~ 35 PSIG (68.9 ~ 241.3 kPa)
SPECIAL REQUIREMENT	:	TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY	:	2
CUSTOMER TAG NO.	:	PRV-O032A / PRV-O032C



MODEL 1000HP

PROCESS PRESSURE REDUCING REGULATOR



Model 1000HP

APPLICATIONS

Used primarily in utilities services – saturated steam, superheated steam, industrial gases, fuel oils, compressed air, or water condensate. Also used in sour gas, chemical and other process services.

Refer to technical bulletin 1000HP-DIFF-TB for differential pressure applications. Refer to technical bulletin 1000HP-CRYO-TB for cryogenic reducer applications.

Refer to technical bulletins 1000LP-BASIC-TB and 1000LP-DIFF-TB for the low pressure (LP) variation of the Model 1000 products.

Refer to technical bulletin 1000HP-H-TB for the high inlet pressure variation of the Model 1000 products.

The Model 1000HP is a high capacity, high pressure regulator used to control downstream pressure between 10 and 300 psig (0.69 and 20.7 Barg). Available in sizes from 1/2" thru 2" (DN15 thru DN50).

The unique internals design allows use in a multitude of applications, including process fluids, that normal pressure reducing regulators can not match. The most versatile self-contained, pressure reducing regulator available to users.

FEATURES

- | | |
|-----------------------------------|---|
| Streamlined Flow Path: | Straight-thru flow path reduces internal turbulence and resistance to flow, increasing stability and capacity. |
| High Inlet Pressures: | Standard construction allows inlet pressures up to 740 psig (51.0 Barg). |
| High Outlet Pressures: | Controlled outlet pressure up to 300 psig (20.7 Barg). |
| High Pressure Drop: | Standard construction with extended guiding allows pressure drop up to 650 psid (44.8 Bard). This regulator is routinely applied in severe service conditions. |
| Flow-to-Open Plug: | Provides unmatched rangeability – far greater than competitive flow-to-close designs. Highly stable at either high or low flow rates. |
| Versatility: | Four body materials and 15 trim material selections allow usage in a multitude of various fluids. Optional constructions extend the capability. |
| Protected Diaphragm Zone: | Internal arrangement isolates the diaphragm from direct impingement, negating any flow induced instability at either low or high flow rates. Allows incorporation of dynamic boost from jet section. Uniformly registers pressure on the diaphragm. |
| Non-Asbestos Construction: | Standard construction provides all gaskets of non-asbestos materials. |
| Diaphragm Travel Stops: | Incorporates mechanical stop in spring chamber to limit diaphragm uptravel and in body for downtravel, minimizing potential internal damage from over-travel conditions. |

PRINCIPLES OF OPERATION

The Model 1000HP is a unique pressure reducing regulator in its design. The major design features are:

- A. Flow-to-Open (FTO) plug design.
- B. Inlet pressure contained in cylinder.
- C. Dynamic boost zone.
- D. Flow isolated diaphragm.
- E. High outlet pressure capability.

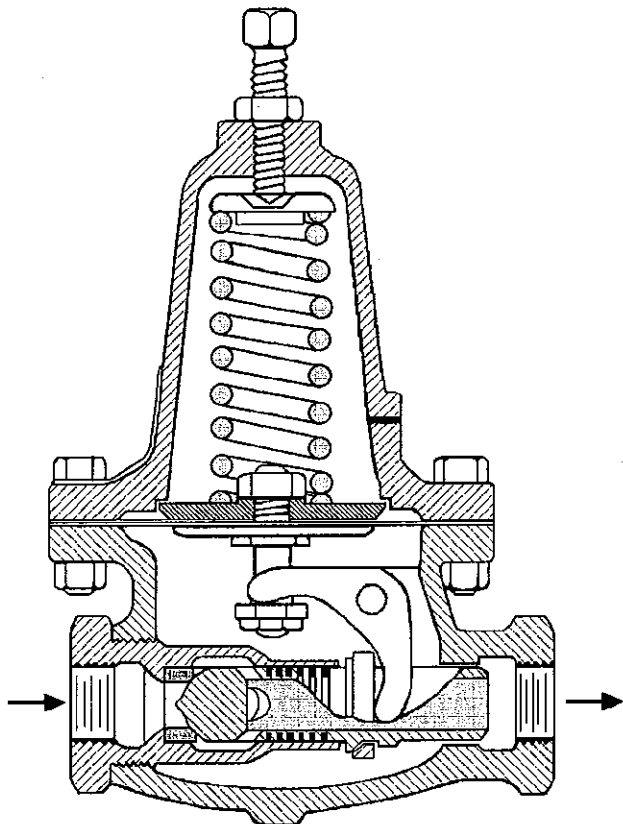


Figure 1
Model 1000HP – Metal Seat

- A. **FTO Plug Design.** Model 1000HP incorporates an internals design that has the higher inlet pressure tending to push the plug open, allowing for greater stability at low flow rates, increasing rangeability.

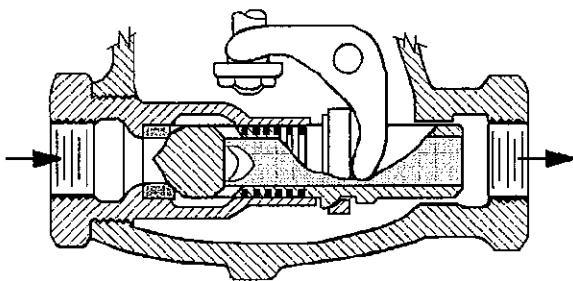


Figure 2
1000HP @ Lower Body

- B. **Inlet Pressure in Cylinder.** Model 1000HP's design has all the higher inlet pressure contained within the cylinder, and the cylinder is a separate casting from the body. This allows for much higher inlet pressure levels – up to 740 psig (51.0 Barg).

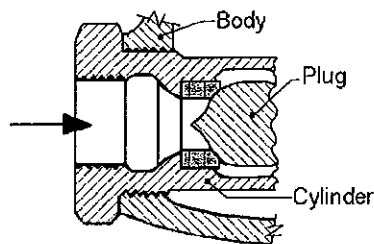


Figure 3
1000HP @ Body Inlet

- C. **Dynamic Boost Zone.** At the point where the flow exits the plug, a velocity decrease occurs due to the increase in cross-sectional area. By proper location of the plug's exit and proper clearance of the annular space between the body and the plug, 1000HP is able to take extra advantage of the "dynamic boost" or "jet effect" that results. The principle is simply an application of Bernoulli's principles – at a point of increasing velocity, the static pressure decreases. The "jet effect" produces a lower registration pressure to the diaphragm, pulling the diaphragm down, allowing the plug to open further, increasing flow capacity.

Each regulator selection requires that the proper "jet" be selected – liquid, gas (vapor), or viscous liquid.

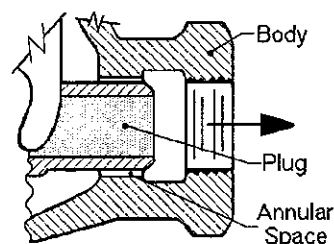


Figure 4
1000HP @ Body Outlet

- D. **Flow Isolated Diaphragm.** The 1000HP's design never has flow directly contacting the diaphragm. This allows for effective use of the "jet effect", and does not allow turbulence to create false registration pressure effects directly on the diaphragm.

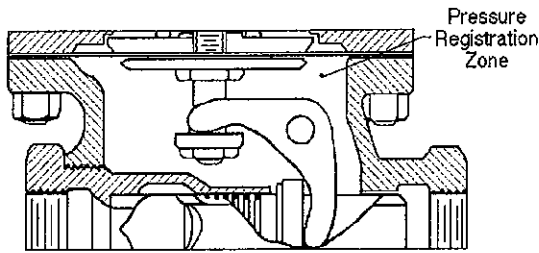


Figure 5
1000HP @ Pressure Registration Zone

E. **High Outlet Pressure.** 1000HP allows for setpoint pressure levels thru a range of 10–300 psig (0.7–20.7 Barg) for sizes 1/2"–1" (DN15–25), and 10–225 psig (0.7–15.5 Barg) for sizes 1-1/4" & 1-1/2" (DN 32 and 40). Only size 2" (DN50) is limited to 150 psig (10.3 Barg).

F. **Summary:**

1. High inlet pressure capability.
2. High rangeability.
3. Stability at high and low flow.
4. High capacity.
5. Broad controlled pressure range.

Limitations. Because of Model 1000HP's FTO design, the fixed ratio of diaphragm area-to-port area limits the ratio of inlet pressure-to-outlet pressure level. For example, a 1/2" (DN15) body size, with full port, a setpoint pressure of 10 psig (0.7 Barg), and metal seat and diaphragm, will limit the maximum inlet pressure to 215 psig (14.8 Barg) (see Table 11). Only by three methods can the maximum inlet pressure be increased:

1. Use of reduced port.
2. Use of composition seat.
3. Increase setpoint pressure.

1 & 2. **Reduced Port and Use of Composition Seat.** Using a single-step reduced port (Opt.-12) with the 1/2" (DN15) unit, a setpoint pressure of 10 psig (0.7 Barg) allows a maximum inlet pressure of 270 psig (18.6 Barg) for a metal seated design, or a maximum of 300 psig (20.7 Barg) for a composition seat design (see Table 12).

3. **Increase Setpoint Pressure.** If the process can be varied, just by increasing the setpoint pressure to 20 psig (1.4 Barg), the same 1/2" (DN15) full port unit with metal seat and diaphragm can handle a maximum inlet pressure of 450 psig (31.0 Barg) (See Table 11).

STANDARD/GENERAL SPECIFICATIONS

Body Sizes: 1/2", 3/4", 1", 1-1/4", 1-1/2" and 2"; (DN15, 20, 25, 32, 40 and 50).

End Connections: Standard – NPT female.
Opt-31: BSP female.
Opt-30: 150# or 300# RF flanged.
Opt-32: Extended plain end pipe nipples.

Body/Spring Chamber Material Combinations: Uniform – CI/CI, BRZ/BRZ, CS/CS and SST/SST.
Combinations – CS/CI, BRZ/CI, SST/CI and SST/CS.

CI = Cast grey iron
CS = Cast carbon steel
BRZ = Cast bronze
SST = Cast stainless steel

See Table 5 for material specifications.

NOTE: 1-1/4" SST body is not available.

Trim Designs: Metal seated (see Figure 1) or composition seat (see Figure 6). Metal or composition diaphragms.

"B_" series designations – BRZ, BR, SST; see Table 7 for materials.

"S_" series designations – SST, CS; see Table 8 for materials.

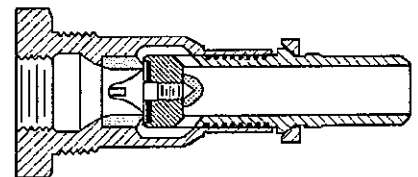


Figure 6: Composition Seat Design

Body/Cylinder Material Combinations: CI/BRZ, CI/SST, CI/CS *.
BRZ/BRZ.
CS/SST, CS/CS *.
SST/SST.
* 2" (DN50) body size only; carbon steel barstock cylinder.

Maximum Inlet Pressure:

Dependent only on cylinder material and type of end connection (See Table 16):

- BRZ – 400 psig (27.6 Barg);
- SST – 740 psig (51.0 Barg);
- CS * – 740 psig (51.0 Barg).
- * 2" (DN50) body size only; carbon steel barstock cylinder.

NOTES: 1. 1000HP is a flow-to-open (FTO) design; this places an upper limitation on inlet pressure for a given outlet pressure setting.

2. Pressure/temperature ratings are reduced for Opt-37 and -37S due to use of SST bolting.

Temperature Range:

Standard: For body/cylinder/spring chamber construction with:

- any BRZ materials – -20° to +400°F (-29° to +205°C).
- any CI, CS or SST materials – -20° to +450°F (-29° to +232°C)

Optional: For body/cylinder/spring chamber construction with Opt-46 asbestos gasket:

- all CS or SST materials – -20° to +600°F (-29° to +315°C).

NOTE: Composition trim materials may lower above ranges.

Outlet Pressure Range:

See Table 2 for individual range spring span.

Body Size In (mm)	Full Range psig (Barg)	Number of Range Springs
1/2" (DN15)	10–300 (0.7–20.7)	5
3/4" (DN20)		6
1" (DN25)		6
1-1/4" (DN32)	10–225 (0.7–15.5)	5
1-1/2" (DN40)	10–150 (0.7–10.3)	4
2" (DN50)		3

NOTES: 1. 1000HP is a flow-to-open (FTO) design; this places a lower limitation on outlet pressure setting for some inlet pressure levels.

2. Opt-37 and -37S use SST range springs, reducing number of range spring choices available.

Maximum

Pressure Drop:

Metal Seated Designs:

- "B_" series trim designations – up to 390 psid (26.9 Bard).
- "S_" series trim designations – up to 650 psid (44.8 Bard).

Composition Seat Designs:

- "B_" series trim designations – up to 390 psid (26.9 Bard).
- "S_" series trim designations – up to 650 psid (44.8 Bard).

Minimum

Pressure Drop:

Standard: $\Delta P > 5$ psid (0.34 Bard)
Opt-17: $\Delta P \leq 1-5$ psid (0.07-0.34 Bard)
 Minimum = 1 psid (0.07 Bard).

Seat Leakage:

Meets ANSI/FCI 70-2 (Rev. 1991).
Metal Seated – Class IV.
Composition Seat – Class VI.

See Tables 9 thru 12 for flow capacity expressed in Cv's for full port and 1-step reduced port (Opt-12).

Fluid	Table No.
Water	12
Air	13
Saturated Steam	14

See Table 3 for "Wide Open Cv"; use for sizing of safety relief device.

Range Springs:

Standard: Heat treated steel, zinc plated.
Opt-37 and -37S: SST.

Diaphragm

Flange Bolting:

Standard: High strength, zinc plated, heat treated steel. For all body/spring chamber materials.
Opt-37 and -37S: SST.

Gaskets:

Required for metal diaphragm constructions only; not required for composition diaphragm construction.

Standard: NON-ASBESTOS; Graphite/NBR. (Not suitable for oxygen service.)

$T_{max} = 450^{\circ}F$ (232°C)

Opt-45: TFE gaskets for oxygen service or as alternate.

$T_{max} = 400^{\circ}F$ (205°C).

Opt-46: Alternate asbestos gaskets. $T_{max} = 600^{\circ}F$ (315°C).

Painting:

CI and CS externals: Enamel per Cashco Spec. #S-1545.

SST and BRZ externals: None.

Opt-95: Epoxy per Cashco Spec #S-1547.

NOTE: Refer to OPTION SPECIFICATIONS for alternate/extra design options, and to TECHNICAL SPECIFICATIONS for a more complete description of the above specifications.

OPTION SPECIFICATIONS

Option -1: CLOSING CAP. A removeable ductile iron cap discourages tampering with spring setting. Available only with CI or CS spring chamber materials. Includes a gasket for sealing the closing cap to the spring chamber, a sealing lock nut and a 1/4" NPT female vent connection.

Option -1+6: DIFFERENTIAL CONSTRUCTION.
Option -1+8: Refer to Technical Bulletin 1000HP-DIFF-TB for technical information for differential pressure applications.

Option -3: MANUAL ADJUSTOR AND LOCKING LEVER. Use when frequent spring range settings are required. For sizes 1/2", 3/4" and 1" (DN15, 20 and 25) adjusting screw has handwheel fixed to end, and locking nut is replaced by a locking lever that is easily loosened/tightened. For sizes 1-1/4", 1-1/2" and 2" (DN32, 40, 50) handwheel is replaced by T-bar adjustor.

Option -5: BRZ/BR CRYOGENIC CONSTRUCTION. Refer to Technical Bulletin 1000HP-CRYO-TB for technical information for cryogenic applications.

Option -12: REDUCED PORT ORIFICE. Used when high inlet pressure negates use of the standard full port orifice. Also used when oversized body is desired to accommodate piping size. Available in metal seated or composition seat materials, in all "B_" or "S_" series trim designations, and in all body sizes except 1-1/4" (DN32). See Tables 10 and 12 for flow capacity in Cv's.

Option -14: INTEGRAL SEAT. Standard pressed-in seat ring-to-cylinder joint is sealed as a path of leakage by brazing or welding. The procedure also serves as a permanent joint for flow conditions where service conditions are "severe", subject to vibration, or thermal cycling.

Seat ring is silver brazed to cylinder for all "B_" series trim designations, and to 1/2" (DN15) body size cylinders with "S_" series trim designations. For all other body sizes with "S_" series

designations the seat ring is welded to the cylinder.

Recommended for all hydrogen or helium applications. Recommended when pressure drop exceeds 300 psid (20.7 Bard). Required when pressure drop exceeds 450 psid (31.0 Bard).

NOTE: Opt-14 is now included whenever Opt-15, stellite seat surfaces is specified.

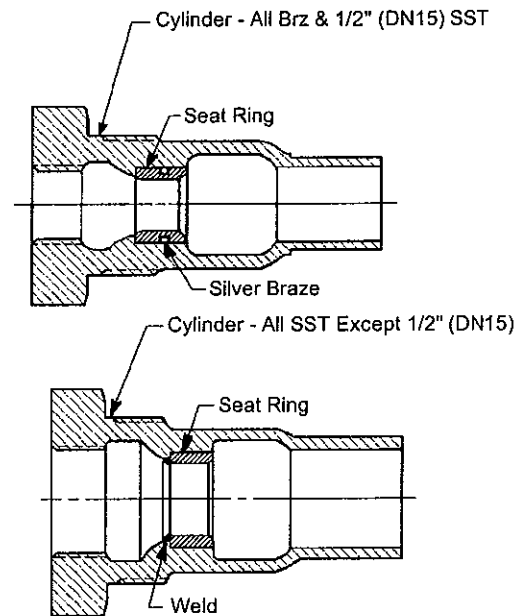


Figure 7:
Opt-14 Integral Seat

Option -15: STELLITED SEAT SURFACES. Available with metal seated S1 trim only, and with full port orifice or Opt-12 reduced port orifice. Both plug face and seat ring's seat edge are coated with stellite hard surfacing using a flame spray process. Always includes integral seat ring Opt-14 (formerly Opt-14+15).

Required for applications when:

1. Liquid flow is flashing and when both outlet pressure $P_2 < 50$ psig (3.5 Barg) and $\Delta P > 50$ psid (3.5 Bard).
2. Steam service when inlet pressure $P_1 > 450$ psig (31.0 Barg).

- Option -15 (Cont.):**
3. Steam service when $\Delta P > 300$ psid (20.7 Bard).
 4. 2-phase flow (liquid + vapor i.e. "wet" steam) at inlet.

Option -17: PISTON SPRING. Required for applications where pressure drop is less than 5 psid (0.34 Bard). Minimizes plug/cylinder frictional effects. 302 SST material only. Not available in 2" (DN50) body size with CS cylinder.

Option -20: PRESSURE LOADED. Former Opt-20 with dome loaded topworks is obsoleted. Use 1000HP-1+6 as alternate. See technical bulletin 1000HP-DIFF-TB.

Option -25: REMOTE VENTING. Use with hazardous or explosive gases where personnel/equipment safety is at issue when a diaphragm leak occurs. 1/4" NPT female connection in spring chamber for piping.

Option -26: DRAIN HOLE. 1/4" NPT drain tap with plug in body underside. Recommend use with highly viscous fluids (above 100 centipoise (Cp)) for downstream piping pressure sensing. Plug material similar to body material. Recommended for flashing liquids.

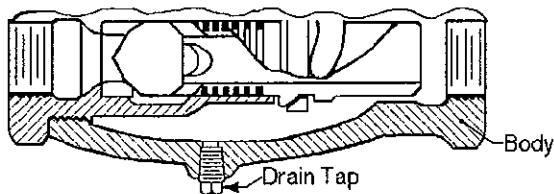


Figure 8:
Opt-26 Drain Hole

Option -27: VISCOUS LIQUID SERVICE. Incorporates special valve plug with drilled openings near the "jet effect" zone to stabilize operation for fluids with viscosity greater than 100 Cp. B1 or S2 trim ONLY.

Option -30: FLANGED END CONNECTIONS. CS or SST body materials only. Flange and pipe nipple materials of same general chemistry as body material.

Available as 150# RF or 300# RF flange configurations. Requires lapped joint-type flange on inlet (cylinder) end. Short-threaded pipe nipples seal welded to body and cylinder. Outlet connection flange is socket weld-type. See Table 16 for lowered P vs T ratings. No post-weld stress relieving performed. Not suitable for NACE service. Not available in 1-1/4" body size.

Option -31: BSP SCREWED END CONNECTIONS. British Standard Pipe threads per ISO 7/1; used as alternate to NPT ends. Available all sizes and body materials.

Option -32: EXTENDED P.E. NIPPLES. Schedule 80 plain end pipe nipples used for field butt or socket welding into pipeline. Pipe nipples of same general chemistry as body material. Short-threaded pipe nipples seal welded to body and cylinder. Adds approximately 8 inches (200 mm) to the face-to-face dimension of standard unit. Use for socket weld pipe systems.

Option -36: SST CRYOGENIC CONSTRUCTION. Refer to technical bulletin 1000HP-CRYO-TB for technical information for cryogenic applications.

Option -37: ALL SST/CLEAN UNIT FOR LIQUIDS AND GASES. Packaged primarily for the food and pharmaceutical industries. NPT and 150# SST RF flanged end connections ONLY. 316 SST body and spring chamber materials ONLY. Use with S6 trim ONLY. T-bar handle, spring chamber internals, and flange bolting of SST materials. All wetted and external castings are electro-polished, and the unit is cleaned to Cashco Spec. #S-1576. Includes Opt-26 1/4" NPT tap with SST plug.

Use of SST diaphragm flange bolting limits P vs T ratings to levels below standard unit (see Table 16). Also limits pressure settings to overall range of 10–80 psig (0.7–5.5 Barg) using multiple SST springs.

Option -37S: ALL SST/CLEAN UNIT FOR STEAM. Similar to Option -37, except is equipped with different trim; use with

S1 trim ONLY. Includes carbon graphite diaphragm gasket material. Includes Opt-26 1/4" NPT tap with SST plug.

Use of SST flange bolting limits P vs T ratings to levels below standard unit (see Table 16). Also limits pressure settings to overall range of 10–80 psig (0.7–5.5 Barg) using multiple SST springs.

Option -40:

NACE CONSTRUCTION. Internal wetted portions meet NACE standard MR0175-90 Revision for application in sour gas service. Exterior of the unit to not be directly exposed to a sour gas environment, buried, insulated or otherwise denied direct atmospheric exposure. CS/CS or SST/CS body/spring chamber materials ONLY. Acceptable ONLY with S40 trim. Diaphragm flange bolting of heat treated steel per ASTM A449 and per NACE Class III. NPT end connections ONLY. Not available with Opt-14, Opt-15, Opt-17, Opt-30, Opt-32 or Opt-37.

Option -45:

ALTERNATE NON-ASBESTOS GASKET. Primarily for oxygen service. Utilizes TFE/Silicate diaphragm gaskets. Limits temperature range to -20° to +400°F (-29° to +205°C). Not required when using a composition diaphragm.

Option -46:

ASBESTOS GASKETS. Utilizes asbestos gaskets over standard gaskets. Primarily applied at temperatures over 400°F (205°C) or at customer's request; range of -20° to +600°F (-29° to +315°C).

Option -55:

SPECIAL CLEANING. BRZ or SST body materials ONLY. Cleaning per Cashco Spec #S-1134. Acceptable cleaning level for oxygen gas service.

Option -56:

SPECIAL CLEANING. All body materials. Cleaning per Cashco Spec #S-1542. Not suitable for oxygen service.

Option -95:

EPOXY PAINT. Two-part epoxy coating for severe ambient conditions to minimize external corrosion. Applied to all exposed external parts except those of SST. Per Cashco Spec #S-1547.

APPLICATION AND SELECTION

The following procedure will help determine a suitable selection for an application.

Step 1.

FIVE KNOWNs. The following minimal parameter / information must be available before a selection procedure can begin:

- Service Fluid - What is it? Liquid or gas? Specific gravity (std. cond.)?
- Inlet Pressure – P1 (upstream pressure).
- Outlet Pressure – P2 (downstream pressure). How much can P2 vary as flow varies?
- Desired Capacity – Cv, GPM, SCFH; minimum and maximum.
- Fluid Temperature – T1, Specific gravity (actual).

Use above data to calculate the Cv required.

STEP 2.

INLET PRESSURE AND TEMPERATURE. Assure that the actual design

inlet pressure and temperature limits do not exceed the limits established in Tables 4 or 16. Both body and spring chamber must comply.

STEP 3.

SEAT DESIGN. Because the 1000HP is an FTO design, the seat design – metal or composition/soft – and materials must be selected before checking for temperature/pressure/pressure drop limitations. Use Table 6 as an aid for recommended possible trim designation numbers, and list the choices.

CAUTION: *Do not apply a metal seated 1000HP in deadend service.*

A composition seat will initially provide tight shutoff in clean fluid service, and will minimize downstream over-pressurization. The best results of repeatable tight shutoff are with "rubber"

STEP 3 (Cont.) materials—Buna-N or EPR. Because TFE is not elastic, repeatable tight shutoff is frequently compromised. Minute leakage should be expected with a metal seated design.

A downstream safety relief valve is recommended. If inlet pressure P1 is greater than the outlet pressure rating, a downstream safety relief valve is required.

STEP 4. TRIM MATERIALS. Refer to Table 7 or 8 for the materials of each wetted part; consider material's suitability for corrosion. Check applicable temperature range indicated in Table 7 or 8 for suitability with actual temperature of exposure.

Select a composition diaphragm whenever possible, as a composition diaphragm will give an extra 20-30% in capacity over the same body size unit with a metal diaphragm.

Systems subject to pulsating inlet or outlet pressures should be provided with metal diaphragms.

Combining Steps 3 and 4 allows a preliminary selection of "Trim Designation Numbers".

STEP 5. PRESSURE DROP. There are two ΔP limits that should not be exceeded.

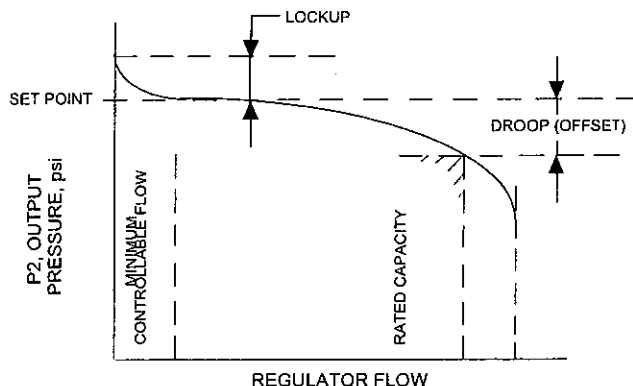
Check Table 1 for recommended maximum levels of pressure drop for the service fluid and trim designation number.

STEP 6. INLET PRESSURE. Check Tables 9 through 12 for the maximum inlet pressure as a function of the outlet (setpoint) pressure – P2. If the actual inlet pressure – P1, is greater than the maximum allowable inlet pressure from Table 9 or 11, go to a 1-Step reduced port, Opt-12, maximum allowable inlet pressure from Tables 10 or 12 (dependent on seat design).

Check Table 16 for pressure/temperature de-ratings due to use of optional constructions and various trim materials. Do not exceed limits.

STEP 7. OUTLET PRESSURE. All self-contained pressure reducing regulators "droop" or "fall-off" from a setpoint pressure level at a given flow as the flow rate increases.

This deviation in setpoint is described as "% droop". Droop is expressed on increasing flow, starting from a minimum flow level.



The "% droop" must be known to enter the capacity tables. The acceptable level of setpoint deviation should be known for the min-to-max flow variation.

A regulator may have a setpoint up to 15% below the lower stated range spring level. (Tags will show the standard ranges.) A setpoint above the higher range spring level is not recommended. Setpoint at the upper limit of a range spring is acceptable. If final setpoint is questionable and expected near the upper limit, the next higher range spring should be utilized. Best performance will be obtained when the lowest range spring is utilized.

Check Table 16 for pressure/temperature de-ratings due to use of optional constructions and various trim materials. Do not exceed limits.

STEP 8. FLUID JET. Depending on the fluid passing through the body, select a liquid, gas or viscous liquid (Opt -27) jet for proper aspiration effect.

STEP 9. GASKET MATERIAL. Considering the fluid, determine the desired gasket material from the three choices offered. Assure that the max temperature of the gasket material is not exceeded.

STEP 10.

CAPACITY. Flow capacities expressed as "Cv vs. Droop" are located in:

- Table 9: Full Port & Comp. Diaph.
- Table 10: Reduced Port & Comp. Diaph.
- Table 11: Full Port & Metal Diaph.
- Table 12: Reduced Port & Metal Diaph.

Full port, water, air or saturated steam flow rates (English units only) are located respectively in Tables 13, 14 and 15.

Using above "Cv vs. Droop" Capacity Tables 9 through 12, find the smallest body size to pass the calculated required Cv for the acceptable level of

droop, the proper diaphragm classification, and the setpoint pressure - P2. Use of the water, air or steam (GPM, SCFH, #/HR) Capacity Tables 13 through 15 will also require the inlet pressure - P1 level in addition to those variables above.

Consult factory for "EXCESSIVE PARTIAL CAVITATION" or "FULL CAVITATION" flow realm applications.

CAUTION: Calculations giving required Cv, flow realm description, velocity levels, and noise prediction using actual flow conditions are always recommended over use of Tables 13 through 15.

TECHNICAL SPECIFICATIONS

TABLE 1
RECOMMENDED PRESSURE DROP
VS. TRIM DESIGN/MATERIALS

NOTE: Consult Factory with Application Details For ΔP 's > 450 psid (31 Bard)

Fluid	Maximum Inlet Pressure psig (Barg)	Operating Pressure Drop Range psid (Bard)	Seat Design	Basic Trim Materials	Trim Designation Numbers
Liquids (Non-cavitating)	400 (27.6)	5-250 (0.34-17.2)	Soft Seat - All Comp Materials	BRZ/BR	B2, B3, B5
	740 (51.0)	5-400 (0.34-27.6)	Soft Seat - All Comp Materials	SST	S3, S3N, S6, S9, S36
	400 (27.6)	5-390 (0.34-26.9)	Metal Seated	BRZ/BR/SST	B1
	740 (51.0)	5-650 (0.34-44.8)	Metal Seated	SST	S2, S2N, S0, S1, S5, S40
Gas	400 (27.6)	5-390 (0.34-26.9)	Soft Seat - All Comp Materials except SST/TFE	BRZ/BR	B2, B3, B5
	740 (51.0)	5-650 (0.34-44.8)	Soft Seat - SST/TFE ONLY	SST	S6, S3N
			Metal Seated	SST	S3, S9, S36
Steam	400* (27.6)	5-200* (0.34-13.8)	Metal Seated	BRZ/BR/SST	B1
	450 (31.0)	5-300 (0.34-20.7)	Metal Seated	SST	S1, S2
	740 (51.0)	5-650 (0.34-44.8)	Metal Seated - Opt-15 Stellite	SST	S1

* Saturated Only

NOTE: For ΔP = 1-5 psid (.07-.34 Bard), use Opt-17 piston spring.

TABLE 2
RANGE SPRINGS

Body Size		Standard – Steel		SST – Opts.-37 & 37S	
In.	(mm)	psig	(Barg)	psig	(Barg)
1/2"	(DN15)	10–50	(.7–3.4)	10–50	(.7–3.4)
		40–100	(2.7–6.9)	40–80	(2.7–5.5)
		80–150	(5.5–10.3)		
		120–190	(8.3–13.1)		
		150–300	(10.3–20.7)		
3/4"	(DN20)	10–40	(.7–2.7)	10–40	(.7–2.7)
		30–60	(2.1–4.1)	30–60	(2.1–4.1)
		50–90	(3.4–6.2)	50–80	(3.4–5.5)
		70–110	(4.8–7.6)		
		90–170	(6.2–11.7)		
		140–300	(9.6–20.7)		
1"	(DN25)	10–40	(.7–2.7)	10–30	(.7–2.1)
		30–60	(2.1–4.1)	25–45	(1.7–3.1)
		50–70	(3.4–4.8)	35–50	(2.4–3.4)
		55–80	(3.8–5.5)	40–80	(2.7–5.5)
		65–130	(4.5–8.9)		
		100–300	(6.9–20.7)		
1-1/4"	(DN32)	10–40	(.7–2.7)		
		30–50	(2.1–3.4)		
		40–60	(2.7–4.1)		
		50–90	(3.4–6.2)		
		70–225	(4.8–15.5)		
1-1/2"	(DN40)	10–40	(.7–2.7)	10–50	(.7–3.4)
		30–75	(2.1–5.2)	40–80	(2.7–5.5)
		60–100	(4.1–6.9)		
		80–225	(5.5–15.5)		
2"	(DN50)	10–40	(.7–2.7)	10–30	(.7–2.1)
		30–60	(2.1–4.1)	25–45	(1.7–3.1)
		50–150	(3.4–10.3)	35–80	(2.4–5.5)

TABLE 3
MAXIMUM CAPACITY – Cv
FOR SIZING SAFETY RELIEF DEVICE
(WITH PLUG WIDE OPEN)

Body Size		Orifice Size			
inch	(mm)	Standard		Opt. -12 Reduced	
		Size	Cv	Size	Cv
1/2"	(DN15)	1/2"	5	3/8"	3
3/4"	(DN20)	3/4"	9	1/2"	7
1"	(DN25)	7/8"	9	5/8"	8
1-1/4"	(DN32)	1"	13	NA	NA
1-1/2"	(DN40)	1-1/4"	17	7/8"	13
2"	(DN50)	1-1/2"	22	1-1/4"	20

- NOTES:**
1. NA = Not Available.
 2. Will permanently deform rocker arm and metal diaphragms
 3. See Footnote 1 of Table 16 for technical information on safety relief valve or rupture disc setpoint pressure.

TABLE 4
 MAXIMUM ALLOWABLE PRESSURE vs. TEMPERATURE;
 FOR PRESSURE CONTAINMENT OF
 BODY, SPRING CHAMBER AND CYLINDER
 (See Table 5 for Material Specifications)

Materials of Construction ¹ Description - Abbreviation Body/Spring Chamber/Cylinder	Inlet – Cylinder				Outlet – Body & Spring Chamber			
	Pressure		Temperature		Pressure		Temperature	
	psig	(Barg)	°F	(°C)	psig	(Barg)	°F	(°C)
CI / CI / BRZ or BRZ / CI / BRZ or BRZ / BRZ / BRZ	400	(27.6)	-20 to +150	(-29 to +66)	400	(27.6)	-20 to +150	(-29 to +66)
	385	(26.5)	+200	(+94)	385	(26.5)	+200	(+94)
	365	(25.2)	+250	(+121)	365	(25.2)	+250	(+121)
	335	(23.1)	+300	(+149)	335	(23.1)	+300	(+149)
	300	(20.7)	+350	(+177)	300	(20.7)	+350	(+177)
	250	(17.2)	+400	(+205)	250	(17.2)	+400	(+205)
CI / CI / SST or CS / CI / SST or SST / CI / SST or CI / CI / CS ² or CS / CI / CS ²	740	(51.0)	-20 to +450	(-29 to +232)	400	(27.6)	-20 to +268	(-29 to +131)
					395	(27.2)	+275	(+135)
					375	(25.9)	+300	(+149)
					335	(23.1)	+350	(+177)
					295	(20.3)	+400	(+205)
					250	(17.2)	+450	(+232)
CS / CS / SST or SST / CS / SST or CS / CS / CS ² SST / SST / SST	740	(51.0)	-20 to +600 ³	(-29 to +315) ³	400	(27.6)	-20 to +600 ³	(-29 to +315) ³

¹ For constructions containing following materials as the body, spring chamber, or cylinder, the pressure vs. temperature limits are based upon:

Material	ANSI Specification No.
BRZ	B16.15
CI	B16.1
CS	B16.5
SST	B16.5

² Cylinders of CS for 2" (DN50) body size only.

³ Requires use of Opt-46, asbestos gasket for temperatures from +450 to +600°F (+232 to +315°C)

TABLE 5
 MATERIAL SPECIFICATIONS OF
 BODY, SPRING CHAMBER AND CYLINDER

Material	ASTM Specifications
BRZ – cast bronze	B62, Alloy 83600; 85% Cu, 5% Sn, 5% Pb, 5% Zn
CI – cast iron	A126, Class B
CS – cast carbon steel	A216, Gr. WCB
SST – cast stainless steel	A351, Gr. CF8M (cast 316 SST)
CS – carbon steel ¹	A108, Cold drawn carbon steel bar, Alloy C1018

¹ Cylinders of CS for 2" (DN50) body size only.

TABLE 6
APPLICATIONS

Fluid	Recommended Construction	Trim Designation No. ¹
Air or Inert Gases	Composition Seat & Diaphragm Metal Seat & Composition Diaphragm	B2, B3, S3N S2N
Liquids	Metal Seat & Diaphragm Composition Seat & Diaphragm	S1 B2, B3, S3N
Chemicals	Metal Seat & Composition Diaphragm Metal Seat & Diaphragm Composition Seat & Diaphragm Composition Seat & Metal Diaphragm	S5, S40 S0 S3, S6 S9
Sour Gas	Metal Seat & Composition Diaphragm	S40
Fuel Oil	Composition Seat & Diaphragm	B2, B3, S3, S3N
Hydrocarbon Gas or Liquids	Composition Seat & Diaphragm	B2, B3, S3, S3N
Steam, Saturated or Superheated	Metal Seat & Diaphragm	B1, S1, S2
Water and Condensate, Low Temperature (32 – 180°F)	Composition Seat & Diaphragm Metal Seat & Composition Diaphragm	B2, B3, S3, S3N S2N
Water and Condensate High Temperature (180 – 300°F)	Metal Seat & Diaphragm	B1, S1 or S2

¹ S1 trim is available with stellite faced plug and valve seat (Opt. -15).

TABLE 7
BRASS TRIM MATERIAL COMBINATIONS

Part	Brass Trim #			
	B1	B2	B3	B5
Diaphragm	302 SST	Neoprene	Neoprene	Phos. Bronze
Cylinder	Brass	Brass	Brass	Brass
Valve Seat	316 SST	Brass	Brass	Brass
Plug	416 SST	Brass	Brass	Brass
Seat Disc	None (metal)	Buna-N	TFE	TFE
Seat Disc Screw	None	Brass	Brass	Brass
Plug Collar	Brass	Brass	Brass	Brass
Rocker Arm Shaft	Brass	Brass	Brass	Brass
Rocker Arm	Bronze	Bronze	Bronze	Bronze
Pusher Plate Stud	Brass	Brass	Brass	Brass
Pusher Plate	Bronze	Bronze	Bronze	Bronze
Stud Collar	Brass	Brass	Brass	Brass
Cotter Pin	Brass	Brass	Brass	Brass
Nut	Brass	Brass	Brass	Brass
Temperature Range °F	-20 to 400	-20 to 180	-20 to 180	-20 to 400
Temperature Range °C	-29 to 205	-20 to 83	-29 to 83	-29 to 205

TABLE 8
STAINLESS STEEL TRIM MATERIAL COMBINATIONS

Part	Stainless Steel Trim #										
	S0	S1 ¹	S2	S2N	S3	S3N	S5	S6	S9	S36	S40
Diaphragm	TFE/ 302 SST	302 SST	302 SST	Neoprene	Neoprene	Neoprene	FC Elast.*	EPDM	TFE/ 302 SST	302SST	Neoprene
Cylinder	CF8M	CF8M	CF8M ²	CF8M ²	CF8M	316 SST	CF8M ²	CF8M	CF8M	CF8M	CF8M
Valve Seat	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Plug	316 SST	316 SST	416 SST	416 SST	316 SST	316 SST	416 SST	316 SST	316 SST	316 SST	316 SST
Seat Disc	None (Metal)	None (Metal)	None (Metal)	None (Metal)	TFE	Buna-N	None (Metal)	EPR	TFE	TFE	None (Metal)
Seat Disc Screw	None	None	None	None	316 SST	316 SST	None	316 SST	316 SST	316 SST	None
Plug Collar	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Rocker Arm Shaft	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Rocker Arm	CF8M	CF8M	CF8M	CF8M	CF8M	316 SST	CF8M	CF8M	CF8M	CF8M	CF8M
Pusher Plate and Stud	CF8M	CF8M	CF8M	CF8M	CF8M	316 SST	CF8M	CF8M	CF8M	CF8M	CF8M
Stud Collar	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Cotter Pin	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Nut	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Temperature Range °F	-20 to 400	-20 to 600	-20 to 600	-20 to 180	-20 to 180	-20 to 180	-20 to 400	-20 to 300	-20 to 400	-20 to 400	-20 to 180
Temperature Range °C	-29 to 205	-29 to 315	-29 to 315	-29 to 83	-29 to 83	-29 to 83	-29 to 205	-29 to 149	-29 to 205	-29 to 205	-29 to 83

¹ Available with Stellite faced plug and valve seat (Opt. -15). Includes a screwed-in seat cone.

² Steel cylinder furnished with 2" units using trim S2, S2N or S5 in iron or steel bodies. All others use 316 SST cylinders with SST trim. Opt. -17 not available with steel cylinder.

* FC Elast. = Fluorocarbon Elastomer

TABLE 9
Cv - FLOW CAPACITY

FULL PORT - COMPOSITION DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

COMPOSITION DIAPHRAGM - SIZE - 1/2" (DN15) - FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	185	(12.8)	185	(12.8)	0.71	1.30	1.89	10-50	(0.7-3.4)
15	(1.0)	300	(20.7)	300	(20.7)	0.77	1.39	1.98	10-50	(0.7-3.4)
20	(1.4)	420	(29.0)	420	(29.0)	0.84	1.48	2.08	10-50	(0.7-3.4)
25	(1.7)	535	(36.9)	425	(29.3)	0.90	1.57	2.17	10-50	(0.7-3.4)
35	(2.4)	685	(47.2)	435	(30.0)	1.03	1.74	2.35	10-50	(0.7-3.4)
50	(3.4)	700	(48.3)	450	(31.0)	1.33	2.17	2.82	40-100	(2.8-6.9)
75	(5.2)	740	(51.0)	475	(32.8)	1.58	2.52	3.43	40-100	(2.8-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	2.07	3.35	3.50	80-150	(5.5-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	2.17	3.50	3.50	80-150	(5.5-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	1.98	3.28	3.50	120-190	(8.3-13.1)
175	(12.1)	740	(51.0)	575	(39.7)	2.00	3.39	3.50	120-190	(8.3-13.1)
200	(13.8)	740	(51.0)	600	(41.4)	2.02	3.50	3.50	150-300	(10.3-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	2.05	3.50	3.50	150-300	(10.3-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	2.09	3.50	3.50	150-300	(10.3-20.7)

COMPOSITION DIAPHRAGM - SIZE - 3/4" (DN20) - FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	145	(10.0)	145	(10.0)	1.16	2.23	2.86	10-40	(0.7-2.8)
15	(1.0)	230	(15.9)	230	(15.9)	1.26	2.34	3.00	10-40	(0.7-2.8)
20	(1.4)	320	(22.1)	320	(22.1)	1.37	2.44	3.15	10-40	(0.7-2.8)
25	(1.7)	410	(28.3)	410	(28.3)	1.47	2.55	3.29	10-40	(0.7-2.8)
35	(2.4)	540	(37.2)	435	(30.0)	1.97	3.15	4.12	30-60	(2.1-4.1)
50	(3.4)	700	(48.3)	450	(31.0)	2.30	2.69	4.85	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	2.83	4.77	5.00	50-90	(3.4-6.2)
100	(6.9)	740	(51.0)	500	(34.5)	3.33	5.00	5.00	70-110	(4.8-7.6)
125	(8.6)	740	(51.0)	525	(36.2)	3.10	5.00	5.00	90-170	(6.2-11.7)
150	(10.3)	740	(51.0)	550	(37.9)	3.33	5.00	5.00	90-170	(6.2-11.7)
175	(12.1)	740	(51.0)	575	(39.7)	2.17	3.54	4.77	140-300	(9.7-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	2.24	3.60	5.00	140-300	(9.7-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	2.37	3.74	5.00	140-300	(9.7-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	2.58	3.87	5.00	140-300	(9.7-20.7)

COMPOSITION DIAPHRAGM - SIZE - 1" (DN25) - FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	130	(9.0)	130	(9.0)	1.25	2.41	3.61	10-40	(0.7-2.8)
15	(1.0)	205	(14.1)	205	(14.1)	1.40	2.69	3.81	10-40	(0.7-2.8)
20	(1.4)	285	(19.7)	285	(19.7)	1.55	2.96	4.01	10-40	(0.7-2.8)
25	(1.7)	360	(24.8)	360	(24.8)	1.70	3.24	4.21	10-40	(0.7-2.8)
35	(2.4)	485	(33.4)	435	(30.0)	2.49	4.21	5.07	30-60	(2.1-4.1)
50	(3.4)	695	(47.9)	450	(31.0)	2.90	5.00	6.00	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	3.67	6.00	6.00	55-80	(3.8-5.5)
100	(6.9)	740	(51.0)	500	(34.5)	3.85	6.00	6.00	65-130	(4.5-9.0)
125	(8.6)	740	(51.0)	525	(36.2)	3.70	6.00	6.00	100-300	(6.9-20.7)
150	(10.3)	740	(51.0)	550	(37.9)	3.76	6.00	6.00	100-300	(6.9-20.7)
175	(12.1)	740	(51.0)	575	(39.7)	3.83	6.00	6.00	100-300	(6.9-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	3.89	6.00	6.00	100-300	(6.9-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	4.02	6.00	6.00	100-300	(6.9-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	4.15	6.00	6.00	100-300	(6.9-20.7)

TABLE 9 (Continued)
Cv – FLOW CAPACITY

FULL PORT – COMPOSITION DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

COMPOSITION DIAPHRAGM – SIZE – 1-1/4" (DN32) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	105	(7.2)	105	(7.2)	1.83	4.07	6.25	10-40	(0.7-2.8)
15	(1.0)	170	(11.7)	170	(11.7)	2.11	4.55	6.69	10-40	(0.7-2.8)
20	(1.4)	235	(16.2)	235	(16.2)	2.40	5.03	7.13	10-40	(0.7-2.8)
25	(1.7)	300	(20.7)	300	(20.7)	2.68	5.51	7.58	10-40	(0.7-2.8)
35	(2.4)	380	(26.2)	380	(26.2)	4.10	7.70	9.00	30-50	(2.1-3.4)
50	(3.4)	525	(36.2)	450	(31.0)	5.30	8.83	9.00	40-60	(2.7-4.1)
75	(5.2)	670	(46.2)	475	(32.8)	7.70	9.00	9.00	50-90	(3.4-6.2)
100	(6.9)	495	(34.1)	495	(34.1)	8.68	9.00	9.00	70-225	(4.8-15.5)
125	(8.6)	700	(48.3)	525	(36.2)	8.73	9.00	9.00	70-225	(4.8-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	8.79	9.00	9.00	70-225	(4.8-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	8.84	9.00	9.00	70-225	(4.8-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	8.90	9.00	9.00	70-225	(4.8-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	8.95	9.00	9.00	70-225	(4.8-15.5)

COMPOSITION DIAPHRAGM – SIZE – 1-1/2" (DN40) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	110	(7.6)	110	(7.6)	2.37	4.59	6.87	10-40	(0.7-2.8)
15	(1.0)	180	(12.4)	180	(12.4)	2.75	5.20	7.38	10-40	(0.7-2.8)
20	(1.4)	245	(16.9)	245	(16.9)	3.14	5.80	7.90	10-40	(0.7-2.8)
25	(1.7)	315	(21.7)	315	(21.7)	3.52	6.41	8.41	10-40	(0.7-2.8)
35	(2.4)	395	(27.3)	395	(27.3)	4.40	8.80	10.00	30-75	(2.1-5.2)
50	(3.4)	600	(41.4)	450	(31.0)	5.50	9.05	10.55	30-75	(2.1-5.2)
75	(5.2)	740	(51.0)	475	(32.8)	6.35	9.65	10.90	60-100	(4.1-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	7.33	10.25	11.00	80-225	(5.5-15.5)
125	(8.6)	740	(51.0)	525	(36.2)	7.49	10.32	11.00	80-225	(5.5-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	7.65	10.39	11.00	80-225	(5.5-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	7.81	10.46	11.00	80-225	(5.5-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	7.97	10.53	11.00	80-225	(5.5-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	8.13	10.60	11.00	80-225	(5.5-15.5)

COMPOSITION DIAPHRAGM – SIZE – 2" (DN50) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	120	(8.3)	120	(8.3)	3.60	7.27	10.30	10-40	(0.7-2.8)
15	(1.0)	220	(15.2)	220	(15.2)	3.84	7.60	10.83	10-40	(0.7-2.8)
20	(1.4)	315	(21.7)	315	(21.7)	4.08	7.92	11.36	10-40	(0.7-2.8)
25	(1.7)	415	(28.6)	415	(28.6)	4.32	8.25	11.89	10-40	(0.7-2.8)
35	(2.4)	420	(29.0)	420	(29.0)	7.90	11.05	12.80	30-60	(2.1-4.1)
50	(3.4)	690	(47.6)	450	(31.0)	8.80	11.75	13.00	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	7.27	10.63	12.37	50-150	(3.4-10.3)
100	(6.9)	740	(51.0)	500	(34.5)	7.78	10.95	12.70	50-150	(3.4-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	8.29	11.26	12.90	50-150	(3.4-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	8.80	11.58	13.00	50-150	(3.4-10.3)

TABLE 10
Cv - FLOW CAPACITY

OPT -12, 1-STEP REDUCED PORT - COMPOSITION DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

$(F_L = 0.93)$

COMPOSITION DIAPHRAGM - SIZE - 1/2" (DN15) - 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	200	(13.8)	220	(15.2)	0.47	1.00	1.55	10-50	(0.7-3.4)
15	(1.0)	335	(23.1)	370	(25.5)	0.53	1.10	1.61	10-50	(0.7-3.4)
20	(1.4)	475	(32.8)	420	(29.0)	0.60	1.18	1.68	10-50	(0.7-3.4)
25	(1.7)	610	(42.1)	425	(29.3)	0.66	1.26	1.74	10-50	(0.7-3.4)
35	(2.4)	685	(47.2)	435	(30.0)	0.78	1.42	1.86	10-50	(0.7-3.4)
50	(3.4)	740	(51.0)	450	(31.0)	1.06	1.79	2.22	40-100	(2.8-6.9)
75	(5.2)	740	(51.0)	475	(32.8)	1.26	2.09	2.36	40-100	(2.8-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	1.67	2.44	2.50	80-150	(5.5-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	1.79	2.50	2.50	80-150	(5.5-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	1.74	2.48	2.50	120-190	(8.3-13.1)
175	(12.1)	740	(51.0)	575	(39.7)	1.81	2.50	2.50	120-190	(8.3-13.1)
200	(13.8)	740	(51.0)	600	(41.4)	1.57	2.37	2.50	150-300	(10.3-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	1.66	2.42	2.50	150-300	(10.3-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	1.75	2.48	2.50	150-300	(10.3-20.7)

COMPOSITION DIAPHRAGM - SIZE - 3/4" (DN20) - 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	175	(12.1)	300	(20.7)	0.71	1.30	1.89	10-40	(0.7-2.8)
15	(1.0)	280	(19.3)	415	(28.6)	0.77	1.39	1.98	10-40	(0.7-2.8)
20	(1.4)	380	(26.2)	420	(29.0)	0.84	1.48	2.08	10-40	(0.7-2.8)
25	(1.7)	480	(33.1)	425	(29.3)	0.90	1.57	2.17	10-40	(0.7-2.8)
35	(2.4)	665	(45.9)	435	(30.0)	1.03	1.74	2.35	30-60	(2.1-4.1)
50	(3.4)	740	(51.0)	450	(31.0)	1.33	2.17	2.82	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	1.58	2.52	3.43	50-90	(3.4-6.2)
100	(6.9)	740	(51.0)	500	(34.5)	2.07	3.35	3.50	70-110	(4.8-7.6)
125	(8.6)	740	(51.0)	525	(36.2)	2.17	3.50	3.50	90-170	(6.2-11.7)
150	(10.3)	740	(51.0)	550	(37.9)	2.12	3.47	3.50	90-170	(6.2-11.7)
175	(12.1)	740	(51.0)	575	(39.7)	2.00	3.39	3.50	140-300	(9.7-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	2.02	3.50	3.50	140-300	(9.7-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	2.05	3.50	3.50	140-300	(9.7-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	2.09	3.50	3.50	140-300	(9.7-20.7)

COMPOSITION DIAPHRAGM - SIZE - 1" (DN25) - 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	170	(11.7)	250	(17.2)	0.86	1.72	2.57	10-40	(0.7-2.8)
15	(1.0)	270	(18.6)	400	(27.6)	0.96	1.93	2.83	10-40	(0.7-2.8)
20	(1.4)	370	(25.5)	420	(29.0)	1.07	2.15	3.09	10-40	(0.7-2.8)
25	(1.7)	475	(32.8)	425	(29.3)	1.17	2.36	3.36	10-40	(0.7-2.8)
35	(2.4)	635	(43.8)	435	(30.0)	1.57	3.50	4.60	30-60	(2.1-4.1)
50	(3.4)	740	(51.0)	450	(31.0)	1.95	4.50	5.46	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	2.85	5.46	5.46	55-80	(3.8-5.5)
100	(6.9)	740	(51.0)	500	(34.5)	2.74	5.38	5.46	65-130	(4.5-9.0)
125	(8.6)	740	(51.0)	525	(36.2)	2.50	5.20	5.46	100-300	(6.9-20.7)
150	(10.3)	740	(51.0)	550	(37.9)	2.58	5.38	5.46	100-300	(6.9-20.7)
175	(12.1)	740	(51.0)	575	(39.7)	2.66	5.46	5.46	100-300	(6.9-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	2.74	5.46	5.46	100-300	(6.9-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	2.91	5.46	5.46	100-300	(6.9-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	3.07	5.46	5.46	100-300	(6.9-20.7)

TABLE 10 (Continued)
Cv – FLOW CAPACITY

OPT -12, 1-STEP REDUCED PORT – COMPOSITION DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

$(F_L = 0.93)$

COMPOSITION DIAPHRAGM – SIZE – 1-1/2" (DN40) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	165	(11.4)	225	(15.5)	1.25	2.41	3.61	10-40	(0.7-2.8)
15	(1.0)	265	(18.3)	365	(25.2)	1.40	2.69	3.81	10-40	(0.7-2.8)
20	(1.4)	360	(24.8)	420	(29.0)	1.55	2.96	4.01	10-40	(0.7-2.8)
25	(1.7)	460	(31.7)	425	(29.3)	1.70	3.24	4.21	10-40	(0.7-2.8)
35	(2.4)	570	(39.3)	435	(30.0)	2.49	4.21	5.07	30-75	(2.1-5.2)
50	(3.4)	700	(48.3)	450	(31.0)	2.90	5.00	6.00	30-75	(2.1-5.2)
75	(5.2)	740	(51.0)	475	(32.8)	3.67	6.00	6.00	60-100	(4.1-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	3.65	6.00	6.00	80-225	(5.5-15.5)
125	(8.6)	740	(51.0)	525	(36.2)	3.70	6.00	6.00	80-225	(5.5-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	3.76	6.00	6.00	80-225	(5.5-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	3.83	6.00	6.00	80-225	(5.5-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	3.89	6.00	6.00	80-225	(5.5-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	3.95	6.00	6.00	80-225	(5.5-15.5)

COMPOSITION DIAPHRAGM – SIZE – 2" (DN50) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	145	(10.0)	145	(10.0)	2.37	4.59	6.87	10-40	(0.7-2.8)
15	(1.0)	245	(16.9)	245	(16.9)	2.75	5.20	7.38	10-40	(0.7-2.8)
20	(1.4)	340	(23.4)	340	(23.4)	3.14	5.80	7.90	10-40	(0.7-2.8)
25	(1.7)	430	(29.7)	425	(29.3)	3.52	6.41	8.41	10-40	(0.7-2.8)
35	(2.4)	460	(31.7)	435	(30.0)	4.40	8.80	10.00	30-60	(2.1-4.1)
50	(3.4)	690	(47.6)	450	(31.0)	5.50	9.05	10.55	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	6.35	9.65	10.90	50-150	(3.4-10.3)
100	(6.9)	740	(51.0)	500	(34.5)	7.33	10.25	11.00	50-150	(3.4-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	7.49	10.32	11.00	50-150	(3.4-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	7.65	10.39	11.00	50-150	(3.4-10.3)

TABLE 11
Cv – FLOW CAPACITY

FULL PORT – METAL DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

METAL DIAPHRAGM – SIZE – 1/2" (DN15) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	215	(14.8)	215	(14.8)	0.42	0.81	1.18	10-50	(0.7-3.4)
15	(1.0)	335	(23.1)	335	(23.1)	0.47	0.89	1.27	10-50	(0.7-3.4)
20	(1.4)	450	(31.0)	420	(29.0)	0.53	0.98	1.37	10-50	(0.7-3.4)
25	(1.7)	570	(39.3)	425	(29.3)	0.58	1.04	1.45	10-50	(0.7-3.4)
35	(2.4)	685	(47.2)	435	(30.0)	0.67	1.18	1.62	10-50	(0.7-3.4)
50	(3.4)	740	(51.0)	450	(31.0)	0.88	1.52	2.01	40-100	(2.8-6.9)
75	(5.2)	740	(51.0)	475	(32.8)	1.03	1.78	2.34	40-100	(2.8-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	1.59	2.58	3.50	80-150	(5.5-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	1.72	2.69	3.50	80-150	(5.5-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	1.64	2.66	3.40	120-190	(8.3-13.1)
175	(12.1)	740	(51.0)	575	(39.7)	1.72	2.80	3.50	120-190	(8.3-13.1)
200	(13.8)	740	(51.0)	600	(41.4)	1.58	2.64	3.50	150-300	(10.3-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	1.67	2.72	3.50	150-300	(10.3-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	1.77	2.88	3.50	150-300	(10.3-20.7)

METAL DIAPHRAGM – SIZE – 3/4" (DN20) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	160	(11.0)	160	(11.0)	0.70	1.36	2.07	10-40	(0.7-2.8)
15	(1.0)	250	(17.2)	250	(17.2)	0.76	1.50	2.20	10-40	(0.7-2.8)
20	(1.4)	340	(23.4)	340	(23.4)	0.82	1.65	2.34	10-40	(0.7-2.8)
25	(1.7)	425	(29.3)	425	(29.3)	0.88	1.77	2.44	10-40	(0.7-2.8)
35	(2.4)	580	(40.0)	435	(30.0)	1.00	2.01	2.65	30-60	(2.1-4.1)
50	(3.4)	700	(48.3)	450	(31.0)	1.33	2.66	3.47	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	1.93	3.32	4.43	50-90	(3.4-6.2)
100	(6.9)	740	(51.0)	500	(34.5)	2.56	4.18	5.00	70-110	(4.8-7.6)
125	(8.6)	740	(51.0)	525	(36.2)	2.43	4.00	5.00	90-170	(6.2-11.7)
150	(10.3)	740	(51.0)	550	(37.9)	2.57	4.18	5.00	90-170	(6.2-11.7)
175	(12.1)	740	(51.0)	575	(39.7)	1.72	3.07	4.14	140-300	(9.7-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	1.80	3.13	4.20	140-300	(9.7-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	2.00	3.38	4.67	140-300	(9.7-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	2.18	3.63	5.00	140-300	(9.7-20.7)

METAL DIAPHRAGM – SIZE – 1" (DN25) – FULL PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	145	(10.0)	145	(10.0)	0.78	1.55	2.42	10-40	(0.7-2.8)
15	(1.0)	220	(15.2)	220	(15.2)	0.87	2.10	2.67	10-40	(0.7-2.8)
20	(1.4)	300	(20.7)	300	(20.7)	0.96	1.92	2.93	10-40	(0.7-2.8)
25	(1.7)	375	(25.9)	375	(25.9)	1.04	2.13	3.13	10-40	(0.7-2.8)
35	(2.4)	515	(35.5)	435	(30.0)	1.21	2.54	3.53	30-60	(2.1-4.1)
50	(3.4)	700	(48.3)	450	(31.0)	1.67	3.47	4.62	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	2.25	4.79	6.00	55-80	(3.8-5.5)
100	(6.9)	740	(51.0)	500	(34.5)	3.03	5.20	6.00	65-130	(4.5-9.0)
125	(8.6)	740	(51.0)	525	(36.2)	2.80	4.93	6.00	100-300	(6.9-20.7)
150	(10.3)	740	(51.0)	550	(37.9)	2.88	5.02	6.00	100-300	(6.9-20.7)
175	(12.1)	740	(51.0)	575	(39.7)	2.95	5.11	6.00	100-300	(6.9-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	3.03	5.20	6.00	100-300	(6.9-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	3.18	5.32	6.00	100-300	(6.9-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	3.33	5.45	6.00	100-300	(6.9-20.7)

TABLE 11 (Continued)
Cv – FLOW CAPACITY

FULL PORT – METAL DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

Outlet Pressure		METAL DIAPHRAGM – SIZE – 1-1/4" (DN32) – FULL PORT								
		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
psig	(Barg)	Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
10	(0.7)	115	(7.9)	115	(7.9)	1.30	2.80	4.40	10-40	(0.7-2.8)
15	(1.0)	180	(12.4)	180	(12.4)	1.47	3.18	4.87	10-40	(0.7-2.8)
20	(1.4)	240	(16.6)	240	(16.6)	1.64	3.55	5.34	10-40	(0.7-2.8)
25	(1.7)	300	(20.7)	300	(20.7)	1.81	3.93	5.81	10-40	(0.7-2.8)
35	(2.4)	370	(25.5)	370	(25.5)	2.35	6.13	8.30	30-50	(2.1-3.4)
50	(3.4)	500	(34.5)	450	(31.0)	4.55	8.60	9.00	40-60	(2.8-4.1)
75	(5.2)	670	(46.2)	475	(32.8)	5.30	8.92	9.00	50-90	(3.4-6.2)
100	(6.9)	740	(51.0)	495	(34.1)	6.80	9.00	9.00	70-225	(4.8-15.5)
125	(8.6)	740	(51.0)	525	(36.2)	6.90	9.00	9.00	70-225	(4.8-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	6.99	9.00	9.00	70-225	(4.8-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	7.09	9.00	9.00	70-225	(4.8-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	7.19	9.00	9.00	70-225	(4.8-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	7.38	9.00	9.00	70-225	(4.8-15.5)

Outlet Pressure		METAL DIAPHRAGM – SIZE – 1-1/2" (DN40) – FULL PORT								
		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
psig	(Barg)	Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
10	(0.7)	115	(7.9)	115	(7.9)	1.75	3.27	4.82	10-40	(0.7-2.8)
15	(1.0)	190	(13.1)	190	(13.1)	2.04	3.79	5.42	10-40	(0.7-2.8)
20	(1.4)	260	(17.9)	260	(17.9)	2.33	4.30	6.01	10-40	(0.7-2.8)
25	(1.7)	330	(22.8)	330	(22.8)	2.62	4.82	6.61	10-40	(0.7-2.8)
35	(2.4)	435	(30.0)	435	(30.0)	3.75	6.53	8.70	30-75	(2.1-5.2)
50	(3.4)	635	(43.8)	450	(31.0)	4.15	7.15	9.10	30-75	(2.1-5.2)
75	(5.2)	740	(51.0)	475	(32.8)	5.30	8.75	10.30	60-100	(4.1-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	6.10	9.40	10.75	80-225	(5.5-15.5)
125	(8.6)	740	(51.0)	525	(36.2)	6.23	9.49	10.78	80-225	(5.5-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	6.37	9.58	10.80	80-225	(5.5-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	6.50	9.68	10.83	80-225	(5.5-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	6.63	9.77	10.85	80-225	(5.5-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	6.90	9.95	10.90	80-225	(5.5-15.5)

Outlet Pressure		METAL DIAPHRAGM – SIZE – 2" (DN50) – FULL PORT								
		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
psig	(Barg)	Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
10	(0.7)	165	(11.4)	165	(11.4)	2.10	4.27	6.55	10-40	(0.7-2.8)
15	(1.0)	270	(18.6)	270	(18.6)	2.26	4.58	6.90	10-40	(0.7-2.8)
20	(1.4)	370	(25.5)	370	(25.5)	2.42	4.90	7.25	10-40	(0.7-2.8)
25	(1.7)	470	(32.4)	425	(29.3)	2.59	5.21	7.60	10-40	(0.7-2.8)
35	(2.4)	500	(34.5)	435	(30.0)	5.55	9.60	11.30	30-60	(2.1-4.1)
50	(3.4)	700	(48.3)	450	(31.0)	6.85	10.35	12.00	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	5.87	9.70	11.40	50-150	(3.4-10.3)
100	(6.9)	740	(51.0)	500	(34.5)	6.48	10.03	11.73	50-150	(3.4-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	7.09	10.37	12.07	50-150	(3.4-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	7.70	10.70	12.40	50-150	(3.4-10.3)

TABLE 12
Cv – FLOW CAPACITY

OPT -12, 1-STEP REDUCED PORT – METAL DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

METAL DIAPHRAGM – SIZE – 1/2" (DN15) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	270	(18.6)	300	(20.7)	0.23	0.57	0.87	10-50	(0.7-3.4)
15	(1.0)	405	(27.9)	415	(28.6)	0.27	0.59	0.95	10-50	(0.7-3.4)
20	(1.4)	540	(37.2)	420	(29.0)	0.31	0.61	1.03	10-50	(0.7-3.4)
25	(1.7)	670	(46.2)	425	(29.3)	0.36	0.63	1.12	10-50	(0.7-3.4)
35	(2.4)	685	(47.2)	435	(30.0)	0.44	0.66	1.28	10-50	(0.7-3.4)
50	(3.4)	740	(51.0)	450	(31.0)	0.63	1.21	1.67	40-100	(2.8-6.9)
75	(5.2)	740	(51.0)	475	(32.8)	0.83	1.52	2.03	40-100	(2.8-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	1.24	2.10	2.45	80-150	(5.5-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	1.32	2.18	2.52	80-150	(5.5-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	1.29	2.17	2.52	120-190	(8.3-13.1)
175	(12.1)	740	(51.0)	575	(39.7)	1.36	2.22	2.52	120-190	(8.3-13.1)
200	(13.8)	740	(51.0)	600	(41.4)	1.28	2.13	2.52	150-300	(10.3-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	1.37	2.21	2.52	150-300	(10.3-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	1.45	2.29	2.52	150-300	(10.3-20.7)

METAL DIAPHRAGM – SIZE – 3/4" (DN20) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	190	(13.1)	325	(22.4)	0.42	0.81	1.18	10-40	(0.7-2.8)
15	(1.0)	295	(20.3)	415	(28.6)	0.47	0.89	1.27	10-40	(0.7-2.8)
20	(1.4)	395	(27.2)	420	(29.0)	0.53	0.98	1.37	10-40	(0.7-2.8)
25	(1.7)	500	(34.5)	425	(29.3)	0.58	1.04	1.45	10-40	(0.7-2.8)
35	(2.4)	685	(47.2)	435	(30.0)	0.67	1.18	1.62	30-60	(2.1-4.1)
50	(3.4)	740	(51.0)	450	(31.0)	0.88	1.52	2.01	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	1.03	1.78	2.34	50-90	(3.4-6.2)
100	(6.9)	740	(51.0)	500	(34.5)	1.59	2.58	3.50	70-110	(4.8-7.6)
125	(8.6)	740	(51.0)	525	(36.2)	1.72	2.69	3.50	90-170	(6.2-11.7)
150	(10.3)	740	(51.0)	550	(37.9)	1.40	2.48	3.45	140-300	(9.7-20.7)
175	(12.1)	740	(51.0)	575	(39.7)	1.49	2.56	3.50	140-300	(9.7-20.7)
200	(13.8)	740	(51.0)	600	(41.4)	1.58	2.64	3.50	140-300	(9.7-20.7)
250	(17.2)	740	(51.0)	650	(44.8)	1.67	2.72	3.50	140-300	(9.7-20.7)
300	(20.7)	740	(51.0)	700	(48.3)	1.77	2.88	3.50	140-300	(9.7-20.7)

METAL DIAPHRAGM – SIZE – 1" (DN25) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	190	(13.1)	280	(19.3)	0.51	1.05	1.55	10-40	(0.7-2.8)
15	(1.0)	290	(20.0)	430	(29.7)	0.57	1.17	1.74	10-40	(0.7-2.8)
20	(1.4)	395	(27.2)	580	(40.1)	0.63	1.29	1.93	10-40	(0.7-2.8)
25	(1.7)	495	(34.1)	675	(46.6)	0.68	1.29	1.93	10-40	(0.7-2.8)
35	(2.4)	675	(46.6)	685	(47.2)	0.68	1.40	2.13	30-60	(2.1-4.1)
50	(3.4)	740	(51.0)	700	(48.3)	0.92	1.90	3.10	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	725	(50.0)	1.13	2.41	4.02	55-80	(3.8-5.5)
100	(6.9)	740	(51.0)	750	(51.7)	1.75	4.08	5.46	65-130	(4.5-9.0)
125	(8.6)	740	(51.0)	775	(53.4)	2.02	4.83	5.46	65-130	(4.5-9.0)
150	(10.3)	740	(51.0)	800	(55.2)	1.88	4.28	5.46	100-300	(6.9-20.7)
175	(12.1)	740	(51.0)	825	(56.9)	1.94	4.39	5.46	100-300	(6.9-20.7)
200	(13.8)	740	(51.0)	850	(58.6)	1.99	4.50	5.46	100-300	(6.9-20.7)
250	(17.2)	740	(51.0)	900	(62.1)	2.04	4.60	5.46	100-300	(6.9-20.7)
300	(20.7)	740	(51.0)	950	(65.5)	2.15	4.82	5.46	100-300	(6.9-20.7)

TABLE 12 (Continued)
Cv – FLOW CAPACITY

OPT -12, 1-STEP REDUCED PORT – METAL DIAPHRAGM

Based on 400 psid (27.6 Bard) max pressure drop limit for composition seat,
and on 650 psid (44.8 Bard) for metal seat.

($F_L = 0.93$)

METAL DIAPHRAGM – SIZE – 1-1/2" (DN40) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	185	(12.8)	255	(17.6)	0.78	1.55	2.42	10-40	(0.7-2.8)
15	(1.0)	285	(19.7)	395	(27.2)	0.87	2.10	2.67	10-40	(0.7-2.8)
20	(1.4)	385	(26.6)	420	(29.0)	0.96	1.92	2.93	10-40	(0.7-2.8)
25	(1.7)	385	(26.6)	425	(29.3)	1.04	2.13	3.13	10-40	(0.7-2.8)
35	(2.4)	660	(45.5)	435	(30.0)	1.21	2.54	3.53	30-75	(2.1-5.2)
50	(3.4)	740	(51.0)	450	(31.0)	1.67	3.47	4.62	30-75	(2.1-5.2)
75	(5.2)	740	(51.0)	475	(32.8)	2.25	4.79	6.00	60-100	(4.1-6.9)
100	(6.9)	740	(51.0)	500	(34.5)	2.72	4.84	6.00	80-225	(5.5-15.5)
125	(8.6)	740	(51.0)	525	(36.2)	2.80	4.93	6.00	80-225	(5.5-15.5)
150	(10.3)	740	(51.0)	550	(37.9)	2.88	5.02	6.00	80-225	(5.5-15.5)
175	(12.1)	740	(51.0)	575	(39.7)	2.95	5.11	6.00	80-225	(5.5-15.5)
200	(13.8)	740	(51.0)	600	(41.4)	3.03	5.20	6.00	80-225	(5.5-15.5)
225	(15.5)	740	(51.0)	625	(43.1)	3.10	5.26	6.00	80-225	(5.5-15.5)

METAL DIAPHRAGM – SIZE – 2" (DN40) – 1-STEP REDUCED PORT										
Outlet Pressure		Max Inlet Pressure				Cv @ % DROOP			Range Spring	
		Metal Seated		Composition Seated		10%	20%	30%	psig	(Barg)
psig	(Barg)	psig	(Barg)	psig	(Barg)					
10	(0.7)	165	(11.4)	165	(11.4)	1.75	3.27	4.82	10-40	(0.7-2.8)
15	(1.0)	265	(18.3)	265	(18.3)	2.04	3.79	5.42	10-40	(0.7-2.8)
20	(1.4)	365	(25.2)	365	(25.2)	2.33	4.30	6.01	10-40	(0.7-2.8)
25	(1.7)	460	(31.7)	425	(29.3)	2.62	4.82	6.61	10-40	(0.7-2.8)
35	(2.4)	530	(36.6)	435	(30.0)	3.75	6.53	8.70	30-60	(2.1-4.1)
50	(3.4)	700	(48.3)	450	(31.0)	4.15	7.15	9.10	30-60	(2.1-4.1)
75	(5.2)	740	(51.0)	475	(32.8)	5.30	8.75	10.30	50-150	(3.4-10.3)
100	(6.9)	740	(51.0)	500	(34.5)	6.10	9.40	10.75	50-150	(3.4-10.3)
125	(8.6)	740	(51.0)	525	(36.2)	6.23	9.49	10.78	50-150	(3.4-10.3)
150	(10.3)	740	(51.0)	550	(37.9)	6.37	9.58	10.80	50-150	(3.4-10.3)

NOTES

TABLE 13
WATER CAPACITY - GPM
S.G. = 1.0 T = 60°F F_L = 0.93

FULL PORT – COMPOSITION DIAPHRAGM & SEAT

Outlet Pressure P2,psig	Inlet Pressure P1,psig	Pressure Drop psi	GPM @ 1/2" Body Size			GPM @ 3/4" Body Size			GPM @ 1" Body Size			GPM @ 1-1/4" Body Size			GPM @ 1-1/2" Body Size			GPM @ 2" Body Size			
			Droop			Droop			Droop			Droop			Droop			Droop			
			10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	
10	25	15	2.7	5.0	7.3	4.5	8.6	11.1	4.8	9.3	14.0	7.1	15.8	24.2	9.2	17.8	26.6	13.9	28.2	39.9	
	50	40	4.5	8.2	12.0	7.3	14.1	18.1	7.9	15.2	22.8	11.6	25.7	39.5	15.0	29.0	43.4	22.8	46.0	65.1	
	75	65	5.7	10.5	HI VEL	9.4	18.0	23.1	10.1	19.4	29.1	14.8	32.8	50.4	19.1	37.0	55.4	29.0	58.6	83.0	
	100	90	6.7	12.3	HI VEL	11.0	21.2	27.1	11.9	22.9	34.2	17.4	38.6	59.3	22.5	43.5	65.2	34.2	69.0	97.7	
	125	115	7.6	13.9	HI VEL	12.4	23.9	HI VEL	13.4	25.8	38.7	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
	150	140	8.4	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1
	175	165	9.1	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1
200	190	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
15	25	10	2.4	4.4	6.3	4.0	7.4	9.5	4.4	8.5	12.0	6.7	14.4	21.2	8.7	16.4	23.3	12.1	24.0	34.2	
	50	35	4.6	8.2	11.7	7.5	13.8	17.7	8.3	15.9	22.5	12.5	26.9	39.6	16.3	30.8	43.7	22.7	45.0	64.1	
	75	60	6.0	10.8	HI VEL	9.8	18.1	23.2	10.8	20.8	29.5	16.3	35.2	51.8	21.3	40.3	57.2	29.7	58.9	83.9	
	100	85	7.1	12.8	HI VEL	11.6	21.6	27.7	12.9	24.8	35.1	19.5	41.9	61.7	25.4	47.9	68.0	35.4	70.1	99.8	
	125	110	8.1	HI VEL	HI VEL	13.2	24.5	HI VEL	14.7	28.2	40.0	22.1	47.7	70.2	28.8	54.5	77.4	40.3	79.7	113.6	
	150	135	8.9	HI VEL	HI VEL	14.6	27.2	HI VEL	16.3	31.3	44.3	24.5	52.9	77.7	32.0	60.4	85.7	44.6	88.3	125.8	
	175	160	9.7	HI VEL	HI VEL	15.9	HI VEL	HI VEL	17.7	34.0	48.2	HI P1	HI P1	HI P1	34.8	65.8	93.4	48.6	96.1	137.0	
200	185	10.5	HI VEL	HI VEL	17.1	HI VEL	HI VEL	19.0	36.6	51.8	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	52.2	103.4	147.3		
250	235	CAV	CAV	CAV	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
20	25	5	1.9	3.3	4.7	3.1	5.5	7.0	3.5	6.6	9.0	5.4	11.2	15.9	7.0	13.0	17.7	9.1	17.7	25.4	
	50	30	4.6	8.1	11.4	7.5	13.4	17.3	8.5	16.2	22.0	13.1	27.6	39.1	17.2	31.8	43.3	22.3	43.4	62.2	
	75	55	6.2	11.0	HI VEL	10.2	18.1	23.4	11.5	22.0	29.7	17.8	37.3	52.9	23.3	43.0	58.6	30.3	58.7	84.2	
	100	80	7.5	13.2	HI VEL	12.3	21.8	28.2	13.9	26.5	35.9	21.5	45.0	63.8	28.1	51.9	70.7	36.5	70.8	101.6	
	125	105	8.6	HI VEL	HI VEL	14.0	25.0	HI VEL	15.9	30.3	41.1	24.6	51.5	73.1	32.2	59.4	81.0	41.8	81.2	116.4	
	150	130	9.6	HI VEL	HI VEL	15.6	27.8	HI VEL	17.7	33.7	45.7	27.4	57.4	81.3	35.8	66.1	90.1	46.5	90.3	129.5	
	175	155	10.5	HI VEL	HI VEL	17.1	HI VEL	HI VEL	19.3	36.9	49.9	29.9	62.6	88.8	39.1	72.2	98.4	50.8	98.6	141.4	
200	180	11.3	HI VEL	HI VEL	18.4	HI VEL	HI VEL	20.8	39.7	53.8	32.2	67.5	95.7	42.1	77.8	106.0	54.7	106.3	152.4		
250	230	12.7	HI VEL	HI VEL	20.8	HI VEL	HI VEL	23.5	44.9	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	61.9	120.1	172.3		
25	50	25	4.5	7.9	10.9	7.4	12.8	16.5	8.5	16.2	21.1	13.4	27.6	37.9	17.6	32.1	42.1	21.6	41.3	59.5	
	75	50	6.4	11.1	HI VEL	10.4	18.0	23.3	12.0	22.9	29.8	19.0	39.0	53.6	24.9	45.3	59.5	30.5	58.3	84.1	
	100	75	7.8	13.6	HI VEL	12.7	22.1	28.5	14.7	28.1	36.5	23.2	47.7	65.6	30.5	55.5	72.8	37.4	71.4	103.0	
	125	100	9.0	HI VEL	HI VEL	14.7	25.5	HI VEL	17.0	32.4	42.1	26.8	55.1	75.8	35.2	64.1	84.1	43.2	82.5	118.9	
	150	125	10.1	HI VEL	HI VEL	16.4	28.5	HI VEL	19.0	36.2	47.1	30.0	61.6	84.7	39.4	71.7	94.0	48.3	92.2	132.9	
	175	150	11.0	HI VEL	HI VEL	18.0	HI VEL	HI VEL	20.8	39.7	51.6	32.8	67.5	92.8	43.1	78.5	103.0	52.9	101.0	145.6	
	200	175	11.9	HI VEL	HI VEL	19.4	HI VEL	HI VEL	22.5	42.9	HI VEL	35.5	72.9	100.3	46.6	84.8	111.3	57.1	109.1	157.3	
250	225	13.5	HI VEL	HI VEL	22.1	HI VEL	HI VEL	25.5	48.6	HI VEL	40.2	82.7	HI VEL	52.8	96.2	126.2	64.8	123.8	178.4		
35	50	15	4.0	6.7	9.1	7.6	12.2	16.0	9.6	16.3	19.6	15.9	29.8	34.9	17.0	34.1	38.7	30.6	42.8	49.6	
	75	40	6.5	11.0	HI VEL	12.5	19.9	26.1	15.7	26.6	32.1	25.9	48.7	56.9	27.8	55.7	63.2	50.0	69.9	81.0	
	100	65	8.3	14.0	HI VEL	15.9	25.4	HI VEL	20.1	33.9	40.9	33.1	62.1	72.6	35.5	70.9	80.6	63.7	89.1	103.2	
	125	90	9.8	HI VEL	HI VEL	18.7	HI VEL	HI VEL	23.6	39.9	48.1	38.9	73.0	85.4	41.7	83.5	94.9	74.9	104.8	121.4	
	150	115	11.0	HI VEL	HI VEL	21.1	HI VEL	HI VEL	26.7	45.1	HI VEL	44.0	82.6	96.5	47.2	94.4	107.2	84.7	118.5	137.3	
	175	140	12.2	HI VEL	HI VEL	23.3	HI VEL	HI VEL	29.5	49.8	HI VEL	48.5	91.1	HI VEL	52.1	104.1	118.3	93.5	130.7	151.5	
	200	165	13.2	HI VEL	HI VEL	25.3	HI VEL	HI VEL	32.0	HI VEL	HI VEL	52.7	98.9	HI VEL	56.5	113.0	128.5	101.5	141.9	164.4	
250	215	HI VEL	HI VEL	HI VEL	28.9	HI VEL	HI VEL	36.5	HI VEL	HI VEL	60.1	HI VEL	HI VEL	64.5	129.0	146.6	115.8	162.0	187.7		
50	75	25	6.7	10.9	14.1	11.5	13.5	24.3	14.5	25.0	30.0	26.5	44.2	45.0	27.5	45.3	52.8	44.0	58.8	65.0	
	100	50	9.4	HI VEL	HI VEL	16.3	19.0	HI VEL	20.5	35.4	42.4	37.5	62.4	63.6	38.9	64.0	74.6	62.2	83.1	91.9	
	125	75	11.5	HI VEL	HI VEL	19.9	23.3	HI VEL	25.1	43.3	52.0	45.9	76.5	77.9	47.6	78.4	91.4	76.2	101.8	112.6	
	150	100	13.3	HI VEL	HI VEL	23.0	26.9	HI VEL	29.0	50.0	HI VEL	53.0	88.3	90.0	55.0	90.5	105.5	88.0	117.5	130.0	
	175	125	HI VEL	HI VEL	HI VEL	25.7	HI VEL	HI VEL	32.4	HI VEL	HI VEL	59.3	98.7	100.6	61.5	101.2	118.0	98.4	131.4	145.3	
	200	150	HI VEL	HI VEL	HI VEL	28.2	HI VEL	HI VEL	35.5	HI VEL	HI VEL	64.9	HI VEL	HI VEL	67.4	110.8	129.2	107.8	143.9	159.2	
	250	200	HI VEL	HI VEL	HI VEL	31.0	HI VEL	HI VEL	41.0	HI VEL	HI VEL	75.0	HI VEL	HI VEL	77.8	128.0	149.2	124.5	166.2	183.8	
75	100	25	7.9	12.6	HI VEL	14.2	23.9	25.0	18.4	30.0	30.0	38.5	45.0	45.0	31.8	48.3	54.5	36.4	53.2	61.9	
	125	50	11.2	HI VEL	HI VEL	20.0	HI VEL	HI VEL	26.0	42.4	42.4	54.4	63.6	63.6	44.9	68.2	77.1	51.4	75.2	87.5	
	150	75	13.7	HI VEL	HI VEL	24.5	HI VEL	HI VEL	31.8	52.0	52.0	66.7	77.9	77.9	55.0	83.6	94.4	63.0	92.1	107.1	
	175	100	HI VEL	HI VEL	HI VEL	28.3	HI VEL	HI VEL	36.7	HI VEL	HI VEL	77.0	90.0	90.0	63.5	96.5	109.0	72.7	106.3	123.7	
	200	125	HI VEL	HI VEL	HI VEL	31.0	HI VEL	HI VEL	41.0	HI VEL	HI VEL	86.1	100.6	100.6	71.0	107.9	121.9	81.3	118.8	138.3	
	250	175	HI VEL	HI VEL	HI VEL	34.5	HI VEL	HI VEL	48.5	HI VEL	HI VEL	101.9	HI VEL	HI VEL	84.0	127.7	144.2	96.2	140.6	163.6	
	100	25	10.4	HI VEL	HI VEL	16.7	25.0	25.0	19.3	30.0	30.0	43.4	45.0	45.0	36.7	51.3	55.0	38.9	54.8	63.5	
150	50	HI VEL	HI VEL	HI VEL	23.5	HI VEL	HI VEL	27.2	42.4	42.4	61.4	63.6	63.6	51.8	72.5	77.8	55.0	77.4	89.8		
175	75	HI VEL	HI VEL	HI VEL	28.8	HI VEL	HI VEL	33.3	52.0	52.0	75.2	77.9	77.9	63.5	88.8	95.3	67.4	94.8	110.0		
200	100	HI VEL	HI VEL	HI VEL	31.0	HI VEL	HI VEL	38.5	HI VEL	HI VEL	86.8	90.0	90.0	73.3	102.5	110.0	77.8	109.5	127.0		
250	150	HI VEL	HI VEL	HI VEL	34.5	HI VEL	HI VEL	47.2	HI VEL	HI VEL	105.0	HI VEL	HI VEL	89.8	125.5	134.7	95.3	134.1	155.5		
125	150	25	10.9	HI VEL	HI VEL	15.5	25.0	25.0	18.5	30.0	30.0	43.7	45.0	45.0	37.5	51.6	55.0	41.5	56.3	64.5	
	175	50	HI VEL	HI VEL	HI VEL	21.9	HI VEL	HI VEL	26.2	42.4	42.4	61.7	63.6	63.6	53.0	73.0	77.8	58.6	79.6	91.2	
	200	75	HI VEL	HI VEL	HI VEL	26.8	HI VEL	HI VEL	32.0	52.0	52.0	75.6	77.9	77.9	64.9	89.4	95.3	71.8	97.5	111.7	
	250	125	HI VEL	HI VEL	HI VEL	31.4	HI VEL	HI VEL	41.4	HI VEL	HI VEL	97.6	100.6	100.6	83.7	115.4	123.0	92.7	125.9	144.2	
150	175	25	9.9	HI VEL	HI VEL	16.7	25.0	25.0	18.8	30.0	30.0	44.0	45.0	45.0	38.3	52.0	55.0	44.0	57.9	65.0	
	200	50	14.0	HI VEL	HI VEL	23.5	HI VEL	HI VEL	26.6	42.4	42.4	62.2	63.6	63.6	54.1	73.5	77.8	62.2	81.9	91.9	
	250	100	HI VEL	HI VEL	HI VEL	31.0	HI VEL	HI VEL	37.6	HI VEL	HI VEL	87.9	90.0	90.0	76.5	103.9	110.				

TABLE 14
 COMPRESSED AIR CAPACITY – SCFH
 S.G. = 1.0 T = 60°F F_L = 0.93

FULL PORT – COMPOSITION DIAPHRAGM & SEAT

Outlet Pressure P2,psig	Inlet Pressure P1,psig	Pressure Drop psi	SCFH @ 1/2" Body Size			SCFH @ 3/4" Body Size			SCFH @ 1" Body Size			SCFH @ 1-1/4" Body Size			SCFH @ 1-1/2" Body Size			SCFH @ 2" Body Size		
			Drop			Drop			Drop			Drop			Drop			Drop		
			10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%
10	25	15	800	1,500	2,200	1,400	2,600	3,300	1,500	2,800	4,200	2,100	4,800	7,300	2,800	5,400	8,000	4,200	8,500	12,000
	50	40	1,500	2,700	3,900	2,400	4,600	5,900	2,600	5,000	7,400	3,800	8,400	12,900	4,900	9,400	14,100	7,400	15,000	21,200
	75	65	2,000	3,700	5,400	3,300	6,400	8,200	3,600	6,900	10,300	5,200	11,600	17,800	6,800	13,100	19,600	10,300	20,800	29,400
	100	90	2,600	4,700	6,900	4,200	8,100	10,400	4,600	8,800	13,200	6,700	14,900	22,800	8,700	16,800	25,100	13,100	26,600	37,600
	150	140	3,700	6,800	9,900	5,100	11,100	14,100	5,500	11,100	16,100	6,100	15,100	22,100	9,100	18,100	27,100	14,100	29,100	42,100
	200	190	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1
15	25	10	800	1,400	2,000	1,300	2,400	3,100	1,400	2,600	3,900	2,200	4,700	6,900	2,800	5,400	7,600	4,000	7,800	11,200
	50	35	1,600	2,800	4,000	2,600	4,800	6,100	2,900	5,500	7,800	4,300	9,300	13,600	5,600	10,600	15,100	7,800	15,500	22,100
	75	60	2,200	4,000	5,700	3,600	6,700	8,600	4,000	7,700	10,900	6,000	13,000	19,100	7,900	14,800	21,100	11,000	21,700	30,900
	100	85	2,800	5,100	7,200	4,600	8,500	11,000	5,100	9,800	13,900	7,700	16,600	24,400	10,000	19,000	27,000	14,000	27,800	39,600
	150	135	4,000	7,300	10,400	6,600	12,300	15,700	7,300	14,100	20,000	11,100	23,900	35,100	14,400	27,300	38,700	20,100	39,900	56,800
	200	185	5,300	9,500	13,500	8,600	16,000	20,500	9,600	18,400	26,100	11,100	23,900	35,100	14,400	27,300	38,700	20,100	39,900	56,800
	250	235	6,500	11,700	16,700	10,100	19,100	25,100	11,100	23,900	35,100	14,400	27,300	38,700	20,100	39,900	56,800	20,100	39,900	56,800
300	285	7,700	14,000	SONIC	11,100	21,100	28,100	11,100	23,900	35,100	14,400	27,300	38,700	20,100	39,900	56,800	20,100	39,900	56,800	
350	335	HI P1	HI P1	SONIC	11,100	21,100	28,100	11,100	23,900	35,100	14,400	27,300	38,700	20,100	39,900	56,800	20,100	39,900	56,800	
20	25	5	700	1,200	1,600	1,100	1,900	2,500	1,200	2,300	3,100	1,900	3,900	5,600	2,500	4,600	6,200	3,200	6,200	8,900
	50	30	1,700	3,000	4,100	2,700	4,900	6,300	3,100	5,900	8,000	4,800	10,000	14,200	6,300	11,600	15,800	8,100	15,800	22,700
	75	55	2,400	4,200	5,900	3,900	7,000	9,000	4,400	8,400	11,400	6,800	14,300	20,300	9,000	16,500	22,500	11,600	22,600	32,400
	100	80	3,100	5,400	7,600	5,000	8,900	11,500	5,700	10,800	14,600	8,800	18,400	26,000	11,500	21,200	28,900	14,900	28,900	41,500
	150	130	4,400	7,800	10,900	7,200	12,800	16,500	8,100	15,500	21,000	12,600	26,400	37,400	16,500	30,400	41,400	21,400	41,600	59,600
	200	180	5,700	10,100	14,200	9,400	16,700	21,600	10,600	20,300	27,400	16,400	34,400	48,800	21,500	39,700	54,100	27,900	54,200	77,700
	250	230	7,100	12,500	17,600	11,800	20,600	26,600	13,100	25,000	33,800	16,100	34,400	48,800	21,500	39,700	54,100	27,900	54,200	77,700
	300	280	8,400	14,900	SONIC	13,800	24,500	31,600	16,100	34,400	48,800	21,500	39,700	54,100	27,900	54,200	77,700	27,900	54,200	77,700
	350	330	9,800	17,200	SONIC	16,100	31,600	41,400	16,100	34,400	48,800	21,500	39,700	54,100	27,900	54,200	77,700	27,900	54,200	77,700
	400	380	11,100	19,600	SONIC	18,400	36,800	48,800	18,400	36,800	48,800	21,500	39,700	54,100	27,900	54,200	77,700	27,900	54,200	77,700
500	480	HI P1	HI P1	SONIC	20,600	41,400	54,100	20,600	41,400	54,100	27,900	54,200	77,700	27,900	54,200	77,700	27,900	54,200	77,700	
25	50	25	1,700	3,000	4,200	2,800	4,900	6,300	3,300	6,200	8,100	5,100	10,600	14,500	6,700	12,300	16,100	8,300	15,800	22,800
	75	50	2,600	4,500	6,200	4,200	7,200	9,300	4,800	9,200	11,900	7,600	15,600	21,500	10,900	18,200	23,900	12,300	23,400	33,700
	100	75	3,300	5,700	7,900	5,400	9,300	12,000	6,200	11,800	15,400	9,800	20,100	27,700	12,900	23,400	30,700	15,800	30,100	43,400
	150	125	4,700	8,200	11,400	7,700	13,400	17,300	8,900	17,000	22,100	14,100	28,900	39,800	18,500	33,600	44,100	22,700	43,300	62,400
	200	175	6,200	10,700	14,800	10,100	17,400	22,500	11,600	22,200	28,800	18,300	37,700	51,900	24,100	43,900	57,500	29,600	56,500	81,400
	250	225	7,600	13,300	18,300	12,400	21,500	27,800	14,300	27,300	35,500	22,600	46,500	64,000	29,700	54,100	71,000	36,500	69,600	100,400
	300	275	9,000	15,800	21,800	14,800	25,600	33,000	17,100	32,500	42,300	26,900	55,300	76,100	35,300	64,400	84,400	43,400	82,800	119,400
	350	325	10,500	18,300	SONIC	17,100	29,700	38,300	19,800	37,700	49,000	31,100	61,100	81,100	41,100	79,100	103,100	50,300	96,000	138,400
	400	375	11,900	20,800	SONIC	19,500	33,800	SONIC	21,100	41,100	54,100	34,100	64,100	84,100	43,100	82,100	106,100	54,100	104,100	144,100
	500	475	HI P1	HI P1	SONIC	21,900	41,900	SONIC	23,900	43,900	57,900	36,100	66,100	86,100	45,100	85,100	109,100	57,100	107,100	147,100
35	50	15	1,700	2,800	3,800	3,200	5,100	6,700	4,100	6,900	8,300	6,700	12,600	14,700	14,400	16,300	19,100	18,100	18,100	20,900
	75	40	2,800	4,800	6,400	5,400	8,600	11,300	6,800	11,600	13,900	11,300	21,100	24,700	12,100	24,100	27,400	21,700	30,300	35,100
	100	65	3,700	6,300	8,500	7,200	11,400	15,000	9,000	15,300	18,400	14,900	28,000	32,700	16,000	32,000	36,300	28,700	40,100	46,500
	150	115	5,400	9,100	12,300	10,300	16,500	21,600	13,100	22,100	26,600	21,500	40,400	47,200	23,100	46,200	52,500	41,400	58,600	67,200
	200	165	7,000	11,900	16,100	13,500	21,600	28,200	17,000	28,800	34,700	28,100	52,700	61,600	30,100	60,200	68,400	54,100	75,600	87,600
	250	215	8,700	14,700	19,800	16,600	26,600	34,800	21,000	35,500	42,800	34,600	65,000	76,000	37,100	74,300	84,400	66,700	93,300	108,000
	300	265	10,300	17,500	23,600	19,800	31,600	41,400	25,000	42,300	50,900	41,200	77,300	90,400	44,200	88,400	100,400	79,300	110,900	128,500
	350	315	12,000	20,300	27,400	22,900	36,700	48,000	29,000	49,000	59,000	47,700	89,600	104,800	51,200	102,400	116,400	92,000	128,600	149,000
	400	365	13,600	23,000	SONIC	26,100	41,700	SONIC	33,000	55,700	67,100	51,100	102,100	121,100	57,100	114,100	133,100	104,600	146,300	169,500
	500	465	HI P1	HI P1	SONIC	28,100	46,100	SONIC	35,100	61,100	74,100	59,100	118,100	141,100	63,100	126,100	151,100	111,100	151,100	181,100
50	75	25	3,200	5,200	6,800	5,600	8,500	11,700	7,000	12,100	14,500	12,800	21,300	21,700	13,300	21,900	25,500	21,300	28,400	31,400
	100	50	4,600	7,600	9,900	8,000	9,400	16,900	10,100	17,500	21,000	18,500	30,900	31,500	19,200	31,600	36,900	30,800	41,100	45,400
	150	100	7,000	11,400	14,800	12,100	14,100	25,400	15,200	26,200	31,400	27,800	46,300	47,200	28,800	47,400	55,300	46,100	61,600	68,100
	200	150	9,100	14,800	19,300	15,700	18,400	33,200	19,800	34,200	41,100	36,300	60,400	61,600	37,600	61,900	72,200	60,200	80,400	89,000
	250	200	11,200	18,300	23,800	19,400														

TABLE 14 (Continued)
 COMPRESSED AIR CAPACITY – SCFH
 S.G. = 1.0 T = 60°F F_L = 0.93

FULL PORT – COMPOSITION DIAPHRAGM & SEAT

Outlet Pressure P2, psig	Inlet Pressure P1, psig	Pressure Drop psi	SCFH @ 1/2" Body Size			SCFH @ 3/4" Body Size			SCFH @ 1" Body Size			SCFH @ 1-1/4" Body Size			SCFH @ 1-1/2" Body Size			SCFH @ 2" Body Size			
			Drop			Drop			Drop			Drop			Drop			Drop			
			10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	
100	150	50	9,400	15,300	16,000	15,200	22,800	22,800	17,600	27,400	27,400	39,600	41,100	41,100	33,400	46,800	50,200	35,500	50,000	58,000	
	200	100	13,700	22,200	23,200	22,100	33,200	33,200	25,500	39,800	39,800	57,600	59,700	59,700	48,600	68,000	73,000	51,600	72,600	84,200	
	250	150	17,400	28,100	29,400	28,000	42,000	42,000	32,300	50,400	50,400	72,900	75,600	75,600	61,600	86,100	92,400	65,300	92,000	106,600	
	300	200	20,800	33,600	35,100	33,400	50,200	50,200	38,700	60,200	60,200	87,100	90,400	90,400	73,600	102,900	110,400	78,100	109,900	127,500	
	350	250	24,100	39,000	40,700	38,800	58,200	58,200	44,800	69,800	69,800	101,000	104,800	104,800	85,300	119,300	128,100	90,600	127,500	147,800	
	400	300	27,400	44,400	46,300	44,100	66,200	66,200	51,000	79,400	79,400	114,900	119,200	119,200	97,100	135,700	145,600	103,000	145,000	168,200	
	500	400	34,000	55,100	57,500	54,700	82,200	82,200	63,300	98,600	98,600	HI P1	HI P1	HI P1	120,500	168,500	180,800	127,900	180,000	208,800	
600	500	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
125	150	25	7,700	12,400	12,400	10,800	17,600	17,600	13,100	21,200	21,200	30,800	31,800	31,800	26,400	36,400	38,800	29,300	39,700	45,500	
	200	75	13,500	21,700	21,700	19,200	31,000	31,000	23,000	37,200	37,200	54,200	55,800	55,800	46,500	64,000	68,200	51,400	69,900	80,000	
	250	125	17,800	28,700	28,700	25,400	41,000	41,000	30,300	49,200	49,200	71,600	73,800	73,800	61,400	84,600	90,200	68,000	92,300	105,800	
	300	175	21,600	34,900	34,900	30,900	49,900	49,900	36,900	59,800	59,800	87,100	89,800	89,800	74,700	102,900	109,700	82,700	112,300	128,600	
	350	225	25,200	40,700	40,700	36,100	58,200	58,200	43,100	69,800	69,800	101,600	104,700	104,700	87,100	120,100	128,000	96,500	131,000	150,100	
	400	275	28,700	46,300	46,300	41,000	66,200	66,200	49,000	79,400	79,400	115,600	119,200	119,200	99,200	136,600	145,600	109,800	149,100	170,800	
	500	375	35,700	57,500	57,500	51,000	82,200	82,200	60,800	98,600	98,600	143,500	147,900	147,900	123,100	169,600	180,800	136,300	185,100	212,000	
600	475	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
150	200	50	10,800	17,800	19,000	18,100	27,200	27,200	20,500	32,600	32,600	47,800	49,000	49,000	41,600	56,500	59,800	47,900	63,000	70,700	
	250	100	15,500	25,600	27,300	26,000	39,100	39,100	29,400	46,900	46,900	68,700	70,300	70,300	59,800	81,200	85,900	68,800	90,500	101,600	
	300	150	19,300	32,000	34,200	32,500	48,900	48,900	36,700	58,600	58,600	85,900	87,900	87,900	74,700	101,500	107,500	86,000	113,100	127,000	
	350	200	22,900	37,900	40,400	38,500	57,700	57,700	43,400	69,300	69,300	101,500	103,900	103,900	88,300	120,000	127,000	101,600	133,700	150,100	
	400	250	26,200	43,400	46,300	44,000	66,100	66,100	49,700	79,300	79,300	116,200	119,000	119,000	101,200	137,400	145,500	116,400	153,100	171,900	
	500	350	32,500	53,900	57,500	54,700	82,200	82,200	61,800	98,600	98,600	144,500	147,900	147,900	125,700	170,800	180,800	144,800	190,300	213,700	
	600	450	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
175	200	25	8,200	13,900	14,400	8,900	14,600	14,600	15,800	24,700	24,700	36,400	37,000	37,000	32,100	43,000	45,200	HI P2	HI P2	HI P2	
	250	75	14,400	24,300	25,100	15,600	25,400	25,400	34,300	27,500	43,100	43,100	63,500	64,600	64,600	56,100	75,100	79,000	HI P2	HI P2	HI P2
	300	125	18,800	31,900	32,900	20,400	33,300	33,300	44,900	36,000	56,500	56,500	83,200	84,700	84,700	73,500	98,400	103,500	HI P2	HI P2	HI P2
	350	175	22,700	38,400	39,700	24,600	40,100	40,100	54,100	43,400	68,000	68,000	100,300	102,100	102,100	88,600	118,600	124,800	HI P2	HI P2	HI P2
	400	225	26,200	44,500	45,900	28,500	46,400	46,400	62,600	50,200	78,700	78,700	116,000	118,100	118,100	102,500	137,200	144,300	HI P2	HI P2	HI P2
	500	325	32,900	55,700	57,500	35,700	58,200	58,200	78,400	63,000	98,600	98,600	145,300	147,900	147,900	128,400	171,900	180,800	HI P2	HI P2	HI P2
	600	425	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P2	HI P2	HI P2
200	250	50	12,500	21,700	21,700	13,900	22,300	22,300	24,100	37,200	37,200	55,200	55,800	55,800	49,400	65,300	68,200	HI P2	HI P2	HI P2	
	300	100	17,900	31,000	31,000	19,800	31,900	31,900	34,400	53,100	53,100	78,800	79,700	79,700	70,600	93,200	97,400	HI P2	HI P2	HI P2	
	350	150	22,200	38,500	38,500	24,600	39,600	39,600	42,800	66,000	66,000	97,900	99,000	99,000	87,700	115,800	121,000	HI P2	HI P2	HI P2	
	400	200	26,100	45,200	45,200	28,900	46,500	46,500	50,200	77,500	77,500	114,900	116,200	116,200	102,900	135,900	142,000	HI P2	HI P2	HI P2	
	500	300	33,100	57,400	57,400	36,700	59,000	59,000	63,700	98,300	98,300	145,800	147,500	147,500	130,600	172,600	180,300	HI P2	HI P2	HI P2	
	600	400	39,700	68,700	68,700	44,000	70,700	70,700	76,400	117,800	117,800	174,800	176,700	176,700	156,500	206,800	216,000	HI P2	HI P2	HI P2	
	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
250	300	50	14,100	24,100	24,100	16,300	25,700	25,700	27,700	41,300	41,300	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	350	100	20,100	34,300	34,300	23,200	36,600	36,600	39,400	58,800	58,800	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	400	150	24,800	42,400	42,400	28,700	45,300	45,300	48,700	72,700	72,700	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	500	250	32,900	56,200	56,200	38,000	60,000	60,000	64,500	96,300	96,300	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	600	350	40,100	68,400	68,400	46,300	73,100	73,100	78,600	117,300	117,300	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
300	350	50	15,700	28,300	28,300	19,400	29,000	29,000	31,100	45,000	45,000	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	400	100	22,300	37,300	37,300	27,500	41,300	41,300	44,200	64,000	64,000	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	500	200	32,000	53,600	53,600	39,500	59,300	59,300	63,600	91,900	91,900	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	
	600	300	40,100	67,100	67,100	49,500	74,200	74,200	79,600	115,100	115,100	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	

- NOTES:** 1. Where "HI P1" is indicated, the inlet pressure exceeds the limit established in Table 9.
 2. Where "HI P2" is indicated, the maximum outlet pressure is exceeded.

TABLE 15
 SATURATED STEAM CAPACITY - LBS/HR
 T = Sat. F_L = 0.93

FULL PORT - METAL DIAPHRAGM & SEAT

OUTLET PRESSURE P2, psig	INLET PRESSURE P1, psig	PRESSURE DROP psi	Lbs/Hr @ 1/2" BODY SIZE			Lbs/Hr @ 3/4" BODY SIZE			Lbs/Hr @ 1" BODY SIZE			Lbs/Hr @ 1-1/4" BODY SIZE			Lbs/Hr @ 1-1/2" BODY SIZE			Lbs/Hr @ 2" BODY SIZE			
			DROOP			DROOP			DROOP			DROOP			DROOP			DROOP			
			10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%
10	25	15	26	50	73	43	84	128	48	96	149	80	173	272	108	202	298	130	264	404	
	50	40	46	88	128	76	147	224	84	168	262	141	303	476	190	354	522	227	462	709	
	75	65	65	125	181	108	209	318	120	238	372	200	431	677	269	503	741	323	657	1007	
	100	90	83	159	232	138	268	407	154	305	476	256	551	866	344	644	949	413	840	1289	
	125	115	100	193	281	167	324	494	186	370	577	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	501	1018	1562	
	150	140	118	227	HI VEL	196	381	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	588	1195	1832
	175	165	135	260	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1
	200	190	153	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1
250	240	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
15	25	10	26	48	69	41	81	119	47	114	145	80	172	264	111	205	294	123	248	374	
	50	35	50	95	136	81	160	235	93	224	285	157	339	520	218	405	579	241	489	737	
	75	60	70	133	189	113	224	328	130	313	398	219	474	726	304	565	808	337	683	1029	
	100	85	93	175	250	150	295	433	171	413	526	289	626	959	402	746	1067	445	901	1358	
	125	110	112	212	303	181	358	525	208	501	637	351	758	1161	487	904	1293	539	1092	1646	
	150	135	132	249	HI VEL	213	420	HI VEL	243	588	747	411	890	1362	571	1060	1516	632	1281	1930	
	175	160	151	286	HI VEL	244	482	HI VEL	280	675	858	473	1022	1565	656	1218	1742	726	1472	2218	
	200	185	171	323	HI VEL	276	545	HI VEL	316	762	969	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
250	235	210	HI VEL	HI VEL	339	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	1008	2043	3077
300	285	249	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
350	335	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
20	25	5	22	40	56	34	68	96	39	79	120	67	146	219	96	176	247	99	201	297	
	50	30	55	102	142	85	171	243	100	200	304	170	369	555	242	447	624	251	509	753	
	75	55	79	146	204	122	245	348	143	285	435	244	527	793	346	639	893	360	728	1077	
	100	80	102	188	263	157	317	449	184	368	562	315	681	1024	447	825	1153	464	940	1391	
	125	105	126	234	327	196	394	558	229	458	699	391	847	1274	556	1026	1433	577	1169	1729	
	150	130	148	274	383	229	462	655	269	537	820	459	993	1494	652	1203	1681	677	1371	2028	
	175	155	170	315	HI VEL	264	530	HI VEL	309	617	942	527	1141	1716	749	1382	1932	778	1575	2330	
	200	180	192	356	HI VEL	298	599	HI VEL	349	697	1064	595	1289	1939	846	1561	2182	879	1779	2632	
250	230	236	HI VEL	HI VEL	366	HI VEL	HI VEL	428	856	HI VEL	HI P1	HI P1	HI P1	1039	1918	HI VEL	1079	2185	3233		
300	280	281	HI VEL	HI VEL	434	HI VEL	HI VEL	508	1016	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	1281	2594	3837	
350	330	325	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	1482	3002	HI VEL
400	380	369	HI VEL	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	
25	50	25	58	103	144	88	176	243	103	212	311	180	391	578	261	479	657	258	518	756	
	75	50	85	153	213	130	261	359	153	314	461	266	578	855	386	709	973	381	767	1118	
	100	75	110	197	275	167	336	463	197	404	593	343	745	1102	497	914	1253	491	988	1441	
	125	100	137	245	341	207	417	575	245	502	737	426	925	1368	617	1135	1556	610	1227	1790	
	150	125	162	291	406	246	495	683	291	596	876	506	1099	1625	733	1348	1849	725	1458	2126	
	175	150	186	334	HI VEL	283	589	784	334	685	1006	582	1263	1867	842	1549	2125	833	1675	2443	
	200	175	211	378	HI VEL	320	643	HI VEL	378	773	1136	657	1427	2109	951	1750	2400	940	1892	2759	
	250	225	259	HI VEL	HI VEL	393	789	HI VEL	464	950	HI VEL	807	1753	HI VEL	1169	2150	2948	1155	2324	3389	
300	275	307	HI VEL	HI VEL	466	HI VEL	HI VEL	550	1127	HI VEL	958	2080	HI VEL	1387	2551	HI VEL	1371	2758	4023		
350	325	355	HI VEL	HI VEL	539	HI VEL	HI VEL	637	HI VEL	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	1587	3192	4656
400	375	404	HI VEL	HI VEL	613	HI VEL	HI VEL	711	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	HI P1	1804	3630	HI VEL
35	50	15	58	99	136	84	169	223	102	214	297	198	516	699	316	550	733	467	808	952	
	75	40	95	167	229	142	284	375	171	359	499	332	867	1174	531	924	1231	785	1358	1599	
	100	65	126	221	304	188	377	497	227	476	662	441	1150	1556	703	1225	1631	1041	1800	2119	
	125	90	154	271	372	230	462	608	278	583	810	540	1407	1906	861	1499	1997	1274	2204	2594	
	150	115	183	322	442	273	548	723	330	693	963	641	1672	2264	1023	1781	2373	1514	2619	3083	
	175	140	215	379	521	321	646	852	389	816	1135	755	1970	2668	1205	2099	2796	1784	3086	3632	
	200	165	243	428	HI VEL	363	730	962	439	922	1282	853	2226	HI VEL	1362	2371	3159	2015	3485	4103	
	250	215	299	526	HI VEL	446	896	HI VEL	540	1133	1574	1048	2734	HI VEL	1672	2912	HI VEL	2475	4281	5040	
300	265	355	HI VEL	HI VEL	529	HI VEL	HI VEL	640	1344	HI VEL	1244	HI VEL	HI VEL	1985	3456	HI VEL	2938	5081	5981		
350	315	410	HI VEL	HI VEL	613	HI VEL	HI VEL	741	1556	HI VEL	1440	HI VEL	HI VEL	2297	HI VEL	HI VEL	3400	5881	HI VEL		
400	365	467	HI VEL	HI VEL	697	HI VEL	HI VEL	843	HI VEL	HI VEL	HI P1	HI P1	HI P1	2612	HI VEL	HI VEL	3866	HI VEL	HI VEL		

NOTES: See Next Page

TABLE 15 (Continued)
 STEAM CAPACITY - LBS/HR
 T = Sat. F_L = 0.93

FULL PORT – METAL DIAPHRAGM & SEAT

OUTLET PRESSURE P2, psig	INLET PRESSURE P1, psig	PRESSURE DROP psi	Lbs/Hr @ 1/2" BODY SIZE			Lbs/Hr @ 3/4" BODY SIZE			Lbs/Hr @ 1" BODY SIZE			Lbs/Hr @ 1-1/4" BODY SIZE			Lbs/Hr @ 1-1/2" BODY SIZE			Lbs/Hr @ 2" BODY SIZE		
			DROOP			DROOP			DROOP			DROOP			DROOP			DROOP		
			10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%
50	75	25	109	188	248	164	329	429	206	429	571	562	1062	1112	513	883	1124	846	1278	1482
	100	50	158	272	360	238	476	621	299	621	827	814	1539	1611	743	1280	1629	1226	1852	2148
	125	75	199	343	454	300	600	783	377	783	1042	1027	1940	2031	936	1613	2053	1545	2335	2707
	150	100	236	408	539	357	714	931	448	931	1240	1221	2308	2415	1114	1919	2442	1838	2778	3220
	175	125	273	471	622	412	824	1075	517	1075	1431	1409	2663	2787	1285	2214	2818	2121	3205	3716
	200	150	312	538	712	471	942	1229	591	1229	1636	1611	3046	3187	1470	2532	3223	2426	3665	4250
	250	200	393	678	HI VEL	593	1186	HI VEL	745	1548	2060	2029	HI VEL	HI VEL	1851	3189	4058	3055	4616	5352
	300	250	466	HI VEL	HI VEL	704	HI VEL	HI VEL	884	1837	HI VEL	2408	HI VEL	HI VEL	2197	3784	4816	3626	5478	6351
	350	300	539	HI VEL	HI VEL	815	HI VEL	HI VEL	1023	HI VEL	HI VEL	2787	HI VEL	HI VEL	2542	4380	HI VEL	4196	6340	7351
400	350	613	HI VEL	HI VEL	927	HI VEL	HI VEL	1163	HI VEL	HI VEL	3170	HI VEL	HI VEL	2891	HI VEL	HI VEL	4772	7210	HI VEL	
75	100	25	148	256	336	277	477	636	323	688	862	761	1281	1293	761	1257	1480	843	1394	1638
	125	50	212	367	482	398	684	913	464	987	1236	1092	1838	1854	1092	1803	2122	1209	1998	2349
	150	75	265	457	601	496	853	1138	578	1230	1541	1361	2291	2312	1361	2248	2646	1508	2492	2928
	175	100	312	540	710	585	1007	1343	682	1453	1819	1607	2705	2729	1607	2653	3123	1780	2941	3457
	200	125	357	618	812	670	1152	1537	781	1662	2082	1839	3095	3123	1839	3036	3574	2037	3365	3955
	250	175	443	765	HI VEL	829	1427	HI VEL	967	2058	2578	2277	3833	3867	2777	3760	4426	2522	4168	4899
	300	225	538	930	HI VEL	1008	1734	HI VEL	1175	2502	HI VEL	2768	4658	4700	2768	4570	5379	3086	5066	5954
	350	275	631	HI VEL	HI VEL	1182	HI VEL	HI VEL	1378	HI VEL	HI VEL	3247	HI VEL	HI VEL	3247	5360	6310	3596	5942	6983
	400	325	718	HI VEL	HI VEL	1345	HI VEL	HI VEL	1568	HI VEL	HI VEL	3692	HI VEL	HI VEL	3692	6096	HI VEL	4089	6758	7942
100	125	25	256	416	564	412	673	805	488	838	967	1095	1450	1450	983	1514	1732	1044	1616	1890
	150	50	365	593	804	588	960	1149	696	1195	1378	1562	2068	2068	1401	2159	2470	1489	2304	2695
	175	75	454	736	999	731	1193	1427	865	1484	1712	1940	2568	2568	1741	2682	3068	1849	2862	3347
	200	100	533	864	1172	858	1400	1675	1015	1742	2010	2278	3015	3015	2043	3149	3601	2171	3360	3929
	250	150	676	1096	HI VEL	1088	1776	2125	1288	2210	2549	2889	3824	3824	2592	3994	4568	2753	4262	4984
	300	200	810	HI VEL	HI VEL	1304	2129	HI VEL	1543	2648	3055	3463	4583	4583	3106	4787	5474	3300	5108	5973
	350	250	941	HI VEL	HI VEL	1515	HI VEL	HI VEL	1793	3078	3551	4025	5327	5327	3610	5563	6362	3835	5936	6942
400	300	1099	HI VEL	HI VEL	1770	HI VEL	HI VEL	2095	3596	HI VEL	4702	6223	6223	4218	6500	7433	4481	6935	8111	
125	150	25	304	475	618	429	706	883	494	871	1059	1218	1589	1589	1100	1676	1903	1252	1831	2131
	175	50	433	677	880	611	1006	1258	704	1240	1509	1736	2264	2264	1567	2387	2712	1784	2609	3036
	200	75	536	838	1090	757	1246	1557	872	1535	1869	2149	2803	2803	1940	2955	3357	2208	3229	3759
	250	125	710	1110	1444	1003	1650	2063	1155	2034	2476	2847	3713	3713	2571	3916	4448	2925	4279	4980
	300	175	865	1353	HI VEL	1223	2012	2516	1409	2480	3019	3471	4528	4528	3134	4775	5424	3567	5217	6073
	350	225	1012	HI VEL	HI VEL	1430	2353	HI VEL	1647	2900	3530	4059	5295	5295	3665	5583	6342	4171	6101	7101
400	275	1155	HI VEL	HI VEL	1631	2685	HI VEL	1880	3309	4028	4632	6042	6042	4182	6370	7236	4759	6861	8102	
150	175	25	313	508	649	491	798	955	550	959	1146	1335	1719	1719	1217	1830	2063	1471	2044	2369
	200	50	446	723	924	698	1136	1358	783	1364	1630	1899	2445	2445	1731	2603	2934	2092	2907	3369
	250	100	642	1041	1330	1005	1635	1956	1127	1964	2347	2734	3520	3520	2492	3747	4224	3012	4185	4850
	300	150	805	1305	1668	1261	2051	2453	1413	2463	2943	3429	4415	4415	3125	4700	5298	3777	5249	6083
	350	200	953	1546	HI VEL	1494	2430	2906	1674	2918	3487	4063	5231	5231	3702	5568	6277	4475	6219	7207
400	250	1095	1777	HI VEL	1717	2792	HI VEL	1924	3353	4007	4689	6011	6011	4254	6398	7213	5143	7146	8282	
175	200	25	352	572	716	352	628	846	603	1045	1227	1449	1840	1840	1329	1979	2214	HI P2	HI P2	HI P2
	250	75	616	1002	1253	616	1099	1482	1056	1829	2147	2537	3221	3221	2326	3464	3876	HI P2	HI P2	HI P2
	300	125	809	1317	1647	809	1444	1948	1388	2404	2823	3336	4234	4234	3058	4554	5095	HI P2	HI P2	HI P2
	350	175	978	1592	1990	978	1745	2354	1677	2905	3411	4031	5117	5117	3695	5503	6157	HI P2	HI P2	HI P2
400	225	1135	1848	HI VEL	1135	2026	2733	1947	3373	3960	4680	5940	5940	4290	6389	7148	HI P2	HI P2	HI P2	
200	250	50	486	813	1078	554	964	1293	933	1601	1847	2213	2771	2771	2041	3008	3340	HI P2	HI P2	HI P2
	300	100	697	1164	1544	794	1380	1852	1336	2293	2646	3171	3969	3969	2924	4309	4785	HI P2	HI P2	HI P2
	350	150	868	1450	1923	989	1719	2307	1665	2857	3296	3950	4944	4944	3642	5367	5960	HI P2	HI P2	HI P2
400	200	1023	1709	2265	1165	2026	2718	1961	3365	3883	4653	5825	5825	4291	6323	7022	HI P2	HI P2	HI P2	
250	300	50	569	926	1192	681	1151	1590	1083	1811	2043	2948	3595	3595	2756	3975	4354	HI P2	HI P2	HI P2
	350	100	812	1322	1701	972	1643	2270	1546	2586	2917	3856	4702	4702	3605	5199	5695	HI P2	HI P2	HI P2
	400	150	1008	1642	2113	1207	2040	2819	1920	3211	3622	4640	5658	5658	4338	6255	6853	HI P2	HI P2	HI P2
300	350	50	655	1066	1296	807	1344	1851	1233	2018	2222	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2
	400	100	935	1521	1848	1151	1917	2640	1759	2878	3168	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2	HI P2

- NOTES:** 1. Where "HI VEL" is indicated, the flow has reached or exceeded a velocity of Mach 0.35.
 2. Where "HI P1" is indicated, the inlet pressure exceeds the limit established in Table 11.
 3. Where "HI P2" is indicated, the maximum outlet pressure is exceeded.

TABLE 16
CONSOLIDATED PRESSURE vs. TEMPERATURE MATERIALS OPERATING LIMITS,
INCLUDING TRIM AND OPTION LIMITS

Materials	End Conn. Option No.	Trim Design. No.	Inlet Pressure		Outlet Pressure ¹		Inlet & Outlet Temperature Rg.		Limiting Portion
			psig	(Barg)	psig	(Barg)	°F	(°C)	
BRZ / BRZ / BRZ BRZ / CI / BRZ CI / CI / BRZ	Std -NPT, Opt-31, Opt-45, Opt-46	B2, B3	400 390	(27.6) (26.9)	400 390	(27.6) (26.9)	-20 to +150 +180	(-29 to +66) (+83)	BRZ, Mech. Internals BRZ, Neoprene BRZ, Mech. Internals
		B1, B5	400	(27.6)	400	(27.6)	-20 to +150	(-29 to +66)	BRZ
			385	(26.6)	385	(26.6)	+200	(+94)	
			365	(25.2)	365	(25.2)	+250	(+121)	
			335	(23.1)	335	(23.1)	+300	(+149)	
			300	(20.7)	300	(20.7)	+350	(+177)	
		250	(17.2)	250	(17.2)	+400	(+205)	BRZ, TFE	
CI / CI / SST CS / CI / SST SST / CI / SST (Note 2)	Std - NPT, Opt-31, Opt-32, Opt-45, Opt-46	S2N, S3, S40	740	(51.0)	400	(27.6)	-20 to +180	(-29 to +83)	Neoprene, Mech. Internals
		S6	740	(51.0)	400	(27.6)	-20 to +250	(-29 to +121)	Mech. Internals
			395	(27.2)	395	(27.2)	+268	(+131)	CI, Mech. Internals
			375	(25.9)	375	(25.9)	+275	(+135)	CI
		S0, S1, S2, S5 S9, S36	740	(51.0)	400	(27.6)	-20 to +250	(-29 to +121)	CI, EPDM/EPR
			400	(27.6)	400	(27.6)	+200	(+94)	Mech. Internals
			395	(27.2)	395	(27.2)	+268	(+131)	CI, Mech. Internals
			375	(25.9)	375	(25.9)	+275	(+135)	CI
			335	(23.1)	335	(23.1)	+300	(+149)	
		295	(20.3)	295	(20.3)	+350	(+177)	+400	(+205)	CI, TFE, Fluorocarbon Elastomer
Std-NPT, Opt-31, Opt-32, Opt-46	S1, S2	740	(51.0)	270 250	(18.6) (17.2)	-20 to +425 +450	(-29 to +219) (+232)	CI, Std. Gasket	
CS / CS / SST SST / CS / SST SST / SST / SST (Note 2)	Std - NPT, Opt-31, Opt-32, Opt-46	S2N, S3, S40	740	(51.0)	400	(27.6)	-20 to +180	(-29 to +83)	Neoprene, Mech. Internals
		S6	740	(51.0)	400	(27.6)	-20 to +300	(-29 to +149)	EPDM/EPR, Mech. Internals
		S0, S5, S9, S36	740	(51.0)	400	(27.6)	-20 to +400	(-29 to +205)	TFE, Fluorocarbon Elastomer, Mech. Internals
		S1, S2	740	(51.0)	400	(27.6)	-20 to +450	(-29 to +232)	Mech. Internals, Std. Gaskets
		S1, S2	740	(51.0)	400	(27.6)	-20 to +600	(-29 to +315)	Mech. Internals, Asb. Gaskets
CS / CI / SST CS / CS / SST (Note 2)	Opt-30, 150# Fig., Opt-45, Opt-46	S2N, S3 S40	285	(19.7)	285	(19.7)	-20 to +100	(-29 to +38)	150# Fig.
			265	(18.3)	265	(18.3)	+180	(+83)	150# Fig., Neoprene
		S6	285	(19.7)	285	(19.7)	-20 to +100	(-29 to +38)	150# Fig.
			260	(17.9)	260	(17.9)	+200	(+94)	150# Fig., EPDM/EPR
			230	(15.9)	230	(15.9)	+300	(+149)	150# Fig.
			285	(19.7)	285	(19.7)	-20 to +100	(-29 to +38)	
			260	(17.9)	260	(17.9)	+200	(+94)	
		S0, S5, S9, S36	230	(15.9)	230	(15.9)	+300	(+149)	TFE, FC Elast., 150# Fig.
			200	(13.8)	200	(13.8)	+400	(+205)	150# Fig.
			285	(19.7)	285	(19.7)	-20 to +100	(-29 to +38)	
		S1, S2	260	(17.9)	260	(17.9)	+200	(+94)	150# Fig.
			230	(15.9)	230	(15.9)	+300	(+149)	TFE Gasket, 150# Fig.
200	(13.8)		200	(13.8)	+400	(+205)	Std. Gasket, 150# Fig., CI		
Opt-30, 150# Fig., Opt-46	S1, S2	185	(12.8)	185	(12.8)	-20 to +450	(-29 to +232)		
CS / CS / SST (Note 2)	Opt-30, 150# Fig. & Opt-46 (Req'd)	S1, S2	170	(11.7)	170	(11.7)	-20 to +500	(-29 to +260)	150# Fig.
			140	(9.7)	140	(9.7)	+600	(315)	Asb. Gasket., 150# Fig., Mech. Internals
SST / CI / SST SST / CS / SST SST / SST / SST (Note 2)	Opt-30 150# Fig., Opt-45, Opt-46	S2N, S3 S40	275	(19.0)	275	(19.0)	-20 to +100	(-29 to +38)	150# Fig.
			245	(16.9)	245	(16.9)	+180	(+83)	150# Fig., Neoprene
		S6	275	(19.0)	275	(19.0)	-20 to +100	(-29 to +38)	150# Fig.
			240	(16.6)	240	(16.6)	+200	(+94)	150# Fig., EPDM/EPR
			215	(14.8)	215	(14.8)	+300	(+149)	150# Fig.
		275	(19.0)	275	(19.0)	-20 to +100	(-29 to +38)		
		240	(16.6)	240	(16.6)	+200	(+94)		
		S0, S5 S9, S36	215	(14.8)	215	(14.8)	+300	(+149)	TFE, FC Elast., 150# Fig.
			195	(13.4)	195	(13.4)	+400	(+205)	150# Fig.
			275	(19.0)	275	(19.0)	-20 to +100	(-29 to +38)	
		S1, S2	240	(16.6)	240	(16.6)	+200	(+94)	150# Fig.
			215	(14.8)	215	(14.8)	+300	(+149)	TFE Gasket, 150# Fig.
195	(13.4)		195	(13.4)	+400	(+205)	Std. Gasket, 150# Fig., CI		
**	S1, S2	180	(12.4)	180	(12.4)	-20 to +450	(-29 to +232)		
SST / CS / SST SST / SST / SST (Note 2)	Opt-30 150# Fig. & Opt-46 (Req'd)	S1, S2	170	(11.7)	170	(11.7)	-20 to +500	(-29 to +260)	150# Fig.
			140	(9.7)	140	(9.7)	+600	(+315)	150# Fig., Asb. Gasket, Mech. Internals

** Opt-30 150# Fig., Opt-46

FC Elast. = Fluorocarbon Elastomer

¹ See Next Page

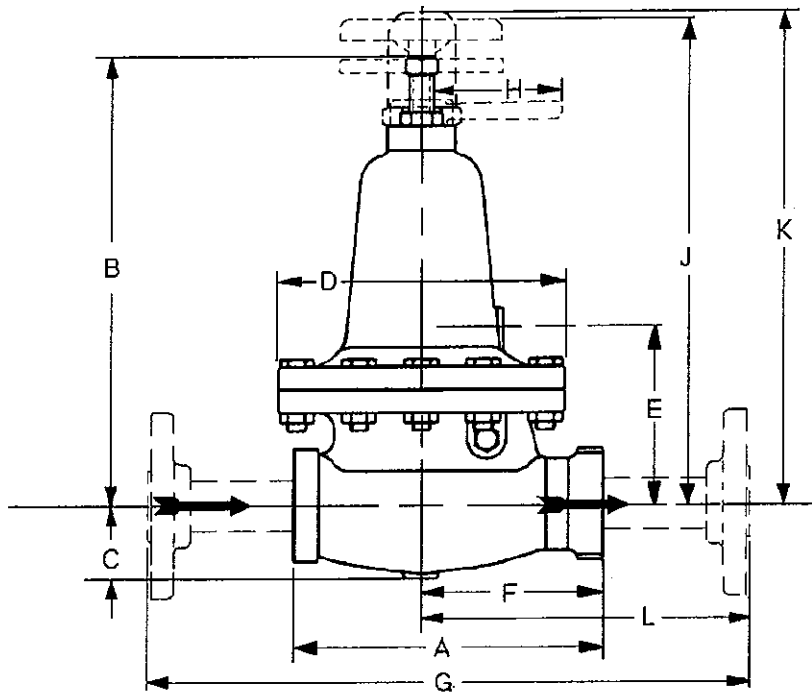
² See Next Page

TABLE 16 (Continued)

Materials	End Conn. Option No.	Trim Design. No.	Inlet Pressure		Outlet Pressure ¹		Inlet & Outlet Temperature Rg.		Limiting Portion
			psig	(Barg)	psig	(Barg)	°F	(°C)	
CS / CI / SST CS / CS / SST (Note 2)	Opt-30 300# Fig., Opt-45, Opt-46	S2N, S3 S40	740	(51.0)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			685	(47.2)	400	(27.6)	+180	(+83)	300# Fig., Mech. Internals, Neoprene
		S6	740	(51.0)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			675	(46.6)	400	(27.6)	+200	(+94)	300# Fig., Mech. Internals, EPDM/EPR
		S0, S5 S9, S36	655	(45.2)	400	(27.6)	+300	(+149)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
			635	(43.8)	400	(27.6)	+400	(+205)	300# Fig., Mech. Internals
		S1, S2	740	(51.0)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			675	(46.6)	400	(27.6)	+200	(+94)	300# Fig., Mech. Int., TFE Gskt.
		S1, S2	655	(45.2)	400	(27.6)	+300	(+149)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
			635	(43.8)	400	(27.6)	+400	(+205)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
Opt-30 300# Fig., Opt-46	S1, S2	615	(42.4)	400	(27.6)	-20 to +450	(-29 to +232)	300# Fig., Mech. Internals, Std. Gaskets, CI	
		615	(42.4)	400	(27.6)	-20 to +450	(-29 to +232)	300# Fig., Mech. Internals, Std. Gaskets, CI	
CS / CS / SST (Note 2)	Opt-30, 300# Fig. & Opt-46(Req'd)	S1, S2	600	(41.4)	400	(27.6)	-20 to +500	(-29 to +260)	300# Fig., Mech. Internals
			550	(37.9)	400	(27.6)	+600	(+315)	300# Fig., Mech. Internals, Asb. Gaskets
SST / CI / SST SST / CS / SST SST / SST / SST (Note 2)	Opt-30 300# Fig., Opt-45, Opt-46	S2N, S3 S40	720	(49.7)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			640	(44.1)	400	(27.6)	+180	(+83)	300# Fig., Mech. Internals, Neoprene
		S6	720	(51.0)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			620	(42.8)	400	(27.6)	+200	(+94)	300# Fig., Mech. Internals, EPDM/EPR
		S0, S5, S9, S36	560	(38.6)	400	(27.6)	+300	(+149)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
			515	(35.5)	400	(27.6)	+400	(+205)	300# Fig., Mech. Internals
		S1, S2	720	(51.0)	400	(27.6)	-20 to +100	(-29 to +38)	300# Fig., Mech. Internals
			620	(42.8)	400	(27.6)	+200	(+94)	300# Fig., Mech. Int., TFE Gskt.
		S1, S2	560	(38.6)	400	(27.6)	+300	(+149)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
			515	(35.5)	400	(27.6)	+400	(+205)	300# Fig., Mech. Internals, TFE, Fluorocarbon Elastomer
Opt-30, 300# Fig., Opt-46	S1, S2	495	(34.1)	400	(27.6)	-20 to +450	(-29 to +232)	300# Fig., Mech. Internals, Std. Gaskets, CI	
		495	(34.1)	400	(27.6)	-20 to +450	(-29 to +232)	300# Fig., Mech. Internals, Std. Gaskets, CI	
SST / CS / SST SST / SST / SST (Note 2)	Opt-300, 300# Fig. & Opt-46 (Req'd)	S1, S2	480	(33.1)	400	(27.6)	-20 to +500	(-29 to +260)	300# Fig., Mech. Internals
			450	(31.0)	400	(27.6)	+600	(+315)	300# Fig., Mech. Internals, Asb. Gaskets
SST / SST / SST	Opt-37	S6	250	(17.2)	100	(6.9)	-20 to +100	(-29 to +38)	Diaphragm Fig. Bolting
SST / SST / SST	Opt-37S	S1	100	(6.9)	100	(6.9)	-20 to +350	(-29 to +177)	Diaphragm Fig. Bolting

¹ Indicated outlet pressure limits are those to contain overpressure conditions; such overpressure may cause diaphragm damage. It is recommended that pressure safety devices – safety relief valve or rupture disc – have their setpoint relief pressures at 110% of the UVRS (UVRS = "Upper Value of Range Spring"). Example: For a 90–170 psig (6.2–11.7 Barg) range spring, the safety device should be set to relieve at 110% x 170 psig = 187 psig (12.9 Barg).

² Body size 2" (DN50) may utilize CS cylinder material; limits do not change.



Valve Size (Inches)	DIMENSIONS – ENGLISH (Inches)													Approx. Weight - lbs.	
	A	B	C	D	E	F	G ¹	G ²	G ³	H	J	K	L	wo/ Flanges	w/ Flanges
1/2"	5.94	10.00	1.62	5.62	3.75	3.94	10.75	11.00	13.94	3.13	11.50	11.62	5.38	18	22
3/4"	7.12	11.25	1.75	6.56	3.81	4.00	11.88	12.25	15.12	3.13	13.00	12.81	5.62	28	34
1"	7.94	11.75	2.12	7.38	4.38	4.69	13.62	14.00	15.94	3.13	13.56	13.44	6.75	37	45
1-1/4"	8.50	12.25	2.38	8.00	4.50	5.06	NA	NA	16.50	4.31	13.94	14.19	6.81	48	N/A
1-1/2"	9.75	15.75	2.50	9.12	6.19	5.75	15.88	16.19	17.75	4.31	16.50	17.00	7.31	77	93
2"	11.25	16.00	2.88	11.25	7.06	6.62	19.31	19.62	20.46	4.31	16.75	17.38	9.81	109	126

- ¹ 150# Flange
- ² 300# Flange
- ³ P.E. Pipe Nipples

Valve Size (mm)	DIMENSIONS – METRIC (mm)													Approx. Weight - kg.	
	A	B	C	D	E	F	G ¹	G ²	G ³	H	J	K	L	wo/ Flanges	w/ Flanges
DN15	151	254	41	143	95	100	273	279	354	79	292	295	137	8	11
DN20	181	286	44	167	97	102	302	311	384	79	330	325	143	13	16
DN25	202	298	54	187	111	119	346	356	405	79	344	341	171	17	21
DN32	216	311	60	203	114	129	NA	NA	419	110	354	360	173	22	N/A
DN40	248	400	64	232	157	146	403	411	451	110	419	432	186	35	42
DN50	286	406	73	286	179	168	490	498	520	110	425	441	249	49	59

- ¹ 150# Flange
- ² 300# Flange
- ³ P.E. Pipe Nipples

TABLE 4
STAINLESS STEEL TRIM

DESIG. NO.	CODE
S1	S1
S6	S6

TABLE 3

BODY/SP. CHMB.	SIZES	CODE
SST/SST	ALL	A

TABLE 2

SIZE	ASPIRATION LEVEL / SERVICE	
	GASEOUS CODE	LIQUID CODE
1/2"	4	J
3/4"	5	K
1"	6	L
1-1/2"	8	N
2"	9	P

TABLE 1

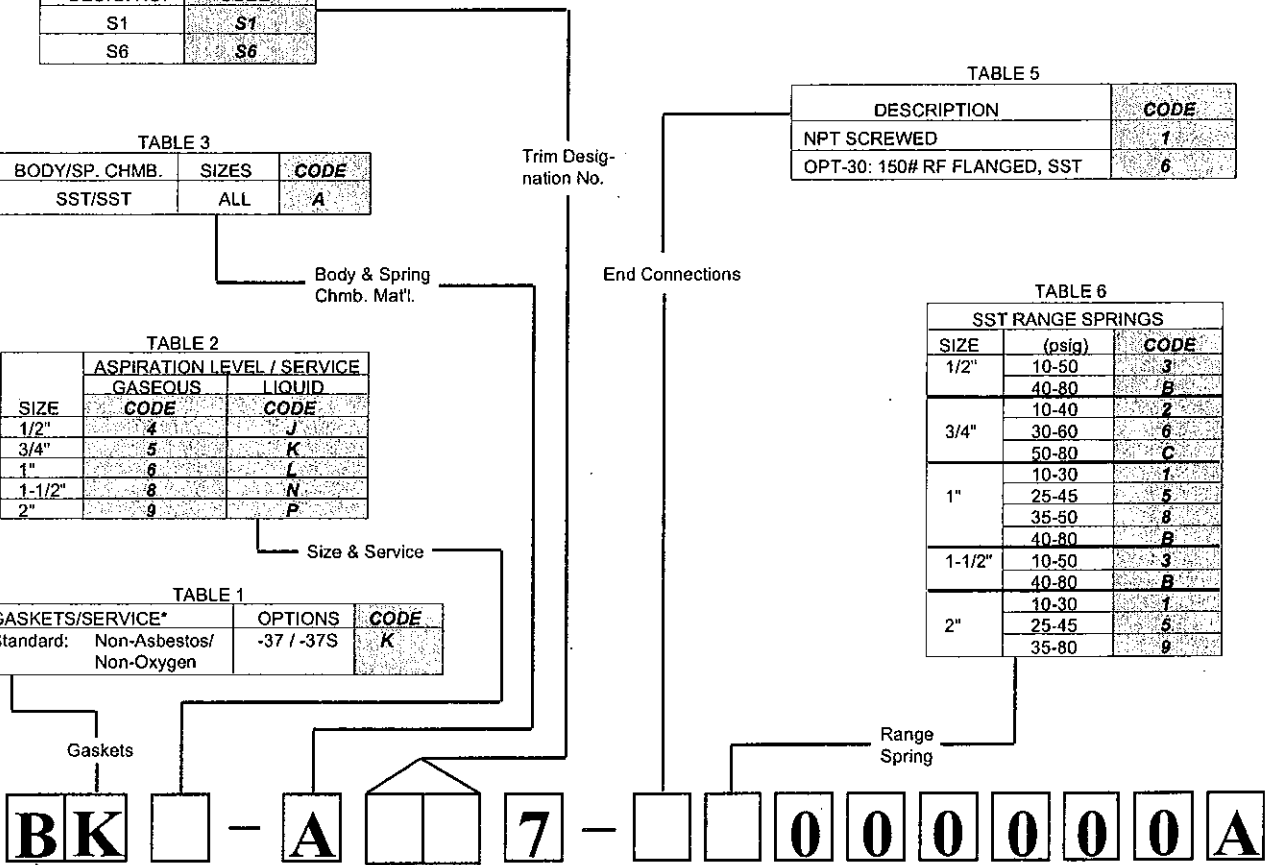
GASKETS/SERVICE*	OPTIONS	CODE
Standard: Non-Asbestos/ Non-Oxygen	-37 / -37S	K

TABLE 5

DESCRIPTION	CODE
NPT SCREWED	1
OPT-30: 150# RF FLANGED, SST	6

TABLE 6
SST RANGE SPRINGS

SIZE	(psig)	CODE
1/2"	10-50	3
	40-80	B
3/4"	10-40	2
	30-60	6
	50-80	C
1"	10-30	1
	25-45	5
	35-50	8
1-1/2"	40-80	B
	10-50	3
2"	40-80	B
	10-30	1
	25-45	5
	35-80	9



**MODEL "1000HP"
PRESSURE REDUCING REGULATOR
FOR THE
FOOD AND PHARMACEUTICAL INDUSTRY**

TABLE 4

BRASS TRIM			STAINLESS STEEL TRIM				
DESIG.	APPLIC. SIZES	CODE	DESIG.	APPLIC. SIZES	BODY MATERIAL		
					CI	CS	SST
					CODE	CODE	CODE
B1	ALL	B1	S0	1/2"-1, 1-1/2"	S0	S0	S0
B2	ALL	B2	S1	ALL	S1	S1	S1
B3	ALL	B3	S2	1/2" - 1-1/2"	S2	S2	S2
B5	ALL	B5	S2N	2" ONLY	C2	C2	—
			S2N	1/2" - 1-1/2"	SN	SN	SN
			S3	2" ONLY	CN	CN	—
			S3	ALL	S3	S3	S3
			S3N	ALL	SC	SC	SC
			S5	1/2" - 1-1/2"	S5	S5	S5
			S6	2" ONLY	C5	C5	—
			S6	1/2"-1", 1-1/2-2"	S6	S6	S6
			S9	1/2"-1", 1-1/2-2"	S9	S9	S9
			S36	ALL	36	36	36
			S40	ALL	40	40	40

PRODUCT CODE 07/01/95

TABLE 5

DESCRIPTION	CODE
NPT SCREWED	1
-30 OPT, 150 LB. RF FLGS. * **	6
-30 OPT, 300 LB. RF FLGS. * **	7
-31 OPT, 8SP-SCREWED British Standard Pipe Thread	B
-32 OPT, SCH. 80 EXT. NIPPLES *	E

* Nipples and Flanges of same material as body.
CS or SST Bodies only.
** Not available in 1-1/4" size.

TABLE 2

SIZE	ASPIRATION LEVEL / SERVICE		
	GASEOUS CODE	LIQUID CODE	VISCOUS (-27 OPT) CODE
1/2"	4	J	R
3/4"	5	K	S
1"	6	L	T
1-1/4"	7	M	U
1-1/2"	8	N	V
2"	9	P	W

TABLE 3

BODY/SP CH	CODE
CI/CI	1
BRZ/CI	2
BRZ/BRZ	3
CS/CI	4
CS/CS	5
¹ SST/CI	7
¹ SST/CS	9
¹ SST/SST	A

NOTE: SST Bodies not available in 1-1/4" size.

TABLE 1

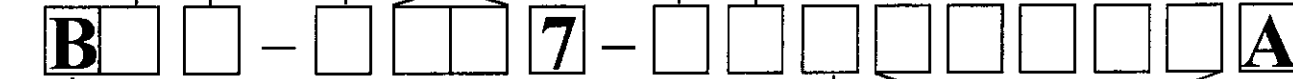
* GASKETS/SERVICE	OPTIONS	CODE
Standard : Non-Asbestos/Non-Oxygen	--	B
Non-Asbestos/Oxygen	-45	D
Asbestos	-46	A

* Gaskets only required for metal diaphs. or closing cap -1 Opt.
Refer to Tech Bulletin for suitable gasket temp. range

Gaskets & Service

Body & Spring Chamber Material

Trim Designation No.



**MODEL "1000HP"
PRESSURE REDUCING
REGULATOR**

When ordering a valve per one of Cashco's special drawings, the code "X" and the 5-digit number following overrides all other options. Otherwise, proceed with the following.

- ASSIGNMENT OF "OPTION" CODES
1. NUMERIC digits assigned first in "ascending" order.
 2. ALPHA designations are assigned second in "alphabetical" order.
 3. Left justify.
 4. Add "0" to all unused squares.
 5. If insufficient quantity of squares, consult factory for proper code.

TABLE 7

DESCRIPTION	OPTION	CODE	TRIM OPTION PLUS PISTON SPG. (-17 OPT)	
			OPTION	CODE
SPECIAL CONSTRUCTION	--	X	--	--
NO SPECIAL TRIM VARIATION	--	0	--	--
REDUCED ORIFICE (ONE-STEP) All Sizes, except 1-1/4"	-12	A	-12+17	1
INTEGRAL SEAT SURFACE: B1, B5, S1, S2, S2N, S3, S5, S36 Trims	-14	C	-14+17	3
STELLATED SEAT SURFACES, INTEGRAL SEAT, S1 Trim Only	-15 *	D	-15+17 *	4
REDUCED ORIFICE (ONE-STEP), INTEGRAL SEAT B1, B5, S1, S2, S2N, S3, S5, & S36 Trims. All Sizes, except 1-1/4"	-12+14	E	-12+14+17	5
REDUCED ORIFICE (ONE-STEP), INTEGRAL & STELLATED SEAT SURFACES - S1 Trim Only, All Sizes, except 1-1/4"	-12+15 *	F	-12+15+17 *	6
PISTON SPRING All Sizes, except 2" with C2 or C5 trim	-17	H	--	--

* Includes integral seat.

TABLE 8

DESCRIPTION	OPTION	CODE
DI CLOSING CAP		
CI or CS Spring Chamber	-1	1
HANDWHEEL & LOCKING LEVER 1/2", 3/4" & 1" Sizes	-3	3
T-BAR & LOCKING LEVER 1-1/4", 1-1/2" & 2" Sizes	-3	4
1/4" NPT SPRING CHAMBER VENT TAP	-25	E
1/4" NPT DRAIN HOLE/PRESSURE TAP	-26	F
NACE CONSTRUCTION: CS/CS/XX Per MR0175-90 Rev., NPT Body All Sizes, except 1-1/4", S40 Trim only.	-40	J
NACE CONSTRUCTION: SST/SST/XX OR SST/CS/XX, Per MR0175-90 Rev. NPT Body, All Sizes, except 1-1/4", S40 Trim only.	-40SST	K
SPECIAL CLEANING: Per Cashco Spec #S-1134. W/properly selected mat'ls, this procedure suitable for oxy. serv. BRZ or SST sp. ch./body mat'ls only.	-55	M
SPECIAL CLEANING: Per Cashco Spec #S-1542. SST, CS & CI sp.ch/body Mat'ls only.	-56	N
EPOXY PAINTED	-95	W

Cashco, Inc.
P.O. Box 6
Ellisworth, KS 67439-0006
PH (785) 472-4461
Fax. # (785) 472-3539
E-mail: sales@cashco.com



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

PRESSURE REGULATING VALVE (LOW FLOW)

MANUFACTURER : CASHCO
MODEL : MODEL D
MODEL NO. : 2D6-AS77-124M0000B
TYPE : SELF-CONTAINED PRESSURE REDUCING REGULATOR
SERVICE : OXYGEN GAS
MATERIAL
 BODY : STAINLESS STEEL
 CYLINDER : TYPE 316 STAINLESS STEEL
 SEAT DISC : VIRGIN TFE
FLOW RATE
 MINIMUM : 10 SFCM (0.264 Nm³/min)
 MAXIMUM : 150 SCFM (3.96 Nm³/min)
PRESSURE
 OPERATING INLET : 60 ~ 70 PSIG (413.7 ~ 482.6 kPa)
 OPERATING OUTLET : 12 ~ 15 PSIG (82.7 ~ 103.4 kPa)
CONNECTION
 INLET : 1" (25 mm) FNPT
 OUTLET : 1" (25 mm) FNPT
LINE SIZE : 2" (50 mm)
SPRING RANGE : 10 ~ 40 PSIG (69 ~ 276 kPa)
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 2

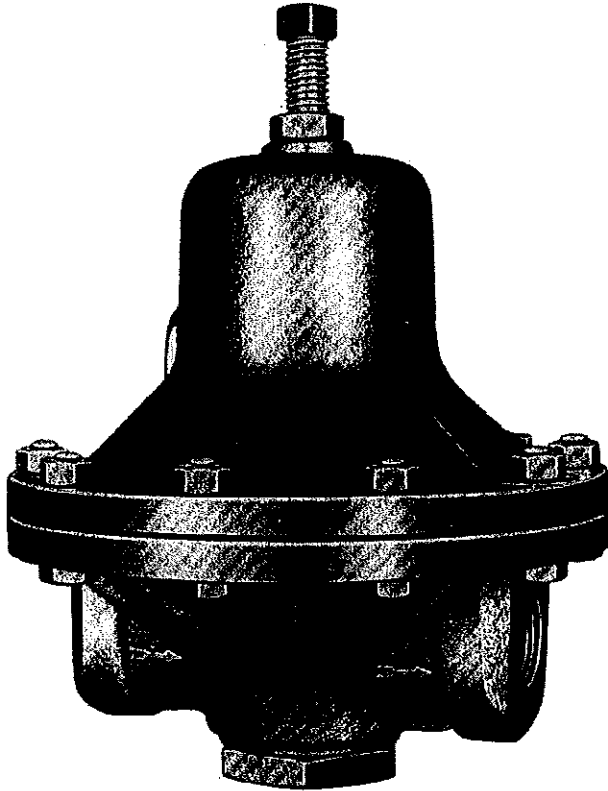
CUSTOMER TAG NO. : PRV-0032B / PRV-0032D



MODEL D

PRESSURE REDUCING REGULATOR

The Model D is Cashco's basic general service, self-contained regulator. Unit handles inlet pressure of up to 300 psig (20.7 Barg) and outlet pressures from 2-150 psig (0.14-10.3 Barg) in multiple spring ranges. Model D is the Cashco reducing regulator product utilized for the majority of industrial applications. A time-proven product with 70+ years of experience.



MODEL D

FEATURES

- Versatile:** Four body materials and seventeen trim material combinations to select from.
- Tight Shutoff:** Composition seats of TFE, Buna-N or EPDM available.
- Non-Asbestos Construction:** Standard design incorporates no asbestos containing materials.
- Capacity:** Handles mid-range flow rates on a line size basis.
- Pressure Drop:** Handles mid-range pressure drops while maintaining good stability.
- Flow-to-Close Plug:** Incorporates the typical reducing regulator internal design.
- Incorporated Cylinder:** Plug is guided through its travel by the cylinder, which also serves to block harmful debris from entry to the seating surfaces.
- Overpressure Travel Stop:** In the event of downstream over-pressurization, diaphragm over-travel is restricted by mechanical stops.

APPLICATIONS

Used in all types of fluids, including cryogenic liquids and gases, sour gas, industrial gases, chemicals, as well as the common industrial fluids - water, oil, steam and compressed air.

STANDARD/GENERAL SPECIFICATIONS

Body Sizes: 3/8", 1/2", 3/4", 1", 1-1/2", 2" (DN10, 15, 20, 25, 40, & 50).

End Connections: Standard: NPT female.
Option-30: Weld-on 150# or 300# RF flanges.
Option-31: BSP (British Standard Pipe Thread) female.
Option-32: Extended Nipples.

Body/Spring Chamber Material Combinations: CI/CI, BRZ/CI, CS/CI, SST/CI, BRZ/BRZ, CS/CS, SST/CS, and SST/SST

CI = Cast grey iron
 CS = Cast carbon steel
 BRZ = Cast bronze
 SST = Cast stainless steel
 See Table 1 for materials specifications.

Inlet Pressure:

Body Material	Max. Pressure	
	psig	(Barg)
CI	250	(17.2)
BRZ	250	(17.2)
CS	300	(20.7)
SST	300	(20.7)

See Table 1.

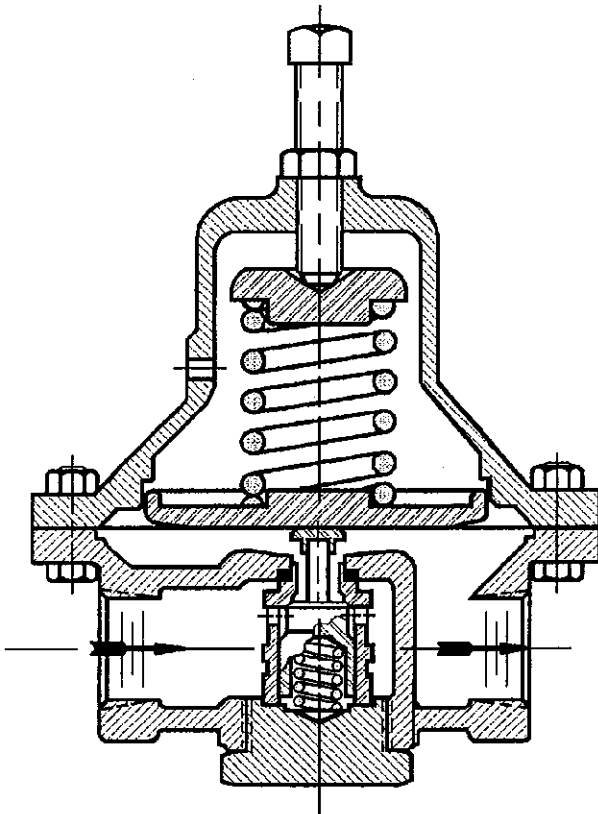


Figure 1: Model D - Standard Metal Seat Design

Temperature: Standard: -20° to 400°F (-29° to +205°C)
Cryogenic: -325° to +100°F (-198° to +38°C)
 See Table 1.

Outlet Pressure: Standard: 2-150 psig (0.14 - 10.3 Barg); in four range springs – see Tables 1 and 2.

Pressure Drop: Up to 150 psid (10.3 Bard). Dependent on range spring selection. See Table 2.

Trim Designs: Metal seated or composition seated, brass or SST materials. See Tables 3 and 4.

Capacities: Up to 10 Cv; see Table 7 for Cv vs. outlet pressure vs. body size vs. diaphragm material.

Water flow - see Tables 8 and 9

Compressed air flow - see Tables 10 and 11.

Steam flow - see Tables 12 and 13

For wide open Cv's, see Table 6; use for safety relief sizing.

Seat Leakage: Meets ANSI/FCI 70-2 (Rev. 1982).
Standard: Metal seated, Class IV.
Optional: Composition (soft) seated Class VI.

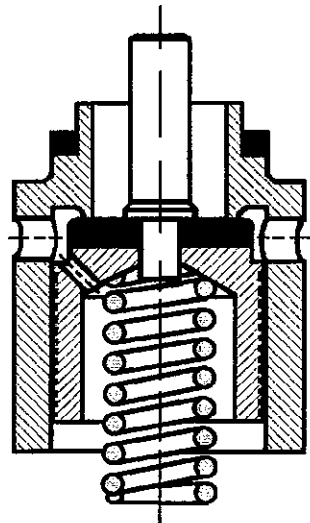


Figure 2: Optional Composition Seat

Diaphragms: SST, Phosphor Bronze, Neoprene, Fluorocarbon Elastomer, EPDM, TFE coated SST.

Gaskets: Standard: Non-asbestos. **NOT SUITABLE FOR OXYGEN SERVICE.**
Cylinder: Graphite/NBR.
Diaphragm: Graphite/NBR. (*NOTE: Composition diaphragms do not use a diaphragm gasket.*)
Alternate: See Options -45 and -46.

Range Springs: Standard: Epoxy coated steel.
Cryogenic: SST.

Standard		Cryogenic	
Steel Range Springs		SST Range Springs	
psig	(Barg)	psig	(Barg)
2-15	(0.14-1.03)	2-15	(0.14-1.03)
10-40	(0.69-2.8)	10-40	(0.69-2.8)
30-80	(2.1-5.5)	30-80	(2.1-5.5)
70-150	(4.8-10.3)	70-135	(4.8-9.3)

Flange Bolting: Standard: Cadmium or zinc plated, heat treated steel.
Cryogenic: SST.

Painting: Standard: CI & CS — Enamel. Per Cashco Spec. #S-1545. SST and BRZ — Non-painted.

Alternate: See Opt. -95.

NOTE: Refer to *OPTION SPECIFICATIONS* for alternate design options, and to *TECHNICAL SPECIFICATIONS* for a more complete description of the above specifications.

OPTION SPECIFICATIONS

Option -3: HANDWHEEL & LOCKING LEVER. Utilize when P₂ pressure setting changes are frequent.

Option -5: BRASS/BRONZE CRYOGENIC CONSTRUCTION. Only available in NPT—end 1/2", 3/4", and 1" (DN15, 20, & 25) body sizes, and in BRZ/BRZ body/spring chamber materials. Only B0 or B5 trim selections allowed. SST flange bolting and range spring; remaining parts of brass or bronze materials. Non-asbestos diaphragm and cylinder gasket. Regulator MUST be mounted with adjusting screw on underneath side in horizontal pipe. 1/8" NPT tapped spring chamber vent/purge connections; drilled condensate drain hole near adjusting screw. Cleaned and packaged for oxygen service per Cashco cleaning specification #S-1134. Applicable temperature range -325° to +100°F (-198° to +38°C). See Figure 3.

Option -25: TAPPED VENT. NPT tapped opening in spring chamber for piping vent to remote location, in the event of diaphragm failure. 1/8" NPT for body sizes 3/8" through 1" (DN10-25); 1/4" NPT for 1-1/2" and 2" (DN40 and 50) sizes.

Option -30: FLANGED END CONNECTIONS. CS or SST body materials only. Flange and pipe nipple materials of same general chemistry as body material. Short-threaded nipples seal welded at body; nipples socket welded at flange. Available in 150# RF or 300# RF flanges only. Not available 3/8" (DN10) body size.

NOTES: 1. The body P vs. T ratings of Table 1 are the limiting variables for flanged end connections, unless further restricted by ASME B16.5.
 2. No post-weld stress relieving performed.

Option -31: BSP END CONNECTIONS. British Standard Pipe threads per ISO 7/1; used as an alternate to NPT ends. Available all body sizes except 3/8" (DN10).

Option -32: EXTENDED NIPPLES. Schedule 80 plain end extension nipples available for carbon steel or 316 SST bodies. Nipples of same basic material as body. Nipples are seal welded after screwing into body. **NOTE:** Used where welded connections are required and in lieu of socket weld ends.

Option -36: SST CRYOGENIC CONSTRUCTION. Same specifications as Option -5, except:

- For SST/SST body/spring chamber materials.
- S1 and S36 only available trim selections.
- Option -30 flanged ends available.

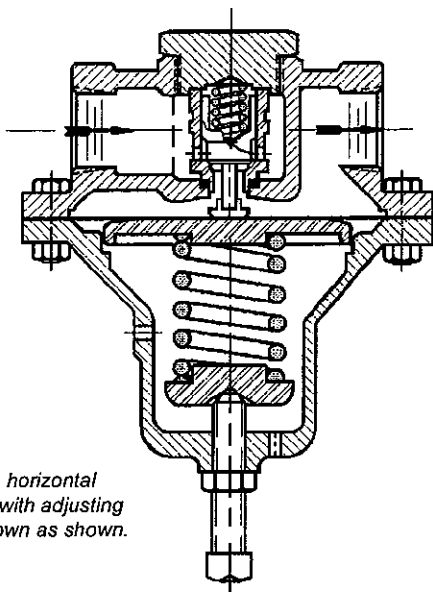


Figure 3: Option-5 or Option -36 Cryogenic Construction.

Option -37: ALL SST/CLEAN UNIT FOR LIQUIDS & GASES. 1/2", 3/4" and 1" (DN 15, 20, & 25) NPT sizes only. Uses 316 SST body and spring chamber, S6 trim only. SST T-handle, spring button, spring, pressure plate, nuts and bolts. All wetted and external castings are electropolished and unit is cleaned to Cashco Specification #S-1576. Suitable for fluids of -20 to 100°F (-29 to 38°C); inlet pressures to 250 psig (17.2 Barg) and outlet pressures adjustable from 2 to 80 psig (.14 to 5.5 Barg) with multiple range springs. Complete with 1/4" NPT outlet gauge connection and 1-1/2" (40 mm) diameter SST pressure gauge, 0-100 psig (0-6.9 Barg).

Option -37S: ALL SST/CLEAN UNIT FOR STEAM. Similar to Option -37, except uses S1 trim with graphite diaphragm gasket. Does not include gauge connection or gauge. Suitable for steam/condensate service up to 350°F (177°C), inlet

pressures to 100 psig (6.9 Barg) and outlet pressures adjustable from 2 to 80 psig (.14 to 5.5 Barg) with multiple range springs.

Option-40: CS NACE CONSTRUCTION. Internal wetted portions meet NACE standard MR0175-90 revision, when the exterior of the regulator is not directly exposed to a sour gas environment, buried, insulated or otherwise denied direct atmospheric exposure. CS/CS body/spring chamber materials only. S40, and S40T only trim selections available. Diaphragm flange bolting of heat treated steel per ASTM A449 and per NACE Class III. Available all sizes, except 3/8" (DN10) NPT ends only; not available with Option -30.

Option -40SST: SST NACE CONSTRUCTION. Same as Option -40, except uses SST/SST body/spring chamber construction, and only available in body sizes 1/2", 3/4" and 1" (DN15, 20 & 25).

Option - 45: NON-ASBESTOS GASKETS. For oxygen service. Utilizes TFE diaphragm gasket and fluorocarbon elastomer cylinder gasket over standard gaskets. Temperature range; -20° to +400°F (-29° to +205°C).

Option -46: ASBESTOS GASKETS. Utilizes asbestos gaskets over standard gaskets.

Option -55: SPECIAL CLEANING. BRZ or SST body materials ONLY. Cleaning per Cashco Spec. #S-1134. Acceptable cleaning level for oxygen service. Use for non-cryogenic service.

Option -56: SPECIAL CLEANING. CI, CS or SST body materials only. Cleaning per Cashco Spec. #S-1542. Not suitable for oxygen service. Use for non-cryogenic service.

Option -95: EPOXY PAINTED. Two-step epoxy coated for severe ambient conditions to minimize external corrosion. Applied to all exposed parts, except those of SST. Procedures and specifications per Cashco Spec. #S-1547.

APPLICATION AND SELECTION

The following procedure will help determine a suitable selection for an application:

STEP 1. FIVE KNOWNs. The following minimal parameters / information must be available before a selection procedure can begin:

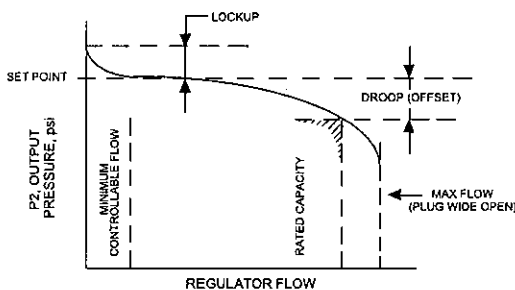
- a. Service Fluid - What is it? Liquid or gas? Specific Gravity (std. cond.)?
- b. Inlet Pressure - P_1 (upstream pressure).
- c. Outlet Pressure - P_2 (downstream pressure). How much can P_2 vary as flow varies?
- d. Desired capacity - C_V , GPM, SCFH; minimum & maximum.
- e. Fluid temperature - T_1 , Specific Gravity (actual).

STEP 2. INLET PRESSURE AND TEMPERATURE. Ensure that the actual design inlet pressure and temperature limits do not exceed the limits established in Table 1. Both body and spring chamber must comply.

STEP 3. PRESSURE DROP. Check the maximum pressure drop ($P_1 - P_2$) against all limits established in Table 2 to ensure not exceeding.

STEP 4. OUTLET PRESSURE. All self-contained pressure reducing regulators "droop" or "falloff" from a setpoint pressure level at a given flow as the flow rate increases.

This deviation in setpoint is described as "% droop". Droop is expressed on increasing flow, starting from a minimum flow level.



The "% droop" must be known to enter the capacity tables. The acceptable level of setpoint deviation should be known for the min-to-max flow variation.

A regulator may have a setpoint up to 15% below the lower stated range spring level. (Tags will show the standard ranges.) A setpoint above the higher range spring level is not recommended. Setpoint at the upper limit of a range spring is acceptable. If final setpoint is questionable and expected near the upper limit, the next higher range spring should be utilized. Best performance will be obtained when the lowest range spring is utilized.

STEP 5. DIAPHRAGM MATERIAL. Select the diaphragm first considering its pressure-temperature limits. See Tables 1, 3, and 4.

Composition diaphragms will give approximately an extra 20-30% in capacity over a metal diaphragm at equal levels of droop.

Systems subject to pulsating inlet or outlet pressures should be provided with metal diaphragms.

Refer to Table 5 as a guide for recommended diaphragms for various services.

STEP 6. GASKET MATERIAL. Considering the fluid, determine the desired gasket material from the three choices offered.

STEP 7. CAPACITY. The five knowns of Step 1 allow proper sizing of the regulator. (Specific Gravity tables are required.) With P_1 , P_2 % droop, flow rate (C_V , GPM, SCFH or #/HR) and the diaphragm type per Step 5, enter the capacity tables and confirm Model D capability. Refer to Tables 7 through 13 for capacities.

STEP 8. TRIM MATERIAL. Combining diaphragm material choice of Step 5, and the use of Tables 3 and 4 allows proper selection of "Trim Designation Numbers" for materials and temperatures. See Table 2 for type of service and allowable pressure drops.

Composition trim will initially provide bubble-tight shutoff in clean service and without downstream overpressurization. Minute leakage should be expected with metal seated designs. A downstream safety relief valve is recommended.

TECHNICAL SPECIFICATIONS

**TABLE 1
DESIGN PRESSURE - TEMPERATURE
MATERIAL SPECIFICATIONS**

STANDARD CONSTRUCTIONS								
Material Specifications (Body/Spring Chamber)		Inlet		Outlet – Diaphragm Design				
		Pressure	Temperature	Pressure	Temperature, °F, (°C)			
					Trim Designation / Diaphragm Type			
Description (Abbr.)	ASTM No.	psig (Barg)	°F (°C)	psig (Barg) *	Metal	Composition		
					B0, B5, S0, S1 S2, S36, S9	B2, B3, S2N, S3, S4, S4N, S40	S6	B4, S40T
CI/CI	A126, Class B	250 (17.2)	-20 to +400°F (-29 to +205°C)	1.10 x UVRS up to 150 (1.10 x UVRS up to 10.3)	-20 to +400°F (-29 to +205°C)	-20 to +180°F (-29 to +83°C)	-20 to +300°F (-29 to +149°C)	-20 to +400°F (-29 to +205°C)
BRZ/CI	B62, Alloy C83600/ A126, Class B							
CS/CI	A216, Gr. WCB/ A126, Class B							
SST/CI	A351, Gr. CF8M/ A126, Class B							
BRZ/BRZ	B62, Alloy C83600	300 (20.7)	-20 to +400°F (-29 to +205°C)	1.10 x UVRS up to 150 (1.10 x UVRS up to 10.3)	-20 to +400°F (-29 to +205°C)	-20 to +180°F (-29 to +83°C)	-20 to +300°F (-29 to +149°C)	-20 to +400°F (-29 to +205°C)
CS/CS	A216, Gr. WCB							
SST/CS	A351, Gr. CF8M/ A216, Gr. WCB							
SST/SST	A351, Gr. CF8M							
OPTIONS -5 and -36 - CRYOGENIC CONSTRUCTIONS								
BRZ/BRZ	B62, ALLOY C83600	250 (17.2)	-325 to +100°F (-198 to +38°C)	1.05 x UVRS (1.05 xUVRS)	-325 to +100°F (198 to +38°C)			
SST/SST	A351, GR. CF8M/ A351, GR. CF8M	300 (20.7)						

* Limit is the lower value of 150 psig (10.3 Barg), or the factor x UVRS (UVRS = "Upper Value of Range Spring). Example: For a 30-80 psig (2.1 - 5.5 Barg) standard range spring, the 1.10 x UVRS value = 1.10 x 80 = 88 psig; 88 < 150, ∴ pressure limit = 88 psig (1.10 x 5.5 = 6.1 Barg; 6.1 , 10.3, ∴ pressure limit = 6.1 Barg).

NOTE: Certification of material chemical and physical properties are routinely available ONLY for CS or SST castings; BRZ or CI material certifications are NOT AVAILABLE. Wrought barstock or diaphragm sheet material certification are NOT AVAILABLE routinely.

**TABLE 2
RANGE SPRINGS WITH
RECOMMENDED PRESSURE DROPS**

Construction	Range spring		Recommended Max. Pressure Drop					
	P2 - Outlet Reduced Pressure Range		Liquid Service (Non-Cavitating)		Gaseous Service		Steam Service*	
	psig	(Barg)	psid	(Bard)	psid	(Bard)	psid	(Bard)
Standard	2-15	(0.14-1.03)	100	(6.9)	125	(8.6)	100	(6.9)
Cryogenic	10-40	(0.69-2.8)	125	(8.6)	150	(10.3)	125	(8.6)
Opt -5 or Opt -36	30-80	(2.1-5.5)	150	(10.3)	150	10.3	150	(10.3)
	70-150 or 70-135	(4.8-10.3) or (4.8 -9.3)	150	(10.3)	150	10.3	150	(10.3)

*For steam service, all B0 & B5 trim options are limited to 50 psid (3.4 Bard).

**TABLE 3
BRASS TRIM MATERIAL COMBINATIONS**

PART	BRASS TRIM #				
	METAL SEAT	COMPOSITION SEAT			
	B0 ¹	B2	B3	B4	B5 ¹
Diaphragm	Phos. Brz	Neoprene	Neoprene	FC Elast.	Phos.Brz
Cylinder	Brass	Brass	Brass	Brass	Brass
Piston	Brass	Brass	Brass	Brass	Brass
Seat Disc	None (Metal)	Buna-N	TFE	TFE	TFE
Piston Spring	302 SST	Phos. Brz	Phos. Brz	Phos. Brz	Phos. Brz
Body Cap	Brass	Brass	Brass	Brass	Brass
Pusher Plate	Brass	Brass	Brass	Brass	Brass
Temperature Range	-20 to -400°F (-29 to +205°C)	-20 to +180°F (-29 to +83°C)	-20 to +180°F (-29 to +83°C)	-20 to +400°F (-29 to +205°C)	-20 to +400°F (-29 to +205°C)

¹ For cryogenic applications, B0 and B5 trim options are ONLY trim selections allowed for -325 to +100°F (-198 to +38°C) range.
FC Elast. = Fluorocarbon Elastomer

**TABLE 4(a)
STAINLESS STEEL TRIM MATERIAL COMBINATION – METAL SEAT**

PART	STAINLESS STEEL TRIM #				
	S0	S1 ¹	S2	S2N	S40 ²
Diaphragm	TFE coated 302 SST	302 SST	302 SST	Neoprene	Neoprene
Cylinder	316 SST	316 SST	416 SST	416 SST	316 SST
Piston	316 SST	316 SST	416 SST	416 SST	316 SST
Seat Disc	None (metal)	None (metal)	None (metal)	None (metal)	None (metal)
Piston Spring	302 SST	302 SST	302 SST	302 SST	Inconel X-750
Body Cap	316 SST	316 SST	416 SST	416 SST	316 SST
Pusher Plate	316 SST	316 SST	316 SST	316 SST	316 SST
Temperature Range	-20 to +400°F (-29 to +205°C)	-20 to +400°F (-29 to +205°C)	-20 to +400°F (-29 to 205°C)	-20 to +180°F (-29 to +83°C)	-20 to +180°F (-29 to +83°C)

¹ For cryogenic applications; S1 and S36 trim options are ONLY allowed for -325° to +100°F (-198° to +38°C) range.
² Trim options for NACE service.

**TABLE 4(b)
STAINLESS STEEL TRIM MATERIAL COMBINATION – COMPOSITION (SOFT) SEAT**

PART	STAINLESS STEEL TRIM #						
	S3	S4	S4N	S6 ³	S9	S36 ¹	S40T ²
Diaphragm	Neoprene	Neoprene	Neoprene	EPDM	TFE coated 302 SST	302 SST	FC Elast.
Cylinder	316 SST	416 SST	416 SST	316 SST	316 SST	316 SST	316 SST
Piston	316 SST	416 SST	416 SST	316 SST	316 SST	316 SST	316 SST
Seat Disc	TFE	TFE	Buna-N	EPDM	TFE	TFE	TFE
Piston Spring	302 SST	302 SST	302 SST	302 SST	302 SST	302 SST	Inconel X-750
Body Cap	316 SST	416 SST	416 SST	316 SST	316 SST	316 SST	316 SST
Pusher Plate	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST	316 SST
Temperature Range	-20 to +180°F (-29 to +83°C)	-20 to +180°F (-29 to +83°C)	-20 to +180°F (-29 to +83°C)	-20 to +300°F (-29 to 149°C)	-20 to +400°F (-29 to +205°C)	-20 to +400°F (-29 to +205°C)	-20 to +400°F (-29 to +205°C)

¹ For cryogenic applications; S1 and S36 trim options are ONLY allowed for -325° to +100°F (-198° to +38°C) range.
² Trim options for NACE service. ³ Only available on sizes 1/2", 3/4" and 1". FC Elast. = Fluorocarbon Elastomer

**TABLE 5
APPLICATIONS**

FLUID	RECOMMENDED CONSTRUCTION	TRIM#
Air or Inert Gases	Composition Seat and Diaphragm Metal Seat and Composition Diaphragm	B2, B3, B4 S2N
Chemicals	Metal Seat and Diaphragm Metal Seat and Composition Diaphragm Composition Seat and Diaphragm TFE seat and Metal Diaphragm	S1, S2, S0 S40 S3, S4, S4N, S6 or S40T S9
Sour Gas	Metal Seat and Composition Diaphragm Composition Seat and Diaphragm	S40 S40T
Cryogenic Gas or Liquids	TFE Seat and Metal Diaphragm Metal Seat and Diaphragm	B5 or S36 B0 or S1
Fuel Oil	Composition Seat and Diaphragm	B2, B3, B4, S3, S4, or S4N
Hydrocarbon Gas or Liquids	Composition Seat and Diaphragm	B2, B3, B4, S3, S4, or S4N
Saturated Steam, Low Pressures - up to 50 psig (3.4 Barg)	Metal Seat and Diaphragm Composition Seat and Diaphragm TFE Seat and Metal Diaphragm	B0, S1, or S2 S6 B5 or S36
Saturated Steam, Pressures up to 100 psig (6.8 Barg) 50 psid (3.4 Barg)	Metal Seat and Diaphragm TFE Seat and Metal Diaphragm	B0, S1 or S2 B5 or S36
Steam Pressures above 100 psig (6.9 Barg) Saturated or Superheated	Metal Seat and Diaphragm	S1 or S2
Water and Condensate Low Temperature – 32–180°F (0–83°C)	Composition Seat and Diaphragm Metal Seat and Composition Diaphragm	B2, B3, S3, S4, or S4N S2N
Water and Condensate High Temperature – 180–300°F (83–149°C)	Metal Seat and Diaphragm	B0, S1 or S2

**TABLE 6
MAXIMUM C_v WITH PLUG WIDE OPEN
(Use for Relief Valve Sizing)**

Body Size		C _v
Inch	(mm)	
3/8"	(DN10)	1.8
1/2"	(DN15)	1.8
3/4"	(DN20)	3.7
1"	(DN25)	4.0
1-1/2"	(DN40)	7.0
2"	(DN50)	10.0

**TABLE 7
CAPACITY - Cv
AT FLOWING PRESSURE
(FL = 0.95)**

METAL DIAPHRAGM

Flowing Pressure psig	3/8" Body			1/2" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.10	0.23	0.41	0.11	0.27	0.46
10	0.15	0.34	0.60	0.17	0.38	0.67
15	0.19	0.44	0.77	0.22	0.49	0.86
25	0.25	0.57	0.99	0.28	0.64	1.09
35	0.29	0.68	1.18	0.33	0.76	1.30
50	0.24	0.56	0.97	0.27	0.62	1.08
75	0.29	0.72	1.26	0.34	0.81	1.39
100	0.37	0.82	1.35	0.41	0.90	1.50
135	0.43	0.93	1.54	0.49	1.04	1.71
150	0.46	1.00	1.56	0.51	1.12	1.78

COMPOSITION DIAPHRAGM

Flowing Pressure psig	3/8" Body			1/2" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.17	0.39	0.69	0.18	0.45	0.77
10	0.25	0.56	1.00	0.28	0.64	1.11
15	0.31	0.74	1.28	0.36	0.82	1.44
25	0.42	0.96	1.65	0.46	1.07	1.80
35	0.48	1.14	1.80	0.54	1.26	1.80
50	0.40	0.93	1.62	0.45	1.04	1.80
75	0.48	1.21	1.80	0.57	1.36	1.80
100	0.61	1.36	1.80	0.69	1.49	1.80
135	0.72	1.56	1.80	0.81	1.73	1.80
150	0.77	1.66	1.80	0.89	1.80	1.80

Flowing Pressure psig	3/4" Body			1" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.38	0.84	1.40	0.38	0.95	1.55
10	0.51	1.15	1.97	0.56	1.27	2.15
15	0.60	1.43	2.49	0.68	1.58	2.72
25	0.45	1.09	1.86	0.54	1.20	2.06
35	0.56	1.33	2.29	0.64	1.47	2.56
50	0.68	1.68	2.93	0.78	1.84	3.18
75	0.91	2.24	3.71	1.02	2.45	3.98
100	0.68	1.70	3.05	0.78	1.89	3.30
135	0.88	2.15	3.71	0.98	2.35	3.92
150	0.95	2.40	3.71	1.09	2.63	3.98

Flowing Pressure psig	3/4" Body			1" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.63	1.41	2.33	0.63	1.58	2.59
10	0.85	1.91	3.28	0.93	2.11	3.59
15	1.00	2.39	3.71	1.14	2.63	3.98
25	0.75	1.81	3.10	0.90	2.00	3.43
35	0.93	2.22	3.71	1.06	2.46	3.98
50	1.14	2.79	3.71	1.30	3.07	3.98
75	1.51	3.71	3.71	1.69	3.98	3.98
100	1.14	2.84	3.71	1.30	3.15	3.98
135	1.47	3.59	3.71	1.64	3.92	3.98
150	1.59	3.71	3.71	1.81	3.98	3.98

Flowing Pressure psig	1-1/2" Body			2" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.54	1.22	1.94	0.60	1.46	2.55
10	0.69	1.60	2.70	0.85	2.05	3.70
15	0.84	1.98	3.41	1.05	2.64	4.80
25	0.67	1.53	2.60	0.77	1.91	3.54
35	0.80	1.86	3.20	0.97	2.43	4.36
50	1.14	2.60	4.31	1.50	3.79	7.01
75	1.50	3.41	5.52	2.00	5.17	9.07
100	1.14	2.66	4.46	1.50	3.89	7.28
150	1.56	3.65	5.92	2.15	5.58	9.59

Flowing Pressure psig	1-1/2" Body			2" Body		
	% Droop			% Droop		
	10%	20%	30%	10%	20%	30%
5	0.90	2.04	3.23	1.00	2.44	4.26
10	1.16	2.67	4.51	1.42	3.41	6.16
15	1.34	3.30	5.68	1.75	4.40	7.99
25	1.12	2.55	4.34	1.28	3.18	5.90
35	1.34	3.10	5.34	1.62	4.05	7.26
50	1.89	4.34	7.00	2.49	6.32	10.00
75	2.49	5.68	7.00	3.33	8.61	10.00
100	1.89	4.43	7.00	2.49	6.48	10.00
150	2.61	6.09	7.00	3.59	9.30	10.00

TABLE 8
WATER CAPACITIES - GPM
S.G. = 1.0 T = 60°F F_L = 0.95

Composition Diaphragm Only

Outlet Pressure P2, psig	Inlet Pressure P1, psig	3/8" Body Size			1/2" Body Size			3/4" Body Size		
		DROOP			DROOP			DROOP		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
5	25	1	2	3	1	2	3	3	6	10
	50	1	3	5	1	3	5	4	10	16
	75	1	3	6	2	4	6	5	12	20
	100	2	4	7	2	4	8	6	14	23
	125	HI DP	HI DP	HI VEL	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
10	25	1	2	4	1	3	4	3	7	13
	50	2	4	6	2	4	7	5	12	21
	75	2	5	HI VEL	2	5	9	7	15	26
	100	2	5	HI VEL	3	6	11	8	18	HI VEL
	125	HI DP	HI DP	HI VEL	HI DP	HI DP	HI DP	HI DP	HI DP	HI VEL
15	25	1	2	4	1	3	5	3	8	12
	50	2	4	HI VEL	2	5	9	6	14	22
	75	2	6	HI VEL	3	6	11	8	19	29
	100	3	7	HI VEL	3	8	13	9	22	HI VEL
	125	3	HI VEL	HI VEL	4	9	HI VEL	11	25	HI VEL
150	HI DP	HI VEL	HI VEL	HI DP	HI DP	HI VEL	HI DP	HI DP	HI VEL	
25	50	2	5	HI VEL	2	5	9	4	9	16
	75	3	7	HI VEL	3	8	13	5	13	22
	100	4	HI VEL	HI VEL	4	9	HI VEL	7	16	27
	125	4	HI VEL	HI VEL	5	11	HI VEL	8	18	HI VEL
	150	5	HI VEL	HI VEL	5	12	HI VEL	8	20	HI VEL
175	HI DP	HI VEL	HI VEL	HI DP	HI DP	HI VEL	HI DP	HI DP	HI VEL	
35	50	2	4	7	2	5	7	4	9	14
	75	3	7	HI VEL	3	8	11	6	14	24
	100	4	HI VEL	HI VEL	4	10	HI VEL	8	18	HI VEL
	125	5	HI VEL	HI VEL	5	12	HI VEL	9	21	HI VEL
	150	5	HI VEL	HI VEL	6	14	HI VEL	10	24	HI VEL
175	HI DP	HI VEL	HI VEL	HI DP	HI VEL	HI VEL	HI DP	HI DP	HI VEL	
50	75	2	5	HI VEL	2	5	9	6	14	19
	100	3	7	HI VEL	3	7	13	8	20	26
	125	4	HI VEL	HI VEL	4	9	HI VEL	10	24	HI VEL
	150	4	HI VEL	HI VEL	5	10	HI VEL	11	28	HI VEL
	175	5	HI VEL	HI VEL	5	12	HI VEL	13	HI VEL	HI VEL
200	5	HI VEL	HI VEL	6	13	HI VEL	14	HI VEL	HI VEL	
75	100	2	6	HI VEL	3	7	9	8	19	19
	125	3	HI VEL	HI VEL	4	10	13	11	26	26
	150	4	HI VEL	HI VEL	5	12	HI VEL	13	HI VEL	HI VEL
	175	5	HI VEL	HI VEL	6	14	HI VEL	15	HI VEL	HI VEL
	200	5	HI VEL	HI VEL	6	HI VEL	HI VEL	17	HI VEL	HI VEL
100	125	3	7	HI VEL	4	8	9	6	14	19
	150	4	HI VEL	HI VEL	5	11	13	8	20	26
	175	5	HI VEL	HI VEL	6	13	HI VEL	10	25	HI VEL
	200	6	HI VEL	HI VEL	7	HI VEL	HI VEL	11	28	HI VEL
135	150	3	6	7	3	7	7	6	14	14
	175	5	HI VEL	HI VEL	5	11	11	9	23	24
	200	6	HI VEL	HI VEL	7	14	HI VEL	12	29	HI VEL
150	175	4	HI VEL	HI VEL	5	9	9	8	19	19
	200	5	HI VEL	HI VEL	6	13	13	11	26	26

NOTE: Where "HI VEL" is indicated, the flow has reached or exceeded the velocities to the right based on Schedule 40 pipe.

Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

SIZE	MAX VEL
1/4"	13 fps
1/2"	15 fps
3/4"	18 fps

**TABLE 9
WATER CAPACITIES - GPM
S.G. = 1.0 T = 60° F_L = 0.95**

Composition Diaphragm Only

Outlet Pressure P2, psig	Inlet Pressure P1, psig	1" Body Size			1-1/2" Body Size			2" Body Size		
		DROOP			DROOP			DROOP		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
5	25	3	7	12	4	9	14	5	11	19
	50	4	11	17	6	14	22	7	16	29
	75	5	13	22	8	17	27	8	20	36
	100	6	15	25	9	20	32	10	24	42
	125	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
10	25	4	8	14	5	10	18	6	13	24
	50	6	13	23	7	17	29	9	22	39
	75	8	17	29	9	22	36	11	28	50
	100	9	20	34	11	25	43	14	32	58
	125	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
15	25	4	8	13	4	10	18	6	14	25
	50	7	16	24	8	20	34	10	26	47
	75	9	20	31	10	26	44	14	34	62
	100	11	24	37	12	30	52	16	41	74
	125	12	28	42	14	35	60	18	46	84
150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
25	50	5	10	17	6	13	22	6	16	30
	75	6	14	24	8	18	31	9	23	42
	100	8	17	30	10	22	38	11	28	51
	125	9	20	34	11	26	43	13	32	59
	150	10	22	38	13	29	49	14	36	66
175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
35	50	4	10	15	5	12	21	6	16	28
	75	7	16	25	9	20	34	10	26	46
	100	9	20	32	11	25	43	13	33	59
	125	10	23	38	13	29	51	15	38	69
	150	11	26	43	14	33	57	17	43	78
175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
50	75	7	15	20	10	22	35	13	32	50
	100	9	22	28	13	31	50	18	45	71
	125	11	27	35	16	38	61	22	55	87
	150	13	31	40	19	43	70	25	63	100
	175	15	34	45	21	49	78	28	71	112
200	16	38	49	23	53	86	31	77	123	
75	100	9	20	20	13	28	35	17	43	50
	125	12	28	28	18	40	50	24	61	71
	150	15	35	35	22	49	61	29	75	87
	175	17	40	40	25	57	70	33	86	100
	200	19	45	45	28	64	78	37	96	112
100	125	7	16	20	10	22	35	13	32	50
	150	9	22	28	13	31	50	18	46	71
	175	11	27	35	16	38	61	22	56	87
	200	13	32	40	19	44	70	25	65	100
	150	6	15	15	9	22	27	13	33	39
135	175	10	25	25	15	35	44	21	53	63
	200	13	32	32	19	45	56	26	68	81
	150	9	20	20	13	31	35	18	47	50
200	13	28	28	19	43	50	25	66	71	

NOTE: Where "HI VEL" is indicated, the flow has reached or exceeded the velocities to the right based on Schedule 40 pipe.
Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

SIZE	MAX VEL
1"	20 fps
1-1/2"	25 fps
2"	27 fps

TABLE 10
AIR CAPACITY - SCFH
S.G. = 1.0 T - 60°F F_L - 0.95

Composition Diaphragm Only

Outlet Pressure P2, psig	Inlet Pressure P1, psig	3/8" Body Size			1/2" Body Size			3/4" Body Size		
		DROOP			DROOP			DROOP		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
2	25	100	200	400	100	200	400	300	700	1200
	50	100	300	600	100	400	600	500	1200	1900
	75	200	500	800	200	500	900	700	1600	2700
	100	300	600	1000	300	700	1100	900	2000	3400
	125	300	700	1200	300	800	1300	1100	2500	4100
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
5	25	200	500	900	200	600	1000	800	1800	2900
	50	400	800	1400	400	900	1600	1300	2900	4800
	75	500	1100	2000	500	1300	2200	1800	4000	6700
	100	600	1400	2500	700	1600	2800	2300	5100	8500
	125	800	1700	3100	800	2000	3400	2800	6300	10400
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
10	25	300	700	1300	400	800	1400	1100	2400	4100
	50	500	1200	2100	600	1300	2300	1800	3900	6800
	75	700	1600	2900	800	1800	3200	2400	5500	9400
	100	900	2000	3700	1000	2300	4100	3100	7000	12000
	125	1100	2500	4500	1200	2800	4900	3800	8500	14600
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
15	25	400	900	1500	400	1000	1700	1200	2800	4400
	50	600	1500	2600	700	1700	3000	2100	4900	7600
	75	900	2100	3700	1000	2300	4100	2900	6800	10600
	100	1100	2700	4700	1300	3000	5300	3700	8700	13500
	125	1400	3300	5700	1600	3600	6400	4500	10600	16500
	150	1600	3900	6700	1900	4300	7600	5200	12500	19500
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
25	50	800	1900	3300	900	2200	3600	1500	3700	6300
	75	1200	2700	4700	1300	3100	5100	2100	5200	8800
	100	1500	3500	6000	1700	3900	6600	2700	6600	11300
	125	1900	4300	7300	2000	4800	8000	3300	8100	13800
	150	2200	5000	8700	2400	5600	9400	3900	9500	16300
	175	2500	5800	10000	2800	6500	10900	4500	10900	18800
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
35	50	900	2000	3200	1000	2200	3200	1700	4000	6600
	75	1400	3200	5100	1500	3600	5100	2600	6300	10500
	100	1800	4200	6600	2000	4600	6600	3400	8100	13500
	125	2100	5100	8000	2400	5600	8000	4100	9900	16500
	150	2500	6000	9400	2800	6600	9400	4900	11700	19500
	175	2900	6900	10900	3300	7600	10900	5600	13400	22400
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
50	75	1000	2400	4100	1100	2700	4600	2900	7100	9500
	100	1400	3300	5800	1600	3700	6400	4100	10000	13300
	125	1800	4100	7200	2000	4600	8000	5100	12400	16500
	150	2100	4900	8500	2400	5500	9400	6000	14600	19500
	175	2400	5600	9800	2700	6300	10900	6900	16900	22400
	200	2700	6400	11100	3100	7100	12300	7800	19100	25400
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
75	100	1400	3600	5400	1700	4100	5400	4500	11000	11000
	125	2000	5100	7500	2400	5700	7500	6300	15500	15500
	150	2500	6200	9300	2900	7000	9300	7800	19100	19100
	175	2900	7300	10800	3400	8200	10800	9100	22300	22300
	200	3300	8300	12300	3900	9300	12300	10300	25400	25400
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
100	125	2000	4500	6000	2300	5000	6000	3800	9500	12400
	150	2900	6400	8500	3200	7000	8500	5400	13300	17400
	175	3500	7800	10400	4000	8600	10400	6600	16400	21400
	200	4100	9100	12100	4600	10000	12100	7700	19100	24900
	250	5100	11500	15200	5800	12600	15200	9600	24000	31300
	300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
135	150	2100	4600	5300	2400	5100	5300	4300	10600	10900
	175	3400	7500	8600	3900	8300	8600	7000	17100	17700
	200	4400	9500	10900	4900	10500	10900	8900	21800	22600
	250	5900	12700	14700	6600	14100	14700	12000	29300	30300
	300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
150	175	3100	6600	7100	3500	7100	7100	6300	14700	14700
	200	4300	9300	10100	5000	10100	10100	8900	20700	20700
	250	6100	13200	14300	7100	14300	14300	12600	29400	29400
	300	7600	16400	17700	8800	17700	17700	15700	36600	36600

NOTE: Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

TABLE 11
AIR CAPACITY - SCFH
S.G = 1.0 T - 60°F F_L - 0.95

Composition Diaphragm Only

Outlet Pressure P2, psig	Inlet Pressure P1, psig	1" Body Size			1-1/2" Body Size			2" Body Size		
		DROOP			DROOP			DROOP		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
2	25	300	800	1300	500	1000	1600	500	1200	2100
	50	500	1300	2100	700	1700	2700	800	2000	3500
	75	700	1800	3000	1000	2300	3700	1100	2800	4900
	100	900	2300	3800	1300	3000	4700	1500	3600	6200
	125	1100	2800	4600	1600	3600	5700	1800	4400	7600
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
5	25	800	2000	3300	1100	2600	4100	1300	3100	5400
	50	1300	3300	5300	1900	4200	6700	2100	5000	8800
	75	1800	4500	7400	2600	5800	9200	2900	7000	12200
	100	2300	5800	9500	3300	7500	11800	3700	8900	15600
	125	2800	7000	11500	4000	9100	14400	4500	10900	19000
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
10	25	1200	2700	4500	1500	3400	5700	1800	4300	7800
	50	1900	4300	7400	2400	5500	9300	2900	7000	12700
	75	2700	6000	10200	3300	7600	12900	4100	9700	17600
	100	3400	7700	13100	4200	9800	16500	5200	12500	22500
	125	4100	9400	16000	5200	11900	20100	6300	15200	27400
	150	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
15	25	1400	3100	4700	1600	3900	6700	2100	5200	9500
	50	2300	5400	8200	2800	6800	11700	3600	9100	16500
	75	3300	7500	11400	3800	9400	16200	5000	12600	22800
	100	4200	9600	14500	4900	12100	20700	6400	16100	29200
	125	5100	11700	17700	6000	14700	25300	7800	19600	35600
	150	6000	13800	20900	7000	17300	29800	9200	23100	41900
25	50	1800	4000	6900	2300	5100	8800	2600	6400	11900
	75	2600	5700	9800	3200	7300	12400	3700	9100	16800
	100	3300	7300	12500	4100	9300	15800	4700	11600	21500
	125	4000	8900	15300	5000	11300	19300	5700	14200	26300
	150	4700	10500	18000	5900	13400	22800	6700	16700	31000
	175	5400	12100	20700	6800	15400	26300	7700	19200	35700
35	50	1900	4400	7100	2400	5500	9500	2900	7200	13000
	75	3000	6900	11200	3800	8800	15100	4600	11400	20500
	100	3900	9000	14500	4900	11300	19500	5900	14800	26500
	125	4700	10900	17700	6000	13800	23800	7200	18000	32300
	150	5600	12900	20900	7000	16300	28000	8500	21300	38100
	175	6400	14900	24100	8100	18800	32300	9800	24500	43900
50	75	3300	7800	10200	4800	11100	17900	6400	16100	25500
	100	4700	11000	14300	6800	15500	25100	8900	22600	35800
	125	5800	13600	17700	8400	19300	31100	11100	28100	44400
	150	6800	16100	20900	9900	22800	36700	13100	33200	52500
	175	7900	18600	24100	11400	26300	42300	15100	38200	60500
	200	8900	21000	27300	12900	29700	47900	17100	43300	68500
75	100	5000	11900	11900	7400	16900	20800	9900	25600	29800
	125	7100	16600	16600	10400	23700	29200	13900	36000	41800
	150	8700	20500	20500	12800	29200	36000	17100	44300	51500
	175	10200	24000	24000	15000	34200	42200	20100	51900	60200
	200	11600	27300	27300	17100	38900	47900	22800	59000	68500
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
100	125	4300	10500	13300	6300	14800	23400	8300	21700	33400
	150	6100	14800	18700	8900	20800	32900	11700	30400	47000
	175	7500	18200	23000	10900	25600	40400	14400	37400	57700
	200	8700	21200	26700	12700	29800	47000	16700	43500	67200
	250	11000	26600	33600	15900	37400	59100	21000	54700	84400
	300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
135	150	4800	11600	11700	5600	13100	20700	7300	19100	29500
	175	7800	18700	19000	9000	21200	33400	11900	31000	47800
	200	10000	23800	24200	11500	26900	42600	15100	39400	60800
	250	13400	32000	32500	15400	36200	57200	20300	52900	81700
150	175	7200	15800	15800	10400	24200	27800	14200	36900	39700
	200	10100	22200	22200	14600	34000	39100	20100	51900	55900
	250	14400	31600	31600	20700	48300	55500	28500	73800	79300
	300	17800	39200	39200	25700	60000	69000	35400	91700	98500

NOTE: Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

TABLE 12
STEAM - LBS/HR
S.G. = Actual T = Saturated $F_L = 0.95$

Metal Diaphragm Only

Outlet Pressure P2, psig	Inlet Pressure P1, psig	3/8" Body Size			1/2" Body Size			3/4" Body Size			
		DROOP			DROOP			DROOP			
		10%	20%	30%	10%	20%	30%	10%	20%	30%	
2	25	3	6	12	3	7	14	8	18	34	
	50	5	10	20	6	11	23	14	31	57	
	75	6	14	28	8	16	32	19	43	79	
	100	8	18	36	10	20	40	24	54	100	
	125	10	22	44	12	24	49	29	65	121	
	150	11	26	51	14	28	57	34	77	142	
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
5	25	7	15	27	7	18	31	25	56	93	
	50	11	25	45	12	30	51	42	93	155	
	75	16	36	65	17	43	72	60	132	220	
	100	20	46	82	22	54	92	76	168	280	
	125	24	56	99	27	65	112	92	204	339	
	150	28	65	117	31	77	131	108	239	398	
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
10	25	9	21	37	11	24	42	32	72	123	
	50	17	37	66	19	42	74	56	126	216	
	75	23	52	92	26	58	103	78	177	303	
	100	30	68	120	34	76	134	102	230	394	
	125	36	82	145	41	92	162	124	279	477	
	150	43	97	171	48	108	190	145	327	HI VEL	
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
15	25	10	24	42	12	27	47	33	78	136	
	50	21	48	83	24	53	93	65	154	269	
	75	29	67	117	33	74	130	91	217	377	
	100	38	87	152	44	97	170	119	283	492	
	125	46	107	187	53	119	208	145	347	603	
	150	54	125	HI VEL	63	139	245	171	407	HI VEL	
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
25	50	25	57	99	28	64	109	45	109	186	
	75	37	85	147	42	95	162	67	162	277	
	100	48	110	190	54	123	210	87	210	358	
	125	59	134	233	66	151	257	106	257	438	
	150	71	162	281	80	182	310	128	310	529	
	175	82	186	HI VEL	91	209	356	147	356	607	
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
35	50	25	58	100	28	64	110	47	112	194	
	75	41	97	168	47	109	186	80	190	327	
	100	55	129	224	63	144	247	106	252	435	
	125	68	158	275	77	177	303	130	310	533	
	150	80	186	323	90	208	356	153	364	627	
	175	93	219	HI VEL	106	245	419	180	429	738	
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
50	75	30	70	120	34	77	134	84	209	364	
	100	43	101	175	49	112	195	123	303	529	
	125	55	128	221	62	141	246	155	383	668	
	150	65	152	264	73	169	294	185	457	797	
	175	75	176	305	85	195	339	214	528	921	
	200	85	199	345	96	220	384	242	597	1042	
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
75	100	42	104	182	49	117	200	131	323	535	
	125	60	149	261	71	168	288	189	465	769	
	150	75	187	327	88	210	360	236	581	962	
	175	89	221	386	104	248	426	279	687	1137	
	200	102	253	443	119	285	488	320	787	1303	
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
	100	125	60	133	218	66	145	242	110	275	493
150		86	189	312	95	208	347	157	393	705	
175		106	236	388	118	259	431	196	489	877	
200		125	277	456	139	304	507	230	575	1031	
250		159	353	581	176	387	645	292	731	1312	
300		HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
135		150	61	132	218	69	147	242	124	304	524
	175	100	216	358	114	242	398	205	500	863	
	200	129	279	461	147	312	512	264	644	1111	
	250	176	380	629	200	425	699	360	879	1516	
	300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	
	150	175	88	191	308	98	214	341	182	459	710
		200	126	273	439	139	306	486	259	655	1012
250		181	394	634	201	441	701	374	945	1461	
300		228	495	797	253	555	882	471	1189	1837	

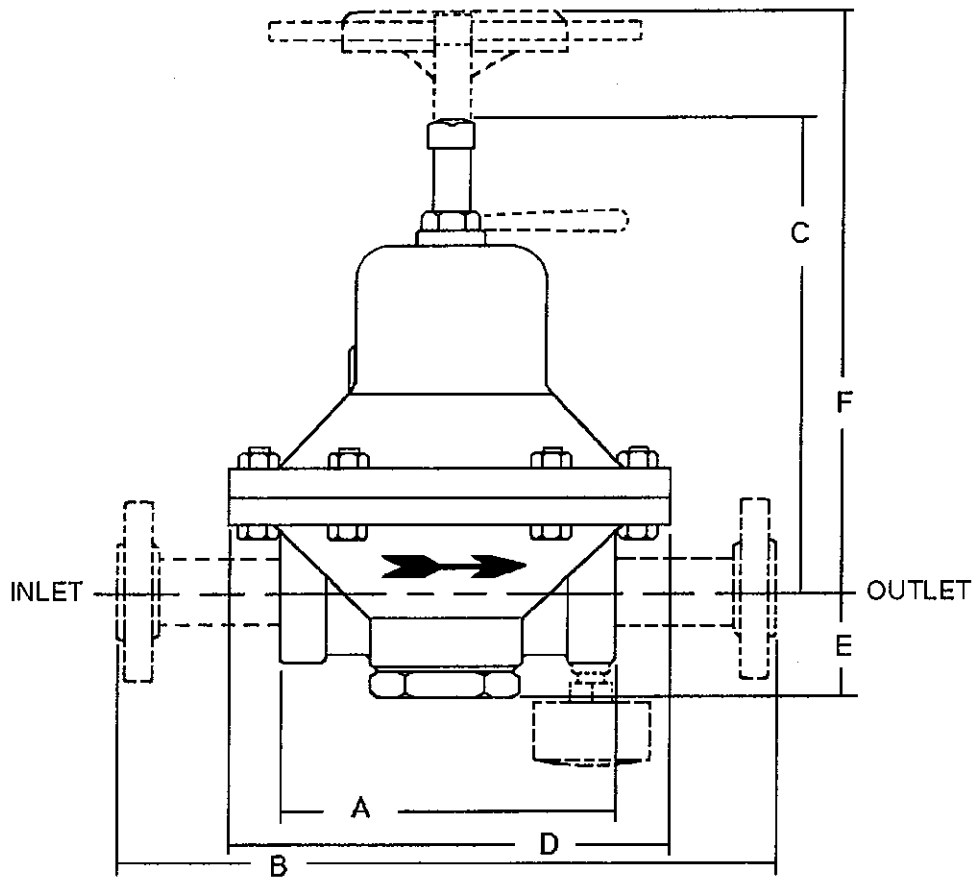
NOTE: Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.

TABLE 13
STEAM - LBS/HR
S.G. = Actual T = Saturated F_L = 0.95

Metal Diaphragm Only

Outlet Pressure P ₂ , psig	Inlet Pressure P ₁ , psig	1" Body Size			1-1/2" Body Size			2" Body Size		
		DROOP			DROOP			DROOP		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
2	25	8	21	41	14	31	42	15	34	66
	50	14	35	68	23	51	69	25	57	110
	75	19	49	94	32	71	96	35	79	153
	100	24	62	120	40	90	122	44	100	194
	125	29	75	145	49	109	148	53	121	235
	150	34	88	171	57	128	173	63	142	276
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
5	25	25	63	103	36	81	129	40	97	170
	50	42	105	171	60	135	214	66	161	282
	75	60	149	244	85	192	305	94	230	401
	100	76	190	310	108	244	388	120	292	510
	125	92	230	376	131	296	470	145	354	618
	150	108	270	441	154	347	551	171	415	725
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
10	25	35	79	134	43	100	168	53	127	230
	50	61	139	236	76	176	296	93	225	406
	75	86	195	331	106	246	415	131	315	569
	100	112	254	430	138	320	540	170	410	740
	125	136	308	521	167	388	654	206	497	897
	150	159	361	611	196	455	768	242	583	1052
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
15	25	37	86	148	46	108	186	57	144	261
	50	73	171	294	91	214	368	113	285	518
	75	103	239	412	127	300	516	159	400	727
	100	134	312	538	166	392	674	208	522	949
	125	165	383	659	204	480	826	254	640	1163
	150	193	449	773	239	563	969	299	750	1364
	175	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
25	50	54	120	206	67	153	261	77	191	355
	75	80	179	307	100	228	387	115	284	527
	100	104	231	396	129	294	500	148	367	681
	125	127	283	485	158	360	612	181	450	834
	150	154	341	586	190	435	739	219	543	1006
	175	176	392	673	219	500	849	252	624	1156
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
35	50	54	124	216	68	157	271	82	205	369
	75	91	210	365	114	265	457	138	347	622
	100	122	279	486	152	353	607	184	461	827
	125	149	342	596	186	433	745	226	566	1015
	150	175	403	701	219	510	877	266	666	1195
	175	206	474	825	258	599	1031	313	783	1405
	200	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
50	75	97	228	395	142	323	535	186	470	870
	100	141	332	574	206	469	778	271	684	1265
	125	178	420	725	260	593	983	342	865	1599
	150	212	500	865	310	707	1172	408	1031	1906
	175	245	578	999	358	817	1354	471	1191	2203
	200	277	654	1131	405	924	1532	533	1348	2492
	250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
75	100	147	353	574	216	492	796	288	746	1308
	125	212	508	825	311	707	1145	415	1072	1881
	150	264	635	1032	389	884	1431	518	1340	2351
	175	313	751	1220	460	1045	1692	613	1585	2780
	200	358	861	1398	527	1198	1939	703	1816	3186
		250	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
100	125	126	305	533	184	430	721	242	629	1176
	150	180	437	762	263	614	1030	347	899	1682
	175	224	543	949	328	765	1282	431	1118	2093
	200	264	639	1116	385	899	1508	507	1315	2461
	250	335	813	1419	490	1144	1918	645	1673	3130
		300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
135	150	139	332	554	198	474	779	269	693	1216
	175	228	546	911	326	779	1281	442	1139	1999
	200	294	704	1174	419	1003	1650	569	1467	2576
	250	401	960	1602	572	1369	2252	776	2002	3514
	300	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP	HI DP
150	175	209	503	762	299	699	1133	412	1068	1836
	200	297	717	1086	426	996	1615	587	1522	2616
	250	429	1036	1568	615	1438	2332	847	2198	3778
	300	540	1303	1971	773	1808	2932	1065	2763	4749

NOTE: Where "HI DP" is indicated, the actual pressure drop has exceeded the recommended limits of Table 2.



Valve Size (Inches)	DIMENSIONS - ENGLISH (INCHES)								Shipping Weight lbs. ⁵
	A	B ¹	B ²	B ³	C	D	E ⁴	F	
3/8	3.88*	N/A	N/A	N/A	6.31	5.31	1.62	7.66	7
1/2	3.88*	9	9	11.75	6.31	5.31	1.62	7.66	7
3/4	4.94	11	11.75	12.81	7.25	6.50	1.56	8.59	13
1	4.94	11	11.75	12.81	7.25	6.50	1.56	8.59	13
1-1/2	6.38	14	14	14.38	7.62	8.12	2.50	8.72	25
2	7.25	15	15	15.25	9.44	9.62	2.94	10.53	37

*NPT Only ¹ 150# Flanged, Opt. -30 ² 300# Flanged, Opt. -30 ³ Extended Nipples, Opt. -32
⁴ Add 1 inch for -37 option. ⁵ Weights do not include flanges.

Valve Size (DN)	DIMENSIONS - METRIC (mm)								Shipping Weight kgs. ⁵
	A	B ¹	B ²	B ³	C	D	E ⁴	F	
10	98*	N/A	N/A	N/A	160	135	41	194	3.18
15	98*	229	229	298	160	135	41	194	3.18
20	125	279	298	325	184	165	40	218	5.90
25	125	279	298	325	184	165	40	218	5.90
40	162	356	356	365	194	206	64	221	11.34
50	184	381	381	387	240	245	75	267	16.78

*NPT Only ¹ 150# Flanged, Opt. -30 ² 300# Flanged, Opt. -30 ³ Extended Nipples, Opt. -32
⁴ Add 1 inch for -37 option. ⁵ Weights do not include flanges.

NOTES

PRODUCT CODE 06/30/93

TABLE 3

BODY/SP.CH.	SIZE	CODE
SST/SST	ALL	A

TABLE 2

SIZE	CODE
1/2"	4
3/4"	5
1"	6

TABLE 1

GASKETS/SERVICE	OPTIONS	CODE
Standard: Non-Asbestos/ Non-Oxygen	-37 / -37S	K

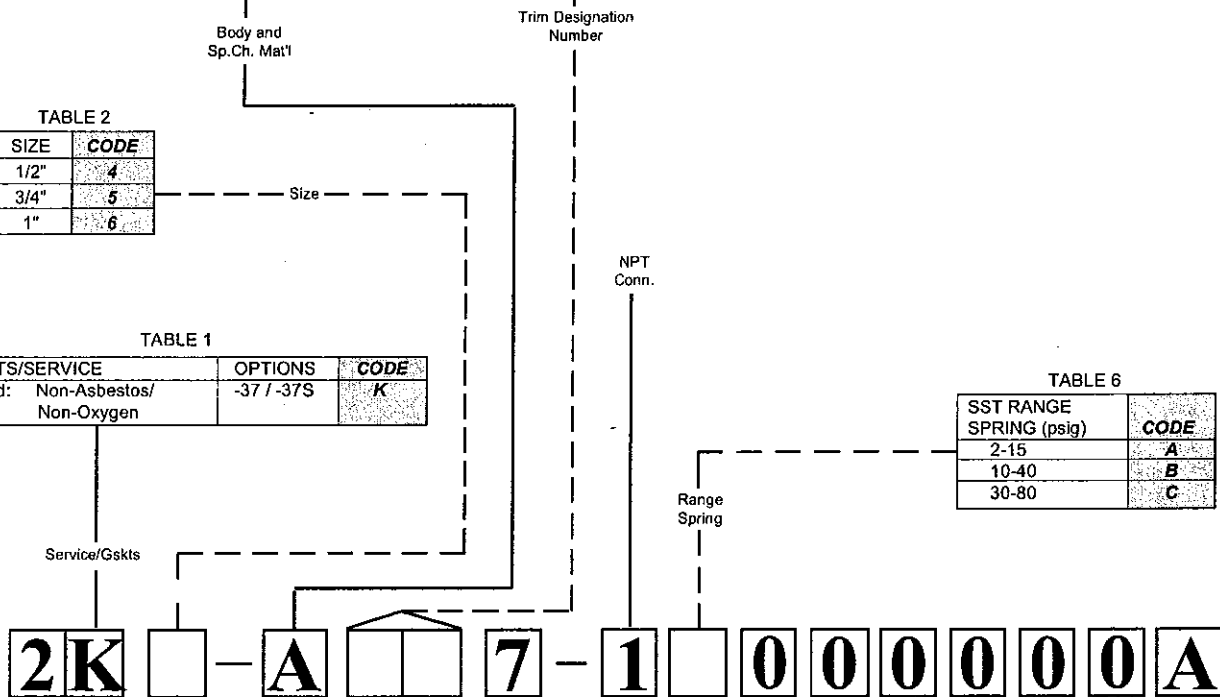
TABLE 4

STAINLESS STEEL TRIM		
DESIG.	CODE	APPLIC. SIZES
S1*	S1	ALL*
S6	S6	ALL

*Trim utilized on steam service only (-37S Opt.)

TABLE 6

SST RANGE SPRING (psig)	CODE
2-15	A
10-40	B
30-80	C



**MODEL "D" PRESSURE REDUCING REGULATOR
FOR THE PHARMACEUTICAL
AND FOOD INDUSTRY**

PRODUCT CODE 11/15/95

TABLE 3

Body/Spring Chamber	SIZE	CODE
BRZ/BRZ	-5	3
SST/SST	-36	A

TABLE 2

SIZE	CODE
1/2"	4
3/4"	5
1"	6

TABLE 1

SERVICE*	GASKETS	OPTIONS	CODE
Cryogenic	Std. Non-Asbestos TFE/Fluorocarbon-elastomer(Below -20°F)	-5 or -36**	C

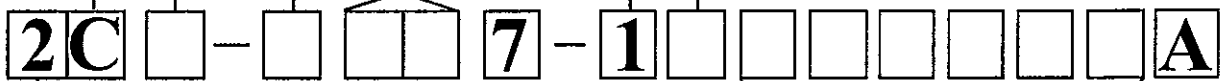
* Refer to Tech Bulletin for complete temperature range.
 **Cryo. Const. includes Special Cleaning #S-1134 (Opt-55).

TABLE 4

Brass Trim		SST Trim	
DESIG.	CODE	DESIG.	CODE
B0	B0	S1	S1
B5	B5	S36	36

TABLE 5

SST RANGE SPRING (psig)	CODE
2-15	A
10-40	B
30-80	C
70-135	D



MODEL "D" CRYOGENIC PRESSURE REDUCING REGULATOR

- ASSIGNMENT OF "OPTION" CODES**
1. When ordering a valve per one of Cashco's special drawings, the code "X" and the 5-digit number following override all other options. Otherwise, proceed with the following.
 2. NUMERIC digits assigned first in "ascending" order.
 3. ALPHA designations are assigned second (excluding the "X") in "alphabetical" order.
 4. Left justify.
 5. Add "0" to all unused squares.
 6. If insufficient quantity of squares, consult factory for proper code.

TABLE 6

DESCRIPTION	OPTION	CODE
SPECIAL CONSTRUCTION	—	X

PRODUCT CODE 03/15/94

TABLE 4

BRASS TRIM			STAINLESS STEEL TRIM					
DESIG.	APPLIC. SIZES	CODE	DESIG.	APPLIC. SIZES	BODY MATERIAL			
					BR CODE	CI CODE	CS CODE	SS CODE
B0	ALL	B0	S0	ALL	S0	S0	S0	S0
B2	ALL	B2	S1*	ALL	S1	S1	S1	S1
B3	ALL	B3	S2	ALL	S2	S2	S2	S2
B4	ALL	B4	S2N	ALL	SN	SN	SN	SN
B5	ALL	B5	S3*	ALL	S3	S3	S3	S3
			S4	ALL	S4	S4	S4	S4
			S4N	ALL	SD	SD	SD	SD
			S6	1/2", 3/4", 1"	S6	S6	S6	S6
			S9	ALL	S9	S9	S9	S9
			S36*	ALL	S6	S6	S6	S6
			S40	ALL	40	40	40	40
			S40T	ALL	4T	4T	4T	4T

*Note: 1-1/2" and 2" size bodies only in SST material are restricted to S1, S3, and S36 trims only.

TABLE 3

BODY/SP.CH.	SIZE	CODE
CI/CI	ALL	1
BRZ/CI	ALL	2
BRZ/BRZ	ALL	3
CS/CI	All except 3/8"	4
CS/CS	All except 3/8"	5
SST/CI	1/2" thru 2"	7
SST/CS	1/2" thru 2"	9
SST/SST	1/2" thru 2"	A

TABLE 2

SIZE	CODE
3/8"	3
1/2"	4
3/4"	5
1"	6
1-1/2"	8
2"	9

Body and Sp.Ch. Mat'l

TABLE 1

GASKETS/SERVICE *	OPTIONS	CODE
Standard : Non-Asbestos/Non-Oxygen	--	B
Non-Asbestos TFE/Oxygen	-45	D
Asbestos	-46	A

* Refer to TechBulletin for suitable gasket temp. range

TABLE 5

DESCRIPTION	CODE
NPT - SCREWED	1
-30 Opt. - 150 LB RF FLGS * (CS Bodies-All Sizes except 3/8") (SST Bodies-1/2", 3/4", & 1" Sizes)	6
-30 Opt. - 300 LB RF FLGS * (CS Bodies-All Sizes except 3/8") (SST Bodies-1/2", 3/4" & 1" Sizes)	7
-31 Opt. - BSP - SCREWED British Standard Pipe thread	B
-32 Opt. - SCH. 80 PE EXT. NIPPLES*	E

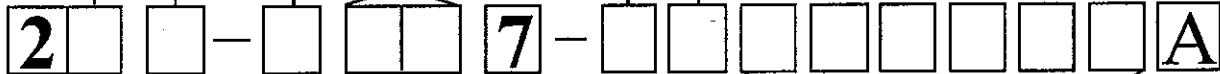
*Nipples & flanges of same material as body. CS or SST bodies only.

TABLE 6

STANDARD STEEL RANGE SPRING (psig)	CODE
2-15	1
10-40	2
30-80	3
70-150	4

End Conn

Range Spring



MODEL "D" "BASIC" PRESSURE REDUCING REGULATOR

TABLE 7

DESCRIPTION	OPTION	CODE
SPECIAL CONSTRUCTION	--	X
HANDWHEEL & LOCKING LEVER	-3	3
1/8"NPT SPRING CHAMBER VENT TAP 3/8", 1/2", 3/4", 1" Sizes, CI or CS Sp.Ch.	-25	D
1/4"NPT SPRING CHAMBER VENT TAP 1-1/2" & 2" Sizes, CI or CS Sp.Ch.	-25	E
NACE CONST: CS/CS/XX Per MR0175-90 Rev., NPT Body, S40,S40T Trims	-40	J
NACE CONST: SST/SST/XX Per MR0175-90 Rev., NPT Body, S40,S40T Trims	-40SST	K
SPECIAL CLEANING: Per Cashco Spec #S-1134.W/properly selected mat'ls,this procedure suitable for oxy.serv.BRZ or SST body material.	-55	M
SPECIAL CLEANING: Per Cashco Spec #S-1542. SST,CS & CI body/sp.ch.mat'ls.	-56	N
EPOXY PAINTED	-95	W

ASSIGNMENT OF "OPTION" CODES

1. When ordering a valve per one of Cashco's special drawings, the code "X" and the 5-digit number following override all other options. Otherwise, proceed with the following.
2. NUMERIC digits assigned first in "ascending" order.
3. ALPHA designations are assigned second (excluding the "X") in "alphabetical" order.
4. Left justify.
5. Add "0" to all unused squares.
6. If insufficient quantity of squares, consult factory for proper code.

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Printed in U.S.A. D-TB



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

GOX SUPPLY SYSTEM

PRESSURE RELIEF VALVE

MANUFACTURER	:	KUNKLE
MODEL	:	MODEL 900
MODEL NO.	:	917BGFV01-KE0025
SERVICE	:	OXYGEN GAS
FLOW RATE	:	282 SCFM (7.43 Nm ³ /min)
CONNECTION	:	
INLET	:	1 1/4" (32 mm) MNPT
OUTLET	:	2" (50 mm) FNPT
MATERIAL OF CONSTRUCTION	:	
BODY	:	STAINLESS STEEL
BODY O-RING	:	TEFLON
RETAINER RING	:	STAINLESS STEEL
SPRING	:	STAINLESS STEEL
ORIFICE AREA	:	0.553 SQ INCH (357 mm ²)
SET PRESSURE	:	18 PSIG (124 kPa)
SPECIAL REQUIREMENT	:	TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY	:	1
CUSTOMER TAG NO.	:	PSV-O032A

Model 900

KUNKLE

Models 910, 911, 916, 917, 920, 921 and 927 – ASME Section VIII, Air/Gas/Steam/Liquid, 'UV' National Board Certified. Also available for Vacuum Service. PED Certified for Non-Hazardous Gas.

Features

- **Available** with soft seats.
- **Threaded cap** standard (back pressure tight). Maximum back pressure 50 psig [3.4 barg].
- **Hex on valve nozzle** provides for easy installation.
- **Single control ring** offers easy adjustability.
- **Pivoting disc design** offers exceptional seat alignment.
- **Guide to nozzle ratio** reduces friction.
- **Valve bodies** are heavy duty casting.
- **Full nozzle design** for optimum flow performance.
- **Threaded side outlet** for piped off discharge to eliminate fugitive emissions.

Model Descriptions

Model 910: CS body and bonnet with SS trim.

Model 911: All SS construction.

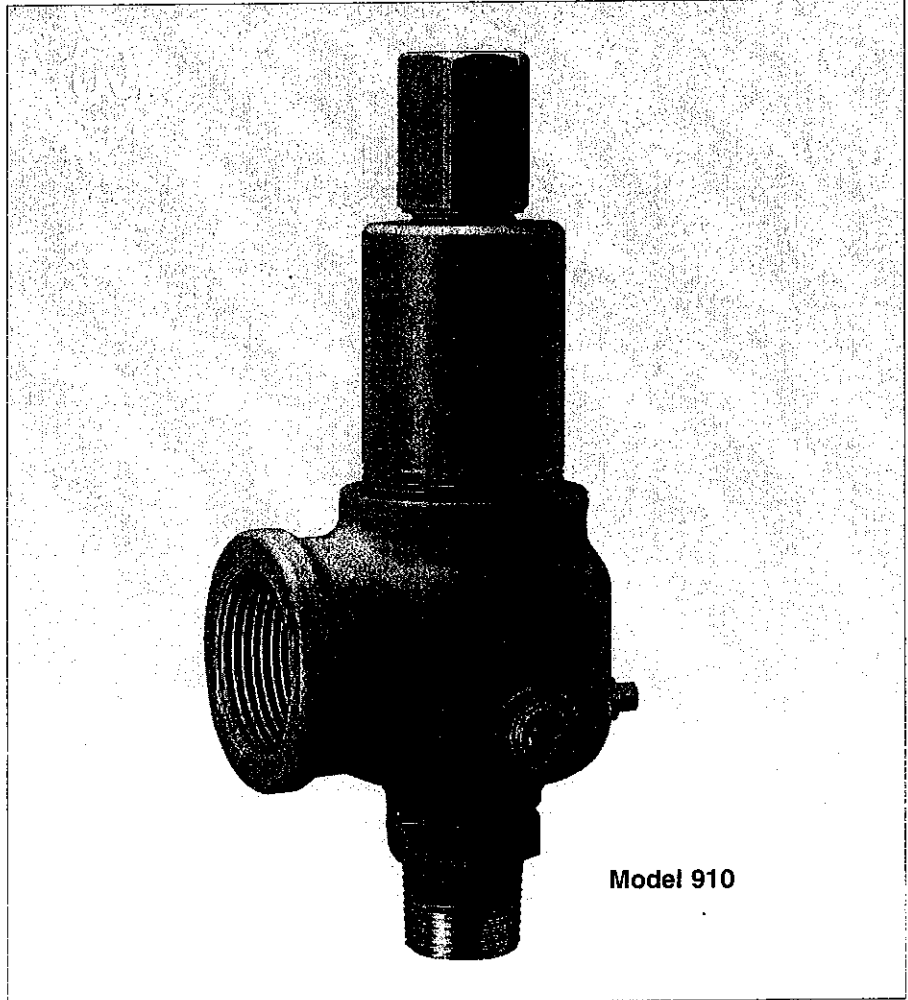
Model 916: Same as Model 910 except resilient seat/seals. Superior 'leak-free' performance.

Model 917: Same as Model 911 except resilient seat/seals. Superior 'leak-free' performance.

Model 920: Steel body and bonnet with screwed cap and stainless steel spring for organic fluid vaporizers (ASME Section I - 'V' Special Use or application). 800 psig [55.2 barg] maximum set pressure.

Model 921: Steel body and bonnet with plain lift lever and stainless steel spring for forced flow steam generators (ASME Section I - 'V' Special Use or application). 800 psig [55.2 barg] maximum set pressure.

Model 927: Steel body and bonnet with packed lift lever and SS spring for high temperature/pressure hot water boilers (ASME Section I - 'V' Special Use or application). 800 psig [55.2 barg] maximum set pressure.



Model 910

Applications

- Air/gas compressors, intercoolers, aftercoolers.
- Liquid filled pressure vessels/systems, ASME Section VIII (UV).
- Vacuum systems including pumps, tanks and equipment.
- Pressure vessels - containing gas, air, liquid or steam, including tanks and receivers.
- Oil/gas separators.
- Overpressure relief and protection of pumps, tanks, lines and hydraulic systems.
- Bypass relief or pressure regulation.
- All SS Model 911 may be suitable for sanitary/edible applications.
- Process and industrial corrosive applications.

tyco / Flow Control

Total Flow Control Solutions™

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Model 900

Specifications - Models 910, 911, 916, 917, 920, 921 and 927

Options

- Threaded cap. (Variation 01)
- Threaded cap with gag. (Variation 02)
- Plain lever. (Variation 03)
- Plain lever with gag. (Variation 04)
- Plain lever with vibration dampener. (Variation 05)
- Packed lever. (Variation 06)
- Packed lever with gag. (Variation 07)
- Models 910 and 911 available with 150#, 300# and 600# inlet flanges and 150# outlet flange per ANSI B16.5.
- Model 911 available with Tri-Clover Adapter Inlet.

Model	Inlet	Orifice	Outlet
911 ZDE	1"	D	1"
911 ZEE	1"	E	1 1/4"
911 ZFG	1 1/2"	F	1 1/2"
911 ZGG	1 1/2"	G	2"
911 ZGH	2"	G	2"
911 ZHH	2"	H	2 1/2"
911 ZJJ	2 1/2"	J	3"

Pressure Limits

See Specification Table

Temperature Limits

Model 910:

-20°/800°F [-28.9°/427°C]

Model 911:

-320°/800°F [-195°/427°C]

Models 916 and 917:

Temperatures limited by Elastomer seat material.

1. ASME standard valves for air, steam and hot water above 140°F [60°C] must have lift lever.

Model 900

Specifications - Models 910, 911, 916, 917, 920, 921 and 927

ASME Section VIII, Non-Code Air/Gas/Steam/Liquid, 'UV' National Board Certified. 920 is ASME Section I Special Purpose, Steam, 'UV' National Board Certified. 910, 911 Available for Vacuum Service

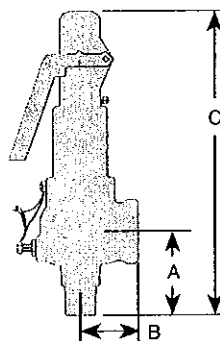
Service Recommendations for Gas/Liquid/Steam/Liquid/Gas

Seat/Seal Materials	Service Recommendation
BUNA-N (-40° to 275°F) [-40° to 135°C]	Air, Anhydrous Ammonia, Butane, Carbon Dioxide, Diesel Oil, Ethyl Chloride, Ethyl Ether, Freons #11 and 12, Fuel Oil, Gasoline, Helium, Hydrogen Sulphide, Kerosene, Lube Oil, Natural Gas, Nitrogen, Oxygen (Gas), Propane, Propylene, Sulphur Dioxide, Vinyl Chloride
Viton® A (-10° to 406°F) [-23° to 208°C]	Acetone, Air, Amyl Alcohol, Aniline, Benzene, Butane, Carbon Disulphide, Carbon Tetrachloride, Dowtherm 'A' and 'J', Ethyl Chloride, Ethylene, Ethylene Glycol, Ethyl Alcohol, Gasoline, Hexane, Hydrogen Sulphide, Isobutyl Alcohol, JP - 4 Fuel, JP - 5 Fuel, Kerosene, Lube Oil, Natural Gas, Naphtha, Nitrogen, Propane, Propylene, Propyl Alcohol, Sulphur Dioxide, Toluene, Trichloroethylene, Turpentine, Water, Xylene
Silicone (-100° to 406°F) [-73° to 208°C]	Air, Helium, Nitrogen, Oxygen (Gas)
Ethylene Propylene (-70° to 400°F) [-57° to 205°C]	Steam, Hot Water
Neoprene (-45° to 300°F) [-43° to 149°C]	Air, Anhydrous Ammonia, Butane, Butyl Alcohol, Castor Oil, Denatured Alcohol, Ethanol, Ethyl Alcohol, Freons (12, 13, 14 and 22), Glycols, Natural Gas and Silicate Esters

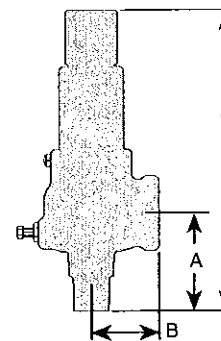
Specifications

Model Number ¹	Orifice	Connections		Min/Max Set Pressure psig [barg]	Min/Max Temp. (°F) ² [°C]	Dimensions, in [mm]					Approx. Weight lb [kg]
		ANSI Standard Inlet	Outlet			A	B	C Threaded Cap	C Plain Lever	C Packed Lever	
9*BDC#	D	1/2" [12.7]	1" [25.4]	3/900 [0.2/62]	-320/800 [-195/427]	23/8 [60.3]	15/8 [41.3]	7 1/4 [184.2]	8 3/8 [212.7]	9 [228.6]	3 [1.4]
9*BDD#	D*	3/4" [19.0]	1" [25.4]	3/900 [0.2/62]	-320/800 [-195/427]	23/8 [60.3]	15/8 [41.3]	7 1/4 [184.2]	8 3/8 [212.7]	9 [228.6]	3 [1.4]
9*BED#	E	3/4" [19.0]	1 1/4" [31.8]	3/900 [0.2/62]	-320/800 [-195/427]	2 5/8 [66.7]	2 [50.8]	7 5/8 [193.7]	8 3/4 [222.3]	9 3/8 [238.1]	4 [1.8]
9*BFE#	F	1" [25.4]	1 1/2" [38.1]	3/600 [0.2/41.4]	-320/800 [-195/427]	2 7/8 [73.0]	2 3/8 [60.3]	8 3/4 [222.3]	9 7/8 [250.8]	10 1/2 [266.7]	6 [2.7]
9*BGF#	G	1 1/4" [31.8]	2" [50.8]	3/600 [0.2/41.4]	-320/800 [-195/427]	3 1/4 [82.6]	2 5/8 [66.7]	10 1/8 [257.2]	11 1/4 [285.8]	11 3/4 [298.5]	8 [3.6]
9*BHG#	H	1 1/2" [38.1]	2 1/2" [63.5]	3/500 [0.2/34.5]	-320/800 [-195/427]	3 1/2 [88.9]	2 3/4 [69.9]	11 1/8 [282.6]	13 [330.2]	12 1/2 [317.5]	11 [5.0]
9*BJH#	J ³	2" [50.8]	3" [76.2]	3/500 [0.2/34.5]	-320/800 [-195/427]	4 [101.6]	3 1/4 [82.6]	12 1/2 [317.5]	14 1/2 [368.3]	15 1/8 [384.2]	15 [6.8]

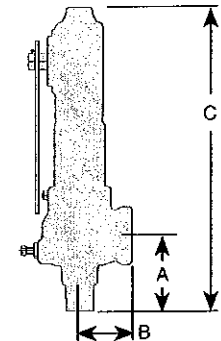
1. Replace asterisk with desired Model Number. Replace # with seat material designation. Data applicable to all models.
2. Temperature limits for Model 910 = -20°/800°F [-28.9°/427°C]; for Model 911 = -320°/800°F [-195°/427°C]. Temperature limits for elastomer seats per above table.
3. For C dimensions: pressures above 200 psig [14 barg] add 1.25-inch [31.8 mm] to the overall height.
4. Flange option not available.



Plain Lever



Threaded Cap



Packed Lever

Model 900

Specifications - Models 910, 911, 916, 917, 920, 921 and 927

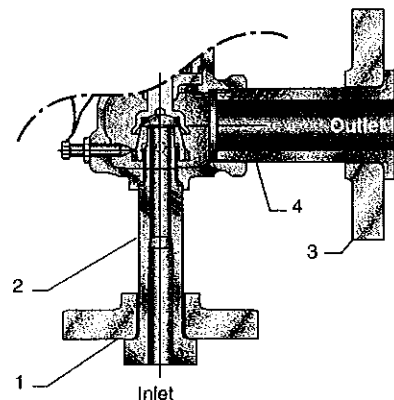
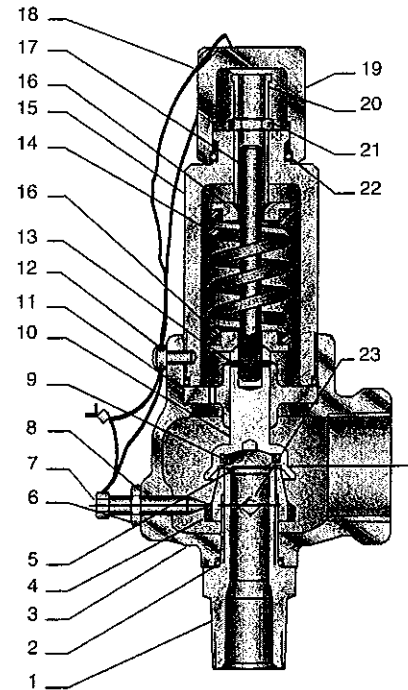
Models 910, 911, 916 and 917 Available for Vacuum Service

Parts and Materials (Models 910 and 911 Threaded Cap)

No. Part Name	910, 916, 920, 921, 927	911, 917
1 Nozzle	SS, SA351-CF8M	SS, SA351-CF8M
2 Body O-ring	Teflon®	Teflon®
3 Body	Steel, SA216 Gr. WCB	SS, SA351-CF8M
4 Worn Ring	SS, A743-CF8M	SS, A743-CF8M
5 Disc	SS, A479-316	SS, A479-316
6 Set Screw Nut	SS 18-8	SS 18-8
7 Set Screw	SS, Commercial Gr. 18-8	SS, A479-316
8 Set Screw Seal	Teflon®	Teflon®
9 Retainer Ring	SS, A303-316	SS, A313-316
10 Disc Holder	SS, A351-CF8M	SS, A351-CF8M
11 Guide	SS, A743-CF8M	SS, A743-CF8M
12 Screw	SS, Commercial Gr. 18-8	SS, Commercial Gr. 18-8
13 Coiled Spring Pin	SS, A313-302	SS, A313-302
14 Spring	SS: A313-316 or A313-T631 Alloy steel: A681-H12 or B637-X750	
15 Bonnet	Steel, A108 Gr. 1117	SS, SA479-316
16 Spring Step	SS, A479-316	SS, A479-316
17 Stem	SS, A479-316	SS, A479-316
18 Wire and Seal	SS wire and Lead seal, Commercial	SS wire and Lead seal, Commercial
19 Cap	Steel, A108 Gr. C1018	SS, A479-316
20 Compression Screw	SS, A479-316	SS, A479-316
21 Jam Nut	SS 18-8 or SS A479-316	SS 18-8 or SS A479-316
22 Cap O-ring	BUNA-N	BUNA-N
23 Body Plug	Steel, A108 Gr. C1018	SS, Commercial Gr. 18-8
24 Guide	SS, A479-316	SS, A479-316
25 Guide Locknut	SS, A479-316	SS, A479-316
26 Shield	SS, A167-316	SS, A167-316
27 Bonnet Gasket	Teflon®	Teflon®
28 Bonnet Cap	Steel, A108 Gr. 1117	SS, A479-316
29 Cap O-ring	BUNA-N	BUNA-N
30 Bonnet	Steel, A108-1018	SS, A312-316

No. Part Name 910 Flanged

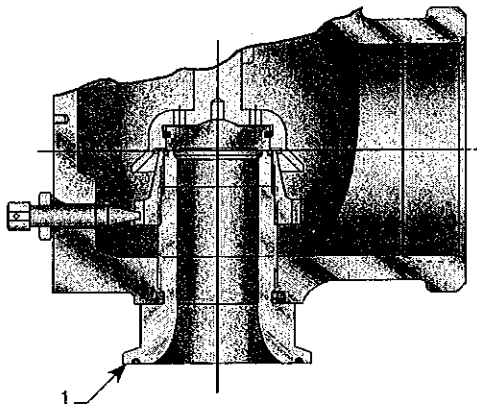
1 Inlet Flange	CS, A105
2 Inlet Stub End	SS, A479-316
3 Outlet Flange	CS, A105
4 Outlet Stub End	SS, A479-316



Flanged Option

Model 900

Specifications - Models 910, 911, 916, 917, 920, 921 and 927



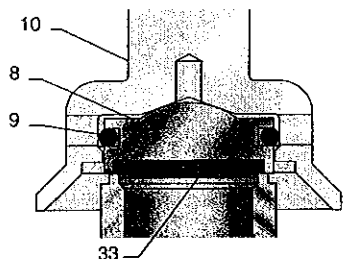
Tri-Clover

Parts and Materials - Tri-Clover (no option)

No.	Part Name	910, 911, 916, 917, 920, 921 and 927
1	Nozzle	SS A479-316

Parts and Materials - Models 916 and 917 (Soft Seat) - Hard Orifice

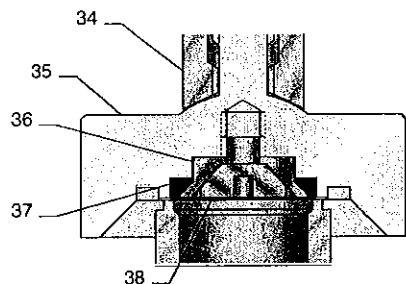
No.	Part Name	916	917
8	Disc	SS A479-316	SS A479-316
9	Ring, Retainer	SS A313-316	SS A313-316
10	Disc Holder	SS A351-CF8M	SS A351-CF8M
33	Molded Seat		



Soft Seat F thru J Orifice

Parts and Materials - Models 916 and 917 (Soft Seat) - Hard Orifice

No.	Part Name	916	917
34	Spindle	SS A479-316	SS A479-316
35	Disc Holder	SS A479-316	SS A479-316
36	Retainer	SS A479-316	SS A479-316
37	O-ring Seat		
38	Seat Retainer Screw	SS 18-8	SS 18-8



Soft Seat D and E Orifice

1. Material	Letter Designation
BUNA-N	- B
Ethylene Propylene (EPR/EPDM)	- E
Neoprene	- N
Silicone	- S
Viton®	- V

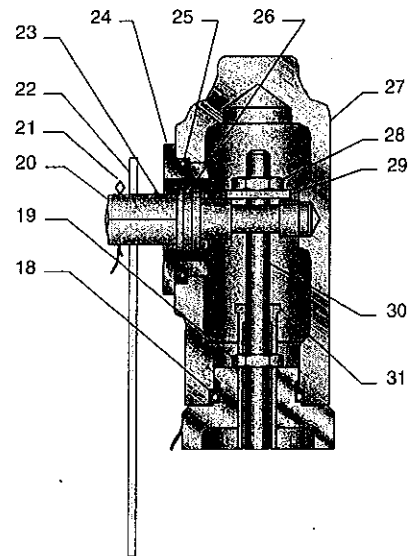
Model 900

Specifications - Models 910, 911, 916, 917, 920, 921 and 927

Models 910, 911, 916 and 917 Available for Vacuum Service

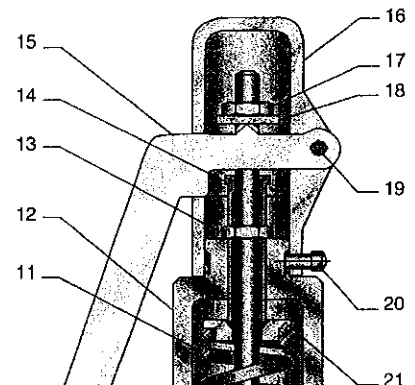
Parts and Materials - Models 910 and 911 - Packaged Valve

No.	Part Name	Materials
18	Cap O-ring	BUNA-N 70
19	Jam Nut	SS, A479-316
20	Lift Cam	SS, A743-CF8M
21	Cotter Pin	CS, Commercial
22	Lever	Steel, Zinc Plated A108-GR. 1018
23	Drive Screw	SS, Commercial
24	Retainer Nut	SS, A479-316
25	Retainer O-ring	BUNA-N
26	Lift Cam O-ring	BUNA-N
27	Cap	(Model 910) Steel, A216 GR. WCB, (Model 911) SS, A743-CF8M
28	Lift Nut	SS, A479-316
29	Lift Washer	SS, A479-316
30	Stem	SS, A479-316
31	Compression Screw	SS, A479-316



Parts and Materials - Models 910 and 911 - Hand Lever

No.	Part Name	Materials
11	Spring	Cadmium plated steel: A231/A231M SS: A313-302 SS: A313-316 Alloy steel: A681-H12
12	Bonnet	(Model 910) Steel, A108-1117, (Model 911) SS, A479-316
13	Jam Nut	SS, A479-316
14	Compression Screw	SS, A479-316
15	Lever	Steel, A109 Cadmium Plated
16	Cap	Brass, B176
17	Lift Nut	SS, A479-316
18	Lift Washer	SS, A479-316
19	Rivet	Steel, Commercial
20	Cap Screw	SS, Commercial 18-8
21	Spring Step	SS, A479-316



Model 900

Order Information - Models 910, 911, 916, 917, 920, 921 and 927

Models 910, 911, 916, 917, 920, 921, 927 ASME Section VIII, Air/Gas/Steam/Liquid, 'UV' National Board Certified. 927 is ASME Section I Special Purpose, Steam, 'UV' National Board Certified. 910, 911 Available for Vacuum Service

Model Number Position

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----

Example

9	1	0	B	J	H	M	0	1	A	K	E	0	3	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Model _____
910, 911, 916, 917, 920, 921, 927

Connection Model _____
 B - Male x Female NPT L - 300# Flange x 150# Flange
 E - 150# Flange x FNPT N - 600# Flange x 150# Flange
 J - 150# Flange x 150# Flange Z - Tri-clover (911)

Orifice _____
D, E, F, G, H, J

Inlet Size _____
 C - 1/2-inch [12.7 mm] F - 1 1/4-inch [31.8 mm]
 D - 3/4-inch [19.1 mm] G - 1 1/2-inch [38.1 mm]
 E - 1-inch [25.4 mm] H - 2-inch [50.8 mm]

Seat/Seal Material _____
 M - Metal-to-metal - Models 910, 911, 920, 921, 927
 B - BUNA-N - Models 916, 917 only
 E - EPR - Models 916, 917 only
 S - Silicone - Models 916, 917 only
 V - Viton® - Models 916, 917 only
 N - Neoprene - Models 916, 917 only

Variation (01 through 99) _____
 Number provided only by Kunkle to cover specific feature or option.
 01 - Threaded cap 05 - Plain lever with vibration dampner
 02 - Threaded cap with gag 06 - Packed lever
 03 - Plain lever 07 - Packed lever with gag
 04 - Plain lever with gag 60 - BSP Threads with threaded cap

Design Revision _____

Models	Orifice Size					
	D	E	F	G	H	J
910	A	A	A	A	A	A
911	A	A	A	A	A	A
916	B	B	A	A	A	A
917	B	B	A	A	A	A
920	A	A	A	A	A	A
921	A	A	A	A	A	A
927	A	A	A	A	A	A

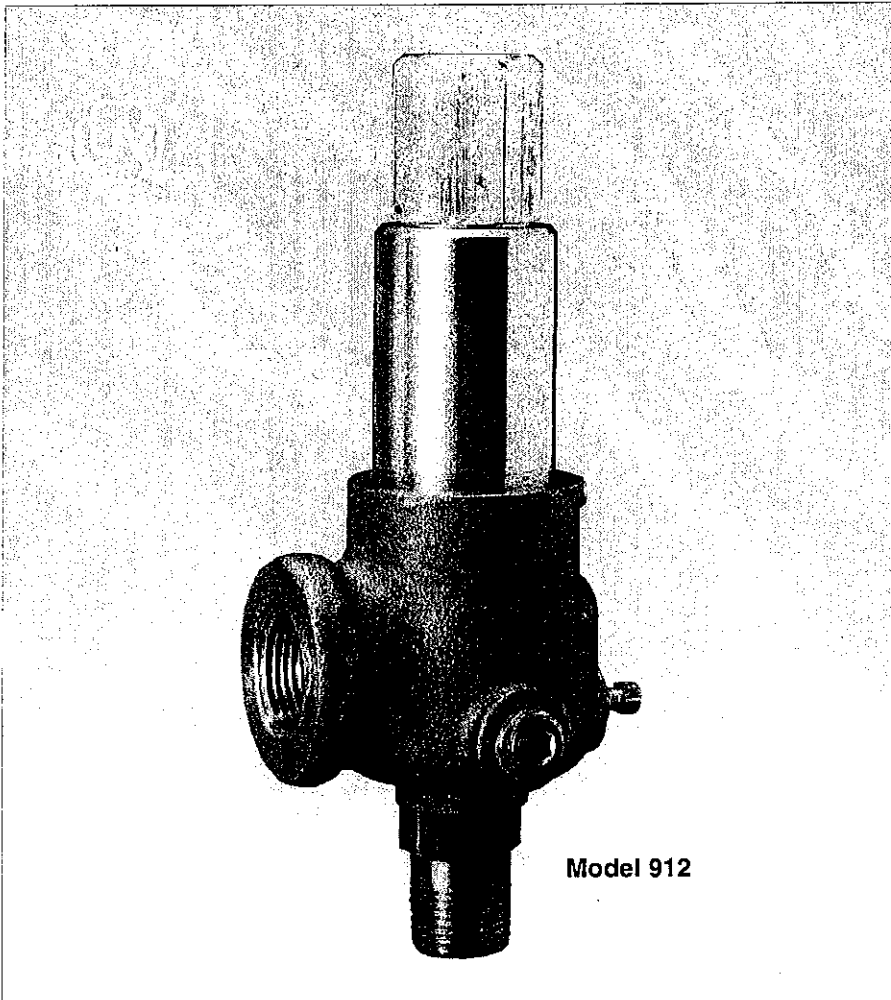
Valve Service _____
 B - High-temperature Hot Water ASME Sect. I (Model 927 only) - Packed lever only
 C - Organic Fluid ASME Section I (Threaded Cap only) (Model 920 only)
 J - Liquid ASME Section VIII (Threaded Cap/Packed Lever only)
 K - Air/Gas ASME Section VIII (Plain Lever/Packed Lever required for air)
 L - Steam ASME Section VIII (Plain Lever/Packed Lever required)
 M - Non-code Liquid (Threaded Cap/Packed Lever only)
 N - Non-code Air/Gas
 P - Non-code Steam
 Q - Vacuum (Threaded Cap/Packed Lever only)
 R - Forced Flow Steam ASME Section I (Plain Lever only) (921 only)

Spring Material _____
 E - SS (-60° to 550°F) [-51° to 288°C]
 F - High-temperature Alloy Steel (-60° to 800°F) [-51° to 427°C]

Set Pressure _____
 3 psig (0003) through 900 psig (0900) [0.48 barg through 62 barg]
 Vacuum 6-inch [200 mbarg] HG (inches of Mercury) (0006) through 29-inch [1000 mbarg]
 HG (0029) Models 910, 911, 920, 921

Model 900

Models 912, 913, 918 and 919 ASME Section VIII, Air/Steam/Gas/Liquid, 'UV' National Board Certified. Also available for Vacuum Service. PED Certified for Non-Hazardous Gas.



Model 912

Features

- **Available** with soft seat.
- **Threaded cap** is standard (back pressure tight).
- **Hex on valve nozzle** provides for easy installation.
- **Single control ring** offers easy adjustability.
- **Pivoting disc design** corrects misalignment and offers exceptional performance.
- **Guide to nozzle ratio** reduces friction.
- **Full nozzle design** for optimum flow performance.
- **Threaded side outlet** for piped off discharge to eliminate fugitive emissions.

Model Descriptions

- Model 912:** Full nozzle design. SS warn ring and disc with brass/bronze base. Bronze/ brass body and bonnet.
- Model 913:** Full nozzle design. Bronze/ brass body and bonnet. 316 SS trim (base, disc and disc holder).
- Model 918:** Same as Model 912 except resilient seat/seal. Superior 'leak-free' performance.
- Model 919:** Same as Model 913 except resilient seat/seal. Superior 'leak-free' performance. Bronze body and bonnet. 316 SS trim (base, disc and disc holder).

Applications

- Air/gas compressors - intercoolers - aftercoolers.
- Liquid filled pressure vessels/systems - ASME Section VIII (UV).
- Pressure vessels - containing gas, air, liquid or steam. Including tanks and receivers.
- Vacuum systems including pumps, tanks and equipment.
- Optional materials for low temperature - cryogenic applications.
- Oil/gas separators.
- Overpressure relief and protection of pumps, tanks, lines and hydraulic systems.
- By-pass relief or pressure regulation.

Options

- Threaded cap. (Variation 01)
- Threaded cap with gag. (Variation 02)
- Plain lever. (Variation 03)
- Plain lever with gag. (Variation 04)
- Plain lever with vibration dampener. (Variation 05)
- Packed lever. (Variation 06)
- Packed lever with gag. (Variation 07)

Pressure and Temperature Limits

Models 912, 918: – Steam
3 to 250 psig [-0.2 to 17 barg]¹
-320° to 406°F [-195° to 208°C]

Models 913, 919: – Steam
3 to 300 psig [-0.2 to 17 barg]¹
-320° to 425°F [-195° to 219°C]

Models 912, 918: – Air/Gas/Liquid
3 to 300 psig [-0.2 to 21 barg]
-320° to 406°F [-195° to 208°C]

Models 913, 919: – Air/Gas/Liquid
3 to 900 psig [-0.2 to 62 barg]
-320° to 425°F [-195° to 219°C]

Vacuum – 6- through 29-inch HG
[200 through 1000 mbarg] – 300°F [149°C]

Maximum back pressure 50 psig [3 barg] - threaded cap and packed lever

1. ASME standard valves for air or steam service must have lift lever. For steam boilers and generators.

Model 900

Specifications - Models 912, 913, 918, and 919

Models 912, 913, 918, 919 ASME Section VIII, Steam/Air/Gas/ Liquid, 'UV' National Board Certified. Also available for Vacuum Service

Seat/Seal Materials ¹	Service Recommendation
BUNA-N (-40° to 275°F) [-40° to 135°C]	Air, Anhydrous Ammonia, Butane, Carbon Dioxide, Diesel Oil, Ethyl Chloride, Ethyl Ether, Freons #11 and 12, Fuel Oil, Gasoline, Helium, Hydrogen Sulphide, Kerosene, Lube Oil, Natural Gas, Nitrogen, Oxygen (Gas), Propane, Propylene, Sulphur Dioxide, Vinyl Chloride
Viton® A (-10° to 406°F) [-23° to 208°C]	Acetone, Air, Amyl Alcohol, Aniline, Benzene, Butane, Carbon Disulphide, Carbon Tetrachloride, Dowtherm 'A' and 'E', Ethyl Chloride, Ethylene, Ethylene Glycol, Ethyl Alcohol, Gasoline, Hexane, Hydrogen Sulphide, Isobutyl Alcohol, JP - 4 Fuel, JP - 5 Fuel, Kerosene, Lube Oil, Natural Gas, Naphtha, Nitrogen, Propane, Propylene, Propyl Alcohol, Sulphur Dioxide, Toluene, Trichloroethylene, Turpentine, Water, Xylene
Silicone (-100° to 406°F) [-73° to 208°C]	Air, Helium, Nitrogen, Oxygen (Gas)
Ethylene Propylene (-70° to 400°F) [-57° to 205°C]	Steam, Hot Water
Neoprene (-45° to 300°F) [-43° to 149°C]	Air, Anhydrous Ammonia, Butane, Butyl Alcohol, Castor Oil Denatured Alcohol, Ethanol, Ethyl Alcohol, Freons (12, 13, 14 and 22), Glycols, Natural Gas and Silicate Esters

Notes

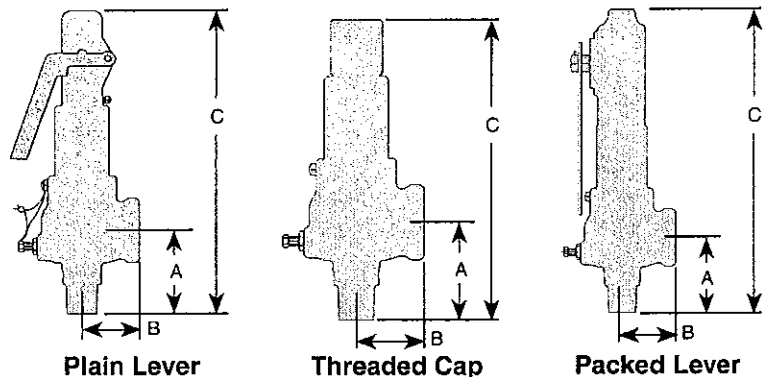
1. These recommendations are a guide only. For the final selection of the proper material, your experience with available elastomers of various lading fluids should be considered.

Size Applications

Model ² Number	Orifice	Connections		Maximum Set Pressure psig [barg]		Dimensions, in [mm]						Approx. Weight lb [kg]
		ANSI Standard Inlet	ANSI Standard Outlet	912-918 ⁴	913-919 ⁵	A	B	C Plain Lever	C Threaded Cap	C Packed Lever		
9*BDC	D	1/2" [12.7]	3/4" [19.0]	300 [20.7]	900 [62.1]	2 9/8 [60]	1 5/8 [41]	8 3/8 [213]	7 1/4 [184]	9 [229]	3 [1.4]	
9*BDC ⁷	D	1/2" [12.7]	1" [25.4]	300 [20.7]	900 [62.1]	2 9/8 [60]	1 5/8 [41]	8 3/8 [213]	7 1/4 [184]	9 [229]	3 [1.4]	
9*BDD ³	D	3/4" [19.0]	3/4" [19.0]	—	900 [62.1]	2 9/8 [60]	1 5/8 [41]	8 3/8 [213]	7 1/4 [184]	9 [229]	3 [1.4]	
9*BDE ³	D	1" [25.4]	1" [25.4]	—	900 [62.1]	2 9/8 [67]	1 5/8 [41]	8 5/8 [219]	7 1/2 [191]	9 1/8 [232]	3 [1.4]	
9*BED	E	3/4" [19.0]	1 1/4" [31.8]	300 [20.7]	900 [62.1]	2 5/8 [67]	2 [51]	8 3/4 [222]	7 5/8 [194]	9 3/8 [238]	4 [1.8]	
9*BEF ³	E	1 1/4" [31.8]	1 1/4" [31.8]	—	900 [62.1]	3 [76]	2 [51]	9 1/8 [232]	8 [203]	9 3/4 [248]	4 [1.8]	
9*BFE	F	1" [25.4]	1 1/2" [38.1]	300 [20.7]	600 [41.4]	2 7/8 [73]	2 3/8 [60]	9 7/8 [251]	8 3/4 [222]	10 1/2 [267]	6 [2.7]	
9*BFG ³	F	1 1/2" [38.1]	1 1/2" [38.1]	—	600 [41.4]	3 [76]	2 3/8 [60]	10 [254]	8 7/8 [225]	10 5/8 [270]	6 [2.7]	
9*BGF	G	1 1/4" [31.8]	2" [50.8]	300 [20.7]	600 [41.4]	3 1/4 [83]	2 5/8 [67]	11 1/4 [286]	10 1/8 [257]	11 3/4 [298]	8 [3.6]	
9*BGH ³	G	2" [50.8]	2" [50.8]	—	600 [41.4]	3 1/4 [83]	2 5/8 [67]	11 1/4 [286]	10 1/8 [257]	11 3/4 [298]	8 [3.6]	
9*BHG	H	1 1/2" [38.1]	2 1/2" [63.5]	300 [20.7]	500 [34.5]	3 1/2 [89]	2 3/4 [70]	13 [330]	11 1/8 [283]	12 1/2 [318]	11 [5.0]	
9*BJH	J ⁶	2" [50.8]	3" [76.2]	300 [20.7]	500 [34.5]	4 [102]	3 1/4 [83]	14 1/2 [368]	12 1/2 [318]	15 1/8 [384]	15 [6.8]	

Notes

1. Maximum temperature controlled by resilient seat/seal material.
2. Replace asterisk with desired Model Number. Data applicable to all models.
3. Available with SS trim only.
4. Maximum pressure on steam is 250 psig.
5. Maximum pressure on steam is 300 psig.
6. For C dimensions: pressures above 200 psig [14 barg] add 1.25-inch [31.8 mm] to the overall height.
7. Special variation required. Consult factory.



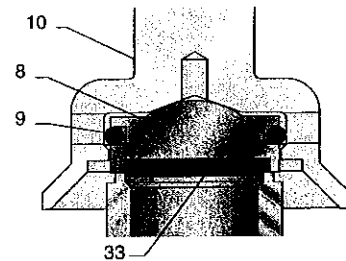
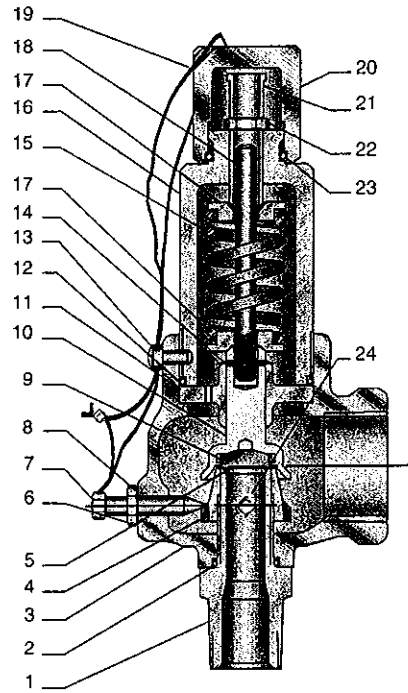
Model 900

Specifications - Models 912, 913, 918, and 919

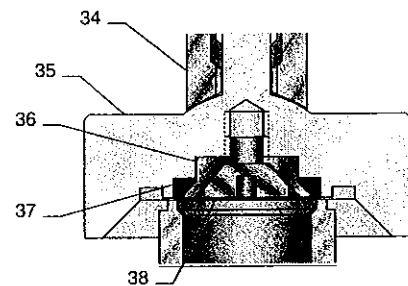
Models 912, 913, 918, 919 ASME Section VIII, Steam/Air/Gas/ Liquid, 'UV'
National Board Certified. Also available for Vacuum Service

Parts and Materials - Models 912, 913, 918, 919 Threaded Cap

No.	Part Name	Materials
1	Nozzle ¹	Brass, B21 Alloy 485, (SS, SA351-CF8M ¹ Models 913, 919 only)
2	O-ring Body	Teflon [®]
3	Body	Bronze, B584 Alloy 84400
4	Wash Ring	SS, A743-CF8M
5	Disc ²	SS, A479-316
6	Set Screw Nut	SS 18-8
7	Set Screw	Brass, B16
8	Seal	Teflon [®]
9	Retainer Ring	SS, A313-316
10	Disc Holder	Brass, B16, (SS A351-CF8M Models 913, 919 only)
11	Guide ³	Brass, B16
12	Bonnet O-ring	Teflon [®]
13	Screw	SS, Commercial 18-8
14	Coiled Spring Pin	SS, A313-302
15	Spring	SS: A313-316 or A313-T631 Alloy steel: A681-H12 or B637-X750
16	Bonnet ⁴	Brass, B16-H02
17	Spring Step	Brass, B16
18	Stem	Brass, B16
19	Wire and Seal	SS wire and Lead seal, Commercial
20	Cap	Brass, B16
21	Compression Screw	Brass, B16
22	Jam Nut	SS 18-8 or Brass, B16
23	Cap O-ring	BUNA-N
24	Body Plug	Brass, B16 [1/4" - 18 NPT]



Soft Seat F thru J Orifice



Soft Seat D and E Orifice

Parts and Materials - Models 918 and 919 Soft Seat F thru J Orifice

No.	Part Name	918	919
8	Disc	SS A479-316	SS A479-316
9	Ring, Retainer	SS A313-316	SS A313-316
10	Disc Holder	Brass, B16	SS A351-CF8M
33	Molded Seat ²		

Parts and Materials - Models 918 and 919 Soft Seat D and E Orifice

No.	Part Name	918	919
34	Spindle	Brass, B16	SS A479-316
35	Disc Holder	Brass, B16	SS A479-316
36	Retainer	Brass, B16	SS A479-316
37	O-ring Seat ²		
38	Seat Retainer Screw	SS 18-8	SS 18-8

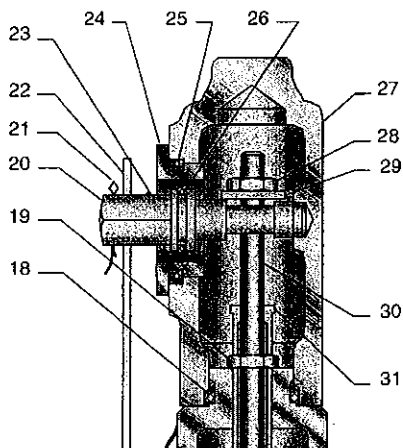
Notes

- F through J orifice nozzle material is Bronze, B62.
 - G through J orifice guide material is Bronze, B584, Alloy 84400.
 - F through J orifice bonnet material is Bronze, B584, Alloy 84400.
- | | |
|-------------------------------|--------------------|
| Material | Letter Designation |
| BUNA-N | - B |
| Ethylene Propylene (EPR/EPDM) | - E |
| Neoprene | - N |
| Silicone | - S |
| Viton [®] | - V |

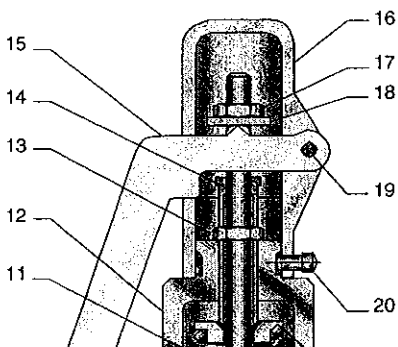
Model 900

Specifications - Models 912, 913, 918, and 919

Models 912, 913, 918, 919 ASME Section VIII, Steam/Air/Gas/Liquid, 'UV'
National Board Certified. Also available for Vacuum Service



Parts and Materials - Model 900 - Packaged Valve		
No.	Part Name	Materials
18	Cap O-ring	BUNA-N 70 Duro, Commercial
19	Jam Nut	Brass, B16
20	Lift Cam	SS, A743 CF8M
21	Cotter Pin	Steel, Commercial
22	Lever	Zinc Plated Steel, A108
23	Drive Screw	SS, Commercial
24	Retainer Nut	Brass, B16
25	Retainer O-ring	BUNA-N 70 Duro, Commercial
26	Lift Cam O-ring	BUNA-N 70 Duro, Commercial
27	Cap	Bronze, B584 Alloy 84400
28	Lift Nut	SS, A479 316
29	Lift Washer	SS, A479 316
30	Stem	Brass, B16
31	Compression Screw	Brass, B16



Parts and Materials - Model 912 - Plain Valve		
No.	Part Name	Materials
11	Spring	Steel: A231/A231M w/coating' SS: A313-302 SS: A313-316 Alloy steel: A681-H12
12	Bonnet	Brass, B16
13	Jam Nut	Brass, B16
14	Compression Screw	Brass, B16
15	Lever	Steel, A109 w/coating'
16	Cap	Brass, B179
17	Lift Nut	SS, A479-316
18	Lift Washer	SS, A479-316
19	Rivet	Steel, Commercial
20	Screw	SS, Commercial Gr. 18-8
21	Spring Step	Brass, B16

1. Corrosion preventative coating.

Model 900

Models 912, 913, 918, 919 ASME Section VIII, Steam/Air/Gas/ Liquid, 'UV' National Board Certified.
Also available for Vacuum Service

Model
Number
Position

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----

Example

9	1	2	B	J	H	M	0	1	-	K	E	0	3	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Model

912, 913, 918, 919

Connection Model

B - Male x Female Threaded or NPT

Orifice

D, E, F, G, H, J

Inlet Size

C - 1/2-inch [15 mm] F - 1 1/4-inch [32 mm]
D - 3/4-inch [18 mm] G - 1 1/2-inch [40 mm]
E - 1-inch [25 mm] H - 2-inch [50 mm]

Seat/Seal Material

M - Metal-to-metal S - Silicone
B - BUNA-N V - Viton®
E - EPR N - Neoprene

Variation (01 through 99)

Number provided only by manufacturer to cover specific feature or option.

- 01 - Threaded cap
- 02 - Threaded cap with gag
- 03 - Plain lever
- 04 - Plain lever with gag
- 05 - Plain lever with vibration dampener
- 06 - Packed lever
- 07 - Packed lever with gag
- 60 - BSP threads with threaded cap

Design Revision

Models	Orifice Size					
	D	E	F	G	H	J
912	-	-	-	-	-	-
913	-	-	-	-	-	-
918	B	B	-	-	-	-
919	B	B	-	-	-	-

Valve Service

- J - Liquid ASME Section VIII (Standard Cap/Packed Lever only)
- K - Air/Gas ASME Section VIII (Plain Lever/Packed Lever required for air)
- L - Steam ASME Section VIII (Plain Lever/Packed Lever required)
- M - Non-Code Liquid (Standard Cap/Packed Lever only)
- N - Non-Code Air Gas
- P - Non-Code Steam
- Q - Vacuum (Standard Cap/Packed Lever only)

Spring Material

- E - SS
- F - Alloy Steel (high temperature)

Set Pressure

- 3 psig [0.2 barg] (0003) through 900 psig [62 barg] (0900)
- Vacuum 6-inch HG [200 mbarg] (0006) through 29-inch HG [1000 mbarg] (0029)

Model 900

Capacities - Models 920, 921, 927

1. Pressure and Temperature Limitations
 Steam Section I - 'V' Special Use
 15 to 800 psig
 -20° to 800°F

Set Pressure (psig)	Orifice Area, in ²					
	D (0.1213)	E (0.2157)	F (0.3369)	G (0.553)	H (0.864)	J (1.415)
15	174	309	482	792	1237	2026
25	228	406	635	1042	1628	2665
35	283	504	787	1292	2018	3305
45	338	601	939	1541	2408	3944
55	393	699	1091	1791	2798	4583
65	448	796	1243	2041	3189	5222
75	504	896	1399	2297	3589	5877
85	560	996	1556	2554	3991	6536
95	617	1097	1713	2812	4393	7194
100	645	1147	1791	2940	4594	7523
125	786	1398	2183	3583	5599	9169
150	927	1649	2575	4227	6604	10815
175	1068	1900	2967	4870	7609	12461
200	1209	2150	3359	5513	8614	14107
225	1350	2401	3751	6156	9619	15753
250	1492	2652	4143	6800	10624	17399
275	1633	2903	4534	7443	11629	19045
300	1774	3154	4926	8086	12634	20691
325	1915	3405	5318	8730	13639	22337
350	2056	3656	5710	9373	14644	23983
375	2197	3907	6102	10016	15649	25629
400	2338	4158	6494	10659	16654	27275
425	2479	4409	6886	11303	17659	28921
450	2620	4660	7278	11946	18664	30567
475	2761	4910	7670	12589	19669	32212
500	2902	5161	8061	13232	20674	33858
525	3044	5412	8453	13876	—	—
550	3185	5663	8845	14519	—	—
575	3326	5914	9237	15162	—	—
600	3467	6165	9629	15805	—	—
625	3608	6416	—	—	—	—
650	3749	6667	—	—	—	—
675	3890	6918	—	—	—	—
700	4031	7169	—	—	—	—
725	4172	7419	—	—	—	—
750	4313	7670	—	—	—	—
775	4455	7921	—	—	—	—
800	4596	8172	—	—	—	—

Model 900

Capacities - Models 920, 921, 927

Set Pressure [barg]	Orifice Area, cm ²					
	D [0.7826]	E [1.3916]	F [2.1735]	G [3.5677]	H [5.574]	J [9.129]
1.1	81	144	225	370	578	946
2.0	114	202	315	518	809	1325
3.0	150	266	415	682	1065	1745
4.0	186	330	516	846	1322	2165
5.0	222	395	617	1013	1582	2591
6.0	259	461	720	1182	1846	3024
7.0	296	527	823	1351	2111	3457
8.0	333	593	926	1520	2375	3890
9.0	371	659	1029	1689	2640	4323
10.0	408	725	1132	1859	2904	4756
12.0	482	857	1339	2197	3433	5622
14.0	556	989	1545	2536	3961	6488
16.0	630	1121	1751	2874	4490	7354
18.0	705	1253	1957	3212	5019	8220
20.0	779	1385	2163	3551	5548	9086
22.0	853	1517	2369	3889	6077	9952
24.0	927	1649	2576	4228	6605	10818
26.0	1002	1781	2782	4566	7134	11684
28.0	1076	1913	2988	4905	7663	12550
30.0	1150	2045	3194	5243	8192	13416
32.0	1224	2177	3400	5582	8720	14282
34.0	1299	2309	3607	5920	9249	15148
36.0	1373	2441	3813	6259	—	—
38.0	1447	2573	4019	6597	—	—
40.0	1521	2705	4225	6935	—	—
42.0	1596	2837	—	—	—	—
44.0	1670	2969	—	—	—	—
46.0	1744	3101	—	—	—	—
48.0	1818	3233	—	—	—	—
50.0	1893	3365	—	—	—	—
52.0	1967	3497	—	—	—	—
54.0	2041	3629	—	—	—	—
58.0	2190	3893	—	—	—	—
62.0	2338	4157	—	—	—	—

1. Pressure and Temperature Limitations
 Steam Section I - 'V' Special Use
 1 to 55 barg
 -28° to 427°C

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

1. No code stamp or 'NB' on nameplate below 15 psig set.
2. Pressure Limitations
Models 910, 916: 3 to 900 psig
Models 911, 917: 3 to 900 psig
Models 912, 918: 3 to 300 psig
Models 913, 919: 3 to 900 psig

Non-Coder and ASME Section VIII Div. (English) SOE (1)
 Flow Coefficient = 0.73

Set Pressure (psig)	Orifice Area, in ²					
	D (0.1213)	E (0.2157)	F (0.3369)	G (0.553)	H (0.864)	J (1.415)
3	28	50	77	127	198	325
4	32	57	89	146	228	374
5	36	64	99	163	255	417
6	39	70	109	178	278	456
7	42	75	117	192	300	491
8	45	80	125	205	320	524
9	48	85	132	217	338	554
10	50	89	139	228	356	583
11	52	93	145	238	372	610
12	54	97	151	248	388	635
13	57	101	157	258	403	660
14	59	104	163	267	417	683
15	64	114	177	291	455	745
25	83	148	232	380	594	972
35	104	185	288	474	740	1212
45	125	223	348	571	893	1462
55	147	261	408	669	1046	1713
65	168	299	467	767	1199	1963
75	190	337	527	865	1352	2214
85	211	376	587	963	1505	2464
95	233	414	646	1061	1658	2715
100	243	433	676	1110	1734	2840
125	297	528	825	1355	2116	3466
150	351	624	974	1599	2499	4093
175	405	719	1124	1844	2881	4719
200	458	815	1273	2089	3264	5345
225	512	910	1422	2334	3646	5971
250	566	1006	1571	2578	4029	6598
275	619	1101	1720	2823	4411	7224
300	673	1197	1869	3068	4793	7850
325	727	1292	2018	3313	5176	8477
350	780	1388	2167	3558	5558	9103
375	834	1483	2316	3802	5941	9729
400	888	1579	2466	4047	6323	10355
425	941	1674	2615	4292	6705	10982
450	995	1769	2764	4537	7088	11608
475	1049	1865	2913	4781	7470	12234
500	1102	1960	3062	5026	7853	12861
550	1210	2151	3360	5516	—	—
600	1317	2342	3658	6005	—	—
650	1425	2533	—	—	—	—
700	1532	2724	—	—	—	—
750	1639	2915	—	—	—	—
800	1747	3106	—	—	—	—
850	1849	3298	—	—	—	—
900	1957	3489	—	—	—	—

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Non-code stamp ASME Section VIII Div. 1 (para. UG-91b)
Flow Coefficient = 1.878

Set Pressure [barg]	Orifice Area, cm ²					
	D [0.7826]	E [1.3916]	F [2.1735]	G [3.5677]	H [5.574]	J [9.129]
0.2	45	80	126	206	322	528
0.5	71	126	196	323	504	825
1.0	98	175	273	448	700	1147
2.0	151	268	419	687	1074	1758
3.0	202	359	561	920	1438	2355
4.0	253	451	704	1155	1805	2956
5.0	305	542	847	1390	2172	3557
6.0	356	634	990	1625	2538	4157
7.0	408	725	1133	1860	2905	4758
8.0	459	817	1276	2094	3272	5359
9.0	511	908	1419	2329	3639	5960
10.0	562	1000	1562	2564	4006	6560
12.0	665	1183	1848	3033	4739	7762
14.0	768	1366	2134	3503	5473	8963
16.0	871	1549	2420	3972	6206	10165
18.0	974	1733	2706	4442	6940	11366
20.0	1077	1916	2992	4911	7673	12567
22.0	1180	2099	3278	5381	8407	13769
24.0	1283	2282	3564	5851	9141	14970
26.0	1386	2465	3850	6320	9874	16172
28.0	1489	2648	4136	6790	10608	17373
30.0	1592	2831	4422	7259	11341	18574
32.0	1695	3015	4708	7729	12075	19776
34.0	1798	3198	4994	8198	12808	20977
36.0	1901	3381	5280	8668	—	—
38.0	2004	3564	5567	9137	—	—
40.0	2107	3747	5853	9607	—	—
42.0	2210	3930	—	—	—	—
44.0	2313	4113	—	—	—	—
46.0	2416	4297	—	—	—	—
48.0	2519	4480	—	—	—	—
50.0	2622	4663	—	—	—	—
52.0	2725	4846	—	—	—	—
54.0	2828	5029	—	—	—	—
56.0	2931	5212	—	—	—	—
58.0	3034	5395	—	—	—	—
60.0	3137	5579	—	—	—	—
62.0	3240	5762	—	—	—	—

1. No code stamp or 'NB' on nameplate below 1.1 barg set.
2. Pressure Limitations
Models 910, 916: 0.2 to 62 barg
Models 911, 917: 0.2 to 62 barg
Models 912, 918: 0.2 to 20.7 barg
Models 913, 919: 0.2 to 62 barg

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

1. No code stamp or 'NB' on nameplate below 15 psig set.
2. Pressure Limitations
Model 910: 3 to 900 psig
Model 911: 3 to 900 psig
Model 912: 3 to 250 psig
Model 913: 3 to 300 psig

Non-condensable ASME Section VIII Steam (English Units)
 Flow Coefficient = 0.975

Set Pressure (psig)	Orifice Area, in ²					
	D (0.1213)	E (0.2157)	F (0.3369)	G (0.553)	H (0.864)	J (1.415)
3	87	155	242	398	621	1017
4	100	178	278	456	712	1167
5	111	197	308	506	791	1295
6	121	215	336	551	861	1410
7	130	231	360	591	924	1513
8	138	245	383	628	981	1607
9	145	258	403	662	1035	1694
10	152	271	423	694	1084	1776
11	159	282	441	724	1131	1852
12	165	293	458	752	1175	1924
13	171	304	474	778	1216	1992
14	176	313	489	803	1255	2056
15	179	319	498	818	1278	2092
25	234	416	650	1068	1668	2732
35	292	519	810	1330	2078	3404
45	352	626	978	1605	2508	4108
55	412	733	1146	1880	2938	4811
65	473	841	1313	2155	3368	5515
75	533	948	1481	2430	3797	6219
85	593	1055	1648	2706	4227	6923
95	654	1163	1816	2981	4657	7627
100	684	1216	1900	3118	4872	7979
125	835	1484	2319	3806	5946	9738
150	986	1753	2737	4493	7020	11498
175	1136	2021	3156	5181	8095	13257
200	1287	2289	3575	5869	9169	15017
225	1438	2557	3994	6556	10243	16776
250	1589	2826	4413	7244	11318	18536
275	1740	3094	4832	7932	12392	20295
300	1891	3362	5251	8619	13467	22055
325	2041	3630	5670	9307	14541	23814
350	2192	3898	6089	9994	15615	25574
375	2343	4167	6508	10682	16690	27333
400	2494	4435	6927	11370	17764	29093
425	2645	4703	7346	12057	18838	30852
450	2796	4971	7765	12745	19913	32612
475	2946	5239	8183	13433	20987	34371
500	3097	5508	8602	14120	22061	36131
550	3399	6044	9440	15496	—	—
600	3701	6581	10278	16871	—	—
650	4002	7117	—	—	—	—
700	4304	7653	—	—	—	—
750	4606	8190	—	—	—	—
800	4907	8726	—	—	—	—
850	5209	9263	—	—	—	—
900	5511	9799	—	—	—	—

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Non-codified ASME Section VIII, Steam (Metric, kg/h)
 Flow Coefficient = 0.875

Set Pressure [barg]	Orifice Area, cm ²					
	D [0.7826]	E [1.3916]	F [2.1735]	G [3.5677]	H [5.574]	J [9.129]
0.2	39	69	108	177	277	453
0.5	60	106	166	272	425	697
1.0	81	144	225	369	577	945
2.0	116	207	323	529	827	1355
3.0	156	277	432	709	1108	1815
4.0	195	347	542	890	1391	2278
5.0	235	418	653	1071	1673	2741
6.0	275	488	763	1252	1956	3204
7.0	314	559	873	1433	2239	3666
8.0	354	629	983	1614	2521	4129
9.0	394	700	1093	1795	2804	4592
10.0	433	771	1204	1976	3087	5055
12.0	513	912	1424	2337	3652	5981
14.0	592	1053	1644	2699	4217	6907
16.0	671	1194	1865	3061	4782	7832
18.0	751	1335	2085	3423	5348	8758
20.0	830	1476	2306	3785	5913	9684
22.0	910	1617	2526	4146	6478	10610
24.0	989	1758	2746	4508	7043	11535
26.0	1068	1900	2967	4870	7609	12461
28.0	1148	2041	3187	5232	8174	13387
30.0	1227	2182	3408	5594	8739	14313
32.0	1306	2323	3628	5955	9304	15238
34.0	1386	2464	3849	6317	9870	16164
36.0	1465	2605	4069	6679	—	—
38.0	1544	2746	4289	7041	—	—
40.0	1624	2887	4510	7403	—	—
42.0	1703	3029	—	—	—	—
44.0	1783	3170	—	—	—	—
46.0	1862	3311	—	—	—	—
48.0	1941	3452	—	—	—	—
50.0	2021	3593	—	—	—	—
52.0	2100	3734	—	—	—	—
54.0	2179	3875	—	—	—	—
56.0	2259	4016	—	—	—	—
58.0	2338	4157	—	—	—	—
60.0	2417	4299	—	—	—	—
62.0	2497	4440	—	—	—	—

NOTES

1. No code stamp or 'NB' on nameplate below 1.1 barg set.
2. Pressure Limitations
Model 910: 0.2 to 62 barg
Model 911: 0.2 to 62 barg
Model 912: 0.2 to 17.2 barg
Model 913: 0.2 to 20.7 barg

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Noncode and ASME Section VIII Liquid Weight (m³/hr)
Flow Coefficient = 0.710

Set Pressure [barg]	Orifice Area, cm²					
	D [0.783]	E [1.392]	F [2.174]	G [3.568]	H [5.574]	J [9.129]
1.0	3	6	9	14	22	36
2.0	4	7	12	19	30	49
3.0	5	9	14	23	37	60
4.0	6	11	16	27	42	69
5.0	7	12	18	30	47	77
6.0	7	13	20	33	52	85
7.0	8	14	22	36	56	92
8.0	8	15	23	38	60	98
9.0	9	16	25	41	63	104
10.0	9	17	26	43	67	110
12.0	10	18	29	47	73	120
14.0	11	20	31	51	79	130
16.0	12	21	33	54	85	139
18.0	13	22	35	57	90	147
20.0	13	24	37	61	95	155
22.0	14	25	39	63	99	162
24.0	15	26	40	66	104	170
26.0	15	27	42	69	108	177
28.0	16	28	44	72	112	183
30.0	16	29	45	74	116	190
32.0	17	30	47	77	120	196
34.0	17	31	48	79	123	202
36.0	18	32	49	81	—	—
38.0	18	33	51	83	—	—
40.0	19	33	52	86	—	—
42.0	19	34	—	—	—	—
44.0	20	35	—	—	—	—
46.0	20	36	—	—	—	—
48.0	21	37	—	—	—	—
50.0	21	37	—	—	—	—
52.0	21	38	—	—	—	—
54.0	22	39	—	—	—	—
56.0	22	40	—	—	—	—
58.0	23	40	—	—	—	—
60.0	23	41	—	—	—	—
62.0	23	42	—	—	—	—

1. No code stamp or 'NB' on nameplate below 1.1 barg set.

2. Pressure Limitations
Model 910, 916: 0.2 to 62 barg

Model 911, 917: 0.2 to 62 barg

Model 912, 918: 0.2 to 20.7 barg

Model 913, 919: 0.2 to 62 barg

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

1. Pressure Limitations
 Models 910, 916: 3 to 900 psig
 Models 911, 917: 3 to 900 psig
 Models 912, 918: 3 to 300 psig
 Models 913, 919: 3 to 900 psig

Non-Code Liquid 25% Accumulation (English GPM) Flow Coefficient = 0.710						
Set Pressure (psig)	Orifice Area, in ²					
	D (0.1213)	E (0.2157)	F (0.3369)	G (0.553)	H (0.864)	J (1.415)
3	6	11	18	29	45	74
4	7	13	20	33	52	85
5	8	15	23	37	58	95
6	9	16	25	41	64	105
7	10	17	27	44	69	113
8	10	18	29	47	74	121
9	11	20	30	50	78	128
10	12	21	32	53	82	135
11	12	22	34	55	86	142
12	13	23	35	58	90	148
13	13	23	37	60	94	154
14	14	24	38	62	98	160
15	14	25	39	65	101	165
25	18	33	51	83	130	213
35	22	38	60	99	154	253
45	25	44	68	112	175	286
55	27	48	75	124	193	317
65	29	52	82	134	210	344
75	32	56	88	144	226	370
85	34	60	94	154	240	394
95	36	63	99	163	254	416
100	37	65	102	167	261	427
125	41	73	114	186	291	477
150	45	80	124	204	319	523
175	48	86	134	221	345	565
200	52	92	144	236	369	604
225	55	98	152	250	391	640
250	58	103	161	264	412	675
275	61	108	169	277	432	708
300	63	113	176	289	451	739
325	66	117	183	301	470	769
350	68	122	190	312	488	799
375	71	126	197	323	505	827
400	73	130	203	334	521	854
425	75	134	210	344	537	880
450	78	138	216	354	553	905
475	80	142	221	364	568	930
500	82	145	227	373	583	954
550	86	153	238	391	—	—
600	90	159	249	409	—	—
650	93	166	—	—	—	—
700	97	172	—	—	—	—
750	100	178	—	—	—	—
800	103	184	—	—	—	—
850	107	190	—	—	—	—
900	110	195	—	—	—	—

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Reference Liquid: 25% Acetone in Water @ 15°C (60°F)
 Flow Coefficient: 0.710

Set Pressure [barg]	Orifice Area, cm ²					
	D [0.783]	E [1.392]	F [2.174]	G [3.568]	H [5.574]	J [9.129]
0.2	1	3	4	6	10	17
0.5	2	4	6	10	16	26
1.0	3	6	9	14	23	37
2.0	4	8	12	20	32	52
3.0	5	10	15	25	39	64
4.0	6	11	18	29	45	74
5.0	7	13	20	32	50	83
6.0	8	14	22	35	55	90
7.0	8	15	23	38	60	98
8.0	9	16	25	41	64	104
9.0	9	17	26	43	68	111
10.0	10	18	28	46	71	117
12.0	11	19	30	50	78	128
14.0	12	21	33	54	84	138
16.0	13	23	35	58	90	148
18.0	13	24	37	61	96	157
20.0	14	25	39	65	101	165
22.0	15	26	41	68	106	173
24.0	16	28	43	71	110	181
26.0	16	29	45	74	115	188
28.0	17	30	47	76	119	195
30.0	17	31	48	79	123	202
32.0	18	32	50	82	128	209
34.0	18	33	51	84	131	215
36.0	19	34	53	87	—	—
38.0	20	35	54	89	—	—
40.0	20	36	56	91	—	—
42.0	21	36	—	—	—	—
44.0	21	37	—	—	—	—
46.0	21	38	—	—	—	—
48.0	22	39	—	—	—	—
50.0	22	40	—	—	—	—
52.0	23	41	—	—	—	—
54.0	23	41	—	—	—	—
56.0	24	42	—	—	—	—
58.0	24	43	—	—	—	—
60.0	25	44	—	—	—	—
62.0	25	44	—	—	—	—

1. Pressure Limitations
 Models 910, 916: 0.2 to 62 barg
 Models 911, 917: 0.2 to 62 barg
 Models 912, 918: 0.2 to 20.7 barg
 Models 913, 919: 0.2 to 62 barg

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Non-Roche Vacuum All 310% Accumulation (Length 3000)
Flow Coefficient = 0.875

Set Inches Mercury	Orifice Area, in ²					
	D (0.1213)	E (0.2157)	F (0.3369)	G (0.553)	H (0.864)	J (1.415)
6	24	43	68	111	173	284
7	26	45	71	117	182	298
8	27	47	74	121	189	310
9	27	49	76	125	195	320
10	28	50	78	128	199	327
11	28	51	79	129	202	331
12	29	51	80	131	204	334
13	29	51	80	131	204	335
14	29	51	80	131	204	335
15	29	51	80	131	204	335
16	29	51	80	131	204	335
17	29	51	80	131	204	335
18	29	51	80	131	204	335
19	29	51	80	131	204	335
20	29	51	80	131	204	335
21	29	51	80	131	204	335
22	29	51	80	131	204	335
23	29	51	80	131	204	335
24	29	51	80	131	204	335
25	29	51	80	131	204	335
26	29	51	80	131	204	335
27	29	51	80	131	204	335
28	29	51	80	131	204	335

Model 900

Capacities - Models 910, 911, 912, 913, 916, 917, 918 and 919

Nominal Valve Size: 1 1/2" Accumulation: 11 Bar (160 PSI) Flow Coefficient: 0.678						
Set Pressure [mbarg]	Orifice Area, cm ²					
	D [0.7826]	E [1.3916]	F [2.1735]	G [3.5677]	H [5.574]	J [9.129]
200	40	71	111	182	285	466
225	42	74	115	189	296	485
250	43	76	119	196	306	501
275	44	78	123	201	314	515
300	45	80	125	206	321	526
325	46	82	127	209	327	535
350	46	83	129	212	331	542
375	47	83	130	214	334	548
400	47	84	131	215	336	551
425	47	84	132	216	337	553
450	47	84	132	216	337	552
475	47	84	132	216	338	553
500	47	84	132	216	338	553
525	47	84	132	216	338	553
550	47	84	132	216	338	553
575	47	84	132	216	338	553
600	47	84	132	216	338	553
625	47	84	132	216	338	553
650	47	84	132	216	338	553
675	47	84	132	216	338	553
700	47	84	132	216	338	553
725	47	84	132	216	338	553
750	47	84	132	216	338	553
775	47	84	132	216	338	553
800	47	84	132	216	338	553
845	47	84	132	216	338	553
850	47	84	132	216	338	553
875	47	84	132	216	338	553
900	47	84	132	216	338	553
925	47	84	132	216	338	553
950	47	84	132	216	338	553
975	47	84	132	216	338	553
1000	47	84	132	216	338	553

Facility Phone: 828-669-3700

Tyco Valves & Controls

www.kunklevalve.com

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Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

The supplemental air (source of nitrogen gas) supply system is to provide clean and low dew point compressed air which to be injected into the GOX stream line to enhance the production of the ozone generation.

The amount of air (nitrogen gas) to be injected to the ozone system (GOX line) is between 0.2 % and 0.5 % by volume.



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

SUPPLEMENTAL AIR / NITROGEN SUPPLY SYSTEM

MANUFACTURER : POWEREX
SERVICE : INJECTION OF CLEAN DRY COMPRESSED AIR INTO
OXYGEN GAS LINE
SOUND LEVEL : < 85 dBA @ 3 FT (1 m)
FEATURE : SKID MOUNTED PACKAGE
FOLLOWING ITEMS ARE INCLUDED IN SKID UNIT
- (2) PARTICULATE FILTERS
- (2) AIR COMPRESSORS
- AFTER COOLER
- 80 GALLON HORIZONTAL AIR RECEIVER TANK
WITH ELECTRIC DRAIN
- PRESSURE INDICATOR
- PRESSURE SWITCH (HIGH)
- PRESSURE RELIEF VALVE
- DESSICANT DRYER
- NEMA 4 LOCAL CONTROL PANEL
POWER REQUIREMENT : 480 VAC / 3 PHASE / 60 Hz
QUANTITY : 1
CUSTOMER TAG NO. : N/A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

AIR COMPRESSOR / AIR RECEIVER TANK (SKID)

MANUFACTURER : POWEREX
MODEL : STD0203
SERVICE : SUPPLEMENTAL AIR / NITROGEN SUPPLY
CAPACITY : 6.1 SCFM @ 100 PSIG (0.161 Nm³/min @ 689.5 kPa), TOTAL
OF 12.2 SCFM (0.322 Nm³/min)
OPERATING PRESSURE : 80 ~ 115 PSIG (551.6 ~ 792.9 kPa)
TYPE : SCROLL OILLESS SERIES DUPLEX TANK MOUNT UNIT
RECEIVER : 80 GALLON (228 L) HORIZONTAL TANK
CONNECTION : 1/2" (12.7 mm) NPT DISCHARGE FROM DRYER
POWER : 480 VAC / 3 PHASE / 60 Hz
QUANTITY : 1

CUSTOMER TAN NO. : CMP-O050A / CMP-O052A (COMPRESSOR)
PV-O050A (RECEIVER TANK)

NOTE:

FOLLOWING ITEMS TO BE MOUNTED ON THE AIR RECEIVER TANK.

- PARTICULATE FILTER (TAG NO. : CF-O052A/CF-O053A)
- AFTERCOOLER (TAG NO. : CC-O050A)
- PRESSURE INDICATOR (TAG NO. : PI-O050A)
- PRESSURE RELIEF VALVE (TAG NO. : PSV-O050A)
- PRESSURE SWITCH (TAG NO. : PS-O050A)
- BALL VALVES (TAG NO. : HV-O050A/HV-O051A)
- AUTOMATIC ELECTRIC DRAIN (TAG NO. : BV-O050A)



Scroll Tankmount/Basemount Air Compressors

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Descriptions

GENERAL

The Powerex Oilless Rotary Scroll Air Compressor has advanced scroll compressor technology through the development of a completely oilless unit. The Powerex Scroll Compressor offers a dynamically balanced air end which insures vibration-free operation. The rotary design permits a continuous 100% duty cycle. No oil separation, oil filtration, or inlet valves are required on the Powerex Scroll unit.

COMPRESSION CYCLE

The Powerex oilless rotary scroll air compressor is based on the theory of scroll compression. A scroll is a free standing, intricate spiral bounded on one side by a solid, flat plane or base. A scroll set, the basic compression element of a scroll compressor, is made up of two identical spirals which form right and left hand parts. One of these scroll components is indexed or phased 180° with respect to the other so the scrolls can mesh. Crescent-shaped gas pockets are formed and bounded by the spirals and the base plate of both scrolls. As the moving scroll is orbited around the fixed scroll, the pockets formed by the meshed scrolls follow the spiral toward the center and diminish in size. The moving scroll is prevented from rotating during this process so the 180° phase relationship of the scrolls is maintained. The compressor's inlet is at the outer boundary of the scrolls. The compressed gas is discharged through the outlet at the center of the fixed scroll so no valves are needed.

TIP SEAL

The tip seal on the scroll compressor is self-lubricated and allows the unit to operate efficiently without oil and expensive filtration. The tip seal should be replaced every 10,000 hours of operation.

BEARINGS

The bearings on the scroll compressor are regreaseable to allow extended compressor life. Service should be performed every 10,000 hours of operation.

DRY TYPE INLET FILTER (P/N IP032901AV)

Order P/N IP032901AV for both the 3 HP and 5HP units. Change every 2,500 hours or more often in dirty locations.

HOURLY METER

The hourmeter on the scroll compressor indicates the actual number of hours the unit has been in operation. The hourmeter is also used to determine maintenance and service timing. **An hourmeter must be installed with every Scroll compressor.**

CONDENSATE DRAIN VALVE

A condensate drain valve must be installed on any tank used to allow removal of the liquid which will collect during compressor operation.

NOTICE

Drain liquid from tank daily.

▲ DANGER

Breathable Air Warning

This compressor/pump is NOT equipped and should NOT be used "as is" to supply breathing quality air. For any application of air for human consumption, you must fit the air compressor/pump with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1 - 1966, OSHA 29 CFR 1910. 134, and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES IN THE EVENT THE COMPRESSOR IS USED FOR THE PURPOSE OF BREATHING AIR APPLICATION AND PROPER IN-LINE SAFETY AND ALARM EQUIPMENT IS NOT SIMULTANEOUSLY USED, EXISTING WARRANTIES ARE VOIDED, AND POWEREX DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY LOSS, PERSONAL INJURY OR DAMAGE.

Earth Tech (Canada) Inc.

Reviewed for compliance with the following standards:
Residential Code, National Building Code, and other applicable codes and standards.

Responsible for the design and construction of the project in accordance with the above standards and all parts of the project.

REVIEWED

REVIEWED AS MINIMUM

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 24/1/06 By: [Signature]

Scroll Air Compressors Tankmount/Basemount

Installation

RECEIVING THE UNIT

Immediately upon receipt of the scroll compressor, the unit should be inspected for any damage which may have occurred in shipment.

The compressor nameplate should be checked to see if the unit is the correct model and voltage as ordered.

APPLICATION

When the scroll compressor is to be used in applications other than the compressing of atmospheric air, please contact a Powerex representative for engineering and warranty information at 1-888-769-7979.

INSTALLATION SITE

1. The scroll compressor must be located in a clean, well lit and well ventilated area.
2. The area should be free of excessive dust, toxic or flammable gases and moisture.
3. Never install the compressor where the ambient temperature is higher than 104° F or where humidity is high.
4. Clearance must allow for safe, effective inspection and maintenance.

Minimum Clearances

Above	24"
Drive belt side	12"
Other sides	20"

5. If necessary, use metal shims or leveling pads to level the compressor. Never use wood to shim the compressor.

VENTILATION

1. If the scroll compressor is located in a totally enclosed room, an exhaust fan with access to outside air must be installed.
2. Never restrict the cooling fan exhaust air.
3. Never locate the compressor where hot exhaust air from other heat generating units may be pulled into the unit.

WIRING

Refer to the general product manual.

All electrical hook-ups must be performed by a qualified electrician. Installations must be in accordance with local and national electrical codes.

Use solderless terminals to connect the electric power source.

PIPING

Refer to the general product manual.

1. Make sure the piping is lined up without being strained or twisted when assembling the piping for the scroll compressor.
2. Appropriate expansion loops or bends should be installed at the compressor to avoid stresses caused by changes in hot and cold conditions.
3. Piping supports should be anchored separately from the compressor to reduce noise and vibration.
4. Never use any piping smaller than the compressor connection.
5. Use flexible hose to connect the outlet of the compressor to the piping so that the vibration of the compressor does not transfer to the piping.

SAFETY VALVES

Tank mounted compressors are shipped from the factory with safety valves installed in the tank manifold. The flow capacity of the safety valve is equal to or greater than the capacity of the compressor.

1. The pressure setting of the safety valve must be no higher than the maximum working pressure of the tank.
2. Safety valves should be placed ahead of any possible blockage point in the system, i.e. shutoff valve.
3. Avoid connecting the safety valve with any tubing or piping.
4. Manually operate the safety valve every six months to avoid sticking or freezing.

Operation

BEFORE START UP

1. Make sure all safety warnings, labels and instructions have been read and understood before continuing.
2. Remove any shipping materials, brackets, etc.
3. Confirm that the electric power source and ground have been firmly connected.
4. Be sure all pressure connections are tight.
5. Check to be certain all safety relief valves, etc., are correctly installed.
6. Check that all fuses, circuit breakers, etc., are the proper size.
7. Make sure the inlet filter is properly installed.
8. Confirm that the drain valve is closed.
9. Visually check the rotation of the compressor pump. If the rotation is incorrect, have a qualified electrician correct the motor wiring.

START-UP AND OPERATION

1. Follow all the procedures under "Before start-up" before attempting operation of the compressor.
2. Switch the electric source breaker on.
3. Open the tank discharge valve completely.
4. Check that the compressor operates without excessive vibration, unusual noises or leaks.
5. Close the discharge valve completely.
6. If the pressure does not rise on a three phase unit, turn the unit off. Have a qualified electrician switch the breaker OFF and exchange the R and T connections (two out of three phases of electric source) inside the magnetic switch.
7. Check the discharge pressure. Also make sure the air pressure rises to the designated pressure setting by checking the discharge pressure gauge.
8. Check the operation of the pressure switch by opening the stop valve and confirming the compressor starts as pressure drops.

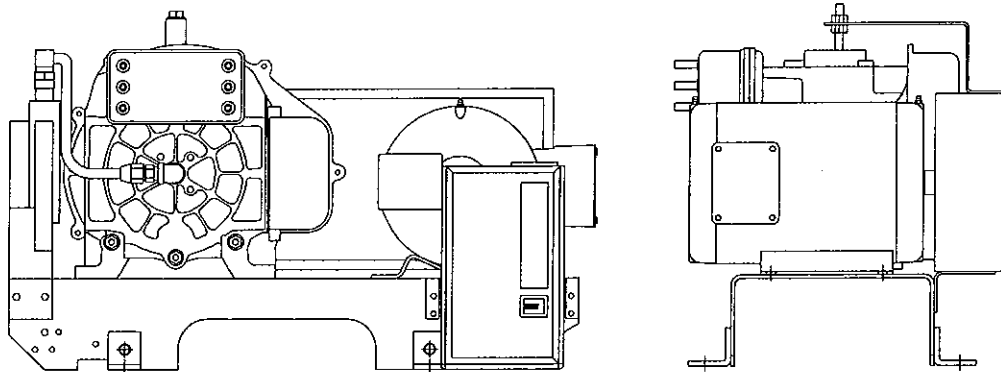


Figure 1 - SBS Scroll Basemount Simplex

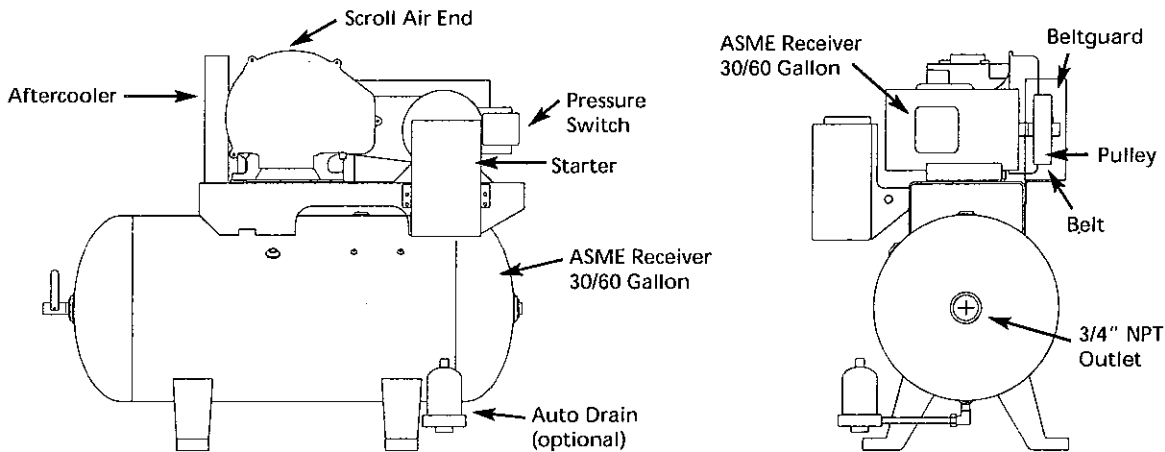


Figure 2 - STS Scroll Tankmount

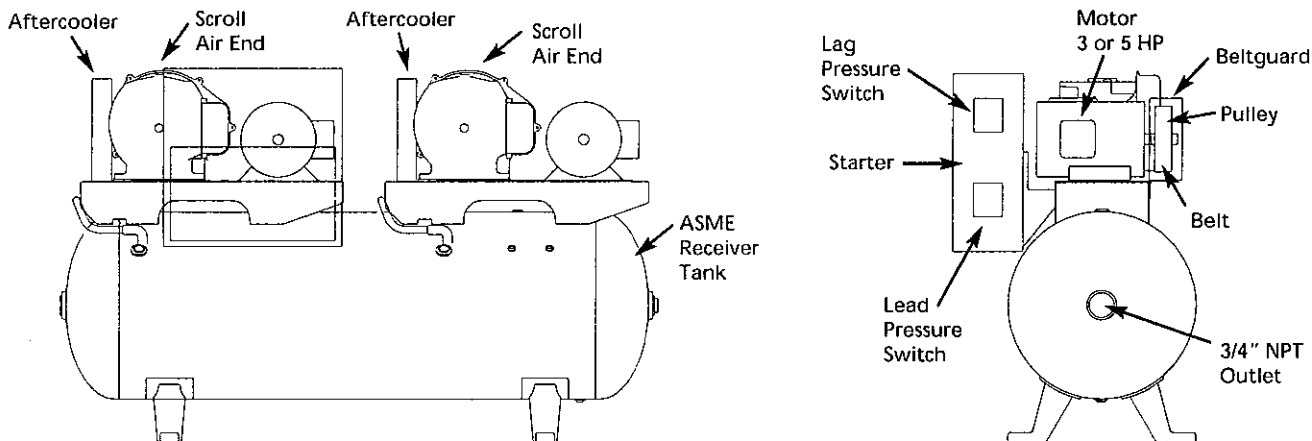


Figure 3 - STD Scroll Tankmount Duplex

Scroll Air Compressors Tankmount/Basemount

Specifications

Scroll Basemount Simplex - Model SBS

Model	HP	Phase	SCFM @100 PSIG	Voltage	Full Load Amperage	Gallon Tank	Dimension LxWxH	Ship Weight (Lbs.)
SBS0307	3	3	8.6	208/230/460	8.7/8.0/4.0	Basemount	29x19x19	160
SBS1307	3	1	8.6	230	17	Basemount	29x19x19	175
SBS0507	5	3	14.7	208/230/460	13.7/13.2/6.6	Basemount	29x19x19	180
SBS1517	5	1	14.7	230	25	Basemount	29x19x19	190

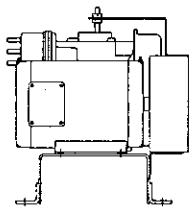
Scroll Tankmount Simplex - Model STS

Model	HP	Phase	SCFM @100 PSIG	Voltage	Full Load Amperage	Gallon Tank	Dimension LxWxH	Ship Weight (Lbs.)
STS030	3	3	8.6	208/230/460	8.7/8.0/4.0	30 / 60	39x22x35 / 51x23x39	280 / 390
STS130	3	1	8.6	230	17	30 / 60	39x22x35 / 51x23x39	295 / 405
STS050	5	3	14.7	208/230/460	13.7/13.2/6.6	30 / 60	39x22x35 / 51x23x39	300 / 410
STS151	5	1	14.7	230	25	30 / 60	39x22x35 / 51x23x39	310 / 420

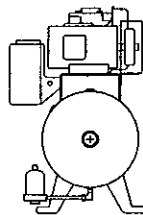
Scroll Tankmount Duplex - Model STD

Model	HP	Phase	SCFM @100 PSIG	Voltage	Full Load Amperage	Gallon Tank	Dimension LxWxH	Ship Weight (Lbs.)
STD030	3 (2)	3	17.2	208/230/460	17.4/16.0/8.0	80	64x26x40	650
STD130	3 (2)	1	17.2	230	34	80	64x26x40	680
STD050	5 (2)	3	29.4	208/230/460	27.4/26.4/13.2	80 / 120	64x26x40 / 71x35x75	690 / 715
STD151	5 (2)	1	29.4	230	50	80 / 120	64x26x40 / 71x35x75	710 / 735

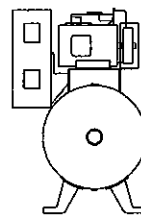
MODEL SBS



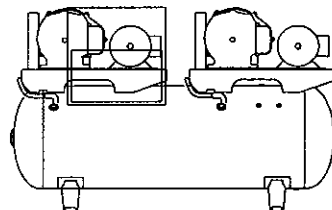
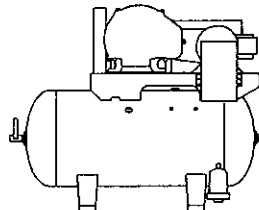
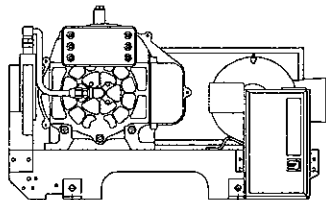
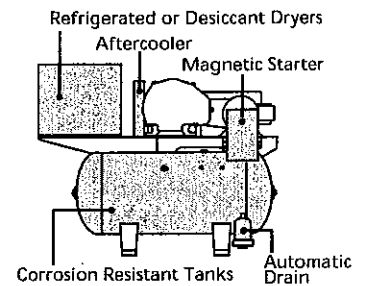
MODEL STS



MODEL STD



OPTIONAL EQUIPMENT



Scroll Air Compressors Tankmount/Basemount

Maintenance Schedule

Item	Action needed	500	2500	Operating Hours				Remarks
				5000	10,000	15,000	20,000	
Tank	Drain moisture	Daily						
Inlet air filter	Replace	●	▲	<i>(Every 2,500 hrs or less)</i>				Part #IP032901AV
Blower fan	Clean			●	●	●	●	
Fan Duct	Clean			●	●	●	●	
Compressor Fins	Clean		●	<i>(Every 2,500 hrs or less)</i>				
Bearings	Grease				▲		▲	Service Center Only
Tip seal	Replace				▲		▲	
Dust seal	Replace				▲		▲	
V-belt	Inspect, replace	*Note 3	●	▲	▲	▲	▲	
Pressure Switch	Confirm operation				●		●	
Magnetic starter	Inspect				●		●	Replace if contact points deteriorated
Safety valve	Confirm operation		●	<i>(Every 2,500 hrs or less)</i>				
Pressure gauge	Inspect		●	<i>(Every 2,500 hrs or less)</i>				

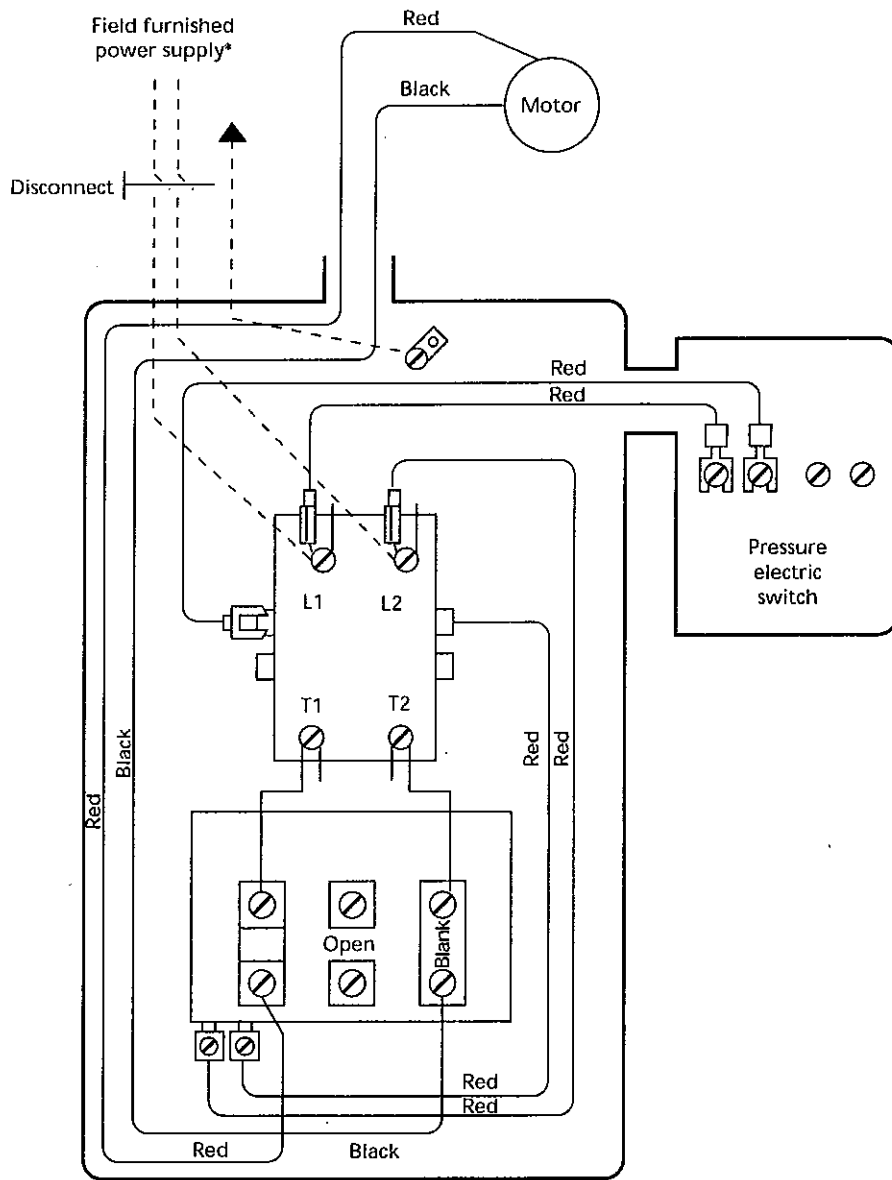
- Inspect
- ▲ Replace

NOTES:

1. Inspect and perform maintenance periodically according to maintenance schedule.
2. The maintenance schedule relates to the normal operating conditions. If the circumstances and load condition are adverse, shorten the cycle time and do maintenance accordingly.
3. * The tension of the V-belt should be adjusted during the initial stage and inspected every 2,500 hours afterwards. Proper belt tension for 3 HP units is 7 lbs./16" deflection; for 5 HP units, 7 lbs./19" deflection.
4. See Compressor Pump Manuals for replacement or service procedures.

Scroll Air Compressors Tankmount/Basemount

Electrical Wiring Diagram - Simplex

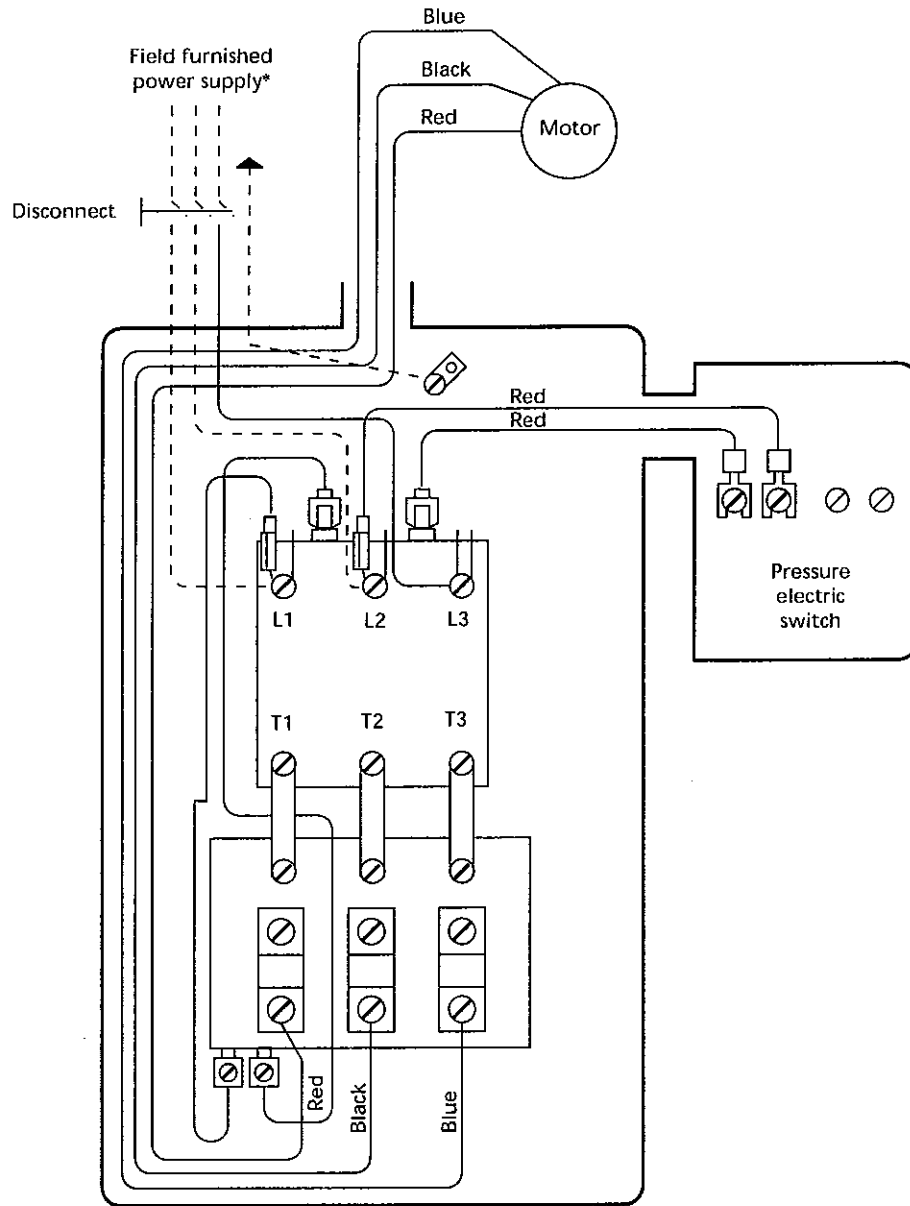


*Main disconnect and branch circuit protection to be installed by a qualified electrician in accordance with national and local codes.

Figure 4 - 3-5 HP Basemount/Simplex Single-Phase 208/230 Volts

Scroll Air Compressors Tankmount/Basemount

Electrical Wiring Diagram - Simplex



*Main disconnect and branch circuit protection to be installed by a qualified electrician in accordance with national and local codes.

Figure 5 - 3-5 HP Basemount/Simplex Three-Phase 208-230/460 Volts

Scroll Air Compressors Tankmount/Basemount

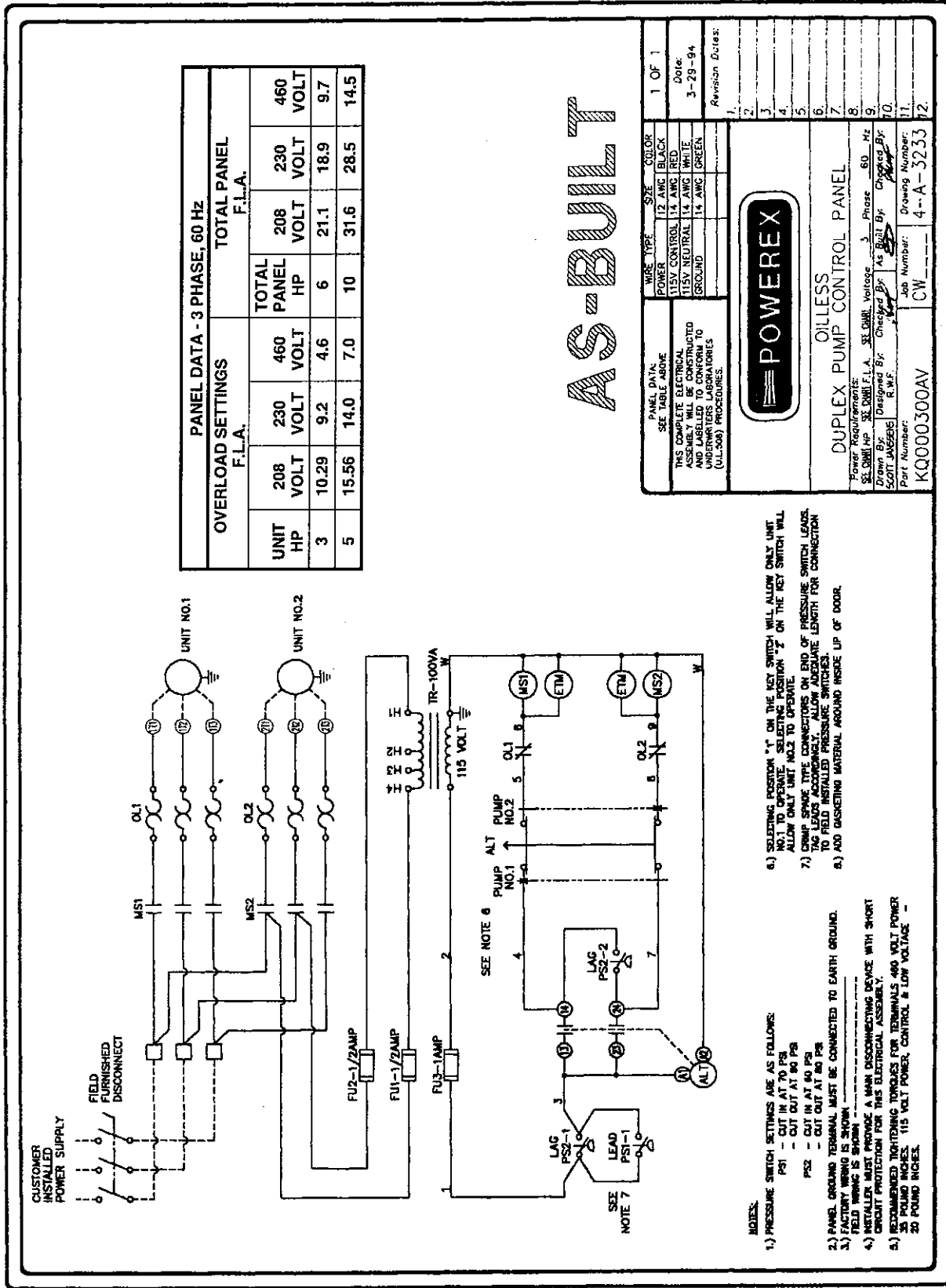
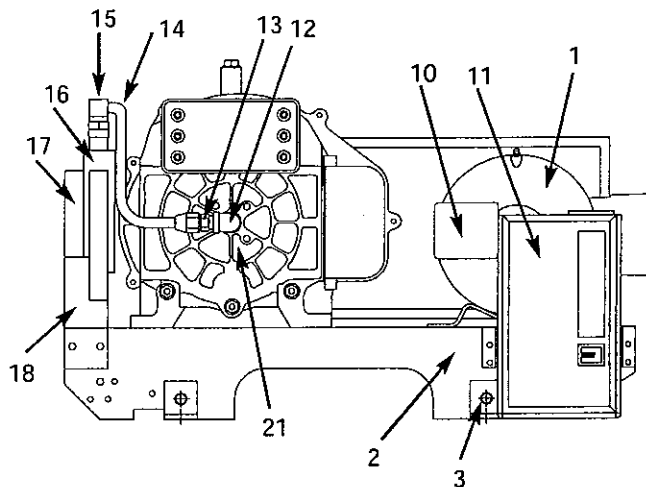
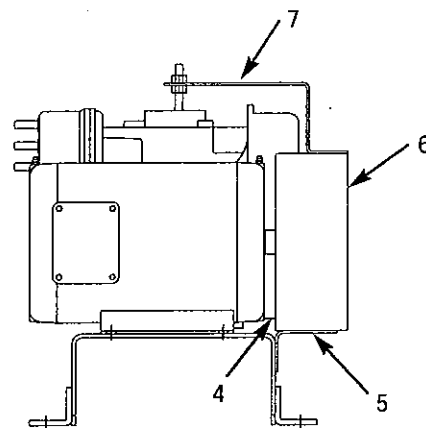


Figure 6 - 3-5 HP Duplex Three-Phase 208-230/460 Volts

Replacement Parts List for SBS Models

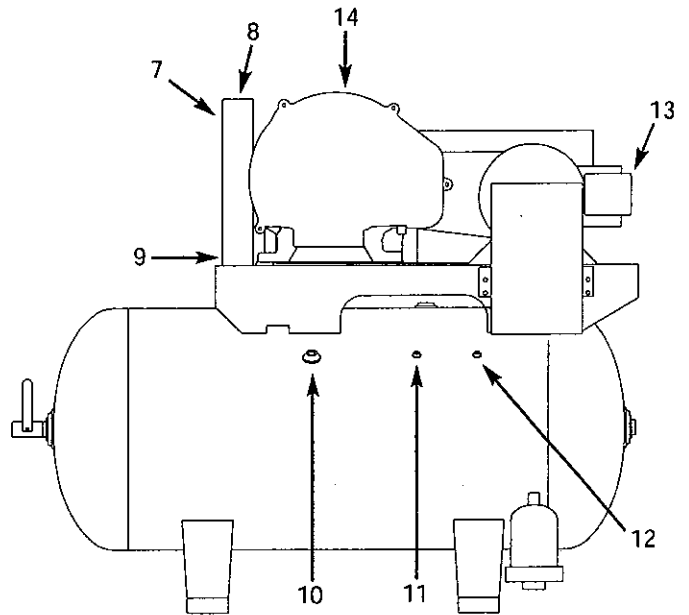
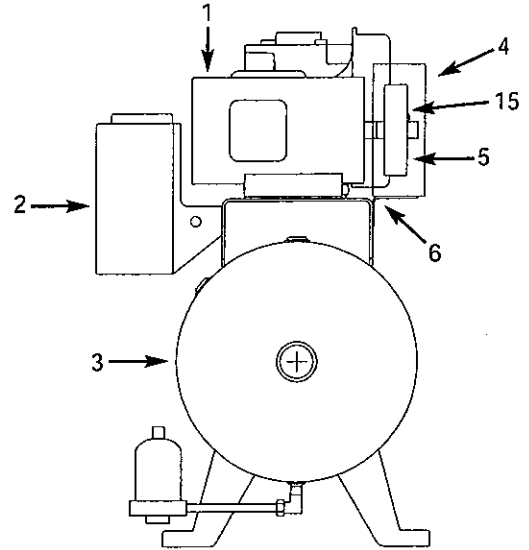
Ref. No.	Description	SBS Model Part Number	Qty.
1	Motor 3 HP 3 Phase	MC022374AV	1
	Motor 3 HP 1 Phase	MC301519AV	1
	Motor 5HP 3 Phase	MC022307AV	1
	Motor 5HP 1 Phase	MC301520AV	1
2	Base	BA000301AV	1
3	Angle bracket	ST185500AV	4
4	Beltguard back	BG303800AV	1
5	Bracket	SL050700AV	1
6	Beltguard front	BG303900AV	1
7	3 HP Beltguard bracket	BG304000AV	1
	5 HP Beltguard bracket	BG304100AV	1
8	Δ Belt:		
	3 HP	BT010700AV	1
	5 HP	BT010700AV	2
9	Δ Motor pulley:		
	3 HP	PU009753AV	1
	5 HP	PU009754AV	1
10	Pressure switch	CW207559AV	1
11	Starter:		
	3 HP 230V 1 Phase	JP001045AV	1
	5 HP 230V 1 Phase	IP001046AV	1
	3 HP 230V 3 Phase	JP001047AV	1
	5 HP 230V 3 Phase	JP001049AV	1
	3 HP 460V 3 Phase	JP001048AV	1
	5 HP 460V 3 Phase	JP001050AV	1
12	90° Elbow	ST074204AV	1
13	1/2" Flare	ST126207AV	1
14	Discharge tube	SL300900AV	1
15	90° Flare elbow	ST126204AV	1
16	Aftercooler	SL300100AV	1
17	Left aftercooler bracket	SL300200AV	1
18	Right aftercooler bracket	SL300300AV	1
19	Δ Check valve	IP087700AV	1
20	Δ Safety valve	V-215100AV	1
21	Scroll air end:		
	3 HP	SL014000AJ	1
	5 HP	SL016500AJ	1

(Δ) Not shown.



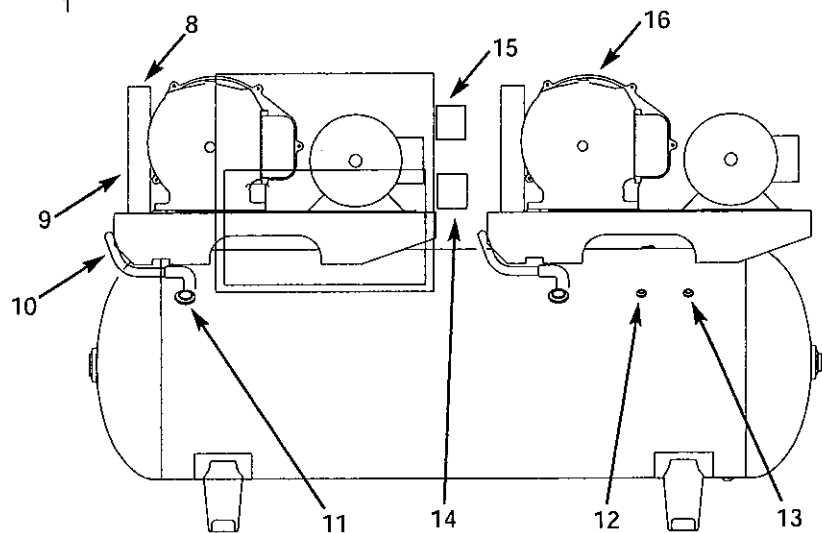
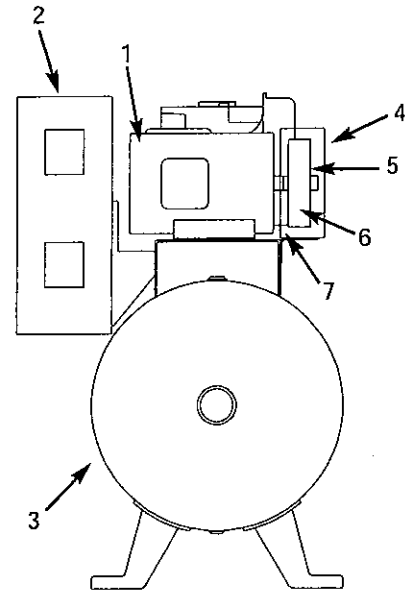
Replacement Parts List for STS Models

Ref. No.	Description	STS Model Part Number	Quantity
1	Motor:		
	3 HP 3 Phase	MC022374AV	1
	3 HP 1 Phase	MC301519AV	1
	5 HP 3 Phase	MC022307AV	1
	5 HP 1 Phase	MC301520AV	1
2	Starter:		
	3 HP 230V 1 Phase	JP001045AV	1
	5 HP 230V 1 Phase	JP001046AV	1
	3 HP 230V 3 Phase	JP001047AV	1
	5 HP 230V 3 Phase	JP001049AV	1
	3 HP 460V 3 Phase	JP001048AV	1
	5 HP 460V 3 Phase	JP001050AV	1
3	Receiver tank:		
	30 gallon	AR024700AJ	1
	60 gallon	AR022500AJ	1
4	Beltguard	BT303900AV	1
5	Motor pulley:		
	3 HP	PU009753AV	1
	5 HP	PU009754AV	1
6	Guard plate	BG217500AV	1
7	Aftercooler	SL300100AV	1
8	Tube air end/aftercooler	SL301000AP	1
9	Tube aftercooler/tank	SL300900AP	1
10	Check valve	IP087700AV	1
11	Pressure gauge	GA016701AV	1
12	Safety valve	V-215100AV	1
13	Pressure switch	CW207573AV	1
14	Scroll air end:		
	3 HP	SL014000AJ	1
	5 HP	SL016500AJ	1
15	Belt:		
	3 HP	BT010700AV	1
	5 HP	BT010700AV	2



Replacement Parts List for STD Models

Ref. No.	Description	STD Model Part Number	Quantity
1	Motor:		
	3 HP 3 Phase	MC022374AV	1
	3 HP 1 Phase	MC301519AV	1
	5 HP 3 Phase	MC022307AV	1
	5 HP 1 Phase	MC301520AV	1
2	Starter alternator panel:		
	3 HP 230V 1 Phase	ZZ000435AJ	1
	5 HP 230V 1 Phase	ZZ000436AJ	1
	3 HP 230V 3 Phase	ZZ000418AJ	1
	5 HP 230V 3 Phase	ZZ000419AJ	1
	3 HP 460V 3 Phase	ZZ000420AJ	1
	5 HP 460V 3 Phase	ZZ000421AJ	1
3	Receiver tank:		
	80 gallon	AR022900AJ	1
	120 gallon	AR023600AJ	1
4	Beltguard	BT303900AV	1
5	Belt:		
	3 HP	BT010700AV	2
	5 HP	BT010700AV	4
6	Motor pulley:		
	3 HP	PU009753AV	1
	5 HP	PU009754AV	1
7	Guard plate	BG217500AV	1
8	Aftercooler	SL300100AV	1
9	Tube air end/aftercooler	SL301000AP	1
10	Tube aftercooler/tank	SL300900AP	1
11	Check valve	IP087700AV	1
12	Pressure gauge	GA016701AV	1
13	Safety valve	V-215100AV	1
14	Pressure switch (Lead)	CW207558AV	1
15	Pressure switch (Lag)	CW207559AV	1
16	Scroll air end:		
	3 HP	SL014000AJ	1
	5 HP	SL016500AJ	1





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

DESICCANT DRYER

MANUFACTURER : HANKISON
MODEL : DHW-5
SERVICE : DRY COMPRESSED AIR
CAPACITY : 4.3 SCFM (0.113 Nm³/min) @ 100 PSIG (689.5 kPa)
OPERATING PRESSURE : 50 PSIG (344.7 kPa) MIN. / 150 PSIG (1,034 kPa) MAX.
TYPE : HEATLESS REGENERATIVE, TWIN TOWER
DESICCANT : ACTIVATED ALUMINIA
CONNECTION : 1/2" (13 mm) NPT
OUTLET DEWPOINT : -100° F (-73.3° C)
CYCLE TIME : EVERY 4 MINUTES
POWER REQUIREMENT : 120 VAC / 1 PHASE / 60 Hz
ACCESSORIES : INLET AND OUTLET PARTICULATE FILTERS WITH GAUGES
POWER CORD : NON-CONDUIT CONNECTION
QUANTITY : 1 SET
CUSTOMER TAG NO. : DES-O051A (DESICCANT DRYER)
GF-O051A / GF-O051B (PARTICULATE FILTERS)

NOTE:

THE DESICCANT DRYER UNIT TO BE INTEGRALLY MOUNTED ON AIR RECIEVER TANK (TAG NO. PV-O050A).

INSTRUCTION MANUAL

Models 5 through 25 scfm

Contents

1.0 GENERAL INFORMATION	1
2.0 DESCRIPTION	2
3.0 INSTALLATION	3
4.0 OPERATION	5
5.0 MAINTENANCE	7
WARRANTY	8

IMPORTANT READ PRIOR TO STARTING THIS EQUIPMENT

UNPACKING

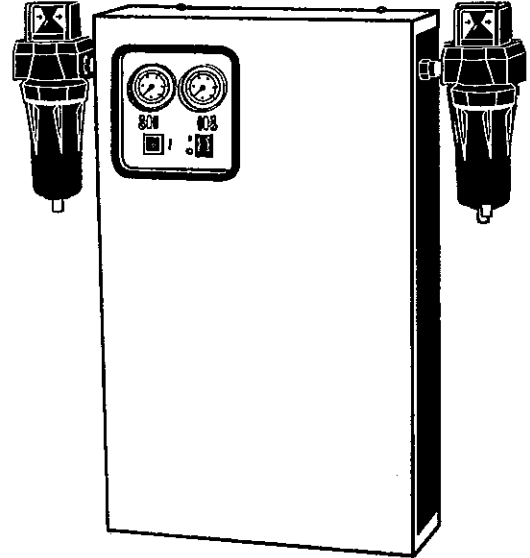
This shipment has been thoroughly checked, packed and inspected before leaving our plant. It was received in good condition by the carrier and was so acknowledged.

- 1) Check for Visible Loss or Damage. If this shipment shows evidence of loss or damage at time of delivery to you, insist that a notation of this loss or damage be made on the delivery receipt by the carrier's agent.
- 2) Check for Concealed Loss or Damage. When a shipment has been delivered to you in apparent good order, but concealed damage is found upon unpacking, notify the carrier immediately and insist on his agent inspecting the shipment. Fifteen days from receipt of shipment is the maximum time limit for requesting such inspection. Concealed damage claims are not our responsibility as our terms are F.O.B. point of shipment.

1.0 General Information

CAUTION

- A. Pressurized devices-
This equipment is a pressure containing device.
 - Do not exceed maximum operating pressure as shown on equipment serial number tag.
 - Make sure equipment is depressurized before working on or disassembling it for servicing.
- B. Electrical-
This equipment requires electricity to operate.
 - Install equipment in compliance with national and local electrical codes.
- C. Breathing air-
 - Air treated by this equipment may not be suitable for breathing without further purification. Refer to OSHA standard 1910.134 for the requirements for breathing quality air.



PRESSURE-

SWING (Heatless)

DESICCANT

COMPRESSED

AIR DRYERS

ENGLISH

ESPAÑOL

FRANÇAIS

2.0 Description

2.1 Function

Dual tower regenerative desiccant dryers are utilized to dry compressed air to dew points below the freezing point of water or reduce the moisture content to low levels for use in critical process applications.

Air is dried by using two identical towers, each containing a desiccant bed. While one tower is on-stream drying the compressed air, the other tower is off-stream being regenerated (reactivated, i.e., dried out).

Desiccant dryers lower the dew point by adsorbing most of the water vapor present onto the surface of the desiccant. Adsorption occurs until an equilibrium is reached between the partial pressure of the water vapor in the air and that on the surface of the desiccant.

Desiccant can then be regenerated by desorbing the water collected on its surface. Regeneration occurs by expanding a portion of the dried air to atmospheric pressure. This very dry air (called purge air) causes the moisture to desorb from the desiccant and then carries the desorbed water out of the dryer.

2.2 Operation

Compressed air enters the dryer and is directed to TOWER I through valve (A) and then exits the dryer through shuttle valve (B). A portion of the dried air is throttled to near atmospheric pressure by means of an orifice (C). This extremely dry, low pressure air flows through and regenerates the desiccant in TOWER II and is then exhausted through purge/repressurization valve (D) and exhaust muffler (E) to atmosphere.

After a set time, the automatic solid state timer closes purge/repressurization valve (D) allowing TOWER II to repressurize slowly.

At the end of 5 minutes (when operating on a 10 minute cycle) or 2 minutes (when operating on a 4 minute cycle), valve (A) shifts and purge/repressurization valve (D) re-opens. The main air flow is now dried by TOWER II while TOWER I is regenerated.

NOTE: On models 5, 10, 15 - optional air-by-pass valve is installed inside cabinet. Make certain that valve is in desired mode (flow thru (dry) or by-pass).

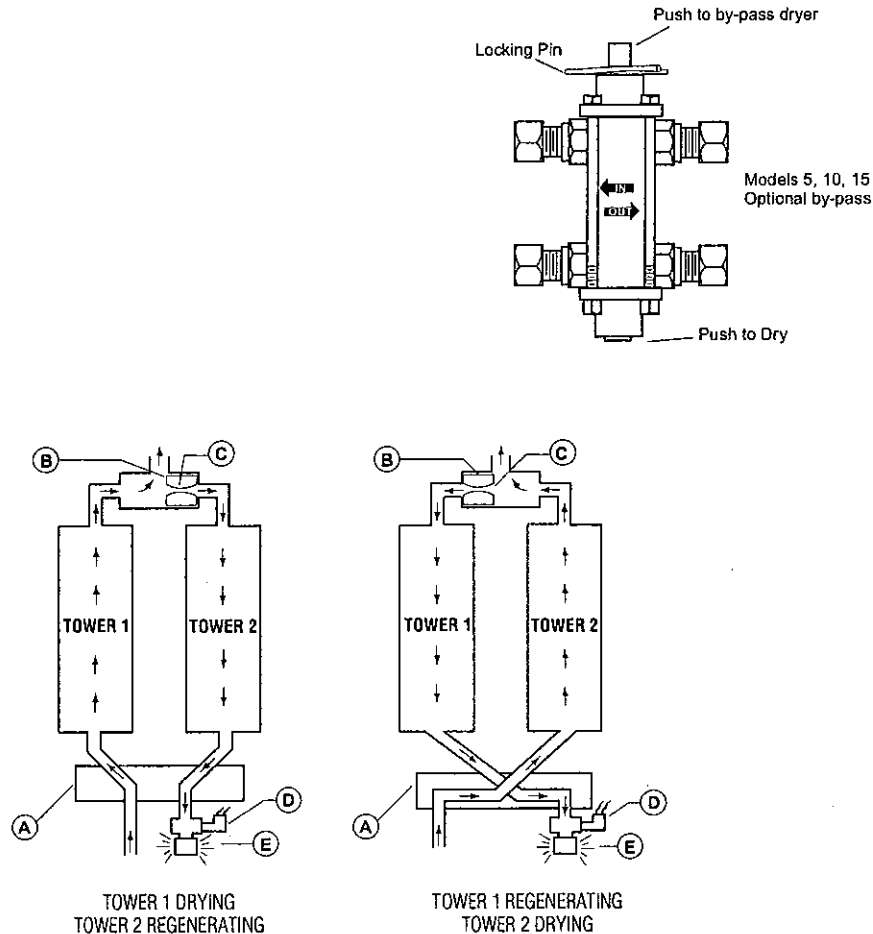
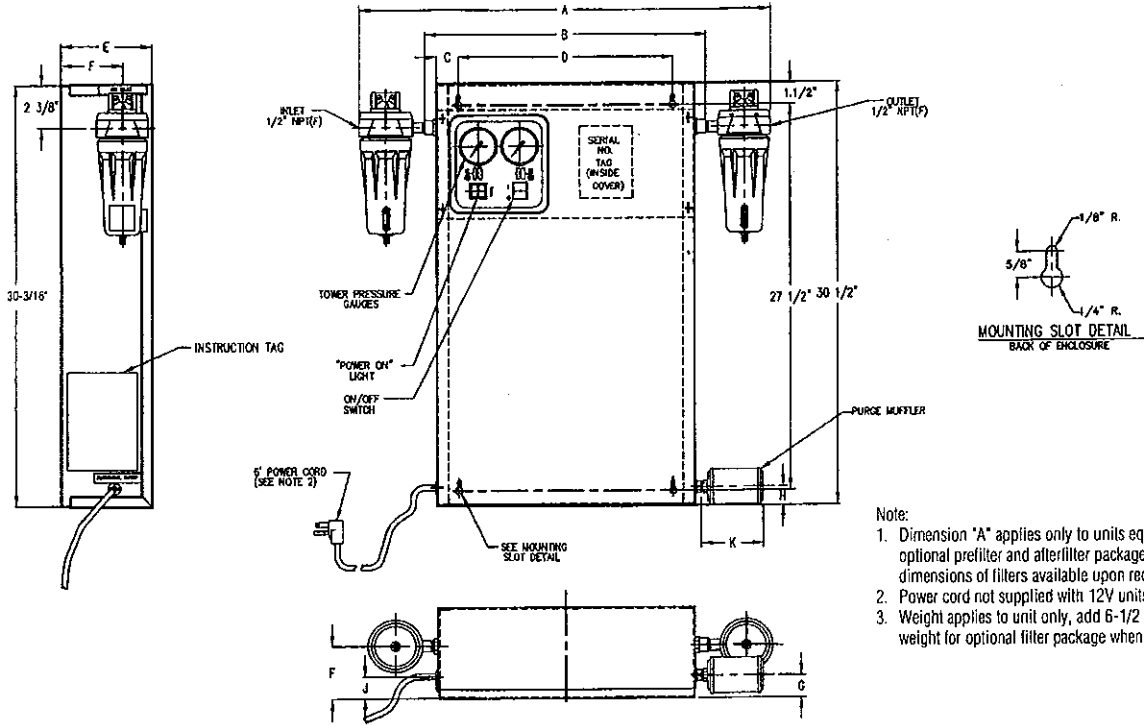


Figure 1 Flow Schematic

3.0 Installation

3.1 Dimensions, Connections, Weight

MODEL NUMBER	DIMENSIONS in (mm)										WEIGHT lb (kg)
	A	B	C	D	E	F	G	H	J	K	
5	30-5/8 (778)	20-1/8 (511)	1-13/16 (46)	15-1/4 (387)	6-11/16 (170)	3-3/4 (95)	1-1/2 (38)	1-1/2 (38)	3-3/4 (95)	3 (76)	82 (37)
10	30-5/8 (778)	20-1/8 (511)	1-13/16 (46)	15-1/4 (387)	6-11/16 (170)	3-3/4 (95)	1-1/2 (38)	1-1/2 (38)	3-3/4 (95)	3 (76)	119 (54)
15	30-5/8 (778)	20-1/8 (511)	1-13/16 (46)	15-1/4 (387)	6-11/16 (170)	3-3/4 (95)	1-1/2 (38)	1-1/2 (38)	3-3/4 (95)	3 (76)	136 (62)
20	36-5/8 (930)	26-1/8 (664)	1-11/16 (43)	21 (533)	8-9/16 (217)	6-3/4 (171)	4-1/4 (108)	1-1/4 (32)	4-1/4 (108)	5 (127)	171 (78)
25	36-5/8 (930)	26-1/8 (664)	1-11/16 (43)	21 (533)	8-9/16 (217)	6-3/4 (171)	4-1/4 (108)	1-1/4 (32)	4-1/4 (108)	5 (127)	196 (89)



- Note:
1. Dimension "A" applies only to units equipped with optional prefilter and afterfilter package. Specific dimensions of filters available upon request.
 2. Power cord not supplied with 12V units.
 3. Weight applies to unit only, add 6-1/2 lbs. (3 kg) to weight for optional filter package when specified.

Figure 2 Dimensional Drawing

3.2 Electrical Specifications

MODEL	WATTS	AMPS	
		HOLDING	INRUSH
5	27.5	0.3	0.5
10	27.5	0.3	0.5
15	27.5	0.3	0.5
20	31.8	0.4	0.8
25	33.0	0.6	1.1

Standard enclosure: NEMA 1

LEGEND

- LT Light
 SST Solid State Timer
 PBS Push Button Switch
 1SOL 4-Way Solenoid Valve
 2SOL 2-Way Solenoid Valve

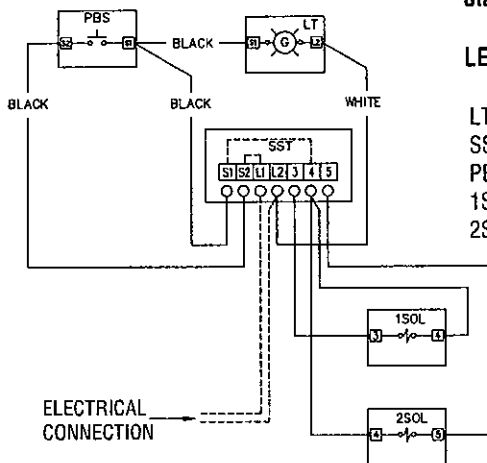
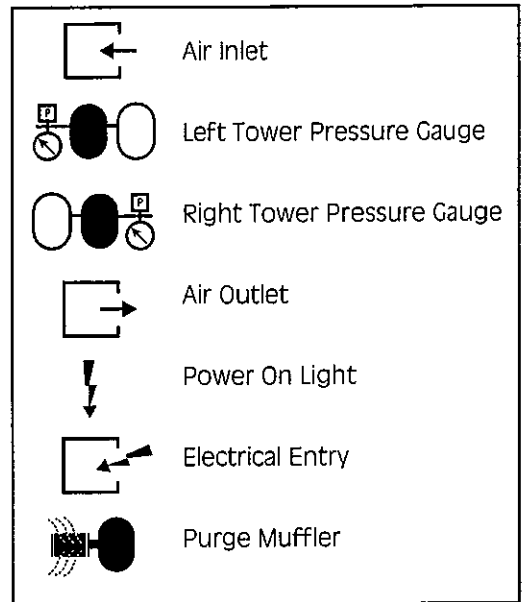


Figure 3 Electrical Hook-up

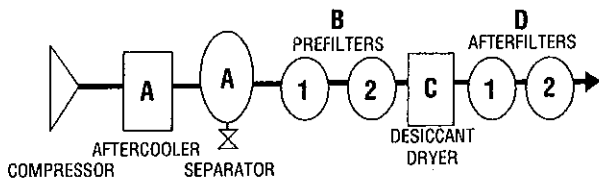


Maximum Operating Pressure:
150 psig, 10.5 kgf/cm²

Maximum Operating Temperature:
120°F, 49°C

ENGLISH

3.3 Dryer Location In a Compressed Air System



NOTE: Air Compressor should be adequately sized to handle air system demands as well as purge loss. Failure to take this into account could result in overloading air compressors and/or insufficient air supply downstream.

NOTE: It is desirable to install dryer where compressed air is at the lowest possible temperature (downstream of aftercoolers) and the highest possible pressure (upstream of pressure reducing valves) without exceeding the maximum working pressure.

A. Aftercooler/separator - Compressed air entering dryer must be cooled to at least 120°F (49°C). Use aftercooler and separator if higher temperatures are present.

NOTE: Installation of a refrigerated dryer ahead of a pressure-swing desiccant dryer does not increase desiccant dryer capacity or reduce purge flow requirements. However, if necessary, a cooling unit can be installed ahead of the desiccant dryer to reduce the inlet air temperature to the dryer, producing a correspondingly lower outlet dew point.

B. Prefilters - Adequate filtration is required upstream of the dryer in order to protect the desiccant bed from contamination. The following filters are recommended:

1. **Air Line Filter** - On compressed air systems utilizing non-lubricated (oil-free) air compressors, use to protect desiccant bed from solid and liquid contamination. On systems with lubricated compressors, if bulk liquid is present, use as a prefilter ahead of the oil aerosol removal filter.
2. **Oil Aerosol Removal Filter** - On systems with lubricated compressors, use to remove oil aerosols and protect desiccant bed from oil contamination.

C. Desiccant dryer

D. Afterfilters - To ensure downstream air purity (prevent desiccant dust from traveling downstream) adequate filtration down-stream of the dryer is required. Depending on the degree of purity you require from your compressed air system, the following filters are recommended:

1. **Air Line Filter** - Use as an afterfilter to remove desiccant fines and protect downstream components from solid particles 1 micron and larger. Filters for finer solid particle filtration are available.
2. **Oil Vapor Adsorber** - Use as an afterfilter to remove oil vapor and its subsequent taste and odor and to protect downstream components from solid particles 0.01 micron and larger.

NOTE: By-pass lines and isolation valves are recommended so that maintenance work can be performed without shutting off the air supply.

IMPORTANT: The compressed air supply inlet should be periodically checked to ensure that equipment design specifications are not exceeded. Normally the compressor installation includes intercoolers, aftercoolers, separators, receivers, or similar equipment which adequately pretreat the compressed air supply in order to avoid excessively high air temperatures and liquid slugging of down-stream equipment.

3.4. Pre and Afterfilter Installation

If supplied, install Prefilter and Afterfilter
NOTE: When installing, hold bulkhead fitting on dryer with wrench and thread filter on by hand.

- a. Install prefilter (HF5-16-4) ahead (upstream) of dryer. Use nipple supplied to connect filter to inlet port of dryer.
- b. Install afterfilter (HF7-16-4) downstream of dryer. Use nipple supplied to connect filter to outlet port of dryer.

NOTE: Observe arrows on differential pressure gauge to ensure proper flow direction through filter.

3.5 Wall-mounting

Four holes are provided in the rear of cabinet. Attach cabinet to wall using four (4): #14 round head wood screws; or #14 round or pan head machine screws; or #14 pan head self-tapping or sheet metal screws; or 1/4" round or pan head machine screws.

3.6 Piping

Connect air line from compressor to inlet of prefilter or dryer. Connect downstream air line to outlet of afterfilter or dryer.

3.7 Electrical connection

Check to see that power supply to dryer is the same as the power requirements indicated on the identification label. Install plug into receptacle of proper voltage or hardwire to pigtailed and ground screw inside cabinet.

3.8 Muffler Installation

Install muffler (shipped separately inside of cabinet) to fitting on side of cabinet.

3.9 Initial desiccant charge

The dryer is shipped complete with desiccant and ready to operate after piping and electrical connections are made.

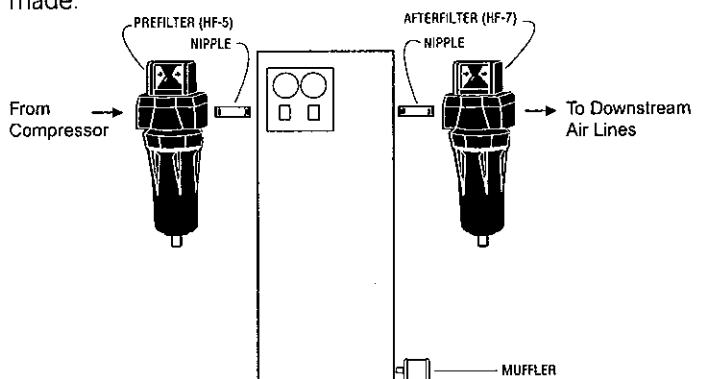


Figure 4

4.0 Operation

4.1 Start-up

- A. During the initial start-up, slowly pressurize dryer to full line pressure and check entire system for leaks. Depressurize and correct any leaks.
- B. Timer Board Setting - With the dryer de-energized, (Power-on light extinguished) verify position of the Cycle Time Jumpers. The jumpers are located on the timer board in the cabinet. Refer to Figure 5.
 1. Cycle Time Jumper - Determine the cycle time necessary to produce the desired dew point and set two jumpers as follows:
 - a. For a 10 Minute Cycle Position jumpers on terminals per Figure 5a.
 - b. For a 4 Minute Cycle Position jumpers on terminals per Figure 5b.
- C. Slowly pressurize the dryer.
- D. Energize the Dryer On-Off switch located on the enclosure door (Power-on light should illuminate).

NOTE: If dryer is installed with either internally or externally mounted air by-pass valve, make certain that by-pass valve is closed to prevent untreated air from flowing downstream.

TABLE 1

MODEL	CYCLE TIME	INLET FLOW (1)		PURGE FLOW (2)			
		scfm	m ³ /min	Average Purge Flow		Maximum Purge Flow	
				scfm	m ³ /min	scfm	m ³ /min
5	10	5	0.14	1.0	0.03	1.1	0.03
10	MINUTE	10	0.29	2.0	0.06	2.2	0.06
15	(-40°C	15	0.43	3.0	0.09	3.3	0.09
20	-40°F	20	0.57	4.0	0.11	4.4	0.13
25	PDP)	25	0.72	5.0	0.14	5.5	0.16
5	4	4.3	0.12	0.8	0.02	1.1	0.03
10	MINUTE	8.5	0.24	1.7	0.05	2.2	0.06
15	(-73°C	13	0.37	2.6	0.07	3.3	0.09
20	-100°F	17	0.49	3.4	0.10	4.4	0.13
25	PDP)	21	0.60	4.4	0.13	5.5	0.16

1. Inlet flows are established in accordance with CAGI (Compressed Air and Gas Institute) standard ADF-200, Dual Stage Regenerative Desiccant Compressed Air Dryers - Methods for Testing and Rating. Conditions for rating dryers are: inlet pressure - 100 psig (7 kgf/cm²); inlet temperature - saturated at 100°F (38°C).
2. Average Purge Flow is the total amount of air used to purge and repressurize off-stream towers averaged over the cycle time. Maximum Purge Flow is the flow rate through the off-stream tower during that portion of the cycle the purge/repressurization valve is open.

TABLE 2 Capacity Correction Factor for various inlet pressures

Inlet Pressure	psig	50	60	70	80	90	100	110	120	130	140	150
		kgf/cm ²	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.5
Multiplier		0.31	0.42	0.54	0.73	0.83	1.00	1.09	1.17	1.26	1.35	1.44

TABLE 3 Purge Flow Correction Factor for various inlet pressures

Inlet Pressure	psig	50	60	70	80	90	100	110	120	130	140	150
		kgf/cm ²	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.5
Multiplier		0.55	0.64	0.73	0.82	0.91	1.00	1.09	1.17	1.26	1.35	1.44

TABLE 4 Outlet pressure dew points at various inlet temperatures

INLET TEMP. °F (°C)	35 (1.7)	40 (4.4)	50 (10.1)	60 (15.6)	70 (21.1)	80 (26.7)	90 (32.2)	100 (37.8)	110 (43.3)	120 (48.9)
OUTLET P.D.P. °F 10 MIN CYCLE (°C)	-75 (-59.4)	-70 (-56.7)	-65 (-53.9)	-60 (-51.1)	-55 (-48.3)	-50 (-45.6)	-45 (-42.8)	-40 (-40.0)	-35 (-37.2)	-30 (-34.4)
OUTLET P.D.P. °F 4 MIN CYCLE (°C)	-149 (-100.6)	-145 (-98.3)	-138 (-94.4)	-130 (-90.0)	-122 (-85.6)	-115 (-81.7)	-108 (-77.8)	-100 (-73.3)	-92 (-68.9)	-85 (-65.0)

TABLE 5 Outlet pressure dew points at Moisture Indicator color change

INLET TEMP. °F (°C)	35 (1.7)	40 (4.4)	50 (10.1)	60 (15.6)	70 (21.1)	80 (26.7)	90 (32.2)	100 (37.8)	110 (43.3)	120 (48.9)
OUTLET P.D.P. °F (°C)	-34 (-36.7)	-28 (-33.4)	-22 (-30.0)	-16 (-26.7)	-10 (-23.4)	-4 (-20.0)	3 (-16.1)	9 (-12.8)	15 (-9.5)	21 (-6.1)

4.2 Inlet, Purge, and Outlet Flows @ 100 psig (7 kgf/cm²)

A. Inlet Flows

1. Maximum Inlet Flow at Rated Conditions
For maximum inlet flow at rated conditions refer to Table 1.
2. Maximum inlet flow at various pressures
To determine maximum inlet flow at inlet pressures other than 100 psig (7kgf/cm²), multiply inlet flow from Table 1 by multiplier from Table 2 that corresponds to system pressure at inlet of dryer.

B. Purge Flow

- For maximum and average purge flows at 100 psig (7 kgf/cm²) refer to Table 1.
1. Maximum Purge Flow
Maximum Purge Flow (MFP) is the amount of purge flowing through the off-stream tower when the purge/repressurization valve is open. After the purge/repressurization valve closes, the purge flow will gradually decrease as the off-stream tower repressurizes to line pressure. Refer to Table 1 for Maximum Purge Flows at 100 psig (7kgf/cm²). Use column corresponding to the dryer cycle time setting (4 or 10 minutes).

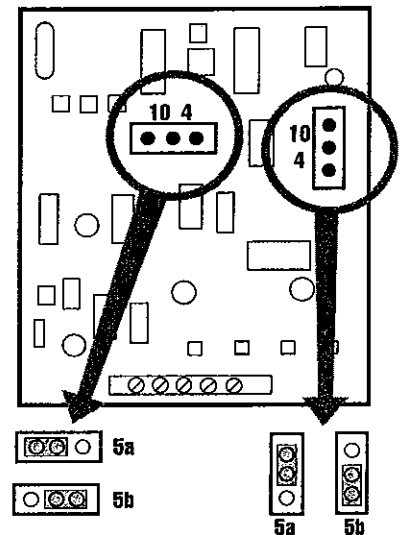


Figure 5

2. Average Purge Flow

The Average Purge Flow (APF) is the actual amount of flow averaged over the entire purge/repressurization cycle. It includes the maximum purge flow (MFP) for a set amount of the purge/repressurization time and the volume of air used for repressurization. Refer to Table 1 for Average Purge Flows at 100 psig. Use column corresponding to the dryer cycle time setting (4 or 10 minutes).

3. Purge flows at pressures other than 100 psig
To determine Maximum or Average Purge Flow at inlet pressures other than 100 psig, multiply purge flow at 100 psig from Table 1 by the multiplier from Table 3 that corresponds to system pressure at inlet to dryer.

C. Outlet Air Flow

1. Minimum Outlet Flow

Determine minimum outlet flow available from dryer by subtracting Maximum Purge Flow from inlet flow to dryer.

NOTE: Air compressor should be adequately sized to handle air system demands as well as purge loss. Failure to do so could result in overloading air compressors and/or insufficient air supply downstream.

2. Average Outlet Flow

Determine average outlet flow available by subtracting Average Purge Flow from inlet flow to dryer.

NOTE: Average outlet flow may be used to determine available downstream air supply if a storage vessel (receiver tank) of sufficient volume is available between dryer and point of air usage. Otherwise use 3.2.3.1 To compute downstream air available.

EXAMPLE:

Find maximum inlet flow, maximum and average purge flows, and minimum and average outlet flows for a 10 scfm unit operated at 120 psig on a 10 minute cycle. Dryer will operate with an inlet air flow of 11 scfm.

- Step 1: Find Maximum Inlet Flow by multiplying Maximum Inlet Flow at Rated Conditions from Table 1 by Inlet Pressure Correction Factor from Table 2: $10 \times 1.17 = 11.7$ scfm.
- Step 2: Find Maximum Purge Flow by multiplying Maximum Purge Flow at 100 psig from Table 1 by Purge Flow Correction Factor from Table 3: $2.2 \times 1.17 = 2.6$ scfm, the maximum purge flow.
- Step 3: Find Average Purge Flow by multiplying Average Purge Flow at 100 psig from Table 1 by Purge Flow Correction Factor from Table 3: $2.0 \times 1.17 = 2.3$ scfm, the average purge flow.
- Step 4: Find Minimum Outlet Flow available by subtracting Maximum Purge Flow (Step 2) from inlet flow of 11 scfm: $11 - 2.6 = 8.4$ scfm.
- Step 5: Find Average Outlet Flow available by subtracting Average Purge Flow (Step 3) from inlet flow of 11 scfm: $11 - 2.3 = 8.7$ scfm.

4.3 Operating Conditions

- A. Maximum Working Pressure: 150 psig (10.5 kgf/cm²)
- B. Minimum Working Pressure: 50 psig (3.5 kgf/cm²)
It is recommended that the air dryer be operated at the highest available pressure not exceeding the maximum working pressure since the dryer capacity increases and % of purge air decreases at higher pressures.
- C. Maximum Operating Temperature: 120°F (49°C)
- D. Outlet Pressure Dew Points
Outlet pressure dew points at various inlet compressed air temperatures: The outlet pressure dew point is determined by the compressed air temperature at the inlet to the dryer and cycle time. Use Table 4 to determine outlet dew points at corresponding inlet compressed air temperatures.

4.4 Operational Check Points

- A. Check periodically that there is power to the unit - Power on light is on.
- B. Periodically check tower pressure gauges to verify that valves are operating and sequencing correctly. Tower pressure gauge of tower on line should read line pressure. Tower pressure gauge of tower off line should read below 2 psig (0.14 kgf/cm²) while tower is purging.
- C. If unit is equipped with optional moisture indicator check every four hours. Outlet relative humidity of the desiccant dryer is indicated by the color change humidity indicator. Green indicates R.H. below 3% and yellow indicates R.H. above 3%. Table 5 indicates outlet dew point when moisture indicator changes from green to yellow at various inlet temperatures. During startup the indicator may be yellow, however, it should begin to change to green within 4 hours.
- D. If supplied with optional prefilter/afterfilter. Check that indicators are in green area. If indicator is in red area element replacement is necessary.

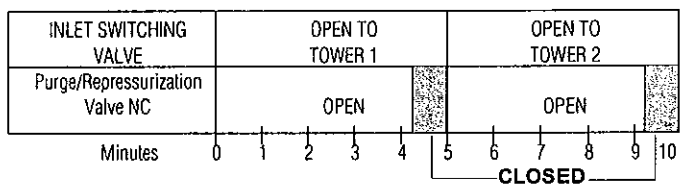
4.5 Dryer Shutdown

To shut down the dryer, de-energize using the on-off switch (Power-on light extinguished). Unit will remain pressurized.

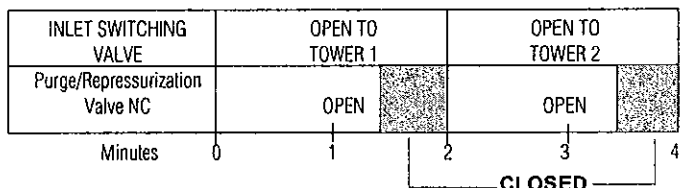
4.6 Depressurization

- To depressurize unit
- A. Open by-pass valve (if one is installed) and close inlet and outlet valves.
- B. Run timer through a tower change cycle until pressure gauges on both towers read 0 psig (0 kgf/cm²).

10 MINUTE CYCLE



4 MINUTE CYCLE



5.0 Maintenance

CAUTION: The heatless desiccant dryer is a pressure containing device. Depressurize before servicing. (See section 4.6.)

5.1 Desiccant Replacement

IMPORTANT: The use of the correct replacement desiccant is necessary for proper drying operation. Never use hygroscopic salts of the type commonly used in "deliquescent" type dryers.

A. Frequency of Desiccant Replacement - Desiccant should be replaced whenever the required dew point cannot be maintained while the dryer is being operated within its design conditions and there are no mechanical malfunctions.

NOTE: Desiccant life is determined by the quality of the inlet air. Proper filtering of the inlet air will extend the life of the desiccant.

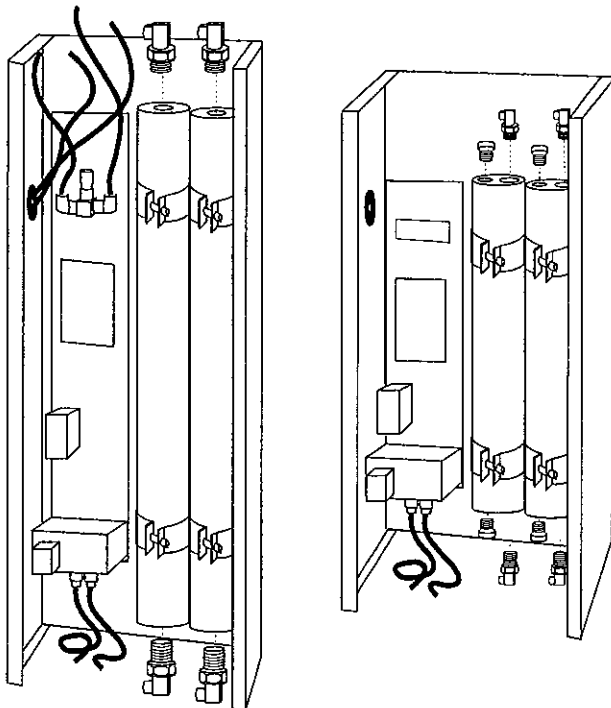
B. Procedure for Desiccant Replacement

1. Depressurize and de-energize the dryer.
2. Remove front panel from cabinet.
3. Remove spent desiccant:

NOTE: Be prepared to catch the desiccant being removed in a container. Desiccant will readily pour out when drain port is opened.

5 and 10 scfm units - Remove tubing from top and bottom of desiccant towers and unscrew strainer assemblies.

15, 20 and 25 scfm units - Remove fill ports from top of desiccant towers and drain ports from bottom of desiccant towers.



MODELS 5 & 10

MODELS 15, 20, & 25

4. Allow the spent desiccant to drain from the towers.
5. Replace bottom strainer assemblies (5 and 10 scfm units) or bottom drain plugs (15, 20 & 25 scfm units) using teflon tape sealant or equivalent.
6. Fill the desiccant drying towers as full as possible with dry desiccant.
7. Replace top strainer assemblies (5 and 10 scfm units) or top drain plugs (15, 20 & 25 scfm units) using teflon tape sealant or equivalent.
8. 5 & 10 scfm units - Reinstall tubing to top and bottom of desiccant towers.

C. Ensuring Desiccant Dryness

1. Replacement desiccant is shipped in air tight containers. Keep containers closed until use to avoid moisture contamination. If desiccant is exposed to air it can be heated in an oven at 400°F for four hours before use, or the next procedure can be used.
2. If the dryer is not refilled with dry desiccant, it will be necessary to operate the dryer on 100% purge for approximately twenty-four hours to dry the desiccant.

Amount of desiccant required for complete change

MODEL	DESICCANT REQUIRED	
	lb	(kg)
5	7	(3)
10	15	(7)
15	22	(10)
20	28	(13)
25	39	(18)

5.2 Prefilter/Afterfilter Maintenance

A. Element Replacement

1. For maximum filtration efficiency, replace element when pressure drop reaches 10 psi (0.7 kgf/cm²) (indicator in red area) or annually, whichever occurs first.
2. Procedure

WARNING: THIS FILTER IS A PRESSURE CONTAINING DEVICE. DEPRESSURIZE BEFORE SERVICING. If filter has not been depressurized before disassembly, an audible alarm will sound when the bowl begins to be removed from the head. If this occurs, stop disassembly, isolate and completely depressurize filter before proceeding.

1. Isolate filter (close inlet and outlet valves if installed) or shut off air supply.
2. Depressurize filter by slowly opening manual drain valve.
3. Remove bowl by pushing bowl up, turning bowl 1/8th turn to your left, and pulling bowl straight down.
4. Clean filter bowl.

5. Replace element.
 - a. Pull off old element and discard.
 - b. Make certain o-ring inside top of replacement element is in place and push element onto filter head.

NOTE: Prefilter - Do not handle element by outside foam cover. Handle by bottom end cap only.

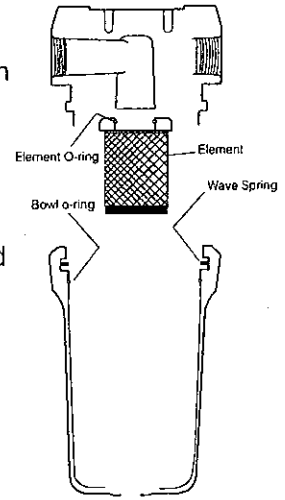
6. After making certain that o-ring and wave spring inside top of bowl are in place, reassemble bowl to head.

NOTE: Make certain o-ring is generously lubricated.

NOTE: Wave spring ends should be pointed down to prevent the wave spring from interfering with reassembly.

B. Auto Drain Mechanism Replacement

Prefilter only: It is recommended that drain mechanism be replaced annually.



5.3 Repair Parts

PART	MODEL				
	5	10	15	20	25
PRESSURE GAUGE	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1
STRAINER (BOTTOM)	4130.698.13	4130.698.13	4130.698.13	4130.698.6	4130.698.6
STRAINER (TOP)	33.7420-01	33.7420-01	33.7420-01	4130.698.6	4130.698.6
MUFFLER	3442.516.1	3442.516.1	3442.516.1	3442.516.2	3442.516.2
SHUTTLE VALVE	4820.715.1-1	4820.715.3	4820.715.4	4820.715.5	4820.715.6
SWITCH (ON/OFF)	6110.706.3	6110.706.3	6110.706.3	6110.706.3	6110.706.3
TIMER 115V	5945.690.17	5945.690.17	5945.690.17	5945.690.17	5945.690.17
230V	5945.690.21	5945.690.21	5945.690.21	5945.690.21	5945.690.21
LIGHT (POWER ON) 115V	6350.457.3	6350.457.3	6350.457.3	6350.457.3	6350.457.3
230V	6350.457.8	6350.457.8	6350.457.8	6350.457.8	6350.457.8
P/R VALVE 115V	4810.741.7	4810.741.7	4810.741.7	4810.741.7	4810.741.7
230V	4810.741.10	4810.741.10	4810.741.10	4810.741.10	4810.741.10
REPAIR KIT (P/R VALVE)	4810.442.1	4810.442.1	4810.442.1	4810.442.1	4810.442.1
COIL (P/R VALVE) 115V	4810.130.1	4810.130.1	4810.130.1	4810.130.1	4810.130.1
230V	4810.130.8	4810.130.8	4810.130.8	4810.130.8	4810.130.8
SWITCHING VALVE 115V	4810.748.1	4810.748.1	4810.748.1	4810.748.2	4810.748.2
230V	4810.748.3	4810.748.3	4810.748.3	4810.748.4	4810.748.4
REPAIR KIT (SWITCHING VALVE)	4810.448.1	4810.448.1	4810.448.1	4810.448.2	4810.448.2
REPLACEMENT ELEMENT - PREFILTER (HF5-16)	E5-16	E5-16	E5-16	E5-16	E5-16
REPLACEMENT ELEMENT - AFTERFILTER (HF7-16)	E7-16	E7-16	E7-16	E7-16	E7-16
REPLACEMENT DRAIN - PREFILTER	05.1881-01	05.1881-01	05.1881-01	05.1881-01	05.1881-01

WARRANTY

The manufacturer warrants the product manufactured by it, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, to be free from defects in material or workmanship for a period of one (1) year from the date of shipment to the buyer by the manufacturer or manufacturer's authorized distributor, or eighteen months from the date of shipment from the factory, whichever occurs first, provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period. The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident.

The warranty covers parts and labor for the warranty period. Repair or replacement shall be made at the factory or the installation site, at the sole option of the manufacturer. Any service performed on the product by anyone other than the manufacturer must first be authorized by the manufacturer. Normal maintenance items requiring routine replacement are not warranted. Unauthorized service voids the warranty and any resulting charge or subsequent claim will not be paid. Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product. The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSED IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN. THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

The manufacturer does not warrant any product, part, material, component, or accessory manufactured by others and sold or supplied in connection with the sale of manufacturer's products.

01/01/93

AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.

SPX HANKISON

Canonsburg, PA 15317-1700 U.S.A.
Tel 724-745-1555 Fax 724-745-6040
hankison.service@airtreatment.spox.com



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

PRESSURE REGULATOR

MANUFACTURER : DAYTON
MODEL : 4ZM20
SERVICE : CLEAN DRY COMPRESSED AIR
MAXIMUM FLOW RATE : 60 CFM (1.70 m³/min)
MAXIMUM PRESSURE : 300 PSIG (2.07 MPa)
MAXIMUM TEMP. : 175° F (79.4° C)
ADJUSTMENT RANGE : 5 ~ 150 PSIG (34.5 ~ 1,034 kPa)
GAUGE PORT : FULL FLOW
CONNECTION : 1/2" (13 mm) NPT
QUANTITY : 1

CUSTOMER TAG NO. : PRV-0051A

Air Pressure Regulator

Regulator allows precise adjustment of compressed air pressures. Balanced valve design for accurate pressure control. Pull to adjust/press to lock adjustment knob. Two full-flow gauge ports. T-handle adjustment is optional. Manifold regulators provide multiple pressures from a common inlet.

Manufacturer : Dayton

Model No. : 4ZM20

Connection : ½" NPT

Maximum Flow Rate : 60 CFM

Maximum Pressure : 300 PSI

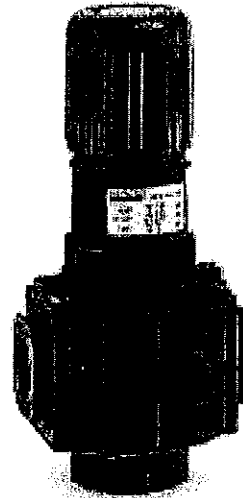
Maximum Temperature : 175 Deg. F

Adjustment Range : 5 - 150 PSI

Gauge Port : Full Flow

Bowl/Adjustment Knob Type Non Rising Knob

Height : 5.34 Inches, Width : 2.68 Inches





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

PRESSURE INDICATOR

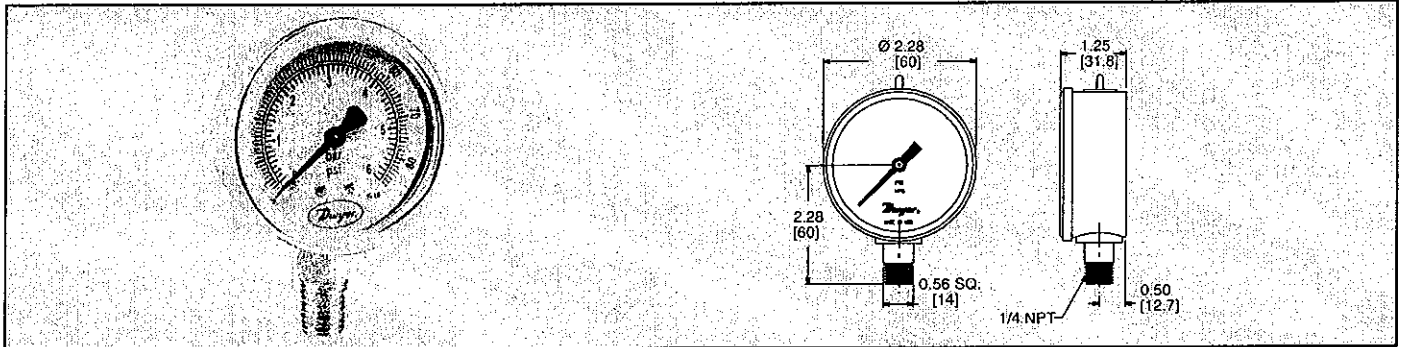
MANUFACTURER	:	DWYER
MODEL NO.	:	64060
SERVICE	:	CLEAN DRY COMPRESSED AIR
ACCURACY	:	± 1.6 % FULL SCALE
RANGE	:	0 ~ 60 PSIG (0 ~ 400 kPa)
WETTED MATERIAL	:	TYPE 316 S.S.
HOUSING MATERIAL	:	TYPE 304 S.S.
FILL SOLUTION	:	GLYCERIN
CONNECTION	:	1/4" (6.35 mm) NPT
QUANTITY	:	1
CUSTOMER TAG NO.	:	PI-0051A



Series
64000

2.5" Stainless Steel Pressure Gage

316 SS Wetted Parts, Glycerin Filled



Pressure spikes, vibration, and pulsation are overcome with the Series 64000 Liquid Filled Stainless Steel Pressure Gage. The unit's glycerin fill provides superior performance for many mechanical applications. All internal parts are constructed of 316 SS for greater chemical compatibility. The 2.5" (63 mm) diameter gage features $\pm 1.6\%$ accuracy and is housed in a 304 SS case.

MODELS

Model Number	Ranges
64030V	0 to 30" Hg Vac (0 to -100 kPa)
64015	0 to 15 psi (0 to 100 kPa)
64030	0 to 30 psi (0 to 200 kPa)
64060	0 to 60 psi (0 to 400 kPa)
64100	0 to 100 psi (0 to 700 kPa)
64160	0 to 160 psi (0 to 1100 kPa)
64200	0 to 200 psi (0 to 1400 kPa)
64300	0 to 300 psi (0 to 2000 kPa)

SPECIFICATIONS

Service: Compatible liquids or gases.

Wetted Materials: 316 SS.

Fill Solution: Glycerin.

Housing: 304 SS.

Accuracy: $\pm 1.6\%$ full scale.

Pressure Limit: 130% x full scale.

Temperature Limit:

Ambient: -13 to 150°F (-25 to 65°C);

Process: 60 to 150°F (15 to 65°C).

Size: 2-1/2" (63 mm) diameter.

Process Connection: 1/4" male NPT.

Enclosure Rating: NEMA 3 (IP55).

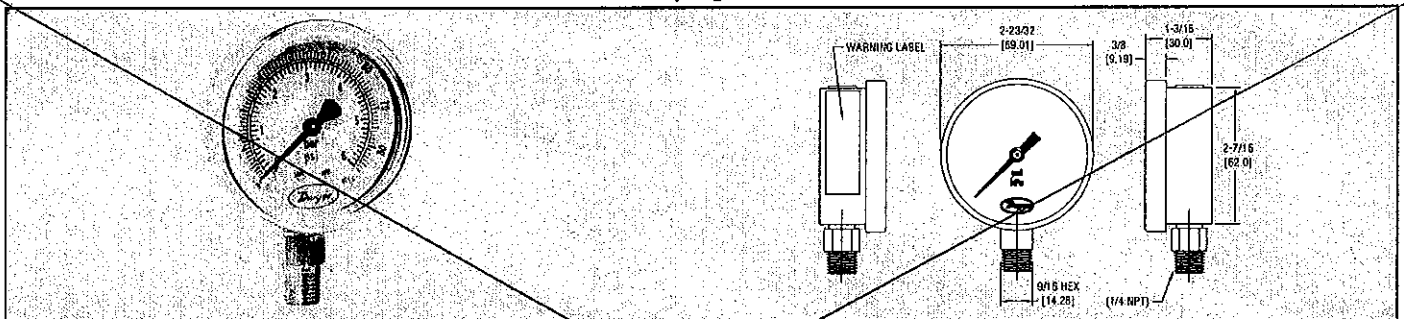
Weight: 9 oz (255 g).



Series
63000M

2.5" Stainless Steel Pressure Gage

Brass Wetted Parts, Glycerin Filled



The Series 63000M Liquid Filled Pressure Gages provide superior performance in applications where vibration, pulsation, mechanical shock and pressure spikes are common. The Series 63000M gages have dual English/metric scales with $\pm 1.6\%$ full scale accuracy and are available in 2.5" dial sizes. Units are designed with 304 SS housings and brass wetted parts. These gages can withstand ambient temperatures up to 140°F (60°C) and process temperatures up to 149°F (65°C).

MODELS

Model Number	Ranges
63030VM	0 to 30 in. Hg Vac (0 to -100 kPa)
63015M	0 to 15 psi (0 to 100 kPa)
63030M	0 to 30 psi (0 to 200 kPa)
63060M	0 to 60 psi (0 to 400 kPa)
63100M	0 to 100 psi (0 to 700 kPa)
63200M	0 to 200 psi (0 to 1400 kPa)
63300M	0 to 300 psi (0 to 2000 kPa)

SPECIFICATIONS

Service: Compatible gases and liquids.

Wetted Materials: Brass.

Housing: 304 SS.

Fill Solution: Glycerin.

Accuracy: $\pm 1.6\%$ full scale.

Pressure Limits: 130% of full scale.

Temperature Limits:

Ambient: -4 to 140°F (-20 to 60°C);

Process: 149°F max. (65°C max.).

Size: 2-1/2" (63 mm).

Process Connection: 1/4" male NPT.

Enclosure Rating: NEMA 3 (IP55).

Weight: 8.6 oz (245 g).



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

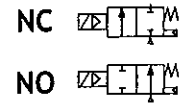
SOLENOID VALVE

MANUFACTURER : ASCO
MODEL : 8210G87V-120VAC
SERVICE : CLEAN DRY COMPRESSED AIR
CONNECTION : 1/2" (13 mm) NPT
MATERIAL OF CONSTRUCTION
 BODY : STAINLESS STEEL
 SEAL : PTFE
POWER REQUIRED : 115 VAC / 1 PHASE / 60 Hz
QUANTITY : 1

CUSTOMER TAG NO. : FV-0051A



Pilot Operated
General Service Solenoid Valves
 Brass or Stainless Steel Bodies
 3/8" to 2 1/2" NPT



2/2
 SERIES
8210

Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage.
- High Flow Valves for liquid, corrosive, and air/inert gas service.
- Industrial applications include:
 - Car wash
 - Laundry equipment
 - Air compressors
 - Industrial water control
 - Pumps

Construction

Valve Parts in Contact with Fluids		
Body	Brass	304 Stainless Steel
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

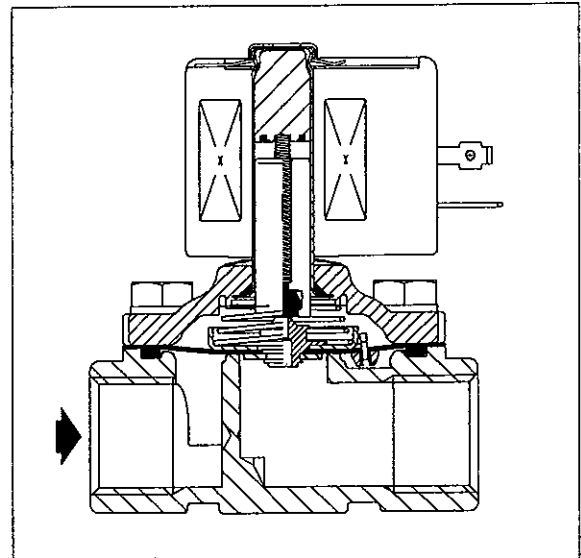
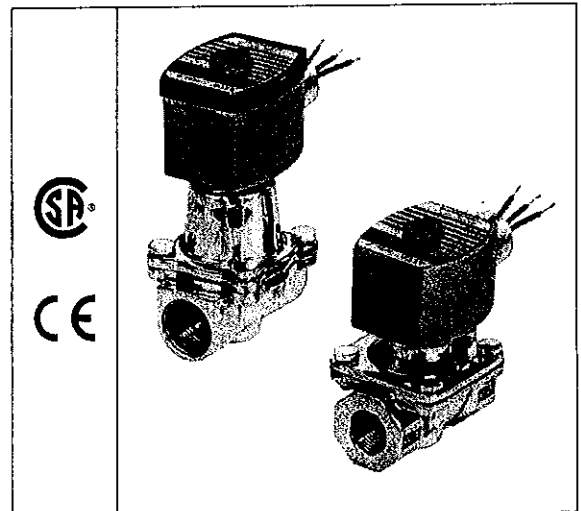
Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	99257	-	99257	-
F	-	20.1	48	240	272610	-	272614	-
H	30.6	-	-	-	-	74073	-	74073
F	40.6	-	-	-	-	238910	-	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz).
 6, 12, 24, 120, 240 volts DC. Must be specified when ordering. Other voltages available when required.

Solenoid Enclosures

Standard: Red-Hat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; Red-Hat - Type I.
Optional: Red-Hat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9.
 (To order, add prefix "EF" to catalog number, except Catalog Numbers 8210B57, 8210B58, and 8210B59. Valves not available with Explosionproof enclosures.)
 See *Optional Features* Section for other available options.



Nominal Ambient Temperature Ranges:

- Red-Hat II/ Red-Hat AC: 32°F to 125°F (0°C to 52°C)
- Red-Hat II DC: 32°F to 104°F (0°C to 40°C)
- Red-Hat DC: 32°F to 77°F (0°C to 25°C)
 (104°F/40°C occasionally)

Refer to *Engineering Section* for details.

Approvals:

CSA certified. Red-Hat II meets applicable CE directives.
 Refer to *Engineering Section* for details.

Specifications (English units)

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Operating Pressure Differential (psi)							Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/Class of Coil Insulation ②		
			Max. AC			Max. DC				AC	DC	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	AC	DC	
			Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	Min.											Max.	Max.
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ③ Seating																				
3/8	3/8	1.5	0	150	125	-	40	40	-	180	150	8210G73 ③	1P	●	8210G36 ③	1P	●	6.1/F	11.6/F	
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G93	5D	○	-	-	-	10.1/F	11.6/F	
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G1	6D	○	-	-	-	6.1/F	11.6/F	
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G6	5D	○	-	-	-	17.1/F	-	
1/2	7/16	2.2	0	150	125	-	40	40	-	180	150	8210G15 ③	2P	●	8210G37 ③	2P	●	6.1/F	11.6/F	
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G94	5D	○	-	-	-	10.1/F	11.6/F	
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G87	7D	●	17.1/F	11.6/F	
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G2	6D	○	-	-	-	6.1/F	11.6/F	
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G7	5D	○	-	-	-	17.1/F	-	
1/2	5/8	4	5	300	300	-	300	300	-	180	125	8210G227	5D	○	-	-	-	17.1/F	40.6/H	
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G88	7D	●	17.1/F	11.6/F	
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G9	9D	○	-	-	-	6.1/F	11.6/F	
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G95	8D	○	-	-	-	10.1/F	11.6/F	
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G3	11D	○	-	-	-	6.1/F	11.6/F	
3/4	3/4	6	0	-	-	-	200	180	180	-	77	8210B26 ② ‡	10P	-	-	-	-	-	30.6/H	
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G26 ② ‡	40P	●	-	-	-	16.1/F	-	
1	1	13	0	-	-	-	100	100	80	-	77	8210B54 ‡	31D	-	-	8210D89	15D	-	30.6/H	
1	1	13	0	150	125	125	-	-	-	180	-	8210G54	41D	●	-	8210G89	45D	●	16.1/F	-
1	1	13	5	150	150	100	125	125	125	180	150	8210G4	12D	○	-	-	-	6.1/F	11.6/F	
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G27 ‡	42P	●	-	-	-	20.1/F	-	
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G78 ②	13P	-	-	-	-	17.1/F	-	
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B55 ‡	32D	-	-	-	-	-	30.6/H	
1 1/4	1 1/8	15	0	150	125	125	-	-	-	180	-	8210G55	43D	●	-	-	-	16.1/F	-	
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G8	16D	○	-	-	-	6.1/F	11.6/F	
1 1/2	1 1/4	22.5	0	-	-	-	100	100	80	-	77	8210B56 ‡	33D	-	-	-	-	-	30.6/H	
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210G56 ‡	44D	●	-	-	-	16.1/F	-	
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G22	18D	●	-	-	-	6.1/F	11.6/F	
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	-	-	-	6.1/F	11.6/F	
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	●	-	-	-	6.1/F	11.6/F	
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																				
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G33	23D	●	-	-	-	10.1/F	11.6/F	
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G11 ③ ④	39D	●	-	-	-	10.1/F	11.6/F	
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G34	23D	●	-	-	-	10.1/F	11.6/F	
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G30	37D	●	10.1/F	11.6/F	
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G12 ③ ④	39D	●	-	-	-	10.1/F	11.6/F	
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G35	25D	●	-	-	-	10.1/F	11.6/F	
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G38	38D	●	10.1/F	11.6/F	
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C13	24D	●	-	-	-	-	16.8/F	
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G13	46D	●	-	-	-	16.1/F	-	
1	1	13	0	125	125	125	-	-	-	180	-	8210B57 ⑥ ⑦	34D	●	-	-	-	20/F	-	
1	1	13	5	-	-	-	125	125	125	-	180	8210D14	26D	●	-	-	-	-	16.8/F	
1	1	13	5	150	150	125	-	-	-	180	-	8210G14	47D	●	-	-	-	16.1/F	-	
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B58 ⑥ ⑦	35D	●	-	-	-	20/F	-	
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D18	28D	●	-	-	-	-	16.8/F	
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G18	48D	●	-	-	-	16.1/F	-	
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B59 ⑥ ⑦	36D	●	-	-	-	20/F	-	
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D32	29D	●	-	-	-	-	16.8/F	
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G32	49D	●	-	-	-	16.1/F	-	
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210I03	30P	●	-	-	-	-	16.8/F	
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	-	-	-	16.1/F	-	
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210I04	27P	●	-	-	-	-	16.8/F	
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/F	-	
Notes: ① 5 psi on Air; 1 psi on Water. ② Valve provided with PTFE main disc. ③ Valve includes UItem (G.E. trademark) piston. ④ Letter "D" denotes diaphragm construction; "P" denotes piston construction. ⑤ Safety Shutoff Valve; ● General Purpose Valve. Refer to Engineering Section (Approvals) for details.												⑥ Valves not available with Explosionproof enclosures. ⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts. ⑧ AC construction also has PA seating. ⑨ No disc-holder. ⑩ Stainless Steel disc-holder. ‡ Must have solenoid mounted vertical and upright.								

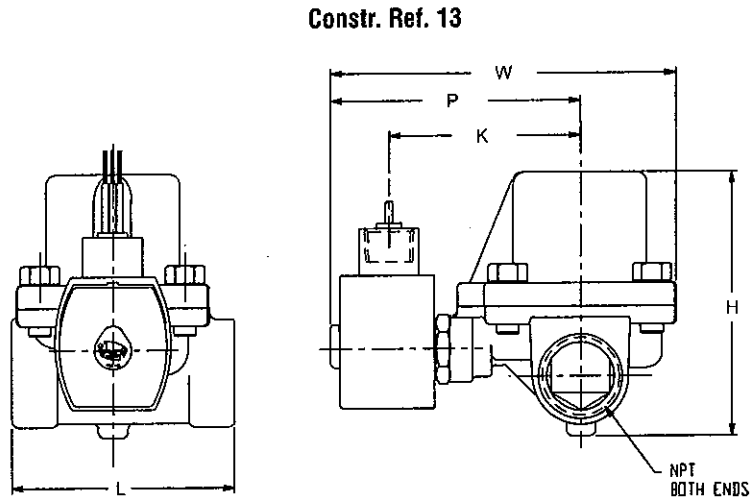
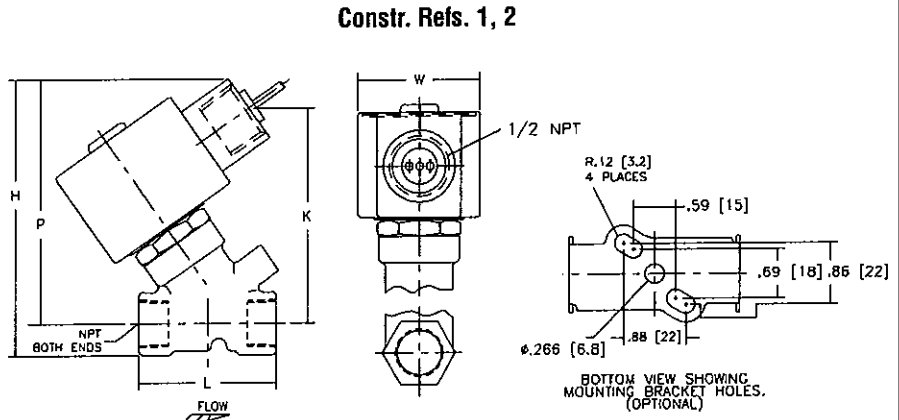
Specifications (Metric units)

Pipe Size (ins.)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Operating Pressure Differential (bar)						Max. Fluid Temp. °C		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦		
			Max. AC			Max. DC			AC	DC	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	Catalog Number	Constr. Ref. No. ④	UL ⑤ Listing	AC	DC	
			Min.	Air-Inert Gas	Water	Air-Inert Gas	Water	Light Oil @ 300 SSU											
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	10	1.29	①	10	9	-	3	3	-	81	65	8210G73 ③	1P	●	8210G36 ③	1P	●	6.1/F	11.6/F
3/8	16	2.57	0	10	10	-	3	3	-	81	65	8210G93	5D	○	-	-	-	10.1/F	11.6/F
3/8	16	2.57	0.3	14	10	9	9	7	7	81	65	8210G1	6D	○	-	-	-	6.1/F	11.6/F
3/8	16	2.57	0.3	21	21	21	-	-	-	79	-	8210G6	5D	○	-	-	-	17.1/F	-
1/2	11	1.89	①	10	9	-	3	3	-	81	65	8210G15 ③	2P	●	8210G37 ③	2P	●	6.1/F	11.6/F
1/2	16	3.43	0	10	10	-	3	3	-	81	65	8210G94	5D	○	-	-	-	10.1/F	11.6/F
1/2	16	3.43	0	10	10	9	3	3	-	79	65	-	-	-	8210G87	7D	●	17.1/F	11.6/F
1/2	16	3.43	0.3	14	10	9	9	7	7	81	65	8210G2	6D	○	-	-	-	6.1/F	11.6/F
1/2	16	3.43	0.3	21	21	21	-	-	-	79	-	8210G7	5D	○	-	-	-	17.1/F	-
1/2	16	3.43	0.3	21	21	-	21	21	-	81	52	8210G227	5D	○	-	-	-	17.1/F	40.6F
3/4	16	3.86	0	10	10	9	3	3	-	79	85	-	-	-	8210G88	7D	●	17.1/F	11.6/F
3/4	19	4.29	0.3	9	9	9	7	6	5	81	65	8210G9	9D	○	-	-	-	6.1/F	11.6/F
3/4	19	4.29	0	10	10	-	3	3	-	81	65	8210G95	8D	○	-	-	-	10.1/F	11.6/F
3/4	19	5.57	0.3	17	10	7	9	9	9	81	65	8210G3	11D	○	-	-	-	6.1/F	11.6/F
3/4	19	5.14	0	-	-	-	14	12	12	-	25	8210B26 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	19	5.14	0	24	21	14	-	-	-	92	-	8210G26 ② ‡	40P	●	-	-	-	-	16.1F
1	25	11.14	0	-	-	-	7	7	6	-	25	8210B54 ‡	31D	-	8210D89	15D	-	-	30.6/H
1	25	11.14	0	10	9	9	-	-	-	81	-	8210G54	41D	●	8210G89	45D	●	16.1/F	-
1	25	11.14	0.3	10	10	7	9	9	9	81	65	8210G4	12D	○	-	-	-	6.1/F	11.6/F
1	25	11.57	0	21	16	8	-	-	-	92	-	8210G27 ‡	42P	●	-	-	-	20.1/F	-
1	25	11.57	0.7	21	21	21	-	-	-	79	-	8210G78 ②	13P	-	-	-	-	17.1/F	-
1 1/4	29	12.86	0	-	-	-	7	7	6	-	25	8210B55 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	29	12.86	0	10	9	9	-	-	-	81	-	8210G55	43D	●	-	-	-	16.1/F	-
1 1/4	29	12.86	0.3	10	10	7	9	9	9	81	65	8210G8	16D	○	-	-	-	6.1/F	11.6/F
1 1/2	32	19.29	0	-	-	-	7	7	6	-	25	8210B56 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	32	19.29	0	10	9	9	-	-	-	81	-	8210G56 ‡	44D	●	-	-	-	16.1/F	-
1 1/2	32	19.29	0.3	10	10	7	9	9	9	81	65	8210G22	18D	●	-	-	-	6.1/F	11.6/F
2	44	36.86	0.3	10	9	6	3	3	3	81	65	8210G100	20P	●	-	-	-	6.1/F	11.6/F
2 1/2	44	38.57	0.3	10	9	6	3	3	3	81	65	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	16	2.57	0.0	10	10	9	9	9	6	81	65	8210G33	23D	●	-	-	-	10.1/F	11.6/F
3/8	16	2.57	0.3	17	14	14	17	14	14	81	81	8210G11 ② ③	39D	●	-	-	-	10.1/F	11.6/F
1/2	16	3.43	0	10	10	9	9	9	6	81	65	8210G34	23D	●	-	-	-	10.1/F	11.6/F
1/2	16	2.57	0	10	10	7	9	9	6	81	65	-	-	-	8210G30	37D	●	10.1/F	11.6/F
1/2	16	3.43	0.3	17	14	14	17	14	14	81	81	8210G12 ② ③	39D	●	-	-	-	10.1/F	11.6/F
3/4	19	4.71	0	10	10	9	9	9	6	81	65	8210G35	25D	●	-	-	-	10.1/F	11.6/F
3/4	16	2.57	0	10	10	7	9	9	6	81	65	-	-	-	8210G38	38D	●	10.1/F	11.6/F
3/4	19	5.57	0.3	-	-	-	17	14	14	-	81	8210C13	24D	●	-	-	-	-	16.8/F
3/4	19	5.57	0.3	17	14	14	-	-	-	81	-	8210G13	46D	●	-	-	-	16.1/F	-
1	25	11.14	0	9	9	9	-	-	-	81	-	8210B57 ② ③	34D	●	-	-	-	20/F	-
1	25	11.14	0.3	-	-	-	9	9	9	-	81	8210D14	26D	●	-	-	-	-	16.8/F
1	25	11.14	0.3	10	10	9	-	-	-	81	-	8210G14	47D	●	-	-	-	16.1/F	-
1 1/4	29	12.86	0	9	9	9	-	-	-	81	-	8210B58 ② ③	35D	●	-	-	-	20/F	-
1 1/4	29	12.86	0.3	-	-	-	9	9	9	-	81	8210D18	28D	●	-	-	-	-	16.8/F
1 1/4	29	12.86	0.3	10	10	9	-	-	-	81	-	8210G18	48D	●	-	-	-	16.1/F	-
1 1/2	32	19.29	0	9	9	9	-	-	-	81	-	8210B59 ② ③	36D	●	-	-	-	20/F	-
1 1/2	32	19.29	0.3	-	-	-	9	9	9	-	81	8210D32	29D	●	-	-	-	-	16.8/F
1 1/2	32	19.29	0.3	10	10	9	-	-	-	81	-	8210G32	49D	●	-	-	-	16.1/F	-
2	44	36.86	0.3	-	-	-	9	9	9	-	65	8210I03	30P	●	-	-	-	-	16.8/F
2	44	36.86	0.3	9	9	9	-	-	-	81	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	44	38.57	0.3	-	-	-	9	9	9	-	65	8210I04	27P	●	-	-	-	-	16.8/F
2 1/2	44	38.57	0.3	9	9	9	-	-	-	81	-	8210G104	51P	●	-	-	-	16.1/F	-
Notes: ① 0.3 bar on Air; 0.0 bar on Water. ② Valve provided with PTFE main disc. ③ Valve includes Ultem (G.E. trademark) piston. ④ Letter "D" denotes diaphragm construction; "P" denotes piston construction. ⑤ ○ Safety Shutoff Valve; ● General Purpose Valve. Refer to Engineering Section (Approvals) for details.											⑥ Valves not available with Explosionproof enclosures. ⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts. ⑧ AC construction also has PA seating. ⑨ No disc-holder. ⑩ Stainless Steel disc-holder. ‡ Must have solenoid mounted vertical and upright.								

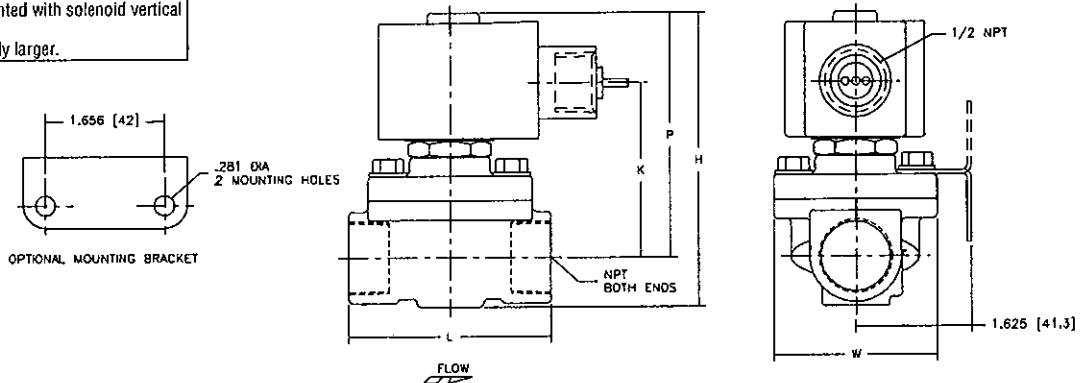
Dimensions: inches (mm)

Constr. Ref. No.		H	K	L	P	W
1*	ins.	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	ins.	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
13	ins.	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
5	ins.	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	ins.	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	ins.	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	ins.	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	ins.	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10*Ⓞ	ins.	5.25	X	2.81	4.59	2.31
	mm	133	X	71	117	59
11*	ins.	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	ins.	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
15*	ins.	5.34	X	3.75	4.47	3.84
	mm	136	X	95	114	98
16	ins.	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18	ins.	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	ins.	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	ins.	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	ins.	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	ins.	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	ins.	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	ins.	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	ins.	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	ins.	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	ins.	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

Ⓞ Valves must be mounted with solenoid vertical and upright.
* DC dimensions slightly larger.



Constr. Refs. 5-9, 11, 20, 21, 23, 25, 37, 38

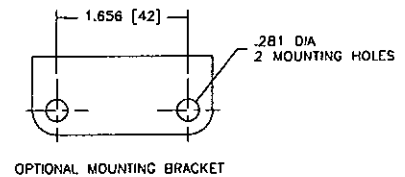
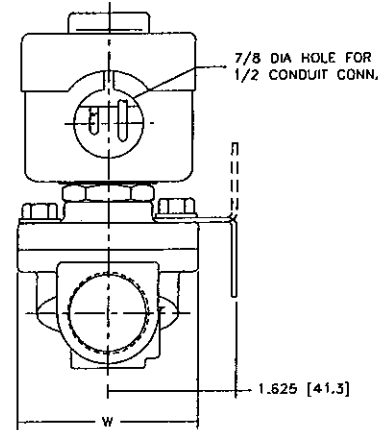
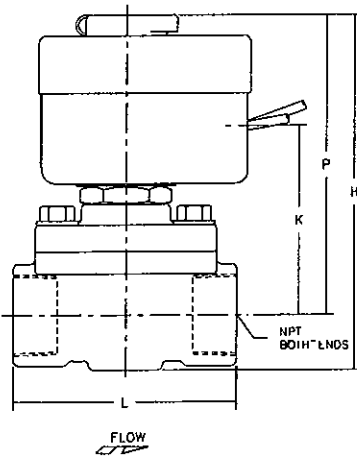


Dimensions: inches (mm)

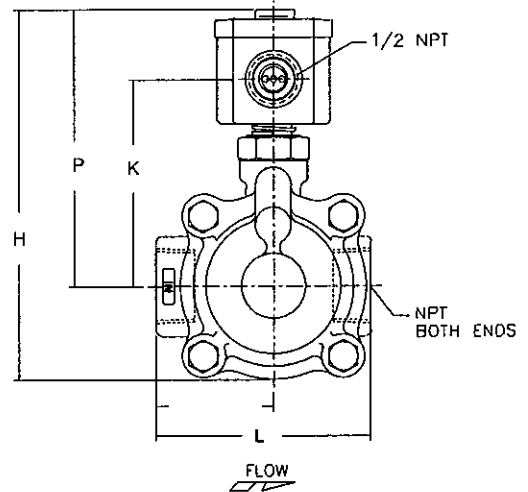
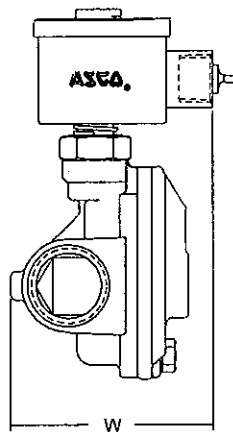
Constr. Ref. No.		H	K	L	P	W
30	ins.	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	ins.	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	ins.	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	ins.	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	ins.	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	ins.	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	ins.	7.66	X	4.38	6.56	3.91
	mm	195	X	111	167	99
37	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	ins.	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	ins.	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	ins.	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	ins.	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	ins.	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	ins.	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	ins.	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	ins.	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	ins.	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	ins.	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	ins.	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	ins.	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	ins.	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Constr. Refs. 10, 15, 24, 26-36



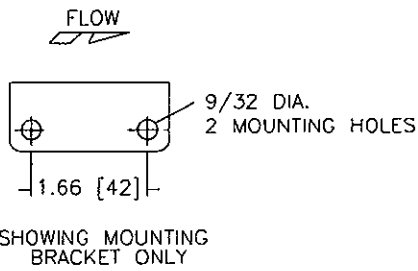
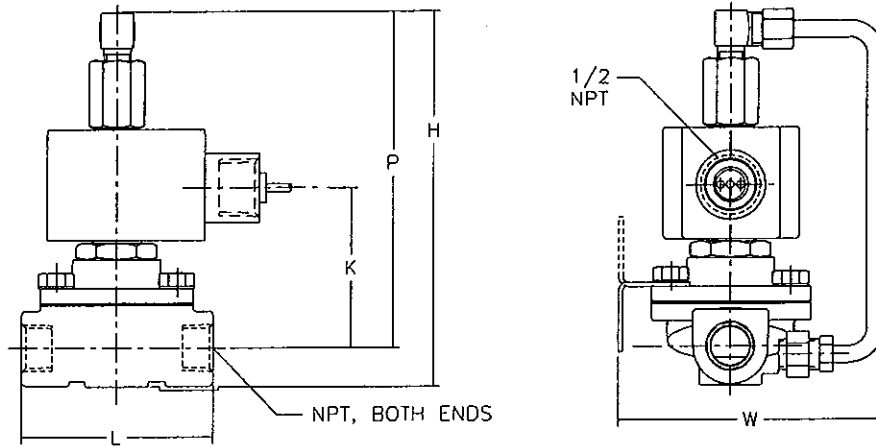
Constr. Refs. 12, 16, 18



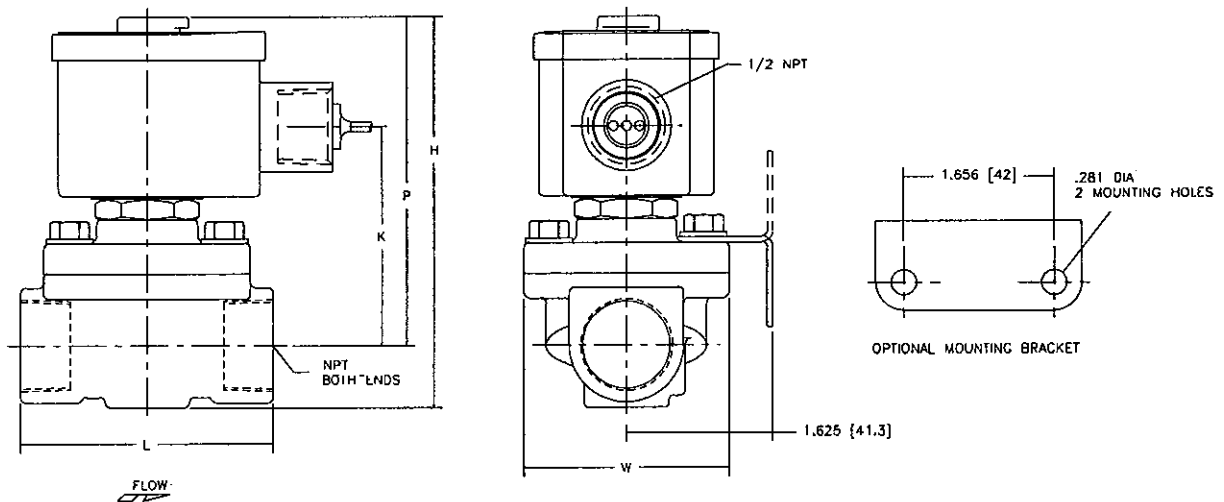
Note: Valve must be mounted with solenoid vertical and upright.

Dimensions: inches (mm)

Constr. Refs. 39



Constr. Refs. 40-51





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

FLOWMETER

MANUFACTURER : KING
 MODEL : 7430 SERIES
 MODEL NO. : 74C-2-32-G-042 3 2 3 7 1 3
 SERVICE : CLEAN DRY COMPRESSED AIR
 SIZE : 6" (150 mm) SCALE RANGE
 SCALE : 0 ~ 82 SCFH (0 ~ 2,300 SLPH) OF AIR
 MATERIAL OF CONSTRUCTION
 METERING TUBE : BOROSILICATE GLASS
 FITTING : TYPE 316 STAINLESS STEEL
 ELASTOMER : VITON
 PRESSURE LIMIT : 200 PSIG (1.38 MPa)
 CONNECTION : 1/2" (13 mm) FNPT
 ACCESSORIES : NEEDLE VALVE (INLET SIDE)
 OPTION : ALARM (INDUCTIVE RING SENSOR)
 QUANTITY : 1
 CUSTOEMR TAG NO. : FS-O051A

*PROVIDES INPUT
TO OZONE PLC FOR
THIS FLOW SWITCH*

Earth Tech (Canada) Inc.

Reviewed for approval
 Responsibility
 Date

DATE REVIEWED

Project No. 79538-C14-16
 Date: 24/1/06 By: [Signature]

7430 Series

Both 65 mm and 150 mm scales, borosilicate glass tube models feature all stainless steel frame and horizontal connections at a less expensive price than competitive products. Valve optional.

Description

Metering Tube
Borosilicate Glass

Internal Components
316L Stainless Steel, Black Glass,
Sapphire, Carboly, Tantalum

Inlet/Outlet Fittings
1/4" FNPT, Horizontal
Control Valve optional

Fitting Material
316L Stainless Steel

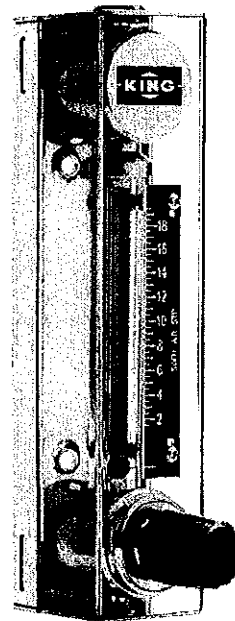
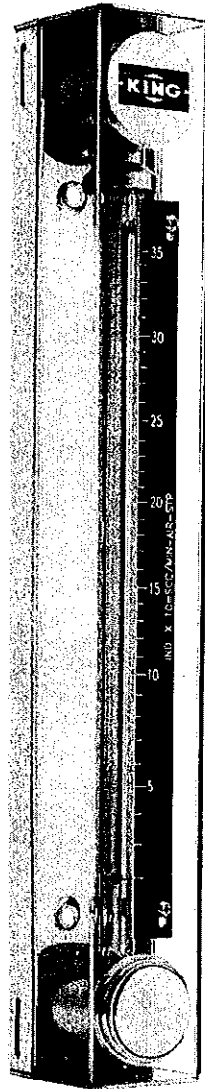
Elastomers
Standard: Viton
Optional: Buna N, EPR, and
Kalrez®

Options

Alarm
Fiber-Optic or Inductive Ring
Sensor (See Below)

Certified Calibrations
Conform to ISA RP 16.6

Scales
Can be produced in any volumetric
unit



Performance

Capacities
.72 to 1800 cc/mn – Water
66 to 70000 cc/mn – Air

Scale
65 mm, 150 mm
Direct reading, detachable

Accuracy
± 6% of Full Scale Flow, 65 mm
± 4% of Full Scale Flow, 150 mm

Turndown
10:1 to 12.5:1 unless otherwise
indicated

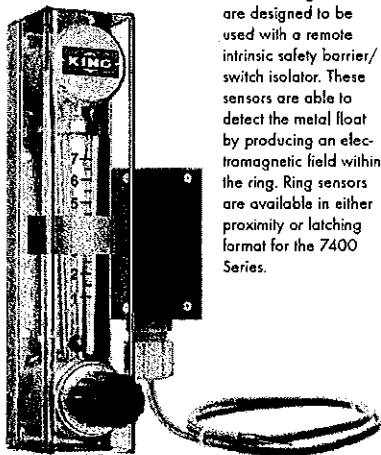
Repeatability
1%

Max Temperature
250° F (121° C) Gases
200° F (93° C) Liquids

Max Pressure
316L SS Fittings - 200 psig
PVC Fittings – 130 psig
PVDF Fittings – 150 psig

Ambient Temperature
33° F to 125° F (1° C to 52° C)

Alarm Options:



Inductive Ring Sensor
Inductive ring sensors are designed to be used with a remote intrinsic safety barrier/switch isolator. These sensors are able to detect the metal float by producing an electromagnetic field within the ring. Ring sensors are available in either proximity or latching format for the 7400 Series.

Sensor Specifications
Power Supply: 5-25 VDC (from Switch Isolator)
Max Current, Target Present: 1 mA
Max Current, Target Absent: 15 mA
Temperature Limits: -14°F to +158°F
Output: NAMUR
Repeatability: 0.01 mm
Switching Frequency: 2 kHz (.125"), 1.5 kHz (.25")
Sensor Approvals:
UL Listed: General Purpose
FM Approved: Intrinsically Safe*
CSA Certified: Intrinsically Safe*
Cenelec: Intrinsically Safe*
*Additional cost, call for pricing

Float/Sensor Compatibility

Type	Tube Size	Float Material
Proximity	.125"	SS, CB
Proximity	.25"	SS, CB
Latching	.125"	SS, CB
Latching	.25"	SS, CB

Fiber Optic Sensor

The fiber optic sensor is housed in a junction box attached to the side of a 7400 Series flowmeter. The sensor uses a pair of fiber optic cables, an emitter and receiver to transmit the light across the metering tube and back to the sensor. If the light beam is blocked by the float, the sensor output will change. The sensor provides a transistor output that switches the common or negative voltage (NPN) or positive voltage (PNP) to the load. The fiber optic sensor is compatible with all 7400 Series float types

Sensor Specifications
Supply Voltage: 10-30 Vdc
Current Consumption: 25 mA
Temperature Limits: -14°F to +212°F
Output:
NPN (Sinking), N.O. or N.C.
PNP (Sourcing), N.O. or N.C.
Offstate Leakage Current = 1 microamp at 30 Vdc
Output Saturation Voltage = 1 V at 10 mA DC < 1.5 V at 150 mA DC

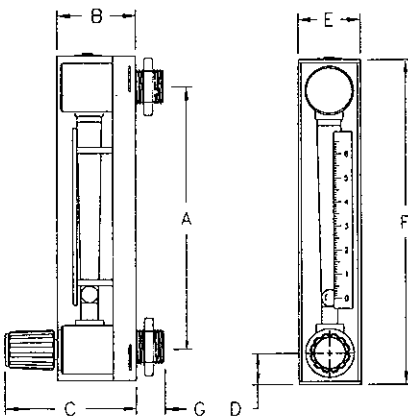
Note: Sapphire floats are not compatible with Fiber Optic Sensor

7430 Series

Specifications:

Glass Tube

65MM Scale Flow Ranges							150 MM Scale Flow Ranges								
Tube Number	Float Material	Air (STP)			Water (70°F)			Tube Number	Float Material	Air (STP)			Water (70°F)		
		CC/MIN	SCFH	SLPH	CC/MIN	GPH	LPH			CC/MIN	SCFH	SLPH	CC/MIN	GPH	LPH
1-02-G-021	Glass	66	.14	4.0	0.72	.011	.042	1-03-G-022	Glass	54	.114	3.2	.56	.0088	.033
	Sapphire	105	.22	6.2	1.3	.021	.078		Sapphire	82	.175	4.9	1.04	.0160	.062
	Stainless Steel	200	.42	12.0	3.3	.052	.190		Stainless Steel	160	.340	9.8	2.25	.0350	.135
	Carboloy	340	.70	20.0	7.0	.110	.420		Carboloy	280	.580	16.5	5.00	.0780	.300
	Tantalum	350	.74	21.0	7.8	.125	.460		Tantalum	300	.620	17.5	5.20	.0840	.320
1-03-G-041	Glass	76	.16	4.6	1.15	.018	.068	1-04-G-042	Glass	106	.225	6.4	1.24	.0195	.074
	Sapphire	120	.25	7.2	2.10	.032	.125		Sapphire	165	.35	10.0	2.35	.0380	.145
	Stainless Steel	230	.50	14.0	4.20	.068	.260		Stainless Steel	320	.68	19.0	5.60	.0900	.340
	Carboloy	400	.85	24.0	9.00	.145	.560		Carboloy	540	1.14	32.0	12.4	.1950	.740
	Tantalum	440	.90	26.0	10.00	.165	.620		Tantalum	580	1.24	35.0	13.5	.2100	.820
1-08-G-061	Glass	525	1.1	31	9.0	.14	.54	1-07-G-062	Glass	350	.74	21.0	4.7	.074	.28
	Sapphire	700	1.5	42	15.5	.24	.95		Sapphire	500	1.06	30.0	10.0	.160	.60
	Stainless Steel	1130	2.4	68	29.0	.46	1.70		Stainless Steel	820	1.75	50.0	20.5	.330	1.25
	Carboloy	1600	3.4	95	46.0	.72	2.80		Carboloy	1250	2.60	76.0	34.0	.540	2.05
	Tantalum	1700	3.6	100	50.0	.78	3.00		Tantalum	1350	2.90	80.0	36.0	.560	2.15
1-23-G-081	Glass	2000	4.2	120	44	.70	2.6	1-11-G-082	Glass	850	1.8	50.0	16.5	.26	1.0
	Sapphire	2600	5.4	150	68	1.05	4.0		Sapphire	1100	2.3	66.0	27.0	.42	1.6
	Stainless Steel	3800	8.2	230	110	1.70	6.6		Stainless Steel	1600	3.4	100.0	46.0	.72	2.7
	Carboloy	5600	12.0	340	170	2.70	10.5		Carboloy	2300	4.9	140.0	72.0	1.15	4.4
	Tantalum	6000	13.0	360	180	2.90	11.0		Tantalum	2450	5.2	155.0	80.0	1.25	4.8
2-14-G-021	Glass	6800	14.5	400	160	2.6	9.5	1-27-G-102	Glass	2150	4.6	130.0	52	.84	3.1
	Sapphire	9200	19.5	540	240	3.8	14.5		Sapphire	2800	6.0	170.0	78	1.24	4.7
	Stainless Steel	13000	28.0	800	400	6.4	24.0		Stainless Steel	4400	9.2	260.0	130	2.05	7.8
	Carboloy	19000	40.0	1100	600	9.5	36.0		Carboloy	6200	13.5	380.0	205	3.20	12.5
	Tantalum	20000	42.0	1200	640	10.0	38.0		Tantalum	6750	14.0	400.0	210	3.30	12.5
2-34-G-041	Glass	19000	40.0	1150	520	8.25	31.0	2-09-G-002	Glass	3800	8.2	230.0	86	1.35	5.2
	Sapphire	25000	52.0	1500	740	11.50	44.0		Sapphire	5000	10.6	300.0	130	2.05	7.8
	Stainless Steel	42500	90.0	2550	1200	19.00	72.0		Stainless Steel	7500	16.0	450.0	220	3.40	13.0
	Carboloy	60000	125.0	3600	1700	27.00	105.0		Carboloy	10600	22.5	640.0	330	5.20	20.0
	Tantalum	70000	145.0	4200	1800	29.00	110.0		Tantalum	11500	24.0	680.0	360	5.60	21.5
2-17-G-022	Glass	9000	19.0	540.0	215	3.40	13.0	2-32-G-042	Glass	20500	43.0	1220.0	470	7.5	28.0
	Sapphire	11400	24.5	700.0	320	5.00	19.0		Sapphire	26000	56.0	1550.0	700	11.0	42.0
	Stainless Steel	17000	36.0	1000.0	520	8.20	31.0		Stainless Steel	38000	82.0	2300.0	1120	18.0	68.0
	Carboloy	24000	50.0	1450.0	760	12.2	46.0		Carboloy	54000	116.0	3300.0	1650	26.0	100.0
	Tantalum	25000	54.0	1500.0	820	13.0	49.0		Tantalum	60000	125.0	3500.0	1750	28.0	106.0



Dimensions (Inches)

Detail Letter	Scale length	
	65mm	150mm
*A	4.53	8.826
B	1.66	1.66
C	2.90	2.90
D	.73	.73
E	1.50	1.50
F	6.05	10.25
G	.50	.50

*The FNPT fittings have a 3/4 - 16 O.D. thread with mounting nuts installed.

Ordering:

Use the following guide to determine the specific product number you require.

Meter Series	Tube Number	Float Material	Fitting Material	O-ring Material	Scale	Valve Option	Optional Alarm Switch
74C		Glass - 1	316L SS - 1/8" FNPT - 1	EPR - 1	Millimeter - 1	316L SS - Inlet - 1	Without Alarm - 0
		Sapphire - 2	316L SS - 1/4" FNPT - 2	Buna-N - 2	GPH Water@70°F - 2	316L SS - Outlet - 2	Fiber-Optic NPN [Proximity] - 1
		316 SS - 3	PVC - 1/4" FNPT - 3	Viton® - 3	LPH Water@70°F - 3	No Valve - 3	Fiber-Optic PNP [Proximity] - 2
		Carboloy - 4	PVC - 1/8" FNPT - 4	Kalrez® With No Valve - 4	CC/MIN Water@STP - 4	PVC - Inlet - 4	Inductive Ring Sensor [Proximity] - 3
		Tantalum - 5		Kalrez® With Valve - 5	SCFH Air@STP - 5	PVC - Outlet - 5	Inductive Ring Sensor [Latching] - 4
					SLPH Air@STP - 6		
					SCC/MIN Air@STP - 7		
					Non standard - 8		

Note: Hastelloy® C-276 and PVDF materials of construction are available by special order.

Example: 74C - 102G021 - 1 - 2 - 3 - 1 - 1 - 0



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

BALL VALVE (FOR INSTRUMENT ISOLATION)

MANUFACTURER : APOLLO
MODEL : 76-101-01
SERVICE : CLEAN DRY COMPRESSED AIR
SIZE : 1/4" (6.35 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
QUANTITY : 2

CUSTOMER TAG NO. : HV-O051B / HV-O051C



Fuji Electric Corporation of America

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Revision : 00
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WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APPOLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

CHECK VALVE

MANUFACTURER : APOLLO
MODEL : 62-103-57
SERVICE : CLEAN DRY COMPRESSED AIR
MATERIAL OF CONSTRUCTION
BODY : A351-CFF8M
BALL CHECK : RPTFE
SPRING : STAINLESS STEEL
OPENING PRESSURE : 0.5 PSIG (3.45 kPa)
CONNECTION : 1/2" (13 mm) NPT
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 1
CUSTOMER TAG NO. : CV-O051A

Apollo® 62-100 Series

Stainless Steel Ball-Cone® Check Valve

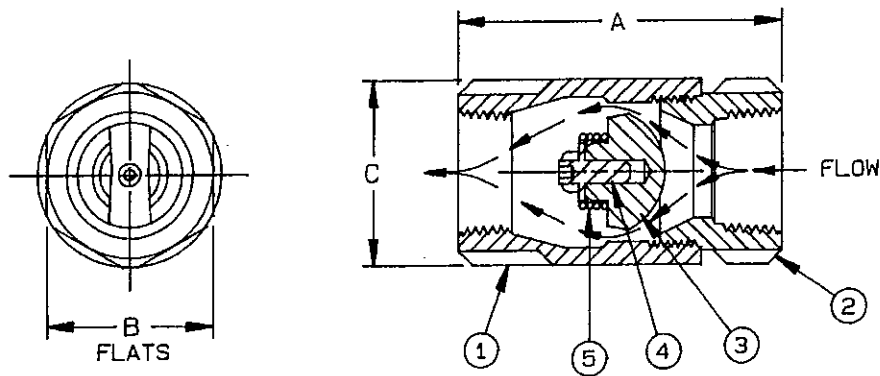
NPT Threaded, 1/4" through 2" 400 psig WOG, Cold Non-Shock. 125 psig Saturated Steam.

FEATURES

- U.S. Patent #4,172,465
- No radial alignment necessary
- Tight shutoff
- Optional light spring available (62-12X-Series)
- Ball-Cone check is spring-loaded for fast seating action
- Straight through stream lined for minimum change in velocity
- Investment cast body

STANDARD MATERIAL LIST

1. Body	ASTM A351-CF8M	4. Guide	ASTM A276-316
2. Tail Piece	ASTM A276-316 (1/4" to 1")	5. Spring	AISI 316 SS
3. Ball Check	ASTM A351-CF8M (1-1/4" to 2") RPTFE		



NUMBERING SYSTEM		SPECIALS	
6 X - X X X - X X			
TYPE	_____	01 - STANDARD VALVE	
2 - STAINLESS STEEL		E05 - 5 POUND OPENING PRESSURE*	
CHECK	_____	E10 - 10 POUND OPENING PRESSURE*	
1 - BALL CONE		17 - SATIN CHROME PLATED	
0 - REPAIR KIT		57 - OXYGEN CLEANED	
SPRING TYPE	_____		
0 - .5 CRACKING PRESSURE			
2 - .2 CRACKING PRESSURE			
			*1/4" to 1" Sizes Only
	SIZE		
	1 - 1/4" 5 - 1"		
	2 - 3/8" 6 - 1-1/4"		
	3 - 1/2" 7 - 1-1/2"		
	4 - 3/4" 8 - 2"		

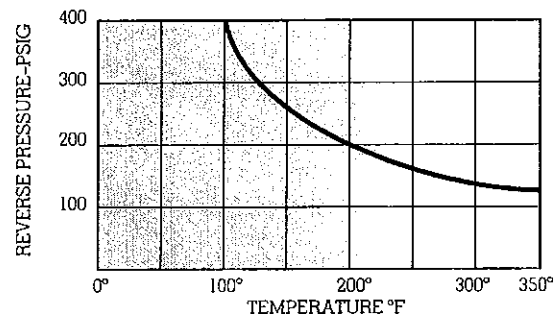
Dimensional Specifications

Number	Size	A	B	C	Wt/100
62-101-01	1/4"	2.06	1.12	1.12	38
62-102-01	3/8"	2.12	1.12	1.12	38
62-103-01	1/2"	2.31	1.12	1.12	38
62-104-01	3/4"	2.87	1.37	1.50	75
62-105-01	1"	3.50	1.75	1.93	145
62-106-01	1-1/4"	4.18	2.12	2.37	237
62-107-01	1-1/2"	4.93	2.50	2.81	381
62-108-01	2"	6.00	3.00	3.68	636

NOTE: NOT ALL COMBINATIONS AVAILABLE. CONTACT CUSTOMER SERVICE FOR VERIFICATION.

NOTE: Not recommended for use with reciprocating pumps and similar applications with repetitious vibrations. Upstream flow disturbances, which create turbulence, may result in rapid wear and premature valve failures. It is recommended that a minimum of 10 diameters of straight pipe be provided between the check valve inlet and any upstream flow disturbance such as pumps, control valves, elbows, etc. It is also recommended that a minimum of 2 diameters of straight pipe be allowed downstream of the valve outlet. Low flow rates may also cause high frequency vibrations.

RPTFE BALL CONE CHECK





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

BALL VALVE

MANUFACTURER : APOLLO
MODEL : 76-103-57
SERVICE : AIR/NITROGEN TO GOX LINE
CONNECTION : 1/2" (13 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
QUANTITY : 1
CUSTOMER TAG NO. : HV-O051D



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

SUPPLEMENTAL AIR/NITROGEN SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APPOLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE GENERATION SYSTEM



There are three (3) Fuji Ozone generators for Winnipeg Water Treatment Program. Each generator is designed to produce 673 ppd (305 kg/day) of ozone at 10 wt. % concentration or 1,010 ppd (458 kg/day) at 6 wt. % concentration at 79° F (26°C) cooling water temperature (open loop). Each generator is supported on an independent skid. Utilities (480 VAC, 3 Phase, 60 Hz Power, plant cooling water, and de-ionized water) and gaseous oxygen must be provided to the ozone generator. Each ozone generator can be operated independently in manual mode (LCP on PSU) or remote mode (MCP/SCADA).

LIST INSTRUMENTS

LIST INSTRUMENTS

Each ozone generator skid consists of a stainless steel ozone generator vessel, a high voltage box and requisite instruments. The cooling water skid ~~which will be later joined together with the generator skid~~ consists of a closed loop cooling system (including heat exchanger, pump, water tank, resin bottle, motorized valves, etc.) and the requisite instruments. Dry gaseous oxygen (from LOX storage tank) with a small quantity of dry compressed air (source of nitrogen) is fed to the ozone generator. Dryness of the oxygen gas is measured by Dewpoint Monitor. The oxygen flow control valve regulates the quantity of gaseous oxygen ^{which flows} into the generator. With power from the Power Supply Unit (PSU), the ozone is generated under high voltage/high frequency electric corona discharge. The High Concentration Ozone Monitor continuously monitors ozone produced by the generator. ~~the monitor which PLC~~

Based on the quantity of ozone required by the plant, PLC automatically sets the incoming oxygen flow rate and the electrical power required. The amount of ozone produced (~~ppd~~ kg/day) is automatically calculated by the PLC and displayed on the ^{on} Local Control touch-screen Panel. Other operating parameters are also displayed on multiple touch-screens. *which other parameters and which screens.*

Incoming gas flow rates are automatically calculated by the PLC and values are displayed on the PSU Local Control Panel screen. The flow rate signal along with the ozone concentration signal, pressure and temperature signals are used to calculate the amount of Ozone being produced by the ozone generating system.

Not all of the electrical energy is used up in the conversion of Oxygen to Ozone. A significant amount of heat is created during the conversion. Fuji's proprietary double cooling MicroGap™ dielectric technology provides additional cooling to prevent the degradation of produced-ozone (thus improving production efficiency). This enhanced cooling is accomplished using a dedicated internal closed DI cooling water loop in addition to the external closed DI cooling water loop. *DE IONIZED*

The process gas stream (containing primarily Ozone and Oxygen gas) exiting the generator vessel ^{flows} ~~purges~~ to the diffusers (ozone dissolution system).

what happens in the event of a high level in generator.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

OZONE GENERATOR

MANUFACTURER : FUJI ELECTRIC
MODEL : FWX-458K
TYPE : HORIZONTAL
OZONE CONCENTRATION : 6% TO 10% BY WT IN OXYGEN
DESIGN PRODUCTION : 1,010 PPD (458 Kg/DAY) EACH @ 6 WT % OZONE
673 PPD (305 Kg/DAY) EACH @ 10 WT % OZONE
ACTIVE DIELECTRIC : 90 - MICROGAP™ GLASS LINED TYPE 316L S.S. TUBES
FEED GAS
TYPE : GASEOUS OXYGEN
MAX. TEMPERATURE : 90° F (32° C)
DEWPOINT : -76° F (-60° C) OR LOWER
PRESSURE : 12 ~ 15 PSIG (83 ~ 103 kPa) AT GENERATOR
GAS FLOW RATE : 0 ~ 141 SCFM (0 ~ 3.72 Nm³/min) PER GENERATOR
COOLING WATER (OPEN LOOP TO GENERATOR'S HEAT EXCHANGER)
TYPE OF SUPPLY : PLANT WATER
PRESSURE : 30 PSIG (207 kPa) MAXIMUM
INLET TEMPERATURE : 79° F (26° C) MAXIMUM
FLOW RATE (NORMAL) : 181.1 GPM. (686 L/min)
CONNECTION SIZE
OXYGEN GAS INLET : 2" (100 mm) ANSI 150# FLANGE
OZONE GAS OUTLET : 2" (100 mm) ANSI 150# FLANGE
DI WATER INLET : 2" (100 mm) ANSI 150# FLANGE
DI WATER OUTLET : 2" (100 mm) ANSI 150# FLANGE
COOLING WATER INLET: 3" (100 mm) ANSI 150# FLANGE
COOLING WATER OUTLET: 3" (100 mm) ANSI 150# FLANGE
MATERIAL OF CONSTRUCTION
BODY : TYPE 316L S.S.
HEAD GASKET : HYPALON
GENERATOR AND SKID UNIT WEIGHTS (ESTIMATE)
EMPTY / OPERATION : 3,100 LB (1,409 Kg) / 6,300 LB (2,864 Kg)
SKID UNIT (EMPTY/OPR): 5,300 LB (2,409 Kg) / 8,900 LB (4,045 Kg)
QUANTITY : 3
CUSTOMER TAG NO. : GEN-O110A / GEN-O130A / GEN-O150A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

LEVEL (FLOAT) SWITCH

MANUFACTURER : W.E. ANDERSON
 MODEL : F7-SS2
 STYLE : FLOAT
 SERVICE : OXYGEN GAS & OXYGEN/OZONE GAS MIXTURE
 MATERIAL : TYPE 316 S.S.
 CONNECTION : 1/8" (3.175 mm) NPT
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
 QUANTITY : 6 (2 PER GENERATOR)
 CUSTOMER TAG NO. : LS-O110A / LS-O112A
 LS-O130A / LS-O132A
 LS-O150A / LS-O152A

Earth Tech (Canada) Inc.

Reviewed for general compliance with drawings and specifications as shown on the drawings and specifications.

Reviewed for compliance with conditions of field installation and operation of the equipment and the installation of all equipment and materials involved.

REVIEWED _____

REMOVED AS NOTIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

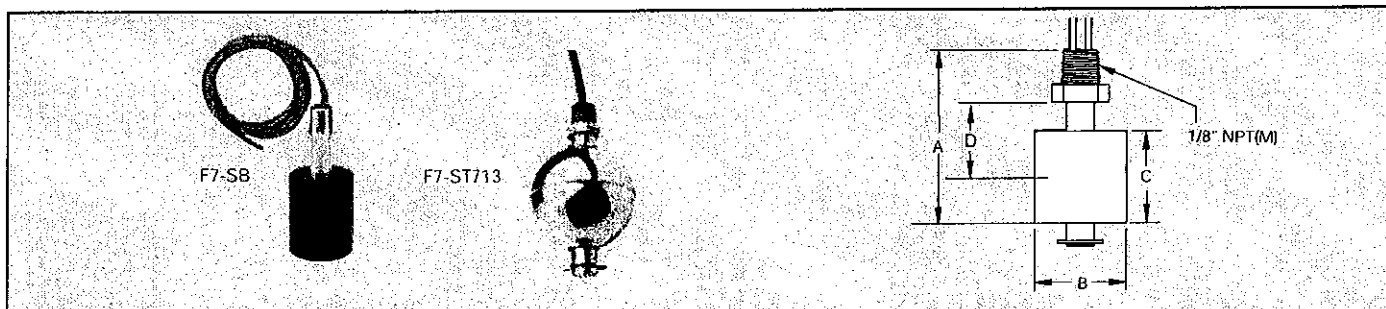
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Series
F7

Level Switches - Vertical

Low Cost, Reliable and Compact, Hermetically Sealed Contacts



Series F7 compact level switches combine low cost and reliability with fast, simple installation. Hermetically sealed reed switches are actuated by magnets permanently bonded inside the float and can be easily adapted to open or close a circuit on rising or falling levels. Vertical mount models are shipped with normally open switch contacts which close as the float rises toward the mounting threads. Reverse switch action by removing the float, rotating it end-for-end and replacing it on the stem. Vertical models mount internally, oriented within 30° of vertical, or select optional fittings for external mounting. Switch ratings are suitable for many solid state control systems and monitors or alarms. Simple relay interfaces can be used for higher current applications.

DIMENSIONS in Inches [mm]

Model Number	(A) Stem Length	(B) Float Diameter	(C) Float Height	(D) Actuation from Hex [⊙]
F7-SB	2.75 [70]	1.38 [35]	1.13 [29]	1.2 [31]
F7-SS2	2.06 [52]	1.0 [25]	1.0 [25]	0.73 [19]
F7-MPP	1.63 [41]	0.63 [16]	0.63 [16]	0.47 [12]
F7-PP	2.18 [55]	1.18 [30]	1.0 [25]	0.69 [18]
F7-BT	2.18 [55]	1.18 [30]	1.0 [25]	0.69 [18]
F7-K	2.13 [54]	1.0 [25]	1.0 [25]	0.65 [17]
F7-C11	2.06 [52]	1.0 [25]	1.0 [25]	0.56 [14]
F7-C21	2.06 [52]	1.0 [25]	1.0 [25]	0.56 [14]
F7-BB	3.19 [81]	1.88 [48]	1.81 [46]	1.19 [30]
F7-PS	3.38 [86]	1.88 [48]	1.88 [48]	1.25 [32]
F7-PVC	3.44 [87]	1.5 [38]	1.81 [46]	0.75 [19]
F7-T1	3.47 [88]	2.13 [54]	1.94 [49]	0.92 [22]
F7-ST713	3.38 [86]	2.06 [52]	2.06 [52]	1.09 [28]
F7-ST714	3.38 [86]	2.06 [52]	2.06 [52]	1.09 [28]

MODELS

Model Number	Applications	Material Float/Stem	Temp. Limits	Press. Limits	Min. S.G.	Electrical Rating	Wire Leads	Mtg NPT(M)	Weight oz (g)
F7-SB	General purpose	Buna-N & Epoxy/ 316 SS	220F 105C	150 psig 10 bar	0.60	25 VA: 1A @ 220VAC	22 AWG 18' [45 cm]	1/8"	2 (58)
F7-SS2	High temp/pressure, corrosives	316SS.(CYC)/ 316 SS	300F 149C	450 psig 31 bar	0.75	25 VA: 1A @ 200VAC	22 AWG, 18' [45 cm]	1/8"	1.2 (34)
F7-MPP**	Broad chemical compatibility	Polypropylene/ Polypropylene	180F 82C	100 psig 6.89 bar	0.90	10 VA: 0.1A @ 100VAC	22 AWG, 24' [61 cm]	1/8"	0.8 (23)
F7-MPP-NO**	Broad chemical compatibility	Polypropylene/ Polypropylene	176F 80C	100 psig 6.89 bar	0.90	50 VA: 0.2A @ 240VAC	22 AWG, 24' [61 cm]	1/8"	0.8 (23)
F7-PP	Broad chemical compatibility	Polypropylene & Epoxy/Polypropylene	220F 105C	100 psig 6.89 bar	0.60	30 VA: 0.14A @ 220VAC	22 AWG, 24' [61 cm]	1/8"	0.8 (23)
F7-BT	Oils & Fuels	Buna-N & Epoxy/ PBT*	220F 105C	150 psig 10 bar	0.45	30 VA: 0.14A @ 220VAC	22 AWG, 24' [61 cm]	1/8"	0.7 (20)
F7-K	Food/beverage, corrosives	PVDF/ PVDF	180F 82C	100 psig 6.89 bar	1.00	50 VA: 0.25A @ 150VAC	22 AWG, 24' [61 cm]	1/8"	1.5 (43)
F7-C11	General purpose	Buna-N/ Brass	180F 82C	150 psig 10 bar	0.45	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/8"	1.5 (43)
F7-C21	Oils & water, general purpose	Buna-N/ 316 SS	180F 82C	150 psig 10 bar	0.45	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/8"	1.5 (43)
F7-BB	High viscosity liquids	Buna-N/ Brass	180F 82C	150 psig 10 bar	0.55	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/4"	5 (140)
F7-PS	Water-based liquids, complies with FDA	Polysulfone/ Polysulfone [†]	225F 107C	50 psig 3 bar	0.55	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/4"	4 (110)
F7-PVC	Chemical & plating	CPVC/ CPVC	180F 82C	15 psig 1 bar	0.85	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/4"	5 (140)
F7-T1	Viscous, sticky or corrosive liquids	PTFE/ TFE	300F 149C	30 psig 2 bar	0.80	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/4"	6 (170)
F7-ST713 [‡]	Oils, water & chemicals	316 SS/ 316 SS	300F 149C	750 psig 52 bar	0.80	20 VA: 0.08A @ 240VAC	22 AWG, 24' [61 cm]	1/4"	6 (170)

⊙ Distance between hex and liquid (S.G. = 1.0) level at actuation point will vary with specific gravity changes.

*PBT - Polybutylene Terephthalate.

† Includes 316 SS clip.

‡ Spherical floats.

Note: F7-SB, F7-SS2 not CSA listed.

**F7-MPP is normally closed

F7-MPP-NO is normally open

Optional Fittings — For external mounting of vertical models

A-347, 1/8" x 1 1/2" NPT carbon steel adapter

A-347-SS, 1/8" x 1 1/2" NPT 316 SS adapter

A-348, 1/8" x 1 1/2" NPT carbon steel adapter

A-348-SS, 1/8" x 1 1/2" NPT 316 SS adapter



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

BALL VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES 2801
STYLE : FLANGED END FULL PORT BALL VALVE
SERVICE : OXYGEN GAS & OZONE/OXYGEN GAS MIXTURE
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
STEM : TYPE 316 S.S.
BALL : TYPE 316 S.S.
SEAT : PTFE
PRESSURE RATING : 275 PSIG (1.90 MPa)
OPERATION : OPEN / CLOSE WITH HANDLE PIPE
CONNECTION : 2" (50 mm) 150# FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 12 (4 PER GENERATOR)
CUSTOMER TAG NO. : HV-O119B / HV-O110A / HV-O115A / HV-O115B
HV-O139B / HV-O130A / HV-O135A / HV-O135B
HV-O159B / HV-O150A / HV-O155A / HV-O155B



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE GENERATION SYSTEM

**REFER TO VOLUME 1
TAB # 2D**

**FOR
CONTROMATICS BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE GENERATION SYSTEM

MOTORIZED BALL VALVE

VALVE

MANUFACTURER : CONTROMATICS
 TYPE : SERIES 2801
 STYLE : FLANGED END FULL PORT BALL VALVE
 SERVICE : OXYGEN GAS & OZONE/OXYGEN GAS MIXTURE
 MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 STEM : TYPE 316 S.S.
 BALL : TYPE 316 S.S.
 SEAT : PTFE
 PRESSURE RATING : 275 PSIG (1.90 MPa)
 OPERATION : OPEN / CLOSE WITH ELECTRIC ACTUATOR
 CONNECTION : 2" (50 mm) 150# FLANGE
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
 QUANTITY : 6 (2 PER GENERATOR)

ACTUATOR

MANUFACTURER : ROTORK
 TYPE : Q SERIES 100 ON/OFF ELECTRIC ACTUATOR WITH Q-PAK
 ENCLOSURE : NEMA 4
 ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
 QUANTITY : 6 (2 PER GENERATOR)

CUSTOMER TAG NO. : FV-0119A / FV-0112A
 FV-0139A / FV-0132A
 FV-0159A / FV-0152A

SEE SECTION 4K

Closure that this model of actuator can be monitored for COMPARE/OFF/HAND as required by specification



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

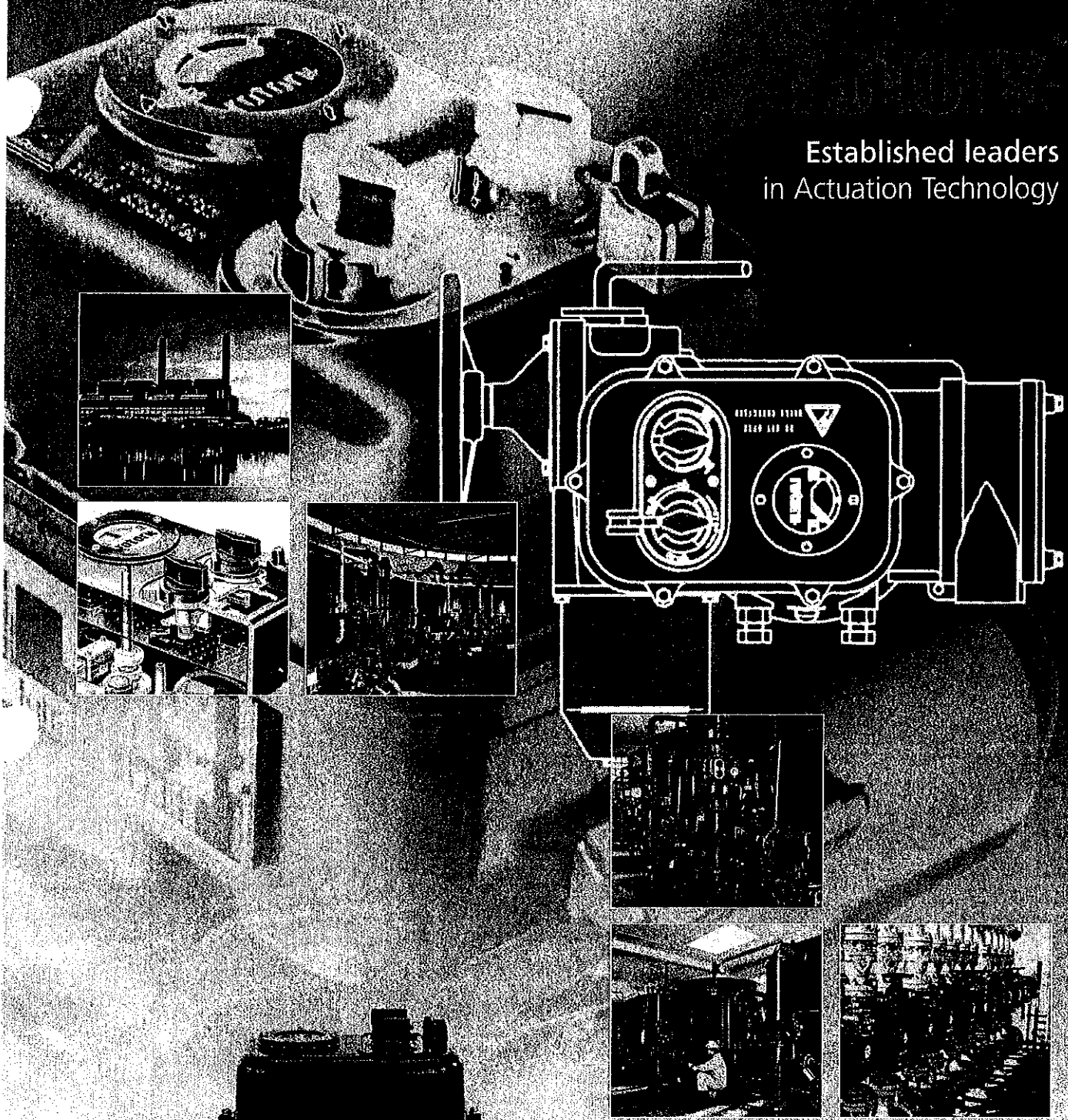
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

**REFER TO VOLUME 1
TAB # 2D**

**FOR
CONTROMATICS BALL VALVE**

Established leaders
in Actuation Technology



Q Range

watertight single phase
electric quarter turn actuators for
part turn valves and dampers

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent.
Resumes by [unclear] in the source range
rusty [unclear]

Revised [unclear] [unclear] [unclear]
[unclear] [unclear] [unclear] [unclear]
[unclear] [unclear] [unclear] [unclear]
[unclear] [unclear] [unclear] [unclear]

Reviewed by [unclear] [unclear] [unclear]

Reviewed by [unclear] [unclear] [unclear]

Reviewed by [unclear] [unclear] [unclear] ✓

Reviewed by [unclear] [unclear] [unclear]

Project No. 79538-C14-16

Date: 24/1/06 By: M. [unclear]

rotork



defining your exact requirements

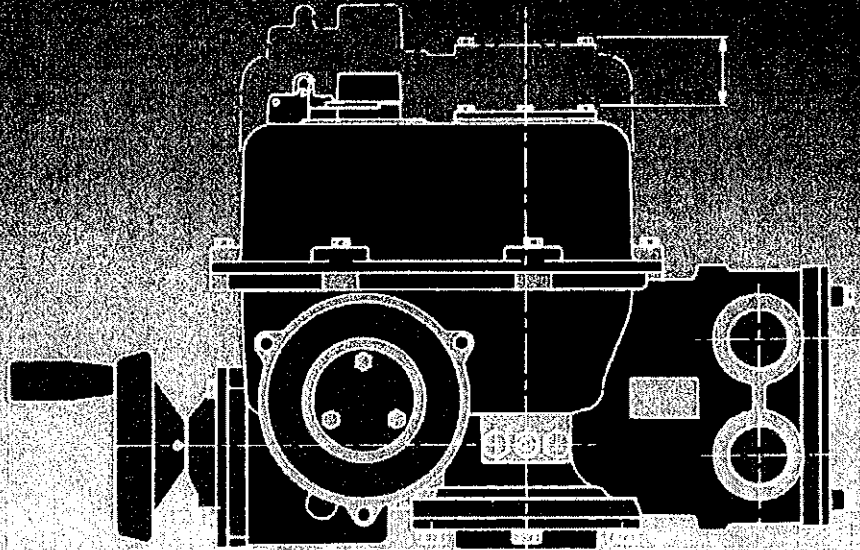
whatever you need wherever you are

In the 45 years since it was founded Rotork has become the name for excellence in the field of valve, sluice gate and damper actuation products for every industry - worldwide.

Rotork has the experience, know-how and product range to deliver virtually any actuation solution - from compact, manually operated gearboxes, to large, highly specified actuators for use in extreme temperature and hazardous environments.

the knowledge to help

Rotork has been at the forefront of actuation technology since the company was formed in 1957 and enjoys an unrivalled reputation for its commitment to the development of leading-edge techniques and processes. Rotork products are designed and manufactured to the highest possible standards of engineering - a principle which drives all areas of our business. So whether you require electric, fluid power, specialist gear or valve adaption products services Rotork has the experience to help you.



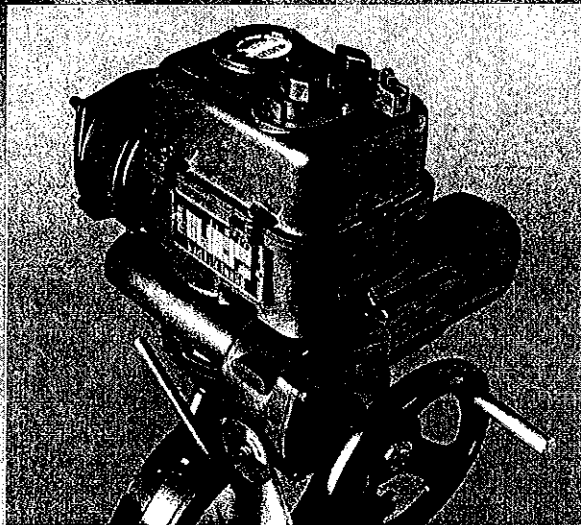
everything you need to succeed

Our involvement can go further than just providing the actuator. We can also supply the gearbox, valve adaption kits and control systems to complement it.

Well equipped, Rotork-trained engineers, technicians and representatives work out of 76 offices worldwide and offer both on-site and factory service. Specialist teams offer predictive maintenance and retrofit valve motorisation backed by a quick responsive service. Our aim is to provide our customers with service excellence.

Contents

Features of the 'Q' Range	4
'Q' Range performance	5
'Q' Standard specification	6
'Q' Pak specifications	7



Q - Set actuator

The new watertight 'Q' Range actuators have been designed using Rotork's world proven reliability in combination with the latest technology.

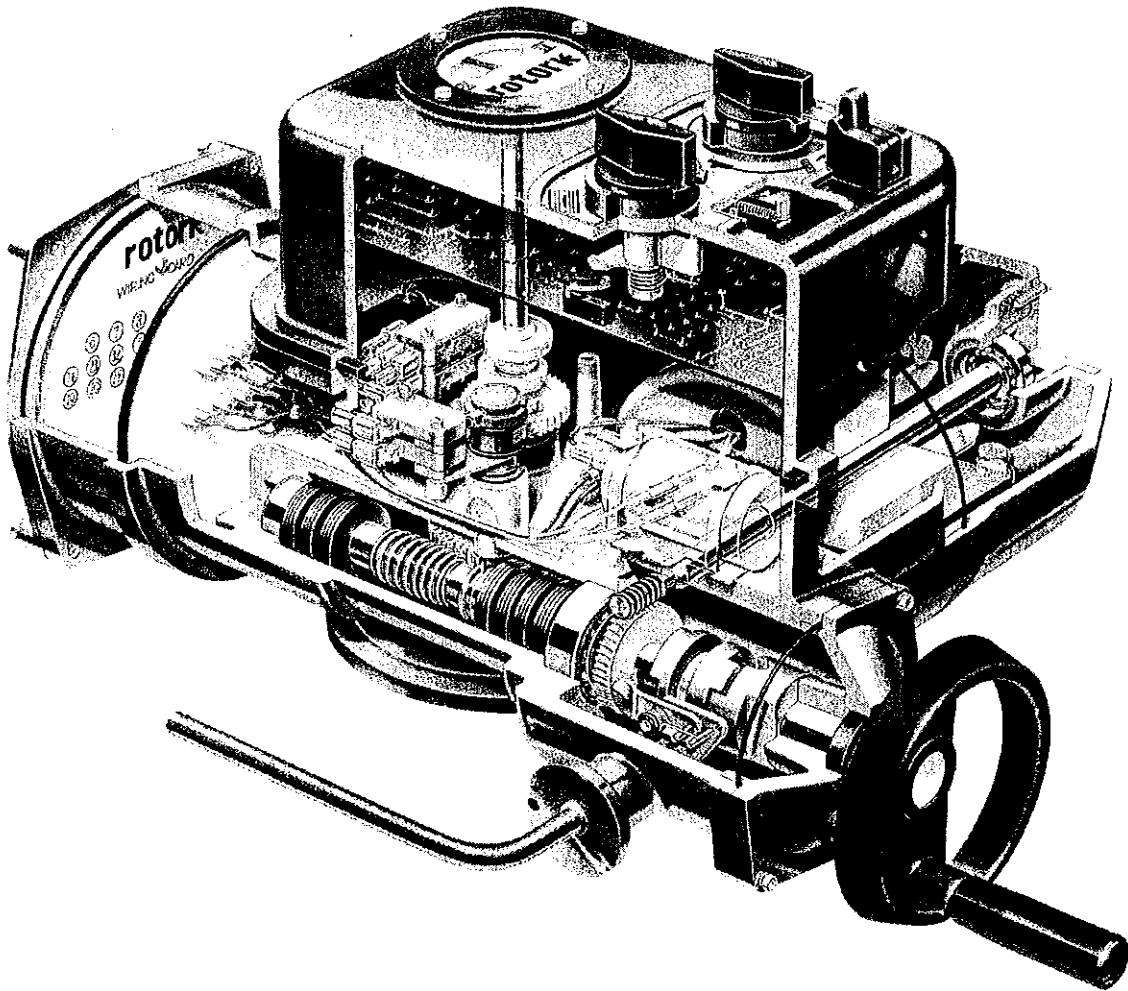
They provide a simple, cost-effective way of controlling small quarter turn valves and dampers. Designed to meet industry's need for a compact and reliable watertight actuator, it is suitable for use in many areas where an IP68 (NEMA 6) enclosure is required. The 'Q' Range is a single phase electric actuator which is available in two versions, both with the Rotork 'double sealed' IP68 enclosure.

The Q-standard version is suitable for simple open/close duties where on/off control is required. This is achieved without the need for reversing contactors, giving simplified wiring. The designs of the motor and limit switch mechanism ensure combined ease of setting and reliability in use.



Q - Pak actuator

The Q-pak version benefits from the addition of a specially designed control interface module which enables it to operate from a wide variety of remote control signals and provides status monitoring outputs.



- Reliability of single phase squirrel cage motors.
- Simple remote control for basic applications.
- Rugged compact double sealed watertight enclosure providing environmental protection during plant construction and cabling.
- Positive travel limitation by externally adjustable mechanical stops.
- Simple action auxiliary switch setting.
- Declutchable handwheel with padlockable hand/auto selector arranged for power preference.
- Self locking electrical and manual drive.
- Q-pak version gives compatibility of control and monitoring functions with 'A' and 'AQ' series actuators

Q

Performance Summary

MECHANICAL DATA

Model	Electrical supply volts	90° Travel time seconds		Torque† Nm lbsft	Mounting base designation to ISO5211		Maximum stem acceptance	
		50Hz	60Hz		Standard	Optional	bore/keyway mm	ins. A/F square
Q100	220, 240	27, 18, 9	23, 15, 8	135	F05	F07	22*	16*
				100	FA05	FA07	13/16*	5/8*
	110, 115, 120	27, 18, 9	23, 15, 8	135	F05	F07	22*	16*
				100	FA05	FA07	13/16*	5/8*
Q300	220, 240	54, 36, 18	45, 30, 15	406	F10	F07	42**	30**
				300	FA10	FA07	1 7/8	1 1/8
Q300	110, 115, 120	54, 36, 18	45, 30, 15	406	F10	F07	42**	30**
				300	FA10	FA07	1 7/8	1 1/8**

Q100/Q300 handwheel turns: 15

† Torque rating is maximum torque. Switch setting is in both directions. Torque output is adjustable from 30% to 100% of rated torque

Drive sleeves are normally supplied blank for machining by valve supplier

* Maximum stem acceptance for both Q100 F05/FA05 and F07/FA07 bases

** These dimensions apply to F10/FA10 base. With Q300 F07/FA07 base, max. acceptance is 28mm bore or 20mm A/F square hole.

ELECTRICAL DATA

Model	Electrical supply volts	Travel time seconds		Starting current Amps	Run current Amps	Nominal kW	Power factor
		50Hz or 60Hz	50Hz 60Hz				
Q100	110, 115, 120	27, 18, 9	23	2.7	2.6	0.07	0.99
			15	3.2	2.3	0.10	0.97
			8	7.0	4.9	0.21	0.90
	220, 240	27, 18, 9	23	1.35	1.3	0.07	0.99
			15	1.65	1.2	0.10	0.95
			8	3.6	2.6	0.21	0.90
Q300	110, 115, 120	54, 36, 18	45	2.5	1.8	0.08	0.98
			30	6.0	3.1	0.14	0.95
			15	8.6	5.3	0.27	0.90
	220, 240	54, 36, 18	45	1.4	1.0	0.08	0.98
			30	2.9	1.6	0.14	0.95
			15	4.7	2.6	0.27	0.90

Motor poles **6** **4** **2**

Enclosure

Watertight to IEC529, IP68 (suitable for submersion under 3 metres head of water for 48 hours) NEMA 4 and 6. Even when the terminal cover is removed, the electrical compartment is protected to a level of IP67 from ingress of dirt and moisture.

Temperature

The 'Q' Range has been designed for use in ambient temperatures from -30°C to +70°C.

Vibration

The actuator can withstand plant induced vibration of 0.5g over a frequency range of 10 to 200Hz and seismic vibration of 1g in a frequency range of 0.2 to 33Hz. Structural integrity is maintained with a seismic vibration of up to 6g.

Performance

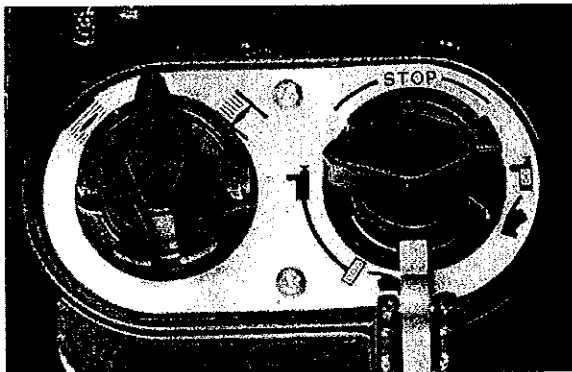
Output torque available from 30lbs.ft (40Nm).

Power Supply

The 'Q' Range of actuators is available as standard for use on the following single phase electrical supplies: 50Hz-110v, 220v, 240v; 60Hz-110v, 115v, 120v, 127v, 220v and 240v. Other voltages can be supplied to special order. A tolerance of $\pm 10\%$ applies to the above voltages. The motor is S2 rated for a 20% duty cycle according to IEC 34.2.

Construction

The gearcase and all housings are diecast aluminium to BS1490. The main gearcase and motor housings are to grade LM4 with the remainder being LM24.



Local control selectors

Output Drive

Easily removable blank, steel drive bush suitable for machining by customer to suit valve stem.

Gearing

Double reduction worm and wheel with steel worm and aluminium bronze worm wheel. The second stage worm and wheel is self locking to ensure that the output cannot be back driven by valve reaction forces.

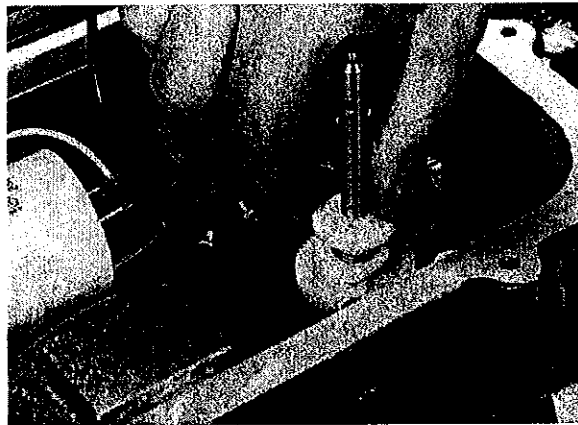
Switches

Torque-limit and auxiliary limit switches are provided as detailed below and have the following electrical ratings on inductive loads:

110/240V ac 15A
110V dc 0.25A
50V dc 2.5A
24V dc 3A



Torque switch setting



Auxiliary limit switch setting

Torque-Limit Switches

One each for open and close ends of travel with normally closed contacts.

Torque measurement is derived from the self locking output worm and wheel gearing, which avoids torque switch reset on the de-energization of the motor and its associated 'hammering' phenomenon.

Auxiliary Limit Switches

One auxiliary limit switch with a change over contact is provided for each direction of travel.

Q

Pak Specification

Motor

A single phase squirrel cage capacitor run, class F insulated induction motor is fitted. The motor is protected from overload by a thermostat.

Local Indication

A mechanical, continuous position indicator is provided on the electrical compartment cover.

Mounting

All flange mountings are in accordance with ISO5211. As an alternative, they are available with UNC thread holes. See publication E640E.

Manual Operation

A handwheel is provided for manual operation, which is engaged by a padlockable hand/auto selection lever arranged for power preference. When engaged, the handwheel drives the second wormshaft. At no time can the handwheel be driven by the motor.



Mechanical stop adjustment

Mechanical Stops

Externally adjustable mechanical stops are provided with a setting range of 80° to 100° of output movement. The setting of these provides travel limitation for both electrical and manual operation.

Conduit Entries

Two off M32 or two off 1 inch ASA NPT.

Q-Standard – Optional Extras

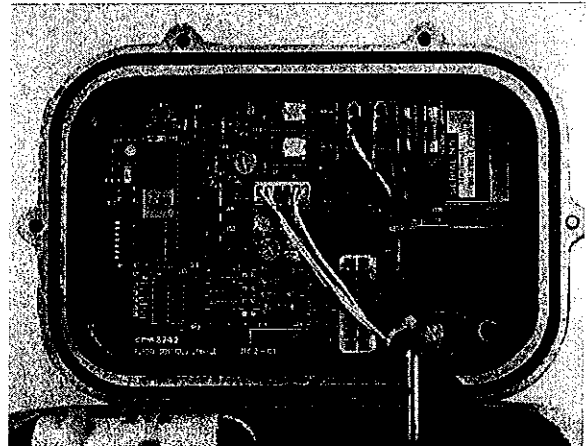
Two auxiliary limit switches each independently adjustable to any pointing of valve travel.

12 watt anti-condensation heater to suit motor supply voltage.

Integrally mounted open/close and local/stop/remote selectors.

1 watt potentiometer for remote valve position indication. Externally powered 4-20mA Current Position Transmitter (CPT).

The Q-pak comprises all the features of the Q-standard, as described above, with the addition of the control interface module.



Control interface module

Control Interface Module

This module incorporates a deep cover which houses a printed circuit board with logic circuits, control switches and a transformer. The cover carries open/close and local/stop/remote selectors. The logic circuits allow either internally or externally fed remote controls. Other facilities include: motor running indication, monitor relay and emergency shut down (ESD) facility.

Optional Extras

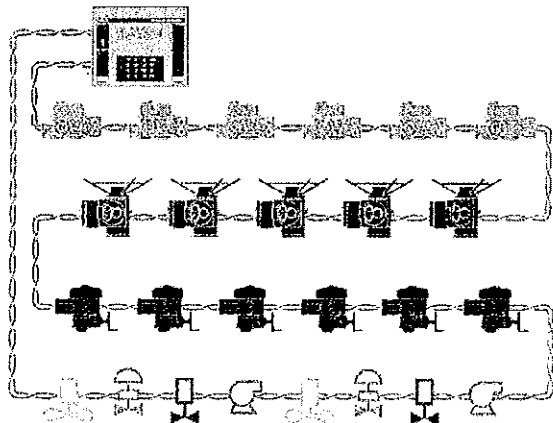
As Q-standard plus:

Folomatic proportional control.

Pak-scan two wire control.

Internally powered Current Position Transmitter (CPT).

For detail of mechanical and electrical specification see publications E640E and E620E.



Pakscan two wire control for up to 240 actuators and/or other devices

Q Range

watertight single phase electric quarter turn actuators for part turn valves and dampers

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Rotork Controls Inc, Rochester, USA

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Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

PRESSURE INDICATOR / TRANSMITTER

TRANSMITTER

MANUFACTURER : FOXBORO
MODEL : I/A SERIES ELECTRONIC TRANSMITTER, IGP10
MODEL NO. : IGP10-T23C1C-L1X2
SERVICE : OXYGEN GAS & OZONE/OXYGEN GAS MIXTURE
RANGE : 0 ~ 30 PSIG (0 ~ 206 kPa)
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 11.5 ~ 42 VDC
CONNECTION : 1/2" (12.7 mm) NPT
MATERIAL OF CONSTRUCTION (WETTED PARTS)
CONNECTION : TYPE 316L S.S.
SENSOR : TYPE 316L S.S.
FILL FLUID : FLUORINERT
DISPLAY : DIGITAL LCD DISPLAY
QUANTITY : 6 (2 PER GENERATOR)
CUSTOMER TAG NO. : PT-O110A / PT-O112A
PT-O130A / PT-O132A
PT-O150A / PT-O152A

VALVE

MANUFACTURER : ANDERSON GREENWOOD
TYPE : TWO-VALVE SINGLE OUTLET GAUGE VALVE
MODEL NO. : M25VIS-44-OC
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
PACKING : TEFLON
MOUNTING PIPE SIZE : 2" (50 mm) S.S. PIPE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 6 (2 PER GENERATOR)
CUSTOMER TAG NO. : HV-O110A / HV-O112A
HV-O130A / HV-O132A
HV-O150A / HV-O152A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for final design in the shop drawing
remains with the contractor.

See schedule for verification and correlation of field
dimensions. If modifications are needed, field master of
construction must be notified in writing. Verification of all
parts of the work remains with the contractor.

REVIEWED _____ ✓ _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____ ✗ _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 24/1/06

By: M. Foub

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for final design in the shop drawing
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See schedule for verification and correlation of field
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parts of the work remains with the contractor.

REVIEWED _____ ✓ _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____ ✗ _____

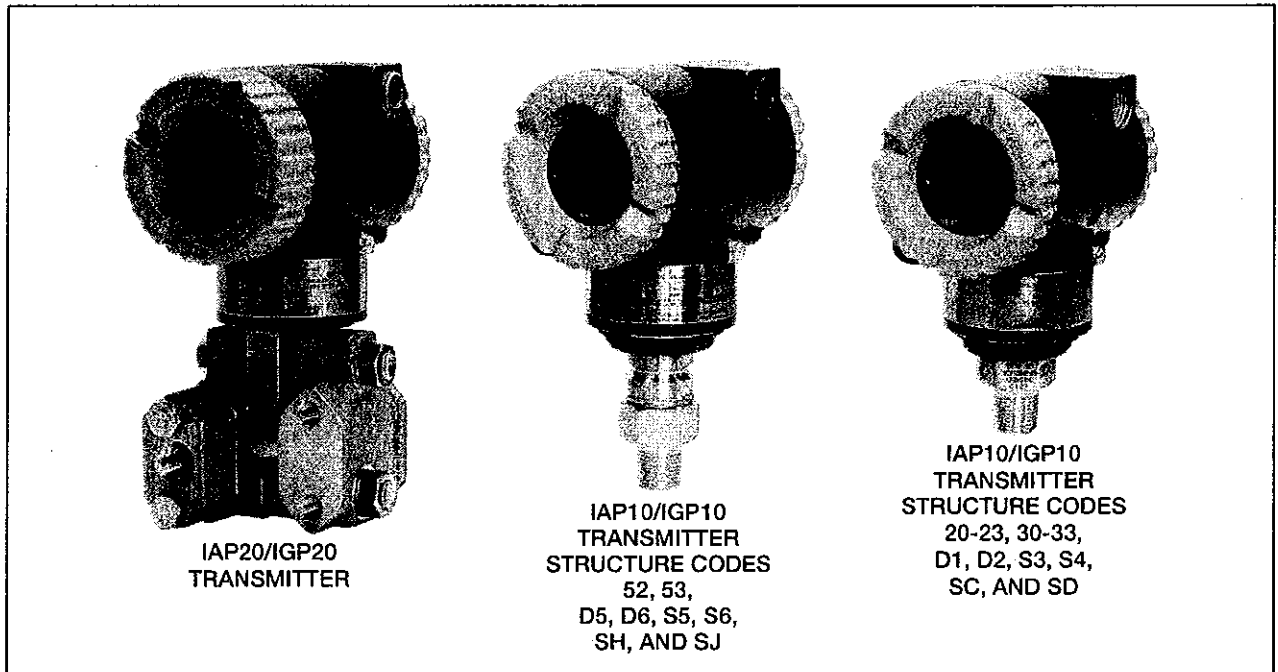
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Project No. 79538-C14-16

Date: 24/1/06

By: M. Joubert

I/A Series[®] Electronic Pressure Transmitters with 4 to 20 mA Analog Output for Absolute and Gauge Pressure Measurement



The IAP10, IGP10, IAP20, and IGP20 Series of electronic analog output, two-wire transmitters provide precise, reliable measurement of absolute or gauge pressure, and transmit a 4 to 20 mA output signal.

HIGH DEPENDABILITY

- Simple, elegant sensor packaging uses very few parts to achieve exceptionally high reliability
- NEMA[®] 4X and IEC IP66 durable epoxy-coated aluminum, or 316 ss housings.
- Co-Ni-Cr, 316L ss, and Hastelloy[®] sensor materials for all transmitters; additional materials available for IAP20/IGP20 Transmitters.
- Can be provided with numerous configurations of direct connect or remote mount seals.
- Integral process connections for sanitary, and pulp/paper installations with IAP10/IGP10.
- CE marked; complies with applicable EMC, ATEX, and PED European Union Directives.
- Meet numerous Agency requirements for hazardous locations. Versions available to meet Agency flameproof and zone requirements.
- Standard 2-year warranty; 5-year optional.

INTELLIGENT TRANSMITTER FEATURES AT AN ECONOMICAL PRICE

When you want the flexibility and performance of a configurable, intelligent transmitter but you don't need a digital output signal, these transmitters provide exceptional benefits at a very affordable price:

- Liquid Crystal Display (LCD) digital indicator with on-board pushbuttons
- Pushbutton configuration and calibration:
 - Zero and Span Settings
 - Adjustable Damping
 - Forward or Reverse Output
 - Failsafe Output; Upscale or Downscale
 - Reranging without applying pressure
- Easily upgradeable to FoxCom[™], HART[®], FOUNDATION[®] fieldbus, or PROFIBUS[®] fully intelligent versions

I/A Series® PRESSURE TRANSMITTER FAMILY

The I/A Series Electronic Pressure Transmitters are a complete family of d/p Cell®, gauge, absolute, multirange, multivariable, and premium performance transmitters, as well as transmitters with remote or direct connect pressure seals, all using field-proven silicon strain gauge sensors and common topworks.

MODULAR ELECTRONICS

A common 4 to 20 mA output electronics module is used with these transmitters. Also, because all configuration and calibration data is stored in the sensor, you can replace this module with another like module without transmitter reconfiguration or recalibration.

Furthermore, if your needs change, the transmitter modular design allows easy migration to other standards, including FoxCom, HART, FOUNDATION Fieldbus, PROFIBUS, and 1 to 5 V dc.

ELECTRONICS VERSION -A TRANSMITTER

This 4 to 20 mA analog output transmitter is a very cost effective analog output transmitter. It provides full configuration capability and represents Invensys Foxboro advancements in providing the greatest functionality for the largest number of applications at the least possible cost to you.

The transmitter even provides the ability to rerange to new calibrated ranges, using the LCD Indicator, without the need to apply calibration pressure.

These transmitters are explosionproof for use in Division 1 hazardous areas and comply with Division 2 requirements. They also provide the flameproof certification for use in Zone 1 hazardous areas.

HIGH PERFORMANCE

Both direct-connected and bracket-mounted transmitters utilize microprocessor-based correction to achieve excellent accuracy and ambient temperature compensation.

EASE OF INSTALLATION

Rotatable Topworks allows transmitter installation in tight places, allows indicator to be positioned in preferred direction, and eases field retrofit.

Two Conduit Entrances offer a choice of entry positions for ease of installation and self-draining of condensation regardless of mounting position and topworks rotation.

Wiring Guides and Terminations provide ease of wire entry and support, plenty of space to work and store excess wire, and large, rugged, rugged screw terminals for easy wire termination.

STANDARD LCD DIGITAL INDICATOR

A two-line digital indicator with on-board pushbuttons displays the measurement with a choice of units. The pushbuttons allow zero and span adjustments as well as local configuration without the need for a PC-based Configurator.

When local process indication is not required or desired, an optional blind (solid) cover can be substituted for the standard window cover.

CHOOSE MOUNTING CONFIGURATION NEEDED

Direct Connected Transmitter (Figure 1)

Light weight and easy-to-install. Uses 316L ss or Hastelloy C process connections and a choice of either 316L ss, Cobalt-Nickel-Chrome, or Hastelloy C for the sensing diaphragm. See Direct-Connected Transmitters on next page.

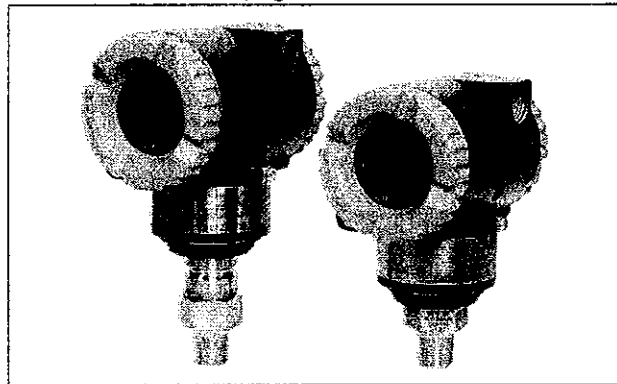


Figure 1. Direct Connected Transmitter (Flameproof Version on Left)

Bracket-Mounted Transmitter (Figure 2)

A large selection of corrosion resistant materials; suitable for applications requiring low spans, vacuum service, and high overrange pressure. See Bracket-Mounted Transmitters on next page.

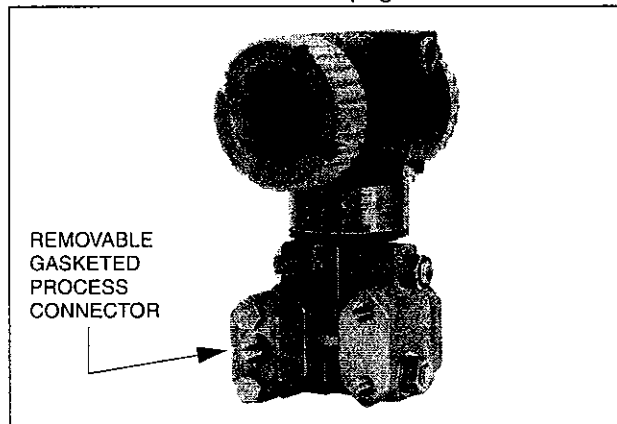


Figure 2. Bracket-Mounted Transmitter with Conventional Process Connector

DIRECT-CONNECTED TRANSMITTERS — IAP10 AND IGP10 (See Figure 1)

EXCEPTIONAL VALUE

The combination of small size, light weight, direct mounting, standard materials, and wide measurement capability with high performance makes these transmitters an exceptionally cost effective solution for process pressure measurement.

DIRECT PROCESS MOUNTING

Because of their light weight and external threaded connection, these transmitters can be installed directly on process piping without mounting brackets. However, for unique requirements, an optional bracket is offered and connection can be made to the standard 1/4 NPT internal thread.

WIDE RANGEABILITY

Three absolute pressure versions are offered to allow spans from 7 to 21 000 kPa (1 to 3000 psi), and four gauge pressure versions are offered to allow spans from 7 to 42 000 kPa (1 to 6000 psi). Refer to the IGP20 Transmitter section below for gauge pressure vacuum service.

316L ss, HASTELLOY C, AND Co-Ni-Cr PROCESS WETTED PARTS

With process connection of 316L ss or Hastelloy C, and sensor diaphragm available in either 316L ss, Hastelloy C, or highly corrosion resistant Co-Ni-Cr, this transmitter is an excellent choice for the vast majority of process pressure measurements.

HIGH GAUGE PRESSURE VERSIONS

Three high gauge pressure versions with URLs of 52, 105, and 210 MPa (7500, 15 000, and 30 000 psi) are available in the IGP10 line. See PSS 2A-1C13 F.

SANITARY AND PULP AND PAPER VERSIONS

These transmitters are also available with integral process connections for use in sanitary and pulp and paper installations. See PSS 2A-1C13 K and PSS 2A-1C13 L, respectively.

FLAMEPROOF DESIGN

The IAP10 and IGP10 flameproof versions are designed to meet Agency flameproof and zone requirements.

BRACKET-MOUNTED TRANSMITTERS — IAP20 AND IGP20 (See Figure 2)

SENSOR CORROSION PROTECTION

Choice of Co-Ni-Cr, 316L ss, Gold-Plated 316L ss, Hastelloy C, Monel, or Tantalum materials. High corrosion resistance of Co-Ni-Cr (TI 037-038) means long service life in many difficult applications without the extra cost for exotic materials. Also see TI 37-75b for process application with Co-Ni-Cr and other wetted parts materials.

WIDE RANGEABILITY

Gauge pressure measurement spans may be as low as 0.12 kPa (0.5 inH₂O) to as high as 21 MPa (3000 psi) by choosing one of only five sensors, and absolute pressure spans may be as low as 0.87 kPa (3.5 inH₂O) to as high as 21 MPa (3000 psi) by choosing one of only four sensors. This provides exceptional measurement range capability with a minimum of versions.

EASE OF MOUNTING TWO-VALVE MANIFOLD

Optional two-valve manifold, to isolate transmitter and to vent pressure, is easily mounted directly to the transmitter.

VACUUM SERVICE

A lower range limit of -100 kPa (-14.7 psi, -1 bar or kg/cm²) means that vacuum measurements are easily handled with the versatile IGP20 Gauge Pressure transmitter.

FLAMEPROOF DESIGN

The transmitters are designed to meet Agency flameproof and zone requirements.

PROCESS CONNECTOR

Removable, gasketed process connector (Figure 3) allows a wide range of selections, including 1/4 NPT, 1/2 NPT, Rc 1/4, Rc 1/2, and weld neck connections.

For highly corrosive chemical processes, a 1/2 NPT pvdf (Kynar[®]) insert is installed in the HI-side 316 ss cover and is used as the process connector. In these applications, tantalum is used as the sensor diaphragm material.

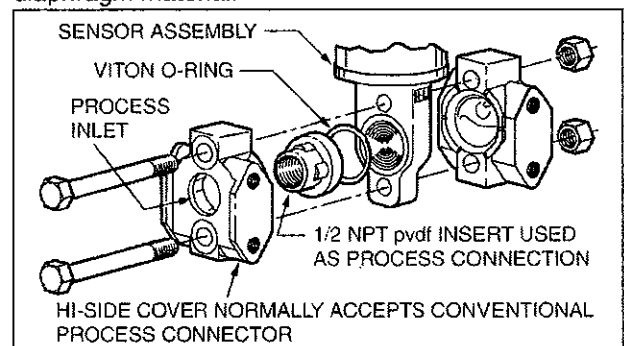


Figure 3. Bracket-Mounted Transmitter Shown with 1/2 NPT pvdf Insert Installed in HI-Side Cover

PRESSURE SEALS

Pressure seals are used with the IAP10, IGP10, IAP20, and IGP20 Series Transmitters when it is necessary to keep the transmitter isolated from the process. A sealed system is used for a process fluid that may be corrosive, viscous, subject to temperature extremes, toxic, sanitary, or tend to collect and solidify.

Tables 1 and 2 list the various seals that can be used with these transmitters. To order a transmitter with seals, both a Transmitter Model Number and Seal Model Number are required. See PSS 2A-1Z11 A for a complete listing of pressure seal models and specifications. Also see Figure 4 for typical pressure seal configurations.

Table 1. Pressure Seals Used with IAP10, IGP10, IAP20, and IGP20 Transmitters

Direct Connect Pressure Seal Assemblies		
Seal Model	Seal Description	Process Connections
PSFLT	Flanged, Direct Connect (Flanged Level), Flush or Extended Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40, 10/16, 25/40 flanges
PSFAD	Flanged, Direct Connect, Recessed Diaphragm	ANSI Class 150, 300, 600, 1500 flanges
PSTAD	Threaded, Direct Connect, Recessed Diaphragm	1/4, 1/2, 3/4, 1, or 1 1/2 NPT internal thread
PSISD	In-Line Saddle Weld, Direct Connect, Recessed Diaphragm	Lower housing of seal is in-line saddle welded to nominal 3- or 4-inch (and larger) Pipe
PSSCT	Sanitary, Direct Connect (Level Seal), Flush Diaphragm	Process Connection to Sanitary Piping with 2- or 3-inch Tri-Clamp
PSSST	Sanitary, Direct Connect (Level Seal), Extended Diaphragm	Process Connection to 2-in Mini Spud or 4-in Standard Spud; Tri-Clamp
Remote Mount, Capillary-Connected Pressure Seal Assemblies		
Seal Model	Seal Description	Process Connections
PSFPS	Flanged, Remote Mount, Flush Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40 flanges
PSFES	Flanged, Remote Mount, Extended Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40, 10/16, 25/40 flanges
PSFAR	Flanged, Remote Mount, Recessed Diaphragm	ANSI Class 150/300/600/1500 flanges
PSTAR	Threaded, Remote Mount, Recessed Diaphragm	1/4, 1/2, 3/4, 1, or 1 1/2 NPT internal thread
PSISR	In-Line Saddle Weld, Remote Mount, Recessed Diaphragm	Lower housing of seal is in-line saddle welded to nominal 3- or 4-inch (and larger) Pipe
PSSCR	Sanitary, Remote Mount, Flush Diaphragm	Process Connection secured with a Tri-Clamp to a 2- or 3-inch pipe
PSSSR	Sanitary, Remote Mount, Extended Diaphragm	Process Connection to 2-in Mini Spud or 4-in Standard Spud; Tri-Clamp

Table 2. I/A Series Pressure Transmitters and Applicable Pressure Seals

Transmitter Model	Used with Pressure Seal Model: (a)												
	FLT	FAD	TAD	ISD	SCT	SST	FPS	FES	FAR	TAR	ISR	SCR	SSR
IAP10	-	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	✓
IGP10	-	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	✓
IAP20	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
IGP20	✓	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓

(a) Pressure Seal models are shown with an abbreviated code; all seal codes have a PS prefix; for example, FLT is really PSFLT.

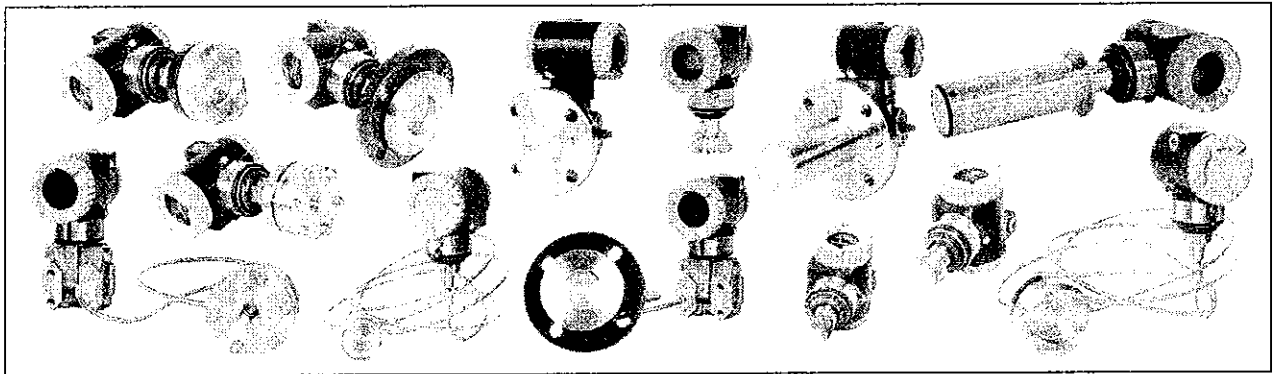


Figure 4. Typical Pressure Seals used with IAP10, IGP10, IAP20, and IGP20 Transmitters

FUNCTIONAL SPECIFICATIONS

Span and Range Limits for IAP10 and IGP10 Transmitters

Span Code	Span Limits			Range Limits (Absolute or Gauge Units)		
	MPa	psi	bar or kg/cm ²	MPa	psi	bar or kg/cm ²
C	0.007 and 0.21	1 and 30	0.07 and 2.1	0 and 0.21	0 and 30	0 and 2.1
D	0.07 and 2.1	10 and 300	0.7 and 21	0 and 2.1	0 and 300	0 and 21
E	0.7 and 21	100 and 3000	7 and 210	0 and 21	0 and 3000	0 and 210
F (a)	14 and 42	2000 and 6000	140 and 420	0 and 42	0 and 6000	0 and 420

(a) Span Limit Code F is applicable to IGP10 Transmitter only.

Maximum Overage and Proof Pressure Ratings for IAP10 and IGP10 Transmitters

Span Code	Maximum Overage Pressure Rating (a)			Proof Pressure Rating (a)(b)		
	MPa	psi	bar or kg/cm ²	MPa	psi	bar or kg/cm ²
C	0.31	45	3.15	0.827	120	8.27
D	3.1	450	31.5	8.27	1200	82.7
E	31	4500	315	79.3	11500	793
F (c)	59	8400	580	152	22000	1517

(a) Values listed are in absolute or gauge pressure units, as applicable. Maximum overrange pressure is the maximum pressure that may be applied without causing damage to the transmitter.

(b) Proof pressure ratings meet ANSI/ISA Standard S82.03-1988. Unit may become nonfunctional after application of proof pressure.

(c) Span Limit Code F is applicable to IGP10 Transmitter only.

Span and Range Limits for IAP20 and IGP20 Transmitters

Span Code	Span Limits			Range Limits (Absolute or Gauge Units) (a)		
	kPa	inH ₂ O	mbar	kPa	inH ₂ O	mbar
A (b)	0.12 and 7.5	0.5 and 30	1.2 and 75	-7.5 and +7.5	-30 and +30	-75 and +75
B	0.87(c) and 50	3.5(c) and 200	8.7(c) and 500	-50(a) and +50	-200(a) and +200	-500(a) and +500
	MPa	psi	bar or kg/cm ²	MPa	psi	bar or kg/cm ²
C	0.007 and 0.21	1 and 30	0.07 and 2.1	-0.1(a) and 0.21	-14.7(a) and +30	-1(a) and +2.1
D	0.07 and 2.1	10 and 300	0.7 and 21	-0.1(a) and 2.1	-14.7(a) and +300	-1(a) and +21
E (d)	0.7 and 21	100 and 3000	7 and 210	-0.1(a) and 21	-14.7(a) and +3000	-1(a) and +210

(a) For absolute pressure transmitters (IAP20), the lower range limit is 0.

(b) Span Code A is applicable to the IGP20 Transmitter only. Also, Span Limit Code A is not available when pressure seals are specified.

(c) For IAP20, the minimum span for factory calibration is 1.2 kPa (5 inH₂O, 12.4 mbar). Can be field reranged within limits shown in table.

(d) When certain options are specified, the upper span and range limit values are reduced as listed in the "Options Impact" table.

FUNCTIONAL SPECIFICATIONS (Cont.)

Maximum Overrange and Proof Pressure Ratings for IAP 20 and IGP20 Transmitters (a)

Transmitter Configuration (See Model Code for Description of Options)	Overrange Pressure Rating			Proof Pressure Rating (b)		
	MPa	psi	bar or kg/cm ²	MPa	psi	bar or kg/cm ²
Standard or with Option -B2, -D3, or -D7	25	3625	250	100	14500	1000
With Option -B3	20	2900	200	70	11150	700
With Option -D1	16	2320	160	64	9280	640
With Option -B1 or -D5	15	2175	150	60	8700	600
With Option -D2, -D4, -D6, or -D8	10	1500	100	40	6000	400
With Structure Codes 78 and 79 (pvdf insert)	2.1	300	21	8.4	1200	84

(a) Refer to Model Code section for application and restrictions related to the items listed in the table.

(b) Proof pressure ratings meet ANSI/ISA[®] Standard S82.03-1988. Unit may become nonfunctional after application of proof pressure.

Impact of Certain Options on IAP20/IGP20 Span and Range Limits (a)

Option	Description (Also see Model Code)	Span and Range Limits Derated to:
-B3	B7-M Bolts and Nuts (NACE)	20 MPa (2900 psi, 200 bar, or kg/cm ²)
-D1	DIN Construction	16 MPa (2320 psi, 160 bar or kg/cm ²)
-D5 or -B1	DIN Construction or 316 ss Bolting	15 MPa (2175 psi, 150 bar or kg/cm ²)
-D2, -D4, -D6, or -D8 (a)	DIN Construction (a)	10 MPa (1500 psi, 100 bar or kg/cm ²) (a)

(a) Refer to Model Code section for application and restrictions related to the items listed in the table.

Output Signal

4 to 20 mA, Linear

Field Wiring Reversal

No transmitter damage

Supply Voltage Requirements and External Loop Load Limitations (Figure 5)

Minimum supply voltage is 11.5 V dc. This can be reduced to 11 V dc using a plug-in jumper in the field wiring compartment terminal block as shown in the "Physical Specifications" section.

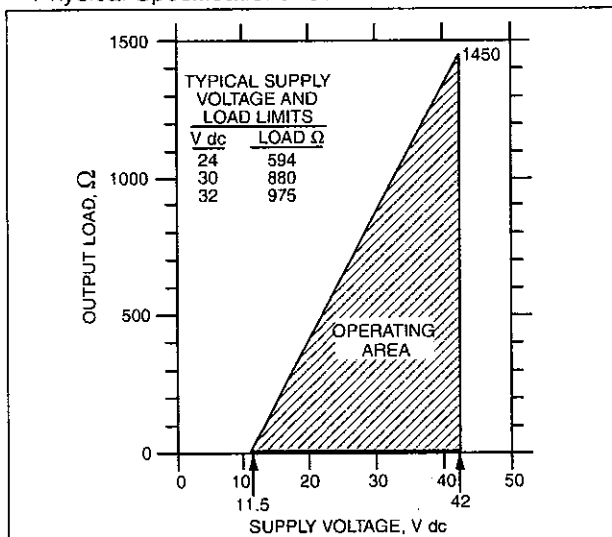


Figure 5. Supply Voltage vs. Output Load

Suppressed Zero and Elevated Zero

Suppressed or elevated zero ranges are acceptable as long as the Span and Range Limits are not exceeded (elevated zero applicable to IGP20 only).

Zeroing for Nonzero-Based Ranges

Dual Function Zeroing is provided to allow zeroing with the transmitter open to atmosphere, even when there is a nonzero-based range. This greatly simplifies position effect zeroing on many pressure and level applications. It applies to the standard LCD Indicator, and External Zero Adjustment option.

Zero and Span Adjustments (See Figure 8)

Zero and span adjustments can be accomplished using the pushbuttons on the LCD indicator.

Optional External Zero Adjustment (See Figure 8)

An external zero pushbutton mechanism is isolated from the electronics compartment and magnetically activates an internal reed switch through the housing. This eliminates a potential leak path for moisture or contaminants to get into the electronics compartment. The external zero adjustment can be disabled by a configuration selection.

Write Protect Jumper

Can be positioned to lock out all configurators from making database changes. This makes transmitter suitable for Safety Shutdown System Applications that require this feature.

FUNCTIONAL SPECIFICATIONS (Cont.)

Adjustable Damping

Transmitter response time is normally 0.75 s, or the electronically adjustable setting of 0 (none), 2, 4, or 8 seconds, whichever is greater, for a 90% recovery from an 80% input step per ANSI/ISA S51.1. (For 63.2% recovery, 0.5 s with sensors B to F, and 0.6 s with sensor A.)

Minimum Allowable Absolute Pressure vs. Transmitter Temperature

WITH SILICONE FILL FLUID

Full vacuum: up to 121°C (250°F)

WITH FLUORINERT® FILL FLUID (FIGURE 6.)

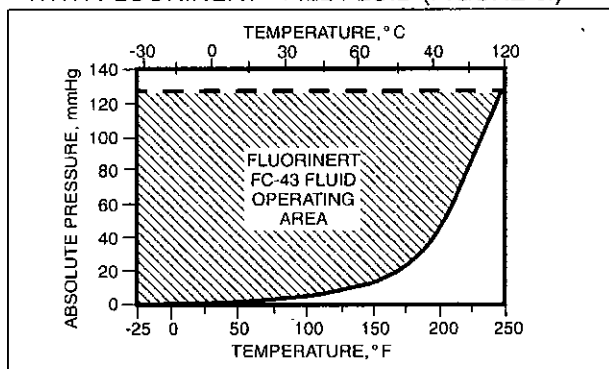


Figure 6. Minimum Allowable Absolute Pressure vs. Transmitter Temperature, Fluorinert FC-43, 2.6 cSt at 25°C (77°F)

European Union Directives

- Complies with Electromagnetic Compatibility Requirements of European EMC Directive 89/336/EEC by conforming to the following CENELEC and IEC Standards: EN 50081-2, EN 50082-2, and IEC 801-2 through 801-6.
- Transmitter Complies with NAMUR Part 1 Interference Immunity Requirement (EMC)
- Transmitter Conforms to Applicable European Union Directives ("CE" Logo marked on product).

Configuration and Calibration Data, and Electronics Upgradeability

All factory characterization data and user configuration and calibration data are stored in the sensor (Figure 7). This means that the electronics module may be replaced, with one of like type, without the need for reconfiguration or recalibration.

Although module replacement can affect accuracy by a maximum of 0.20% of span, this error can be removed by an mA trim without application of pressure.

Changing module types (e.g., from one protocol to another protocol) may require reconfiguration and recalibration, as well as a different terminal block, but all factory characterization data is retained.

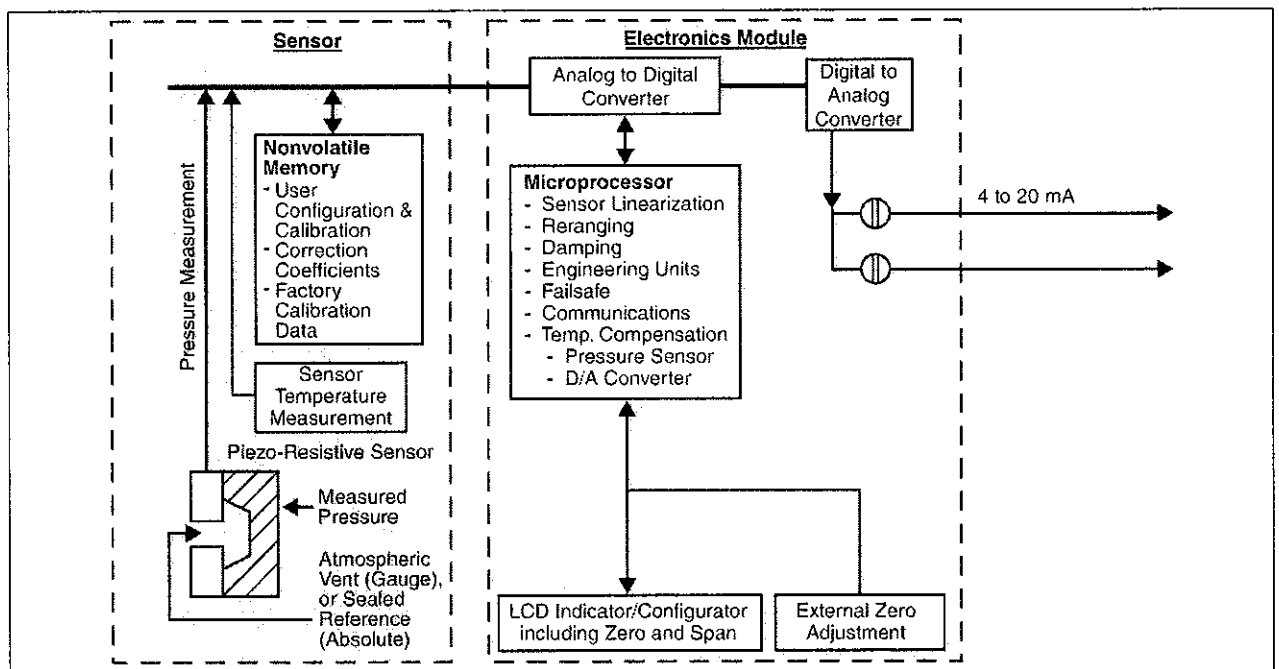


Figure 7. Transmitter Functional Block Diagram

FUNCTIONAL SPECIFICATIONS (Cont.)

Standard LCD Indicator with On-Board Pushbuttons (Figure 8) Provides:

- Two lines; four numeric characters on top line, and seven alphanumeric characters on bottom line.
- Measurement Readout; value on top line and units label on bottom line.
- Configuration and Calibration Prompts.

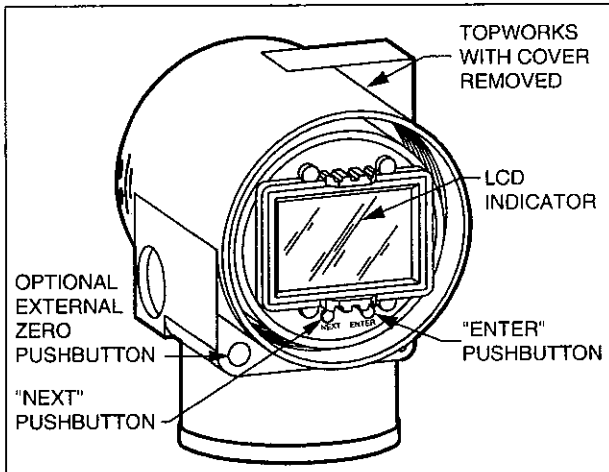


Figure 8. Standard LCD Indicator with Pushbuttons

Optional Custom Configuration (Option -C2)

For the transmitter to be custom configured by the factory, the user must fill out a data form. If this option is not selected, a standard default configuration will be provided. See Tables 3 and 4.

Table 3. Example of Option -C2

Parameter	Standard (Default) Configuration	Example of Custom Configuration Option -C2
Calibrated Range • Pressure EGU • LRV • URV	per S.O.(a) per S.O. per S.O.	KG/CM2 (a) 0 1
Output Direction	Forward	Forward
Damping	None	2
Failsafe Action	Upscale	Downscale
Ext. Zero Option	Enabled	Disabled
Other • Label (2nd line) • Display LRV • Display URV	(b) (c) (c)	KG/CM2 (b) 0 (c) 1 (c)

(a) Select from list in Table 4 below.

(b) Same as pressure units used for calibrated range, or percent.

(c) Same as calibrated range or 0 and 100 for percent.

Table 4.

Available Pressure Units in Calibrated Range (a)

inH ₂ O	inHg	kPa	mbar	kg/cm ²
ftH ₂ O	mmHg	MPa	bar	psi
mmH ₂ O	Pa	torr	g/cm ²	atm

(a) Absolute or gauge pressure units, as applicable.

NOTE

There is a maximum of 4 digits for entering range values.

OPERATING, STORAGE, AND TRANSPORTATION CONDITIONS

Influence	Reference Operating Conditions	Normal Operating Conditions (a)	Operative Limits (a)	Storage and Transportation Limits
Process Connection Temp. • with Silicone Fill Fluid • with Fluorinert Fill Fluid	• 24 ±2°C (75 ±3°F) • 24 ±2°C (75 ±3°F)	• -29 to + 82°C (-20 to +180°F) • -29 to + 82°C (-20 to +180°F)	• -46 and +121°C (b) (-50 and +250°F) (b) • -29 and +121°C (-20 and +250°F)	• Not Applicable • Not Applicable
Electronics Temperature • with LCD Indicator (Note c)	• 24 ±2°C (75 ±3°F) • 24 ±2°C (75 ±3°F)	• -29 to + 82°C (-20 to +180°F) • -20 to + 82°C (-4 to +180°F)	• -40 and +85°C (b) (-40 and +185°F) (b) • -29 and +85°C (-20 and +185°F)	• -54 and +85°C (-65 and +185°F) • -54 and +85°C (-65 and +185°F)
Relative Humidity (Note d)	50 ±10%	0 to 100%	0 and 100%	0 and 100% Noncondensing
Supply Voltage - mA Output	30 ±0.5 V dc	11.5 to 42 V dc (e)	11.5 and 42 V dc (e)	Not Applicable
Output Load - mA Output	650 Ω	0 to 1450 Ω	0 and 1450 Ω	Not Applicable
Vibration	1 m/s ² (0.1 "g")	6.3 mm (0.25 in) Double Amplitude: from 5 to 15 Hz with Aluminum Housing and from 5 to 9 Hz with 316 ss Housing ----- 0 to 30 m/s ² (0 to 3 "g") from 15 to 500 Hz with Aluminum Housing; and 0 to 10 m/s ² (0 to 1 "g") from 9 to 500 Hz with 316 ss Housing	11 m/s ² (1.1 "g") from 2.5 to 5 Hz (in Shipping Package)	
Mounting Position	Upright (f)	Upright (f)	No Limit	Not Applicable

(a) Temperature limits are derated as follows:

IAP20 and IGP20 Transmitters:

to -7 and +82°C (20 and 180°F) when Structure Codes 78/79 (pdf inserts) are used, and
to 0 and 60°C (32 and 140°F) when DIN Construction Options D2/D4/D6/D8 are used.

(b) Selection of Option -J extends the low temperature limit of transmitters with silicone filled sensors down to -50°C (-58°F).

(c) Although the LCD will not be damaged at any temperature within the "Storage and Transportation Limits", updates will be slowed and readability decreased at temperatures outside the "Normal Operating Conditions".

(d) With topworks covers on and conduit entrances sealed.

(e) 11.5 V dc can be reduced to 11 V dc by using a plug-in shorting bar; see "Physical Specifications" sections.

(f) Sensor process wetted diaphragms in a vertical plane for IAP20 and IGP20 Transmitter.

PERFORMANCE SPECIFICATIONS

Zero-Based Calibrations; Cobalt-Nickel-Chromium or Stainless Steel Sensor with Silicone Fluid;
 Under Reference Operating Conditions unless otherwise specified;
 URL = Upper Range Limit, and Span = Calibrated Span

Accuracy (includes Linearity, Hysteresis, and Repeatability)

±0.20% of Span

Small Span Accuracy for Spans <5% and <6.7% of URL

See Table 5 below.

Table 5. Accuracy with Small Spans

For Span Code (a)	If Span is:	Then Small Span Accuracy in % of Span is:
B	<5% of URL	$\pm \left[(0.10) + (0.005) \left(\frac{URL}{Span} \right) \right]$
A, C, D, E, and F	<6.7% of URL	$\pm \left[(0.10) + (0.0067) \left(\frac{URL}{Span} \right) \right]$

(a) See Model Code for Span Codes applicable to each transmitter.

Stability

Long term drift is less than ±0.05% of URL per year over a 5-year period.

Power-Up Time

Less than 5 seconds for output to reach first valid measurement.

Supply Voltage Effect

The output changes less than 0.005% of span for each 1 V change within the specified supply voltage requirements. See Figure 5.

Position Effect

The transmitter may be mounted in any position. Any zero effect caused by the mounting position can be eliminated by rezeroing. There is no span effect.

RFI Effect

The output error is less than 0.1% of span for radio frequencies in the range of 27 to 1000 MHz and field intensity of 30 V/m when the transmitter is properly installed with shielded conduit and grounding, and housing covers are in place. (Per IEC Std. 801-3.)

Vibration Effect

Total effect: ±0.2% of URL per “g” for vibrations in the frequency range of 5 to 500 Hz; with double amplitudes of 6.35 mm (0.25 in) in the range of 5 to 15 Hz, or accelerations of 3 “g” in the range of 15 to 500 Hz, whichever is smaller, for transmitters with aluminum housings; and with double amplitudes of 6.35 mm (0.25 in) in the range of 5 to 9 Hz, or accelerations of 1 “g” in the range of 9 to 500 Hz, whichever is smaller, for transmitters with 316 ss housings.

Switching and Indirect Lightning Transients

The transmitter can withstand a transient surge up to 2000 V common mode or 1000 V normal mode without permanent damage. The output shift is less than 1.0%. (Per ANSI/IEEE C62.41-1980 and IEC Std. 801-5.)

Ambient Temperature Effect

Total effect for a 28°C (50°F) change within Normal Operating Condition limits is:

FOR THE IAP10 AND IGP10 TRANSMITTERS

Span Code (a)	Ambient Temperature Effect
C, D, E, and F	±(0.08% URL + 0.1% Span)

(a) Span Code F applicable to IGP10 Transmitter only.

FOR THE IAP20 AND IGP20 TRANSMITTERS

Span Code	Ambient Temperature Effect
A (a)	±(0.18% URL + 0.15% Span)
B and C	±(0.03% URL + 0.20% Span)
D	±(0.05% URL + 0.18% Span)
E	±(0.08% URL + 0.15% Span)

(a) Span Limit Code A applicable to IGP20 Transmitter only.

NOTE

For additional ambient temperature effect when pressure seals are used, see PSS 2A-1Z11 A.

PHYSICAL SPECIFICATIONS

Description	Direct Connected Absolute and Gauge Pressure Transmitters IAP10 and IGP10	Bracket-Mounted Absolute and Gauge Pressure Transmitters IAP20 and IGP20
Process Wetted Parts Mat'ls. (High Pressure Side) <ul style="list-style-type: none"> • Process Connection • Gaskets • Sensor Diaphragm 	<ul style="list-style-type: none"> • 316L ss or Hastelloy C • Not Applicable • 316L ss, Co-Ni-Cr, or Hastelloy C 	<ul style="list-style-type: none"> • Carbon Steel, 316 ss, Hastelloy C, Monel, or pvdf (Kynar®) • Glass-filled ptfе (Chemloy®), Viton® • Co-Ni-Cr, 316L ss, Gold-plated 316L ss, Monel, Hastelloy C, or Tantalum
Reference Side Materials (Atmospheric Pressure Side)	IGP10 Transmitter: <ul style="list-style-type: none"> • Silicon, Pyrex, RTV, and 316 ss IAP10 Transmitter: <ul style="list-style-type: none"> • N/A 	Sensor Diaphragm: <ul style="list-style-type: none"> • Same as specified for High Pressure side process wetted material. Cover: <ul style="list-style-type: none"> • 316 ss
Sensor Fill Fluid	Silicone or Fluorinert	Silicone or Fluorinert
Bolts and Nuts for Process Cover and Connector	N/A	Standard Bolting: <ul style="list-style-type: none"> • ASTM A193, Grade B7 Bolts • ASTM A194, Grade 2H Nuts Optional Bolting: <ul style="list-style-type: none"> • 316 ss, Type 17-4 ss, or B7M (NACE)
Electrical Housing and Housing Covers	Two compartments to separate electronics from field connections. Material is low copper (1% maximum) die-cast aluminum alloy with epoxy finish; or 316 ss.	
Environmental Protection	Dusttight and weatherproof per IEC IP66 and NEMA 4X.	
Electronics Module	Printed wiring assemblies are conformally coated for moisture and dust protection.	
Electrical Connections	1/2 NPT or PG 13.5 entrances on both sides of electronics housing, as specified. Unused entrance must be plugged to ensure moisture and RFI protection (aluminum or 316 ss plug supplied by Invensys Foxboro).	
Mounting Position	The transmitter may be mounted in any orientation.	
Approximate Mass (a)	Standard Transmitter 1.5 kg (3.3 lb) With 316 ss Housing Add 1.1 kg (2.4 lb)	With Process Connectors 4.2 kg (9.2 lb) Without Process Connectors 3.5 kg (7.8 lb) With 316 ss Housing Add 1.1. kg (2.4 lb)
Field Terminal Connections		

(a) LCD Indicator is standard with these transmitters. For approximate mass with pressure seals, see PSS 2A-1Z11 A.

ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Electrical Safety Design Code
ATEX flameproof; II 2 GD EEx d IIC, Zone 1; hazardous locations.	D
CSA explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof for Class II, Division 1, Groups E, F, and G, and Class III, Division 1. Also Class I, Division 2, Groups A, B, C, and D, Class II, Division 2, Groups F and G, and Class III, Division 2.	C
CSA zone certified flameproof Ex d IIC. Also explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof for Class II, Division 1, Groups E, F, and G, and Class III, Division 1. Also Class I, Division 2, Groups A, B, C, and D, Class II, Division 2, Groups F and G, and Class III, Division 2.	B
FM explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof for Class II, Division 1, Groups E, F, and G, and Class III, Division 1. Also nonincendive for Class I, Division 2, Groups A, B, C, and D, Class II, Division 2, Groups F and G, and Class III, Division 2.	F
FM zone approved flameproof AEx d IIC. Also explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof for Class II, Division 1, Groups E, F, and G, and Class III, Division 1. Also nonincendive for Class I, Division 2, Groups A, B, C, and D, Class II, Division 2, Groups F and G, and Class III, Division 2.	G
SAA Ex d IIC, flameproof, Gas Group IIC, Zone 1.	A
SAA Ex n IIC, nonincendive, Gas Group IIC, Zone 2	K

NOTES

1. Transmitter has been designed to meet the electrical safety descriptions listed. Contact Invensys Foxboro for information or status of testing laboratory approvals or certifications.
2. See Model Codes section for availability of Electrical Safety Design Codes with particular Transmitter Models and Structures.
3. Refer to applicable Instruction Manual for application conditions and connectivity requirements.

**IAP10 AND IGP10 ABSOLUTE AND GAUGE PRESSURE TRANSMITTERS
MODEL CODE**

<u>Description</u>				<u>Model</u>
I/A Series, Electronic, Direct Connected Absolute Pressure Transmitter				IAP10 (a)
I/A Series, Electronic, Direct Connected Gauge Pressure Transmitter				IGP10 (a)
Electronics Versions and Output Signal				
Analog; 4 to 20 mA dc Output (Version -A)				-A
Structure Code - Select from one of the following six groups:				
1. Transmitter Only (no seals)				
Process	Sensor	Sensor	Fill Fluid	Connection Type
<u>Connection</u>	<u>Sensor</u>	<u>Fill Fluid</u>	<u>Connection Type</u>	
316L ss	Co-Ni-Cr	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	20
316L ss	Co-Ni-Cr	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	21
316L ss	316L ss	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	22
316L ss	316L ss	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	23
316L ss	Hastelloy C	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	30
316L ss	Hastelloy C	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	31
Hastelloy C	Hastelloy C	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	32
Hastelloy C	Hastelloy C	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	33
2. Transmitter Prepared for Foxboro Model Coded Seals (b)				
Transmitter Prepared for Foxboro Direct Connect Seal; Silicone Fill in Sensor (c)				D1
Transmitter Prepared for Foxboro Direct Connect Seal; Fluorinert Fill in Sensor (IGP10 only) (c)				D2
Transmitter Prepared for Foxboro Remote Mount Seal; Silicone Fill in Sensor (d)				S3
Transmitter Prepared for Foxboro Remote Mount Seal; Fluorinert Fill in Sensor (IGP10 only) (d)				S4
3. Transmitters Prepared for non-Foxboro Seals				
Transmitter Prepared for Remote Seal; Silicone Fill in Sensor (e)				SC
Transmitter Prepared for Remote Seal; Fluorinert Fill in Sensor (f)				SD
4. Flameproof Transmitter Only (no seals)				
Process	Sensor	Sensor	Fill Fluid	Connection Type
<u>Connection</u>	<u>Sensor</u>	<u>Fill Fluid</u>	<u>Connection Type</u>	
316L ss	316L ss	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	52
316L ss	316L ss	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	53
316L ss	Hastelloy C	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	60
316L ss	Hastelloy C	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	61
Hastelloy C	Hastelloy C	Silicone	1/2 NPT External Thread, 1/4 NPT Internal Thread	62
Hastelloy C	Hastelloy C	Fluorinert	1/2 NPT External Thread, 1/4 NPT Internal Thread	63
5. Flameproof Transmitter Prepared for Foxboro Model Coded Seals (b)				
Flameproof Transmitter Prepared for Direct Connect Seal; Silicone Fill in Sensor (c)				D5
Flameproof Transmitter Prepared for Direct Connect Seal; Fluorinert Fill in Sensor (IGP10 only) (c)				D6
Flameproof Transmitter Prepared for Remote Mount Seal; Silicone Fill in Sensor (d)				S5
Flameproof Transmitter Prepared for Remote Mount Seal; Fluorinert Fill in Sensor (IGP10 only) (d)				S6
6. Flameproof Transmitter Prepared for non-Foxboro Seals				
Flameproof Transmitter Prepared for Remote Seal; Silicone Fill in Sensor (e)				SH
Flameproof Transmitter Prepared for Remote Seal; Fluorinert Fill in Sensor (f)				SJ
Span Limits - Absolute or Gauge Pressure Units, as Applicable				
MPa	psi	bar or kg/cm²		
0.007 and 0.21	1 and 30	0.07 and 2.1		C
0.07 and 2.1	10 and 300	0.7 and 21		D
0.7 and 21	100 and 3000	7 and 210		E
14 and 42	2000 and 6000	140 and 420 (IGP10 only)		F

Model Code continued on next page

IAP10 AND IGP10 ABSOLUTE AND GAUGE PRESSURE TRANSMITTERS (Cont.)

MODEL CODE (Cont.)

<u>Description</u>	
Conduit Connection and Housing Material	
1/2 NPT Conduit Connection, Aluminum Housing	1
1/2 NPT Conduit Connection, 316 ss Housing	3
Conduit Connection and Housing Material	
1/2 NPT Conduit Connection, Aluminum Housing	1
PG 13.5 Conduit Connection, Aluminum Housing (With Electrical Safety Code D only)	2
1/2 NPT Conduit Connection, 316 ss Housing	3
PG 13.5 Conduit Connection, 316 ss Housing (With Electrical Safety Code D only)	4
M20 Conduit Connection, Both Sides, Aluminum Housing (With Electrical Safety Code D only)	5
M20 Conduit Connection, Both Sides, 316 ss Housing (With Electrical Safety Code D only)	6
Electrical Safety (See Electrical Safety Specifications Section for Description and Approval Status)	
ATEX flameproof; II 2 GD, EEx d IIC, Zone 1 (g)(j)	D
CSA® Division 1 explosionproof (h)	C
CSA Zone Certified Ex d IIC; also Division 1 explosionproof (g)(j)	B
FM® Division 1 explosionproof (h)	F
FM Zone Certified AEx d IIC; also Division 1 explosionproof (g)(j)	G
SAA Certified Ex d IIC, Zone 1 (h)	A
SAA Certified Ex n IIC, Zone 2 (h)	K
Optional Selections See descriptions below.	
Mounting Bracket Set (k)	
Painted Steel Bracket with Plated Steel Bolts, 1/2 NPT (with Conduit Connection Codes 1 and 3 only)	-M1
Stainless Steel Bracket with Stainless Steel Bolts, 1/2 NPT (with Conduit Connection Codes 1 and 3 only)	-M2
Painted Steel Bracket with Plated Steel Bolts, PG 13.5 (with Conduit Connection Codes 2 and 4 only)	-M3
Stainless Steel Bracket with Stainless Steel Bolts, PG 13.5 (with Conduit Connection Codes 2 and 4 only)	-M4
Painted Steel Bracket with Plated Steel Bolts, M20 (with Conduit Connection Codes 5 and 6 only)	-M5
Stainless Steel Bracket with Stainless Steel Bolts, M20 (with Conduit Connection Codes 5 and 6 only)	-M6
Stainless Steel Bracket with Stainless Steel Bolts (with Structure Codes 52 and 53 only)	-M7
Universal Style Stainless Steel Bracket with Stainless Steel Bolts (with Structure Codes 52 and 53 only)	-M8
Blind (Solid) Cover over Standard LCD Indicator	
Blind (Solid) Cover replaces Window Cover	-L2
Vent Screw and Block & Bleed Valve	
316 ss Vent Screw in Process Connection (Not with Structure Codes 32 or 33, or Pressure Seals)	-V1
Block and Bleed Valve, Carbon Steel (Not with Pressure Seals)	-V2
Block and Bleed Valve, 316 ss (Not with Pressure Seals)	-V3
Block and Bleed Valve, 316 ss w/Monel® Trim (Not with Pressure Seals)	-V4
Conduit Thread Adapters	
Hawke-Type 1/2 NPT Cable Gland for use with Conduit Connection Codes 1 and 3 only (l)	-A1
M20 Connector for use with Conduit Connection Codes 1 and 3 only (l)	-A3
Electronics Housing Features	
External Zero Adjustment	-Z1
Custody Transfer Lock and Seal	-Z2
External Zero Adjustment and Custody Transfer Lock and Seal	-Z3
Custom Factory Configuration	
Full Factory Configuration (Requires Configuration Form to be filled out)	-C2
Cleaning and Preparation	
Unit Degreased - for Silicone Filled Sensors Only	-X1
Not for Oxygen/Chlorine Service, Option -V1, or Pressure Seals	
Cleaned and Prepared for Oxygen Service - for Fluorinert Filled Sensors Only	-X2
Not with Option -V1, or Pressure Seals	
Cleaned and Prepared for Chlorine Service - with Structure Code 33 Only	-X3
Not with Option -V1, or Pressure Seals	

Model Code continued on next page

MODEL CODE (Cont.)

Description	
Instruction Books (Common MI, Brochure, and Full Documentation Set on CD-ROM is Standard) Without Instruction Book and CD - Only "Getting Started" Brochure is supplied	-K1
Miscellaneous Optional Selections G 1/2 B Manometer Process Connection (Not Available with Option -V1 or Pressure Seals) Low Temperature Operative Limit of Electronics Housing Extended Down to -50°C (-58°F) (m) R 1/2 Process Connection (1/2 NPT to R 1/2 Adapter) (n) Supplemental Customer Tag (Stainless Steel Tag wired onto Transmitter) Five Year Warranty	-G -J -R -T -W

(a) Refer to PSS 2A-1C13 F for very high GP versions with upper range limits of 52, 105, and 210 MPa (7500, 15000, and 30000 psi). Refer to PSS 2A-1C13 K and PSS 2A-1C13 L for AP and GP versions for sanitary and pulp/paper industries, respectively.

(b) Both transmitter and pressure seal Model Numbers are required. Refer to PSS 2A-1Z11 A for pressure seal Model Codes.

(c) Direct Connect Seal Models that may be specified are PSTAD, PSFAD, and PSISD.

(d) Remote Mount Seal Models that may be specified are PSFPS, PSFES, PSFAR, PSTAR, PSISR, PSSCR, and PSSSR.

(e) For transmitters with Silicone fill prepared for remote seal by others, specify Structure Code 22 or 52.

(f) For transmitters with Fluorinert fill prepared for remote seal by others, specify Structure Code 23 or 53.

(g) Electrical Safety Codes D, B, and G are only available with flameproof Structure Codes 52, 53, D5, D6, S5, S6, SH, and SJ.

(h) Electrical Safety Codes C, F, A, and K are not available with flameproof Structure Codes 52, 53, D5, D6, S5, S6, SH, and SJ.

(j) A cover lock is standard construction with Electrical Safety Codes D, B, and G.

(k) Mounting sets not offered with direct mounted seals. However, if a direct mounted PSTAD threaded seal with a 1/4 NPT process connection is used, then a mounting set is recommended.

(l) Available with Electrical Safety Code D only.

(m) Not available with Fluorinert fill in sensor or seal.

(n) Not available with pressure seals, or Hastelloy C sensors.

IAP20 AND IGP20 ABSOLUTE AND GAUGE PRESSURE TRANSMITTERS

MODEL CODE

<u>Description</u>			<u>Model</u>
I/A Series, Electronic, Bracket-Mounted Absolute Pressure Transmitter			IAP20
I/A Series, Electronic, Bracket-Mounted Gauge Pressure Transmitter			IGP20
<u>Electronics Versions and Output Signal</u>			
Analog; 4 to 20 mA dc Output (Version -A)			-A
<u>Structure Code - Select from one of the following three groups:</u>			
1. Transmitter			
Hi-Side Cover	Sensor	Sensor Fill Fluid	
Steel	Co-Ni-Cr	Silicone	10
Steel	Co-Ni-Cr	Fluorinert	11
Steel	316L ss	Silicone	12
Steel	316L ss	Fluorinert	13
Steel	Hastelloy C	Silicone	16
Steel	Hastelloy C	Fluorinert	17
316 ss	Co-Ni-Cr	Silicone	20
316 ss	Co-Ni-Cr	Fluorinert	21
316 ss	316L ss	Silicone	22
316 ss	316L ss	Fluorinert	23
316 ss	316L ss, Gold Plated	Silicone	2G
316 ss	Monel	Silicone	24
316 ss	Monel	Fluorinert	25
316 ss	Hastelloy C	Silicone	26
316 ss	Hastelloy C	Fluorinert	27
Monel	Monel	Silicone	34
Monel	Monel	Fluorinert	35
Hastelloy C	Hastelloy C	Silicone	46
Hastelloy C	Hastelloy C	Fluorinert	47
Hastelloy C	Tantalum	Silicone	48
Hastelloy C	Tantalum	Fluorinert	49
pvdf Insert (Kynar®)	Tantalum	Silicone (Used with Process Connector Type 7 below)	78 (a)
pvdf Insert (Kynar)	Tantalum	Fluorinert (Used with Process Connector Type 7 below)	79 (a)
2. Transmitter Prepared for Foxboro Model Coded Seals (b)			
Transmitter Prepared for Remote Seal on HI Side; Silicone fill in sensor			S3 (c)
Transmitter Prepared for Remote Seal on HI Side; Fluorinert fill in sensor (IGP20 only)			S4 (c)
Transmitter Prepared for PSFLT, PSSCT, or PSSST Seal, HI Side; Silicone fill in sensor (IGP20 only)			F1
Transmitter Prepared for PSFLT, PSSCT, or PSSST Seal, HI Side; Fluorinert fill in sensor (IGP20 only)			F2
3. Transmitter Prepared for non-Foxboro Seals			
Transmitter Prepared for Remote Seal; Silicone Fill in Sensor			SC
Transmitter Prepared for Remote Seal; Fluorinert Fill in Sensor			SD
Span Limits (Absolute or Gauge Pressure Units)			
kPa	inH₂O	mbar	
0.12 and 7.5	0.5 and 30	1.2 and 75 (IGP20 only)	A (d)
0.87 and 50	3.5 and 200	8.7 and 500	B
MPa	psi	bar or kg/cm²	
0.007 and 0.21	1 and 30	0.07 and 2.1	C
0.07 and 2.1	10 and 300	0.7 and 21	D
0.7 and 21	100 and 3000	7 and 210	E (e)

Model Code continued on next page

IAP20 AND IGP20 ABSOLUTE AND GAUGE PRESSURE TRANSMITTERS (Cont.)

MODEL CODE (Cont.)

Process Connector Type (Material Same as Process Cover Material)				
None; connect directly to process cover (not available with Structure Codes 78 and 79)				0
1/4 NPT (not available with Structure Codes 46, 47, 48, 49, 78, 79)				1
1/2 NPT (not available with Structure Codes 78, 79)				2
Rc 1/4 (not available with Structure Codes 46, 47, 48, 49, 78, 79)				3
Rc 1/2 (not available with Structure Codes 78, 79)				4
1/2 Schedule 80 Welding Neck (not available with Structure Codes 46, 47, 48, 49, 78, 79)				6
None; pvdf (Kynar) insert tapped for 1/2 NPT on side of 316 ss Process Cover (only with Codes 78/79)				7
Conduit Connection and Housing Material				
1/2 NPT Conduit Connection, Aluminum Housing				1
PG 13.5 Conduit Connection, Aluminum Housing (With Electrical Safety Code D only)				2
1/2 NPT Conduit Connection, 316 ss Housing				3
PG 13.5 Conduit Connection, 316 ss Housing (With Electrical Safety Code D only)				4
M20 Conduit Connection, Both Sides, Aluminum Housing				5
M20 Conduit Connection, Both Sides, 316 ss Housing				6
Electrical Safety (Also see Electrical Safety Specifications section for descriptions and approval status)				
ATEX flameproof; II 2 GD, EEx d IIC, Zone 1 (n)				D
CSA Division 1 explosionproof				C
CSA Zone certified Ex d IIC; also Division 1 explosionproof (n)				B
FM Division 1 explosionproof				F
FM Zone certified AEx d IIC; also Division 1 explosionproof (n)				G
SAA Certified Ex d IIC, Zone 1				A
SAA Certified Ex n IIC, Zone 2				K
Optional Selections				
Refer to Optional Selection descriptions below.				
Mounting Bracket Set - Not available with Direct Connect Seals, Structure Codes F1 and F2				
Standard Style Painted Steel Bracket with Plated Steel Bolts				-M1
Standard Style Stainless Steel Bracket with Stainless Steel Bolts				-M2
Universal Style Stainless Steel Bracket with Stainless Steel Bolts				-M3
Blind (Solid) Cover over Standard LCD Indicator				
Blind (Solid) Cover replaces Window Cover				-L2
DIN 19213 Construction used with Process Connector Code "0" and 316 ss Process Covers Only (h)				
Process Cover	Cover Screw	Connector Screw		
Type	Material	Size	Material	
Single Ended (f)	Steel	M10 (by User)	N/A	-D1
Double Ended (f)(g) (Blind Kidney Flange on back)	Steel	M10	Steel	-D2
Single Ended	Steel	7/16 (by User)	N/A	-D3
Double Ended (f)(g) (Blind Kidney Flange on back)	Steel	7/16	Steel	-D4
Single Ended (f)	316 ss	7/16 (by User)	N/A	-D5
Double Ended (f)(g) (Blind Kidney Flange on back)	316 ss	7/16	316 ss	-D6
Single Ended	17-4 ss	7/16 (by User)	N/A	-D7
Double Ended (f)(g) (Blind Kidney Flange on back)	17-4 ss	7/16	17-4 ss	-D8

Model Code continued on next page

IAP20 AND IGP20 ABSOLUTE AND GAUGE PRESSURE TRANSMITTERS (Cont.)

MODEL CODE (Cont.)

Optional Selections (Cont.)	
Cleaning and Preparation - Not Available w/Gold-Plated Sensor, Structure 2G (h)	
Unit Degreased - for Silicone Filled Sensors Only (Not for Oxygen/Chlorine/Other Fluids that may react with Silicone)	-X1
Cleaned and Prepared for Oxygen Service - for Fluorinert Filled Sensors Only (Not available with Carbon Steel Covers or with Silicone Filled Sensors)	-X2
Cleaned and Prepared for Chlorine Service - for Fluorinert Filled Sensors Only (j) (Not available with Carbon Steel Covers or with Silicone Filled Sensors)	-X3
Bolting for Process Covers/Connectors (k)	
316 ss Bolts and Nuts (Pressure Derated) (f)	-B1
17-4 ss Bolts and Nuts (j)	-B2
B7M Bolts and Nuts (NACE)(Pressure Derated) (f)	-B3
Conduit Thread Adapters	
Hawke-Type 1/2 NPT Cable Gland for use with Conduit Connection Codes 1 and 3 (l)	-A1
M20 Connector for use with Conduit Connection Codes 1 and 3 (l)	-A3
Electronics Housing Features	
External Zero Adjustment	-Z1
Custody Transfer Lock and Seal	-Z2
External Zero Adjustment and Custody Transfer Lock and Seal	-Z3
Custom Factory Configuration	
Full Factory Configuration (Requires Configuration Form to be filled out)	-C2
Tubeing Connectors - Specify Only One (Only 316 ss process covers; no side vents on cover) (h)	
Steel, Connecting 6 mm Tubing to 1/4 NPT Process Connector	-E1
Steel, Connecting 12 mm Tubing to 1/2 NPT Process Connector	-E2
316 ss, Connecting 6 mm Tubing to 1/4 NPT Process Connector	-E3
316 ss, Connecting 12 mm Tubing to 1/2 NPT Process Connector	-E4
Gaskets	
Gasket for Vacuum Service with Pressure Seals (m)	-G1
Instruction Books (Common MI, Brochure, and Full Documentation Set on CD-ROM is Standard)	
Without Instruction Book and CD - Only "Getting Started" Brochure is supplied	-K1
Miscellaneous Optional Selections	
Low Temperature Operative Limit of Electronics Housing Extended Down to -50°C (-58°F) Not available with sensors and seals with fluorinert fill, Structure Codes 78 and 79, or DIN Options -D2, -D4, -D6, and -D8	-J
Vent Screw in side of Process Cover (with 316 ss process covers only) Not available with seals, DIN construction options, or Structure Codes 78 and 79	-V (h)
Five Year Warranty	-W
Supplemental Customer Tag (Stainless Steel Tag wired onto Transmitter)	-T
Examples: IGP20-A20B21F-M1Z2; IAP20-AS3C11F-T	

- (a) Maximum overrange pressure is 2.1 MPa (300 psi); temperature limits are -7 and +82°C (20 and 180°F).
- (b) Transmitter and Pressure Seal Model Codes are both required. See PSS 2A-1Z11 A for the various pressure seal model codes.
- (c) Remote Seal Models that may be specified are PSFPS, PSFES, PSFAR, PSTAR, PSISR, PSSCR, and PSSSR.
- (d) Span Limit Code A is not available with pressure seals (Structure Codes F1, F2, S3, S4, SC, SD).
- (e) Span Limit Code E is not available with Structure Codes 78 and 79 (pvdf insert in HI Side Cover).
- (f) Pressure derated. See derating table in specifications section.
- (g) Temperature limits derated to 0 and 60°C (32 and 140°F). Also Mounting Sets -M1 and -M2 not available.
- (h) Not available when Remote Mount or Direct Connect Pressure Seals are specified.
- (j) When -X3 is specified, the standard bolting is replaced with 17-4 ss bolts and nuts. Therefore, there is no need to specify Option -B2 when selecting the Chlorine Service Option -X3.
- (k) Not available with DIN construction options. For stainless steel bolts with DIN construction, specify -D5 to -D8, as required.
- (l) Available with Electrical Safety Code D only.
- (m) Standard offering with IAP20 Transmitters with pressure seals. However, -G1 is a required option with IGP20 Transmitters when pressure seal (Structure Codes S3, S4, F1, F2, SC, and SD) will be used in vacuum applications. This option substitutes vacuum service metal gasket for standard ptfe process cover gasket.
- (n) A cover lock is standard construction with Electrical Safety Codes D, B, and G.

SUGGESTED RFQ SPECIFICATIONS

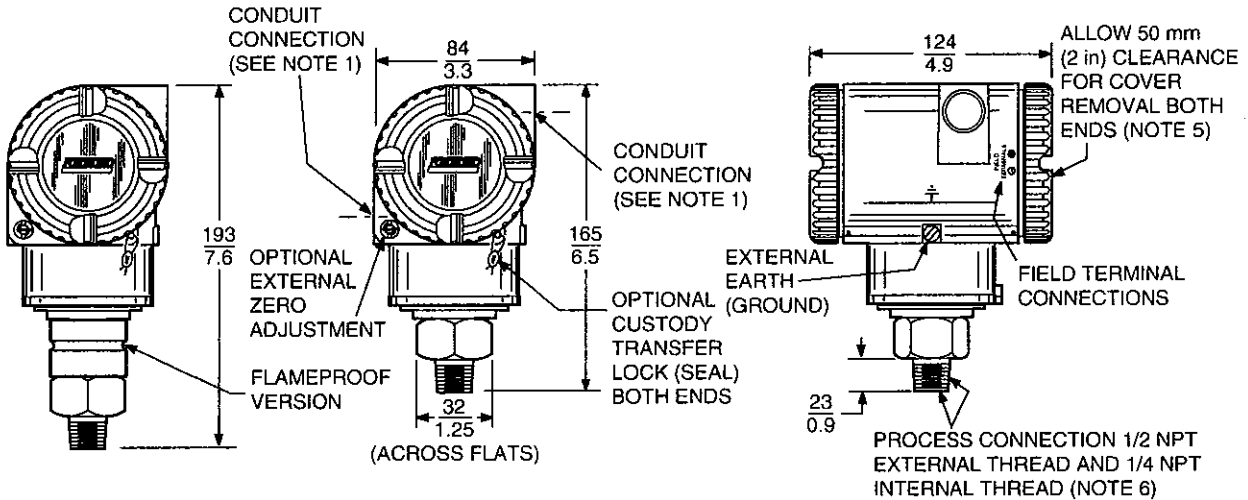
The manufacturer shall provide two-wire, 4 to 20 mA dc analog output pressure transmitter(s) suitable for field mounting. These transmitters shall also be provided (as required) with direct connect pressure seals, or remote capillary connected pressure seals. The specifications for these transmitters are as follows:

- Accuracy:** $\pm 0.20\%$ of calibrated span.
- Span Limits:** From 1 psi to 6000 psi for standard direct-connected transmitters, and from 0.5 inH₂O to 3000 psi for standard bracket-mounted transmitters, as specified; or SI and Metric equivalents.
- Damping:** Settable for a range of none to 8 seconds.
- RFI Protection:** The maximum error shall be no more than an additional $\pm 0.1\%$ of calibrated span for 30 V/m field intensity between 27 and 1000 MHz.
- Electronics Housing:** IEC IP66 (NEMA 4X); 316 ss or aluminum housing with Epoxy finish; two compartments (field wiring and electronics); housing sealed with O-rings for double protection against moisture or other contaminants.
- Modular Electronics:** Easily replaceable modular electronics standard.
- LCD Indicator:** Liquid Crystal Display (LCD) Indicator, with on-board pushbuttons for calibration and configuration, is standard.
- Mounting:** Direct to process or bracket mounted to pipe or surface.
- Process Connection:** IAP10/IGP10 Transmitters: Direct to process piping or pressure seal with 1/2 NPT; optional Rc 1/2 or G 1/2 B external threads to process piping. Internal 1/4 NPT thread also provided as plumbing connection to process; or prepared for a direct connect seal or capillary connected seal.
IAP20/IGP20 Transmitters: Used with process connectors to accept 1/4 NPT, 1/2 NPT, Rc 1/4, Rc 1/2, Schedule 80 welding neck; or a pvdf insert (tapped for 1/2 NPT) in HI side process cover is used as process connection. Process connection can also be prepared to accept a direct connect seal; or prepared for a remote capillary connected seal.
- Process Cover Materials Available:** Applicable to IAP20/IGP20 transmitters only. Industry Standard 316 ss, Carbon Steel, Monel, and Hastelloy C.
- Sensor Materials:** Co-Ni-Cr, 316L ss, and Hastelloy C for IAP10/IGP10 transmitters; and Co-Ni-Cr, 316L ss, Hastelloy C, Monel, Tantalum, and Gold-Plated 316L ss for IAP20/IGP20 transmitters.
- Electrical Classification:** Nonincendive for Class I and Class II, Division 2 locations, and explosionproof for Class I and Class II, Division 1 locations. Versions available to meet Agency flameproof and zone requirements; comply with applicable European Union Directives.
- Approximate Mass:** Direct Connected Transmitter: 1.5 kg (3.3 lb)
Bracket-Mounted Transmitter: 3.5 kg (7.8 lb) w/o process connector
4.2 kg (9.2 lb) w/process connector
With 316 ss Electronics Housing: Add 1.1 kg (2.4 lb)
With Pressure Seals: See PSS 2A-1Z11 A
- Model Codes:** I/A Series IAP10-A or IGP10-A, Direct Connected Absolute or Gauge Pressure Transmitters; or IAP20-A or IGP20-A Bracket Mounted Absolute or Gauge Pressure Transmitters; with or without pressure seals; or equivalent.

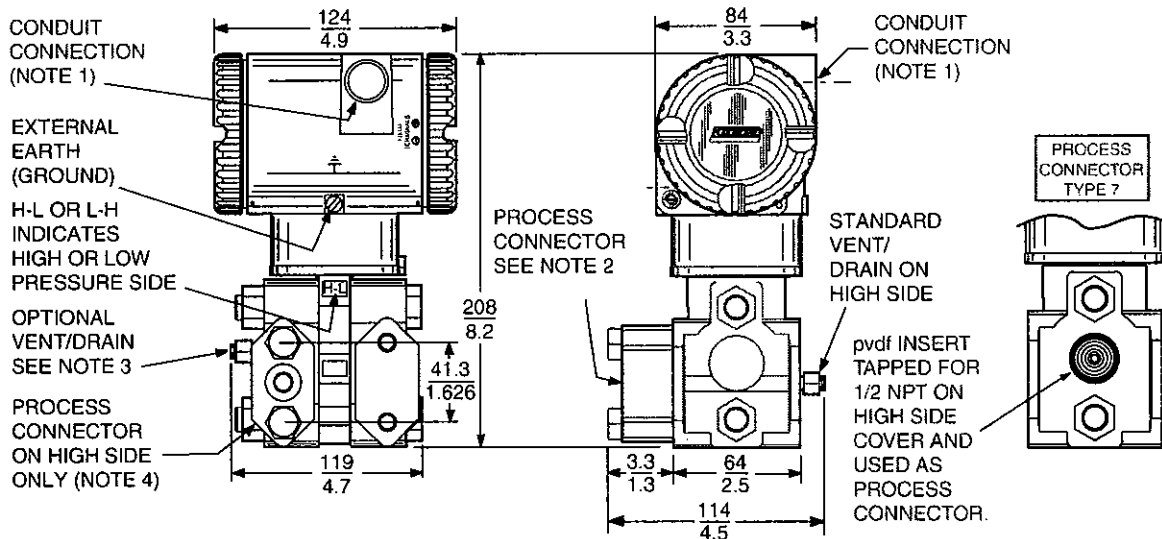
DIMENSIONS-NOMINAL

mm
in

IAP10 AND IGP10 DIRECT CONNECTED TRANSMITTERS



IAP20 AND IGP20 BRACKET MOUNTED TRANSMITTERS



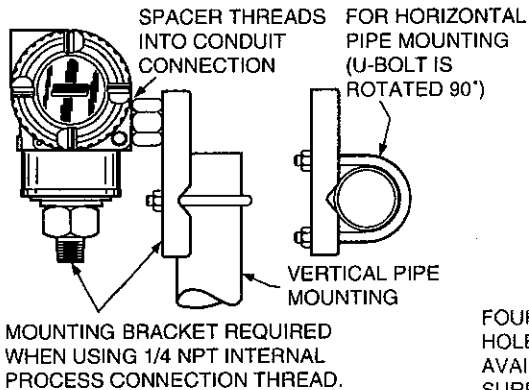
NOTES

1. CONDUIT CONNECTION 1/2 NPT, PG 13.5, OR M20, BOTH SIDES : PLUG UNUSED CONNECTION WITH METAL PLUG (SUPPLIED).
2. PROCESS CONNECTOR CAN BE REMOVED AND CONNECTION MADE DIRECTLY TO PROCESS COVER USING 1/4 NPT INTERNAL THREAD IN PROCESS COVER. NOTE THAT WITH PROCESS CONNECTION CODE "0", THERE IS NO CONNECTOR.
3. PROCESS COVER CAN BE INVERTED MAKING OPTIONAL SIDE VENT A SIDE DRAIN.
4. FOR USERS WHO DESIRE THE PROCESS CONNECTOR ON THE RIGHT SIDE, MERELY ROTATE TRANSMITTER 180° AND RELOCATE PROCESS CONNECTOR SHOWN TO THE RIGHT SIDE.
5. TOPWORKS ROTATABLE TO ANY POSITION WITHIN ONE TURN COUNTERCLOCKWISE OF FULLY TIGHTENED POSITION.
6. DO NOT USE THE 1/4 NPT INTERNAL THREAD TO DIRECT-CONNECT THE TRANSMITTER.

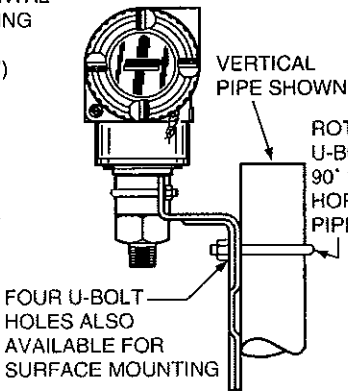
DIMENSIONS-NOMINAL (Cont.)

mm
in

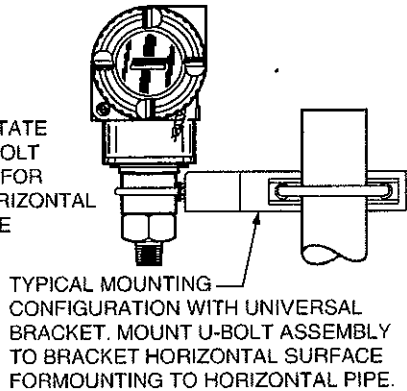
IAP10/IGP10
WITH OPTIONS -M1 TO -M6



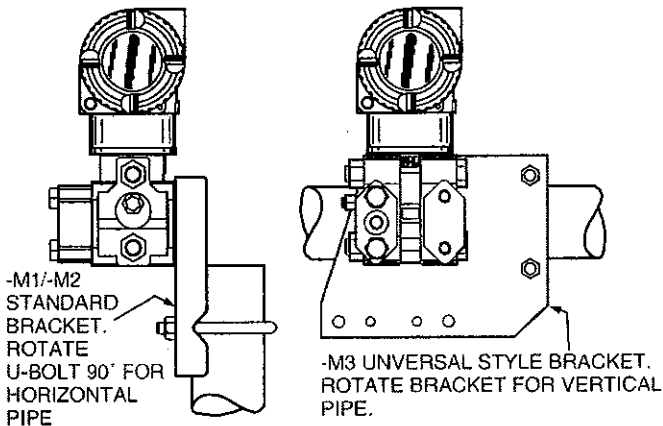
IAP10/IGP10
WITH OPTION -M7



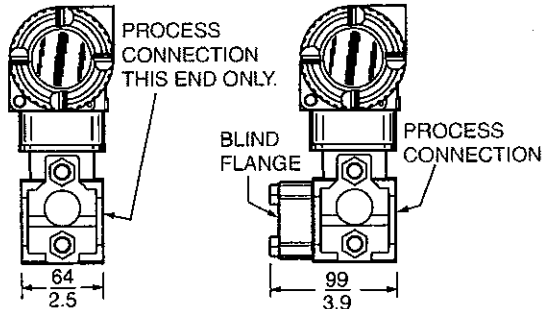
IAP10/IGP10
WITH OPTION -M8



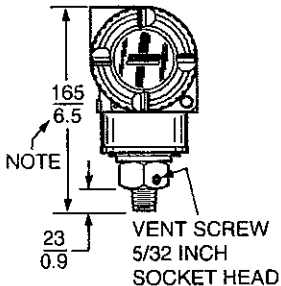
IAP20/IGP20 WITH
OPTIONS -M1, -M2, AND -M3



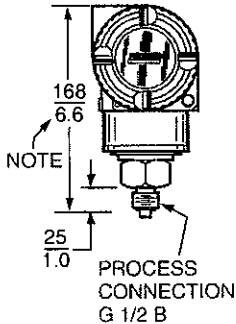
IAP20/IGP20 WITH OPTIONS
-D1, -D3, -D5, -D7 -D2, -D4, -D6, -D8



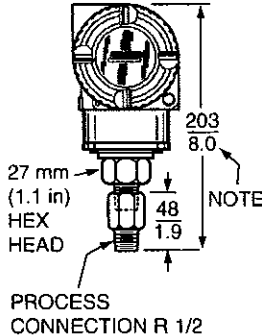
IAP10/IGP10
VENT SCREW IN
PROCESS CONNECTOR
OPTION -V1



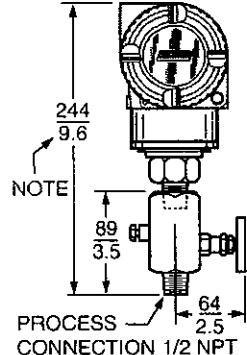
IAP10/IGP10
PROCESS CONNECTION
OPTION -G



IAP10/IGP10
METRIC PROCESS CONNECTOR
OPTION -R



IAP10/IGP10
BLOCK AND BLEED
VALVE OPTIONS
-V2, -V3, OR -V4



NOTES

1. FOR FLAMEPROOF TRANSMITTERS, ADD 28 mm (1.1 in) TO OVERALL HEIGHT DIMENSION.
2. REFER TO DIMENSIONAL PRINT DP 020-447 (AP AND GP) FOR FURTHER INFORMATION.

ORDERING INSTRUCTIONS

1. Model Number(s) as follows:
 - Transmitter only if pressure seals are not selected
 - Both transmitter and pressure seal if pressure seal is selected.See PSS 2A-1Z11 A.
2. Calibrated Pressure Range (using Allowable Pressure Units from the table below).
3. Configuration Data Form when Factory Calibration Option -C2 is specified.
4. Options and Accessories not in Model Code (see PSS 2A-1Z9 E).
5. User Tag Data - Data Plate; 32 characters maximum. For additional tag data, specify Optional Supplemental Tag -T.

Allowable Pressure Units for Calibrated Range (a)

inH ₂ O	inHg	kPa	mbar	kg/cm ²
ftH ₂ O	mmHg	MPa	bar	psi
mmH ₂ O	Pa	torr	g/cm ²	atm

(a) Absolute or gauge pressure units, as applicable.

OTHER M&I PRODUCTS

Invensys Foxboro provides a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, positioners, temperature, controlling and recording. For a listing of these offerings, visit the Invensys Foxboro web site at:

www.foxboro.com/instrumentation

33 Commercial Street
Foxboro, MA 02035-2099
United States of America

www.foxboro.com
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
or contact your local Foxboro
representative.
Facsimile: 1-508-549-4999

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MB 010

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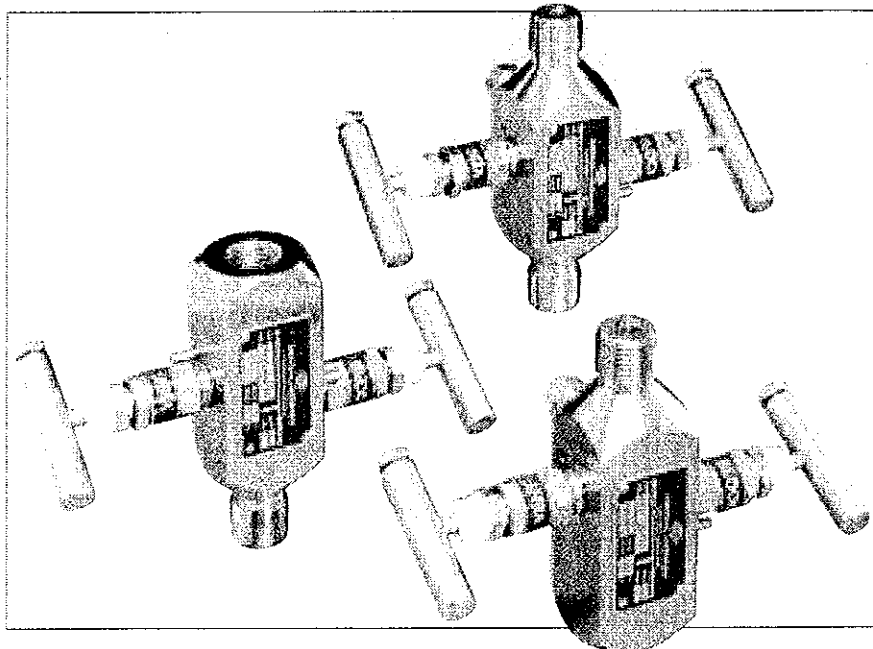
0505

Block and Bleed Gauge Valves – M25 and M251

Product Overview

The M25 and M251 are two-valve single outlet gauge valves that combine isolating, calibrating, and venting facilities in a single compact unit. These valves enable gauges, pressure transmitters, or switches to be reliably installed and serviced, by reducing potential leak points.

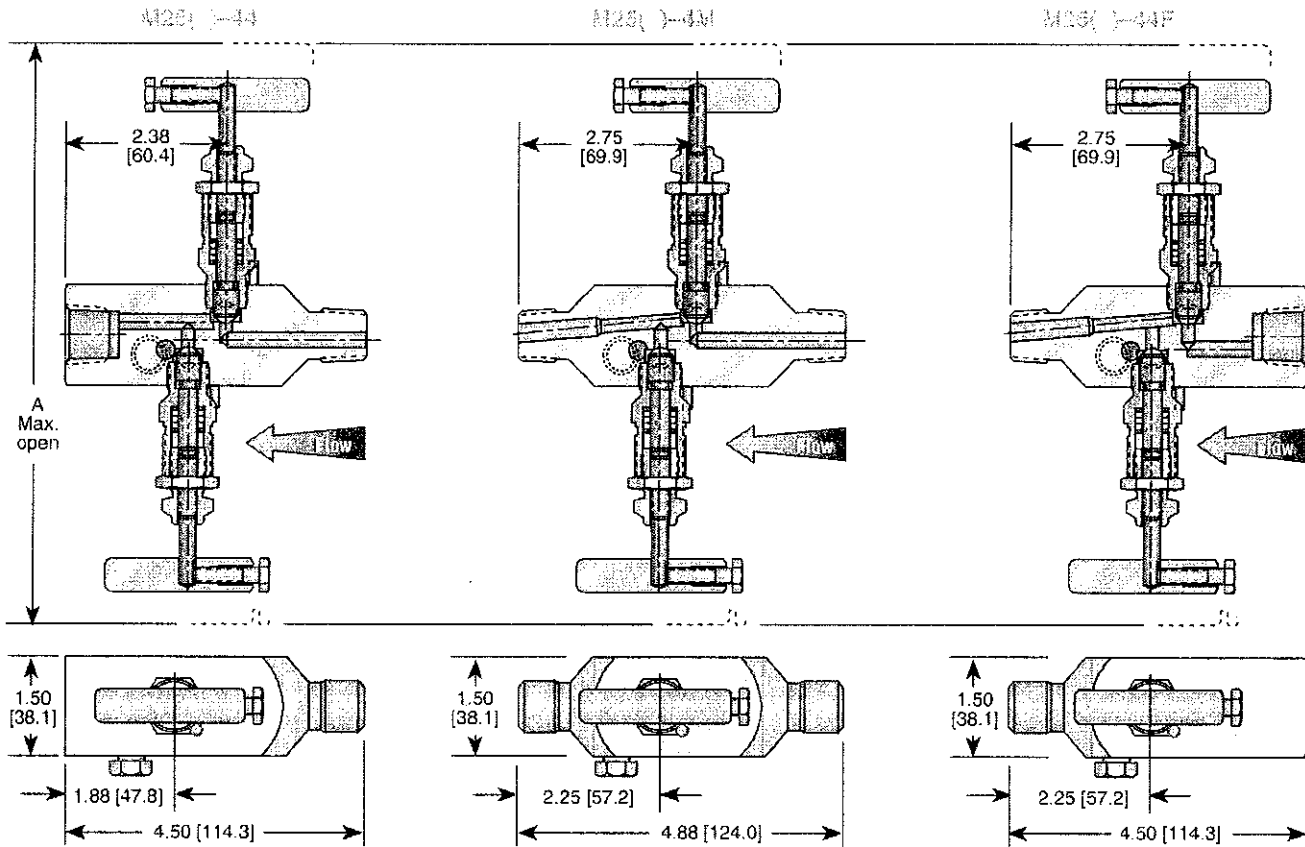
The vent port is threaded 1/4-inch NPT on all valves and is fitted with a plug. This facilitates installation of exhaust piping/tubing on hazardous services, which in turn contributes to operator safety.



Features and Benefits

- **Compact design** requires minimum space for operation and installation. Lower valve weight increases strength at the process connection and reduces gauge whip.
- **Cost savings** from reduced number of components required for instrument installation, also decreases possible leak points.
- **Easy instrument check calibration** using 1/4-inch FNPT vent/test port.
- **Ball end stem** eliminates seat galling, provides bubble-tight shutoff and long life. The hardened, non-rotating ball ensures perfect alignment closure.
- **Packing below threads** prevents lubricant washout, thread corrosion, and keeps solids from entering the thread area, which can cause galling. It also prevents process contamination.
- **Adjustable packing** adjusts easily – loosen jam nut, tighten bushing slightly, then retighten jam nut. Decreases packing replacement downtime and increases valve life.
- **Safety back seating** prevents stem blowout or accidental removal while in operation and provides a metal-to-metal secondary stem seal while in the full open position.
- **Dust cover** prevents lubricant washout and keeps contaminants (dirt, rain, etc.) out of bonnet assembly.
- **Panel mount** (optional) affords opportunity to use high quality products in racks or panels.
- **Chrome plating of 316 SS** prevents galling or freezing of stem threads when similar metals mate. CS valves use a 303 SS stem.
- **Rolled threads** provide additional thread strength. The stem, bonnet, and male NPT threads are rolled, not cut.
- **Mirror stem finish** burnished to a 16 RMS finish in the packing area enables smooth stem operation and extends packing life.
- **Body-to-bonnet seal** is metal-to-metal in constant compression, isolating the bonnet threads from process fluid corrosion. Eliminates possible tensile breakage of bonnet, and gives a reliable seal point.
- **Bonnet lock pin** is another safety feature which prevents the accidental separation of the bonnet from the body. However, normal valve maintenance and repair are still easily accomplished.

Block and Bleed Gauge Valves – M25 and M251 Specifications



Valve Body	Body	Stem	Seat	Packing
CS ¹	A105 CS	A108 CS	A581-303 SS	17-4 PH Teflon®
CS ²	A105 CS	A105 CS	A581-303 SS	17-4 PH GRAFOIL® Low Emissions Graphite
SS	A479-316 SS	A479-316 SS	A276-316 SS	316 SS Teflon®
SS	A479-316 SS	A479-316 SS	A276-316 SS	316 SS GRAFOIL® Low Emissions Graphite
SG ²	A479-316 SS	A479-316 SS	Monel® 400	Monel® K500 Teflon®
SG ²	A479-316 SS	A479-316 SS	Monel® 400	Monel® K500 GRAFOIL® Low Emissions Graphite
SG3 ³	Hastelloy® C-276	Hastelloy® C-276	Hastelloy® C-276	Stellite Teflon®
SG3 ³	Hastelloy® C-276	Hastelloy® C-276	Hastelloy® C-276	Monel® GRAFOIL® Low Emissions Graphite

Teflon® Packing

CS,		
SS,	6000 psig @ 200°F	4000 psig @ 500°F
SG	[414 barg @ 93°C]	[276 barg @ 260°C]
SG3		

GRAFOIL® and Low Emissions Graphite Packing

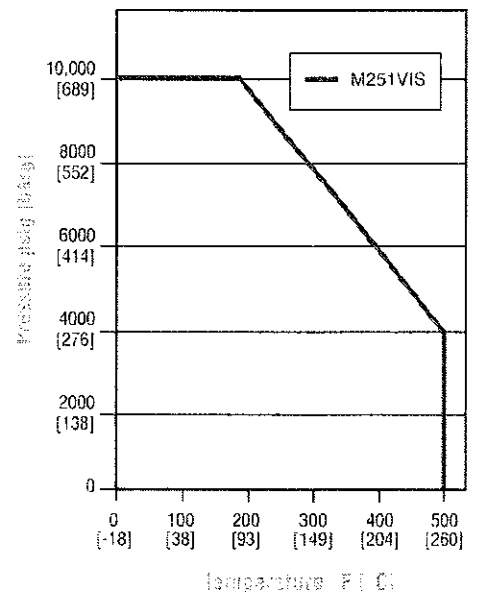
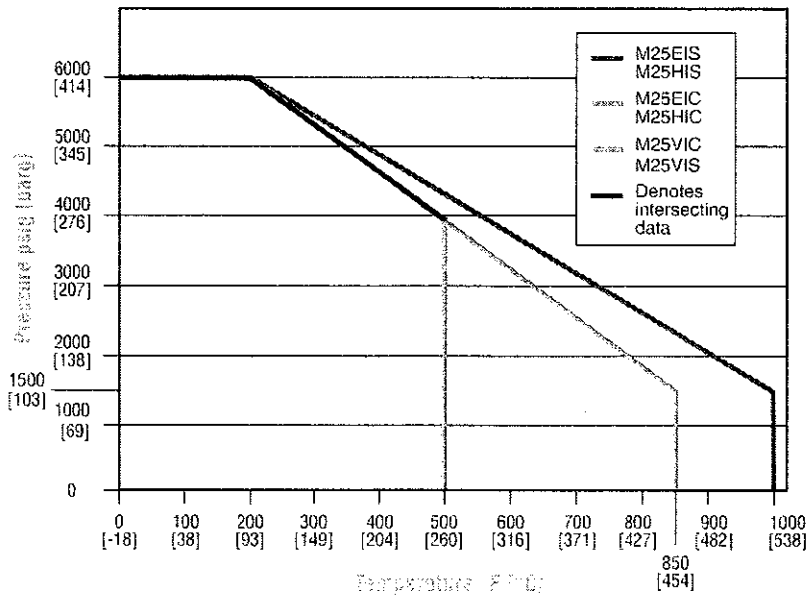
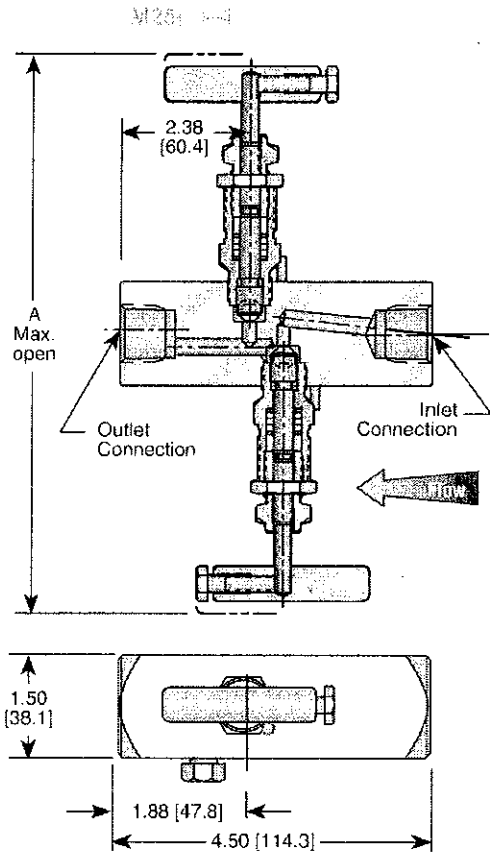
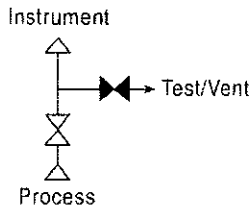
CS,		
SS,	6000 psig @ 200°F	1500 psig @ 850°F
SG	[414 barg @ 93°C]	[103 barg @ 454°C]
SG3		
SS,	6000 psig @ 200°F	1500 psig @ 1000°F
SG	[414 barg @ 93°C]	[103 barg @ 538°C]
SG3		

- CS is zinc-cobalt plated to prevent corrosion.
- SG (Sour Gas) meets the requirements of NACE MR0175-2002.
- SG3 (Sour Gas) meets the requirements of NACE MR0175-2003.

Block and Bleed Gauge Valves – M25 and M251 Specifications

Packing	A
Low Emissions (E)	3.14
GRAFOIL®(H)	[206.8]
Teflon®(V)	6.54
M251 only	[173.7]

1. Approximate valve weight M25()-44 and M25()-44F 3.6 lb [1.63 kg].
M25()-4M 3.8 lb [1.72 kg].
Valve C_v 0.52 maximum.
2. M25()-4 body length 4.5-inch [114.3].
3. For Hastelloy® and SG3 call factory for dimensions and weights.



Block and Bleed Gauge Valves – M25 and M251 Specifications

M25 V I S - 44C - SG

Model Number

M25, M251

Packing

- V – Teflon®
- H – GRAFOIL®
- E – Low Emissions Graphite

Seat Material

- I – Integral

Body Material¹

- C – CS
- S – 316 SS
- M – Monel®
- J – Hastelloy®

Connections (Inlet/Outlet)²

- 4M – 1/2-inch MNPT x 1/2-inch MNPT
- 44 – 1/2-inch MNPT x 1/2-inch FNPT
- 44F – 1/2-inch FNPT x 1/2-inch MNPT
- 46 – 3/4-inch MNPT x 1/2-inch FNPT
- 4 – 1/2-inch FNPT x 1/2-inch FNPT (body length 4.5-inch [114.5 mm])

- C – Male plain end (CS is black oxide coated)

Options

- BL – Bonnet Lock Device (patent protected)
- CLC – Chlorine Cleaning
- HD – Hydrostatic Testing (100%)(MSS-SP-61)
- OC – Oxygen Cleaning
- SG – Sour Gas meets the requirements of NACE MR0175-2002 (SS only)
- SP – Special Requirements - please specify
- AM – AGCO Mount
- SG3 – Sour Gas meets the requirements of NACE MR0175-2003

1. For other body materials, consult factory.
2. Consult factory for other optional connections.

Block and Bleed Gauge Valves – M25 ASME B31.1 and B31.3

M25 HP S - 44C - XP

Model Number

M25 HP

Body Material

S - SS, A479-316

Connections (Inlet/Outlet)

- 4M - 1/2-inch MNPT x 1/2-inch MNPT
- 44 - 1/2-inch MNPT x 1/2-inch FNPT
- 44F - 1/2-inch FNPT x 1/2-inch MNPT
- 46 - 3/4-inch MNPT x 1/2-inch FNPT
- 4 - 1/2-inch FNPT x 1/2-inch FNPT

C - Male plain end (CS is black oxide coated)

Options

- SP - Special Requirements - please specify
- AM - AGCO Mount

1. All Power M25 Gauge Valves come standard with GRAFOIL[®] packing, integral seats, bonnet locks, and are subjected to hydrostatic testing.
2. Ratings
SS
6000 psig @ 100°F [414 barg @ 38°C]
2915 psig @ 1000°F [201 barg @ 538°C]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

TEMPERATURE TRANSMITTER

MANUFACTURER : FOXBORO
SERVICE : OXYGEN GAS & OZONE/OXYGEN MIXTURE

TRANSMITTER

TYPE : I/A SERIES INTELLIGENT TEMPERATURE
TRANSMITTER, RTT20
MODEL NO. : RTT20-I1LCQFD
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 12 ~ 42 VDC
TEMPERATURE LIMIT : -40 ~ 185° F (-40 ~ 85° C)

ELEMENT

SENSOR : RTD, PLATINUM, 100 Ω
THERMOWELL : W-PTS-A16
MODEL NO. :
MATERIAL : TYPE 316 S.S.
LENGTH : U = 2.5" (64 mm), C = 5" (125 mm) BY USING THREDOLET
CONNECTION : 1/2" (13 mm) NPT
MOUNTING PIPE SIZE : 2" (50 mm) S.S. PIPE
CLEANING : THERMOWELL TO BE CLEANED AND PACKAGED FOR
OXYGEN SERVICE
QUANTITY : 6 (2 PER GENERATOR)
CUSTOMER TAG NO. : TT-O110A / TT-112A
TT-O130A / TT-132A
TT-O150A / TT-O152A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for checked conformance in the shop drawings rests with the Contractor.

Responsibility for accuracy and correlation of field dimensions, quantities, and construction of all parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

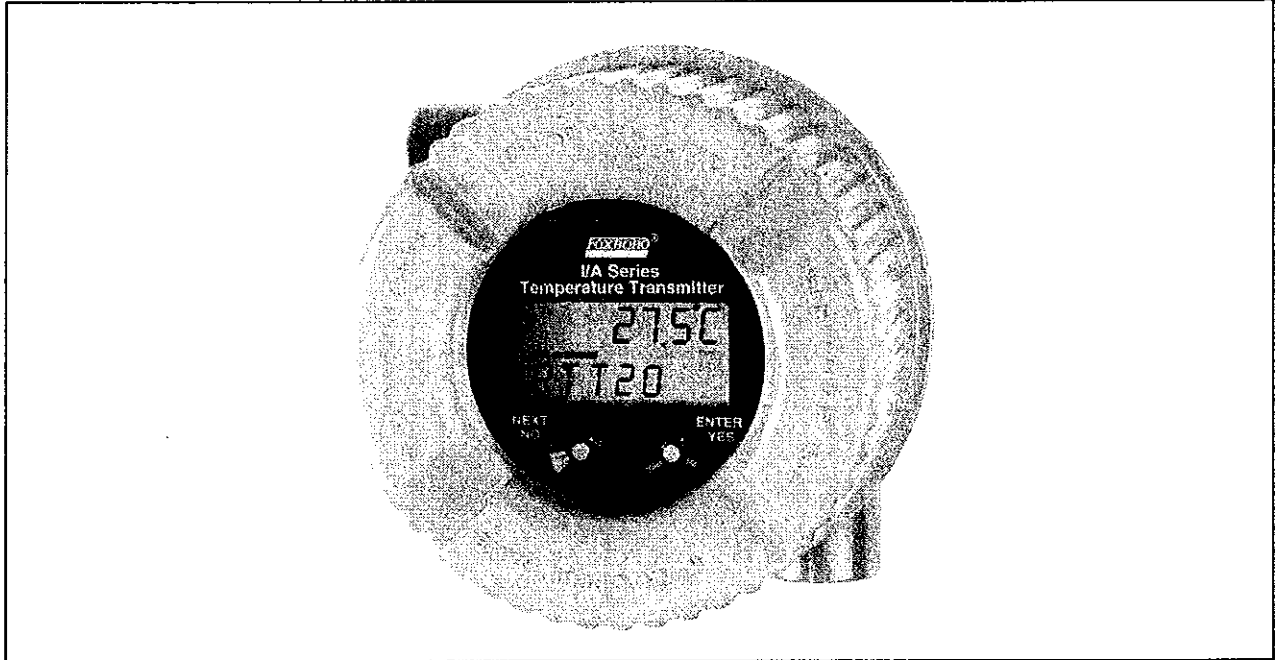
24/1/06

By:

M. Joubert

I/A Series® Intelligent Temperature Transmitter

Model RTT20 Transmitter with Analog 4 to 20 mA Output, or with FoxCom or HART Communication Protocol



The Intelligent Temperature Transmitter receives input signals from RTDs, thermocouples, ohms sensors, or dc mV sources, and transmits a linear 4 to 20 mA dc or FoxCom digital output signal. This microprocessor-based transmitter is available with HART or Foxboro digital communications protocol for remote communication and database configuration from a hand-held terminal, personal computer, or I/A Series System.

- 4 to 20 mA, HART, or FoxCom Digital Output
- Superior Accuracy
- Long-Term Stability
- Multiple Packaging Configurations offered, including Pipe or Surface Mounting, DIN Rail Mounting, Integral Bare Sensor, and Integral Sensor with Thermowell
- One Unit Configurable for all T/C, RTD, mV, Ohm, and Dew Point Inputs. Custom Inputs can also be accommodated.
- Available as a Basic Unit, or in Aluminum or 316 ss Enclosure. Enclosure is Explosionproof and meets NEMA 4X and IEC IP66.
- Automatic Self-Diagnostics and Self-Calibration
- Configurable Failsafe Value
- Optional One-Line or Three-Line Integral, Plug-in LCD Indicator/Configurator
- Wide Selection of Thermowell Configurations
- RFI, Voltage Surge, and Reverse Polarity Protection
- Conforms to Applicable European Union Directives (Product marked with "CE" Logo)
- NAMUR Compliant Failure Current
- Transmitter complies with EMC (ElectroMagnetic Compatibility) Directives
- Meets many Testing Agency Requirements for Intrinsically Safe, Explosionproof, Flameproof, Nonincendive, and Nonsparking Hazardous Area Installations
- Standard 2-Year Warranty

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for fieldwork shown in the shop drawings
rests with the contractor.

Responsibility for verification and execution of field
drawings rests with the contractor. The contractor is responsible for
construction of the work shown on the drawings. The contractor is responsible for all
parts of the work shown on the drawings.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

2/1/06

By:

A. Paulson

GENERAL DESCRIPTION

The RTT20 provides a wide range of packaging, sensor types, and options along with three choices of output signals, 4 to 20 mA, smart HART, and Intelligent, making this transmitter suitable for virtually all temperature measurement applications. The microprocessor-based electronics eliminates ambient temperature effects and results in high accuracy, repeatability and linearization of the sensor signal. Ease of mounting and installation makes these transmitters an extremely attractive offering.

INTELLIGENT TRANSMITTER FAMILY

The RTT20 Temperature Transmitter is designed for single measurements, but can be configured for dual 2-wire RTDs. However, for dual thermocouples, or dual 3- or 4-wire RTDs, the Model RTT25 is the correct choice. The Model RTT25 Temperature Transmitter is available with FOUNDATION Fieldbus Communication Protocol (refer to PSS 2A-1F4 C).

EFFICIENT AND DURABLE

Industrial-grade integrated circuits and sealed electronics combine to make this microprocessor-based transmitter an efficient and durable device.

MULTIPLE PACKAGING CONFIGURATIONS

The transmitter (Figure 1) is suitable for use in a variety of applications. Transmitters with integrally mounted sensor have an environmentally protected enclosure and are mounted directly to the process. Surface- and pipe-mounted configurations allow the transmitter to be mounted remotely from the process. The transmitter is also available with DIN-mounting hardware, and as a basic transmitter package. Built-in protection from vibration and radio frequency interference (RFI) are also provided.

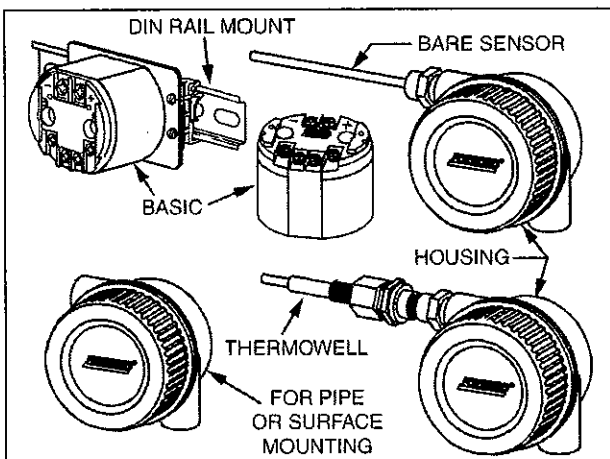


Figure 1. Multiple Packaging Configurations

REMOTE COMMUNICATIONS

This high-performance temperature transmitter can be ordered with or without remote communications, making it ideal for use in new process applications and for upgrading existing applications. Remote communication is available in either Intelligent FoxCom or HART protocol.

INPUT TYPES

This RTT20 Intelligent Temperature Transmitter can be used with a wide variety of temperature sensors, including two, three, and four-wire RTDs, all popular thermocouples, and other resistance and millivolt input devices. The following is a general list of transmitter input types:

- Platinum RTDs
- Nickel RTDs
- Copper RTDs
- Differential RTDs
- Thermocouples
- Millivolts
- Ohms
- Dew Point
- Custom

OUTPUT TYPES AND REMOTE CONFIGURATION

The transmitter provides a 4 to 20 mA or digital output linear with temperature ($^{\circ}\text{F}$, $^{\circ}\text{C}$, K, or $^{\circ}\text{R}$), linear with input (mV, ohms, or mA), or linear with Dew Point. The internal, or an external Cold Junction (CJ) sensor automatically compensates thermocouple measurements. When configured for FoxCom digital or with HART output, up to three FoxCom or four HART outputs can be provided to the host control system. The HART output can be configured for Burst Mode or Multidrop operation. The transmitter can be locally or remotely reconfigured as follows:

- 4 to 20 mA: Local configuration via optional integral one- or three-line LCD Indicator/Configurator. No remote communications.
- 4 to 20 mA with HART Communication Protocol: Local configuration via optional integral one- or three-line LCD Indicator/Configurator. Remote configuration using HART Model 275 Configurator or Foxboro PC20 Configurator.
- Intelligent FoxCom: Configurable for 4 to 20 mA or FoxCom digital output. Local configuration via optional integral one- or three-line LCD Indicator/Configurator. Remote configuration via a Model PC10 or Model PC20 Configurator, Model HHT Hand-Held Terminal, or I/A Series System.

LCD INDICATOR/CONFIGURATOR OPTIONS

These versatile one- and three-line Indicators plug into the top of the transmitter (see Figure 2) and provide the following features:

- **Local Configuration** – Both indicators have two pushbuttons to rerange or reconfigure the transmitter database without the use of a separate configurator. Configuration menu messages of the 3-line indicator are configurable in English, French, German, or Spanish.
- **Highly Accurate** – The indicators are micro-processor driven, thereby eliminating any D/A conversion error associated with the 4 to 20 mA output signal.
- **Non-Interactive** – Transmitter output is unaffected whether inserting or removing the indicator, reading parameters, or downloading data; or by indicator failure.
- **Portable** – A single indicator can be used for multiple transmitters. No tools are required to install or remove it. Simply plug it in, make desired readings and/or adjustments to the transmitter, unplug the indicator, and install it in the next transmitter.
- **One Indicator** – The same indicator is used regardless of transmitter output.
- **Custody Transfer/Security** – For Intelligent and HART Output versions (Code -D or -T), the configurator pushbuttons can be disabled via the remote configurators.
- **Highly Visible Measurement Display** – 1-Line Indicator has four 6 mm (0.25 in) high digits. Corresponding top line of 3-Line Indicator has six 8 mm (0.31 in) high digits. Both indicators display negative values with a minus sign.
- **Innovative 3-Line Indicator** – The second line of this indicator is an eleven-segment bargraph that displays readings in percent of calibrated range. Temperatures outside the calibrated range are indicated by a left-pointing (underrange) or right-pointing (overrange) arrow. The third line displays a user-configurable tag number on a 6 mm (0.25 in) high, seven-character, alphanumeric display. This line also automatically displays the following fault messages:
 - FAILSAFE – transmitter or sensor failure
 - D FAIL (Display FAIL) – temperature exceeds the limit of the display

The 1-Line Indicator displays sensor and transmitter faults as FAILSAFE.

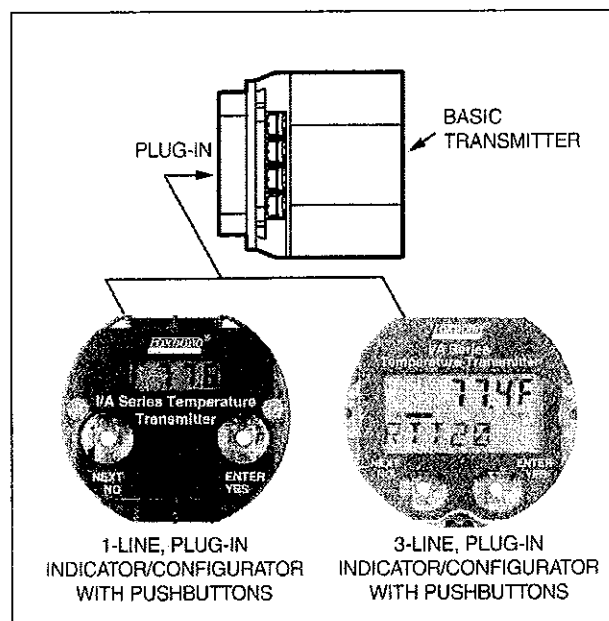


Figure 2. LCD Indicator/Configurator Options

- **Configurable Display** – The 1-Line Indicator and top line of the 3-Line Indicator display the output in any one of five different ways:
 - Engineering Units (EGU)
 - mA
 - %
 - mA and EGU
 - % and EGU

AUTOMATIC SELF-CALIBRATION

This transmitter has an advanced automatic self-calibration routine that greatly extends the time between recalibrations. Every three seconds, the transmitter checks the zero and full scale output against highly accurate and stable internal voltage signals that are referenced back to the factory calibration stored in non-volatile EEPROM memory. Any necessary adjustments are made automatically without interrupting the output signal.

NAMUR COMPLIANT FAILURE CURRENT

The transmitter's current output is linear between 3.8 to 20.75 mA. But the failsafe current is adjustable between 3.6 to 3.8 mA for a failsafe-low condition, or from 20.75 to 23 mA for a failsafe-high condition. By having the failsafe current different from the out-of-range current, determining whether the transmitter is in a failsafe condition, or just the process temperature is beyond the calibrated range, is quick and easy without the use of a configurator tool.

INSTALLATION ASSISTANT

Let Foxboro be your Installation Assistant. When you order a transmitter with an integral sensor and thermowell, everything is assembled, tagged, wired, calibrated, and configured to your specifications. Just open the shipping container and install. This feature is ordered by specifying Model Code Package Configuration Code "L" or "M," along with Option "-D2." See Figure 3.

REAL WORLD PERFORMANCE

The transmitter nonvolatile memory stores many coefficients to eliminate errors. Every transmitter is factory tested from -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$) ambient temperature, and the error coefficients, along with the curves for all sensor types, are stored in the nonvolatile memory. Therefore, the accuracy specification is applicable merely by choosing the sensor type and calibrated range, without the need for any calibration equipment. In addition, the internal cold junction sensor not only compensates for a thermocouple measurement, but its temperature is used to compensate any ambient temperature error, no matter what sensor type is selected.

FAILSAFE MODE

Transmitter failsafe operation is user-configurable as either ON or OFF. The failsafe output is user-configurable for any value between 3.60 and 3.80 mA (downscale failsafe) or 20.75 and 23.00 mA (upscale failsafe). Every three seconds, the transmitter checks for open or shorted sensor leads and for internal transmitter faults. If two successive faults are reported while failsafe is ON, the transmitter output will default to the configured failsafe value.

The transmitter underrange and overrange currents have been set to 3.80 and 20.75 mA, respectively, which are inside the failsafe value. This makes troubleshooting quick and easy because the mA failsafe current will be different than an out-of-range condition.

With HART communication, the transmitter reset mode is also user-configurable. When configured for AUTO reset, the transmitter automatically returns to normal operation after the fault has been eliminated. With LATCHED reset, transmitter power must be turned off, then back on to return to normal operation.

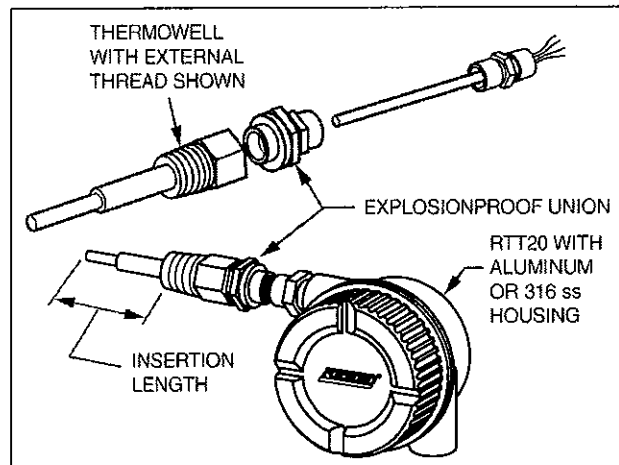


Figure 3. RTT20 with Integral Sensor with Thermowell

CONFIGURATION STORAGE

All configurable parameters are stored in nonvolatile EEPROM memory and retained when power is removed from the transmitter. The transmitter is ready for immediate use when repowered.

Configured data from the Intelligent version can also be stored offline in a Hand-Held Terminal Memory Pak, on a floppy disk (using PC10 or PC 20 software), or in an I/A Series system allowing other transmitters to be easily cloned or configured. This data can be factory-customized by ordering Option Code "-C2". It can also be supplied on a floppy disk by ordering Option Code "-C3".

INTELLIGENT SMOOTHING

Innovative Intelligent Smoothing automatically eliminates noise while maintaining fast response to rapid input changes. It provides a highly accurate and smooth output signal without the need for excessive damping. A digital filtering algorithm (signal conditioner) is active over a band of input fluctuations. Any noise (process or electrical) is eliminated while the conditioned signal reacts immediately to any input change that exceeds the smoothing band. This allows the transmitter to be used in a wide variety of electrically noisy installations.

When there is a rapid signal change, the smoothing band is immediately exceeded, and the output of the signal conditioner uses this change as the basis for the output signal. As long as the input fluctuates or moves at a rate that is outside the smoothing band, the output instantly tracks the input signal. Once the input settles at a new value, the filtering algorithm is automatically reactivated, eliminating noise and producing an accurate and stable output.

OPERATING, STORAGE, AND TRANSPORTATION CONDITIONS

Influence	Reference Operating Conditions	Operative Limits	Storage and Transportation Limits
Ambient Temperature Without Integral Display	24 ±2°C (75 ±3°F)	-40 and +85°C (-40 and +185°F)	-54 and +85°C (-65 and +185°F)
With Integral Display	24 ±2°C (75 ±3°F)	-29 and +70°C (-20 and +158°F)	-54 and +85°C 65 and +185°F)
Relative Humidity	50 ±10%	0 and 100% (noncondensing)	0 and 100% (noncondensing)
Supply Voltage	30 ±0.5 V dc	12 and 42 V dc	Not Applicable
Vibration	Negligible	19 mm (0.75 in) Double Amplitude from 5 to 9 Hz 0 to 30 m/s ² (0 to 3 "g")(a) from 9 to 500 Hz	107 mm (42 in) Drop in Shipping Container

(a) 10 m/s (1g) maximum with Package Configuration Code M, T, or Y.

PERFORMANCE SPECIFICATIONS

(Under Reference Operating Conditions Unless Otherwise Specified)

Accuracy

Refer to Table 1. The accuracy specification is applicable merely by choosing a sensor type and calibrated range without the need for any calibration equipment.

Repeatability and Linearity

Included in accuracy.

Long-Term Stability

DIGITAL OUTPUT:
<0.05% of input reading (mV or Ω) per year
4 to 20 mA OUTPUT:
Digital Stability plus 0.043% of span per year.

Vibration Effect

<0.05% at 30 m/s² (3 g)

Ambient Temperature Effect

Error is less than 1/2 the reference accuracy plus 0.1°C per 28°C (50°F)

Relative Humidity Effect

<0.01% of calibrated span from 0 to 100% RH, noncondensing.

Mounting Position Effect

None

Supply Voltage Effect

DIGITAL OUTPUT: None
4 to 20 mA OUTPUT: ≤0.005% per volt

Output Load Effect

DIGITAL OUTPUT: None
4 to 20 mA OUTPUT: ≤0.005% per volt

PHYSICAL SPECIFICATIONS

Basic Transmitter (Package Code B)

Enclosed in polycarbonate material

Enclosure Construction

HOUSING (Package Codes S, W, L):
Epoxy-coated, low-copper aluminum
HOUSING (Package Codes T, Y, M):
316 ss (CF-8M/UNS-J92900)
HOUSING COVER O-RING
UV Stabilized Buna-N

Union Coupling for Thermowell Mount

- Zinc-Plated Steel for Foxboro Code "L" housing, or with user-supplied thermowell option "-D5" (Codes "L" or "M" housing). See Model Code.
- Stainless Steel for Foxboro Code "M" housing, or with Option "-H2". See Model Code.

Environmental Protection

Housing: NEMA 4X, IP66

Mounting Options

Option	Code	Bracket	Hardware
Mounting Set	-M1	Epoxy-Coated Steel	Plated Steel
	-M2	Stainless Steel	Stainless Steel
DIN Rail	-D1	Aluminum and Plastic	Plated Steel

Approximate Transmitter Mass

BASIC: 0.13 kg (0.28 lb)
SURFACE MOUNT (Aluminum): 1.47 kg (3.25 lb)
SURFACE MOUNT (316 ss): 3.25 kg (7.25 lb)
WITH 1-LINE INDICATOR: Add 0.02 kg (0.05 lb)
WITH 3-LINE INDICATOR: Add 0.06 kg (0.13 lb)

FUNCTIONAL SPECIFICATIONS

Input Types and Range Limits

See Table 1 and Table 2.

Input Impedance (in mV Input Mode)

>10 MΩ

Span Limits

MINIMUM: 5°C (10°F)

MAXIMUM: See Table 1.

Engineering Units

The transmitter electronic database can be configured for ohms, mV, mA, °F, °C, K, or Dew Point.

Output Types

- 4 to 20 mA
- Smart HART
- Intelligent (4 to 20 mA or FoxCom Digital)

Output

RANGING:

Zero and span adjustment are non-interacting.

FAILSAFE (User-Configurable):

Downscale: 3.6 to 3.8 mA

Upscale: 20.75 to 23.0 mA

UNDERRANGE CURRENT: 3.8 mA

OVERRANGE CURRENT: 20.75 mA

ACTION: Direct or Reverse

Table 1. Range Limits, Maximum Span, and Accuracy^(a)

Input Type	Model Code	See Note	Range Limits		Maximum Span		Digital Accuracy(b,q)	
			°C	°F	°C	°F	°C	°F
RTD (2, 3, or 4 wire)								
Pt100 DIN/IEC	Q	c	-200 and +850	-328 and +1562	1050	1890	±0.05	±0.09
Pt100 DIN/IEC	A	d	-200 and +850	-328 and +1562	1050	1890	±0.05	±0.09
Pt100 SAMA	P	e	-200 and +650	-328 and +1202	850	1530	±0.05	±0.09
Ni 200	D	f,n	-130 and +315	-202 and + 599	445	801	±0.44	±0.79
Ni 120, Minco	G	n	-80 and +320	-112 and + 608	400	720	±0.03	±0.05
Ni 100	I	g,n	-60 and +250	-76 and +482	310	558	±0.04	±0.07
Cu 10	F	h,n	-70 and +150	-94 and +302	220	396	±0.51	±0.92
Thermocouple								
Type B	B	k,r	0 and +1820	+32 and +3308	1820	3276	±0.51	±0.92
Type C	C	k,p	0 and +2320	+32 and +4208	2320	4176	±0.38	±0.68
Type E	E	k	-270 and +1000	-454 and +1832	1270	2286	±0.08	±0.14
Type J	J	k	-210 and +1200	-346 and +2129	1410	2538	±0.11	±0.20
Type K	K	k	-270 and +1372	-454 and +2502	1642	2956	±0.14	±0.25
Type L	L	m	-200 and +900	-328 and +1652	1100	1980	±0.13	±0.23
Type N	N	k	-270 and +1300	-454 and +2372	1570	2862	±0.15	±0.27
Type R	R	k	-50 and +1768	-58 and +3214	1818	3272	±0.42	±0.76
Type S	S	k	-50 and +1768	-58 and +3214	1818	3272	±0.49	±0.88
Type T	T	k	-270 and +400	-454 and +752	670	1206	±0.10	±0.18
Type U	U	m	-200 and +600	-328 and -1112	800	1440	±0.09	±0.16
Other								
Millivolt	M	-	-15 and +115 mV dc		130 mV dc		±6 μV	
Resistance	O	-	1 and 500 Ω		500 Ω		±20 mΩ	
Dew Point	W	n	-45 and +60°C (-50 and +140°F)		105°C (190°F)		±0.05°C (0.09°F)	
Custom	Z	n	2- to 22-point user-configurable curve					

(a) For 4 to 20 mA output accuracy, add ±0.05% of span to digital accuracy.

(b) Digital accuracy is either the listed value or ±0.01% of span, whichever is greater. For thermocouples only, add the applicable cold junction error to digital accuracy.

Integral: ±0.2°C (±0.5°F)

Remote: Depends on accuracy of remote sensor.

(c) IEC/DIN 751; alpha = 0.00385 (1984) ASTM-B Standard Accuracy.

(d) IEC/DIN 751; alpha = 0.00385 (1984) ASTM-A High Accuracy

(e) SAMA Standard RC 21-4; alpha = 0.003923.

(f) Foxboro NR 226/227. Refer to TI 005-24a.

(g) DIN 43760.

(h) Foxboro CR 228/229. Refer to TI 005-25a.

(k) NIST Monogram 125, DIN IEC 584.

(m) DIN 43710 (1985).

(n) Not accessible with optional LCD Indicator/Configurator.

(p) Tungsten 5% Rhenium-Tungsten 26%.

(q) Does not include sensor accuracy.

(r) May exhibit a decrease in performance at temperatures below 43°C (109°F).

Table 2. Input Types

Single Sensor Type	Analog, 4 to 20 mA Output Code "-I"	Intelligent FoxCom Output Code "-D"	HART Output Code "-T"
T/C Type B, C, E, J, K, L, N, R, S, T, U	YES	YES	YES
RTD (2, 3, or 4 wire) 100 ohm DIN or SAMA	YES	YES	YES
RTD (2, 3, or 4 wire) 100, 120, or 200 ohm nickel	NO	YES	YES
RTD (2, 3, or 4 wire) 10 ohm copper	NO	YES	YES
Millivolt	YES	YES	YES
Ohms (2, 3, or 4 wire)	YES	YES	YES
Dew Point	NO	YES	YES
2 to 22 Point Custom Curve	NO	YES	YES

Output Update Rate

4 to 20 mA: 6 times per second (all output versions)
HART DIGITAL: 2 times per second
FoxCom DIGITAL: 10 times per second

Input Response Time

With minimum damping, the 90% response time for an 80% input step is 1.2 seconds.

Isolation

500 V ac, rms

RFI Protection

Susceptibility radiated
– IN METAL HOUSING
30 V/m Peak; 26-1000 MHz; 80% A @ 1k Hz
30 V/m Peak; 900 MHz; 50% duty cycle; 200 Hz repetition rate
– BASIC TRANSMITTER
10 V/m Peak; 26-1000 MHz; 80% A @ 1k Hz
10 V/m Peak; 900 MHz; 50% duty cycle; 200 Hz repetition rate

Configurators

4 TO 20 mA VERSION CODE -I:
All configurable parameters can only be changed using the optional one-line or three-line indicator/configurators (Option Code -L1 or -L3).
INTELLIGENT VERSION CODE -D:
All parameters are configurable via the Model PC10, Model PC20, Model HHT, or any I/A Series Workstation. The integral indicator/configurators (Option -L1 and -L3) can also be used to reconfigure the common parameters. Refer to MI 020-461 for details on the optional indicator/configurators.
HART VERSION CODE -T:
All parameters are configurable via the HART M275 Configurator or the Foxboro Model PC20 Configurator. The integral indicator/configurators (Option -L1 and -L3) can also be used to reconfigure the common parameters. Refer to MI 020-461 for details on the optional indicator/configurators.

Configurable Parameters (by the User)

DESCRIPTORS

- Tag Number
- Tag Name
- Location
- Device Name
- Message

OUTPUT

- Output Type
- Engineering Units (EGU)⁽¹⁾
- Burst Mode (HART Only)
- Linearization Mode

INPUT

- Input Type (Refer to Table 2)⁽¹⁾
- Lower Range Value (LRV)⁽¹⁾
- Upper Range Value (URV)⁽¹⁾
- Cold Junction
- Cold Junction EGU

OTHER

- Sensor Fault Detection (On/Off)⁽¹⁾
- Failsafe (On/Off)⁽¹⁾
- Failsafe direction (Upscale/Downscale)⁽¹⁾
- Failsafe Value
- Failsafe Reset (Auto/Locked) (HART Only)
- Power Supply Frequency (50/60 Hz)
- Power Supply Filter (Standard/High)
- Damping
- Sensor Validation
- Intelligent Smoothing Time
- Calibrator's Initials
- mA Output Calibration⁽¹⁾

INTEGRAL LCD INDICATOR/CONFIGURATOR

- Pushbuttons (Enable/Disable)
- Language⁽¹⁾
- Output Display Units (EGU, %, mA, Alternating EGU/mA, or Alternating %/mA)

(1) Accessible with the Optional LCD Indicator/Configurator.

FUNCTIONAL SPECIFICATIONS (Cont.)

Two-Wire Transmitter

The same two wires are used for input power, output signal, and remote communication.

Turn On Time

TWO-WIRE SENSOR: 3.5 seconds
 THREE- AND FOUR-WIRE SENSORS: 7 seconds

Minimum Power Supply Current

35 mA

Electronic Damping

4 to 20 mA VERSION:

1.2 seconds

INTELLIGENT VERSION:

Damping is configurable to settings of 0.25, 0.50, 1, 2, 4, 8, 16, and 32 seconds.

HART VERSION:

Damping is set as a floating decimal point value between 0 and 32 seconds.

Tagging - Hardware and Software

The permanently embossed stainless steel data plate and the transmitter electronic tag number are factory configured, at no charge, using the customer supplied tagging information.

RTT20 Transmitter Functional Block Diagram

Refer to Figure 5.

Supply Voltage Requirements and External Loop Load Limitations (Figure 4)

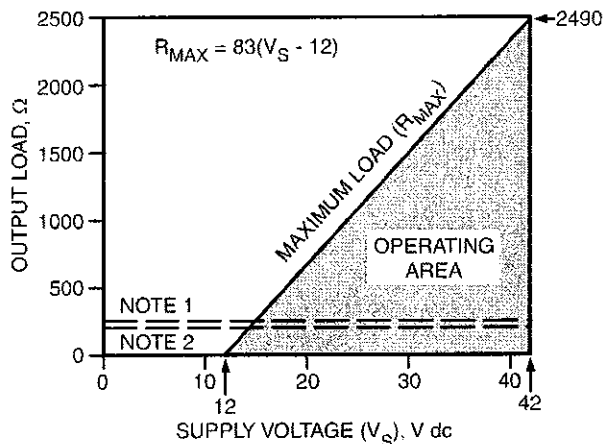


Figure 4. Supply Voltage vs. Output Load

NOTES (See Figure 4)

1. Minimum load with HART communication is 250 Ω.
2. Minimum load with Foxboro HHT, PC10, or PC20 connected is 200 Ω.
3. Connecting an HHT, PC10, PC20, or HART Communicator while operating below the minimum specified load may cause communication problems.

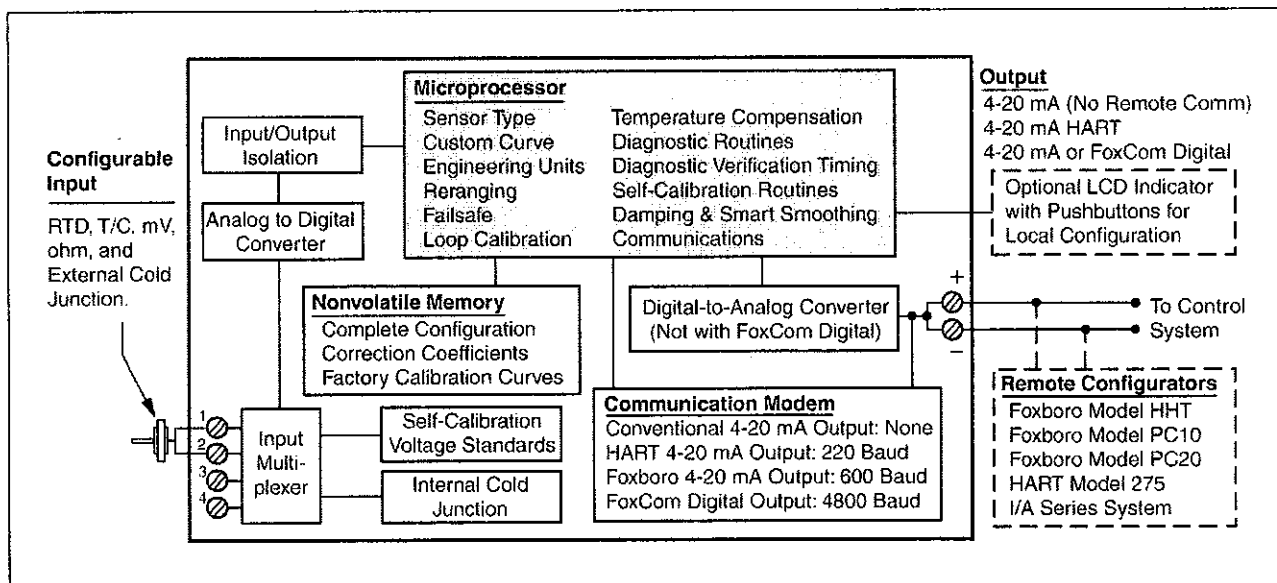


Figure 5. RTT20 Transmitter Functional Block Diagram

Table 3. Electrical Safety Specifications

Testing Laboratory, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Code
CENELEC intrinsically safe EEx ia, Gas Group IIC, Zone 0.	Temperature Class T4-T6.	EA
CENELEC flameproof EEx d, Gas Group IIC, Zone 1.	Temperature Class T6.	ED
CSA intrinsically safe, Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations.	Connect per MI 020-454. Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient	CA
CSA Class I, Division 2, Groups A, B, C, and D hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	
CSA explosionproof, Class I, Division 1, Groups B, C, and D; dust-ignitionproof, Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations.	Connect to source not exceeding 42.4 V. Temperature Class T6 at 40°C (104°F); T5 at 85°C (185°F) max. ambient.	CD
CSA Class I, Division 2, Groups A, B, C, and D hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	
CSA Class I, Division 2, Groups A, B, C, and D hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	CN
FM intrinsically safe, Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations.	Connect per MI 020-454. Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	FA
FM nonincendive, Class I, II, and III, Division 2, Groups A, B, C, D, F and G hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	
FM explosionproof, Class I, Division 1, Groups B, C, and D; dust-ignitionproof, Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations.	Connect to source not exceeding 42.4 V. Temperature Class T6 at 40°C (104°F); T5 at 85°C (185°F) max. ambient.	FD See Note (a)
FM nonincendive, Class I, II, and III, Division 2, Groups A, B, C, D, F and G hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	
FM nonincendive, Class I, II, and III, Division 2, Groups A, B, C, D, F and G hazardous locations.	Temperature Class T6 at 40°C (104°F); T4 at 85°C (185°F) max. ambient.	FN
KEMA European nonsparking/nonincendive "N", Gas Group IIC, Zone 2.	Temperature Class T4-T6.	KN
SAA intrinsically safe Ex ia, Gas Group IIC, Zone 0.	Temperature Class T4.	AA
SAA flameproof Ex d, Gas Group IIC, Zone 1.	Temperature Class T6.	AD
SAA nonsparking Ex n, Gas Group IIC, Zone 2.	Connect to source not exceeding 42.4 V Temperature Class T4.	AN

(a) The Factory Mutual (FM) approval of the Model RTT20 for the explosionproof rating listed above included pressure piling tests with various lengths of conduit to ensure that conduit seals per NEC 501-5(a)1 within 475 mm (18 inches) of the housing are NOT required.

NOTES

1. The RTT20 Transmitter has been designed to meet the Electrical Safety descriptions listed above. For detailed information, or status of testing laboratory approvals or certification, contact Foxboro.
2. Not all Electrical Specifications apply to all package configurations. Refer to the Model Codes section that follows for codes applicable to each package configuration.

MODEL CODES

Model Code – Basic, Surface, or Pipe Mount Transmitter – Remote Sensors not provided with these Transmitters

<u>Description</u>	<u>Model</u>
I/A Series Intelligent Temperature Transmitter	RTT20
<u>Output Signal and Communication Protocol</u>	
4 to 20 mA only; no Remote Communication (a)	-I
4 to 20 mA or FoxCom Digital Communication (b)	-D
4 to 20 mA with HART Communication (c)	-T
<u>Input Configuration</u>	
Single Input Channel	1
<u>Package Configuration and Housing Material (Remote Mounted Sensor)</u>	
Basic Unit (used for Panel Mount, DIN Rail, or Replacement)	B
Surface or Pipe Mount, Aluminum Housing with 1/2 NPT Conduit Thread (Explosionproof)	S
Surface or Pipe Mount, 316 ss Housing with 1/2 NPT Conduit Thread (Explosionproof)	T
<u>Sensor Length</u>	
None (Not Applicable to Transmitters with Remote Mounted Sensors)	N
<u>Measurement Input Type (Software Selectable)</u>	
None - Specified Factory Default to Code Q	X
Thermocouple, Type B, Platinum - 30% Rhodium vs. Platinum - 6% Rhodium	B
Thermocouple, Type C, Tungsten - 5% Rhenium vs. Tungsten - 26% Rhenium	C
Thermocouple, Type E, Nickel-Chromium vs. Copper-Nickel (Chromel-Constantan)	E
Thermocouple, Type J, Iron vs. Copper-Nickel (Iron-Constantan)	J
Thermocouple, Type K, Nickel-Chromium vs. Nickel-Aluminum (Chromel-Alumel)	K
Thermocouple, Type L, Iron vs. Copper-Nickel	L
Thermocouple, Type N, Nicrosil vs. Nisil (Nicrosil-Nisil)	N
Thermocouple, Type R, Platinum - 13% Rhodium vs. Platinum	R
Thermocouple, Type S, Platinum - 10% Rhodium vs. Platinum	S
Thermocouple, Type T, Copper vs. Copper-Nickel (Copper-Constantan)	T
Thermocouple, Type U, Copper vs. Copper-Low Nickel	U
RTD, Platinum, DIN, 100 Ω, IEC 751 (ASTM-B Standard Accuracy)	Q
RTD, Platinum, DIN, 100 Ω, IEC 751 (ASTM-A High Accuracy)	A
RTD, Platinum, 100 Ω, SAMA	P
RTD, Nickel, 200 Ω, Foxboro NR 226/227	D
RTD, Nickel, 120 Ω, Minco	G
RTD, Nickel, 100 Ω, DIN 43760	I
RTD, Copper, 10 Ω, Foxboro CR 228/229	F
Millivolt Input	M
Ohms Input	O
Dew Point Input	W
Custom Input	Z
<u>Electrical Safety (Also see "Electrical Safety Specifications" section)</u>	
SAA, Intrinsically Safe, ia	AA
SAA, Explosionproof, d (Not available with Basic Unit, Package Configuration "B")	AD
SAA, Nonsparking, n	AN
CSA, Intrinsically Safe, ia	CA
CSA, Explosionproof, d (Not available with Basic Unit, Package Configuration "B")	CD
CSA, Nonincendive, n	CN
CENELEC, Intrinsically Safe, ia	EA
CENELEC, Flameproof, d (Not available with Basic Unit, Package Configuration "B")	ED
FM, Intrinsically Safe, ia	FA
FM, Explosionproof, d (Not available with Basic Unit, Package Configuration "B")	FD
FM, Nonincendive, n	FN
KEMA (European), Nonsparking/Nonincendive, N	KN
<u>Optional Selections</u>	
Refer to "Optional Selections" Codes further in document	

(a) With Output Code "-I", transmitter adjustment and output reconfiguration is possible only via an LCD Indicator/Configurator (Optional Selection "-L1" or "-L3") which is easily transportable between transmitters. Remote communication is not available.

(b) Remote configuration with Models PC10, PC20, and HHT; or I/A Series system.

(c) Remote configuration with HART Model 275 Configurator (Foxboro Model HT991), Model PC20, and/or Foxboro ABO991 software.

MODEL CODES (Cont.)**Model Code – Transmitter with Bare Sensor Mount or with Thermowell Mount – Integrally Mounted Sensors**

Description	Model
I/A Series Intelligent Temperature Transmitter	RTT20
Output Signal and Communication Protocol (a) 4 to 20 mA only; no Remote Communication (a) 4 to 20 mA or FoxCom Digital Communication (b) 4 to 20 mA with HART Communication (c)	-I -D -T
Input Configuration Single Input Channel	1
Package Configuration and Housing Material (Integrally Mounted Sensor - Bare or in Thermowell) Bare Sensor Mounted to Aluminum Housing; 1/2 NPT Conduit Threads (Explosionproof) Bare Sensor Mounted to 316 ss Housing; 1/2 NPT Conduit Threads (Explosionproof) Thermowell Mounted to Aluminum Housing; 1/2 NPT Conduit Threads (Explosionproof) Thermowell Mounted to 316 ss Housing; 1/2 NPT Conduit Threads (Explosionproof)	W Y L M
Sensor Length 2 in (50 mm) 2.5 in (64 mm) 3 in (76 mm) 3.5 in (89 mm) 4 in (102 mm) 4.5 in (114 mm) 5 in (127 mm) 5.5 in (140 mm) 6 in (152 mm) 7 in (178 mm) 8 in (203 mm) 9 in (229 mm) 10 in (254 mm) 11 in (279 mm) 12 in (305 mm) 18 in (457 mm) 24 in (610 mm) 30 in (762 mm) 36 in (914 mm) Custom Length per Sales Order – 120 in (3 m) maximum	A B C D E F G H J K L M P Q R S T U V X
Measurement Input Type (Software Selectable) Thermocouple, Type E Thermocouple, Type J Thermocouple, Type K Thermocouple, Type T RTD, Platinum, DIN, 100 Ω, IEC 751 (ASTM-B Standard Accuracy) RTD, Platinum, DIN, 100 Ω, IEC 751 (ASTM-A High Accuracy) RTD, Platinum, 100 Ω, SAMA	E J K T Q A P
Electrical Safety (Also see "Electrical Safety Specifications" Section) SAA, Intrinsically Safe, ia SAA, Explosionproof, d (d) SAA, Nonsparking, n CSA, Intrinsically Safe, ia CSA, Explosionproof, d (d) CSA, Nonincendive, n CENELEC, Intrinsically Safe, ia FM, Intrinsically Safe, ia FM, Explosionproof, d (d) FM, Nonincendive, n KEMA (European), Nonsparking/Nonincendive, N	AA AD AN CA CD CN EA FA FD FN KN
Optional Selections Refer to "Optional Selection" Codes further in document	

(a) With Output Code "-I", transmitter adjustment and output reconfiguration is possible only via an LCD Indicator/Configurator (Optional Selection "-L1" or "-L3") which is easily transportable between transmitters. Remote communications are not available.

(b) Remote configuration with Models PC10, PC20, and HHT; or I/A Series system.

(c) Remote configuration with HART Model 175 Configurator (Foxboro Model HT991), Model PC20, and on Foxboro ABU991 software.

(d) Not available with Package Codes "W" and "Y"; but available with Package Codes "L" and "M" when Option "-D2" is selected.

MODEL CODES (Cont.)

Optional Selection Codes

Option Description	Used with Package Configuration Code:							Option Code
	B	S	T	W	Y	L	M	
Custody Transfer Lock and Seal (a)	-	Yes	Yes	Yes	Yes	Yes	Yes	-A1
PG 13.5 Conduit Thread (in lieu of 1/2 NPT) (b)	-	Yes	-	Yes	-	Yes	-	-A2
Metric Conduit Adapter (1/2 NPT to M20) (c)	-	Yes	Yes	Yes	Yes	Yes	Yes	-A3
Configured for FoxCom Digital (d)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-C1
Custom Database Configuration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-C2
Database on Disk; FoxCom Only (PC20 Format)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-C3
DIN Rail Mounting Hardware (e)	Yes	-	-	-	-	-	-	-D1
Ship with Thermowell Attached (f)	-	-	-	-	-	Yes	Yes	-D2
Retrofit Kit - Adapts RTT20 to older Transmitters (g)	Yes	-	-	-	-	-	-	-D3
Thermowell, 3/4 NPT (Foxboro Std.); Supplied by User (h)	-	-	-	-	-	Yes	Yes	-D4
Thermowell, 1/2 NPT; Supplied by User (i)	-	-	-	-	-	Yes	Yes	-D5
Stainless Steel Union Coupling (j)	-	-	-	-	-	Yes	Yes	-H2
Delete Instruction Book	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-K1
CD-ROM Instruction Book; No Paper Version	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-K2
CD-ROM and Paper Instruction Book	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-K3
One-Line LCD Indicator/Configurator	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-L1
Three-Line LCD Indicator/Configurator	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-L3
Mounting Set, Epoxy-Coated Steel (k)	-	Yes	Yes	-	-	-	-	-M1
Mounting Set, 316 ss (k)	-	Yes	Yes	-	-	-	-	-M2
Inconel Sheath on RTDs or TCs	-	-	-	Yes	Yes	Yes	Yes	-S1
Dual Element Sensor (l)	-	-	-	Yes	Yes	Yes	Yes	-S2
4-Wire RTD Sensor	-	-	-	Yes	Yes	Yes	Yes	-S4

Examples: RTT20-D1SNJFA-A1C1C2M1; RTT20-T1WLPCA-A1S1S4; RTT20-D1LPEFD-C1C3D2S2

- (a) Custody Transfer Lock and Seal is standard construction with Electrical Safety Codes EA and ED.
- (b) PG 13.5 Conduit Thread only available with Electrical Safety Codes EA and ED. Also not available with Option "-A3".
- (c) Not available with Electrical Safety Codes AD, CD, ED, or FD. Also not available with Option "-A2".
- (d) Available with Output Code "-D" only. Transmitter digital output to be connected to FBM18, 39, 43, or 44.
- (e) Hardware only; DIN rail is provided by user.
- (f) Required selection with Electrical Safety Codes AD, CD, or FD when Package Code L or M is used.
- (g) The optional "-D3" retrofit kit provides an adapter plate and hardware to substitute an RTT20 into installations currently using an older type RTT10, 893, E93, and E94 Temperature Transmitter.
- (h) Not available with Electrical Safety Codes AD, CD, ED, or FD.
- (i) Not available with Electrical Safety Codes AD, CD, ED, or FD; nor with Optional Selection "-H2".
- (j) Not available with Optional Selection "-D5".
- (k) For mounting transmitter to surface, or DN 50 or 2-in pipe.
- (l) Two 2-wire RTDs in one sheath. Available with Output Codes "-D" and "-T" only, and with Sensor Input Types "Q" and "P".

NOTE

For further information relating to options, accessories, and services available with the RTT20 Temperature Transmitter, refer to PSS 2A-1Z9 F.

SUGGESTED RFQ SPECIFICATIONS

The manufacturer shall provide a microprocessor-based temperature transmitter with 4 to 20 mA or digital output which is linear to the measured temperature as follows:

Electronics:	Sealed Against Moisture
Sensors:	All Popular RTDs and Thermocouples
Self Calibration:	Automatic with No Prompt Required
Span Rangeability:	At Least 200:1
Enclosure:	Suitable for Remote or Integral Sensor Mounting (NEMA 4X and IP66)
Electrical Classification:	Intrinsically Safe or Explosionproof
Communications:	Must Not Interfere with Output
Configurators:	Integral and Remote Required
LCD Indicator:	Must Display Faults and Tag Number, and have Configuration Pushbuttons
Accuracy:	0.1°C for a 100 W Pt RTD at 0 to 100°C Span
Model Code:	Foxboro Model RTT20, or Equivalent

ALTERNATE SUGGESTED RFQ SPECIFICATIONS

The vendor shall furnish the following instrument for sensing temperature and transmitting a 4 to 20 mA or digital output signal. The instrument shall measure a temperature of ____ to ____°C using a thermocouple or RTD. Range is to be fully adjustable with span rangeability of at least 200:1 for each sensor. The transmitter shall be microprocessor-based with automatic self-calibration to virtually eliminate drift and ambient temperature errors. All diagnostic messages must be automatic and transmitted to a local display or remote configurators.

The transmitter housing should be suitable for integral or remote mounting of the sensor and shall be approved for use in hazardous locations (intrinsically safe and/or explosionproof). The basic transmitter shall be sealed and protected against moisture and other contaminants. The transmitter shall be a Foxboro I/A Series Temperature Transmitter, Model RTT20, or approved equivalent.

ORDERING INSTRUCTIONS

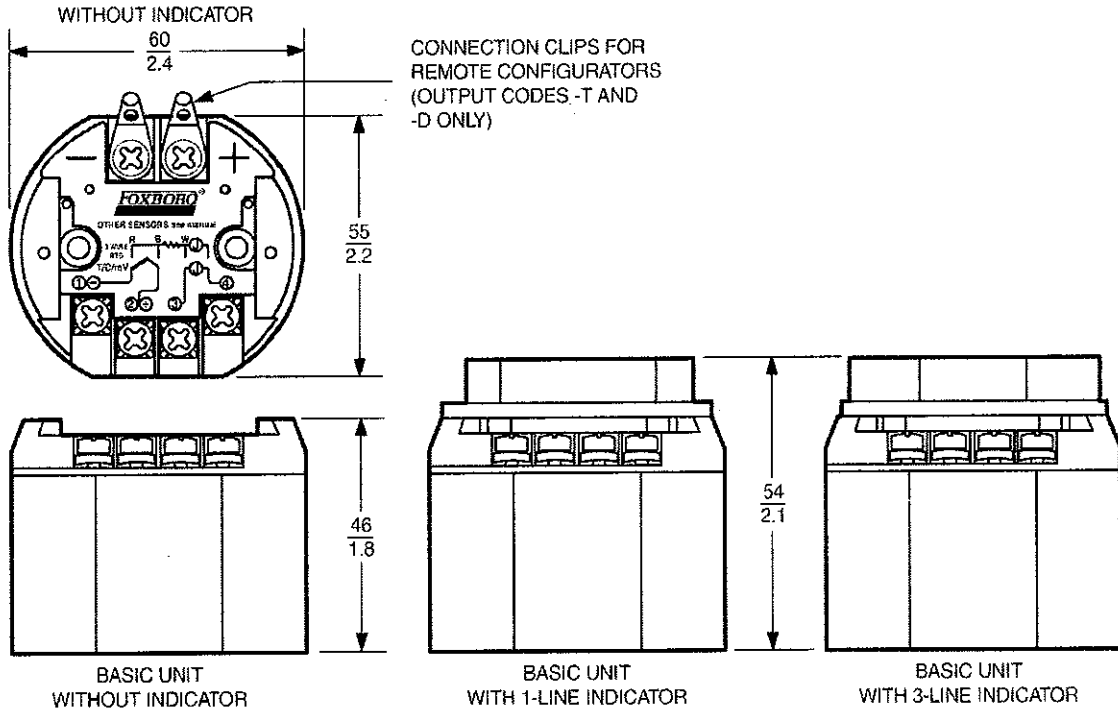
1. Model Number
2. Calibrated Range
3. Thermowell Part Number or Model, if required (See PSS 3-3C1 A)
4. Remote Configurator, if required
 - Models PC10 or PC20 (FoxCom)
 - Model HHT (FoxCom)
 - I/A Series System (FoxCom)
 - Model 275 (HART)
 - Foxboro ABO991 Software (HART)
5. Tag Information

DIMENSIONS – NOMINAL

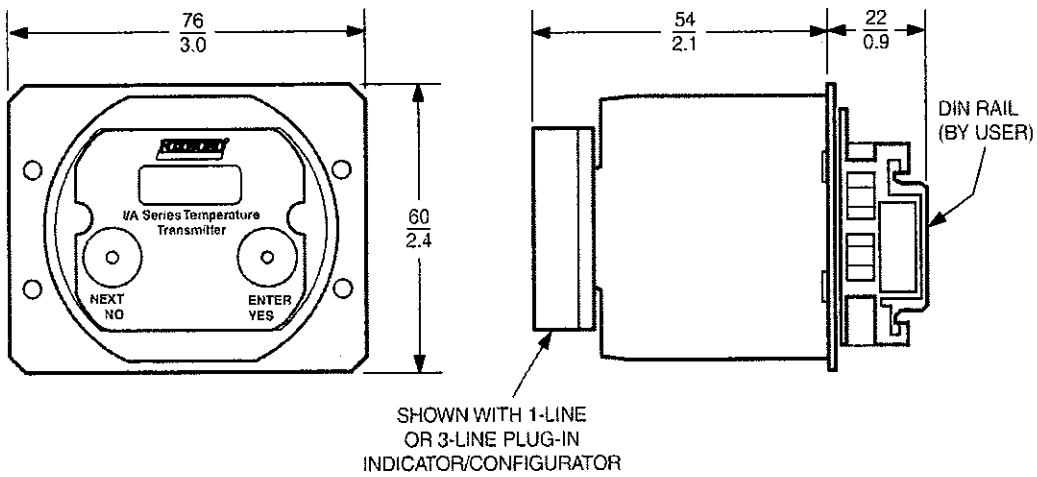
mm
in

NOTE: For additional details, refer to Dimensional Print (DP 020-460).

BASIC UNIT - PACKAGE CONFIGURATION CODE "B"



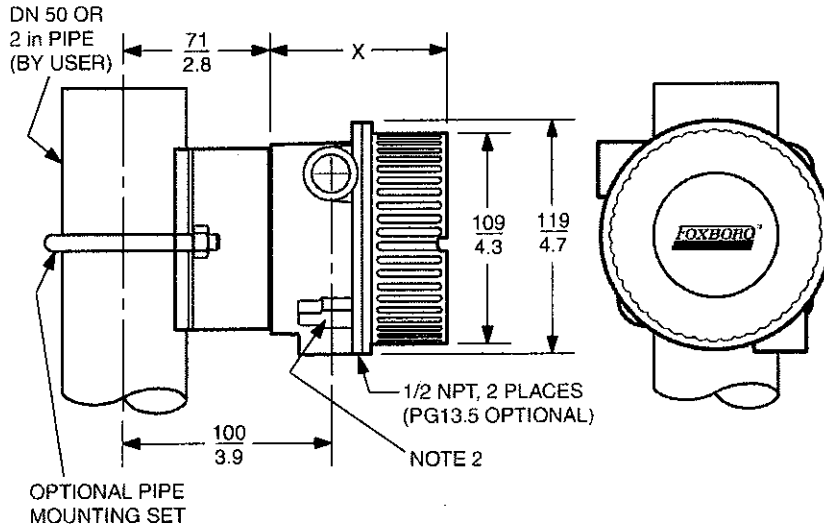
BASIC UNIT WITH DIN MOUNTING HARDWARE



DIMENSIONS – NOMINAL (Cont.)

mm
in

SURFACE OR PIPE MOUNT TRANSMITTER WITH REMOTE SENSOR (PACKAGE CODE "S OR T")

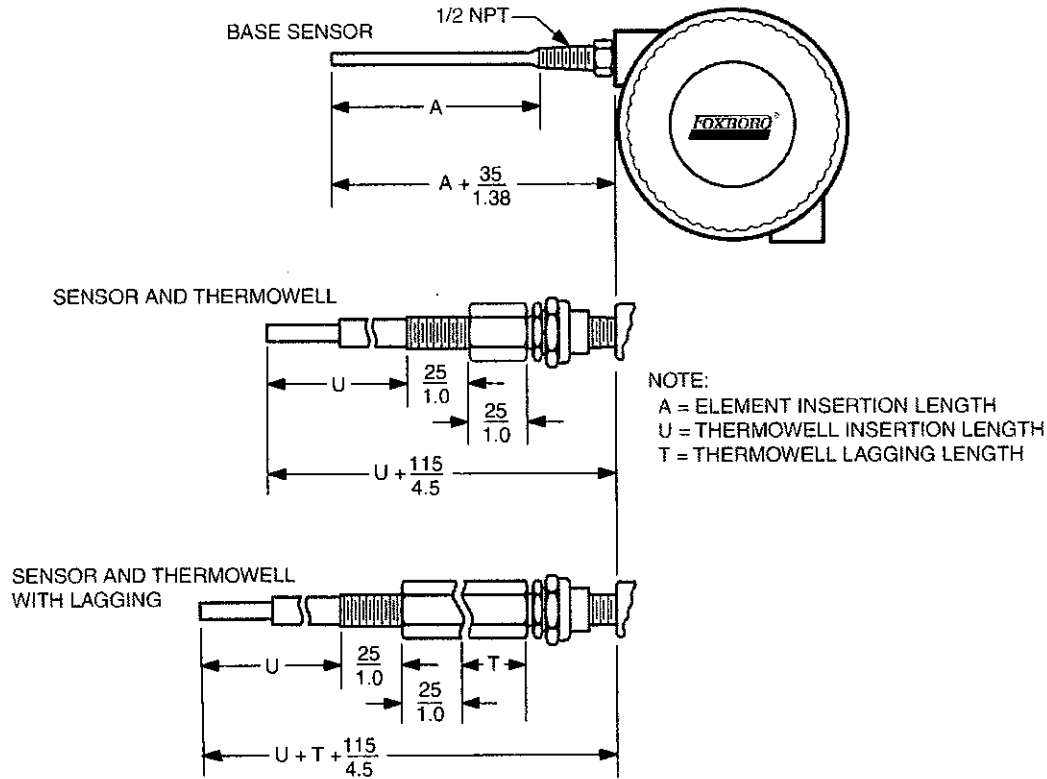


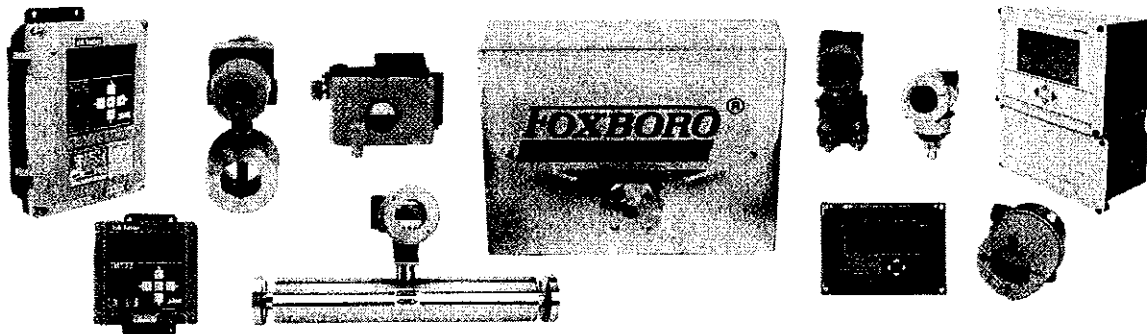
HOUSING MATERIAL	DIMENSION X (NOTE 1)	
	WITHOUT INDICATOR	WITH INDICATOR
316 ss	$\frac{87}{3.4}$	$\frac{99}{3.9}$
ALUMINUM	$\frac{87}{3.4}$	$\frac{112}{4.4}$

NOTES

1. ALLOW 51 mm (2 in) CLEARANCE FOR COVER REMOVAL.
2. EXTERNAL COVER LOCK AND GROUND SCREW LOCATION FOR ELECTRICAL CODES EA, ED, AND KN OR OPTIONAL FEATURE -A1.

TRANSMITTER WITH INTEGRAL SENSOR (PACKAGE CODE "L, M, W, OR Y")





PRODUCT SPECIFICATION SHEETS (PSSs) FOR INTELLIGENT FIELD DEVICES

Category	Device Types	Models	4-20 mA Analog	4-20 mA with FoxCom	4-20 mA with HART	FOUNDATION fieldbus	Other
Pressure	Transmitter - AP	IAP10 & 20	2A-1C13 C	2A-1C13 A	2A-1C13 B	2A-1C13 E	(1)(2)
	Transmitter - GP	IGP10 & 20	2A-1C13 C	2A-1C13 A	2A-1C13 B	2A-1C13 E	(1)(2)
	Transmitter - GP	IGP25/50	N/A	2A-1CTBD/TBD	2A-1CTBD/TBD	2A-1CTBD/TBD	N/A
	Transmitter - DP	IDP10	2A-1C14 C	2A-1C14 A	2A-1C14 B	2A-1C13 E	(1)(2)
	Transmitter - DP	IDP25/50	N/A	2A-1CTBD/TBD	2A-1CTBD/TBD	2A-1CTBD/TBD	N/A
Multivariable	Transmitter - P/T/Flow	IMV30	N/A	2A-1C15 A	N/A	N/A	(2)
	Transmitter - P/T	IMV25	N/A	2A-1C15 B	2A-1C15 B	2A-1C15 B	(2)
Temperature	Transmitter	RTT20	2A-1F4 A	2A-1F4 A	2A-1F4 A	N/A	(2)
	Transmitter	RTT25	N/A	N/A	N/A	2A-1F4 C	(2)
Mass Flow	Transmitter	CFT10	N/A	1-2B3 C	N/A	N/A	N/A
	Transmitter	CFT15	N/A	N/A	N/A	N/A	(3)
	Transmitter	CFT30	N/A	N/A	1-2B5 A	N/A	N/A
Magnetic Flow	Transmitter	IMT25	N/A	1-6F5 A	1-6F5 A	1-6F5 B	N/A
	Transmitter	IMT25L	N/A	1-6F6 A	N/A	N/A	N/A
	Transmitter	IMT96	N/A	1-6F8 A	N/A	N/A	N/A
Vortex Flow	Flanged/Wafer	83F/83W	1-8A1 D	1-8A1 E	1-8A1 E	1-8A1 F	(4)
	Sanitary	83S	1-8A2 E	1-8A2 D	1-8A2 D	N/A	(4)
Electro-Chemical Transmitters	pH, ORP, ISE (6)	870ITPH	6-1B1 B	6-1B1 B	N/A	N/A	N/A
	CC & R (6)	870ITCR	6-3C1 B	6-3C1 B	N/A	N/A	N/A
	EC (6)	870ITEC	6-3N2 A	6-3N2 A	N/A	N/A	N/A
Electro-Chemical Analyzers	pH, ORP, ISE (6)	875PH	6-3A1 E	N/A	6-3A1 E	N/A	N/A
	CC & R (6)	875CR	6-3A1 B	N/A	6-3A1 B	N/A	N/A
	EC (6)	875EC	6-3N1 C	N/A	6-3N1 C	N/A	N/A
Buoyancy	Transmitter	144LD	N/A	EML0610 A-(en)	EML0160 A-(en)	N/A	N/A
	Transmitter	144LVD	N/A	EML1610 A-(en)	EML1610 A-(en)	N/A	N/A
Valves	Positioner	SRD991	EVE0106 A-(en)	EVE0105 A-(en)	EVE0105 A-(en)	EVE0105 A-(en)	(5)

N/A= Field device not available in that protocol at time of printing. Refer to www.foxboro.com/measurement/pss.htm.

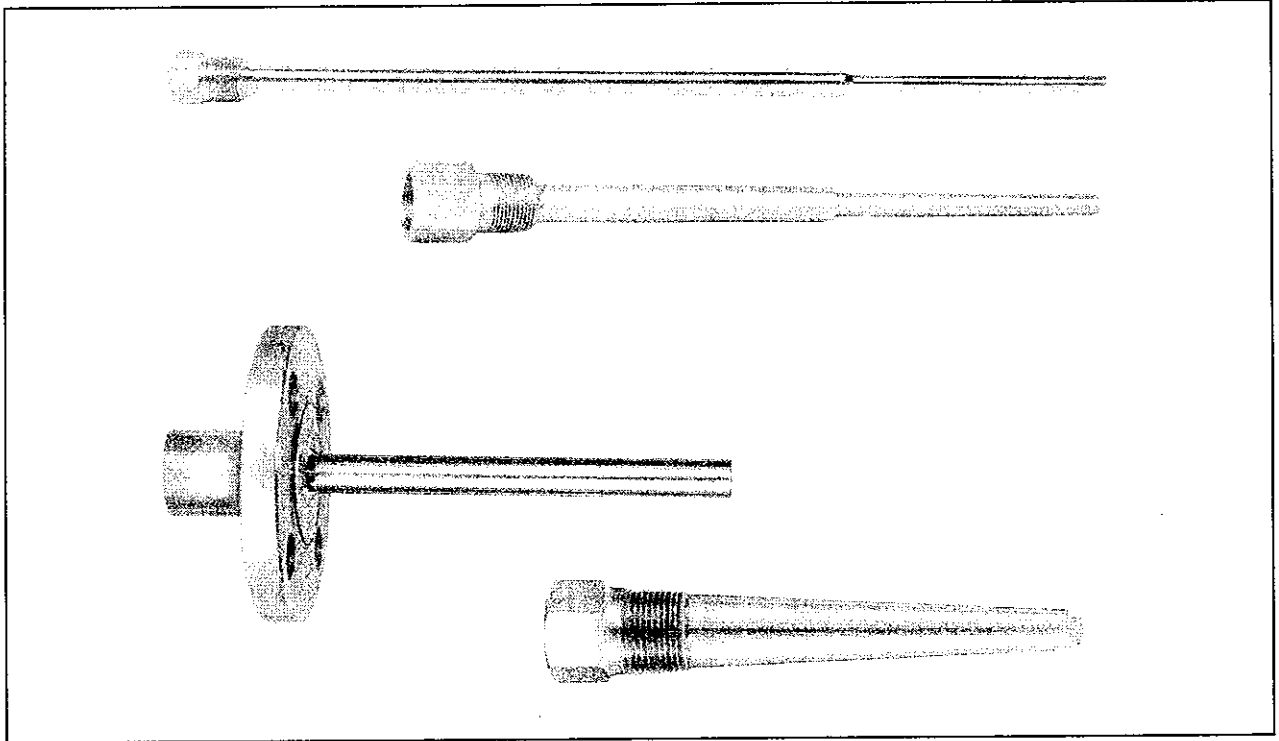
- (1) For low power voltage output (1 to 5 V) pressure transmitter family, refer to PSS 2A-1C13 D.
- (2) Options/Accessories: see PSS 2A-1Z9 E for Pressure and Multivariable Transmitters, and PSS 2A-1Z9 F for Temperature Transmitters.
- (3) For Modbus protocol mass meter Model CFT15, refer to PSS 1-2B3 D.
- (4) For pulse output vortex meter Model, refer to PSS 1-8A1 D (for 83F and 83W) or PSS 1-8A2 D (for 83S).
- (5) For Profibus Pa protocol valve positioner Model SRD991, refer to PSS EVE0105 A-(en).
- (6) ORP = Oxidation Reduction Potential; ISE = Ion Selective Electrode; CC = Contacting Conductivity; EC = Electrodeless Conductivity; and R = Resistivity.

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Thermometer Wells



Foxboro Wells separate the temperature-measuring sensitive portion of a filled thermal system, thermocouple, or resistance temperature detector from potentially corrosive or damaging process media. These wells permit ready removal of the sensor without process shutdown.

PROVEN DEPENDABILITY

Foxboro Wells have been a widely accepted standard of the process control industry for over forty years. Many thousands of successful trouble-free installations have demonstrated the exceptional dependability of these wells.

SPECIAL-PURPOSE WELLS

Wells have been designed to meet the unique requirements of the Dairy Industry, and also Pulp Digester applications.

HIGH-QUALITY CONSTRUCTION

Bore concentricity is held to within 10% of wall thickness, regardless of length, to ensure a stem well which is uniform and structurally sound. The insertion length is also polished all over to provide maximum resistance against corrosion.

MANY MATERIALS—MANY SIZES

A variety of materials and sizes have been selected for construction of wells to satisfy diverse applications. Stringent specifications and quality assurance requirements have been applied to these materials to ensure proper functioning under extreme process conditions.

HEAD CONFIGURATION

Foxboro Threaded Wells have been designed with a head configuration that makes them readily distinguishable from process bushings. This reduces the possibility of mistakenly removing the sensor from a bushing under pressure, or of removing the well itself thinking it is a bushing, causing an egress of process media.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions with design, methods, techniques of
construction, and the best coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____



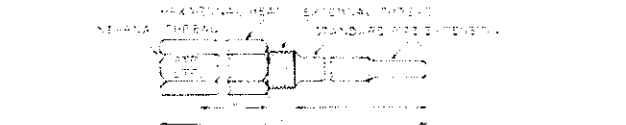

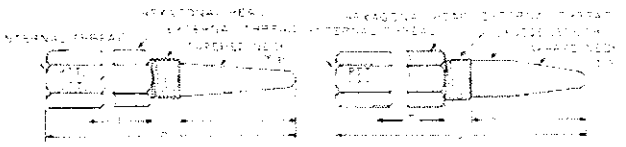
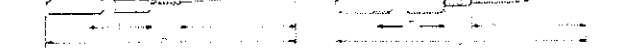
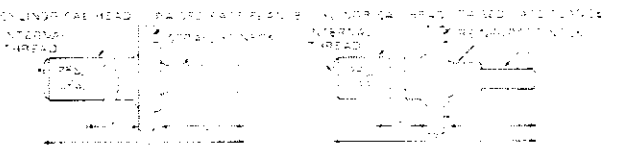

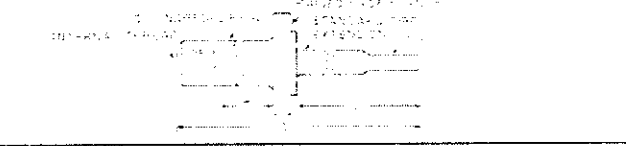



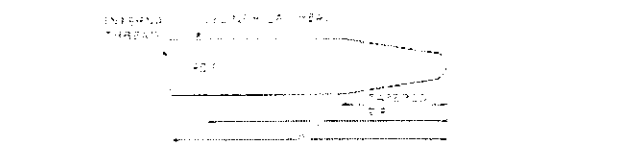
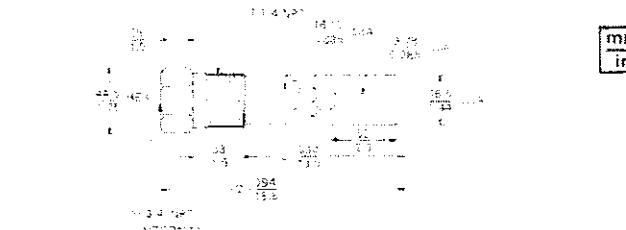
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538

Date: 24/1/06 By: [Signature]

WELL CONFIGURATIONS

Well Type	Description	Configuration
W-PTS	Plain Threaded, Solid	
W-LTS	Lagged Threaded Solid	
W-PTR	Plain Threaded, Welded	
W-LTR	Lagged Threaded Welded	
W-PTT	Plain Threaded, Tapered	
W-LTT	Lagged Threaded Tapered	
W-PFS	Plain Flanged, Solid	
W-LFS	Lagged Flanged, Solid	
W-PFR	Plain Flanged, Welded	
W-LFR	Lagged Flanged, Welded	
W-PFT	Plain Flanged, Tapered	
W-LFT	Lagged Flanged, Tapered	
W-PDT	Plain Dairy Tapered	
Model 711	<p>Pulp Digester Well</p> <p>Designed for digester or other applications where severe mechanical stress is involved. Accommodates 9.53 mm (3/8") ID sensor whose maximum sensitive length is 50 mm (2.0")</p> <p>Standard U length is as shown. For other lengths contact Foxboro</p>	

PERFORMANCE SPECIFICATIONS

W-PTS, W-LTS, W-PTT, W-LTT and W-PDT Hydrostatically pressure tested at 17 MPa (2500 psi, 173 bar or kg/cm²) at 24°C (75°F).

W-PFS, W-LFS, W-PFT, W-LFT, W-PFR and W-LFR Hydrostatically pressure tested at 1.5 times the maximum working pressure of the specified flange at 24°C (75°F).

W-PTR, W-LTR Hydrostatically pressure tested at 7 MPa (1000 psi, 70 bar or kg/cm²) at 24°C (75°F).

PHYSICAL SPECIFICATIONS

MATERIAL

AISI Types 304 and 316 stainless steel (304 ss and 316 ss) are standard. Refer to Optional Features section for other available well materials.

CONSTRUCTION

W-PTS and W-LTS Threaded well drilled construction straight or reinforced neck.

W-PTR and W-LTR Threaded well drilled and welded construction. Formed by welding drilled solid bar stock to each end of a standard pipe extension.

W-PTT and W-LTT Threaded well drilled construction tapered neck length is 200 mm (8.0 in) maximum.

W-PFS and W-LFS Flanged well drilled construction straight or reinforced neck. Flange is welded in place.

W-PFR and W-LFR Flanged well drilled and welded construction. Formed by welding drilled and solid bar stock to each end of a standard pipe extension. Flange is welded in place.

W-PFT and W-LFT Flanged well drilled construction tapered neck length is 200 mm (8.0 in) maximum. Flange is welded in place.

W-PDT Drilled construction tapered neck. Designed for dairy storage tank applications.

Model 7110 Plain threaded solid construction. Designed for cup digesters.

INSERTION LENGTH U

W-PTS, W-LTS, W-PTT and W-LTT Minimum U is 90 mm (3.5 in). Maximum U is 660 mm (22 in). Intermediate lengths available as specified.

W-PFS, W-LFS, W-PFT and W-LFT Minimum U is 150 mm (6.0 in). Maximum U is 660 mm (22 in). Intermediate lengths available as specified.

W-PTR, W-LTR, W-PFR and W-LFR Lengths available as specified from a minimum U of 660 mm (22 in) to a maximum U of 3000 mm (118 in).

W-PDT Refer to W-PDT Standard Dimensions Table.

Model 7110 Refer to table on Page 2.

LAGGING EXTENSION T

Applicable to W-LTS, W-LTR, W-LTT, W-LFS, W-LFR and W-LFT only. Standard T length is 75 mm (3 in) nominal. Other lengths available as specified.

OVERALL LENGTH C

W-PTS, W-LTS, W-PTT, W-LTT, W-PFS, W-LFS, W-PFT and W-LFT $C = U + T - 50$ mm (2 in) nominal, where the maximum C is 600 mm (24 in) and T = 0 for plain wells.

W-PTR, W-LTR, W-PFR and W-LFR $C = U + T + 50$ mm (2 in) nominal, where C is between 600 and 3050 mm (24 and 120 in) and T = 0 for plain wells.

W-PDT Refer to W-PDT Standard Dimensions Table.

Model 7110 Refer to table on Page 2.

Standard Dimensions (W-PDT Only)

Sensor O.D.	Well I.D.	Minimum Wall	Internal Thread	Overall Length C	Designated U Length	Tapered Tip Length
9.53 mm (Ø 375 in)	9.78 mm (Ø 385 in)	3.05 mm (Ø 120 in)	1,000-13 UNS-2B	357.13 mm (13.125 in)	200 mm (8 in)	62.8 mm (2.5 in)
9.53 mm (Ø 375 in)	9.75 mm (Ø 385 in)	3.05 mm (Ø 120 in)	1,000-13 UNS-2B	333.33 mm (13.125 in)	275 mm (11 in)	65.3 mm (2.57 in)
15.88 mm (Ø 625 in)	16.13 mm (Ø 635 in)	3.05 mm (Ø 120 in)	1,000-13 UNS-2B	257.13 mm (10.125 in)	175 mm (7 in)	62.8 mm (2.5 in)
15.88 mm (Ø 625 in)	16.13 mm (Ø 635 in)	3.05 mm (Ø 120 in)	1,000-13 UNS-2B	333.33 mm (13.125 in)	250 mm (10 in)	65.3 mm (2.57 in)

Standard Dimensions (Model 7110 Only) Refer to table on Page 2.

Standard Dimensions (Except for W-PDT and Model 7110)

Sensor O.D.	Well I.D. ^(a)	Well Tip O.D. ^(b)	Internal Thread	Threaded Wells			Flanged Wells ^(a)	Welded Wells ^(d)		
				External Thread ^(a)	Hex Head		Cylindrical Head O.D. ^(c)	Pipe Extension		
					mm	in		Type	Size	O.D.
6.35 mm (0.250 in)	6.60 mm (0.260 in)	11.13 mm (0.438 in)	1/4-14 NFSM	R 1/2 or 1/2 NPT	32	1.14	31.8 mm (1.25 in)	Seamless	3/8	17.15 mm (0.675 in)
				R 3/4 or 3/4 NPT	32	1.14				
				R 1 or 1 NPT	35	1.38				
9.53 mm (0.375 in)	9.78 mm (0.385 in)	14.27 mm (0.562 in)	1.00-16 UNS-2B	R 1/2 or 1/2 NPT	32	1.14	31.8 mm (1.25 in)	Seamless	3/8	17.15 mm (0.675 in)
				R 3/4 or 3/4 NPT	32	1.14				
				R 1 or 1 NPT	35	1.38				
15.88 mm (0.625 in)	16.13 mm (0.635 in)	20.62 mm (0.812 in)	1.00-16 UNS-2B	R 3/4 or 3/4 NPT	32	1.14	31.8 mm (1.25 in)	Seamless	3/4	26.67 mm (1.050 in)
				R 1 or 1 NPT	35	1.38				
				R 1 1/4 or 1 1/4 NPT	44	1.54				
22.23 mm (0.875 in)	22.47 mm (0.885 in)	28.58 mm (1.125 in)	1.00-16 UNS-2B	R 1 or 1 NPT	33	1.12	38.1 mm (1.50 in)	Seamless	1	33.40 mm (1.315 in)
				R 1 1/4 or 1 1/4 NPT	44	1.54				
				R 1 1/2 or 1 1/2 NPT	54	2.13				

- (a) Refer to well classification tables on Pages 5 and 6 for configurations available.
- (b) For all except tapered wells. Tapered wells have a minimum well thickness at the tip of 0.35 mm (0.137 in).
- (c) Wrench flats are provided on the cylindrical head to Foxboro standards.
- (d) Welded wells include W-PT, W-LTR, W-PR and W-LTP.

OPTIONAL FEATURES

Plug and Chain Plug available in stainless steel only. For use with any 6.35, 9.53 and 15.88 mm (0.250, 0.375 and 0.625 in) sensor O.D. well, except for W-PDT.

Sheathing Tantalum or titanium sheathing for use with raised face, flanged, straight neck, seal wells only. Limited to overall length of 600 mm (24 in).

Coatings For use with raised face, flanged wells having a nominal flange size of 25 to 50 mm (1 to 2 in). Coatings available are: Dacromet #6, Stellite #1, Stellite #6, Inco, and Kynar.

Oxygen Service Preparation Wells cleaned, assembled, and packaged in a Class 10,000 Clean Room

which meets both mandatory and nonmandatory requirements established by U.S. Federal Standard 209a, or using acceptable alternative facilities following procedures established to meet strict user requirements for each specific type of service.

NACE Standard MR-01-75 Compliance For 304 ss and 316 ss wells only. Wells are solution annealed to comply with the National Association of Corrosion Engineers (NACE) Standard MR-01-75. Well overall length limited to approximately 750 mm (30 in). Flange type limited to DN 100 PN 64 (1 in Class 150), DN 60 PN 60 (2 1/2 in Class 300), or DN 50 PN 160 (2 in Class 400 or 600).

Material Options

Material	Material Form	Material Designation	Material	Material Form	Material Designation
Brass	a	BRA	Inconel 600	ic	N
Carpenter 20 Cb-3	ia	A-20	Nickel 200	ic	Ni
C1013 Carbon Steel	ia	CS-1	Titanium	c	Ti
R-Monel 405	ia	R-M	316L ss	b	316L
304 ss (standard)	ia	304	Aluminum	c	A1-1
304 Low Carbon (304L) ss	ia	304L	Copper	c	CU
316 ss (standard)	a	316	K-Monel	c	K-M
347 ss	ie	347	309 ss	ic	309
F11 Alloy Steel	ic	F-11	310 ss	c	310
F22 Alloy Steel	ic	F-22	410 ss	ic	410
Hastelloy B	ic	HA-B	446 ss	ic	446
Hastelloy C 276	ic	HA-C			

- (a) Material available in hexagonal bar form.
- (b) Material available in round bar form. Used for wells with external threads of R 1/4 (1/4 NPT) or less. Wrench flats will be provided.
- (c) Material available in round bar form. Used for wells with external threads of R 1/2 (1/2 NPT) or less. Wrench flats will be provided.

WELL CLASSIFICATIONS

Classification—W-PTS and W-LTS Threaded Wells

W-PTS = Well—Plain, Threaded, Solid
W-LTS = Well—Lagged, Threaded, Solid

External Thread and Well I.D.

-A13 = 1/2 NPT	} Available with well I.D. of 6.60 mm (0.260 in.) ^(a)
-B13 = R 1/2	
-A14 = 3/4 NPT	
-B14 = R 3/4	
-A15 = 1 NPT	
-B15 = R 1	
-A16 = 1/2 NPT	} Available with well I.D. of 9.78 mm (0.385 in.)
-B16 = R 1/2	
-A17 = 3/4 NPT	
-B17 = R 3/4	
-A18 = 1 NPT	
-B18 = R 1	
-A19 = 3/4 NPT	} Available with well I.D. of 16.13 mm (0.635 in.)
-B19 = R 3/4	
-A20 = 1 NPT	
-B20 = R 1	
-A21 = 1 NPT	} Available with well I.D. of 22.47 mm (0.885 in.)
-B21 = R 1	
-A25 = 1 1/4 NPT	
-B25 = R 1 1/4	

Examples: W-PTS-A13, W-LTS-B17

Classification—W-PTR and W-LTR Threaded Wells

W-PTR = Well—Plain, Threaded, Welded
W-LTR = Well—Lagged, Threaded, Welded

External Thread and Well I.D.

-A30 = 1 NPT	} Available with well I.D. of 6.60 mm (0.260 in.) ^(a)
-B30 = R 1	
-A31 = 1 NPT	} Available with well I.D. of 9.78 mm (0.385 in.)
-B31 = R 1	
-A32 = 1 NPT	} Available with well I.D. of 16.13 mm (0.635 in.)
-B32 = R 1	
-A33 = 1 1/4 NPT	} Available with well I.D. of 22.47 mm (0.885 in.)
-B33 = R 1 1/4	

Examples: W-PTR-A31, W-LTR-B33

Classification—W-PTT and W-LTT Threaded Wells

W-PTT = Well—Plain, Threaded, Tapered
W-LTT = Well—Lagged, Threaded, Tapered

External Thread and Well I.D.

-A14 = 3/4 NPT	} Available with well I.D. of 6.60 mm (0.260 in.) ^(a)
-B14 = R 3/4	
-A22 = 1 NPT	
-B22 = R 1	
-A17 = 3/4 NPT	} Available with well I.D. of 9.78 mm (0.385 in.)
-B17 = R 3/4	
-A23 = 1 NPT	
-B23 = R 1	
-A24 = 1 NPT	} Available with well I.D. of 16.13 mm (0.635 in.)
-B24 = R 1	
-A25 = 1 1/4 NPT	} Available with well I.D. of 22.47 mm (0.885 in.)
-B25 = R 1 1/4	

Examples: W-PTT-A17, W-LTT-B23

^(a) A 6.35 mm (0.250 in.) O.D. fitted internal system must be specified with a 3/4 NPT bushing to mate with internal threads of 6.60 mm (0.260 in.) O.D. wells.

Classification—Flanged Wells (ANSI Flanges per ANSI B16.5-73)

W-PFS = Well—Plain, Flanged, Solid
 W-LFS = Well—Lagged, Flanged, Solid
 W-PFR = Well—Plain, Flanged, Welded
 W-LFR = Well—Lagged, Flanged, Welded
 W-PFT = Well—Plain, Flanged, Tapered
 W-LFT = Well—Lagged, Flanged, Tapered

Well I.D.

- A26 = 6.60 mm (0.260 in.)^(a)
- A27 = 9.78 mm (0.385 in.)
- A28 = 16.13 mm (0.635 in.)
- A29 = 22.47 mm (0.885 in.)^(b)

Nominal Flange Size

- 1 = 25 mm (1 in.)^(b)
- 1 1/2 = 40 mm (1 1/2 in.)
- 2 = 50 mm (2 in.)
- 3 = 80 mm (3 in.)^(c)
- 4 = 100 mm (4 in.)^(c)

Flange Rating

- 150 = Class 150^(c)
- 300 = Class 300
- 600 = Class 600
- 900 = Class 900
- 1500 = Class 1500

Flange Face

- RF = Raised Face
- FF = Flat Face
- RTJ = Ring Type Joint
- SG = Small Groove—
T and G
- LG = Large Groove—
T and G

Examples: W-PFS-A26-1-150-RF, W-LFR-A27-2-300-FF

(a) A 6.35 mm (0.250 in.) O.D. fitted thermal system must be specified with a 3/4 NPT bushing to mate with internal threads of 6.60 mm (0.260 in.) O.D. wells.
 (b) Nominal 25 mm (1 in.) flange size not available with 22.47 mm (0.885 in.) well I.D.
 (c) 80 and 100 mm (3 and 4 in.) flange sizes are only available with Flange Rating Code -150.

Classification—Flanged Wells (Metric Flanges per B.S. 4504)

W-PFS = Well—Plain, Flanged, Solid
 W-LFS = Well—Lagged, Flanged, Solid
 W-PFR = Well—Plain, Flanged, Welded
 W-LFR = Well—Lagged, Flanged, Welded
 W-PFT = Well—Plain, Flanged, Tapered
 W-LFT = Well—Lagged, Flanged, Tapered

Well I.D.

- B26 = 6.60 mm (0.260 in.)^(a)
- B27 = 9.78 mm (0.385 in.)
- B28 = 16.13 mm (0.635 in.)
- B29 = 22.47 mm (0.885 in.)^(b)

Nominal Flange Size

- 1 = 25 mm—DN 25^(b)
- 1 1/4 = 32 mm—DN 32
- 1 1/2 = 40 mm—DN 40
- 2 = 50 mm—DN 50
- 3 = 80 mm—DN 80
- 4 = 100 mm—DN 100

Flange Rating

- 10 = PN 10^(c)
- 25 = PN 25^(c)
- 40 = PN 40^(c)
- 64 = PN 64
- 100 = PN 100
- 160 = PN 160

Flange Face

- RF = Raised Face
- FF = Flat Face
- RTJ = Ring Type Joint^(c)
- SG = Small Groove—
T and G^(c)
- LG = Large Groove—
T and G^(c)

(a) A 6.35 mm (0.250 in.) O.D. fitted thermal system must be specified with a 3/4 NPT bushing to mate with internal threads of 6.60 mm (0.260 in.) O.D. wells.
 (b) Nominal 25 mm (1 in.) flange size not available with 22.47 mm (0.885 in.) well I.D.
 (c) Ring Type Joint or Tongue-and-Groove Flange Faces are not available with Flange Rating Code -10, -25, or -40.

ORDERING INSTRUCTIONS

1. Model Code
2. Insertion Length U
3. Lagging Length T (if applicable)
4. Material Option
5. Other Options (note that Sheathing and Coatings are for flanged wells only)
6. For W-PFT only, Well I.D. and Overall Length per W-PFT Standard Dimensions Table
7. Tag and Application

The Foxboro Company
33 Commercial Street
Foxboro, MA 02035-2099
United States of America
<http://www.foxboro.com>
Inside U.S.: 1-888-FOXBORO
(1-888-369-2676)
Outside U.S.: Contact your local
Foxboro representative.
Facsimile (508) 549-4492

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MB 010

Printed in U.S.A.

0282



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

ORIFICE PLATE ASSEMBLY

MANUFACTURER : CRANE MANUFACTURING, INC.
 STYLE : STYLE 520 PADDLE TYPE WITH CLASS 300 # WELD
 NECK RF ORIFICE FLANGES
 SERVICE : OXYGEN GAS TO OZONE GENERATOR
 RANGE : 14.1 ~ 141 SCFM (0.372 ~ 3.72 Nm³/min)
 ORIFICE PLATE : 1/8" (3.175 mm) THICK
 BORE DIAMETER SIZE : 0.8952" (22.74 mm) (FOR INITIAL CALCULATION)
 MATERIAL OF CONSTRUCTION
 FLANGE : TYPE 316 STAINLESS STEEL
 ORIFICE PLATE : TYPE 316 STAINLESS STEEL
 CONNECTION
 FLANGE : 2" (50 mm) CLASS 300 # RF
 TAP : 1/2" (19.05 mm) NPT
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
 QUANTITY : 3 (1 PER GENERATOR)
 CUSTOMER TAG NO. : FM-O115A / FM-O135A / FM-O155A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design and specifications.
Responsibility for material design in the shop drawings rests with the fabricator.

Responsibility for installation and correlation of field line items, including materials, quantities and construction details, rests with the fabricator. All parts of the work rests with the Generator.

REVIEWED _____
 REVIEWED AS MODIFIED _____
 REVISE AND RE-SUBMIT _____
 NOT REVIEWED _____

Project No. 79538-C14-16
 Date: 24/1/06 By: [Signature]

C R A N E M A U F A C T U R I N G C O M P A N Y
 9607 54th Street
 Tulsa, Oklahoma 74145
 1-800-232-FLOW in Okla (918) 664-7040
 ORIFICE(tm) SIZING PROGRAM 5000.10

CONCENTRIC SQUARE EDGE ORIFICE CALCULATION

CUSTOMER: Fuji		OUR NO:
CUSTOMER NO:		DATE: 12/19/05
TAG OR SERVICE: Oxygen		
FLUID		
FLUID TYPE		GAS
TAP LOCATION OR ELEMENT TYPE		FLANGE
BETA RATIO DETERMINATION		
METER TYPE		DRY
VENT OR DRAIN HOLE		NONE
MAXIMUM FLOW		141.0000 SCFM
NORMAL FLOW		98.7000 SCFM
BASE TEMPERATURE		60.0000 DEG F
TEMPERATURE		70.0000 DEG F
ORIFICE PLATE MATERIAL		304/316SS
ORIFICE PLATE EXPANSION FACTOR		1.0000 Fa
BASE PRESSURE		14.7300 PSIA
INLET PRESSURE		15.0000 PSIG
DENSITY AT BASE		0.0843 RHOB (#/FT3)
DENSITY AT FLOWING		0.1700 RHOF (#/FT3)
VISCOSITY		0.0204 CENTIPOISE
DIFFERENTIAL, MAXIMUM (3.6092 PSI)		100.0000 Hm (IN WC)
, NORMAL (1.7685 PSI)		49.0000 Hn (IN WC)
PERMANENT LOSS, MAXIMUM (2.8851 PSI)		79.9375 IN WC
, NORMAL (1.4137 PSI)		39.1694 IN-WC
PIPE (2.000 INCH SCH 10S)		2.1570 I.D. (INCHES)
RATIO OF SPECIFIC HEATS		1.4000 Cp/Cv
REYNOLDS NO OF PIPE AT NORM FLOW		71,702.2340 RD
GAS EXPANSION FACTOR		0.9821 Y1
FLOW COEFFICIENT		155.1575 C'
REYNOLDS NUMBER CORRECTION		0.9989 Fc
S COEFFICIENT		0.1055 S
BETA RATIO		0.4150 d/D
ORIFICE PLATE BORE		0.8952 d (INCHES)

ORIFICE is a trademark of MTS Software, St. Louis, MO.
 All rights reserved. 1979, 1983, 1984, 1985

1/2

SCFH = C' (DIFFERENTIAL * PSIA)

REFERENCE: PRINCIPLES AND PRACTICES OF FLOW METER ENGINEERING
 L. K. SPINK 9TH EDITION

$$S = \frac{(Wm)}{(359) (D) (D) (Fa) (Fc) (Fm) (Y) \text{SQR}(RHOF * Hm)} \quad \text{Equ. 44}$$

For volumetric flows, Wm = Qm * RHOB
 Units are PPH, inches, inches wc, #/ft3

Earth Tech (Canada) Inc.

Reviewed for compliance with
Regulation 853 of the
Occupational Health and Safety Act

Reviewed for compliance with
Canadian Standards Association
construction
parts of the Act

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79338-C14-16

Date: 24/1/06

By: [Signature]

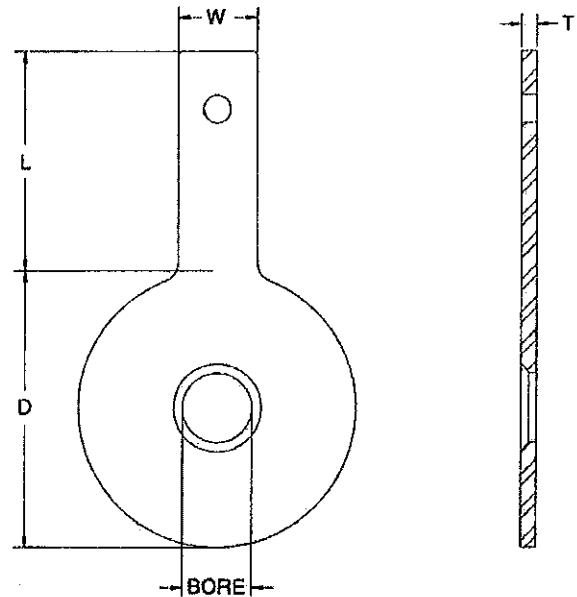


Built on Quality

5531 E. Admiral Pl.
 Tulsa, Oklahoma 74115-8411
 (918) 838-8800
 Toll Free: 1-800-324-FLOW (3569)
 FAX: (918) 838-8803

CRANE PADDLE-TYPE ORIFICE PLATES

Crane Style 520 paddle-type orifice plates are manufactured to meet or exceed AGA, ASME, ISA and ANSI specifications. All plates are furnished in line sizes from 1/2" to 36" and are available with the following type bores: bore and bevel, bore and counterbore, segmental, eccentric and quarter round. All standard line sizes are carried in stock available for immediate shipment. Plates also can be manufactured to customer specifications. Stainless 304 and 316 are stock materials; Monel, Hasteloy B and C, Titanium, Nickel and other special materials are available upon request.



PADDLE-TYPE

LINE SIZE	150 # ANSI D	300 # ANSI D	400 # ANSI D	600 # ANSI D	900 # ANSI D	1500 # ANSI D	2500 # ANSI D	ALL RATINGS L	ALL RATINGS W	ALL RATINGS T
1/2"	1 1/8"	2 1/8"	2 1/8"	2 1/8"	2 1/2"	2 1/2"	2 3/4"	4"	1"	1/8" or 1/4"
3/4"	2 1/4"	2 5/8"	2 5/8"	2 5/8"	2 3/4"	2 1/4"	3"	4"	1"	1/8" or 1/4"
1"	2 5/8"	2 7/8"	2 7/8"	2 7/8"	3 1/8"	3 1/8"	3 3/8"	4"	1"	1/8" or 1/4"
1 1/4"	3"	3 1/4"	3 1/4"	3 1/4"	3 1/2"	3 1/2"	4 1/8"	4"	1"	1/8" or 1/4"
1 1/2"	3 3/8"	3 3/4"	3 3/4"	3 3/4"	3 3/8"	3 7/8"	4 5/8"	4"	1"	1/8" or 1/4"
2"	4 1/8"	4 3/8"	4 3/8"	4 3/8"	5 1/8"	5 1/8"	5 3/4"	4"	1"	1/8" or 1/4"
2 1/2"	4 7/8"	5 1/8"	5 1/8"	5 1/8"	6 1/2"	6 1/2"	6 5/8"	4"	1"	1/8" or 1/4"
3"	5 3/8"	5 1/8"	5 7/8"	5 7/8"	6 5/8"	6 7/8"	7 3/4"	4"	1"	1/8" or 1/4"
4"	6 7/8"	7 1/8"	7"	7 5/8"	8 1/8"	8 1/4"	9 1/4"	4"	1"	1/8" or 1/4"
5"	7 3/4"	8 1/2"	8 3/8"	9 1/2"	9 3/4"	10"	11"	6"	1"	1/8" or 1/4"
6"	8 3/4"	9 3/8"	9 3/4"	10 1/2"	11 3/8"	11 1/8"	12 1/2"	6"	1"	1/8" or 1/4"
8"	11"	12 1/8"	12"	12 5/8"	14 1/8"	13 3/8"	15 1/4"	6"	1"	1/8" or 1/4"
10"	13 3/8"	14 1/4"	14 1/8"	15 3/4"	17 1/8"	17 1/8"	18 3/4"	6"	1 1/2"	1/8" or 1/4"
12"	16 1/8"	16 5/8"	16 1/2"	18"	19 5/8"	20 1/2"	21 5/8"	6"	1 1/2"	1/8" or 1/4"
14"	17 3/4"	19 1/8"	19"	19 3/8"	20 1/2"	22 3/4"	•	6"	1 1/2"	1/8" or 1/4"
16"	20 1/4"	21 1/4"	21 1/8"	22 1/4"	22 5/8"	25 1/4"	•	6"	1 1/2"	1/8" or 1/4"
18"	21 1/2"	23 3/8"	23 3/4"	24"	25"	27 5/8"	•	6"	1 1/2"	1/4"
20"	23 3/4"	25 5/8"	25 5/8"	26 3/4"	27 3/8"	29 5/8"	•	6"	1 1/2"	1/4"
22"	26"	27 3/4"	27 1/2"	28 5/8"	•	•	•	6"	1 1/2"	1/4"
24"	28 1/8"	30 3/8"	30 1/8"	31"	32 1/8"	35 1/2"	•	6"	1 1/2"	1/4"
30"	34 5/8"	37 3/8"	37 1/4"	38 1/8"	•	•	•	6"	1 1/2"	1/4"
36"	41 1/4"	43 7/8"	43 7/8"	44 3/4"	•	•	•	6"	1 1/4"	1/2"

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correction of field
dimensions, fabrication process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____ ✓

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

79538-C14-16

Date: _____

29/1/06

By: _____

[Signature]

RAISED FACE WELD NECK/SLIP-ON ORIFICE FLANGES

Specifications

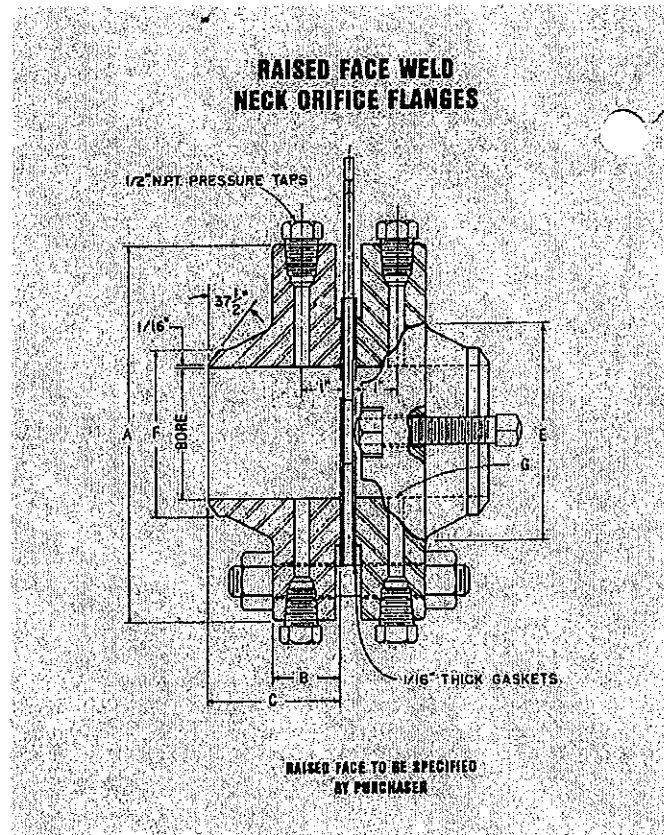
All Crane Manufacturing orifice flanges are manufactured to meet or exceed A.G.A., A.S.M.E., I.S.A. and A.N.S.I. specifications and tolerances.

To assure quality control, Crane Manufacturing maintains a wide variety of precision equipment including computer numerically controlled horizontal and vertical milling machines and lathes.

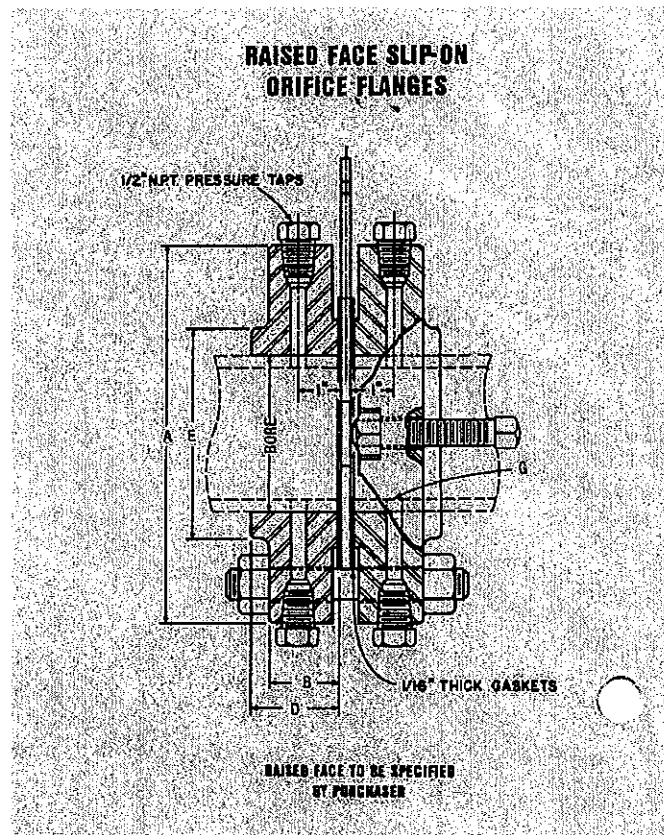
Parts

All Crane Manufacturing raised face weld neck / slip-on orifice flanges are furnished with the following items as standard:

- (1) Stud Bolts — A.S.T.M. A193, Grade B7 alloy steel
- (2) Hexagonal Nuts — A.S.T.M. A194 Grade 2
- (3) Jack Screws — A-307 Grade A
(2 per union)
- (4) Pipe Plugs — Forged steel, hex. head
(2 per union)
- (5) Gaskets — Precision cut, non-asbestos
(2 per union)



ORIFICE PLATE NOT INCLUDED





P.O. Box 470525
 Tulsa, Oklahoma 74147
 Toll Free: 1-800-232-FLOW
 In Okla.: 918-664-7040
 FAX: 918-664-4260

DIMENSION – CLASS 300 LB A.N.S.I. ORIFICE FLANGES

Diameter Internal Line Bore			Size In Inches	Dia. of Flange	Min. Flange THK	Dia. of Raise Face	Length Thru Hub RFWN	Length Thru Hub S D	Hub Dia. at Base	Hub Dia. at Point of Welding RFWN only	Pressure Tap Hole Size	Dia. of Bolt Circle	Dia. of Holes	Number of Holes	Size and Length of Studs	Jack Screw Size and Length
S/40	S/80	S Ø														
1.049	.957	1.36	1	4 ³ / ₈	1 ¹ / ₂	2	2 ¹ / ₈	1 ⁷ / ₈	2 ¹ / ₈	1.32	1/4	3 ¹ / ₂	11/16	4	5/8x5 ¹ / ₄	5/8x4
1.610	1.500	1.95	1 ¹ / ₂	6 ¹ / ₈	1 ¹ / ₂	2 ⁷ / ₈	2 ³ / ₄	1 ⁷ / ₈	2 ³ / ₄	1.90	1/4	4 ¹ / ₂	13/16	4	3/4x5 ¹ / ₄	5/8x4
2.067	1.939	2.44	2	6 ¹ / ₂	1 ¹ / ₂	3 ³ / ₈	3 ⁵ / ₁₆	1 ¹⁵ / ₁₆	3 ⁵ / ₁₆	2.38	1/4	5	11/16	8	5/8x5 ¹ / ₄	5/8x4
3.069	2.900	3.57	3	8 ¹ / ₄	1 ¹ / ₂	5	3 ¹ / ₂	2 ¹ / ₁₆	4 ⁵ / ₈	3.50	3/8	6 ⁵ / ₈	13/16	8	3/4x5 ¹ / ₄	3/4x4
4.026	3.826	4.57	4	10	1 ¹ / ₂	6 ³ / ₁₆	3 ³ / ₈	2 ³ / ₈	5 ³ / ₈	4.50	1/2	7 ⁷ / ₈	13/16	8	3/4x5 ¹ / ₄	3/4x4
6.065	5.761	6.72	6	12 ¹ / ₂	1 ¹ / ₂	8 ¹ / ₂	3 ¹⁵ / ₁₆	2 ³ / ₈	8 ³ / ₈	6.63	1/2	10 ³ / ₈	7/8	12	3/4x5 ¹ / ₄	3/4x4
7.981	7.625	8.72	8	15	1 ³ / ₈	10 ³ / ₈	4 ³ / ₈	2 ⁷ / ₁₆	10 ¹ / ₄	8.63	1/2	13	1	12	7/8x5 ¹ / ₄	3/4x4
10.020	9.564	10.88	10	17 ¹ / ₂	1 ³ / ₈	12 ³ / ₈	4 ³ / ₈	2 ³ / ₈	12 ³ / ₈	10.75	1/2	15 ¹ / ₄	1 ¹ / ₈	16	1x6 ¹ / ₂	3/4x4
11.938	11.376	12.88	12	20 ¹ / ₂	2	15	5 ³ / ₈	2 ³ / ₈	14 ³ / ₈	12.75	1/2	17 ¹ / ₄	1 ¹ / ₄	16	1 ¹ / ₈ x7	1x6
13.124	12.500	14.14	14	23	2 ¹ / ₈	16 ¹ / ₂	5 ³ / ₈	3	16 ³ / ₈	14.00	1/2	20 ¹ / ₄	1 ¹ / ₄	20	1 ¹ / ₈ x7 ¹ / ₂	1x6
15.000	14.314	16.16	16	25 ¹ / ₂	2 ¹ / ₄	18 ¹ / ₂	5 ³ / ₈	3 ¹ / ₄	19	16.00	1/2	22 ¹ / ₂	1 ³ / ₈	20	1 ¹ / ₄ x8	1x6
16.876	16.126	18.18	18	28	2 ³ / ₈	21	6 ¹ / ₄	3 ¹ / ₂	21	18.00	1/2	24 ³ / ₈	1 ³ / ₈	24	1 ¹ / ₄ x8 ¹ / ₄	1x6
18.814	17.938	20.20	20	30 ¹ / ₂	2 ¹ / ₂	23	6 ³ / ₈	3 ³ / ₄	23 ¹ / ₈	20.00	1/2	27	1 ³ / ₈	24	1 ¹ / ₄ x8 ¹ / ₂	1x6
22.626	21.564	24.25	24	36	2 ³ / ₄	27 ¹ / ₄	6 ³ / ₈	4 ³ / ₁₆	27 ³ / ₈	24.00	1/2	32	1 ³ / ₈	24	1 ¹ / ₂ x9 ¹ / ₄	1x6

DIMENSIONS – CLASS 600 LB A.N.S.I. 4" & LARGER ORIFICE FLANGES

4.026	3.826	4.57	4	10 ³ / ₄	1 ¹ / ₂	6 ³ / ₁₆	4	2 ¹ / ₈	6	4.50	1/2	8 ¹ / ₂	1	8	7/8x6	3/4x4
6.065	5.761	6.72	6	14	1 ³ / ₈	8 ¹ / ₂	4 ³ / ₈	2 ³ / ₈	8 ³ / ₈	6.63	1/2	11 ¹ / ₂	1 ¹ / ₈	12	1x7	3/4x4
7.981	7.625	8.72	8	16 ¹ / ₂	1 ³ / ₈	10 ³ / ₈	5 ³ / ₈	3	10 ³ / ₄	8.63	1/2	13 ³ / ₈	1 ¹ / ₄	12	1 ¹ / ₈ x8	3/4x4
10.020	9.564	10.88	10	20	2 ¹ / ₈	12 ³ / ₈	6	3 ³ / ₈	13 ¹ / ₂	10.75	1/2	17	1 ³ / ₈	16	1 ¹ / ₄ x8 ³ / ₄	1x6
11.938	11.376	12.88	12	22	2 ¹ / ₈	15	6 ¹ / ₈	3 ³ / ₈	15 ³ / ₈	12.75	1/2	19 ¹ / ₄	1 ³ / ₈	20	1 ¹ / ₄ x9	1x6
13.124	12.500	14.14	14	23 ³ / ₄	2 ³ / ₈	16 ¹ / ₂	6 ¹ / ₂	To be Specified by Purchaser	17	14.00	1/2	20 ³ / ₄	1 ¹ / ₂	20	1 ³ / ₈ x9 ³ / ₄	1x6
15.000	14.314	16.16	16	27	3	18 ¹ / ₂	7		19 ¹ / ₂	16.00	1/2	23 ³ / ₄	1 ³ / ₈	20	1 ¹ / ₂ x10 ¹ / ₂	1x6
16.876	16.126	18.18	18	29 ¹ / ₄	3 ¹ / ₄	21	7 ¹ / ₄		21 ¹ / ₂	18.00	1/2	25 ³ / ₄	1 ³ / ₄	20	1 ³ / ₈ x11 ¹ / ₄	1x6
18.814	17.938	20.20	20	32	3 ¹ / ₂	23	7 ¹ / ₂		24	20.00	1/2	28 ¹ / ₂	1 ³ / ₄	24	1 ³ / ₈ x11 ³ / ₄	1x6
22.626	21.564	24.25	24	37	4	27 ¹ / ₄	8		28 ³ / ₄	24.00	1/2	33	2	24	1 ⁷ / ₈ x13 ¹ / ₄	1x6

3" and Smaller Same as 300 lb



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

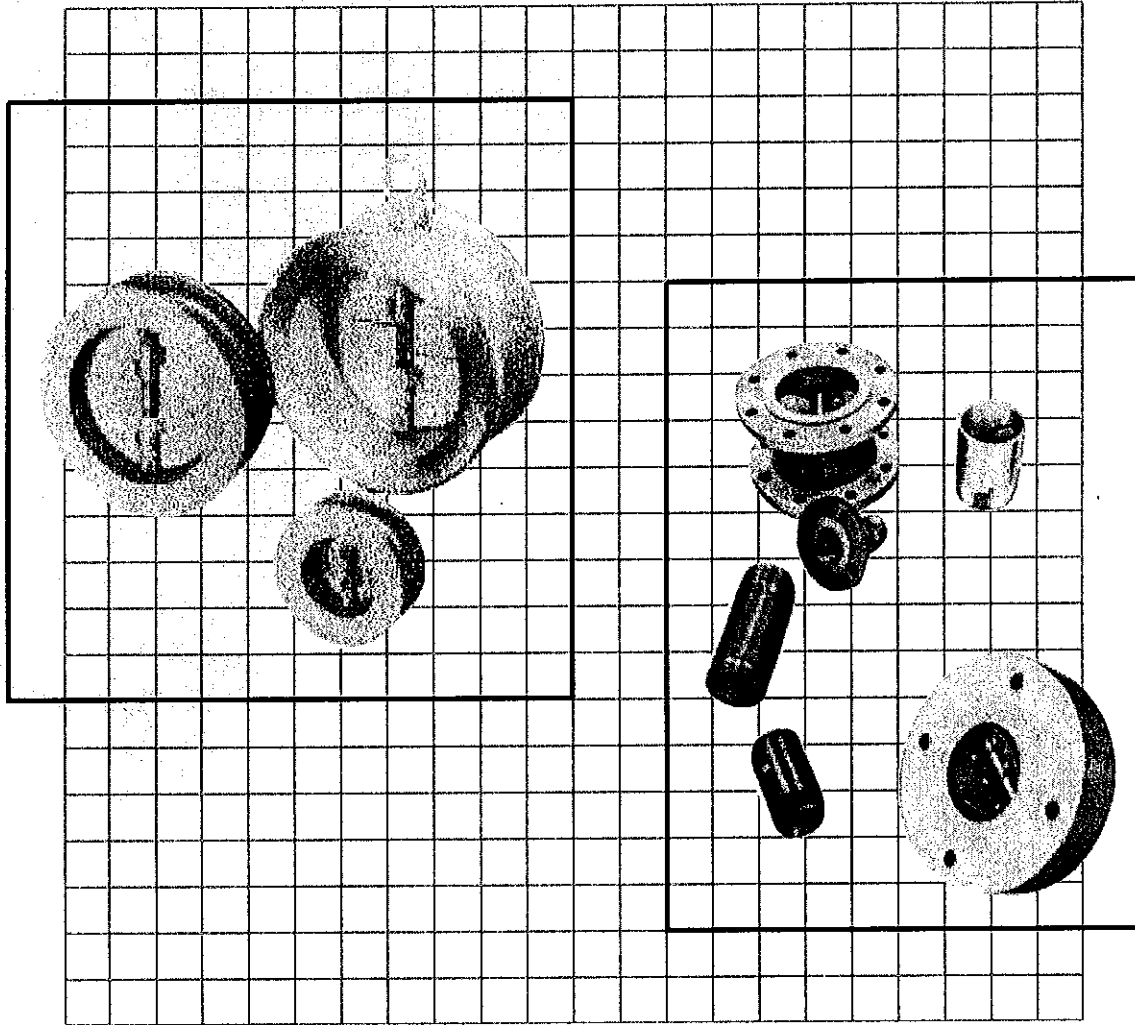
OZONE GENERATION SYSTEM

CHECK VALVE

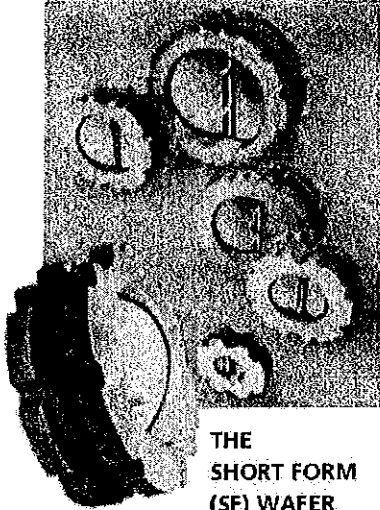
MANUFACTURER : TECHNO
MODEL : 5051-316
STYLE : WAFER / CLASS 150 #
SERVICE : OXYGEN GAS
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
VALVE PLATE : TYPE 316 S.S.
SPRING : TYPE 316 S.S.
SEAL : TEFLON
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150 # FLANGES
PIPE SIZE : 2" (50 mm)
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 3 (1 PER GENERATOR)
CUSTOMER TAG NO. : CV-O110A / CV-O130A / CV-O150A



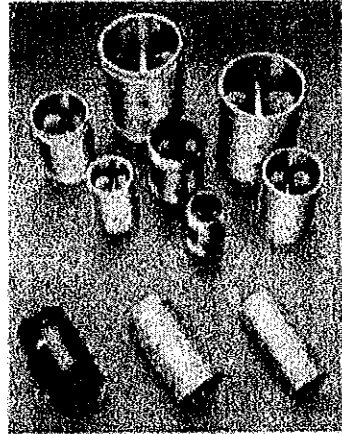
Multi-Purpose Check Valves for Industry



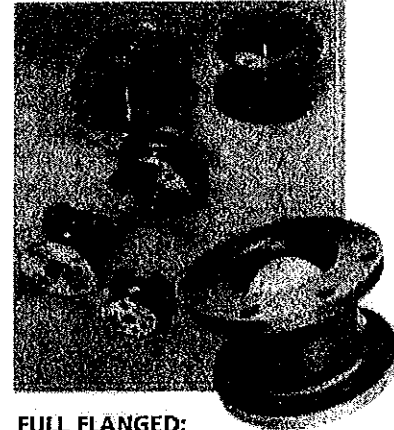
TECHNO



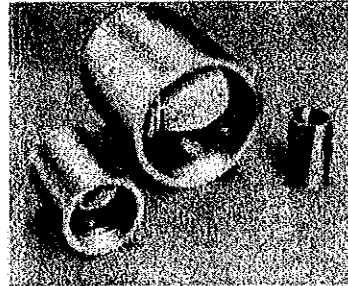
THE SHORT FORM (SF) WAFER IS THE PERFECT DESIGN FOR AIR SERVICE AND LIGHT DUTY LIQUID APPLICATIONS. AVAILABLE IN SIZES 1" - 72"



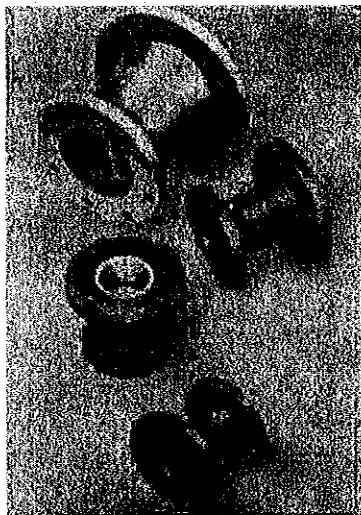
MALE THREADED ENDS, GROOVED ENDS, PLAIN ENDS: AVAILABLE IN SIZES 1" - 20"



FULL FLANGED: 125#, 150# AND 300# CLASS, AVAILABLE IN SIZES 1" - 48"



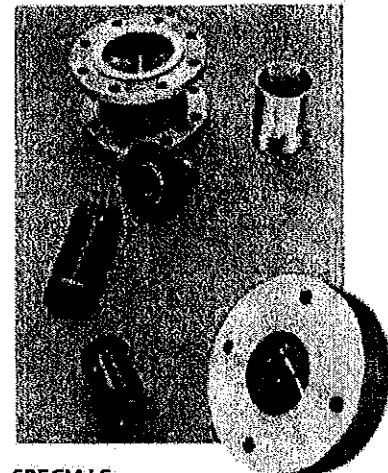
DEEP WELL: FEMALE THREADED VALVE DESIGNED FOR DEEP WELL APPLICATIONS DOWN TO 1000 FEET, AVAILABLE IN SIZES 1" - 12"



EXI-CHECK: INCREASER/DECREASER CHECK VALVES IDEAL FOR PUMP AND BLOWER DISCHARGE APPLICATIONS.



THERMOPLASTIC VALVES: PVC, CPVC, PP AND PVDF, FLANGED, THREADED, PLAIN, GROOVED ENDS AND WAFER STYLE; AVAILABLE IN SIZES 1" - 24"



SPECIALS: WHERE CUSTOM DESIGN IS THE RULE - NOT THE EXCEPTION - CALL ON TECHNO.

TECHNO

TC 1951
0205 NP-1M



TECHNOCHECK OUTPERFORMS, OUTWEARS ALL OTHER CHECK VALVES

Techno is a leading supplier of the highest quality check valves to all phases of industry. Thousands of Techno products are presently in service demonstrating outstanding performance. The reason? Techno is committed to our capability to design, engineer, manufacture and deliver valves to meet your most demanding needs.

Our staff of engineers can speak your language!

They can and do, prepare specifications and design valves to meet the most difficult application requirements.

Where custom design is the rule - not the exception - CALL ON TECHNO!

ELASTOMER HINGE DESIGN

DESIGN FEATURES:

Unrestricted full port seatless design

- Maximum Flow Area
- Minimum Pressure Drop

Elimination of Metal to Metal Rotating Parts

- No Pins to Wear
- No Seats to Wear
- No Routine Maintenance
- No Spring to Break

Non Slam Quick Closure Feature

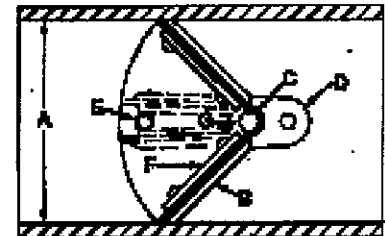
- Minimum Travel of Valve Plates from Full Open to Full Closed Position Reduces Closing Time
- Elimination of Spring Restricts "slamming" action

Tight Shutoff Feature

- Flexible Elastomer Provides Perfect Seal
- Seals Tightly at Extremely Low Back Pressure

CAN BE MOUNTED IN ALMOST ANY POSITION

BODY MATERIALS	
METALS	THERMOPLASTIC
<ul style="list-style-type: none"> • ALUMINUM • BRONZE/BRASS • CAST IRON • CARBON STEEL • 316 STAINLESS STEEL 	<ul style="list-style-type: none"> • PVC • CPVC • PP • PVDF
INTERNAL MATERIALS	
METALS	THERMOPLASTIC
<ul style="list-style-type: none"> • ALUMINUM • BRONZE/BRASS • PLATED STEEL • 316 STAINLESS STEEL • ELECTROLESS NICKEL PLATED STEEL 	<ul style="list-style-type: none"> • PVC • CPVC • PP • PVDF
ELASTOMER MATERIALS	
MATERIALS	* TEMPERATURE RANGE
<ul style="list-style-type: none"> • BUNA-N • EPDM • VITON • SILICONE • NEOPRENE • BUTYL • HYPALON • FDA - WHITE NEOPRENE • ARMALON WITH REINFORCED TEFLON LAYERS** 	<ul style="list-style-type: none"> -60° F TO 225°F -40° F TO 225°F -20° F TO 400°F -100°F TO 500°F -40° F TO 225°F -65° F TO 300°F -20° F TO 300°F -40° F TO 225°F -20° F TO 450°F
BODY CONFIGURATIONS	
<ul style="list-style-type: none"> • MALE THREADED ENDS • FEMALE THREADED ENDS • PLAIN ENDS • GROOVED ENDS 	<ul style="list-style-type: none"> • FLANGED ENDS • WAFER STYLE • INCREASER/DECREASER • COMBINATIONS



- A. FULL PORT**
Provides maximum flow with minimum pressure loss.
- B. VALVE PLATES**
Offer metal to metal support and minimum travel.
- C. SEALING MEMBER**
Provides tight shutoff and prolonged cycle life.
- D. HINGE POST**
Precision air foil design offers streamlined flow.
- E. TRAVEL STOP**
Prevents over-travel of plates. Location is size dependent, smaller valves have stops attached to hinge clamp.
- F. CLAMP PLATE**
Provides added support.
- G. HINGE CLAMP**
Remains stationary, no metal to metal rotation.

* Temperature range is for general guidance. The figures may vary with application and body/internal materials. Consult factory for materials, sizes and pressure ratings not shown as standard.

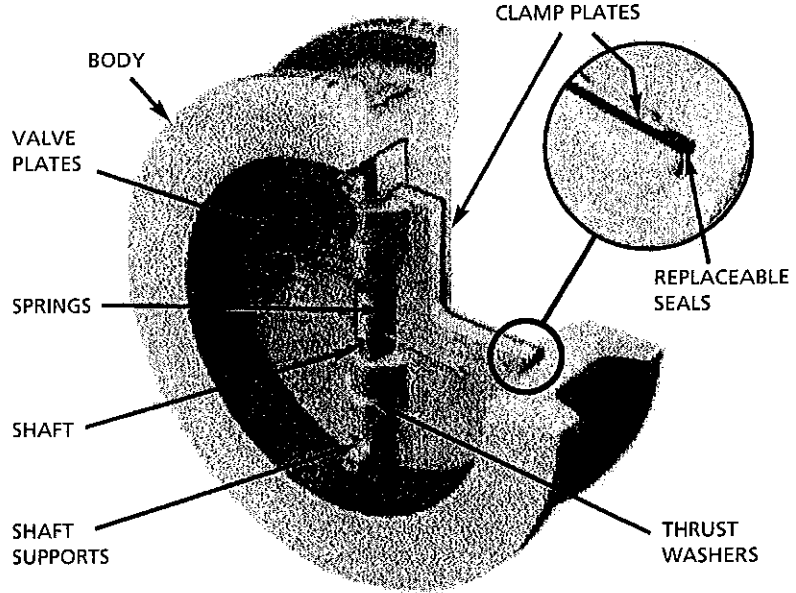
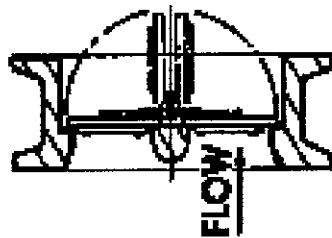
** On valves 2.5" and smaller, the Armalon Layer is omitted and two Layers of Reinforced Teflon Fabric remain.



TECHNO'S METAL HINGED DESIGN

The industry has long awaited the Dual Plate Metal Hinged Check Valve that offers the innovative features of the new TECHNO design.

The ease of maintenance, the exceptional flow characteristics and the insurance of safety by elimination of body leakage, allows this check valve to be the engineer's dream.



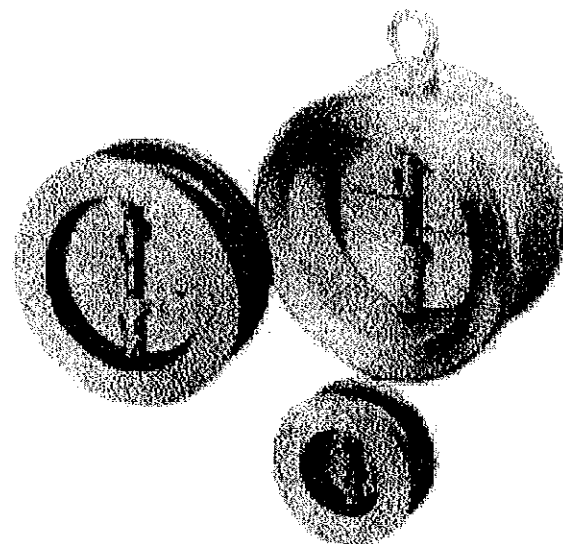
STANDARD MODELS AND MATERIALS OF CONSTRUCTION

STYLE	BODY	VALVE PLATES	SEALS	SPRINGS	TRIM*	ASME CLASS
5050	Cast Iron	Bronze	EPDM	316 Stainless Steel	316 Stainless Steel	125
5051	Carbon Steel	Carbon Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	150
5051-316	316 Stainless Steel	316 Stainless Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	150
5053	Carbon Steel	Carbon Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	300
5053-316	316 Stainless Steel	316 Stainless Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	300
5056	Carbon Steel	Carbon Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	600
5056-316	316 Stainless Steel	316 Stainless Steel	Buna-N	316 Stainless Steel	316 Stainless Steel	600

Trim items include: Shaft Supports, Clamp Plates and Fasteners. Teflon Thrust Washers are Standard Through 12" Size.

OPTIONAL MATERIALS SELECTION

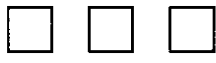
SPRING DATA	
MATERIALS	TEMPERATURE RANGE
• INCONEL 600	750°F
• INCONEL X-750	1000°F
SEAL DATA	
MATERIALS	TEMPERATURE RANGE
• Buna-N	-60°F TO 225°F
• EPDM	-40°F TO 300°F
• Viton	-20°F TO 400°F
• Teflon	-20°F TO 450°F
• Silicone	-90°F TO 500°F
• FDA Approved White Neoprene	-40°F TO 225°F
• Metal to Metal +	-400° F TO 1000°F



* This temperature is for general guidance. The figures may vary with application and body/internal materials.
+ 316 Stainless Steel Thrust Washers are standard with Metal to Metal Seal Option.



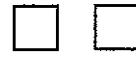
SIZE	VALVE SERIES	BODY MATERIAL	INTERNALS MATERIAL
1.0 = 1"	DPW = Dual Plate Wafer Check, ASME rated 5050, 5051, 5053, 5056	A2 = Alloy 20	A2 = Alloy 20
1.3 = 1 1/4"		AB = Allum Bronze	AB = Allum Bronze
1.5 = 1 1/2"		AL = Alluminum	AL = Alluminum
2.0 = 2"	EHF = Elastomer Hinge Flanged 5001, 5003, 5004, 5102, 5107, 5116, 5117	BR = Brass	BR = Brass
2.5 = 2 1/2"		BZ = Bronze	BZ = Bronze
3.0 = 3"		CI = Cast Iron	CI = Cast Iron
4.0 = 4"	EHW = Elastomer Hinge Short Form Wafer 5005, 5412, 5118, 5831, 5355, 5296, 5865, 5881, 5297(300#)	CP = CPVC	CP = CPVC
5.0 = 5"		CS = Carbon Steel	CS = Carbon Steel
6.0 = 6"		DI = Ductile Iron	DI = Ductile Iron
8.0 = 8"		DS = Duplex Stainless Steel	DS = Duplex Stainless Steel
10.0 = 10"	EHL = Elastomer Hinge Short Form Lug (5463) 5463-300	HB = Hastelloy B	HB = Hastelloy B
12.0 = 12"		HC = Hastelloy C	HC = Hastelloy C
thru		LC = Low Carbon Steel	LC = Low Carbon Steel
72.0 = 72"		M4 = Monel 400	M4 = Monel 400
Exi-Checks:	EHB = Elastomer Hinge long Pattern Flanged (5081) (for direct flanging to b'fly valves) 5081-R (RF), 5081-F (FF)	M5 = Monel K500	M5 = Monel K500
E01 = 1.5 x 2		PP = Polypropylene	PP = Polypropylene
E02 = 2 x 2.5	EHT = Elastomer Hinge Threaded Valve (5000, 5002)	PC = PVC	PC = PVC
E03 = 2 x 3		PD = PVDF (Kynar)	PD = PVDF (Kynar)
E04 = 2.5 x 3		PS = Plated Carbon Steel	PS = Plated Carbon Steel
E05 = 2.5 x 4	EHT = Elastomer Hinge Threaded Valve (5000, 5002)	T2 = Titanium Gr. 2	T2 = Titanium Gr. 2
E06 = 3 x 4		WC = Cast Steel, A216 Gade WCB	WC = Cast Steel A216 Gade WCB
E07 = 3 x 6	EHT = Elastomer Hinge Threaded Valve (5000, 5002)	34 = 304 Stainless Steel	34 = 304 Stainless Steel
E08 = 4 x 5		36 = 316 Stainless Steel	36 = 316 Stainless Steel
E09 = 4 x 6	EHT = Elastomer Hinge Threaded Valve (5000, 5002)	42 = 410 Stainless Steel	42 = 410 Stainless Steel
E10 = 5 x 6		4L = 304L Stainless Steel	4L = 304L Stainless Steel
E11 = 6 x 8	EHT = Elastomer Hinge Threaded Valve (5000, 5002)	6L = 316L Stainless Steel	6L = 316L Stainless Steel
E12 = 8 x 10		XX = Other**	XX = Other**
E13 = 10 x 12	EHT = Elastomer Hinge Threaded Valve (5000, 5002)		
E14 = 12 x 14			
E15 = 14 x 16	EHT = Elastomer Hinge Threaded Valve (5000, 5002)		
E16 = 16 x 18			
E17 = 18 x 20	EHT = Elastomer Hinge Threaded Valve (5000, 5002)		
E18 = 20 x 24			
E19 = 24 x 30	EHT = Elastomer Hinge Threaded Valve (5000, 5002)		
E20 = 30 x 36			
E21 = 3 x 5			
E22 = 5 x 8			
E23 = 2 x 4			
XXX = Other**			



SIZE



VALVE SERIES

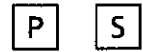


BODY MATERIAL



INTERNALS
MATERIAL

Sample:



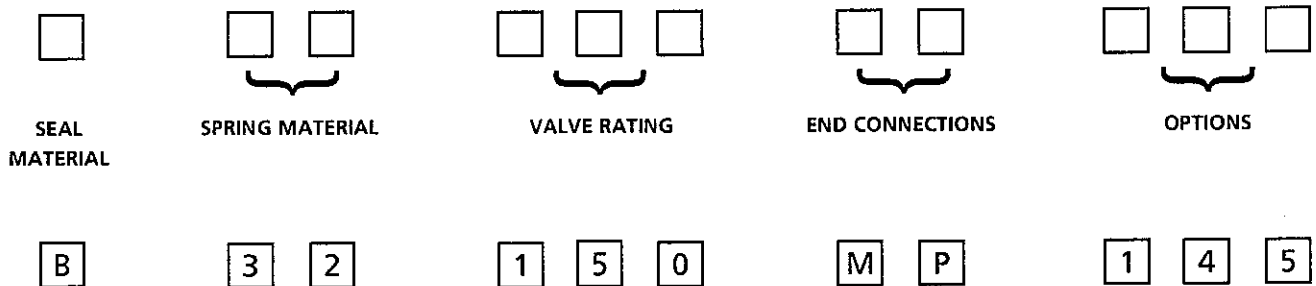


SEAL MATERIAL	SPRING MATERIAL	VALVE RATING	END CONNECTIONS	OPTIONS*
B = Buna-N C = Armalon with Teflon Layers*** (Elastomer Hinge Valves Only) U = EPDM E = Butyl H = Hypalon M = Metal (Metal Hinge Valves Only) N = Neoprene S = Silicone T = Teflon (Metal Hinge Valves Only) V = Viton A W = Food Grade white neoprene X = Other** *** On valves 2.5" and smaller, the Armalon Layer is omitted and two Layers of Reinforced Teflon Fabric remain.	32 = 302 SS 36 = 316 SS HB = Hastelloy B HC = Hastelloy C 60 = Inconel 600 75 = Inconel X-750 M4 = Monel 400 NS = No Spring XX = Other**	A12 = ASME 125 A15 = ASME 150 A30 = ASME 300 A60 = ASME 600 030 = 30 WOG 050 = 50 WOG 100 = 100 WOG 125 = 125 WOG 150 = 150 WOG 300 = 300 WOG 450 = 450 WOG XXX = Other**	RF = Raised Face FF = Flat Face MP = Male Threaded Ends FP = Female Threaded Ends TC = Tri-Clamp Ends VC = Victaulic Grooved PE = Plain Ends XX = Other**	Consult factory for options such as: Epoxy Coat Drain Holes Bypass Holes Special Ports Special Paint Fasteners

*** Techno assigns option suffix numbers to identify special valves.**

Once an option number is assigned to specify the special valve, that number can then be used to reorder an identical valve. Consult factory for options.

**** Other: "X" or "XX" or "XXX" indicates a choice other than standards shown.**





COOPER CAMERON VALVES

Cooper Cameron Valves Headquarters
3250 Briarpark Drive, Suite 300
Houston, Texas 77042
Phone: 281-499-8511
Fax: 281-261-3588

TBV Techno
1537 Grafton Road
Millbury, MA 01527
Phone: 508-887-9400
Fax: 508-839-6624



COOPER CAMERON VALVES

TBV Techno
1537 Grafton Road
Millbury, MA 01527
Phone: 508 887 9400
Fax: 508 839 6624
www.ccvvalve.com



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

PRESSURE RELIEF VALVE

MANUFACTURER : KUNKLE
MODEL NO. : 917BEDV01-KE0025
SERVICE : OXYGEN GAS
FLOW RATE : 141 SCFM (3.71 Nm³/min)
CONNECTION
INLET : 3/4" (19 mm) MNPT
OUTLET : 1 1/4" (32 mm) FNPT
MATERIAL OF CONSTRUCTION
BODY : STAINLESS STEEL
BODY O-RING : TEFLON
RETAINER RING : STAINLESS STEEL
SPRING : STAINLESS STEEL
ORIFICE AREA : 0.2175 SQ INCH (139 mm²)
SET PRESSURE : 25 PSIG (172 kPa)
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 3 (1 PER GENERATOR)
CUSTOMER TAG NO. : PSV-O110A / PSV-O130A / PSV-O150A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

**REFER TO VOLUME 1
TAB # 2G**

**FOR
KUNKLE PRESSURE RELIEF VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE GENERATION SYSTEM

FLOW INDICATOR / TRANSMITTER (THERMAL MASS)

PROV106 ABB

MANUFACTURER : FCI *MB76R AS PER SPEC*

MODEL (INSTRUMENT) : FLEXMASSTER

TYPE (FLOW ELEMENT) : ST98 INSERTION FLOWMETER

SERVICE : OXYGEN / OZONE MIXTURE FLOW AT OUTLET OF OZONE GENERATOR

FLOW RANGE : 14.1 ~ 141 SCFM (0.372 ~ 3.72 Nm³/min)

OUTPUT : 4 ~ 20 mA

ACCURACY : ± 0.5% FULL SCALE

SUPPLY VOLTAGE : 85 ~ 265 VAC

TERMINAL BOX : NEMA 4X

OPERATING PRESSURE : 12 ~ 15 PSIG (82.7 ~ 103.4 kPa)

CONNECTION : 3/4" (19.05 mm) NPT MALE S.S. COMPRESSION FITTING

PROBE LENGTH : 1 ~ 6" (25 ~ 150 mm), FIELD ADJUSTABLE

MOUNTING PIPE SIZE : 2" (50 mm) S.S. PIPE

MATERIALS (WETTED) : ALL WELDED 316L S.S.

SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
CALIBRATED FOR 2" (50 mm) PIPE SIZE

QUANTITY : 3 (1 PER GENERATOR)

CUSTOMER TAG NO. : FT-O112A / FT-O132A / FT-O152A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for design accuracy in the field will rest with the contractor.

Reviewed for conformance with design intent or field conditions. Responsibility for design accuracy in the field will rest with the contractor. All points of the work shall be checked and approved.

REVIEWED _____

REVIEWED AND APPROVED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

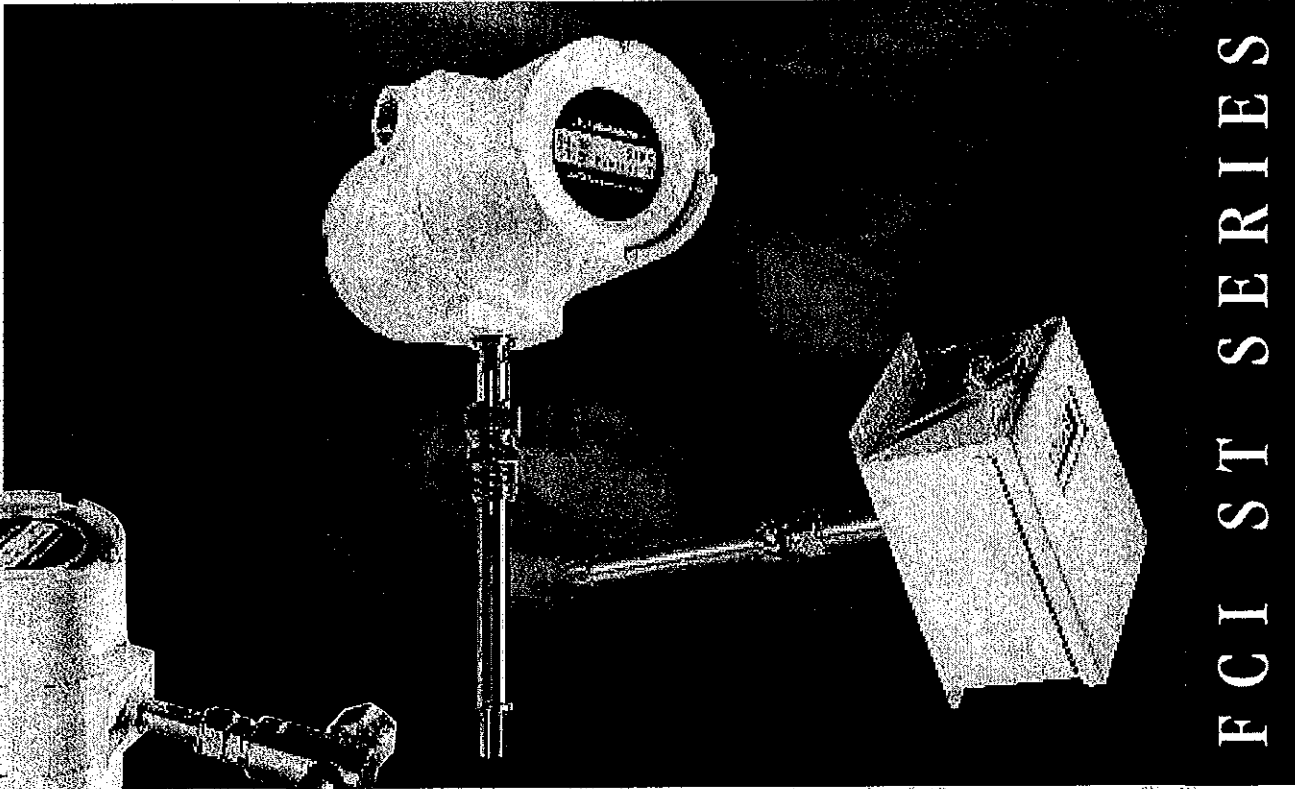
Project No. 79538-C14-16

Date: 29/1/06 By: [Signature]

FCI FlexMASter® ST98 Series:

The Best Value in a

High Performance



FCI ST SERIES

Thermal Mass Flowmeter

for Gas Applications.

FCI®

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for modification and correction of field
drawings rests with the Contractor. Techniques of
construction shall be approved in advance of all
parts of a work rest to with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____ ✓

NOT REVIEWED _____

Project No. 79538-C14-16

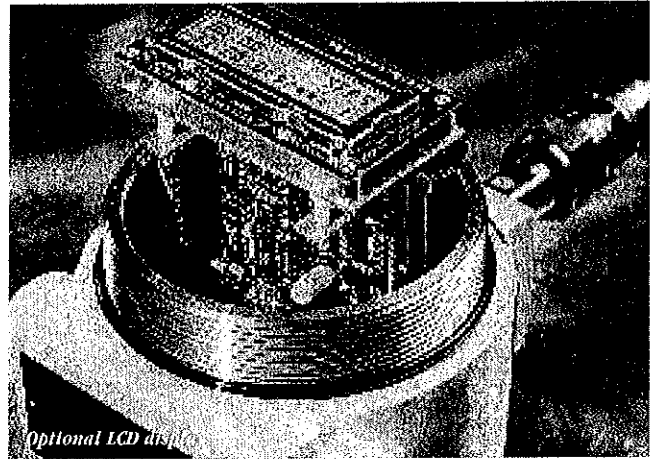
Date: 24/1/06

By: [Signature]

FlexMASter® ST98 Flowmeter Series | The new FCI FlexMASter ST98 Flowmeter Series sets the standard for value and performance with smart electronics in a rugged, economical package. The result is superior performance and application versatility for exceptional installed value. In today's complex process environment, where harsh conditions often exist, the FlexMASter Series is the ideal choice for precision gas flow measurement. Over 35 years of FCI experience in Thermal Dispersion flowmeter technology was applied in the development of the FlexMASter Series.

Smart Electronics | With a smart microprocessor-based design, the intelligent FlexMASter ST98 is ideal for a wide range of gas flow measurement applications. The ST98's electronics are housed in a NEMA/CSA Type 4X or optional FM/CSA/CENELEC system approved explosion-proof electrical enclosure that features ready access to wiring terminals in the dual sided design. The electronics accept universal AC (85 to 260 volts) or 24 Vdc input power. The output signal can be field programmed for 4-20mA, 0-5 Vdc, or 0-10 Vdc. An RS-232C serial port provides an interface to FCI's FC88 Pro-grammer, a computer or any ASCII-oriented terminal.

HART® Field Communications Protocol | The industry standard for digitally enhanced 4-20mA communications with smart field instruments is now available as an option with the ST98 FlexMASter Series. HART's enhanced two-way communication significantly improves plant information management by providing solutions to today's business challenges and yielding reported

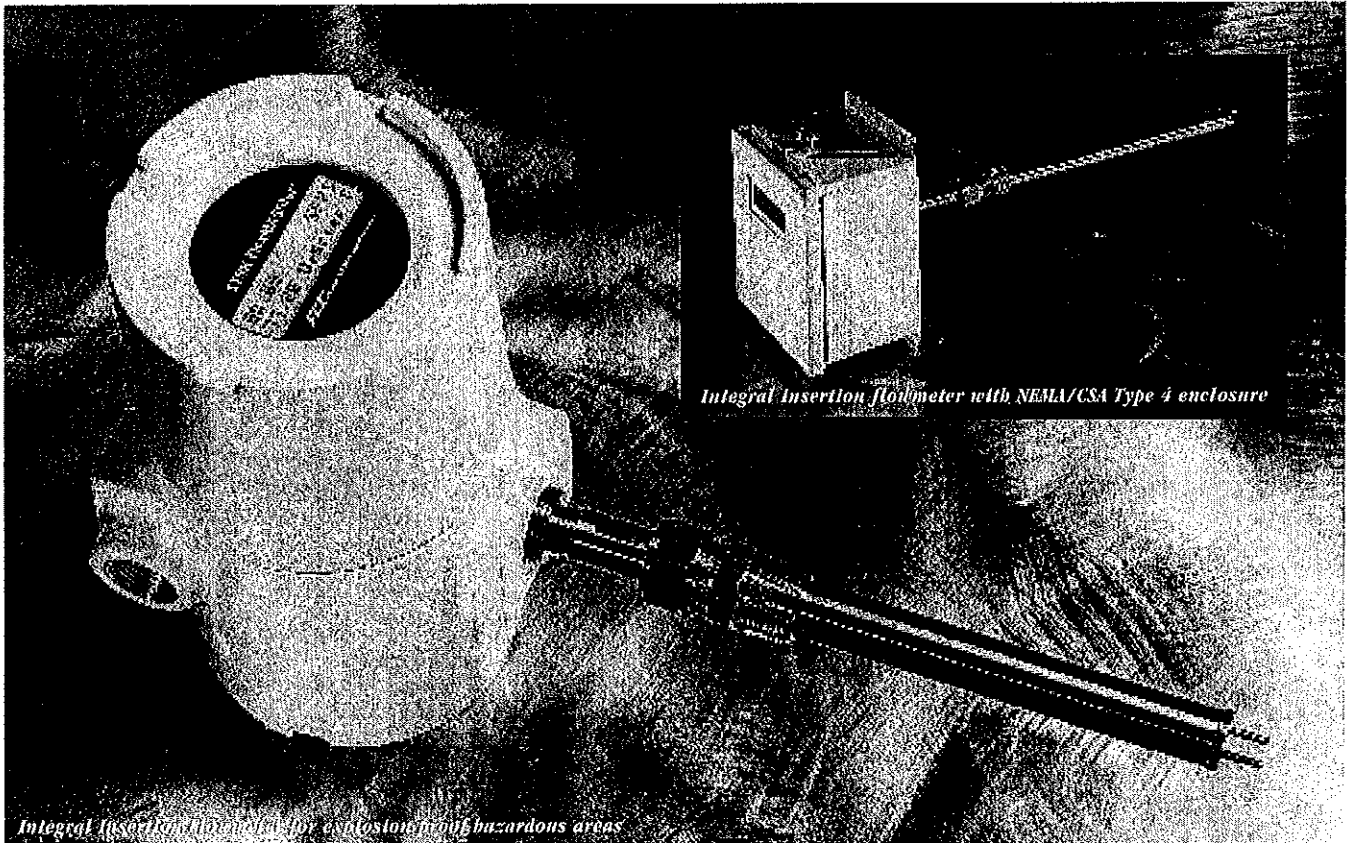


Optional LCD display

substantial cost savings for initial installation/commissioning of \$400 to \$500 per instrument and annual maintenance/operations savings of \$100 to \$200 per instrument.

HART technology benefits include:

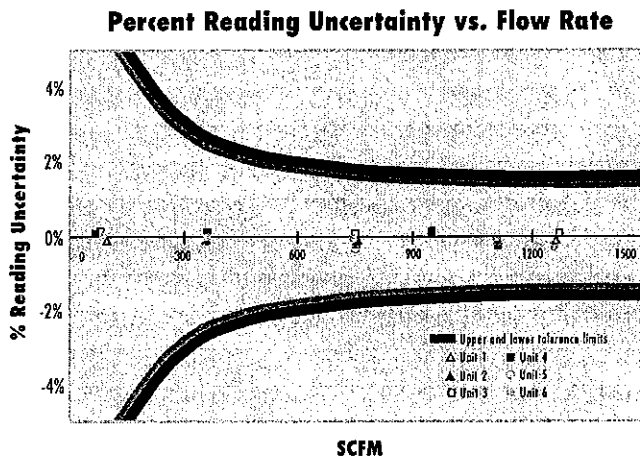
- > The only "open" communications protocol of its type that has been established as the industry standard.
- > Easy access to variables, diagnostics and calibration data
- > No risk solution for maintenance and operations personnel by providing parallel operation of the 4-20 mA instrument signal and HART's enhanced two-way field communication capability
- > Multidrop capability of several field instruments substantially reduces installation costs



Integral insertion flowmeter with NEMA/CSA Type 4 enclosure

Integral insertion flowmeter for explosion proof hazardous areas

Direct Mass Flow Measurement Performance | The FlexMASter ST98 Flowmeter Series features FCI's no-moving parts mass flow element design. It simplifies mass flowmetering with a single process penetration, eliminating temperature / pressure transmitters and the density calculation required with other non-mass flowmeter technologies, such as differential pressure, vortex or turbine. This results in superior accuracy, response time, and repeatability. In today's complex process control schemes, accurate gas flow measurement is essential for product consistency and quality and safe operation of process plants. FCI has partnered with VORTAB® to optimize performance and overcome installation effects in short straight runs. The FlexMASter ST98 Series features an accuracy of $\pm 1\%$ of reading plus 0.5% of full scale, and repeatability of 0.5% of reading.



Air flow in 6 inch schedule 40 pipe (typical factory calibration results)

The air flow calibration range of the insertion unit is from 0.75 to 600 SCFM [0.21 to 172 NMPS] at 70°F [21°C] and 14.7 psia [1 bar (a)]. The ST98-L inline unit air-flow calibration range is from 0.006 to 1,850 SCFM [0.01 to 3,140 NCMH] at 70°F [21°C] and 14.7 psia [1 bar (a)]. The turndown ratio is factory preset per application from a minimum of 10:1, to a maximum of 100:1 and is field adjustable within the calibrated range.

Applications Versatility | With its innovative design, the FlexMASter Flowmeter Series is ideal for a wide range of rigorous applications in:

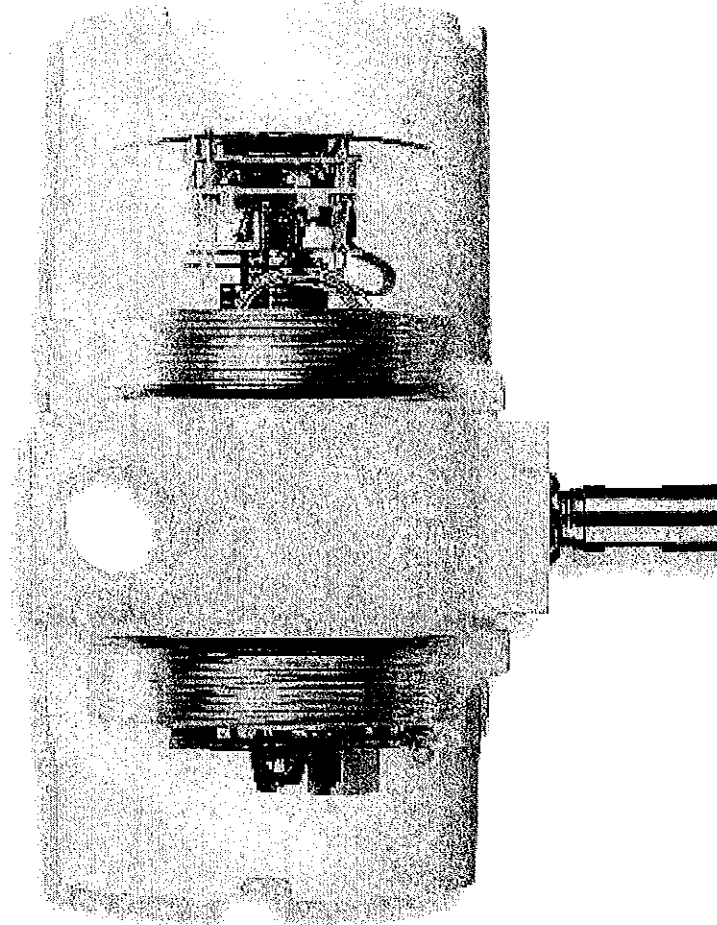
- > Wastewater aeration and digesters
- > Landfill vapor or biogas recovery
- > Natural gas or methane monitoring
- > Compressed air metering
- > Heavy industrial HVAC systems
- > Nitrogen blanketing
- > Combustion air

Easy to install, Easier to Use | Field technicians find that the installation of the FlexMASter ST98 Series flowmeter is a simple, rapid process. No special or custom tools are required.

The FlexMASter ST98 Series is factory-calibrated and tested prior to shipment. FCI technicians set the instrument's units of measure and provide precise adjustment of zero and full scale for specific process applications.

By designing the FlexMASter with nonvolatile memory, FCI helps prevent the loss of valuable application and totalized flow data. Power outages or surrounding equipment failures need never again mean a loss of critical flow data. *Your flow data is truly safe with FCI.*

Comprehensive diagnostics, field-adjustable settings and HART protocol are available with the FlexMASter ST98 Series. The FCI FC88 Programmer is quickly connected to the FlexMASter's RS-232C serial port via an RJ11 phone jack. The serial port provides access to the FlexMASter's flow computer. Password protection offers security against unauthorized access. With the FlexMASter ST98 Series, built-in testing and diagnostic capabilities ensure accurate and reliable flowmeter performance. On-command diagnostics include: out-of-range detection, output loop and sensor element continuity verification, and a forced calibration output.



Field wiring terminations (bottom) and circuit board access are in separate enclosure chambers.

Exceptional Reliability | The FlexMASter ST98 and ST98-L system's unique design is based on FCI's advanced Thermal Dispersion technology flow element, which has no-moving parts for exceptional reliability, trouble-free operation in the dirtiest of environments and a well-known reputation for long-life. There are hundreds-of-thousands of FCI instruments at work today around the world -- ensuring process quality and protecting valuable equipment.

The FlexMASter ST98 and ST98-L meter's flow element is highly resistant to corrosion. It features an all-welded 316L stainless steel construction. For excessively corrosive applications, Hastelloy C is available as an option for all wetted surfaces.

Explosion-Proof Flowmeter | The FlexMASter ST98 and ST98-L's flow element and transmitter are manufactured with high grade industrial components for use over a wide temperature range and in harsh environments. The standard aluminum enclosure is explosion-proof. It is rated for hazardous location use (Class I and II, Division 1 and 2, Group B, C, D, E, F and G; and EEx d IIC, II2G) and resists the effects of weather and corrosion (NEMA/CSA Type 4X and equivalent to IP 66). The flow transmitter can be remotely mounted as an option. FlexMASter is system approved by leading agencies including FM, CSA, CENELEC, and ATEX.

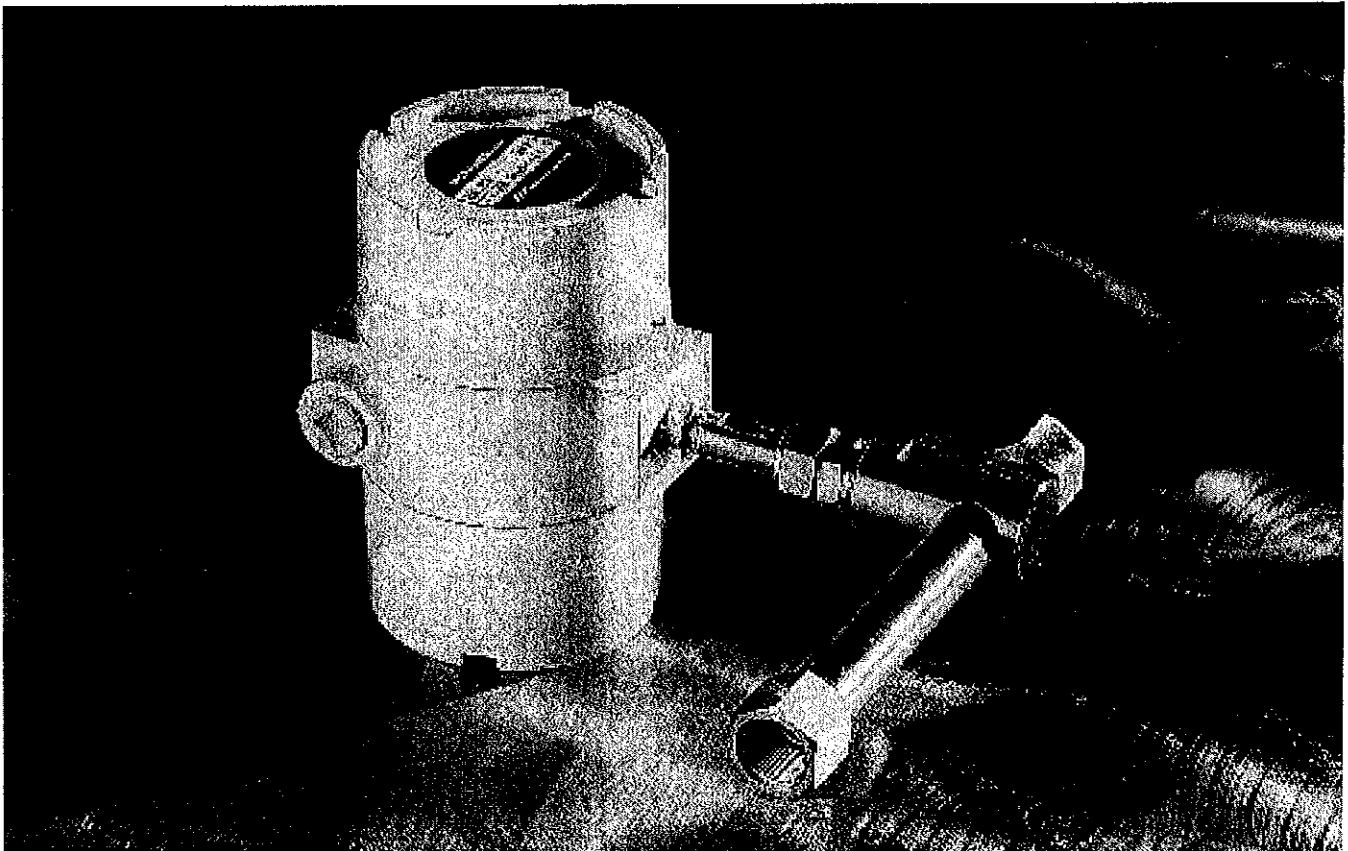
Process Connections | The standard process connection for the ST98 insertion flow element is 3/4 inch male NPT stainless steel compression fitting with either adjustable Teflon ferrule,

rated to 150 psig [10 bar(g)] and 200°F [93°C], or stainless steel ferrule, rated to 250 psig [17 bar(g)] and 500°F [260°C]. Three different field adjustable probe lengths for the insertion flowmeter are available. Male NPT threaded or flanged fixed insertion lengths also can be specified. The standard process connections for the ST98-L inline flow element are 3/4 inch female NPT on the 1 inch diameter tubing assembly and male NPT on the 1 1/2 to 2 inch diameter pipe assemblies (flanged optional).

Global Approvals | The FlexMASter ST98 standard enclosure resists the effects of weather and corrosion (NEMA/CSA Type 4X and equivalent to IP66) and is rated for Class I and II, Division 2, areas. An optional aluminum enclosure is explosion-proof and rated for hazardous location use (Class I and II, Division 1 and 2, Group B, C, D, E, F and G; and EEx d IIC, II2G) while resisting the effects of weather and corrosion (NEMA/CSA Type 4X and equivalent to IP 66). Approvals include FM, CSA, CENELEC, as well as ATEX with CE Mark.

FCI's Instrument User's Protection Plan

Guaranteed Performance. FCI guarantees the performance of its product line in accepted applications or your money back.
1-Year Warranty. The FCI ST98 Series is warranted against faulty materials and workmanship for one year from the date of delivery.
Customer Service. FCI provides prompt 24-hour customer service including expedited field service, start-up and commissioning assistance, repair support, and toll-free factory service.



FlexMASter ST98 Series Mass Flowmeter General Specifications

Instrument

Flow Range

ST98 Insertion Flow Element: 0.75 to 600 SFPS [0.21 to 172 NMPS]

ST98L Inline Flow Accessory: 0.0062 to 1850 SCFM

[0.01 to 3,140 NCMH]

-- Air at standard conditions; 70°F [21.1°C] and 14.7 psia [1.01325 bar (a)].

Media: All gases that are compatible with the flow element material.

Accuracy

Flow: ±1% reading + 0.5% full scale standard accuracy

Temperature: ±2°F (display only, flow rate must be greater than 5 AFPS)

Repeatability

Flow: ±0.5% reading

Temperature: ±1°F (flow rate must be greater than 5 AFPS)

Turndown Ratio:

Standard: Factory set and field adjustable from 10:1 to 100:1 within calibrated flow range.

Temperature Compensation:

Standard: 40° to 100°F [4 to 38°C]

Optional Extended Range: within -50° to 500°F [-46° to 260°C]

Agency Approvals: FM, CSA, CENELEC, T4 Rated (System Approval), ATEX with CE Mark (EMC Directive 89/336/EEC); CPA and INMETRO pending.

Calibration: Performed on NIST traceable equipment.

Flow Element

Material of Construction: All-welded 316L stainless steel; Hastelloy C optional.

Operating Pressure: 0 to 250 psig [0 to 17 bar (g)], derated with Teflon ferrule.

Operating Temperature: Process temperature -40°F to +500°F [-40°C to +260°C]; integral electronics rated to 140°F [60°C].

ST98 Insertion Flow Element

Process Connection: 3/4 inch male NPT stainless steel compression fitting: adjustable Teflon ferrule; 150 psig [10 bar (g)] and 200°F [93°C] max., or metal ferrule; 250 psig [17 bar (g)] and 350°F [177°C] max.; thread-on flange optional.

Insertion Length: Field adjustable lengths: 1 to 6 inch [25 to 152 mm], 1 to 12 inch [25 to 305 mm] or 1 to 21 inch [25 to 533 mm]; custom lengths optional.

ST98L Inline Flow Tube: Insertion flow element is threaded and keyed in an inline flow tube; calibrated and supplied as a unit. Accessories include low flow injection tubes and built-in VORTAB® flow conditioners for optimum low flow rangeability and performance.

Size: 1 inch diameter tubing; 1 inch, 1 1/2 inch or 2 inch schedule 40 pipe.

Length: 9 nominal diameters

Process Connection: Female NPT on 1 inch tubing; male NPT on 1 inch, 1 1/2 inch and 2 inch schedule 40 pipe.

Option: Flanges

Local Enclosure:

Standard: NEMA/CSA Type 4X (equivalent to IP66) and Division 2 (Ex n)

Option: Aluminum rated for hazardous location use Class I and II, Division 1 and 2, Group B, C, D, E, F, G (previously referred to as NEMA 7) and EEx d IIC and resists the effects of weather and corrosion.

Remote Transmitter Configuration: Transmitter may be mounted remotely from flow element using interconnecting cable (up to 500 feet [152 m]).

Flow Transmitter

Operating Temperature: 0 to 140°F [-18 to +60°C]

Input Power: 85 to 265 Vac, 22 to 30 Vdc, 240 Vac (ATEX), or 9 to 36 Vdc (HART or Profibus); 7 watts maximum, 230 mA maximum

Output Signal

Current: 4 to 20 mA, 700 ohms maximum load

Voltage: 0-10 Vdc, 0-5 Vdc, 1-5 Vdc, 100K ohms minimum load

Note: Output signal is isolated from input power on AC powered unit only.

Analog Fault Indication: Per NAMUR NE 43 guideline: Field selectable high (≥ 21.6 mA) or low (≤ 3.75 mA).

Communication Port: EIA-232 [RS-232C]

HART or Profibus Communications: Optional

Display (optional): 2 line/16 character per line, indicating flow rate and process temperature and/or totalized flow.

Programmer (optional): Hand held plug-in interface (model FC88).

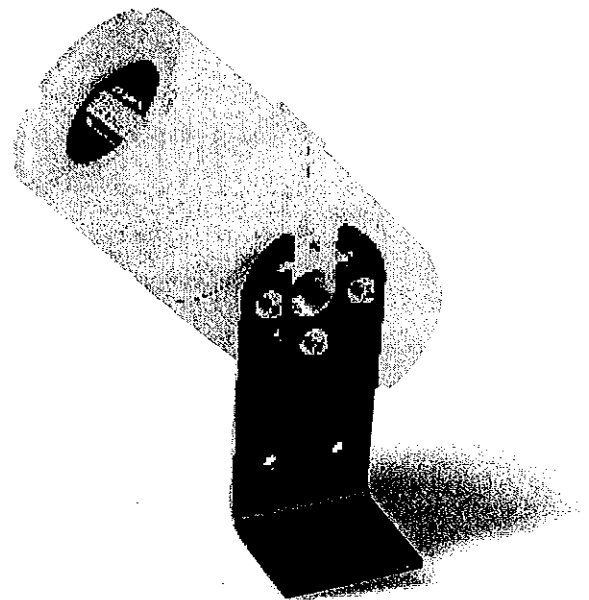
Remote Enclosure (optional):

Standard: NEMA/CSA Type 4X (equivalent to IP66) and Division 2 (Ex n)

Option: Aluminum rated for hazardous location use Class I and II, Division 1 and 2, Group B, C, D, E, F, G (previously referred to as NEMA 7 and EEx d IIC) resists the effects of weather and corrosion.

Flow Conditioning (optional):

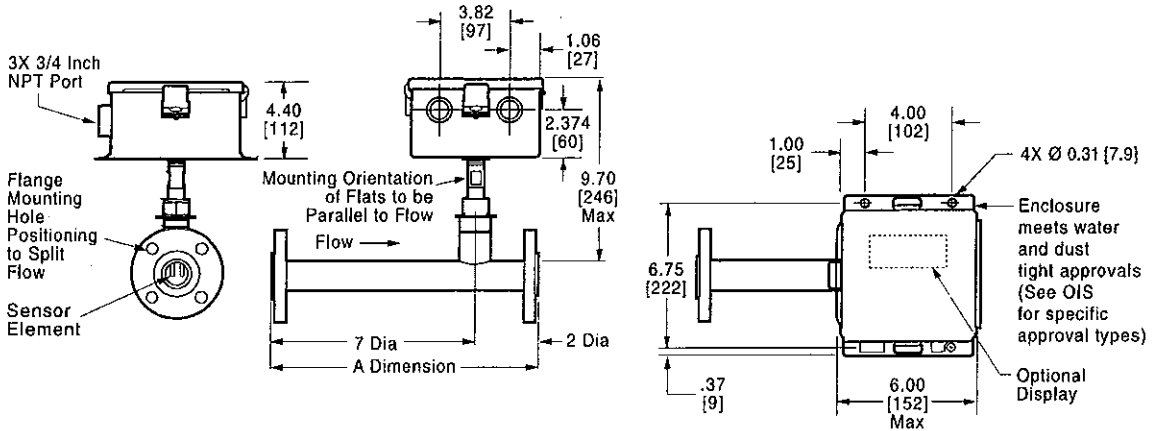
VORTAB® Flow Conditioner: Meter Run (VMR), Insertion Sleeve (VIS) or Field Kit (VFK)



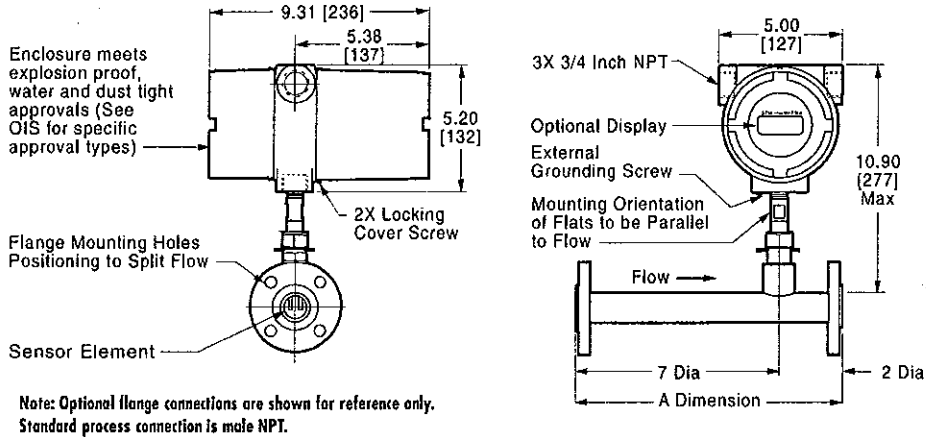
Mounting Bracket: standard feature with remote assemblies.

FlexMASter Model ST98L Inline Flowmeters

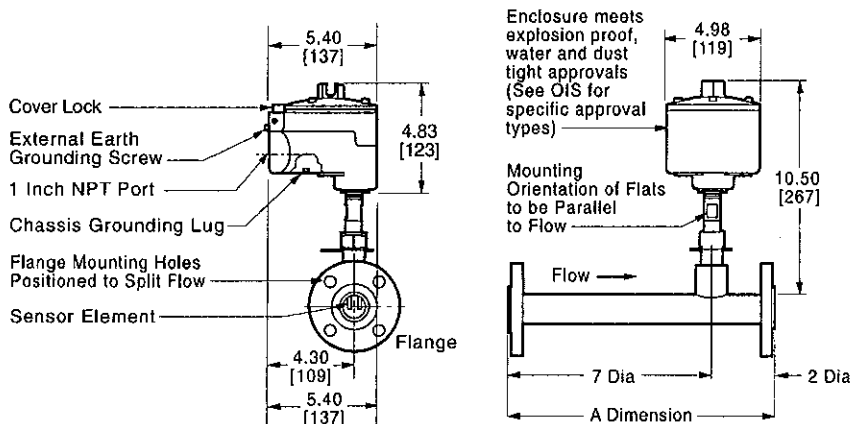
Integral Transmitter NEMA 4 Carbon Steel (Standard) or NEMA 4X, Aluminum (Optional)



Hazardous Locations, Aluminum (Optional)

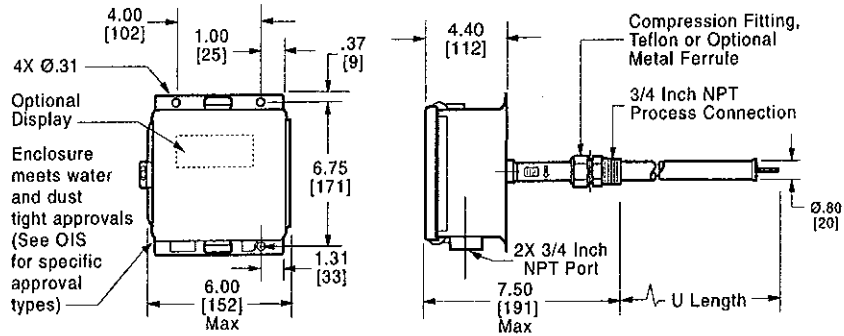


Remote Transmitter Flow element: Hazardous Locations, Aluminum (Optional) Transmitter: See Remote Configurations for ST98 Insertion Flowmeter

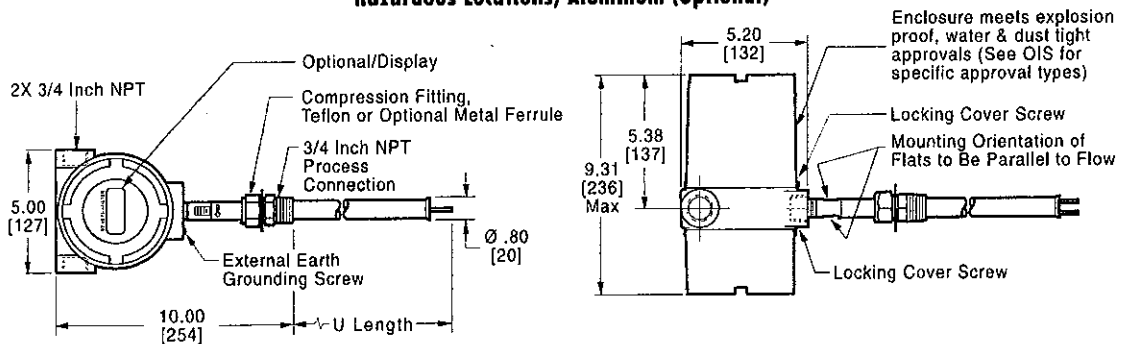


FlexMASter Model ST98 Insertion Flowmeters

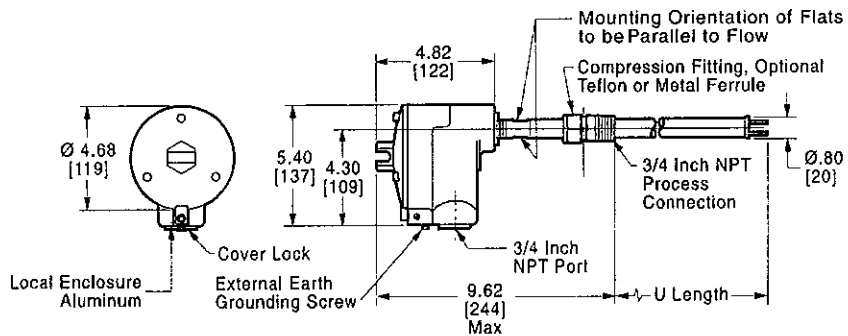
Integral Transmitter NEMA 4 Carbon Steel (Standard) or NEMA 4X, Aluminum (Optional)



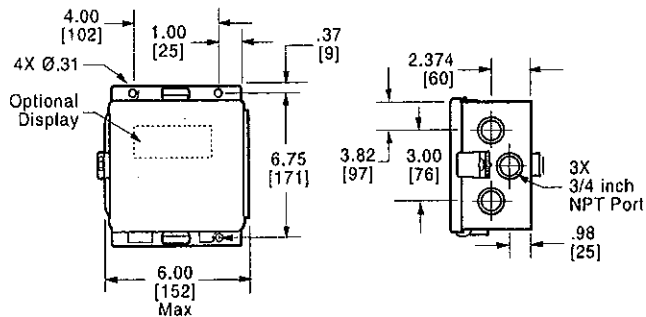
Hazardous Locations, Aluminum (Optional)



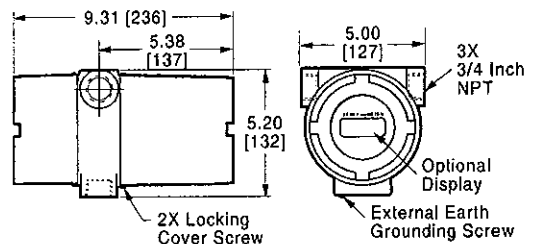
Remote Transmitter Flow Element: Hazardous Locations, Aluminum (Optional)

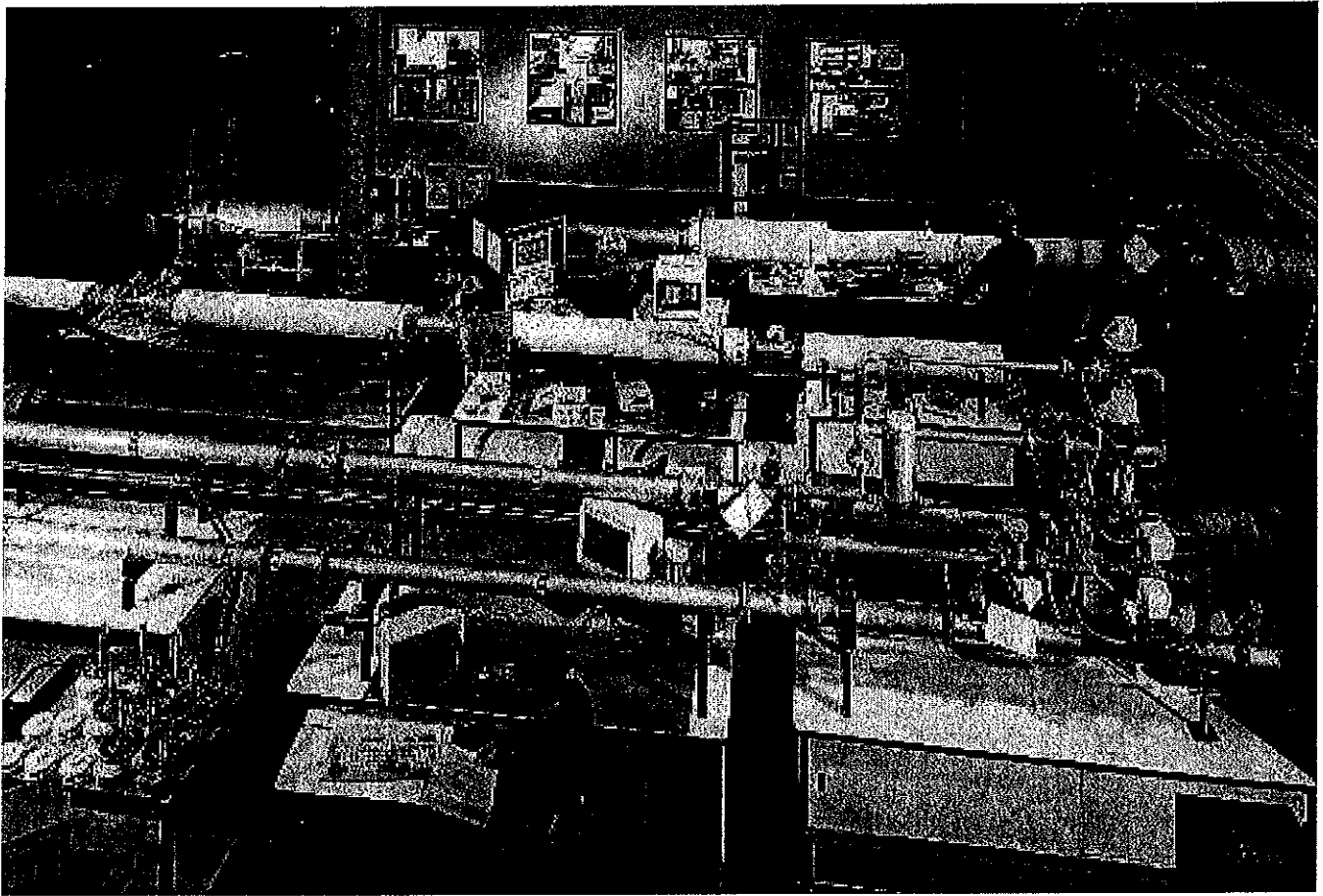


Enclosure: NEMA 4 Carbon Steel or NEMA 4X Aluminum



Enclosure: Hazardous Locations





Test and Calibration Laboratory | Fluid Components International maintains an extensive, instrument test and calibration laboratory at its headquarters in San Marcos, California. Utilizing the latest in advanced, computerized data acquisition systems and calibration test equipment, this facility permits comprehensive product development, testing, and calibration. Any FCI product can be calibrated in accordance with customer specifications. Laboratory standards are maintained with NIST (National Institute of Standards and Technology) traceable Cavitating Venturis (CVs) and precisely calibrated, pressure and temperature corrected turbine flowmeters..

Combustible and non-combustible gas calibration flow stands allow for the calibration of FCI products in a wide range of gases and gas mixtures from flow stand line sizes as small as 1/8 inch to 30 inches [3 to 760 mm] in diameter. A variety of flow profiles

from laminar to turbulent to conditioned are generated to duplicate actual field conditions. Flow rates from 0 to 20,000+ SCFM [0 to 34,000 NCMH], velocities from 0 to 800 SFPS [0 to 240 NMPS], pressures from vacuum to 3000 psig [200 bar(g)], and temperatures from -100° to +900°F [-70° to +480°C] are available.

On-Site Calibration and Training | In-situ calibration is available from FCI's Field Service engineers where precise test and calibration is accomplished in actual media conditions.

FCI's Training Department can provide on-site or at the factory Product Knowledge Workshops for our customers. The workshops cover installation, setup, and troubleshooting skills, and include hands-on exercises using real products, under actual operating conditions.

24 Hour Customer Service Access Available

NIST Net



FCI FLUID COMPONENTS
INTERNATIONAL LLC

Web: www.fluidcomponents.com | Email: info@fluidcomponents.com

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European Office: Persephonestraat 3-01 5047 TT Tilburg, The Netherlands | Phone: 31-13-5159989 | Fax: 31-13-5799036

FCI is ISO 9001 certified /conformance to AS9000



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE GENERATION SYSTEM

FLOW CONTROL VALVE

*PROVIDES ROTOR/LIMITORQUE
ACTUATOR AS PER SPEC.*

VALVE

MANUFACTURER : WORCESTER
TYPE : SERIES 94-150 FLANGED
STYLE : HIGH PERFORMANCE BALL VALVE
SERVICE : OXYGEN / OZONE MIXTURE TO INJECTOR UNIT

MATERIAL OF CONSTRUCTION

BODY : STAINLESS STEEL
STEM : TYPE 316 S.S.
BALL : TYPE 316 S.S.
SEAT : TFE
PRESSURE RATING : 150 PSIG (1.03 MPa)
FLOW RATE : 14.1 ~ 141 SCFM (0.371 ~ 3.71 Nm³/min)
OPERATION : MODULATING VALVE OPERATION WITH ELECTRIC

CONNECTION : 2" (50 mm) ANSI 150# RF FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE

QUANTITY : *3* (1 PER GENERATOR)

ACTUATOR

MANUFACTURER : AUMA
TYPE : SGR SERIES WITH CURRENT POSITION TRANSMITTER
MODEL : SGR 05.1
SIGNAL : 4 ~ 20 mA
ENCLOSURE : NEMA 4X
ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
QUANTITY : 3 (1 PER GENERATOR)

CUSTOMER TAG NO. : FCV-O112A / FCV-O132A / FCV-O152A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication, erection, technique of construction, installation and completion of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

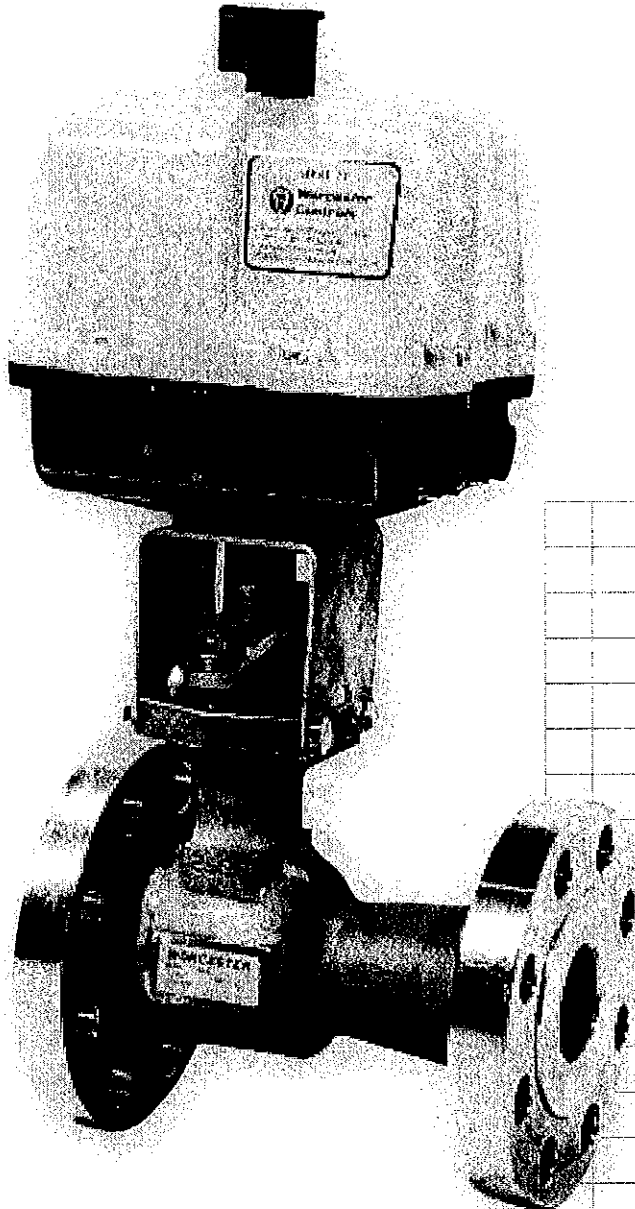
NOT REVIEWED _____

Project No. 79538-C14-16

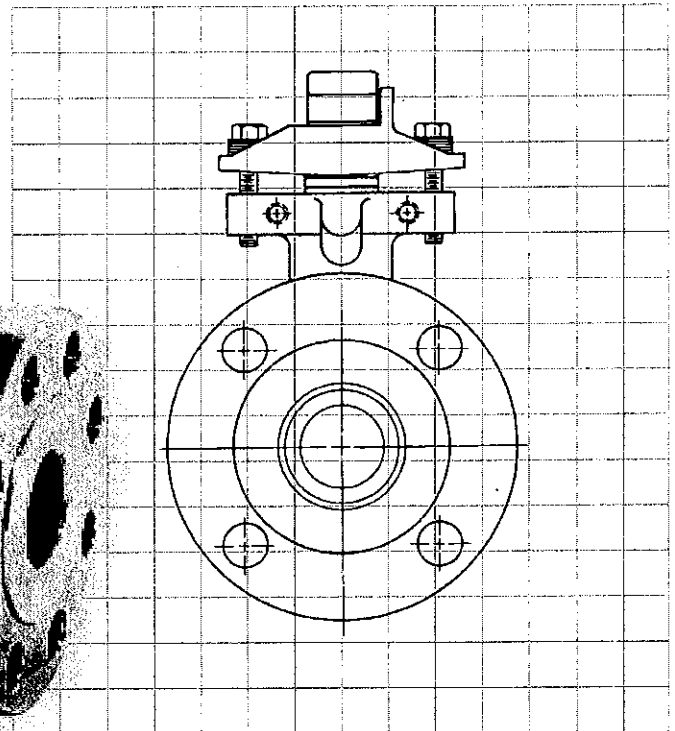
Date: 24/1/06 By: [Signature]

Series 94, 94-150, 94-300 and 94-600

The High-Performance Solution for
Fugitive Emission, Toxic Gas or High Cycle Applications

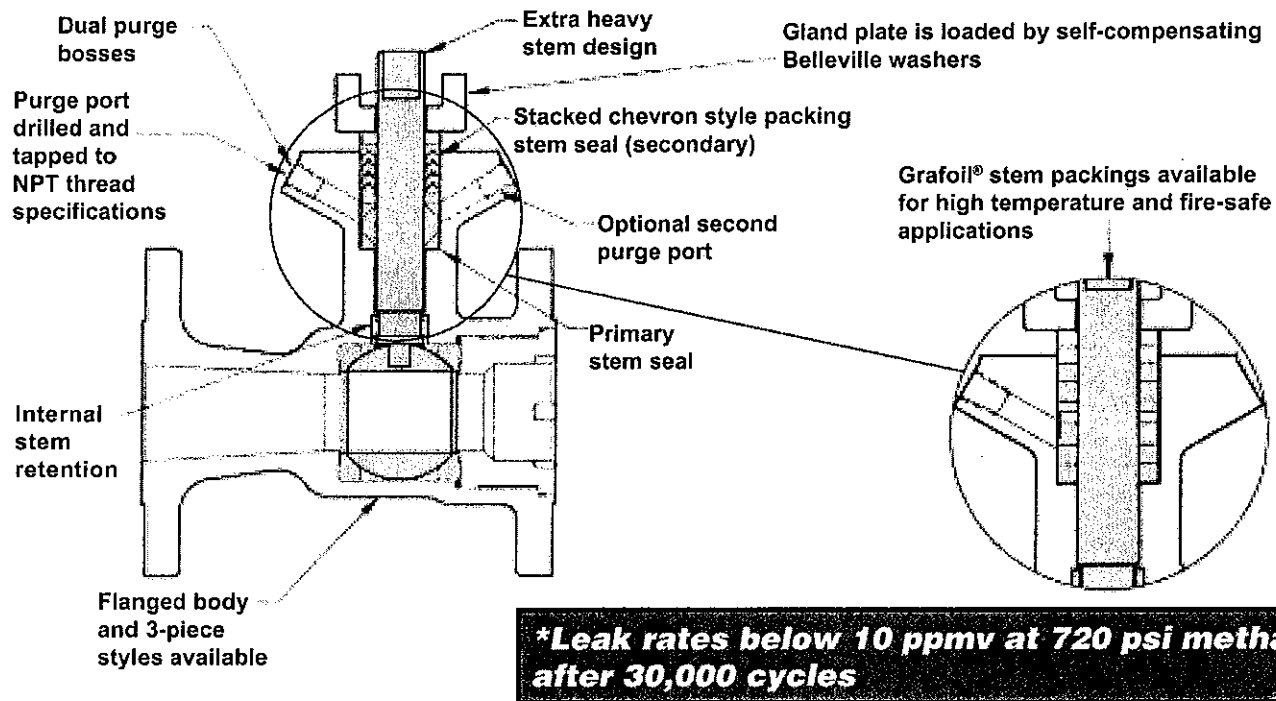


Mass Emission Qualified by
Independent Laboratory to
EPA Testing Procedures.
(*Page 2)



The Series 94

Series 94 (3-Piece) • Series 94-150/300 (Flanged) • Series 94-600 (Flanged)



Worcestor's Series 94 valve sets new performance standards for both cycle-life and leak tightness of ball valves. Available in flanged body or 3 piece styles, it offers a unique combination of features:

- Dual Stem Seals – A primary seal and filler ring seal against the stem and body. Three chevron style packing rings, loaded by the gland plate, for the secondary seal.
- Double "Live-loaded" Stem Seals – Stem seals benefit from the spring-like properties inherent in the chevron style rings. They are further loaded by the gland plate that is under constant force from the stacked belleville washers.
- Two Stem Purge Bosses – The Series 94 comes with 2 bosses in the stem area. One is drilled & tapped to 1/8" NPT standard threads. An optional second port can be added to allow through purging between the stem seals or connection of instrumentation and sensing devices.
- Conductive Stem Seal - One chevronstyle ring is of electrically conductive TFE to positively ground the stem to the body.
- The valve goes from full open to full closed with 90° operation of the stem. Dual stem seals ensure zero leakage.
- The bonnet and body are cast as a single piece. There are no welds, crevices or static seals to fracture and leak.
- The Series 94 is available with stainless steel or Hastelloy® C anti-corrosion trim to meet NACE MRO 1-75.

CONSIDER THESE BENEFITS

High vacuum capability (tight shutoff to 1×10^3 Torr and higher)

Extremely high cycle life (more than 20 times that of a conventional stem seal design.)

For automated versions, the actuator can be removed without affecting the integrity of the valve seals.

The extended bonnet allows easy stem access after insulation. It also provides thermal isolation of the actuation mechanism.

Pneumatic and electric modulating packages with either standard or characterized seats are the only solution in applications where traditional rising stem control valves just cannot be used.

SPECIAL TESTING & PREPARATION AVAILABLE

- OPTIONS:**
- Assembled in a Class 100 clean assembly area
 - Helium leak tested
 - U.V. & wipe tested for hydrocarbons and residue
 - Specially cleaned and bagged for oxygen and chlorine service
 - Hydro tested
 - CMTR's and full compliance to B16.34

APPLICATIONS

Worcester developed the Series 94 available for either on-off or throttling services with the following applications in mind:

- Leak-off systems with sensing devices & alarms for fugitive emissions
- Category M materials
- Applications requiring extremely high cycle life
- Chlorine applications requiring a high performance stem seal design
- Superheated water (400°F & 400 psi)
- High temperature applications and/or high pressure drops requiring metal seated versions
- High temperatures above 500°F requiring a Grafoil stem packing
- Phosgene gas and other highly toxic media requiring zero leakage

Steam:

High cycle steam valves are subject to wide thermal swings.

Polymer Lines:

The Series 94 valve, using FEP or PFA seats and seals, is a technical improvement designed for use in polymer lines.

Cryogenics:

A bonnet extension on the Series 94 valve provides the thermal conductivity to maintain ambient temperatures on the stem seals.

SPECIFICATIONS

Series 94 Flanged (94-150, 94-300 & 94-600)

Sizes:	1/2", 3/4", 1", 1 1/2", 2", 3", 4", 6" & 8"
Flanges:	94-150 (ANSI 150# raised face) 94-300 (ANSI 300# raised face) 94-600 (ANSI 600# raised face – 1"-3")
Body Materials:	Stainless steel, carbon steel
Stem:	316 S.S or Hastelloy C
Stem Seals:	Virgin TFE, Grafoil, Carbon filled TFE
Seats:	Metal "A", Metal "G", High-per Fill®, TFE, Polyfill®, RTFE or UHMWPE
Body Seals:	TFE or graphite coated stainless steel "S" gasket, TFE, Viton® or Grafoil
Ball:	316 S.S or Hastelloy C
Options:	1 leak-off port drilled & tapped to 1/8" NPT standard. Optional 2nd port for purging.
Operation:	Lever handle, pneumatic or electric automation (on/off or proportional control)
Standards:	ANSI B16.5 (flange dimensions), B16.10 (face-to-face dimensions), B16.34, B31.1, B31.3 (including category M materials and MSS SP-72)

Series 94 3-Piece

Sizes:	1/4" - 2"
Ends:	Screwed Ends, Socket Weld, Butt Weld
Body Materials:	Stainless steel, carbon steel
Stem:	316 S.S or Hastelloy C
Stem Seals:	Virgin TFE, Grafoil, Carbon filled TFE
Seats:	Metal "A", Metal "G", High-per Fill, TFE, Polyfill, RTFE or UHMWPE
Body Seals:	Graphite coated "S" gasket, TFE coated "S" gasket, TFE, Viton
Ball:	316 S.S or Hastelloy C
Options:	1 leak-off port drilled & tapped to 1/8" NPT standard. Optional 2nd port for purging.
Operation:	Lever handle, pneumatic or electric automation (on/off or proportional control)
Standards:	ANSI B1.20.1 (for SE, NPT threads), B16.11 (for SW socket dimensions only), B16.34, B31.1, B31.3 (including category M materials) and MSS SP-72 API 607 Edition 4, and EXES 3-14-1-2A fire test approvals.

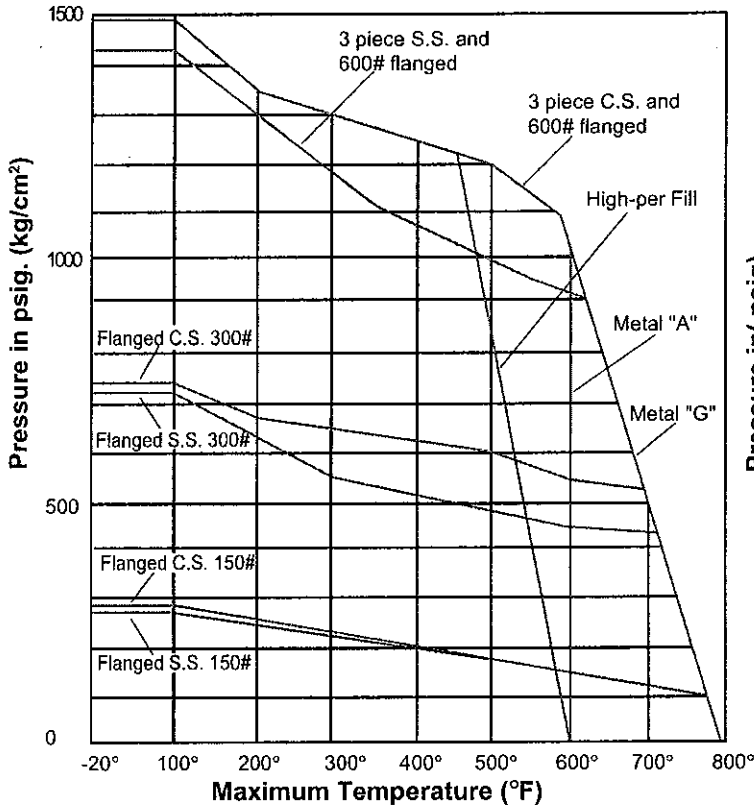
TECHNICAL DATA

Pressure/Temperature Ratings

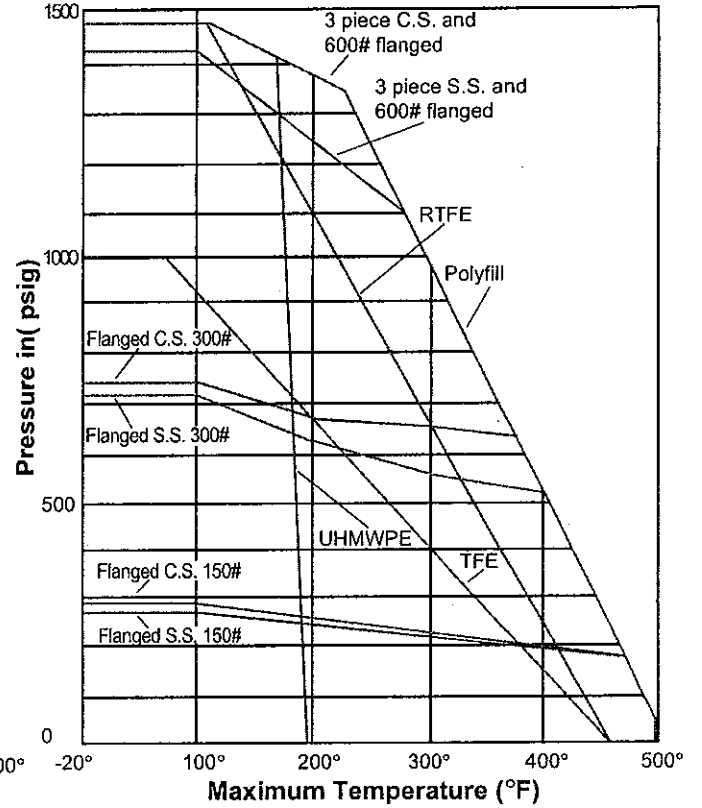
NOTES: Body seals have pressure/temperature ratings that equal or exceed the rating of the seat.

TFE body seals will not withstand thermal cycles in excess of 200°F.

RATINGS FOR METAL "A" & "G" AND HIGH-PER FILL SEATS



RATINGS FOR POLYFILL, RTFE, UHMWPE AND TFE SEATS



CV VALUES AND EQUIVALENT LENGTHS OF PIPE

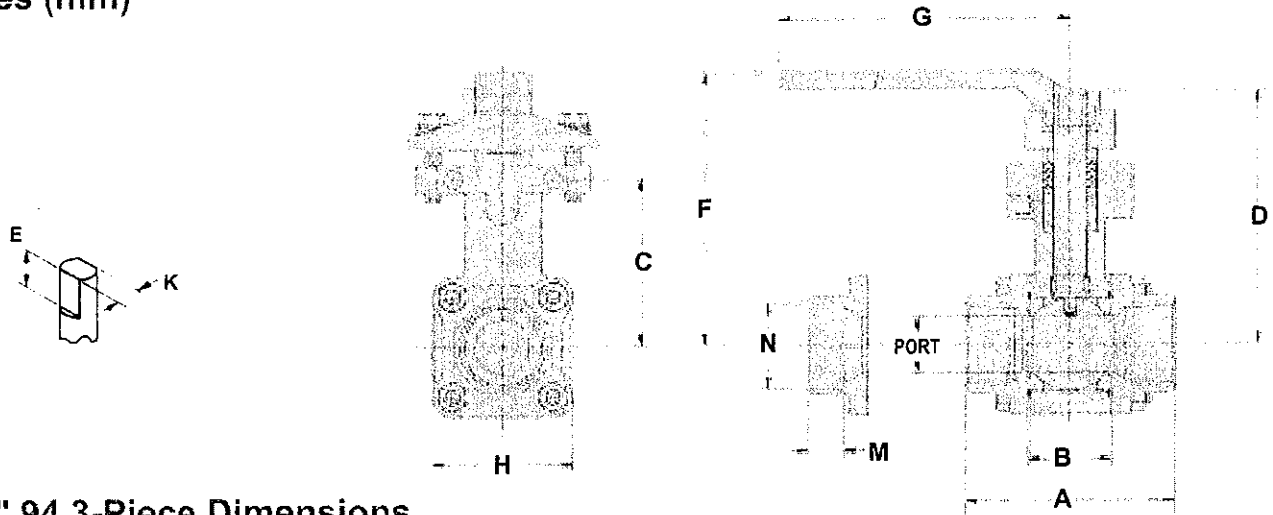
3-Piece

Flanged

Valve Size	C _v	Equiv. length of sched. 40 pipe ft.	Valve Size	C _v	Equiv. length of sched. 40 pipe ft.
1/4" - 3/8"	8	0.9	1"	32	3.6
1/2"	8	3.1	1 1/2"	89	3.7
3/4"	12	6.3	2"	130	6.5
1"	32	3.1	3"	350	6.5
1 1/4"	46	6.3	4"	720	6.9
1 1/2"	82	4.3	6"	1020	20.4
2"	120	7.5	8"	1800	37.7

DIMENSIONS FOR 94 3-PIECE

inches (mm)

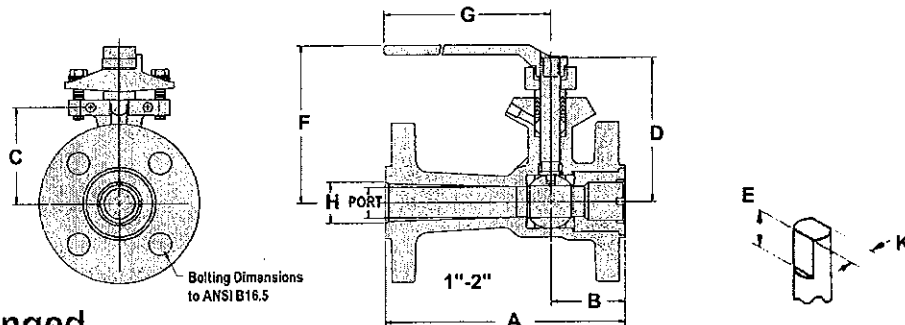


1/4"-2" 94 3-Piece Dimensions

Valve Size	A	B	C	D	E	F	G	H	K	M	N	Port	wt.-lbs. (kg)
1/4"	2.54 (64.52)	.813 (20.65)	2.67 (67.82)	4.40 (111.76)	.70 (17.78)	4.75 (120.65)	8.00 (203.20)	1.75 (44.45)	.296 (7.52)	.44 (11.18)	.555 (14.10)	.44 (11.18)	2 (.91)
3/8"	2.54 (64.52)	.813 (20.65)	2.67 (67.82)	4.40 (111.76)	.70 (17.78)	4.75 (120.65)	8.00 (203.20)	1.75 (44.45)	.296 (7.52)	.44 (11.18)	.690 (17.53)	.44 (11.18)	2 (.91)
1/2"	2.54 (64.52)	.813 (20.65)	2.67 (67.82)	4.40 (111.76)	.70 (17.78)	4.75 (120.65)	8.00 (203.20)	1.75 (44.45)	.296 (7.52)	.44 (11.18)	.855 (21.72)	.44 (11.18)	3 (1.4)
3/4"	2.76 (70.10)	.969 (24.61)	2.76 (70.10)	4.49 (114.05)	.70 (17.78)	4.84 (122.94)	8.00 (203.20)	2.00 (50.80)	.296 (7.52)	.56 (14.22)	1.065 (27.05)	.56 (14.22)	4 (1.8)
1"	3.66 (92.96)	1.250 (31.75)	3.18 (80.77)	4.91 (124.71)	.70 (17.78)	5.26 (133.60)	8.00 (203.20)	2.38 (60.45)	.343 (8.71)	.72 (18.29)	1.330 (33.78)	.81 (20.57)	5 (23)
1 1/4"	4.16 (105.66)	1.625 (41.27)	3.37 (85.60)	5.10 (129.54)	.70 (17.78)	5.45 (138.43)	8.00 (203.20)	2.70 (68.58)	.343 (8.71)	.72 (18.29)	1.675 (42.55)	1.00 (25.40)	10 (4.5)
1 1/2"	4.50 (114.36)	1.906 (48.41)	3.82 (97.03)	5.66 (143.76)	.75 (19.05)	6.14 (155.96)	10.00 (254.00)	3.16 (80.26)	.500 (12.70)	.72 (18.29)	1.915 (48.64)	1.25 (31.75)	11 (5.0)
2"	4.94 (125.48)	2.213 (56.21)	4.01 (101.85)	5.85 (148.59)	.75 (19.05)	6.33 (160.78)	10.00 (254.00)	3.56 (90.42)	.500 (12.70)	.84 (21.34)	2.406 (61.11)	1.50 (38.1)	13 (5.9)

DIMENSIONS FOR 94 600 FLANGED

inches (mm)

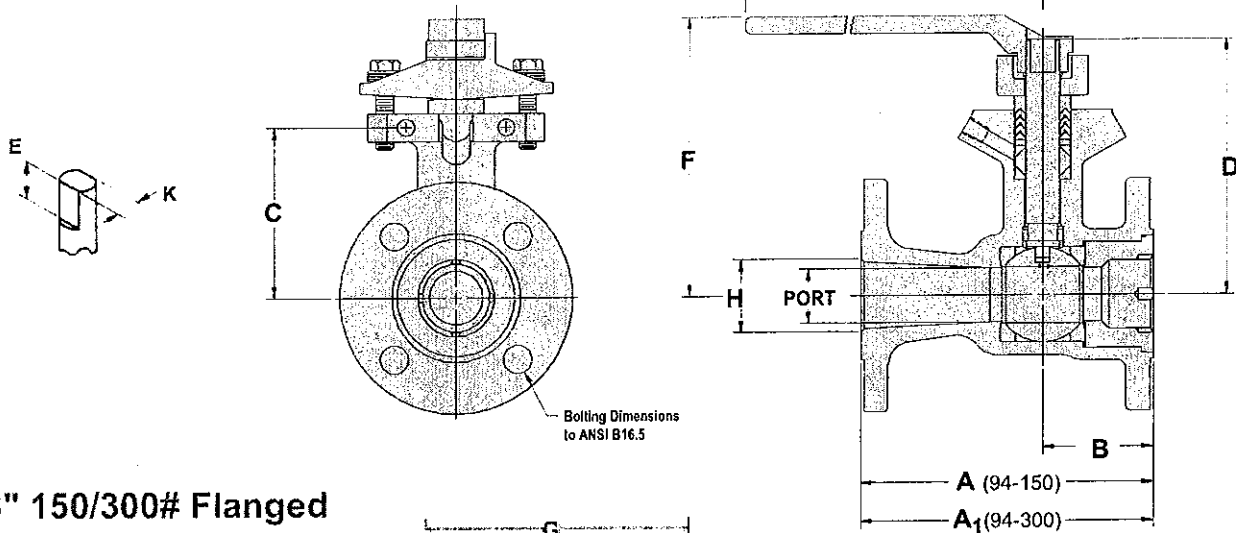


1"-2" 94 600# Flanged

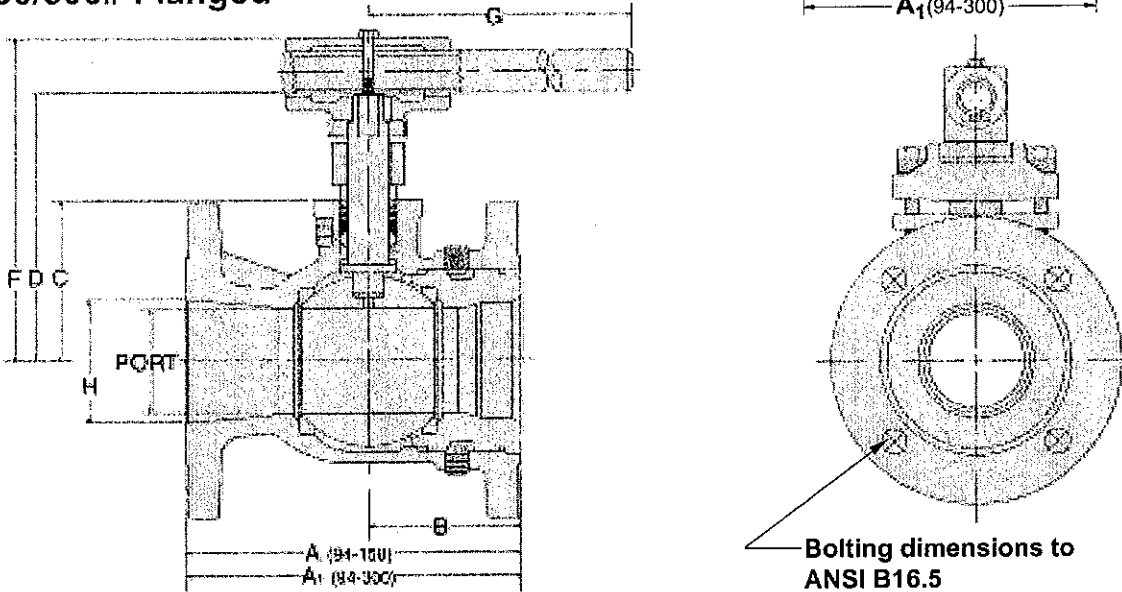
Valve Size	A	B	C	D	E	F	G	H	K	Port	wt. (kg)
1"	8.50 (215.9)	2.75 (69.85)	3.18 (80.77)	4.91 (124.71)	.70 (17.78)	5.26 (133.60)	8.00 (203.20)	1.05 (26.67)	.343 (8.71)	.81 (20.57)	19.5 (8.85)
1 1/2"	9.50 (241.3)	2.96 (75.18)	3.82 (97.03)	5.66 (143.76)	.75 (19.05)	6.14 (155.96)	10.0 (254.00)	1.63 (41.40)	.500 (12.70)	1.25 (31.75)	37 (16.80)
2"	11.50 (292.1)	3.17 (80.52)	4.01 (101.85)	5.85 (148.45)	.75 (19.05)	6.33 (160.78)	10.00 (254.00)	2.01 (51.05)	.500 (12.70)	1.50 (38.10)	48 (21.79)

DIMENSIONS FOR 94 150/300 FLANGED inches (mm)

1/2"-2" 94 150/300# Flanged



3"-8" 150/300# Flanged



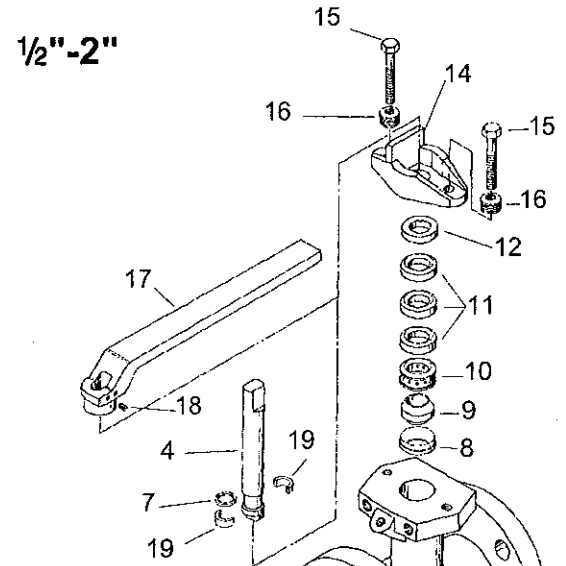
Dimensions are for layout purposes only. For tolerances contact Worcester Controls. Metric dimensions are converted from standard English.

Valve Size	A	A ₁	B	C	D	E	F	G	H	K	Port	150#	300#
1/2"	4.25 (107.95)	5.50 (139.70)	1.81 (45.97)	2.67 (67.82)	4.40 (111.76)	.70 (17.78)	4.75 (120.65)	8.00 (203.20)	.59 (14.99)	.296 (7.52)	.44 (11.18)	5.3 (2.4)	6.3 (2.9)
3/4"	4.62 (117.35)	6.00 (152.40)	1.94 (49.28)	2.76 (70.10)	4.49 (114.05)	.70 (17.78)	4.84 (122.94)	8.00 (203.20)	.83 (21.08)	.296 (7.52)	.56 (14.22)	8 (3.6)	8.9 (4.0)
1"	5.00 (127.0)	6.50 (165.1)	2.25 (57.2)	3.18 (80.77)	4.91 (124.71)	.70 (17.78)	5.26 (133.60)	8.00 (203.20)	1.05 (26.67)	.343 (8.71)	.81 (20.57)	11 (4.9)	12.5 (5.7)
1 1/2"	6.50 (165.10)	7.50 (190.50)	2.45 (62.23)	3.82 (97.03)	5.66 (143.76)	.75 (19.05)	6.14 (155.96)	10.00 (254.00)	1.63 (41.40)	.500 (12.70)	1.25 (31.75)	16 (7.3)	19.1 (8.7)
2"	7.00 (177.80)	8.50 (215.90)	2.67 (67.82)	4.01 (101.85)	5.85 (148.45)	.75 (19.05)	6.33 (160.78)	10.00 (254.00)	2.01 (51.05)	.500 (12.70)	1.50 (38.10)	22 (10.0)	26 (11.8)
3"	8.00 (203.20)	11.12 (282.45)	3.62 (91.95)	3.88 (98.55)	6.38 (162.05)	.66 (16.76)	7.91 (200.91)	22.00 (558.80)	3.06 (77.72)	.745 (18.92)	2.50 (63.50)	40 (18.2)	50 (22.7)
4"	9.00 (228.60)	12.00 (304.80)	4.00 (101.60)	4.48 (113.79)	7.00 (177.80)	.66 (16.76)	8.53 (216.66)	22.00 (558.80)	4.03 (102.36)	.745 (18.92)	3.25 (82.55)	62 (28.1)	80 (36.3)
6"	10.50 (266.7)	15.88 (403.35)	4.25 (107.95)	6.19 (157.23)	9.15 (232.41)	1.03 (26.19)	11.40 (289.56)	26.00 (660.4)	6.06 (153.92)	1.120 (28.45)	4.38 (111.25)	125 (56.7)	150 (68.0)
8"	11.50 (292.0)	16.50 (419.1)	5.69 (144.5)	7.28 (184.9)	10.50 (265.3)	1.03 (26.19)	12.31 (312.7)	26.00 (660.4)	8.00 (203.2)	1.120 (28.45)	5.69 (144.5)	184 (83.5)	225 (102.1)

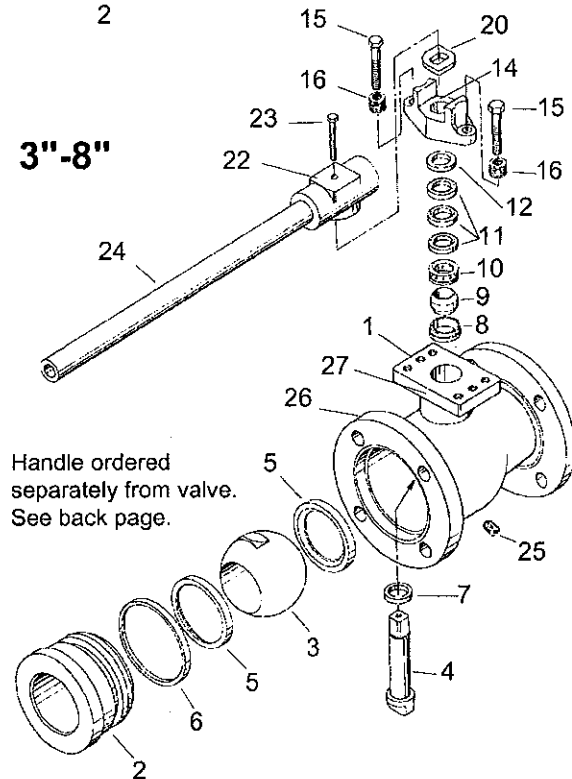
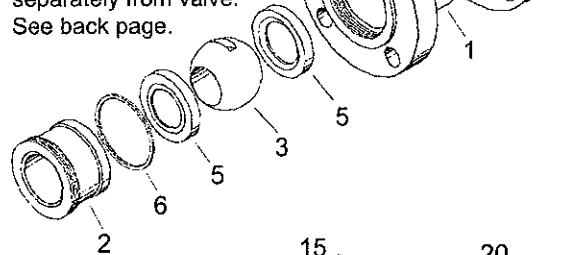
PARTS IDENTIFICATION AND MATERIALS OF CONSTRUCTION

Series 94-150, 94-300 & 94-600 (Flanged)

Part No.	Part Name	Qty. per Valve	Materials
1	Body	1	Stainless Steel ASTM A351-CF8M Carbon Steel ASTM A216-WCB, Black Oxide Coated
2	End Plug	1	Stainless Steel ASTM A479-316 or A351-CF8M Carbon Steel 1008-1030, Black Oxide Coated
3	Ball	1	Stainless Steel ASTM A479-316 (1/2"-2"), A351-CF8M (3"-8") Hastelloy C ASTM B574-N10276
4	Stem	1	Stainless Steel ASTM A479-316 Hastelloy C ASTM B574-N10276
5	Seat	2	TFE, Reinforced TFE, Polyfill, UHMWPE, High-per Fill, Metal "A" & Metal "G"
6	Body Seal	1	TFE, Viton, Stainless Steel AISI-316, TFE or Graphite Coated (1/2"-2") Grafoil (3"-8")
NOT SHOWN	Seat Seal (Metal Seats Only)	2	See illustration on page 11 (3-Piece) for reference
7	Thrust Bearing	1	Celazole PBI (1/2"-3/4" & 1"-2" with G, U or X Seats), Polyfill (1"-2" only), Carbon filled TFE or Grafoil (3"-8" only)
8	Filler Ring	1	TFE or Grafoil (1 solid ring)
9	629 Seal	1	TFE or Grafoil (1 solid ring)
10	Lantern Ring	1	Stainless Steel ASTM A479-316 Hastelloy C ASTM B574-N10276
11	Chevron Style Ring	2 or 3	1/2"-2"—2 TFE + 1 Carbon filled TFE or Grafoil 3"-8"—3 TFE or 2 Grafoil
12	Follower T or G	1	Stainless Steel ASTM A479-316L or 316
14	Gland Plate	1	Stainless Steel ASTM A743-CF8M Carbon Steel
15	Gland Bolt	2	Stainless Steel ASTM A193-GR.B8 Alloy 20 for Chlorine Line (ASTM B473S20)
16	Belleville Washer	12	Stainless Steel ASTM A666, Full Hard Carbon Steel AISI C1075
17	Handle (1/2"-2" Only)	1	Ductile Iron ASTM A536, Zinc Plated, Epoxy Coated
18	Handle Set Screw (1/2"-2" Only)	2	Alloy Steel
19	Split Ring (1/2"-2" Only)	1	Hastelloy C ASTM B574-N10276 Stainless Steel ASTM A479-316L
20	Stop (3"-8" Only)	1	Carbon Steel ASTM A366, Zinc Plated
22	Wrench Block (3"-8" Only)	1	Malleable Iron ASTM A47, Black Oxide Coated
23	Hex Head Bolt	1	Carbon Steel SAE J429 GR.2
24	Wrench Extension (3"-8" Only)	1	Carbon Steel ASTM A53
25	End Plug Screw (3"-8")	4-8	Stainless Steel AISI 303, Zinc Plated
26	Name Plate	1	Stainless Steel Grade 304
27	1/8" Plug	1	Stainless Steel 300 Series



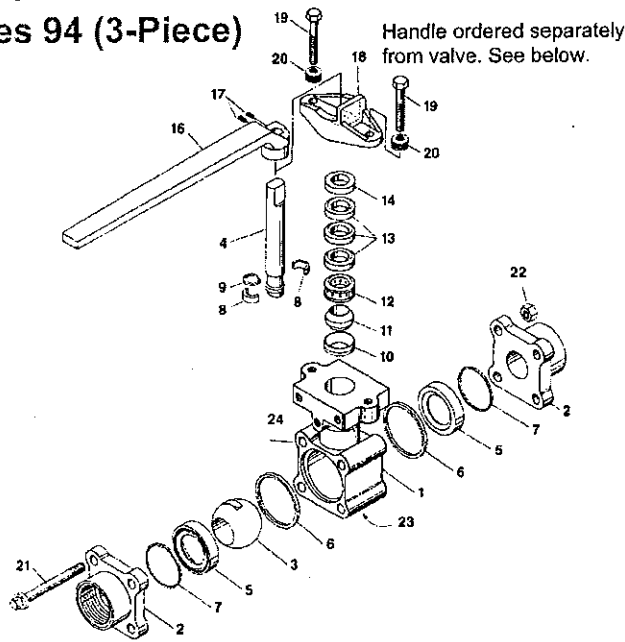
Handle ordered separately from valve. See back page.



Handle ordered separately from valve. See back page.

PARTS IDENTIFICATION AND MATERIALS OF CONSTRUCTION

Series 94 (3-Piece)



Part No.	Part Name	Qty. per Valve	Materials
1	Body	1	Stainless Steel ASTM A351-CF3M, Carbon Steel ASTM A216-WCB, Black Oxide Coated
2	Pipe End	2	Stainless Steel ASTM A351-CF3M, Carbon Steel ASTM A105 or A216-WCB, Black Oxide Coated
3	Ball	1	Stainless Steel, Hastelloy C ASTM B574-N10276
4	Stem	1	Stainless Steel ASTM A479-316 or Hastelloy C, ASTM B574-N10276
5	Seat	2	TFE, Reinforced TFE, Polyfill, High-per Fill, UHMWPE, Metal "A" & Metal "G"
6	Body Seal	2	Viton, TFE, Stainless Steel AISI 316 (TFE or Graphite Coated)
7	Seat Seal	2	Graphite (Metal "A" and "G" Only)
8	Split Ring	1	Hastelloy C ASTM B574-N10276 or Stainless Steel ASTM A479-316L
9	Thrustbearing	1	Celazole® PBI (1/4"-3/4" & 1"-2" with G, X or U seats), Polyfill (1"-2")
10	Filler Ring	1	TFE or Grafoil (1 Solid Ring)
11	629 Seal	1	TFE or Grafoil (1 Solid Ring)
12	Lantern Ring	1	Stainless Steel ASTM A479-316L Hastelloy C ASTM B574-N10276
13	Chevron Style Ring	2 or 3	2 TFE + 1 Carbon Filled TFE or 2 Grafoil
14	Follower T or G	1	Stainless Steel ASTM A479-316L or 316
16	Handle	1	Ductile Iron ASTM A536, Zinc Plated, Epoxy Coated
17	Set Screw	2	Alloy Steel
18	Gland Plate	1	Stainless Steel ASTM A743-CF8M Carbon Steel
19	Gland Bolt	2	Stainless Steel ASTM A193-GR B8 Alloy 20 ASTM B473 S20 for CL94
20	Belleville Washer	12	Stainless Steel ASTM A666 Full Hard Carbon Steel AISI C1075
21	Body Bolt	4	Stainless Steel ASTM A193-GR B8 Carbon Steel ASTM A193 GR B7 and 2H
22	Body Nut	4	Stainless Steel ASTM A194-GR 8 Carbon Steel ASTM A193 GR B7 and 2H
23	Name Plate	1	Stainless Steel Grade 304
24	1/8" Plug	1	Stainless Steel 300 Series

HOW TO ORDER:

VALVES: Sample Ordering Code: 2" 9466GGSW would be a 2" Series 94 valve with stainless steel body, pipe ends, ball and stem. It would have graphite impregnated stainless steel seats and graphite coated stainless steel "S" gasket body seals. Pipe ends would be socket weld.

HANDLES: Operating handles are ordered separately. If ordering a 2" 94 valve, order a 2" HK94 handle. Please specify on the order whether you wish the handle mounted at the factory or shipped separately. Example: 2" HK94 handle - factory mounted.

SERIES 94 150/300/600 FLANGED (600# 1"-2" ONLY)

Valve Size	Series	Body	Ball, Stem	Seats	Body Seal	End Connection
1/2" 3/4" 1" 1 1/2" 2" 3" 4" 6" 8"***	94	4 - Carbon Steel 6 - CF8M Stainless Steel	6 - 316 S.S. C - Hastelloy C	A - Metal "A" w/S.S. ball and stem G* - Metal "G" w/S.S. ball and stem X - High-per Fill T** - TFE P** - Polyfill R** - Reinforced TFE U - UHMWPE	M - TFE coated S.S. "S" gasket (1"-2" only) G - Graphite coated S.S. "S" gasket (1"-2" only) Z** - Grafoil (3"-8" only) T** - TFE V - Viton	150 - ANSI 150# Flanges 300 - ANSI 300# Flanges 600 - ANSI 600# Flanges
1/2" 3/4" 1" 1 1/2" 2" 3" 4"	CL94	4 - Carbon Steel	C - Hastelloy C	R - Reinforced TFE	T - TFE	150 - ANSI 150# Flanges 300 - ANSI 300# Flanges

*Available in Sizes 1/2" - 6" only.

**8" available only in these options

SERIES 94 3-PIECE

Valve Size	Series	Body, Pipe Ends	Ball, Stem	Seats	Body Seals	End Connection
1/4" - 2"	94 - 3-piece	4 - WCB or A105 Carbon Steel 6 - CF3M Stainless Steel	6 - 316 S.S. C - Hastelloy C	A† - Metal "A" w/S.S. ball and stem G - Metal "G" w/S.S. ball and stem X - High-per Fill T - TFE P - Polyfill R - Reinforced TFE U - UHMWPE	M† - TFE coated S.S. "S" gasket G - Graphite coated S.S. "S" gasket T - TFE V - Viton	SE - Screwed End SW - Socket Weld BW4 - Butt Weld, schedule 40 BW8 - Butt weld (C.S.), schedule 80 BW1 - Butt Weld (S.S. only), schedule 10
1/2" - 2"	CL94	4 - Carbon Steel WCB or A105	C - Hastelloy C	T - TFE (1 piece seat/seal)		SE - Screwed End SW - Socket Weld

†AM seat/seal combination with SE only.

Prefixes: V - for vacuum service, TFE, reinforced TFE and polyfill seats only

X - for oxygen service, TFE, reinforced TFE and polyfill seats only

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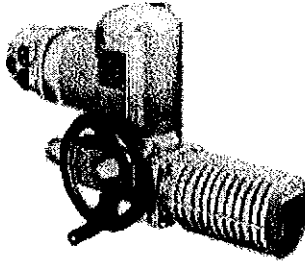
AUMA ELECTRICAL ACTUATOR

Part-turn actuators **SGR 03.3 - SGR 05.3** and **SGR 05.1 - SGR 12.1**

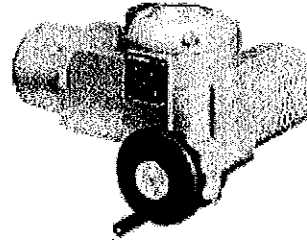
Part-turn actuators SGR .3 and SGR .1 are rated for **intermittent duty S4 - 25%**. Special versions are also available for **S4 - 50 %** and **S5 - 25 %**.

The actuators can be combined with different controls from the simple OPEN-CLOSE controls to the micro-controlled version with logging of operating data or fieldbus interface.

The only exception is the SGR 05.3 which is only available with the SIMPACT controls.



SGR 05.1 - SGR 12.1



SGR 03.3 - SGR 05.3

Design features:

- Torque range from 100 Nm to 1,200 Nm
- Modulating torque range from 100 Nm to 400 Nm
- Max. number of starts 600 c/h
- Swing angles from 80° to 110°
- Operating times for 90 ° from 16 s to 50 s
- Limit and torque seating
- 3-ph AC motors
- Handwheel for manual operation
- Mechanical position indicator
- Torque range from 32 Nm to 125 Nm
- Modulating torque range from 16 Nm to 63 Nm
- Max. number of starts 1200 c/h
- Swing angle from 82 ° to 98 °
- Operating times for 90 ° from 8 s to 63 s
- 3-ph AC, 1-ph AC and DC motors
- Handwheel for manual operation
- Mechanical position indicator

Ambient conditions:

- High enclosure protection
- High quality corrosion protection
- Wide ambient temperature range
- High enclosure protection
- High quality corrosion protection
- Wide ambient temperature range

Options:

- Deviating swing angle
- Intermediate position switches
- Switch in tandem version
- Remote position transmitter
- Magnetic limit and torque transmitter
- Mechanical position indicator
- integral controls SIMPACT for:
 - Switching off (limit and torque seating)
 - adjustable operating times
 - Inputs 24 VDC
 - Intermediate position switches (Standard for SGR 05.3)

Interfaces:

- Electrical connections via AUMA plug/ socket connector (optionally terminals)
- Cable glands in different versions
- Output drive types according to ISO standard
- Electrical connection via AUMA plug/ socket connector
- Cable glands in different versions
- Output drive types according to ISO standard

Technical data AUMA part-turn actuators for modulating duty with 3-phase AC motors

SGR 05.1 – SGR 12.1 AUMA NORM

Type	Operating time for 90° in seconds		Torque range ¹⁾		Modulating torque ²⁾	Number of starts	Valve attachment		Valve shaft			Handwheel		approx. kg ³⁾
	50 Hz	60 Hz	min. Nm	max. Nm			Standard EN ISO 5211	Option EN ISO 5211	Cylindrical max. mm	Square max. mm	Two-flat max. mm	Ø mm	Turns for 90°	
SGR 05.1	16	12	100	150	50	600	F 05	F 07	25,4	22	22	160	58	18
	22	18												
	32	25												
SGR 07.1	16	12	120	300	100	600	F 07	F 10	25,4	22	22	160	58	18
	22	18												
	32	25												
SGR 10.1	22	18	250	600	200	600	F 10	F 12	38	30	27	160	107	24
	32	25												
	45	35												
	63	50												
SGR 12.1	32	25	500	1,200	400	600	F 12	F 14	50	36	41	160	110	28
	45	35		840	400									
	63	50		1,200	400									

General information

Part-turn actuators AUMA NORM require external controls. AUMA offers actuator controls AUMA Matic AM or AUMatic AC. These can also easily be mounted to the actuator at a later date.

Features and functions

Type of duty ⁴⁾	Intermittent duty S4 - 25 %
Motors	3-ph AC asynchronous motor, type IM B9 according to IEC 34
Insulation class	F, tropicalized
Motor protection	Standard: Thermoswitches (NC) Option: PTC thermistors (according to DIN 44082)
Self-locking	yes
Swing angle	Standard: 80° to 110° adjustable between min. and max. value. Options: 30°– 40°, 40°– 55°, 55°– 80°, 110° – 160°, 160°– 230° or 230°– 320°
Limit switching	Counter gear mechanism for end positions OPEN and CLOSED Standard: Single switch (1 NC and 1 NO) for each end position: Options: Tandem switch (2 NC and 2 NO) for each end position, switches galvanically isolated Triple switch (3 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching), available for any intermediate position
Torque switching	Adjustable torque switching for direction OPEN and CLOSE Standard: Single switch (1 NC and 1 NO) for each direction Options: Tandem switch (2 NC and 2 NO) for each direction, switches galvanically isolated
Non-intrusive setting (option)	Magnetic limit and torque transmitter MWG (only possible in combination with actuator controls AUMatic)
Position feedback signal, analogue (options)	Potentiometer or 0/4 – 20 mA (RWG) For further details see separate data sheet
Torque feedback signal, analogue (option)	Only in combination with magnetic limit and torque transmitter MWG and controls AUMatic
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Running indication (option)	Blinker transmitter
Heater in switch compartment	Standard: self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC Options: 24 – 48 V AC/DC or 380 – 400 V AC A resistance type heater (5 W, 24 V DC) is installed in the actuator in combination with the actuator controls AM or AC.
Motor heater (option)	12.5 W
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electric operation. Option: Handwheel lockable
Electrical connection	Plug/socket connector with screw type connection
Threads for cable glands	Standard: Metric thread Options: Pg thread, NPT thread, G thread
Terminal plan	KMS TP 100/001 (basic version)
Splined coupling for connection to the valve shaft	Standard: Coupling without bore Options: Machined coupling with bore and keyway, square bore or bore with two-flats according to EN ISO 5211

1) Tripping torque adjustable for both directions

2) Permissible average torque for modulating

3) Weight for part-turn actuator AUMA NORM with 3-phase AC motor, standard electrical connection, coupling and handwheel

4) For nominal voltage and 20 °C ambient temperature and at average modulating torque load

We reserve the right to alter data according to improvements made. Previous data sheets become invalid with the issue of this data sheet.

auma®

Issue **1.05**

**SGR 05.1 – SGR 12.1
AUMA NORM**

**Technical data AUMA part-turn actuators for modulating duty
with 3-phase AC motors**

Valve attachment Dimensions according to EN ISO 5211

Service conditions

Enclosure protection according to EN 60 529 Standard: IP 67
Options: IP 68
IP 67-DS (Double Sealed)
IP 68-DS (Double Sealed)
(Double Sealed: terminal compartment additionally sealed against interior)

Corrosion protection Standard: KN Suitable for installation in industrial units, in water- or power plants with a low pollutant concentration⁵⁾
Options: KS Suitable for installation in occasionally or permanently aggressive atmosphere with a moderate pollutant concentration (e.g. in waste-water treatment plants, chemical industry)
KX Suitable for installation in extremely aggressive atmosphere with high humidity and high pollutant concentration

Finish coating Standard: two-component iron-mica combination

Standard colour Standard: silver-grey (DB 701, similar to RAL 9007)
Option: Other colours are possible on request

Ambient temperature Standard: - 25 °C to + 60 °C
Options: - 40 °C to + 60 °C (low temperature)

Lifetime ⁶⁾	Type	Modulating steps in millions min.	Number of starts per hour, based on S4 - 25 %, for an expected lifetime of a minimum of operation hours		
			5,000 h	10,000 h	20,000 h
	SGR 05.1	2.5	600	300	150
	SGR 07.1	2.5	600	300	150
	SGR 10.1	2.5	600	300	150
	SGR 12.1	2.5	600	300	150

Other information

EC directives Electromagnetic Compatibility (EMC): (89/336/EEC)
Low Voltage Directive: (73/23/EEC)
Machinery Directive: (98/37/EC)

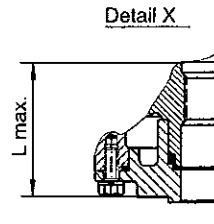
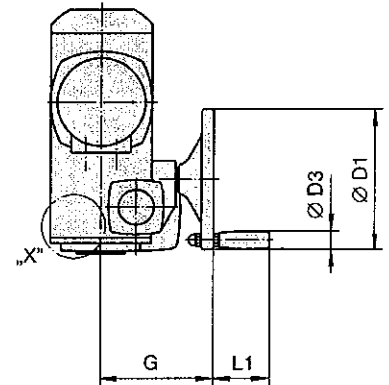
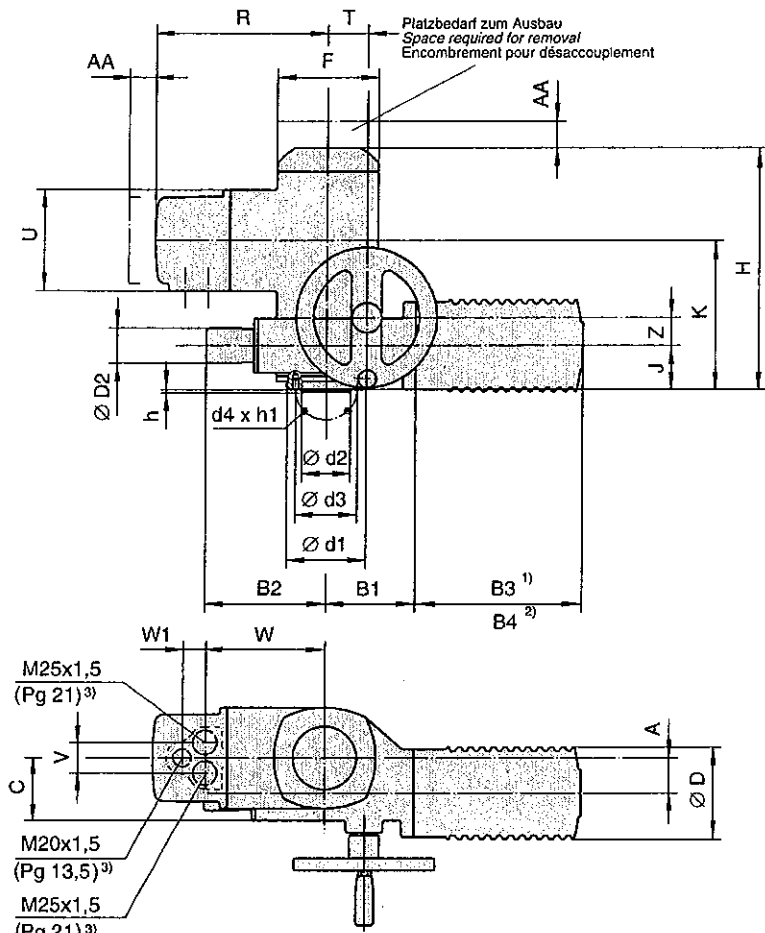
Reference documents Product description "Electric part-turn actuators SG"
Dimension sheets SG
Electrical data SGR

5) If occasionally or permanently exposed to aggressive substances, we recommend a higher corrosion protection KS or KX.
6) The lifetime in operation hours (h) depends on the load and the number of starts. A high starting frequency will rarely improve the modulating accuracy. To reach the longest possible maintenance and fault-free operation time, the number of starts per hour should be chosen as low as permissible for the process

We reserve the right to alter data according to improvements made. Previous data sheets become invalid with the issue of this data sheet.

Maße AUMA Schwenkantriebe
Dimensions AUMA part-turn actuators
Dimensions servo-moteurs à fraction de tour AUMA

SG 05.1 - SG 12.1
SGR 05.1 - SGR 12.1



Armaturenanschluss nach EN ISO 5211
 Maße der Kupplungen siehe Folgeseite

Valve attachment according to EN ISO 5211
 Dimensions of couplings see next page

Forme d'accouplement suivant EN ISO 5211
 Dimensions de la douille voir page suivante

- 1) Drehstrommotor / 3ph AC-motor / moteur triphasé
- 2) Wechselstrom-Spezialmotor und Gleichstrommotor (beide für Regelanwendungen SGR nicht geeignet!)
 1ph AC-motor and DC-motor (both for modulating purposes SGR not suitable!)
 moteur spécial monophasé et moteur CC (non appropriés pour services de régulation SGR!)
- 3) Stahlpanzerrohrgewinde nur auf Bestellung / steel conduit threads only if ordered / filetage pour tube blindé uniquement sur commande

Maße dimensions	EN ISO 5211	A	B1	B2	B3 ¹⁾	B4 ²⁾	C	ØD	ØD1	ØD2	ØD3	F	G	H	J	K	L max.	L1
SG 05.1 SGR 05.1	F 05	40	101	137	190	274	71	105	160	40	20	115	128	275	50	170	60	63
SG 07.1 SGR 07.1	F 07																	
SG 10.1 SGR 10.1	F 10	63	111	172	190	274	94	105	160	40	20	150	153	291	56	170	80	63
SG 12.1 SGR 12.1	F 12	80	111	172	190	274	111	105	160	40	20	150	170	313	70	192	100	63

Maße dimensions	R	T	U	V	W	W1	Z	AA min.	Ød1	Ød2 f8	Ød3	d4	h	h1
SG 05.1 SGR 05.1	195	45	115	35	135	26	32	30	90	-	50	M6	-	9,5
SG 07.1 SGR 07.1										55	70	M8	3	13
SG 10.1 SGR 10.1	205	55	115	35	145	26	32	30	125	70	102	M10	3	17
SG 12.1 SGR 12.1	205	55	115	35	145	26	32	30	150	85	125	M12	3	20

Durch die Weiterentwicklung bedingte Änderungen bleiben vorbehalten. Mit Erscheinen dieses Datenblattes verlieren frühere Ausgaben ihre Gültigkeit.
 We reserve the right to alter data according to improvements made. Previous data sheets become invalid with the issue of this data sheet.
 Nous nous réservons le droit de modifier les valeurs, qui sont conditionnées par le perfectionnement. Les fiches techniques antérieures perdent la validité avec l'édition de cette fiche technique.

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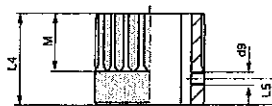
Ausgabe
 Issue
 Edition
1.04

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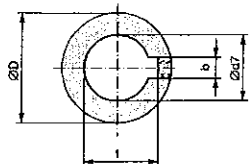
SG 05.1 - SG 12.1
SGR 05.1 - SGR 12.1

Maße Kupplung
Dimensions coupling
Dimensions accouplement

Bohrung nach EN ISO 5211
mit Nut nach DIN 6885 T1
*Bore acc. to EN ISO 5211
with keyway
acc. to DIN 6885 part 1*



Alésage suivant EN ISO 5211
avec rainure
suivant DIN 6885 partie 1

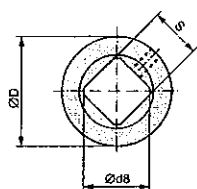
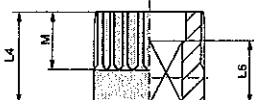


Type	SG 05.1 SGR 05.1	SG 07.1 SGR 07.1	SG 10.1 SGR 10.1	SG 12.1 SGR 12.1
EN ISO 5211	F05	F07	F10	F12
Ø D	41,75		51,75	67,6
b JS9 ¹⁾	6		8	10
Ø d7 H8 ²⁾	18	22	28	36
Ø d7 max.	25,4		38	50
d9 ³⁾	M5		M6	M6
L 4	40		65	75
L 5 ³⁾	8		10	18
M	20		35	40
t ¹⁾	20,8	24,8	31,3	39,3

Innenvierkant nach EN ISO 5211

*Square bore
acc. to EN ISO 5211*

*Carré femelle
suivant EN ISO 5211*

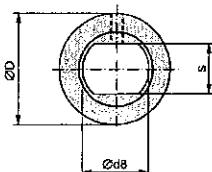
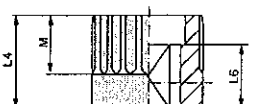


Ø D	41,75		51,75	67,6
Ø d8 min. ²⁾	18,1	22,2	28,2	36,2
Ø d8 max.	28,2		40,2 ⁴⁾	48,2
L 4	40		65	75
L 6 min.	30		30	30
M	20		35	40
s H11 ²⁾	14	17	22	27
s H11 max.	22		30 ⁴⁾	36

Innenzweiflach nach EN ISO 5211

*Bore with two-flats
acc. to EN ISO 5211*

*Méplat
suivant EN ISO 5211*

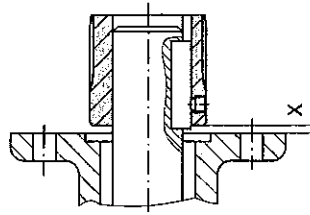
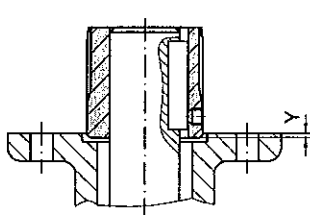


Ø D	41,75		51,75	67,6
Ø d8 min. ²⁾	18,1	22,2	28,2	36,2
Ø d8 max.	28,2		36,2	48 ⁵⁾
L 4	40		65	75
L 6 min.	25		25	40
M	20		35	40
s H11 ²⁾	14	17	22	27
s H11 max.	22		27	41 ⁵⁾

Montageposition der Kupplung

Mounting position of coupling

*Position de montage de
l'accouplement*



X max.	9		15	25
Y max.	—		9	—

1) Maße abhängig von Ø d7, siehe DIN 6885 T1

2) empfohlene Größe nach EN ISO 5211

3) Gewinde mit Gewindestift

4) nach DIN 79

5) nach DIN 475

1) Dimensions dépendant de Ø d7, voir DIN 6885 partie 1

2) Taille recommandée suivant projet EN ISO 5211

3) Filetage avec goupille

4) suivant DIN 79

5) suivant DIN 475

1) Dimensions depend on Ø d7, refer to DIN 6885 part 1

2) recommended size according to EN ISO 5211

3) Thread and grub screw

4) according to DIN 79

5) according to DIN 475

Durch die Weiterentwicklung bedingte Änderungen bleiben vorbehalten. Mit Erscheinen dieses Datenblattes verlieren frühere Ausgaben ihre Gültigkeit.

We reserve the right to alter data according to improvements made. Previous data sheets become invalid with the issue of this data sheet.

Nous nous réservons le droit de modifier les valeurs, qui sont conditionnées par le perfectionnement. Les fiches techniques antérieures perdent la validité avec l'édition de cette fiche technique.

Ausgabe
Issue **1.04**
Edition

Y000.251/001/de-en-fr

auma®



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

BALL VALVE (FOR INSTRUMENT ISOLATION)

MANUFACTURER : APOLLO
MODEL : 76-103-57
SERVICE : INSTRUMENT ISOLATION
CONNECTION : 1/2" (13 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SEAL : PTFE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 3 (1 PER GENERATOR)
CUSTOMER TAG NO. : HV-O112B / HV-O132B / HV-O152B



Fuji Electric Corporation of America

Date : 1/13/06
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Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE GENERATION SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

FLOW CONTROL SYSTEM

The oxygen gas flow rate to be controlled by Flow Control Valve that located downstream of the ozone generator.

The flow control valves and thermal mass flowmeters work together to control the flow rate of oxygen gas (or ozone/oxygen gas mixture) to the contactors. The flow rate is between 14.1 scfm and 141 scfm (0.372 Nm³/min. and 3.72 Nm³/min.).

Earth Tech (Canada) Inc.	
Reviewed for general compliance with design intent. Responsibility for details remains in the shop drawings readings etc.	
Reviewed for field correction of field errors. Responsibility for details remains at contractors. Responsibility for completion of all details remains with the contractor.	✓
REVIEWED	_____
REVIEWED AS MODIFIED	_____
REVIEW AND RE-INSTALL	_____
NOT REVIEWED	_____
Project No.	79538-C14-16
Date: 24/1/06	By: <i>[Signature]</i>



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

WINNIPEG WATER TREATMENT PROGRAM

MANITOBA, CANADA

FLOW CONTROL SYSTEM

MOTORIZED BALL VALVE

VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES 2801
STYLE : FLANGED END FULL PORT BALL VALVE
SERVICE : OZONE/OXYGEN GAS MIXTURE

MATERIAL OF CONSTRUCTION

BODY : TYPE 316 S.S.
STEM : TYPE 316 S.S.
BALL : TYPE 316 S.S.
SEAT : PTFE
PRESSURE RATING : 275 PSIG (1.90 MPa)
OPERATION : OPEN / CLOSE WITH ELECTRIC ACTUATOR
CONNECTION : 2" (50 mm) 150# FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 2

ACTUATOR

MANUFACTURER : ROTORK
TYPE : Q SERIES 100 ON/OFF ELECTRIC ACTUATOR WITH Q-PAK
ENCLOSURE : NEMA 4
ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
QUANTITY : 2
CUSTOMER TAG NO. : FV-O201A / FV-O202A



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Date : 1/13/06
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Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

**REFER TO VOLUME 1
TAB # 2D**

**FOR
CONTROMATICS BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

**REFER TO VOLUME 1
TAB # 4D**

**FOR
ROTORK ACTUATOR**



Fuji Electric Corporation of America

Date : 1/13/06
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

BALL VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES 2801
STYLE : FLANGED END FULL PORT BALL VALVE
SERVICE : OZONE/OXYGEN GAS MIXTURE
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
STEM : TYPE 316 S.S.
BALL : TYPE 316 S.S.
SEAT : PTFE
PRESSURE RATING : 275 PSIG (1.90 MPa)
OPERATION : OPEN / CLOSE WITH HANDLE PIPE
CONNECTION : 2" (50 mm) 150# FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 2
CUSTOMER TAG NO. : HV-O200A / HV-O203A



Fuji Electric Corporation of America

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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

**REFER TO VOLUME 1
TAB # 2D**

**FOR
CONTROMATICS BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

FLOW CONTROL SYSTEM

FLOW INDICATOR / TRANSMITTER (THERMAL MASS)

PRONGS IBB Flowmeter

MANUFACTURER : FCI
 MODEL (INSTRUMENT) : FLEXMASSTER
 TYPE (FLOW ELEMENT) : ST98L INLINE FLOWMETER
 SERVICE : OZONE/OXYGEN GAS MIXTURE
 FLOW RANGE : 14.1 ~ 141 SCFM (0.372 ~ 3.72 Nm³/min)
 OUTPUT : 4 ~ 20 mA
 ACCURACY : ± 0.5% FULL SCALE
 TERMINAL BOX : NEMA 4X
 OPERATING PRESSURE : 12 ~ 15 PSIG (82.7 ~ 103.4 kPa)
 CONNECTION : 1 1/2" (38 mm) NPT
 MATERIALS (WETTED) : ALL WELDED 316L S.S.
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
 CALIBRATE FOR 1 1/2" (38 mm) PIPE SIZE
 ELECTRICAL SUPPLY : 120 VAC / 1 PHASE / 60 Hz
 QUANTITY : 6 (3 PER CONTACTOR)
 CUSTOMER TAG NO. : FT-O216A / FT-O217A / FT-O218A
 FT-O236A / FT-O237A / FT-O238A

NOTE:

INSERTION FLOW ELEMENT IS THREADED AND KEYED IN AN INLINE FLOW TUBE;
CALIBRATED AND SUPPLIED AS A UNIT.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, quantities, masses, and integrations of components, and coordination of all joints of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

Date: _____

By: _____

79538-C14-16

6/2/06

By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

**REFER TO VOLUME 1
TAB # 4J**

**FOR
FCI FLOWMETER**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

FLOW CONTROL SYSTEM

FLOW CONTROL VALVE

*Provides LIMITORQUE OR ROSSER
ACTUATOR*

VALVE

MANUFACTURER : WORCESTER
 TYPE : SERIES 94-150 FLANGED
 STYLE : HIGH PERFORMANCE BALL VALVE
 SERVICE : OZONE/OXYGEN GAS MIXTURE
 MATERIAL OF CONSTRUCTION
 BODY : STAINLESS STEEL
 STEM : TYPE 316 S.S.
 BALL : TYPE 316 S.S.
 SEAT : TFE
 PRESSURE RATING : 150 PSIG (1.03 MPa)
 FLOW RATE : 14.1 ~ 141 SCFM (0.372 ~ 3.72 Nm³/min)
 OPERATION : MODULATING VALVE OPERATION WITH ELECTRIC
 ACTUATOR

CONNECTION : 1-1/2" (38 mm) ANSI 150# RF FLANGE
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
 QUANTITY : 6 (3 PER CONTACTOR)

ACTUATOR

MANUFACTURER : AUMA
 TYPE : SGR SERIES WITH CURRENT POSITION TRANSMITTER
 MODEL : SGR 05.1
 SIGNAL : 4 ~ 20 mA
 ENCLOSURE : NEMA 4X
 ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
 QUANTITY : 6 (3 ER CONTACTOR)

CUSTOMER TAG NO. : FCV-O216A / FCV-O217A / FCV-O218A
 FCV-O236A / FCV-O237A / FCV-O238A

Earth Tech (Canada) Inc.

Reviewed for general performance with the intent,
Responsibility and authority thereon are that
of the reviewer.

Reviewed for compliance with the condition of field
directed by the project manager. The reviewer is
constrained to review the work of the field
staff of the project and is not a contractor.

REVIEWED _____

REVIEWED AS NOTED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-10

Date: 6/2/06

By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

FLOW CONTROL SYSTEM

**REFER TO VOLUME 1
TAB # 4K**

**FOR
WORCESTER FLOW CONTROL
VALVE AND ROTORK ACTUATOR**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

COOLING WATER SUPPLY SYSTEM

a Substantial amount of heat is produced during generation of the ozone gas from the oxygen gas. Fuji Electric proprietary MicroGap™ technology provides “Dual Enhanced Cooling Water System” to permit the production of ozone at very high efficiency via the efficient removal of heat produced.

The open loop cooling water system provides the cooling water for the closed loop ^{de-ionized (DI)} cooling water system. (The open loop cooling water temperature to be between 36° F ~ 79° F (2° C ~ 26° C)) The cooling water (plant water) passes through the plate type heat exchanger to absorb the heat, then it discharges back to the main line. The required amount of plant water for the cooling the ozone generator is 213.3 gmp (807 L/min) and PSU is 34.9 gpm (132 L/min).

The requisite instrumentation ^{is} included in the system to provide the monitoring of Pressure, Temperature and Flow Rate at various stages ^{of the process.}

All piping ~~which to be~~ used in the cooling water line ^{should be} is Schedule 10 stainless steel.

clarify this sentence

Earth Tech (Canada) Inc.	
Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.	
Responsibility for verification and correlation of field dimensions, installation process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.	
REVIEWED	_____
REVIEWED AS MODIFIED	_____
REVISE AND RE-SUBMIT	_____ ✓
NOT REVIEWED	_____
Project No.	71538-C14-16
Date: 24/1/06	By: <i>[Signature]</i>



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

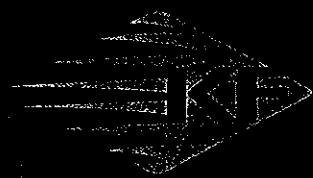
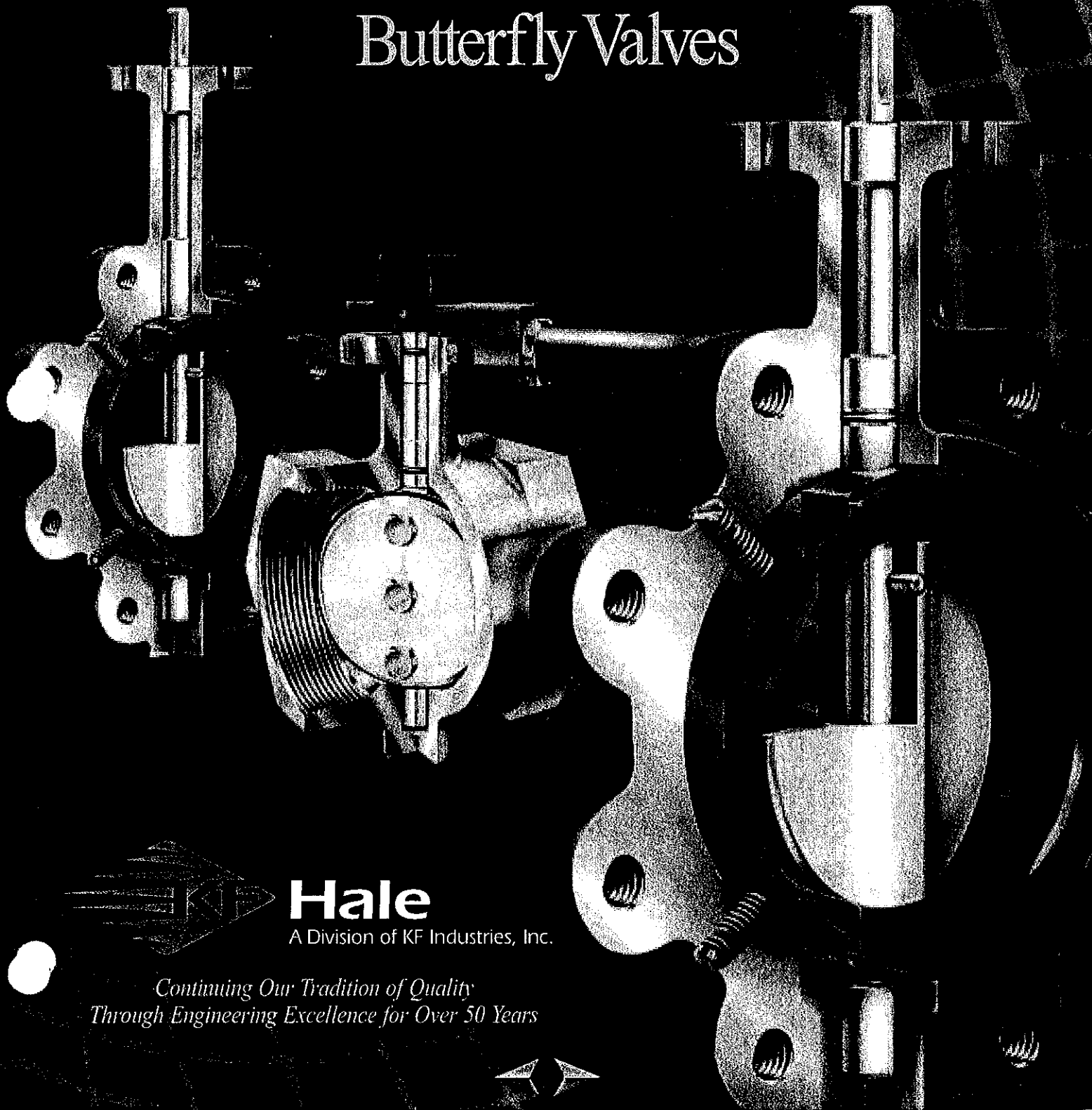
COOLING WATER SUPPLY SYSTEM

BUTTERFLY VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES BG
STYLE : RESILIENT SEATED WAFER STYLE BUTTERFLY VALVE
MODEL NO. : BG-030 0 4 1 3 2 1 5
SERVICE : PLANT WATER / CLOSED LOOP DI COOLING WATER
MATERIAL OF CONSTRUCTION
BODY : CAST IRON
DISC : TYPE 316 S.S
SHAFT : TYPE 316 S.S.
SEAT : EPDM
PRESSURE RATING : 200 PSIG (1.38 MPa)
OPERATION : LEVER, 10 POSITION LOCKING
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
PIPE SIZE : 3" (75 mm)
QUANTITY : 21 (7 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : HV-O410A / HV-O410C / HV-O410E
HV-O111A / HV-O411A / HV-O411C / HV-O411E
HV-O420A / HV-O420C / HV-O420E
HV-O131A / HV-O421A / HV-O421C / HV-O421E
HV-O430A / HV-O430C / HV-O430E
HV-O151A / HV-O431A / HV-O431C / HV-O431E

KF Hale Series BG & BD Resilient Seat Lug and Wafer Style, and Series 2200 Body Style Butterfly Valves



Hale
A Division of KF Industries, Inc.

*Continuing Our Tradition of Quality
Through Engineering Excellence for Over 50 Years*



Series BG Resilient Seat Butterfly Valve

The Series BG resilient seated butterfly valve is available in sizes 2" thru 24", wafer or lug style body design. These Butterfly Valves were designed to meet the stringent requirements for HVAC, Oil & Gas, and Industrial applications, or wherever positive shut-off is required for liquids, gases and slurries.

Incorporating 200 psi pressure rating for 2" thru 12" and 150 psi pressure rating for 14" thru 24"*; the Series BG is constructed of a Cast Iron Body, Ductile Iron Disc and 416 Stainless Steel Shaft; optional materials are available to meet your specific application needs. The Series BG Butterfly Valve is rated bubble-tight in vacuum service to one inch of Mercury Absolute (29 inches of Mercury Vacuum).

The Series BG Lug Style Butterfly Valves are suitable for *Dead End Service* at maximum pressure ratings by securing the phenolic backed seat with four screws that anchor the seat to the body. The phenolic back prevents the seat from collapsing or dislodging and is easily replaced in the field. Available seat materials include Buna N, Viton A[®], and EPDM. In addition to the above features, the Series BG mounting pad design can easily accommodate a gear operator, electric or pneumatic actuator.

The BG butterfly valves are designed and manufactured for use with ANSI 125 or 150 Class flanges and to comply with API 609 (except for the 16", 20" face-to-face dimension). All valves are seat tested at 110% of rated pressure. Compliant to Coast Guard 46CFR Subpart 56.20 Category B.

Nameplate

Nameplate is permanently attached to body providing disc, seat, and shaft material specifications for quick reference.

Pinned Disc

Disc is attached to shaft by pins which minimizes flow turbulence, resulting in higher CV ratings.

Dead End Service

All BG Lug Style Valves are suitable for Bi-Directional Dead End Service at full rated pressure.

Disc

Disc edge is machined and polished 360° to assure leak-proof positive shut-off while minimizing operating torque.

Phenolic Backed Seat

Provides additional support making it non-collapsible. Secured between body and flange making seat replacement simple and fast. No flange gaskets are needed. 360° sealing protects components from media and provides primary shaft seal. Available in EPDM, Viton[®] and Buna N.

Mounting Pad

Designed for easy adaptation of pneumatic or electric actuators, gear operators and handles.

Body

Available in Full Lug and Wafer style. For use between ANSI 125 and 150 flanges. Face-to-Face dimensions of 2" - 14" valves comply with API 609 and MSS SP67. Valves are designed to accommodate 2" of insulation. Standard material is ASTM A126 Cast Iron.

PTFE Bushings (2" - 12")

Stem design utilizes Fiberglass reinforced bushings to provide maximum stem support, centralized alignment of the stem, and reduced operating torque.

Bronze Bushings (14" - 24")

Shaft design utilizes Bronze bushings which provides for maximum shaft support and centralized alignment of one-piece shaft.

Shaft Seal

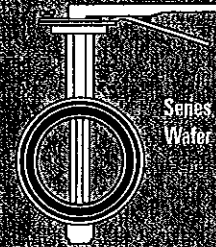
The bi-directional shaft seal prevents external contamination of stem area while providing back-up for the primary shaft seal formed by the disc/seat interface.

One-Piece Shaft

The one-piece shaft design delivers positive disc-to-seat location while offering maximum strength. 416 Stainless Steel is standard with Aluminum Bronze, Ductile Iron and 14" - 24" Stainless Steel discs. 316 Stainless Steel shaft is standard with Stainless Steel disc (2" - 12" only).



Series BG-03
Lug Style

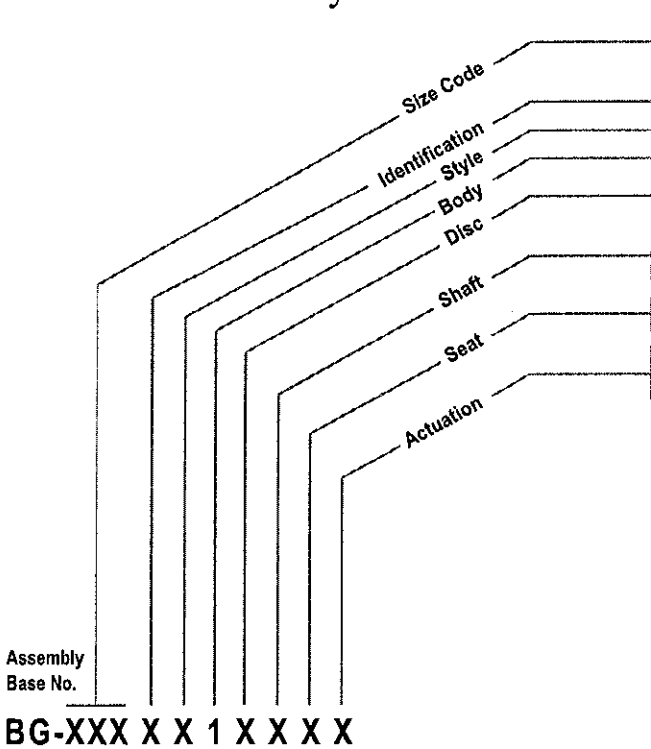


Series BG-04
Wafer Style



*Consult factory for larger sizes.

Series BG Assembly Part Numbers



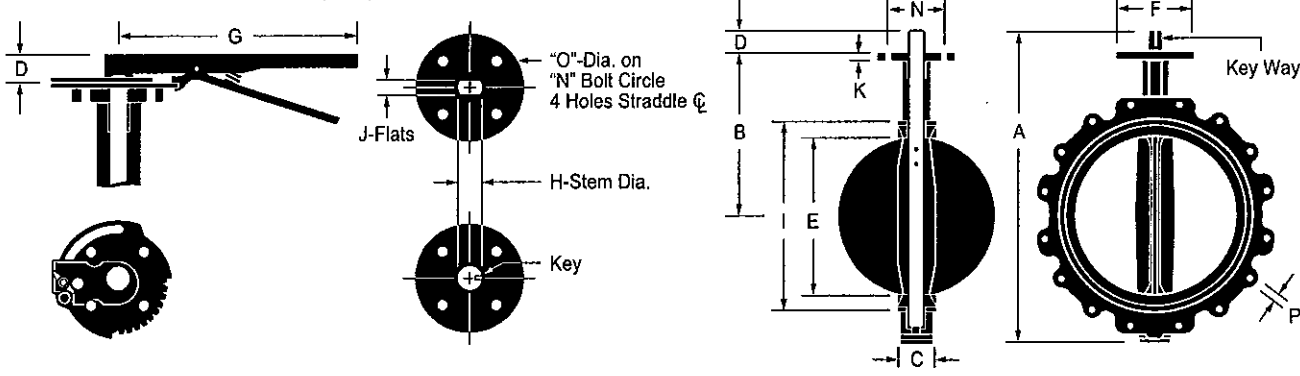
- 020 • 2" 050 • 5" 120 • 12" 220 • 20"
 - 025 • 2 1/2" 060 • 6" 140 • 14" 240 • 24"
 - 030 • 3" 080 • 8" 160 • 16"
 - 040 • 4" 100 • 10" 180 • 18"
- 0 • KF
 - 3 • Full Lug 4 • Wafer Style
 - 1 • Cast Iron (A126)
 - 1 • Ductile Iron w/ENP 3 • 316 Stainless Steel
 - 2 • Aluminum Bronze
 - 1 • 416 Stainless Steel (Std. w/Ductile Disc, Alum. Bronze Disc, and 14"-24" 316 SS Disc)
 - 2 • 316 Stainless Steel (STD w/ 2"-12" 316 SS Disc)
 - 1 • EPDM** 3 • Viton GF® (2" thru 12" only)
 - 2 • Buna N 5 • Viton A®
 - 3 • Gear Operator w/Handwheel 6 • Infinite Throttling*
 - 4 • Buried Service Gear Oper. w/2" Sq. Nut 9 • Less Handle
 - 5 • Standard Handle (10-position locking)* A • For Actuation

*We recommend handle only be used thru 8" valve size for liquid or rated pressure service.
 10"-12" valves with handles should only be used on gas and low pressure applications.
 **NOTE: Do not use EPDM when hydrocarbons are present.

Part Name	Materials
Body	Cast Iron ASTM-A126 D. B.
Disc	Ductile Iron w/ENP ASTM A536 65-45-12, Aluminum Bronze ASTM B148 C954, Stainless Steel ASTM A351 CF8M
Shaft	416 Stainless Steel ASTM A582, 316 Stainless Steel* (2"-12" only) ASTM A276
Shaft Bearings	Fiberglass Reinforced PTFE (2" - 12") Lubenzed Bronze (14" - 24")
Seat	EPDM** (-10°F to +225°F), Buna N (-10°F to +180°F) Viton A® (-10°F to +275°F)

*For 316 Stainless Steel Disc Models. **Note: Do not use EPDM when hydrocarbons are present.

Dimensional Data (in.)



Size (in.)	A	B	C*	D	Disc Chord Length at Face E	F	G	Stem Dia. H	I	Stem Flats J	Pad Thickness K	Mounting Flange Bolt Circle N	Hole Dia. O	Bolt Circle	No. Holes	Bolt P	Key Way
2	10.75	6.34	1.66	1.26	1.26	3.03	10.5	.50	3.94	.349	0.50	2.25	.264	4.75	4	5/8"-11 UNC x 1 1/4"	-
2 1/2	11.65	6.89	1.76	1.26	1.83	3.03	10.5	.50	4.72	.349	0.50	2.25	.264	5.5	4	5/8"-11 UNC x 1 1/2"	-
3	12.12	7.13	1.78	1.26	2.54	3.03	10.5	.50	5.00	.349	0.80	2.25	.264	6.00	4	5/8"-11 UNC x 1 1/2"	-
4	13.62	7.87	2.05	1.26	3.56	3.62	10.5	.625	6.14	.437	0.50	2.75	.406	7.50	8	5/8"-11 UNC x 1 3/4"	-
5	14.85	8.39	2.14	1.26	4.36	3.62	10.5	.75	7.48	.500	0.50	2.75	.406	8.5	8	3/4"-10 UNC x 1 3/4"	-
6	15.63	8.9	2.19	1.26	5.72	3.62	10.5	.75	8.35	.500	0.80	2.75	.406	9.5	8	3/4"-10 UNC x 2"	-
8	18.90	10.24	2.39	1.77	7.61	4.53	14	.875	10.55	.625	0.80	3.50	.562	11.75	8	3/4"-10 UNC x 2"	-
10	21.26	11.5	2.58	1.77	9.52	4.53	14	1.12	12.80	.812	0.70	3.5	.562	14.25	12	7/8"-9 UNC x 2 1/4"	-
12	24.57	13.27	3.03	1.77	11.48	5.51	14	1.25	15.87	-	0.80	4.25	.562	17.00	12	7/8"-9 UNC x 2 1/2"	.25 x 1.00**
14	26.77	14.49	3.01	1.77	12.79	5.51	-	1.25	17.17	-	0.80	4.25	.562	18.75	12	1"-8 UNC x 2 3/4"	.25 x 1.00**
16	29.94	15.75	3.41	2.02	14.98	7.76	-	1.30	19.21	-	0.80	6.25	.811	21.25	16	1"-8 UNC x 2 3/4"	.31 x 1.57
18	31.55	16.61	4.16	2.02	16.96	7.76	-	1.50	21.22	-	0.80	6.25	.811	22.75	16	1 1/8"-7 UNC x 3 1/2"	.37 x 1.81
20	35.65	18.90	5.19	2.53	18.64	7.76	-	1.62	23.35	-	1.00	6.25	.811	25.00	20	1 1/8"-7 UNC x 4"	.37 x 1.81
24	42.97	22.13	5.98	2.76	22.55	10.87	-	2.00	32.13	-	1.00	8.50	.874	29.50	20	1 1/4"-7 UNC x 4 3/4"	.50 x 2.36

*Installed: Approximately 1/8" wider when relaxed. **Woodruff Key



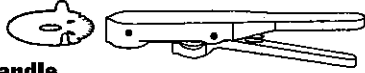
KF reserves the right to change designs, materials or specifications without notice or without obligation to furnish or install such changes on products previously or subsequently sold.

Series BG

Series BG & BD Methods of Operation

Actuation

We can provide easy and cost effective automation with a variety of pneumatic and electric actuators. Consult factory for more information.

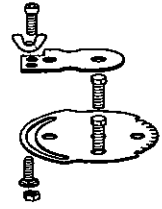


Standard Handle

Size (in.)	Model No.	Part No.
2-3	HDL-1	3921-020011
4	HDL-2	3921-040011
5 & 6	HDL-3	3921-050011
8	HDL-4	3921-080011
10	HDL-5	3921-100011
12	HDL-6*	3921-122011

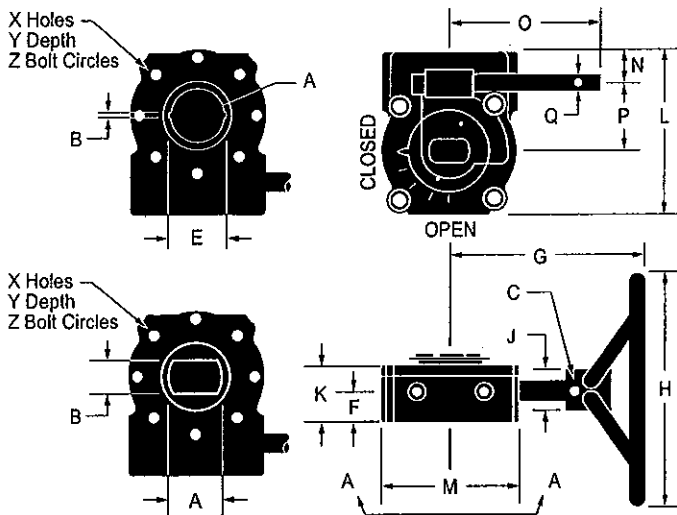
Throttle/Lock Handle

Infinite position with memory stop and locking device.



Size (in.)	Model No.	Part No.
2-3	THDL-1	3921-020021
4	THDL-2	3921-040021
5 & 6	THDL-3	3921-050021
8	THDL-4	3921-080021
10	THDL-5	3921-100021
12	THDL-6	3921-122021

Gear Operators Dimensional Data (in.)



Material Specification

Part Name	Material
Case	Gray Iron
O-Ring (2), Seg. Gear	Buna N
Worm Pin	Steel
Worm Gear	Steel
Segment Gear	Ductile Iron
Bolting	Steel
Indicator	Steel
Input Shaft	Steel
Cover	Gray Iron
Cover Gasket	Paper
Hand Wheel	Gray Iron
Handwheel Pin (Solid)	Steel

NOTE: Bored Service and additional options are available upon request.

Model No.	Part No.	Application Size (in.)	Weight (lbs.)	Ratio*	A	B	C	E	F	G	H	J	K
GA1-M4	0897021	2-3	10	24:1	.510	.353/.356	5/32	-	1 7/16	6 3/8	8	1 3/8	2 11/16
GA2-M4	0897022	4	10	24:1	.632	.439/.442	5/32	-	1 7/16	6 3/8	8	1 3/8	2 11/16
GA3-M4	0897023	5 & 6	10	24:1	.757	.502/.505	5/32	-	1 7/16	6 3/8	6	1 3/8	2 11/16
GA4-M4	0897024	8	27 1/2	30:1	.880	.628/.631	3/16	-	1 3/4	9 3/8	12	1 3/4	2 29/32
GA5-M4	0897025	10	27 1/2	30:1	1.128	.813/.816	3/16	-	1 3/4	9 3/8	12	1 3/4	2 29/32
GA6-M4	0897026	12 & 14	33	50:1	1.290/1.255	.951/.953	3/16	1.484	2	9 3/8	12	1 3/4	2 91/64
GA7-M4	0897027	16	70 1/2	80:1	1.395/1.310	.314/.318	3/8	1.598	2 1/2	9 5/8	16	1 3/4	4 11/64
GA8-M4	0897028	18	70 1/2	80:1	1.497/1.502	.378/.380	3/8	1.838	2 1/2	9 5/8	16	1 3/4	4 11/64
GA9-M4	0897029	20	70 1/2	80:1	1.621/1.626	.378/.380	3/8	1.968	2 1/2	9 5/8	16	1 3/4	4 11/64
GA10-M4	0897030	24	80	80:1	-	-	-	-	2	13	24	-	4.5

Model No.	Part No.	Application Size (in.)	Weight (lbs.)	Ratio*	L	M	N	D	P	Q	V	Y	Z
GA1-M4	0897021	2-3	10	24:1	5	4 9/64	1 1/32	8 1/16	2 5/8	.622	1/4-20	5/8	2 1/4
GA2-M4	0897022	4	10	24:1	5	4 9/64	1 1/32	11 1/2	2 5/8	.622	3/8-16	5/8	2 3/4
GA3-M4	0897023	5 & 6	10	24:1	5	4 9/64	1 1/32	11 1/2	2 5/8	.622	3/8-16	5/8	2 3/4
GA4-M4	0897024	8	27 1/2	30:1	.811/32	6 7/32	1 15/32	11 9/16	2 5/8	.748	1/2-13	7/8	3 1/2
GA5-M4	0897025	10	27 1/2	30:1	.831/32	6 7/32	1 15/32	11 9/16	2 5/8	.748	1/2-13	7/8	3 1/2
GA6-M4	0897026	12 & 14	33	50:1	.751/64	6 3/8	1 1/2	12	3	.748	1/2-13	7/8	4 1/4
GA7-M4	0897027	16	70 1/2	80:1	11 27/64	9 17/32	1 37/64	10	4 3/8	.984	3/4-10	1 1/8	6 1/4
GA8-M4	0897028	18	70 1/2	80:1	11 27/64	9 17/32	1 37/64	10	4 3/8	.984	3/4-10	1 1/8	6 1/4
GA9-M4	0897029	20	70 1/2	80:1	11 27/64	9 17/32	1 37/64	10	4 3/8	.984	3/4-10	1 1/8	6 1/4
GA10-M4	0897030	24	80	80:1	12.6	9.1	-	-	-	-	-	-	-

KF reserves the right to change designs, materials or specifications without notice or without obligation to furnish or install such changes on products previously or subsequently sold.

Series BG & BD Engineering Data

Flow Coefficient (Cv) & Operating Torque

Size (in.)	Seating Torque* (Normal Conditions)		Cv Rating (Full Open)
	Wet	Dry	
2	134	214	115
2 1/2	162	289	196
3	204	387	302
4	352	844	600
5	548	959	1,022
6	907	1,542	1,579
8	1,897	2,919	3,136
10	2,857	4,857	5,340
12	4,338	7,071	8,250
14	4,870	7,305	11,917
16	6,685	10,027	16,388
18	8,958	13,437	21,785
20	11,950	17,925	27,908
24	18,880	28,020	43,116

Normal is defined as ≤ 200 psi shut-off or line pressure and ≤ 16 fps flow rate. With a flow rate greater than 16 fps the customer must consider both Dynamic Torque and Downstream pipe erosion (due to cavitation). Please consult factory for your application requirements.

Operating torque

* Seating torques are based on new, clean operating conditions at full rated pressure. No safety factor is included. The actual torque may exceed these when the temperature approaches the material limit, there is mild disc corrosion, there are minor chemical affects (such as swelling) to the elastomer, or the valve is not cycled every day. When any of these conditions exist, please consult the factory.

Method of calculating flow

Liquid Flow

$$Q_L = C_v \sqrt{\frac{\Delta P}{g}}$$

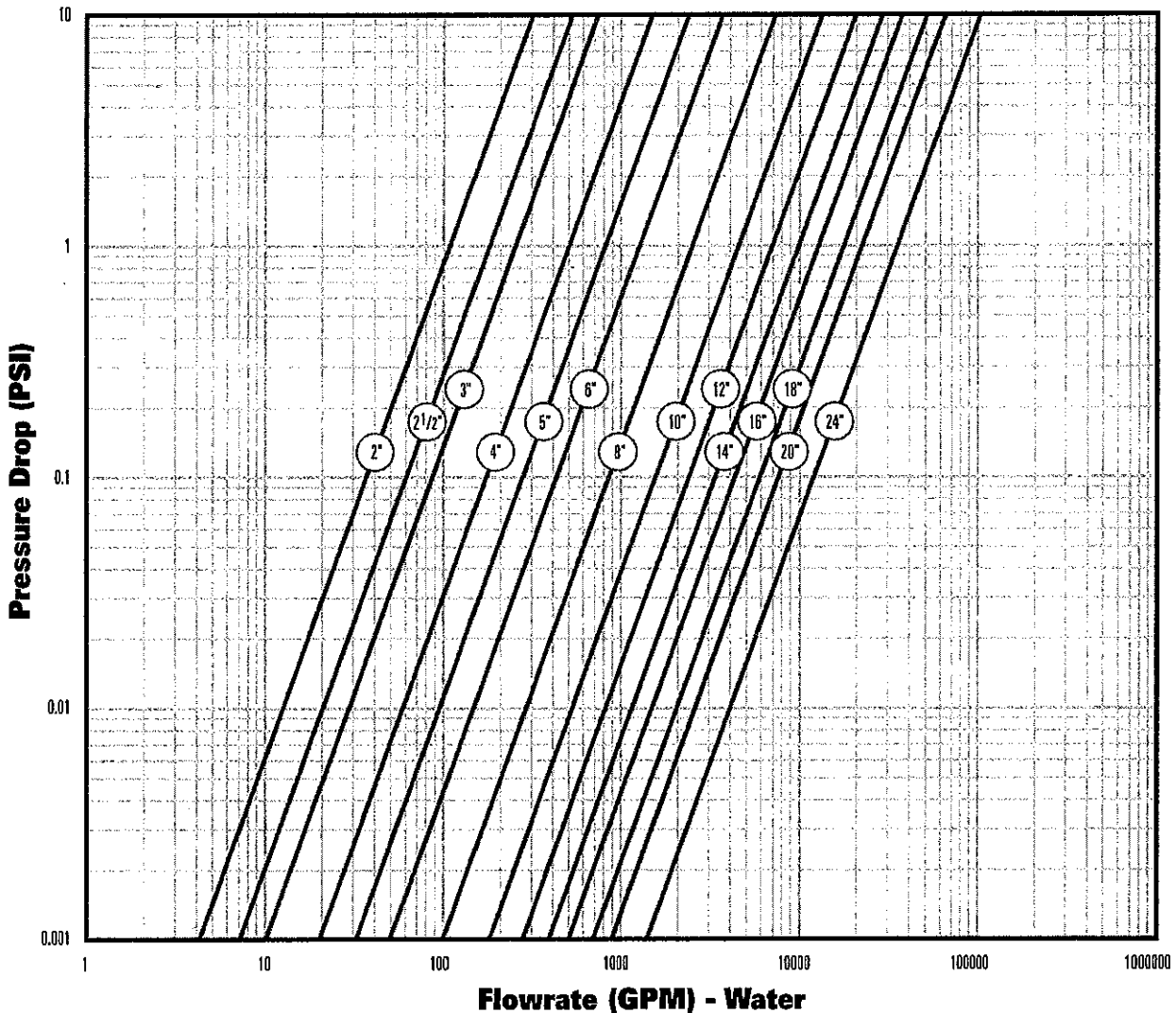
Q_L = flow rate of liquid (gal./min.)
 ΔP = differential pressure across the valve (psi)
 g = specific gravity of liquid: water = 1.000

Gas Flow

For non-critical flow ($\frac{\Delta P}{P_2} < 1.0$)

$$Q_g = 61 C_v \sqrt{\frac{P_2 \Delta P}{g}}$$

Q_g = flow rate of gas (CFH at STP)
 P_2 = outlet pressure (psia)
 g = specific gravity of gas: air = 1.000



KF reserves the right to change designs, materials or specifications without notice or without obligation to furnish or install such changes on products previously or subsequently sold.





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

MOTORIZED BUTTERFLY VALVE

VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES BG
STYLE : RESILIENT SEATED WAFER STYLE BUTTERFLY VALVE
MODEL NO. : BG-030 0 4 1 3 2 1 5
SERVICE : PLANT WATER / CLOSED LOOP DI COOLING WATER

MATERIAL OF CONSTRUCTION

BODY : CAST IRON
SHAFT : TYPE 316 S.S.
DISC : TYPE 316 S.S.
SEAT : EPDM
PRESSURE RATING : 200 PSIG (1.38 MPa)
OPERATION : OPEN / CLOSE WITH ELECTRIC ACTUATOR
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
PIPE SIZE : 3" (75 mm)
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)

ACTUATOR

MANUFACTURER : ROTORK
TYPE : Q SERIES 100 ON/OFF ELECTRIC ACTUATOR
WITH Q-PAK
ENCLOSURE : NEMA 4
ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
QUANTITY : 6 (2 PER COOLING WATER/GENERATOR SKID)
TAG NO. :

CUSTOMER TAG NO. : FV-O410A / FV-O420A / FV-O430A
FV-O111A / FV-O421A / FV-O431A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 6A**

**FOR
CONTROMATICS BUTTERFLY
VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 4D**

**FOR
ROTORK ACTUATOR**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

PRESSURE INDICATOR

MANUFACTURER : ASHCROFT
MODEL : DURAGAUGE
TYPE : 1279
MODEL NO. : 45 1279 RS 02L 0/400 kPa
SERVICE : PLANT WATER / CLOSED LOOP DI COOLING WATER
RANGE : 0 ~ 60 PSIG (0 ~ 400 kPa)
MATERIAL : TYPE 316 S.S.
CONNECTION : 1/4" (6.35 mm) NPT
QUANTITY : 12 (4 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : PI-O410A / PI-O410B / PI-O411A / PI-O113A
PI-O420A / PI-O420B / PI-O421A / PI-O133A
PI-O430A / PI-O430B / PI-O431A / PI-O153A

NOTE:

PRESSURE INDICATORS; PI-O411A, PI-O421A AND PI-O431A WITH PULSATION
~~DAMPENER~~ DAMPENER

Earth Tech (Canada) Inc.

Reviewed for general performance with due intent.
Responsibility for detailed design in the shop drawings rests with the contractor.

Responsibility for verification of compliance of all field work with the approved design rests with the contractor. The contractor shall ensure that all parts of the work are in accordance with the design.

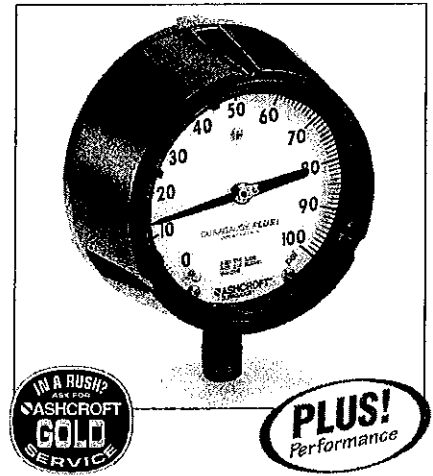
- REVIEWED _____
- REVIEWED AS NOTED ✓ _____
- REVIEWED AND RE-DESIGNED _____
- NOT REVIEWED _____

Project No. 79538-C14-16
Date: 6/2/06 By: M. Paulsen

- 4½" full-size bourdon tube
- Patented Duratube™ with as-welded-tube construction controls stress for longer life
- "Round Cap Tip" construction lowers stresses for longer life
- Easily adjustable, self-locking micrometer pointer
- Burn-resistant phenol turret case
- Exclusive Teflon coated 400 series stainless steel rotary movement for longer life
- New PLUS!™ Performance Option:
 - Liquid-filled performance in a dry gauge
 - Fights vibration and pulsations without liquid-filled headaches

- See pages 6-7 for details
- Order as option XLL
- Epoxy-coated system for superior corrosion resistance

Type 1279 Duragauge® pressure gauge is offered in 4½" phenolic case for superior chemical and heat resistance. Solid-front case design with blow-out back for safety. Dry, liquid-filled, hermetically sealed, weatherproof or **PLUS!** options available. Field convertible to liquid-fill with conversion kit (detailed on page 243). All case styles provide full temperature compensation.



BOURDON SYSTEM SELECTION

Ordering Code	Bourdon Tube & Tip Material ⁽¹⁾ (all joints TIG welded except "A")	Socket Material	Tube Type	Range Selection Limits (psi)	NPT Conn. ⁽²⁾
A	Phosphor Bronze Tube-Brass Tip, Silver Brazed	Brass	C-Tube	12/1000	¼, ½
R	316L stainless steel	1019 steel	C-Tube	12/1500	¼, ½
			Helical	2000/20,000	¼, ½
S	316L stainless steel	316L stainless steel	C-Tube	12/1500	¼, ½
			Helical	2000/20,000	¼, ½
P ⁽³⁾	K Monel	Monel 400	C-Tube	15/1500	¼, ½
			Helical	2000/30,000	¼, ½ ⁽⁴⁾

(1) For selection of the correct bourdon system material, see the media application table on page 243.
 (2) Other connections available on application.
 (3) Use for applications where NACE standard MR-01-75 is specified.
 (4) 30,000 psi range supplied with ¼ high pressure connection, ½ NPT optional.

STANDARD RANGES

Pressure psi	Compound psi
0/15	30 in.Hg/15 psi
0/30	30 in.Hg/30 psi
0/60	30 in.Hg/60 psi
0/100	30 in.Hg/100 psi
0/160	30 in.Hg/150 psi
0/200	30 in.Hg/300 psi
0/300	
0/400	Vacuum
0/600	30/0 in.Hg
0/800	34/0 ftH ₂ O
0/1000	
0/1500	
0/2000	
0/3000	
0/5000	
0/10,000	
0/20,000	
0/30,000	

NOTE:
Equivalent standard kg/cm², and kPa metric ranges are available.

TO ORDER THIS 1279 DURAGAUGE:

Select: 45 1279 SS* 04L XXX 2000#

1. Dial size—4½" _____

2. Case type—1279 _____
Ring-threaded reinforced polypropylene

3. Bourdon system selection ordering code _____

4. Connection—¼ NPT (02), ½ NPT (04), Lower (L), Back (B) _____

5. Optional features—see page 239 _____

6. Standard pressure range _____

7. Accessories—see pages 233-238 _____

(* "S" denotes solid front case design)

Earth Tech (Canada) Inc.

Reviewed for general correctness with due intent.
Responsibility for the accuracy in the shop drawings
rests with the contractor.

Responsible for the accuracy of the information of field
directors and the accuracy of the design of
construction. The contractor is responsible for all
parts of the work as shown on the drawings.

REVIEWED _____

REVIEWED AND APPROVED _____

REVIEWED AND RE-SUBMIT _____

NOT REVIEWED _____

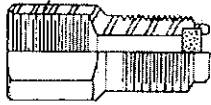
Project No. _____

Date: 22/1/06

By: M. P. [Signature]

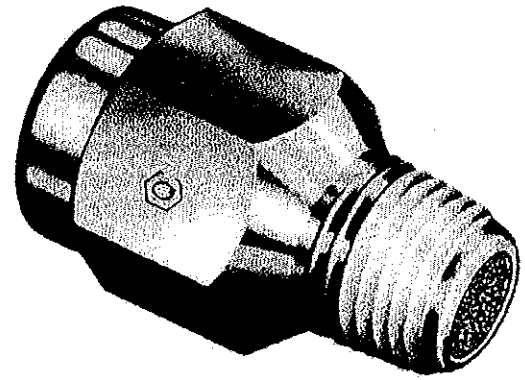
79538-C14716

- 1/4" NPT
- HEX. SIZE: 1/2" (3/8" FOR 12A)
- LENGTH: 1.1" (1 1/4" FOR 12A)



- Cat. No.** **Housing Material**
 12A Aluminum (anodized)
 12B Brass
 12S Stainless Steel (303)

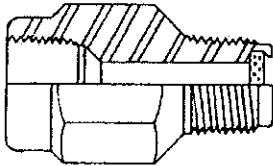
316 S.S. HEX COMPILES TO THE FOLLOWING SPECIFICATIONS
 ASTM-A276, ASTM-A182 OR
 QQ-S-763
 MONEL HEX. COMPILES TO
 QQ-N-281 (FEDERAL)
 SPECIFICATION



engineering data

STANDARD CHEMIQUIP INDUSTRIAL POROUS METAL PRESSURE SNUBBERS

- 1/4" NPT
- HEX. SIZE: 3/8"
- LENGTH: 1 1/2"



- Cat. No.** **Housing Material**
 25B Brass
 25S Stainless Steel (303)
 25M Monel
 25S6 Stainless Steel (316)

RECOMMENDED POROSITIES:

Type of Service	Porosity Designation	Approx. Micron Rating
Highly Viscous Fluids (over 500 S.S.U.)	C	75
Oil (225 S.S.U. to 500 S.S.U.)	D	40-45
Water and Light Oils (30 to 225 S.S.U.)	E	10
Vapor and Low Viscosity Fluids (under 30 S.S.U.)	F	7
Air or other Gases	G	2-5
Pulsating Gas	HX	1
Extreme Gas Pulsation	HXX	1/2

STANDARD MATERIALS OF CONSTRUCTION:

Housings: Brass, Stainless Steel (303,316), Monel, Aluminum
Porous Discs: Type 316 Stainless Steel or Monel (available with Monel Housings)

Note: Intermediate Porosities Available on Special Order
 Special discs to repel water are also available and also smaller micron ratings.

MAXIMUM PRESSURE RATINGS (psi):

Catalog No.	12	25	50
Size (Ports)	1/2" NPTF	1/2" NPTF	1/2" NPTF
Brass	3,000	10,000	10,000
Stainless Steel	5,000	15,000	15,000
Monel	—	15,000	15,000
Aluminum	3,000	—	—
316 Stainless Steel	5,000	15,000	15,000

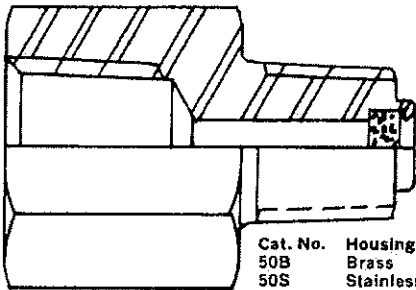
Effective Area .027 sq. in. .05 sq. in. .05 sq. in.

Add suffix to Catalog Number to indicate desired Porosity (e.g. 12AE)

STANDARD DIMENSIONS

Scale 1:1

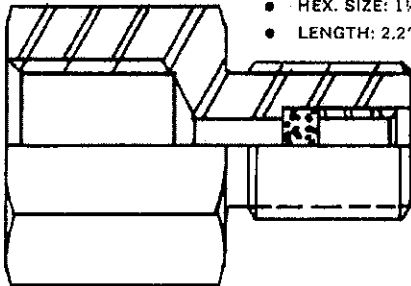
- 1/2" NPT
- HEX. SIZE: 1 1/4"
- LENGTH: 2.2"



- Cat. No.** **Housing Material**
 50B Brass
 50S Stainless Steel (303)
 50M Monel
 50S6 Stainless Steel (316)

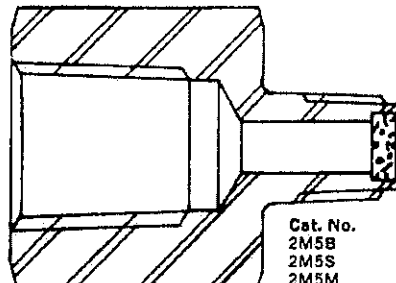
1/2" 14 NPS for High Pressure Service

- HEX. SIZE: 1 1/4"
- LENGTH: 2.2"



- Cat. No.** **Housing Material**
 50SS Stainless Steel (303)

- 1/2" 14 NPT Female x 1/4" NPT Male
- HEX. SIZE: 1 1/4"
- LENGTH: 2.2"



- Cat. No.** **Housing Material**
 2M5B Brass
 2M5S Stainless Steel (303)
 2M5M Monel

NOTE: CHEMIQUIP SNUBBERS are available in other shapes, sizes, threads and materials on special order. Prices quoted on application.

FOREIGN THREADS
 ISO Standard
 British Pipe
 Metric



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

TEMPERATURE TRANSMITTER

MANUFACTURER : FOXBORO
SERVICE : PLANT WATER / CLOSED LOOP DI COOLING WATER

TRANSMITTER

TYPE : I/A SERIES INTELLIGENT TEMPERATURE
TRANSMITTER, RTT20
MODEL NO. : RTT20-I1LGQCA
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 12 ~ 42 VDC
TEMPERATURE LIMIT : -40 ~ 185° F (-40 ~ 85° C)

ELEMENT

SENSOR : RTD, PLATINUM, 100 Ω
THERMOWELL : W-PTS-A16
MATERIAL : TYPE 316 S.S.
LENGTH : U = 3" (76 mm), C = 5.5" (140 mm) BY USING THREDOLET
CONNECTION : 1/2" (13 mm) NPT
MOUNTING PIPE SIZE : 3" (75 mm) S.S. PIPE
QUANTITY : 6 (2 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : TT-O410A / TT-O410B
TT-O411A / TT-O411B
TT-O420A / TT-O420B
TT-O421A / TT-O421B
TT-O430A / TT-O430B
TT-O431A / TT-O431B

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions to design and accuracy of construction rests with the Contractor.

REVIEWED

REVIEWED AS NOTIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 24/1/06 By: M. Falco



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 4F**

**FOR
FOXBORO TEMPERATURE
TRANSMITTER/ELEMENT**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

FLOW INDICATOR / TRANSMITTER

Provide ROSSMOUNT MAG.

MANUFACTURER : YAMATAKE
 TYPE : MAGNEW TWO-WIRE PLUS, ELECTROMAGNETIC FLOWMETER
 MODEL NO. : MTG18A-080P21LSDAAAH2
 STYLE : WAFER STYLE
 SERVICE : PLANT WATER
 PIPE SIZE : 3" (75 mm) STAINLESS STEEL PIPE
 DISPLAY : LCD, MAIN DISPLAY: 7-SEGMENT, 8 DIGITS
 ENCLOSURE : NEMA 4X

MATERIAL OF CONSTRUCTION

ELECTRODE : TYPE 316L STAINLESS STEEL
 GROUNDING RING : TYPE 316 STAINLESS STEEL
 FLOW RATE RANGE : 0 ~ 300 GPM (0 ~ 1,136 L/min)
 OUTPUT : 4 ~ 20 mA
 POWER : 21.05 ~ 42 VDC
 QUANTITY : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
 3 (1 PER COOLING WATER GENERATOR SKID)
 CUSTOMER TAG NO. : FT-O410A / FT-O420A / FT-O430A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for accuracy and correlation of field dimensions, layout, and construction of construction, including the installation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MONITORED _____

REVISE AND RE-SUBMIT _____ ✓

NOT REVIEWED _____ ✗

Project No. 79538-C14-16

Date: 24/1/06

By: [Signature]

MagneW Two-wire PLUS

Smart Two-wire Electromagnetic Flowmeter

Model MTG18A (Integral type)
Model MTG14C/MTG18B (Remote type)

OVERVIEW

The MagneW Two-wire PLUS is a high performance electromagnetic flowmeter based on field proven Yamatake two-wire loop powered technology. The MagneW Two-wire PLUS offers the stable and accurate measurement of a traditional magflow meter with low power consumption. The result is a lower overall cost of ownership.

FEATURES

Two-wire operation

MagneW Two-wire PLUS significantly reduces installation costs when compared to a traditional four wired magnetic flowmeter.

High accuracy and stable output

MagneW Two-wire PLUS provides high accuracy ($\pm 0.5\%$ of rate) and its output is as stable as current four wired magnetic flowmeters.

Minimum measurable fluid conductivity

The MagneW Two-wire PLUS offers a minimum process fluid conductivity of $10\mu\text{S}/\text{cm}$ which is the best among two-wire magflow meters thereby maximizing applicability.

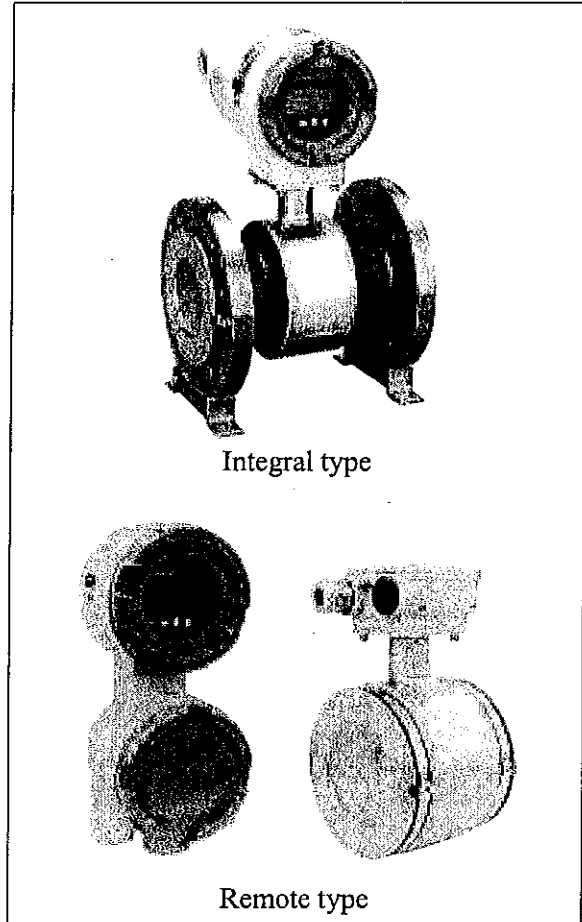
Wider range in size

MagneW Two-wire PLUS offers wider range in detector size.

Detector size: 2.5 to 200 mm.

Wafer and flange style, integral and remote style available

The MagneW Two-wire PLUS is available integral or remote, flanged or wafer, making the selection of the right meter for the application simple.



Integral type

Remote type

APPLICATIONS

- Corrosive liquid measurement
- Chemical solution measurement
- Drainage/waste disposal fluid measurement
- Drinking water and waste water service
- Industrial/agricultural water measurement
- Seawater measurement

FUNCTIONAL SPECIFICATIONS

Enclosure rating

NEMA TYPE 4X, IEC IP67

Hazardous Areas certifications

Integral type

FM approval

<for Division 1>

- Class I, Division 1, Groups A, B, C & D, T4;
- Class II, Division 1, Groups E, F & G, T4;
- Class III, T4, $-20^{\circ}\text{C} \leq \text{Tamb}^* \leq +60^{\circ}\text{C}$

<for Division 2>

Nonincendive for

- Class I, Division 2, Groups A, B, C & D, T4;
- Class II, Division 2, Groups F & G, T4;
- Class III, T4; Class I, Zone 2, Group IIC, T4,
- $-20^{\circ}\text{C} \leq \text{Tamb}^* \leq +60^{\circ}\text{C}$

*Tamb = Ambient Temperature

CSA certification

<for Division 1>

- Class I, Division 1, Groups A, B, C & D, T4;
- Class II, Division 1, Groups E, F & G, T4;
- Class III, T4, $-20^{\circ}\text{C} \leq \text{Tamb} \leq +60^{\circ}\text{C}$

<for Division 2>

- Class I, Division 2, Groups A, B, C, & D, T4;
- Class II, Division 2, Groups E, F & G, T4;
- Class III, T4, $-20^{\circ}\text{C} \leq \text{Tamb}^* \leq +60^{\circ}\text{C}$

*Tamb = Ambient Temperature

Remote type

FM approval

<for Division 2>

Nonincendive for

- Class I, Division 2, Groups A, B, C & D, T4;
- Class II, Division 2, Groups F & G, T4;
- Class III, T4; Class I, Zone 2, Group IIC, T4,
- $-20^{\circ}\text{C} \leq \text{Tamb}^* \leq +60^{\circ}\text{C}$

*Tamb = Ambient Temperature

CSA certification

<for Division 2>

- Class I, Division 2, Groups A, B, C & D, T4;
- Class II, Division 2, Groups E, F & G, T4;
- Class III, T4, $-20^{\circ}\text{C} \leq \text{Tamb}^* \leq +60^{\circ}\text{C}$

*Tamb = Ambient Temperature

Output signal

Analog output

4 to 20 mA DC

Digital output

DE

Analog or Digital output is selectable.

Pulse output

Open collector output (30V DC, 100 mA max.)

Pulse frequency: 0.0001 to 200 Hz

Pulse width: 1 ms to 1 s

Voltage drop during transistor ON : 1.6 Vmax.

Contact output

Open collector output (30V DC, 100 mA max.)

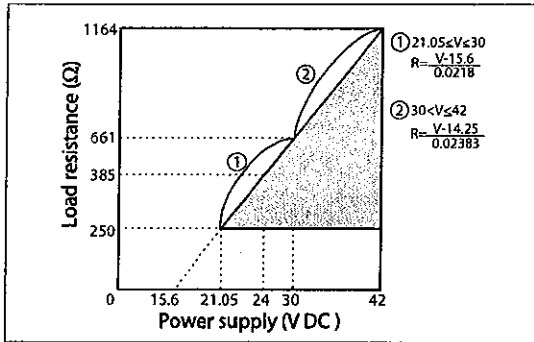
Pulse or contact output is selectable

Communication protocol

SFC communication and HART communication

Load resistance characteristic of communication

External power supply 21.05 to 42V DC for communication.



Note) The load resistance of 250 Ω or more is necessary for communications of SFC and the HART communicator.

Flow unit

Volume flow: m³, L, cm³, G (gallon), mG, kG, B (barrel), IG (imperial gallon), mIG, kIG

Mass flow: t, kg, g, lb

Time: d, h, min, s

Display

Display: LCD

Main display: 7-segment, 8 digits

Sub display: 16 digits, 2 lines

Display contents:

Simultaneously displays % flow rate, Actual flow rate (eng. unit) and Totalized value.

Data setting

Operation by four key switches

Damping

Adjustable between 0.5 and 199.9 seconds.

Low flow cutoff

Adjustable between 0 and 10% of setting range.

Below selected value, output is driven to the zero flow rate signal level.

Dropout

Adjustable between 0 and 10% of setting range.

Below selected value, pulse output is cut.

Empty pipe detection

Detect empty pipe condition by monitoring flow rate signal. Once the flow rate signal fluctuates over a certain threshold, the device judges that the detector is empty. When the detector is empty, the analog output (4 to 20mA output) and pulse output are set to zero flow values. The display alternately shows zero value and "Empty Status".

There are three threshold levels to meet an environment where the device is installed. Set an appropriate threshold level from below.

- SENSITIVITY HIGH
- SENSITIVITY MID
- SENSITIVITY LOW

Default setting: OFF

Operating condition :

The following conditions must be met when using the empty pipe detection function.

- Diameter: 10mm or larger
- Electric conductivity of fluid: 30 μS/cm or greater
- Grounding: Grounding resistance must be less than 100Ω
- The noise level must be over the set threshold when the pipe is empty.

The noise level must be under the set threshold when the process fluid flows in the detector.

Lightning protection

12 kV, 1000A

Equipped with the lightning arrester in the power source and external output terminals.

Power failure

An EEPROM retains data record of totalized value when pulse output is used (retention period approximately 10 years).

Power supply

15.6 to 42V DC (without communication)

21.05 to 42V DC (with communication)

Size

Wafer style

25, 40, 50, 65, 80, 100 mm (1, 1½, 2, 2½, 3, 4 inches)

Flange style

2.5, 5 mm (0.1, 0.2 inch) (Model MTG18A only)
 10, 15, 25, 40, 50, 65, 80, 100, 150, 200 mm (3/8, 1/2, 1, 1½, 2, 2½, 3, 4, 6, 8 inches)

Flange rating

ANSI150, ANSI300, DIN PN10, DIN PN16, DIN PN25, JIS10K, JIS20K, JIS30K

Ambient temperature limits

-20 to 60°C (-4 to 140°F)

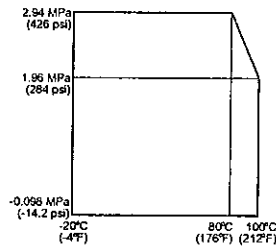
Ambient humidity limits

10 to 90% RH

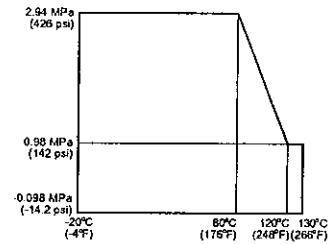
Temperature range and pressure range of process fluid

Refer to the following.

Size: 2.5 to 10 mm (0.1 to 3/8 inch)



Size: 15 to 200 mm (1/2 to 8 inch)



Measurable electrical conductivity

10 μS/cm or greater

50 μS/cm or greater (10 mm (3/8 inch), 15 mm (1/2 inch) for remote type)

Measurement flow range

Size		Maximum flow velocity range is 0 to 0.3 m/s (0 to 0.98 ft/s)		Maximum flow velocity range is 0 to 10 m/s (0 to 32.8 ft/s)		Conversion factor K
		Minimum range		Maximum range		
mm	inches	m ³ /h	GPM	m ³ /h	GPM	
2.5	0.1	0 to 0.00531	0 to 0.02335	0 to 0.1767	0 to 0.778	56.59
5	0.2	0 to 0.02121	0 to 0.09337	0 to 0.7068	0 to 3.112	14.15
10	3/8	0 to 0.08483	0 to 0.3735	0 to 2.827	0 to 12.44	3.537
15	1/2	0 to 0.1909	0 to 0.8404	0 to 6.361	0 to 28.01	1.572
25	1	0 to 0.5302	0 to 2.335	0 to 17.67	0 to 77.80	0.5659
40	1½	0 to 1.358	0 to 5.976	0 to 45.23	0 to 199.1	0.2210
50	2	0 to 2.121	0 to 9.337	0 to 70.68	0 to 311.2	0.1415
65	2½	0 to 3.584	0 to 15.78	0 to 119.4	0 to 525.9	0.08371
80	3	0 to 5.429	0 to 23.90	0 to 180.9	0 to 796.7	0.05526
100	4	0 to 8.483	0 to 37.35	0 to 282.7	0 to 1244	0.03537
150	6	0 to 19.09	0 to 84.04	0 to 636.1	0 to 2801	0.01572
200	8	0 to 33.93	0 to 149.4	0 to 1130	0 to 4979	0.008842

Velocity V (m/s) = K × Q

K = Conversion factor = 1/3600 × 4/(πD²) × 1000², D = Size (mm), Q = Flow rate (m³/h)

PERFORMANCE SPECIFICATIONS**Analog output accuracy**

Size: 2.5, 5 mm (0.1, 0.2 inch)

 V_s = velocity of setting range (m/s)

V_s (m/s)	Velocity during measurement $\geq V_s \times 50\%$	Velocity during measurement $\leq V_s \times 50\%$
$1.0 \leq V_s \leq 10$	$\pm 0.5\%$ of rate	$\pm 0.5\%$ of V_s
$0.3 \leq V_s \leq 1.0$	$\pm \frac{0.5}{V_s} \%$ of rate	$\pm 0.5 \left(\frac{0.5}{V_s} \right) \%$

Size: 10, 15 mm (3/8, 1/2 inch)

 V_s = velocity of setting range (m/s)

V_s (m/s)	Velocity during measurement $\geq V_s \times 40\%$	Velocity during measurement $\leq V_s \times 40\%$
$1.0 \leq V_s \leq 10$	$\pm 0.5\%$ of rate	$\pm 0.5\%$ of V_s
$0.3 \leq V_s \leq 1.0$	$\pm \frac{0.5}{V_s} \%$ of rate	$\pm 0.4 \left(\frac{0.5}{V_s} \right) \%$

Size: 25 to 200 mm (1 to 8 inches)

 V_s = velocity of setting range (m/s)

V_s (m/s)	Velocity during measurement $\geq V_s \times 30\%$	Velocity during measurement $\leq V_s \times 30\%$
$1.0 \leq V_s \leq 10$	$\pm 0.5\%$ of rate	$\pm 0.5\%$ of V_s
$0.3 \leq V_s \leq 1.0$	$\pm \frac{0.5}{V_s} \%$ of rate	$\pm 0.3 \left(\frac{0.5}{V_s} \right) \%$

PHYSICAL SPECIFICATIONS**Converter case finishing****Standard**

Baked acrylic paint

Corrosion-proof

Baked epoxy paint

Converter case material

Aluminum alloy

Display cover material

Tempered glass

Terminal box finishing (Model MTG18B only)**Standard:** Baked acrylic paint**Corrosion-proof:** Baked epoxy paint**Terminal box material** (Model MTG18B only)

Aluminum alloy

Detector main body materials**Case material**

Size 2.5 to 15 mm (0.1 to 1/2 inch):

SCS13 stainless steel

Size 25 to 200 mm (1 to 8 inches):

SUS304 stainless steel

Measuring pipe material

SUS304 stainless steel

Flange

SUS304 stainless steel

(size 2.5 to 65 mm (0.1 to 2½ inches))

Carbon steel + corrosion-preventive painting

(size 80 to 200 mm (3 to 8 inches))

Process wetted materials**Lining:** PFA**Electrodes**

SUS316L, ASTM B574 (Hastelloy C-276 equivalent), Titanium, Tantalum, Nickel, Zirconium, Platinum-Iridium

Grounding rings

SUS316, ASTM B575 (Hastelloy C-276 equivalent), Titanium, Tantalum, Zirconium, Platinum

INSTALLATION**Electrical connection**

1/2NPT internal thread (must be selected for FM approval)

CM20 internal thread

G1/2 internal thread

Remote converter mounting

Wall mounting, 2-inch pipe mounting

Grounding

The grounding is essential for flow measurement.

The most effective grounding method is direct connection to earth ground with minimal impedance.

For approval selection code "1", to maintain Intrinsic safety of system connect conductor to earth ground so that it has less than 1 Ohm to earth ground. See ANSI/ISA RP12.06.01 Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations for guidance on installation of intrinsically safe apparatus and systems.

Pipe connection

Wafer style (Size: 25 to 100 mm (1 to 4 inches))

Flange style (Size: 2.5 to 200 mm (0.1 to 8 inches))

Length of straight pipe

Required straight pipe length clearance on the upstream side and the downstream side, while installing the detector.

Upstream side

A minimum 5D straight pipe length is required.

A minimum 10D straight pipe length is required if a diffuser/valve/pump is installed upstream side.

Downstream side

2D straight pipe length is recommended.

(Where D is the nominal bore diameter of the detector)

Cable between converter and detector

(Remote type)

Length

70 m (233 ft) or shorter

(25 mm (1 inch) to 200 mm (8 inches))

30 m (98 ft) or shorter

(10 mm (3/8 inch), 15 mm (1/2 inch))

Outside diameter

11.4 mm (0.45 inch)

MagneW Two-wire PLUS Wafer/Flange remote type converter

Model MTG14C - I II III IV - Options (some options can be selected per each model)

Basic model no.

MTG14C

Selections

Options

		Selections				Options
I	Analog output / communication	Volume flow 4-20 mA DC output / with SFC communication	A			
		Volume flow DE output / with communication	C			
		Volume flow 4-20 mA DC output / with HART communication	H			
II	Wiring connection	G1/2 internal thread	A			
		G1/2 internal thread with a plastic water-tight gland	B			
		G1/2 internal thread with a brass Ni-plated water-tight gland	C			
		1/2NPT internal thread	D			
		CM20 internal thread	E			
III	Converter mounting	Wall mounting with standard bracket		G		
		2-inch pipe mounting with standard bracket		H		
IV	Approval	None			X	
		FM approval, Class I, II, III, Division 2, Groups A, B, C, D, F & G, T4 CSA certification, Class I, II, III, Division 2, Groups A, B, C, D, E, F & G, T4		*2	2	
V	Option	None				X
		Traceability certificate				B
		With the Tag number plate on the converter housing			*1	K
		Corrosion-proof paint				2

Note) *1: Must be selected if tagging is required.

*2: Must select "Wiring connection D".

MagneW Two-wire PLUS Wafer/Flange remote type cable

Model SMC11 - I II III

Basic model no.

SMC11

Selections

		Selections			
I	Cable	2 m (6 feet 8 inches)		02	
		3 m (10 feet)		03	
		4 m (13 feet 4 inches)		04	
		5 m (16 feet 8 inches)		05	
		10 m (33 feet 4 inches)		10	
		15 m (50 feet)		15	
		20 m (66 feet 8 inches)		20	
		30 m (100 feet)		30	
		40 m (133 feet 4 inches)		40	
		50 m (166 feet 8 inches)		50	
		60 m (200 feet)		60	
		70 m (233 feet 4 inches)		70	
II	Terminals for detector	With terminals		A	
III	Terminals for converter	With terminals			A

MagneW Two-wire PLUS Wafer/Flange remote type detector

Model MTG18B - I II III IV V VI VII VIII IX - Options (some options can be selected per each model)

Basic model no.

Selections

Options

MTG18B											
I	Diameter	10 mm (3/8 inch)	010								
		15 mm (1/2 inch)	015								
		25 mm (1 inch)	025								
		40 mm (1½ inches)	040								
		50 mm (2 inches)	050								
		65 mm (2½ inches)	065								
		80 mm (3 inches)	080								
		100 mm (4 inches)	100								
		150 mm (6 inches)	150								
		200 mm (8 inches)	200								
II	Lining	PFA		P							
III	Pipe connection	Wafer JIS10K		11							
		Wafer JIS16/20K		12							
		Wafer JIS30K		13							
		Wafer ANSI 150		21							
		Wafer ANSI 300		22							
		Wafer DIN PN10		41							
		Wafer DIN PN16		42							
		Wafer DIN PN25		43							
		Flange JIS10K		J1							
		Flange JIS20K		J2							
		Flange JIS30K		J3							
		Flange JIS10K for 10 mm size flange		J4							
		Flange JIS20K for 10 mm size flange		J5							
		Flange ANSI 150		A1							
		Flange ANSI 300		A2							
		Flange DIN PN10		D1							
		Flange DIN PN16		D2							
		Flange DIN PN25		D3							
IV	Electrode	SUS316L		L							
		ASTM B574 (Hastelloy C-276 equivalent)		C							
		Titanium		K							
		Zirconium		H							
		Tantalum		T							
		Nickel		N							
V	Grounding ring	SUS316		S							
		ASTM B575 (Hastelloy C-276 equivalent)		C							
		Titanium		K							
		Zirconium		H							
		Tantalum		T							
		Platinum		P							
VI	Wiring connection	G1/2 internal thread		A							
		G1/2 internal thread with plastic water-tight gland		B							
		G1/2 internal thread with brass Ni-plated water-tight gland		C							
		1/2NPT internal thread		D							
		CM20 internal thread		E							
VII	Face-to-face dimension	Standard		A							
		Yamatake SMT3000 wafer type		S							
VIII	Calibration	Standard calibration			A						
IX	Approval/Certification	None				X					
		FM approval, NI for Class I, II, III, Division 2, Groups A, B, C, D, F & G, T4 CSA certification, Class I, II, III, Division 2, Groups A, B, C, D, E, F & G, T4 ^{*3}					2				

X	None	Options
A	Test report	
B	Traceability certificate	
C	Material certificate (electrode/ grounding ring)	
G	Gasket for plastic piping	
K	With the Tag number plate on the terminal box *1	
2	Corrosion-proof paint	
4	Attached stainless steel 304 bolts and nuts for installation *2	

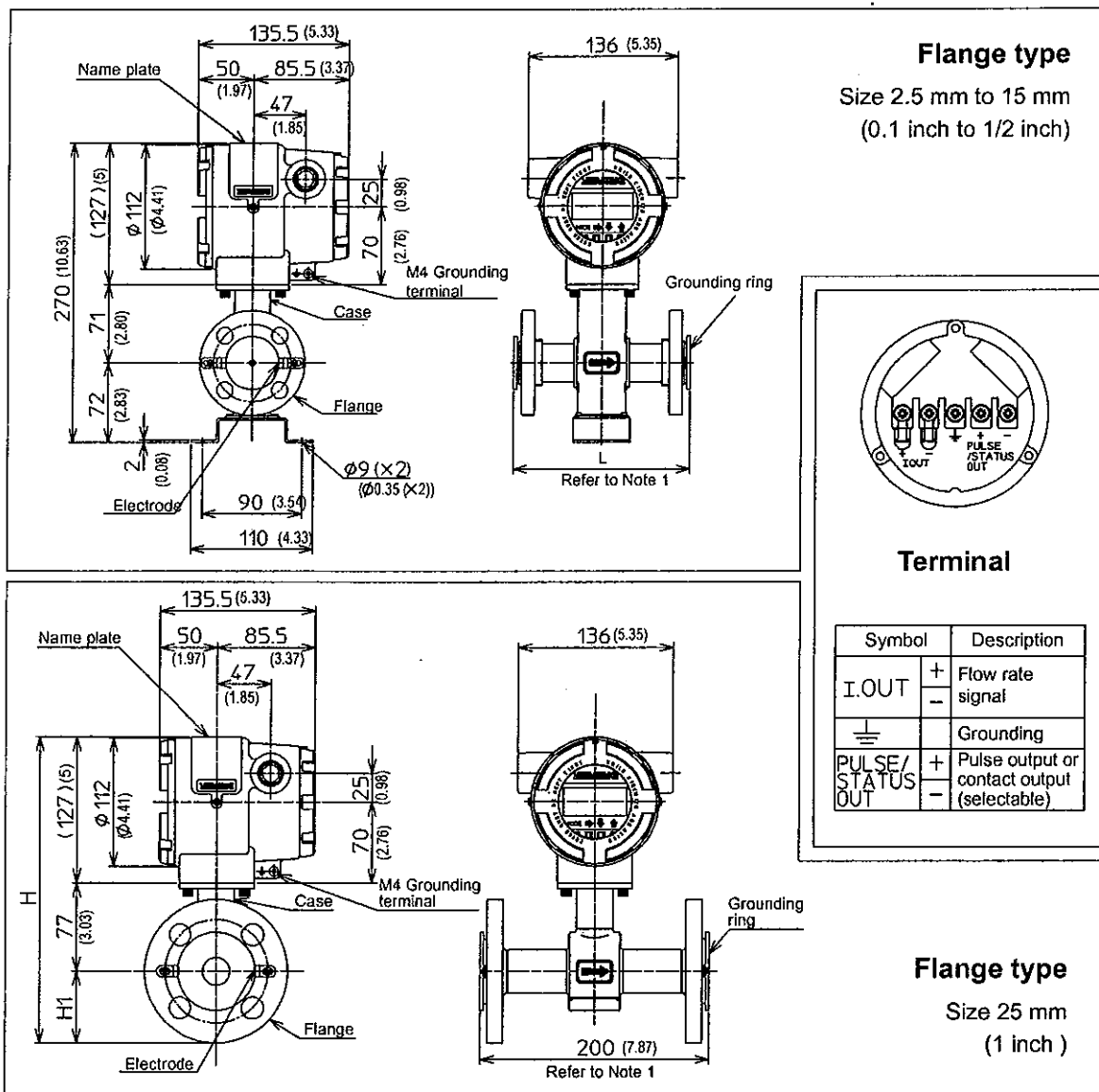
Note)
 *1: Must be selected if tagging is required.
 *2: Available for wafer type.
 *3: Must select "Wiring connection D".

DIMENSIONS

All dimensions are in millimeters, dimensions in brackets () are in inches (inch).

Model MTG18A - Flange type size 2.5 mm (0.1 inch) to 15 mm (1/2 inch)

- Flange type size 25 mm (1 inch)

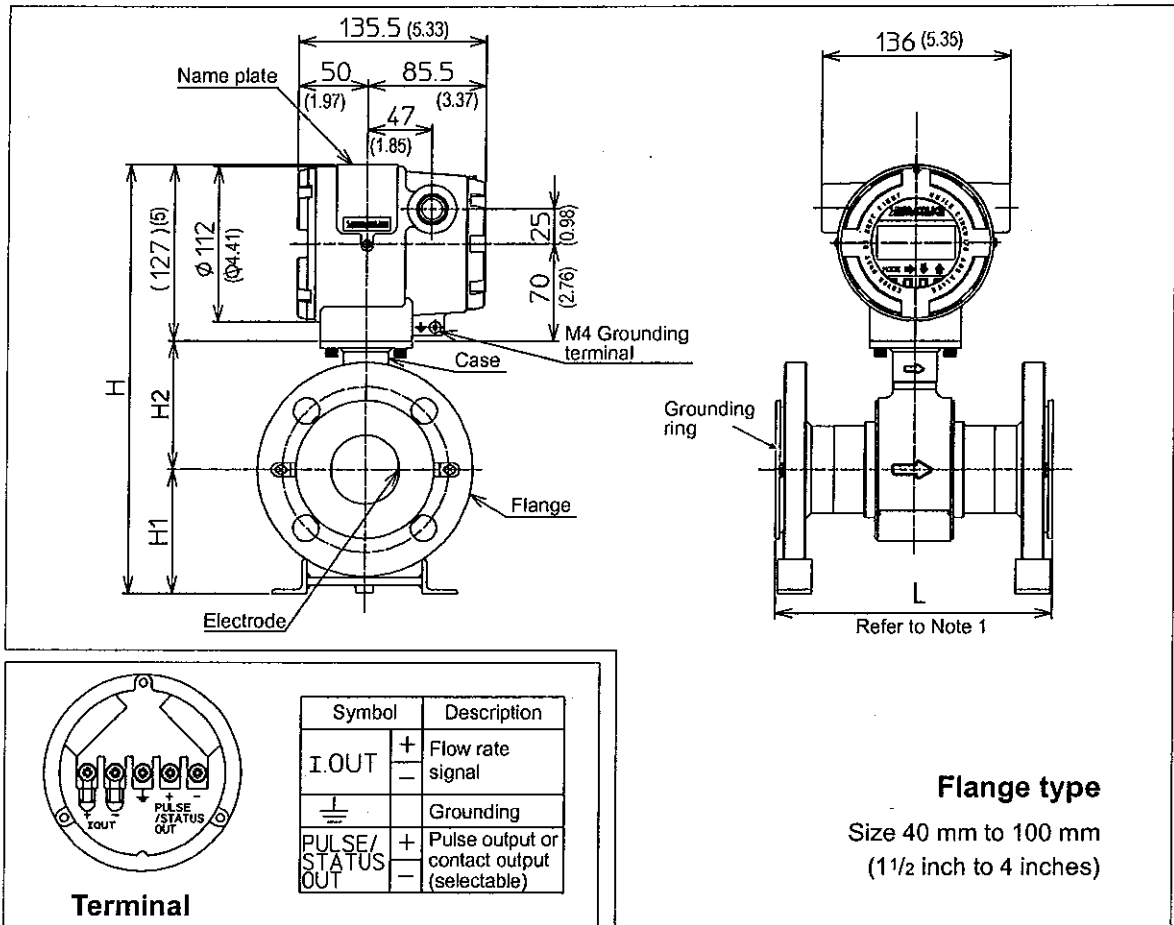


Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
 • When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 1

Size mm (inch)	Model no.		J1	J2	J3	J4	J5	A1	A2	D1/D2	D3/D4
	Flange rating		JIS					ANSI		DIN	
			10K	20K	30K	10K 10 mm flange	20K 10 mm flange	150	300	PN 10/16	PN 25/40
2.5 to 10 (0.1 to 3/8)	Dimension	L	160	160	160	160	160	160 (6.3)	160 (6.3)	160	160
	Weight	(kg)	6.8	7	8	6.7	6.8	6.4 (14.1 lb)	6.9 (15.2 lb)	6.9	7.1
15 (1/2)	Dimension	L	200	200	200	200	200	200 (7.87)	200 (7.87)	200	200
	Weight	(kg)	7	7.2	8.2	6.9	7	6.6 (14.6 lb)	7.1 (15.7 lb)	7.1	7.3
25 (1)	Dimension	H	267	267	269	-	-	258 (10.16)	266 (10.47)	262	262
		H1	63	63	65	-	-	54 (2.13)	62 (2.44)	58	58
	Weight	(kg)	9.2	9.5	10.3	-	-	8.4 (18.5 lb)	9.5 (20.9 lb)	9.1	9.4

Model MTG18A - Flange type size 40 mm (1½ inch) to 100 mm (4 inches)

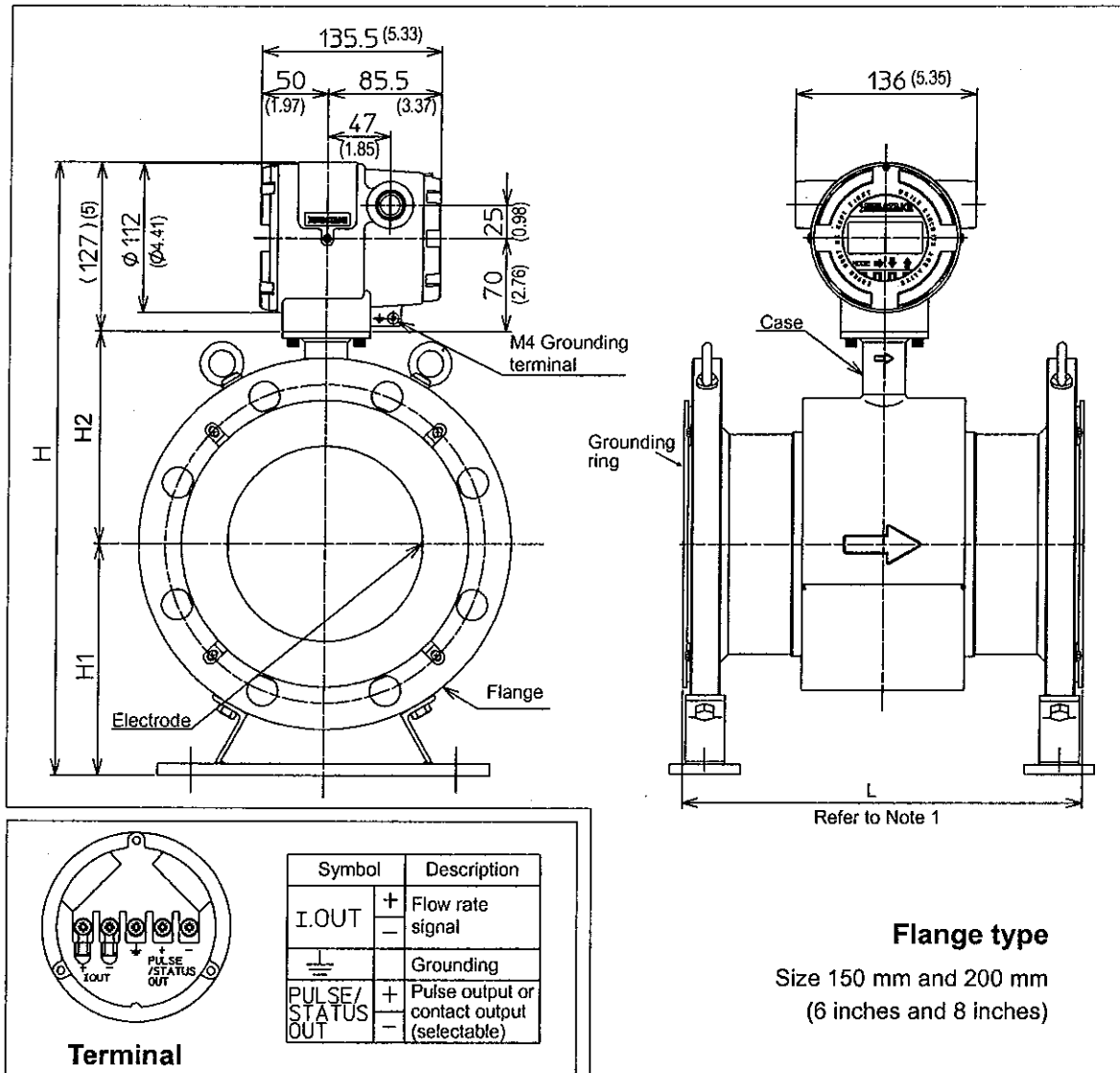


Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
• When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 2

Size mm (inches)	Model no.	Flange rating	J1	J2	J3	A1	A2	D1/D2	D3/D4
			JIS			ANSI		DIN	
			10K	20K	30K	150	300	PN 10/16	PN 25/40
40 (1.5)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	296	296	307	288 (11.34)	305 (12.01)	302	302
		H1	85	85	96	77 (3.03)	94 (3.7)	91	91
		H2	84	84	84	84 (3.31)	84 (3.31)	84	84
	Weight	(kg)	8.3	8.6	11	7.8 (17.2 lb)	10.1 (22.3 lb)	8.7	9.7
50 (2)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	310	310	316	308 (12.13)	316 (12.44)	316	316
		H1	90	90	96	88 (3.46)	96 (3.78)	96	96
		H2	93	93	93	93 (3.66)	93 (3.66)	93	93
	Weight	(kg)	11.9	12	13.7	12.3 (27.1 lb)	13.8 (30.4 lb)	13.3	13.8
65 (2.5)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	329	329	343	330 (12.99)	388 (13.31)	334	334
		H1	102	102	116	103 (4.06)	111 (4.37)	107	107
		H2	100	100	100	100 (3.94)	100 (3.94)	100	100
	Weight	(kg)	13.9	14	15.7	14.3 (31.5 lb)	15.8 (34.8 lb)	15.3	15.8
80 (3)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	345	354	359	346 (13.62)	359 (14.13)	354	354
		H1	110	119	124	113 (4.45)	124 (4.88)	119	119
		H2	108	108	108	108 (4.25)	108 (4.25)	108	108
	Weight	(kg)	14.4	16.7	20.4	17.3 (38.1 lb)	21.3 (47.0 lb)	14.4	16.5
100 (4)	Dimension	L	250	250	250	250 (9.84)	250 (9.84)	250	250
		H	367.5	376.5	384.5	378.5 (14.90)	392.5 (15.45)	373.5	381.5
		H1	120	129	137	131 (5.16)	145 (5.71)	126	134
		H2	120.5	120.5	120.5	120.5 (4.74)	120.5 (4.74)	120.5	120.5
	Weight	(kg)	20.2	23.7	28.6	25.1 (55.3 lb)	34.2 (75.4 lb)	19.6	23.4

Model MTG18A - Flange type size 150 mm (6 inches) and 200 mm (8 inches)

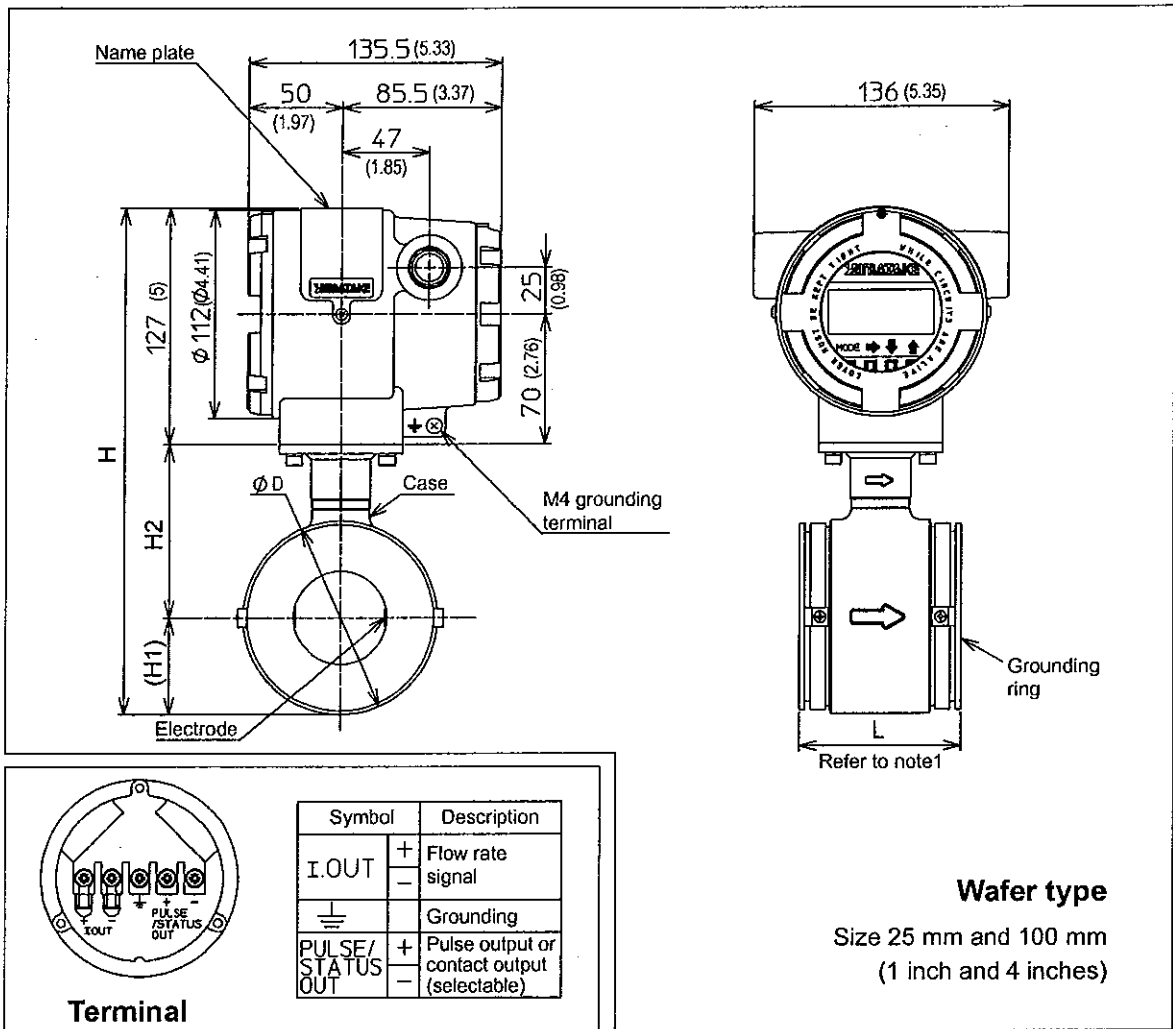


Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
• When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 3

Size mm (inches)	Model no.	J1	J2	J3	A1	A2	DIN			
							Flange rating	ANSI		
								10K	20K	30K	PN 10/16	PN 25	PN 40
150 (6)	Dimension	L	300	300	300	300 (11.81)	300 (11.81)	300	300	300
		H	462	476	487	461 (18.15)	483 (19.02)	465	473	473
		H1	175	189	200	174 (6.85)	196 (7.72)	178	186	186
		H2	160	160	160	160 (6.3)	160 (6.3)	160	160	160
	Weight	(kg)	34.4	41.7	54.3	37.2 (82.0 lb)	56.2 (123.9 lb)	30.7	38.6	38.6
200 (8)	Dimension	L	350	350	350	350 (13.78)	350 (13.78)	350	350	350
		H	508	515	531	516 (20.31)	537 (21.14)	514	526	534
		H1	196	203	219	204 (8.03)	225 (8.86)	202	214	222
		H2	185	185	185	185 (7.28)	185 (7.28)	185	185	185
	Weight	(kg)	49.8	59.8	87	61.8 (136.2 lb)	90.8 (200.2 lb)	48.1	68.5	72

Model MTG18A - Wafer type size 25 mm (1 inch) to 100 mm (4 inches)

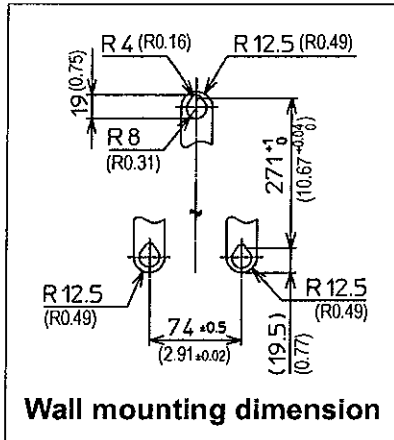


Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
• When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

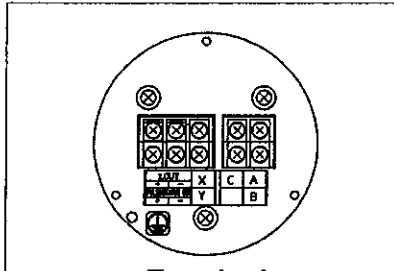
Table 4

Flange rating	25 mm (1 inch)		40 mm (1½ inch)		50 mm (2 inches)		65 mm (2½ inches)		80 mm (3 inches)		100 mm (4 inches)	
	A	S	A	S	A	S	A	S	A	S	A	S
Dimension size	L	94 (3.7)	80 (3.15)	98 (3.86)	86 (3.39)	104 (4.09)	96 (3.78)	106 (4.17)	130 (5.12)	120 (4.72)	150 (5.91)	
	H	238 (9.37)	254.5 (10.02)		272 (10.71)		289 (11.38)		302 (11.89)		327 (12.87)	
	H1	34 (1.34)	43.5 (1.71)		52 (2.05)		62 (2.44)		67 (2.64)		79.5 (3.13)	
	H2	77 (3.03)	84 (3.31)		93 (3.66)		100 (3.94)		108 (4.25)		120.5 (4.74)	
	D	68 (2.68)	87 (3.43)		104 (4.09)		124 (4.88)		134 (5.28)		159 (6.26)	
Weight	(kg)	3.7 (8.2 lb)	3.8 (8.4 lb)	4.3 (9.5 lb)	4.4 (9.7 lb)	5.0 (11.0 lb)	5.5 (12.1 lb)	6.4 (14.1 lb)	7.1 (15.7 lb)	8.2 (18.1 lb)	9.2 (20.3 lb)	

Model MTG14C - Converter



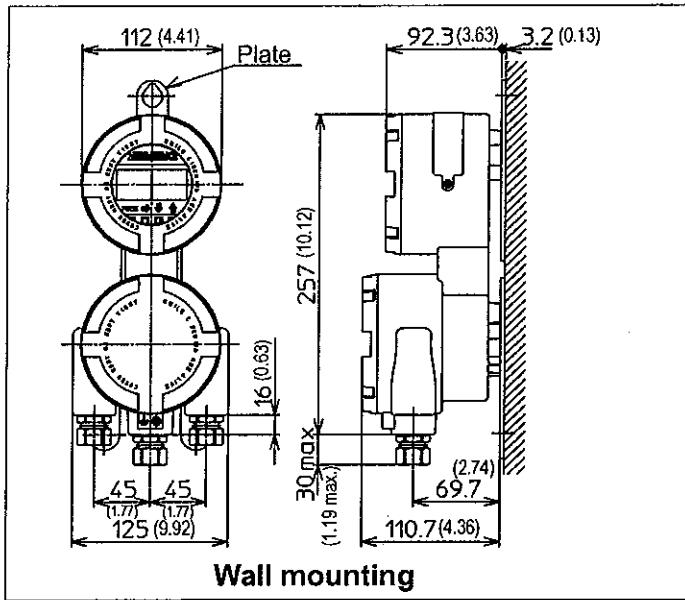
Wall mounting dimension



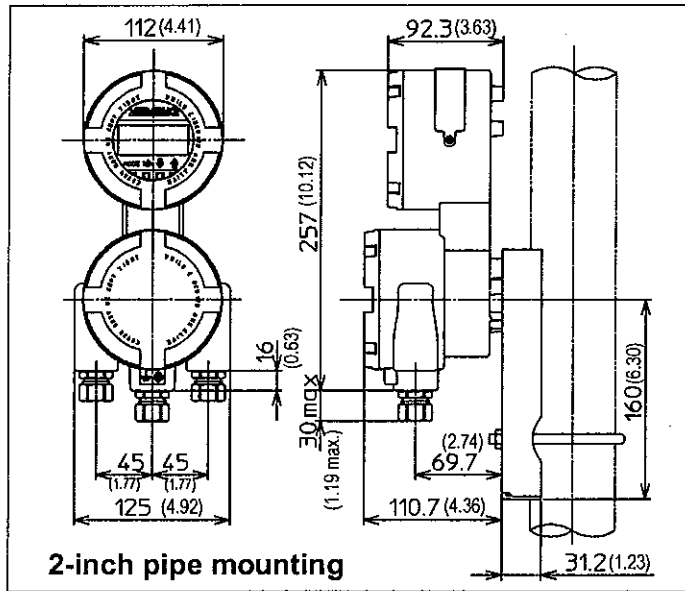
Terminal

Symbol	Description
I-OUT	Flow rate signal
⊥	Grounding
PULSE/STATUS OUT	Pulse output or contact (selectable)
X	Excitation output
Y	
A	Flow rate signal input
B	
C	

* Terminal screw: M4

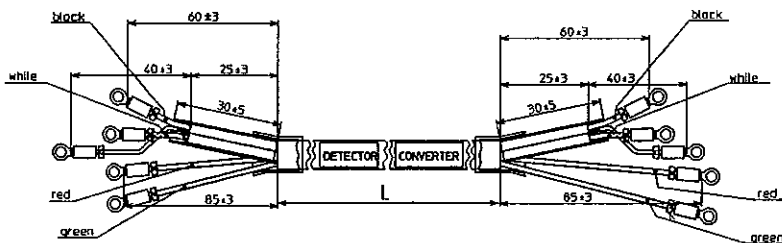


Wall mounting

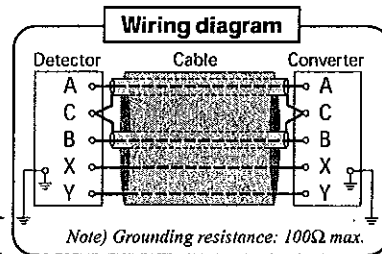


2-inch pipe mounting

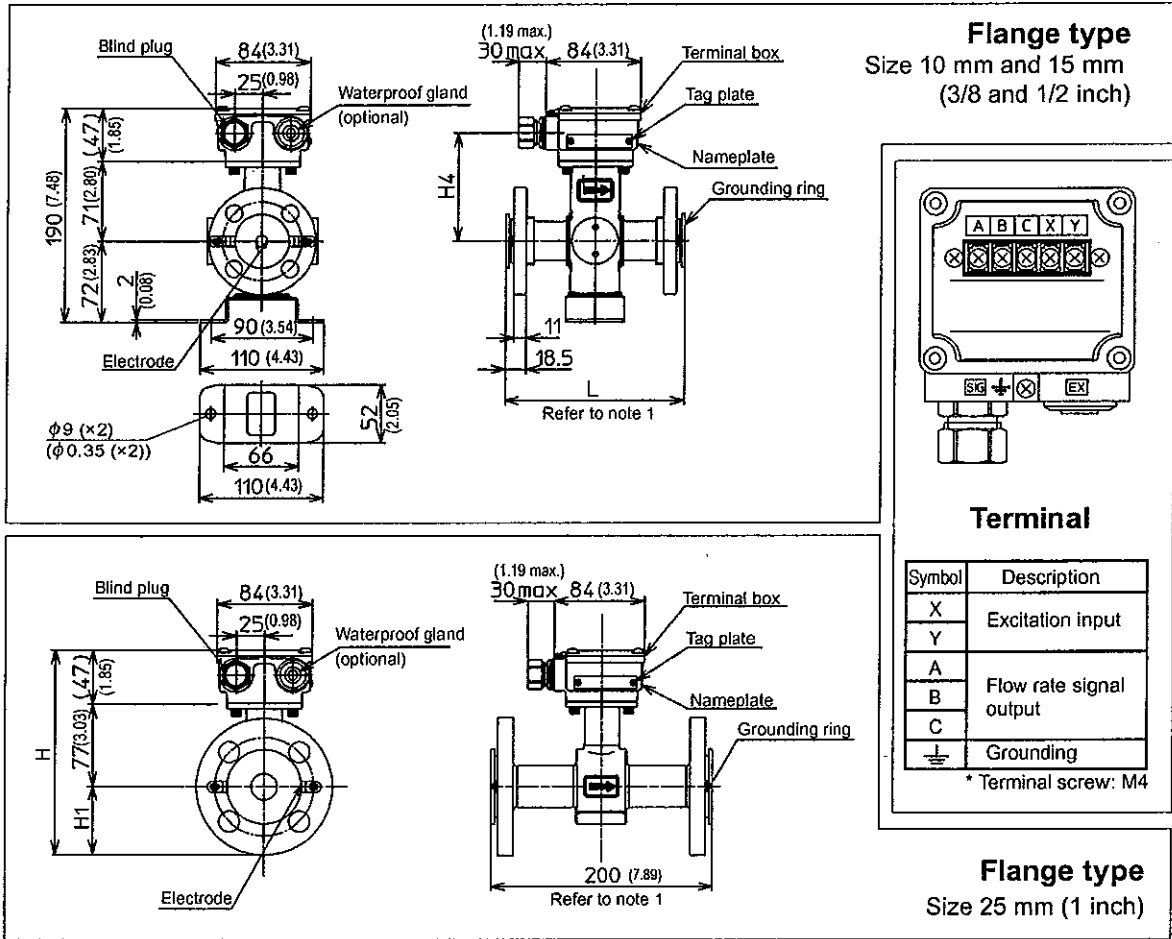
Model SMC11 - Cable



L: Cable length



**Model MTG18B - Detector - Flange type size 10 mm (3/8 inch) and 15 mm (1/2 inch)
- Flange type size 25 mm (1 inch)**

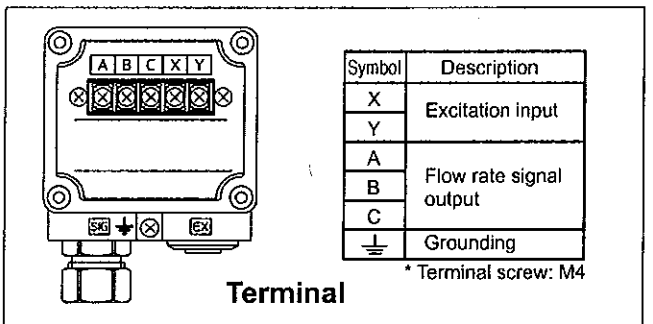
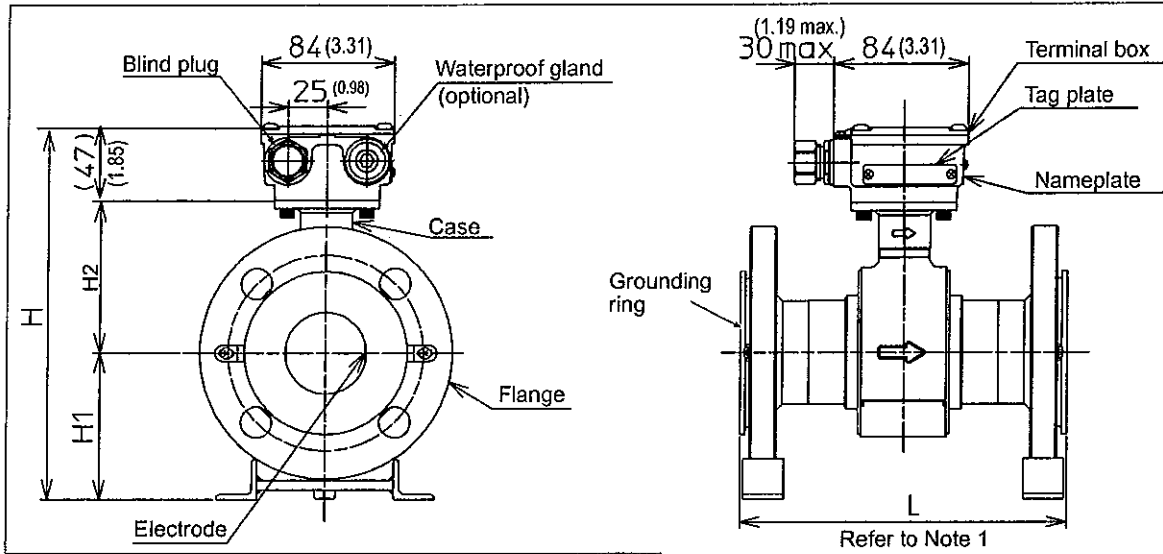


*Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
• When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.*

Table 5

Size mm (inches)	Model no.		J1	J2	J3	J4	J5	A1	A2	D1/D2	D3/D4
	Flange rating		JIS					ANSI		DIN	
			10K	20K	30K	10K 10 mm flange	20K 10 mm flange	150	300	PN 10/16	PN 25/40
10 (3/8)	Dimension	L	160	160	160	160	160	160 (6.3)	160 (6.3)	160	160
	Weight	(kg)	5	5.2	6.2	4.9	5	4.6 (10.1 lb)	5.1 (11.2 lb)	5.1	5.3
15 (1/2)	Dimension	L	200	200	200	200	200	200 (7.87)	200 (7.87)	200	200
	Weight	(kg)	5.2	5.4	6.4	5.1	5.2	4.8 (10.6 lb)	5.3 (11.7 lb)	5.3	5.5
25 (1)	Dimension	H	187	187	189	-	-	188 (7.4)	186 (7.32)	182	182
		H1	63	63	65	-	-	54 (2.13)	62 (2.44)	58	58
	Weight	(kg)	7.4	7.7	8.5	-	-	6.6 (14.6 lb)	7.7 (17.0 lb)	7.3	7.6

Model MTG18B - Detector - Flange type size 40 mm (1½ inch) to 100 mm (4 inches)



Flange type

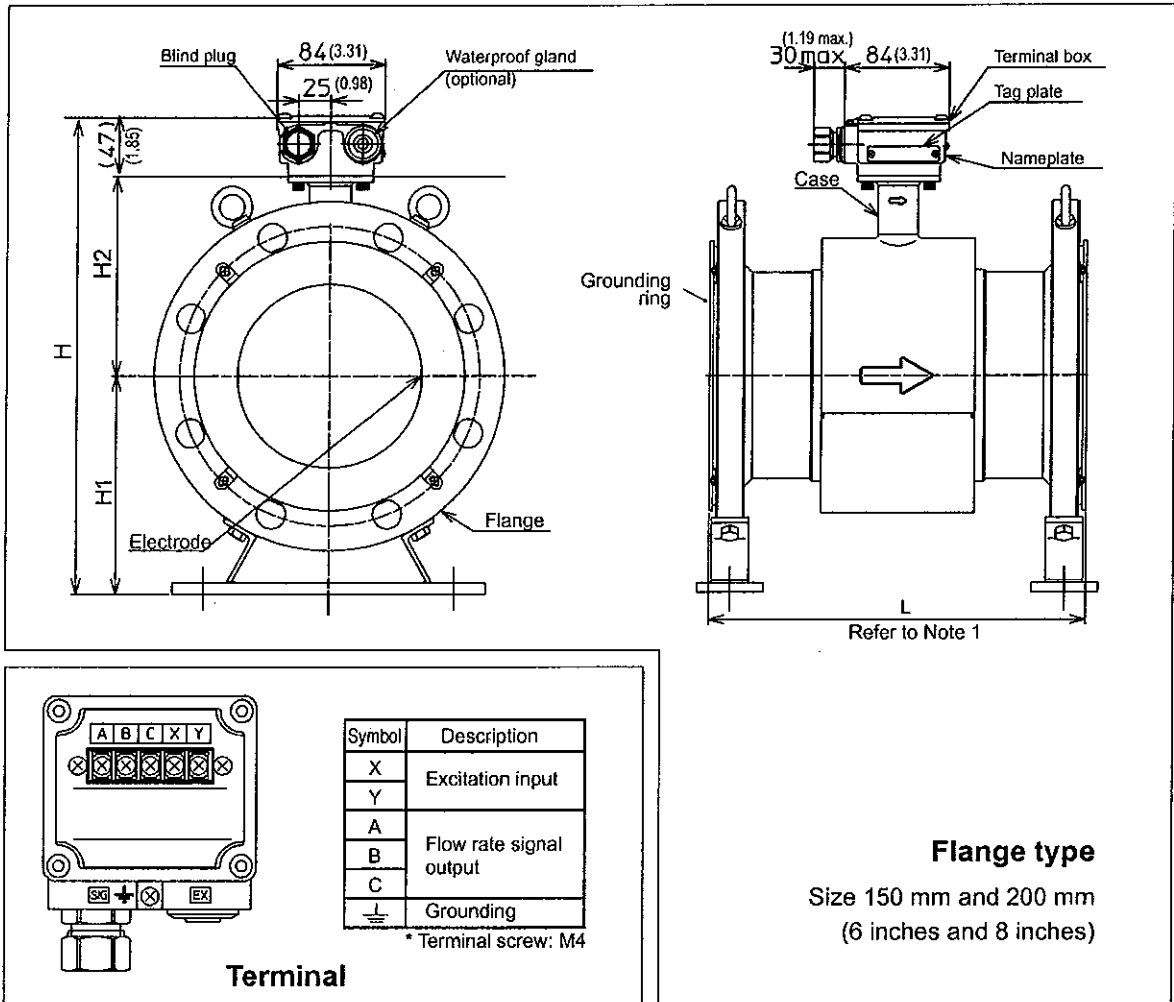
Size 40 mm to 100 mm
(1½ inch to 4 inches)

- Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
 • When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 6

Size mm (Inches)	Model no. Flange rating	J1	J2	J3	ANSI		DIN		
		JIS			ANSI		DIN		
		10K	20K	30K	150	300	PN 10/16	PN 25/40	
40 (1.5)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	216	216	227	208 (8.19)	225 (8.86)	222	222
		H1	85	85	96	77 (3.03)	94 (3.7)	91	91
		H2	84	84	84	84 (3.31)	84 (3.31)	84	84
	Weight	(kg)	6.5	6.8	9.2	6 (13.2 lb)	8.3 (18.3 lb)	6.9	7.9
50 (2)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	230	230	236	228 (8.98)	236 (9.29)	236	236
		H1	90	90	96	88 (3.46)	96 (3.78)	96	96
		H2	93	93	93	93 (3.66)	93 (3.66)	93	93
	Weight	(kg)	10.1	10.2	11.9	10.5 (23.1 lb)	12 (26.5 lb)	11.5	12
65 (2.5)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	249	249	263	250 (9.84)	258 (10.16)	254	254
		H1	102	102	116	103 (4.06)	111 (4.37)	107	107
		H2	100	100	100	100 (3.94)	100 (3.94)	100	100
	Weight	(kg)	12.1	12.2	13.9	12.5 (27.6 lb)	14 (30.9 lb)	13.5	14
80 (3)	Dimension	L	200	200	200	200 (7.87)	200 (7.87)	200	200
		H	265	274	279	266 (10.47)	279 (10.98)	274	274
		H1	110	119	124	113 (4.45)	124 (4.88)	119	119
		H2	108	108	108	108 (4.25)	108 (4.25)	108	108
	Weight	(kg)	16.6	14.9	18.6	15.5 (34.2 lb)	19.5 (43.0 lb)	12.6	14.7
100 (4)	Dimension	L	250	250	250	250 (9.84)	250 (9.84)	250	250
		H	287.5	296.5	304.5	298.5 (11.75)	312.5 (12.30)	293.5	301.5
		H1	120	129	137	131 (5.16)	145 (5.71)	126	134
		H2	120.5	120.5	120.5	120.5 (4.74)	120.5 (4.74)	120.5	120.5
	Weight	(kg)	18.4	21.9	26.8	23.3 (51.4 lb)	32.4 (71.4 lb)	17.8	21.6

Model MTG18B - Detector - Flange type size 150 mm (6 inches) and 200 mm (8 inches)

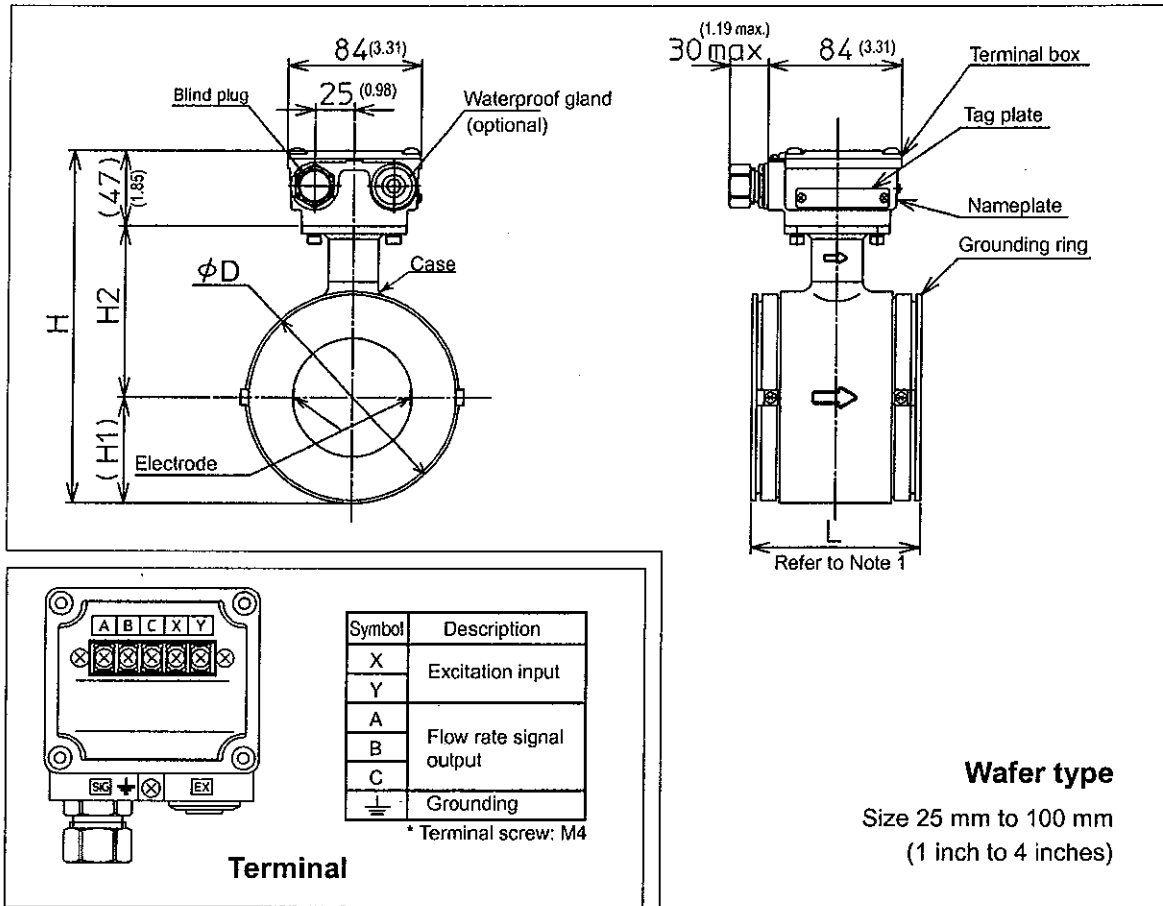


Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
 • When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 7

Size mm (inches)	Model no. Flange rating	J1	J2	J3	A1	A2	D1/D2	D3	D4	
		JIS			ANSI		DIN			
		10K	20K	30K	150	300	PN 10/16	PN 25	PN 40	
150 (6)	Dimension	L	300	300	300	300 (11.81)	300 (11.81)	300	300	300
		H	382	396	407	381 (15)	403 (15.87)	385	393	393
		H1	175	189	200	174 (6.85)	196 (7.72)	178	186	186
		H2	160	160	160	160 (6.3)	160 (6.3)	160	160	160
	Weight	(kg)	32.6	39.9	52.5	35.4 (78 lb)	54.4 (119.9 lb)	28.9	36.8	36.8
200 (8)	Dimension	L	350	350	350	350 (13.78)	350 (13.78)	350	350	350
		H	428	435	451	436 (17.17)	457 (17.99)	434	446	454
		H1	196	203	219	204 (8.03)	225 (8.86)	202	214	222
		H2	185	185	185	185 (7.28)	185 (7.28)	185	185	185
	Weight	(kg)	48	58	85.2	60 (132.3 lb)	89 (196.2 lb)	46.3	66.7	70.2

Model MTG18B - Detector - Wafer type size 25 mm (1 inch) to 100 mm (4 inches)



Note 1 • When grounding ring material is SUS316, gasket dimension is not included to the face-to-face dimension.
• When grounding ring material is other than SUS316, a 3 mm of Teflon gasket dimension is included to the face-to-face dimension.

Table 8

Flange rating	25 mm (1 inch)	40 mm (1½ inch)		50 mm (2 inches)		65 mm (2½ inches)		80 mm (3 inches)		100 mm (4 inches)	
		A	A	S	A	S	A	A	S	A	S
Dimension size	L	94 (3.7)	80 (3.15)	98 (3.86)	86 (3.39)	104 (4.09)	96 (3.78)	106 (4.17)	130 (5.12)	120 (4.72)	150 (5.91)
	H	158 (6.22)	174.5 (6.87)		192 (7.56)		209 (8.23)	222 (8.74)		247 (9.72)	
	H1	34 (1.34)	43.5 (1.71)		52 (2.05)		62 (2.44)	67 (2.64)		79.5 (3.13)	
	H2	77 (3.03)	84 (3.31)		93 (3.66)		100 (3.94)	108 (4.25)		120.5 (4.74)	
	D	68 (2.68)	87 (3.43)		104 (4.09)		124 (4.88)	134 (5.28)		159 (6.26)	
Weight	(kg)	2	2	2.5	2.6	3.2	3.7	4.6	5.3	6.4	7.4
		(4.4 lb)	(4.4 lb)	(5.5 lb)	(5.7 lb)	(7.1 lb)	(8.2 lb)	(10.1 lb)	(11.7 lb)	(14.1 lb)	(16.3 lb)

YAMATAKE

Savemation

Saving through Automation

Yamatake Corporation

Totate international Building

2-12-19 Shibuya

Shibuya-ku, Tokyo 150-8316

Japan

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Fax : 81-3-3486-2593



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

FLOW INDICATOR / TRANSMITTER

MANUFACTURER : SIGNET
 MODEL NO. : FLOW TRANSMITTER 3-8550-1
 INTEGRAL MOUNT KIT 3-8051
 INTEGRAL MOUNT SENSOR 3-8512-P0
 INSTALLATION FITTING CR4W030
 SERVICE : CLOSED LOOP DI COOLING WATER
 PIPE SIZE : 3" (75 mm) STAINLESS STEEL PIPE
 ENCLOSURE : NEMA 4X
 MATERIAL OF CONSTRUCTION
 SENSOR : POLYPROPYLENE
 INST. FITTING : STAINLESS STEEL WELD-ON WELDOLET
 FLOW RATE RANGE : 0 ~ 300 GPM (0 ~ 1,136 L/min)
 OUTPUT : 4 ~ 20 mA
 POWER : 12 ~ 24 VDC
 QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)
 CUSTOMER TAG NO. : FT-O111A / FT-O131A / FT-O151A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsible for installation and operation of field
instruments, and for providing adequate subsurface
information and design for the installation of all
parts of the work in accordance with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

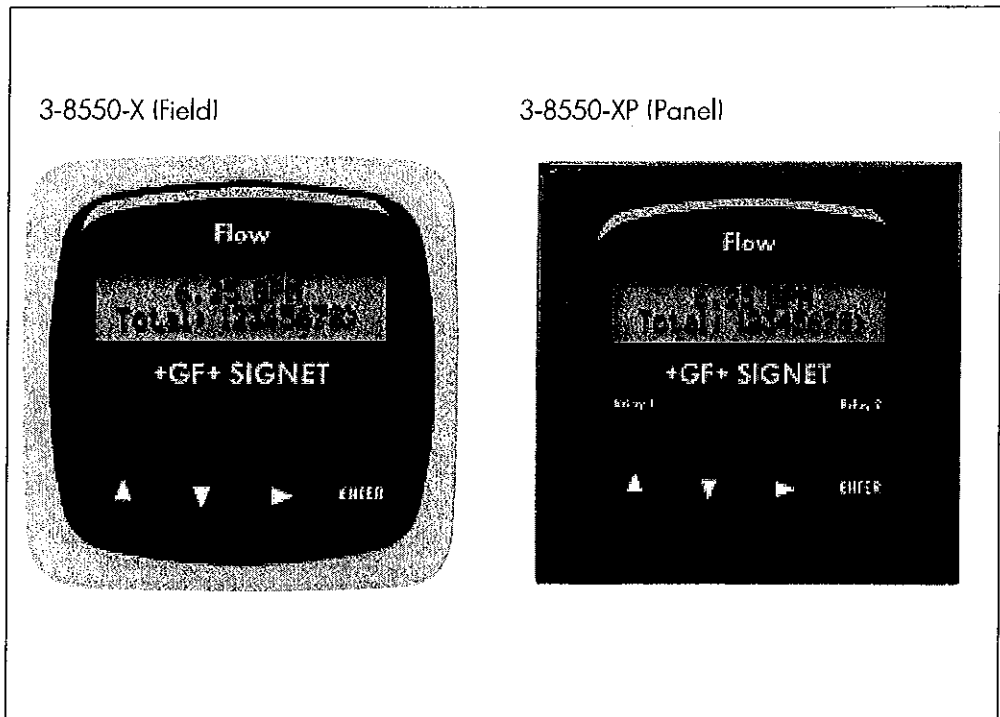
REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-014-16

Date: 24/1/06 By: M. J. Falco

+GF+ SIGNET 8550 Flow Transmitters



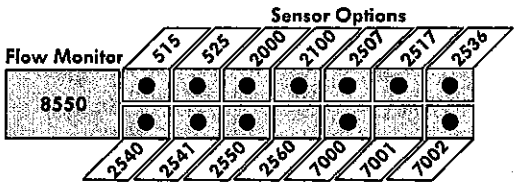
Features

- Permanent & resettable totalizers
- Scaleable outputs
- Relay options
- Mounting versatility
- 2 x 16 character dot matrix LCD
- NEMA 4X enclosure with self-healing window
- Large pushbuttons
- Numbered terminals
- Output simulation for complete system testing

Application

- Flow control and monitoring
- Filtration or softener regeneration
- Effluent totalization
- Pump protection
- Feed pump pulsing
- Ratio control
- Water distribution
- Leak detection

Options

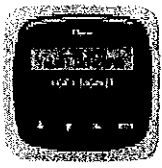



Description

+GF+ SIGNET 8550 Flow Transmitters are advanced instruments that convert the signal from all +GF+ SIGNET flow sensors into a 4 to 20 mA signal for long distance transmission. Configuration flexibility is maximized with single or dual input/output, two optional relays for process control, two packaging

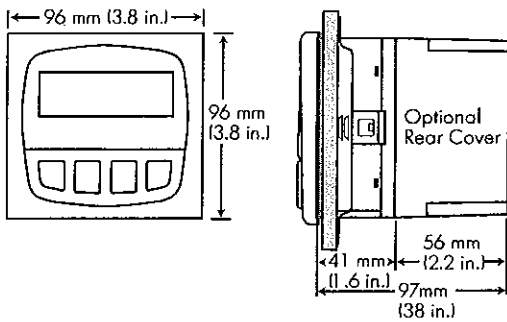
options for integral/pipe mount or panel installation, and scalability for virtually any flow range or engineering unit. State-of-the-art electronic design ensures long-term reliability, signal stability, and simple user setup and operation.

Technical Features

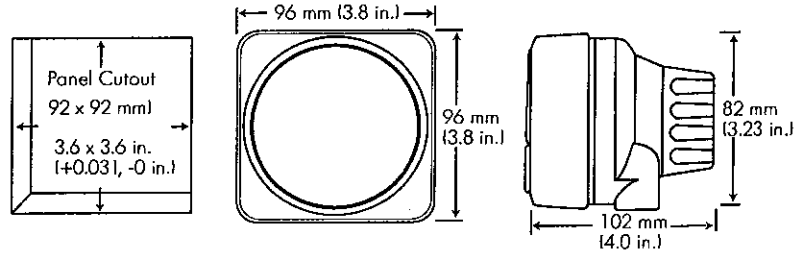
Mounting Version	Part No.	Wire Power	Sensor Input	4 to 20 mA Output	Open Collector/Relay
Field 	3-8550-1	2/4 non-powered and powered sensors	1	1	1 O.C. Hi, Lo, Pulse Freq or Off
	3-8550-2	4 non-powered and powered sensors	1	1	2 Relays Hi, Lo, Pulse or Off
	3-8550-3	2/4 non-powered and powered sensors	2	2 Sensor 1, Sensor 2 or delta Flow	2 O.C.'s Hi, Lo, Pulse Freq or Off
Panel 	3-8550-1P	2/4 non-powered and powered sensors	1	1	1 O.C. Hi, Lo, Pulse Freq or Off
	3-8550-2P	4 non-powered and powered sensors	1	1	2 Relays Hi, Lo, Pulse or Off
	3-8550-3P	2/4 non-powered and powered sensors	2	2 Sensor 1, Sensor 2 or delta Flow	2 O.C.'s Hi, Lo, Pulse Freq or Off

Dimensions

Panel Mount



Integral/Universal Mount

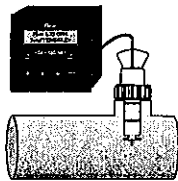


Installation

The transmitter is available in a panel mount or a field version. The field version is mounted to the sensor using the integral mount kit (3-8051) or you may select the universal mount kit (3-8050) to mount the transmitter on a surface near the sensor.

1. Panel Mount

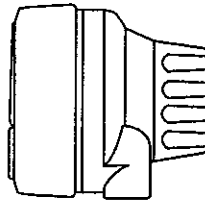
3-8550-XP



All panel mount transmitters (3-8550-XP) include a mounting bracket and gasket for a NEMA 4X watertight panel installation. Panel mount transmitters fit into a standard 1/4 DIN panel cutout.

2. Integral Mount

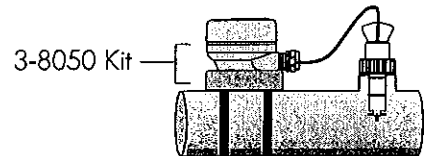
3-8051 Kit



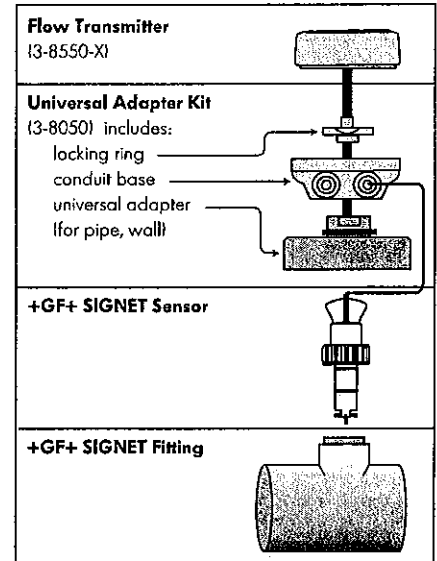
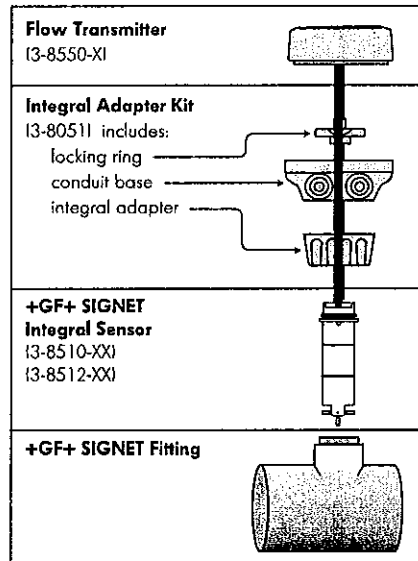
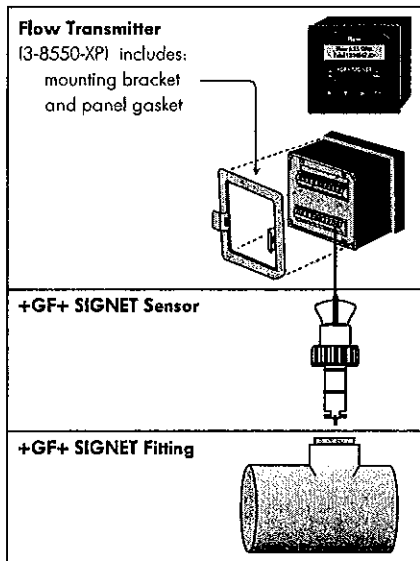
The Integral Mount Kit (3-8051) can be ordered separately and includes a conduit base, locking ring, and integral adapter for mounting the transmitter directly onto a sensor.

3. Universal Mount

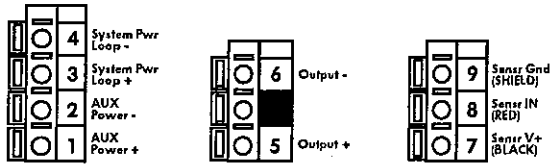
3-8550-X Transmitter



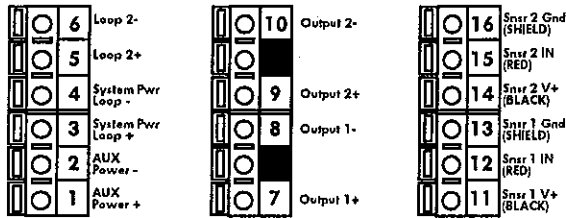
The Universal Mount Kit (3-8050) can be ordered separately and includes a conduit base, locking ring, and universal adapter for mounting the transmitter on a pipe, wall, or other stationary surface.



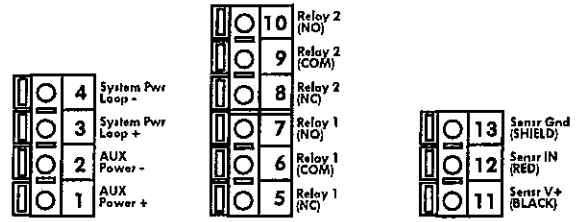
Rear Terminal View



Terminal 8550-1



Terminal 8550-3



Terminal 8550-2

Note: The terminal blocks are not labeled on the back of the unit. An adhesive label is supplied with terminal descriptions to serve as a remote terminal display.

Technical Data

General

Compatibility:

+GF+ SIGNET Flow Sensors with frequency outputs (all except 2560 and 7001)

Accuracy: $\pm 0.5\%$ of reading @ 25°C

Enclosure:

- Rating: NEMA 4X/IP65 front
- Case: PBT
- Panel Case Gasket: Neoprene
- Window: Polyurethane coated polycarbonate
- Keypad: Sealed 4-key silicone rubber
- Shipping Weight: 0.325kg (0.8 lbs.)

Display:

- Alphanumeric 2 x 16 LCD
- Update rate: 1 second
- Contrast: User selectable, 5 levels

Environmental

Operating temperature:

-10 to 70°C (14 to 158°F)

Storage temperature:

-15 to 80°C (5 to 176°F)

Relative humidity:

0 to 95%, non-condensing

Standards and Approvals

- CSA, CE, UL listed
- Manufactured under ISO 9001 and ISO 14001
- NEMA 4X and IP65

Electrical

Power:

- 12 to 24 VDC $\pm 10\%$, regulated
- (-1) 61 mA max.; (-2) 200 mA max.; (-3) 122 mA max.

Sensor Input:

- Range: 0.5 to 1500 Hz
- Sensor power:
 - 2-wire: 1.5 mA @ 5 VDC $\pm 1\%$
 - 3 or 4 wire: 20 mA @ 5 VDC $\pm 1\%$
- Optically isolated from current loop
- Short circuit protected

Current output:

- 4 to 20 mA, isolated, fully adjustable and reversible
- Max loop impedance:
 - 50Ω max. @ 12 V,
 - 325Ω max. @ 18 V,
 - 600Ω max. @ 24 V
- Update rate: 100 ms
- Accuracy: ± 0.03 mA

Relay output:

- Mechanical SPDT contacts: Hi, Lo, Pulse, Off
- Maximum voltage rating: 5 A @ 30 VDC, 5 A @ 250 VAC resistive load
- Hysteresis: User selectable
- Max 300 pulses/min.

Open-collector output: Hi, Lo, Pulse, Off

- Open-collector, optically isolated, 50 mA max. sink, 30 VDC max. pull-up voltage.
- Max 300 pulses/min.
- Hysteresis: User selectable

Ordering Information

Mfr. Part No.	Code	Description
3-8550-1	159 000 047	Flow transmitter, Field mount
3-8550-1P	159 000 048	Flow transmitter, Panel mount
3-8550-2	159 000 049	Flow transmitter, Field mount with relays
3-8550-2P	159 000 050	Flow transmitter, Panel mount with relays
3-8550-3	159 000 051	Flow transmitter, Field mount with dual input/output
3-8550-3P	159 000 052	Flow transmitter, Panel mount with dual input/output

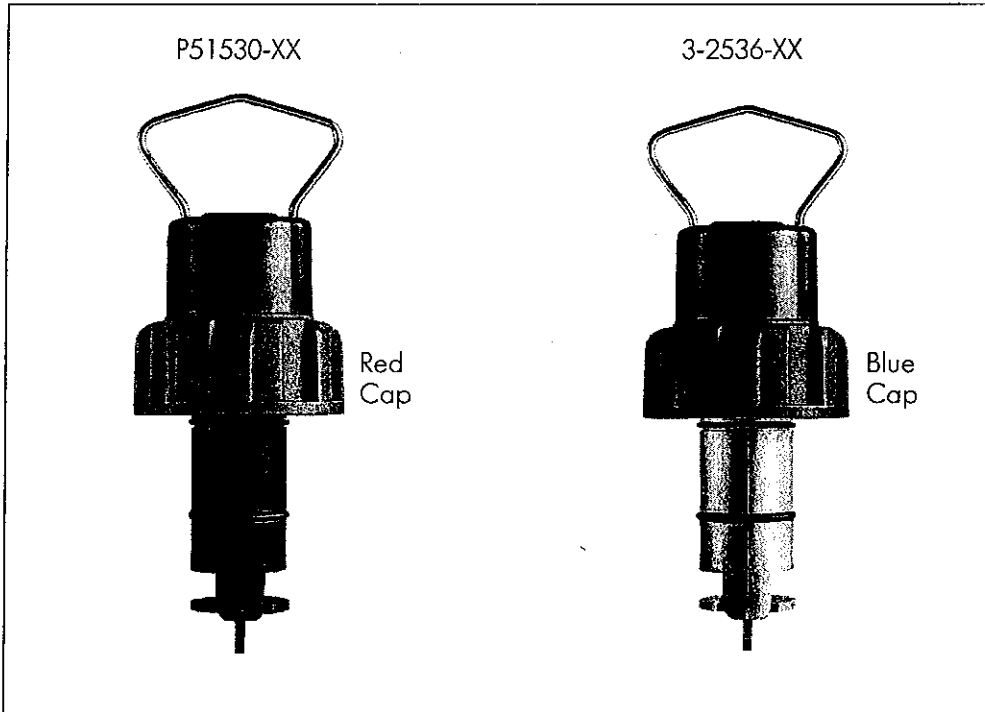
Accessories

Mfr. Part No.	Code	Description
3-8050	159 000 184	Universal mounting kit
3-8050.395	159 000 186	Transmitter NEMA 4X cover
3-8051	159 000 187	Flow Integral Mnt NPT
3-8052	159 000 188	3/4 in. Integral Mounting Kit
3-8050.396	159 000 617	RC Filter kit (for relay use)
3-8050.392	159 000 640	Model 200 retro-fit adapter
3-0000.596	159 000 641	Heavy duty wall mount bracket
3-5000.598	198 840 225	Surface Mount Bracket
3-9000.392	159 000 368	Liquid tight connector kit for rear cover (includes 3 connectors)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 piece)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG13.5 (1 piece)

Engineering Specifications

- The transmitter shall meet appropriate CE, CSA & UL standards.
- The transmitter shall be manufactured under ISO 9001 and ISO 14001 certified processes.
- The transmitter shall be field or panel mountable.
- The transmitter shall have flow rate and dual totalization capability.
- The display units shall be fully scaleable.
- The device shall meet NEMA 4X and IP65 standards.
- The operating voltage shall be 12 to 24 VDC.
- The transmitter shall have a 4 to 20 mA output with an open collector output, 5 to 30 VDC or a 4 to 20 mA output with 2 relays, or dual 4 to 20 mA output with dual open collector with delta capability.
- The transmitter shall have simulate capability.
- The transmitter shall be +GF+ SIGNET 8550 Flow Transmitter.

+GF+ SIGNET 515/2536 Rotor-X Flow Sensors



Features

- PVDF or Polypropylene molded sensor body
- Simple insertion design
- Separate versions for remote and integral installations
- Wide Turndown Ratio of 66:1 for 2536, 20:1 for 515
- Use with comprehensive line of fittings from DN15 to DN1000 (0.5 to 36 in.)
- Process Ready Signal (3-2536-XX)
- Extended length for wet-tap installations available

Description

Simple and reliable, Rotor-X paddlewheel flow sensors deliver time-honored performance. These highly repeatable, rugged sensors offer exceptional value with little or no maintenance required. Installation is simple with +GF+ SIGNET's comprehensive line of fittings for all pipe materi-

als in sizes from DN15 to DN1000 (0.5 to 36 in.). Output signal of the 515 is a sinusoidal frequency capable of driving a self-powered flowmeter (3-5090). The 3-2536 has a process-ready open-collector signal and can operate to flows as low as 0.1 m/s (0.3 ft/s).

Application

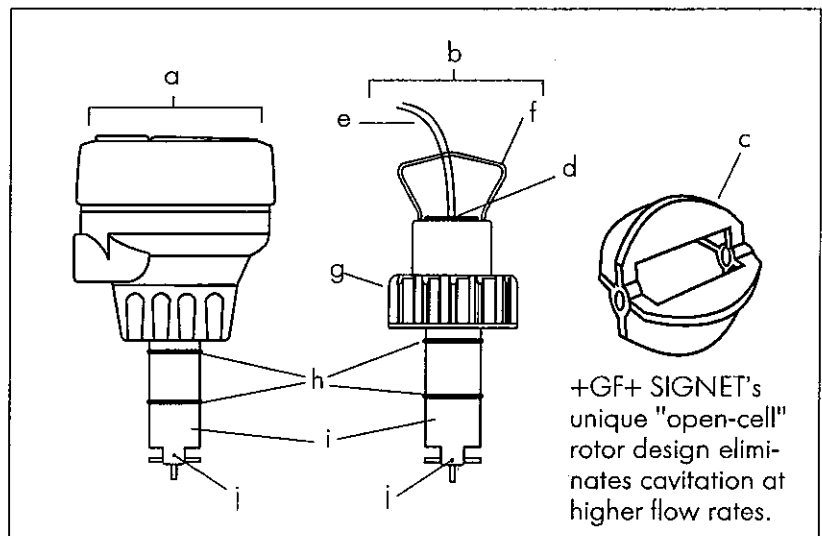
- Pure Water Production
- Filtration Systems
- Chemical Production
- Liquid Delivery Systems
- Pump Protection
- Scrubbers

Options

Rotor-X Sensors	Instrument Options									
	8550-1	8550-2	8550-3	8550-XP	5090	5075	5100	5500	5600	9010
515	●	●	●	●	●	●	●	●	●	●
8510	●	●	●	●						
2536	●	●	●	●	●	●	●	●	●	●
8512	●	●	●							

Technical Features

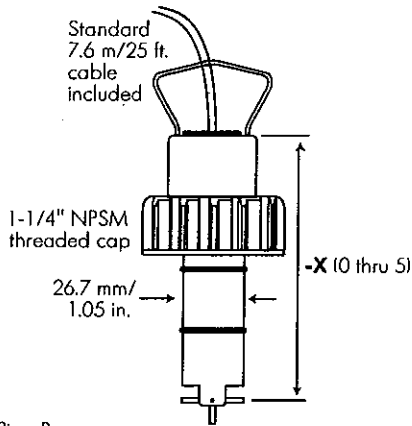
- Integral mount sensor (8510/8512) shown with field-mount transmitter (sold separately)
- Remote mount sensor (515/2536)
- Open cell rotor and rotor pins available in variety of material options (sleeved rotor available for abrasive solutions)
- 1/2 in. NPT conduit connection
- 7.6m/25 ft. cable standard, extendable up to 60m/200 ft. (515) or 305m/1,000 ft. (2536)
- Large bail for sensor removal
- Glass-filled PP ring nut with provision for lead seal installation
- Dual O-ring seal (FPM standard, EPR and Kalrez® available)
- One-piece injection molded (black glass-filled PP or natural PVDF) sensor body
- Rotor pin



+GF+ SIGNET's unique "open-cell" rotor design eliminates cavitation at higher flow rates.

Dimensions

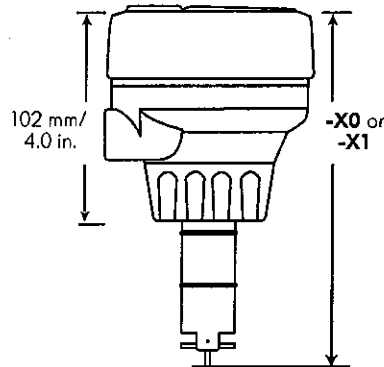
515/2536 Sensor



Pipe Range:

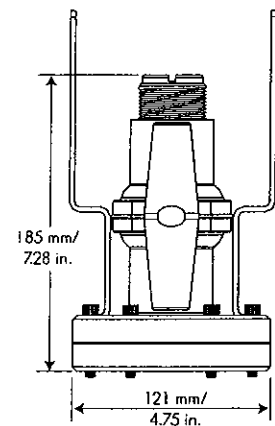
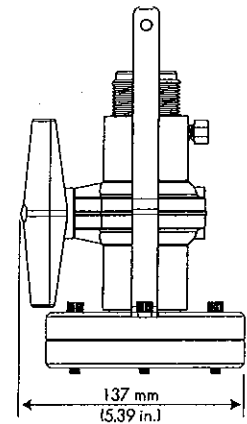
- | | | |
|--------------|-----------------------|-------------------|
| 1/2 to 4 in. | -X0 = 104 mm/4.1 in. | } Wet-tap Lengths |
| 5 to 8 in. | -X1 = 137 mm/5.4 in. | |
| 10" and up | -X2 = 213 mm/8.4 in. | |
| 1/2 to 4 in. | -X3 = 297 mm/11.7 in. | |
| 5 to 8 in. | -X4 = 333 mm/13.1 in. | |
| 10" and up | -X5 = 409 mm/16.1 in. | |

8512 Integral Sensor with Transmitter (sold separately)













- X0 = 152 mm/6.0 in.
-X1 = 185 mm/7.3 in.

3519 Wet Tap Assembly (see catalog page for details)



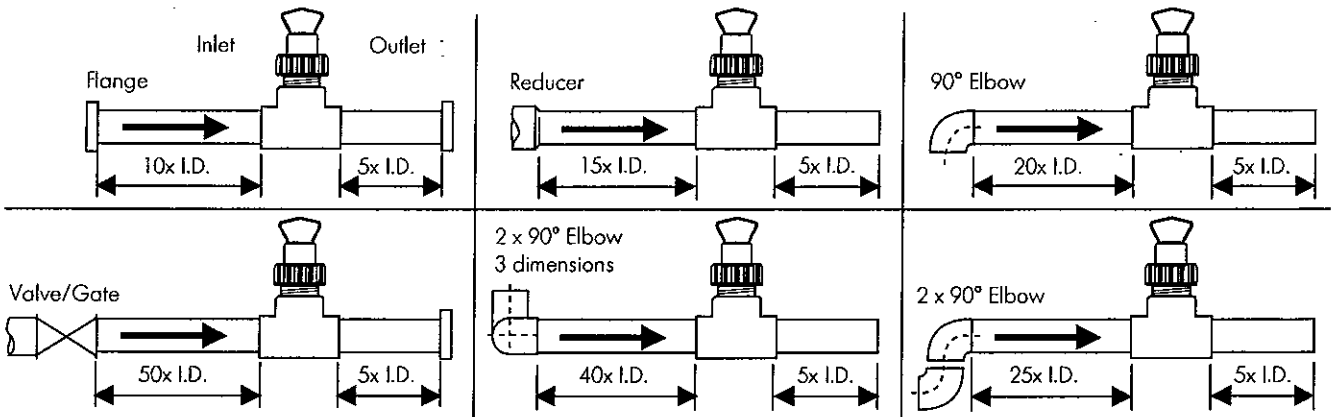
Fitting Types

Refer to Fittings section of +GF+ SIGNET catalog for a complete listing of part numbers

Type	Description	Type	Description
 Plastic tees	<ul style="list-style-type: none"> • 0.5 to 4 inch versions • PVC or CPVC 	 Iron, Carbon Steel, 316 SS Threaded tees	<ul style="list-style-type: none"> • 0.5 to 2 in. versions • Mounts on threaded pipe ends
 PVC Glue-on Saddles	<ul style="list-style-type: none"> • Available in 10 and 12 inch sizes only • Cut 2-1/2 inch hole in pipe • Weld in place using solvent cement 	 Carbon steel & stainless steel Weld-on Weldolets	<ul style="list-style-type: none"> • 2 to 4 inch, cut 1-7/16 inch hole in pipe • Over 4 inch, cut 2-1/4 inch hole in pipe
 PVC Saddles	<ul style="list-style-type: none"> • 2 to 4 inch, cut 1-7/16 inch hole in pipe • 6 to 8 inch, cut 2-1/4 inch hole in pipe 	 Fiberglass tees & saddles: FPT FPS	<ul style="list-style-type: none"> • 1.5 in. to 8 in. PVDF insert • > 8 in. PVC insert • Special order 12 in. to 36 in.
 PP Clamp-on Saddles	<ul style="list-style-type: none"> • Available in 10 and 12 inch sizes only • Cut 2-1/4 inch hole in pipe 	 Metric Wafer Fitting	<ul style="list-style-type: none"> • For pipes DN 65 to 200 mm • PP or PVDF
 Iron Strap-on saddles	<ul style="list-style-type: none"> • 2 to 4 inch, cut 1-7/16 inch hole in pipe • Over 4 inch, cut 2-1/4 inch hole in pipe • Special order 12 in. to 36 in. 	 Metric Union Fitting	<ul style="list-style-type: none"> • For pipes from DN 15 to 50 mm • PP or PVDF

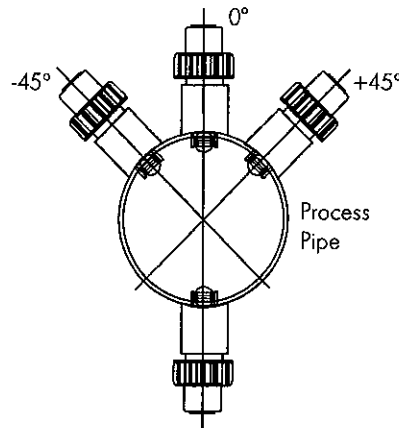
Installation

- Six common installation configurations are shown here as guidelines to help you select the best location in your piping system for a paddlewheel flow sensor.
- Always maximize distance between sensors and pump sources.



Sensor Mounting Position

- Horizontal pipe runs: Mount sensor in a vertical position for best performance, or at a maximum 45° angle to avoid air bubbles (pipe must be full). Do not mount the sensor on the bottom of the pipe if sedimentation is likely.
- Vertical pipe runs: Mount sensor in any orientation. Upward flow is preferred to ensure full pipe.



Maximum Operating Pressure/Temperature

515 Sensor:

Glass-filled Polypropylene Body:

12.5 bar (180 psi) max. @ 20°C (68°F)

1.7 bar (25 psi) max. @ 90°C (194°F)

PVDF Body:

14 bar (200 psi) max. @ 20°C (68°F)

1.7 bar (25 psi) max. @ 100°C (212°F)

2536 Sensor:

Polypropylene Body:

12.5 bar (180 psi) max. @ 20°C (68°F)

1.7 bar (25 psi) max. @ 85°C (185°F)

PVDF Body:

14 bar (200 psi) max. @ 20°C (68°F)

1.7 bar (25 psi) max. @ 85°C (185°F)

3519 Wet-Tap:

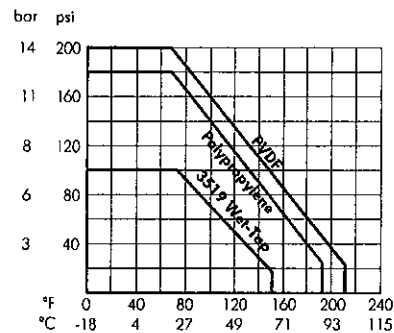
7 bar (100psi) max. @ -18° to 20°C (0° to 68°F)

1.4 bar (20 psi) max. @ 66°C (150°F)

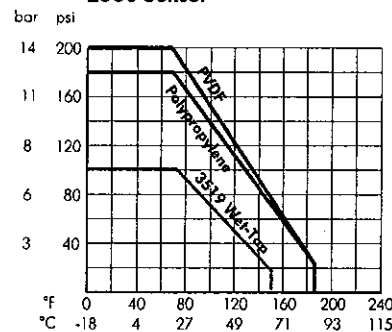
Note: Wet-tap max. installation/removal pressure:

1.7 bar (25 psi) @ 22°C (72°F).

515 Sensor

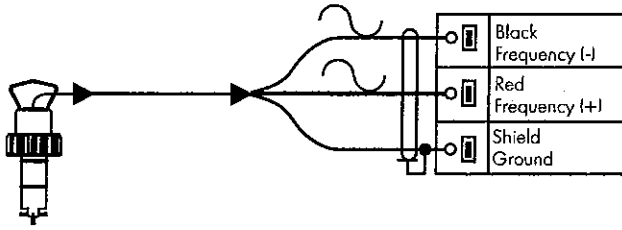


2536 Sensor

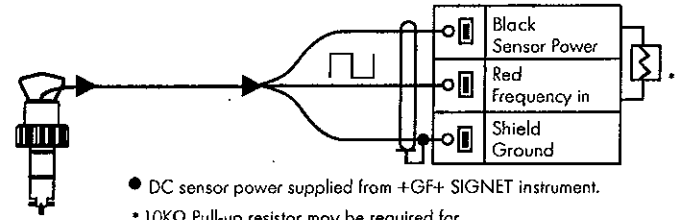


Wiring

515 Sensor Connection to +GF+ SIGNET Instruments



2536 Sensor Connection to +GF+ SIGNET Instruments



- DC sensor power supplied from +GF+ SIGNET instrument.
- * 10K Ω Pull-up resistor may be required for non +GF+ SIGNET brand instrument

Technical Data

General (for both 515 & 2536)

Pipe Size Range: 15 to 1000 mm (0.5 to 36 in.)
 Linearity: $\pm 1\%$ of full range
 Repeatability: $\pm 0.5\%$ of full range
 Minimum Reynolds Number Required: 4500
 Wetted Materials:

Sensor Body: Glass-filled Polypropylene (black) or PVDF (natural)
 O-rings: FPM-Viton[®] (std) or EPDM or FPM-Kalrez[®]
 Pin: Titanium or Hastelloy-C or PVDF; other material options available
 Rotor: Black PVDF or Natural PVDF; optional Tefzel with or w/o Fluoraloy B[®] sleeve

Cable Type: 2-conductor twisted pair with shield (22 AWG)
 Shipping Weight:

-X0	0.454 kg	1 lb.
-X1	0.476 kg	1.04 lbs.
-X2	0.680 kg	1.50 lbs.
-X3	0.794 kg	1.75 lbs.
-X4	0.850 kg	1.87 lbs.
-X5	1 kg	2.20 lbs.
3519	1.3 kg	2.86 lbs.

Standards and Approvals (for both 515 & 2536):

- Manufactured under ISO 9001 and ISO 14001
- CE

General (515 Only)

Flow Rate Range: 0.3 to 6 m/s (1 to 20 ft./s)
 Pipe Size Range: DN15 to DN1000 (0.5 to 36 in.)
 Cable Length: 7.6 m (25 ft.) standard/60 m (200 ft.) maximum
 Signal:
 Frequency: 19.7 Hz per m/s nominal (6 Hz per ft/s)
 Amplitude: 3.3 V p/p per m/s nominal (1 V p/p per ft/s)
 Source Impedance: 8 Ω

Standards and Approvals (515 only):

- FM Class I, II, II/Div./groups A-G

General (2536 Only)

Flow Rate Range: 0.1 to 6 m/s (0.3 to 20 ft./s)
 Pipe Size Range: DN15 to DN1000 (0.5 to 36 in.)
 Cable Length: 7.6 m (25 ft.) standard/305 m (1,000 ft.) maximum
 Signal:
 Frequency: 49Hz per m/s nominal (15 Hz per ft/s nominal)
 Supply voltage: 3.5 to 24 VDC regulated
 Supply current: <1.5 mA @ 3.3 to 6 VDC
 <20 mA @ 6 to 24 VDC
 Output Type: Open collector transistor, sinking
 Output Current: 10 mA max.

Ordering Information

515/8510-XX (Sinusoidal)

Mfr. Part No.	Code	Pipe Sizes	Body	Rotor/Pin
Remote				
P51530-H0	198 801 659	0.5 to 4 in.	Polypro	Blk PVDF/Hastelloy-C
P51530-P0	198 801 620	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
P51530-P1	198 801 621	5 to 8 in.	Polypro	Blk PVDF/Titanium
P51530-P2	198 801 622	10 to 36 in.	Polypro	Blk PVDF/Titanium
Remote Wet-Tap				
P51530-P3	198 840 310	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
P51530-P4	198 840 311	5 to 8 in.	Polypro	Blk PVDF/Titanium
P51530-P5	198 840 312	10 to 36 in.	Polypro	Blk PVDF/Titanium
Remote				
P51530-S0	198 801 661	0.5 to 4 in.	Polypro	Blk PVDF/Natural PVDF
P51530-T0	198 801 663	0.5 to 4 in.	Natural PVDF	Natural PVDF
P51530-T1	198 801 664	5 to 8 in.	Natural PVDF	Natural PVDF
P51530-V0	198 801 623	0.5 to 4 in.	Natural PVDF	Nat. PVDF/Hastelloy-C
P51530-V1	198 801 624	5 to 8 in.	Natural PVDF	Nat. PVDF/Hastelloy-C
P51530-V2	198 801 625	10 to 36 in.	Natural PVDF	Nat. PVDF/Hastelloy-C
Integral				
3-8510-P0	198 864 504	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3-8510-P1	198 864 505	5 to 8 in.	Polypro	Blk PVDF/Titanium
3-8510-T0	159 000 622	0.5 to 4 in.	Natural PVDF	Natural PVDF
3-8510-V0	198 864 506	0.5 to 4 in.	Natural PVDF	Nat. PVDF/Hastelloy-C

2536/8512-XX (Open-Collector)

Remote				
3-2536-P0	198 840 143	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3-2536-P1	198 840 144	5 to 8 in.	Polypro	Blk PVDF/Titanium
3-2536-P2	198 840 145	10 to 36 in.	Polypro	Blk PVDF/Titanium
3-2536-T0	198 840 149	0.5 to 4 in.	Polypro	Natural PVDF
3-2536-V0	198 840 146	0.5 to 4 in.	Natural PVDF	Nat. PVDF/Hastelloy-C
3-2536-V1	198 840 147	5 to 8 in.	Natural PVDF	Nat. PVDF/Hastelloy-C
Remote Wet-Tap				
3-2536-P3	159 000 758	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3-2536-P4	159 000 759	5 to 8 in.	Polypro	Blk PVDF/Titanium
3-2536-P5	159 000 760	10 to 36 in.	Polypro	Blk PVDF/Titanium
Integral				
3-8512-P0	198 864 513	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3-8512-P1	198 864 514	5 to 8 in.	Polypro	Blk PVDF/Titanium
3-8512-T0	198 864 518	0.5 to 4 in.	Natural PVDF	Natural PVDF
3-8512-V0	198 864 516	0.5 to 4 in.	Natural PVDF	Nat. PVDF/Hastelloy-C

Wet-Tap Sensor and Valve Assembly (Fitting Separate)

Remote Wet-Tap				
3519/515-P3	159 000 819	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3519/515-P4	159 000 820	5 to 8 in.	Polypro	Blk PVDF/Titanium
3519/515-P5	159 000 821	10 to 36 in.	Polypro	Blk PVDF/Titanium
3519/2536-P3	159 000 822	0.5 to 4 in.	Polypro	Blk PVDF/Titanium
3519/2536-P4	159 000 823	5 to 8 in.	Polypro	Blk PVDF/Titanium
3519/2536-P5	159 000 824	10 to 36 in.	Polypro	Blk PVDF/Titanium

Accessories

Mfr. Part No.	Code	Description
Rotors 515/8510-XX		
M1538-2	198 801 181	Rotor, PVDF Black
P51547-3	159 000 474	Rotor, PVDF Natural
M1538-4	198 820 018	Rotor, Tefzel®
P51550-3	198 820 043	Rotor and Pin, PVDF Natural
3-0515.322-1	198 820 059	Sleeved Rotor, PVDF Black
3-0515.322-2	198 820 060	Sleeved Rotor, PVDF Natural
3-0515.322-3	198 820 017	Sleeved Rotor, Tefzel®

Accessories (continued)

Mfr. Part No.	Code	Description
Rotors 2536/8512-XX		
3-2536.320-1	198 820 052	Rotor, PVDF Black
3-2536.320-2	159 000 272	Rotor, PVDF Natural
3-2536.320-3	159 000 273	Rotor, Tefzel®
3-2536.321	198 820 054	Rotor and Pin, PVDF Natural
3-2536.322-1	198 820 056	Sleeved Rotor, PVDF Black
3-2536.322-2	198 820 057	Sleeved Rotor, PVDF Natural
3-2536.322-3	198 820 058	Sleeved Rotor, Tefzel®
Rotor Pins		
M1546-1	198 801 182	Pin, Titanium
M1546-2	198 801 183	Pin, Hastelloy-C
M1546-3	198 820 014	Pin, Tantalum
M1546-4	198 820 015	Pin, Stainless Steel
P51545	198 820 016	Pin, Ceramic
O-Rings		
1220-0021	198 801 186	O-Ring, FPM-Viton®
1224-0021	198 820 006	O-Ring, EPDM
1228-0021	198 820 007	O-Ring, FPM-Kalrez®
Miscellaneous		
P31536	198 840 201	Sensor Plug, Polypro
P31536-1	198 840 202	Sensor Plug, PVDF Metric
P31536-2	159 000 649	Sensor Plug, PVDF
P31542	198 801 630	Sensor Cap, Red (for use w/515)
P31542-3	159 000 464	Sensor Cap, Blue (for use w/2536)
P31934	159 000 466	Conduit Cap
P51589	159 000 476	Conduit Adapter Kit
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
3-8051	159 000 187	Transmitter Integral Adapter

Engineering Specifications for both 515 and 2536 Flow Sensors

- The flow sensor shall use a four-blade, open-cell rotor design using insertion paddlewheel technology.
- Linearity of the output signal with respect to flow rate shall be $\pm 1\%$ of full range.
- Measurement repeatability of the output signal with respect to flow rate shall be $\pm 0.5\%$ of full range.
- The sensor body shall be made of injection-molded polypropylene (PP) that shall accommodate up to 12.5 bar @ 20°C (180 psi @ 68°F) and 1.7 bar @ 90°C (25 psi @ 194°F). As an alternative, the sensor shall be made of injection-molded polyvinylidene fluoride (PVDF) that shall accommodate up to 14 bar @ 20°C (200 psi @ 68°F) and 1.7 bar @ 100°C (25 psi @ 212°F).
- The sensor shall attach to a pipe via a variety of insertion-style installation fittings supplied by the flow sensor manufacturer. Attachment shall use a 1-1/4 X 11-1/2 NPSM threaded cap. Sealing shall be accomplished with a double O-ring seal. O-rings shall be made of FPM-Viton®, FPM-Kalrez® or EPDM.
- The sensor shall be equipped with 0.5 in. female conduit connection.

Engineering Specifications for +GF+ SIGNET 515 Rotor-X Flow Sensor

- The sensor shall require no electrical power.
- The sensor shall provide an output signal of 3.3 V p-p per m/s nominal (1 V p-p per ft/s) at a frequency of 19.7 Hz per m/s nominal (6 Hz per ft/s) from 0.3 to 6 m/s (1 to 20 ft/s).
- Output shall be via a twisted pair, foil-shielded cable with drain wire. Supplied cable shall be at least 7.6 m (25 ft) long, with a maximum allowable length of 60 m (200 ft).
- The operating range of the sensor shall accommodate nominal flow rates from 0.3 to 6 m/s (1 to 20 ft/s).
- The sensor shall meet appropriate CE standards and FM standards for Classes 1, 11 and 111, Division I/Groups A-G.

Engineering Specifications for +GF+ SIGNET 2536 Low Flow Sensor

- The sensor shall operate with a power input of 3.3 to 6VDC @ <1.5 mA or from 6 to 24 VDC @ <20 mA.
- The sensor output shall provide an open-collector pulse at a frequency of 49.2 Hz per m/s nominal (15 Hz per ft/s).
- Output shall be via a twisted pair, foil-shielded cable with drain wire. Supplied cable shall be at least 7.6 m (25 ft) long, with a maximum allowable length of 305 m (1000 ft).
- The operating range of the sensor shall accommodate nominal flow rates from 0.1 to 6 m/s (0.3 to 20 ft/s).
- The sensor shall meet appropriate CE standards.

Viton®, Tefzel® and Kalrez® are registered trademarks of DuPont Dow Elastomers.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

PRESSURE INDICATOR / TRANSMITTER

TRANSMITTER

MANUFACTURER : FOXBORO
MODEL : I/A SERIES ELECTRONIC TRANSMITTER, IGP10
MODEL NO. : IGP10-T23D1C-L1X2
SERVICE : CLOSED LOOP DI COOLING WATER
RANGE : 0 ~ 60 PSIG (0 ~ 400 kPa)
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 11.5 ~ 42 VDC
CONNECTION : 1/2" (12.7 mm) NPT
MATERIAL OF CONSTRUCTION (WETTED PARTS)
CONNECTION : TYPE 316L S.S.
SENSOR : TYPE 316L S.S.
FILL FLUID : FLUORINERT
DISPLAY : DIGITAL LCD DISPLAY
CUSTOMER TAG NO. : PT-O111A / PT-O131A / PT-O151A

VALVE

MANUFACTURER : ANDERSON GREENWOOD
TYPE : TWO-VALVE SINGLE OUTLET GAUGE VALVE
MODEL NO. : M25VIS-44-OC
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
PACKING : TEFLON
MOUNTING PIPE SIZE : 3" (75 mm) S.S. PIPE
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)
CUSTOMER TAG NO. : HV-O111B / HV-O131B / HV-O151B

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the contractor.

Responsibility for verification and correction of field dimensions, formation, and installation of construction, and for the accuracy of all parts of the work rests with the contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 25/1/06 By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 4E**

**FOR
FOXBORO PRESSURE
INDICATOR/TRANSMITTER
AND
ANDERSON GREENWOOD VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

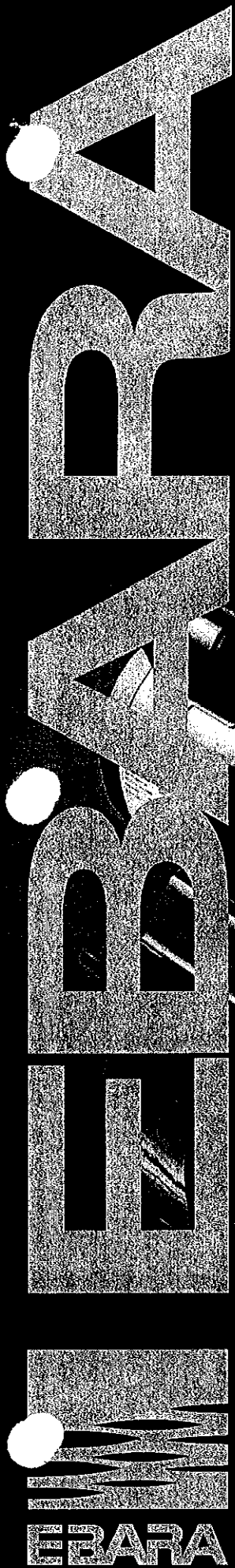
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

CLOSED LOOP COOLING WATER PUMP

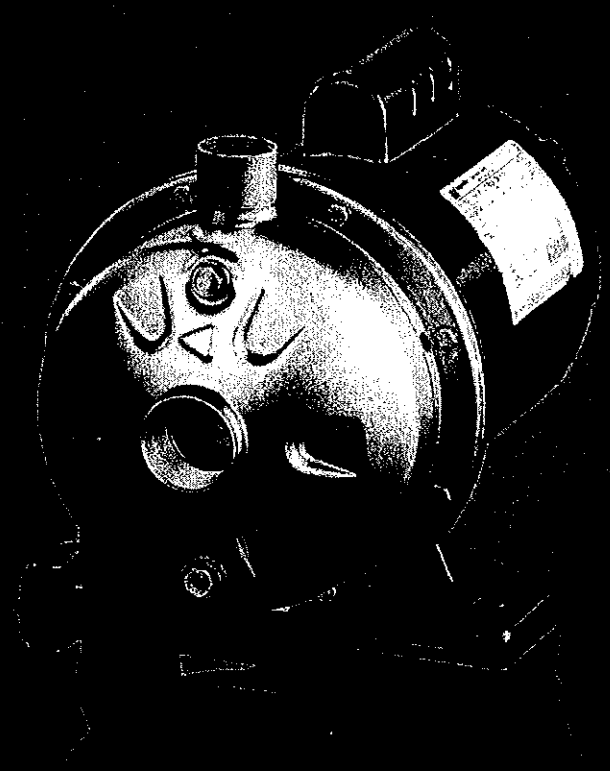
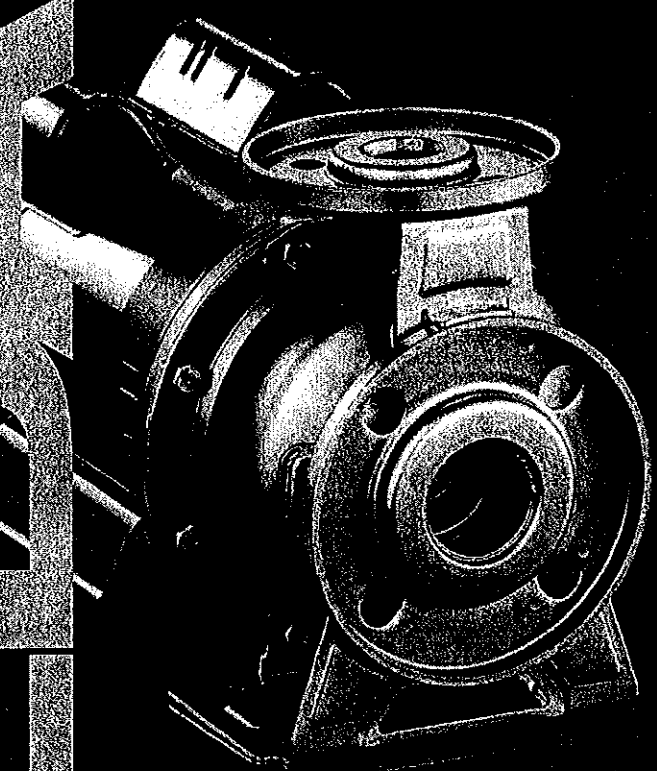
MANUFACTURER : EBARA
MODEL : 3U-50-125-7 1/2 HP
TYPE : CLOSE COUPLED END SUCTION CENTRIFUGAL
SERVICE : CLOSED LOOP DI COOLING WATER
REQ'D FLOW RATE : 213.3 GPM (807 L/min)
HEAD REQUIREMENT : 60 FT (18.3 m) OF H₂O
MATERIAL OF CONSTRUCTION
 CASING : TYPE 304L S.S.
 IMPELLER : TYPE 304L S.S.
CONNECTION
 SUCTION SIDE : 2½" (64 mm) FLANGE
 DISCHARGE SIDE : 2" (50 mm) FLANGE
MOTOR : 7.5 HP, 3450 RPM, TEFC
POWER : 480 VAC / 3 PHASE / 60 Hz
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : P-O411A / P-O421A / P-O431A



Model 3U/CDU

end suction centrifugal



EBARA

EBARA International Corporation

Standard Pump Division

Model 3U / CDU

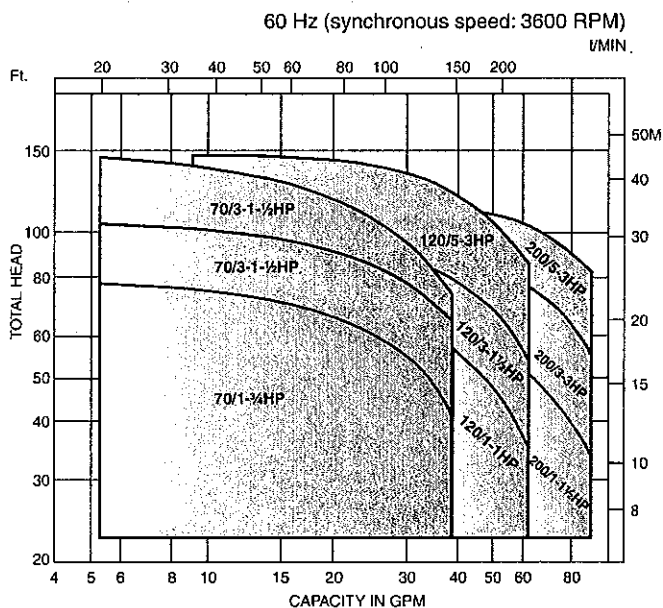
Features

- **Close coupled design**
 - saves space; simplifies maintenance and installation
- **Stainless steel liquid end components**
 - high quality; corrosion resistance
- **Versatile mounting**
 - can be installed horizontally or vertically
- **Back pullout construction**
 - assembly and overhaul of the impeller and seal without distorting suction and discharge connections
- **Top centerline discharge and foot support under casing**
 - ensures self-venting and reduces misalignment from pipe loads
- **High operating efficiency**
 - lowers operating costs
- **High quality mechanical shaft seals and o-rings**
 - available for standard pumping requirements or optional high temperature and chemical duty operation

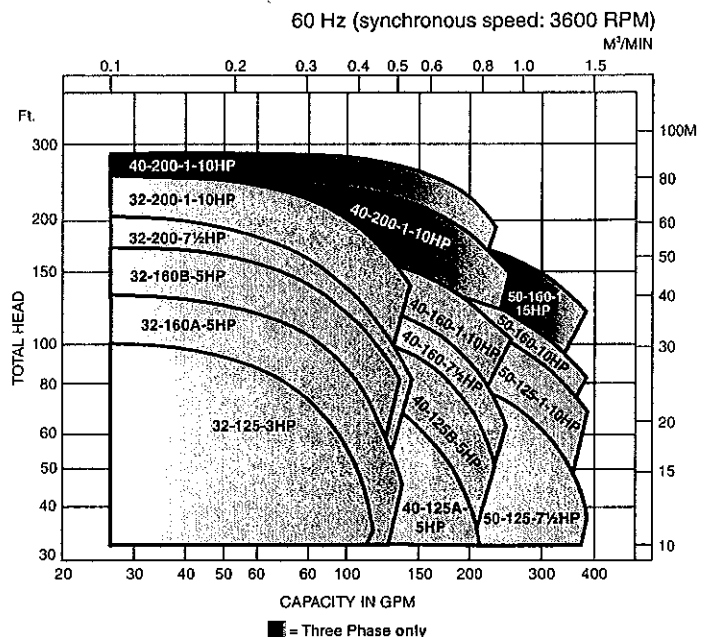
Applications

- Plant services
- Water supply systems
- Washing plants
- Cooling water
- Car wash
- Scrubbers
- Ultrapure water systems
- Jockey pump services
- Air conditioning
- Sprinkler/flow irrigation
- OEM equipment application
- Pressure boosting
- Liquid transfer
- Heat exchanger
- Spray systems
- Heating
- Beverage processing
- Pharmaceutical services
- Water reclamation and treatment
- General pump applications

CDU selection chart



3U selection chart



EBARA International Corporation

Standard Pump Division

1651 Cedar Line Drive • Rock Hill, SC 29730 • (t) 803 327 5005 • (f) 803 327 5097

info@pumpsebara.com • www.pumpsebara.com

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EIC3U_CDU 0105

Model 3U/3UB

EBARA Stainless Steel Centrifugal Pumps

Specifications

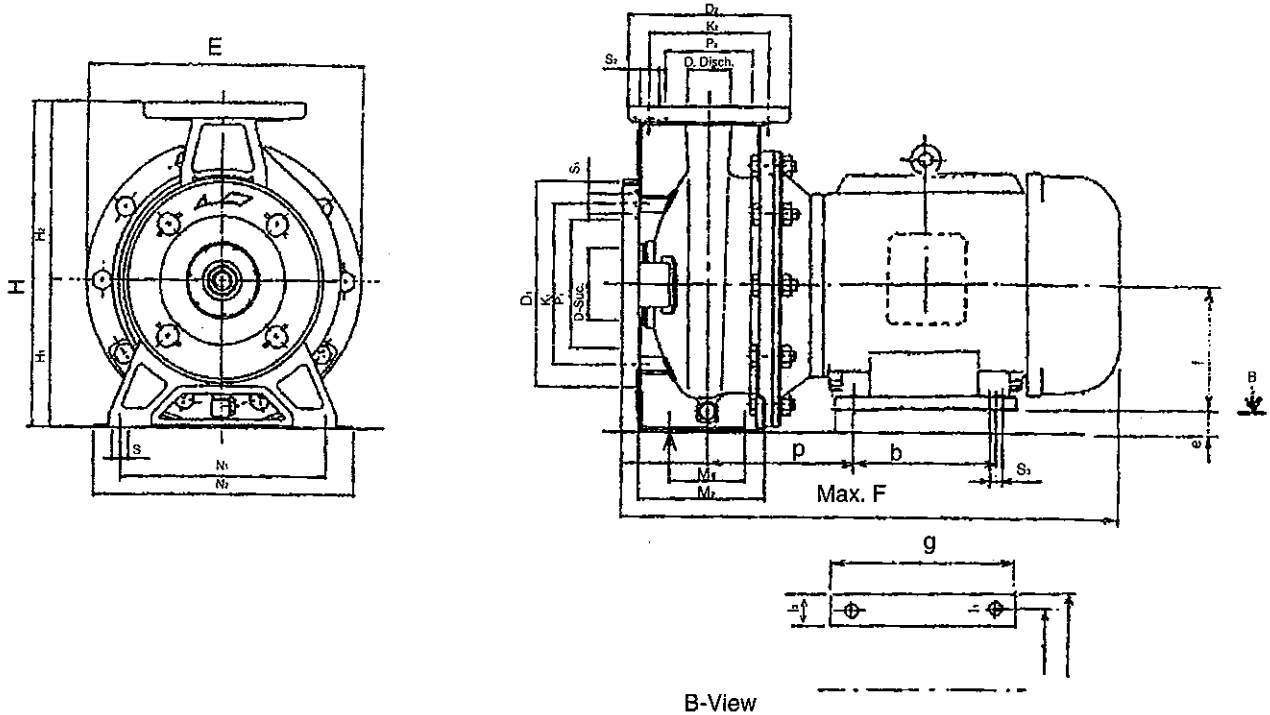
	Standard	Optional										
Size Suction (150 lb. ANSI R.F. equivalent) Discharge (150 lb. ANSI R.F. equivalent)	3U32 – 2" ANSI Equivalent 3U40 – 2½" ANSI Equivalent 3U50 – 2½" ANSI Equivalent 3UB65 – 3" ANSI Equivalent 3U32 – 1¼" ANSI Equivalent 3U40 – 1½" ANSI Equivalent 3U50 – 2" ANSI Equivalent 3UB65 – 2½" ANSI Equivalent	Companion Flange kit 150 Lb. ANSI, Female NPT										
Range of HP	3U – 3 HP to 15 HP 3UB – 7½ HP to 30 HP											
Range of Performance Capacity Head	13 to 750 GPM at 3450 RPM 33 to 250 feet at 3450 RPM											
Liquid handled Type of liquid Temperature Max. working pressure	Clean water 212°F (100°C) 230 PSI (15 Bar)	Max. 250°F (121°C) with optional high temperature seal										
Materials Casing Impeller (closed type) Shaft Sleeve Bracket	<table border="0"> <tr> <td>3U</td> <td>3UB</td> </tr> <tr> <td>304L Stainless Steel</td> <td>304L Stainless Steel</td> </tr> <tr> <td>304L Stainless Steel</td> <td>Bronze</td> </tr> <tr> <td>304L Stainless Steel</td> <td>304L Stainless Steel</td> </tr> <tr> <td>Cast iron</td> <td>Cast iron</td> </tr> </table>	3U	3UB	304L Stainless Steel	304L Stainless Steel	304L Stainless Steel	Bronze	304L Stainless Steel	304L Stainless Steel	Cast iron	Cast iron	
3U	3UB											
304L Stainless Steel	304L Stainless Steel											
304L Stainless Steel	Bronze											
304L Stainless Steel	304L Stainless Steel											
Cast iron	Cast iron											
Shaft Seal Seal Material	Mechanical Seal – Type 21 Carbon/Ceramic/Viton Carbon/Ceramic/Buna Hot water – Carbon/Ni-Resist/Viton, 250°F (121°C) max.	Consult factory for additional optional seal availability										
Direction of Rotation	Clockwise when viewed from motor end											
Motor Type Speed Bearing Single Phase Three Phase Motor Protection	NEMA JM, TC, TSC Frame 60 Hz, 3450 RPM (2 poles) Ball Bearing TEFC – 3 HP ODP – 3 HP to 10 HP TEFC – 3 HP to 30 HP ODP – 3 HP to 30 HP 208-230/460V Overload protection must be provided	4 pole – consult factory as noted Explosion proof – consult factory for availability Washdown duty – consult factory for availability										
Standard Accessories	Suction and Discharge Flange Gasket Motor support											



Model 3U

EBARA Stainless Steel Centrifugal Pumps

Pump Dimensions



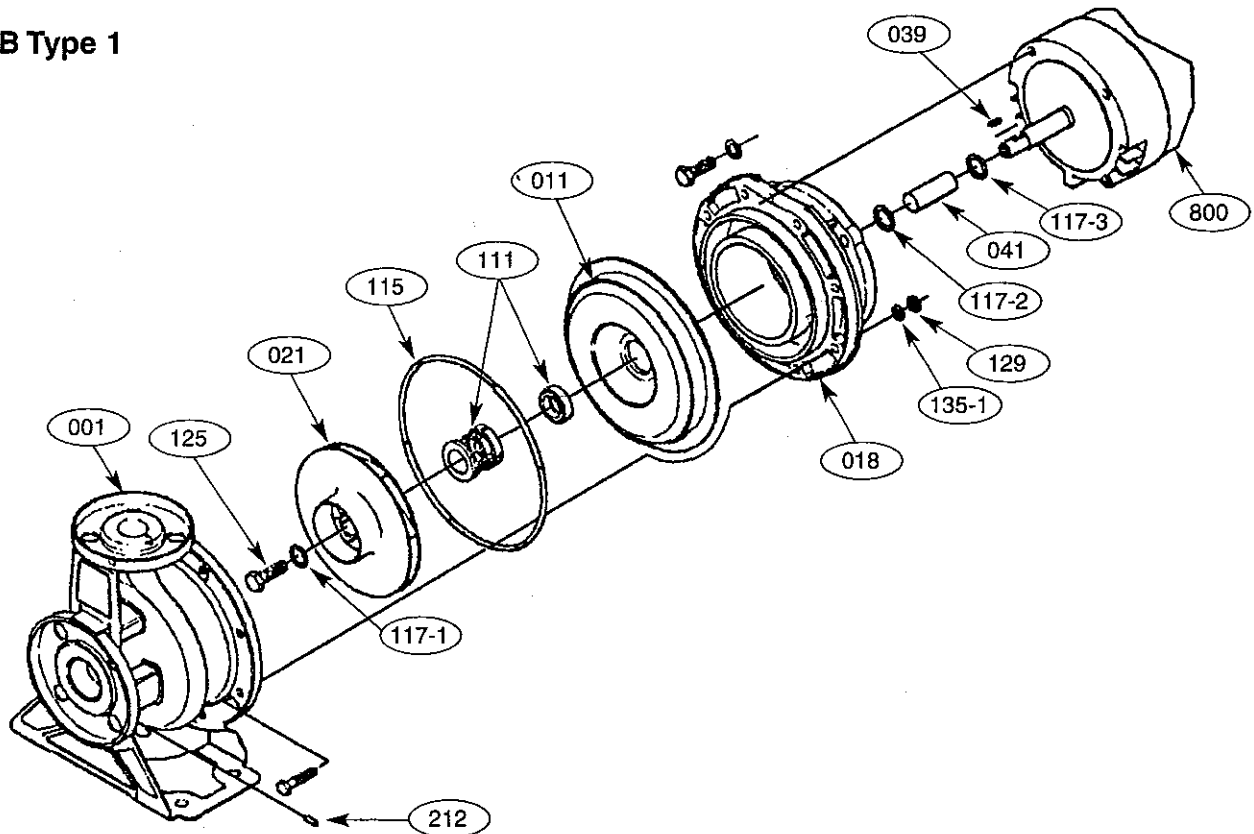
Unit: inch

Model	Size	Flange										Pump									
		Suction					Discharge														
		D. Suc.	P.	K.	D.	S.	D. Disch.	P.	K.	D.	S.	A	E	H	H ₁	H ₂	M ₁	M ₂	N ₁	N ₂	S
32-125-3HP	1 1/4 x 2 x 5 9/16	2	3 3/4	4 15/16	6 1/2	1 1/16	1 1/4	2 1/2	3 1/2	5 1/2	5/8	3 1/8	8 3/8	9 15/16	4 7/16	5 1/2	2 3/4	4 1/2	5 1/2	7 1/2	9 1/16
32-160A-5HP	1 1/4 x 2 x 5 15/16	2	3 3/4	4 15/16	6 1/2	1 1/16	1 1/4	2 1/2	3 1/2	5 1/2	5/8	3 1/8	10	11 1/2	5 3/16	6 5/16	2 3/4	4 5/8	7 1/2	9 7/16	9 1/16
32-160B-5HP	1 1/4 x 2 x 6 1/16	2	3 3/4	4 15/16	6 1/2	1 1/16	1 1/4	2 1/2	3 1/2	5 1/2	5/8	3 1/8	10	11 1/2	5 3/16	6 5/16	2 3/4	4 5/8	7 1/2	9 7/16	9 1/16
32-200-7 1/2HP	1 1/4 x 2 x 7 5/16	2	3 3/4	4 15/16	6 1/2	1 1/16	1 1/4	2 1/2	3 1/2	5 1/2	5/8	3 1/8	11 9/16	13 3/8	6 9/16	7 1/16	2 3/4	4 11/16	7 1/2	9 7/16	9 1/16
32-200-10HP	1 1/4 x 2 x 7 1/8	2	3 3/4	4 15/16	6 1/2	1 1/16	1 1/4	2 1/2	3 1/2	5 1/2	5/8	3 1/8	11 9/16	13 3/8	6 9/16	7 1/16	2 3/4	4 11/16	7 1/2	9 7/16	9 1/16
40-125A-5HP	1 1/2 x 2 1/2 x 4 15/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 1/8	8 3/8	9 5/16	4 7/16	5 1/2	2 3/4	4 1/2	6 5/16	8 1/4	9 1/16
40-125B-5HP	1 1/2 x 2 1/2 x 5 1/2	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 1/8	8 3/8	9 5/16	4 7/16	5 1/2	2 3/4	4 1/2	6 5/16	8 1/4	9 1/16
40-160-7 1/2HP	1 1/2 x 2 1/2 x 5 15/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 1/8	10	11 1/2	5 3/16	6 5/16	2 3/4	4 5/8	7 1/2	9 7/16	9 1/16
40-160-1-10HP	1 1/2 x 2 1/2 x 6 9/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 1/8	10	11 1/2	5 3/16	6 5/16	2 3/4	4 5/8	7 1/2	9 7/16	9 1/16
40-200A-15HP	1 1/2 x 2 1/2 x 7 5/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 5/16	11 1/16	13 3/8	6 5/16	7 1/16	2 3/4	4 1/2	8 3/8	10 7/16	9 1/16
40-200B-15HP	1 1/2 x 2 1/2 x 7 1/8	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	1 1/2	2 7/8	3 7/8	5 7/8	5/8	3 5/16	11 1/16	13 3/8	6 5/16	7 1/16	2 3/4	4 1/2	8 3/8	10 7/16	9 1/16
50-125-7 1/2HP	2 x 2 1/2 x 5 3/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	2	3 3/4	4 15/16	6 1/2	11/16	3 5/16	10	11 1/2	5 3/16	6 5/16	2 3/4	4 1/2	7 1/2	9 7/16	9 1/16
50-125-10HP	2 x 2 1/2 x 5 1/2	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	2	3 3/4	4 15/16	6 1/2	11/16	3 5/16	10	11 1/2	5 3/16	6 5/16	2 3/4	4 1/2	7 1/2	9 7/16	9 1/16
50-160-10HP	2 x 2 1/2 x 6 9/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	2	3 3/4	4 15/16	6 1/2	11/16	3 5/16	11 9/16	13 3/8	6 5/16	7 1/16	2 3/4	4 1/2	8 3/8	10 7/16	9 1/16
50-160-1-15HP	2 x 2 1/2 x 6 1/16	2 1/2	4 9/16	5 1 1/16	7 5/16	1 1/16	2	3 3/4	4 15/16	6 1/2	11/16	3 5/16	11 11/16	13 3/8	6 5/16	7 1/16	2 3/4	4 1/2	8 3/8	10 7/16	9 1/16

Exploded View

3U

3UB Type 1

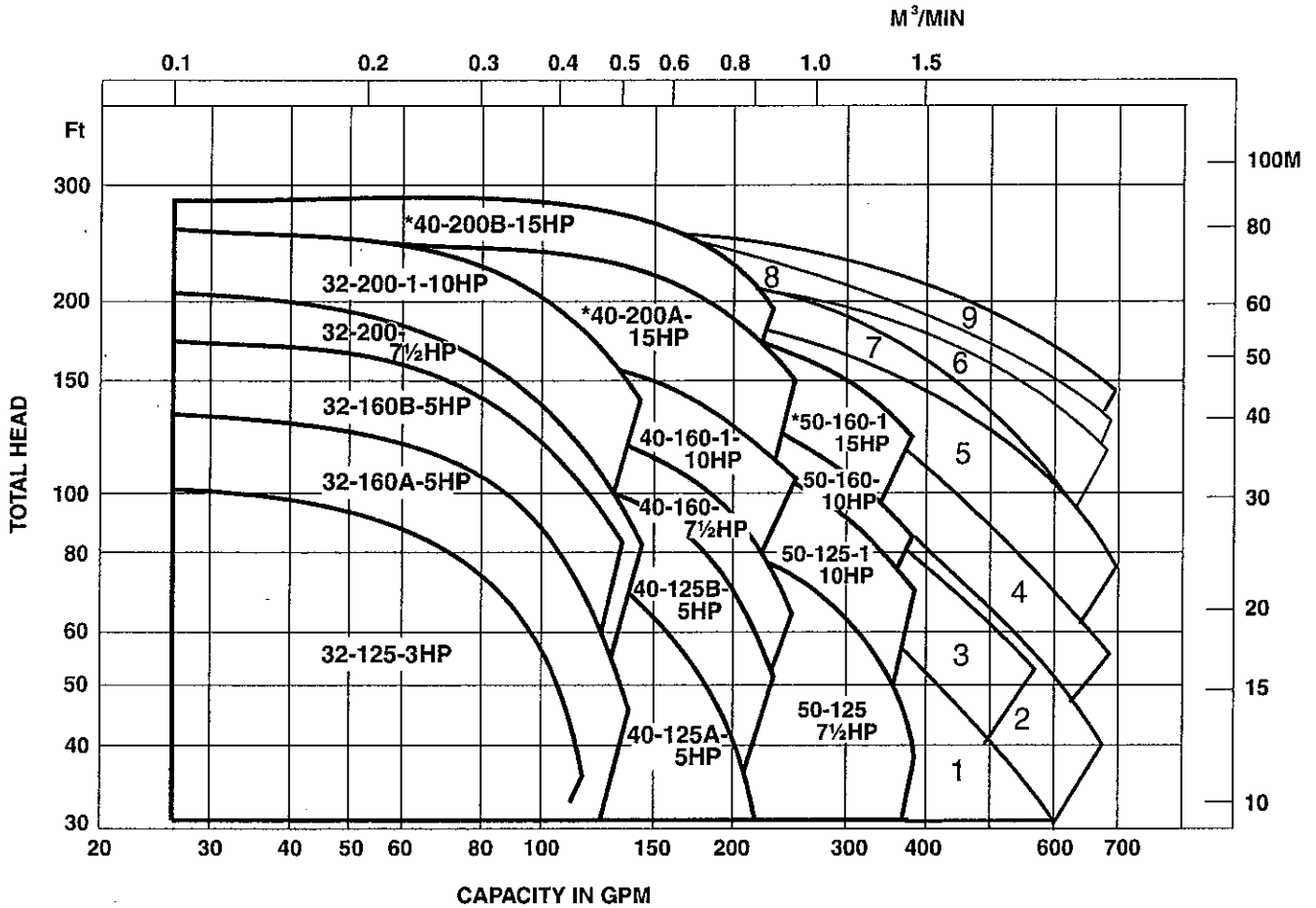


Part No.	Part Name	Material	No. for 1 Unit
001	Casing	304L Stainless	1
011	Casing cover	304L Stainless	1
018	Bracket	Cast Iron	1
021	Impeller (3U)	304L Stainless	1
021	Impeller (3UB)	Bronze	1
039	Key	304L Stainless	1
041	Shaft sleeve	304L Stainless	1
111	Mechanical seal	-	1
115	O-Ring	Viton	1
117-1	Gasket	Nylon	1
117-2	Gasket	Nylon	1
117-3	Gasket	Nylon	1
125	Impeller Bolt	304L Stainless	1
160	Motor support (not shown)	Steel	1 set
212	Plug	304L Stainless	1
800	Motor	-	1
	Suction Flange Gasket	Viton	1
	Discharge Flange Gasket	Viton	1



Selection chart

Synchronous Speed 3450 RPM



*Three phase motor only

1. 3U65-125-7.5HP
2. 3U65-125-10HP
3. 3U65-160-10HP
4. 3U65-160-15HP*
5. 3U65-160-20HP*
6. 3U65-160-25HP*
7. 3U65-200-20HP*
8. 3U65-200-25HP*
9. 3U65-200-30HP*



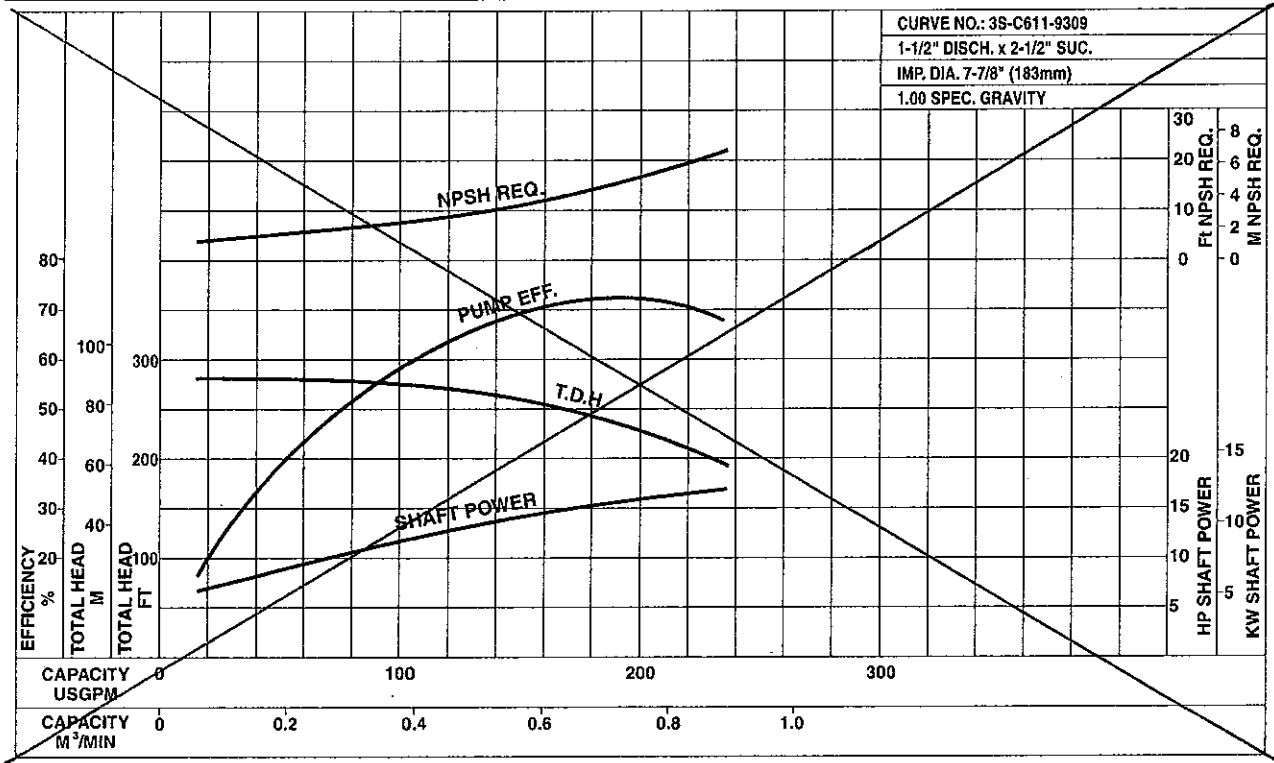
Model 3U
Performance Curves

EBARA Stainless Steel Centrifugal Pumps

3U 40-200B-15HP

Synchronous Speed: 3450 RPM

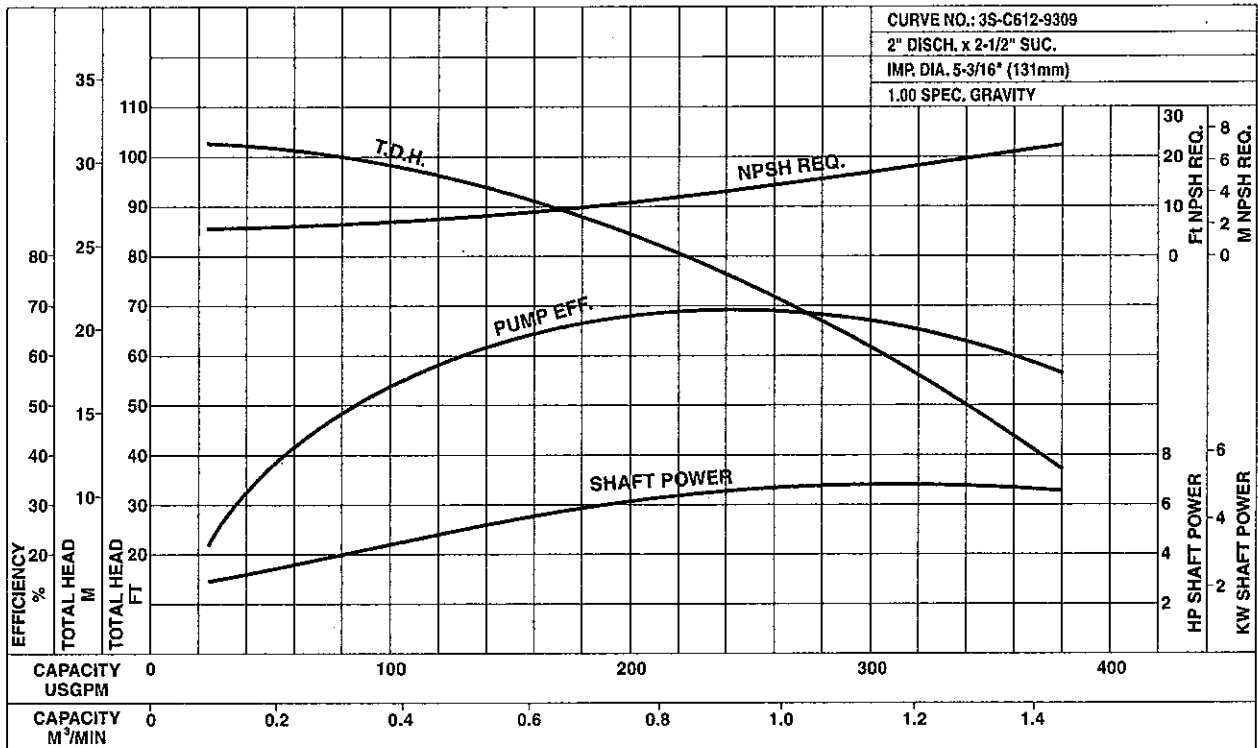
Size: 1 1/2 x 2 1/2 x 7 1/8



3U 50-125-7 1/2 HP

Synchronous Speed: 3450 RPM

Size: 2 x 2 1/2 x 5 3/16





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

CHECK VALVE

MANUFACTURER : TECHNO
MODEL : 5051-316
STYLE : WAFER / CLASS 150 #
SERVICE : CLOSED LOOP DI COOLING WATER
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
VALVE PLATE : TYPE 316 S.S.
SPRING : TYPE 316 S.S.
SEAL : TEFLON
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150 # FLANGES
PIPE SIZE : 3" (75 mm)
QUANTITY : 6 (2 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : CV-O411A / CV-O411B
CV-O421A / CV-O421B
CV-O431A / CV-O431B



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 4H**

**FOR
TECHNO CHECK VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

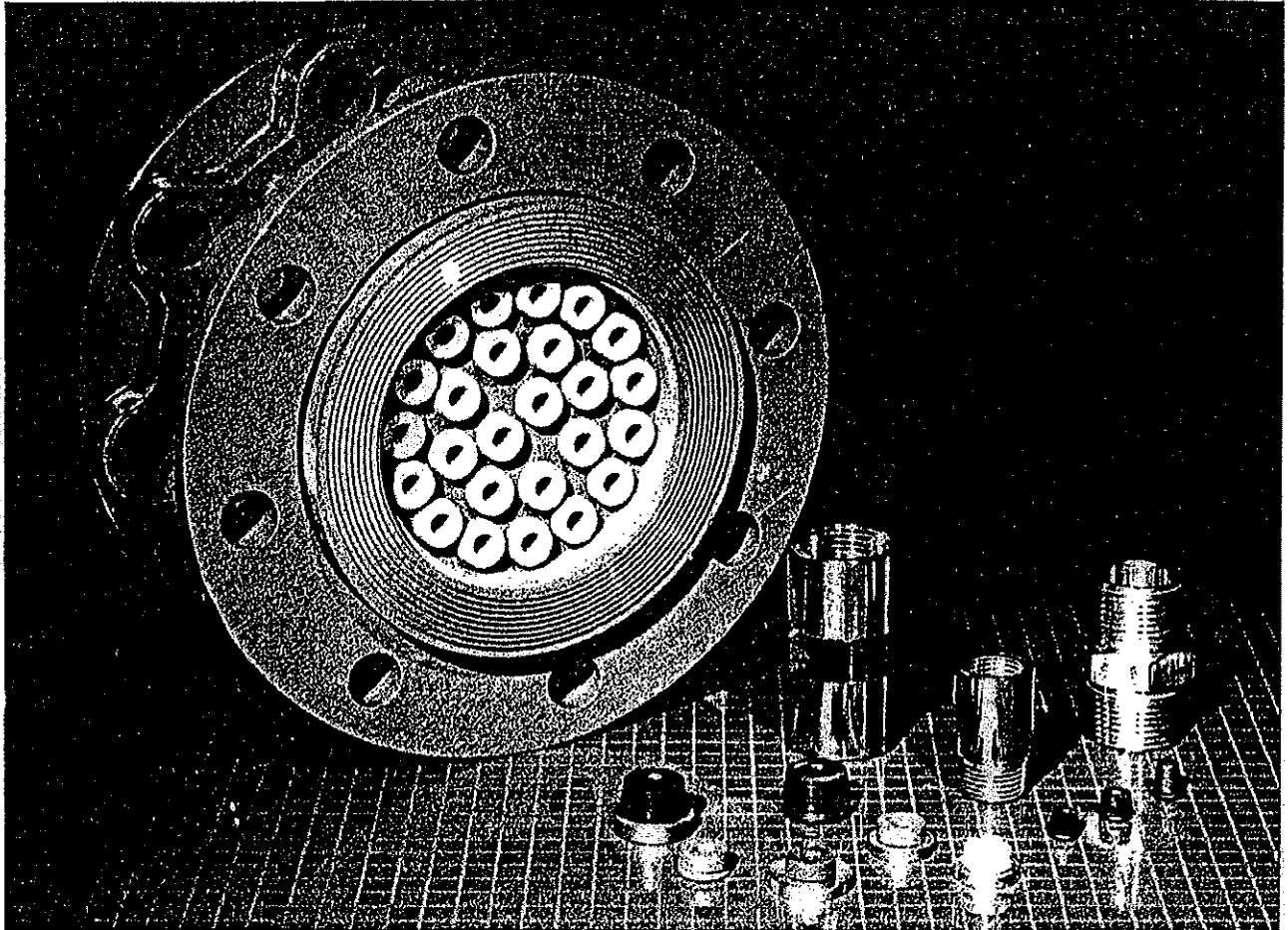
COOLING WATER SUPPLY SYSTEM

FLOW CONTROL VALVE

MANUFACTURER : CLACK
MODEL : 075-1, FLO-ET
CONNECTION : 3/4" (19.05 mm) FNPT
SERVICE : DI WATER POLISHING LOOP
MOUNTING : IN-LINE
MATERIAL OF CONSTRUCTION
 BODY : STAINLESS STEEL
 INTERNAL : PVC
FLOW RATE : 5 GPM
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : FCV-O411A / FCV-O421A / FCV-O431A

FLO-ET FLOW CONTROLS



REDUCE WATER CONSUMPTION INCREASE SAVINGS

Clack offers a full line of Flo-et® flow controls that provide an easy, efficient way to reduce water usage, water waste, and energy consumption in a wide range of liquid handling systems.

With every increase in energy costs, Flo-et flow controls offer increased cost efficiency.

These simple to install units can precisely control liquid flow rates from 1/4 gpm to 540 gpm, between 30 and 120 psi. They are ideal for applications that require tamper-proof volume regulation and pressure equalization.

Flo-et Inserts are constructed of corrosion-resistant, molded material for maximum dependability and minimum maintenance to fit most flow regulation needs. And, this durable material complies with existing FDA regulations for food handling applications.

For residential, commercial, or industrial applications, Flo-et flow controls provide more accurate, reliable and economical liquid flow control.

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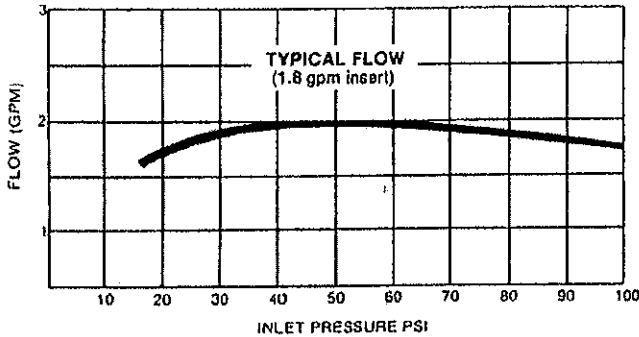
FLO-ET → FLOW CONTROLS

Clack Flo-et flow controls offer many advantages over conventional valve-type flow controls.

Initially, Flo-et controls cost less to install. And, because they require no maintenance or adjustments, they maximize cost savings over the life of your equipment.

Flo-et flow controls are completely tamper-proof, yet authorized persons can easily alter them for increases or decreases in the flow rate.

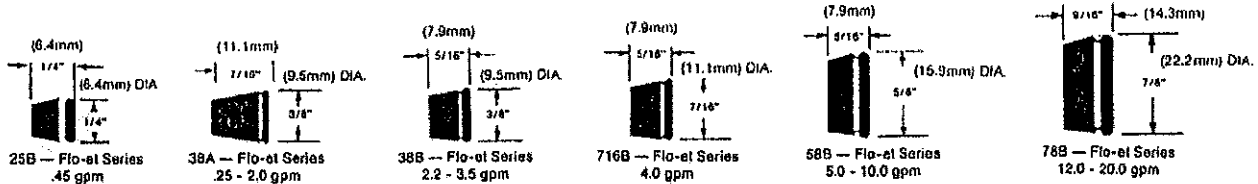
Clack offers a wide range of customized Flo-et inserts to meet your exact application needs. Both Flo-et inserts and retainers are ideal for incorporation into custom-designed housings. This provides additional cost savings by eliminating the need to purchase the brass housing. Because of our unique design Clack can offer you the option to purchase only the Flo-et insert or the insert and retainer.



	ABRASION RESISTANCE	SUNLIGHT AGING	OXIDATION RESISTANCE	SOLVENT RESISTANCE (ALIPHATIC)	SOLVENT RESISTANCE (AROMATIC)	ON VULCANIZED RUBBERS	SOLVENT RESISTANCE (ALCOHOLS)	OIL & GREASE RESISTANCE	ACID RESISTANCE (SULFURIC)	ACID RESISTANCE (HYDROFLUORIC)	ACID RESISTANCE (ACETIC)	RESISTANCE TO CONCENTRATED WATER	WATER RESISTANCE
Fair		●										●	
Good	●			●		●						●	
Excellent					●			●					●

Normal Operating Temperature Range 40° F to 140° F (5° C to 60° C)
Normal Operating Pressure Range 20 to 120 psi
(1.4 - 8.4 Kg. per Sq. Cm.)

CHEMICAL RESISTANCE CHART (58B & 78B Series Inserts)

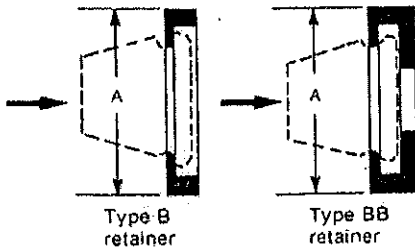


Order No.	Description
V7B12B.46	#25B4-52 0.45 gpm
V7B21A.25	#38A3-47 0.25 gpm
V7B21A0.3	#38A3-57 0.30 gpm
V7B21A0.4	#38A4-47 0.40 gpm
V7B21A0.6	#38A4-57 0.50 gpm
V7B21A0.8	#38A5-46 0.60 gpm
V7B21A0.7	#38A5-47 0.70 gpm
V7B21A0.8	#38A5-57 0.80 gpm
V7B21A0.9	#38A6-47 0.90 gpm
V7B21A1.0	#38A6-57 1.0 gpm
V7B21A1.2	#38A7-47 1.2 gpm

Order No.	Description
V7B21A1.4	#38A7-52 1.4 gpm
V7B21A1.6	#38A8-47 1.8 gpm
V7B21A1.8	#38A8-52 1.8 gpm
V7B21A2.0	#38A8-57 2.0 gpm
V7B22A2.2	#38B9-52 2.2 gpm
V7B22B2.5	#38B9-57 2.5 gpm
V7B22A2.6	#38B10-52 2.6 gpm
V7B22B3.0	#38B10-57 3.0 gpm
V7B22A3.5	#38B10-62 3.5 gpm

Order No.	Description
V7B42A4.0	#716B11-623 4.0 gpm
V7B62B5.0	#58B13-535 5.0 gpm
V7B62B6.0	#58B14-568 6.0 gpm
V7B62B7.0	#58B15-568 7.0 gpm
V7B62B8.0	#58B16-568 8.0 gpm
V7B62B9.0	#58B16-602 9.0 gpm
V7B62B10	#58B17-602 10 gpm
V7B82B12	#78B20-58 12 gpm
V7B82B15	#78B21-62 15 gpm
V7B82B17	#78B23-62 17 gpm
V7B82B20	#78B24-74 20 gpm

Note: Special flow rates can be designed upon request.

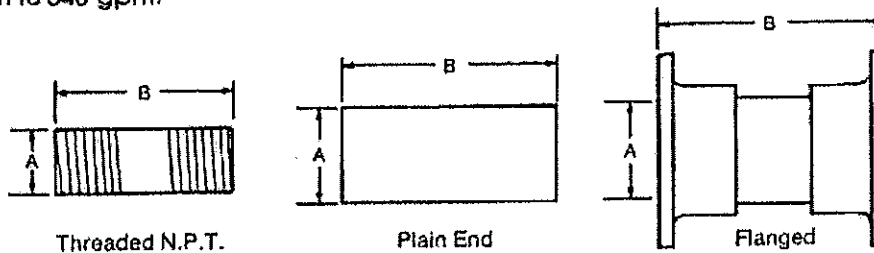


Type B retainer is intended for a press fit into an adapter that provides back-up support for the Flo-et insert. The BB type can be used in an adapter that does not provide back-up support.

Order No.	Description	"A" Dimension		For Insert Series No.
		Inches	Millimeters	
V7C12B1	#25R-1BB Retainer	.301 - .303	7.6 - 7.7	25B
V7C21B3	#38R-1B Retainer	.463 - .465	11.7 - 11.8	38A & 38B
V7C22B3	#38R-1BB Retainer	.463 - .465	11.7 - 11.8	38A & 38B
V7C21B5	#38R-2B Retainer	.525 - .527	13.3 - 13.4	38A & 38B
V7C22B6	#38R-4BB Retainer	.787 - .789	20.0 - 20.1	38A & 38B
V7C41B5	#716R-1B Retainer	.525 - .527	13.3 - 13.4	716B
V7C42B6	#716R-2BB Retainer	.787 - .789	20.0 - 20.1	716B
V7C62B6	#58R-2BB Retainer	.787 - .789	20.0 - 20.1	58B
V7C82B8	#58R-4BB Retainer	.995 - .997	25.2 - 25.3	58B
V7C82B8	#78R-2BB Retainer	.995 - .997	25.2 - 25.3	78B

Clack Corporation

Clack PVC flow controls are designed for applications where constant flow rates are required and variable pressures are encountered. They are ideal for use in environments where metal housings are not recommended, such as high purity, deionized water applications. Flow capacities are available from 1/4 gpm to 540 gpm.



FLOW RATE GPM (1)	NO. OF INSERTS (2)	PIPE SIZE "A"	THREADED N.P.T.			PLAIN END			FLANGED		
			MODEL NO.	LENGTH "B" (INCHES)	APPROX. WEIGHT LBS.	MODEL NO.	LENGTH "B" (INCHES)	APPROX. WEIGHT LBS.	MODEL NO.	LENGTH "B" (INCHES)	APPROX. WEIGHT LBS.
0.25-3.5	1	1/2	T-050-1	2	0.05	P-050-1	5	0.09	F-050-1	5	0.49
0.25-10	1	3/4	T-075-1	2	0.06	P-075-1	5	0.12	F-075-1	5	0.68
5-20	1	1	T-100-1	3	0.12	P-100-1	5	0.18	F-100-1	6	0.96
10-20	2	1-1/4	T-125-2	3	0.18	P-125-2	5	0.27	F-125-2	6	1.27
20-40	4	1-1/2	T-150-4	3	0.25	P-150-4	5	0.36	F-150-4	6	1.84
35-70	7	2	T-200-7	3	0.31	P-200-7	5	0.47	F-200-7	6	2.43
45-90	9	2-1/2	T-250-9	4	0.56	P-250-9	5	0.80	F-250-9	6	3.80
70-140	14	3	T-300-14	4	0.68	P-300-14	5	1.00	F-300-14	6	4.76
120-250	25	4	T-400-25	4	1.00	P-400-25	5	1.47	F-400-25	6	7.55
270-540	54	6	T-600-54	4	2.50	P-600-54	8	3.90	F-600-54	8-1/2	12.60

TABLE A
Inserts 0.25 to 3.5 GPM
Not color coded (Black)

0.25 GPM	1.60 GPM
0.30 GPM	1.00 GPM
0.40 GPM	2.00 GPM
0.70 GPM	2.20 GPM
0.80 GPM	2.50 GPM*
0.90 GPM	2.60 GPM
1.20 GPM	3.00 GPM
1.40 GPM	3.50 GPM

TABLE B
Color Identification of
BUNA (N) Inserts

5 GPM — Blue
6 GPM — Red
7 GPM — Brown
8 GPM — Green
9 GPM — Tan
10 GPM — Orange

*2.50 GPM available in
brown on special request

Clack Corporation

4462 Duraform Lane P.O. Box 500
Windsor, Wisconsin 53598-0500 USA

Phone (608) 846-3010 • Fax No. (608) 846-2586
Sales/Customer Service Fax (800) 755-3010



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

SOLENOID VALVE

MANUFACTURER : ASCO
MODEL : 8210G88V-120VAC
SERVICE : DI WATER POLISHING LOOP
SIZE : 3/4" (19.05 mm)
MATERIAL OF CONSTRUCTION
BODY : STAINLESS STEEL
SEAL : PTFE
POWER REQUIRED : 115 VAC / 1 PHASE / 60 Hz
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : SOL-O411A / SOL-O421A / SOL-O431A

Earth Tech (Canada) Inc.

Reviewed for general performance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabricating process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____ ✓
REVIEWED AS MODIFIED _____
REVISE AND RE-SUBMIT _____
NOT REVIEWED _____

Project No. 79538-C14-16
Date: 25/1/06 By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 3E**

**FOR
ASCO SOLENOID VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

RESIN BOTTLE

MANUFACTURER	:	RESIN TECH INC.
MODEL	:	TK-1047-4010
SERVICE	:	DI WATER POLISHING LOOP
FLOW RATE	:	5 GPM (18.9 L/min)
MATERIAL	:	FIBERGLASS WOUND
CONNECTION	:	3/4" NPT (19.05 mm)
SIZE	:	10" DIA X 48" (APPROXIMATELY 254 x 1,219 mm)
QUANTITY	:	3 (1 PER COOLING WAER/GENERATOR SKID)
CUSTOMER TAG NO.	:	RB-O411A / RB-O421A / RB-O431A



INNOVATIONS IN
ION EXCHANGE

Exchange Tanks

Available from ResinTech

Residential, Portable Exchange and Light Commercial
6" through 22" diameter - .18 through 11.2 cu. ft. capacity
for Softening, Filtration, De-ionization

Seamless, One-Piece Tank Liner

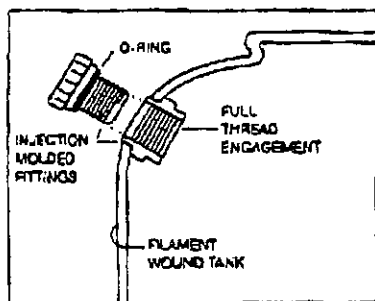
Blow molded from engineering grade thermoplastic.

- Smooth, fiber-free inner surface with wide chemical resistance
- Liner materials in compliance with FDA under 21CFR - Part 177.
- Not affected by regenerating chemicals (Acid-Caustic) or DI water

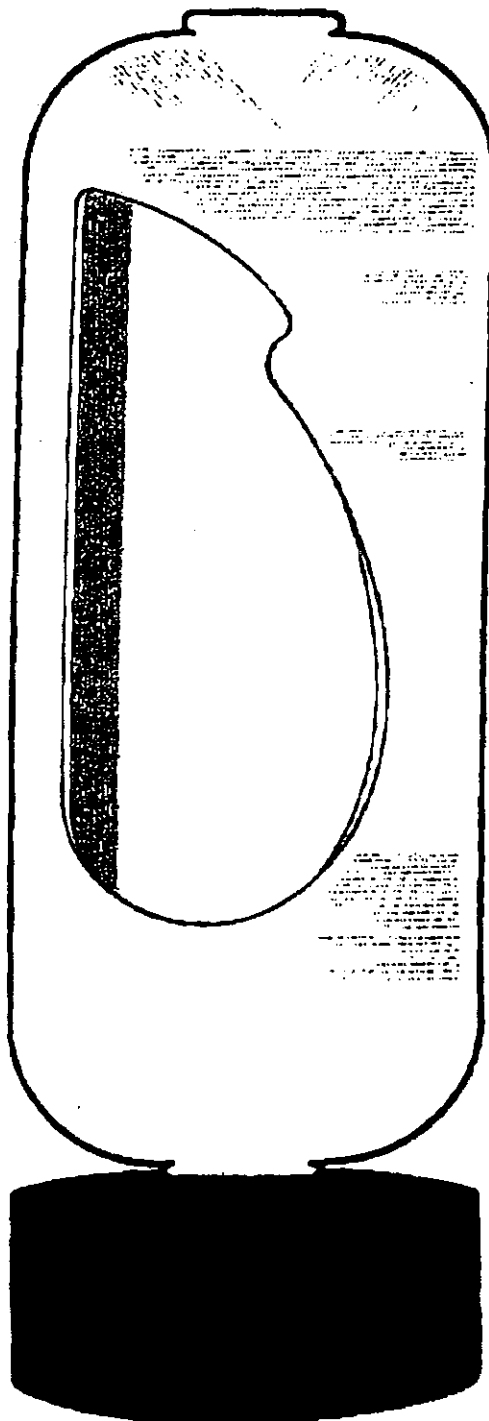
Precision Injection Molded Threads

For all standard industry valves and fittings.

Dome Hole Option



- Available 8" through 20" diameter tanks
- Injection molded ABS fitting provides 1" opening with full internal threads
- Fillcap features O-ring seal straight thread no taped thread binding on tank wall
 - Flexible factory installation for valve or manifold clearance



Tough Outer Laminate Filament Wound

Continuous strands of fiberglass with high strength epoxy resin.

- Completely rust and corrosion free.
- Excellent impact and abrasion resistance

Industry Approved

Approved by NSF, UL and meets the requirements of WQA Standard S-100

Rated for 150 psi operating pressure at 120°F.

Testing

Testing of PARK pressure vessels is performed to all industry standards, assuring top field performance.

STANDARD BASES

For Tanks 6" through 14" Diameter
Plastic - Injection Molding

For Tanks 16" Diameter
Rubber - Compression Molding

For Tanks 20" and 22" Diameter
Fiberglass - Compression Molding

OPTIONAL BASES

For Tanks 8"-9"-10"-12"-13" & 14"
Rubber-Compression Molding

Extended Bases

(For Double Entry Tanks)
Available for Tanks 10"-12"-14"-16"-20" & 22" fiberglass

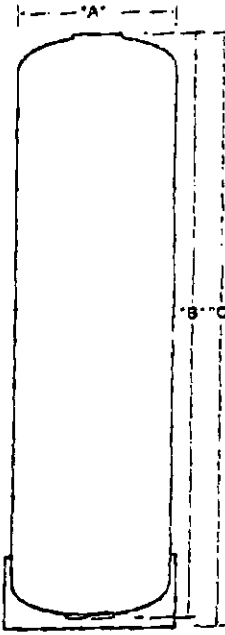
TANK SPECIFICATIONS

ABS TANK LINER 69 - 229. FRP TANK LINER 249 - 489.

U.S. STANDARD

METRIC

PRODUCT NO.	"A" DIA.	"B" HEIGHT W/O BASE	"C" HEIGHT W/BASE	CAPACITY		DOME VOLUMES	
				CU. FT.	GALS.	CU. FT.	GALS.
RT-621	5.2	28.2	29.0	.22	1.07	.022	.18
RT-612	6.5	12.5	12.9	.18	1.35	.024	.18
RT-618	6.5	18.3	18.7	.27	2.02		
RT-629	6.5	29.0	29.3	.46	3.46		
RT-635	6.5	35.0	35.4	.60	4.49		
RT-724	7.6	23.9	24.3	.51	3.87		
RT-730	7.6	30.0	30.3	.65	4.95		
RT-735	7.6	33.0	33.3	.80	5.96		
RT-740	7.6	40.0	40.3	.96	7.23		
RT-744	7.6	46.0	46.3	.96	7.18		
RT-817	8.4	16.8	17.1	.47	3.52		
RT-818	8.4	18.6	18.9	.47	3.52		
RT-824	8.4	27.9	28.2	.64	4.78		
RT-830	8.4	28.3	28.6	.87	6.58		
RT-835	8.4	35.2	35.5	.88	7.23		
RT-840	8.4	38.8	39.1	1.10	8.23		
RT-844	8.4	43.8	44.1	1.25	9.45		
RT-817	9.2	16.9	17.4	.49	3.64		
RT-935	9.2	35.1	35.6	1.18	8.83		
RT-940	9.2	40.0	40.5	1.32	9.87		
RT-942	9.2	42.1	42.6	1.41	10.55		
RT-946	9.2	48.0	48.5	1.55	11.59		
RT-1016	10.2	18.1	18.4	.59	4.71		
RT-1022	10.2	22.8	23.1	.78	5.82		
RT-1036	10.2	35.0	35.5	1.40	10.43		
RT-1040	10.2	40.0	40.5	1.60	11.97		
RT-1044	10.2	44.1	44.6	1.76	13.1		
RT-1047	10.2	47.0	47.5	1.99	14.21		
RT-1054	10.2	51.8	52.3	2.20	16.46		
RT-1060	10.2	59.9	60.4	2.38	17.88		
RT-1238	12.0	26.4	26.8	2.19	16.38		
RT-1242	12.0	32.1	32.5	2.81	21.32		
RT-1248	12.0	46.0	46.5	3.00	22.6		
RT-1252	12.0	52.1	52.6	3.32	24.83		
RT-1354	13.1	54.0	54.6	3.60	26.83		
RT-1447	14.0	45.8	46.4	3.88	28.93		
RT-1465	14.0	64.0	64.7	5.00	37.62		
RT-1636	16.1	38.2	38.7	5.5	40.38		
RT-1638	16.1	43.6	44.2	5.48	40.74		
RT-1665	16.1	64.2	64.7	6.58	48.28		
RT-2062	20.0	61.5	63.9	9.73	72.77		
RT-2244	21.8	49.0	49.7	7.77	57.67		
RT-2254	21.8	53.0	53.7	8.61	62.40		
RT-2260	21.8	59.0	59.7	10.18	71.08		
RT-2466	24.8	60.4	62.7	13.8	103.20		
RT-2471	24.8	71.1	71.6	15.8	118.5		
RT-3062	30.9	61.4	70.8	21.1	157.6		
RT-3072	30.9	71.4	80.6	25.6	191.3		
RT-3672	37.1	77.0	87.2	37.6	281.0		
RT-4272	43.8	82.2	93.8	48.7	363.8		
RT-4272	43.8	92.2	103.8	60.5	446.0		
RT-4872	48.0	72.2	86.0	62.0	464.0		



PRODUCT NO.	"A" DIA.	"B" HEIGHT W/O BASE	"C" HEIGHT W/BASE	CAPACITY IN LITRES	DOME VOLUME LITRES
RT-612	165	318	328	5.11	0.69
RT-618	165	465	475	7.65	
RT-629	165	724	742	13.1	
RT-635	165	889	899	16.99	
RT-724	193	607	617	14.42	
RT-730	193	762	770	18.1	
RT-735	193	839	842	22.63	
RT-740	193	1016	1024	25.47	
RT-744	193	1118	1125	27.18	
RT-817	213	427	434	17.8	
RT-818	213	472	480	13.32	
RT-824	213	607	612	18.1	
RT-830	213	737	742	22.04	
RT-835	213	884	889	27.74	
RT-840	213	988	1016	31.15	
RT-844	213	1187	1193	36.39	
RT-917	234	429	442	13.0	
RT-935	234	892	904	33.42	
RT-940	234	1016	1029	37.36	
RT-942	234	1089	1074	39.93	
RT-948	234	1219	1232	43.67	
RT-1016	259	409	416	15.6	
RT-1022	259	508	506	22.0	
RT-1035	259	689	702	30.63	
RT-1040	259	1016	1029	45.31	
RT-1044	259	1128	1143	49.94	
RT-1047	259	1184	1207	53.78	
RT-1054	259	1368	1382	62.30	
RT-1060	259	1511	1424	67.85	
RT-1238	325	699	696	82.00	
RT-1242	325	1074	1084	73.88	
RT-1248	325	1276	1227	84.7	
RT-1252	325	1323	1384	83.98	
RT-1354	333	1372	1382	101.83	
RT-1447	360	1183	1179	101.80	
RT-1465	356	1828	1838	142.38	
RT-1636	408	917	932	99.2	
RT-1638	408	1082	1077	154.4	
RT-1665	408	1621	1643	186.58	
RT-2062	508	1562	1623	275.43	
RT-2244	540	1082	1163	216.28	
RT-2254	540	1345	1415	274.05	
RT-2260	540	1495	1567	306.56	
RT-2466	625	1634	1705	390.8	
RT-2471	625	1814	1889	448.6	
RT-3062	765	1560	1793	596.0	
RT-3072	765	1814	2047	724.1	
RT-3672	912	1679	2089	1082.8	
RT-4272	1064	1780	1990	1398.8	
RT-4272	1064	1834	2184	1317.2	
RT-4872	1219	1834	2184	1758.2	

Dimensions in inches

Tanks 6" through 10" available in 2-1/2" thread only
 Tanks 12" - 13" and 14" also available in 2-1/2" thread
 Tanks 12" through 22" available in 4" or 4-1/2" threads
 See inside cover for threads and connections
 available in 24" - 30" - 35" - 42" and 48" tanks

Dimensions in mm





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

DI WATER FILTER

MANUFACTURER : AMETEK
SERVICE : DI WATER POLISHING LOOP
HOUSING
MODEL : 150067
SIZE : 10" (254 mm)
CONNECTION : 3/4" (19.05 mm) NPT
MATERIAL : POLYPROPYLENE

CARTRIDGE

MODEL : GX-05-9 3/4
MATERIAL : HYTREX II
RATING : 5 MICRON
LENGTH : 9 3/4" (248 mm)

QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)

CUSTOMER TAG NO. : WF-O411A / WF-O421A / WF-O431A

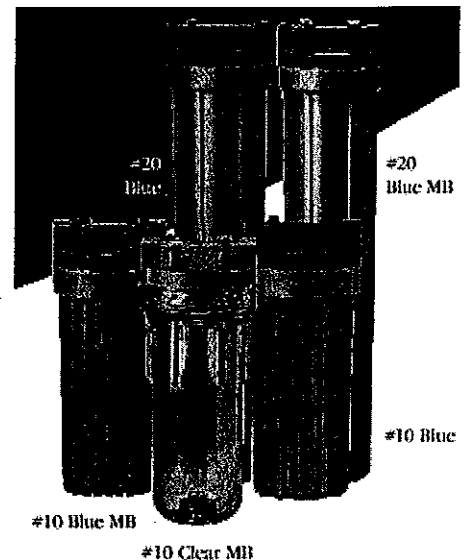


150067 10-3/4-Blue-Black-MB-PR

(USFilter Ametek Plymouth) Standard Housing for 10" Cartridge, Port Size: 3/4", Sump: Blue, Cap: Black, Connects with Mounting Bracket, Comes with Pressure Relief Button

STANDARD FILTER HOUSINGS

- Ideal for a wide range of applications, including residential, commercial and industrial
- Available in 10" and 20" sizes to meet your needs
- Optional pressure-relief/bleed button on inlet side of cap
- Thick walls for increased strength
- Leak-proof sealing with top-seated Buna-N O-ring
- Available with clear and opaque sumps



Standard filter housings are manufactured of a durable polypropylene or clear Styrene-Acrylonitrile (SAN). All are equipped with 3/4" FPT inlet and outlet ports.

Reinforced polypropylene housings have excellent chemical resistance and are ideal for many residential, commercial and industrial applications. Clear sumps are manufactured from a clear, FDA-approved Styrene-Acrylonitrile (SAN).

They offer on-site examination of flow and have excellent chemical compatibility as well.

Standard filter housings are available in both 10" and 20" lengths and will accommodate a wide range of 2-1/2" and 2-3/4" diameter cartridges.

- The 150067, 150068, 150062, and 150001 are Tested and Certified by USF International under ANSI/NSF Standard 42 -Conforms for material and structural integrity requirements only.



Housing Specifications and Performance Data

- **Model: #10 Opaque - Maximum Dimensions: 12-1/4" x 5-1/8" (311 mm x 130 mm) - Initial psi @ Flow Rate (gpm): 1 psi @ 10 gpm (0.1 bar @ 3.8 lpm)**
- **Model: #10 Clear - Maximum Dimensions: 12-5/8" x 5-1/4" (321 mm x 133 mm) - Initial psi @ Flow Rate (gpm): 1 psi @ 10 gpm (0.1 bar @ 3.8 lpm)**
- **Model #20 - Maximum Dimensions: 22- 3/8" x 5- 1/8" (568 mm x 130 mm) - Initial psi @ Flow Rate (gpm): 1 psi @ 10 gpm (0.1 bar @ 3.8 lpm)**

Materials of Construction

Housing: Polypropylene (Opaque) / Styrene Acrylonitrile (Clear)

Cap: Reinforced Polypropylene

Button Assembly: 300-series Stainless Steel

O-Ring: Buna-N

Maximum Temperature: 125°F (52°C)

Maximum Pressure: 125 psi (8.6 bar)

CAUTION: Filter must be protected against freezing, which can cause cracking of the filter and water leakage.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

TANK WITH LID (FOR EXPANSION AND MAKE-UP)

MANUFACTURER	:	ST. GOBAIN
MODEL	:	11100-0010
SERVICE	:	DI WATER POLISHING LOOP
CONNECTION	:	3/4" (19.05 mm) NPT
MATERIAL	:	HIGH DENSITY POLYETHYLENE
CAPACITY	:	10 GAL. (38 L)
SIZE	:	13" DIA X 20" HIGH (330 x 500 mm)
QUANTITY	:	3 (1 PER COOLING WATER/GENERATOR SKID)
CUSTOMR TAG NO.	:	TK-O411A / TK-O421A / TK-O431A

Cylindrical Tanks with Cover

Features:

- Rotationally molded with rigid, heavy-duty seamless walls for maximum strength.
- Calibrated in liters and gallons (except the 7-1/2 and 10-gallon sizes which do not show liters).
- Welded or bulkhead type fittings available.
- Stands available as an option.

Series 11100 HDPE

- For continuous service to 140°F.
- Resin complies with FDA Regulation 177.1520.
- Available with spigot mounted on welded boss through 55-gallon size.

Series 11200 Polypropylene

- Service to 180°F.
- Excellent stress-crack resistance.

Series 11300 XLPE

- For continuous service to 140°F.
- Excellent resistance to stress cracking and high impact.
- Superior service at below freezing temperatures.

Series 11500 PVDF

- Service to 230°F.
- Excellent chemical resistance; for use with corrosives, halogenated compounds, many acids, strong oxidizing agents, and a variety of solvents including chlorinated hydrocarbons.
- Excellent stress-crack resistance.
- Calibrated visible liquid level.
- UV stable.
- High purity; low in extractables.
- PVDF welded fittings available.



Cylindrical Tanks with Cover

Size (Gals.)	Dimensions (In.)	Approx. Wall Size (In.)	Series 11100 High Density Polyethylene		Series 11200 Polypropylene		Series 11300 XL Polyethylene		Series 11500 PVDF		
			Part Number	Price Ea. (\$)	Part Number	Price Ea. (\$)	Part Number	Price Ea. (\$)	Approx. Wall Size (In.)	Part Number	Price Ea. (\$)
5	11 x 15	3/16	11100-0005	44.73	11200-0005	77.51	11300-0005	56.50	3/32	11500-0005	345.00
7 1/2	12 x 18	3/16	11100-0007	60.80	11200-0007	93.21	11300-0007	96.50	-	-	-
10	13 x 20	3/16	11100-0010	62.16	11200-0010	99.10	11300-0010	100.80	3/32	11500-0010	475.00
15	13 x 27	3/16	11100-0015	77.91	11200-0015	114.56	11300-0015	112.30	3/32	11500-0015	643.80
30	18 x 30	3/16	11100-0030	122.33	11200-0030	174.83	11300-0030	167.10	3/12	11500-0030	921.30
55	22 x 36	1/4	11100-0055	168.53	11200-0055	230.58	11300-0055	237.30	1/8	11500-0055	1,655.10
80	24 x 48	1/4	11100-0080	307.50	11200-0080	432.60	11300-0080	390.10	-	-	-
100	28 x 44	3/8	11100-0100	326.60	11200-0100	496.55	11300-0100	482.50	-	-	-
150	31 x 49	1/4	11100-0150	443.70	11200-0150	595.98	11300-0150	528.90	-	-	-
200	36 x 51	3/8	11100-0200	481.60	11200-0200	627.69	11300-0200	557.90	-	-	-
275	42 x 49	1/4	11100-0275	640.60	11200-0275	828.66	11300-0275	719.90	-	-	-
360	48 x 49	3/8	11100-0360	779.70	11200-0360	1,021.02	11300-0360	876.50	-	-	-
500	53 x 62	5/16	11100-0500	1,104.92	-	-	-	-	-	-	-
1000	66 x 72	7/16	11100-1000	1,850.00	-	-	-	-	-	-	-

Series 11100 and 11300 are available in black. Many sizes are available with FRP casing.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

ISOLATION BALL VALVE

MANUFACTURER : APOLLO
MODEL : 76-104
SERVICE : DI WATER POLISHING LOOP
CONNECTION : 3/4" (19.05 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
QUANTITY : 3 (1 PER COOLING WATER/GENERATOR SKID)
TAG NO. :

CUSTOMER TAG NO. : HV-O411D / HV-O421D / HV-O431D



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

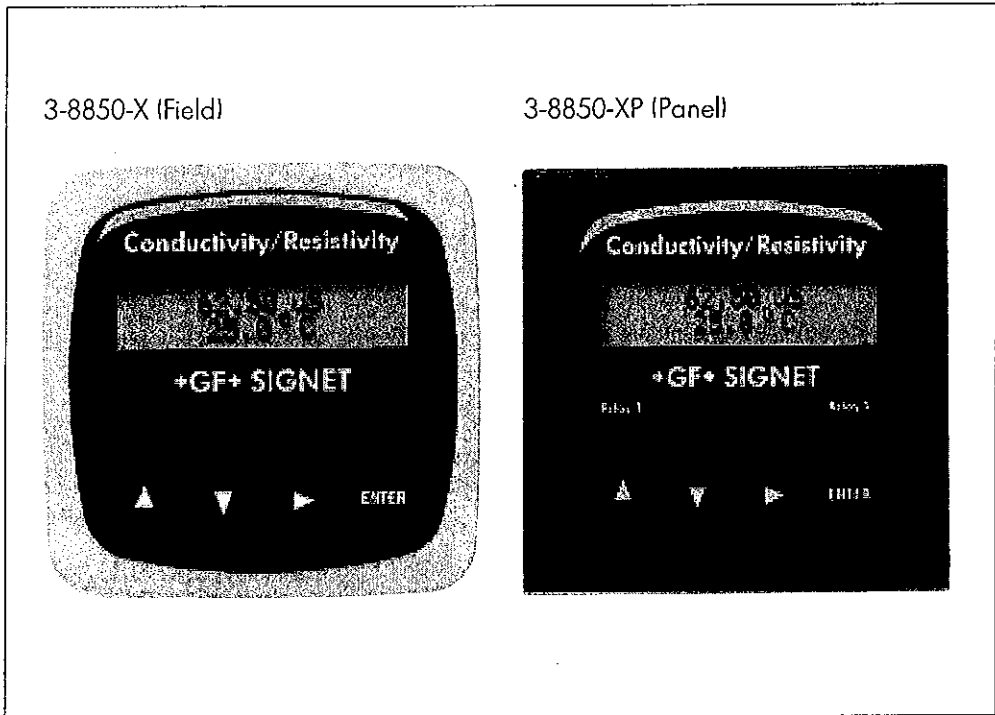
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**

+GF+ SIGNET 8850 Conductivity/Resistivity Transmitters



Features

- Display in μS , mS , $\text{K}\Omega$, $\text{M}\Omega$, PPM (TDS)
- Simulate function
- Programmable Temperature compensation
- Relay options
- Dual output option allows temperature and process signal transmission
- 2 x 16 character dot matrix LCD
- NEMA 4X/IP65 enclosure with self-healing window
- Large pushbuttons
- Meets USP requirements

Description



The +GF+ SIGNET 8850 Conductivity/Resistivity Transmitter is designed for broad application and ease of setup and use. The unit can be used for conductance, resistance, or TDS signal transmission and display. Mounting can be accomplished in several options best

tailored to your application requirements. Full-microprocessor based electronics allow wide operating range, and long term signal stability due to the elimination of potentiometers, jumpers and dip switches.

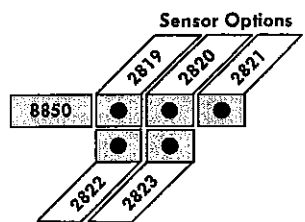
Application

- RO/DI system control
- Rinse tank control
- Cooling tower, scrubber or blowdown control
- Environmental study (TDS)
- Desalinization monitor
- Water quality monitoring
- Leak detection
- Chemical concentration

Technical Features

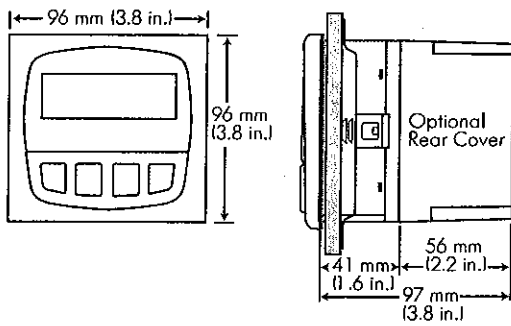
Mounting Version	Part No.	Wire Power	Sensor Input	4 to 20 mA Output	Open Collector/Relay
Field 	3-8850-1	4	1	1	1 O.C. Hi, Lo, Pulse or Off
	3-8850-2	4	1	1	2 Relays Hi, Lo, Pulse or Off
	3-8850-3	4	1	2 Cond/Res or Temp	2 O.C.'s Hi, Lo, Pulse or Off
Panel 	3-8850-1P	4	1	1	1 O.C. Hi, Lo, Pulse or Off
	3-8850-2P	4	1	1	2 Relays Hi, Lo, Pulse or Off
	3-8850-3P	4	1	2 Cond/Res or Temp	2 O.C.'s Hi, Lo, Pulse or Off

Options

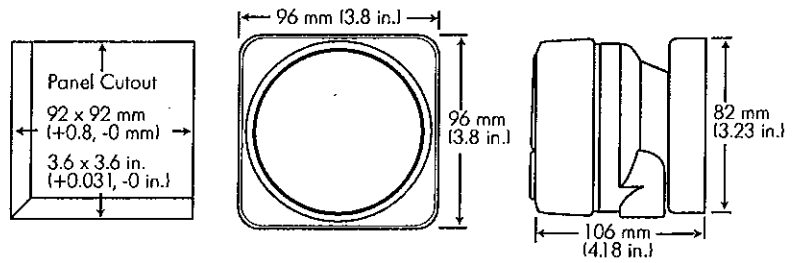


Dimensions

Panel Mount



Universal Mount

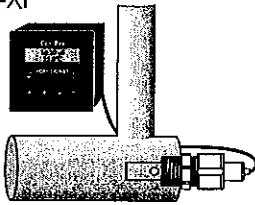


Installation

The transmitter is available in a panel or a field mount version. Select the universal mount kit (3-8050) to mount the transmitter on a surface near the electrode.

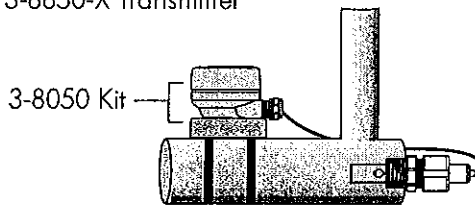
1. Panel Mount

3-8850-XP



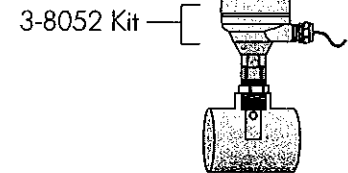
2. Universal Mount

3-8850-X Transmitter



3. Integral Mount

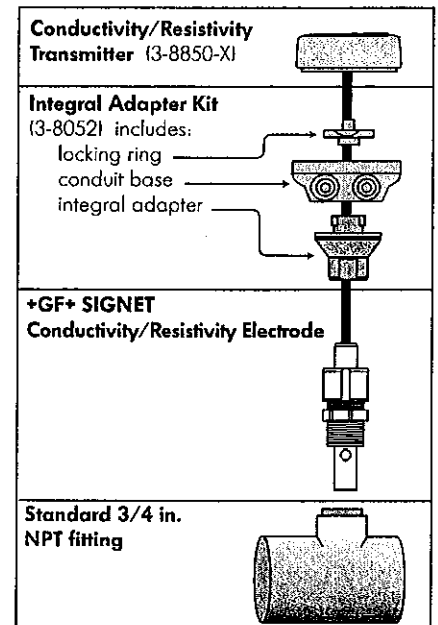
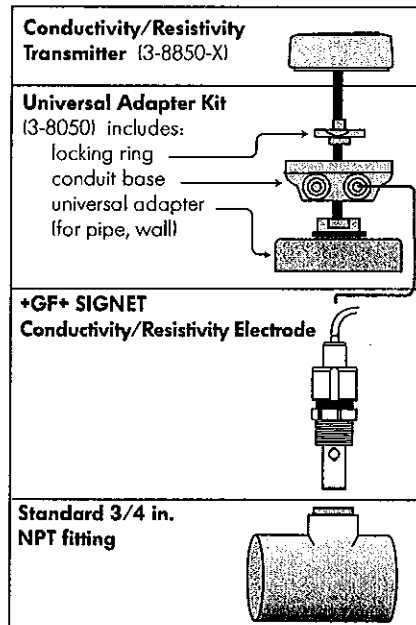
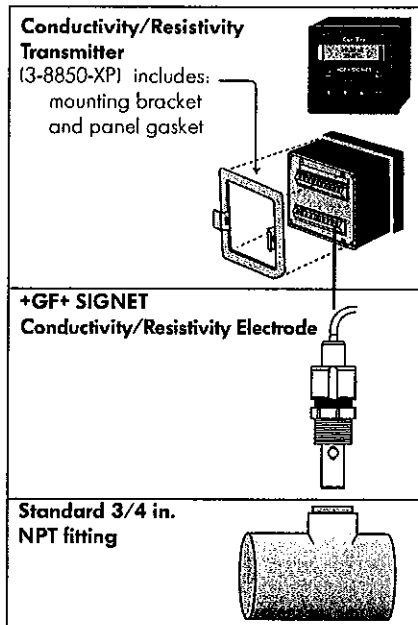
3-8850-X Transmitter



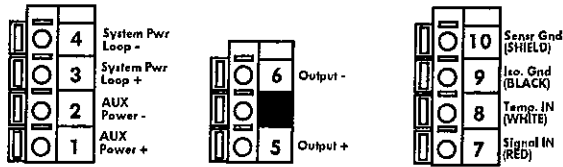
All panel mount transmitters (3-8850-XP) include a mounting bracket and gasket for a NEMA 4X watertight panel installation. Panel mount transmitters fit into a standard 1/4 DIN panel cutout.

The Universal Mount Kit (3-8050) can be ordered separately and includes a conduit base, locking ring, and universal adapter for mounting the transmitter on a pipe, wall, or other stationary surface.

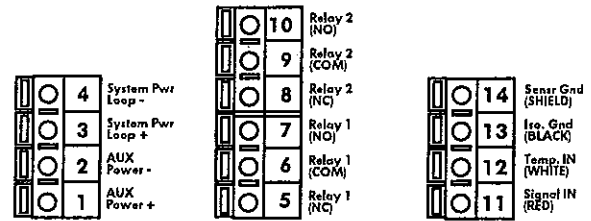
The Integral Mount Kit (3-8052) includes a conduit base, locking ring, and integral adapter for mounting the transmitter and sensor directly into a pipe.



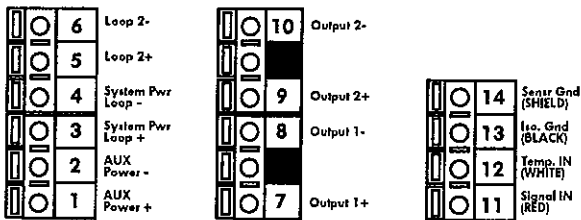
Rear Terminal View



Terminal 8850-1



Terminal 8850-2



Terminal 8850-3

Note: The terminal blocks are not labeled on the back of the unit. An adhesive label is supplied with terminal descriptions to serve as a remote terminal display.

Technical Data

General

Compatible electrodes: +GF+ SIGNET 3-28XX-X
Standard and Certified (NIST) Series
Conductivity/Resistivity Electrodes

Accuracy: $\pm 2\%$ of reading

Enclosure:

- Rating: NEMA 4X/IP65 front
- Case: PBT
- Panel case gasket: Neoprene
- Window: Polyurethane coated polycarbonate
- Keypad: Sealed 4-key silicone rubber
- Weight: Approx. 325g (12 oz.)

Display:

- Alphanumeric 2 x 16 LCD
- Contrast: User selected, 5 levels

Shipping Weight: 0.6 kg (1.32 lb.)

Environmental

Operating temperature: -10 to 70°C (14 to 158°F)

Storage temperature: -15 to 80°C (5 to 176°F)

Relative humidity: 0 to 95%, non-condensing

Standards and Approvals

- CSA, CE, UL listed
- Manufactured under ISO 9001 and ISO 14001

Electrical

Power:

- 12 to 24 VDC $\pm 10\%$ regulated
- (-1) 21 mA max.: (-2) 220 mA max.: (-3) 60mA max.

Sensor input range:

- Conductance: 0.055 to 400,000 μS
- Resistivity: 10K Ω to 18.2M Ω
- TDS: 0.023 to 200,000 ppm
- Temperature: PT 1000, -25 to 120°C (-13 to 248°F)

Current output:

- 4 to 20 mA, isolated, fully adjustable and reversible
- Max loop impedance:
50 Ω max. @ 12 V,
325 Ω max. @ 18 V,
600 Ω max. @ 24 V
- Update rate: 0.5 seconds
- Accuracy: ± 0.03 mA @ 25°C , 24 V

Relay output:

- Mechanical SPDT contacts: Hi, Lo, Pulse, Off
- Maximum voltage rating: 5 A @ 30 VDC, or 5 A @ 250 VAC resistive load
- Hysteresis: User Adjustable
- Max 400 pulses/min.

Open-collector output: Hi, Lo, Pulse, Off

- Open-collector, optically isolated,
50 mA max, sink, 30 VDC max. pull-up voltage.
- Hysteresis: User Adjustable
- Max 400 pulses/min.

Ordering Information

Mfr. Part No.	Code	Description
3-8850-1	159 000 228	Conductivity/Resistivity transmitter, Field mount
3-8850-1P	159 000 229	Conductivity/Resistivity transmitter, Panel mount
3-8850-2	159 000 230	Conductivity/Resistivity transmitter, Field mount with relays
3-8850-2P	159 000 231	Conductivity/Resistivity transmitter, Panel mount with relays
3-8850-3	159 000 232	Conductivity/Resistivity, Field mount with single input/dual output
3-8850-3P	159 000 233	Conductivity/Resistivity, Panel mount with single input/dual output

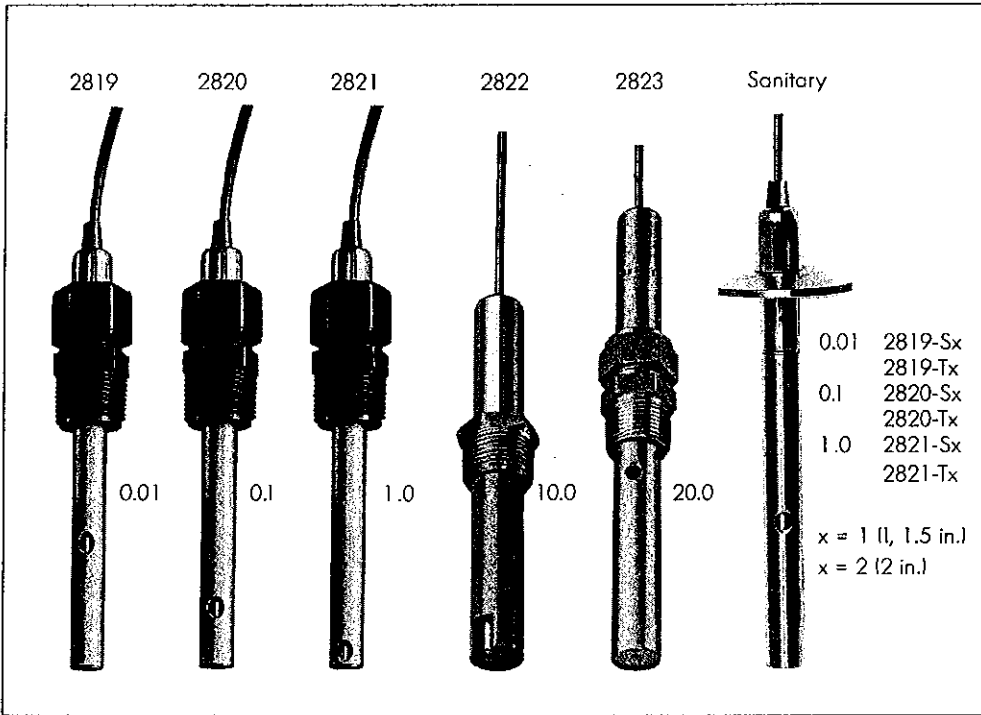
Accessories

Mfr. Part No.	Code	Description
3-8050	159 000 184	Universal mounting kit
3-8050.395	159 000 186	Transmitter NEMA 4X/IP65 cover
3-8052	159 000 188	3/4 in. Integral mounting kit
3-8052-1	159 000 755	3/4 in. NPT mount junction box
3-8050.396	159 000 617	RC Filter kit (for relay use)
3-0000.596	159 000 641	Heavy duty wall mount bracket
3-5000.598	198 840 225	Surface Mount Bracket
3-8050.392	159 000 640	Model 200 retrofit adapter

Engineering Specifications

- The transmitter shall be CSA, UL and CE listed.
- The transmitter shall be manufactured under ISO 9001 and ISO 14001 certified processes.
- The transmitter shall be field or panel mountable.
- The transmitter shall display μS , mS , $\text{K}\Omega$, $\text{M}\Omega$, ppm (TDS).
- The display units shall be fully scaleable without jumpers, pots or switches.
- The transmitter allows for certified cell entry for use with NIST traceable sensors.
- The device shall meet NEMA 4X and IP65 standards.
- The transmitter shall have a 4 to 20 mA output with an open collector output, 5 to 30 VDC or a 4 to 20 mA output with 2 relays, or dual 4 to 20 mA outputs with dual open collector with source selection (conductivity, resistivity or temperature) capability.
- The transmitter shall be programmable for temperature compensation, cell constants and TDS factors.
- The transmitter shall have simulate capability.
- The transmitter shall be +GF+ SIGNET 8850 Conductivity/Resistivity Transmitter.

+GF+ SIGNET 2819 to 2823 Conductivity/Resistivity Sensors



Features

- Controlled surface finish ensures accuracy and repeatability
- Flow-through design
- In-line or submersible mounting
- Certified cells $\pm 2\%$ meets USP requirements
- Standard process connections
 - * $3/4"$ NPT Polypro
 - * Tri-clamp 1 - $1\frac{1}{2}"$, 2"
 - * Opt. $1/2"$ NPT 316 SS
- 316 SS Standard Electrode
- Alternate materials -
 - * Titanium
 - * Hastelloy-C
 - * Monel
- PTFE insulator

Application

- Pure Water Treatment
 - * Reverse Osmosis
 - * De-ionization
 - * Distillation
- Boiler Condensate
- Semiconductor Water Production
- Rinse water monitoring and control
- Chemical Concentrations
- Cleaner and Degreaser Concentrations
- TDS
- Salinity
- USP Purified Water and WFI Water Production

Description

+GF+ SIGNET Conductivity/Resistivity Sensors are designed to provide versatile installation and accurate sensing across a very broad dynamic range. Coupled with +GF+ SIGNET-patented measuring circuitry a three decade range with $\pm 2\%$ of reading accuracy is

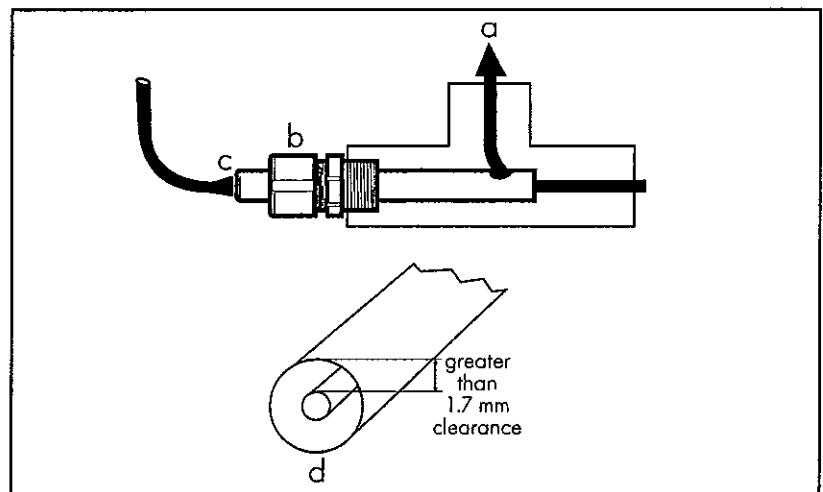
achieved without the need for troublesome sensor platinization. Platinum RTD (PT-1000) properly located within the sensor allows optimal temperature sensing. Standard wiring allows connection without costly "patch cords."

Options

Conductivity Sensors	Instrument Options			
	8850	5800CR	5900	9050CR
3-2819-1 to 3-2823-1	●	●	2/2/23	●
Certified Cells	●	●		

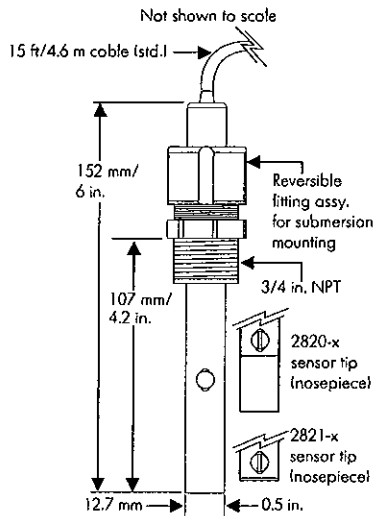
Technical Features

- Flow-through design eliminate bubble entrapment or sediment build-up
- Removable/reversible sensor fitting design
- Built-in strain relief
- Proper electrode clearance reduces possible DI resin or particle entrapment, critical with 0.01 cell designs

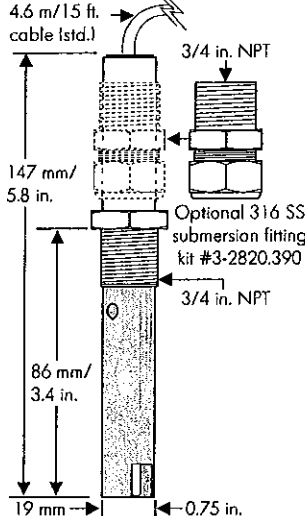


Dimensions

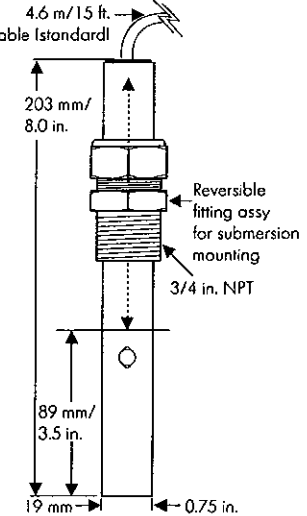
2819, 2820, 2821



2822

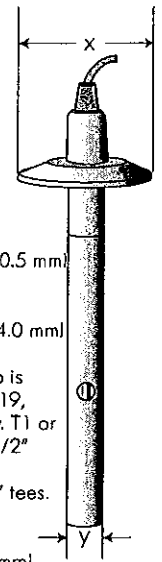


2823



Sanitary:

2819-tx
2820-tx
2821-tx



28nn-T1/S1:
x = 1.984" (50.5 mm)
28nn-T2/S2:
x = 2.516" (64.0 mm)

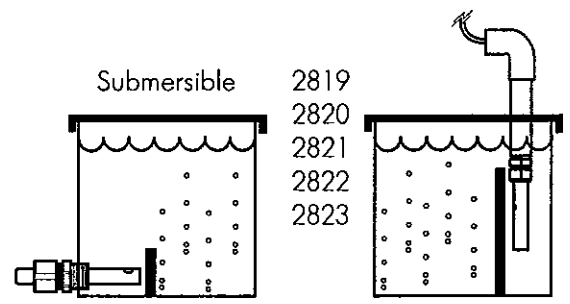
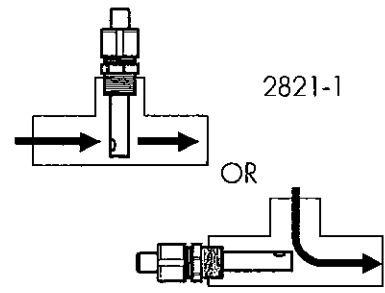
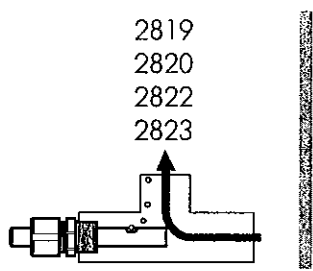
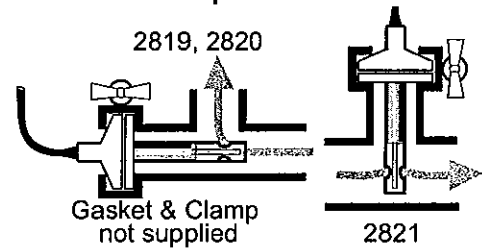
NOTE: Tri-clamp is available for 2819, 2820, 2821 only. T1 or S1 is for 1 to 1 1/2" tees. T2 or S2 is for 2" tees.

y = 0.5" (12.77 mm)

Installation

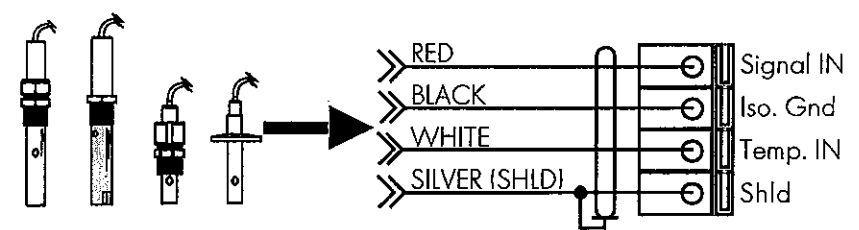
- Select a sensor location free of air bubbles and sediment buildup.
- Conductivity measurements are adversely affected by substances that coat the electrodes.

Tri-clamp Connection

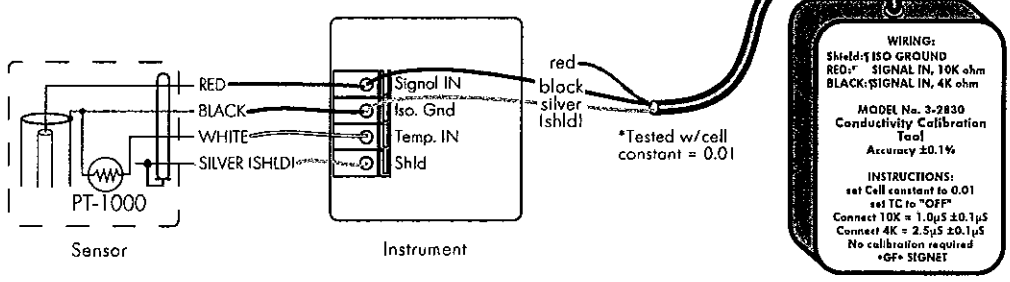


Wiring

- Standard cable length 4.6 m (15 ft.) extendable up to 30 m (100 ft.) with 3-conductor shielded 22 AWG cable
- Route sensor cable separate from power lines

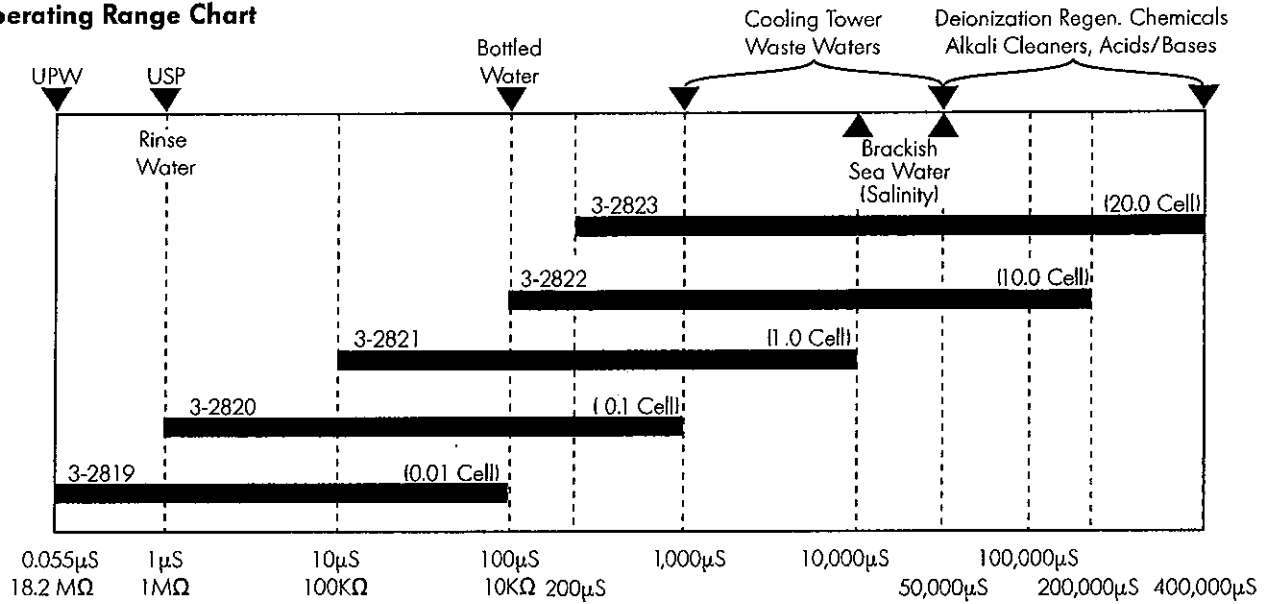


+GF+ SIGNET 3-2830 Conductivity Recertification Tool



Technical Data

Operating Range Chart



	3-2819	3-2820	3-2821	3-2822	3-2823
Range:	0.055 to 100 µS (18.2MΩ to 10KΩ) (0.02 to 50 ppm)	1 to 1000 µS (1MΩ to 1KΩ) (0.5 to 500 ppm)	10 to 10,000µS (5 to 5,000 ppm)	100 to 200,000µS (50 to 100,000 ppm)	200 to 400,000 µS (100 to 200,000 ppm)
Accuracy:	±2% of reading				

Models 3-2819-1* (0.01 Cell)

Models 3-2820-1* (0.1 Cell)

Models 3-2821-1* (1.0 Cell)

*Certified versions available (add "C" suffix to part number)

Temp. comp. device:	PT1000
O-rings:	EPR
Insulator material:	PTFE
Electrodes:	316 Stainless Steel or Titanium
Maximum Temperature/Pressure Rating:	
Std. Polypro fitting:	6.9 bar (100 psi) @ 100°C (212 °F)
Opt. 316 SS fitting:	13.8 bar (200 psi) @ 120°C (248 °F)
Sanitary Connection:	6.9 bar (100 psi) @ 120°C (248°C)
Cable Length:	15 ft. (4.6 meter) std.
Sensor weight:	312 g (11 oz.)
Temperature response, τ:	7 sec. (0.01) 53 sec. (0.1) 21 sec. (1.0)
Temperature accuracy:	0.3°C

Model 3-2822-1 (10.0 Cell)

Temp. comp. device:	PT1000
O-rings:	EPR
Insulator material:	CPVC
Electrodes:	316 Stainless Steel
Std. 316 SS fitting:	3/4 in. NPT threads
Opt. 316 SS submersion adapter fitting:	3/4 in. NPT threads
Max. press./temp.:	6.9 bar (95 psi) @ 150°C (203°F)
Temp. response, τ:	5 seconds
Temp. accuracy:	0.3°C
Cable Length:	15 ft. (5 m) std.
Sensor weight:	371 g (13 oz.)

Model 3-2823-1 (20.0 Cell)

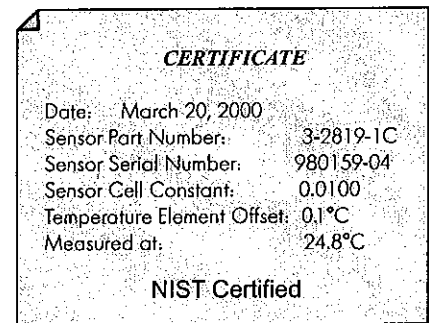
Temp. comp. device:	PT1000
O-rings:	EPR
Insulator material:	PTFE
Electrodes:	316 Stainless Steel
Std. 316 SS fitting:	3/4 in. NPT thread
Max. press./temp.:	6.9 bar (100 psi) @ 100°C (212 °F)
Temp. response, τ:	120 seconds
Temp. accuracy:	0.3°C
Cable Length:	15 ft. (5 meter) std.
Sensor weight:	312 g (11 oz.)

Standards and Approvals

- NIST Traceable ±2% (add "C" suffix to part number)
- CE, Manufactured under ISO 9001

Ordering +GF+ SIGNET 3-2819 to 2823 Conductivity/Resistivity Sensors

Mfr. Part No.	Code	Description
3-2819-1	198 844 010	Conductivity/Resistivity (CR) Cell, 0.01, SS
3-2820-1	198 844 000	Conductivity Cell, 0.1, SS
3-2821-1	198 844 001	Conductivity Cell, 1.0, SS
3-2822-1	198 844 002	Conductivity Cell, 10, SS
3-2823-1	198 844 003	Conductivity Cell, 20, SS
3-2819-S1	159 000 085	CR Sanitary, 0.01, SS, 1 to 1 1/2 in.
3-2819-S1C	159 000 087	CR Sanitary, 0.01, SS, 1 to 1 1/2 in., Certified
3-2819-S2	159 000 086	CR Sanitary, 0.01, SS, 2 in.
3-2819-S2C	159 000 088	CR Sanitary, 0.01, SS, 2 in., Certified
3-2819-T1	159 000 081	CR Sanitary, 0.01, Titanium, 1 to 1 1/2 in.
3-2819-T1C	159 000 083	CR Sanitary, 0.01, Titanium, 1 to 1 1/2 in., Certified
3-2819-T2	159 000 082	CR Sanitary, 0.01, Titanium, 2 in.
3-2819-T2C	159 000 084	CR Sanitary, 0.01, Titanium, 2 in., Certified
3-2820-S1	159 000 089	CR Sanitary, 0.1, SS, 1 to 1 1/2 in.
3-2820-S1C	159 000 091	CR Sanitary, 0.1, SS, 1 to 1 1/2 in., Certified
3-2820-S2	159 000 090	CR Sanitary, 0.1, SS, 2 in.
3-2820-S2C	159 000 092	CR Sanitary, 0.1, SS, 2 in., Certified
3-2820-T1	159 000 624	CR Sanitary, 0.1, Titanium, 1 to 1 1/2 in.
3-2820-T2	159 000 625	CR Sanitary, 0.1, Titanium, 2 in.
3-2821-S1	159 000 093	CR Sanitary, 1.0, SS, 1 to 1 1/2 in.
3-2821-S1C	159 000 095	CR Sanitary, 1.0, SS, 1 to 1 1/2 in., Certified
3-2821-S2	159 000 094	CR Sanitary, 1.0, SS, 2 in.
3-2821-S2C	159 000 096	CR Sanitary, 1.0, SS, 2 in., Certified
3-2821-T1	159 000 626	CR Sanitary, 1.0, Titanium, 1 to 1 1/2 in.
3-2821-T2	159 000 627	CR Sanitary, 1.0, Titanium, 2 in.



NOTE: Alternate wetted materials and lengths are available through special order.
Cable length extensions to 100 ft. (30 m) are available through special order.

Accessories

Mfr. Part No.	Code	Description
3-2820.392	198 840 222	1/2 in. NPT Fitting, 316SS
3-2820.390	198 840 223	3/4 in. NPT Fitting, 316SS
3-2820.391	198 840 221	3/4 in. NPT Fitting, Polypro
3-2830	159 000 628	Conductivity Recertification Tool

Engineering Specifications

- The sensors shall meet appropriate CE standards.
- The sensors shall be manufactured under ISO 9001 certified processes.
- The sensors shall be 316 SS or Titanium.
- The sensors shall have PTFE insulation. The 10.0 Cell insulation shall be CPVC.
- The sensors shall be supplied with a PT-1000 Platinum RTD.
- The sensors shall be supplied with a reversible 3/4 in. NPT Polypropylene fitting or alternatively a 1/2 in. NPT 316 SS fitting or alternatively an optional 3/4 in. (2822-1, 2823-1) 316 SS NPT fitting for in-line or submersion installation.
- The sensors shall be of a concentric design with a minimum clearance of 0.06 in. (1.5 mm) between electrodes.
- The process connection shall allow accessibility of removal for cleaning.
- The sensor cell constant, model number and date of manufacture shall be clearly stated on the sensor cable.
- The sensor cable shall be standard 15 feet, 3 conductor, foil shield, with drain wire. The allowable cable extension using like cable is 100 feet.
- The sensor shall have a maximum pressure rating of 100 psi, at 100°C or alternatively shall be supplied with an SS process connection having a maximum pressure rating of 200 psi, at 120°C.
- Optional: The sensor will be equipped with a certification of cell constant value. Such certification is to be supplied in printed form on the sensor cabling and additionally in written form.
- The sensors shall be Model +GF+ SIGNET as ordered.



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

COOLING WATER SUPPLY SYSTEM

HEAT EXCHANGER

MANUFACTURER	:	ALFA LAVAL	
MODEL	:	M6-FG	
TYPE	:	PLATE AND FRAME STYLE	
SERVICE	:	PLANT WATER/CLOSED LOOP DI COOLING WATER	
WATER	:	<u>COLD SIDE</u>	<u>HOT SIDE</u>
INLET	:	79.0° F (26.1° C)	90.8° F (32.7° C)
OUTLET	:	85.4° F (29.7° C)	84.4° F (29.1° C)
FLOW	:	213.3 GPM (808 L/min)	213.3 GPM (808 L/min)
PRESS. DROP	:	9.93 PSI (68.5 kPa)	9.84 PSI (67.8 kPa)
NO. PLATES	:	73	
MATERIAL OF CONSTRUCTION			
PLATE	:	TYPE 316 S.S.	
TIE ROD	:	ZINC PLATED CARBON STEEL	
GASKET	:	EPDM	
NUMBER OF PASSES	:	1	
CONNECTION SIZE	:	2" (50 mm) NPT	
SIZE (ESTIMATE)	:	29" X 13" X 36" (737 x 330 x 914 mm)	
WEIGHT: (EMPTY / OP.)	:	397 / 445 LB (180 / 202 kg)	
QUANTITY	:	3 (1 PER COOLING WATER/GENERATOR SKID)	
CUSTOMER TAG NO.	:	HEX-O410A / HEX-O420A / HEX-O430A	



M6

Plate heat exchanger

Applications

General heating and cooling duties. Heating by means of steam.

Standard design

The plate heat exchanger consists of a pack of corrugated metal plates with portholes for the passage of the two fluids between which heat transfer will take place.

The plate pack is assembled between a fix frame plate and a movable pressure plate and compressed by tightening bolts. The plates are fitted with a gasket which seals the interplate channel and directs the fluids into alternate channels. The number of plates is determined by the flow rate, physical properties of the fluids, pressure drop and temperature program. The plate corrugations promote fluid turbulence and support the plates against differential pressure.

The plate and the pressure plate are suspended from an upper carrying bar and located by a lower guiding bar, both of which are fixed to a support column.

Connections are located in the frame plate or, if either or both fluids make more than a single pass within the unit, in the frame and pressure plates.

Typical capacities

Liquid flow rate

Up to 16 kg/s, depending on media, permitted pressure drop and temperature program.

Water heating by steam

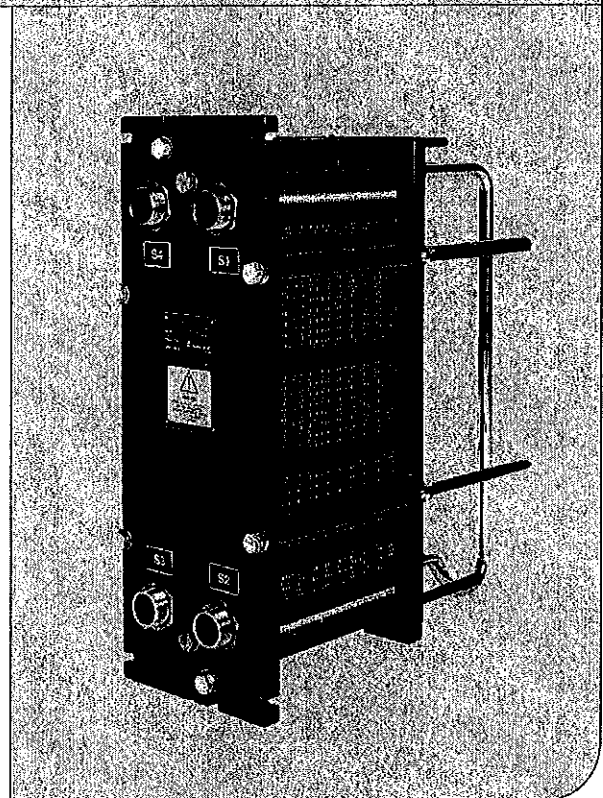
300 to 800 kW

Plate types

M6 and M6M

Frame types

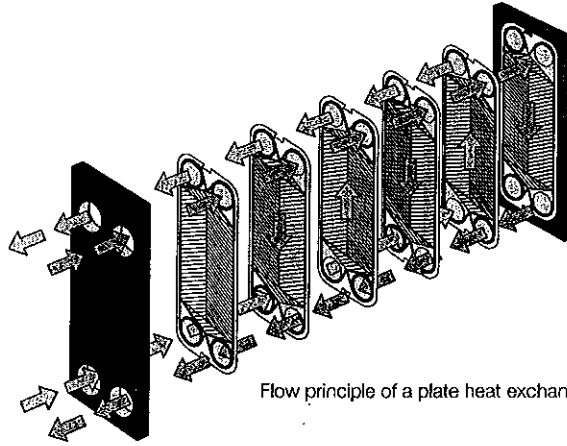
FM, FG, FD, FML and FGL



M6-FG

Working principle

Channels are formed between the plates and the corner ports are arranged so that the two media flow through alternate channels. The heat is transferred through the plate between the channels, and complete counter-current flow is created for highest possible efficiency. The corrugation of the plates provides the passage between the plates, supports each plate against the adjacent one and enhances the turbulence, resulting in efficient heat transfer.



Flow principle of a plate heat exchanger

Standard materials

Frame plate

Mild steel, Epoxy painted

Nozzles

Flange:

Carbon steel

Lined; Stainless steel, Rubber, Titanium

Pipe:

Stainless steel, Carbon steel

Plates

Stainless steel AISI 316

Titanium (M6M only)

Gaskets

M6 Nitrile, EPDM, HeatSeal F™

M6M Nitrile, EPDM, HeatSeal F™, HNBR, Viton®G

Connections

Pipe connections:

Straight threaded ISO-G2 (not for frame type -FD)

Straight welded (not for frame type -FD)

With flanges:

FM Size 60 mm DIN 2501 PN10 or ANSI 150

FG Size 60 mm DIN 2501 PN16 or ANSI 150

FD Size 60 mm DIN 2501 PN25 or ANSI 150/ANSI 300

Technical data

Mechanical design pressure (g) / temperature

FM 1.0 MPa / 160°C

FG 1.6 MPa / 180°C *)

FD 2.5 MPa / 160°C

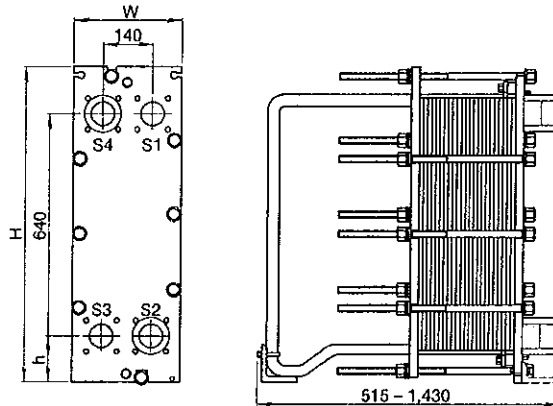
FS ASME 300 psig / 320°F

*) Frame FG also approved for 1.2 MPa / 200°C to allow use in steam systems without safety valves.

Maximum heat transfer surface

38 m² (410 sq. ft)

Dimensions



Measurements (mm)

Type	H	W	h
M6-FML/FGL	920	320	140
M6-FM	920	320	140
M6-FG	920	320	140
M6-FD	940	330	150

The number of tightening bolts may vary depending on pressure rating.

Particulars required for quotation

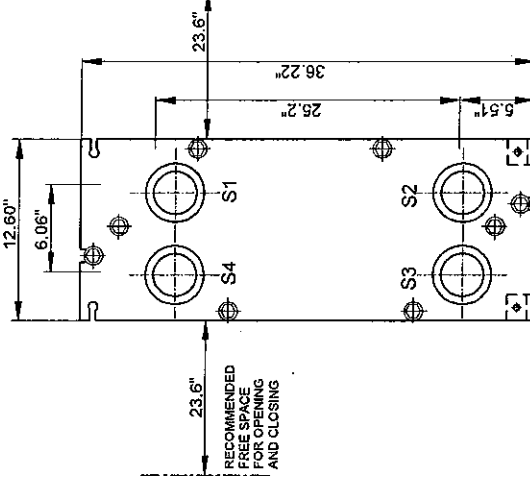
- Flow rates or heat load
- Temperature program
- Physical properties of liquids in question (if not water)
- Desired working pressure
- Maximum permitted pressure drop
- Available steam pressure

How to contact Alfa Laval

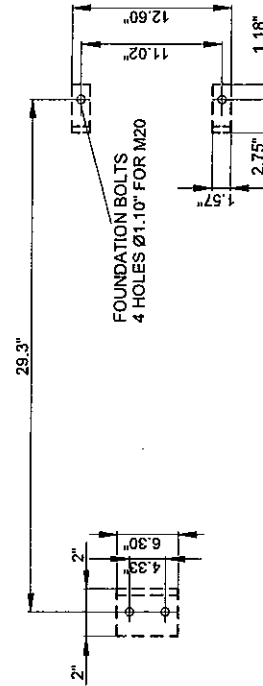
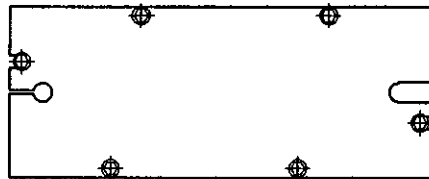
Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information directly.

Designed constructed and stamped in accordance with 2004 ASME Code and Addendum 2006.

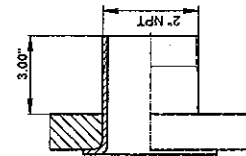
FRAME PLATE
(FIXED)



PRESSURE PLATE
(MOVABLE)
SECTION A-A



ASME
SS
PIPE
S1,S2,S3,S4



REMARKS:	SIDE1	SIDE2
DESIGN PRESSURE	150 psig	150 psig
TEST PRESSURE	195 psig	195 psig
MAX TEMPERATURE	200 °F	200 °F
MIN TEMPERATURE	32 °F	32 °F
MAWP	150 psig	150 psig
MDMT	{MDMT}	

GASKET	EPDMCT CLIP-ON
PLATE MATERIAL	ALLOY 316
PLATE THICKNESS	0.50 mm
HEATING SURFACE	114.6 ft²
PLATE GROUPING	1* (31MH+5L)/1* (31ML+5L)
OPERATING WEIGHT	445 lb
NETWEIGHT	397 lb

TOTAL LENGTH	28.9"
TOTAL WIDTH	12.6"
TOTAL HEIGHT	36.2"

SIDE	MEDIA	INLET	TEMP.	OUTLET	TEMP.	FLOW RATE	PRESSURE DROP	LIQUID VOL.
1	Water	S1	90.8 °F	S2	84.4 °F	213.0 GPM	9,818 psi	0.3948 ft³
2	Water	S3	79.0 °F	S4	85.4 °F	213.0 GPM	9,899 psi	0.3948 ft³

ALL DIMENSIONS IN INCHES

SUPPLIER	REF.	MP NO.
AGENT/REF. Alfa Laval Inc		
CUSTOMER NAME / REF. NO. MAZZA		
SIGN.		RISKCATEGORY N/A

PLATE HEAT EXCHANGER

M6-FG

ASME

QUOTATION
INQ 060105 FUJI

DATE
01/05/2006

REV
No. 0



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

BALL VALVE

MANUFACTURER : APOLLO
MODEL : 76-103
SERVICE : DRAIN
CONNECTION : 1/2" (12.7 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SEAL : PTFE
QUANTITY TO PSU : 3 (1 PER COOLING WATER/GENERATOR SKID)
CUSTOMER TAG NO. : HV-O412A / HV-O422A / HV-O432A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

BALL VALVE (FOR INSTRUMENT ISOLATION)

MANUFACTURER : APOLLO
MODEL : 76-103
SERVICE : ISOLATION OF INSTRUMENT
CONNECTION : 1/4" (6.35 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SEAL : PTFE
QUANTITY TO PSU : 12 (4 PER COOLING WATER/GENERATOR SKID)
CUSTOMER TAG NO. : HV-O410B / HV-O410D / HV-O411B / HV-O411D
HV-O420B / HV-O420D / HV-O421B / HV-O421D
HV-O430B / HV-O430D / HV-O431B / HV-O431D



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

PSU COOLING WATER SUPPLY SYSTEM

BUTTERFLY VALVE

MANUFACTURER : CONTROMATICS
TYPE : SERIES BG
STYLE : RESILIENT SEATED WAFER STYLE BUTTERFLY VALVE
MODEL NO. : BG-020 0 4 1 3 2 1 50
SERVICE : PLANT COOLING WATER
MATERIAL OF CONSTRUCTION
BODY : CAST IRON
DISC : TYPE 316 S.S.
SHAFT : TYPE 316 S.S.
SEAT : EPDM
PRESSURE RATING : 200 PSIG (1.,40 MPa)
OPERATION : LEVER, 10 POSITION LOCKING
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
PIPE SIZE : 2" (50 mm)
QUANTITY : 6 (2 PER PSU)

CUSTOMER TAG NO. : HV-O310A / HV-O310C
HV-O320A / HV-O320C
HV-O330A / HV-O330C



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

PSU COOLING WATER SUPPLY SYSTEM

**REFER TO VOLUME 1
TAB # 6A**

**FOR
CONTROMATICS BG SERIRES
BUTTERFULY VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

PSU COOLING WATER SUPPLY SYSTEM

FLOWMETER

MANUFACTURER : KING
MODEL : 7200 SERIES
MODEL NO. : 7205-0241-2-1-W
SERVICE : COOLING WATER TO POWER SUPPLY UNIT
SIZE : 5" (125 mm) SCALE RANGE
SCALE : 0 ~ 80 GPM (0 ~ 300 L/min) WATER

MATERIAL OF CONSTRUCTION

METERING TUBE : ACRYLIC
INTERNAL : TYPE 316 STAINLESS STEEL
FITTING : TYPE 316 STAINLESS STEEL
ELASTOMER : EPR
PRESSURE LIMIT : 150 PSIG (1.03 MPa)
CONNECTION : 2" (50 mm) FNPT
QUANTITY : 3 (1 PER PSU)

CUSTOEMR TAG NO. : FI-O310A / FI-O320A / FI-O330A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, manufacturing processes, techniques of construction, material used and completion of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWER AS MODIFIED _____

SAVE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-2 C14-16

Date 25/1/06 By: [Signature]

7200 Series

A real value in general purpose rotameters. Vertical connections are from 3/8" NPT to 2" NPT

Description

Metering Tube
Machined Cast Acrylic

Internal Components
316L Stainless Steel

Inlet/Outlet Fittings
NPT, Vertical

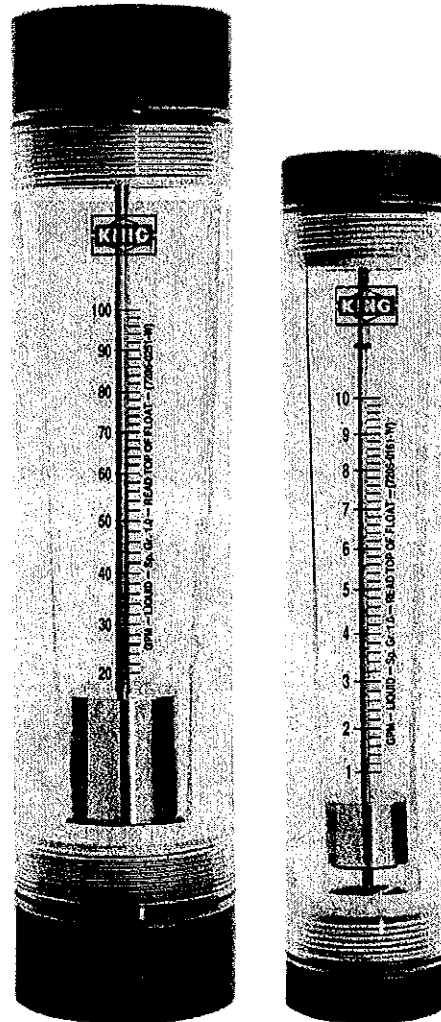
Fitting Material
Standard: PVC (not for air service)
Optional: 316 Stainless Steel, Brass, Aluminum

Elastomers
Standard: EPR
Optional: Buna-N, Viton®

Options

Certified Calibrations
Conform to ISA RP 16.6

Scales
Can be produced in any volumetric unit



Performance

Capacities
1 to 200 GPM – Water
4 to 245 SCFM – Air

Scale
127 mm (5")
Direct reading

Accuracy
± 3% to ± 6% of Full Scale Flow
See specifications table

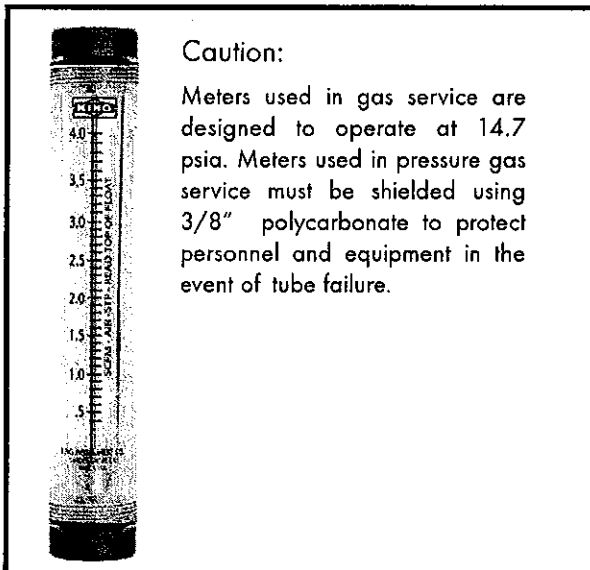
Turndown
10:1 to 12.5:1 unless otherwise indicated

Repeatability
1% to 2%
See specifications table

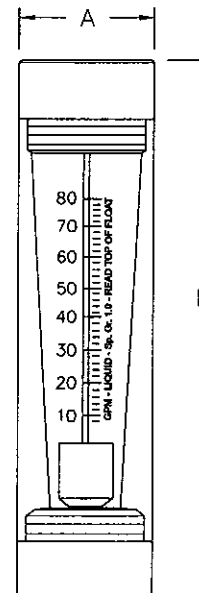
Max Temperature
Water – 130° F (54° C)
Air – 100° F (38° C)

Max Pressure
Water – 150 psig
Air – 100 psig

Ambient Temperature
33° F to 125° F (1° C to 52° C)



Caution:
Meters used in gas service are designed to operate at 14.7 psia. Meters used in pressure gas service must be shielded using 3/8" polycarbonate to protect personnel and equipment in the event of tube failure.



Refer to specification table on page 7

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 25/1/06 By: M. Jordan

7200 Series

Specifications:

Acrylic Tube

Order Number	Flow GPM - Water	Flow SCFM - Air	F.S. Accuracy ±/ Repeatability	Press. Drop (In. / W.C.)	Connection Size	Dimensions	
						A	B
0051	1	4	3%/2%	2.9	3/8" FNPT	1.375"	8.25"
0052	1	4	3%/2%	2.9	1/2" FNPT	1.375"	8.25"
0061	2	8	3%/2%	5.2	3/8" FNPT	1.375"	8.25"
0062	2	8	3%/2%	5.2	1/2" FNPT	1.375"	8.25"
0071	3.5	14	3%/2%	9.5	3/8" FNPT	1.375"	8.25"
0072	3.5	14	3%/2%	9.5	1/2" FNPT	1.375"	8.25"
0081	5	20	3%/2%	13.1	3/8" FNPT	1.375"	8.25"
0082	5	20	3%/2%	13.1	1/2" FNPT	1.375"	8.25"
0151	5	20	3%/1%	10	1" FNPT	2.000"	10.25"
0161	10	43	3%/1%	12	1" FNPT	2.000"	10.25"
0171	15	62	3%/1%	18	1" FNPT	2.000"	10.25"
0181	21	86	3%/1%	22	1" FNPT	2.000"	10.25"
0191	30.5	—	3%/1%	26	1" FNPT	2.000"	10.25"
0201	40	—	6%/2%	32	1 1/2" MNPT	2.000"	12.06"
0211	50	—	6%/2%	38	1 1/2" MNPT	2.000"	12.06"
0221	40	165	4%/1%	18	2" FNPT	3.000"	13.25"
0231	60	245	4%/1%	25	2" FNPT	3.000"	13.25"
0241	80	—	4%/1%	30	2" FNPT	3.000"	13.25"
0251	100*	—	4%/1%	35	2" FNPT	3.000"	13.25"
0261	120*	—	6%/2%	45	2" FNPT	3.000"	13.25"
0271	160*	—	6%/2%	60	2" FNPT	3.000"	13.25"
0281	200*	—	6%/2%	80	2" FNPT	3.000"	13.25"

* These meters have less than 10:1 turndown. See table for specifics.

Order Number	Flow Range	Actual Turndown
0251	20 - 100 GPM	5:1
0261	30 - 120 GPM	4:1
0271	45 - 160 GPM	3.55:1
0281	55 - 200 GPM	3.63:1

Max. Pressure		Max. Temp	
Water	Air	Water	Air
150 psig	100 psig	130° F	100° F

Ordering:

Use the following guide to determine the specific product number you require.



Meter Series	Order number from specifications table above	Fitting Material	O-Ring Material	Fluid To Be Metered
		Brass - 1	EPR - 1	GPM—Liquid - W
		316 SSL - 2	Buna-N - 2	SCFM—Air - A
		PVC - 3	Viton® - 3	
		Aluminum - 6		

Example: 7205 - 0281 - 3 - 1 - W



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DISSOLUTION SYSTEM

OZONE DISSOLUTION SYSTEM

The dissolution system is designed to efficiently transfer the ozone gas into the raw water to react with the impurities in the water. The diffusers for the Winnipeg Water Treatment Program are "LITTLE BUBBLY" - Airmatic disc diffuser manufactured by Filtros (Ferro Corporation). The diffusers are made of ceramic material that is specifically designed and manufactured to provide for maximum ozone diffusion efficiency. The fine bubble diffusers, in conjunction with the head of water on the diffusers are used to produce a small diameter gas bubble (2 ~ 3mm diameter). These small diameter bubbles increase the surface area of the gas which results in high mass transfer of the gas into the water. Other design details that increase the mass transfer of ozone gas into the water include multiple ozonation points and counter current flow. Countercurrent flow means the gas bubbles are rising while the water flow is being forced in a downward direction. The number of diffusers required for each cell is dependent on the gas flow into each cell and cell size. Each diffuser is designed to have a flow range of 0.4 to 1.6 scfm (0.01 to 0.04 Nm³/min.).

The maximum total flow rate for all three legs is 141 scfm (3.72 Nm³/min.) per contactor.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DISSOLUTION SYSTEM

OZONE DIFFUSER

MANUFACTURER : FILTROS (FERRO)
TYPE : AIRAMIC DISC - LITTLE BUBBLY
MODEL : FAO-30
SERVICE : OXYGEN/OZONE GAS MIXTURE INTO RAW WATER
DIFFUSER DIAMETER : 8 1/8" (206 mm) O.D.
GAS DIFFUSION DIA. : 7 3/4" (197 mm)
MAX. PORE DIAMETER : 100 MICRONS
MATERIAL OF CONSTRUCTION
DISC : CERAMIC
BASEPLATE : TYPE 316L S.S.
GASKET : WHITE VITON
ORIFICE SIZE : 1/4" (6.3 mm)
CONNECTION : 3/4" (19 mm) NPT
FLOW RANGE : 0.4 ~ 1.6 SCFM (0.01 ~ 0.04 Nm³/min) EACH
SPECIAL REQUIREMENT : CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 192 (96 PER CONTACTOR)

CUSTOMER TAG NO. : N/A



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DISSOLUTION SYSTEM

WATER BLOW OFF DIFFUSER

MANUFACTURER : FILTROS (FERRO)
TYPE : AIRAMIC DISC - LITTLE BUBBLY
MODEL : FAO-50
SERVICE : WATER BLOW OFF FROM LINE
DIFFUSER DIAMETER : 8 1/8" (206 mm) O.D.
GAS DIFFUSION DIA. : 7 3/4" (197 mm)
MAX. PORE DIAMETER : 140 MICRONS
MATERIAL OF CONSTRUCTION
DISC : CERAMIC
BASEPLATE : TYPE 316L S.S.
GASKET : WHITE VITON
ORIFICE SIZE : 1/4" (6.35 mm)
CONNECTION : 3/4" (19 mm) NPT
FLOW RANGE : 0.4 ~ 1.6 SCFM (0.01 ~ 0.04 Nm³/min) EACH
SPECIAL REQUIREMENT : CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 8 (4 PER CONTACTOR)

CUSTOMER TAG NO. : N/A



Filtros Ltd. • P.O. Box 339 • East Rochester, NY 14445
Tel: (585) 546-8770 • Fax: (585) 580-7164

"LITTLE BUBBLY" AIRAMIC® DISC DIFFUSER ASSEMBLY

This diffuser consists of an 8-1/8" (21 cm.) diameter holder with an integral 3/4" male pipe thread, a large peripheral gasket, the permeable ceramic diffuser disc, and a 1/2" stainless steel orifice bolt with a washer and gasket. The holder is available in stainless steel or PVC, and various gasketing-materials may be selected.

The flat diffusion surface of 38 in.² (1/4 ft.²) provides for uniformly dispersed small bubbles for optimum gas/liquid reaction efficiency. Depending upon pore size selection, this unit will diffuser evenly at rates of 0.5 to 1.5 cfm. This diffuser is ideal for aeration, ozonation or other gas diffusion requiring small bubble efficiency. Selection of one of our FAO pore-size grades is dependent upon the application. FAO-50 is often used for aeration, FAO-30 for ozonation, Ceramic diffusers perform best after a several hour soak in the usage liquid.

INSTALLATION REQUIRES TEFLON® TAPE OR LUBRICANT ON THE ON THE PIPE THREAD. THE UNIT SHOULD BE HAND TIGHTENED INTO A GAS SUPPLY. THE BOLT IS FACTORY TORQUED AT 70 INCH-POUNDS TO SEAL THE GASKETS, AND SHOULD NEVER BE USED TO INSTALL, NOR REMOVE THE UNIT. TAMPERING WITH ASSEMBLY BOLT COULD RESULT IN IMPROPER GASKET COMPRESSION LEADING TO A MALFUNCTION OF THE UNIT.

With a clean air or gas supply and appropriate gasket selection, the diffuser should operate maintenance-free indefinitely. However, due to shut-downs or other facility maintenance problems, some build-up of foreign substances can occur. If cleaning is required, the ceramic disc can be physically brushed in place with an appropriate cleaner or solvent.

For other cleaning methods or ceramic or gasket replacement, the disc may be removed by unscrewing the stainless bolt. A verity of cleaning methods can then be used, such as soaking in a mineral acid, oxalic acid or detergent. Ultrasonic cleaning or heating to 1000°F are other options. Safety precautions must be taken for all cleaning operations. Additional cleaning information can be obtained from the "Water Environment Federation Manual of Practice", FD-13, 1988.

Filtros® Porous Ceramics

Since 1913, Filtros has provided industry with holes—tiny holes in ceramic media. Over that time, the holes haven't changed much, but the number of ways they're used has increased dramatically. Filtros has made these porous ceramics cost effective in hundreds of different products.

Our engineers in each of these cases designed just the right composition, porosity, size and strength for a successful application. You will find Filtros porous ceramics used for everything from sewage treatment to medical equipment. As the market leader, we pioneered many of these. Our broad experience provides a unique capability to continue finding new uses for tiny holes.

This folder is designed to give you a brief introduction to porous ceramics technology. Perhaps this will provide enough information to determine whether small pores can solve a problem you have.

Technology Tidbits

Filtros Porous Ceramics consist of bonded, closely-sized particles resulting in a strong, uniform, permeable material forming a tortuous path for fluid flow. The most common materials are alumina and silica, with others available. The chemical environment, strength and durability requirements dictate which of these is the most cost-effective.

Pore Size is the diameter measured in microns (μ), which are a thousandth of a millimeter, or 40 millionths of an inch. So, 25 microns = 0.001". Dust particles in the air, for example, are typically 10 microns in diameter. Filtros can control pore size from 1/2 to 1500 microns, within a very narrow range.

Porosity is the percent of open pores by volume and can be controlled from 20-50%, but is normally 35%.

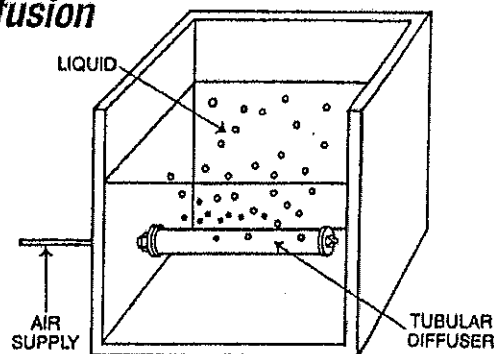
Permeability describes the volume of flow of fluids per unit time in a porous ceramic. It is measured with air passing through a 12" square plate at a pressure drop of 2" of water. Permeabilities can be controlled between 1/2 and 200 cubic feet per minute (c.f.m.).

A "HOLE" Solution

Filtros has standard grades, materials, and sizes of porous ceramics which can be used in an application you might have. If these products are not suitable, our engineers have experience in designing custom products for a wide variety of end-use markets. They know how to replace other porous or perforated materials such as metal, plastic, and woven fibers; they have worked in diffusion, filtration, conveying, venting, electrolysis, mixing, and dispersal. They employ all the porous ceramics advantages of strength, inertness, uniformity, and temperature and chemical resistance in every design.

The following applications are the most common ways our porous ceramics are used. These may help to stimulate your thinking about the way a "hole" solution can be applied to your problem.

Diffusion

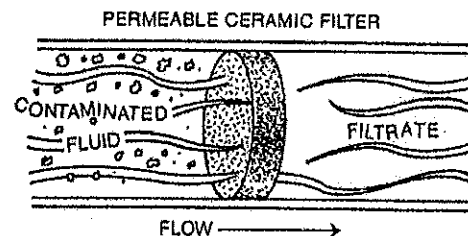


Diffusion is the formation of small bubbles produced by a gas flow (usually air) through a porous ceramic into a liquid (usually water). Filtros porous materials best suited for diffusion are ceramically-bonded alumina and glass-bonded silica. A wide range of permeabilities is available, depending on bubble size, flow requirement, and product design. A major advantage is excellent uniformity, resulting in an even distribution of small bubbles.

Standard diffusers include tubes (2-1/2" dia. x 24" long), plates (12" x 12"), and a variety of special configurations such as discs and domes, as well as assemblies. These products are highly chemically resistant, durable, cleanable, and can be used in most solutions and atmospheres.

Typical applications include air diffusion in secondary sewage treatment and aquaculture, oxygen and ozone diffusion in sewage and water treatment, chemical reactions using any of a variety of gases, and inert gas mixing of molten metals.

Filtration



Materials for filtration are a function of chemical and temperature resistance. They include ceramically bonded alumina and glass-and resin-bonded silica. Various grades of each are available, depending upon particle retention and flow requirements. All have excellent uniformity, rigidity, high strength and are easily cleaned or backwashed.

Chemically resistant porous materials can be selected for hot and cold solutions, alkaline solutions, organic solutions, and most acids. As for thermal resistance, standard materials can operate to 2000°F, and with special compositions, even higher.

Available standard filter sizes include 10", 20" and 30"-long tubes; 12" x 12" plates; and special shapes such as fluted or closed-end tubes, discs and grooved-bottom plates.

Typical uses are for liquids or gases in high-temperature, cryogenic, crossflow, high-pressure, ultra, micro, and pre-coat filtration; and as a membrane support or underdrain in filtration systems. These materials are also used in many specialized chemical applications, as well as high-volume potable water and tertiary sewage filtration systems.



Filtros Limited
 803 West Commercial Street
 P.O. Box 389
 East Rochester, New York 14445
 Phone: 716-586-8770
 Fax: 716-586-7154

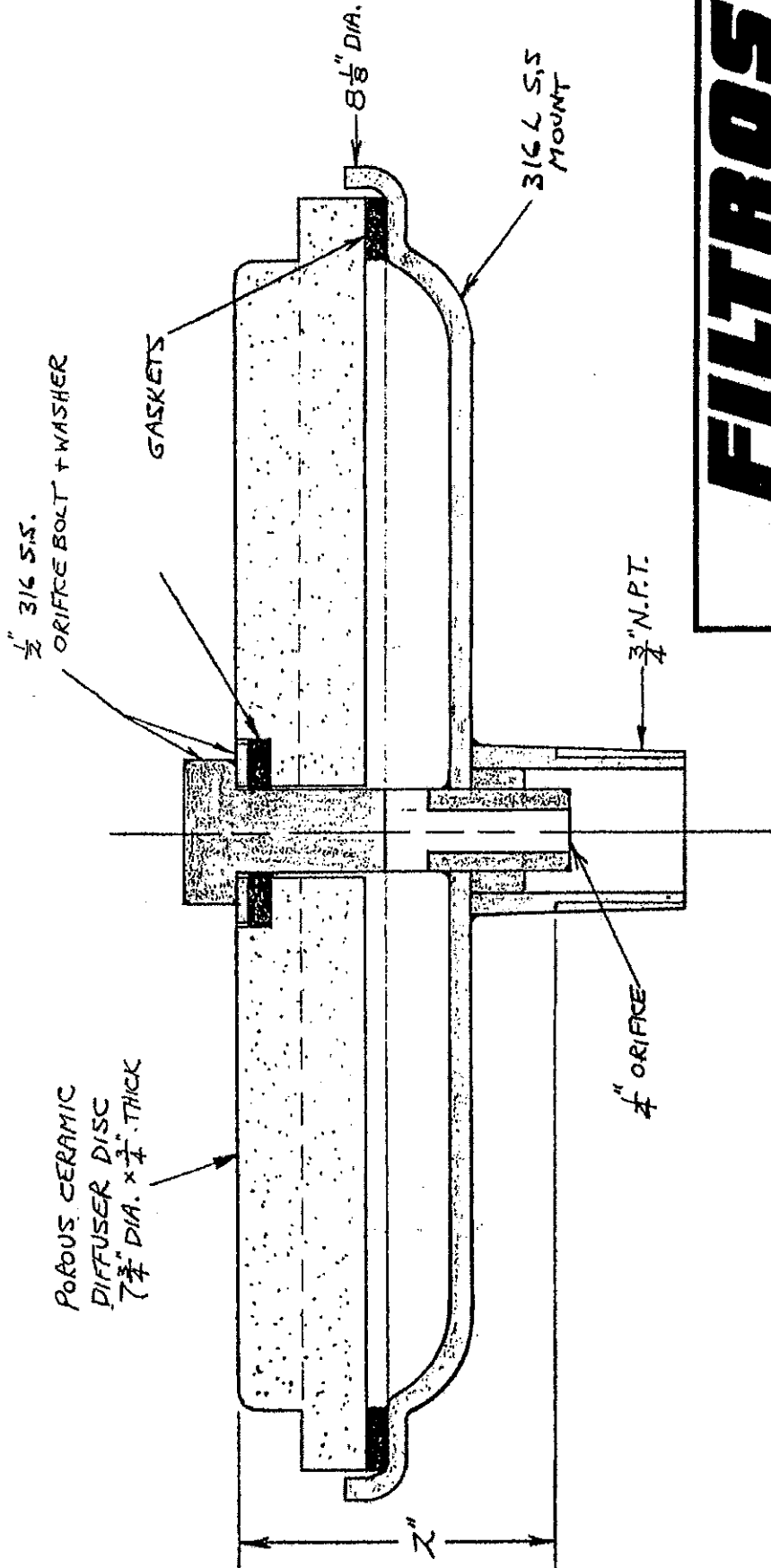
PHYSICAL PROPERTIES OF PERMEABLE CERAMIC MATERIALS

MATERIAL - NOMINAL PARTICLE RETENTION (MICRONS)			MAXIMUM PORE DIAMETER (MICRONS)	PERMEABILITY (CFM AIR/FT. ² / 1-1/2" THICKNESS * @ 2" H2O)
ELECTROFLO®	FILTROS®	KELLUNDITE®		
QR-10	QF-10	FAO-10	60	2-3
QR-20	QF-20	FAO-20	80	3-5
---	---	FAO-30	100	5-8
QR-40	QF-40	FAO-40	120	8-12
QR-50	QF-50	FAO-50	140	12-15
---	---	FAO-70	170	20-25
---	---	FAO-100	210	35-45
QR-130	---	---	230	35-45
---	---	FAO-160	300	70-80
QR-340	---	---	500	85-100
---	---	FAO-700	800	120-140
---	---	FAO-1200	1300	170-190
350°	800°	2000°	MAXIMUM USE TEMP. IN AIR WITH NO LOAD (°F)	
8 LB	8 LB	12 LB	WEIGHT OF 12" X 12" X 1" PLATE (LBS.)	
30-40%	35-45%	30-40%	POROSITY (% VOLUME)	
RESIN BONDED SILICA	GLASS BONDED SILICA	CERAMICALLY BONDED ALUMINA	MATERIAL COMPOSITION	
RESISTANT TO CHEMICALS THAT DO NOT ATTACK PHENOLIC RESIN. NOT FOR ALKALINE SOLUTIONS OR SOLUTION TEMP. ABOVE 100°F	RESISTANT TO CHEMICALS THAT DO NOT ATTACK SILICA GLASS. NOT FOR STRONG ALKALINE SOLUTIONS. INITIAL HYDROLYSIS OCCURS.	MOST RESISTANT TO CHEMICAL ATTACK. NOT RECOMMENDED FOR HYDROFLUORIC OR PHOSPHORIC ACIDS OR STRONG ALKALINE SOLUTIONS.	CHEMICAL RESISTANCE	

GRADE	FLEXURAL STRENGTH (PSI)		
	QR	QF	FAO
10	3000	4000	6000
20	2900	3500	5500
30	---	---	5000
40	2800	3000	4500
50	2700	2500	4000
70	---	---	3500
100	---	---	3000
130	2000	1000	---
0	---	---	2500
0	1500	---	---
700	---	---	1500
1200	---	---	1000

- NOTES:**
- (1) MORE REFRACTORY & CHEMICALLY RESISTANT COMPOSITIONS ARE AVAILABLE.
 - (2) SPECIAL GRADES & OTHER MATERIALS, SUCH AS SILICON CARBIDE ARE ALSO AVAILABLE.
 - (3) PARTICLE RETENTION IN A GAS IS APPROXIMATELY TEN TIMES SMALLER.
 - (4) THIS DATA IS TYPICAL AND IS NOT INTENDED FOR USE AS SPECIFICATION REQUIREMENTS.





FILTROS

EAST ROCHESTER, N. Y.

S.S. DIFFUSER DISC ASSEMBLY

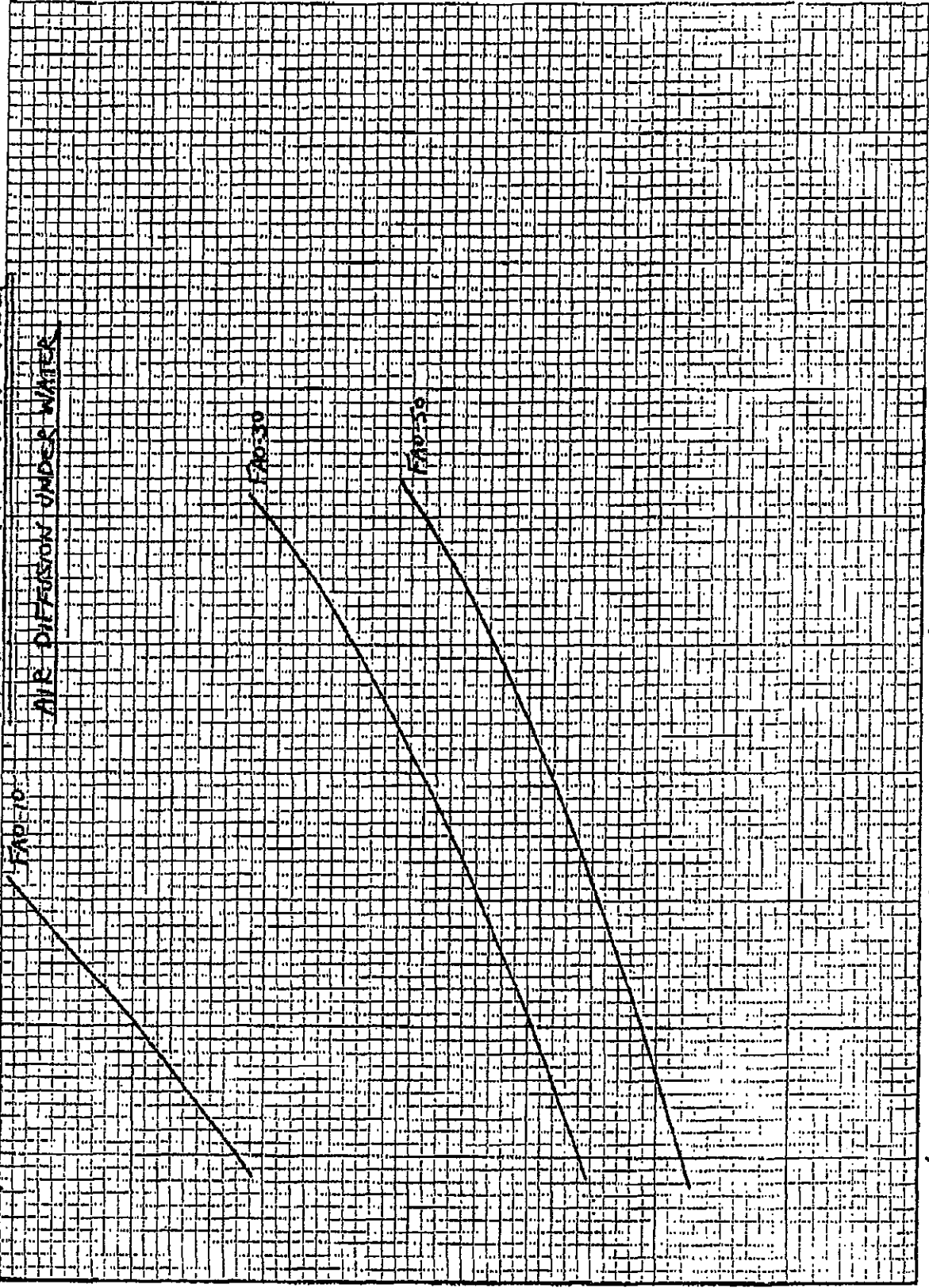
SYM.	REVISIONS	DATE	BY	AUTH. BY

SCALE APPROX.	10-26-84
DESIGNED BY	CHECKED BY
DRAWN BY	

F-203

AIRAMIC® DISC DIFFUSER ASSEMBLY
AIR DIFFUSION UNDER WATER

IN.H₂O (PRESSURE)



CFM (FLOW)



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

DISSOLVED OZONE MONITORING SYSTEM

DISSOLVED OZONE MONITORING SYSTEM

The Dissolved Ozone Monitoring System is to measure the dissolved ozone in the raw water.

Each dissolved ozone monitor to have a flow range of between 1.0 gpm and 4.0 gpm (3.8 L/min. to 15.1 L/min.) and pressure must be keep below 50 psig (345 kPa). During the measurement, the flow and pressure must be constant.

The sample pumps need to be placed below the water level.



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

DISSOLVED OZONE MONITORING SYSTEM

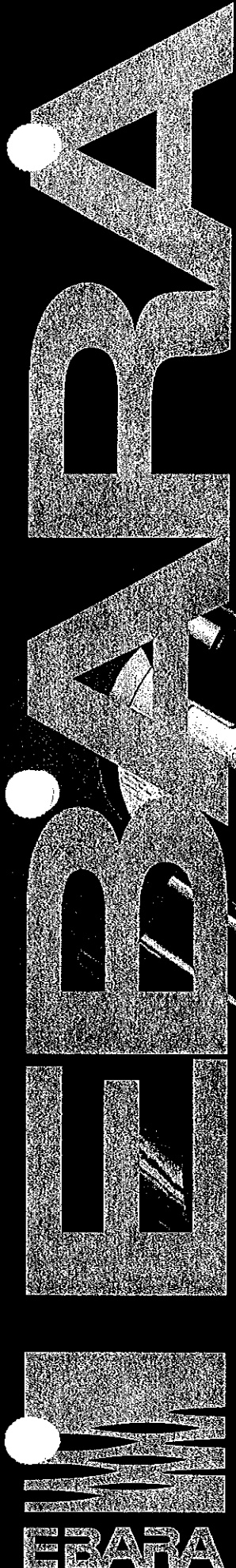
SAMPLE PUMP

MANUFACTURER : EBARA
MODEL : CDU70/1
TYPE : CLOSE COUPLED END SUCTION CENTRIFUGAL
SERVICE : SAMPLE WATER TO DISSOLVED OZONE ANALYZER
FLOW CAPACITY : 20 GPM (75 L/min)
HEAD REQUIREMENT : 66 FT (20 m) H₂O
MATERIAL OF CONSTRUCTION
CASING : TYPE 304L S.S.
IMPELLER : TYPE 304L S.S.
CONNECTION
SUCTION SIDE : 1 1/4" (32 mm) FNPT
DISCHARGE SIDE : 1 (25 mm) FNPT
MOTOR : 3/4 HP, 3450 RPM, TEFC
POWER : 480 VAC / 3 PHASE / 60 Hz
WEIGHT : 31 LB (14 Kg)
QUANTITY : 4 (2 PER CONTACTOR)

CUSTOMER TAG NO. : SP-O220A / SP-O225A
SP-O240A / SP-O245A

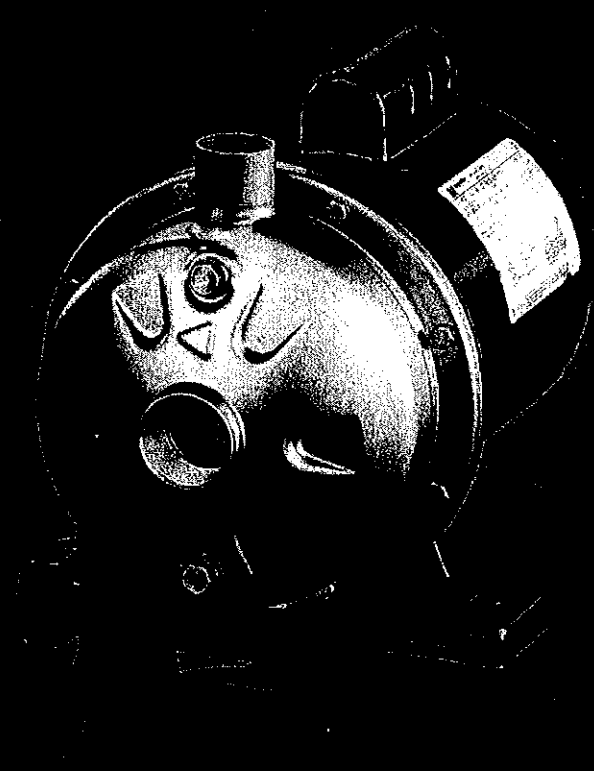
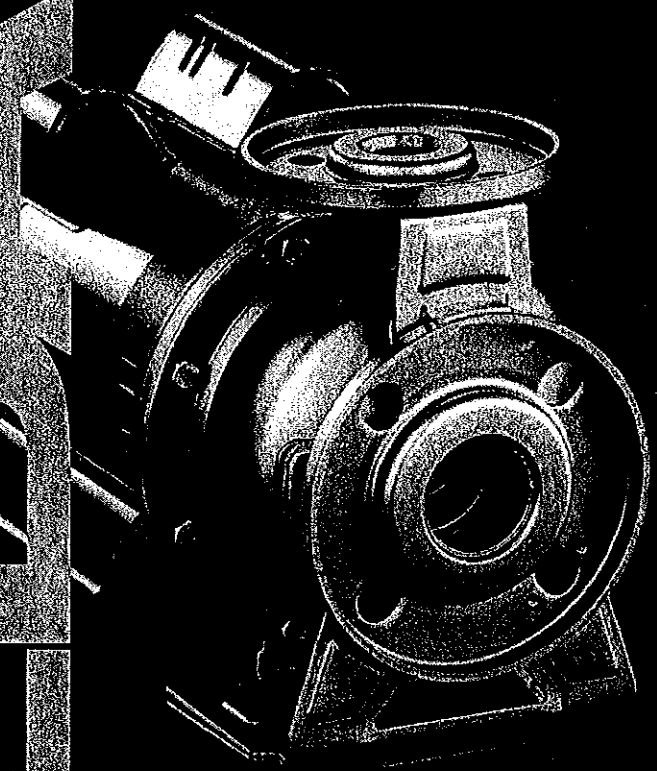
NOTE:

THE SAMPLE PUMPS TO BE PLACED BELOW WATER LEVEL.



Model 3U/CDU

end suction centrifugal



EBARA

EBARA International Corporation

Standard Pump Division

Model 3U / CDU

Features

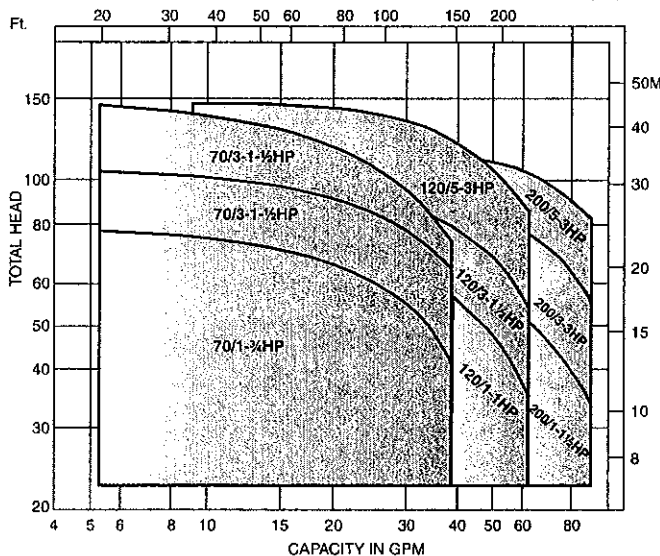
- **Close coupled design**
 - saves space; simplifies maintenance and installation
- **Stainless steel liquid end components**
 - high quality; corrosion resistance
- **Versatile mounting**
 - can be installed horizontally or vertically
- **Back pullout construction**
 - assembly and overhaul of the impeller and seal without distorting suction and discharge connections
- **Top centerline discharge and foot support under casing**
 - ensures self-venting and reduces misalignment from pipe loads
- **High operating efficiency**
 - lowers operating costs
- **High quality mechanical shaft seals and o-rings**
 - available for standard pumping requirements or optional high temperature and chemical duty operation

Applications

- Plant services
- Water supply systems
- Washing plants
- Cooling water
- Car wash
- Scrubbers
- Ultrapure water systems
- Jockey pump services
- Air conditioning
- Sprinkler/flow irrigation
- OEM equipment application
- Pressure boosting
- Liquid transfer
- Heat exchanger
- Spray systems
- Heating
- Beverage processing
- Pharmaceutical services
- Water reclamation and treatment
- General pump applications

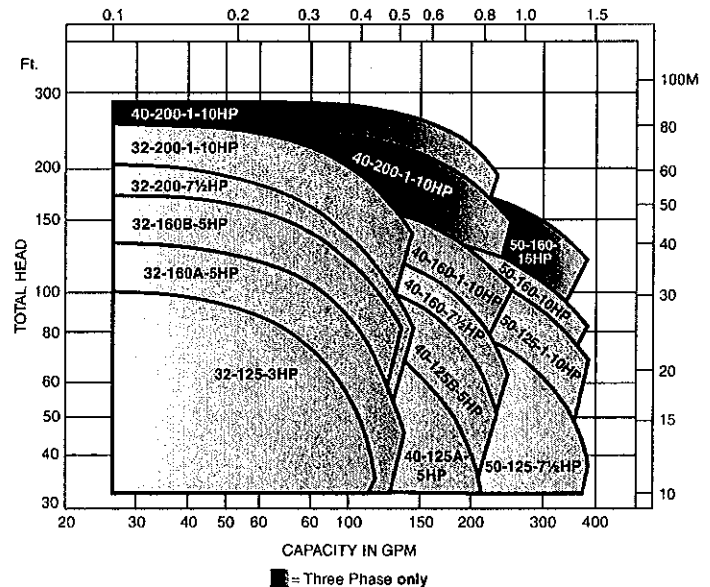
CDU selection chart

60 Hz (synchronous speed: 3600 RPM)
L/MIN



3U selection chart

60 Hz (synchronous speed: 3600 RPM)
M³/MIN



EBARA International Corporation

Standard Pump Division

1651 Cedar Line Drive • Rock Hill, SC 29730 • (t) 803 327 5005 • (f) 803 327 5097

info@pumpsebara.com • www.pumpsebara.com

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EIC3U_CDU 0105

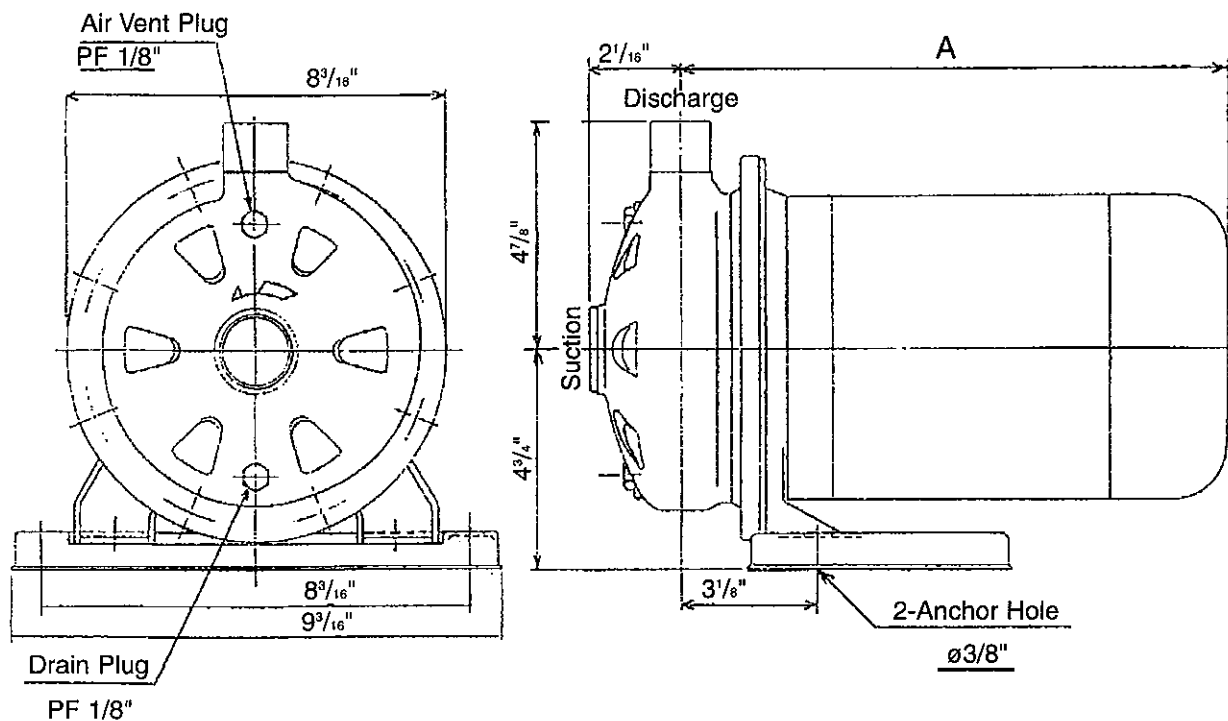
Specifications

	Standard	Optional
Size		
Suction	CDU70 – 1¼" NPT thread CDU120 – 1¼" NPT thread CDU200 – 1½" NPT thread	
Discharge	1" NPT thread	
Range of HP	¾ HP to 3 HP	
Range of Performance		
Capacity	5.5 to 95 GPM at 3450 RPM	
Head	26 to 144 feet at 3450 RPM	
Liquid handled		
Type of liquid	Water	
Temperature	212°F (100°C)	Max. 250°F (121°C) with optional high temperature seal
Max. working pressure	125 PSI (9 Bar)	
Materials		
Casing	304L Stainless Steel	
Impeller (closed type)	304L Stainless Steel	
Shaft	Stainless Steel	
Bracket	Aluminum	
Shaft Seal	Mechanical Seal – Type 21	High temperature version Mild chemical version
Bearing	Ball Bearing	
Direction of Rotation	Clockwise when viewed from motor end	
Motor		
Type	NEMA 56J Frame	
Speed	60 Hz, 3450 RPM (2 poles)	
Single Phase	TEFC – ¾ HP to 3 HP ODP – ¾ HP to 3 HP, 115/230V	Explosion proof – consult factory
Three Phase	TEFC – ¾ HP to 3 HP ODP – ¾ HP to 3 HP, 208-230/460V	Washdown duty – consult factory
Motor Protection	Built-in overload protection (single phase)	



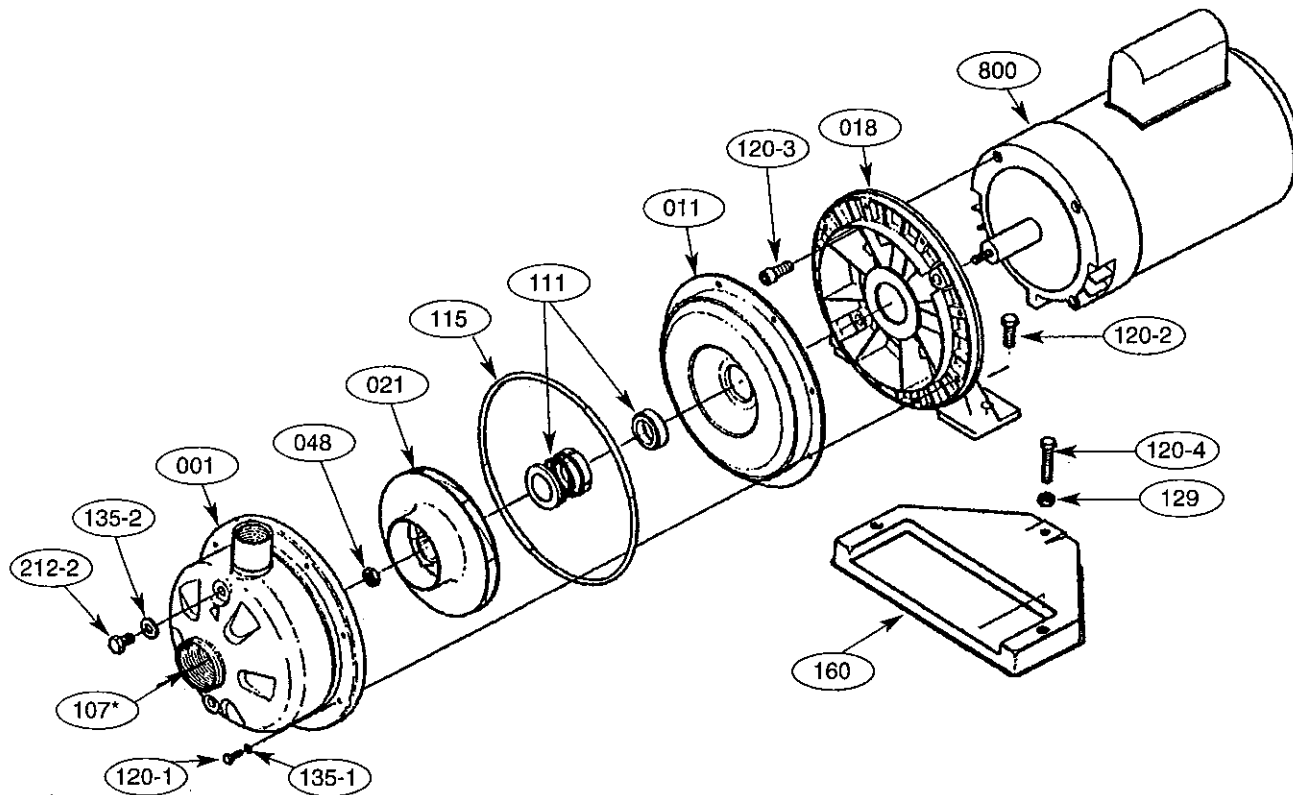
**Model CDU
Pump Dimensions**

EBARA Stainless Steel Centrifugal Pumps



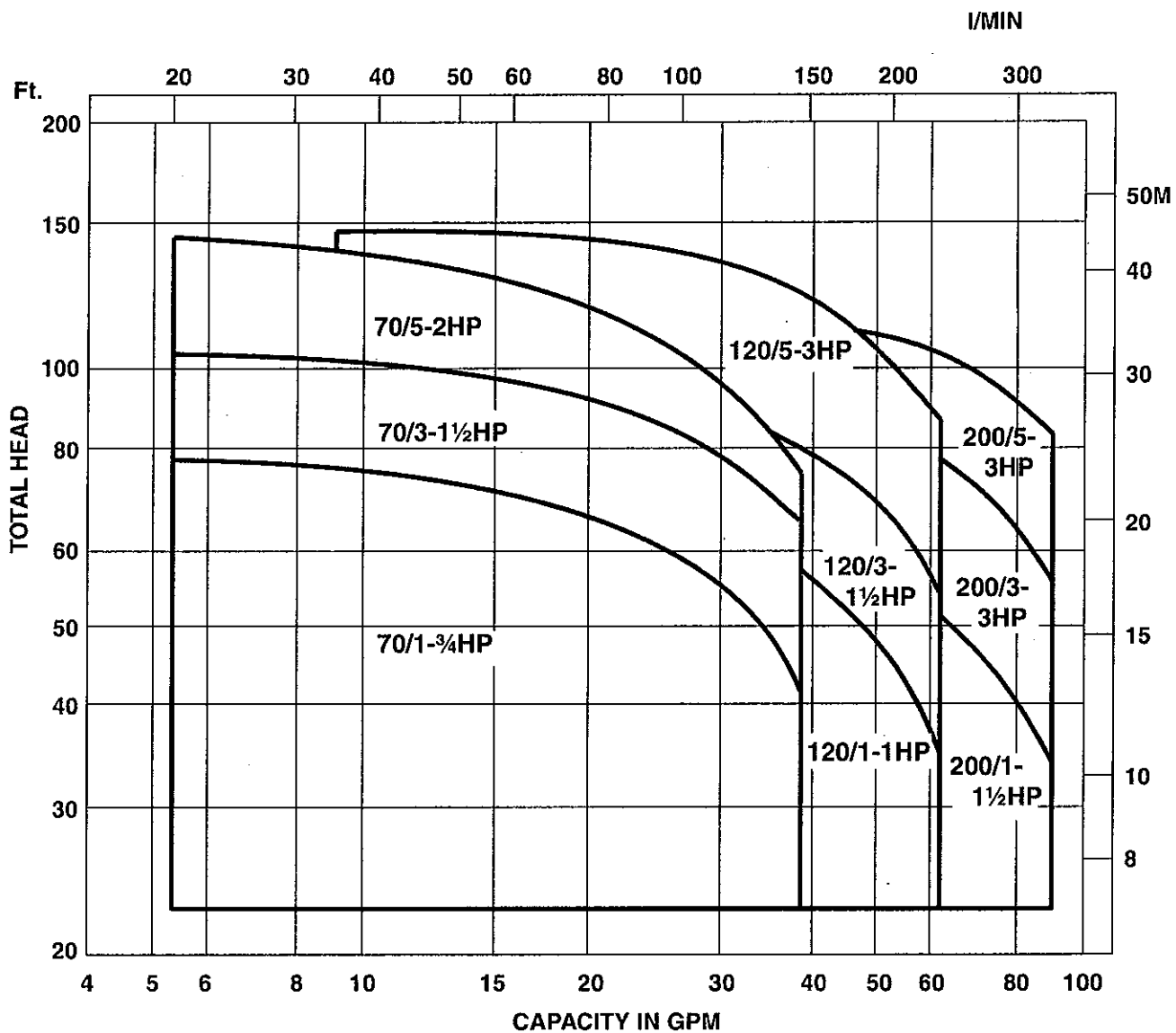
Model	Model	Pump Size – NPT (Inch)		Dimension (Inch)	Unit Weight (lbs.)			
		Suction	Discharge	A	Single Phase		Three Phase	
					ODP	TEFC	ODP	TEFC
CDU70/1-3/4HP	1 x 1 1/4 x 4 1/2	1 1/4	1	13 1/8 Max.	36	41	31	31
CDU70/3-1 1/2HP	1 x 1 1/4 x 5 9/16	1 1/4	1	13 9/16 Max.	47	50	39	39
CDU70/5-2HP	1 x 1 1/4 x 6 9/16	1 1/4	1	14 7/16 Max.	51	58	44	48
CDU120/1-1HP	1 x 1 1/4 x 4 1/2	1 1/4	1	13 9/16 Max.	41	46	33	32
CDU120/3-1 1/2HP	1 x 1 1/4 x 5 9/16	1 1/4	1	13 9/16 Max.	47	50	39	39
CDU120/5-3HP	1 x 1 1/4 x 6 9/16	1 1/4	1	14 7/16 Max.	59	66	51	60
CDU200/1-1 1/2HP	1 x 1 1/2 x 4 1/2	1 1/2	1	13 9/16 Max.	47	50	39	39
CDU200/3-3HP	1 x 1 1/2 x 5 9/16	1 1/2	1	14 7/16 Max.	58	65	50	59
CDU200/5-3HP	1 x 1 1/2 x 5 11/16	1 1/2	1	14 7/16 Max.	58	65	50	59

Sectional View



Part No.	Part Name	Material	No. for 1 Unit
001	Casing	304L Stainless	1
011	Casing cover	304L Stainless	1
018	Bracket	Aluminum	1
021	Impeller	304L Stainless	1
048	Impeller nut	304L Stainless	1
107*	Casing ring (*CDU 70 series only)	Viton	1
111	Mechanical seal	---	1
115	O-Ring	Viton	1
120-1	Bolt	304L Stainless	8
120-2	Bolt	304L Stainless	2
120-3	Bolt	304L Stainless	4
120-4	Bolt	304L Stainless	1
129	Nut	304L Stainless	1
135-1	Washer	304L Stainless	8
135-2	Washer	Aluminum	2
160	Base	Steel	1
212-2	Plug	304L Stainless	2
800	Motor	---	1





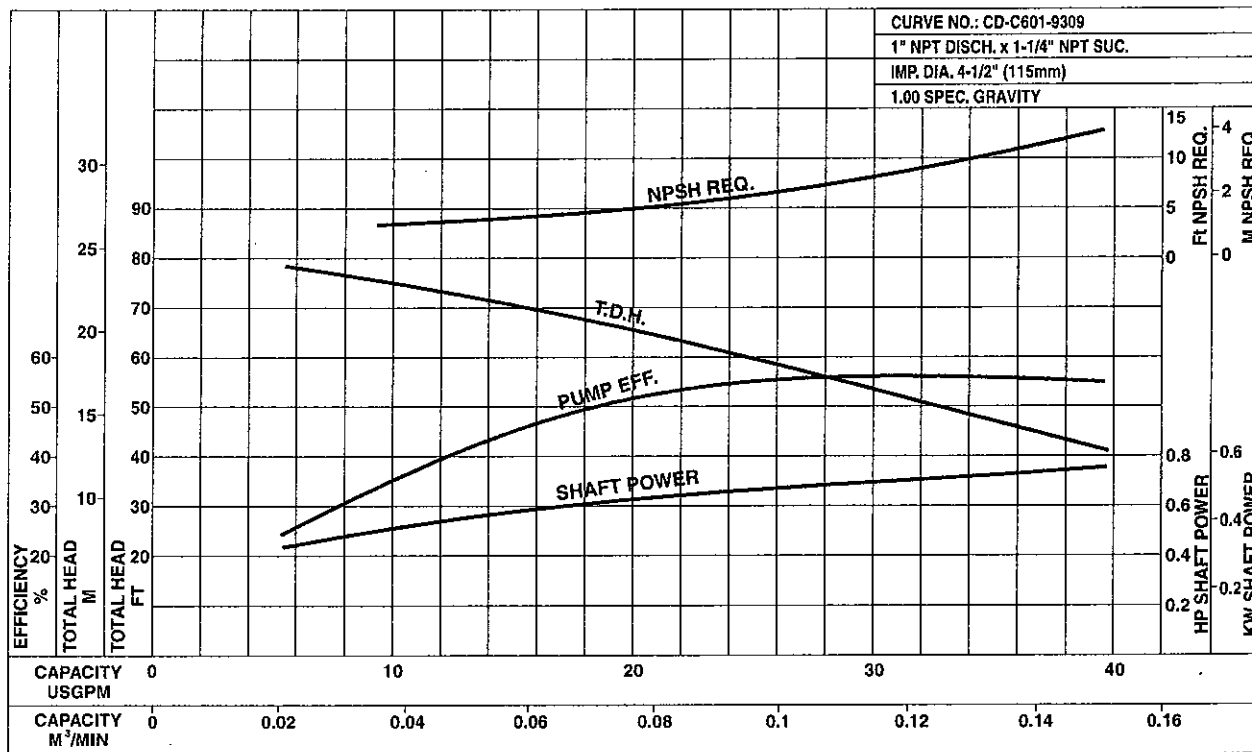
Model CDU
Performance Curves

EBARA Stainless Steel Centrifugal Pumps

CDU70/1-3/4 HP

Synchronous Speed: 3450 RPM

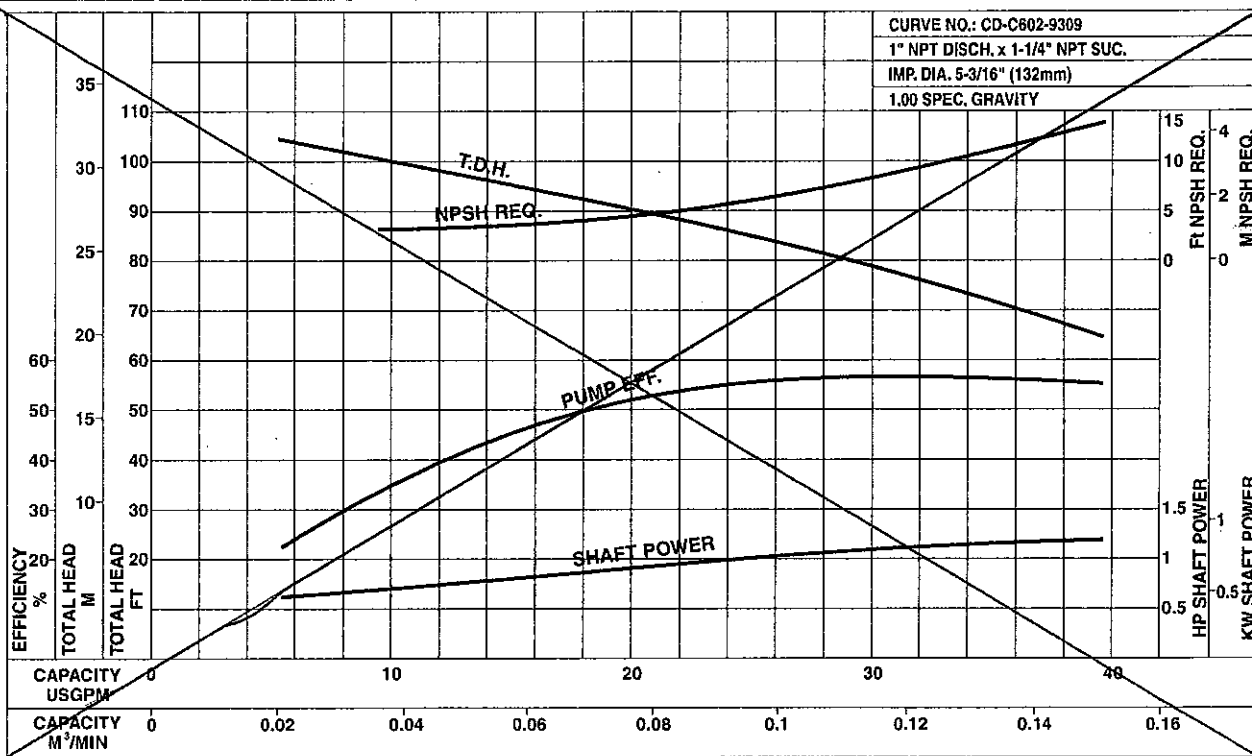
Size: 1 x 1 1/4 x 4 1/2



CDU70/3-1 1/2 HP

Synchronous Speed: 3450 RPM

Size: 1 x 1 1/4 x 5 3/16





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

DISSOLVED OZONE MONITORING SYSTEM

BALL VALVE

MANUFACTURER : APOLLO
MODEL : 76-103
SERVICE : SAMPLE WATER
CONNECTION : 1/2" (12.7 mm) NPT
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
QUANTITY : 8 (4 PER RESIDUAL OZONE MONITORING PANEL)

CUSTOMER TAG NO. : HV-O221A / HV-O221B
 HV-O226A / HV-O226B
 HV-O241A / HV-O241B
 HV-O246A / HV-O246B



Fuji Electric Corporation of America

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Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

DISSOLVED OZONE MONITORING SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

DISSOLVED OZONE MONITORING SYSTEM

FLOWMETER

WHY IS THIS A DIFFERENT MANUFACTURER THAN OUR SPECIES ENGLISH

MANUFACTURER : KING
 MODEL : 7470 SERIES
 MODEL NO. : 747 1 2 3 53W 1
 SERVICE : SAMPLE WATER
 SCALE : 0 ~ 5 GPM (0 ~ 18.9 L/min) WATER

MATERIAL OF CONSTRUCTION

METERING TUBE : BOROSILICATE GLASS
 INTERNAL : TYPE 316L STAINLESS STEEL
 FITTING : TYPE 316L STAINLESS STEEL
 ELASTOMER : VITON

MAXIMUM PRESSURE : 200 PSIG (1.38 MPa)
 OPTION : ALARM (LATCHING REED SWITCH)
 SWITCH TYPE : SPDT
 MAX. CONTACT VOLT.: 100 VDC

ACCURACY : ± 3 % OF FULL SCALE
 TEMPERATURE LIMIT : 33 ~ 125° F (1 ~ 52° C)
 CONNECTION : 3/4" (19 mm) FNPT
 QUANTITY : 4 (2 PER RESIDUAL OZONE MONITORING PANEL)

CUSTOEMR TAG NO. :

FT-O220A / FT-O225A / FT-O240A / FT-O245A
Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, tolerances, materials, techniques of construction, and design and coordination of all parts of the work rests with the Contractor.

REVIEWED _____ ✓
 REVISIONS AS MODIFIED _____
 REVISED AND RE-SUBMIT _____
 NOT REVIEWED _____

Project No. 79538-C14-16
 Date: 25/1/06 By: M. Yule

7470 Series

Available with NPT or flange connections, vertical or horizontal, this 127 mm scale glass tube meter offer value and versatility in 304 stainless case construction.

Description

Metering Tube
Borosilicate Glass

Internal Components
Standard: 316L Stainless Steel
Optional: Hastelloy®C-276

Inlet/Outlet Fittings
FNPT or Flange, Vertical or Horizontal

Fitting Material
Standard: 316L Stainless Steel
Optional: PVC (vertical connections only)

Elastomers
Standard: Viton
Optional: Buna-N, EPR, and Kalrez®

Case and Covers
304 Stainless Steel

Options

Alarm
Latching reed switch

Certified Calibrations
Conform to ISA RP 16.6

Scales
Can be produced in any volumetric unit

Float Types:



Semi Viscosity Compensation



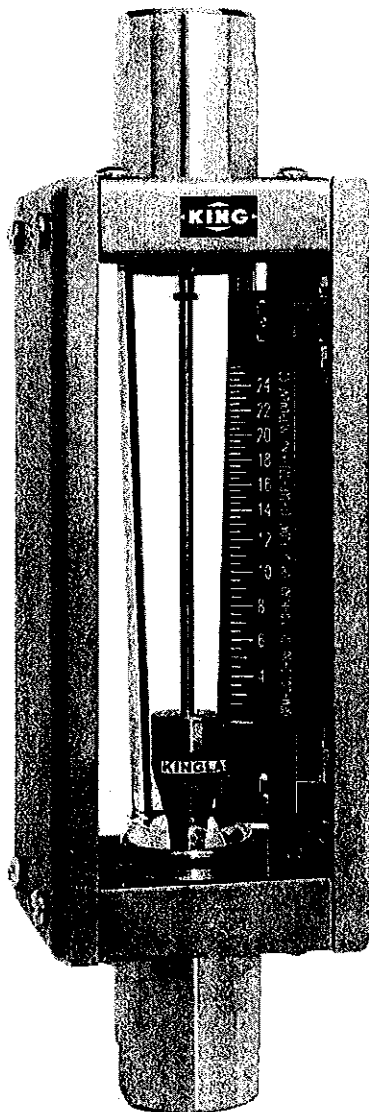
Maximum Viscosity Compensation



Lowest Pressure Loss



Maximum Flow



Glass Tube

Performance

Capacities
.25 to 116 GPM – Water
1 to 245 SCFM – Air

Scale
127 mm (5")
Direct reading, detachable

Accuracy
± 3% of Full Scale Flow

Turndown
10:1 to 12.5:1 unless otherwise indicated

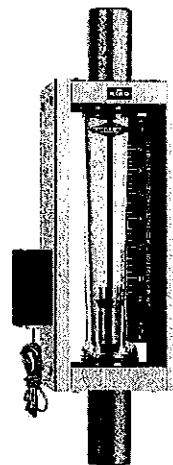
Repeatability
1/2 %

Max Temperature
316L SS Fittings
250° F (121° C) - Gases
200° F (93° C) - Liquid
PVC Fittings
110° F (43° C) - Liquid

Max Pressure
316L SS Fittings – 250 psig, size 3 & 4
316L SS Fittings – 200 psig, size 5 & 6
316L SS Fittings – 150 psig, size 8 & 9
PVC Fittings – 150 psig

Ambient Temperature
33° F to 125° F (1° C to 52° C)

Alarm Options:



Latching Reed Switch
A latching reed switch is available for all 7300, 7600 and 7900 Series flowmeters. The switch is reed type and uses a biasing magnet to create a latching feature. The switch is classified as a simple apparatus by UL, FM, etc. and may be suitable for hazardous use when connected to an intrinsic safety barrier. Check your local electrical code for wiring specifications.

Switch Specifications
Switch Type: SPDT
Max Contact Voltage: 100 Vdc
Max Contact Current: 0.2 A
Max Contact Power: 4 W
Breakdown Voltage: 200 Vdc

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REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

23/1/06

By:

N. Jordan

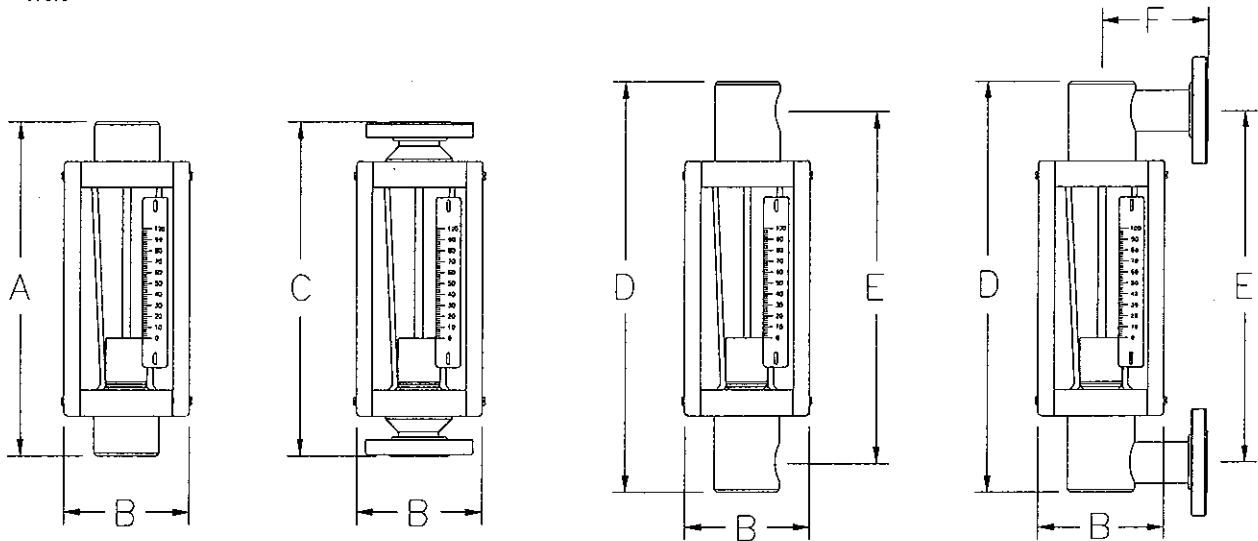
7470 Series

Glass Tube

Specifications:

Order Number	Full Scale Flow GPM - Water	Alarm Options	Order Number	Full Scale Flow SCFM - Air	Alarm Options	Float Number	Float Type	Press. Drop In W.C.	Tube Size - Number	Dimensions (Inches)						Connection Size	
										A	B	C	D	E	F	FNPT	Flange
31W	.25	No	31A	1.0	No	3/8-LPG-01	LP	-	3G-3/8-20-G-5	14.78	4.22	14.78	13.13	11.50	3.50	3/4"	1/2"
32W	.36	No	32A	1.5	No	3/8-SLG-01	SL	-	3G-3/8-20-G-5	14.78	4.22	14.78	13.13	11.50	3.50	3/4"	1/2"
33W	.74	No	33A	3.0	No	3/8-SLG-02	SL	5	3G-3/8-20-G-5	14.78	4.22	14.78	13.13	11.50	3.50	3/4"	1/2"
41W	1.0	No	41A	4.2	No	1/2-LPG-01	LP	6	4G-1/2-27-G-5	14.78	4.22	14.78	13.13	11.50	3.50	3/4"	1/2"
43W	2.0	Yes	43A	8.2	Yes	1/2-SLG-01	GS	10	4G-1/2-27-G-5	14.78	4.22	14.78	13.13	11.50	3.50	3/4"	1/2"
51W	1.5	No	51A	6.0	No	3/4-LPG-01	LP	3	5G-3/4-30-G-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
52W	3.8	Yes	52A	16.0	Yes	3/4-GSG-01	GS	10	5G-3/4-30-G-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
53W	5.0	Yes	53A	21.5	Yes	3/4-SLG-01	SL	14	5G-3/4-30-G-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
61W	6.0	No	61A	25.5	No	1-GVP-01	GV	5	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
62W	7.4	No	62A	30.0	No	1-GVP-02	GV	6	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
63W	9.6	No	63A	40.0	No	1-GSP-01	GS	10	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
64W	11.0	No	64A	45.0	No	1-GSP-02	GS	13	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
65W	14.0	No	65A	62.0	No	1-GSP-03	GS	24	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
66W	20.0	Yes	66A	90.0	Yes	1-SLP-01	SL	39	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
67W	26.0	Yes	-	-	-	1-SLP-02	SL	45	6P-1-33-P-5	14.78	4.22	14.78	13.13	11.50	4.00	3/4"	1"
81W	22.0	Yes	81A	90.0	Yes	1 1/2-GVP-01	GV	16	8P-1 1/2-34-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
82W	30.0	Yes	82A	125.0	Yes	1 1/2-GVP-02	SL	23	8P-1 1/2-34-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
83W	44.0	Yes	83A	180.0	Yes	1 1/2-SLP-01	SL	30	8P-1 1/2-34-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
84W	50.0	Yes	84A	200.0	Yes	1 1/2-SLP-02	SL	35	8P-1 1/2-34-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
85W	61.0	Yes	85A	250.0	Yes	1 1/2-SLP-03	SL	40	8P-1 1/2-34-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
91W	41.0	Yes	91A	160.0	Yes	2-GVP-01	GV	5	9P-2-33-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
92W	60.0	Yes	92A	245.0	Yes	2-GSP-01	GS	16	9P-2-33-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
93W	86.0	Yes	-	-	-	2-SLP-01	SL	25	9P-2-33-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"
94W	-	Yes	-	-	-	2-SLP-02	SL	45	9P-2-33-P-5	13.86	5.90	13.86	17.25	14.50	5.00	1 1/2"	1 1/2"

116.0



Ordering:

Use the following guide to determine the specific product number you require.

Meter Series	Fitting Type/Material	Float Material	O-Ring Material	Order Number	Alarm Option
7	Vertical FNPT - 316L SS - 1	316L SS - 2	EPR - 1	See Specifications	Check Specifications
4	Horizontal FNPT - 316L SS - 2	Hastelloy® C-276 - 4	Buna-N - 2	Table	Table For Availability
7	Vertical Flange - 150# - 3		Viton® - 3		Without Alarm - 0
	Vertical Flange - 300# - 4		Kalrez® - 4		With Alarm - 1
	Horizontal Flange - 150# - 5				
	Horizontal Flange - 300# - 6				
	Vertical FNPT-PVC - 7 (not for air service)				

Example: 747-2-2-1-83W-0



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

OZONE DESTRUCT UNIT

LIST AND DESCRIBE INSTRUMENTATION

what does?

Fuji's Ozone Destruct Units delivered are pre-wired, pre-piped, with requisite instrumentation all mounted on a single skid. They are mounted on top of the contactors.

The unused ozone and oxygen ^{is} ~~are~~ evacuated from the top of the contactors (as "off-gas") by using centrifugal blowers. It creates a slight vacuum inside the contactor tanks. ~~Since the off-gas contains entrained moisture, in-line mist eliminators remove the entrained water from the moisture-laden off-gas stream.~~ Pressure vacuum relief valves (set pressure at 5" water column and vacuum at 4" water column) are provided to protect the contactor tanks in the event of overpressure or excess vacuum.

Each ozone destruct unit is capable to handle ^{of treating} 177 cfm (300 m³/min) of the off-gas.

Prior to the destruct reactor, the off-gas is pre-heated by an indirect electric heater. The heated gas stream is channeled through the destruct vessel where a manganese-oxide based catalyst converts virtually all the unused ozone gas into oxygen gas. This oxygen-rich vent-gas stream containing less than 0.1 ppmv of ozone from the destruct vessel is vented directly into the atmosphere. A vent-gas ozone monitor continuously samples and displays the ozone concentration in the vent-gas.

which is removed by in line demisters

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NOT REVIEWED	_____
Project No.	79538-C14-16
Date: 25/1/06	By: <i>[Signature]</i>



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

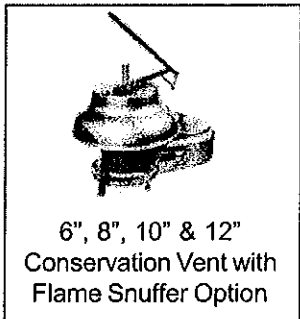
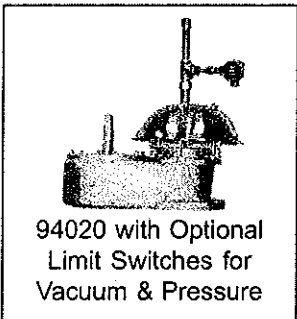
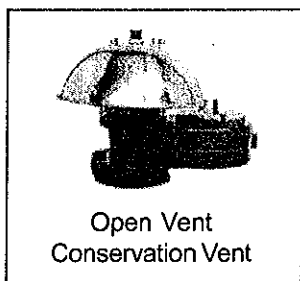
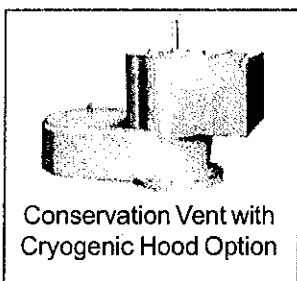
OZONE DESTRUCT SYSTEM

PRESSURE VACUUM RELIEF VALVE

MANUFACTURER : SHAND & JURS
MODEL : 94020-75-11-26-01
TYPE : CLOSED VENT PRESSURE/VACUUM
SERVICE : OFF-GAS FROM/AIR TO CONTACTOR
LOCATION : TOP OF CONTACTOR
MAXIMUM GAS FLOW : 300 CFM (8.50 m³/min)
SETTINGS
 VACUUM : 4" (100 mm) W.C.
 PRESSURE : 5" (125 mm) W.C.
DISCHARGE : 4" (100 mm) FLNAGE
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 HOOD : STAINLESS STEEL
 SEAL : TFE
INLET CONNECTION : 4" (100 mm) CLASS 150# RF FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 2 (1 PER CONTACTOR)
CUSTOMER TAG NO. : PSV-O210A / PSV-O230A

NOTE:

THE UNIT MAY BE MOUNTED TO A PIPE SPOOL TO DESIRED ELEVATION.



- Suitable materials available for corrosive and extreme temperature service
- Pallet reaction lip for smooth lift and reseating
- Vertical lift pallets assure reliable operation and maximum flow
- Floating diaphragm results in a positive seal and minimal blow-down
- Capacity certified to API Standards

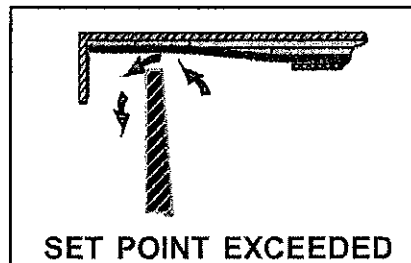
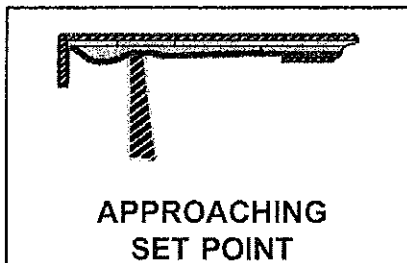
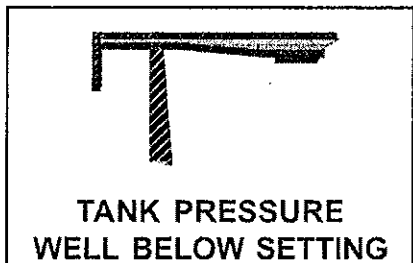
The Shand & Jurs Model 94020 Conservation Vent (Pressure/Vacuum)

The Shand & Jurs Model 94020 Conservation Vent is designed utilizing over 75 years of experience in producing high quality and dependable conservation fittings. Continued design improvements provide these vents with high efficiency, maximum flow capacity, and minimum leakage. The easily serviceable configuration and lightweight construction reduces maintenance and installation costs.

Standard materials of construction are low copper aluminum, cast iron, ductile iron, cast steel and 316 stainless steel for body materials. Aluminum, stainless steel and steel body vents come standard with integral seats and have optional replaceable seats. Cast iron and ductile iron bodies come with replaceable seats as standard design. Replaceable seats are made of corrosion resistant molded thermosetting phenolic, teflon, aluminum, 316 stainless steel or stainless steel teflon coated and are easily replaced.

Diaphragms are air cushion seated and are constructed of FEP Teflon for reliability and extended service life. Teflon diaphragms contribute to high resistance to adhesion of ice and gum formations, thus assuring protection against pallet sticking to the seating surface. The body is self-draining and drip rings keep condensates from the seating surfaces. The carefully engineered body, seat, and pallet assembly results in a superior combination of tight sealing and high capacity at low over-pressure with minimal blowdown.

Conservation Vents are available in a full range of sizes and configurations, such as closed vent hoods (pipe-away), cryogenic hoods and flame snuffers. Standard pressure and vacuum settings are 1/2 oz./sq. in. The S&J Model 94020 Conservation Vent is available with optional pressure and vacuum limit switches and visual indicators.



Shand & Jurs "Expanda-Seal" option is available on all pressure pallet assemblies. This feature, shown in blue, significantly reduces leakage. The ballooning effect of the teflon diaphragm effectively seals the valve. The "Expanda-Seal" feature ensures less than .5 SCFH of leakage at 95% of the set point.



PRODUCT DATA SHEET

94020 Conservation Vent (Pressure/Vacuum)

SPECIFICATIONS:

Sizes: 2", 3", 4", 6", 8", 10" & 12"

Standard Settings*:

Pressure & Vacuum: 1/2 oz./sq. in. (.865 in.W.C.) (See note* for 2")

Maximum Open Vent Setting w/o Modification:

Table with columns for (Pressure) and (Vacuum)** and rows for sizes 2" through 12" with corresponding oz./sq. in. values.

Service and Body Material:

Normal: Cast Low Copper Aluminum
Low Temperature: Cast Low Copper Aluminum
Severe: Cast Iron, Ductile Iron, Cast Steel, Cast 316 Stainless Steel

Integral Seats: Same as body; AL, 316 SS, CS with 316 SS seat overlay

Replaceable Seats:

Ryton for: 2" size
Phenolic for: 3" Thru 12" sizes
Aluminum for: 2", 3", 4", 6", 8", 10" & 12" sizes
316 Stainless Steel for: 2", 3", 4", 6", 8", 10" & 12" sizes
Teflon for: 2", 3", 4", 6", 8" sizes
SS Teflon Coated for: 2", 3", 4", 6", 8", 10" & 12" sizes

Type of Flange Connection:

Screwed or flanged for: 2" & 3" sizes
Flanged for: 4", 6", 8", 10" & 12" sizes

Raised face flange available, except for aluminum body material.

Temperature Range: Body and Seal

Options for Process Temperature Ranges of -300°F to 500°F

Options available:

Flame Snuffer for all sizes (open vent) and material, except low temperature service. Closed vent for all sizes and materials. Material substitutions as required. Cleaning for LOX/LIN service.

Notes:

Expanda-Seal Vent only:

Expanda-Seal Pressure Setting: 1.5 oz./sq. in. Minimum (Consult Factory for lower settings)

** Modifications may be required to vacuum port for installations where product contamination may occur. See figure 4 for Principle of Operation. Caution—any obstruction to vacuum port may alter the set point.

Standard Materials of Construction

Table with columns: Component, Normal Aluminum, Low Temperature, and Severe (with sub-columns for CI/DI, CS, 316SS).

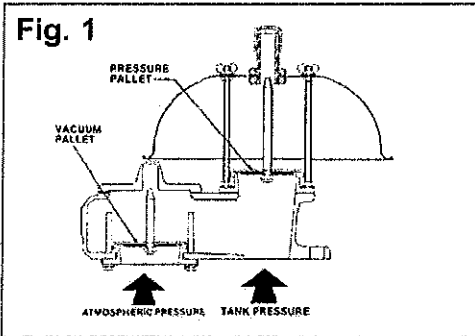
- NOTES: 1. 18-8SS for 2", 3", 4", 6" & 8" sizes; spun alum. for 10" & 12" sizes.
2. 2", 3", 4", 6", 8", 10" & 12" sizes ; alum. enclosure w/flapper.
3. CS for 6" & 8", 10" & 12" sizes only.
4. Material same as body except CI and DI.
5. 316SS for elevated settings.

Material Legend:

AL Aluminum CS Cast Steel PA Spun Aluminum
CA Cast Aluminum DI Ductile Iron FEP FEP Teflon
CI Cast Iron GI Galvanized Iron ZS Zinc Plated Steel
GS Galvanized Steel

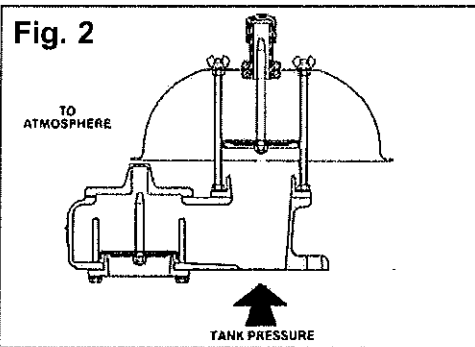


Principle of Operation



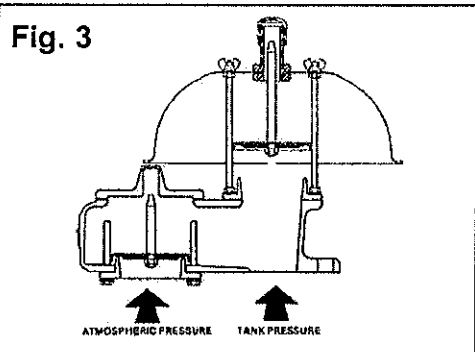
Figures 1 and 3 show the relation of the pressure or vacuum pallet assembly to the seat when atmospheric and tank pressures are equal. The "wrap around" effect of the resilient diaphragm on the edge of the seat and the resulting high ratio of seating force to seating area affords a tight seal.

As the pressure or vacuum increases, the pallet begins to rise. Because there is still a wrap-around effect on the edge of the seat, good sealing is maintained. Teflon diaphragm memory and lapped seating surface further enhance sealing characteristics.



As increasing pressure or vacuum continues to lift the pallet, the diaphragm is held in close proximity to the seat by the flat plane memory of the diaphragm material.

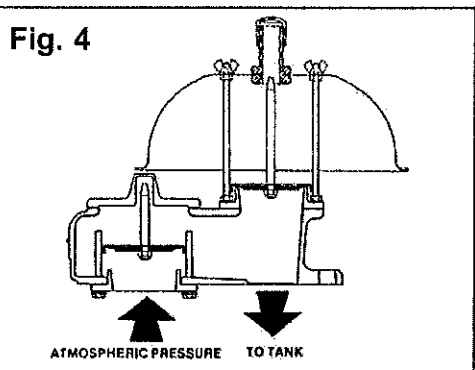
As set pressure or vacuum is reached the diaphragm leaves the seat (see Figures 2 and 4) and the escaping vapor lifts the pallet even further.



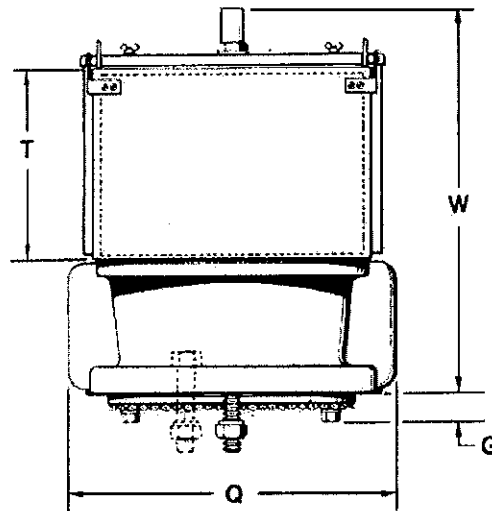
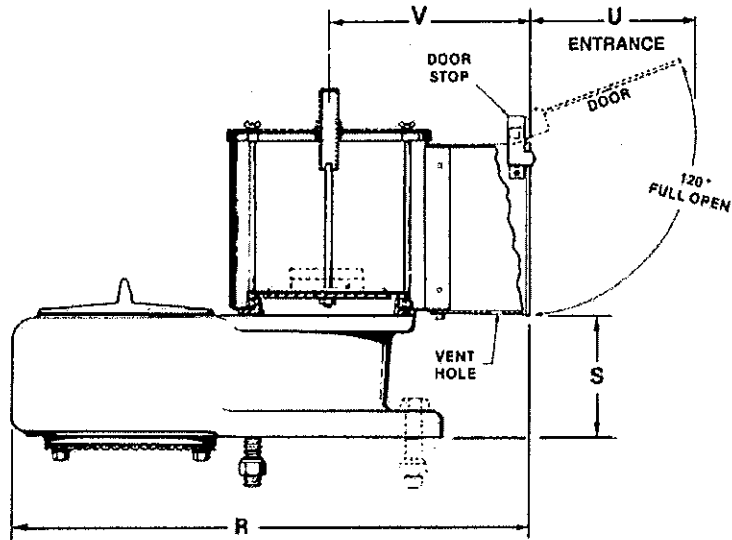
The vacuum pallet is guided in the same manner as the pressure pallet. Both are pallet stem and pallet side guided for smooth movement.

STEAM JACKETED OPTION:

Designed for use on tanks containing liquids whose vapors crystallize at ambient temperatures. Stainless steel pressure and vacuum pallets are cased in a steam heated jacket ensuring the valves will be free from plugging. The jacket is steel or stainless steel construction. The standard jacket can withstand steam pressures up to 100 psig. Higher pressure ratings are available.

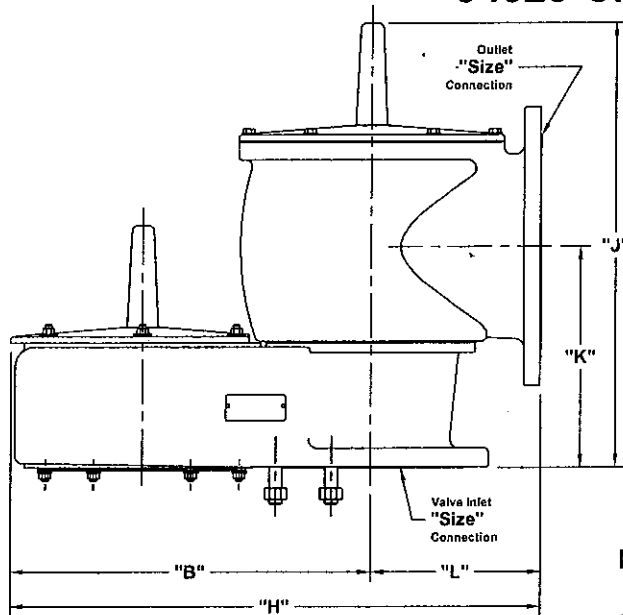


6", 8", 10" & 12"
Cryogenic
Hood Model



Vent Size* (In.)	Dimensions in Inches						
	R	Q	S	T	U	V	W
6	30	12 1/8	5 5/8	8 1/8	8 1/2	11 1/2	17 1/16
8	34 1/2	14 11/16	7 3/8	9 5/8	10	12 1/2	21 1/4
10	41	17 1/2	8 3/8	11 3/8	11 5/8	14 3/16	25 1/2
12	44 1/2	19 3/4	10	12 5/8	13	15 3/8	29 7/8

94020 Closed Vent



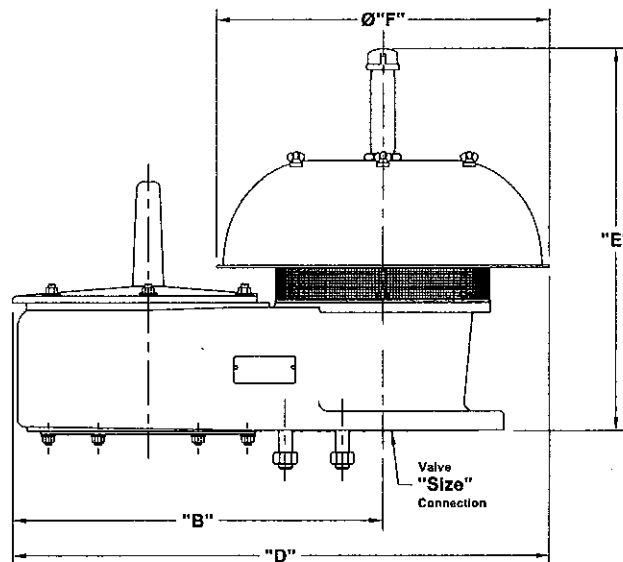
Valve Size	Outlet Size	"H"	"J"	"K"	"L"
2"	2"	13	11 1/8	5 1/32	4 1/4
2"	3"	13	11 1/8	5 1/32	4 1/4
* 3"	3"	16 3/8	13 1/4	5 9/16	5 1/4
* 3"	4"	16 3/16	13 3/4	5 31/32	5 1/4
* 4"	4"	20	20 3/8	7	6 1/2
* 4"	6"	19 1/4	15 3/4	7 1/32	5 15/16
* 6"	6"	26 1/4	21 1/4	9 3/8	8 3/8
* 6"	8"	26 3/16	21 1/4	10 11/32	8 1/4
* 8"	8"	31 5/8	25 1/2	11 11/16	9 3/4
* 8"	10"	31 5/8	26 3/16	12 23/32	9 3/4
* 10"	10"	37 7/8	30	13 7/8	11 19/32
* 10"	12"	37 7/8	30 1/4	14 29/32	11 19/32
* 12"	12"	43 3/8	33 7/8	16 1/4	12 13/16
* 12"	14"	43 3/8	33 7/8	16 29/32	12 13/16

NOTES:

1. Connection size matches ANSI, DIN & JIS.
2. Mounting Holes straddle centerline except: 2" & 3" sizes; holes are on centerline.
3. Optional NPT Adapter available for 2" & 3".

*Table D option 5 for same size inlet and outlet connections has been obsolete and replaced by Table D option 6. Dimensions do not match. Consult Factory for replacement valve.

94020 Open Vent



Valve Size	"B"	"D"	"E"	Diameter "F"
2"	9	15 1/4	11 1/8	12 7/8
3"	11 1/8	17 15/16	13 3/4	13 9/16
4"	13 1/2	21 1/2	15 3/4	15 15/16
6"	17 15/16	28 1/2	18 3/4	18 5/8
8"	21 7/8	31 3/16	21 1/4	18 5/8
10"	26 1/4	40 5/8	28 1/8	25 9/16
12"	30 9/16	44 5/8	32 1/4	29 7/8

NOTES:

1. Connection size matches ANSI, DIN & JIS.
2. Mounting Holes straddle centerline except: 2" & 3" sizes; holes are on centerline.
3. Optional NPT Adapter available for 2" & 3".

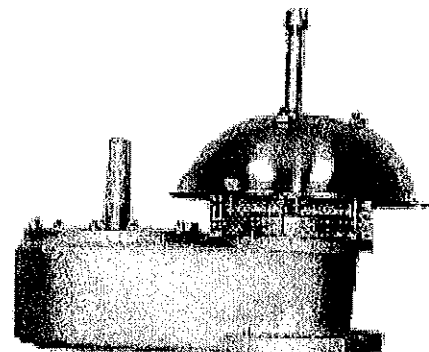
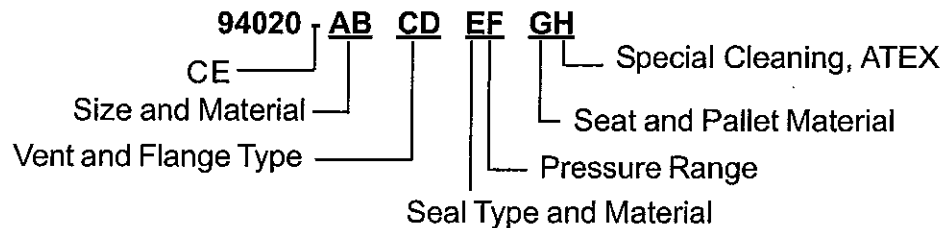
All designs subject to change. Certified dimensions and specifications available upon request

The **CONSERVATION VENTS** provide tank venting and breathing with high efficiency, maximum flow capacity and minimum leakage. Standard materials of construction include low copper aluminum, cast iron, ductile iron, cast steel, and 316 Stainless Steel. The 94020 comes in open or closed vent versions, and in sizes 2" through 12". Cryogenic hoods, flame snuffers, limit switches and steam jacketing and steam tracing are available.

- *Low copper aluminum alloy construction reduces need for special materials in corrosive and extreme temperature service
- *Peripheral and stem guided pressure pallet assures smooth lift and closure.
- *Unique floating diaphragm construction assures positive seal and minimal blowdown, thus conserving valuable tank content
- *Capacity certified in accordance with API standards
- *Expand-Seal diaphragm for reduced leakage

MODEL NUMBER SELECTION:

The model number will consist of a base number 94020 followed by a dash and 8 numbers.



ORDERING INFORMATION

Specify:

1. Model 94020 Conservation Vent
2. Size, Body Material, and Service
3. Screwed or Flanged Connection on 2" and 3" Size
4. Closed Vent or Vent to Atmosphere (With or without flame snuffer)
5. Pressure and Vacuum Settings (if other than normal setting)
6. Type of Cleaning (if for oxygen service)
7. Optional Materials of Construction, as Required
8. To Specify CE for Ordinary EU Locations use 94020C AB-CD-EF-GH
9. ATEX Certification for Group IIB, IIA EU Locations use Table H5, H6, or H7

TABLE (AB) - SIZE AND BODY MATERIAL

Option AB	Size	TYPE OF CONNECTION	BODY MATERIAL
11	2"	NPT	ALUM
12	2"	Flanged	ALUM
21	2"	NPT	ALUM CRYO HOOD
22	2"	Flanged	ALUM CRYO HOOD
*31/41	2"	NPT	CI/DI
*32/42	2"	Flanged	CI/DI
51	2"	NPT	CS
52	2"	Flanged	CS
71	2"	NPT	SS 316
72	2"	Flanged	SS 316
13	3"	NPT	ALUM
14	3"	Flanged	ALUM
23	3"	NPT	ALUM CRYO HOOD
24	3"	Flanged	ALUM CRYO HOOD
*33/43	3"	NPT	CI/DI
*34/44	3"	Flanged	CI/DI
53	3"	NPT	CS
54	3"	Flanged	CS
73	3"	NPT	SS 316
74	3"	Flanged	SS 316
15	4"	Flanged	ALUM
25	4"	Flanged	ALUM CRYO HOOD

Option AB	SIZE	TYPE OF CONNECTION	BODY MATERIAL
*35/45	4"	Flanged	CI/DI
55	4"	Flanged	CS
75	4"	Flanged	SS 316
16	6"	Flanged	ALUM
26	6"	Flanged	ALUM CRYO HOOD
*36/46	6"	Flanged	CI/DI
56	6"	Flanged	CS
76	6"	Flanged	SS 316
17	8"	Flanged	ALUM
27	8"	Flanged	ALUM CRYO HOOD
*37/47	8"	Flanged	CI/DI
57	8"	Flanged	CS
77	8"	Flanged	SS 316
18	10"	Flanged	ALUM
28	10"	Flanged	ALUM CRYO HOOD
*38/48	10"	Flanged	CI/DI
58	10"	Flanged	CS
78	10"	Flanged	SS 316
19	12"	Flanged	ALUM
29	12"	Flanged	ALUM CRYO HOOD
*39/49	12"	Flanged	CI/DI
59	12"	Flanged	CS
79	12"	Flanged	SS 316

* 3X = Cast Iron
4X = Ductile Iron

TABLE (C) - FLANGE TYPE

OPTION #	DESCRIPTION
0	FF
1	RF (not available in ALUM)
2	DIN 2633 PN 16 FF
3	DIN 2633 PN 16 RF
4	JIS 10K FF
5	JIS 10K RF

TABLE (D) - VENT TYPE

OPTION #	DESCRIPTION
1	Open Vent
2	Open Vent w/ Flame Snuffer-Not Available with ATEX (H5, H6, or H7)
3	Closed, Standard Outlet>Inlet*
4	Closed, P&V C.F.
6	Closed, Same Size Inlet, Outlet, Seat**

* Standard closed vent (outlet is one size larger than the inlet)
Ex. - 2" Inlet X 3" Outlet, 6" Inlet X 8" Outlet

**Note: Replaced Option 5. Dimensions are not identical.
Consult Factory if replacement valve is required.

TABLE (E) - SEAL TYPE AND MATERIAL

OPTION E	DESCRIPTION
0	Normal FEP / N8090
1	Expanda Seal FEP / N8090
2	Normal FEP (all)
3	Expanda FEP (all)
4	Normal Viton
5	Expanda Viton
6	Normal PTFE
8	Normal Buna
9	Expanda Buna

TABLE (F) - PRESSURE RANGE

OPTION F	DESCRIPTION	MATERIAL
1	Standard Setting*	Lead
2	Over 2.9 oz/sq. in.	Lead
3	Standard to 2.9 oz/sq.in.	Lead
4	Standard Setting	316 SS
5	Over 2.9 oz/sq. in.	316 SS
6	Standard to 2.9 oz/sq.in.	316 SS

* Expanda-Seal Pressure Setting:
1.5 oz./sq. in. Minimum
(Consult Factory for lower settings)

TABLE (G) - SEAT MATERIAL & PALLET MATERIAL

Option G	Seat	Pallet
0	STD*	STD*
+ 1	Teflon	STD*
2	AL	STD*
+ 3	Phenolic	STD*
4	SS	STD*
5	Teflon Coated SS	STD*
A	STD*	316SS
+ B	Teflon	316SS
C	AL	316SS
+ D	Phenolic	316SS
E	SS	316SS
F	Teflon Coated SS	316SS

* See Materials of Construction
+ These Options not Available with ATEX Models

TABLE (H) - LOX (Liquid Oxygen) & LIN (Liquid Nitrogen) Cleaning, Trim

Option H	Cleaning	Trim
0	Normal	STD
1	LOX	STD
2	LIN	STD
5	Normal	316SS
6	LOX	316SS
7	LIN	316SS
8	Normal	Monel
9	LOX	Monel
A	LIN	Monel

For an ATEX Certified Valve choose Option 5, 6, 7.
Trim includes Stem, Stem Guides, Side Guides, Nuts, Bolts, Screen, and Distribution Plate.

NOTE: LOX/LIN cleaning for Cryogenic Breathers of aluminum construction includes degreasing before assembly only!



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

PRESSURE INDICATOR / TRANSMITTER

TRANSMITTER

MANUFACTURER : FOXBORO
MODEL : I/A SERIES ELECTRONIC TRANSMITTER, IGP20
MODEL NO. : IGP20-A23A21C-X2
SERVICE : OFF-GAS FROM CONTACTOR
RANGE : -30" ~ 30" W.C. (-750 mm ~ 750 mm W.C.)
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 11.5 ~ 42 VDC
CONNECTION : 1/2" (12.7 mm) NPT
MATERIAL OF CONSTRUCTION (WETTED PARTS)
HI-SIDE COVER : TYPE 316 S.S.
SENSOR : TYPE 316L S.S.
FILL FLUID : FLUORINERT
DISPLAY : DIGITAL LCD DISPLAY

VALVE

MANUFACTURER : ANDERSON GREENWOOD
TYPE : STATIC PRESSURE MANIFOLD
MODEL NO. : M4TPVVS-4-OC
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SEAT : TEFLON
MOUNTING PIPE SIZE : 3" (75 mm) S.S. PIPE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 2 (1 PER CONTACTOR)
CUSTOMER TAG NO. : PT-O501A / PT-O505A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

25/1/06

By:

M. Pulso



Fuji Electric Corporation of America

Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4E**

**FOR
FOXBORO PRESSURE
INDICAOTR/TRANSMITTER**

INDICATOR

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent.
Responsibility for the design in the shop drawings
rests with the contractor.

Responsible for the correlation of field
dimensions with the design intent of
the drawings. The contractor is responsible for all
parts of the work shown on the drawings.

REVIEWED _____

REVIEWED BY: _____

REVIEWED BY: _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 6/2/06 By: [Signature]

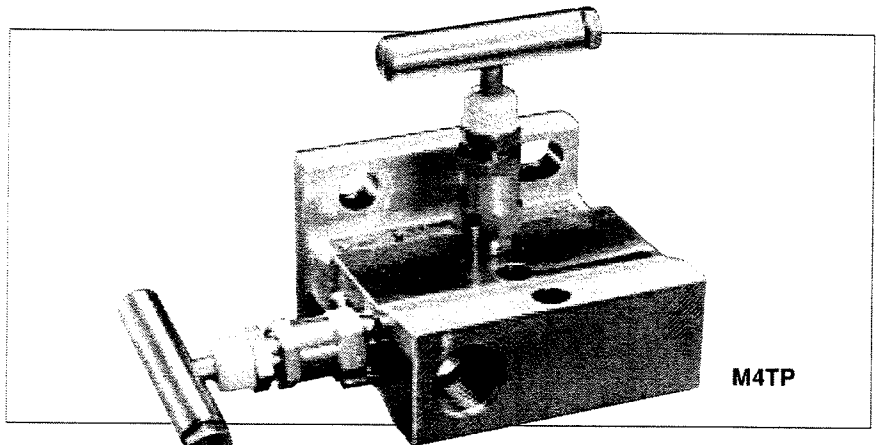
Static Pressure Manifolds – M4AP and M4TP Manifolds

Product Overview

The M4AP and M4TP are block and bleed, static pressure manifolds. They are designed for use with DP-style pressure transmitters.

The manifold's two valves have free-swiveling, ball-ended stems or soft seats. The block valve isolates the instrument from the process and is open during normal operation. When the block valve is closed, the bleed valve can be opened to vent pressure from the transmitter.

The M4AP permits the transmitter's funnel flange to connect the process signal line to the manifold directly, with either a 1/2-inch pipe or tubing connection. The M4TP has a 1/2-inch NPT inlet connection. A 1/4-inch NPT purge connection is available. The 1/4-inch NPT vent port may be used for testing calibration. They may be mounted using the AGCO Mount option for ease of assembly and maintenance.



Features and Benefits

- **Cost savings** when manifolding the instruments. This eliminates several parts used in conventional methods of 'piping up' resulting in cost reduction of 20-30 percent.
- **Compact design** requires minimum space for operation and installation.
- **Fewer leak points** reduce leakage by having fewer parts to assemble.
- **Free-swiveling ball end stem (metal seat)** assures bubble-tight valve closure without seat galling.
- **The AGCO Mount provides easy instrument removal.** Direct bolting to the manifold allows the instrument to be removed independently of the piping. This facilitates repairs, service, and calibration.
- **Immediate installation** with AGCO Mount's manifold, steam block, bracket, and all associated piping can be installed without the instrument at the time of plant construction.
- **Secure mounting** is provided by the AGCO Mount. Instrument piping stability is enhanced when directly supported by the pipestand through the manifold.
- **All valve threading is isolated.** Packing is below stem threads, body-to-bonnet seal is below the threads eliminating process fluid corrosion.
- **Less instrument damage** with the AGCO Mount. The instrument can be safely warehoused until final 'loop' checkout, reducing the chances of damage during construction.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
 and availability for delivery design in the shop drawings
 with the Contractor.

and availability for installation and completion of field
 drawings, and installation techniques of
 work items, and availability for completion of all
 work items with the Contractor.

DATE: _____

REVIEWED AS REQUIRED _____

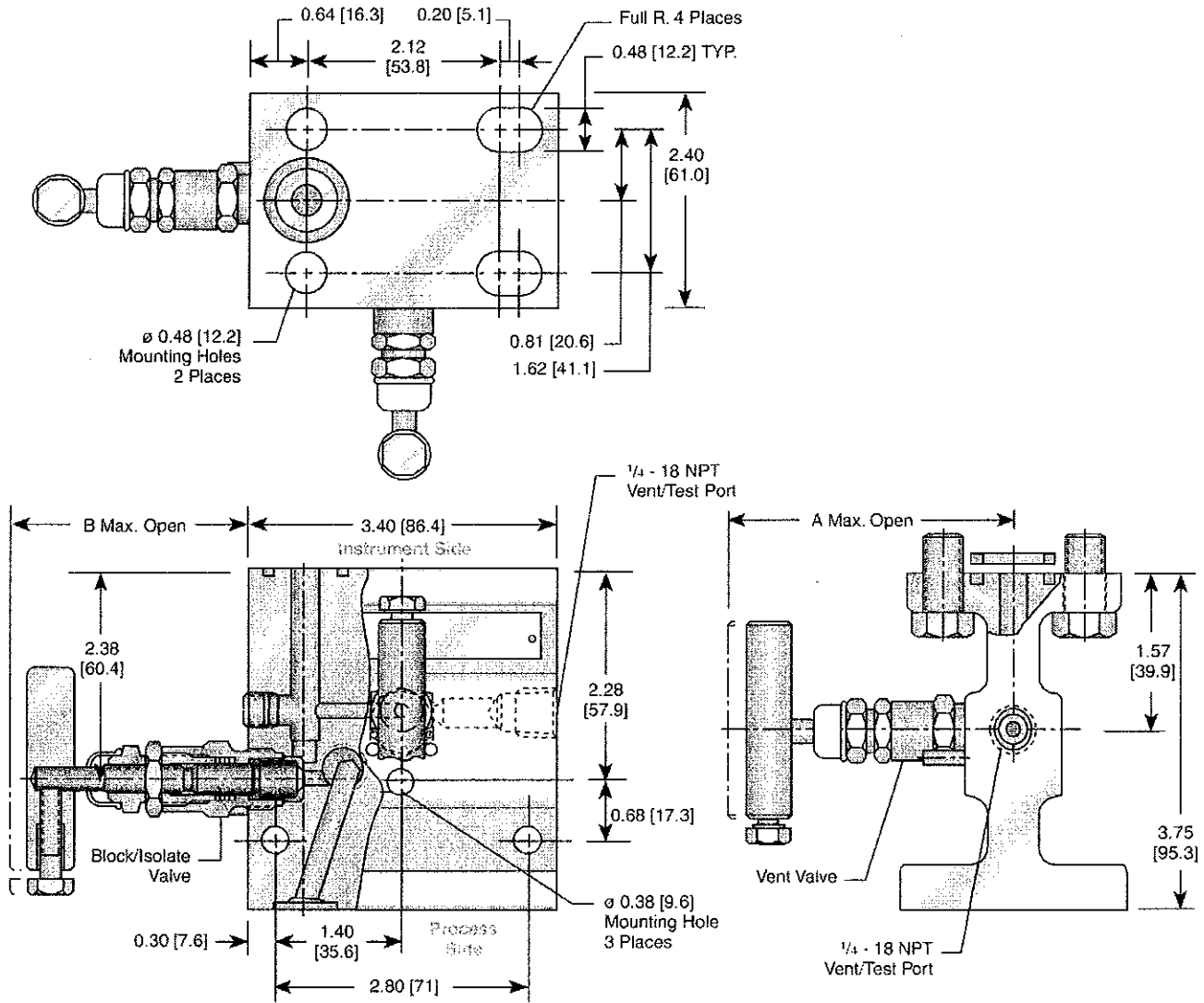
DATE FOR RE-SUBMIT _____

REVIEWED _____

Project No. 79538-C14-16

Date: 25/1/06 By: [Signature]

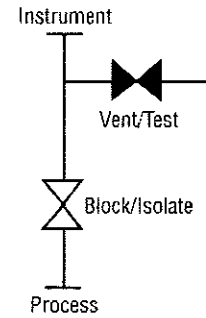
Static Pressure Manifolds – M4AP Specifications



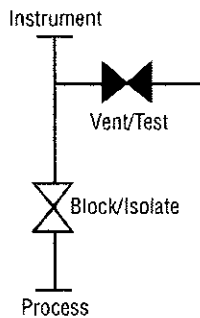
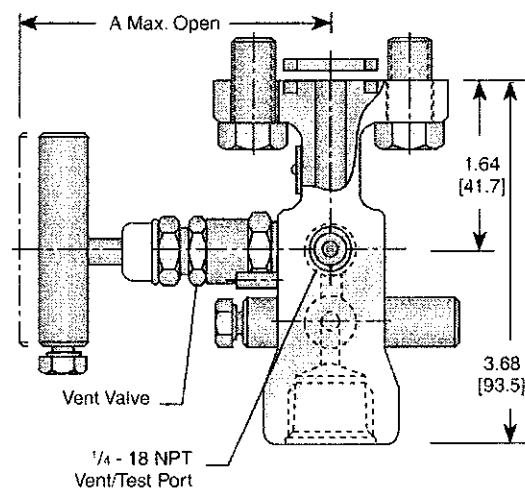
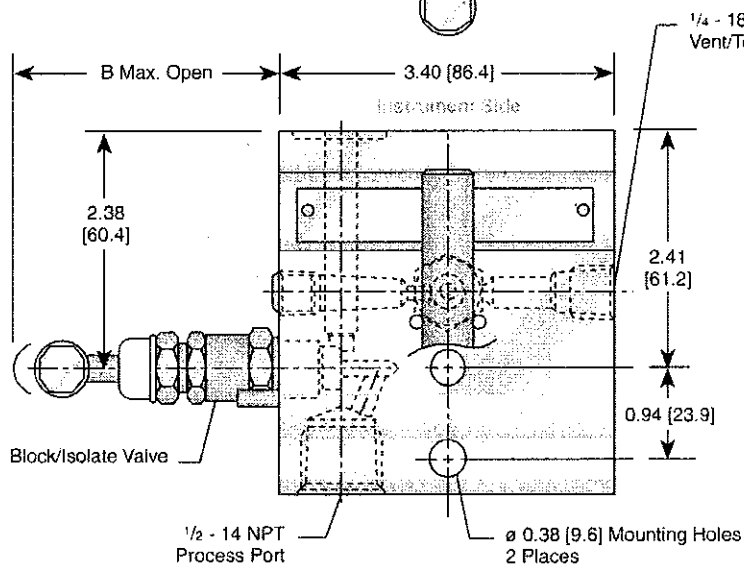
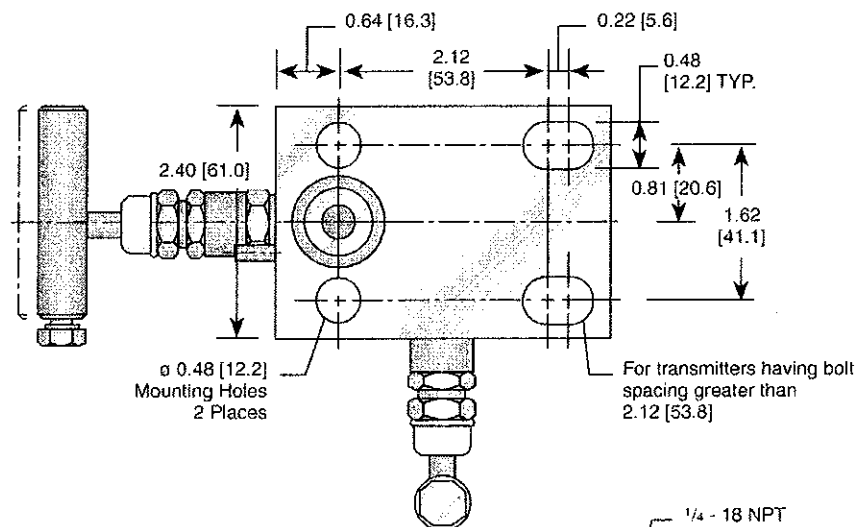
PACKING SPECIFICATIONS

Packing	A	B
Teflon®	3.14 [79.8]	2.60 [66.0]
GRAFOIL®	3.79	3.25
Low Emissions Graphite	[96.3]	[82.6]

- Approximate valve weight: 4.4 lb [2.0 kg].
 Metal seat:
 0.156-inch [4 mm] diameter orifice.
 Valve C_v 0.36 maximum.
 Soft seat:
 0.187-inch [4.8 mm] diameter orifice.
 Valve C_v 0.83 maximum.
- Teflon® is a registered trademark of the E.I. duPont de Nemours Company.



Static Pressure Manifolds – M4TP Specifications



Packing	A	B
Teflon®	3.14 [79.8]	2.60 [66.0]
GRAFOIL®	3.79	3.25
Low Emissions Graphite	[96.3]	[82.6]

- Approximate valve weight: 4.2 lb [1.9 kg].
 Metal seat:
 0.156-inch [4 mm] diameter orifice.
 Valve C_v 0.36 maximum.
 Soft seat:
 0.187-inch [4.8 mm] diameter orifice.
 Valve C_v 0.83 maximum.

Static Pressure Manifolds – M4AP and M4TP Specifications

Material Options

Valve	Body	Seal	Stem	Ball	Bolts	Packing
CS ¹	A576-10L18	A108	A581-303	17-4 PH	A193-B7	Teflon®
CS ¹	A576-10L18	A105	A581-303	17-4 PH	A193-B7	GRAFOIL®
316 SS	A479-316	A479-316	A276-316	316 SS	A193-B7	Teflon®
316 SS	A479-316	A479-316	A276-316	316 SS	A193-B7	GRAFOIL®
SG ²	A479-316	A479-316	Monel® 400	Monel® K500	A193-B7	Teflon®
Monel®	Monel® 400	Monel® R405	Monel® 400	Monel® K500	A193-B7	Teflon®
SG3 ⁵	Hastelloy® C276	Hastelloy® C276	Hastelloy® C276	Stellite	A193-B7	Teflon®

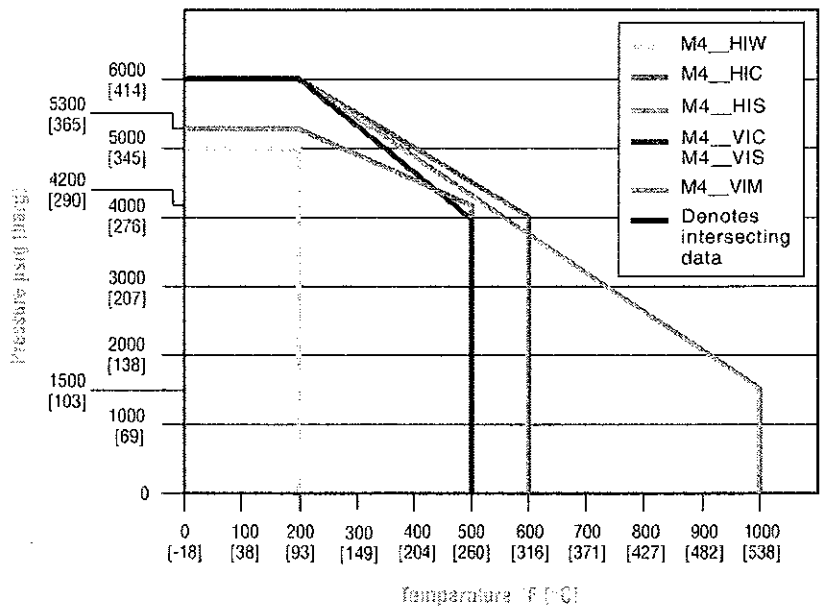
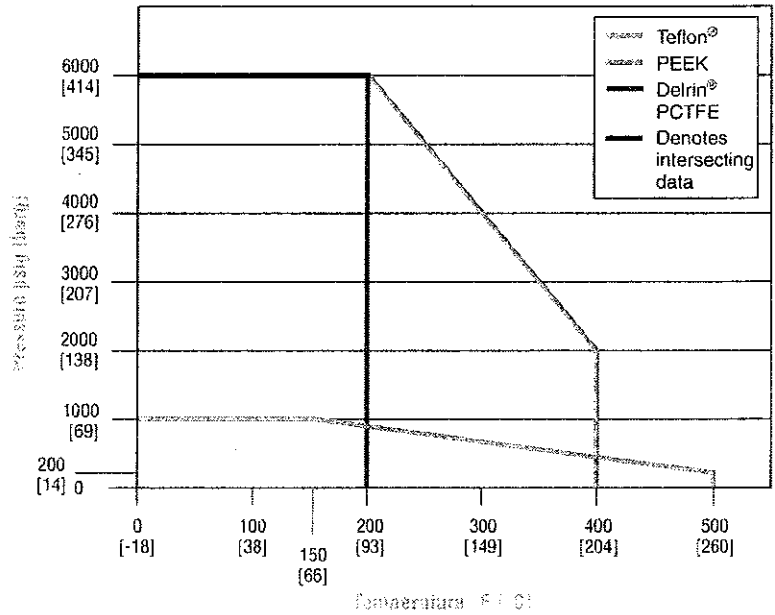
Pressure and Temperature Ratings

Packing	Valve	Seat	Pressure and Temperature Ratings	
Teflon®	CS, SS	Delrin®	6000 psig @ 200°F	[414 barg @ 93°C]
Teflon®	CS, SS	PEEK	6000 psig @ 200°F 2000 psig @ 400°F	[414 barg @ 93°C] [138 barg @ 204°C]
Teflon®	CS, SS	Teflon®	1000 psig @ 150°F 200 psig @ 500°F	[69 barg @ 66°C] [14 barg @ 260°C]
Teflon®	CS, SS	Integral	6000 psig @ 200°F 4000 psig @ 500°F	[414 barg @ 93°C] [276 barg @ 260°C]
Teflon®	Monel®	Integral	5300 psig @ 200°F 4200 psig @ 500°F	[365 barg @ 93°C] [290 barg @ 260°C]
GRAFOIL®/ Low Emissions Graphite	CS	Integral	6000 psig @ 200°F 4000 psig @ 600°F	[414 barg @ 93°C] [276 barg @ 316°C]
GRAFOIL®/ Low Emissions Graphite	SS	Integral	6000 psig @ 200°F 1500 psig @ 1000°F	[414 barg @ 93°C] [103 barg @ 538°C]

1. CS is zinc cobalt plated to prevent corrosion.
2. SG (Sour Gas) all SS wetted parts are RC22 or less to meet requirements of NACE MR0175-2002.
3. Monel® is a registered trademark of International Nickel Company.
4. 316 SS bolts lower pressure ratings to a maximum of 4500 psi [310 barg]. Consult factory for full rating with 316 SS bolts.
5. SG3 (Sour Gas) meets the requirements of NACE MR0175-2003.
6. Hastelloy® is a registered trademark of Haynes International.

Static Pressure Manifolds – M4AP and M4TP Specifications

1. PCTFE (Polychlorotrifluoroethylene) is the exact equivalent of Kel-F®.
2. Delrin® is a registered trademark of the E.I. duPont de Nemours Company.
3. 316 SS bolts lower pressure ratings to a maximum of 4500 psi [310 barg]. Consult factory for full rating with 316 SS bolts.



Static Pressure Manifolds – M4AP and M4TP Specifications

AGCO Mount Kit

M4TP V D C - 4 - AM

316 SS bolts lower pressure ratings to a maximum of 4500 psi [310 barg]. Consult factory for full rating with 316 SS bolts.

Valve Type

- M4AP – Flange x Flange
- M4TP – FNPT x Flange

Bonnet Packing

- V – Teflon® (Soft and Integral seats)
- H – GRAFOIL® (Integral seat only)
- E – Low Emissions Graphite (Integral seat only)

Seat Material

- D – Delrin® (standard)
- V – Teflon®
- E – PEEK
- K – PCTFE (Polychlorotrifluoroethylene) is the exact equivalent of Kel-F®.
- I – Integral (body material)

Body Material

- C – CS
- S – 316 SS
- M – Monel®
- W – 316L SS
- J – Hastelloy®

Process Connections

- 4 – 1/2-inch FNPT (M4TP only)

Options

- AM AGCO Mount Kit for 2-inch pipestand mounting of manifold (page 38).
- BC Accessory bracket for mounting conduit with AGCO Mount.
- BP Accessory bracket for mounting purge meters with AGCO Mount.
- CL Cleaned for chlorine service.
- HD Hydrostatic testing (100 percent)
- LP Street Elbows and Top Purge Ports
- OC Cleaned for oxygen service.
- PB Bottom purge port (Metal Seat only)
- PT Top purge port (Metal Seat only) (if elbow is required, specify -LP, not -PT)
- R3V Add for use with Rosemount® Model 3051C (SS 18-8 Bolts)
- SB Steam Block (CS)
- SSA 1/2" SS Flange Bolt (grade 18-8) - Maximum pressure rating 4500 psi [310 barg]
- SSC 1/2" 316 Flange Bolt (B8M) - Maximum pressure rating 4500 psi [310 barg]
- SG Sour Gas meets the requirements of NACE MR0175-2002. (SS valves only)
- SG3 Sour Gas meets the requirements of NACE MR0175-2003.
- SP Special Requirements - please specify

Static Pressure Manifolds – M4TP ASME B31.1 and B31.3 Specifications Meets MSS-SP-105

GENERAL INFORMATION FOR THE USER

M4TPHP S - 4 -XP - AM

Valve Type

M4TPHP

Body Material

C - CS, A105
S - 316 SS
W - 316L SS
J - Hastelloy

Process Connections (Process x Instrument x Vent)

4 - 1/2-inch FNPT
4AT - Integral 1/2-inch Single Ferrule Tube Fittings
316 SS Ferrule and Nut
4ATD - Integral 1/2-inch Dual Ferrule Tube Fittings
316 SS Ferrule and Nut
4TB - 1/2-inch Tube S.W. x Flange x 1/4-inch FNPT

Options

-AM AGCO Mount Kit for 2-inch pipestand mounting of manifold (page 38).
-R3V Add for use with Rosemount® Model 3051C (SS 18-8 Bolts)
-SB Steam Block (CS)
-SSA⁴ SS Flange Bolt (grade 18-8) - Maximum pressure rating 4500 psi [310 barg]
-SSC⁴ 316 Flange Bolt (B8M) - Maximum pressure rating 4500 psi [310 barg]
-SP Special Requirements - please specify

MANIFOLD RATINGS

1. All Manifolds come standard with GRAFOIL® packing, integral seats, bonnet locks, and are subjected to hydrostatic testing.
2. Manifold ratings:
SST 6000 psig @ 100°F [414 barg @ 38°C]
2915 psig @ 1000°F [201 barg @ 538°C]
STL 6170 psig @ 100°F [425 barg @ 38°C]
3430 psig @ 800°F [236 barg @ 427°C]
3. See page 131 for Code Requirements.
4. 316 SS bolts lower pressure ratings to a maximum of 4500 psi [310 barg]. Consult factory for full rating with 316 SS bolts.



Fuji Electric Corporation of America

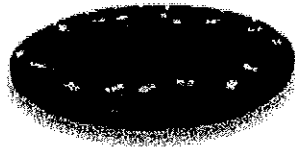
Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

DEMISTER

MANUFACTURER	:	KOCH-OTTO YORK
STYLE	:	FLEXIMESH
SERVICE	:	OFF-GAS FROM CONTACTOR
MATERIAL	:	TYPE 316L S.S. MESH, 6" (150 mm) THICK
GASKET	:	PTFE, 1/8" (3 mm) THICK
DESIGN FLOW RATE	:	177 CFM (5 m ³ /min)
REMOVAL EFF.	:	99.9% @ 5 MICRONS AND LARGER
PRESSURE DROP	:	0.39" (9.9 mm) W.C.
OPERATING TEMP.	:	40 ~ 90° F (4.4 ~ 32.2° C)
OPERATING PRESS.	:	2 ~ 4" (50 ~ 100 mm) W.C. VACUUM (BASIN HEADSPACE)
INSTALLATION	:	INSIDE 8" (200 mm) DIA. SPOOL
SPECIAL REQUIREMENT	:	TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY	:	2 (1 PER CONTACTOR)
CUSTOMER TAG NO.	:	DEM-O501A / DEM-O505A



DEMISTER® mist eliminators collect essentially 100% of all liquid particles 2 to 5 microns in diameter, depending on design parameters. Available in virtually any size or shape, in a broad range of metals or plastics, individual styles of DEMISTER® mist eliminators can be supplied to meet specific customer needs. DEMISTER® mist eliminators offer high collection efficiency, lowest installed cost, low pressure drop, fast delivery and service.

The DEMISTER® mist eliminator is an assembly of YORKMESH™ knitted mesh supported on, and held down by high open area grids. It is made to any size and shape. Stainless steels and exotic alloys are fully annealed to provide maximum corrosion resistance. When a vapor steam carrying entrained liquid droplets passes through a DEMISTER® mist eliminator pad, the vapor moves freely through the YORKMESH™ knitted mesh but the inertia of the droplets causes them to contact the wire surfaces, coalesce, and ultimately drained as large droplets.

DEMISTER® mist eliminators are available in all 300 and 400 series SS, Alloys 200,400,600,800, etc., Alloy 20, titanium, tantalum, aluminum, copper, polypropylene, Teflon*, Halar* and Kynar* and more than 80 other metals and 30 nonmetals. For example, Alloy 66 is a specially designed material to extend service life in sulfuric acid plants.

Benefits of DEMISTER® Mist Eliminators

- **Easy to install in all process equipment**
- **Most cost effective solution when equipment sizes are set by other requirements**
- **High efficiency with low pressure drop**
- **Emergency delivery available**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

DIFFERENTIAL PRESSURE INDICATOR/TRANSMITTER *PLEASE PROVIDE ROSEMOUNT TRANSMITTER AND MANIFOLD AS PER*

- MANUFACTURER : ORANGE RESEARCH *MANIFOLD AS PER*
- MODEL : 1833DGT-1-C-2.5-B-T1-0-5" W.C. *SPECIFICATION*
- SERVICE : PRESSURE DROP ACROSS DEMISTER
- RANGE : 0 ~ 5" W.C. (0 ~ 125 mm) DIFFERENTIAL
- DIAL SIZE : 2 1/2" (64 mm)
- ACCURACY : ± 2 % OF FULL SCALE
- MATERIAL
- BODY : TYPE 316 STAINLESS STEEL
- SEAL : VITON
- CONNECTION : 1/4" (6.35 mm) NPT
- OUTPUT : 4 ~ 20 mA
- CERTIFICATION : NEMA 4X
- SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
- QUANTITY : 2 (1 PER DEMISTER)
- CUSTOMER TAG NO. : PT-0501B / PFO505B

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, installation procedure, techniques of construction, installation and examination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 25/1/06 By: M. Joubert



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2B**

**FOR
ORANGE RESEARCH
DIFFERENTIAL PRESSURE
INDICATOR/TRANSMITTER**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

PRESSURE VACUUM RELIEF VALVE

MANUFACTURER : SHAND & JURS
MODEL : 94020-75-11-26-01
TYPE : CLOSED VENT PRESSURE/VACUUM
SERVICE : OFF-GAS
LOCATION : OFF-GAS LINE
MAXIMUM GAS FLOW : 150 CFM (4.24 m³/min)
SETTINGS
 VACUUM : 4" (100 mm) W.C.
 PRESSURE : 5" (125 mm) W.C.
DISCHARGE : 3" (75 mm) FLANGE
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 HOOD : STAINLESS STEEL
 SEAL : TFE
INLET CONNECTION : 3" (75 mm) CLASS 150# RF FLANGE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 2 (1 PER CONTACTOR)
CUSTOMER TAG NO. : PSV-O501A / PSV-O505A

NOTE:

THE UNIT MAY BE MOUNTED TO A PIPE SPOOL TO DESIRED ELEVATION.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 10A**

**FOR
SHAND & JURS PRESSURE VACUUM
RELIEF VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

MOTORIZED BUTTERFLY VALVE

*ACTUATOR UNSUITABLE
FOR USE - CAN'T MONITOR
COH SWITCH*

VALVE
 MANUFACTURER : COTROMATICS
 TYPE : QF SERIES
 STYLE : QUARTER-FLEX HIGH PERFORMANCE BUTTERFLY VALVE (FULL LUG TYPE)
 SERVICE : OFF-GAS
 MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SHAFT : 17-4 PH S.S.
 DISC : TYPE 316 S.S.
 SEAT : PTFE
 PRESSURE RATING : 150 PSIG (1.03 MPa)
 OPERATION : OPEN / CLOSE WITH ELECTRIC ACTUATOR
 CONNECTION : TO BE INSTALLED BETWEEN ASNI 150# FLANGES
 PIPE SIZE : 3" (75 mm)
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
 QUANTITY : 2

ACTUATOR
 MANUFACTURER : ROTORK
 TYPE : Q SERIES 100 ON/OFF ELECTRIC ACTUATOR WITH Q-PAK
 ENCLOSURE : NEMA 4
 ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
 QUANTITY : 2
 CUSTOMER TAG NO. : FV-O521A / FV-O523A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, during the process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____ ✓

NOT REVIEWED _____

Project No. _____

Date: 6/2/06

By: [Signature]

79538-C14-16

Contromatics

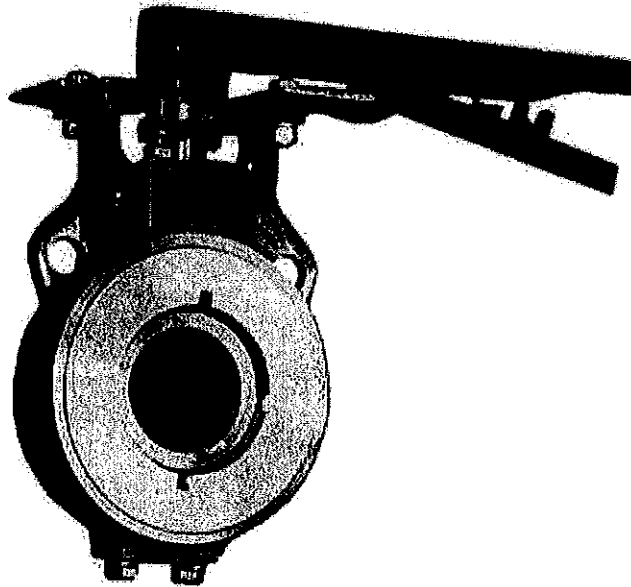
A division of CIRCOR International, Inc.

Series QF Quarter-Flex High Performance Butterfly Valve Ansi Class 150 & 300

Contromatics Quarter-Flex High Performance Butterfly Valves

Design

The Contromatics QF Series High Performance Butterfly Valve design criteria is predicted on providing three very important factors: superior performance, extended service life, and economical cost. As evidenced by its extraordinary design capabilities we have succeeded in achieving all three. The QF incorporates many of the design standards applicable today.



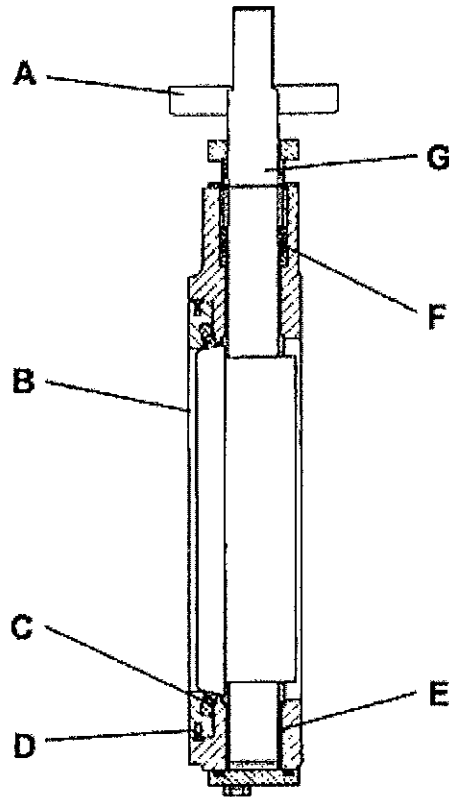
- ANSI B16.5 - Steel pipe flanges and flange fittings
- ANSI B16.34 - Steel valves
- ANSI B31.3 - Chemical plant & petroleum refinery piping
- API 601 - Metallic gaskets for piping
- API 609 - Butterfly valves
- MSS SP-6 - Standard finish for pipe flanges
- MSS SP-25 - Standard marking system for valves

These features make the valve suitable for the most demanding on/off or throttle applications in such industries as chemical, and pulp & paper. And as with all our products, it is backed by Contromatics' reputation as a leading manufacturer of quality valves and automation.

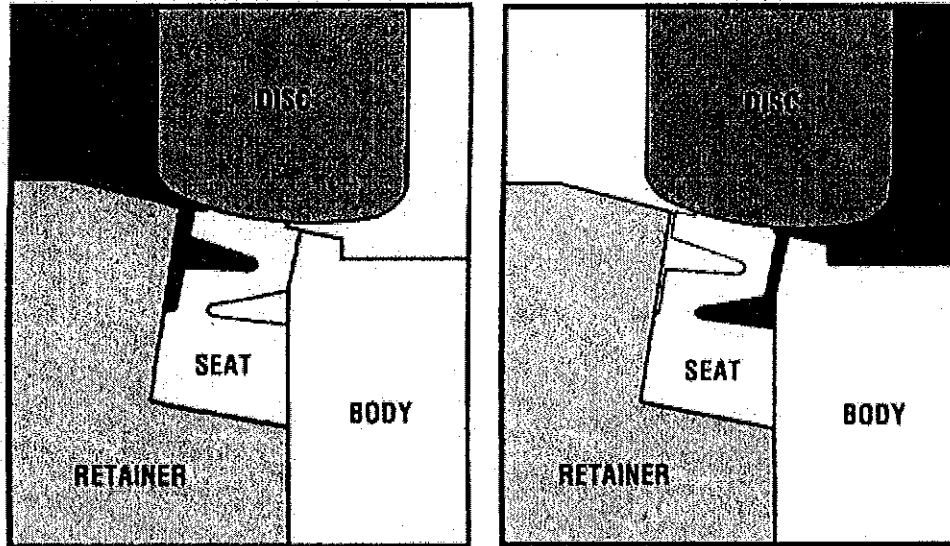
Sizes

Standard sizes 2 1/2" - 24" ANSI Class 150 and 3" - 12" ANSI Class 300, in carbon or stainless steel construction, wafer or lug body designs.

Features



- A. Heavy duty four bolt actuator mounting pad
- B. Employs an uninterrupted gasket seal surface-meeting API 609-suitable for spiral wound gaskets (wafer style only)
- C. Patented, pressure assisted seat assures bubble tight shutoff (ANSI Class VI)- in both directions at full rated pressure
- D. Body/retainer joint seal falls within pipeline gasketing area-prevents external leakage
- E. RPTFE backed bearings - fiberglass composite in carbon steel valves, 316 S.S in stainless steel models-provide corrosion resistance while minimizing shaft deflection
- F. Multiple Vee-ring PTFE stem packing
- G. High strength 17-4 PH stainless steel shaft (one-piece construction in sizes 2-1/2"-16") is internally retained for safety, meeting API 609 requirements.



Patented Pressure Assisted Seat Design

The Quarter-Flex incorporates an exclusive patented seat design which assures bidirectional bubble tight sealing. Providing effective low pressure sealing capability, the sealing function is further enhanced as system pressure increases. The line pressure exerts an upward force on the seat which forces the seat against the valve disc, "accordion" style. Increased line pressure causes tighter sealing, which assures continuous bubble tight closure.

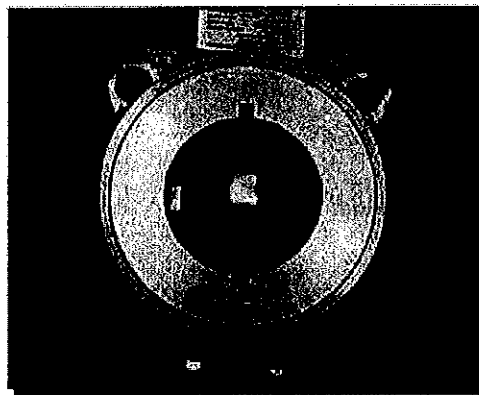
When the direction of flow is reversed the seat functions in the same manner, once again achieving tight shutoff.

Available seat materials:

- PTFE
- RPTFE
- UHMWPE
- PFA

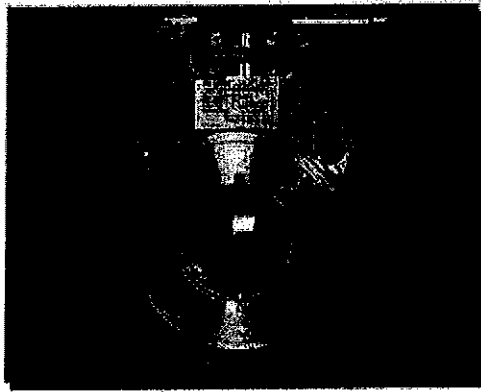
Seat Retainer

The seat retainer in wafer style valves utilizes a locking method that precludes the use of set screws, thus providing an uninterrupted gasket (pipeline) surface area, meeting API 609 requirements. The retainer/body joint falls within the gasketing area preventing any external leakage in the event of seat failure. Furthermore, the retainer protects the seat from premature failure due to erosion. And since no special tools are required in the removal of the seat retainer, maintenance is quick and easy.



Integrally Cast Travel Stop

The internal travel stop is designed to provide proper disc positioning and to prevent seat damage due to the disc rotating beyond the closed position.



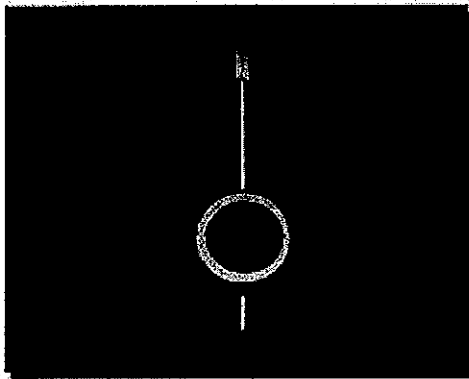
Double Offset Shaft

The double offset shaft design reduces seat wear and enhances sealing by providing a camming action that lifts the disc off the seat. This minimizes seat contact in both directions, resulting in lower operating torques, longer seat life, and prevents the possibility of seat deformation from excessive pressure on the seat. This offset design results in full 360° sealing contact, ensuring no leakage occurs when in the fully closed position.



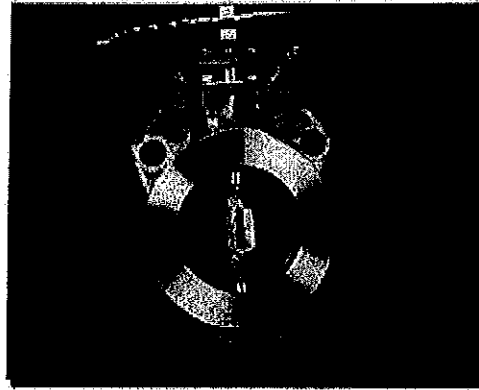
One Piece Shaft

The heavy duty one-piece shaft (in sizes 2-1/2" - 16") constructed of high strength 17-4 PH stainless steel, is internally retained by a snap ring located above the packing area (non-wetted area). This provides safe tamper-proof retention that does not interfere with packing adjustments, eliminating the need for removal of the shaft when replacing packing (meets API 609 standards). Additionally, RPTFE-lined bearings - fiberglass in carbon valves, 316 S.S. in stainless steel models - maximize corrosion resistance and minimize shaft deflection. And for absolute positive indication valve position, the shaft is engraved to denote the open and closed positions



Disc To Shaft Attachment

The shaft is secured to the disc by utilizing a modified Woodruff key design, up through 8", that is tack welded to prevent loosening. Sizes 10" and above use cryogenically shrink fitted stainless steel pins that are prefitted as assembly and expanded in ambient temperature for absolute positive retention.



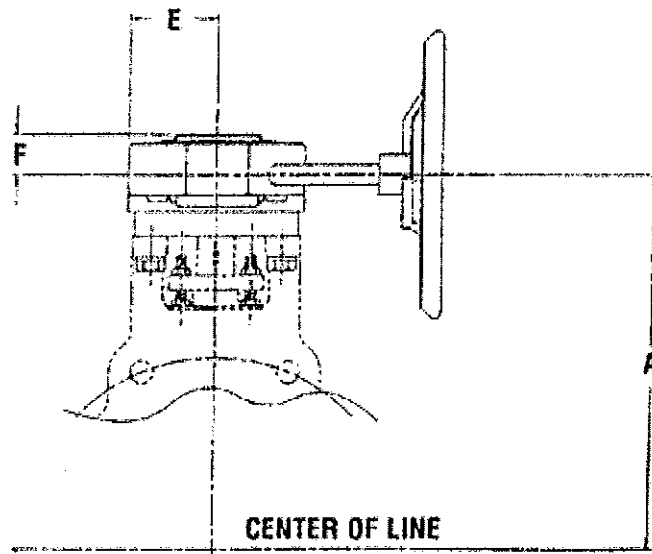
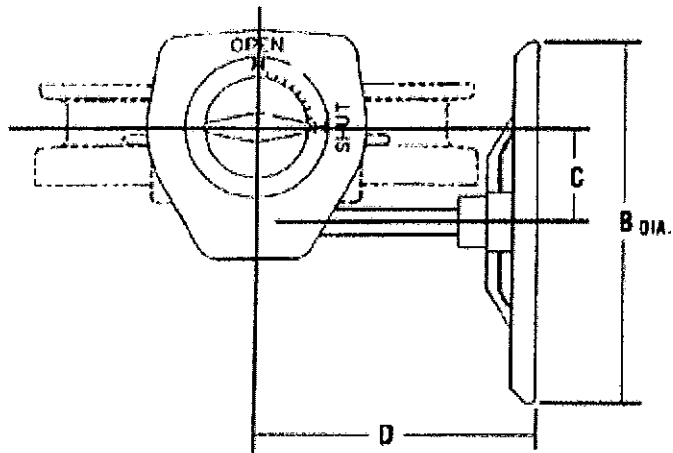
Handles and Manual Gear Operators

Manual operation of the QF Series can be achieved through the use of worm gear operators, or in the case of sizes 2-1/2" - 8", with ten-position locking handles.

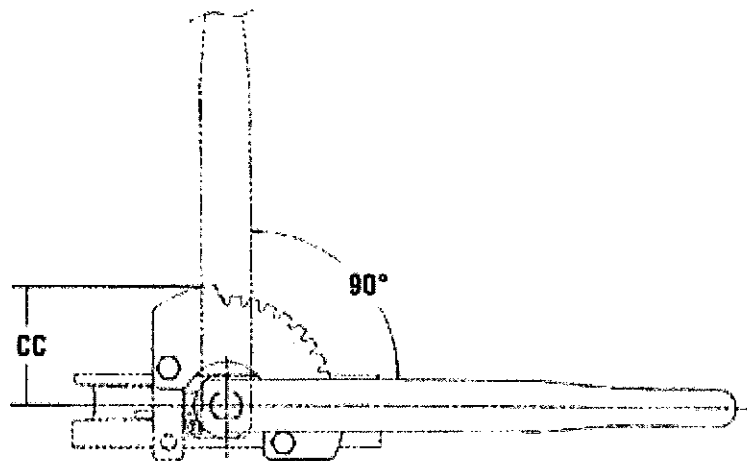
Gear operators are standardly available in weather-proof cast iron. Ductile iron models are also available.

Dimensions (Inches)								
Model	Size	A		B	C	D	E	F
		150 Class	300 Class					
GO-QF-C3	2-1/2"	6-5/8	—	6	1-27/32	6-1/8	2-13/32	1-1/4
GO-QF-C3	3"	7	7-3/4	6	1-27/32	6-1/8	2-13/32	1-1/4
GO-QF-C4	4"	8-1/8	8-5/8	9	1-27/32	6-7/16	2-13/32	1-1/4
GO-QF-C6	6"	9-1/2	10-3/8	9	1-27/32	6-7/16	2-13/32	1-1/4
GO-QF-C8	8"	11-1/2	—	9	2-3/8	7-1/2	2-11/16	1-1/4
GO-QF-C10	10"	12-3/32	—	13	3	8-7/8	3-11/32	1-13/32
GO-QF-C12	12"	14-1/16	—	8	4-3/8	8-1/2	4-1/2	1-7/8
GO-QF-C14	14"	15-1/2	—	18	5-3/8	10-9/16	5-13/32	1-7/8
GO-QF-C16	16"	16-7/16	—	12	5-7/16	15-3/32	5-5/8	2-1/8
GO-QF-C18	18"	18-5/8	—	12	5-7/16	15-3/32	5-5/8	2-1/8
GO-QF-C20	20"	20-1/2	—	12	6	15-3/8	6	2-1/2
GO-QF-C24	24"	22-3/4	—	12	6	15-3/8	6	2-1/2

Dimensions are for reference only



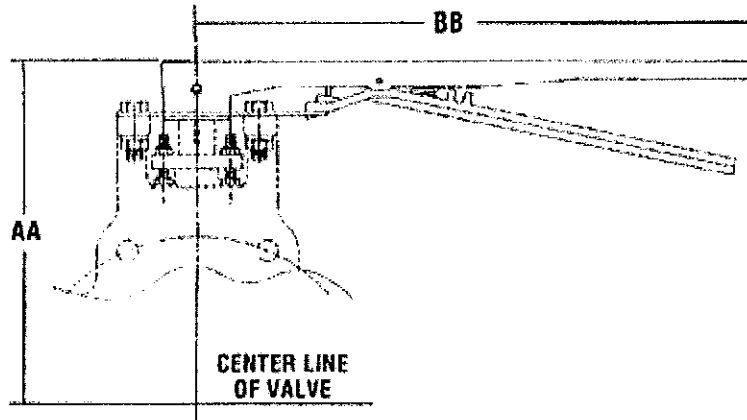
Handles



Notes:

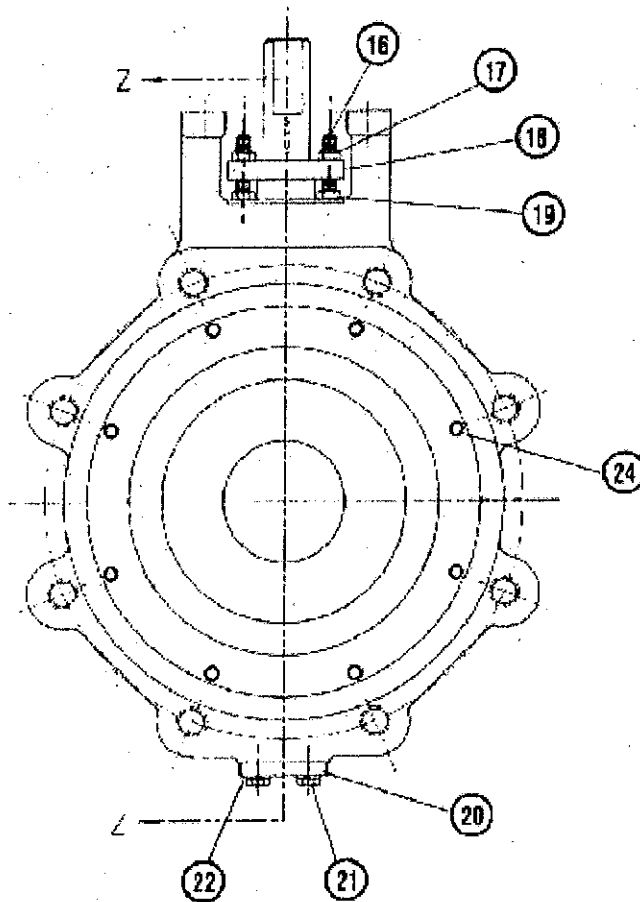
1. Maximum differential pressure for soft seat valves with lever handles.

2-1/2" through 4"	150 Class	285 PSIG
5"	150 Class	200 PSIG
6"	150 Class	150 PSIG
8"	150 Class	150 PSIG
3", 4"	300 Class	300 PSIG
6"	300 Class	150 PSIG



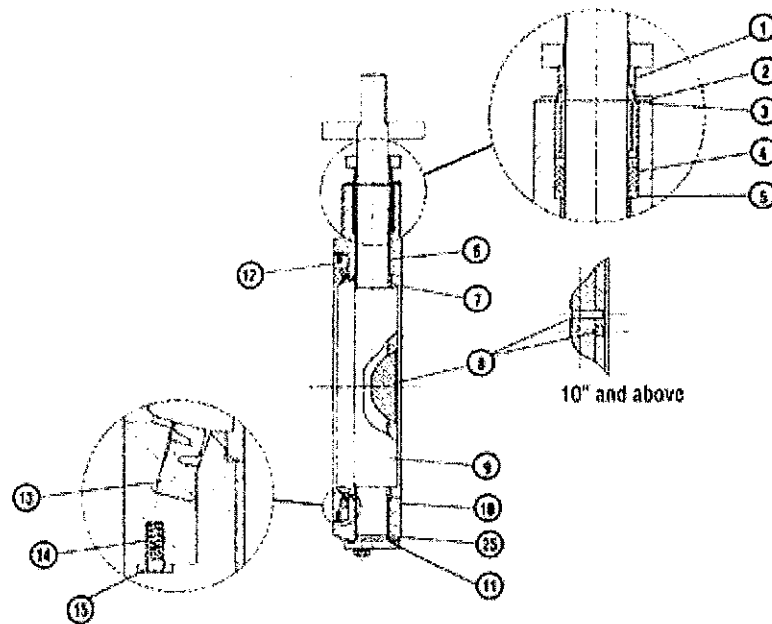
Valve Size	150# AA	300# AA	BB	CC
2-1/2"	5-3/4"	-	12"	3-9/16"
3"	6-1/8"	6-7/8"	12"	3-9/16"
4"	7-1/4"	7-3/4"	12"	3-9/16"
6"	8-5/8"	9-1/4"	12"	3-9/16"
8"	11-3/8"	-	18"	4-3/16"

Series QF Materials of Construction - ANSI Class 150



Size 2-1/2" - 14", ANSI Class 150, Soft Seated Butterfly Valves, Wafer & Full Lug Type				
Detail Number	Quantity Required	Description	Material	
			Carbon Steel	Stainless Steel
1	1	Outer Gland Ring	300 Series Stainless Steel	300 Series Stainless Steel
2	1	Shaft Retaining Plate	300 Series Stainless Steel	300 Series Stainless Steel
3	1	Shaft Retaining Ring	300 Series Stainless Steel	300 Series Stainless Steel
4	1 Set	Packing	PTFE**	PTFE**
5	2	Inner Gland Ring	316 Stainless Steel	316 Stainless Steel
6	2	Bushing	High Temperature Fiberglass Composite Backed RPTFE	316 Stainless Steel Backed RPTFE
7	2	Thrust Washer	316 Stainless Steel	316 Stainless Steel
8	See Note #1	Key / Pin	Key=ASTM-A-564 Gr. 630 17-4 PH Pin=316 Stainless Steel	Key=ASTM-A-564 Gr. 630 17-4 PH Pin=316 Stainless Steel
9	1	Shaft & Disc Assembly	Shaft=ASTM-A-564 Gr. 630 17-4 PH Disc=ASTM-A-351 Gr. CF8M	Shaft=ASTM-A-564 Gr. 630 17-4 PH Disc=ASTM-A-351 Gr. CF8M
10	1	Body	ASTM-A-216 Gr. WCB	ASTM-A-216 Gr. CF8M
11	1	"O" Ring	Viton®	Viton®

12	1	Seat Retainer	ASTM-A-515 or 516 Gr. 70 Carbon Steel	ASTM-A-240 or 316 Gr. 70 Carbon Steel
13	1	Seat	PTFE**	PTFE**
*14	2	Spring	302 Stainless Steel	302 Stainless Steel
*14a	2	Retaining Spring	Inconel 750	Inconel 750
*15	2	Seat Retainer Lock Pin	300 Series Stainless Steel	300 Series Stainless Steel
16	2	Stud	18/8 Stainless Steel	18/8 Stainless Steel
17	2	Self-Locking Nut	18/8 Stainless Steel	18/8 Stainless Steel
18	1	Gland Retainer	300 Series Stainless Steel	300 Series Stainless Steel
19	2	Jam Nut	18/8 Stainless Steel	18/8 Stainless Steel
20	1	End Cap	316 Stainless Steel	316 Stainless Steel
21	See Note #2	Hex. Hd. Cap Screw	18/8 Stainless Steel	18/8 Stainless Steel
22	See Note #2	Split Lockwasher	18/8 Stainless Steel	18/8 Stainless Steel
23	1	Name Plate	300 Series Stainless Steel	300 Series Stainless Steel
24	See Note #3	Soc. Hd. Cap Screw	18/8 Stainless Steel	18/8 Stainless Steel
25	1	Bearing Retaining Ring	300 Series Stainless Steel	300 Series Stainless Steel



Notes:

1. Key: Qty. of (1) for 2 1/2" through 8" valves.

Pins: Qty. of (2) for 10" through 12" valves.

Pins: Qty. of (4) for 14" valves.

2. Hex. Hd. Cap Screw & Split Lockwashers.

Qty. of (2) for 2-1/2" through 6" valves.

Qty. of (4) for 8" through 14" valves.

3. Soc. Hd. Cap Screw (Lug Type only):

Qty. of (4) for 2-1/2" and 3" valves.

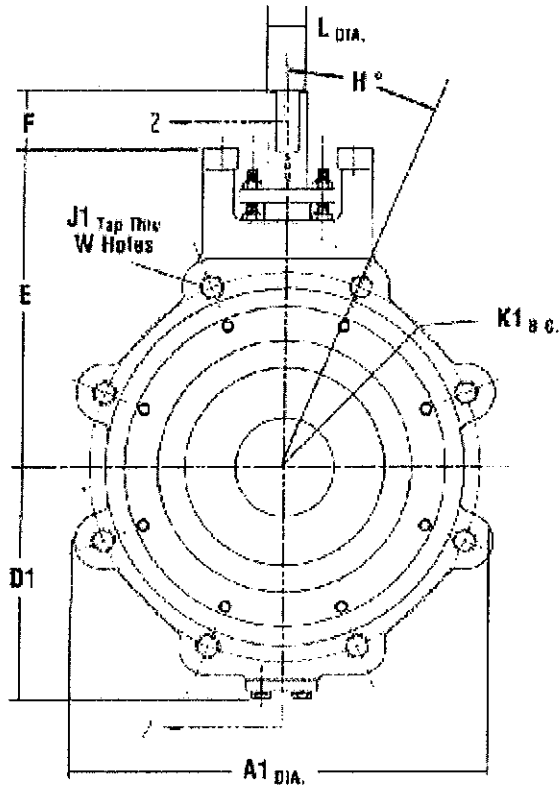
Qty. of (8) for 4" through 8" valves.

Qty. of (12) for 10" through 14" valves.

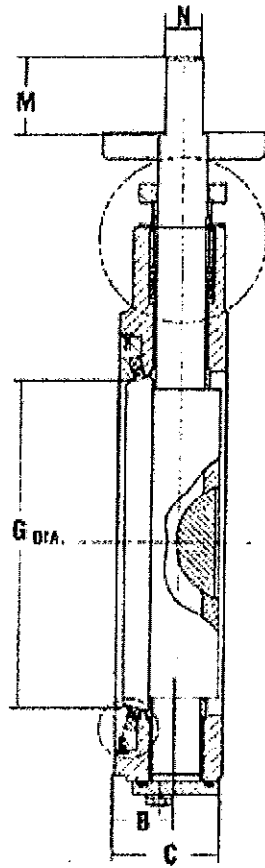
*Detail numbers 14, 14a and 15 (wafer type only).

**Optional materials available, refer to "How To Order".

FULL LUG STYLE



Sizes 2-1/2" - 14" Wafer and Full Lug Type ANSI Class 150													
Valve Size	Full Lug K1	L	M	N	P	R	S	T	U	V	Full Lug W	X	Y
2-1/2"	5-1/2	9/16	1.078	3/8	N/A	N/A	N/A	1-1/2	3-1/4	11/32	4	3/4	1-5/8
3"	6	9/16	1.078	8/8	N/A	N/A	N/A	1-1/2	3-1/4	11/32	4	3/4	1-5/8
4"	7-1/2	5/8	1.078	1/2	N/A	N/A	N/A	2	3-1/2	13/32	8	1	1-3/4
5"	9	7/8	1.078	5/8	N/A	N/A	N/A	2	3-1/2	13/32	8	1	1-3/4
6"	9-1/2	7/8	1.078	5/8	N/A	N/A	N/A	2	3-1/2	13/32	8	1	1-3/4
8"	11-3/4	1-1/8	1.828	7/8	N/A	N/A	N/A	2-9/16	4	9/16	8	1-9/32	2
10"	14-1/4	1-1/8	N/A	N/A	.250	.984	2-1/4	3-1/4	4-3/4	9/16	12	1-5/8	2-3/8
12"	17	1-1/4	N/A	N/A	.375	1.033	2-1/4	3-1/2	5	11/16	12	1-3/4	2-1/2
14"	18-3/4	1-3/8	N/A	N/A	.375	1.156	2-1/4	4-3/4	5-5/8	11/16	12	2-3/8	2-13/16



Weight (Lbs.) Bare Shaft					
Valve Size	1150/ 2150	1151/ 2151	Valve Size	1150/ 2150	1151/ 2151
2-1/2"	10	15	12"	150	210
3"	12	17	14"	215	300
4"	16	23	16"	325	455
5"	25	37	18"	375	525
6"	30	42	20"	450	630
8"	50	70	24"	590	950
10"	80	112			

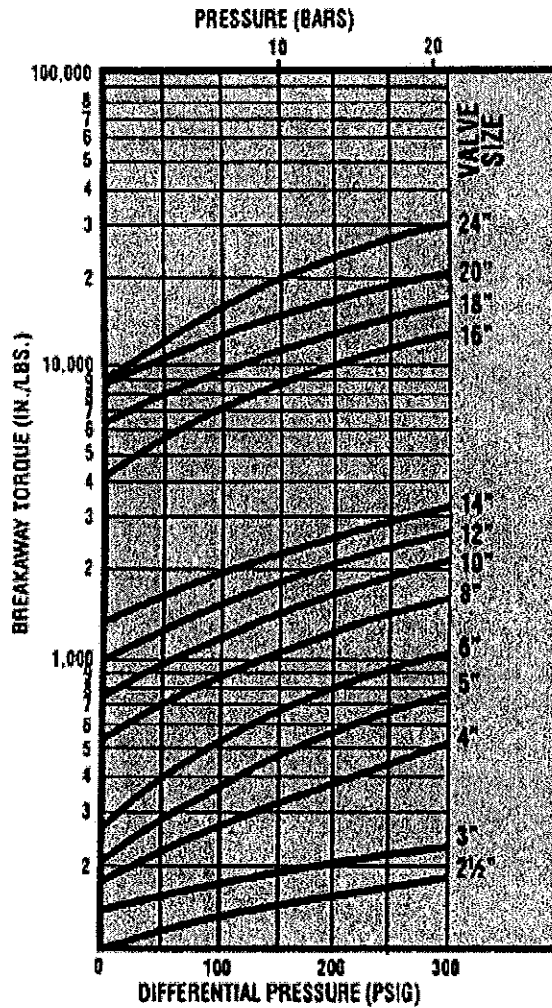
Weight (Lbs.) Bare Shaft		
Valve Size	1300/ 2300	1301/ 2301
3"	19	23
4"	23	30
6"	37	49
8"	60	80
10"	92	124
12"	176	240

Series QF Technical Data - ANSI Class 150

Size (Inches)	C _v Rating
2-1/2	90
3	205
4	403
5	640
6	1075
8	2243
10	3885

Size (Inches)	C _v Rating
12	5925
14	7307
16	10,050
18	13,075
20	18,050
24	26,863

Breakaway Torque



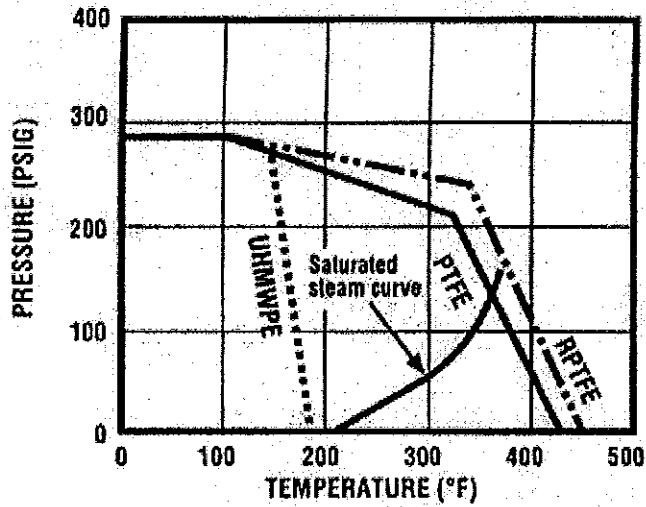
NOTE: Torques based on clean service only. Certain highly viscous or abrasive services could increase these values.

Pressure Rating @ 100°F
 Class 150:
 285 PSIG (A216 Gr. WCB)
 275 PSIG (A351 Gr. CF8M)

Maximum Temperature for Seats and Seals @ 0 PSIG
 PTFE 425°F
 Reinforced PTFE 450°F
 UHMWPE 180°F

Minimum Operating Temperature
 -35°F

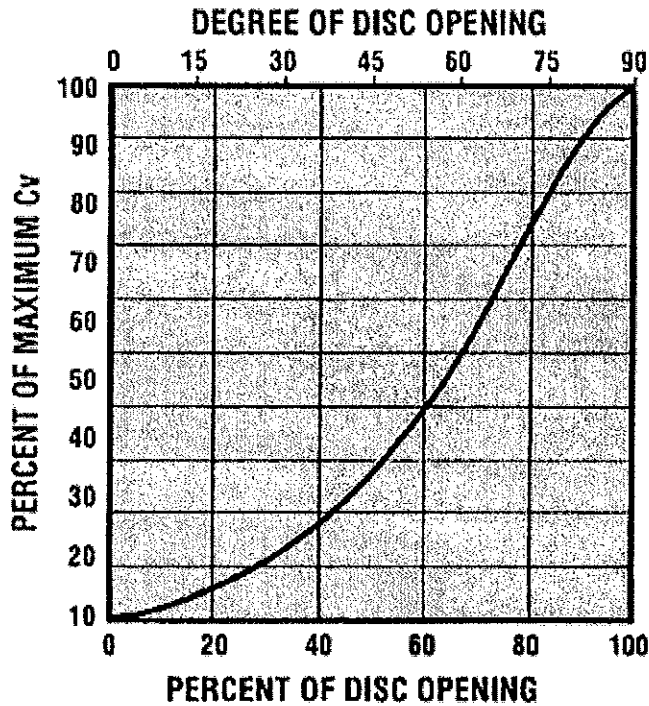
Seat Rating



Note: Maximum continuous operating temperature; consult factory for applications above those shown.

NOTE: Maximum continuous operating temperature; consult factory for applications above those shown.

Flow Characteristics



Note: Based on water at ambient temperature.

Vacuum Rating

10mm Hg

Services to 2×10^{-5} mm Hg may require special handling, seals and grease.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4D**

**FOR
ROTORK ACTUATOR**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

OZONE DESTRUCT SKID

MANUFACTURER : FUJI ELECTRIC
FUNCTION : DESTROY OFF GAS OZONE TO 0.1 PPMV
MODEL : FOD0300F
DESTRUCT VESSEL, PREHEATER, BLOWER, OZONE
MONITOR, INSTRUMENTS, AND ELECTRICAL PANEL
ARE MOUNTED ON A COMMON SKID
DESTRUCT VESSEL : 16" (406 mm) DIAMETER
MATERIAL OF CONSTRUCTION
VESSEL : TYPE 316L S.S.
HEAD GASKET : HYPALON
SKID FRAME : PAINTED CARBON STEEL
PIPING CONNECTION : 3" (75 mm) 150# FLANGE AT INLET
INLET GAS TEMP. : 36° F (2° C) MINIMUM
INLET GAS RH : 100 %
DESIGN FLOW RATE : 177 CFM (5 m³/min) MAXIMUM
PRESSURE DROP : 10" (254 mm) W.C. MAXIMUM
EFFICIENCY : 0.1 PPMV, VENT-GAS OZONE CONCENTRATION AT
DISCHARGE
POWER : 600 VAC / 3 PHASE / 60Hz
SPECIAL REQUIREMENT : VESSEL TO BE CLEANED FOR OXYGEN SERVICE
CATALYST : MANGANESE DIOXIDE
CATALYST DEPTH : 18.5" (470 mm)
DIMENSION (ESTIMATE) : 30" WIDE x 124" LONG x 81.5" HIGH (76 x 315 x 207 cm)
WEIGHT (ESTIMATE) : 2,400 LB (1,090 Kg)
QUANTITY : 3
CUSTOMER TAG NO. : N/A



Fuji Electric Corporation of America

Date : 1/13/06
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Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

BUTTERFLY VALVE

MANUFACTURER : CONTROMATICS
TYPE : QF SERIES
STYLE : QUARTER-FLEX HIGH PERFORMANCE BUTTERFLY VALVE WITH LOCKING LEVER (FULL LUG STYLE)
SERVICE : OFF-GAS & VENT-GAS
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SHAFT : 17-4 PH S.S.
DISC : TYPE 316 S.S.
SEAT : PTFE
PRESSURE RATING : 150 PSIG (1.03 MPa)
OPERATION : MANUAL WITH LEVER & LOCKING DEVICE (MODEL GO-QF-C3)
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
PIPE SIZE : 3" (75 mm) AND 6" (150 mm)
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY : 6 (2 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : HV-O510A / HV-O520A / HV-O530A (3" OR 75 mm)
HV-O510J / HV-O520J / HV-O530J (6" OR 75 mm)



Fuji Electric Corporation of America

Date : 1/13/06
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 10F**

**FOR
CONTROMATICS QF SERIES
BUTTERFLY VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM

MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

MOTORIZED BUTTERFLY VALVE

*SEE PREVIOUS COMMENTS
ON THIS ACTUATOR.*

VALVE

MANUFACTURER : CONTROMATICS
 TYPE : QF SERIES
 STYLE : QUARTER-FLEX HIGH PERFORMANCE BUTTERFLY VALVE (FULL LUG TYPE)
 SERVICE : OFF-GAS
 MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SHAFT : 17-4 PH S.S.
 DISC : TYPE 316 S.S.
 SEAT : PTFE
 PRESSURE RATING : 150 PSIG (1.03 MPa)
 OPERATION : OPEN / CLOSE WITH ELECTRIC ACTUATOR
 CONNECTION : TO BE INSTALLED BETWEEN ANSI 150# FLANGES
 PIPE SIZE : 3" (75 mm)
 SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
 QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT)

ACTUATOR

MANUFACTURER : ROTORK
 TYPE : Q SERIES 100 ON/OFF ELECTRIC ACTUATOR WITH Q-PAK
 ENCLOSURE : NEMA 4
 ELECTRICAL SUPPLY : 120VAC / 1 PHASE / 60 Hz
 QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
 CUSTOMER TAG NO. : FCV-O510A / FCV-O520A / FCV-O530A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and completion of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 25/1/06 By: M. Joubert



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 10F**

**FOR
CONTROMATICS QF SERIES
BUTTERFLY VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4D**

**FOR
ROTORK ACTUATOR**



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

TEMPERATURE TRANSMITTER

MANUFACTURER : FOXBORO
SERVICE : OFF-GAS & VENT-GAS

TRANSMITTER

TYPE : I/A SERIES INTELLIGENT TEMPERATURE
TRANSMITTER, RTT20
MODEL NO. : RTT20-I1LGQCA
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 12 ~ 42 VDC
TEMPERATURE LIMIT : -40 ~ 185° F (-40 ~ 85° C)

ELEMENT

SENSOR : RTD, PLATINUM, 100 Ω
THERMOWELL : W-PTS-A16
MODEL NO. :
MATERIAL : TYPE 316 S.S.
LENGTH : U = 3" (76 mm), C = 5.5" (140 mm) BY USING THREDOLET
CONNECTION : 1/2" (13 mm) NPT
MOUNTING PIPE SIZE : 3" (75 mm) S.S. PIPE
CLEANING : THERMOWELL TO BE CLEANED AND PACKAGED FOR
OXYGEN SERVICE
QUANTITY : 6 (2 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : TT-O510A / TT-O510B
TT-O520A / TT-O520B
TT-O530A / TT-O530B

Earth Tech (Canada) Inc.

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rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 23/1/06

By: M. Joubert



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4F**

**FOR
FOXBORO TEMPERATURE
TRANSMITTER/ELEMENT**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

TEMPERATURE TRANSMITTER

MANUFACTURER : FOXBORO
SERVICE : VENT-GAS

TRANSMITTER

TYPE : I/A SERIES INTELLIGENT TEMPERATURE
TRANSMITTER, RTT20
MODEL NO. : RTT20-I1LJQCA
ENCLOSURE : NEMA 4X
OUTPUT : 4 ~ 20 mA
POWER : 12 ~ 42 VDC
TEMPERATURE LIMIT : -40 ~ 185° F (-40 ~ 85° C)

ELEMENT

SENSOR : RTD, PLATINUM, 100 Ω
THERMOWELL : W-PTS-A16
MODEL NO. :
MATERIAL : TYPE 316 S.S.
LENGTH : U = 4.5" (114 mm), C = 7" (178 mm) BY USING THREDOLET
CONNECTION : 1/2" (13 mm) NPT
MOUNTING PIPE SIZE : 6" (150 mm) TYPE 316L S.S. PIPE
CLEANING : THERMOWELL TO BE CLEANED AND PACKAGED FOR
OXYGEN SERVICE
QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : TT-O510C / TT-O520C / TT-O530C

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, installation process, fabrication of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 25/1/06 By: M. Jordan



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4F**

**FOR
FOXBORO TEMPERATURE
TRANSMITTER/ELEMENT**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

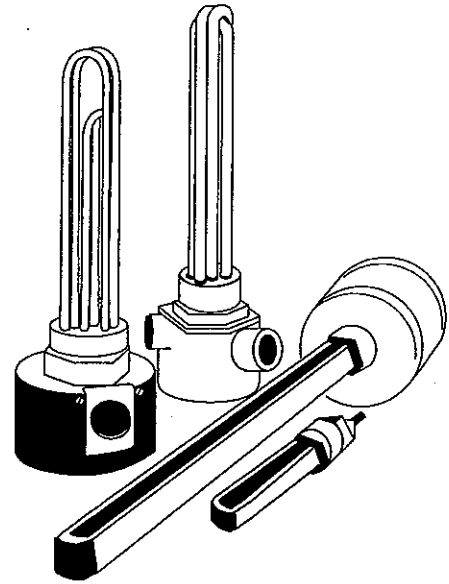
OZONE DESTRUCT SYSTEM

PREHEATER

MANUFACTURER : WATLOW
TYPE : SCREW PLUG IMMERSION HEATER
SERVICE : OFF-GAS
MATERIAL OF CONSTRUCTION
HEATER ELEMENT : TYPE 316L S.S.
SCREW PLUG : TYPE 316L S.S.
MOUNTING CONNECTION: 2 1/2" (63 mm) NPT
DESIGN FLOW RATE : 177 CFM (5 m³/min)
INLET TEMPERATURE : 36° F (2° C) MINIMUM
TEMPERATURE RISE : 30° F (17° C) MINIMUM
SELECTED HEATER RATING: 4 kW
POWER REQUIREMENT : 600VAC / 3 PHASE / 60 Hz
ENCLOSURE RATING : NEMA 4
IMMERSION LENGTH : 30" (762 mm)
HEATER ACCESSORIES : TYPE K THERMOCOUPLE ATTACHED TO ELEMENT
CLEARANCE : PULL OUT LENGTH = 32" (813 mm) FROM SCREW PLUG
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : HTR-O510A / HTR-O520A / HTR-O530A

SCREW PLUG IMMERSION HEATERS

Ideal For Direct Immersion Heating of Liquids



Features

- A variety of element sheath and screw plug materials
- Integral thermowells
- Terminal enclosures rotate to simplify connection with existing conduits
- Welded or brazed element to heater construction
- Repressed (recompacted) WATROD hairpins
- 2½ inch NPT screw plug assemblies feature element support(s)
- UL® and CSA component recognition; under files #E52951 and 31388 respectively

Benefits

- Compatible with media being heated
- Provide convenient temperature sensor insertion and replacement without draining the fluid being heated
- Protect terminals from environment and provide ease of installation
- Provides a pressure tight seal between media and termination
- Maintain MgO density, dielectric strength, heat transfer and life
- Ensures proper element spacing for maximizing heater performance and life
- Designed and built for safety

Screw plug immersion heaters are ideal for direct immersion heating of liquids, including all types of oils and heat transfer solutions.

Available in a variety of stock and Made-to-Order sizes, Watlow screw plug immersion heaters feature both WATROD round and FIREBAR® flat tubular elements.

Heating elements are hairpin bent and either welded or brazed into the screw plug - depending on element sheath and plug material compatibility.

General purpose (NEMA 1) terminal enclosures are standard. Optional moisture resistant (NEMA 4), explosion resistant (NEMA 7) and explosion/moisture resistant (NEMA 7/4) enclosures are available to meet specific application needs.

Optional thermostats provide convenient process temperature regulation.



A subsidiary of Watlow, Designer and Manufacturer of Industrial Heaters, Sensors and Controls
6 Industrial Loop Road
Hannibal, Missouri 63401 USA
Phone: 573-221-2816
Fax: 573-221-3723
Internet: www.watlow.com

UL® is registered to Underwriters Laboratories, Inc.

SCREW PLUG IMMERSION HEATERS

Applications

- Water:
 - Deionized
 - Demineralized
 - Clean
 - Potable
 - Process
- Industrial water rinse tanks
- Vapor degreasers
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Air and gas flow
- Caustic solutions
- Chemical baths
- Anti-freeze (glycol) solutions
- Paraffin

Specifications

Screw plug and element sizes:

1 in. NPT	0.315 in. WATROD
1½ in. NPT	0.315 in. WATROD; 1 in. FIREBAR
2 in. NPT	0.475 in. WATROD
2½ in. NPT	0.475 in. WATROD 1 in. FIREBAR

Phase capability

1 in. NPT	1-Phase
1½, 2, and 2½ in. NPT	1 or 3-phase

Options

Terminal Enclosures

General purpose terminal enclosures, without thermostats, are standard on all screw plug immersion heaters. Optional terminal enclosures include:

- General purpose (NEMA 1) with a single or double pole thermostat.
- Moisture resistant (NEMA 4). Available with or without a single or double pole thermostat.
- Corrosion resistant (NEMA 4X). Available with or without a single or double pole thermostat.
- Explosion resistant (NEMA 7) class 1 groups C and D. Available with or without a single or double pole thermostat.
- Explosion / moisture resistant (NEMA 7/4) combinations. Available with or without a single or double pole thermostat.
- For class 1, group B enclosures, consult your Watlow representative.

Note: Unless otherwise stated, both WATROD and FIREBAR screw plugs are centered on the terminal enclosure.

Caution!

Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this NEMA rating. NEMA rating effectiveness may be comprised by abuse or misapplication.

CSA Certified Enclosures

CSA certified moisture and/or explosion resistant terminal enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA file number 61707, are available on all WATROD and FIREBAR screw plug immersion heaters. For additional information, consult your Watlow representative.

Pilot Light

The optional pilot light gives the operator visual indication of heater ON or OFF power status. The PL10 pilot light is configured to a maximum 250VAC, and supplied with 6 inch (150 mm) leads. The PL11 pilot light is rated for 480VAC, and supplied with 4 inch (100 mm) leads. Pilot lights may be attached to either single or double pole thermostats with general purpose (NEMA 1) enclosure only. For moisture or explosion resistant terminal enclosures (NEMA 4 or NEMA 7), consult factory.

Thermostats

To provide process temperature control, Watlow offers optional single pole, single throw (SPST) and double pole, single throw (DPST) thermostats.

Unless otherwise specified, thermostats are mounted inside the terminal enclosure.

Thermocouples

ANSI Type J or K thermocouples offer more accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath.

Thermocouples are supplied with 120 inch (3050 mm) leads (longer lead lengths are available).

Using a thermocouple requires an appropriate temperature and power control. These must be purchased separately. Watlow offers a wide variety of temperature and power controls to meet virtually all applications. Temperature controls can be configured to accept process variable inputs, too.

SCREW PLUG IMMERSION HEATERS

Wattages and Voltages

Watlow routinely supplies screw plug immersion heaters with 120 to 480VAC as well as wattages from 250 watts to 38 kW. If required, Watlow will configure heaters with voltages and wattages outside these parameters. For more information on special voltage and wattage configurations, consult your Watlow representative.

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR flange heaters:

Standard Sheath Materials

WATROD	Incoloy®
	316 stainless steel
	Steel
FIREBAR	Copper
	Incoloy

Made-to-Order Sheath Materials

WATROD	304 stainless steel
	Monel®
FIREBAR	304 stainless steel

Exotic Sheath Materials
Consult your Watlow representative for details and availability.

External Finishing

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical sheath applications, passivation will remove free iron from the sheath.

Other Finishes

Simple belt polishing and glass beading are available to meet cosmetic demands.

Screw Plug Materials

The following screw plug materials are available:

Standard Screw Plug Materials

WATROD	304 stainless steel
	316 stainless steel
	Steel
	Brass
FIREBAR	304 stainless steel

Made-to-Order Plug Materials

For both WATROD and FIREBAR, consult factory about details and availability.

Screw Plug to Flange Adaptors

Screw plug to flange adaptors permit replacing flange heaters with screw plug heaters.

Ordering Information

How to Order

To order a stock screw plug heater, please specify:

- Watlow code number (from Watlow Heater's Catalog)
- NPT screw plug size and material
- Volts/watts
- Phase
- Options
- Quantity

If our stock units do not meet your application needs, Watlow can provide Made-to-Order heaters. For a Made-to-Order unit, please specify:

- Application, including heated material, process temperature and flow rate, etc.
- Volts/watts
- Watt density
- Phase
- Screw plug size, style and material
- Element diameter
- Number of heating element(s)
- Sheath material
- Immersed length
- No-heat section below the plug
- Terminal enclosure type
- Options
- Quantity

Availability

- **Stock:** Same day shipment
- **Assembly Stock:** 3-5 working days
- **Modified Stock**^①: 5-7 working days
- **Standard:** 10 working days
- **Made-to-Order:** 4-6 weeks

Options, complexity and quantity may affect availability and leadtimes. Consult factory.

^① Stock and assembly stock units with catalog options.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

CATALYST

MANUFACTURER : CARUS CARULITE 200
COMPOSITION : MANGANESE DIOXIDE
SERVICE : DESTRUCTION OF OZONE TO 0.1 PPMV OR LOWER
SHAPE : 3/16" (4.76 mm) EXTRUDED
CRUSH STRENGTH : > 10 Kg
SURFACE AREA : > 200 m²/g
BULK DENSITY : 0.8 ~ 0.9 g/CC
QUANTITY PER UNIT : 121 LB (55 Kg)
TOTAL QUANTITY : 363 LB (165Kg) OR 8 DRUMS (45 LB OR 20.45 Kg/DRUM)
SPARE : 3 DRUMS

CUSTOMER TAG NO. : N/A



CARULITE® 200
Catalyst

C A R U S

OZONE DESTRUCTION

Introduction

The versatility and effectiveness of CARULITE® 200 catalyst make it the benchmark technology for destruction of toxic and corrosive emissions of ozone. Ambient temperature destruction of ozone and long catalyst lifetime provide a cost-effective solution to the problem of ozone emissions.

Benefits

- Efficient:** > 99% destruction of ozone at ambient temperature, with residence times less than a fifth required for thermal destruction.
- Safe:** No toxic or hazardous off-gas, as the catalyst converts ozone to oxygen.
- Economic:** Long catalyst lifetime
Low operational cost
Low capital cost
- Versatile:** Can be used to effectively destroy ozone from various sources including water and wastewater off-gas, corona treaters, office equipment and chemical processes.

Applications

- Potable Water or Wastewater Off-gas
- Corona treater emissions
- Office equipment (copiers/printers) emissions
- Pools/spas
- Chemical processes

Operating Conditions

- 0.36 - 0.72 second residence time, depending upon the application
- 2.2 ft/sec (0.66 m/sec) linear velocity
- Ambient temperature operation (in water off-gas application heat the inlet air stream 5-10° C above ambient to prevent condensation of moisture on the catalyst).

Available Product Sizes

- 1/8" (3mm) diameter extrusion
- 3/16" (4.8 mm) diameter extrusion
- 8 x 14 (2.4 mm x 1.4 mm) mesh granular
- Special mesh sizes available upon request



CARULITE® 200 Catalyst

Protects the Environment from Toxic-Corrosive Ozone

CARUS CHEMICAL COMPANY

LABORATORY SUPPORT

Carus Chemical Company has technical assistance available to its potential and current customers to answer questions, evaluate applications alternatives or perform laboratory testing. Our laboratory capabilities include: Catalyst Analysis, Performance Testing, Process Evaluations, and Analytical Services.

TECHNICAL SERVICES

As an integral part of our technical support, Carus provides in-house and on-site assistance. We offer full application services, including technical expertise, design recommendations, and follow-up support.

CARUS CHEMICAL COMPANY

For over 80 years, our dedication to research and development, technical support, and customer service has enabled Carus to become the world leader in permanganate, manganese, and catalyst oxidation technologies. Call Carus for assistance with specific applications.



C A R U S



Responsible Care®
Good Chemistry at Work

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Date : 1/13/06
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Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

DIFFERENTIAL PRESSURE INDICATOR/TRANSMITTER

*See Previous Comments
ON DP TRANSMITTERS*

- MANUFACTURER : ORANGE RESEARCH
- MODEL : 1833DGT-1-C-2.5-B-T1-0-20" W.C.
- SERVICE : PRESSURE DROP ACROSS OZONE DESTRUCT VESSEL
- RANGE : 0 ~ 20" W.C. (0 ~ 508 mm W.C.) DIFFERENTIAL
- DIAL SIZE : 2 1/2" (64 mm)
- ACCURACY : ± 2 % OF FULL SCALE
- MATERIAL
 - BODY : TYPE 316 STAINLESS STEEL
 - SEAL : VITON
- CONNECTION : 1/4" (6.35 mm) NPT
- OUTPUT : 4 ~ 20 mA
- CERTIFICATION : NEMA 4X
- SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
- QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
- CUSTOMER TAG NO. : PT-O510A / PTO520A / PT-O530A

Earth Tech (Canada) Inc.	
Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.	
Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and completion of all parts of the work rests with the Contractor.	
REVIEWED	_____
REVIEWED AS MODIFIED	_____
REVISE AND RE-SUBMIT	_____ ✓
NOT REVIEWED	_____
Project No.	79538-C14-16
Date:	25/1/06 By: <i>[Signature]</i>



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2B**

**FOR
ORANGE RESEARCH
DIFFERENTIAL PRESSURE
INDICATOR/TRANSMITTER**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

EXPANSION JOINT

MANUFACTURER : GENERAL RUBBER
STYLE : 1010 MAXI-SPHERE
SERVICE : VENT-GAS
SIZE : 6" (150 mm)
LENGTH : 6" (150 mm)
CONNECTION : ANSI 150# FLANGE
MATERIAL OF CONSTRUCTION
COVER : EPDM
TUBE : EPDM
FLANGE : ZINC PLATED STEEL
QUANTITY : 3 (1 PER OZONE DESTUCT UNIT SKID)
CUTOMER TAG NO. : EJ-O510A / EJ-O520A / EJ-O530A

Maxi-Sphere®

Molded Spherical Expansion Joints

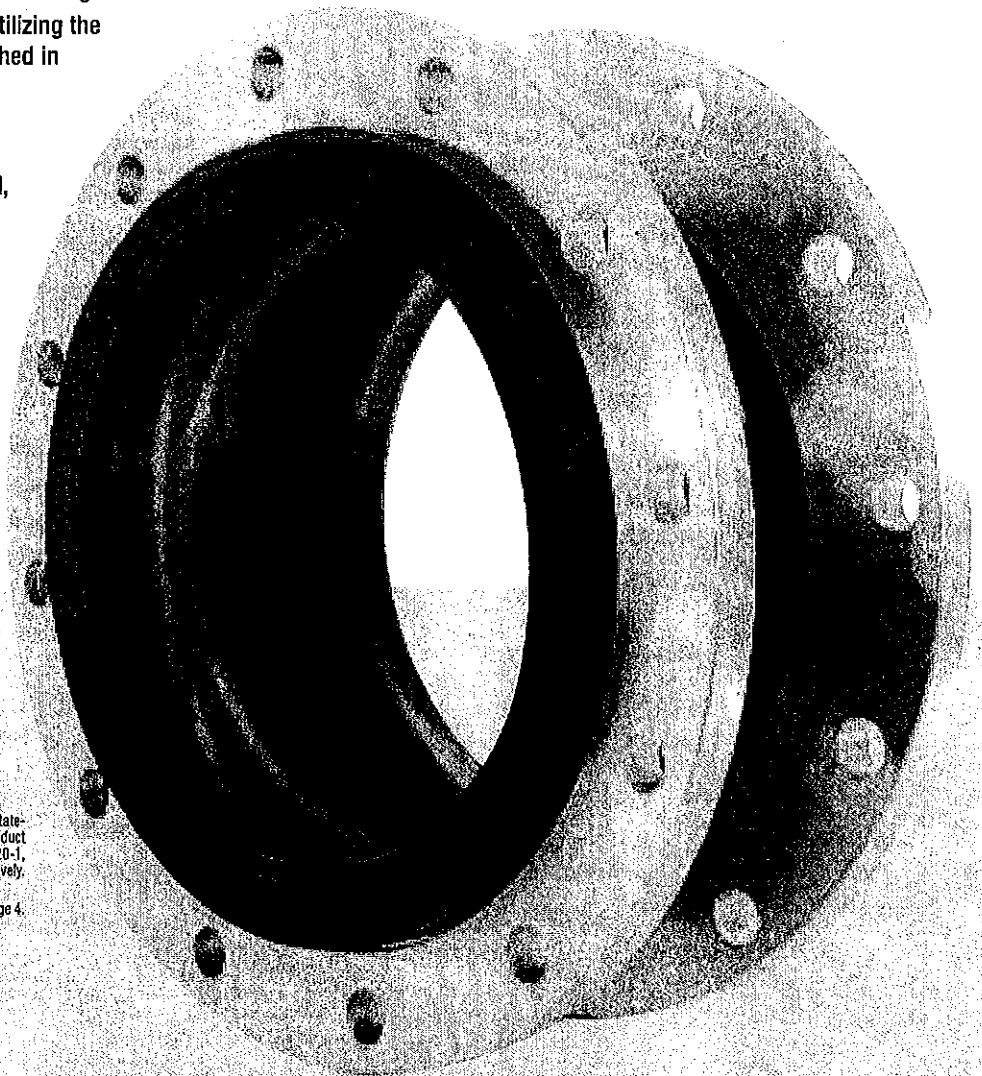
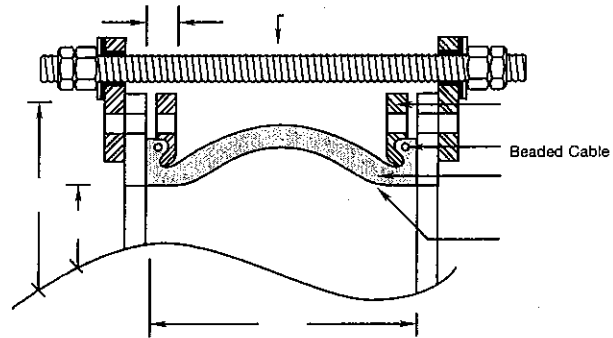
Style 1010, 1020 & 1030

Features:

- Superior Noise and Vibration Control
- Most Economical Flexible Connector
- Precision Molded Spherical Flowing Arch Design
- Multiple Plies of Tire Cord Reinforcement and a Wide Variety of Tube and Cover Elastomers
- Solid Galvanized Steel Floating Flanges Avoids the Problematic Hooked or Interlocking Split Flange Design
- High Tensile Aircraft Cable is Embedded in the Raised Face Rubber Ends to Prevent Pull Out and Avoids the Sharp Cutting Edge of Solid Steel Rings
- Safe Industry Standard Proven Design Utilizing the same Beaded Cable Technology Established in the Tire Industry
- No Gaskets Required; ANSI 150 lb. Drilling Standard, other Flange Drilling Available, including ANSI 300 lb., DIN, PN, JIS and API
- Compensates for Minor Misalignment and Offset while Providing Easy Access to Piping and Equipment
- Large Inventory Means Quick Shipments

Style 1010

Single Sphere with Floating Flanges

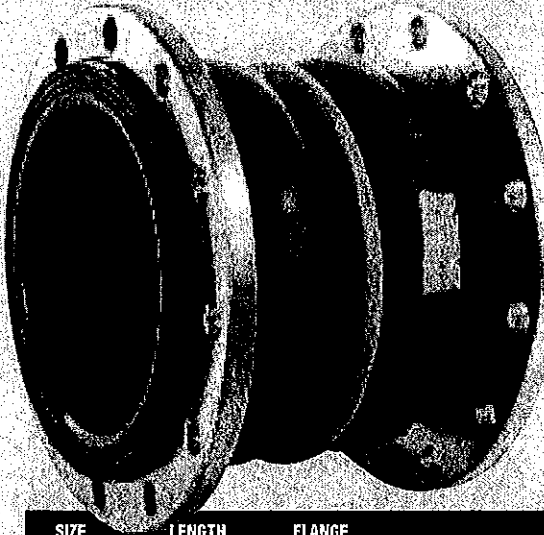
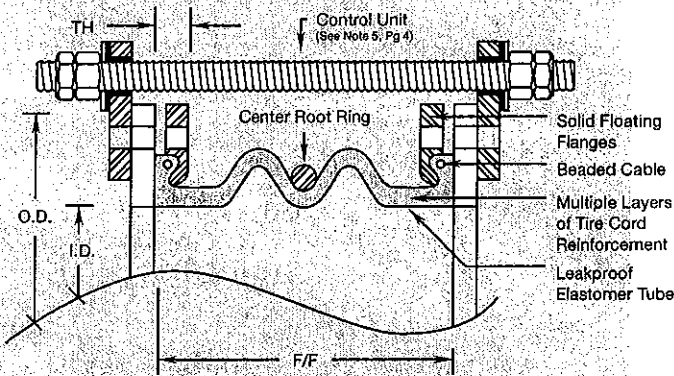


Notes:

- 1.) Style 1015 Notes 2, 5 and 6 as shown on page 4, including a WARNING statement, also applies to Style 1010, 1020 and 1030. For full product specifications and installation instructions, see SPEC 1010-1, SPEC 1020-1, SPEC 1030-1 and ININ 1010-1, ININ 1020-1, ININ 1030-1 respectively. Gross weights include flanges or union ends.
- 2.) For drilling information see 125/150 lb. chart on page 5 and note 8 on page 4.

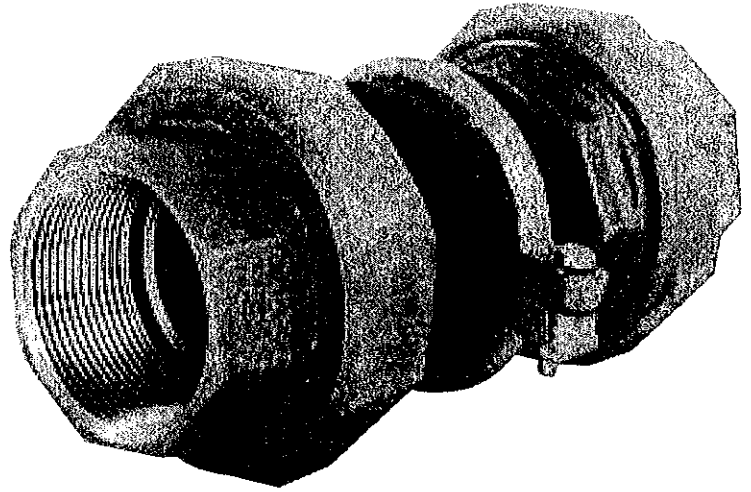
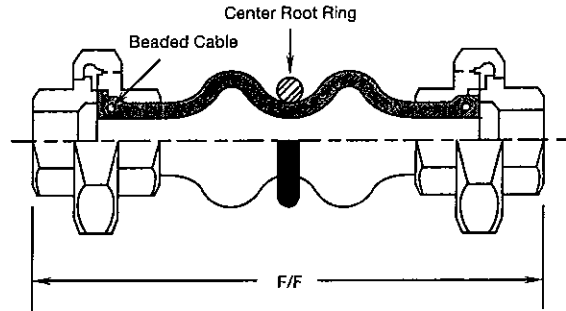
Style 1020

Double Sphere with Floating Flanges



Style 1030

Double Sphere with Union Ends



SIZE I.D. (inch)	LENGTH F/F (inch)	FLANGE TH. (inch)	Comp. (inch)	Ext. (inch)	MOVEMENTS			MAX Pressure (PSIG)	VACUUM Rating (inch Hg)	GROSS Weight (lbs)
					Lateral (inch)	Angular (degree)	Torsional (degree)			
1010 Single Sphere with Floating Flanges										
2	6	7/8	5/8	3/8	3/8	22	3.1	225	30	8.8
2-1/2	6	15/16	5/8	3/8	3/8	17	3.0	225	30	12.5
3	6	1	7/8	1/2	1/2	19	2.9	225	30	14
4	6	1	7/8	1/2	1/2	14	2.7	225	30	18
5	6	1-3/16	7/8	1/2	1/2	12	2.6	225	30	22.5
6	6	1-5/16	7/8	1/2	1/2	11.5	2.4	225	30	26.8
8	6	1-5/16	1-1/4	3/4	3/4	11	2.2	225	30	37.8
10	8	1-5/16	1-1/4	3/4	3/4	9	2.1	225	30	55.5
12	8	1-5/16	1-1/4	3/4	3/4	7	2.0	225	20	83
14	8	1-9/16	1-1/4	3/4	3/4	6	1.8	150	20	111
16	8	1-11/16	1-1/4	3/4	3/4	5.5	1.4	125	20	145
18	8	1-3/4	1-1/4	3/4	3/4	5	1.0	125	15	153
20	8	1-3/4	1-1/4	3/4	3/4	4.3	0.8	125	15	178
24	10	2	1-1/2	3/4	1	3.6	0.7	110	15	255
1020 Double Sphere with Floating Flanges										
2	7	7/8	2	1-1/8	1-1/4	68	9.5	225	30	9
2-1/2	7	15/16	2	1-1/8	1-1/4	53	7.5	225	30	13.5
3	7	1	2	1-1/8	1-1/4	44	6.2	225	30	14.5
4	9	1	2-1/2	1-3/8	1-3/4	40	5.6	225	30	20.5
5	9	1-3/16	2-1/2	1-3/8	1-3/4	32	4.5	225	30	25
6	9	1-5/16	2-1/2	1-3/8	1-3/4	26	3.6	225	30	30
8	13	1-5/16	2-1/2	1-3/8	1-3/4	20	2.8	225	30	44
10	13	1-5/16	2-1/2	1-3/8	1-3/4	16	2.2	225	15	66
12	13	1-5/16	2-1/2	1-3/8	1-3/4	13	1.8	225	15	95.5
14	13-3/4	1-9/16	2-1/2	1-3/8	1-3/4	12	1.7	150	15	113
1030 Double Sphere with Union Ends										
3/4	8	N/A	7/8	1/4	7/8	32	4.8	150	30	2.5
1	8	N/A	7/8	1/4	7/8	25	3.7	150	30	3
1-1/4	8	N/A	7/8	1/4	7/8	20	3	150	30	4
1-1/2	8	N/A	7/8	1/4	7/8	17	2.5	150	30	5
2	8	N/A	7/8	1/4	7/8	13	2	150	30	7.5

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, placement, access, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

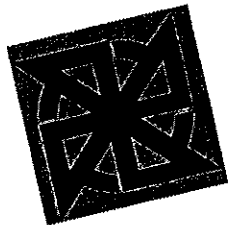
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538

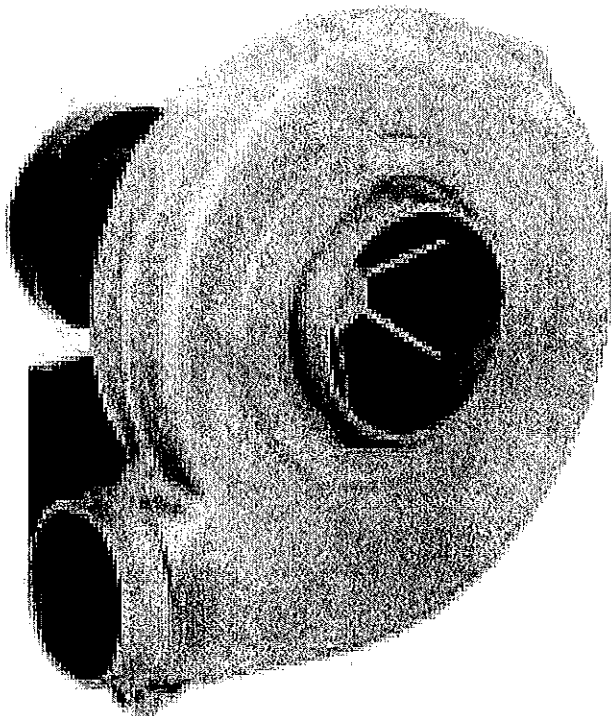
Date: 06/02/06

By: [Signature]



cincinnati fan

OEM and Industrial Air Handling Specialist



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SERIES**

**CAST
ALUMINUM
PRESSURE
BLOWERS**

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**Cat. No. A1102
Supersedes A400**

Cincinnati Fan

A Company That Stands Behind Its Product

Since the founding of **Cincinnati Fan** in 1956, the company's mission has been to provide quality products at competitive prices, backed by dependable service.

This mission is carried out by specializing in the market for industrial air handling products up to 125 HP. But specialization does not mean the product line is small. **Cincinnati Fan** offers a wide variety of standard and customized products, production flexibility, and customer responsiveness.

Cincinnati Fan has over 170 experienced sales engineers across the U.S. and Canada ready to serve your air handling needs.

Cincinnati Fan can provide:

- Technical evaluation for correct performance conditions.
- Review of air stream and ambient conditions that require special attention.
- Selection of proper components to meet required design specifications.
- Selection of proper accessories.
- System analysis for proper fan design.

Cincinnati Fan operates in a modern facility specifically designed for world class manufacturing enabling us to build standard products to order, including accessories, and ship within 5 to 10 working days.

With support like this, you can be sure your **Cincinnati Fan** product will be well-built and will provide maximum dependability and longevity.

Visit us at www.cincinnati-fan.com for more information.



FEATURES/BENEFITS OF CAST ALUMINUM

Cincinnati Cast Aluminum Blowers are a smart buy now and for many years to come because aluminum is:

NON-SPARKING

Cincinnati Cast Aluminum Blowers are AMCA Type B spark resistant. With the addition of a non-sparking shaft, they meet AMCA Type A requirements. See Page 5.

CORROSION-FREE

No painting required. Maintenance free in moist environments.

LIGHTWEIGHT

Aluminum is 1/3 the weight of steel and, therefore, less structural support is required.

NON-TOXIC

Aluminum is friendly to foods, beverages and medicines. Cast Aluminum Blowers are used in many food processing applications where cleanliness is important.

STRONG

Aluminum's strength is exhibited in products such as high-way guard rails, truck trailers and baseball bats. In high

speed blower wheels, aluminum is alloyed with magnesium and other metals for greater strength.

ATTRACTIVE

Aluminum's natural appearance is desirable. No other metal accepts a greater variety of finishes. It can be brushed, buffed, colored by anodizing and has excellent paint adhesion.

NON-MAGNETIC

Resists magnetism even in magnetic fields making it ideal in electronic applications where prevention of interference is very important.

WORKABLE

Aluminum can be machined by every known metal working process. This makes future modifications easier.

NOT AFFECTED BY COLD

Unlike many materials that become brittle when super cold, aluminum alloys can actually become stronger. Cast aluminum blowers are used in many sub-zero applications.

AVAILABLE

Approximately eight percent of the earth's crust contains aluminum, making it the most common metal on earth.

SUGGESTED SPECIFICATIONS FOR CAST ALUMINUM BLOWERS

Blowers shall be cast with commercial grade 319 cast aluminum, having a 3/16" minimum wall thickness. Housing halves should be attached with tapered lugs having a minimum 45 degree taper from centerline for additional strength. Inlets and outlets shall be round for convenient slip fit of duct work or hose. Blower sizes 14A and larger shall have a reversible housing that is rotatable. Blowers shall be AMCA type B spark resistant or better. Blower performance shall be derived from data as tested per AMCA Standard 210.

Blower wheels with tip speeds up to 13,000 feet per minute shall be 319 cast aluminum. Blower wheels with tip speeds over 13,000 feet per minute shall be 356 aluminum with a T6 heat treatment. Wheel hub shall be an integral part of the wheel casting. Wheels shall be locked onto the motor or fan shaft with two, knurled, cup point set screws with a locking patch or nylon insert. Set screws shall be 90° – 120° apart with one over shaft keyway. Up to 13" diameter wheels shall have 5/16-18 set screws torqued to 165 inch pounds. Wheels over 13" in diameter shall have 3/8-16 set screws torqued to 228 inch pounds.

Balancing shall be accomplished by removal of material only —no additional weights are to be used in the balancing process. Wheel diameters up to 13" shall

be statically balanced. Wheel diameters above 13" shall be dynamically balanced.

Fan motor and bearing cap vibration levels shall not exceed 1.5 mils displacement at 3450 RPM.

All fan bases shall be a minimum of 12 gauge steel.

All motors shall be continuous duty type.

Inlet or outlet flanges (if required) shall be 319 cast aluminum and shall meet ANSI bolt circle and outside diameter dimensions (see dimensions on page 21).

DANGER

All fans & blowers shown have rotating parts and pinch points. Severe personal injury can result if operated without guards. Stay away from rotating equipment unless it is disconnected from its power source.

Read operating instructions.

HOW TO SELECT A CINCINNATI PB BLOWER

A word about ratings...

Thirty years ago Cincinnati Fan manufactured one size blower and one size wheel. Today we stock eight sizes of blower housings and fifty-seven wheel sizes. Four of our eight housings are each available with three different inlet sizes. By combining different housings, wheels and inlet sizes, we can offer you more standard direct drive pressure blower ratings than any other fan company in the world. Because we have so many direct drive ratings, chances are good that we can meet your requirements with a compact, cost efficient direct drive Cincinnati PB instead of a heavier, more expensive V-belt driven alternative.

Your Cincinnati Fan Representative is a ratings expert who is ready to help you select precisely the right PB blower for your application.

How to use the PB Series Direct-Drive Rating Tables

If you know the static pressure and CFM required for your blower application, you can determine which PB blowers you should consider by referring to the tables on Pages 8 and 9 of this catalog. To use the tables, follow these simple directions:

1. Reading to the right, find the column heading which displays the static pressure (SP) you require.
2. Reading down that column, find the line(s) displaying the CFM rating(s) which will satisfy your requirement.
3. Follow the line(s) to the left side of the table, where you will identify the wheel(s) and the blower housing model(s) used to achieve the CFM rating(s).

You may find that several ratings come close to meeting your requirements. Generally, the rating with the lowest brake horsepower requirement (BHP) is the best selection (highest efficiency, least noise). In some situations, other requirements, such as blower dimensions and/or specific inlet/outlet sizes, may override the lower horsepower rule-of-thumb. **Your Cincinnati Fan Representative is available to assist you with selection and pricing information.**

Some DOs and DON'Ts

- DO...** consider that radial blades are self-cleaning in most applications. Backward curved (BC) blades are not self-cleaning and may collect dust which can cause balance problems.
- DO...** specify heat-resistant construction (steel wheel) for use with airstreams having temperatures exceeding 200° F (93° C). BC wheels are not available in steel.

W A R N I N G

- DO NOT** use a steel wheel and/or a steel blower housing in any type of environment where sparks could cause an explosion and/or fire. **See Page 5.**
- DO NOT** use any blower with an unducted inlet and/or outlet without an inlet and/or outlet guard. Severe personal injury could result. **See Page 7 for guard accessory.**

8 STANDARD DISCHARGE POSITIONS AVAILABLE. 45° DISCHARGE POSITIONS AT ADDITIONAL CHARGE.
Discharges shown are determined by viewing fan from motor or drive side.



Clockwise Top
Horizontal
Discharge



Clockwise
Down-Blast
Discharge



Clockwise
Bottom
Horizontal
Discharge



Clockwise
Up-Blast
Discharge



Counter-
Clockwise Top
Horizontal
Discharge



Counter-
Clockwise
Down-Blast
Discharge



Counter-
Clockwise
Bottom
Horizontal
Discharge



Counter-
Clockwise
Up-Blast
Discharge

SPARK-RESISTANT CONSTRUCTION

Type A: All parts in contact with airstream are of nonferrous material. Blind bore in wheel and brass hardware in airstream. **Maximum Temperature 200°F.**

Type B: Standard on all PBs. Aluminum wheel and aluminum rubbing ring on motor shaft or fan shaft. **Maximum Temperature up to 400°F except if with EXP motor, maximum temperature is 150°F.**

⚠ WARNING

The use of aluminum or aluminum alloys in the presence of steel which has been allowed to rust requires special consideration. Research by the U.S. Bureau of Mines and others has shown that aluminum impellers rubbing on rusty steel may cause high intensity sparking.

The use of the above Standard in no way implies a guarantee of safety for any level of spark resistance. Spark-resistant construction also does not protect against ignition of explosive gases caused by catastrophic failure or from any airstream material that may be present in a system.

HIGH TEMPERATURE CONSTRUCTION

MODEL PB: Arrangements 2, 4 & 4HM

Up To 150° F. Standard fan construction.

151 - 400° F. Standard fan with heat slinger and slinger guard. External hub on wheel or a shaft extension may be required (except on Arr. 2). Wheel is either high temperature cast aluminum or fabricated steel. **NOTE: No BC type steel wheels.**

Arrangements 1, 8 and 9

Up To 200° F. Standard fan construction.

201 - 300° F. Standard fan with high temperature cast aluminum wheel or fabricated steel wheel. **NOTE: No BC type steel wheels.**

301 - 400° F. Standard fan with heat slinger and slinger guard. Wheel is either high temperature cast aluminum or fabricated steel.

NOTE: No BC type steel wheels.

MODEL PBS: Arrangements 2, 4 & 4HM

Up To 200° F. Standard fan construction. **NOTE: No BC type steel wheels.**

201 - 400° F. Standard fan with heat slinger and slinger guard. External hub on wheel (except on Arr. 2). **NOTE: No BC type steel wheels.**

Arrangements 1, 8 and 9

Up To 300° F. Standard fan construction. **NOTE: No BC type steel wheels.**

301 - 400° F. Standard fan with heat slinger and slinger guard. **NOTE: No BC type steel wheels.**

401 - 600° F. Standard fan with heat slinger, slinger guard, fiberfrax shaft seal, high temperature aluminum paint and silicone gasketing.

NOTE: No BC type steel wheels.

601 - 750° F. Standard fan with heat slinger, slinger guard, fiberfrax shaft seal and gasketing, high temperature aluminum paint and 316SS fan shaft. **NOTE: No BC type steel wheels.**

TEMPERATURE - ALTITUDE CONVERSIONS

AIR TEMP. F	ALTITUDE IN FEET ABOVE SEA LEVEL										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
0°	.87	.91	.94	.98	1.01	1.05	1.09	1.13	1.17	1.22	1.26
40°	.94	.98	1.02	1.06	1.10	1.14	1.19	1.23	1.28	1.32	1.36
70°	1.00	1.04	1.08	1.12	1.16	1.20	1.25	1.30	1.35	1.40	1.45
80°	1.02	1.06	1.10	1.14	1.19	1.23	1.28	1.33	1.38	1.43	1.48
100°	1.06	1.10	1.14	1.19	1.23	1.28	1.33	1.38	1.43	1.48	1.54
120°	1.09	1.14	1.18	1.23	1.28	1.32	1.38	1.43	1.48	1.53	1.58
140°	1.13	1.18	1.22	1.27	1.32	1.37	1.42	1.48	1.54	1.58	1.65
160°	1.17	1.22	1.26	1.31	1.36	1.42	1.47	1.53	1.59	1.64	1.70
180°	1.21	1.26	1.30	1.36	1.41	1.46	1.52	1.58	1.64	1.70	1.75
200°	1.25	1.29	1.34	1.40	1.45	1.51	1.57	1.63	1.69	1.75	1.81
250°	1.34	1.39	1.45	1.50	1.56	1.62	1.68	1.74	1.82	1.88	1.94
300°	1.43	1.49	1.55	1.61	1.67	1.74	1.80	1.87	1.94	2.00	2.08
350°	1.53	1.59	1.65	1.72	1.78	1.85	1.92	2.00	2.07	2.14	2.22
400°	1.62	1.69	1.75	1.82	1.89	1.96	2.04	2.12	2.20	2.27	2.35
450°	1.72	1.79	1.86	1.93	2.00	2.08	2.16	2.24	2.33	2.41	2.50
500°	1.81	1.88	1.96	2.03	2.11	2.19	2.28	2.36	2.46	2.54	2.62
550°	1.91	1.98	2.06	2.14	2.22	2.30	2.40	2.49	2.58	2.68	2.77
600°	2.00	2.08	2.16	2.24	2.33	2.42	2.50	2.61	2.71	2.80	2.90
650°	2.10	2.18	2.26	2.35	2.44	2.54	2.63	2.74	2.84	2.94	3.04
700°	2.19	2.27	2.36	2.46	2.55	2.65	2.75	2.86	2.97	3.06	3.18
750°	2.28	2.37	2.47	2.56	2.66	2.76	2.87	2.98	3.10	3.19	3.31

Fan performance tables are developed using standard air which is 70°F., 29.92" barometric pressure and .075 lbs. per cubic foot. Density changes resulting from temperature or barometric pressure variations (such as higher altitudes) must be corrected to standard conditions before selecting a fan based on standard performance data. Temperature and/or altitude conversion factors are used in making corrections to standard conditions.

EXAMPLE:

Select a belt driven PB-15A to deliver 1500 CFM at 8.6" SP at 200°F., and 7000' altitude.

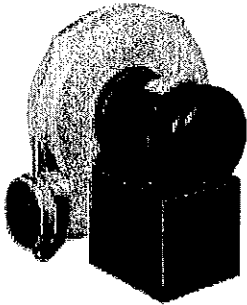
STEP 1. From the table, conversion factor is 1.63.

STEP 2. Correct static pressure is: 1.63 x 8.6" SP = 14" SP at standard conditions.

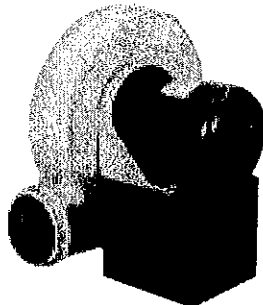
STEP 3. Check PB catalog for 1500 CFM at 14" SP. We select a belt driven PB-15A and interpolation gives 3456 RPM and 5.15 BHP.

STEP 4. Correct the BHP for the lighter air: 5.15 ÷ 1.63 = 3.16 BHP. A 5 HP motor will suffice at 200°F., and 7000' but not at standard conditions. Special motor insulation may be required above 3500 feet altitude. Consult Factory.

9 STANDARD ARRANGEMENTS



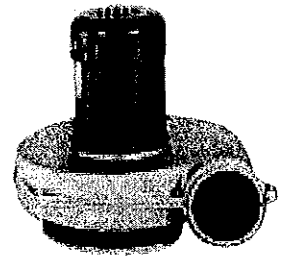
Arrangement 4
(Foot & flange motor)



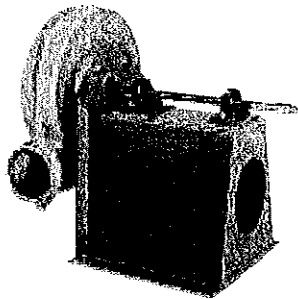
Arrangement 4
(Flange mount-footless motor)



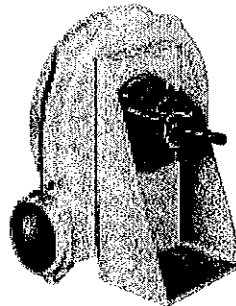
Arrangement 4
(Foot mounted motor)



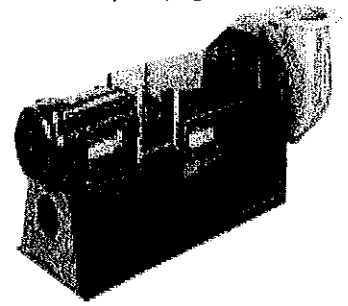
Arrangement 4HM
(Horizontal mount)
(See page 18)



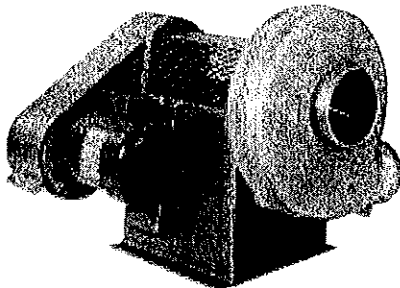
Arrangement 1



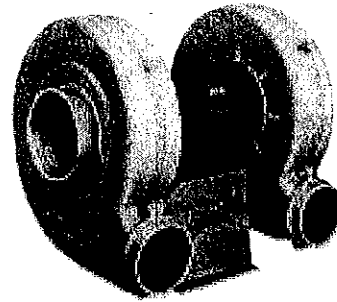
Arrangement 2



Arrangement 8

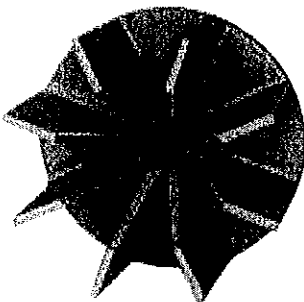


Arrangement 9

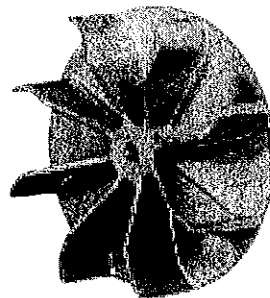


Arrangement 4D
(Double blower unit)

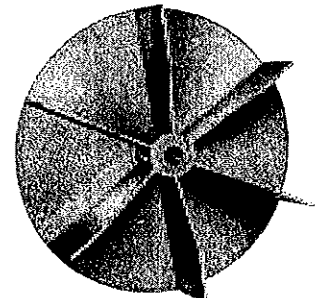
BLOWER WHEELS



CAST ALUMINUM RADIAL



CAST ALUMINUM B.C.
(Backward Curve)



**OPTIONAL FABRICATED
STEEL or STAINLESS STEEL**
(Not available in B.C.)

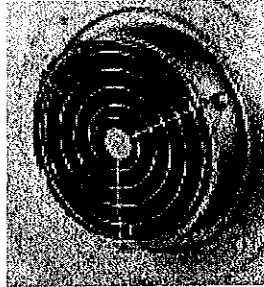
All wheels have two set screws, 90°-120° apart, with one being over keyway. Up to 13" diameter wheels are dynamically, single plane balanced. Wheels over 13" in diameter are dynamically, 2 plane balanced. Use steel wheel for high abrasive or high temperature application above 200°F. (93° C). Stainless steel or coated wheels should be used in corrosive environments.

See page 22 for max. wheel size with steel housings

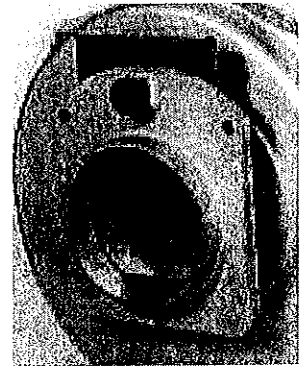
OPTIONAL ACCESSORIES



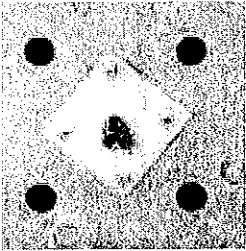
INLET/OUTLET FLANGE
Cast aluminum drilled to ANSI-125 pound flange bolt circle dimensions if requested. Outlet flange not available in downblast configuration. See dimensions on page 21.



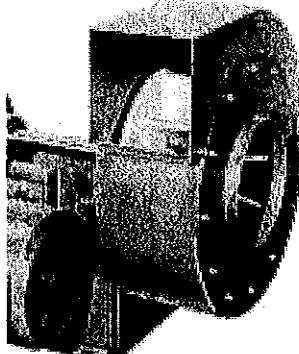
INLET/OUTLET GUARD
Spiral guard with nickel/chrome/lacquer finish. OSHA type. Available on 4, 5, 6, 7, 8 and 10 inch inlets or outlets. Required by OSHA on non-ducted inlet and/or discharge.



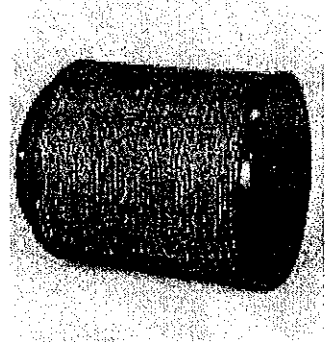
SLIDE GATE DAMPER
Available for 4, 5, 6, 7, 8 and 10 inch inlets or outlets. Cast aluminum frame, galvanized steel gate. Suitable for duct work. Dimensions on page 21. Add inlet/outlet guard if not ducted. Not available on downblast discharge position.



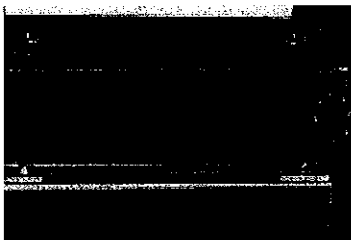
TEFLON SHAFT SEAL
1/8" thick tefflon shaft seal good to 400°F. Ceramic fiber gasket material with steel cover plate above 400°F.



STEEL HOUSING
For high abrasive or high temperature applications. Also in 304 or 316 stainless steel for corrosive environments. 10 gauge steel. Rotatable not reversible. See page 22 for dimensions and max wheel sizes. Not available on model PB-8.



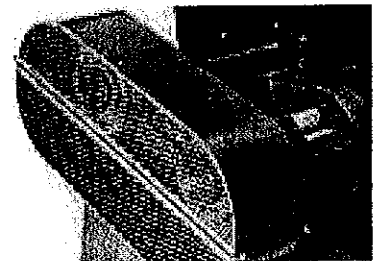
INLET FILTERS
Many layered fine wire mesh. Pleated paper media available on some sizes.



SHAFT and/or HEAT SLINGER GUARD
Available on arrangement 1 and 9. Covers bearings and shaft between fan housing and belt guard. Has extended lube lines. Meets OSHA standards.



DRAIN
1/2" drain with plug on PB series. 3/4" NPT with plug on PBS series. Not required on bottom horizontal discharges.



BELT GUARD—STANDARD ARR. 9
Bearing side is enclosed. Not available unless Cincinnati Fan mounts motor.



PB SERIES DIRECT DRIVE RATING TABLES at 3450 RPM

CFM and BHP at Static Pressure Shown

Ratings at 70°F., .075 Density, Sea Level

MODEL NO.	WHEEL DIA. & WIDTH	O.D. INLET SIZE	1" SP		2" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP		
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
PB-8	7 x 2 1/8	4"	280	30	230	26	140	24											
	8 x 2 3/4		343	36	294	33	227	28	125	23									
PB-9	8 x 2 3/4	5"	388	39	341	36	287	32	160	25									
	8 1/2 x 2 3/4		435	46	385	41	325	37	240	33									
	9 x 2 7/8		490	52	450	48	380	42	310	37									
	10 1/4 x 3 BC		515	57	460	50	403	45	347	42	284	39	210	33					
	9 3/4 x 2 7/8		550	82	500	75	450	71	390	66	340	60	260	51					
	10 3/8 x 2 5/8		590	83	555	79	510	75	460	65	412	59	365	52	287	44			
PB-10A	9 x 2 7/8	6"	577	70	500	64	427	58	319	49									
	10 1/4 x 3 BC		609	78	544	71	480	65	397	59	295	53	124	42					
	9 3/4 x 2 7/8		706	1.04	649	.94	594	.89	519	.82	422	.72	321	.63					
	11 x 3 BC		732	1.07	680	1.00	637	.97	583	.88	506	.80	424	.71	302	.60			
	10 3/8 x 2 5/8		826	1.39	764	1.30	697	1.23	643	1.13	555	1.05	475	.97	364	.84			
	11 x 2 3/4		827	1.43	779	1.33	725	1.23	672	1.15	609	1.08	532	.97	449	.88	298	.68	
11 1/2 x 2 1/8	886	1.55	835	1.46	783	1.37	716	1.30	647	1.22	583	1.13	509	1.04	409	.93			
PB-12A	11 x 3 BC	7"	874	1.10	805	1.03	733	.98	639	.88	541	.81	418	.71	177	.52			
	10 3/8 x 2 5/8		1068	1.65	988	1.53	893	1.41	797	1.28	678	1.16	551	.98	374	.79			
	11 x 2 3/4		1166	1.93	1067	1.83	972	1.71	876	1.57	760	1.41	634	1.21	481	1.03			
	11 1/2 x 2 1/8		1259	2.44	1182	2.28	1089	2.12	994	1.97	899	1.82	797	1.68	683	1.52	550	1.30	
	12 x 2 7/8		1307	2.54	1223	2.42	1139	2.29	1053	2.15	964	2.01	874	1.85	783	1.71	679	1.58	
	13 x 3 1/4 BC		1294	2.58	1236	2.49	1163	2.39	1095	2.29	1018	2.18	945	2.08	868	1.96	793	1.84	
	12 1/4 x 2 7/8		1350	2.93	1276	2.75	1201	2.58	1116	2.41	1016	2.23	935	2.06	839	1.91	743	1.74	
	12 1/4 x 2 7/8		1446	3.17	1377	3.04	1307	2.92	1222	2.80	1148	2.66	1060	2.48	976	2.31	890	2.18	
	13 x 3 3/4																		
PB-14A	13 x 3 1/4 BC	6"	1315	2.48	1247	2.39	1179	2.30	1111	2.21	1034	2.11	948	1.97	854	1.81	737	1.61	
	13 x 3 3/4 BC	7"	1360	2.47	1282	2.39	1206	2.29	1133	2.18	1060	2.07	964	1.94	860	1.80	744	1.65	
	13 x 3 3/4 BC	8"	1414	2.50	1326	2.43	1239	2.32	1151	2.20	1063	2.09	969	1.96	868	1.81	762	1.66	
	12 1/4 x 2 7/8	6"	1486	2.95	1397	2.80	1307	2.65	1213	2.52	1106	2.33	999	2.14	884	1.96	745	1.74	
	13 x 3 3/4	6"	1504	3.56	1439	3.41	1373	3.27	1308	3.14	1242	3.01	1165	2.83	1079	2.61	976	2.39	
	12 1/4 x 2 1/8	6"	1575	3.33	1476	3.16	1377	2.99	1286	2.91	1178	2.74	1058	2.38	927	2.21	766	1.85	
	14 x 3 1/4 BC	6"	1594	3.87	1520	3.73	1447	3.59	1369	3.43	1291	3.27	1213	3.11	1135	2.95	1041	2.75	
	13 x 3 3/4	7"	1571	3.65	1502	3.50	1433	3.35	1371	3.21	1311	3.07	1228	2.87	1134	2.66	1022	2.44	
	12 1/4 x 2 7/8	8"	1624	3.45	1528	3.30	1433	3.15	1328	2.95	1222	2.73	1097	2.55	948	2.30	776	2.05	
	13 x 3 3/4	8"	1630	3.77	1560	3.60	1491	3.42	1425	3.26	1363	3.09	1262	2.88	1167	2.67	1031	2.47	
	14 x 3 3/4 BC	7"	1670	4.07	1587	3.88	1510	3.73	1426	3.56	1338	3.40	1249	3.22	1160	3.05	1071	2.89	
	14 x 3 3/4	6"	1649	4.65	1598	4.51	1548	4.36	1492	4.20	1412	3.96	1335	3.84	1258	3.76	1183	3.54	
	14 x 3 3/4 BC	8"	1738	4.10	1658	3.95	1578	3.79	1493	3.64	1406	3.50	1313	3.31	1215	3.11	1122	2.94	
	14 x 3 3/4	7"	1829	5.20	1769	5.00	1709	4.79	1649	4.58	1570	4.40	1475	4.16	1377	3.77	1287	3.62	
	14 x 4	6"	1860	5.81	1791	5.63	1723	5.47	1656	5.30	1589	5.14	1526	4.97	1467	4.82	1404	4.65	
	14 x 3 3/4	8"	2002	5.49	1915	5.27	1827	5.06	1740	4.85	1646	4.62	1543	4.37	1435	4.10	1314	3.77	
	14 1/4 x 4	7"	1984	6.32	1918	6.14	1856	5.99	1784	5.75	1702	5.52	1620	5.26	1546	5.06	1473	4.86	
	14 1/4 x 4	8"	2103	6.81	2046	6.62	1972	6.40	1878	6.01	1788	5.69	1702	5.38	1614	5.10	1523	4.85	
PB-15A (1) USE 182T FRAME MIN	14 x 3 3/4 BC	6"	1778	3.45	1690	3.60	1602	3.27	1494	3.06	1377	2.87	1253	2.70	1131	2.55	1002	2.32	
	14 x 3 3/4 BC	8"	2109	4.34	2002	4.15	1882	3.91	1763	3.62	1614	3.34	1447	3.06	1266	2.74	1083	2.46	
	14 x 3 3/4 BC	10"	2171	4.41	2051	4.21	1916	3.97	1797	3.76	1639	3.44	1459	3.05	1277	2.77	1083	2.53	
	15 1/2 x 5 BC	6"	2059	5.38	1974	5.21	1889	5.03	1809	4.81	1711	4.64	1603	4.50	1524	4.32	1448	4.15	
	14 x 3 3/4	6"	2207	5.73	2127	5.62	2039	5.47	1917	5.24	1808	5.03	1725	4.83	1616	4.49	1479	4.14	
	16 1/2 x 4 1/4 BC	6"	2247	6.47	2188	6.38	2119	6.27	2038	6.12	1948	5.94	1846	5.71	1716	5.35	1631	5.17	
	15 1/2 x 5	6"	2382	8.22	2312	8.03	2241	7.84	2182	7.72	2105	7.51	2017	7.25	1928	6.99	1851	6.82	
	15 1/2 x 5 BC	8"	2688	7.37	2576	7.14	2448	6.86	2319	6.55	2193	6.19	2063	5.82	1934	5.45	1803	5.11	
	16 1/2 x 4 3/4	8"	2616	9.83	2552	9.65	2483	9.45	2413	9.25	2337	9.02	2257	8.79	2177	8.55	2098	8.31	
	14 x 3 3/4	8"	2930	8.01	2781	7.62	2626	7.24	2467	6.86	2314	6.39	2137	5.94	1958	5.48	1795	5.00	
	16 1/2 x 4 3/4 BC	6"	2707	7.78	2635	7.66	2554	7.48	2470	7.27	2385	7.03	2282	6.76	2172	6.48	2062	6.20	
	15 1/2 x 5 BC	8"	2812	7.85	2704	7.60	2591	7.29	2472	6.94	2344	6.64	2202	6.23	2055	5.78	1901	5.34	
	16 1/2 x 4 3/4 BC	10"	2814	7.85	2748	7.69	2673	7.52	2587	7.32	2476	7.10	2362	6.86	2244	6.56	2126	6.26	
	14 x 3 3/4	10"	2983	8.36	2866	8.02	2742	7.66	2602	7.26	2444	6.79	2276	6.29	2085	5.78	1837	5.12	
	15 1/2 x 5	8"	3262	11.83	3154	11.45	3046	11.08	2939	10.68	2830	10.30	2714	9.95	2588	9.45	2459	8.91	
	15 1/2 x 5	10"	3459	12.83	3368	12.47	3277	12.10	3175	11.65	3060	11.09	2938	10.54	2786	10.02	2622	9.42	
	16 1/2 x 4 3/4	8"	3610	13.72	3521	13.44	3431	13.16	3339	12.87	3239	12.58	3118	12.13	2995	11.66	2871	11.18	
	16 1/2 x 4 3/4	10"	3696	14.22	3633	14.04	3549	13.86	3465	13.62	3345	13.28	3215	12.94	3023	12.49	2979	11.99	
PB-18 USE 182T FRAME MIN.	14 x 3 3/4 BC	6"	1140	2.75	1098	2.71	1041	2.68	979	2.61	914	2.56	861	2.47	806	2.42	725	2.33	
	14 x 3 3/4	8"	1385	4.15	1339	4.10	1290	4.02	1234	3.93	1167	3.77	1112	3.63	1055	3.51	989	3.45	
	14 x 3 3/4 BC	6"	1510	3.72	1450	3.64	1383	3.52	1307	3.39	1235	3.21	1145	3.05	1051	2.90	959	2.75	
	16 1/2 x 4 3/4 BC	6"	1536	5.48	1492	5.46	1449	5.37	1407	5.28	1361	5.23	1316	5.17	1261	5.02	1206	4.86	
	14 x 3 3/4 BC	10"	1593	3.83	1513	3.68	1440	3.56	1351	3.38	1268	3.23	1193	3.03	1098	2.93	1010	2.82	
	18 x 4 3/4 BC	6"	1595	6.35	1550	6.29	1508	6.27	1460	6.15	1418	6.07	1376	6.00					



PB SERIES DIRECT DRIVE RATING TABLES at 3450 RPM

(Continued from Page 8)

MODEL NO.	WHEEL DIA. & WIDTH	O.D. INLET SIZE	9" SP		10" SP		11" SP		12" SP		14" SP		16" SP		18" SP		20" SP *		
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
PB-12A	12 x 2 1/4	7"	550	1.34															
	12 1/4 x 2 1/4		637	1.55	432	1.25													
	13 x 3 1/4 BC		704	1.69	582	1.59	346	1.26											
	13 x 3 1/4		805	2.05	725	1.85	568	1.57											
PB-14A	12 1/4 x 2 1/4	7"	565	1.44															
	12 1/4 x 2 1/4	8"	576	1.75															
	12 1/4 x 2 1/4	6"	573	1.46	231	.88													
	13 x 3 1/4 BC	6"	587	1.38	430	1.13													
	13 x 3 1/4 BC	8"	602	1.42	405	1.10													
	13 x 3 1/4 BC	7"	615	1.48	421	1.10													
	13 x 3 1/4	6"	859	2.17	719	1.90													
	13 x 3 1/4	8"	880	2.16	707	1.79													
	13 x 3 1/4	7"	877	2.18	728	1.90													
	14 x 3 1/4 BC	6"	944	2.55	839	2.33	698	2.01	495	1.56									
	14 x 3 1/4 BC	7"	974	2.68	863	2.41	743	2.11	580	1.68									
	14 x 3 1/4 BC	8"	1028	2.78	891	2.49	739	2.16	533	1.68									
	14 x 3 1/4	6"	1108	3.31	1014	3.04	910	2.75	785	2.28									
	14 x 3 1/4	7"	1189	3.42	1080	3.13	951	2.85	795	2.48									
	14 x 3 1/4	8"	1194	3.46	1080	3.23	949	2.87	788	2.44									
	14 3/4 x 4	6"	1309	4.39	1215	4.14	1120	3.88	1007	3.56	777	2.90							
14 3/4 x 4	7"	1382	4.60	1289	4.34	1195	4.07	1102	3.80	799	2.92								
14 3/4 x 4	8"	1431	4.61	1340	4.37	1249	4.12	1126	3.79	834	3.01								
PB-15A (1)	14 x 3 1/4 BC	10"	870	2.21	606	1.86													
	14 x 3 1/4 BC	6"	858	2.03	661	1.86	458	1.60											
	14 x 3 1/4 BC	8"	908	2.29	683	1.92	320	1.35											
	14 x 3 1/4	6"	1336	3.87	1179	3.55	1008	3.17	767	2.53									
	15 1/2 x 5 BC	6"	1350	4.00	1248	3.77	1132	3.50	973	3.20	610	2.41							
	14 x 3 1/4	8"	1594	4.47	1342	3.87	1070	3.27	778	2.59									
	14 x 3 1/4	10"	1646	4.55	1369	3.85	1102	3.32											
	16 1/2 x 4 3/4 BC	6"	1547	4.99	1453	4.81	1335	4.60	1227	4.35	904	3.53	397	2.52					
	15 1/2 x 5 BC	8"	1682	4.85	1517	4.48	1371	4.12	1189	3.69	673	2.53							
	15 1/2 x 5 BC	10"	1725	4.91	1535	4.47	1368	4.09	1208	3.71									
	15 1/2 x 5	6"	1770	6.59	1682	6.23	1594	5.87	1485	5.53	1202	4.73	671	3.00					
	16 1/2 x 4 3/4 BC	8"	1945	5.94	1816	5.68	1646	5.32	1475	4.96	1213	4.29	708	2.99					
	16 1/2 x 4 3/4 BC	10"	1992	5.99	1848	5.72	1677	5.37	1506	5.03	1143	4.29	636	2.99					
	16 1/2 x 4 3/4	6"	2018	8.07	1921	7.87	1822	7.69	1729	7.43	1552	6.78	1295	5.84	780	3.77			
	15 1/2 x 5	8"	2298	8.22	2130	7.56	1974	7.02	1822	6.53	1513	5.61	909	3.85					
	15 1/2 x 5	10"	2425	8.60	2247	7.95	2085	7.41	1926	6.89	1571	5.77							
16 1/2 x 4 3/4	8"	2748	10.71	2586	10.22	2399	9.43	2215	8.69	1869	7.61	1541	6.67						
16 1/2 x 4 3/4	10"	2946	11.41	2797	10.79	2624	10.14	2469	9.62	2128	8.48	1734	7.16						
PB-18	14 x 3 1/4 BC	6"	634	2.28	570	2.13	461	1.96	352	1.79									
	14 x 3 1/4 BC	8"	855	2.60	740	2.45	590	2.22	440	1.98									
	14 x 3 1/4 BC	10"	914	2.63	767	2.45	563	2.20											
	14 x 3 1/4	6"	921	3.25	854	3.14	772	2.99	690	2.83									
	16 1/2 x 4 3/4 BC	6"	1145	4.81	1084	4.75	1007	4.62	931	4.48	767	4.28	609	4.05	393	3.51			
	14 x 3 1/4	8"	1200	3.90	1105	3.70	1012	3.55	920	3.40									
	14 x 3 1/4	10"	1244	3.87	1153	2.72	1050	3.56	947	3.40									
	18 x 4 3/4 BC	6"	1243	5.76	1193	5.68	1138	5.55	1084	5.42	995	5.13	844	4.63	694	4.12	543	3.62	
	16 1/2 x 4 3/4 BC	8"	1480	5.90	1405	5.75	1322	5.58	1240	5.40	1030	5.00	800	4.45	460	3.70			
	16 1/2 x 4 3/4	6"	1465	6.31	1418	6.11	1367	5.89	1316	5.67	1193	5.32	1041	4.85	825	4.22			
	16 1/2 x 4 3/4 BC	10"	1628	6.40	1533	6.17	1447	5.94	1362	5.70	1180	5.13	947	4.69	528	3.91			
	18 x 4 3/4	6"	1644	8.37	1602	8.19	1557	8.04	1513	7.89	1429	7.53	1316	7.11	1180	6.60	963	5.94	
	18 x 4 3/4 BC	8"	1745	7.70	1680	7.40	1605	7.13	1530	6.85	1370	6.30	1200	5.65	1005	5.05	720	4.10	
	16 1/2 x 4 3/4	8"	1840	8.10	1770	7.90	1705	7.65	1640	7.40	1490	6.70	1350	6.10	1110	5.10			
	16 1/2 x 4 3/4	10"	2049	9.09	1974	8.93	1888	8.65	1803	8.37	1650	7.76	1482	7.19	1244	6.45			
	18 x 4 3/4 BC	10"	2088	8.69	2021	8.40	1941	8.02	1861	7.63	1669	6.99	1553	6.44	1316	5.82	1026	4.99	
18 x 4 3/4	8"	2140	10.55	2080	10.20	2015	9.95	1950	9.70	1810	9.10	1680	8.60	1550	8.00	1360	7.30		
18 x 4 3/4	10"	2417	11.22	2346	10.94	2278	10.74	2211	10.53	2044	9.98	1878	9.30	1705	8.66	1513	7.81		
PB-18WA	15 1/2 x 5 BC	10"	1646	5.31	1446	4.91	1246	4.51	1057	4.12	525	3.24							
	16 1/2 x 5 BC	8"	1747	6.03	1635	5.80	1508	5.55	1377	5.28	1075	4.64	734	3.95					
	15 1/2 x 5	8"	1879	6.94	1754	6.59	1627	6.23	1468	5.86	1112	5.01	631	3.85					
	16 1/2 x 5 BC	10"	1967	6.62	1830	6.29	1670	5.97	1509	5.64	1105	4.81	537	3.68					
	16 1/2 x 5	8"	2251	8.92	2141	8.59	2033	8.25	1901	7.91	1616	7.20	1325	6.37	868	5.11			
	15 1/2 x 5	10"	2348	8.25	2126	7.65	1936	7.19	1758	6.78	1349	5.78	751	4.44					
	17 x 6	8"	2303	9.86	2190	9.60	2076	9.35	1969	9.09	1746	8.51	1442	7.65	1207	6.86			
	16 1/2 x 5	10"	2779	11.61	2614	11.00	2448	10.40	2276	9.82	1922	8.69	1528	7.59	1104	6.34			
17 x 6	10"	2846	11.98	2708	11.64	2574	11.29	2447	10.91	2137	9.95	1792	8.92	1457	7.86				
18 1/2 x 6	10"	3397	17.71	3294	17.35	3185	16.87	3069	16.25	2877	15.04	2631	14.08	2374	13.25	2087	12.34		

For static pressures above 20", see "HP" Series catalog.

For higher CFM values, see "RBE" Series catalog.

(1) Additional ratings available with 7" inlet. Consult your local CFV representative.



PB SERIES BELT DRIVE RATING TABLES

Ratings at 70°F., .075 Density, Sea Level

PB-8

Outlet Area (Sq. Ft.) 0.087

Wheel Diameter 8"

VOLUME CFM	SP (IN.) WG																			
	.50		1.00		1.50		2.00		2.50		3.00		3.50		4.00		4.50		5.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
50	1231	.01	1711	.03	2089	.05	2408	.08	2690	.10	2944	.14	3178	.17	3396	.20	3601	.24	3795	.28
100	1447	.02	1838	.04	2168	.06	2463	.09	2727	.12	2976	.15	3208	.19	3421	.23	3625	.27	3818	.31
150	1743	.04	2093	.07	2384	.10	2637	.12	2871	.15	3093	.19	3304	.22	3502	.26	3694	.30	3876	.35
200	2111	.08	2390	.11	2656	.14	2894	.18	3111	.21	3309	.25	3495	.29	3676	.33	3847	.37		
250	2574	.15	2726	.17	2958	.21	3180	.25	3382	.29	3572	.33	3751	.38	3919	.42				
300	3046	.25	3143	.27	3295	.30	3486	.34	3679	.39	3858	.44								
350	3523	.38	3608	.40	3689	.43	3830	.47	3994	.52										

4" O.D. INLET

PB-9

Outlet Area (Sq. Ft.) 0.087

Wheel Diameter 9"

VOLUME CFM	SP (IN.) WG																			
	1.00		1.50		2.00		2.50		3.00		3.50		4.00		4.50		5.00		6.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
50	1514	.02	1854	.04	2143	.06	2396	.09	2624	.12	2833	.15	3027	.17	3210	.20	3383	.24	3708	.31
100	1564	.03	1876	.05	2151	.07	2455	.11	2662	.14	2863	.17	3050	.20	3226	.23	3392	.27	3712	.34
150	1710	.05	1988	.07	2232	.09	2455	.11	2662	.14	2863	.17	3050	.20	3226	.23	3392	.27	3712	.34
200	1894	.07	2152	.09	2379	.12	2584	.15	2772	.17	2956	.21	3129	.24	3291	.27	3444	.31	2753	.39
250	2108	.10	2341	.13	2553	.16	2749	.19	2930	.22	3100	.26	3259	.29	3409	.33	3559	.37	3843	.45
300	2351	.15	2553	.18	2749	.21	2930	.25	3104	.28	3267	.32	3420	.36	3568	.40	3709	.44	3972	.52
350	2640	.22	2793	.25	2965	.28	3134	.32	3296	.36	3447	.40	3597	.44	3740	.49	3875	.53		
400	2958	.31	3053	.34	3205	.37	3356	.41	3502	.45	3650	.50	3789	.54	3921	.59				
450	3280	.43	3368	.46	3453	.48	3597	.53	3733	.57	3861	.62	3994	.67						
500	3606	.58	3687	.61	3765	.64	3845	.67	3975	.72										
550	3935	.76																		

5" O.D. INLET

PB-10A

Outlet Area (Sq. Ft.) 0.136

Wheel Diameter 10.625"

VOLUME CFM	SP (IN.) WG																			
	1.00		2.00		3.00		4.00		5.00		6.00		7.00		8.00		9.00		10.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
100	1288	.04	1806	.10	2204	.17	2539	.25	2835	.33	3101	.43	3348	.53	3576	.64	3791	.76	3995	.88
200	1421	.07	1852	.13	2241	.21	2576	.31	2872	.41	3139	.53	3384	.64	3613	.77	3827	.90		
300	1667	.12	2050	.21	2362	.30	2648	.40	2909	.50	3176	.63	3421	.76	3650	.90	3865	1.05		
400	1983	.23	2296	.32	2595	.44	2843	.55	3076	.68	3299	.80	3509	.93	3705	1.05	3902	1.20		
500	2310	.38	2579	.49	2837	.61	3092	.76	3307	.89	3504	1.03	3697	1.19	3878	1.35				
600	2626	.58	2920	.75	3115	.85	3335	1.00	3554	1.17	3759	1.35	3935	1.51						
700	2958	.86	3244	1.06	3459	1.24	3622	1.35	3806	1.50	3995	1.69								
800	3295	1.20	3565	1.45	3796	1.68	3967	1.86												
900	3635	1.64	3885	1.91																

6" O.D. INLET

PB-12A

Outlet Area (Sq. Ft.) 0.196

Wheel Diameter 12.250"

VOLUME CFM	SP (IN.) WG																			
	2.00		3.00		4.00		5.00		6.00		7.00		8.00		9.00		10.00		12.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
100	1508	.08	1840	.14	2120	.21	2366	.28	2589	.37	2794	.45	2985	.55	3164	.65	3333	.75	3648	.98
200	1545	.11	1874	.18	2152	.26	2398	.35	2621	.44	2826	.54	3016	.65	3196	.76	3365	.86	3680	1.13
300	1625	.16	1927	.25	2192	.34	2437	.44	2658	.54	2861	.65	3050	.76	3228	.88	3397	1.01	3713	1.28
400	1768	.24	2033	.33	2272	.43	2499	.54	2705	.66	2902	.79	3091	.92	3268	1.05	3436	1.19	3749	1.48
500	1926	.35	2181	.46	2401	.57	2604	.68	2792	.80	2981	.95	3157	1.09	3322	1.24	3478	1.39	3790	1.55
600	2100	.49	2338	.62	2553	.76	2746	.89	2922	1.02	3092	1.16	3251	1.30	3409	1.45	3565	1.62	3855	1.97
700	2286	.67	2506	.81	2712	.97	2900	1.13	3073	1.28	3234	1.44	3385	1.59	3532	1.75	3673	1.91	3943	2.25
800	2458	.87	2696	1.07	2878	1.22	3060	1.40	3230	1.59	3388	1.77	3536	1.95	3676	2.12	3810	2.29		
900	2648	1.13	2872	1.36	3067	1.56	3228	1.72	3391	1.92	3546	2.13	3692	2.35	3830	2.55	3962	2.75		
1000	2856	1.47	3046	1.67	3250	1.94	3418	2.15	3563	2.33	3708	2.54	3852	2.78	3988	3.01				
1100	3068	1.87	3238	2.07	3421	2.34	3603	2.63	3753	2.86	3886	3.05								
1200	3282	2.34	3446	2.57	3597	2.79	3774	3.11	3938	3.43										
1300	3500	2.87	3656	3.14	3801	3.38	3948	3.65												
1400	3721	3.52	3870	3.79																
1500	3945	4.24																		

7" O.D. INLET

PB-14A

Outlet Area (Sq. Ft.) 0.196

Wheel Diameter 14"

VOLUME CFM	SP (IN.) WG																			
	2.00		4.00		6.00		8.00		10.00		12.00		14.00		16.00		18.00		20.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
200	1353	.10	1894	.22	2310	.36	2661	.53	2969	.71	3249	.90	3506	1.11	3745	1.32	3969	1.55		
400	1466	.22	1959	.41	2355	.60	2705	.82	3014	1.04	3293	1.27	3550	1.51	3789	1.76				
600	1670	.40	2104	.66	2481	.95	2789	1.23	3080	1.51	3342	1.79	3595	2.10	3834	2.43				
800	1925	.69	2308	1.03	2635	1.36	2932	1.74	3195	2.12	3453	2.50	3693	2.87	3918	3.25				
1000	2192	1.13	2555	1.51	2849	1.96	3121	2.37	3372	2.80	3609	3.27	3827	3.75						
1200	2494	1.74	2811	2.25	3097	2.67	3341	3.23	3578	3.72	3796	4.20								
1400	2823	2.62	3080	3.12	3352	3.69	3594	4.19	3808	4.84										
1600	3160	3.77	3370	4.23	3615	4.96	3850	5.55												
1800	3502	5.23	3695	5.76	3890	6.37														

7" O.D. INLET

NOTE: DRIVE LOSSES ARE NOT INCLUDED IN BHP.

CONSULT FACTORY FOR SPEEDS HIGHER THAN THOSE SHOWN.

FOR RPMs & BHPs IN BOLD PRINT, DIRECT DRIVE BLOWERS SHOULD BE CONSIDERED.

CONTINUED ON PAGE 11



PB SERIES BELT DRIVE RATING TABLES

(Continued from Page 10)

PB-15A

Outlet Area (Sq. Ft.) 0.349

Wheel Diameter 15.5"

VOLUME CFM	SP (IN.) WG																			
	2.00		4.00		6.00		8.00		10.00		12.00		14.00		16.00		18.00		20.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
200	1200	.12	1690	.28	2066	.46	2383	.67	2662	.89	2916	1.14	3150	1.42	3368	1.73	3572	2.05	3765	2.39
400	1238	.20	1716	.44	2087	.70	2401	.98	2680	1.28	2933	1.59	3165	1.92	3381	2.26	3583	2.61	3776	2.97
600	1316	.32	1760	.61	2120	.93	2432	1.29	2708	1.67	2957	2.06	3186	2.47	3399	2.89	3601	3.32	3793	3.76
800	1445	.50	1840	.85	2179	1.23	2475	1.64	2741	2.06	2990	2.53	3219	3.01	3432	3.50	3632	4.01	3821	4.53
1000	1574	.74	1958	1.16	2262	1.59	2547	2.07	2799	2.56	3038	3.07	3258	3.60	3465	4.14	3665	4.72		
1200	1702	1.06	2087	1.56	2382	2.06	2632	2.57	2882	3.14	3110	3.72	3319	4.31	3520	4.91	3713	5.53		
1400	1857	1.48	2216	2.05	2511	2.64	2759	3.23	2979	3.82	3193	4.45	3402	5.12	3597	5.79	3780	6.47		
1600	2020	2.01	2343	2.65	2639	3.32	2889	4.00	3108	4.67	3306	5.34	3490	6.01	3680	6.76				
1800	2191	2.64	2486	3.39	2769	4.12	3017	4.89	3237	5.64	3435	6.40	3617	7.16	3787	7.90				
2000	2368	3.42	2642	4.29	2896	5.07	3148	5.90	3365	6.76	3564	7.60	3747	8.44						
2200	2550	4.37	2803	5.33	3041	6.21	3274	7.10	3495	8.00	3692	8.95								
2400	2736	5.49	2973	6.51	3197	7.52	3405	8.45	3622	9.45	3822	10.44								
2600	2923	6.78	3145	7.86	3356	9.02	3558	10.05	3750	11.07										
2800	3112	8.28	3323	9.44	3522	10.70	3714	11.86												

8" O.D. INLET

PB-18

Outlet Area (Sq. Ft.) 0.196

Wheel Diameter 18"

VOLUME CFM	SP (IN.) WG																			
	4.00		6.00		8.00		10.00		12.00		14.00		16.00		18.00		20.00		22.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
200	1438	.27	1758	.44	2029	.63	2268	.85	2483	1.09	2682	1.34	2866	1.60	3040	1.87	3204	2.16	3360	2.46
400	1458	.43	1769	.67	2039	.94	2278	1.22	2493	1.51	2691	1.81	2875	2.13	3048	2.45	3212	2.78	3367	3.13
600	1537	.64	1819	.95	2069	1.28	2299	1.63	2507	1.98	2702	2.36	2886	2.75	3059	3.16	3223	3.57	3379	4.00
800	1689	.98	1923	1.31	2148	1.70	2356	2.11	2556	2.55	2739	2.99	2916	3.45	3083	3.91	3241	4.38	3392	4.86
1000	1875	1.47	2087	1.86	2280	2.27	2458	2.70	2641	3.20	2811	3.70	2977	4.23	3137	4.77	3288	5.32	3432	5.88
1200	2069	2.11	2273	2.60	2451	3.07	2615	3.54	2773	4.05	2921	4.56	3073	5.14	3222	5.74	3362	6.35	3500	6.97
1400	2277	2.99	2465	3.52	2638	4.08	2794	4.63	2939	5.18	3078	5.74	3214	6.33	3343	6.93	3467	7.54		
1600	2495	4.11	2668	4.69	2830	5.30	2982	5.94	3123	6.58	3254	7.21	3379	7.83	3500	8.47				
1800	2730	5.56	2880	6.16	3031	6.81	3175	7.50	3312	8.23	3441	8.95	3562	9.66						
2000	2970	7.32	3103	7.95	3242	8.66	3376	9.39	3505	10.15										
2200	3213	9.44	3338	10.15	3457	10.84	3586	11.66												
2400	3459	11.96	3577	12.74																

8" O.D. INLET

PB-18WA

Outlet Area (Sq. Ft.) 0.349

Wheel Diameter 18.5"

VOLUME CFM	SP (IN.) WG																			
	4.00		6.00		8.00		10.00		12.00		14.00		16.00		18.00		20.00		22.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
200	1374	.40	1686	.71	1949	1.07			2381	2.19	2568	2.68	2748	3.23	2916	3.81	3076	4.41		
400	1393	.54	1696	.90	1952	1.29	2177	1.72	2403	2.61	2591	3.17	2765	3.76	2928	4.36	3083	5.00	3230	5.65
600	1421	.70	1719	1.12	1975	1.58	2200	2.08	2403	2.61	2591	3.17	2765	3.76	2928	4.36	3083	5.00	3230	5.65
800	1491	.94	1763	1.40	1998	1.89	2223	2.46	2426	3.06	2613	3.68	2787	4.34	2951	5.01	3106	5.71	3253	6.44
1000	1568	1.19	1834	1.76	2061	2.34	2265	2.92	2449	3.51	2636	4.21	2810	4.93	2974	5.68	3128	6.45	3275	7.24
1200	1667	1.54	1911	2.14	2135	2.82	2333	3.53	2516	4.21	2685	4.90	2843	5.61	2997	6.37	3151	7.21	3298	8.07
1400	1766	1.93	2006	2.63	2213	3.33	2409	4.12	2588	4.93	2754	5.75	2911	6.55	3058	7.35	3198	8.17	3331	9.00
1600	1883	2.50	2107	3.20	2308	3.99	2488	4.78	2665	5.67	2829	6.58	2992	7.52	3127	8.46	3266	9.36	3399	10.28
1800	2008	3.23	2205	3.82	2410	4.74	2586	5.62	2747	6.50	2907	7.47	3059	8.49	3203	9.52	3339	10.57	3468	11.64
2000	2128	4.03	2332	4.81	2507	5.54	2688	6.57	2847	7.54	2995	8.51	3137	9.54	3280	10.65	3415	11.78	3544	12.93
2200	2257	4.93	2456	5.91	2623	6.66	2786	7.56	2949	8.69	3096	9.76	3233	10.83	3362	11.90	3494	13.08		
2400	2388	5.96	2576	7.09	2752	8.07	2895	8.82	3047	9.88	3197	11.11	3334	12.29	3462	13.45	3585	14.62		
2600	2511	7.17	2703	8.39	2872	9.54	3023	10.51	3153	11.32	3295	12.50	3434	13.83	3564	15.13				
2800	2634	8.54	2833	9.83	2992	11.16	3148	12.34	3280	13.31	3401	14.17	3532	15.44						
3000	2760	10.09	2963	11.46	3120	12.89	3267	14.25	3408	15.50	3528	16.48								
3200	2888	11.83	3085	13.32	3250	14.80	3389	16.33	3527	17.71										
3400	3016	13.75	3208	15.38	3382	16.91	3518	18.55												
3600	3147	15.90	3333	17.64	3504	19.30														
3800	3278	18.25	3460	20.12																
4000	3412	20.66	3589	22.87																

10" O.D. INLET

NOTE: DRIVE LOSSES ARE NOT INCLUDED IN BHP.

CONSULT FACTORY FOR SPEEDS HIGHER THAN THOSE SHOWN.

FOR RPMs & BHPs IN BOLD PRINT, DIRECT DRIVE BLOWERS SHOULD BE CONSIDERED.

★ Motor frame size above line must be 182T minimum even though BHP is available in smaller frame size.



PB SERIES DIRECT DRIVE RATING TABLES at 2850 RPM

NOTE: THESE RATINGS ARE FOR 50 CYCLE MOTORS ONLY.

CFM and BHP at Static Pressure Shown

Ratings at 70°F., .075 Density, Sea Level

MODEL NO.	WHEEL DIA. & WIDTH	O.D. INLET SIZE	1" SP		2" SP		3" SP		4" SP		5" SP		6" SP		7" SP		8" SP		
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
PB-8	7 x 2 1/16	4"	212	.16	120	.15													
	8 x 2 3/4		264	.20	191	.16													
PB-9	8 x 2 3/4	5"	340	.25	271	.21													
	9 x 2 7/8		389	.28	317	.24	220	.20											
	10 1/4 x 3 BC		404	.30	336	.26	266	.23	181	.19									
	9 3/4 x 2 7/8		435	.44	374	.40	305	.36	223	.30									
	10 3/8 x 2 5/8		473	.46	423	.42	364	.35	306	.30									
PB-10A	9 x 2 1/4	6"	443	.38	358	.33	229	.26											
	10 1/4 x 3 BC		477	.43	400	.37	297	.32	135	.25									
	9 3/4 x 2 1/4		567	.56	494	.51	401	.45	276	.38									
	11 x 3 BC		584	.59	529	.54	458	.48	360	.41	203	.31							
	10 3/4 x 2 3/4		666	.76	579	.69	504	.62	403	.55									
	11 x 2 3/4		668	.78	601	.70	535	.63	449	.55	341	.47							
	11 1/2 x 2 1/4		712	.85	650	.78	565	.72	490	.64	397	.57							
	12 x 2 1/4		751	1.09	704	1.04	643	.98	570	.91	496	.83	372	.72					
12 1/4 x 2 1/4	784	1.21	746	1.14	702	1.05	642	1.00	561	.92	468	.82	207	.52					
PB-12A	11 x 3 BC	7"	696	.60	610	.56	496	.48	361	.40									
	10 3/8 x 2 3/4		851	.90	744	.80	623	.70	471	.56									
	11 x 2 3/4		925	1.06	808	.97	686	.85	539	.70	350	.54							
	11 1/2 x 2 1/4		1010	1.33	905	1.20	790	1.07	670	.96	529	.82							
	12 x 2 1/4		1048	1.40	945	1.30	842	1.18	732	1.06	619	.94	482	.79					
	13 x 3/4 BC		1053	1.43	965	1.35	885	1.27	790	1.18	697	1.08	597	.97	445	.87			
	12 3/4 x 2 1/4		1087	1.61	997	1.46	886	1.32	784	1.17	667	1.05	545	.90	271	.61			
	14 x 3/4 BC		1092	1.71	1000	1.59	908	1.48	819	1.38	722	1.27	626	1.15	525	1.04	385	.85	
	13 x 3/4		1168	1.75	1084	1.65	994	1.55	886	1.42	783	1.27	680	1.17	573	1.01			
	14 x 3/4		1302	2.62	1218	2.45	1119	2.26	1030	2.04	941	1.91	833	1.76	727	1.60	615	1.44	
PB-14A	13 x 3/4 BC	6"	1060	1.37	978	1.30	895	1.23	793	1.12	677	.99	511	.80					
	13 x 3/4 BC	7"	1093	1.37	1001	1.30	912	1.21	808	1.11	682	.99	530	.86					
	13 x 3/4 BC	8"	1134	1.39	1028	1.31	922	1.22	812	1.12	689	1.00	526	.83					
	12 1/4 x 2 1/4	6"	1193	1.62	1085	1.50	969	1.39	837	1.22	697	1.07	514	.87					
	12 1/4 x 2 1/4	7"	1263	1.83	1143	1.69	1029	1.61	887	1.37	730	1.22	506	.85					
	13 x 3/4	6"	1217	1.97	1138	1.85	1059	1.74	972	1.61	865	1.43	732	1.25	546	1.00			
	12 1/4 x 2 1/4	8"	1305	1.91	1189	1.78	1062	1.62	921	1.45	742	1.25	513	1.03					
	13 x 3/4	7"	1271	2.02	1188	1.89	1113	1.78	1025	1.63	910	1.46	750	1.26	568	1.03			
	14 x 3/4 BC	6"	1288	2.15	1200	2.03	1105	1.90	1011	1.77	914	1.63	796	1.46	663	1.27	480	.99	
	13 x 3/4	8"	1320	2.08	1235	1.94	1157	1.80	1054	1.64	934	1.47	753	1.26	544	.95			
	14 x 3/4 BC	7"	1345	2.23	1252	2.11	1149	1.97	1042	1.83	935	1.69	824	1.54	690	1.32	516	1.01	
	14 x 3/4 BC	8"	1405	2.27	1308	2.14	1205	2.02	1096	1.89	979	1.72	865	1.59	703	1.36	506	1.05	
	14 x 3/4	6"	1343	2.59	1281	2.46	1206	2.31	1111	2.17	1019	2.08	928	1.90	815	1.67	667	1.36	
	14 x 3/4	7"	1488	2.88	1415	2.71	1343	2.54	1230	2.38	1113	2.09	1001	1.97	868	1.72	706	1.49	
	14 3/4 x 4	6"	1510	3.23	1427	3.09	1346	2.95	1267	2.82	1195	2.69	1098	2.51	983	2.30	858	2.06	
	14 x 3/4	8"	1620	3.04	1514	2.86	1408	2.69	1287	2.49	1155	2.26	1006	1.98	866	1.78	703	1.46	
	14 3/4 x 4	7"	1613	3.51	1537	3.38	1447	3.20	1347	2.98	1258	2.82	1158	2.63	1045	2.41	931	2.19	
	14 3/4 x 4	8"	1715	3.79	1635	3.60	1520	3.31	1416	3.06	1308	2.83	1198	2.63	1088	2.43	963	2.20	
PB-15A (1)	14 x 3/4 BC	6"	1435	1.92	1328	1.86	1199	1.68	1049	1.53	902	1.41	739	1.17	505	1.02			
	14 x 3/4 BC	8"	1707	2.40	1561	2.21	1408	1.98	1216	1.74	994	1.47	779	1.31	517	1.03			
	14 x 3/4 BC	10"	1752	2.45	1590	2.25	1435	2.05	1227	1.75	1006	1.63	756	1.28					
	15 1/2 x 5 BC	6"	1670	2.99	1565	2.84	1468	2.66	1333	2.55	1238	2.41	1132	2.27	1009	2.09	840	1.85	
	14 x 3/4	6"	1795	3.21	1689	3.09	1544	2.91	1434	2.74	1300	2.45	1128	2.21	940	1.95	689	1.53	
	16 1/2 x 4 1/2 BC	6"	1836	3.62	1754	3.54	1654	3.41	1541	3.25	1395	2.98	1292	2.84	1175	2.68	1037	2.50	
	15 1/2 x 5	6"	1941	4.58	1855	4.43	1763	4.32	1676	4.11	1572	3.91	1477	3.76	1371	3.46	1256	3.17	
	15 1/2 x 5 BC	8"	2177	4.10	2030	3.88	1874	3.61	1719	3.31	1562	3.01	1397	2.77	1222	2.47	1029	2.15	
	14 x 3/4	8"	2363	4.41	2179	4.10	1988	3.76	1786	3.38	1573	3.00	1360	2.59	1052	2.10	716	1.58	
	14 x 3/4	10"	2419	4.62	2273	4.33	2101	4.00	1902	3.59	1653	3.14	1392	2.63	1070	2.07			
	15 1/2 x 5 BC	10"	2281	4.36	2147	4.12	2000	3.85	1835	3.55	1658	3.17	1458	2.82	1227	2.46	1053	2.19	
	16 1/2 x 4 1/2 BC	8"	2208	4.35	2115	4.22	2013	4.05	1898	3.83	1765	3.60	1628	3.38	1464	3.15	1258	2.85	
	16 1/2 x 4 1/2	6"	2136	5.49	2055	5.34	1970	5.17	1874	4.97	1777	4.78	1681	4.58	1565	4.41	1448	4.24	
	16 1/2 x 4 1/2 BC	10"	2299	4.38	2213	4.25	2100	4.08	1964	3.89	1822	3.64	1670	3.41	1490	3.17	1283	2.89	
	15 1/2 x 5	8"	2653	6.57	2522	6.26	2393	5.93	2255	5.64	2103	5.23	1928	4.72	1727	4.18	1538	3.75	
	15 1/2 x 5	10"	2822	7.14	2712	6.84	2585	6.44	2445	5.98	2261	5.55	2037	4.95	1820	4.39	1628	3.97	
	16 1/2 x 4 1/2	8"	2948	7.66	2840	7.43	2726	7.19	2590	6.88	2441	6.49	2291	6.09	2097	5.65	1870	5.00	
	16 1/2 x 4 1/2	10"	3029	7.97	2952	7.82	2858	7.60	2749	7.32	2612	6.95	2457	6.50	2274	5.99	2073	5.50	
PB-18	14 x 3/4 BC	6"	925	1.54	863	1.50	787	1.46	717	1.40	643	1.35	539	1.29	447	1.18	315	1.04	
	14 x 3/4	8"	1126	2.33	1068	2.27	997	2.18	924	2.06	853	1.97	772	1.86	688	1.75	588	1.62	
	14 x 3/4 BC	8"	1224	2.08	1146	1.99	1056	1.87	956	1.73	843	1.61	724	1.48	579	1.35	397	1.15	
	14 x 3/4 BC	10"	1285	2.12	1193	2.01	1088	1.87	994	1.72	883	1.63	771	1.51	590	1.35			
	16 1/2 x 4 1/2 BC	6"	1251	3.08	1199	3.03	1147	2.96	1092	2.92	1026	2.80	956	2.72	879	2.66	786	2.55	
	18 x 4 1/2 BC	6"	1300	3.56	1246	3.54	1192	3.46	1141	3.39	1093	3.34	1035	3.26	973	3.18	907	3.08	
	14 x 3/4	8"	1466	2.79	1375	2.66	1287	2.57	1197	2.44	1101	2.35	1005	2.22	893	2.06	781	1.94	
	16 1/2 x 4 1/2	6"	1466	4.15	1428	4.05	1379	3.94	1328	3.80	1274	3.71	1218	3.58	1160	3.41			



PB SERIES DIRECT DRIVE RATING TABLES at 2850 RPM

NOTE: THESE RATINGS ARE FOR 50 CYCLE MOTORS ONLY.

(CONTINUED FROM PAGE 12)

MODEL NO.	WHEEL DIA. & WIDTH	O.D. INLET SIZE	9" SP		10" SP		11" SP		12" SP		13" SP		14" SP		15" SP		16" SP ★		
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
PB-14A	14 x 3 1/4	6"	407	.93															
	14 3/4 x 4	6"	719	1.79	548	1.45													
	14 3/4 x 4	7"	763	1.85	577	1.48													
	14 3/4 x 4	8"	787	1.87	610	1.55													
PB-15A (1)	15 1/2 x 5 BC	6"	645	1.60	385	1.16													
	15 1/2 x 5 BC	10"	704	1.63															
	15 1/2 x 5 BC	8"	751	1.75															
	16 1/2 x 4 3/4 BC	6"	917	2.27	606	1.76	308	1.40											
	16 1/2 x 4 3/4 BC	10"	1080	2.66	828	2.19													
	16 1/2 x 4 3/4 BC	8"	1081	2.57	863	2.17	561	1.64											
	15 1/2 x 5	6"	1098	2.88	909	2.50	521	1.63											
	15 1/2 x 5	8"	1365	3.40	1122	2.91	690	2.06											
	16 1/2 x 4 3/4	6"	1342	3.97	1234	3.71	1051	3.25	808	2.61									
	15 1/2 x 5	10"	1436	3.54	1173	3.00													
PB-18	16 1/2 x 4 3/4 BC	6"	688	2.46	590	2.37	492	2.27	361	2.04									
	16 1/2 x 4 3/4 BC	8"	921	2.91	788	2.72	644	2.48	438	2.17									
	18 x 4 3/4 BC	6"	851	2.96	781	2.83	690	2.59	599	2.38	508	2.17	416	1.96	326	1.76			
	16 1/2 x 4 3/4 BC	10"	1035	3.02	911	2.81	761	2.62	508	2.30									
	16 1/2 x 4 3/4	6"	1026	3.08	944	2.91	849	2.71	718	2.45	525	2.10							
	18 x 4 3/4 BC	8"	1185	3.68	1085	3.43	981	3.17	863	2.92	706	2.57	493	2.10					
	18 x 4 3/4	6"	1208	4.33	1149	4.17	1080	3.99	998	3.78	880	3.53	740	3.23	583	2.89	265	1.90	
	16 1/2 x 4 3/4	8"	1281	3.94	1193	3.67	1103	3.41	958	2.99	717	2.43							
	16 1/2 x 4 3/4	10"	1414	4.51	1317	4.27	1212	4.03	1068	3.72	837	3.27							
	18 x 4 3/4 BC	10"	1443	4.09	1347	3.84	1271	3.61	1127	3.35	961	3.04	720	2.64					
PB-18WA	15 1/2 x 5 BC	10"	626	2.01															
	16 1/2 x 5 BC	10"	1076	2.99	774	2.55	409	2.02											
	16 1/2 x 5 BC	8"	988	2.76	822	2.51	583	2.19											
	15 1/2 x 5	8"	1050	3.04	812	2.65	472	2.08											
	15 1/2 x 5	10"	1268	3.47	976	3.05	585	2.45											
	16 1/2 x 5	8"	1427	4.23	1262	3.91	1077	3.56	843	3.11									
	17 x 6	8"	1529	4.96	1356	4.64	1180	4.29	1045	3.97	806	3.50							
	16 1/2 x 5	10"	1708	5.16	1490	4.70	1243	4.24	988	3.72									
	17 x 6	10"	1882	5.88	1671	5.41	1463	5.00	1260	4.56	1005	3.97							
	18 1/2 x 6	10"	2438	8.75	2327	8.26	2150	7.91	2004	7.56	1853	7.22	1652	6.81	1446	6.37	1220	5.70	

(1) Additional ratings available with 7" inlet. Consult your local CFV representative.

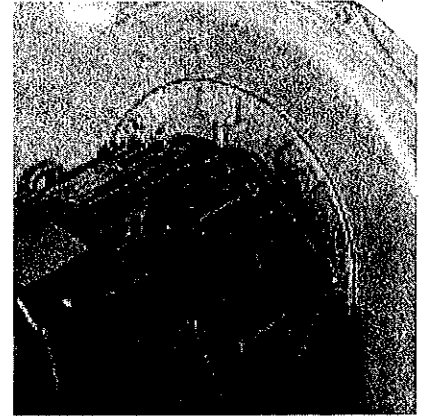
★ For static pressures above 16", see "HP" Series catalogs. For higher CFM values, see "RBE" Series catalog.

HOUSING SIDE PLATES



On models PB-8 through PB-12A, the inlet collar and motor mounting pad are an integral part of the housing halves. Housings are rotatable but not reversible.

On models PB-14A through PB-18WA, the inlet collars and motor side plates are separate castings which are bolted to the housing halves. These housings are rotatable and reversible. Note, however, BC type wheels are not reversible.



MATERIAL CONVEYING

Bulky materials such as those shown in Table 1, page 15, can be conveyed pneumatically using a Cincinnati Fan "PB" series cast aluminum pressure blower. Follow the steps below to determine the fan best suited for your application.

EXAMPLE: Assume a requirement to move 900 pounds per hour of barley through 75 feet of straight, horizontal, round duct. See notes 1 & 2 below.

- I. Convert pounds per hour to pounds per minute: $900 \text{ lbs/hr} \div 60 = 15 \text{ lbs/min}$
- II. Refer to Table 1, page 15. Find "barley" under material (column A) and read horizontally. Barley weighs 38 pounds per cubic foot (column B), requires 38 CFM of air per pound of material (column C) and a minimum of 5000 feet per minute conveying velocity (column D).
- III. Determine the *minimum* cubic feet per minute (CFM) requirements:

$$\begin{array}{r} \text{CFM/LB of Material} \quad 38 \text{ (from column C)} \\ \times \quad \text{lbs/Minute} \quad = \quad \times 15 \text{ (from step 1)} \\ \hline 570 \text{ Total minimum CFM required @ 5000 ft/min conveying velocity (column D)} \end{array}$$

- IV. Determine the system static pressure requirements from Table 2, page 15. Read across the 5000 ft/min velocity line to the 6" duct size column.

We have selected 6" duct size with 980 CFM (actual) to maintain a velocity of 5000 ft/min.

The friction loss is 8.02" SP per 100' x .75 = 6.01" plus 3.5" SP suction pickup (column E, Table 1) = 9.51" total system static pressure for 75 feet of straight 6" duct.

- V. Check direct drive rating tables for 980 CFM at 9.51" SP at the lowest horsepower. We suggest a Model PB-14A, 14 x 3 1/4" wheel, 6" inlet. Interpolate 2.94 BHP. **Do not use B.C. type wheels for material conveying.**
- VI. If material being conveyed will be going through the fan, the fan BHP can be significantly increased. The approximate increase is calculated as:

$$\text{Actual BHP} = \frac{\text{lbs/Minute of air} + \text{lbs/Minute of material}}{\text{lbs/Minute of air}} \times \text{Fan BHP (2.94, Step V)}$$

In this example: lbs/Minute of air = 980 (Actual CFM, Step IV) x .075 lbs/ft³ (Standard Density) = 73.5
 lbs/Minute of material = 15
 (See note 3).

Therefore: $\frac{73.5 + 15}{73.5} = \frac{88.5}{73.5} = 1.20 \times 2.94 = 3.53 \text{ Actual BHP}$

NOTES:

1. For each 10 feet of vertical duct, add 10 feet to your total straight duct length.
2. For equivalent losses through elbows, see chart on page 9 of our Engineering Data catalog.
3. Make sure you use correct density for location of fan.

YOUR MATERIAL CONVEYING CALCULATIONS

<p>(1) Material Being Conveyed _____</p> <p>(2) Pounds Conveyed/Hour _____</p> <p>(3) Pounds/Minute _____</p> <p>(4) Feet of Straight Horizontal Duct _____</p> <p>(5) Number of 90° Elbows _____</p> <p>(6) Total Equivalent Feet of Duct _____</p> <p>(7) Material Weight, Lbs./Cu. Ft. (col. B) _____</p> <p>(8) CFM/Pound of Material (col. C) _____</p> <p>(9) Pounds/Minute (step 3) _____</p> <p>(10) Total Min. CFM Required _____</p> <p>(11) Min. Conveying Velocity in FPM (col. D) _____</p> <p>(12) Duct Size to Get Total CFM (step 10) @ Minimum Velocity (step 11) per table 2 _____</p> <p>(13) Actual CFM for Duct (step 12) _____</p> <p>(14) Friction Loss/100 Ft. _____</p> <p>(15) Total Equivalent Feet of Duct (step 6) (in 100's of feet) _____</p> <p>(16) Suction Pickup in Inches of WC (col. E) _____</p> <p>(17) Total System SP _____</p>	<p>(1) _____</p> <p>(2) <u> </u> + <u> </u> ----- 60 ----- (3) _____</p> <p>(4) _____ See note 1 above</p> <p>(5) + _____ See note 2 above ----- (6) _____</p> <p>(7) _____</p> <p>(8) _____</p> <p>(9) x _____ ----- (10) _____</p> <p>(11) _____</p> <p>(12) _____ DUCT SIZE</p> <p>(13)* _____ ACTUAL CFM*</p> <p>(14) _____</p> <p>(15) x _____ (in 100's of feet) ----- (16) + _____ ----- (17) _____ TOTAL SYSTEM SP</p>	<p>NOTE: If conveying long, stringy material, be sure to specify paper trim type wheel.</p>
<p>FAN MODEL TO GET #13 (Actual CFM) & #17 (Total SP) ABOVE _____</p> <p>FAN RPM _____</p> <p>ACTUAL FAN BHP _____ (See VI above)</p>		

*Must be equal or greater than Step 10.

TABLE 1

A	B	C	D	E
Material	Approx. Weight (Lbs./Cu. Ft.)	Cu. Ft. of Air Per Lb. of Material	Min. Conveying Velocity (In fpm*)	Suction Pickup (Inches of W.C.)
Ashes, Coal	30	42	4500	3.0
Barley	38	38	5000	3.5
Beans, Soy	47	36	5200	4.0
Bran	16	56	3500	2.0
Cement, Portland	100	35	7000	5.0
Cinders, Coal	45	36	6000	4.0
Coal, Powdered	30	42	4000	3.0
Coffee, Beans	42	36	3500	3.0
Cork, Ground	14	59	3500	1.5
Corn, Cobs	25	44	5000	2.5
Corn, Meal	40	38	5500	3.5
Corn, Shelled	45	36	5500	3.5
Cotton, Dry	5	94	4000	2.0
Dust, Grinding	30	42	5000	3.0
Fruit, Dried	30	42	4000	3.0
Hair or Feathers, Dry	5	94	3000	1.5
Lime, Hydrated	30	42	5000	3.0
Malt, Dry	35	39	4800	3.0
Oats	26	44	4500	3.0
Paper, Shredded	20	49	5000	3.0
Plastic, Granulated	35	42	5400	3.0
Rags, Dry	30	42	4500	2.5
Salt, Coarse	45	36	5500	4.0
Sand, Dry	105	35	7000	5.0
Sawdust, Dry	13	63	3700	2.5
Wheat, Dry	46	37	5800	4.0
Wood Chips, Heavy	24	45	4500	3.0
Wood Shavings, Light	9	73	3400	2.0
Wool, Dry	5	94	5000	2.0

⚠ WARNING

When fans are used in material conveying applications, care must be used in their selection and location within each material conveying system. The material should be crushed, shredded or pulverized **BEFORE** it passes through the fan to eliminate premature fan housing, wheel and/or bearing failure which could cause severe, personal injury and/or complete system failure. Please contact a Cincinnati Fan sales engineer in your area for selection assistance for your specific application.

* Feet per minute

TABLE 2

Friction Loss (FL) in Inches of Water per 100 Feet of Straight, Horizontal, Round Duct

VEL FPM	PIPE DIAMETER & AREA IN SQ. FT.																					
	4" .087		5" .136		6" .196		7" .267		8" .349		10" .545		12" .785		14" 1.069		16" 1.396		18" 1.767		20" 2.182	
	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL	CFM	FL
2600	227	3.26	355	2.60	511	2.17	695	1.86	909	1.63	1420	1.30										
2800	245	3.76	382	3.01	550	2.52	748	2.15	977	1.89	1530	1.61										
3000	262	4.33	409	3.46	588	2.88	802	2.47	1048	2.08	1638	1.73										
3200	279	4.93	437	3.94	628	3.28	855	2.82	1118	2.47	1748	1.97										
3400	297	5.56	464	4.45	668	3.71	910	3.18	1188	2.78	1855	2.22										
3500	304	5.89	476	4.71	686	3.93	935	3.37	1222	2.95	1908	2.35										
3600	314	6.23	492	4.98	707	4.15	962	3.56	1258	3.12	1965	2.49										
3700	322	6.59	503	5.26	725	4.38	988	3.76	1291	3.30	2017	2.63										
3800	332	6.95	518	5.55	746	4.62	1018	3.97	1327	3.48	2070	2.78										
4000	350	7.69	546	6.15	796	5.13	1070	4.40	1398	3.85	2184	3.08										
4200	367	8.48	573	6.78	825	5.65	1125	4.85	1467	4.25	2290	3.49										
4400	384	9.26	600	7.41	864	6.18	1176	5.30	1536	4.63	2400	3.71										
4500	392	9.70	612	7.77	882	6.48	1202	5.55	1571	4.86	2453	3.89										
4800	418	11.05	654	8.85	944	7.38	1284	6.32	1676	5.55	2620	4.43										
5000	435	12.02	680	9.67	980	8.02	1335	6.88	1745	6.02	2725	4.82										
5200	454	13.00	710	10.50	1022	8.66	1390	7.44	1818	6.50	2840	5.21										
5500	479	14.68	748	11.64	1078	9.68	1469	8.31	1920	7.28	2997	5.81										
5600	490	15.25	764	12.05	1100	10.05	1496	8.61	1954	7.55	3060	6.03										
5800	505	16.27	789	12.95	1137	10.78	1549	9.25	2024	8.10	3161	6.47										
6000	524	17.30	818	13.85	1176	11.52	1604	9.89	2096	8.66	3276	6.92										
7000	611	23.60	955	18.90	1375	15.65	1873	13.50	2445	11.80	3820	9.41										

SEE "RBE" CATALOG



DIMENSIONS and SPECIFICATIONS

NOTE: The table below contains blower housing dimensions common to all arrangements on pages 17, 18, 19 and 20.

MODEL	C	D	J	M	N	O	P	R	S	T	AA ①②③	DD ④
PB-8	1	3 3/4	2 7/8	4 1/8	1 1/8	4 5/8	5 9/16	6 1/2	4 7/8	1 1/8	4	4
PB-9	1 1/16	4 1/8	3 1/8	5 5/8	1 3/16	6 1/16	7 1/2	7 7/8	6 5/8	1	5	4
PB-10A	1 1/4	4 1/4	3 3/8	6 9/16	1	6 7/8	9 7/16	8 15/16	7 13/16	1	6	5
PB-12A	1 1/4	5	3 3/4	7 9/16	7/8	8	9 5/8	11	9 7/16	1	7	6
PB-14A	1 1/4	6	4 1/4	8 1/16	1 1/8	8 11/16	10 1/4	11 5/16	10 1/4	1	7①	6
PB-15A	1 1/4	7 1/4	4 7/8	7 7/8	1	9 13/16	11 3/8	12 13/16	10 13/16	1	8②	8
PB-18	1 1/4	6 1/4	4 3/8	10 1/2	15/16	10 1/2	12 11/16	13 3/4	11 3/8	1	8②	6
PB-18WA	1 1/4	8 1/16	5 5/16	9 7/8	7/8	11	12 7/8	14 1/8	11 13/16	1	10③	8

① PB-14A ALSO AVAILABLE WITH 6" AND 8" INLETS.

③ PB-18WA ALSO AVAILABLE WITH 8" INLET.

② PB-15A AND PB-18 ALSO AVAILABLE WITH 6" AND 10" INLETS.

④ ALL MODELS, DISCHARGE FLANGE NOT AVAILABLE FOR DOWN BLAST POSITION.

APPROXIMATE SHIPPING WEIGHT IN POUNDS*

MODEL	ARR.1 (No motor)	ARR.2 (No motor)	ARR.4	ARR.4HM	ARR.8	ARR.9	NOMINAL MOTOR HP-WT.
PB-8	60	30	50	42	130	104	1/3-21
PB-9	66	37	57	48	138	111	1/2-22
PB-10A	78	43	63	54	150	126	1-22
PB-12A	85	61	91	75	187	157	2-41
PB-14A	140	84	139	118	259	226	3-54
PB-15A	155	99	176	155	296	273	5-76
PB-18	163	105	190	181	320	299	7 1/2-87
PB-18WA	197	—	262	197 (1)	399	389	10-122

* ARRANGEMENT 4, 4HM, 8 and 9 WEIGHTS INCLUDE NOMINAL HP AND CORRESPONDING MOTOR WEIGHT INDICATED IN COLUMN EIGHT. MAKE CORRECTIONS AS NECESSARY BY DEDUCTING NOMINAL WEIGHT AND ADDING WEIGHT OF ACTUAL MOTOR TO BE USED.

(1) WITH 7 1/2 HP MOTOR MAX. CONSULT FACTORY FOR LARGER SIZES.

METRIC CONVERSION FACTORS

POWER:
1 HP = .7457 kw
1 kw = 1.34 HP

HP = Horse power
kw = kilowatts

VOLUME:
1 cfm = .00047 m³/s
FLOW:
1m³/s = 2118.88 cfm

cfm = cubic feet per minute
m³/s = cubic meters per second

PRESSURE:
1 in. wg = 248.36 Pa
1 Pa = .004 in. wg

in. wg = inches water gauge
Pa = Pascals

DENSITY:
1lb/ft³ = 16.02 kg/m³
1 kg/m³ = .0624 lb/ft³

lb/ft³ = Pounds per cubic foot
kg/m³ = kilograms per cubic meter

TEMPERATURE:
°C = (°F - 32) x .5556
°F = (°C x 1.8) + 32

C = Centigrade
F = Fahrenheit

DIMENSIONAL:
1 in. = 25.40 mm
1 mm = .03937 in.

in. = inches
mm = millimeters

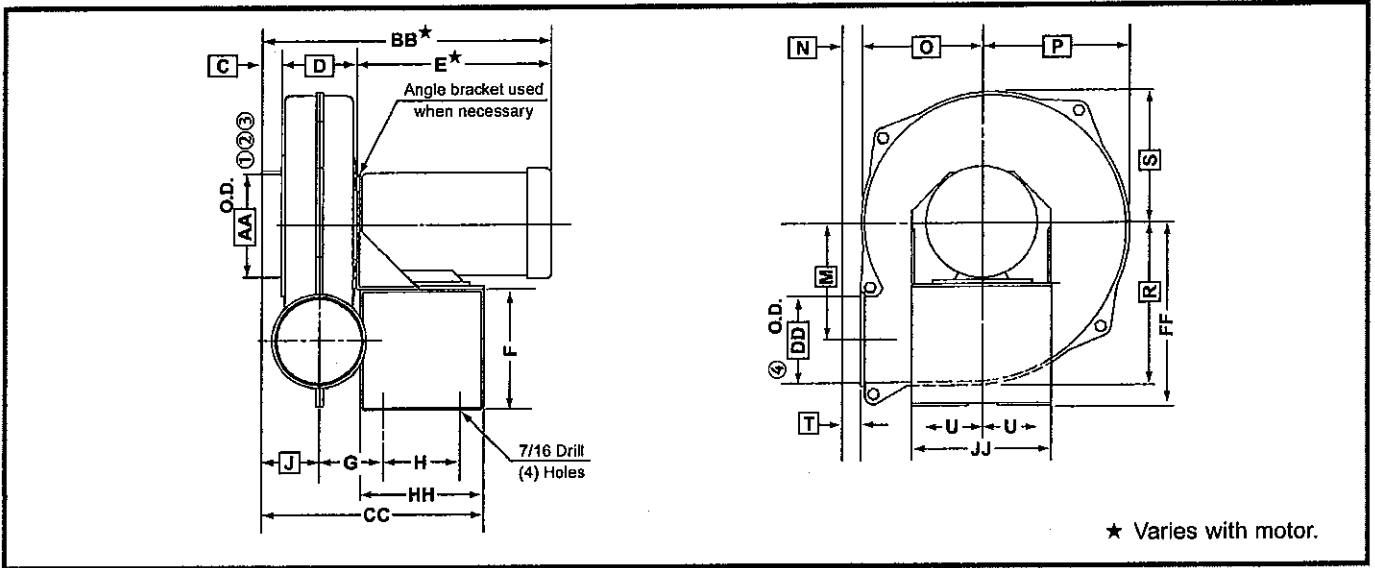
WEIGHT:
1 lb = .4536 kgs.
1 kg. = 2.205 lbs.

lb = pounds
kg = kilograms



DIMENSIONS and SPECIFICATIONS

Arrangement #4, Direct Drive



Note: For common boxed blower housing dimensions, see Page 16.

DIMENSIONS IN INCHES ± 1/8"

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

MODEL NO	MOTOR FRAME	E	F	G	H	U	BB*	CC	FF	HH	JJ	KK	MM
PB-8	56	12 1/2	5	3 3/16	5	2 3/4	17 1/4	12 1/8	8 9/16	7 1/8	7	1 5/16	3 3/16
PB-9	56	12 1/2	6 7/8	3 3/8	5 3/4	2 3/4	17 11/16	13 5/16	10 7/16	7 7/8	7	1 3/8	3 7/16
	143T-145T	12	8 1/4	4 3/16	5	3 3/4	17 3/16	13 13/16	11 7/8	8	9		
PB-10A	56	12 1/2	6 7/8	3 7/16	5 3/4	2 3/4	18	13 11/16	10 7/16	7 7/8	7	1 9/16	3 11/16
	143T-145T	12	8 1/4	4 1/4	5	3 3/4	17 1/2	14 3/16	11 7/8	8	9		
PB-12A	56	12 1/2	8 1/4	4 1/4	5	3 3/4	18 3/4	14 1/2		8	9		
	143T-145T	12	8 1/4	4 5/8	5	3 3/4	18 1/4	14 7/8	11 7/8	8	9	1 9/16	4 1/16
	182T-184T	15 1/2	6 7/16	5	8 3/4	4 15/16	21 3/4	19		11 3/4	12		
PB-14A	56	12 1/2					19 3/4						
	143T-145T	12	9 15/16	5 1/2	8 3/4	4 15/16	19 1/4	20	15 3/16	11 3/4	12	1 9/16	4 9/16
	182T-184T	15 1/2					22 3/4						
PB-15A	182T-184T	15 1/2					24						
	213T-215T	16	9 15/16	6 1/8	8 3/4	4 15/16	24 1/2	21 1/4	15 3/16	11 3/4	12	1 9/16	5 3/16
	254T-256T	19	8 15/16		13		27 1/2	25 1/2		16	16 1/2		
PB-18	182T-184T	15 1/2					23						
	213T-215T	16	9 15/16	5 5/8	8 3/4	4 15/16	23 1/2	20 1/4	15 3/16	11 3/4	12	1 9/16	4 11/16
	254T-256T	19	8 15/16		13		26 1/2	24 1/2		16	16 1/2		
PB-18WA	182T-184T	15 1/2					24 13/16						
	213T-215T	16	12 3/4		10 3/4		25 5/16	24 1/16		13 3/4			
	254T-256T	19	11 3/4	6 1/2		6 1/4	28 5/16	29 1/16	18		16 1/2	1 9/16	5 5/8
	284T-286T	22	11		15 3/4		31 5/16			18 3/4			

① PB-14A ALSO AVAILABLE WITH 6" AND 8" INLETS.

② PB-15A AND PB-18 ALSO AVAILABLE WITH 6" AND 10" INLETS.

③ PB-18WA ALSO AVAILABLE WITH 8" INLET.

④ ALL MODELS, DISCHARGE FLANGE NOT AVAILABLE FOR DOWN BLAST POSITION.

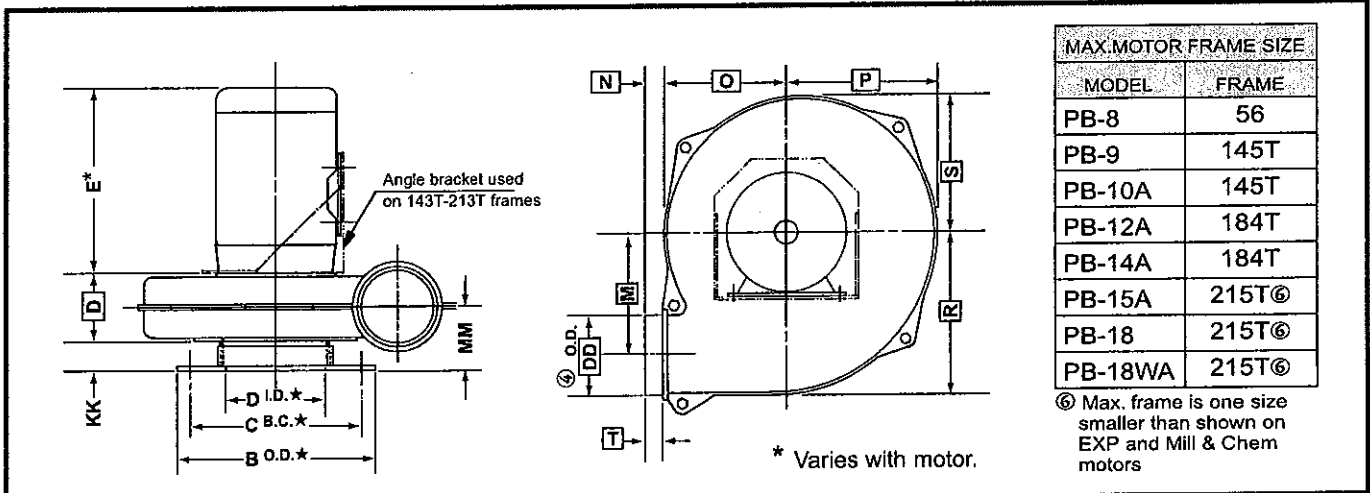
KK & MM pertain to arrangement #4HM on page 18 only.



DIMENSIONS and SPECIFICATIONS

Arrangement #4 HM, (Horizontal Mount) Direct Drive

NOTE: Inlet flange is optional on arrangement #4HM.

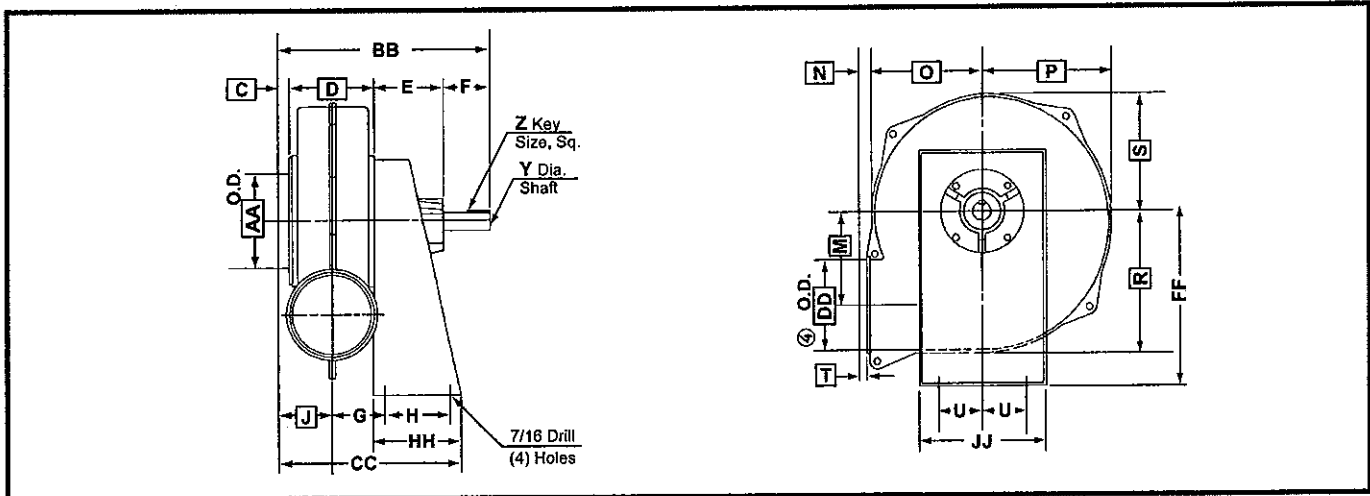


Note: For common boxed blower housing dimensions, see Page 16.

★ For inlet flange dimensions B, C and D above, see flange dimension table on page 21 for corresponding A dimension. For KK and MM dimensions, see page 17.



Arrangement #2, Belt Drive



Note: For common boxed blower housing dimensions, see Page 16.

DIMENSIONS IN INCHES ± 1/8"

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

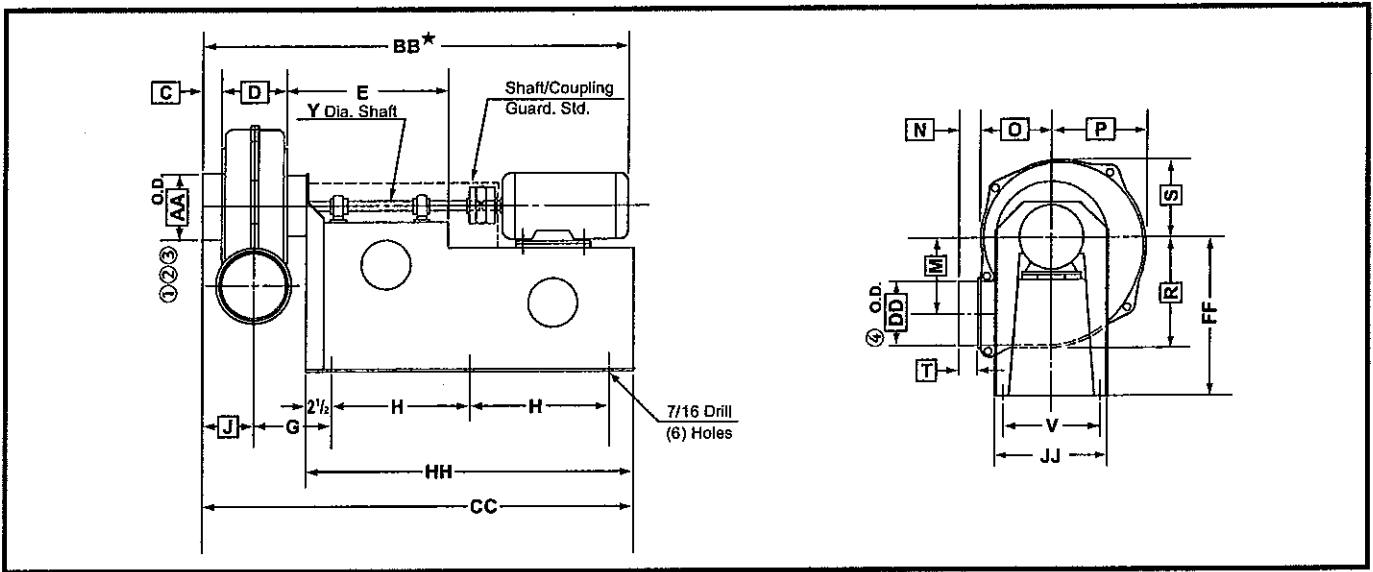
MODEL NO.	E	F	G	H	U	Y	Z	BB	CC	FF	HH	JJ
PB-8	3 1/2	3	2 7/8	3 1/4	2 7/8	5/8	3/16	11 1/4	9 3/4	7 13/16	5	7 3/4
PB-9	3 11/16	3	3 1/16	4 1/4	2 7/8	3/4	3/16	11 7/8	11 3/16	9 7/8	6	7 3/4
PB-10A	3 11/16	3	3 1/8	4 1/4	2 7/8	3/4	3/16	12 1/4	11 9/16	9 7/8	6	7 3/4
PB-12A	5 1/2	4	4	4 1/2	3 1/8	1	1/4	15 3/4	13 1/4	11 1/2	7	9
PB-14A	5 3/16	4	4 1/2	5 1/2	3 3/4	17/16	3/8	16 7/16	15 1/4	15	8	10 1/4
PB-15A	5 3/16	4	5 1/8	5 1/2	3 3/4	17/16	3/8	17 11/16	16 1/2	15	8	10 1/4
PB-18	5 3/16	4	4 5/8	5 1/2	3 3/4	17/16	3/8	16 11/16	15 1/2	15	8	10 1/4

[Ⓞ] ALL MODELS, DISCHARGE FLANGE NOT AVAILABLE FOR DOWN BLAST POSITION.



DIMENSIONS and SPECIFICATIONS

Arrangement #8, Direct Connected



Note: For common boxed blower housing dimensions, see Page 16.

DIMENSIONS IN INCHES ± 1/8"

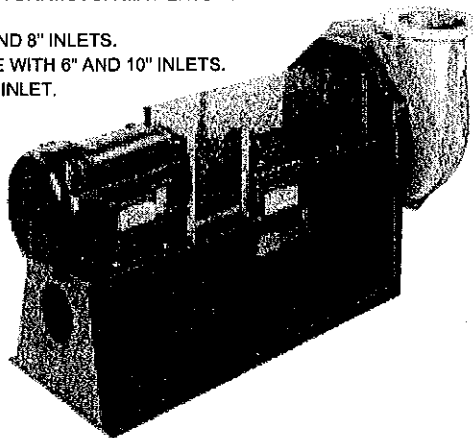
DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

MODEL NO.	MOTOR FRAME	E	G	H	V	Y	*BB	CC	FF	HH	JJ
PB-8	56	12	5 ⁵ / ₈	12 ¹ / ₄	11 ³ / ₈	³ / ₄	35 ³ / ₁₆	35 ¹ / ₂	14	29 ¹ / ₂	12 ⁷ / ₈
PB-9	56-145T	12	5 ¹³ / ₁₆	12 ¹ / ₄	11 ³ / ₈	³ / ₄	35 ¹¹ / ₁₆	35 ¹⁵ / ₁₆	14	29 ¹ / ₂	12 ⁷ / ₈
PB-10A	56-145T	12	5 ⁷ / ₈	12 ¹ / ₄	11 ³ / ₈	³ / ₄	36 ¹ / ₁₆	36 ⁵ / ₁₆	14	29 ¹ / ₂	12 ⁷ / ₈
PB-12A	56-145T	12	6 ¹ / ₄	12 ¹ / ₄	11 ³ / ₈	1	36 ³ / ₄	37	14	29 ¹ / ₂	12 ⁷ / ₈
	182T-215T	13		15 ¹ / ₈	16		42 ⁹ / ₁₆	42 ³ / ₄	18	35 ¹ / ₄	17 ¹ / ₂
PB-14A	56-145T	12	6 ³ / ₄	12 ¹ / ₄	11 ³ / ₈	1 ³ / ₁₆	37 ³ / ₄	38	14	29 ¹ / ₂	12 ⁷ / ₈
	182T-215T	13		15 ¹ / ₈	16		43 ⁹ / ₁₆	43 ³ / ₄	18	35 ¹ / ₄	17 ¹ / ₂
PB-15A	182T-215T	13	7 ³ / ₈	15 ¹ / ₈	16	1 ³ / ₁₆	44 ⁷ / ₁₆	45	18	35 ¹ / ₄	17 ¹ / ₂
	254T-256T			18 ³ / ₄	17 ¹ / ₄		48 ⁵ / ₈	52 ¹ / ₄	23	42 ¹ / ₂	19
PB-18	182T-215T	13	6 ⁷ / ₈	15 ¹ / ₈	16	1 ³ / ₁₆	43 ¹³ / ₁₆	44	18	35 ¹ / ₄	17 ¹ / ₂
	254T-256T			18 ³ / ₄	17 ¹ / ₄	1 ⁷ / ₁₆	48	51 ¹ / ₄	23	42 ¹ / ₂	19
PB-18WA	182T-215T	13	7 ³ / ₄	15 ¹ / ₈	16	1 ⁷ / ₁₆	45 ⁵ / ₈	45 ¹³ / ₁₆	18	35 ¹ / ₄	17 ¹ / ₂
	254T-286T			18 ³ / ₄	17 ¹ / ₄		52 ¹⁵ / ₁₆	53 ¹ / ₁₆	23	42 ¹ / ₂	19

★ DIMENSIONS "BB" VARIES WITH MOTOR. MOTOR MAY EXTEND PAST END OF BASE.

Ⓞ ALL MODELS, DISCHARGE FLANGE NOT AVAILABLE FOR DOWN BLAST POSITION.

- ① PB-14A ALSO AVAILABLE WITH 6" AND 8" INLETS.
- ② PB-15A AND PB-18 ALSO AVAILABLE WITH 6" AND 10" INLETS.
- ③ PB-18WA ALSO AVAILABLE WITH 8" INLET.

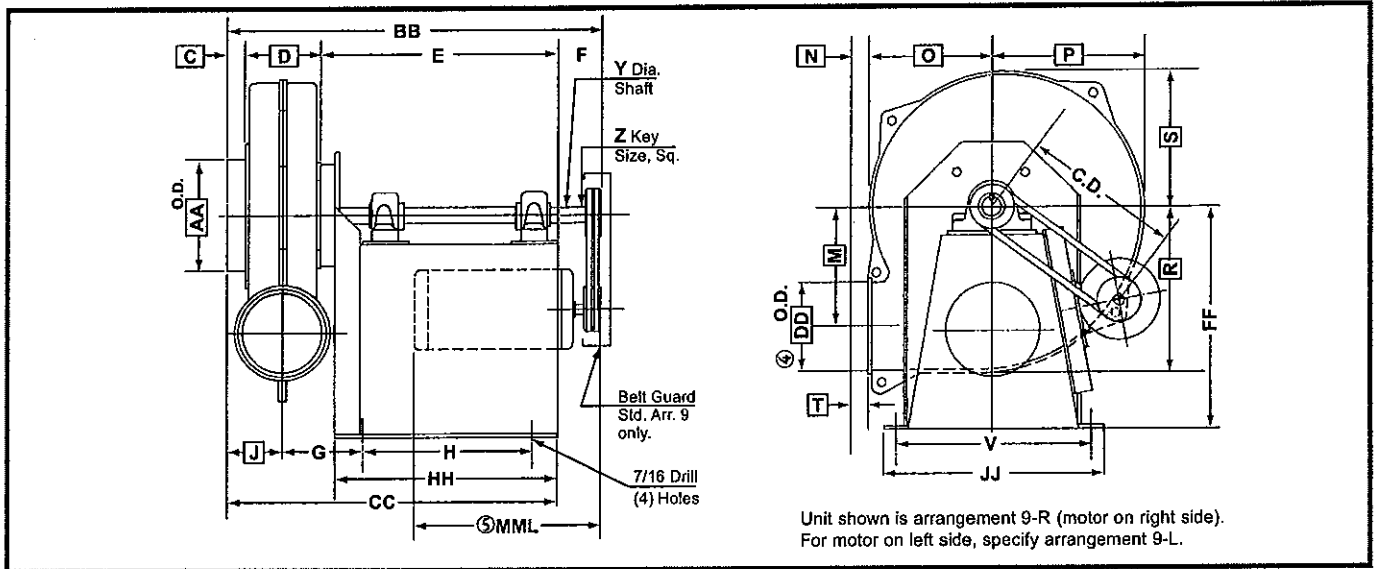




DIMENSIONS and SPECIFICATIONS

Arrangement #1 and #9, Belt Drive

NOTE: Arrangement 9 dimensions are the same as arrangement 1 with exception of dimensions C.D. and MML which are for arrangement 9 only.



Note: For common boxed blower housing dimensions, see Page 16.

DIMENSIONS IN INCHES ± 1/8"

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

MODEL NO.	MOTOR FRAME	E	F	G	H	V	Y	Z	BB	CC	FF	HH	JJ	Ⓞ MML
PB-8	56-145T	16 1/4	3	5 3/8	10	11 3/8	3/4	3/16	24	21	14	15	12 7/8	15
PB-9	56-145T	16 1/4	3	5 13/16	10	11 3/8	3/4	3/16	24 7/16	21 7/16	14	15	12 7/8	15
PB-10A	56-145T	16 1/4	3	5 7/8	10	11 3/8	3/4	3/16	24 13/16	21 13/16	14	15	12 7/8	15
PB-12A ★	56-145T★	16 1/4	4	6 1/4	10	11 3/8	1	1/4	26 1/2	22 1/2	14	15	12 7/8	15
	182T-215T	19 1/4			13	16			29 1/2	25 1/2	18	18	17 1/2	19
PB-14A	56-215T	19 1/4	4	6 3/4	13	16	1 7/16	3/8	30 1/2	26 1/2	18	18	17 1/2	19
PB-15A ★	182T-215T★	19 1/4	4	7 3/8	13	16	1 7/16	3/8	31 3/4	27 3/4	18	18	17 1/2	19
	254T-256T	25 3/4			19 1/2	17 1/4	1 11/16	3/8	38 1/4	34 1/4	23	24 1/2	19	26
PB-18 ★	182T-215T★	19 1/4	4	6 7/8	13	16	1 7/16	3/8	30 3/4	26 3/4	18	18	17 1/2	19
	254T-256T	25 3/4			19 1/2	17 1/4	1 11/16		37 1/4	33 1/4	23	24 1/2	19	26
PB-18WA ★	182T-215T★	19 1/4	4	7 3/4	13	16	1 7/16	3/8	32 9/16	28 9/16	18	18	17 1/2	19
	254T-286T	25 3/4			6	19 1/2	17 1/4		1 11/16	41 1/16	35 1/16	23	24 1/2	19	26

Ⓞ ALL MODELS, DISCHARGE FLANGE NOT AVAILABLE FOR DOWN BLAST POSITION.

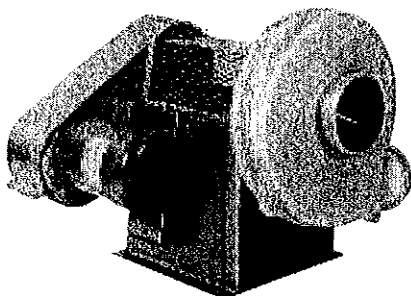
Ⓞ MML IS MAXIMUM MOTOR LENGTH ON CUSTOMER-SUPPLIED MOTOR. MOTOR MANUFACTURERS "C" DIMENSION CANNOT EXCEED MML.

★ ALL ARRANGEMENT 1 UNITS USE SMALL BASE DIMENSIONS.

C.D. BELT CENTER DISTANCE

(Dimensions in Inches)

MODEL NO.	MOTOR FRAME/SIZE									
	56-145T		182T-184T		213T-215T		254T-256T		284T-286T	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
PB-8	10 1/4	11 1/4								
PB-9	10 1/4	11 1/4								
PB-10A	10 1/4	11 1/4								
PB-12A	10 1/4	11 1/4	13 5/8	14 5/8	14 3/8	15 1/2				
PB-14A	12	13	13 5/8	14 5/8	14 3/8	15 1/2				
PB-15A			13 5/8	14 5/8	14 3/8	15 1/2	17	18 5/8		
PB-18			13 5/8	14 5/8	14 3/8	15 1/2	17	18 5/8		
PB-18WA			13 5/8	14 5/8	14 3/8	15 1/2	17	18 5/8	17 3/8	19 1/4





DIMENSIONS and SPECIFICATIONS

INLET AND DISCHARGE FLANGE DIMENSIONS FOR PB-8 THROUGH PB-18WA

Dimensions in inches

A*	B*	C*	D	E	F	G	H
4 ¹ / ₁₆	9	7 ¹ / ₂	3 ¹¹ / ₁₆	4 ⁹ / ₁₆	7 ¹ / ₁₆	4	1 ⁵ / ₁₆
5 ¹ / ₁₆	11	8 ¹ / ₂	4 ⁹ / ₁₆	5 ⁹ / ₁₆	7 ¹ / ₁₆	4	1 ⁵ / ₁₆
6 ¹ / ₁₆	11	9 ¹ / ₂	5 ¹ / ₂	6 ⁹ / ₁₆	7 ¹ / ₁₆	4	1 ¹ / ₁₆
7 ¹ / ₁₆	11	9	6 ¹ / ₁₆	7 ⁵ / ₈	7 ¹ / ₁₆	8	1 ⁵ / ₁₆
8 ¹ / ₁₆	13 ¹ / ₂	11 ³ / ₄	7 ¹ / ₂	8 ⁵ / ₈	7 ¹ / ₁₆	8	1
10 ¹ / ₁₆	16	14 ¹ / ₄	9 ¹¹ / ₁₆	10 ⁹ / ₁₆	7 ¹ / ₁₆	8	1

① Holes will not be drilled unless customer specifies. If drilled per our standard, holes will be drilled on centerlines unless specified otherwise on order. Dimensions "C, F & G" can be made to customer specifications; at an additional charge.
 ② All dimensions are ±1/8" except C & F.
 ③ All flanges are 319 cast aluminum.

★ *A* fits over inlet or outlet of blower, "AA" or "DD" dimension.
 * Meet ANSI-125 pound flange dimensions.

◆ DISCHARGE FLANGES NOT AVAILABLE ON DOWNBLAST DISCHARGE POSITION.

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

INLET AND DISCHARGE SLIDE GATE DIMENSIONS FOR PB-8 THROUGH PB-18WA

◆ NOT AVAILABLE ON DOWNBLAST DISCHARGE POSITION.

① Gate halves are 319 cast aluminum.
 Slide gate is 12 gauge galvanized steel.
 Aluminum slide gate available at additional charge.
 DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Flange, filter or guard can be mounted over this O.D.

DIMENSIONS IN INCHES

MODEL	A*	B	C	D	E	F	G	H	J	K
FG-4	4 ¹ / ₁₆	3 ¹⁵ / ₁₆	3 ¹ / ₄	4 ¹ / ₂	2 ¹¹ / ₁₆	1	1 ¹ / ₁₆	5 ⁵ / ₈	9	7 ³ / ₄
FG-5	5 ¹ / ₁₆	4 ¹⁵ / ₁₆	3 ¹ / ₂	5 ¹ / ₂	2 ⁹ / ₁₆	1 ¹ / ₈	7 ¹ / ₈	6 ¹ / ₈	10 ¹ / ₂	9
FG-6	6 ¹ / ₁₆	5 ¹⁵ / ₁₆	4	5 ¹ / ₂	2 ¹¹ / ₁₆	1 ¹ / ₁₆	1	6 ¹ / ₄	11 ¹ / ₂	9 ¹ / ₂
FG-7	7 ¹ / ₁₆	6 ¹⁵ / ₁₆	4 ¹ / ₂	5 ¹ / ₂	2 ⁷ / ₈	1 ¹ / ₈	1 ¹ / ₈	6 ¹ / ₄	12 ¹ / ₂	10
FG-8	8 ¹ / ₁₆	7 ¹⁵ / ₁₆	5	6 ³ / ₄	2 ¹³ / ₁₆	1	1 ³ / ₁₆	7 ³ / ₄	15	11 ³ / ₄
FG-10	10 ¹ / ₁₆	9 ¹⁵ / ₁₆	6	8	3 ¹ / ₁₆	1 ⁵ / ₁₆	1	9	18 ¹ / ₂	14

★ *A* FITS OVER INLET OR OUTLET OF BLOWER, "AA" OR "DD" DIMENSION



FABRICATED STEEL HOUSING DIMENSIONS

For All Arrangements

All housings are 10 gauge steel

NOTE

DIMENSIONS IN INCHES

MODEL No.	MOTOR FRAME SIZE	D	* G	J	DD	MAX. ALLOWABLE WHEEL DIA.
PBS-8	—	NOT AVAILABLE THIS SIZE				—
PBS-9	56	3 ⁵ / ₈	3 ¹ / ₈	3 ¹³ / ₁₆	4	9 ³ / ₄
	143T-145T		3 ¹⁵ / ₁₆			
PBS-10A	56	4	3 ⁹ / ₁₆	4	4 ³ / ₈	11 ¹ / ₂
	143T-145T		4 ¹ / ₈			
PBS-12A	56	4 ⁵ / ₈	4 ¹ / ₁₆	4 ⁵ / ₁₆	5 ¹ / ₂	13
	143T-145T		4 ⁷ / ₁₆			
	182T-184T		4 ¹³ / ₁₆			
PBS-14A	ALL	5 ¹ / ₈	5 ¹ / ₁₆	4 ⁹ / ₁₆	6	14
PBS-15A	ALL	5 ⁷ / ₈	5 ⁷ / ₁₆	4 ¹⁵ / ₁₆	8	16 ¹ / ₂
PBS-18	ALL	5 ¹ / ₄	5 ¹ / ₈	4 ⁵ / ₈	6	18
PBS-18WA	ALL	6 ³ / ₄	5 ⁷ / ₈	5 ³ / ₈	7	18 ¹ / ₂

DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.
★ FOR ARRANGEMENT 4 ONLY

Steel Housing Discharge Flange Dimensions ♦

For Steel housing inlet flanges, see dimensions A, B, C, F & G on Page 21.

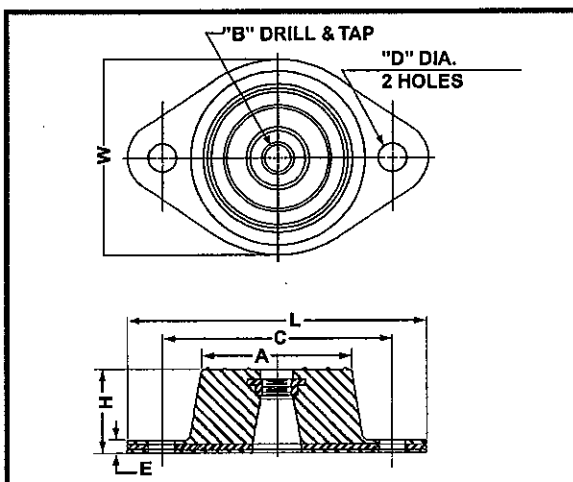
♦ Not available on downblast discharge position

DIMENSIONS IN INCHES

MODEL No.	B	C	D	DD	G
PBS-8	NOT AVAILABLE THIS SIZE				
PBS-9	9	7 ¹ / ₂	3 ⁵ / ₈	4	4
PBS-10A	10	8 ¹ / ₂	4	4 ³ / ₈	4
PBS-12A	11	9 ¹ / ₂	4 ⁵ / ₈	5 ¹ / ₂	4
PBS-14A	11	9 ¹ / ₂	5 ¹ / ₈	6	4
PBS-15A	13 ¹ / ₂	11 ³ / ₄	5 ⁷ / ₈	8	8
PBS-18	11	9 ¹ / ₂	5 ¹ / ₄	6	4
PBS-18WA	13 ¹ / ₂	11 ³ / ₄	6 ³ / ₄	7	8

All flanges are 10 gauge steel.

RUBBER-IN-SHEAR (RIS) VIBRATION ISOLATORS

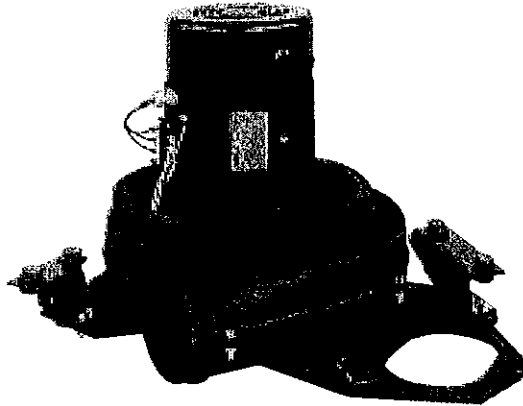


Do not use RIS Isolators on any arrangement 1 or 2 fans.

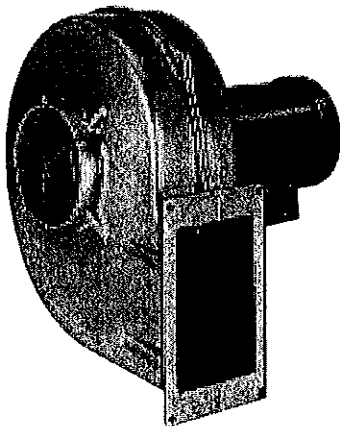
TYPE R NEOPRENE IN SHEAR MOUNTINGS											
TYPE	MAX. LOAD EACH LBS.	DEFLECTION IN INCHES	DIMENSION IN INCHES								
			R	L	W	H	A	B	C	D	E
R1	BLACK	45	0.20	3 ¹ / ₈	1 ³ / ₄	1	1 ¹ / ₄	5 ¹ / ₁₆ "-18NC	2 ³ / ₈	11 ¹ / ₃₂	3 ¹ / ₁₆
	RED	70									
	GREEN	120									
R2	BLUE	135	0.25	3 ⁷ / ₈	2 ³ / ₈	1 ¹ / ₄	1 ³ / ₄	3 ³ / ₈ "-16NC	3	11 ¹ / ₃₂	7 ¹ / ₃₂
	BLACK	170									
	RED	240									
	GREEN	380									

EXAMPLES OF CUSTOM PRODUCTS

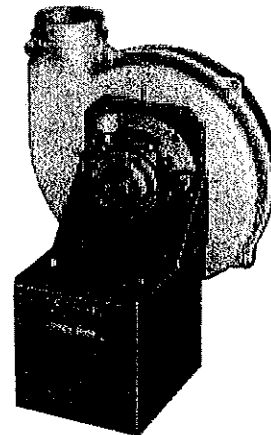
These are just a few of the many custom blowers designed to meet the customers' exact requirements. Let us design one to yours



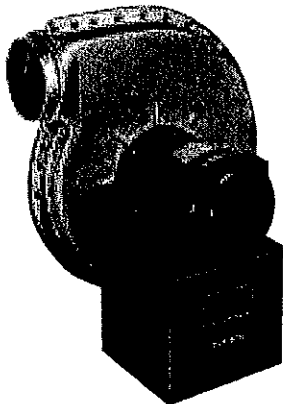
PB-14 with special motor and mounting plate for cooling traction motors on rapid transit systems. All aluminum parts were black anodized.



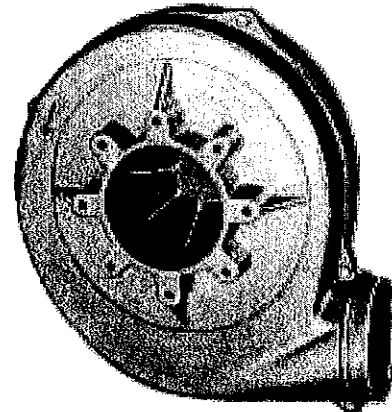
PB-12 with special wider housing (PB-12W) and integral discharge flange. Blower used to cool large DC motors.



PB-9 with air motor. Cast aluminum blower with non-electric motor required to handle highly volatile substances at variable flow rates.

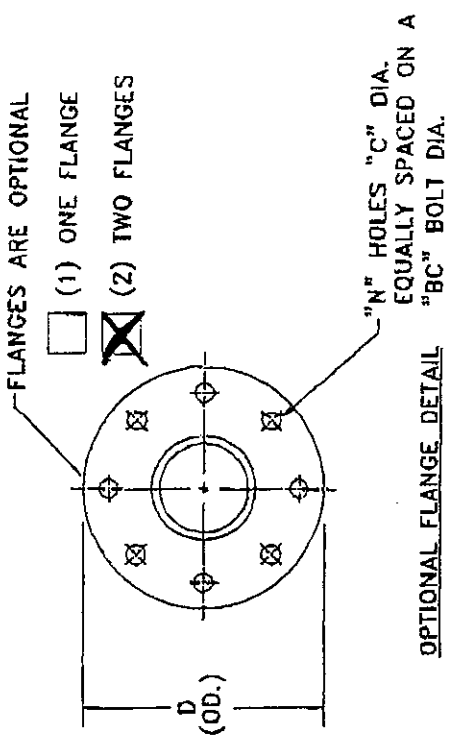


PB-14 with continuous flange added to ensure meeting "low leakage" requirement in evacuating oil mist at 14" SP WG on discharge.



PB-14 with special inlet mounting pad used to pressurize calendar rolls on corrugated paper machines.

A 51252



OPTIONAL FLANGE DETAIL

OPTIONAL:
 FLANGES WITH NO HOLES

MODEL NO.	SILENCER SIZE	SILENCER				SILENCER FLANGE				APPROX. WEIGHT (LBS.)
		A (OD.)	B (OD.)	C	D	B.C.	N			
SSA-4	4	4-1/4	12	3/4	9	7-1/2	8	46		
SSA-5	5	5-1/4	13	7/8	10	8-1/2	8	51		
SSA-6	6	6-1/4	14	7/8	11	9-1/2	8	57		
SSA-7	7	7-1/4	15	7/8	11	9-1/2	8	60		
SSA-8	8	8-1/4	16	7/8	13-1/2	11-3/4	8	68		
SSA-10	10	10-1/4	18	1	16	14-1/4	12	80		
SSA-12	12	12-1/4	20	1	19	17	12	94		
SSA-14	14	14-1/4	22	1-1/8	21	18-3/4	12	105		

NOTES:

1. MAXIMUM AIRSTREAM TEMPERATURE: 500°F.
STANDARD PAINT MAY FADE OR DETERIORATE AT TEMPERATURES ABOVE 200°F.
2. SILENCERS MUST BE INDEPENDENTLY SUPPORTED.
3. STANDARD MATERIALS OF CONSTRUCTION:
 16 GA. STEEL CASING
 22 GA. PERFORATED STEEL (INTERNAL)
 11 GA. STEEL LIP CONNECTOR COLLARS (FLANGES OPTIONAL)
 FIBERGLASS MEDIA
 OPTIONAL STAINLESS STEEL CONST. AVAILABLE.

cincinnati fan
 7697 SNIDER ROAD MASON, OHIO 45040

TOLERANCES:
 ANGLES: ± 1°
 FRACTIONS: ± 1/8

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

SUPERSIDES:

CERTIFIED DRAWING

TITLE: STEEL SOUND ATTENUATORS (SSA SERIES)

DRAWING NO. **A** 51252

REV. 10



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

DIFFERENTIAL PRESSURE INDICATOR / TRANSMITTER

SEE PREVIOUS
COMMENTS

- MANUFACTURER : ORANGE RESEARCH
- MODEL : 1833DGT-1-C-2.5-B-T1-0-40" W.C.
- SERVICE : PRESSURE DIFFERENCE ACROSS BLOWER
- RANGE : 0 ~ 40" W.C. (0 ~ 1,016 mm W.C.) DIFFERENTIAL
- DIAL SIZE : 2 1/2" (64 mm)
- ACCURACY : ± 2 % OF FULL SCALE
- MATERIAL
- BODY : TYPE 316 STAINLESS STEEL
- SEAL : VITON
- CONNECTION : 1/4" (6.35 mm) NPT
- OUTPUT : 4 ~ 20 mA
- CERTIFICATION : NEMA 4X
- SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
- QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
- CUSTOMER TAG NO. : PT-O510A / PTO520A / PT-O530A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication methods, techniques of construction, installation and orientation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT

NOT REVIEWED _____

Project No. 79538-C14716

Date: 25/1/06 By: M. Ford



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2B**

**FOR
ORANGE RESEARCH
DIFFERENTIAL PRESSURE
INDICATOR/TRANSMITTER**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

CHECK VALVE

MANUFACTURER : TECHNO
MODEL : 5051-316
STYLE : WAFER / CLASS 150 #
SERVICE : VENT-GAS
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
VALVE PLATE : TYPE 316 S.S.
SPRING : TYPE 316 S.S.
SEAL : TEFLON
CONNECTION : TO BE INSTALLED BETWEEN ANSI 150 # FLANGES
PIPE SIZE : 8" (200 mm)
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : CV-O510A / CV-O520A / CV-O530A



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 4H**

**FOR
TECHNO CHECK VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

BALL VALVE (FOR INSTRUMENT ISOLATION)

MANUFACTURER : APOLLO
MODEL : 76-101-57
SERVICE : INSTRUMENT ISOLATION
SIZE : 1/4" (6.35 mm)
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
BODY : TYPE 316 S.S.
SEAL : PTFE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
SERVICE
QUANTITY : 15 (5 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : HV-O510D / HV-O510E / HV-O510F / HV-O510G
/ HV-O510H
HV-O520D / HV-O520E / HV-O520F / HV-O520G
/ HV-O520H
HV-O530D / HV-O530E / HV-O530F / HV-O530G
/ HV-O530H



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

BALL VALVE

MANUFACTURER : APOLLO
MODEL : 76-103-57
SERVICE : DRAIN
SIZE : 1/2" (13 mm)
ACTUATOR : LEVER
MATERIAL OF CONSTRUCTION
 BODY : TYPE 316 S.S.
 SEAL : PTFE
SPECIAL REQUIREMENT : TO BE CLEANED AND PACKAGED FOR OXYGEN
 SERVICE
QUANTITY : 3 (1 PER OZONE DESTRUCT UNIT SKID)
CUSTOMER TAG NO. : HV-O510C / HV-O520C / HV-O530C



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

**REFER TO VOLUME 1
TAB # 2C**

**FOR
APOLLO BALL VALVE**



DRINKING WATER OZONE SYSTEM

Winnipeg Water Treatment Program

OZONE SYSTEM SUBMITTAL

Fuji Electric Project No. WPMB-1105

Vol. 2 of 3

Fuji Electric Corp. of America

Park 80 West, Plaza II
Saddle Brook, New Jersey 07663
T: (201)-712-0555 x 422
F: (201)-368-8258

Water Treatment Division
Executive Plaza III, Suite 110
135 Merchant St.
Cincinnati, OH 45246
T: 513-326-1280
F: 513-326-1288

DRINKING WATER OZONE SYSTEM

For Winnipeg Water Treatment Program

**The City of Winnipeg
Manitoba, Canada**

OZONE SYSTEM SUBMITTAL

Fuji Electric Project No. WPMB-1105

**OZONE SYSTEM
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Treatment Program
Manitoba, Canada
Project No.: WPMB-1105**

VOLUME 1 OF 3

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VOLUME 1 OF 3

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Treatment Program
Manitoba, Canada
Project No.: WPMB-1105****VOLUME 2 OF 3**

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VOLUME 3 OF 3**FUJI ELECTRIC DRAWINGS/WIRING REQUIREMENTS**

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- **OZONE EQUIPMENT DRAWINGS**
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 - OZONE GENERATOR/COOLING WATER SKID DRAWING
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- **POWER SUPPLY UNIT & LOCAL CONTROL PANEL DRAWINGS**
- **OZONE MASTER PLC PANEL (OSCP) DRAWINGS**
- **OZONE DESTRUCT PANEL DRAWINGS**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

MONITOR (INDICATOR / ANALYZER)

An assortment of monitors (indicators and analyzers) to be installed to measure the dew point of gaseous oxygen, ozone concentration and dissolved ozone concentration at various stages of process. The oxygen content in the area where the ozone generators are installed is also measured by Ambient Oxygen Monitors.

The ambient ozone concentration to be constantly monitored by Ambient Ozone Monitors.

One portable ambient ozone concentration monitor is supplied for ease of measuring the ozone concentration at various places in the plant.



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

DEW POINT INDICATOR / ANALYZER

MANUFACTURER : PANAMETRICS
SERVICE : CLEAN DRY AIR AND GASEOUS OXYGEN

ANALYZER

MODEL : MOISTURE TARGET SERIES 5
PART NO. : MTS5-321-10
CONFIGURATION : SINGLE CHANNEL, PANEL MOUNT
RANGE : -166° F ~ 140° F (-110° C ~ 60° C)
ANALOG OUTPUT : SINGLE INTERNAL ISOLATED RECORDER OUTPUT
OUTPUT : 4 ~ 20 mA
ALARM RELAY : (2) STANDARD FORM-C ALARM RELAYS SPDT
(1) FAIL-SAFE FAULT RELAY
POWER : 120 VAC / 1 PHASE / 60 Hz
QUANTITY : 2
TAG NO. :

SENSING ELEMENT (M SERIES)

MODEL : M SERIES
PART NO. : M2LR-(SP)
PROBE MATERIAL : ALUMINUM / THIN FILM ALUMINUM OXIDE
PRESSURE RANGE : 5 MICRONS Hg ~ 5,000 PSIG (34.47 MPa)
CALIBRATION : TRACEABLE TO NIST
ACCURACY : ± 5.4° F (± 3° C)
REPEATABILITY : ± 1.8° F (± 1° C)
FLOW RANGE : STATIC TO 10,000 CM/S LINEAR VELOCITY AT 1 ATM
QUANTITY : 2

SAMPLING SYSTEM

PART NO. : 035-2830-135A-095C-035-175-185B-SP
CONNECTION : 1/4" (6.35 mm) TUBE
QUANTITY : 2
TAG NO. :

CUSTOMER TAG NO. : AT-O032A / AT-O051A

Earth Tech (Canada) Inc.

Reviewed for general compliance with the applicable code of practice.
Responsibility for the design and construction of the works
rests with the client.

Responsibility for the design and construction of the works
dimensioned to the design and construction of all
parts of the works rests with the client.

REVIEWED

REVIEWED AS MODIFIED

RE-USE AND RE-DESIGN

NOT REVIEWED

Project No. 79538-C14-16

Date: 26/1/06 By: [Signature]

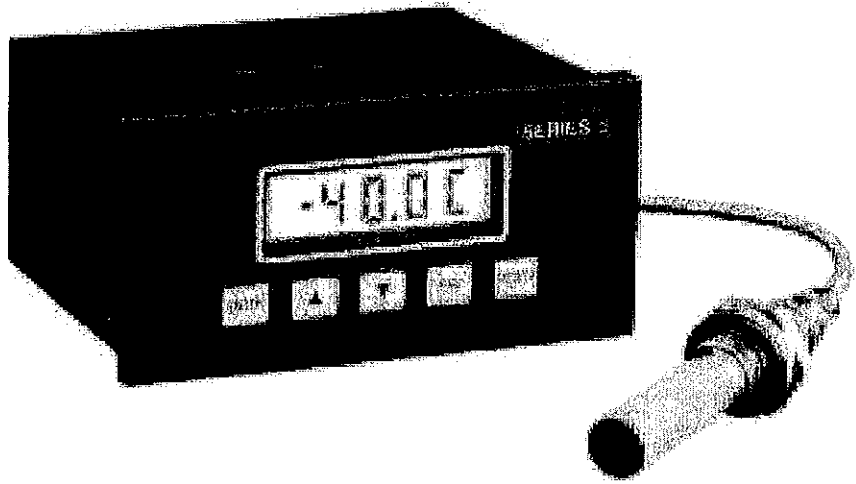
GE Infrastructure Sensing

Applications

This single-channel analyzer measures moisture in gases and non-aqueous liquids. Designed for permanent installations, it is used in conjunction with GE Infrastructure Sensing M Series moisture probes for air/gas dryer OEM industries.

Features

- Low-cost, single-channel hygrometer for original equipment manufacturer applications
- Two Form C alarm relays, standard or hermetically sealed for hazardous areas
- M Series moisture probes with NIST-traceable moisture calibration
- Weatherproof membrane front panel display/keypad
- Built-in isolated analog output in current or voltage
- Panel-mount and PC-board configurations
- Fail-safe fault alarm



MTS 5 Moisture Target™ Series 5

Low Cost, Real-Time Moisture Measurement

The Moisture Target Series 5 is an economical, single channel, aluminum oxide hygrometer in the GE Moisture Series line of analyzers. It is intended for original equipment manufacturer (OEM) applications requiring low-cost, accurate, real-time moisture measurement.

Improves OEM Product Performance

The Moisture Target Series 5 can significantly enhance the performance of OEM products by allowing closed-loop control of moisture. For example, in a regenerative dryer application it can improve efficiency by initiating desiccant bed regeneration when needed, rather than on an open-loop timed cycle.

Panel-Mount Version

The panel-mount version of the Moisture Target Series 5 comes in a compact DIN standard meter housing for applications where space is at a

premium. The case slides directly into the panel cutout, and is held in place from the rear by captive screws.

PC-Board Version


The Moisture Target Series 5 is also available in PC-board form for complete product design flexibility. The board is typically installed inside the cover of a product enclosure or cabinet, with the LCD and keypad visible through cutouts in the cabinet door.

Uses M Series Probes

Both versions of the Moisture Target Series 5 use GE M Series aluminum oxide moisture sensor probes. M Series probes are rugged and accurate true absolute humidity sensors with calibration traceable to the National Institute of Standards and Technology (NIST). Exceptional dynamic range, speed of response and calibration stability have made the M Series probe the standard for performance and value in industrial moisture measurement for more than 40 years.

GE Panametrics has joined other GE high-technology sensing businesses under a new name --

GE Infrastructure
Sensing

imagination at work 

Earth Tech (Canada) Inc.

Reviewed for general comprehension with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for installation and coordination of field dimensions, materials, quantities, sequencing of construction, and final acceptance of all parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

26/1/06

By:

M. Foulse

Microprocessor-Based Electronics

The microprocessor-based Moisture Target Series 5 accurately tracks fast-changing process conditions and displays dew/frost point temperature in °C or °F on a six-digit LCD. Dew/frost point is also available as an analog voltage or current output, and the Moisture Target Series 5 features built-in isolation to ensure the integrity of signals to remote devices. The unit also features two optional Form C alarm relays for high and low dew/frost point limits. For applications in Division 2 hazardous areas, hermetically sealed relays are available. The microprocessor-based electronics and five-button keypad combine to make selection of analog output zero and span, and alarm set-points fast and easy.

Specifications

Electronics

Intrinsic Safety

External safety barrier for moisture input (optional)

European Compliance

Complies with EMC Directive 89/336/EEC, 73/23/EEC LVD (Installation Category II, Pollution Degree 2) and PED 97/23/EC for DN<25

Input

Moisture signal from GE M Series thin-film aluminum oxide moisture probe

Analog Output

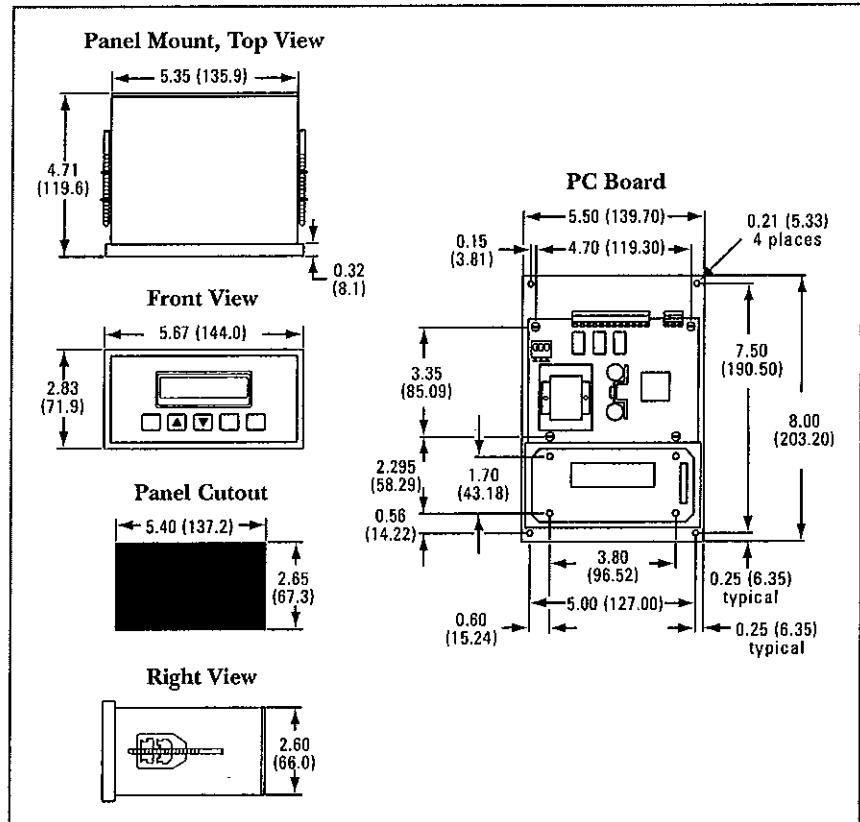
Single internal isolated recorder output for dew/frost point temperature; 10-bit (0.1%) resolution

Standard Switch-Selectable Outputs

- 0 to 2 V, 10-kΩ minimum load resistance
- 0 to 20 mA, 400-Ω maximum series resistance
- 4 to 20 mA, 400-Ω maximum series resistance
- Zero and span are user-programmable within the range of the instrument and the corresponding sensor

Alarm Relays

- One fail-safe fault relay
- Two standard Form C relays SPDT, rated for 2 A at 28 VAC/28 VDC
- Hermetically sealed relays available
- Set to any level within the range of the instrument; programmable from front panel



Left: Panel-mount model. Right: PC-board model. Dimensions in inches (mm).

Alarm Set Point Repeatability

±0.1°C dew point

Display

One-line, six-digit backlit LCD

Display Functions

Dew/frost point temperature °C or °F

Power Requirements

100/120/230/240 VAC, 50/60 Hz, 24 VDC

Temperature

- Operating: -20° to 60°C (-4° to 140°F)
- Storage: -30° to 70°C (-22° to 158°F)

Warm-Up Time

Meets specified accuracy within three minutes

Configurations

- Panel (front panel meets NEMA 4 and IP66 requirements)
- PC-board versions

Moisture Measurement

Sensor Type

Thin-film aluminum oxide moisture sensor probe

Moisture Probe Compatibility

Compatible with GE M Series aluminum oxide moisture probes

Dew/Frost Point Temperature

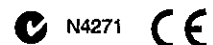
- Overall calibration range capability: 60° to -110°C
- Available calibration range options: Standard 20° to -80°C with data to -110°C or extended high 60° to -80°C with data to -110°C

Accuracy

- ±2°C from 60° to -65°C dew/frost point
- ±3°C from -66° to -110°C dew/frost point

Repeatability

- ±0.5°C from 60° to -65°C dew/frost point
- ±1.0°C from -66° to -110°C dew/frost point



GE Infrastructure Sensing

Applications

This aluminum oxide moisture-sensor probe measures moisture concentration in gases and non-aqueous liquids from trace to ambient levels. It is designed to be used in conjunction with all GE Infrastructure Sensing moisture analyzers for industries including:

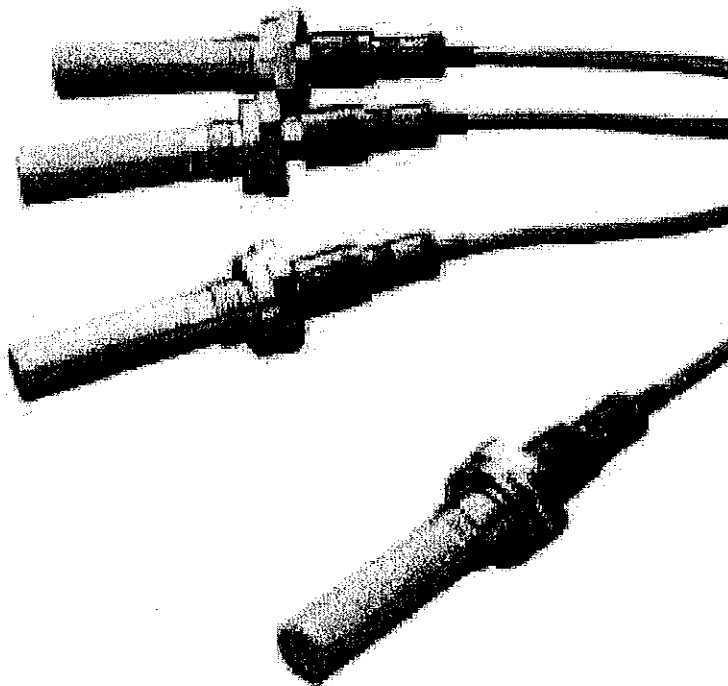
- Petrochemical
- Natural gas
- Industrial gas
- Semiconductor
- Furnace gas/heat treating
- Power generation
- Air dryer
- Pharmaceutical
- Aerospace

Features

- Intrinsically safe
- Superior sensitivity, response speed and calibration stability
- Optional temperature sensor
- Calibrations traceable to NIST
- Designed for in situ applications or in conjunction with sample conditioning systems
- True absolute humidity sensor
- Wide dynamic range

GE Panametrics has joined other GE high-technology sensing businesses under a new name —

GE Infrastructure
Sensing



M Series Aluminum Oxide Moisture Probe

GE Panametrics Hygrometer Systems and Moisture Probes

GE aluminum oxide moisture probes have set the standard of performance and value in industrial moisture measurement for more than 40 years.

In use, M Series moisture probes are coupled to GE Panametrics hygrometer consoles by an interconnecting cable. Ease of use, wide measurement range and rigorous calibration standards make these systems the preferred choice for industrial moisture measurement worldwide.

Superior Performance

Film thickness of the oxide layer is critical to the performance of this type of sensor. GE Infrastructure Sensing manufactures sensors with an oxide film thickness that causes them to exhibit true absolute humidity, rather than relative humidity response, while minimizing any temperature or hysteresis effects. This critical film thickness also gives the GE M Series probe quick response and exceptional calibration stability.

Rigorous Calibration Standards Traceable to the NIST

Each GE aluminum oxide sensor is individually calibrated in one of the world's most advanced moisture calibration facilities. Developed over several decades, this facility uses flow, temperature and pressure measuring devices, traceable to the National Institute of Standards and Technology (NIST), to generate precisely known moisture concentrations to which each probe is exposed during the calibration process.

All data is gathered and stored by a dedicated computer system. Calibrations are repeated over a period of months to determine the stability of each individual moisture probe. Only those probes that meet GE Infrastructure Sensing's demanding specifications for accuracy and stability are shipped to customers.

Theory of Operation in Gases and Liquids

The direct measurement of water vapor pressure is accomplished easily and effectively in both gases and liquids by the M Series aluminum oxide moisture sensor. The sensor consists of an aluminum strip that is anodized by a special process to provide a porous oxide layer over which a very thin coating of gold is evaporated. The aluminum base and the gold layer form the two electrodes of what is essentially an aluminum oxide capacitor.

Water vapor is rapidly transported through the gold layer and equilibrates on the pore walls of the oxide layer. The number of water molecules absorbed on the oxide structure determines the conductivity of the pore walls. Each value of pore wall resistance provides a distinct value of electrical impedance, which in turn is functionally related to the water vapor pressure. This functional relationship holds for measurements made in either gas phase or liquid phase.

Installation Flexibility

GE M Series probes are designed to be located at the process, exactly where the measurement is needed. Cable length between the probe and hygrometer may be 2,000 ft (610 m) or more. Operating temperature range is -110°C to 70°C (-166°F to 158°F), pressure range is from vacuum up to 5,000 psig (345 bar), and no minimum flow rate is required. Sample cells make M Series probes easy to install, and the cells are available in general purpose, NEMA 4 weatherproof, and NEMA 7 explosion-proof housings.

Remote installation of the probe and wide operating parameters allow for in situ placement of the probe. Because a sample need not be brought to the analyzer, both the time lag and the potential for sample contamination associated with sample delivery systems are eliminated. This feature is extremely important in the measurement of very low moisture content or where rapid changes occur.

When the integrity of the measurement is threatened by conductive or erosive particles, or adverse process conditions, sample conditioning will be required.

GE Infrastructure Sensing manufactures turnkey sample-conditioning systems that maintain the integrity of the sample's moisture content while removing the contaminants. These designs have been field-tested and have proven to be reliable, while requiring little or no maintenance.

Specifications

Moisture Probe

Intrinsic Safety

Intrinsically safe when connected to a GE Moisture Series analyzer or intrinsically safe barriers in accordance with the user's manual. M Series moisture probe: BASEEFA Cert. No. BAS01ATEX1096X (Ex) II 1 G EEx ia IIC T4 (-20°C to $+80^{\circ}\text{C}$), System Cert. No. Ex 95C2056; and CSA C US Cl I, Div 1, Gr A,B,C,D T4, LR44204-23

European Compliance

Complies with EMC Directive 89/336/EEC and PED 97/23/EC for DN<25

Type

Aluminum oxide moisture sensor

Calibration

Each probe is individually computer calibrated against known moisture concentrations, traceable to the NIST

Dew/Frost Point Calibration Ranges

- Overall capability: 60°C to -110° (by request)
- Standard calibrated range: 20°C to -80°

Accuracy

- $\pm 2^{\circ}\text{C}$ in range of 60°C to -65°
- $\pm 3^{\circ}\text{C}$ in range of -66° to -110°C

Repeatability

- $\pm 0.5^{\circ}\text{C}$ in range of 60°C to -65°
- $\pm 1.0^{\circ}\text{C}$ in range of -66° to -110°C

Temperature

- Operating: -110°C to 70°C (-166° to 158°F)
- Storage: Maximum 70°C (158°F)

Operating Pressure (Dependent on Mount)

- Flange process connection (M1): $5\ \mu\text{Hg}$ to 75 psig (6 bar)
- Threaded process connection (M2): $5\ \mu\text{Hg}$ to 5,000 psig (345 bar)

Flow Range

- Gases: Static to 10,000 cm/s linear velocity at 1 atm
- Liquids: Static to 10 cm/s linear velocity at density of 1 g/cc

Response Time

Less than five seconds for 63% step change in moisture content in either wet-up or dry-down cycle

Note: Consult factory for specifications of other moisture probes available for special applications.

Construction

Sensor: 99.99% aluminum, aluminum oxide, gold, nichrome; back wire: 316 stainless steel; contact wire: gold foil spot-welded to 304 stainless steel ribbon; front wire: 316 stainless steel spot-welded to contact wire and pins; support: glass, Corning® 9010

Electrical Connector Construction

Pins: Al 152 alloy (52% Ni); Glass: type 9010; shell: 303 stainless steel; O-ring: Viton® A; end cap: 316 stainless steel

Input Voltage

1 VAC, 77 Hz

Impedance Range

50 k Ω to 2 M Ω depending on water vapor

Limited Warranty

- Calibration: Six months from delivery
- Materials and workmanship: One year from delivery

Optional Temperature Sensor

Type

Nonlinear negative temperature coefficient (NTC) thermistor (resultant temperature linearized by micro-processor)

Operating Range

-30°C to 70°C (-22° to 158°F)

Accuracy

$\pm 0.5^{\circ}\text{C}$ overall

Response Time (Maximum)

1 second in well stirred oil or 10 seconds in still air for a 63% step change in increasing or decreasing temperature



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

WINNIPEG WATER TREATMENT PROGRAM

MANITOBA, CANADA

MONITORS

AMBIENT OXYGEN MONITOR

MANUFACTURER : TELEDYNE ANALYTICAL INSTRUMENTS
 MODEL : 3350
 TYPE : MICRO FUEL CELL
 SERVICE : AMBIENT OXYGEN CONCENTRATION
 DISPLAY RANGE : 0 ~ 25% O₂
 ACCURACY : ± 2% OF FULL SCALE AT CONSTANT TEMPERATURE
 DISPLAY : LED
 OPR. TEMP. RANGE : 32 ~ 122° F (0 ~ 50° C)
 OUTPUT : FOR MEASUREMENT
 - VOLTAGE - 0 ~ 10 VDC, NEGATIVE GROUND
 - CURRENT - 4 ~ 20 mA, NEGATIVE GROUND
 FOR RANGE IDENTIFICATION
 - 10 VDC/500 OHMS MAXIMUM OPERATING RANGE
 ALARM : TWO FACTORY PRESET ALARMS AND SENSOR
 FAILURE ~~FAILURE~~ ALARM
 ENCLOSURE : NEMA 4, WALL MOUNTABLE TYPE
 POWER :
 INPUT : 100 ~ 240 VAC / 1 PHASE / 60 Hz
 BATTERY BACKUP : 12 VDC LEAD ACID BATTERY (RECHARGEABLE)
 SENSOR : SEALED ELECTROCHEMICAL TRANSDUCER
 QUANTITY : 2
 TAG NO. :
 CUSTOMER TAG NO. : AT-O110B / AT-O130B

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for actual design in the shop drawings
rests with the contractor.

Field engineer to ensure a correlation of field
work with design. The contractor is responsible for
the accuracy of the field work and for all
parts of the work until accepted by the engineer.

REVIEWED _____

REVIEWED AS NOTED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

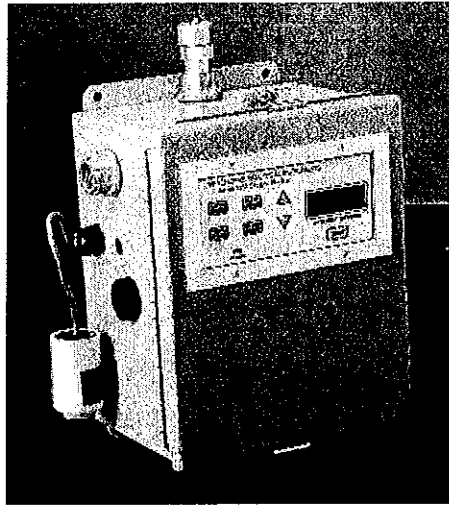
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Teledyne Analytical Instruments

3350



Control Room Oxygen Monitor

Personnel safety is a primary issue in nearly every industry, and no factor is of greater importance than assuring an appropriate level of oxygen in an enclosed area. Teledyne's Model 3350 Control Room Oxygen Monitor accurately measures the concentration of oxygen in control rooms, closed atmospheres, critical breathing circuits, and other applications that require the fail-safe monitoring of breathable, ambient air. Simple to use and maintain, this unit shoulders the burden of personnel safety with the quality and reliability offered by the Teledyne name.

The Model 3350 is a microprocessor-based oxygen alarm monitor for real-time measurement of the oxygen content of the atmosphere surrounding its sensor. The standard instrument is configured to run from an AC power source and is also available with an optional, continuously charging, DC battery backup. The rated battery life is approximately 17 hours configured in failsafe mode and 48 hours in non-failsafe mode.

DUAL OXYGEN ALARMS

The alarm setpoints provide an operational band that covers all acceptable oxygen concentrations. If the oxygen level at the sensor crosses the adjusted setpoint of one of the alarms, that alarm will cause the switching of relay contacts.

Designed in consideration of OSHA specifications, the standard factory setting of the two alarms provides a CAUTION alarm at 20% oxygen and a DANGER alarm at 19.5% oxygen. To cover special situations, a limited amount of adjustment is possible. Both alarm setpoints are factory set (internal) to prevent tampering or resetting by unauthorized personnel.

When an insufficient oxygen concentration triggers either alarm, a red panel light and an audible annunciator are energized. The alarms remain energized until the oxygen concentration has been elevated above the trigger point.

BATTERY BACKED STANDBY POWER

An optional Battery Backed Standby Power Configuration is offered for potential power failure or "brown out" conditions. With this feature, power outages will not interfere with a properly working alarm. The standby power source uses a rechargeable lead acid battery. If the AC power is interrupted, the stand-by power supply automatically supports analyzer operation. Periodic testing of the battery pack is possible through a simple pushbutton inside the instrument's control panel.

MAINTENANCE-FREE SENSOR

The 3350 uses a patented Micro-fuel Cell to measure the concentration of oxygen in breathable air. This sensor is a sealed electrochemical transducer with no electrolyte to change or electrodes to clean, so it is virtually maintenance free. When it reaches the end of its useful life, it is easily replaced.

SIMPLE CALIBRATION

Periodic calibration is quickly and easily accomplished with no specialty gas requirements. The Micro-fuel Cell produces a linear output from zero to 100% oxygen so ambient air or readily available instrument grade air (20.9% oxygen) can be economically used for calibration. Also, since the Micro-fuel Cell has an absolute zero, no zero gases are needed.

EASY TO INSTALL

The Model 3350 is designed for easy installation. Mount the unit to a wall or bulkhead, connect AC power, and the installation is complete. The unit is lightweight with a slim profile, eliminating the need for special reinforcement in most installations. (Note: Teledyne recommends consulting a safety expert to select a suitable location for installation.)

REMOTE PROBE AVAILABLE

A special version of the 3350 is available with a remote-mountable oxygen probe. This option permits the user to install the oxygen probe inside the control room, while the control unit is mounted outside. This allows personnel to see the analyzer and confirm a safe level of ambient oxygen is present before entering the control room.



The 3350 is a
CE marked product

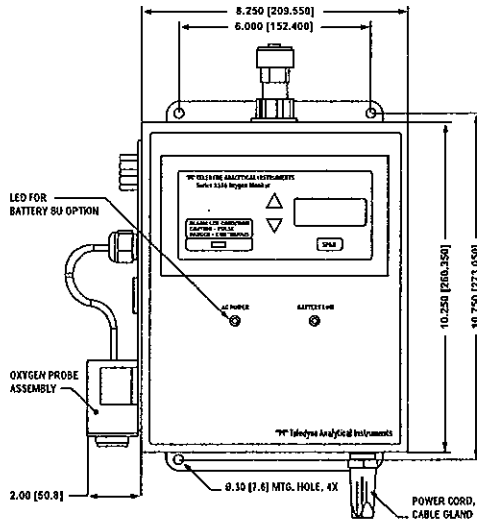
3350 CONTROL ROOM OXYGEN MONITOR

FEATURES

- Large, bright, LED meter readout
- Nylon cell holder
- Audible and visual alarm indicators
- Simple pushbutton controls
- Long-life, maintenance-free Micro-fuel Cell oxygen sensor
- Unaffected by oxidizing gases
- Fast response and recovery time
- Microprocessor based electronics
- Air calibration range for convenient spanning at 20.9% oxygen
- Two factory preset alarms, Form C relay contacts, configured as failsafe or non-failsafe
- Sensor failure alarm, Form C relay contact, configured as failsafe or non-failsafe
- Three analog outputs: two for measurement (0-10 Vdc and negative ground 4-20 mA) and one for range identification (0-10 Vdc)
- Compact and rugged, wall mounted NEMA-4 rated enclosure
- CE Mark approval

OPTIONS

- Battery back-up
- Power requirement: 100 / 220VAC, 50 / 60 Hz
- Special ranges
- Special remote probe
- Provisions for conduit-in power connection



SPECIFICATIONS

- Range:** 0-25% oxygen
- Sensitivity:** 0.5% of full scale
- Accuracy:** ±2% of full scale at constant temperature; ±5% of full scale (over operating temperature range, once the system has reached equilibrium at a constant temperature)
- Response time:** 90% in less than 20 seconds at 25°C
- Operating and storage temperature:** 32 to 122°F (0 to 50°C)
- Relative humidity:** 0-95% non-condensing
- Maximum altitude:** 6562 feet (2000 meters)
- Reproducibility:** ±1% of full scale
- Sensor type:** B-3 class Micro-fuel Cell
- Display:** LED
- Battery life:** 48 hours (non-alarm conditions) non-failsafe
17 hours (non- alarm conditions) failsafe
- Power requirements:** AC 100 to 240 Vac @ 50/60 Hz, 0.3A Max
Battery backup version charges and maintains a 12 Vdc lead acid battery
- Signal output:** *Voltage:* 0-10 Vdc, negative ground (10mA max)
Current: 4-20 mA, negative ground (15V max open circuit)
10 Vdc / 500 ohms maximum operating range
- Audible alarm:** 12-15 Vdc, 4.3 mA max
- Range ID:** 0-10 Vdc (0-10 mA max) (80mA short circuit)
- Enclosure:** Wall mounting, NEMA-4 enclosure
- Dimensions:** 8" wide x 10" high x 6" deep (20.3 x 25.4 x 15.2 cm)
- Alarms:** *Factory set:* Caution — 20.0%
Danger — 19.5%
Sensor failure: Audible — buzzer
Visual — red indicator lamps

TELEDYNE ANALYTICAL INSTRUMENTS

16830 Chestnut Street
City of Industry, California 91748, USA

TEL: 626-934-1500 FAX: 626-934-1651

TOLL FREE: 888-789-8168

www.teledyne-ai.com

Regional Office

Tokyo, Japan81-33-239-9090

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Warranty

Instrument is warranted for 1 year against defects in material or workmanship

NOTE: Specifications and features will vary with application. The above are established and validated during design, but are not to be construed as test criteria for every product. All specifications and features are subject to change without notice.





Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

AMBIENT OZONE ANALYZER / TRANSMITTER

MANUFACTURER : IN-USA
MODEL : IN-2000-L2-LC
SERVICE : AMBIENT OZONE CONCENTRATION
DISPLAY TYPE : 20 CHARACTER ALPHANUMERIC, LCD
MEASUREMENT RANGE : 0 ~ 1 PPM
OUTPUT : 4 ~ 20 mA
ALARM RELAY OUTPUT : TWO FIELD PROGRAMMABLE ALARMS WITH FORM C
RELAY CONTACTS
ENCLOSURE : NEMA 4X, WALL MOUNT
POWER : 100 ~ 240 VAC / 1 PHASE / 60 Hz
PROCESS CONNECTION : 1/4" (6.35 mm) S.S. COMPRESSION FITTING
ACCESSORIES : IN-LINE FILTER/DRYER SAVILLEX MODEL #4-47-4
(SHIPPED LOOSE, TO BE INSTALLED IN THE FIELD)
SPECIAL REQUIREMENT : TO BE CLEANED FOR OXYGEN SERVICE
QUANTITY : 4
TAG NO. :
CUSTOMER TAG NO. : AT-O110A / AT-O130A / AT-O150A / AT-O520B

INSTALLATION NOTE:

IF ANY HOLES ARE MADE IN THE FIBERGLASS ENCLOSURE, CARE SHOULD BE
TAKEN TO PREVENT INTERNAL CONTAMINATION.
THE FIBERGLASS DUST PRODUCED WILL INTERFERE WITH THE PROPER
OPERATION OF THE ANALYZERS.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsible for related design in the shop drawings
as well as the Contractor.

Responsible for verification and correlation of field
measurements with design process. Techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

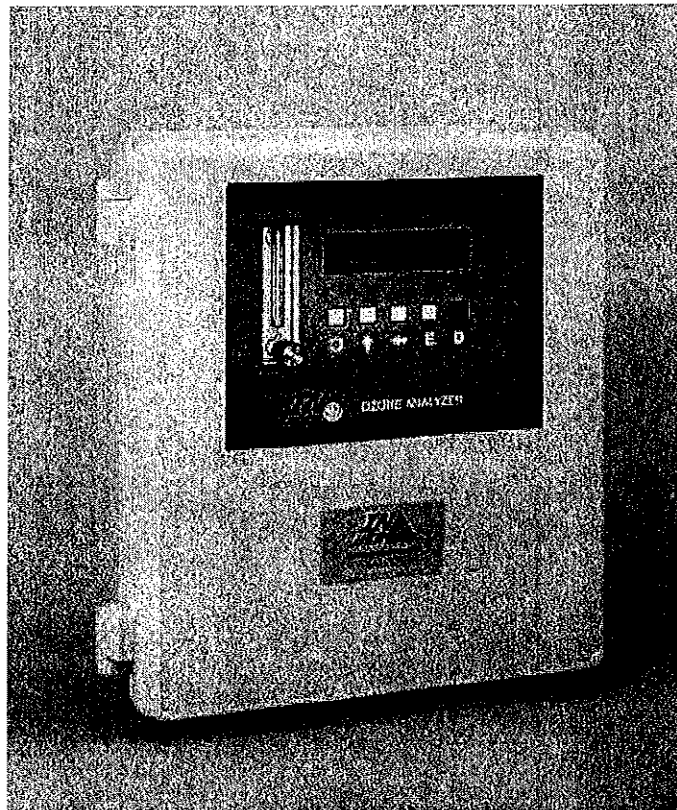
Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]



**Model
IN-2000-L2-LC**

LOW CONCENTRATION OZONE ANALYZER



The Model **IN-2000-L2-LC** uses UV absorption to continuously measure low concentrations of ozone in the gas phase. With its advanced electronics design, the Model **IN-2000-L2-LC** delivers highly accurate and stable readings traceable to NIST standards. Sample temperature and pressure compensation is available as an option. The model **IN-2000-L2-LC** is typically used in areas around ozone generators, contact chambers, ozone destruct units, gas delivery systems, and semiconductor tools.

Applications:

- Ozone leak detection for environmental monitoring
- Workplace safety
- Ozone levels in post-destruct or pre-destruct units with a sample conditioning system
- Ozone levels in vent gas

Features:

- UV Absorption technique
- Highly stable optical system
- Microprocessor based technology
- Dual field programmable alarms
- No consumables
- Reliable, repeatable and accurate

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, field construction, and changes of
construction, and coordination of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

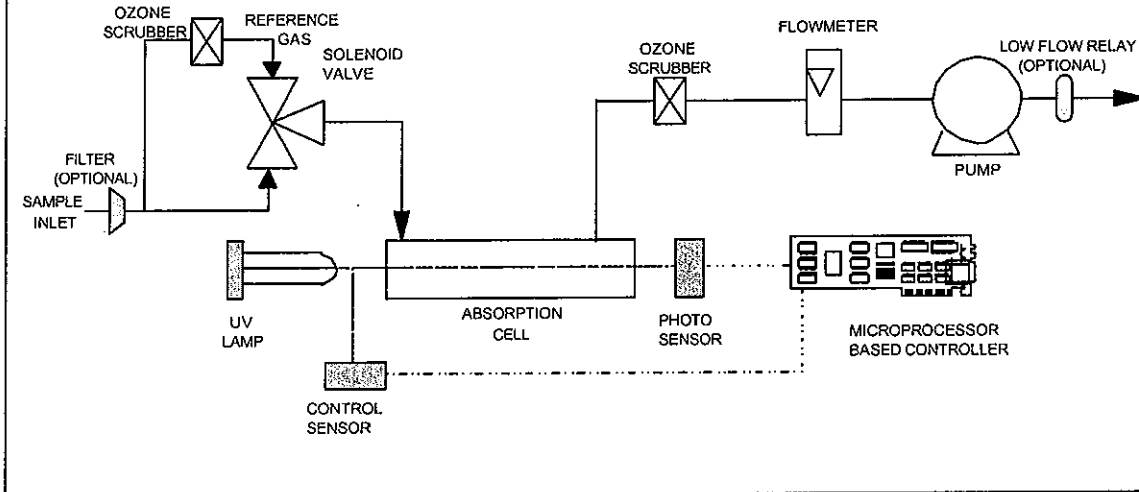
Project No. 79538-C14-16

Date: 28/1/06

By: [Signature]

Specifications **Model IN-2000-L2-LC**

Principle of Operation: The controller calculates the attenuation ratio of Ultra Violet light on the Photo sensor between a Ozone free reference gas and the sample gas. The Ozone concentration is directly related to the amount of UV light absorbed in the sample cell at a specific wavelength.



Measuring Principle:	UV absorption with automatic zeroing	Readout:	2x20 character, alpha-numeric, LCD
Measuring Range:	0 – 10,000 PPM*, in multiples ranges	Analog Outputs:	4-20 mA and 0-10 VDC standard.
Resolution:	0.001 ppm (range 0-1 or 0 -10) 0.01ppm (range 0 -100) 0.1 ppm (range 0-1,000) 1 ppm (range 0-10,000)	Digital Outputs:	RS-232 interface
Linearity:	Better than 99% throughout range	Supply Voltage:	100-240 VAC 50/60 Hz
Calibration Standard:	Traceable to the US NIST	Sample Flow Rate:	1.0 LPM
Zero Drift:	None, digitally autozeroed	Connections:	¼" Swagelok fittings, others available
Standard Alarms:	Two field programmable alarms with form C relay contacts (SPDT, 5A 250 VAC resistive)	Configurations:	Nema-4X IP65 Wall Mount; 19" Rack Mount, others available
Diagnostic Features:	Continuous internal diagnostics with error messages & one instrument error relay	Dimensions:	(H x W x D) Nema-4X Weatherproof: 15.6 x 14.4 x 6.7 in. (396.9 x 365.1 x 169.9 mm.) Rack Mount: 5.25 x 19.00 x 18.18 in. (133.3 x 482.6 x 461.8 mm.)
Options:	Pressure and temperature compensation Low flow relay RS-422 Isolated 4-20 mA Sample Conditioning	Environmental Operating Conditions:	5-45°C; 0-95% RH non-condensing

* Other concentration units available upon request



IN USA, INC. - 87 CRESCENT ROAD - NEEDHAM, MA - 02494 - USA
TOLL FREE: (1) 800-798-4029 - TEL: (1)781-444-2929 - - FAX: (1)781-444-9229

www.inusacorp.com; E-mail: info@inusacorp.com

Specifications subject to change without notice

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Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

VENT GAS OZONE ANALYZER / TRANSMITTER

MANUFACTURER : IN-USA
MODEL : IN-2000-L2-LC
SERVICE : VENT GAS CONCENTRATION AT OUTLET OF OZONE
DESTRUCT UNIT
DISPLAY TYPE : 20 CHARACTER ALPHANUMERIC, LCD
MEASUREMENT RANGE : 0 ~ 1 PPM
OUTPUT : 4 ~ 20 mA
ALARM RELAY OUTPUT : TWO FIELD PROGRAMMABLE ALARMS WITH FORM C
RELAY CONTACTS
ENCLOSURE : NEMA 4X, WALL MOUNT
POWER : 100 ~ 240 VAC / 1 PHASE / 60 Hz
PROCESS CONNECTION : 1/4" (6.35 mm) S.S. COMPRESSION FITTING
ACCESSORIES : IN-LINE FILTER/DRYER SAVILLEX MODEL #4-47-4
(SHIPPED LOOSE, TO BE INSTALLED IN THE FIELD)
SPECIAL REQUIREMENT : TO BE CLEANED FOR OXYGEN SERVICE
QUANTITY : 3
TAG NO. :

CUSTOMER TAG NO. : AT-O510A / AT-O520A / AT-530A

INSTALLATION NOTE:

IF ANY HOLES ARE MADE IN THE FIBERGLASS ENCLOSURE, CARE SHOULD BE
TAKEN TO PREVENT INTERNAL CONTAMINATION.
THE FIBERGLASS DUST PRODUCED WILL INTERFERE WITH THE PROPER
OPERATION OF THE ANALYZERS.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for full compliance in the shop drawings rests with the Contractor.

Responsibility for accuracy and correlation of field dimensions, placement and construction of all construction materials and installation of all parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

**REFER TO VOLUME 1
TAB # 12C**

**FOR
LOW CONCENTRATION OZONE
ANALYZER/TRANSMITTER**



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

HIGH CONCENTRATION OZONE ANALYZER / TRANSMITTER

MANUFACTURER	:	BMT MESSTECHNIK GmbH
MODEL	:	BMT 964 C (CABINET VERSION)
TYPE	:	DUAL BEAM UV PHOTOMETER
SERVICE	:	OZONE CONCENTRATION AFTER OZONE GENERATOR
OPERATING RANGE	:	0 ~ 14 WT % OZONE
ACCURACY	:	ERROR LESS THAN 0.5 %
REPEATABILITY ERROR	:	0.2 % MAXIMUM
OUTPUT	:	4 ~ 20 mA
ENCLOSURE	:	NEMA 4X
POWER	:	120 VAC / 1 PHASE / 60 Hz
PROCESS CONNECTION	:	3 x 5 mm S.S. COMPRESSION FITTING
SPECIAL REQUIREMENT	:	TO BE CLEANED AND PACKAGED FOR OXYGEN SERVICE
QUANTITY	:	3 (1 PER GENERATOR)
TAG NO.	:	
CUSTOMER TAG NO.	:	AT-O112A / AT-O132A / AT-O152A

Earth Tech (Canada) Inc.

Reviewed for general conformity with design intent. Responsibility for all dimensions in the shop drawings rests with the fabricator.

Responsible for the accuracy and correlation of field data and shop drawings. Responsible for the accuracy of quantities and material take-off. Responsible for all parts of the work under the contract.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT

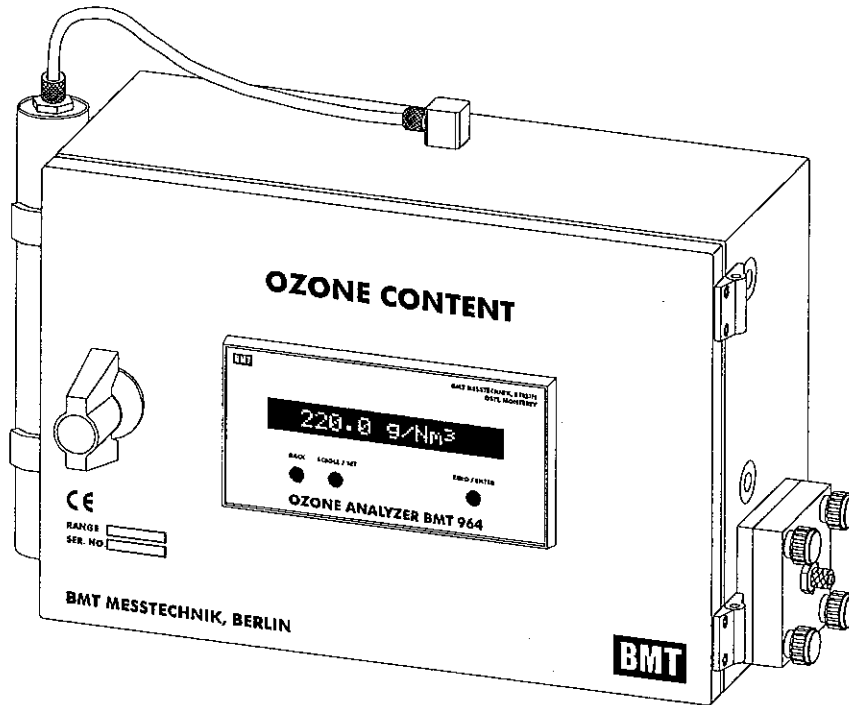
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Project No. 79538-C14-16

Date: 27/1/06 By [Signature]

OZONE ANALYZER BMT 964 C

*Cabinet Version of
High Concentration
Ozone Gas Analyzer*



FEATURES

- Dual beam UV photometer
- Warranty 3 years
- Long-life mercury lamp
- High accuracy, error less than 0.5%
- Pressure and temperature compensated
- Ranges from 2 to 400 g/Nm³
- Built-in sample gas filter
- Built-in purge unit for automatic zeroing
- Failure warnings include: lamp low, cuvette dirty, overrange, summary error
- Key functions programmable via the front panel, or a Windows PC
- Display in g/Nm³, %wt/wt, or ppmv
- High and low limit alarms
- Timing sequence for automatic zeroing
- Pressure readout in bar, psi, Torr or MPa
- 4-20mA and 0-10V isolated outputs
- RS-232 interface (bidirectional)

APPLICATIONS

- Ozone measurement in hostile environment
- Monitoring of ozone generator output
- Monitoring of residual ozone after a process
- Potable water treatment
- Waste water treatment
- Industrial ozone processes

The OZONE ANALYZER BMT 964 C is the wall-mount version of the standard BMT 964 (see data sheet of standard BMT 964) for application in a hostile environment. It is housed in a splash-proof IP 65 (NEMA 4X) steel cabinet, and is equipped with everything needed for fully automatic stand-alone operation.

Fully automatic means: a purge unit is provided which consists of a 3-way solenoid valve, and an air pump (with particle filter), both being controlled by the automatic purge timer of the analyser. The system automatically purges the cuvette with clean, filtered air, and then zeroes the analyser. The zeroing interval may be chosen between 1 and 99 hours.

Stand-alone means: a sample gas filter is provided (external to the cabinet), a throttle valve, a flow meter (behind the front door), and a Catalyzing Cartridge (external). An external Dirt Trap to remove namely fluidic dirt before it can reach the analyser, may be provided on request.

Superior stability of the photometer is achieved by use of a true dual beam optical system with an extremely long-life mercury lamp. MTBF of the instrument, including the lamp, is in excess of 65,000 hours. Excluding the lamp it is 120,000 hours.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

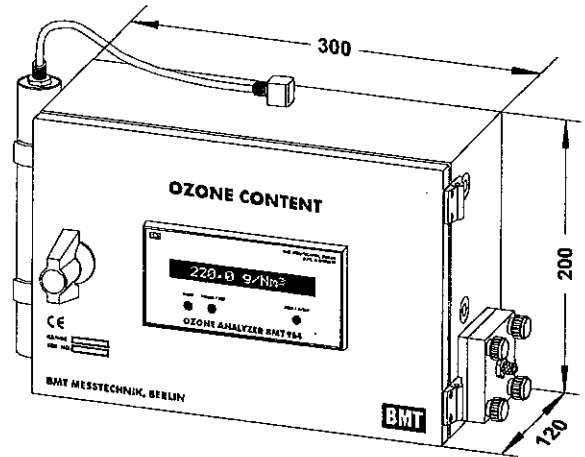
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]

SPECIFICATIONS

measurement principle	dual-beam UV photometer (254 nm), no moving parts
MTBF	instrument incl. UV lamp 65,000 h, excl. UV lamp 120,000 h
UV lamp	low pressure mercury lamp, long life design, burnt-in for 300 h
display	16 character alphanumeric backlit LCD
concentration ranges	50, 100, 200, 300, 400 g/Nm ³ , selectable units g/Nm ³ , %wt/wt and ppmv
optional ranges	10, 20 g/Nm ³ , selectable units g/Nm ³ , %wt/wt and ppmv
concentration error	0.5 % max.
repeatability error	0.2 % max.
response time	0.03 s (analog output), 0.3 s (display)
zero drift	0.2 % per day, after 10 minutes warm-up, non-cumulative
proof pressure	min. 1 bar above pressure range
ambient temperature	0 - 50°C (non-condensing)
materials in contact with ozone	quartz (cuvette windows), Al ₂ O ₃ (cuvette), FFPM (window seals), PTFE (tubing), stainless steel (fillings, cuvette spacer)
gas ports	for PTFE tubing 3 x 5 mm (1/8" x 3/16"), opt. 1/8" or 1/4" Swagelok, 4x6mm PTFE Built-in sample gas filter is standard
recommended flow rate	0.1 to 1 l/min typical
pressure drop	approx. 5 mbar at 0.5 l/min (throttle valve fully open)
temperature compens.	is standard
pressure compensation	with built-in cuvette pressure transducer, for ozone measurement at an arbitrary systemic pressure, abs. pressure range 1.15 bar (optional up to 4.0 bar in steps of 0.5, please specify) units selectable: bar, psi, Torr, Mpa
signal outputs	concentration 4 - 20 mA (isolated, active) concentration 0 - 10 V (isolated)
concentration alarms	High Alarm, Low Alarm, latching, not latching
control input	set to zero (24 V, 18 mA, isolated)
control outputs	relay contacts, 28 V, 0.5 A, isolated: Lamp Low Cuvette Dirty High Alarm Low Alarm
error handling	Error Relay: 30 V, 1 A, summarizing instrument failures Warnings and errors: Lamp Low Warning, Lamp Low Error, Lamp Off Error, Cuvette Dirty Warning, Cuvette Dirty Error, Overrange, Overpressure
serial interface	RS-232, bidirectional, 2400 - 38400 Baud
automatic zeroing	with internal purge pump and solenoid valve only with pressure range 1.15 bara
software	BMT 964 Link, instrument configuration and readout of Event and Error Logs on a Windows PC
power	wide range input: 85 - 264 VAC, 15 VA optional: 12 - 36 VDC, 15 W
dimensions (W x H x D)	300 x 200 x 120 mm (W x H x D)
weight	5.5 kg



dimensional outline

The OZONE ANALYZER BMT 964 C is housed in a powder coated steel cabinet. The space needed (door open, sample gas tubing and cables connected) is approx. 480 x 240 x 420 mm (W x H x D). The cabinet can be wall-mounted using the four brackets provided at the rear (four mounting holes 6 mm ID, spaced 240 x 225 mm, W x H).

For sample gas connection 3 x 5 mm (or 1/8" x 3/16") PTFE tubing should be used. The BMT 964 C is also available with 1/8" or 1/4" Swagelok fittings and steel tubing to the Catalyzing Cartridge.

Additional BMT Products (for details, refer to the appropriate data sheets):

- BMT 964 BT (Bench Top) for stand-alone applications on the bench, or in the field
- BMT 964 AQ and BMT 964 AQ-INLINE for ozone measurement in DI (de-ionized) water
- BMT 964 AQ/HF for ozone measurement in DI water with HF
- BMT DH3 Sample Gas Dehumidifier for drying of wet ozone sample gas
- BMT 930 Ozone Monitor for TLV monitoring in ambient air (1, 3 & 6 channels)

A broad spectrum of field-proven accessories - from simple fittings and tubing up to the thermoelectric sample gas dryer DH3 - helps the user with the application and installation of the OZONE ANALYZER BMT 964 C. Please ask for our assistance!



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

DISSOLVED OZONE ANALYZER / TRANSMITTER

MANUFACTURER : ROSEMOUNT
SERVICE : DISSOLVED OZONE CONCENTRATION AT CONTACTORS

ANALYZER

TYPE : SOLU COMP II
MODEL : 1055
POWER : 115 VAC / 1PHASE / 60 Hz
DISPLAY : TWO LINES, 16 CHARACTER BACK-LIT DISPLAY
CURRENT OUTPUT : 4 ~ 20 mA
OPERATING TEMP. : 32 ~ 122° F (0 ~ 50° C) WITH RH 5 TO 95%
ENCLOSURE : NEMA 4X/CSA 4
QUANTITY : 4
TAG NO. :

SENSOR

MODEL : 499AOZ
RANGE : 0 ~ 3 PPM OR mg/L
CONNECTION : 1" (25 mm) MNPT
PRESSURE RANGE : 0 ~ 65 PSIG (0 ~ 549 kPa)
TEMP. RANGE : 32 ~ 122° F (0 ~ 50° C)
REPEATABILITY : ± 2% OF READING AT CONSTANT TEMPERATURE
MATERIAL : NORYL, VITON, TEFLON, SILICON (WETTED PARTS)
ELECTROLYTE : 25 mL (APPROXIMATE)
ELECTROLYTE LIFE : 3 MONTHS
CABLE LENGTH : 25 FT (7.6 m)
ACCESSORY : FLOW-THROUGH TEE (2")
QUANTITY : 4
TAG NO. :

CUSTOMER TAG NO. : AT-O221A / AT-O226A / AT-O241A / AT-O246A

Earth Tech (Canada) Inc.

Reviewed for general contract use with design intent.
Responsibility for details rests in the shop drawings
submitted to the Contractor.

Responsibility for installation and correlation of field
findings with design intent rests in the hands of
Contractor. Earth Tech will coordinate all
items of the work with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

Date:

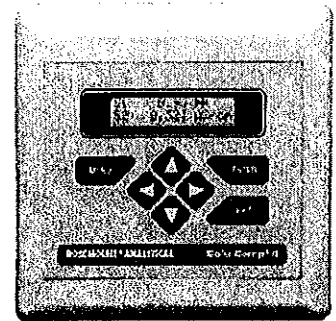
27/1/06

By:

[Signature]

Solu Comp® II Dual Input Analyzer

- BROAD SELECTION OF MEASUREMENT CHOICES includes pH/ORP, Resistivity/Conductivity, % Concentration, Total and Free Chlorine, Dissolved Oxygen, Dissolved Ozone, Flow, and Temperature.
- SINGLE OR DUAL MEASUREMENT with dual 4-20 mA outputs.
- FULL COMPLEMENT OF MEASUREMENT COMBINATIONS CAN BE COMMISSIONED IN THE FIELD.
- THREE FULLY PROGRAMMABLE ALARMS.
- CLEAR, EASY-TO-READ, two-line, back-lit display easily customized to read in English, French, German, Italian, Spanish, or Portuguese.
- CHOICE OF ENCLOSURES for pipe, surface, and panel mounting meet NEMA 4X/CSA 4 (IP 65) requirements.



FEATURES AND APPLICATIONS

The Solu Comp II analyzers offer the choice of single or dual sensor input with measurement choices of pH/ORP, resistivity/conductivity/TDS, % concentration, ratio conductivity, total and free chlorine, dissolved oxygen, dissolved ozone, flow and temperature. Dual measurement analyzers offer a wide choice of measurement combinations thus reducing the cost per loop and needed panel space.

FIELD COMMISSION OPTION: The Solu Comp II can be ordered with the ability to commission measurements in the field. This added flexibility can greatly reduce the number of spare instruments required for field servicing.

QUICK START PROGRAMMING: Exclusive Quick Start screens appear the first time the Solu Comp II is powered up. Screen prompts direct the user to register the number of sensors, the measurement unit(s) and the language to display. Some measurement specific prompts are also displayed. The measurement loop is ready for use in a matter of minutes.

MENUS: Menu screens for calibrating and registering choices are simple and intuitive. Plain language prompts guide the user through the procedures. There are no service codes to enter before gaining access to menus.

DUAL SENSOR INPUT AND OUTPUT: The Solu Comp II accepts single or dual sensor input. The two 4-20 mA outputs can be independently programmed to correspond to any selected measurement or temperature. Output damping and linear or log output may also be field selected.

ALARMS: The Solu Comp II has three fully programmable alarm relays that can be assigned to any selected measurement or temperature. Alarms can be configured as high, low, or USP¹. The third relay has the additional choice of fault alarm operation. When selected, a fault alarm will activate the relay when a sensor or analyzer fault occurs.

ENCLOSURE: The panel mount version fits standard ½ DIN panel cutouts, and its shallow depth is ideally suited for easy mounting in Hoffman-type enclosures. A panel mount gasket is included to maintain the weather rating of the panel. Surface/pipe mount enclosure includes self-tapping screws for surface mounting. A pipe mounting accessory kit is available for mounting to a 2-inch pipe.

¹USP alarm applies to conductivity/resistivity only.

Continued on page 2

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for actual design in the shop drawings rests with the contractor.

Responsibility for verification and correlation of field dimensions with the design drawings and construction of all parts of the work rests with the contractor.

REVIEWED _____

REVIEWED AS NOTIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No.

79538-C14-16

Date:

27/1/06

By:

M. Joubert

DISPLAY: The two-line, 16-character, back-lit display can be customized to meet user requirements. All operations and descriptive messages can be field selected for English, French, German, Italian, Spanish, or Portuguese. Informative screens, which permit data not shown in the regular display, may be seen at the push of a button.

TEMPERATURE: Most measurements (except ORP and flow) require temperature compensation. The Solu Comp II will automatically recognize either a Pt100 or Pt1000 RTD, normally built into the sensor. When this RTD is present, the Solu Comp II can be set up to display the temperature in °C or °F as well as set any one or more of the alarms and/or outputs to respond to this sensor input. If two measurements with temperature are present either can be chosen for each alarm and output selected.

SPECIFICATIONS - General

Case: ABS. Pipe, surface, and panel mount versions are NEMA 4X/CSA 4 (IP65).

Dimensions

Panel (code -10): 6.10 x 6.10 x 3.72 in. (155 x 155 x 94.5 mm)

Surface/Pipe (code -11): 6.23 x 6.23 x 3.23 in. (158 x 158 x 82 mm); see page 5 for dimensions of pipe mounting bracket.

Conduit openings: Accepts PG13.5 or 1/2 in. conduit fittings

Display: Two line, 16-character, back-lit display. Character height: 4.8 mm. Display can be customized to meet individual requirements. Depending on number of sensors, as many as 14 display screens are available.

Ambient temperature and humidity: 0 to 50°C, (32 to 122°F) RH 5 to 95% (non-condensing)

Note: The analyzer is operable from -20 to 60°C (-4 to 140°F) with some degradation in display performance.

Power:

Code -01: 115/230 Vac ±15%, 50/60 Hz ±6%, 8.0W

Code -02*: 24 Vdc ±15%, 6.0W

Installation Category II

* For +24Vdc Power Supply use only devices meeting NEC Class II or UL recognized (UL 1950).

Equipment protected throughout by double insulation.

Hazardous Location:



-LR 34186

Class I, Division 2,
Groups A, B, C, & D



POLLUTION DEGREE 4: Extended Environment
Outdoor use where conductive contamination such as rain, snow, or dust may be present. (Hazardous Location only)

RFI/EMI: EN-61326

LVD: EN-61010-1



Code -68 only:



12RN

POLLUTION DEGREE 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

Input: Choice of single or dual sensor input with measurement choices of pH/ORP, conductivity/resistivity, toroidal conductivity, flow, chlorine, dissolved oxygen, and dissolved ozone. Field-commissioned units allow user to change measurements on either or both inputs. See combination guide for valid combinations. For contacting conductivity measurements, temperature element must be a Pt 1000 RTD. For other measurements, use either a Pt100 RTD, Pt1000 RTD, or 22k NTC (D.O. only).

Outputs: Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Linear or logarithmic. Maximum load 600 ohms. Output dampening with time constant of 5 sec is user-selectable.

Alarms: Three alarm relays for process measurement(s) or temperature. Alarm 3 can be configured as a fault alarm, instead of a process alarm. Each relay can be configured independently. Alarm logic (high or low activation or USP*) and deadband are user-programmable. The USP* alarm can be programmed to activate when the conductivity is within a user-selectable percentage of the limit.



*conductivity/resistivity measurement only

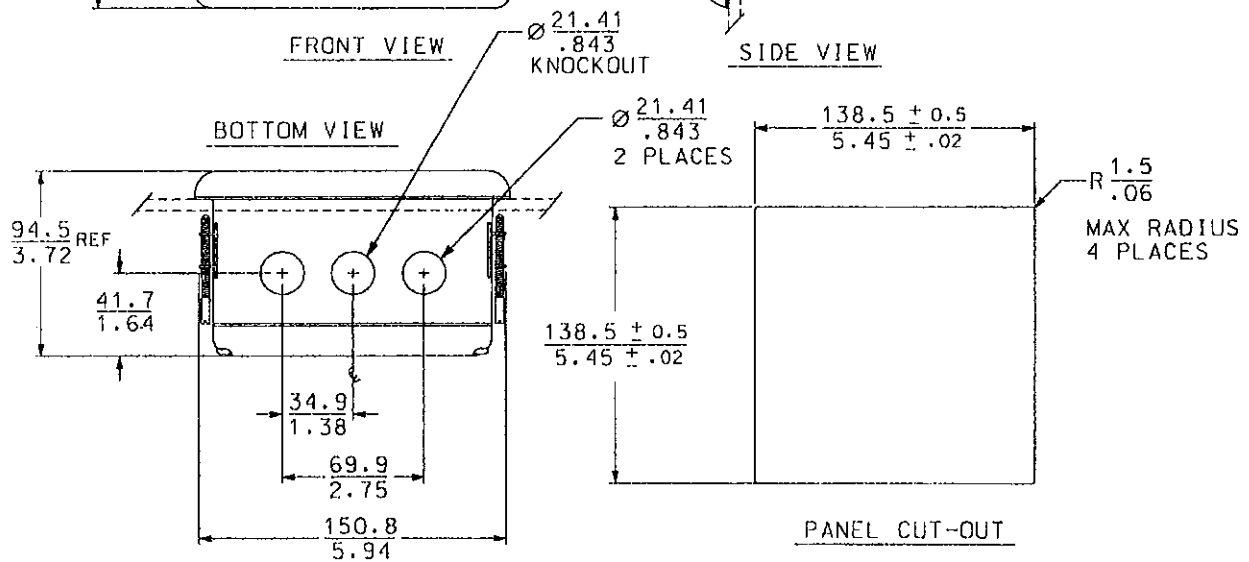
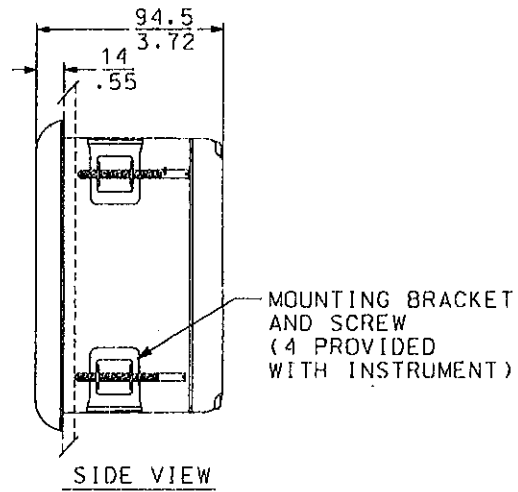
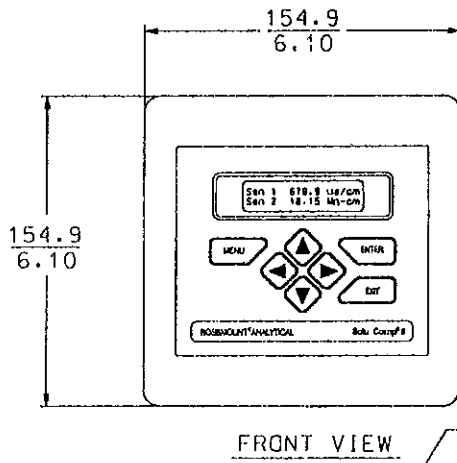
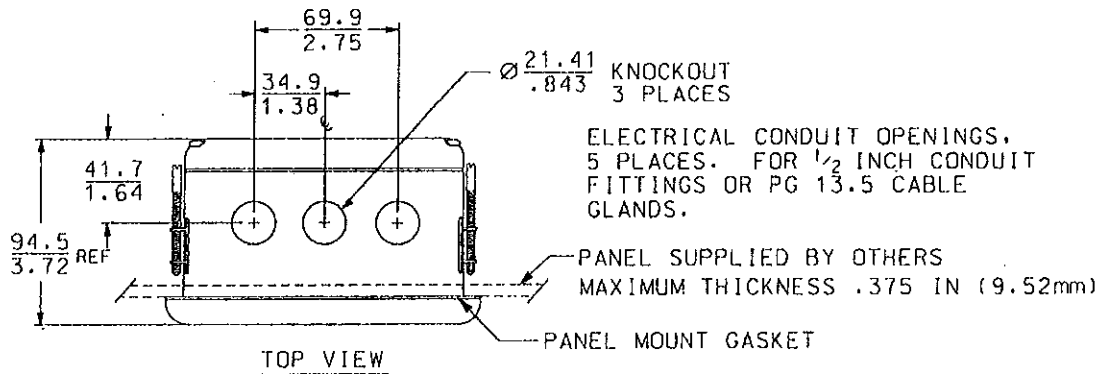
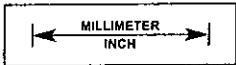
Relays: Form C, single pole double throw, epoxy sealed



	Resistive	Inductive
28 Vdc	5.0 A	3.0 A
115 Vac	5.0 A	3.0 A
230 Vac	5.0 A	1.5 A

Terminal Connections Rating: 26-14 AWG wire size

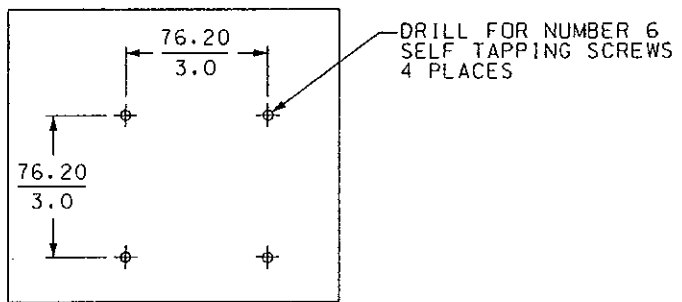
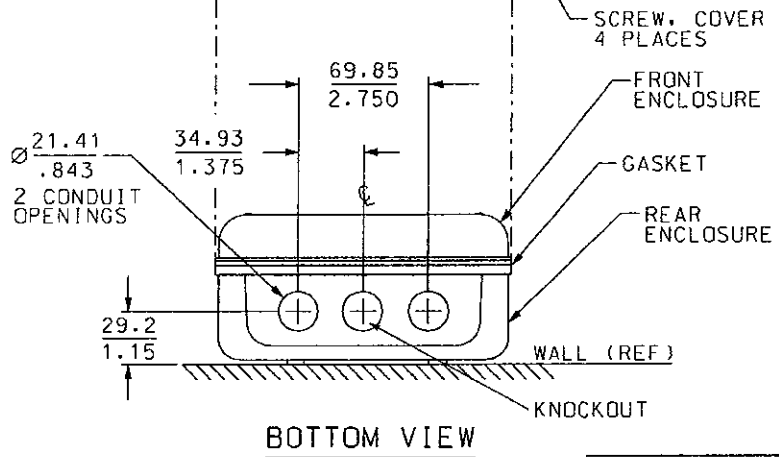
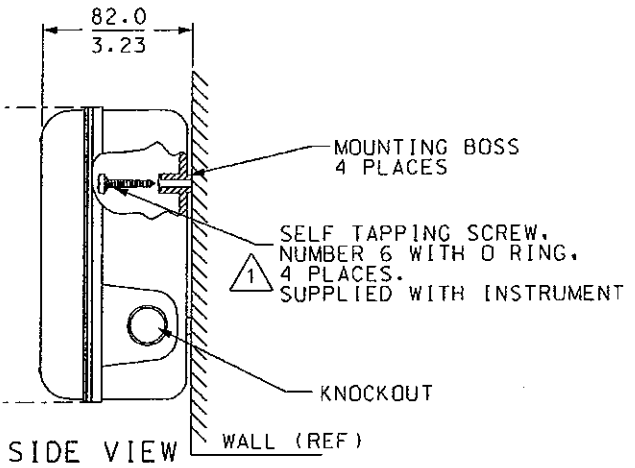
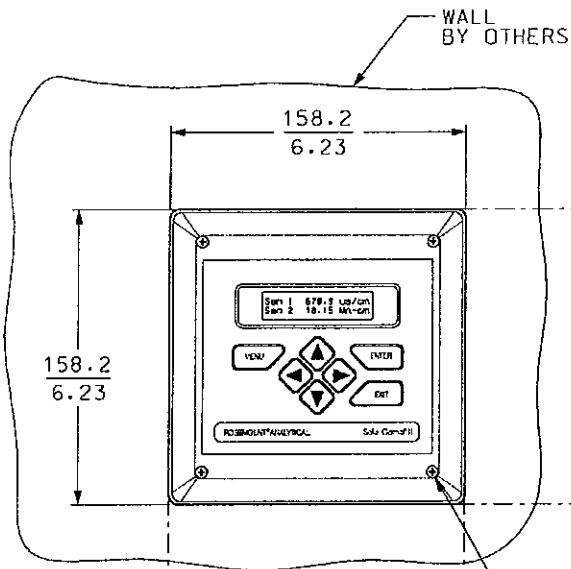
Weight/Shipping weight (rounded up to nearest lb or nearest 0.5 kg): 3 lb (1.5 kg)/4 lb (2.0 kg)



DO NOT OPERATE OR ENERGIZE
INSTRUMENT WITH CASE OPEN.

PANEL MOUNT INSTALLATION

Access to the wiring terminals is through the rear cover. Four screws hold the cover in place.

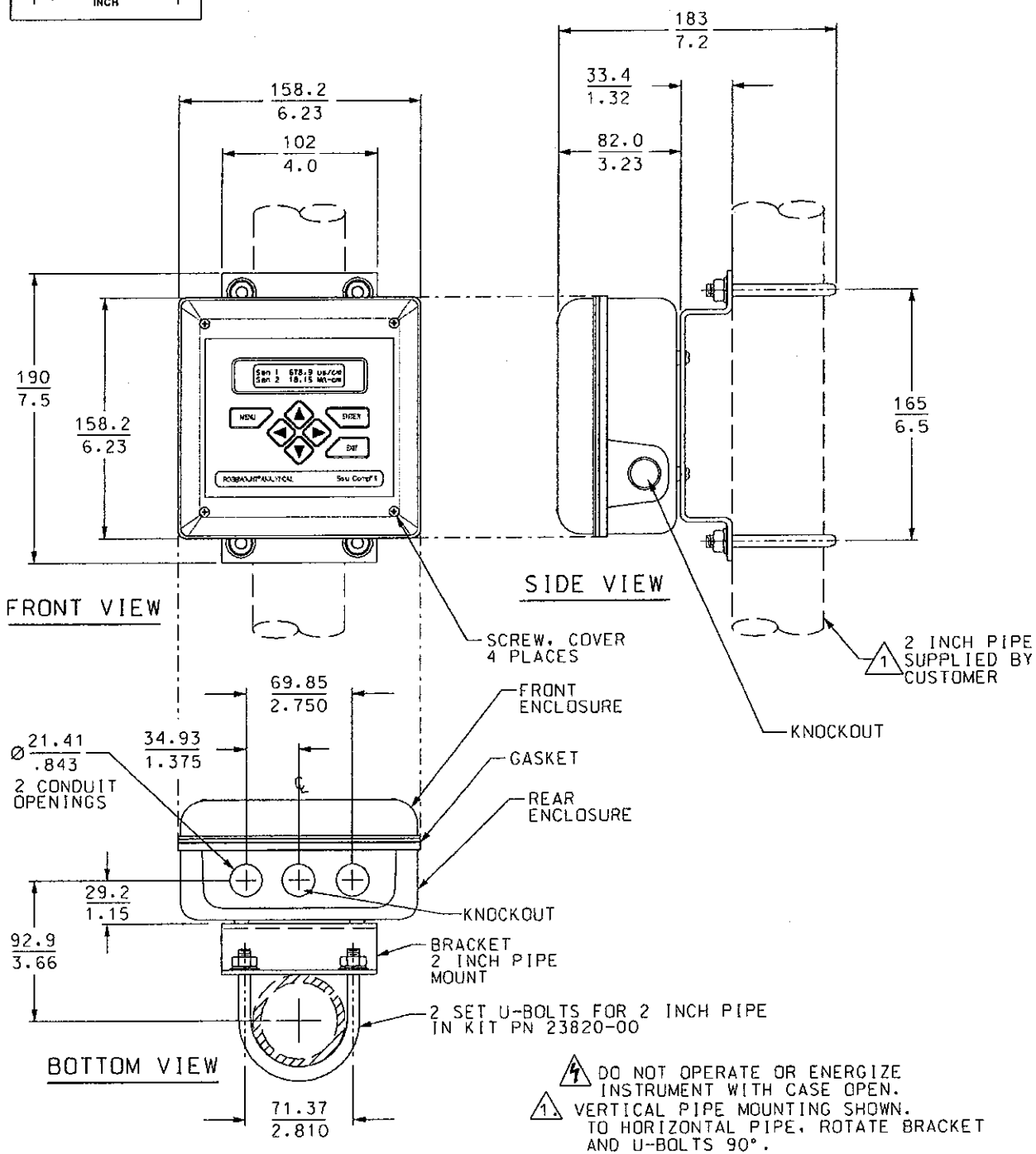


⚠ DO NOT OPERATE OR ENERGIZE INSTRUMENT WITH CASE OPEN.
 ⚠ PIERCE MEMBRANE WITH SELF TAPPING SCREW

SURFACE MOUNT INSTALLATION

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

MILLIMETER
INCH



PIPE MOUNT INSTALLATION

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

CONTACTING CONDUCTIVITY (Codes -20 and/or -30)

Measures conductivity in the range 0 to 20,000 $\mu\text{S}/\text{cm}$. Display choices are conductivity, resistivity, and TDS (total dissolved solids). Three temperature corrections are available: high purity water (dilute sodium chloride), cation conductivity (dilute hydrochloric acid), and adjustable linear temperature coefficient (0 to 5.00%/°C). Temperature correction can be disabled, allowing the analyzer to display raw conductivity.

PERFORMANCE SPECIFICATIONS -

Range	Cell constant (/cm)	Accuracy ^{1,2}
0.055 - 9.99 $\mu\text{S}/\text{cm}$	0.01	0.9% of reading or $\pm 0.002 \mu\text{S}/\text{cm}$
10 - 50 $\mu\text{S}/\text{cm}$	0.01	$\pm 2\%$ of reading
0.055 - 500 $\mu\text{S}/\text{cm}$	0.1	$\pm 2\%$ of reading or $\pm 0.1 \mu\text{S}/\text{cm}$
0.055 - 5000 $\mu\text{S}/\text{cm}$	1.0	$\pm 2\%$ of reading or $\pm 1 \mu\text{S}/\text{cm}$
0 - 5 mS/cm	1.0	$\pm 2\%$ of reading or $\pm 0.001 \text{ mS}/\text{cm}$
0 - 20 mS/cm	10	$\pm 2\%$ of reading or $\pm 0.01 \text{ mS}/\text{cm}$

ANALYZER (CONDUCTIVITY INPUT)

Accuracy (Resistivity)²: 0.9% of reading

Accuracy (Temperature)²: $\pm 0.1^\circ\text{C}$ between 5°C and 100°C ; $\pm 1^\circ\text{C}$ between 101°C and 200°C

Stability: 0.5% of reading/month

Ambient Temperature Effect: $\pm 0.05\%$ of reading/ $^\circ\text{C}$

Output Accuracy: $\pm 0.05 \text{ mA}$

Temperature correction: High purity water (dilute sodium chloride), cation conductivity (dilute hydrochloric acid), linear temperature coefficient (0.0 to 5.00%/°C), or none. High purity water and cation conductivity temperature correction apply between 0 and 100°C . Linear temperature coefficient can be applied between -5 and 200°C .

Measurement Range: 0.0 to 20,000 $\mu\text{S}/\text{cm}$, 0.05 to 20 M Ω -cm, or 0 to 10,000 ppm TDS

Temperature Range: -5°C to 200°C (23°F to 392°F)

12.34 $\mu\text{S}/\text{cm}$	40.3 C
7.34PH	25.3 C

¹ whichever is greater

² Accuracy values pertain to Endurance Model 400 Series conductivity sensors only

RECOMMENDED SENSORS FOR CONDUCTIVITY:

The Solu Comp II is intended for use with the ENDURANCE Model 400 series conductivity sensor (Pt 1000 RTD).

Model 400 Screw-in/Insertion

Model 400VP Screw-in/Insertion with 6.0 VP connector

Model 401 Screw-in/Insertion (except 401-15)

Model 402 Retractable

Model 402VP Retractable with 6.0 VP connector

Model 403 Sanitary Flanged

Model 403VP Sanitary Flanged with 6.0 VP connector

Model 404 Flow-Through

The analyzer can also be used with Rosemount Analytical conductivity sensor Models 140, 141, 142, and 150 having a Pt 100 RTD.

Ratio Conductivity (Codes -20-30):

The dual conductivity Solu Comp II can function as a ratio analyzer or recovery device (% passage or % rejection). Product sensor 2's conductivity reading is always displayed.

Ratio

Ratio	.3325
S2	4.621 $\mu\text{S}/\text{cm}$

%Pass

%Passage	12.1
S2	4.621 $\mu\text{S}/\text{cm}$

%Reject

%Reject	87.9
S2	4.621 $\mu\text{S}/\text{cm}$

TOROIDAL CONDUCTIVITY (Codes -21 and/or -31)

When used with Model Series 200 Toroidal Conductivity Sensors, display choices are conductivity, resistivity, and percent concentration. The percent concentration selection includes the choice of four common solutions (0-12% NaOH, 0-15% HCl, and 0-25% or 96-99.7% H₂SO₄). The conductivity-concentration algorithms for these solutions are fully temperature compensated. For other solutions, a simple-to-use menu allows the customer to enter his own data. The analyzer accepts as many as five (5) data points and fits either a linear (two [2] points) or a quadratic function (three [3] or more points) to the data. Reference temperature and linear temperature slope may also be adjusted for optimum results.

RECOMMENDED SENSORS:

- Model 222 Flow-through conductivity sensor
- Model 225 Clean-in-place conductivity sensor
- Model 226 Large bore conductivity sensor
- Model 228 Toroidal conductivity sensor
- Model 242 Flow-through conductivity sensor
- Model 247 Economy conductivity sensor

PERFORMANCE SPECIFICATIONS -

Measurement Range: see table below

Accuracy: ± 1% of reading and ± 0.01 mS/cm

Repeatability: ± 0.5% of reading and ± 0.005 mS/cm

Stability: ± 0.25% of reading and ± 0.005 mS/cm/month, noncumulative

Ambient Temperature Effect: ± 0.05% of reading/°C

Temperature Compensation: -15 to 200°C (5 to 392°F) automatic or manual. Automatic requires a Pt100/1000 RTD

Temperature correction: Linear temperature coefficient (0.0 to 5.00%/°C) neutral salt (dilute sodium chloride) or none

S1	1027mS/cm	100 C
S2	847.1µS/cm	100 C

RECOMMENDED RANGES FOR TOROIDAL SENSORS							
Conductivity Sensor Model	226	228	225	222 (1in.)	222 (2 in.)	242	247
Nominal Cell Constant	1.0	3.0	3.0	6.0	4.0	*	3.5
Minimum Conductivity (µS/cm)	50	200	200	500	500	100*	500
Maximum Conductivity (µS/cm)	1,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000*	2,000,000

* Model 242 values depend on sensor configuration and wiring.

pH/ORP (Codes -22 and/or -32)

For use with any standard pH or ORP sensor and all Uniloc sensors and junction boxes with built-in diagnostic style preamplifiers, display choices are pH, ORP or Redox. The automatic buffer recognition feature uses stored buffer values and their temperature curves for the most common buffer standards available worldwide. The analyzer will recognize the value of the buffer being measured and perform a self stabilization check on the sensor before completing the calibration. Manual or automatic temperature compensation is keypad selectable. Change in pH due to process temperature can be compensated using a programmable temperature coefficient or isopotential point. Measurement and display of pH glass and reference impedance helps alert the user to sensor maintenance needs.

**reference impedance is suppressed with amperometric/pH combinations (-24, -25, -26)*

PERFORMANCE SPECIFICATIONS - ANALYZER (pH INPUT)

Measurement Range [pH]: 0 to 14 pH

Accuracy: ± 0.01 pH

Repeatability: ± 0.01 pH

Stability: ± 0.01 pH/month, non-cumulative

Temperature Coefficient: ± 0.003 pH/ $^{\circ}$ C

Temperature Compensation: Pt100/Pt1000 RTD, Automatic or Manual -15 to 100 $^{\circ}$ C (5 to 212 $^{\circ}$ F)

Temperature Correction: Choose from standard measurement compensation, solution temperature correction for high purity or dilute base solutions, and custom temperature correction.

PERFORMANCE SPECIFICATIONS - ANALYZER (ORP INPUT)

Measurement Range [ORP]: -1400 to +1400 mV

Accuracy: ± 2.0 mV

Repeatability: ± 1.0 mV

Stability: ± 1.0 mV/month, non-cumulative

Temperature Coefficient: ± 0.2 mV/ $^{\circ}$ C

Temperature Measurement: -15 to 100 $^{\circ}$ C (5 to 212 $^{\circ}$ F)

Temperature Correction: none required

S1	4.34pH	25 C
S2	12.34pH	27 C

RECOMMENDED SENSORS FOR pH:

Model 320B Flow Through pH
Model 320HP High Purity pH
Model 328A Steam Sterilizable pH
Model 370 and 371 EuroSenz pH
Model 381+ Insertion/Submersion/Flow Through pH
Model 385+ Insertion/Submersion/Retractable pH
Model 389 Insertion/Submersion pH
Model 396 Insertion/Submersion pH
Model 396VP Insertion/Submersion pH with VP 6.0 connector
Model 396P Insertion/Submersion pH
Model 396PVP Insertion/Submersion pH with VP 6.0 connector
Model 396R Retractable pH
Model 396RVP Retractable pH with VP 6.0 connector
Model 397 Quik Disconnect pH
Model 398 Insertion/Submersion pH
Model 398VP Insertion/Submersion with VP 6.0 connector
Model 398R Retractable pH
Model 398RVP Retractable pH with VP 6.0 connector
Model 399 Insertion/Submersion pH
Model Hx338 Steam Sterilizable pH
Model Hx348 Steam Sterilizable pH

RECOMMENDED SENSORS FOR ORP:

Model 330 Flow Through ORP
Model 371 EuroSenz ORP
Model 381+ Insertion/Submersion/Flow Through ORP
Model 385+ Insertion/Submersion/Retractable pH
Model 389 Insertion/Submersion ORP
Model 396P Insertion/Submersion ORP
Model 396PVP Insertion/Submersion ORP with VP 6.0 connector
Model 396R Retractable ORP
Model 398 Insertion/Submersion ORP
Model 398VP Insertion/Submersion with VP 6.0 connector
Model 398R Retractable ORP
Model 398RVP Retractable ORP with VP 6.0 connector

When used with conductivity (-20-32 or -22-30):

Model 320HP High Purity ORP
Model 381+ Insertion/Submersion/Flow Through ORP
Model 385+ Insertion/Submersion/Retractable ORP
Model 396P Insertion/Submersion ORP
Model 396PVP Insertion/Submersion ORP with VP 6.0 connector
Model 396R Retractable ORP
Model 396RVP Retractable ORP with VP 6.0 connector

FLOW (Code -23 and/or -33 or Suite 2)

For use with most pulse signal flow sensors, the Solu Comp II's user selectable units of measure include flow rates in GPM (Gallon per minute), LPM (liters per minute), or m³/hr (cubic meters per hour), and velocity in ft/sec or m/sec. When configured to measure flow, the unit also acts as a totalizer in the chosen unit (gallons, liters, or cubic meters).

Dual flow instruments can be configured as a % recovery device or a flow difference device.

PERFORMANCE SPECIFICATIONS

Frequency Range: 0.5 - 4000 Hz

Flow Rate: 0 - 9999 GPM, LPM, m³/hr

Totalized Flow: 0 - 9,999,999 Gallons;
37,850,000 Liters; 37,850 m³

Accuracy: ±1% (±1.5% from 3000 to 4000 Hz)

Repeatability: ±1%

RECOMMENDED SENSORS*

+GF+ Signet 515 Rotor-X Flow sensor Model
515/8510-XX (PN P51530-PO)

Fluidyne Flow Sensor Model 2300A
(PN Hydro-Flow-2300-A-10-5R-3-1-1)

* *Input voltage not to exceed ±36V*

Consult factory for other pulse type sensor compatibility.

S2 12.34 GPM

S2 47.25K Gal

FREE AND TOTAL CHLORINE (Code -24)

The Solu Comp II is compatible with the Model 499ACL-01 free chlorine sensor and the Model 499ACL-02 total chlorine sensor. The Model 499ACL-02 sensor **must** be used with the Model SCS921 sample conditioning system. Both sensors are membrane covered amperometric sensors. For more information concerning the use and operation of chlorine amperometric sensors, refer to the sensor product data sheets.

The Solu Comp II fully compensates free and total chlorine readings for changes in membrane permeability caused by temperature changes. Temperature is measured by a Pt 100 RTD in the sensor.

For free chlorine measurements, both automatic and manual pH correction are available. pH correction is necessary because amperometric chlorine sensors measure only hypochlorous acid. To measure free chlorine (hypochlorous acid plus hypochlorite ion) most competing analyzers add acid to the sample. Acid lowers the pH and converts hypochlorite to hypochlorous acid. The Solu Comp II eliminates messy and expensive chemicals by using the measured pH to correct the chlorine sensor signal. If the pH is relatively constant, a fixed pH correction can be used. If the pH is greater than 7 and fluctuates more than about 0.2 units, continuous measurement of pH and automatic pH correction is necessary. Corrections are valid to pH 9.5. For automatic pH correction select code -32 and an appropriate pH sensor.

An input filter allows the user to configure the analyzer for rapid response or low noise. The low noise option is recommended for samples containing less than 0.1 ppm chlorine.

Chlorine solutions are unstable, so chlorine standards are not generally available. Instead, chlorine sensors must be calibrated against the results of a chemical test run on a grab sample.

PERFORMANCE SPECIFICATIONS

Measurement Range: 0-20 ppm (mg/L) chlorine
(as Cl₂)

Resolution: 0.001 ppm

Automatic pH Correction (requires Code -32): 5.0
to 9.5 pH

Temperature Correction: Automatic (with Pt100 RTD
in sensor) or manual 0-50°C. Can be disabled if
desired.

Input filter: time constant 1 - 999 sec

RECOMMENDED SENSORS

Chlorine: Model 499A CL-01 Free Chlorine or Model
499A CL-02 Total Residual Chlorine (requires
sample conditioning)

pH: The following pH sensors are recommended for
automatic pH correction of chlorine readings:
Models: 399-09-62, 399-14, and 399VP-09

12.34 PPM

26.3 C	8.34pH
--------	--------

DISSOLVED OXYGEN (Code -25)

The Solu Comp II is compatible with the Model 499ADO, 499ATrDO, Hx438, and Gx438 dissolved oxygen sensors. The sensors are membrane-covered amperometric sensors. For more information concerning the use and operation of the amperometric oxygen sensors, refer to the product data sheets. The Solu Comp II displays dissolved oxygen in ppm, ppb, or percent saturation.

The Solu Comp II fully compensates oxygen readings for changes in membrane permeability caused by temperature changes. In the Model 499ADO and 499ATrDO sensors, temperature is measured by a Pt 100 RTD. The Hx438 and Gx438 sensors use a 22kNTC.

Calibration is easy. Simply expose the sensor to water saturated air. Wait until readings are stable and press a few keys. The analyzer measures the temperature and barometric pressure and automatically completes the calibration. If removing the sensor from the process liquid is impractical, the analyzer can be calibrated against a standard instrument. Calibration can be corrected for process salinity.

PERFORMANCE SPECIFICATIONS

Measurement Range: 0-20 ppm (mg/L) dissolved oxygen; 0- 250% saturation

Resolution: 0.01 ppm; 0.1 ppb for 499A TrDO sensor (when O₂ <1.00 ppm); 0.1%

Temperature Correction for Membrane Permeability: Automatic (with Pt100 RTD in sensor) or manual 0-50°C. Can be disabled if desired.

Input filter: time constant 1 - 999 sec

RECOMMENDED SENSORS

Model 499A DO Dissolved Oxygen Sensor

Model Hx438 Steam Sterilizable Dissolved Oxygen Sensor

Model Gx438 Steam Sterilizable Dissolved Oxygen Sensor

Model 499A TrDO Trace Dissolved Oxygen Sensor

10.34 PPM	
29.3 C	12.34mA

DISSOLVED OZONE (Code -26)

The Solu Comp II is intended for use with the Model 499AOZ sensor. The Model 499AOZ sensor is a membrane-covered amperometric sensor. For more information concerning the use and operation of the sensor, refer to the sensor product data sheet.

The Solu Comp II fully compensates ozone readings for changes in membrane permeability caused by temperature changes. Temperature is measure by a Pt 100 RTD in the sensor.

An input filter allows the user to configure the analyzer for rapid response or low noise. The low noise option is recommended for samples containing less than 0.1 ppm ozone.

Ozone solutions are unstable; commercial standards are not available. Instead, ozone sensors must be calibrated against the results of a chemical test run on a grab sample.

PERFORMANCE SPECIFICATIONS

Measurement Range: 0-10 ppm (mg/L)

Resolution: 0.001 ppm dissolved ozone

Temperature Correction for Membrane Permeability: Automatic (with Pt100 RTD in sensor) or manual 0-35°C. Can be disabled if desired.

Input filter: time constant 1 - 999 sec

RECOMMENDED SENSOR

Model 499A OZ Dissolved Ozone Sensor

10.34 PPM	
29.3 C	12.34mA

ORDERING INFORMATION

The **Solu Comp II** analyzers offer the choice of single or dual sensor input with measurement choices of pH/ORP, conductivity/resistivity, toroidal conductivity, flow, chlorine, dissolved oxygen, and dissolved ozone. See combination guide for valid combinations. Standard features include two isolated outputs, three alarm relays, customizable two-line display, and temperature correction.

MODEL 1055 SOLU COMP II ANALYZER

CODE	POWER
01	115/230 Vac, 50/60 Hz
02	24 Vdc

CODE	MOUNTING
10	Panel mounting enclosure
11	Pipe/Surface mounting enclosure (Pipe mounting requires accessory kit PN 23820-00)

CODE	MEASUREMENT 1 (Required Selection)
20	Contacting Conductivity
21	Toroidal Conductivity
22	pH/ORP
23	Flow
24	Chlorine
25	Dissolved Oxygen
26	Ozone

CODE	MEASUREMENT 2 (Optional)
30	Contacting Conductivity
31	Toroidal Conductivity
32	pH/ORP
33	Flow

CODE	OPTIONAL
68	UL Approval

Field Commissioned Suites option offers the user the ability to commission the Solu Comp II to any valid measurement combination. This feature provides the benefit of a reduction in the number of spare instruments required to meet emergency inventory needs. Please refer to the Suites tables (right) for valid measurement combinations. Suites include a complete set of instrument wiring labels.

MODEL 1055 SOLU COMP II ANALYZER

CODE	POWER
01	115/230 Vac, 50/60 Hz
02	24 Vdc

CODE	MOUNTING
10	Panel mounting enclosure
11	Pipe/Surface mounting enclosure (Pipe mounting requires accessory kit PN 23820-00)

CODE	FIELD-COMMISSIONED SUITES (Optional) see tables below
S1	Suite 1 - Field Commissioned Measurement (basic)
S1A	Suite 1 - Field Commissioned Measurement (includes amperometric)
S2	Suite 2 - Field Commissioned Measurement (basic)
S2A	Suite 2 - Field Commissioned Measurement (includes amperometric)

CODE	OPTIONAL
DM	Dual Measurement

CODE	OPTIONAL
68	UL Approval

COMBINATION GUIDE

Measurement Choices

Measure 1 \ Measure 2	None	pH/ORP	Flow	Conductivity	
				Toroid	Contact
pH/ORP					
Contacting conductivity					
Flow					
Toroidal Conductivity					
Dissolved Oxygen					
Chlorine					
Ozone					

Field Commissioned Measurement Choices Suite 1

Measure 1 \ Measure 2	None	Dual Measurement (DM)		
		pH/ORP	Flow	Contacting Conductivity
Basic	pH/ORP			
	Contacting conductivity			
	Toroidal Conductivity			
Amperometric	Dissolved Oxygen*			
	Chlorine			
	Ozone			
	Toroidal Conductivity			

Field Commissioned Measurement Choices Suite 2

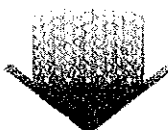
Measure 1 \ Measure 2	None	Dual Measurement (DM)			
		pH/ORP	Flow	Conductivity	
				Toroid	Contact
Basic	pH/ORP				
	Flow				
	Contacting conductivity				
	Toroidal Conductivity				
Amperometric	Dissolved Oxygen*				
	Chlorine				
	Ozone				
	Toroidal Conductivity				

 Available
 Not available

* For D.O. sensors with 22k thermistor, use Suite 1 only.

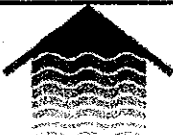
ACCESSORIES (Weights are rounded up to nearest whole lb or 0.5 kg)

PART NUMBER	DESCRIPTION	WEIGHT	SHIPPING WT.
23820-00	Pipe mounting kit, includes U-bolts, mounting bracket, nuts, washers, and screws (complete)	2 lb (1.0 kg)	4 lb (2.0 kg)
23554-00	Gland fittings, PG 13.5, 5 per package	1 lb (0.5 kg)	2 lb (1.0 kg)
9240048-00	Tag, stainless steel (specify marking)	1 lb (0.5 kg)	1 lb (0.5 kg)
	pH INPUT		
905-3506	Buffer Solution, 4.01 pH, 1 pt.	1 lb (0.5 kg)	2 lb (1.0 kg)
905-3501	Buffer Solution, 7.0 pH, 1 pt.	1 lb (0.5 kg)	2 lb (1.0 kg)
905-3505	Buffer Solution, 10.0 pH, 1 pt.	1 lb (0.5 kg)	2 lb (1.0 kg)
	CONDUCTIVITY INPUT		
SS-1	Conductivity Standard, 1409 μ S/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-1A	Conductivity Standard, 1409 μ S/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-5	Conductivity Standard, 1000 μ S/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-5A	Conductivity Standard, 1000 μ S/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-6	Conductivity Standard, 200 μ S/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-6A	Conductivity Standard, 200 μ S/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)
SS-7	Conductivity Standard, 5000 μ S/cm at 25°C, 1 quart (945 mL)	2 lb (1.0 kg)	4 lb (2.0 kg)
SS-7A	Conductivity Standard, 5000 μ S/cm at 25°C, 1 gallon (3785 mL)	9 lb (4.0 kg)	11 lb (5.0 kg)



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Fax: (949) 474-7250

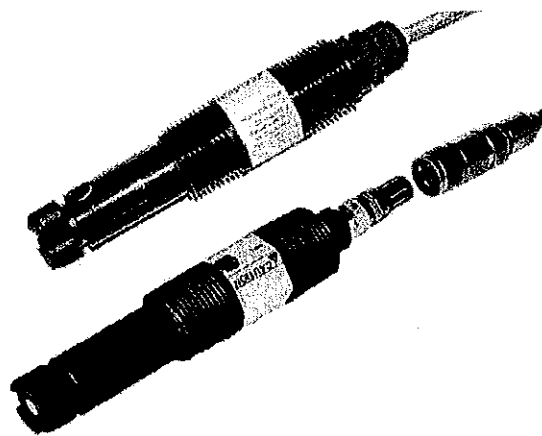
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Dissolved Ozone Sensor

- RUGGED CONSTRUCTION.
- EASILY REPLACEABLE MEMBRANE; no special tools required.
- AUTOMATIC COMPENSATION for changes in membrane permeability with temperature.
- AUTOMATIC PRESSURE EQUALIZATION maintains correct membrane tension.
- COMPATIBLE with most Delta and Rosemount Analytical analyzers.
- VARIOPOL CONNECTOR OPTION allows the sensor to be replaced without running new cable.



FEATURES AND APPLICATIONS

The Model 499AOZ sensor is intended for the continuous determination of dissolved ozone. The primary application is ozonation basins in municipal water filter plants. Pretreating the raw water with ozone reduces the amount of filter aid chemicals needed and reduces the amount of chlorine required to disinfect the finished water. Lowered chlorine dosage means a reduced level of harmful chlorination byproducts in the finished water. Ozone is also used as a disinfectant in bottling and food processing plants.

The Model 499AOZ is a membrane-covered amperometric sensor. The sensor consists of a gas-permeable membrane stretched tightly over a gold cathode. A silver anode and an electrolyte solution complete the internal circuit. During operation, ozone diffuses from the sample through the membrane. Once inside the sensor, the ozone reacts with the electrolyte solution to form an intermediate compound. A polarizing voltage applied to the cathode completely reduces the intermediate. The reduction produces a current, which the analyzer measures. The current is directly proportional to the rate at which ozone diffuses through the membrane into the sensor, which is ultimately proportional to the concentration of ozone in the sample.

Because the rate of diffusion of ozone through the membrane depends on temperature, sensor response must be corrected for changes in membrane permeability caused by temperature. A Pt 100 RTD in the

sensor (Delta-compatible sensors use a thermistor) measures the temperature, and the analyzer automatically performs the correction.

Because ozone standards do not exist, the sensor must be calibrated against the results of a laboratory test run on a grab sample of the process liquid. Ozone solutions are unstable, so the sample must be tested immediately. Portable test kits are available from other manufacturers.

Maintenance is fast and easy. Replacing the membrane requires no special tools or fixtures. Simply place a few drops of electrolyte solution in the membrane assembly, place it over the cathode, and screw the retainer in place. To replenish the electrolyte solution, unscrew the fill plug, add the reagent from a squeeze bottle, and replace the plug.

Pressure changes have little influence on sensor response. A flexible bladder in the sensor prevents distortion of the membrane by keeping the pressure inside the sensor equal to the sample pressure.

Several mounting configurations are possible. For most applications the low flow cell is recommended.

The Model 499AOZ sensor is available with a Variopol (VP) watertight connector. Wire the interconnecting cable to the analyzer and run the cable to the sensor. The sensor plugs into the cable receptacle. To replace the sensor, simply disconnect the Variopol fitting and plug in a new sensor.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for field re-design in the shop drawings
rests with the contractor.

Responsible for verification and correlation of field
dimensions with design and shop drawings. All changes of
contractor to be noted and coordination of all
parts of the work with the contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____ ✓

NOT REVIEWED _____ ✗

Project No. 74338-C14-16

Date: 27/1/06

By: M. Jula

SENSOR SPECIFICATIONS

Range: 0 to 3 ppm (mg/L) as O₃. For prolonged exposure to ozone levels greater than 1 ppm, consult the factory.

Wetted Parts: Noryl¹, Viton², Teflon³, silicone

Cathode: gold (not normally wetted)

Accuracy: Accuracy depends on the accuracy of the chemical test used to calibrate the sensor.

Linearity: ±5% of reading or ±3 ppb (whichever is greater) at 25°C

Repeatability: ±2% of reading at constant temperature

Response time: 30 sec to 90% of final reading at 25°C

Pressure: 0 to 65 psig (0 to 549 kPa abs)

Temperature (Operating): 32 to 122°F (0 to 50°C)

Membrane Permeability Correction: Defined between 41 and 95°F (5 and 35°F)

Process Connection: 1 inch MNPT

Electrolyte Volume: 25 mL (approx.)

Electrolyte Life: 3 months (approx.); for best results, replace electrolyte monthly

Cable Length (standard integral cable): 25 ft (7.6 m)

Cable Length (maximum): 300 ft (91 m)

Sample Flow:

Flow through	1-5 gpm (3.8 to 19 L/min)
Open channel	1 ft/sec (0.3 m/sec)
Low flow cell	2 to 5 gph (7.6 to 19 L/hr)

Weight/Shipping Weight: 1 lb/3 lb (0.5 kg/1.5 kg)

¹ Noryl is a registered trademark of General Electric.

² Viton is a registered trademark of E.I. duPont de Nemours & Co.

³ Teflon is a registered trademark of E.I. duPont de Nemours & Co.

FLOW CELL SPECIFICATIONS

LOW FLOW CELL PN 24091-00

Wetted Parts: polycarbonate, 316 stainless steel, Buna N

Process Connection: 1/4-inch OD tubing compression fitting or 1/4-inch FNPT

Maximum Pressure: 65 psig (549 kPa abs)

Maximum Temperature: 122°F (50°C)

FLOW-THROUGH TEE (1½ inch body) PN 23567-00

Wetted Parts: CPVC and Buna N; body is schedule 80 CPVC

Process Connection: 1-½ inch socket

Maximum Pressure: 65 psig (549 kPa abs)

Maximum Temperature: 122°F (50°C)

FLOW-THROUGH TEE (2 in. body) PN 915240-03/04/05

Wetted Parts: PVC and Buna N; body is schedule 80 PVC

Process Connection: ¾ inch NFPT, 1 inch NFPT, or 1½ inch NFPT

Maximum Pressure: 60 psig (515 kPa abs)

Maximum Temperature: 120°F (49°C)

VALVED ROTAMETER PN 9390004

for use with Flow Cell

Flow: 0.4 to 5 gph (1.5 to 19 L/hr)

Wetted Parts: acrylic, 316 stainless steel, Viton

Process Connection: ¾ inch NFPT (316 SS)

Maximum Pressure: 100 psig (858 kPa abs)

Maximum Temperature: 150°F (65°C)

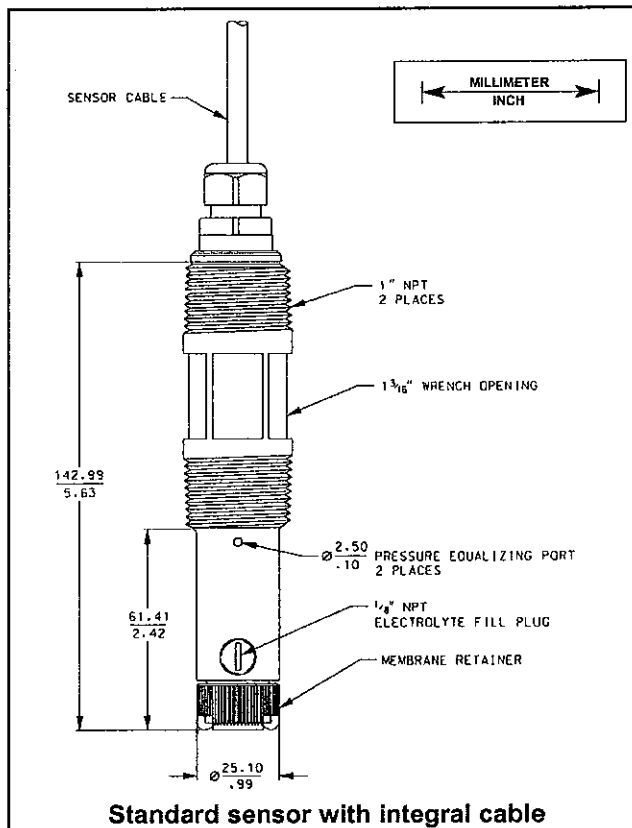
RECOMMENDED ANALYZERS

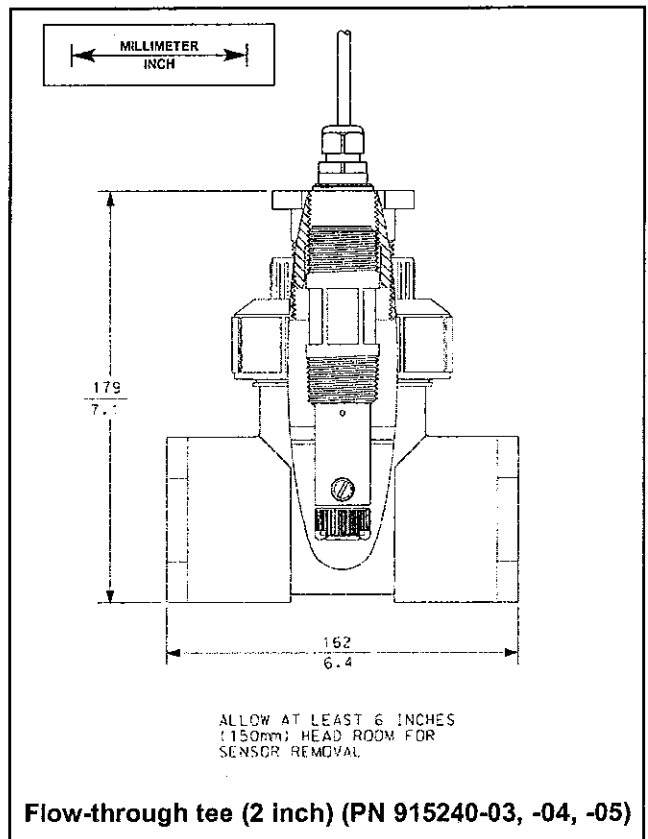
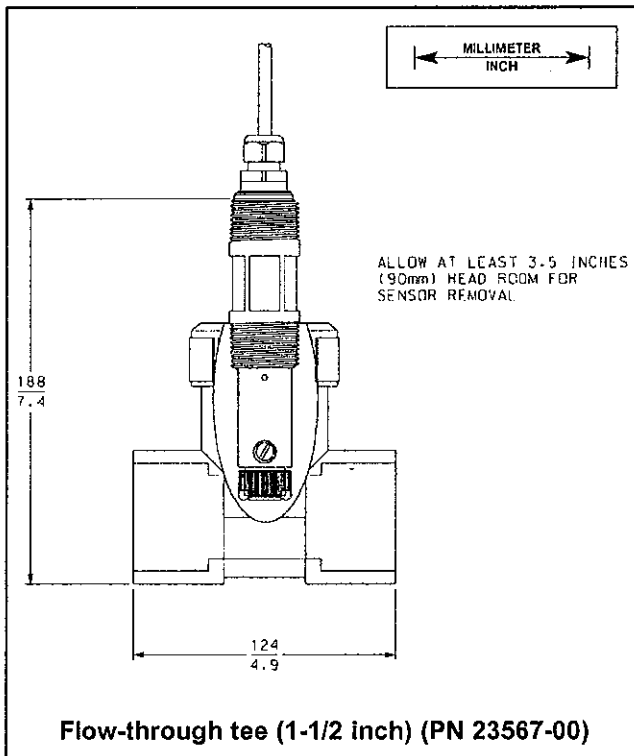
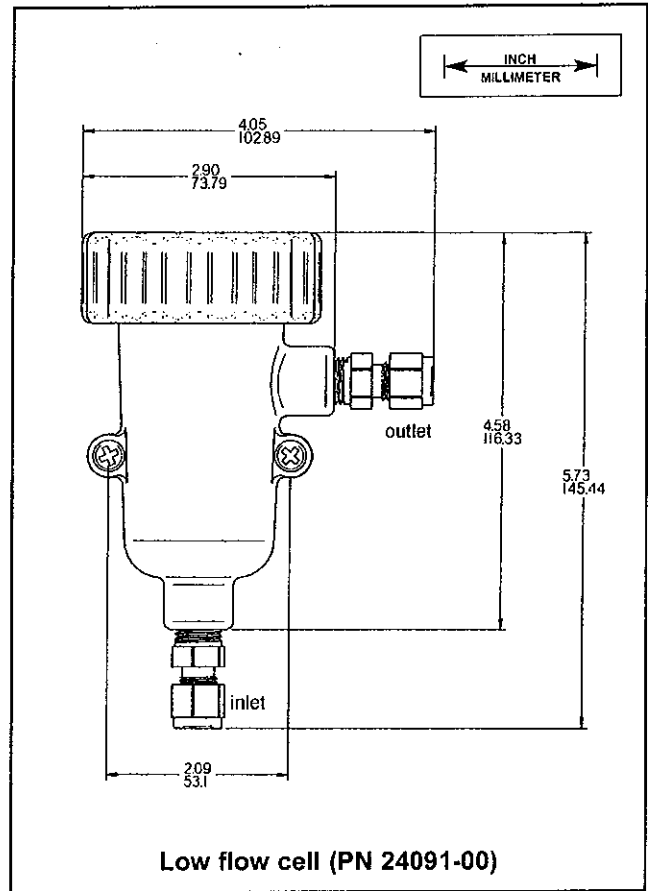
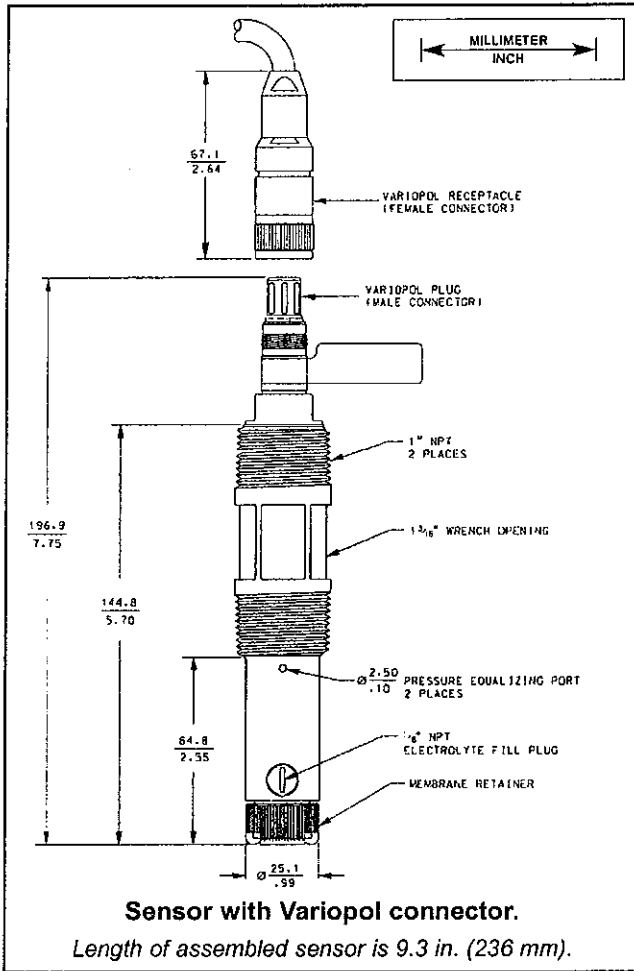
Rosemount Analytical: 1054AOZ, 1054BOZ, 1055-26, 54eA, 5081-A, and Xmt-A.

Delta: 940, 8240, and 8340. (Note: Delta analyzers are obsolete; information is provided for customers using Delta equipment.)

OBSOLETE SENSORS

The 499AOZ sensor replaces Rosemount Analytical Model 499OZ and Delta Model 921403. Both sensors are obsolete.





ORDERING INFORMATION

The Model 499AOZ sensor is intended for the determination of dissolved ozone in a variety of municipal and industrial applications. The sensor is generally intended for mounting in an off-line flow cell. The sensor is available with either an integral cable or a VP6.0 quick disconnect fitting. Three replacement membrane assemblies, three o-rings and a 4-oz (125 mL) bottle of electrolyte solution are provided with each sensor.

MODEL 499AOZ DISSOLVED OXYGEN SENSOR	
CODE	Required selection
54	For use with Model 1054AOZ, 1054BOZ, 1055-26, 54eA, 5081-A, and Xmt-A analyzers
56	For use with Delta analyzers*
CODE	Optional selection
60	Optimum EMI/RFI cable (not available with -VP and -56 options)
VP	Sensor with Variopool 6.0 fitting (interconnecting cable must be ordered separately, not available with option -56)
499AOZ	-54 -VP EXAMPLE

* For first time replacement of Delta sensors: If a Delta ozone sensor (Model 921403) is being replaced for the first time, a retrofit adapter must be ordered. Use PN 33211-00 to adapt the 499AOZ 1-in. MNPT to the Delta 1-½ in. FNPT flow-through tee.

FOR FIRST TIME VARIOPOL INSTALLATIONS

PART #	DESCRIPTION
23747-02	VP 6.0 interconnecting cable, 10 ft (3 m)
23747-03	VP 6.0 interconnecting cable, 50 ft (15 m)

For junction box and connecting cable between junction box and analyzer, see **ACCESSORIES**. The cable in PN 9200275 (unterminated) and PN 23747-00 (terminated) is the same cable used in the VP interconnecting cable.

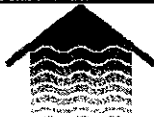
ACCESSORIES

PART #	DESCRIPTION
23567-00	1-½ in. flow through tee with 1-½ socket connections
914240-03	2-in. flow through tee with ¾-in FNPT connections
915240-04	2-in. flow through tee with 1-in FNPT connections
915240-05	2-in. flow through tee with 1-½-in FNPT connections
24091-00	Low flow cell with ¼-in OD tubing compression fittings
9390004	Rotameter: 0.5 - 5.0 gph
22719-02	Junction box, 8 terminals
9200266	Extension cable for option -54, unterminated (specify length)
ED0011	Extension cable for option -56, unterminated (specify length)
9200275	Extension cable for optimum EMI/RFI cable, unterminated (specify length)
23747-00	Extension cable for optimum EMI/RFI cable, terminated (specify length)
2001492	Stainless steel tag
23501-04	Dissolved ozone membrane assembly: includes one membrane assembly and O-ring.
23502-04	Dissolved ozone membrane assembly: includes three membrane assemblies and three O-rings.
9210299	#3 Dissolved ozone sensor fill solution, 4 oz (125 mL)



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Process Management



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

OFF GAS OZONE ANALYZER / TRANSMITTER

MANUFACTURER	:	IN-USA
MODEL	:	H1-LR
SERVICE	:	OFF-GAS OZONE CONCENTRATION AFTER DEMISTER
DISPLAY TYPE	:	20 CHARACTERS ALPHANUMERIC VACUUM FLUORESCENT DISPLAY
MEASUREMENT RANGE	:	0 ~ 4 WT % OZONE
OUTPUT	:	4 ~ 20 mA
ALARM RELAY OUTPUT	:	TWO FIELD PROGRAMMABLE ALARMS WITH FORM C RELAY CONTACTS
ENCLOSURE	:	NEMA 4X, WALL MOUNT
POWER	:	100 ~ 240 VAC / 1 PHASE / 60 Hz
PROCESS CONNECTION	:	1/4" (6.35 mm) S.S. COMPRESSION FITTING
ACCESSORIES	:	SC-010-R, SAMPLING AND CONDITIONING SYSTEM (SHIPPED LOOSE TO BE CONNECTED AND MOUNTED IN THE FIELD)
SPECIAL REQUIREMENT	:	TO BE CLEANED FOR OXYGEN SERVICE
QUANTITY	:	2
TAG NO.	:	
CUSTOMER TAG NO.	:	AT-O501A / AT-O505A

INSTALLATION NOTE:

IF ANY HOLES ARE MADE IN THE FIBERGLASS ENCLOSURE, CARE SHOULD BE TAKEN TO PREVENT INTERNAL CONTAMINATION.
THE FIBERGLASS DUST PRODUCED WILL INTERFERE WITH THE PROPER OPERATION OF THE ANALYZERS.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for correct design in the shop drawings rests with the fabricator.

Responsibility for correct correlation of field dimensions with the shop drawings rests with the contractor. It is the responsibility of all parts of the work to refer to the shop drawings.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

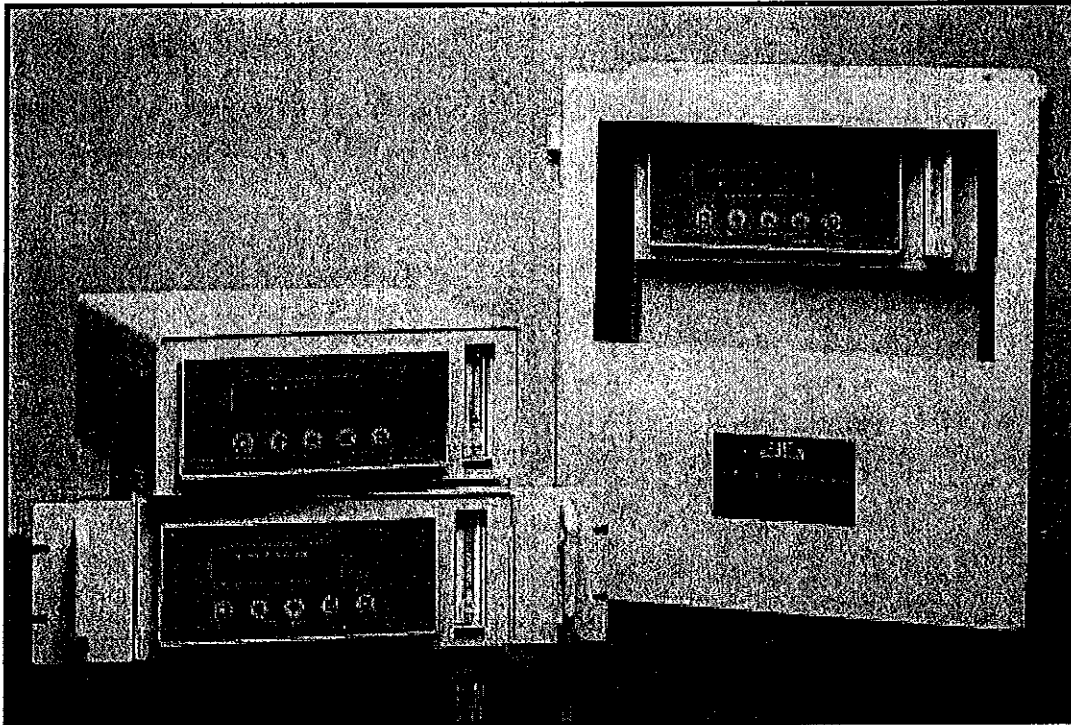
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H1 Series

High Concentration Process Ozone Analyzers



Ideal for Measuring Ozone Generator Output

Applications:

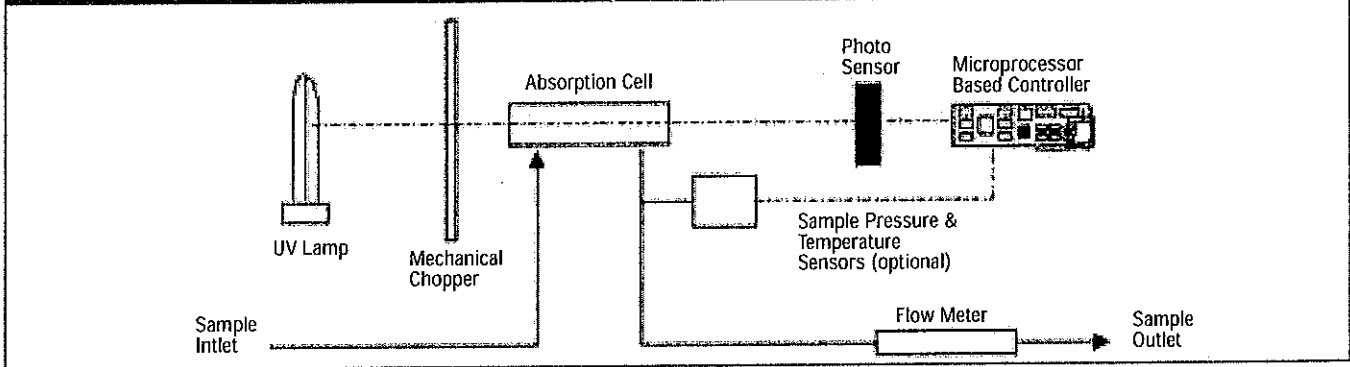
- Ozone generator output
- Ultrapure water systems
- Pharmaceutical industry
- Water treatment applications
- Other industrial processes

Features:

- Microprocessor controlled
- High accuracy UV Absorption method
- Ranges up to 400 g/m³
- Automatic sample pressure and sample temperature compensation
- Molecular weight compensation
- Continuous sample flow
- No solenoid valves, no external reference
- Analog and Digital I/O built-in
- User programmable alarm relays
- AutoZero built-in
- Continuous internal diagnostics
- No regular maintenance required

Specifications H1 Series

Principle of Operation



Specifications

Measuring Principle	Absolute determination by UV absorption through innovative optical system
Cycle Time	Continuous measurement, uninterrupted sample flow - no solenoid valves
Upper Measurement Ranges	H1-LR: 50 G/M ³ (4%) - H1-S: 125 G/M ³ (10%) - H1-X: 200 G/M ³ (15%) - H1-UH: 400 G/M ³ (28%)
Precision/Repeatability	0.1 G/M ³ or 1% of reading (whichever is greater)
Resolution	0.1 G/M ³ (0.01% W/W) in the range from 0.1-125 G/M ³
Linearity	Better than 99% throughout range
Zero Drift	Less than 0.1 G/M ³ per month, non cumulative
Calibrated Standard	Per the International Ozone Association (IOA) K1 method to 1% repeatability
Ozone Concentration Units	G/M ³ , G/NM ³ , % weight, % volume (field selectable)
Sample Pressure and Temperature Sensors	Optional, automatic compensation for sample pressure, temperature and molecular weight. Normalizing parameters are field selectable
Standard Alarms	2 field-programmable alarms with form C relay contacts (5 A 250 VAC res.)
Diagnostic Features	Continuous internal diagnostics with error messaging & instrument error relay
Sample Flow Rate	0.5 l/min. (built-in flow meter) at 30 PSIG max. Higher pressures on request
Readout	2 line by 20 character alphanumeric vacuum fluorescent display
Analog Outputs	Scalable 4-20 mA and 0-10 VDC standard. Others available on request
Digital Outputs	RS232 bi-directional interface standard
Available Configurations	NEMA 4x/IP65 non-metallic enclosure (wall mount); 19" rack, bench-top
Sample Inlet/Outlet Ports	1/8" or 1/4" compression fittings. Metric, VCR or other fittings on request
Supply Voltage	100-240 VAC 50/60 Hz
Dimensions (W x H x D)	Bench: 12.5" x 5.4" x 14.2" (318 x 137 x 361 mm) Rack: 19" x 5.3" x 14.2" (483 x 133 x 361 mm) Wall mount: 16.8" x 19.5" x 9.6" (425 x 495 x 244 mm)
Compliance	CE

Specifications subject to change without notice

Ozone instrumentation for every application						
	Generator Output	Safety/Leak Detection	Toof Leak Detection	Stack & Environment	Dissolved Ozone	Spot Checking
Model dFFOZ-TR	•				•	
Model dFFOZ					•	
Model WJ Series					•	
Model gFFOZ	•					
Model Mini-HiCon	•					
Model H1 Series	•					
Model L2RM			•			
Model IN-2000		•	•	•		
Model AET-030						•



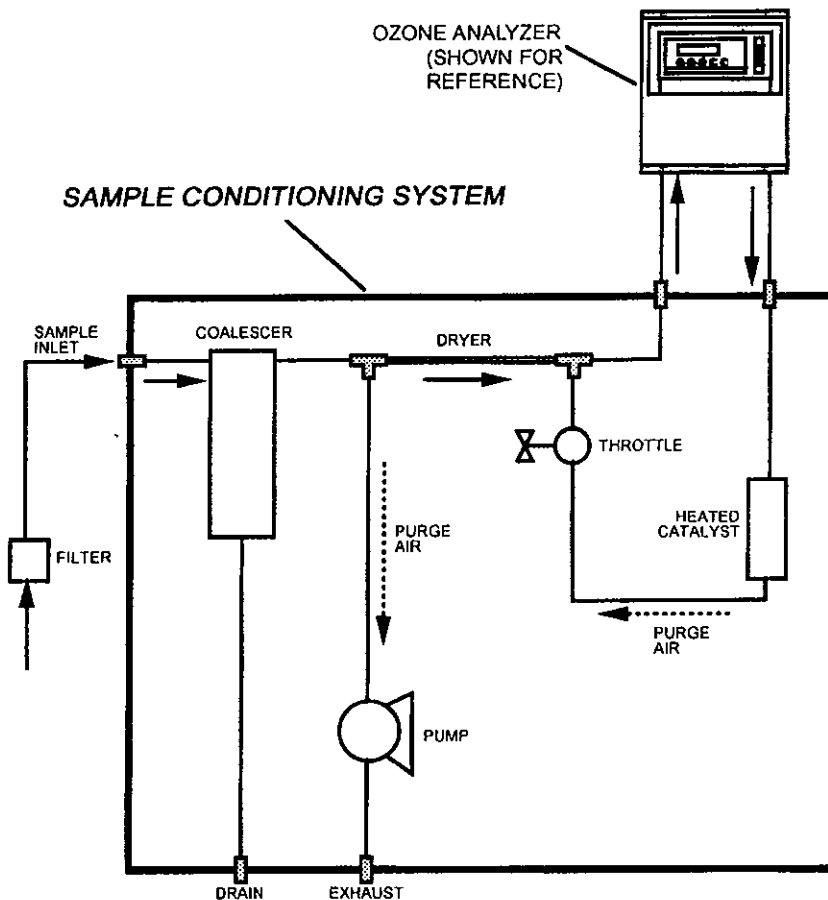
IN USA, INC. - 87 Crescent Road - Needham, MA 02494 USA - Toll Free (1)-800-798-4029
Tel: (1)-781-444-2929 FAX: (1)-781-444-9229 Website: www.inusacorp.com



OZONE SAMPLING AND CONDITIONING SYSTEM MODEL SC-010-R

Application:

The SC-010-R Sampling and Conditioning system is ideal when measuring Ozone in off-gas where the sample is typically wet and saturated with water vapor. In such cases, the SC-010-R can be used in conjunction with either the AFX series H1 or the AFX series IN-2000 Ozone analyzers from IN USA, INC. If the sample is not properly conditioned prior to entering the Ozone analyzer, liquid water or condensation on the optical components are likely to cause inconsistent and false readings.



Functionality:

The SC-010-R includes a pump, a coalescer, a dryer and a heated catalyst. The system performs the following functions required to condition the sample prior to entering the monitor:

- The coalescer removes water droplets and mist from the sample
- The dryer removes water vapor and lowers the sample gas dew point
- The pump draws the sample gas stream into the analyzer at the nominal flow rate
- The heated catalyst destroys Ozone in the gas stream exhaust

Note that NO external sources of dry purge gas are required.

Specifications:

- NEMA 4X (IP65) wall mount enclosure 13" (330mm) W x 15" (380 mm) H x 7" (178 mm) D
- All components compatible with Ozone
- Swagelok (tm) fittings for inlet and outlet
- Throttling valve for gas flow control
- Can sample from vacuum lines up to 300 mm Hg
- Operates on either 110 or 220 VAC

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

79338-C14-16

Date: _____

27/1/06

By: _____

[Signature]



Date : 1/13/06

Revision : 00

Project No. : WPMB-1105

Fuji Electric Corporation of America

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

MONITORS

PORTABLE OZONE MONITOR

MANUFACTURER	:	ATI (ANALYTICAL TECHNOLOGY, INC.)
MODEL NO.	:	PORTA SENS II, C-16-1 PORTABLE HANDHELD LCD DISPLAY
SERVICE	:	ATMOSPHERIC OZONE CONCENTRATION
POWER	:	D CELL BATTERY (ALKALINE) INTERNAL RECHARGEABLE NICAD BATTERY
SENSOR MODULE	:	00-1008
RANGE	:	0 ~ 2 PPM
ACCURACY	:	± 5% (LIMITED BY CALIBRATED GAS)
SENSITIVITY	:	± 1% OF SENSOR MODULE RANGE
OPERATING TEMP.	:	-13 ~ 131° F (-25 ~ 55° C)
HUMIDITY	:	0 ~ 95 % NON CONDENSING
DETECTOR MATERIAL	:	GLASS FILLED POLYCARBONATE
SIZE	:	3.5" W x 9" H x 5.5" D (89 mm x 229 mm x 140 mm)
WEIGHT	:	7 LBS (3.2 KG)
QUANTITY	:	1
CUSTOMER TAG NO.	:	N/A

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for field check and correlation of field dimensions, materials and workmanship of construction, methods and sequence of all parts of the work rests with the Contractor.

REVIEWED _____

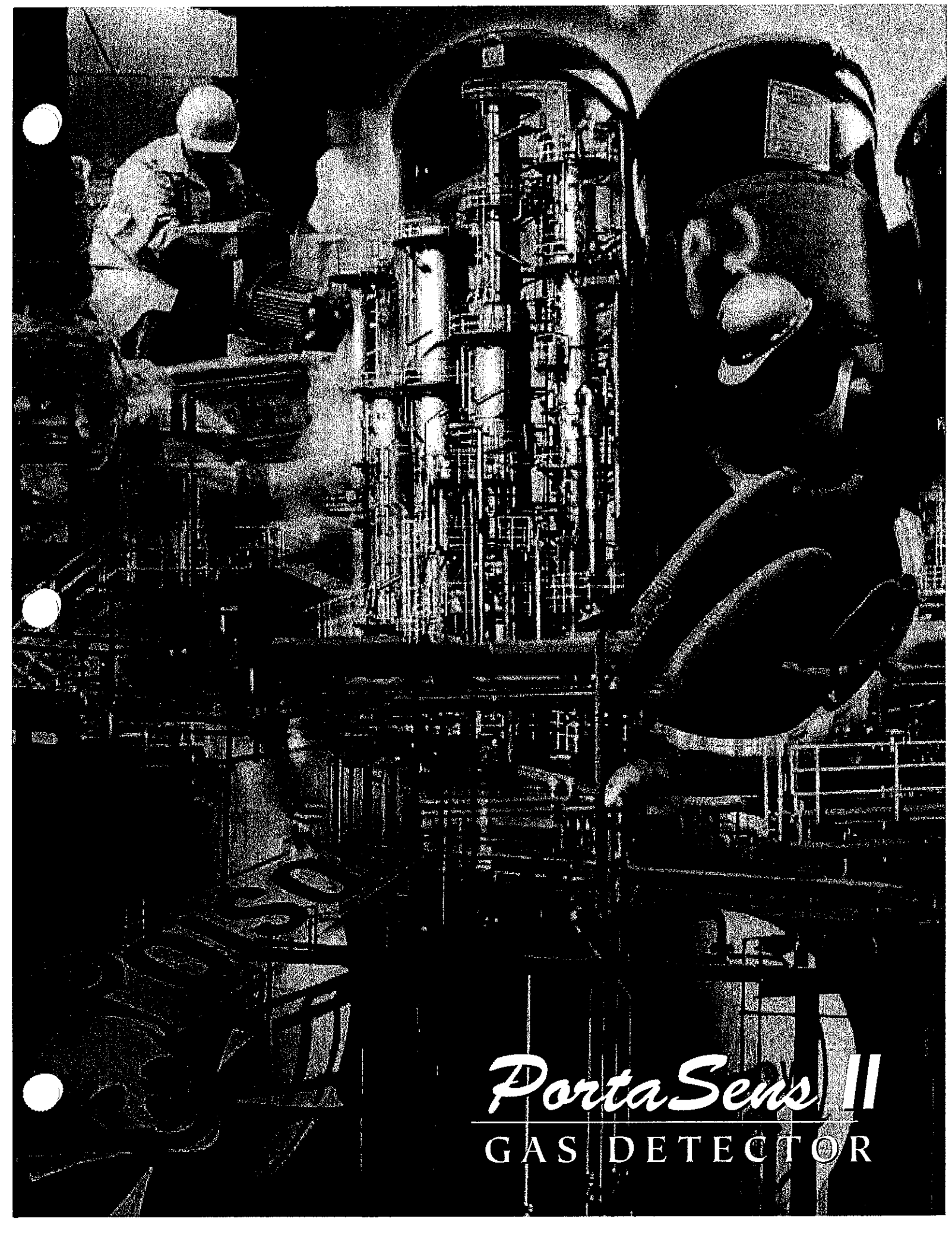
REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]



PortaSense II
GAS DETECTOR

A black and white photograph of a hand holding a handheld gas detector. The detector has a rectangular face with a backlit LCD screen displaying the brand name 'Bresler II' and several icons. A long, flexible sampling wand is attached to the top of the device. The background shows an industrial facility with tall chimneys and structures under a hazy sky.

Features

- Interchangeable "Smart Sensors" for over 30 gases
- Internal sample pump and external sampling wand
- One-hand pistol grip design
- Standard "D" cell battery and rechargeable backup battery
- Easy to read back-lit graphics liquid crystal display
- Instantaneous and timed sampling modes of operation
- Visual and Audible alarms
- Internal data-logger with RS-232 output

PortaSens II

Gas leak detection is an important part of every plant safety program. Many industrial processes require the use of potentially toxic gases, and other processes may generate hazardous gases as a byproduct. Such hazards can be managed through careful equipment maintenance and regular monitoring for early signs of leakage.

The Series C16 **PortaSens II** portable gas leak detector is a versatile tool for performing regular leak checks in gas storage areas, around process equipment and piping, or in confined spaces prior to entry. Designed for easy one-hand operation, the detector contains an internal sample pump and a flexible sampling wand to allow pinpoint location of the source of leakage. A large character display insures that measured values are easily visible, and a back-light for the display insures readability in low or no light conditions.

A unique feature of the C16 detector is its ability to measure a variety of different gases by simply inserting the appropriate sensor for that gas. This means that one detector can be used to measure over 30 different gases or vapors, reducing the need to purchase individual detectors for each type of gas. And sensors can be changed quickly and easily, without the need for calibration when a sensor change is made.

Sensors used in the **PortaSens II** are ATI's newest miniaturized smart sensor modules. Each sensor module is actually a sensor, amplifier, and memory module in one compact package. Because of this design, sensor modules can be calibrated independently and simply plugged into any detector for immediate use. When installed in a detector, calibration data is loaded into the microprocessor so that no adjustments are needed. The result is that a detector can, for example, go from phosgene measurement to ammonia measurement in less than one minute.



Computer interface is a standard feature of the PortaSens II. An RS-232 output allows stored data to be downloaded to a PC through an interface cable supplied with the unit. Software is provided to allow simple data transfer.

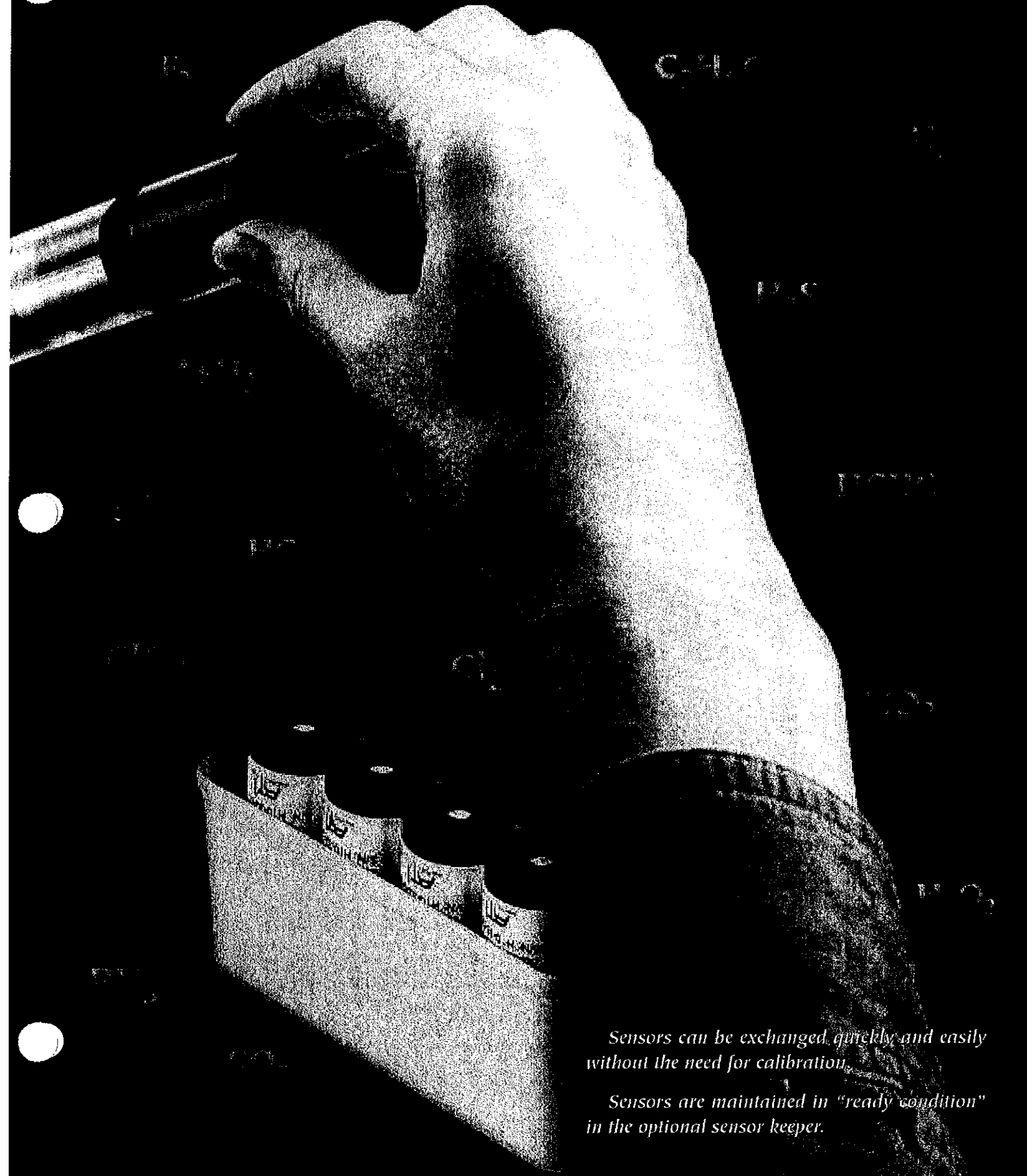
Specifications

- **Range:** Dependent on sensor module used
- **Display:** Back-lit graphics liquid crystal display
- **Accuracy:** Sensor dependent but generally $\pm 5\%$ of value (limited by cal. gas)
- **Sensitivity:** 1% of sensor module range
- **Outputs:** RS-232 output of stored gas values
0-1 VDC analog (requires optional output cable)
- **Memory:** 12,000 data points
- **Storage Interval:** Programmable from 1 minute to 60 minutes
- **Typical Capacity:** 8 days at 1 minute storage interval
- **Alarms:** Three concentration alarms (caution, warning, and alarm with adjustable setpoints)
Low flow and low battery alarms
Alarms displayed on LCD & Indicated by audible beeper
- **Power:** D cell battery, alkaline recommended, 75 hours operation
Internal rechargeable Nicad for backup power, 6 hours operation
120 or 220 VAC chargers available
- **Operating Temp.:** -25° to $+55^{\circ}\text{C}$
- **Humidity:** 0-95% Non-condensing
- **Detector Material:** Glass Filled Polycarbonate
- **Size:** 3.5" (W) x 9" (H) x 5.5" (D)
89mm x 229mm x 140mm
- **Shipping Weight:** 7 lbs. (3.2 Kg.)

ONE DETECTOR . . .



FOR MANY GASES!



Sensors can be exchanged quickly and easily without the need for calibration.

Sensors are maintained in "ready condition" in the optional sensor keeper.

PortaSens II

PortaSens II Gas Detectors are supplied in a padded carrying case for easy storage and transport. Space is provided for an extra battery plus up to two sensor keepers, which means up to 8 extra sensors ready for immediate use. The following components are standard.

- PortaSens Gas Detector
- 10" Teflon Lined Sampling Wand
- Battery Charger
- Spare Filters
- Flowmeter
- RS-232 Output Cable
- Spare "D" Cell Battery
- Calibration "T" Fitting



Ordering Information

- #00-0998 MODEL C16-1 PortaSens II, 120 VAC Charger
- #00-0999 MODEL C16-2 PortaSens II, 220 VAC Charger
- #00-0981 Optional Sensor Keeper for 4 Sensors

The basic **PortaSens II** detector does not include sensor modules. Because the C16 is designed to accept any gas sensor, you can select one or more sensor modules from the list below. Each sensor module is factory calibrated at the time of shipment and is ready to use by plugging it into the receptacle in the C16 manifold. Each module can be calibrated for the minimum and maximum ranges indicated. The standard factory calibration for the module is listed in parentheses.

Part#	Gas & Range	Part#	Gas & Range
00-1000	Bromine, 0-1/5 PPM (2 PPM Std.)	00-1022	Nitrogen Dioxide, 0-10/200 PPM (20 PPM Std.)
00-1001	Bromine, 0-5/200 (20 PPM Std.)	00-1023	Sulfur Dioxide, 0-10/500 PPM (20 PPM Std.)
00-1002	Chlorine, 0-1/5 PPM (2 PPM Std.)	00-1024	Arsine, 0-500/2000 PPB (1000 PPB Std.)
00-1003	Chlorine, 0-5/200 (20 PPM Std.)	00-1025	Arsine, 0-10/200 PPM (10 PPM Std.)
00-1004	Chlorine Dioxide, 0-1/5 PPM (2 PPM Std.)	00-1026	Diborane, 0-500/2000 PPB (1000 PPB Std.)
00-1005	Chlorine Dioxide, 0-5/200 (20 PPM Std.)	00-1027	Diborane, 0-10/200 PPM (10 PPM Std.)
00-1006	Fluorine, 0-1/5 PPM (2 PPM Std.)	00-1028	Germane, 0-500/2000 PPB (1000 PPB Std.)
00-1007	Fluorine, 0-5/200 (20 PPM Std.)	00-1029	Germane, 0-10/200 PPM (10 PPM Std.)
00-1008	Ozone, 0-1/5 PPM (2 PPM Std.)	00-1030	Hydrogen Selenide, 0-500/2000 PPB (1000 PPB Std.)
00-1009	Ozone, 0-5/200 PPM (20 PPM Std.)	00-1031	Hydrogen Selenide, 0-10/200 PPM (10 PPM Std.)
00-1010	Ammonia, 0-50/500 PPM (200 PPM Std.)	00-1032	Phosphine, 0-500/2000 PPB (1000 PPB Std.)
00-1011	Ammonia, 0-500/2000 PPM (1000 PPM Std.)	00-1033	Phosphine, 0-10/200 PPM (10 PPM Std.)
00-1012	Carbon Monoxide, 0-50/1000 PPM (200 PPM Std.)	00-1034	Phosphine, 0-200/2000 PPM (1000 PPM Std.)
00-1013	Hydrogen, 0-1/10% (4% Std.)	00-1035	Silane, 0-10/200 PPM (10 PPM Std.)
00-1041	Hydrogen, 0-500/2000 PPM (2000 PPM Std.)	00-1036	Iodine, 0-1/5 PPM (2 PPM Std.)
00-1014	Oxygen, 0-5/25% (25% Std.)	00-1037	Iodine, 0-5/200 PPM (20 PPM Std.)
00-1015	Phosgene, 0-1/5 PPM (2 PPM Std.)	00-1038	Acid Gases, 0-10/200 PPM (20 PPM Std.)
00-1016	Phosgene, 0-5/100 PPM (100 PPM Std.)	00-1039	Ethylene Oxide, 0-20/200 PPM (20 PPM Std.)
00-1017	Hydrogen Chloride, 0-10/200 PPM (20 PPM Std.)	00-1040	Formaldehyde, 0-20/200 PPM (20 PPM Std.)
00-1018	Hydrogen Cyanide, 0-10/200 PPM (20 PPM Std.)	00-1042	Hydrogen Peroxide, 0-10/100 PPM (20 PPM Std.)
00-1019	Hydrogen Fluoride, 0-10/200 PPM (20 PPM Std.)	00-1043	Alcohol, 0-50/500 PPM (200 PPM Std.)
00-1020	Hydrogen Sulfide, 0-10/200 PPM (20 PPM Std.)	00-1044	Alcohol, 0-500/2000 PPM (2000 PPM Std.)
00-1021	Nitric Oxide, 0-50/500 PPM (200 PPM Std.)	00-1057	Acetylene, 0-50/500 PPM (0-200 PPM Std.)

Represented by:



Analytical Technology, Inc.
680 Hollow Road, Box 879 • Oaks, PA 19456
800-959-0299 • 610-917-0991 • Fax 610-917-0992
www.analyticaltechnology.com
email: sales@analyticaltechnology.com

ATI (UK) Limited
First Floor • 237-239 Oldham Road
Springhead, Oldham OL4 4QR
0161-624-0200 • Fax 0161-624-0400
email: sales@atiuk.com



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

POWER SUPPLY UNIT

ITEM:

ENCLOSURE

MANUFACTURER:
MODEL:
TYPE:

HOFFMAN
A-907236FS
TWO DOOR, NEMA 12 ENCLOSURE
(90" X 72" X 36")

QUANTITY:
COLOR:
TYPE:
MODEL:
TYPE:
MODEL:
QUANTITY:

3
FUJI BLUE
SIDE MOUNTED PANEL (78" X 20")
A-90SMP20
FULL SIZE, BACK PANEL (78" X 68")
A-90P72F1
1

ANSI GREY 61

SEE SPEC

17110

SECTION 2.1.2

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabric to drawings, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fit and form, process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: M. J. Paul



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM:

ENCLOSURE

MANUFACTURER:

HOFFMAN

MODEL:

A-903636FS

TYPE:

SINGLE DOOR, NEMA 12 ENCLOSURE
(90" X 36" X 36")

QUANTITY:

2

COLOR:

FUJI BLUE *ANSI GR6Y 61*

TYPE:

FULL SIZE, BACK PANEL (78" X 32")

MODEL:

A-90P36F1

QUANTITY:

2

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for correct design in the shop drawings
rests with the client.

Responsibility for correct interpretation of field
conditions rests with the contractor. The contractor
is responsible for the accuracy of the field work
parts of the work under the contract.

REVIEWED _____

APPROVED AS SHOWN _____ ✓

ADVISE ADD TO BILL OF MATERIALS _____

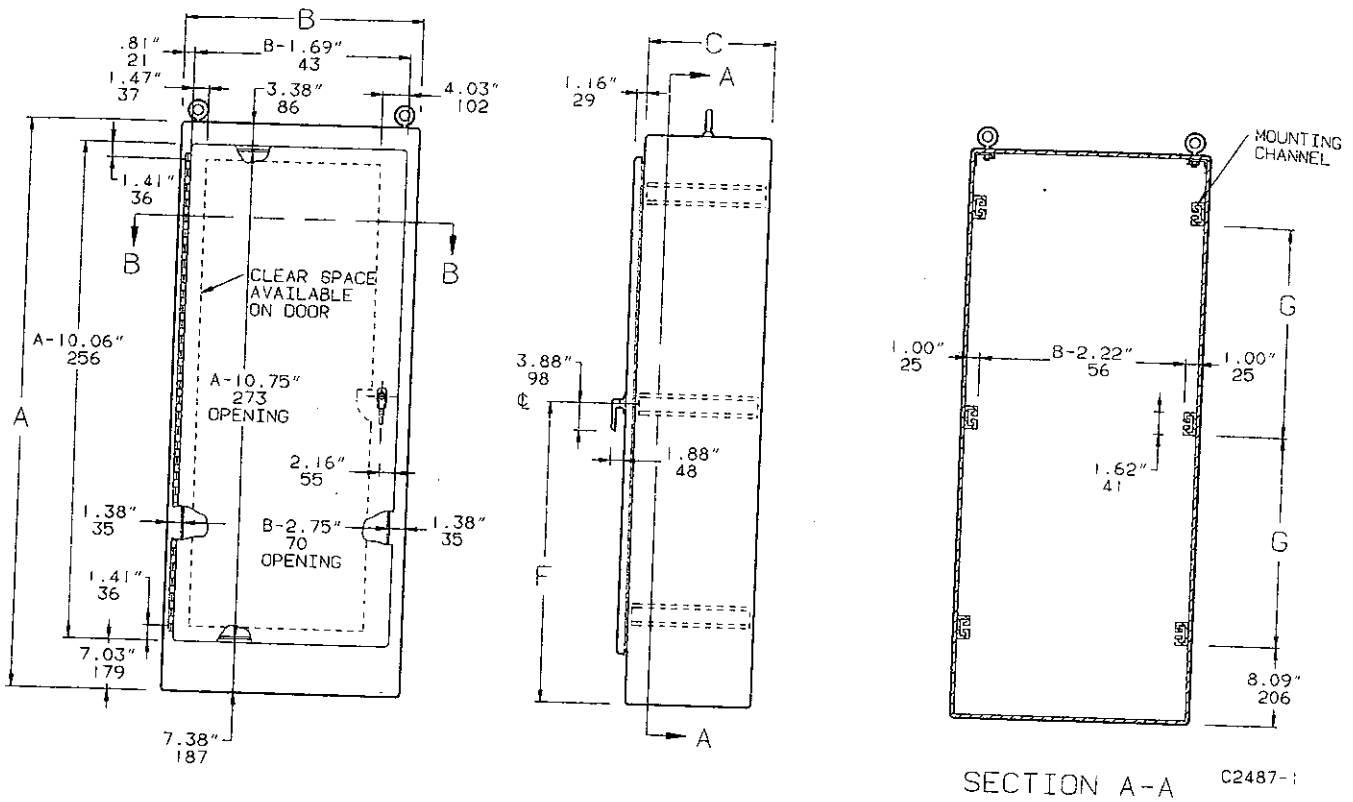
NOT REVIEWED _____

Project No. 79538-C14-16

Date 27/1/06

By: [Signature]

Single-Door Single Access



- NOTE: 1. Four lifting eyes are furnished if C = 30.06 (764) or more.
 2. See General Accessories for section views A-A and B-B showing accessories.
 3. Removable 12.00x12.00 (305x305) data pocket.

Inch
Millimeter

Standard Sizes Single-Door Single Access Free-Standing Type 12 Enclosures

Enclosure Catalog Number	Enclosure Size A x B x C		F		G	
	inch	(millimeter)	inch	(mm)	inch	(mm)
A-602418FS	60.06 x 24.06 x 18.06	(1526 x 611 x 459)	32.03	(814)	23.12	(587)
A-722418FS	72.06 x 24.06 x 18.06	(1830 x 611 x 459)	38.03	(966)	29.12	(740)
A-723018FS	72.06 x 30.06 x 18.06	(1830 x 764 x 459)	38.03	(966)	29.12	(740)
A-723618FS	72.06 x 36.06 x 18.06	(1830 x 916 x 459)	38.03	(966)	29.12	(740)
A-902420FS	90.06 x 24.06 x 20.06	(2288 x 611 x 510)	47.03	(1195)	38.12	(968)
A-903620FS	90.06 x 36.06 x 20.06	(2288 x 916 x 510)	47.03	(1195)	38.12	(968)
A-603624FS	60.06 x 36.06 x 24.06	(1526 x 916 x 611)	32.03	(814)	23.12	(587)
A-722424FS	72.06 x 24.06 x 24.06	(1830 x 611 x 611)	38.03	(966)	29.12	(740)
A-723024FS	72.06 x 30.06 x 24.06	(1830 x 764 x 611)	38.03	(966)	29.12	(740)
A-723624FS	72.06 x 36.06 x 24.06	(1830 x 916 x 611)	38.03	(966)	29.12	(740)
A-903624FS	90.06 x 36.06 x 24.06	(2288 x 916 x 611)	47.03	(1195)	38.12	(968)
A-723630FS	72.06 x 36.06 x 30.06	(1830 x 916 x 764)	38.03	(966)	29.12	(740)
A-723636FS	72.06 x 36.06 x 36.06	(1830 x 916 x 916)	38.03	(966)	29.12	(740)
A-903636FS	90.06 x 36.06 x 36.06	(2288 x 916 x 916)	47.03	(1195)	38.12	(968)

Millimeter dimensions () are for reference only; do not convert metric dimensions to inch.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for field changes in the shop drawings
rests with the contractor.

Responsible for verification and correlation of field
dimensions with design intent, techniques of
construction, and for the coordination of all
parts of the work with the Contractor.

REVIEWED _____ ✓ _____

REVIEWED AS MODIFIED _____ ✓ _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/11/06 By: M. Paul

Panels (Full- and Half-Length)

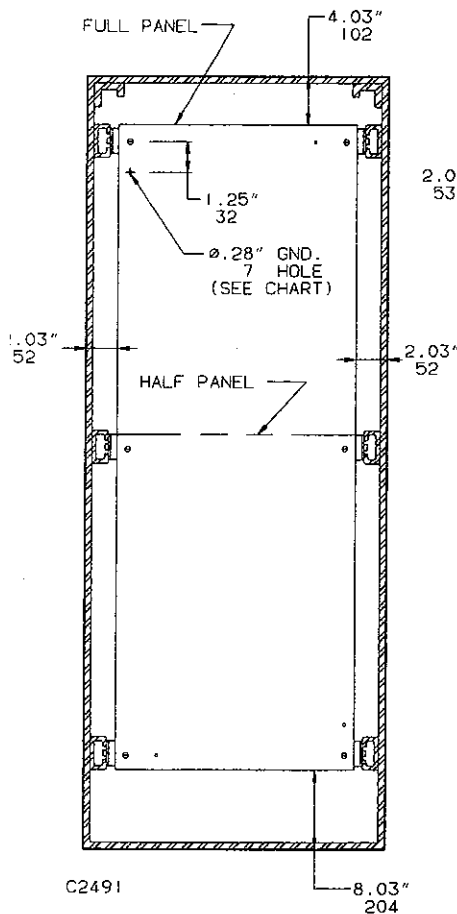
Panels for single-door single access and single-door dual access Free-Standing Type 12 Enclosures, Free-Standing Type 4 Enclosures, and Single-Door Type 4X Free-Standing Fiberglass Enclosures.

Panels are 12 gauge steel and can be positioned anywhere along horizontal mounting channels (see Sections B-B for limitations). Half-length panels can be located in the upper or lower portion of the enclosure.

All panels are white and are furnished with zinc plated mounting hardware.

Catalog Number	Description	Fits Enclosure A x B inch (millimeter)	Panel Size inch (mm)
A-60P24F1	Full Panel	60.00 x 24.00 (1524 x 610)	48.00 x 20.00 (1219 x 508)
A-60P24F2	Half Panel	60.00 x 24.00 (1524 x 610)	24.88 x 20.00 (632 x 508)
A-72P24F1	Full Panel	72.00 x 24.00 (1829 x 610)	60.00 x 20.00 (1524 x 508)
A-72P24F2	Half Panel	72.00 x 24.00 (1829 x 610)	30.88 x 20.00 (784 x 508)
A-90P24F1	Full Panel	90.00 x 24.00 (2286 x 610)	78.00 x 20.00 (1981 x 508)
A-90P24F2	Half Panel	90.00 x 24.00 (2286 x 610)	39.88 x 20.00 (1013 x 508)
A-72P30F1	Full Panel	72.00 x 30.00 (1829 x 762)	60.00 x 26.00 (1524 x 660)
A-72P30F2	Half Panel	72.00 x 30.00 (1829 x 762)	30.88 x 26.00 (784 x 660)
A-60P36F1	Full Panel	60.00 x 36.00 (1524 x 914)	48.00 x 32.00 (1219 x 813)
A-60P36F2	Half Panel	60.00 x 36.00 (1524 x 914)	24.88 x 32.00 (632 x 813)
A-72P36F1	Full Panel	72.00 x 36.00 (1829 x 914)	60.00 x 32.00 (1524 x 813)
A-72P36F2	Half Panel	72.00 x 36.00 (1829 x 914)	30.88 x 32.00 (784 x 813)
A-90P36F1	Full Panel	90.00 x 36.00 (2286 x 914)	78.00 x 32.00 (1981 x 813)
A-90P36F2	Half Panel	90.00 x 36.00 (2286 x 914)	39.88 x 32.00 (1013 x 813)

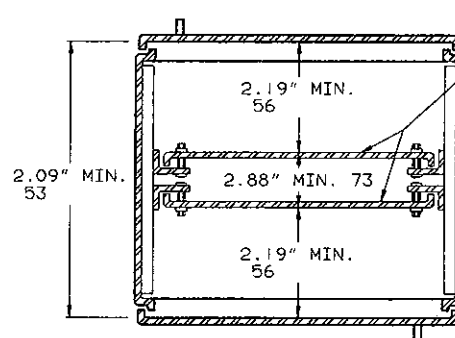
Millimeter dimensions () are for reference only; do not convert metric dimensions to inch.



C2491

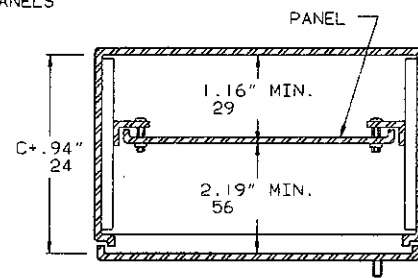
SECTION A-A

Showing regular panels installed



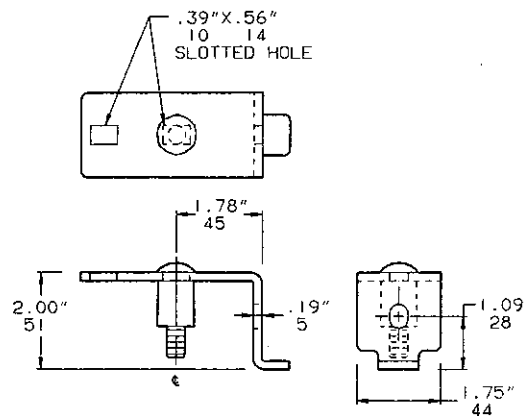
SECTION B-B

Showing two regular panels mounted in single-door dual access enclosure



SECTION B-B

Showing regular panel mounted in single-door single access enclosure



DETAIL of panel support

Inch
Millimeter



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

DOOR INTERLOCK

DESCRIPTIONS
MANUFACTURER
CATALOG NO
QUANTITY
CATALOG NO
DESCRIPTION
QUANTITY
EQUIP ID

DOOR INTERLOCK SAFETY SWITCH
SQUARE D
XCSTE5533
2
XCSZ12
ACTUATING KEYS
2
DS-1, 2

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for fabrication in the shop drawings rests with the contractor.

Responsible for correlation of field dimensions with shop drawings and removal of construction errors. Responsibility for all parts of the work rests with the contractor.

REVIEWED _____ ✓

REVIEWED AS NOTIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

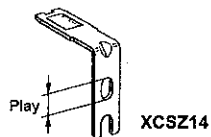
Project No. 79538-C14-16

Date 27/1/06 By: M. Joubert

XCS Safety Interlock Switches

XCSPA, XCSTA, XCSTE, XCSMP

Actuating Keys



Plastic body

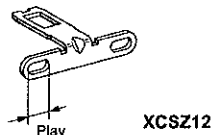
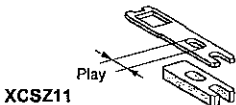
Actuating Keys

The actuating keys are common to all XCSPA, XCSTA, and XCSTE plastic body safety interlock switch models. Their oblong mounting holes enable simple adjustment when mounting on moving guards.

A pivoting actuating key (both horizontally and vertically) is available when using the switches in conjunction with hinged guards or guards with imprecise guidance.

Straight actuating keys are supplied with an adapter for simple replacement of an XCKP safety interlock switch by an XCSPA switch or an XCKT safety interlock switch by an XCSTA switch, without the need to drill additional mounting holes.

The XCSMP safety interlock switches use actuating different actuating keys, due to the smaller size of the switch. Straight, 90°, and pivoting actuating keys are available for the XCSMP.



Turret Head

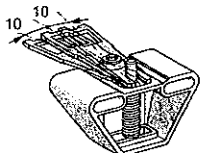
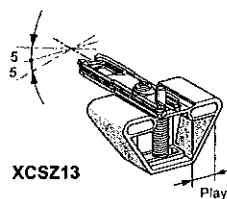
The XCSPA, XCSTA and XCSTE safety interlock switches are fitted with a square turret head which can be rotated through 360° in 90° steps.

Eight directions of actuation are possible for the actuating key:

- 4 in the horizontal plane,
- 4 from above the switch (4 alternative positions of the key slot, depending on the orientation of the head).

When loosening the head mounting screws for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged. There are 2 head mounting screws for the XCSPA and XCSTA, and 4 head mounting screws for the XCSTE.

XCSMP safety interlock switches have a fixed head that is not rotatable. The actuating key can approach the switch from the top and side of the switch.



Turret Head

Contact Configurations.

Safety interlock switches incorporate a 2-pole (XCSMP, XCSPA and XCSTE) or a 3-pole (XCSMP and XCSTA) contact block, with positive opening operation, which is actuated by insertion or withdrawal of the actuating key attached to the guard.

The withdrawal of the actuating key opens the N.C. safety contact(s), even in the event of the contact sticking or welding.

The contact block enables redundant safety circuits to be established and also, to provide signaling (for example: PLC, illuminated beacon, etc.).

NOTE: Only the N.C. contacts should be used in the safety control circuit. The N.O. contacts are provided solely for signaling – NOT for safety functions.

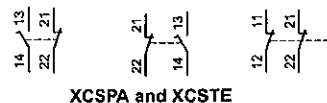
Guard Retaining Device

The guard retaining device XCSZ21 can be used with plastic body safety interlock switches XCSPA and XCSTA that are used in conjunction with either the wide (XCSZ12) or pivoting (XCSZ13) actuating key.

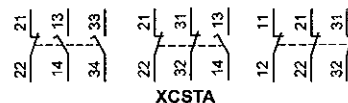
They assist in holding the guard closed by providing an extra magnetic retaining force, for a total of 11.3 lbf (5 daN).

It is specially suited for use with light machines operating in arduous conditions (vibration, mechanical shock, guard not vertical, risk of guard rebound on closing).

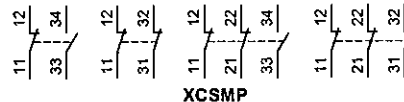
It can be used for horizontal actuating key actuating directions as well as those from above.



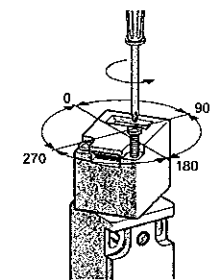
XCSPA and XCSTE



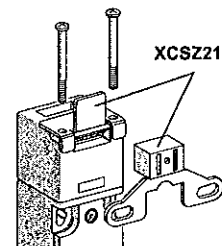
XCSTA



XCSMP



Guard Retaining Device



Earth Tech (Canada) Inc.

Reviewed for general contract use with design intent.
Responsible for design shown in the shop drawings
rests with the contractor.

Responsible for the condition of field
drawings, and the coordination of
construction with the contractor of all
parts of the work with the contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538

Date: 27/1/06 By: M. Johnson



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

PWM CONVERTER MODULE

MANUFACTURER
DEVICE
PHASE
VOLTAGE
CATALOG NO
QUANTITY
EQUIP ID

FUJI ELECTRIC
PWM
3-PHASE
480V
RHC-280
1
PWM



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

INVERTER MODULE

MANUFACTURER
DEVICE
OUTPUT VOLTAGE
OUTPUT FREQUENCY
CATALOG NO
QUANTITY
EQUIP ID

FUJI ELECTRIC
INVERTER
710 VOLTS
7 - 10 KHZ
FRN280G115-4
1
INV-11



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

HIGH VOLTAGE TRANSFORMER

MANUFACTURER
SECONDARY VOLTAGE
PRIMARY VOLTAGE
OUTPUT FREQUENCY
QUANTITY
EQUIP ID

FUJI ELECTRIC
1900 V
704 Vrms
9.8 ~ 10.2 KHZ
1
T5-11



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

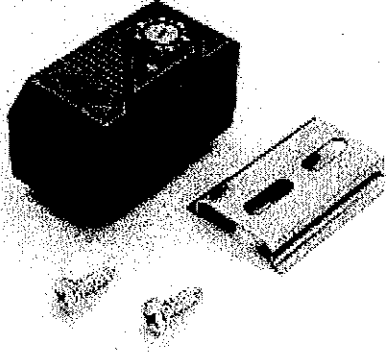
ITEM

HIGH VOLTAGE REACTOR

MANUFACTURER
RATED CAPACITY
OUTPUT FREQUENCY
QUANTITY
EQUIP ID

FUJI ELECTRIC
162.2A
9.8 ~ 10.2 KHZ
1
T6-11

Temperature Control Switches (Thermostats)



These easy to install thermostats are designed to regulate and monitor air temperature in switch-gear enclosures that are set up to operate with heaters, fans, filter ventilators, heat exchangers, and/or signal transmitters. Thermostat A-TEMNC is specifically designed for use with heaters (contacts close on temperature drop), while thermostat A-TEMNO is designed to control fans, filter ventilators, or for switching signal transmitters in the event of overheating (contacts close on temperature rise). Both thermostats have a bi-metallic adjustable set point range of 30 to 140° F. An additional label is provided to convert set point range to degrees Celsius. A preset label is also provided to cover the set point range label after the thermostat is put at desired temperature.

When the enclosure reaches the pre-determined set point, temperature contacts in the thermostat are activated and the fan or heater automatically begins to operate. Thermostats prolong the life expectancy of heaters and fans by curtailing their operating hours and also increase the working efficiency of electrical components by exposing them to fewer contaminants from the surrounding environment. Connections consist of tubular screw terminals for AWG 14 (0.04 in²). Provision for both panel mounting and DIN rail mounting. Housing is plastic UL94-VO. Protection rating IEC IP30, UL and CSA Component Recognized.

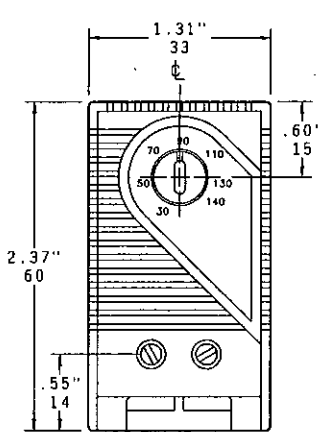


UL File Number E164102

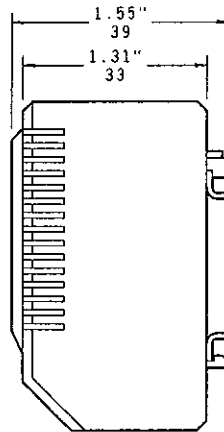


Catalog Number	Contact Type
A-TEMNC	NC (normally closed), quick-acting
A-TEMNO	NO (normally open), quick-acting

Switching Capacity		
Amp	Volts	Load
15	120 AC	Resistive
16	250 AC	Resistive
1	120-250 AC	Inductive
10	12-24 DC	Resistive
1	12-24 DC	Inductive

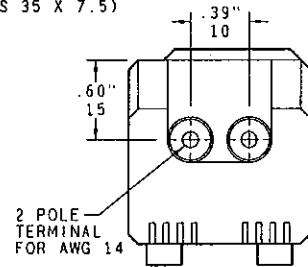


Front View



Side View

DIN 3 TYPE MOUNTING RAIL (TS 35 X 7.5)



Bottom View

87541408

Inch
Millimeter



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

CIRCUIT BREAKER

MANUFACTURER:	SQUARE D
MODEL NO:	LCL-36300
CURRENT RATING:	300A
TYPE:	THERMAL MAGNETIC MOLD CASE
FRAME SIZE:	300A
NO. OF POLES:	3
QTY:	1
TAG NO:	CB-1
DOOR OPERATING MECHANISM:	LK1

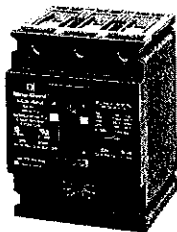
Thermal-Magnetic Molded Case

100, 225 Ampere Frame
Class 525, 650, 734, 820

5 CIRCUIT BREAKERS



FIL36100



GJL 3-pole circuit breaker



Q2L
2- and 3-pole
100-225 Amperes

F Frame – 100A, Thermal-Magnetic (600Vac)

Continuous Current Rating @ 40° C	AC Magnetic Trip Settings		Standard Interrupting		High Interrupting		Current Limiting		Terminal Wire Range
	Hold	Trip	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	
1-Pole, 277Vac, 125Vdc									
15	275	600	FHL16015	\$287.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	...	...	FHL16020	287.	...	...
25	275	600	...	...	FHL16025	287.	...	...
30	275	600	...	...	FHL16030	287.	...	...
35	400	850	FHL16035	287.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	...	...	FHL16040	287.	...	...
45	400	850	...	...	FHL16045	287.	...	...
50	400	850	...	...	FHL16050	287.	...	...
60	800	1450	...	...	FHL16060	287.	...	...
70	800	1450	...	...	FHL16070	323.	...	...
80	800	1450	...	...	FHL16080	323.	...	...
90	900	1700	...	...	FHL16090	323.	...	...
100	900	1700	...	...	FHL16100	323.	...	...
2-Pole, 600Vac, 250Vdc									
15	275	600	FAL26015	\$447.	FHL26015	\$738.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL26020	447.	FHL26020	738.	FIL26020	\$1671.	
25	275	600	FAL26025	447.	FHL26025	738.	...	...
30	275	600	FAL26030	447.	FHL26030	738.	FIL26030	1671.	
35	400	850	FAL26035	447.	FHL26035	738.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL26040	447.	FHL26040	738.	FIL26040	1671.	
45	400	850	FAL26045	447.	FHL26045	738.	...	...
50	400	850	FAL26050	447.	FHL26050	738.	FIL26050	1671.	
60	800	1450	FAL26060	447.	FHL26060	738.	FIL26060	1671.	
70	800	1450	FAL26070	565.	FHL26070	859.	FIL26070	1671.	
80	800	1450	FAL26080	565.	FHL26080	859.	FIL26080	1671.	
90	900	1700	FAL26090	565.	FHL26090	859.	FIL26090	1671.	
100	900	1700	FAL26100	565.	FHL26100	859.	FIL26100	1671.	
3-Pole, 600Vac, 250Vdc									
15	275	600	FAL36015	\$575.	FHL36015	\$862.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL36020	575.	FHL36020	862.	FIL36020	\$2092.	
25	275	600	FAL36025	575.	FHL36025	862.	...	...
30	275	600	FAL36030	575.	FHL36030	862.	FIL36030	2092.	
35	400	850	FAL36035	575.	FHL36035	862.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL36040	575.	FHL36040	862.	FIL36040	2092.	
45	400	850	FAL36045	575.	FHL36045	862.	...	...
50	400	850	FAL36050	575.	FHL36050	862.	FIL36050	2092.	
60	800	1450	FAL36060	575.	FHL36060	862.	FIL36060	2092.	
70	800	1450	FAL36070	708.	FHL36070	978.	FIL36070	2092.	
80	800	1450	FAL36080	708.	FHL36080	978.	FIL36080	2092.	
90	900	1700	FAL36090	708.	FHL36090	978.	FIL36090	2092.	
100	900	1700	FAL36100	708.	FHL36100	978.	FIL36100	2092.	

PowerPact™ G Frame – 100A, Thermal-Magnetic (600Y/347Vac)

Continuous Current Rating @ 40° C	AC Magnetic Trip Settings		J Interrupting		Terminal Wire Range
	Hold	Trip	Catalog Number	Price	
3-Pole, Vac, Vdc					
20	...	600	GJL36020	\$1264.	#14-#1/0 AWG Cu #8-#1/0 AWG Al
30	...	600	GJL36030	1264.	
40	...	600	GJL36040	1264.	
50	...	800	GJL36050	1264.	
60	...	800	GJL36060	1264.	
70	...	800	GJL36070	1554.	
80	...	800	GJL36080	1554.	
100	...	800	GJL36100	1554.	

Q Frame★ – 225A, Thermal-Magnetic (240Vac)

Continuous Current Rating @ 40° C	AC Magnetic Trip Settings		Standard Interrupting		High Interrupting		Extra High Interrupting	
	Hold	Trip	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price
2-Pole, 240Vac								
100	1400	2400	Q2L2100●	\$301.	Q2L2100H	\$726.	Q2LH2100	\$966.
110	1400	2400	Q2L2110●	301.	Q2L2110H	726.	Q2LH2110	966.
125	1400	2400	Q2L2125●	301.	Q2L2125H	726.	Q2LH2125	966.
150	1400	2400	Q2L2150●	301.	Q2L2150H	726.	Q2LH2150	966.
175	1400	2400	Q2L2175●	301.	Q2L2175H	726.	Q2LH2175	966.
200	1400	2400	Q2L2200●	301.	Q2L2200H	726.	Q2LH2200	966.
225	1400	2400	Q2L2225●	301.	Q2L2225H	726.	Q2LH2225	966.
3-Pole, 240Vac								
100	1400	2400	Q2L3100	\$792.	Q2L3100H	\$1132.	...	...
110	1400	2400	Q2L3110	792.	Q2L3110H	1132.	...	...
125	1400	2400	Q2L3125	792.	Q2L3125H	1132.	...	...
150	1400	2400	Q2L3150	792.	Q2L3150H	1132.	...	...
175	1400	2400	Q2L3175	792.	Q2L3175H	1132.	...	...
200	1400	2400	Q2L3200	792.	Q2L3200H	1132.	...	...
225	1400	2400	Q2L3225	792.	Q2L3225H	1132.	...	...

★ Accessories and replacement lugs are not available on the Q2 circuit breaker. Lugs for the Q2 circuit breakers accept 1-#4 AWG-300 kcmil.
● 2-pole Q2 is 10kA at 120/240Vac.

Interrupting Ratings (kA)

	FAL	FHL	FIL	GJL	Q2L	Q2L-H	Q2LH
240V	25	25 (1P:35-100A), 65 (2, 3P)	200	100	10●	22	42
480V	18	25 (2, 3P)	200	65	...	...	...
600V	14	18 (2, 3P)	100	25▲	...	...	...

▲ GJL is rated 25kA at 600Y/347Vac.

Accessories Page 5-22-5-24
Optional Lugs Page 5-26-5-27
Dimensions Page 5-35-5-36
Enclosures Page 5-37-5-40

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PowerPact is a Trademark of Square D Company.



Thermal-Magnetic Molded Case

250 Ampere Frame
Class 540, 655, 825

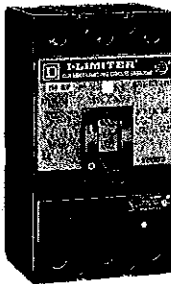
5 CIRCUIT BREAKERS



**KDL and KGL
Circuit Breaker
3-pole
100-250 Amperes**



**KAL/KHL
2- and 3-pole
70-250 Amperes**



KIL36250

PowerPact™ K Frame – 250A, Thermal-Magnetic (240Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings		D Interrupting Level		G Interrupting Level		Terminal Wire Range
	Hold	Trip	Catalog Number	Price	Catalog Number	Price	
2-Pole, 240Vac							
100	1100	1700	KDL22100	\$ 726.	KGL22100	\$3072.	AL250KD #6 AWG-350 kcmil Al or Cu
110	1100	1700	KDL22110	726.	KGL22110	3072.	
125	1100	1700	KDL22125	726.	KGL22125	3072.	
150	1100	1700	KDL22150	726.	KGL22150	3072.	
175	1400	2400	KDL22175	726.	KGL22175	3072.	
200	1400	2400	KDL22200	726.	KGL22200	3072.	
225	1400	2400	KDL22225	726.	KGL22225	3072.	
250	1400	2400	KDL22250	1235.	KGL22250	4039.	
3-Pole, 240Vac							
100	1100	1700	KDL32100	\$1132.	KGL32100	3713.	AL250KD #6 AWG-350 kcmil Al or Cu
110	1100	1700	KDL32110	1132.	KGL32110	3713.	
125	1100	1700	KDL32125	1132.	KGL32125	3713.	
150	1100	1700	KDL32150	1132.	KGL32150	3713.	
175	1400	2400	KDL32175	1132.	KGL32175	3713.	
200	1400	2400	KDL32200	1132.	KGL32200	3713.	
225	1400	2400	KDL32225	1132.	KGL32225	3713.	
250	1400	2400	KDL32250	1925.	KGL32250	4824.	

K Frame – 250A, Thermal-Magnetic (600Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings▲		Standard Interrupting		High Interrupting		Current Limiting		Terminal Wire Range
	Low	High	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	
2-Pole, 600Vac, 250Vdc									
70	350	700	KAL26070	\$1315.	KHL26070	\$3072.	AL250KA 1-#6 AWG-350 kcmil
80	400	800	KAL26080	1315.	KHL26080	3072.	...	...
90	450	900	KAL26090	1315.	KHL26090	3072.	...	...
100	500	1000	KAL26100	1315.	KHL26100	3072.	...	...
110	550	1100	KAL26110	1315.	KHL26110	3072.	KIL26110	\$3922.	
125	625	1250	KAL26125	1315.	KHL26125	3072.	KIL26125	3922.	
150	750	1500	KAL26150	1315.	KHL26150	3072.	KIL26150	3922.	
175	875	1750	KAL26175	1315.	KHL26175	3072.	KIL26175	3922.	
200	1000	2000	KAL26200	1315.	KHL26200	3072.	KIL26200	3922.	AL250KI 1-#1/0 AWG-350 kcmil
225	1125	2250	KAL26225	1315.	KHL26225	3072.	KIL26225	3922.	
250	1250	2500	KAL26250	2286.	KHL26250	4039.	KIL26250	4586.	
3-Pole, 600Vac, 250Vdc									
70	350	700	KAL36070	\$1650.	KHL36070	\$3713.	AL250KA 1-#6 AWG-350 kcmil
80	400	800	KAL36080	1650.	KHL36080	3713.	...	...
90	450	900	KAL36090	1650.	KHL36090	3713.	...	...
100	500	1000	KAL36100	1650.	KHL36100	3713.	...	...
110	550	1100	KAL36110	1650.	KHL36110	3713.	KIL36110	\$4923.	
125	625	1250	KAL36125	1650.	KHL36125	3713.	KIL36125	4923.	
150	750	1500	KAL36150	1650.	KHL36150	3713.	KIL36150	4923.	
175	875	1750	KAL36175	1650.	KHL36175	3713.	KIL36175	4923.	
200	1000	2000	KAL36200	1650.	KHL36200	3713.	KIL36200	4923.	AL250KI 1-#1/0 AWG-350 kcmil
225	1125	2250	KAL36225	1650.	KHL36225	3713.	KIL36225	4923.	
250	1250	2500	KAL36250	2751.	KHL36250	4824.	KIL36250	5766.	

K Frame – 250A, Thermal-Magnetic (480Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings▲		Extra High Interrupting		Terminal Wire Range
	Low	High	Catalog Number	Price	
2-Pole, 480Vac					
110	550	1100	KCL24110	\$3465.	AL250KA 1-#6 AWG-350 kcmil
125	625	1250	KCL24125	3465.	
150	750	1500	KCL24150	3465.	
175	875	1750	KCL24175	3465.	
200	1000	2000	KCL24200	3465.	AL250KI 1-#1/0 AWG-350 kcmil
225	1125	2250	KCL24225	3465.	
250	1250	2500	KCL24250	4248.	
3-Pole, 480Vac					
110	550	1100	KCL34110	4331.	AL250KA 1-#6 AWG-350 kcmil
125	625	1250	KCL34125	4331.	
150	750	1500	KCL34150	4331.	
175	875	1750	KCL34175	4331.	
200	1000	2000	KCL34200	4331.	AL250KI 1-#1/0 AWG-350 kcmil
225	1125	2250	KCL34225	4331.	
250	1250	2500	KCL34250	5314.	

▲ UL magnetic trip setting tolerances are ±25% (low) and ±20% (high) from nominal values shown.

Interrupting Ratings (kA)

	KDL	KGL	KAL	KHL	KCL	KIL
240V	25	65	42	65	100	200
480V	...	...	25	35	65	200
600V	...	...	22	25	...	100

Accessories Page 5-22-5-24
Optional Lugs Page 5-26-5-27
Dimensions Page 5-35-5-36
Enclosures Page 5-37-5-40

PowerPact is a Trademark of Square D Company.



Thermal-Magnetic Molded Case

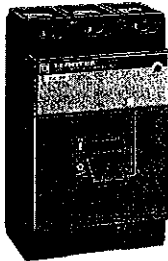
400, 600, 1000 Ampere Frame

Class 660, 665, 735, 830

5 CIRCUIT BREAKERS



LAL/LHL
2- and 3-pole
125-400 Amperes



LIL36600



MAL/MHL
2- and 3-pole
300-1000 Amperes

Interrupting Ratings (kA)

	Q4L	LAL	LHL	LCL	LIL	MAL	MHL
240V	25	42	65	100	200	42	65
480V	...	30	35	65	200	30	65
600V	...	22	25	35	100	22	25

Q4 Frame – 400A, Thermal-Magnetic (240Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings [▲]		Standard Interrupting		Terminal Wire Range
	Low	High	Catalog Number	Price	
2-Pole, 240Vac					
250	1250	2500	Q4L2250	\$2013.	AL400LA 1-#1 AWG-600 kcmil or 2-#1 AWG-250 kcmil
300	1500	3000	Q4L2300	2013.	
350	1750	3500	Q4L2350	2013.	
400	2000	4000	Q4L2400	2013.	
3-Pole, 240Vac					
250	1250	2500	Q4L3250	\$2432.	AL400LA 1-#1 AWG-600 kcmil or 2-#1 AWG-250 kcmil
300	1500	3000	Q4L3300	2432.	
350	1750	3500	Q4L3350	2432.	
400	2000	4000	Q4L3400	2432.	

L Frame – 400A, Thermal-Magnetic (600Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings [▲]		Standard Interrupting		High Interrupting		Extra High Interrupting		Current Limiting		Terminal Wire Range
	Low	High	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	Catalog Number	Price	
2-Pole, 600Vac, 250Vdc											
125	625	1250	LAL26125	\$2417.	LHL26125	\$4039.	AL400LA 1-#1 AWG- 600 kcmil or 2-#1 AWG- 250 kcmil
150	750	1500	LAL26150	2417.	LHL26150	4039.	...	...	...	...
175	875	1750	LAL26175	2417.	LHL26175	4039.	...	...	...	...
200	1000	2000	LAL26200	2417.	LHL26200	4039.	...	...	...	...
225	1125	2250	LAL26225	2417.	LHL26225	4039.	...	...	...	...
250	1250	2500	LAL26250	2417.	LHL26250	4039.	...	...	...	...
300	1500	3000	LAL26300	2417.	LHL26300	4039.	LCL26300	\$4749.	LIL26300	\$5463.	
350	1750	3500	LAL26350	2417.	LHL26350	4039.	LCL26350	4749.	LIL26350	5463.	
400	2000	4000	LAL26400	2417.	LHL26400	4039.	LCL26400	4749.	LIL26400	5463.	
3-Pole, 600Vac, 250Vdc											
125	625	1250	LAL36125	\$2932.	LHL36125	\$4824.	AL400LA 1-#1 AWG- 600 kcmil or 2-#1 AWG- 250 kcmil
150	750	1500	LAL36150	2932.	LHL36150	4824.	...	...	...	...
175	875	1750	LAL36175	2932.	LHL36175	4824.	...	...	...	...
200	1000	2000	LAL36200	2932.	LHL36200	4824.	...	...	...	...
225	1125	2250	LAL36225	2932.	LHL36225	4824.	...	...	...	...
250	1250	2500	LAL36250	2932.	LHL36250	4824.	...	...	...	...
300	1500	3000	LAL36300	2932.	LHL36300	4824.	LCL36300	\$5277.	LIL36300	\$6071.	
350	1750	3500	LAL36350	2932.	LHL36350	4824.	LCL36350	5277.	LIL36350	6071.	
400	2000	4000	LAL36400	2932.	LHL36400	4824.	LCL36400	5277.	LIL36400	6071.	
L Frame – 600A, Thermal-Magnetic (600Vac)											
Continuous Current Rating A 40° C	AC Magnetic Trip Settings [▲]		Extra High Interrupting [■]		Current Limiting		Terminal Wire Range				
	Low	High	Catalog Number	Price	Catalog Number	Price					
2-Pole, 600Vac											
450	2250	4500	LCL26450	\$4967.	LIL26450	\$7969.	AL600LI5 2-#4/0 AWG-500 kcmil				
500	2500	5000	LCL26500	4967.	LIL26500	7969.					
600	3000	5400	LCL26600	4967.	LIL26600	7969.					
3-Pole, 600Vac											
450	2250	4500	LCL36450	\$5518.	LIL36450	\$8856.	AL600LI5 2-#4/0 AWG-500 kcmil				
500	2500	5000	LCL36500	5518.	LIL36500	8856.					
600	3000	5400	LCL36600	5518.	LIL36600	8856.					

M Frame – 1000A, Thermal-Magnetic (600Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings [▲]		Standard Interrupting		High Interrupting		Terminal Wire Range
	Low	High	Catalog Number	Price	Catalog Number	Price	
2-Pole, 600Vac, 250Vdc							
300	1500	3000	MAL26300	\$3784.	MHL26300	\$4970.	AL900MA 3-#3/0 AWG- 500 kcmil
350	1750	3500	MAL26350	3784.	MHL26350	4970.	
400	2000	4000	MAL26400	3784.	MHL26400	4970.	
450	2250	4500	MAL26450	3784.	MHL26450	4970.	
500	2500	5000	MAL26500	3784.	MHL26500	4970.	
600	3000	6000	MAL26600	3784.	MHL26600	4970.	
700	3500	7000	MAL26700	4901.	MHL26700	6131.	
800	4000	8000	MAL26800	4901.	MHL26800	6131.	
900	4500	9000	MAL26900	6991.	MHL26900	7753.	
1000	5000	10000	MAL261000	6991.	MHL261000	7753.	
1200	5500	12000	MAL261200	8221.	MHL261200	9684.	AL1000MA* 4-#1/0 AWG- 350 kcmil
3-Pole, 600Vac, 250Vdc							
300	1500	3000	MAL36300	\$4800.	MHL36300	\$6004.	AL900MA 3-#3/0 AWG- 500 kcmil
350	1750	3500	MAL36350	4800.	MHL36350	6004.	
400	2000	4000	MAL36400	4800.	MHL36400	6004.	
450	2250	4500	MAL36450	4800.	MHL36450	6004.	
500	2500	5000	MAL36500	4800.	MHL36500	6004.	
600	3000	6000	MAL36600	4800.	MHL36600	6004.	
700	3500	7000	MAL36700	6303.	MHL36700	7544.	
800	4000	8000	MAL36800	6303.	MHL36800	7544.	
900	4500	9000	MAL36900	8067.	MHL36900	8938.	
1000	5000	10000	MAL361000	8067.	MHL361000	8938.	
1200	5500	12000	MAL361200	9591.	MHL361200	11182.	AL1000MA* 4-#1/0 AWG- 350 kcmil

Accessories..... Page 5-22, 5-24, 5-25
 Optional Lugs..... Page 5-26-5-27
 Dimensions..... Page 5-36-5-37
 Enclosures..... Page 5-37-5-40

▲ UL magnetic trip setting tolerances are ±25% (low) and ±20% (high) from nominal values shown.
 ■ Use only in tested and listed enclosures.
 * The AL1000MA lug is the only lug available for the 1200 Ampere MA and MH circuit breaker.



10/97

DE2A

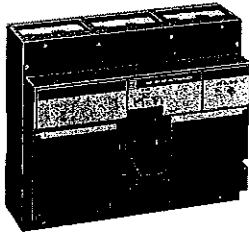
Discount
Schedule

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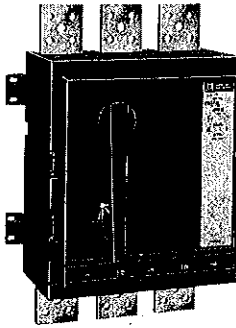
5-11

Thermal-Magnetic Molded Case

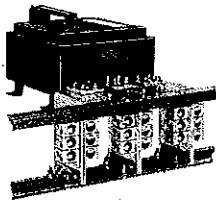
100, 225 Ampere Frames
Class 670, 675, 676



NAL/NCL
Two- and Three-Pole
600-1200 Amperes

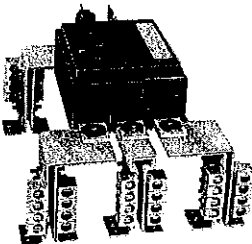


PAF/PHF
Two- and Three-Pole
600-2000 Amperes



PALTB

PAF and PHF circuit breakers can be bus or cable connected. For cable connections, optional terminal pad kit PALTB or equivalent bus structure is required. Each PALTB kit contains terminal pads for one end of the circuit breaker only and has provisions for mounting a maximum of six lugs per phase. Order lugs separately. See Pages 5-26 and 5-27.



PCF circuit breakers are supplied with terminal pads for both ends of the circuit breaker. The supplied terminal pads or equivalent bus structure must be used for bus or cable connections. Terminal pads have provisions for mounting a maximum of eight lugs per phase. Order lugs separately. See Pages 5-26 and 5-27.

N Frame – 1200A, Thermal-Magnetic (600Vac)

Continuous Current Rating A 40°C	AC Magnetic Trip Settings [▲]		Standard Interrupting		Extra High Interrupting		Terminal Wire Range
	Low	High	Catalog Number	Price	Catalog Number	Price	
2-Pole, 600Vac							
600	4000	8000	NAL26600	\$11024.	NCL26600	\$12694.	AL1200NE6 4-#3/0AWG-600 kcmil
700	4000	8000	NAL26700	11024.	NCL26700	12694.	
800	4000	8000	NAL26800	11024.	NCL26800	12694.	
900	5000	10000	NAL26900	11024.	NCL26900	12694.	
1000	5000	10000	NAL261000	11024.	NCL261000	12694.	
1200	5000	10000	NAL261200	11024.	NCL261200	12694.	
3-Pole, 600Vac							
600	4000	8000	NAL36600	\$12094.	NCL36600	\$13620.	AL1200NE6 4-#3/0AWG-600 kcmil
700	4000	8000	NAL36700	12094.	NCL36700	13620.	
800	4000	8000	NAL36800	12094.	NCL36800	13620.	
900	5000	10000	NAL36900	12094.	NCL36900	13620.	
1000	5000	10000	NAL361000	12094.	NCL361000	13620.	
1200	5000	10000	NAL361200	12094.	NCL361200	13620.	

P Frame – 2000 and 2500A, Thermal-Magnetic (600Vac)

Ampere Rating	AC Magnetic Trip Settings Amperes [▲]		2-pole – 600Vac				3-pole – 600Vac					
			Frame Only		Rating Columns Two Per Kit		Total Price†	Frame Only		Rating Columns Three Per Kit		Total Price†
			Low	High	Catalog Number	Price		Kit Catalog No.	Kit Price	Catalog Number	Price	

2000 Ampere Frame

PAF Standard Interrupting – Complete Circuit Breaker Requires Frame and Rating Columns											
600	3200	9000			PA2600RC	\$232.				PA3600RC	\$350.
700	3200	9000			PA2700RC	232.				PA3700RC	350.
800	3200	9000			PA2800RC	232.				PA3800RC	350.
1000	3500	9000			PA21000RC	232.				PA31000RC	350.
1200	3500	9000	PAF2026	\$10809.	PA21200RC	232.	\$11041.	PAF2036	\$13855.	PA31200RC	350.
1400	4500	9000			PA21400RC	232.				PA31400RC	350.
1600	5000	10000			PA21600RC	232.				PA31600RC	350.
1800	6500	11000			PA21800RC	232.				PA31800RC	350.
2000	8000	12000			PA22000RC	232.				PA32000RC	350.

PHF High Interrupting – Complete Circuit Breaker Requires Frame and Rating Columns

600	3200	9000			PA2600RC	\$232.				PA3600RC	\$350.
700	3200	9000			PA2700RC	232.				PA3700RC	350.
800	3200	9000			PA2800RC	232.				PA3800RC	350.
1000	3500	9000			PA21000RC	232.				PA31000RC	350.
1200	3500	9000	PHF2026	\$12397.	PA21200RC	232.	\$12629.	PHF2036	\$15347.	PA31200RC	350.
1400	4500	9000			PA21400RC	232.				PA31400RC	350.
1600	5000	10000			PA21600RC	232.				PA31600RC	350.
1800	6500	11000			PA21800RC	232.				PA31800RC	350.
2000	8000	12000			PA22000RC	232.				PA32000RC	350.

2500 Ampere Frame

PCF High Interrupting – Complete Circuit Breaker Requires Frame and Rating Columns											
1600	6000	12000			PC21600RC	\$232.				PC31600RC	\$350.
1800	6000	12000			PC21800RC	232.				PC31800RC	350.
2000	6000	12000	PCF2526	\$19945.	PC22000RC	232.	\$20177.	PCF2536	\$24855.	PC32000RC	350.
2500	8000	14000			PC22500RC	232.				PC32500RC	350.

† Price does not include lugs. See Pages 5-26 and 5-27 for catalog numbers and prices.

▲ UL magnetic trip setting tolerances are ±25% (Low) and ±20% (High) from the nominal values shown.

Interrupting Ratings (kA)

	NAL	NCL	PAF	PHF	PCF
240V	100	125	65	125	125
480V	50	100	50	100	100
600V	25	65	42	65	65

Accessories	Pages 5-22, 5-24, 5-25
Optional Lugs	Pages 5-26, 5-27
Dimensions	Page 5-36
Enclosures	Pages 5-37-5-40





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

SOLENOID VALVE

MANUFACTURER:
MODEL NO:
QTY:
TAG NO:

ASCO
8221-G11
1
SV-224

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, quantities, and construction of construction items and installation of all parts of the work rests with the Contractor.

REVIEWED _____ ✓

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]

Features

- Pilot Operated, Normally Open or Normally Closed.
- Snubber slows disc closing speed to protect system against water hammer damage more effectively than other techniques.
- Pressure spike due to water hammer reduced to a point eliminating the need for suppressors or other controls in most water systems.
- Fluid Controls Institute Inc. evaluations have classified these valves:

Pipe Sizes	FCI-82-1 Class
3/8", 1/2", 3/4"	CC
1", 1 1/4", 1 1/2", 2", 2 1/2"	BB

Construction

Valve Parts in Contact with Fluids	
Body	Brass
Disc	NBR
Seals	PTFE & NBR
Core Tube	305 Stainless Steel
Core and Plugnut	430F Stainless Steel
Springs	302 Stainless Steel
Piston	Stainless Steel or Brass
Shading Coil	Copper

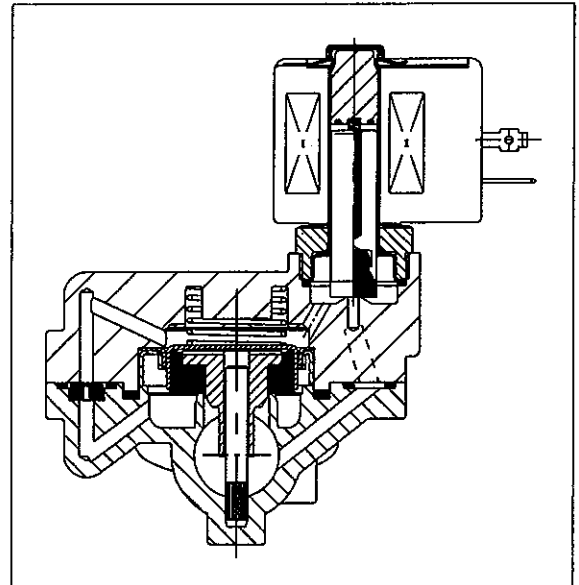
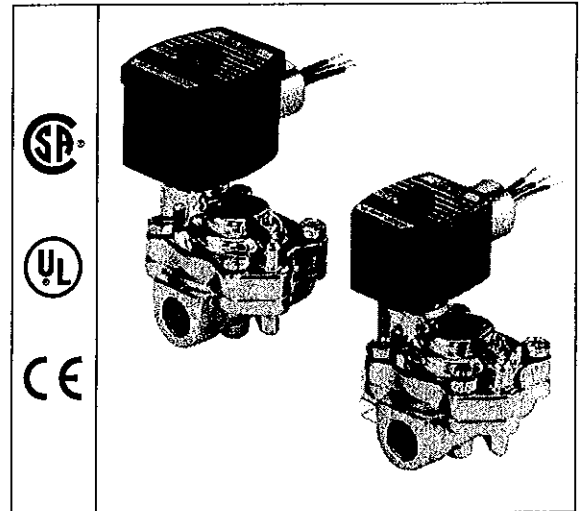
Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part No.			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	11.6	6.1	16	30	238210	238710	238214	238714
F	16.8	16.1	35	95	272610	97617	272614	97617
F	22.6	-	-	-	-	238710	-	238714

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz).
 6, 12, 24, 120, 240 volts DC. Must be specified when ordering. Other voltages are available when required.

Solenoid Enclosures

Standard: Red-Hat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; Red-Hat - Type I.
Optional: Red-Hat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Raintight, Types 3, 7, and 9. (To order, add prefix "EP" to catalog number.)
 See *Optional Features Section* for other available options.



Nominal Ambient Temperature Ranges:

Red-Hat II/
 Red-Hat AC: 32°F to 125°F (0°C to 52°C)
 Red-Hat II DC: 32°F to 104°F (0°C to 40°C)
 Red-Hat DC: 32°F to 77°F (0°C to 25°C)
 (104°F/40°C occasionally)

Refer to *Engineering Section* for details.

Approvals:

CSA certified. UL listed, General Purpose Valves.
 Red-Hat II meets applicable CE directives.
 Refer to *Engineering Section* for details.

Earth Tech (Canada) Inc.

Reviewed for general performance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correction of field
dimensions, formwork conditions, techniques of
construction, and other details of all
parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 27/1/06 By: M. Pulson

Specifications (English units)

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Operating Pressure Differential (psi)			Maximum Fluid Temp. °F		Brass Body		Watt Rating/ Class of Coil Insulation ③	
			Min. ①	Max. AC	Max. DC	AC	DC	Catalog Number	Constr. Ref. No.	AC	DC
				Water ②	Water ②						
NORMALLY CLOSED (Closed when de-energized)											
3/8	9/16	3	5	150	125	180	150	8221G1	1	6.1/F	11.6/F
1/2	9/16	3.5	5	150	125	180	150	8221G3	1	6.1/F	11.6/F
3/4	3/4	5.5	5	150	125	180	150	8221G5	2	6.1/F	11.6/F
1	1	11.5	5	150	125	180	150	8221G7	5	6.1/F	11.6/F
1 1/4	1 1/8	13	5	150	125	180	150	8221G9	6	6.1/F	11.6/F
1 1/2	1 1/4	24	5	150	125	180	150	8221G11	7	6.1/F	11.6/F
2	1 3/4	36	5	150	125	180	150	8221G13	11	6.1/F	22.6/F
2 1/2	1 3/4	38	5	150	125	180	150	8221G15	12	6.1/F	22.6/F
NORMALLY OPEN (Open when de-energized)											
3/8	9/16	3	5	-	125	-	150	822121	15	-	16.8/F
3/8	9/16	3	5	150	-	180	-	8221G21	3	16.1/F	-
1/2	9/16	3.5	5	-	125	-	150	822123	15	-	16.8/F
1/2	9/16	3.5	5	150	-	180	-	8221G23	3	16.1/F	-
3/4	3/4	5.5	5	-	125	-	150	822125	16	-	16.8/F
3/4	3/4	5.5	5	150	-	180	-	8221G25	4	16.1/F	-
1	1	11.5	5	-	125	-	150	822127	17	-	16.8/F
1	1	11.5	5	150	-	180	-	8221G27	8	16.1/F	-
1 1/4	1 1/8	13	5	-	125	-	150	822129	18	-	16.8/F
1 1/4	1 1/8	13	5	150	-	180	-	8221G29	9	16.1/F	-
1 1/2	1 1/4	24	5	-	125	-	150	822131	19	-	16.8/F
1 1/2	1 1/4	24	5	150	-	180	-	8221G31	10	16.1/F	-
2	1 3/4	36	5	-	125	-	150	822133	20	-	16.8/F
2	1 3/4	36	5	150	-	180	-	8221G33	13	16.1/F	-
2 1/2	1 3/4	38	5	-	125	-	150	822135	21	-	16.8/F
2 1/2	1 3/4	38	5	150	-	180	-	8221G35	14	16.1/F	-

Notes: ① Valves require a 5 psi Minimum Pressure Differential to open. Once open, they remain open with 3 psi differential pressure.
 ② Refer to Steam/Hot Water Valve Series for Hot Water constructions.
 ③ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.

Specifications (Metric units)

Pipe Size (ins.)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Operating Pressure Differential (bar)			Maximum Fluid Temp. °C		Brass Body		Watt Rating/ Class of Coil Insulation ③	
			Min. ①	Max. AC	Max. DC	AC	DC	Catalog Number	Constr. Ref. No.	AC	DC
				Water ②	Water ②						
NORMALLY CLOSED (Closed when de-energized)											
3/8	14	2.57	0.3	10	9	81	65	8221G1	1	6.1/F	11.6/F
1/2	14	3.00	0.3	10	9	81	65	8221G3	1	6.1/F	11.6/F
3/4	19	4.71	0.3	10	9	81	65	8221G5	2	6.1/F	11.6/F
1	25	9.86	0.3	10	9	81	65	8221G7	5	6.1/F	11.6/F
1 1/4	29	11.14	0.3	10	9	81	65	8221G9	6	6.1/F	11.6/F
1 1/2	32	20.57	0.3	10	9	81	65	8221G11	7	6.1/F	11.6/F
2	44	30.86	0.3	10	9	81	65	8221G13	11	6.1/F	22.6/F
2 1/2	44	32.57	0.3	10	9	81	65	8221G15	12	6.1/F	22.6/F
NORMALLY OPEN (Open when de-energized)											
3/8	14	2.57	0.3	-	9	-	65	822121	15	-	16.8/F
3/8	14	2.57	0.3	10	-	81	-	8221G21	3	16.1/F	-
1/2	14	3.00	0.3	-	9	-	65	822123	15	-	16.8/F
1/2	14	3.00	0.3	10	-	81	-	8221G23	3	16.1/F	-
3/4	19	4.71	0.3	-	9	-	65	822125	16	-	16.8/F
3/4	19	4.71	0.3	10	-	81	-	8221G25	4	16.1/F	-
1	25	9.86	0.3	-	9	-	65	822127	17	-	16.8/F
1	25	9.86	0.3	10	-	81	-	8221G27	8	16.1/F	-
1 1/4	29	11.14	0.3	-	9	-	65	822129	18	-	16.8/F
1 1/4	29	11.14	0.3	10	-	81	-	8221G29	9	16.1/F	-
1 1/2	32	20.57	0.3	-	9	-	65	822131	19	-	16.8/F
1 1/2	32	20.57	0.3	10	-	81	-	8221G31	10	16.1/F	-
2	44	30.86	0.3	-	9	-	65	822133	20	-	16.8/F
2	44	30.86	0.3	10	-	81	-	8221G33	13	16.1/F	-
2 1/2	44	32.57	0.3	-	9	-	65	822135	21	-	16.8/F
2 1/2	44	32.57	0.3	10	-	81	-	8221G35	14	16.1/F	-

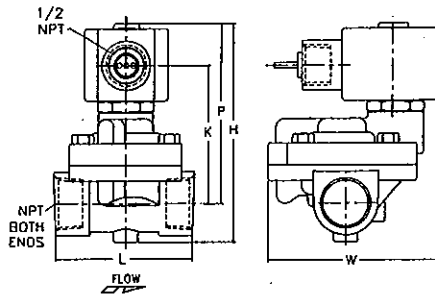
Notes: ① Valves require a 0.3 bar Minimum Pressure Differential to open. Once open, they remain open with 0.2 bar differential pressure.
 ② Refer to Steam/Hot Water Valve Series for Hot Water constructions.
 ③ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.

Dimensions: inches (mm)

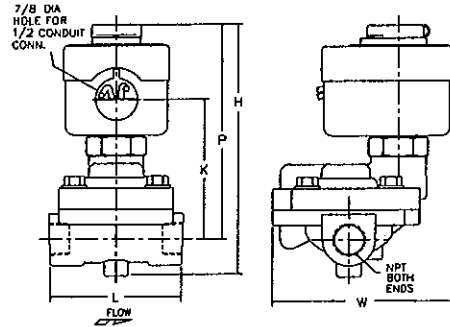
Constr. Ref. No.		H	K	L	P	W
1	ins.	4.34	2.69	2.72	3.59	3.41
	mm	110	68	69	91	87
2	ins.	4.53	2.69	2.78	3.75	3.41
	mm	115	68	71	95	87
3	ins.	5.22	3.14	2.72	4.47	3.69
	mm	133	80	69	114	94
4	ins.	5.41	3.30	2.78	4.62	3.69
	mm	137	84	71	117	94
5	ins.	5.62	3.15	3.75	4.03	3.16
	mm	143	80	95	102	80
6	ins.	5.56	3.15	3.66	4.03	3.56
	mm	141	80	93	102	90
7	ins.	6.12	3.30	4.38	4.19	4.12
	mm	156	84	111	106	105
8	ins.	6.53	3.59	3.75	4.91	3.16
	mm	166	91	95	125	80
9	ins.	6.47	3.59	3.56	4.91	3.56
	mm	164	91	93	125	90
10	ins.	7.03	3.74	4.38	5.06	4.12
	mm	179	95	111	129	105
11	ins.	7.38	3.71	5.06	4.59	4.72
	mm	188	94	129	117	120
12	ins.	7.38	3.71	5.50	4.59	5.19
	mm	188	94	140	117	132
13	ins.	8.22	4.15	5.06	5.47	4.72
	mm	209	105	129	139	120
14	ins.	8.22	4.15	5.50	5.47	5.19
	mm	209	105	140	139	132
15	ins.	5.22	X	2.72	4.47	3.69
	mm	133	X	69	114	94
16	ins.	5.41	X	2.78	4.62	3.69
	mm	137	X	71	117	94
17	ins.	6.53	X	3.75	4.91	3.16
	mm	166	X	95	125	80
18	ins.	6.47	X	3.66	4.91	3.56
	mm	164	X	93	125	90
19	ins.	7.03	X	4.38	5.06	4.12
	mm	179	X	111	129	105
20	ins.	8.22	X	5.06	5.47	4.72
	mm	209	X	129	139	120
21	ins.	8.22	X	5.50	5.47	5.19
	mm	209	X	140	139	132

IMPORTANT: Valves may be mounted in any position.

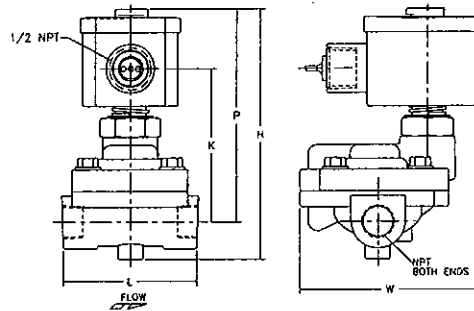
Constr. Refs. 1, 2



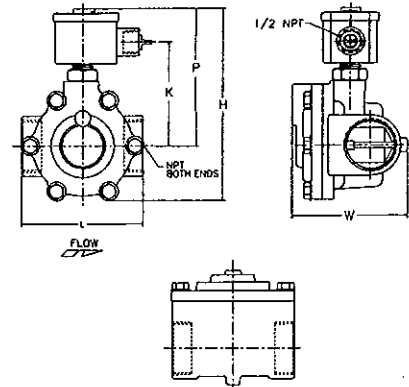
Constr. Refs. 15, 16



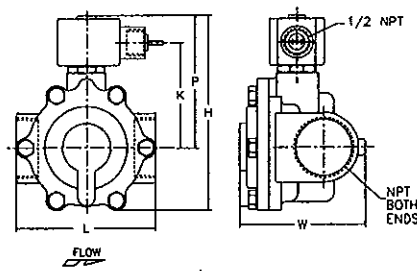
Constr. Refs. 3, 4



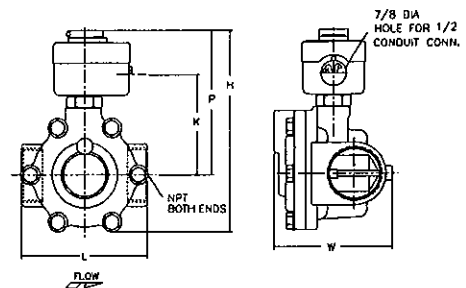
Constr. Refs. 8, 9, 10, 13, 14



Constr. Refs. 5, 6, 7, 11, 12



Constr. Refs. 17 - 21





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

CONTROL TRANSFORMER

MANUFACTURER
POWER
STEP-DOWN VOLTAGE
CATALOG NO
QUANTITY
EQUIP ID

SQUARE D
1 KVA
600V TO 120V
9070-T1000D1
1
T1

DIMENSIONS

Table 17: Dimensions for Type T

VA	A		B		C		E		F		Slots				Figure	FINGERSAFE®			
																Catalog Number	D*		
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm					
Voltage Codes: D1; D3; D4; D5; D6; D17; D24; D31; D33; D37; D51; D55; D57; D58; D60; D84; D85; D86; D93; D100; D101; D102; D103																			
25	3.09	79	3.00	76	2.58	66	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84	98
50	3.09	79	3.00	76	2.558	65	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84	98
75	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09	104
100	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09	104
150	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34	110
200	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34	110
250	5.25	133	3.75	95	3.25	83	2.88	73	3.13	80	0.20	5	X	0.38	10	2	FSC-2	6.05	154
300	4.70	119	4.50	114	3.80	97	2.56	65	3.75	95	0.20	5	X	0.38	10	2	FSC-2	5.50	140
350	5.09	129	4.50	114	3.80	97	3.00	76	3.75	95	0.20	5	X	0.38	10	2	FSC-C	5.89	150
500	5.46	139	4.50	114	3.80	97	3.56	90	3.75	95	0.20	5	X	0.38	10	2	FSC-2	6.26	159
750	5.66	144	5.25	133	4.43	113	3.43	87	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.46	164
1000	6.04	153	5.25	133	4.43	113	4.31	110	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.84	174
1500	5.81	148	7.06	179	6.16	157	4.13	105	5.81	148	0.28	7	X	0.56	14	2	FSC-2	6.61	168
2000	7.04	179	7.06	179	6.16	157	4.56	116	5.81	148	0.28	7	X	0.56	14	2	FSC-2	7.84	199
Voltage Codes: D1; D5; D6; D17; D24; D84; D85; D102;																			
3000	6.86	174	9	229	8.46	215	4.63	118	7.63	194	0.44	11	X	0.69	18	3	FSC-2	7.26	184
5000	8.73	222	9	229	8.46	215	6.56	167	7.63	194	0.44	11	X	0.69	18	3	FSC-2	9.13	232
Voltage Codes: D31; D33; D37; D55; D57; D58; D60																			
3000	5.79	147	9	229	7.88	200	4.63	118	7.63	194	0.44	11	X	0.69	18	2	FSC-2	6.59	167
5000	7.66	195	9	229	7.88	200	6.56	167	7.63	194	0.44	11	X	0.69	18	2	FSC-2	8.46	215
Voltage Codes: D3; D4; D51; D86; D93; D100; D101; D103																			
3000	5.79	147	9	229	7.88	200	4.63	118	7.63	194	0.44	11	X	0.69	18	2	FSC-2	6.59	167
5000	8.73	222	9	229	8.46	215	6.56	167	7.63	194	0.44	11	X	0.69	18	3	FSC-2	9.13	232

* Dimension when FINGERSAFE covers are field installed

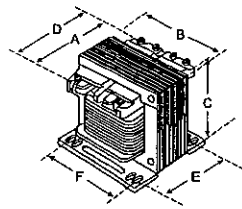


Figure 1

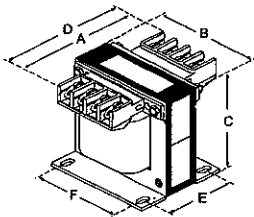


Figure 2

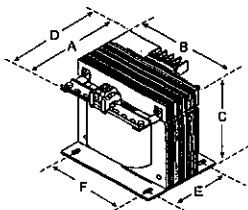


Figure 3

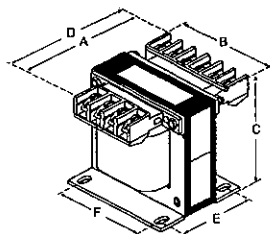


Figure 4

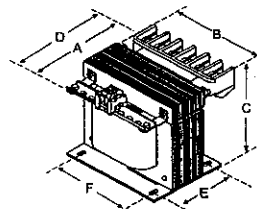


Figure 5

Table 18: Dimensions for Type T

VA	A		B		C		E		F		Slots				Figure	FINGERSAFE®			
																Catalog Number	D*		
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm					
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																			
25	3.09	79	3.00	76	2.58	66	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84	98
50	3.09	79	3.00	76	2.58	65	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84	98
75	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09	104
100	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09	104
150	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34	110
200	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-2	4.34	110
250	5.25	133	3.75	95	3.25	83	2.88	73	3.13	80	0.20	5	X	0.38	10	2	FSC-2	6.05	154
Voltage Codes: D2; D13; D14; D16; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																			
350	5.09	129	4.50	114	3.80	97	3.00	76	3.75	95	0.20	5	X	0.38	10	2	FSC-2	5.89	150
500	5.46	139	4.50	114	3.80	97	3.56	90	3.75	95	0.20	5	X	0.38	10	2	FSC-2	6.26	159
Voltage Codes: D21; D38																			
350	6.15	156	4.50	114	4.38	111	3.00	76	3.75	95	0.20	5	X	0.38	10	3	FSC-2	6.55	166
500	6.52	166	4.50	114	4.38	111	3.56	90	3.75	95	0.20	5	X	0.38	10	3	FSC-2	6.92	176
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D66; D88; D89; D92																			
750	6.72	171	5.25	133	5.01	127	3.43	87	4.38	111	0.28	7	X	0.56	14	3	FSC-2	7.12	181
1000	7.10	180	5.25	133	5.01	127	4.31	110	4.38	111	0.28	7	X	0.56	14	3	FSC-2	7.50	190.5
Voltage Codes: D63; D64; D78																			
750	5.66	144	5.25	133	4.43	113	3.43	87	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.46	164
1000	6.04	153	5.25	133	4.43	113	4.31	110	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.84	174
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																			
1500	6.86	174	7.06	179	6.74	171	4.13	105	5.81	148	0.28	7	X	0.56	14	3	FSC-2	7.26	184
2000	8.11	206	7.06	179	6.74	171	4.56	116	5.81	148	0.28	7	X	0.56	14	3	FSC-2	8.51	216

* Dimension when FINGERSAFE covers are field installed





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

KW TRANSDUCER

DESCRIPTIONS

KW WATTS TRANSDUCER WITH 4-20 MA
OUTPUT

MANUFACTURER

VERIS INDUSTRIES

POWER

3P, 550V

CATALOG NO

H8044-0400-3

QUANTITY

1

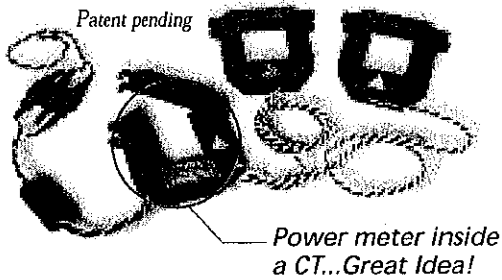
EQUIP ID

WT-1

H8040 SERIES

Enercept® Self-contained Split-core kW Transducers (4-20mA)

Integral monitoring solution eliminates the need for separate transducers!



DESCRIPTION

The H8040 Series kW (power demand) transducers combine processing electronics and industrial grade CT(s) in an easy to install split-core package. Voltage and current values of the monitored conductors are continuously measured and calculations are updated to provide highly accurate true RMS power readings. Models designed for balanced loads include one CT only, while models for unbalanced loads have three.

The unique design of the H8040 Series transducers reduces the number of installed components, making them ideal for monitoring electrical power in commercial and industrial facilities using industry standard 4-20mA output.

The installation of these meters is simple. Connect the three colored voltage leads one at a time to the three power conductors to be monitored, and attach the matching CTs (e.g., red voltage lead and red CT must be on the same conductor). To further simplify the installation these meters automatically detect and compensate for phase reversal eliminating the concern of CT load orientation.

Applications

- Optimization of chillers, pumps and cooling towers
- Energy management & performance contracting
- Process control
- Real time power monitoring

Reduced Installation and Setup Costs

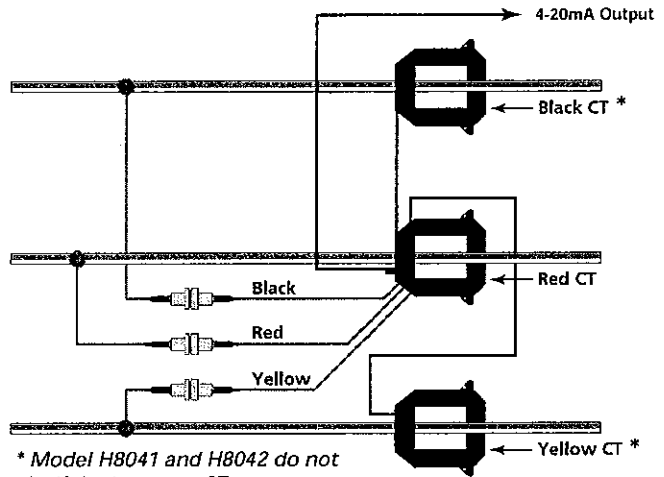
- Fast split-core installation eliminates the need to remove conductors
- Precision meter electronics and current transformers in a single package...reduces the number of installed components... huge labor savings
- Smart electronics eliminate the need to be concerned with CT orientation...fast trouble free installation

High Accuracy

- ±1% accuracy

APPLICATIONS or WIRING EXAMPLE

TYPICAL 208 or 480 VAC 3Ø, 3,4 WIRE INSTALLATION



* Model H8041 and H8042 do not include these two CTs.



Ordering INFORMATION

SINGLE CT MODELS FOR USE WITH W/BALANCED 3Ø LOADS

MODEL	VOLTAGE	MAXIMUM AMPS	CT SIZE
H8041-0100-2	208/240	100	MEDIUM
H8041-0300-2	208/240	300	MEDIUM
H8041-0400-3	208/240	400	LARGE
H8041-0800-3	208/240	800	LARGE
H8041-0800-4	208/240	800	BUS BAR
H8041-1600-4	208/240	1600	BUS BAR
H8041-2400-4	208/240	2400	BUS BAR
H8042-0100-2	480	100	MEDIUM
H8042-0300-2	480	300	MEDIUM
H8042-0400-3	480	400	LARGE
H8042-0800-3	480	800	LARGE
H8042-0800-4	480	800	BUS BAR
H8042-1600-4	480	1600	BUS BAR
H8042-2400-4	480	2400	BUS BAR

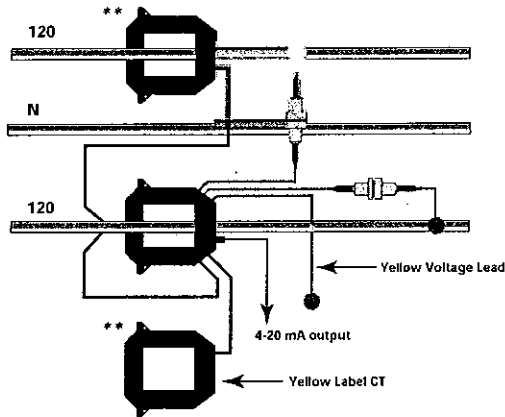
THREE CT MODELS FOR USE WITH ANY 3Ø LOAD

MODEL	VOLTAGE	MAXIMUM AMPS	CT SIZE
H8043-0100-2	208	100	MEDIUM
H8043-0300-2	208	300	MEDIUM
H8043-0400-3	208	400	LARGE
H8043-0800-3	208	800	LARGE
H8043-0800-4	208	800	BUS BAR
H8043-1600-4	208	1600	BUS BAR
H8043-2400-4	208	2400	BUS BAR
H8044-0100-2	480	100	MEDIUM
H8044-0300-2	480	300	MEDIUM
H8044-0400-3	480	400	LARGE
H8044-0800-3	480	800	LARGE
H8044-0800-4	480	800	BUS BAR
H8044-1600-4	480	1600	BUS BAR
H8044-2400-4	480	2400	BUS BAR

POWER MONITORING

H8040 SERIES

TYPICAL 240 VAC 1Ø, 3-WIRE INSTALLATION

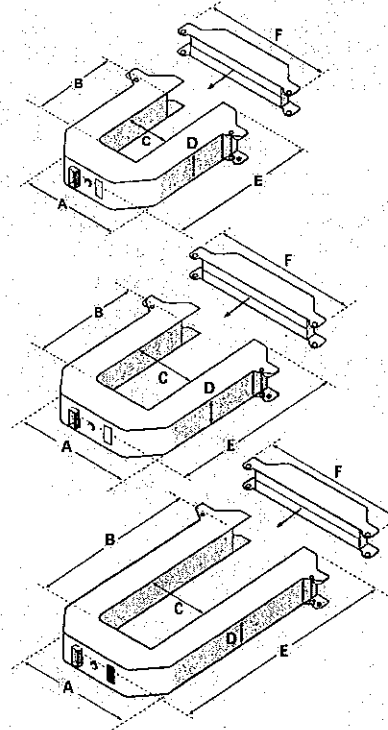


- * Use Model H8041 or H8043 for 240V single phase systems
- ** Model H8041 and H8042 do not include these two CTs.

MAXIMUM KW, READING AT 20MA

MODEL	3Ø POWER	1Ø POWER
H8041-0100-2	36.03 kW	24.00 kW
H8041-0300-2	108.1 kW	72.00 kW
H8041-0400-3	144.1 kW	96.00 kW
H8041-0800-3	288.2 kW	192.0 kW
H8041-0800-4	288.2 kW	192.0 kW
H8041-1600-4	576.4 kW	384.0 kW
H8041-2400-4	864.6 kW	576.0 kW
H8042-0100-2	83.14 kW	55.43 kW
H8042-0300-2	249.4 kW	166.3 kW
H8042-0400-3	332.6 kW	221.7 kW
H8042-0800-3	665.1 kW	443.4 kW
H8042-0800-4	665.1 kW	443.4 kW
H8042-1600-4	1330 kW	886.7 kW
H8042-2400-4	1995 kW	1330 kW
H8043-0100-2	36.03 kW	36.03 kW
H8043-0300-2	108.1 kW	108.1 kW
H8043-0400-3	144.1 kW	144.1 kW
H8043-0800-3	288.2 kW	288.2 kW
H8043-0800-4	288.2 kW	288.2 kW
H8043-1600-4	576.4 kW	576.4 kW
H8043-2400-4	864.6 kW	864.6 kW
H8044-0100-2	83.14 kW	83.14 kW
H8044-0300-2	249.4 kW	249.4 kW
H8044-0400-3	332.6 kW	332.6 kW
H8044-0800-3	665.1 kW	665.1 kW
H8044-0800-4	665.1 kW	665.1 kW
H8044-1600-4	1330 kW	1330 kW
H8044-2400-4	1995 kW	1995 kW

DIMENSIONAL DRAWINGS



MEDIUM 100 Amp 300 Amp (-2)	LARGE 400 Amp 800 Amp (-3)	BUS BAR 800 Amp 1600 Amp 2400 Amp (-4)
A = 3.75" (95 mm)	A = 4.90" (124 mm)	A = 4.90" (124 mm)
B = 1.51" (38 mm)	B = 2.89" (73 mm)	B = 5.50" (140 mm)
C = 1.25" (32 mm)	C = 2.45" (62 mm)	C = 2.45" (62 mm)
D = 1.13" (29 mm)	D = 1.13" (29 mm)	D = 1.13" (29 mm)
E = 4.20" (107 mm)	E = 5.57" (141 mm)	E = 8.13" (207 mm)
F = 4.75" (121 mm)	F = 5.91" (150 mm)	F = 5.92" (150 mm)

H8040 SERIES SPECIFICATIONS

- Input Primary Voltage 208 or 480 VAC rms†
- Number of Phases Monitored One or Three
- Frequency 50/60 Hz
- Maximum Primary Current Up to 2400 amps cont. per phase†
- Internal Isolation 2000 VAC rms
- Case Insulation 600 VAC rms
- Temperature Range 0 to 60° C
- Humidity Range 0 - 95% non-condensing
- Accuracy ±1.0%
- Output 4-20mA
- Supply Power (loop) 9-30 VDC; 30mA max.
- Current Transformer Split core, 100, 300, 400, 800, 1600, 2400 amps

† Contact factory to interface with voltages above 480 VAC or current above 2400 Amps

POWER MONITORING



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

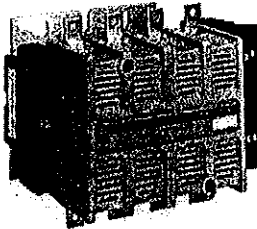
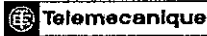
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM:	LINE CONTACTOR
MANUFACTURER:	SQUARE D
MAX. HP RATINGS @ 480V:	200
NO. OF POLES:	3P, 600V
COIL VOLTAGE:	120V
AUXILLARY CONTACTS:	1 N.O.
CATALOG NO:	LC1F300F7
QUANTITY:	2
EQUIP ID:	S2, 3
TYPE:	LUG KIT
CATALOG:	DZ2FG6
QUANTITY:	2

IEC Style Contactors

2- and 4- Pole Non-Reversing, AC Coil Selection and Pricing



LCF1 F1154

2- and 4-Pole Contactors with AC Coils

Maximum Current		Power Poles		Auxiliary Contacts		Catalog Number ⁴	Price
Inductive AC3 A	Resistive AC1 A	N.O.	N.C.	Built In			
				N.O.	N.C.		
12	25	4	0	0	0	LC1 D12 004**	\$ 109.00
		2	2	0	0	LC1 D12 008**	109.00
25	40	4	0	0	0	LC1 D25 004**	176.00
		2	2	0	0	LC1 D25 008**	176.00
40	60	4	0	0	0	LC1 D40 004**	271.00
		2	2	0	0	LC1 D40 008**	271.00
65	80	4	0	0	0	LC1 D65 004**	409.00
		2	2	0	0	LC1 D65 008**	409.00
80	110	4	0	0	0	LC1 D80 004**	447.00
		2	2	0	0	LC1 D80 008**	447.00
115	175	4	0	1*	0	LC1 F1154*	577.00
150	200	4	0	1*	0	LC1 F1504	755.00
185	200	4	0	1*	0	LC1 F1854*	1318.00
265	285	4	0	1*	0	LC1 F2654*	1507.00
330	360	4	0	1*	0	LC1 F3304*	1891.00
400	420	2	0	1*	0	LC1 F4002*	1393.00
		4	0	1*	0	LC1 F4004*	1954.00
500	700	2	0	1*	0	LC1 F5002*	3960.00
500	700	4	0	1*	0	LC1 F5004*	5144.00
630	1000	2	0	1*	0	LC1 F6302*	5419.00
630	1000	4	0	1*	0	LC1 F6304*	6944.00
780	1350	4	0	0*	0	LC1 F7804*	9104.00

* This one normally open circuit contact is incorporated in the design of the coil.
⁴ Contactor catalog number to be completed by the code corresponding to the coil voltages.

D-Line Voltage Codes

** Coil voltages for LC1 D09 to D80

Volts	24	48	110	120	127	208	220	240	277	380	415	440	480	575	600	660
50 Hz	B5	E6	F5	-	G5	-	M5	U5	-	Q5	N5	R5	-	-	-	Y5
60 Hz	B6	E6	F6	G6	-	L6	M6	U6	W6	Q6	-	R6	T6	S6	X6	-
50/60 Hz	B7	F7	-	-	-	-	M7	U7	-	Q7	N7	R7	-	-	-	-

F-Line Coil Voltage Codes

*Coil voltages for LC1 F115 to F780

Contacteur	Hz	24V	48V	110V	120V	208V	220V	240V	380V	415V	480V	600V
F115, F150	50Hz	B5	E5	F5	-	-	M5	U5	Q5	-	-	-
F185	60 Hz	B6	E6	F6	G6	L6	M6	U6	Q6	N6	O6	SC
F265, F330	50/60 Hz	B7	E7	F7	G7	L7	M7	U7	Q7	O7	S7	X7
F400 - F780	50/60 Hz	-	E7	F7	F7	L7	M7	U7	Q7	N7	N7	X7

Lugs

Lugs for F-line contactors and overload relays must be ordered separately. Each kit consists of one (1) lug.

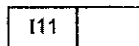
Contacteur Type	Lug Kit Catalog Number	Maximum Cable Size	Price
LC1			
F115	DZ2 FF1	0	\$ 6.00
F150, F185, F225	DZ2 FG1	3/0	10.00
F265, F330	DZ2 FH1	300 MCM	10.00
F400	DZ2 FJ1	500 MCM	10.00
F500	DZ2 FK1	2 x 500 MCM	20.00
F630, F780	DZ2 FL1*, DZ2 FL2*, DZ2 FL3*	3 x 500 MCM	25.00

* Two of each must be ordered per phase.

How to Order:

To Order Specify:	Catalog Number	
• Type Number	Type	Coil Code
• Coil Voltage	LC1D40004	G6

Technical Data	Pages 13-34 - 13-37, 13-43 - 13-48
Dimensions	Pages 13-58 - 13-63
Overload Relays	Page 13-30
Accessories	Pages 13-14 - 13-23
Replacement Coils	Pages 13-25 - 13-26

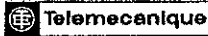


Discount Schedule

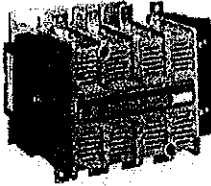
13 IEC STYLE CONTACTORS

IEC Style Contactors

2- and 4- Pole Non-Reversing, DC Coil
Selection and Pricing



2 and 4-Pole Contactors With DC Coils



LC1F1154

13 IEC STYLE CONTACTORS

Maximum Current		Power Poles		Auxiliary Contacts Built In		Catalog Number ^A	Price
Inductive AC3 A	Resistive AC1 A	N.O.	N.C.	N.O.	N.C.		
12	25	4	0	0	0	LP1 D12 004**	\$ 133.00
		2	2	0	0	LP1 D12 008**	141.00
25	40	4	0	0	0	LP1 D25 004**	220.00
		2	2	0	0	LP1 D25 008**	220.00
40	60	4	0	0	0	LP1 D40 004**	323.00
		2	2	0	0	LP1 D40 008**	323.00
65	80	4	0	0	0	LP1 D65 004**	461.00
		2	2	0	0	LP1 D65 008**	461.00
80	110	4	0	0	0	LP1 D80 004**	499.00
		2	2	0	0	LP1 D80 008**	499.00
115	175	4	0	1*	0	LC1 F1154*	577.00
		4	0	1*	0	LC1 F1804	755.00
185	200	4	0	1*	0	LC1 F1854*	1318.00
		4	0	1*	0	LC1 F2654*	1507.00
330	360	4	0	1*	0	LC1 F3304*	1891.00
		2	0	1*	0	LC1 F4002*	1393.00
400	420	4	0	1*	0	LC1 F4004*	1954.00
		2	0	1*	0	LC1 F5002*	3960.00
500	700	4	0	1*	0	LC1 F5004*	5144.00
		2	0	1*	0	LC1 F6302*	5419.00
630	1000	4	0	1*	0	LC1 F6304*	6944.00
		4	0	0	0	LC1 F7804*	9104.00

* This one normally open holding circuit contact is incorporated into the design of the coil.
^A Contactor catalog number to be completed by entering the code corresponding to the coil voltage.

••Coil voltages for LP1 D09 to D80

Volts DC	12	24	36	48	60	72	110	125	220	250	440
Coil code	JD	BD	CD	ED	ND	SD	FD	GD	MD	UD	RD

••Coil voltages for LC1 F115 to F780

Contactor	24V	48V	110V	125V	220V	250V	440V
LC1 F115-F330	BD	ED	FD	F5	MD	UD	RD
LC1 F400-F780		ED	FD	F5	MD	UD	RD

Lugs

Lugs for F-line contactors and overload relays must be ordered separately. Each kit consists of one (1) lug.

Contactor Type LC1	Lug Kit Catalog Number	Maximum Cable Size	Price
F115	DZ2 FF1	0	\$ 6.00
F150, F185, F225	DZ2 FG1	3/0	10.00
F265, F330	DZ2 FH1	300 MCM	10.00
F400	DZ2 FJ1	600 MCM	10.00
F500	DZ2 FK1	2 x 600 MCM	20.00
F630, F780	DZ2 FL1*, DZ2 FL2*, DZ2 FL3*	3 x 600 MCM	25.00

* Two of each must be ordered per phase.

Technical Data	Pages 13-35 - 13-37, 13-43 - 13-48
Dimensions	Pages 13-53, 13-62 - 13-63
Overload Relays	Page 13-30
Accessories	Pages 13-14 - 13-23
Replacement Coils	Pages 13-27 - 13-28

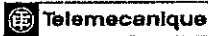
How to Order:

To Order Specify: • Type Number • Coil Voltage	Catalog Number	
	Type LP1D25004	Coil Code FD

IEC Style Contactors

Control Circuit Characteristics, AC and DC

Technical Data



13 IEC STYLE CONTACTORS

D-Line AC Coil Characteristics

D-Line			LC1 D09	LC1 D12	LC1 D18	LC1 D25	LC1 D32	LC1 D40	LC1 D50	LC1 D65	LC1 D80	
Voltage limits (ø 55°C/131°F)												
Single frequency coils	operating	% nominal voltage	85 to 110					85 to 110				
	drop-out	% nominal voltage	30 to 60					30 to 60				
Dual frequency coils	operating	% nominal voltage	85 to 110					85 to 110				
Average consumption AC 50 Hz		at 20°C/68°F & nominal voltage										
Inrush	1 frequency coil	VA	60	60	60	90	90	200	200	200	200	
	2 frequency coils	VA	70	70	70	100	100	250	250	250	250	
Inductance	Non/ies	H	0.75	0.75	0.75	0.75	0.6	0.6	0.6	0.6	0.6	
	Sealed	VA	7	7	7.5	7.5	20	20	20	20	20	
AC 60 Hz	Inrush	VA	70	70	70	100	100	220	220	220	220	
	Inductance	H	0.75	0.75	0.75	0.75	0.76	0.6	0.6	0.6	0.6	
1 frequency coil	Sealed	VA	7.5	7.5	7.5	8.5	8.5	26	26	26	26	
	Inductance	H	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Thermal dissipation at 50 or 60 Hz		W	2 to 3	2 to 3	2 to 3	2.5 to 3.5	2.5 to 3.5	6 to 10	6 to 10	6 to 10	6 to 10	
Average operating time at nominal voltage	Closing	ms	12 to 22	12 to 22	12 to 22	15 to 24	15 to 24	20 to 26	20 to 26	20 to 28	20 to 35	
	Opening	ms	4 to 12	4 to 12	4 to 12	5 to 19	5 to 19	8 to 12	8 to 12	8 to 12	8 to 20	

D-Line DC Coil Characteristics

D-Line			LP1 D09	LP1 D12	LP1 D18	LP1 D25	LP1 D32	LP1 D40	LP1 D50	LP1 D65	LP1 D80	
Voltage limits		operating	% nominal voltage					85 to 110				
(ø 55°C/131°F)		drop out	% nominal voltage					40 to 30				
Average consumption DC		at 20°C/68°F & nominal voltage										
Inrush	Non/ies	W	9	9	9	11	11	22	22	22	22	
	Sealed	W	9	9	9	11	11	22	22	22	22	
Operating time avg. at nominal voltage	Closing	ms	40 to 68	40 to 68	40 to 68	52 to 64	52 to 64	85 to 110	85 to 110	85 to 110	95 to 130	
	Opening	ms	8 to 14	8 to 14	8 to 14	8 to 14	8 to 14	20 to 35	20 to 35	20 to 35	20 to 35	

F-Line AC Coil Characteristics

F-Line			LC1 F115/ F160	LC1 F185	LC1 F205/ F330	LC1 F400	LC1 F500	LC1 F630	LC1 F780		
Rated control voltage		V	24 to 1000	24 to 1000	24 to 1000	42 to 1000	42 to 1000	42 to 1000	110 to 500		
Average operating limits	Pick up	% nom.V	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110		
	Drop out	% nom.V	35 to 55	35 to 55	35 to 55	30 to 50	30 to 50	25 to 50	20 to 40		
AC 50 Hz	Inrush	VA	550	800	1200	1075	1100	1650	2100		
	Sealed	VA	45	55	55	15	18	22	50		
AC 60 Hz	Inrush	VA	670	975	1400	1075	110	1650	2100		
	Sealed	VA	54	66	113	15	18	22	50		
Thermal dissipation at 50 or 60 Hz		W	12 to 16	18 to 24	30 to 40	14	18	20	2 x 22		
Avg. operating time at nominal voltage	LX1 Closing	ms	23 to 35	20 to 35	20 to 35	40 to 75	40 to 75	40 to 80	40 to 80		
	LX1 Opening	ms	5 to 15	7 to 15	8 to 15	100 to 170	100 to 170	100 to 200	130 to 230		
Avg. operating time at nominal voltage	LX9 Closing	ms	130	130	165	60	60	60	-		
	LX9 Opening	ms	35	35	20 to 40	20 to 50	20 to 50	20 to 50	-		

F-Line DC Coil Characteristics

F-Line			LC1 F115/ F160	LC1 F185	LC1 F205/ F330	LC1 F400	LC1 F500	LC1 F630	LC1 F780		
Rated control voltage		V	24 to 460	24 to 460	24 to 460	48 to 460	48 to 460	48 to 460	110 to 460		
Operating limits	pick-up	% nom.V	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110	85 to 110		
	drop-out	% nom.V	15 to 20	15 to 20	15 to 35	15 to 35	15 to 40	15 to 40	15 to 40		
Average consumption	Inrush	W	560	800	750	1000	1100	1600	2 x 1000		
	Sealed	W	4.5	5	5	6	6	9	2 x 21		
Average operating time at rated voltage U _n For LX4 coils	Closing	ms	30 to 40	30 to 40	40 to 50	50 to 60	60 to 70	60 to 70	70 to 80		
	Opening	ms	30 to 50	30 to 50	40 to 65	45 to 60	45 to 60	40 to 50	100 to 130		

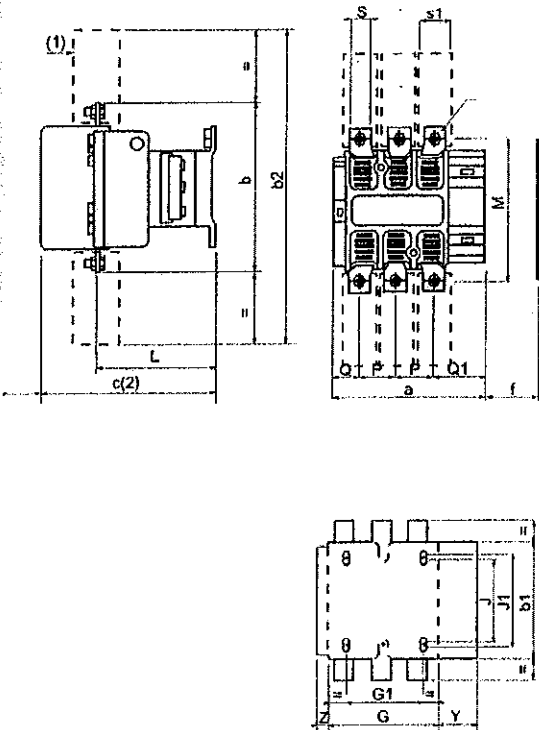
Note: The closing is measured from the moment the control supply is switched on to the moment the main contacts first make contact. The opening time is measured from the moment the coil supply is switched off to the moment the main contacts separate.

IEC Style Contactors
F-LINE Contactors
 Approximate Dimensions



13 IEC STYLE CONTACTORS

LC1-F11 to F330



All dimensions shown in mm. To convert to inches multiply by .0394.

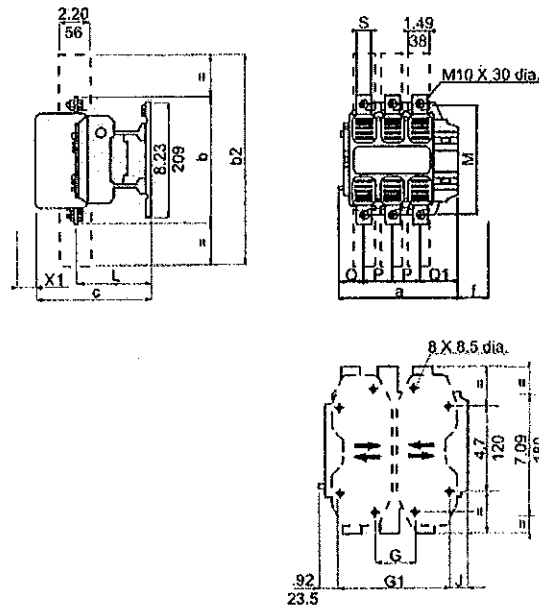
LC1-	F115		F150		F185		F265	
	3 P	4 P	3 P	4 P	3 P	4 P	3 P	4 P
a	163.5	200.5	163.5	200.5	168.5	208.5	201.5	243.5
b	162	162	170	170	174	174	203	203
b1	137	137	137	137	137	137	145	145
b2	265	265	301	301	305	305	370	370
c	165 ϕ	165 ϕ	165 ϕ	165 ϕ	176	176	207	207
f	131	131	131	131	130	130	147	147
G	106	143	106	143	111	151	142	190
G1	80	80	80	80	88	96	96	96
J	106	106	106	106	108	108	106	106
J1	120	120	120	120	120	120	120	120
L	107	107	107	107	113.5	113.5	141	141
M	147	147	150	150	154	154	178	178
P	37	37	40	40	40	40	48	48
Q	29.5	29.5	26.5	26	29	29	39	31
Q1	60	60	57.5	55.5	59.5	59.5	68.5	68.5
S	15	15	20	20	20	20	25	25
S1	27	27	34	34	34	34	38	38
Y	44	44	44	44	44	44	38	38
Z	13.5	13.6	13.5	13.5	13.5	13.5	21.5	21.5

f = minimum distance required for coil removal.
 X1: Minimum clearance according to the operational voltage and the breaking capacity.

Voltage in V	220/300	415/440	500	660	1000
LC1 F115, F150	20	25	30	40	20
LC1 F185	20	25	30	40	30
LC1 F265	20	25	40	50	40
LC1 F330	25	35	40	50	50

⊕ Protective cover.
 ⊕ + 6mm with time delay block (for F115 and F150).

LC1-F400 to F500



LC1-	F400			F500		
	2 P	3 P	4 P	2 P	3 P	4 P
a	213	213	261	233	233	288
b	206	206	206	238	238	238
b2	375	375	375	400	400	400
c	213	213	213	226	226	226
f	119	119	119	141	141	141
G*	80	80	80	80	80	140
G min.	68	66	66	66	66	68
G max.	102	102	150	120	120	175
G1*	170	170	170	170	170	230
G1 min.	166	158	156	156	156	156
G1 max.	192	192	240	210	210	265
* Supplied						
J	19.5	19.6	67.5	39.5	39.5	34.5
L	145	145	145	148	148	148
M	181	181	181	208	208	208
P	48	48	48	55	53	55
Q	69	43	43	76	46	46
Q1	96	74	74	102	77	77
S	25	25	25	30	30	30

f = Minimum distance required for coil removal.
 X1: Minimum clearance according to the operational voltage and the breaking capacity.

Voltage in V	220/230	415/440	500	660	1000
LC1 F400	30	40	40	50	60
LC1 F500	40	45	50	60	60

⊕ Protective cover.





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

POWER SUPPLY UNIT

ITEM

POWER METER DISPLAY

INPUT:	480V/60HZ @ 5A F.S.
MANUFACTURER:	SQUARE D
POWER METER DISPLAY:	3020 PMD32
TAG NO.:	PMD-1
POWER METER MODULE:	3020-PM600
TAG NO.:	PM-1

THIS METER DOES NOT COMPLY WITH THIS SPECIFICATION

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for details shown in the shop drawings rests with the contractor.

Responsibility for the accuracy of field dimensions rests with the contractor. The contractor is responsible for construction and installation of all parts of the work shown on this drawing.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVIEWED AND RE-SUBMIT _____

NOT REVIEWED _____

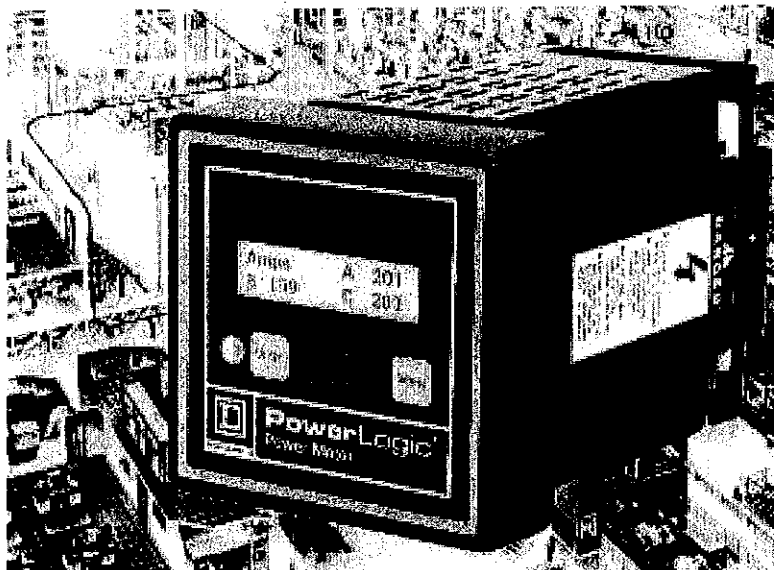
Project No. 79538-C14-16

Date: 27/01/06 By: M. Jolson

Class 3020

POWERLOGIC® Power Meter

The POWERLOGIC Power Meter is capable of replacing a full complement of basic analog meters. This cost effective, high performance meter can operate as a stand-alone device or as part of a POWERLOGIC Power Monitoring System to help reduce energy and maintenance costs by providing valuable power information.



Power Meter Features

- True rms metering to the 31st harmonic
- Certified ANSI C12.16 revenue accuracy
- UL Listed, CSA Approved, CE Marking, NOM Approved
- 0.25% accuracy on current and voltage
- All readings are scaled to their actual values without the need for a multiplier
- THD readings for each metered phase of current and voltage
- Onboard data and event logging
- Simultaneous display of phase A, B, C quantities
- Flexible mounting with separate meter and display
- Optional display mounts in standard 1% meter cutout
- Easy retrofit into existing power equipment
- No PTs or separate control power required up to 600V
- Flexible communication options including Modbus® RTU and POWERLOGIC protocols
- KYZ pulse initiator for communication to energy management systems

Economical Metering Solution

- Neutral current monitoring to detect overloaded neutrals
- Individual machine load monitoring
- Available feeder capacity monitoring (peak demand current)
- Load monitoring for predictive maintenance/troubleshooting
- Departmental kWh cost allocation
- Remote meter reading and data logging from a personal computer using POWERLOGIC System Manager™ software and RS-485 communications

Reduce Costs and Maintain Power System Reliability

The POWERLOGIC Power Meter is designed for use in basic power metering applications. It can replace conventional metering devices such as ammeters, voltmeters, and watt-hour meters while providing powerful capabilities not offered by analog metering. The power meter's true rms readings (31st harmonic response) accurately reflect non-linear circuit loading more than conventional analog metering devices. The power meter calculates the neutral current, which can assist in identifying overloaded neutrals due to either unbalanced single phase loads or triplen harmonics. Circuits can be closely monitored for available capacity by keeping track of the peak average demand current. Accurate circuit loading information is essential to get the most out of existing power equipment while maintaining power system reliability.

The power meter provides a full complement of accurate true rms metering values through the optional display, or via the standard RS-485 communication port to a POWERLOGIC Power Monitoring and Control System. A model PM-600 power meter module replaces a full complement of basic analog meters including a watt-hour meter. The model PM-620 power meter module extends the metering capabilities to report demand readings for power and current including the date and time of peak demand. The model PM-620 also provides neutral current and per phase THD for each metered current and voltage. The model PM-650 extends the metering capabilities further to provide min/max readings and basic onboard alarming and logging. Refer to the tables for information about the metering values reported by each model. Each model also includes a KYZ output to communicate energy and demand information to third party systems.



SQUARE D
GROUPE SCHNEIDER

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawing rests with the Contractor.

Responsibility for verification and correlation of field dimensions, installation, and construction of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

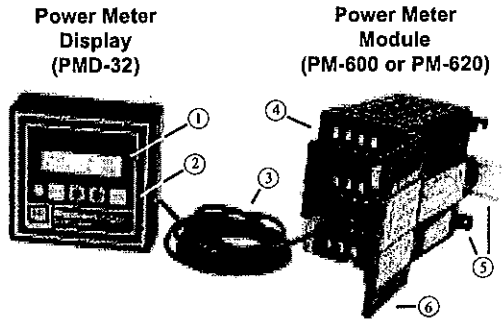
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: M. Joubert

POWERLOGIC Power Meter



Power Meter Module and Display Features

- ① 2-line x 16 character LCD display
- ② Tactile function keys
- ③ Multi-conductor communication cable (up to 50 feet)
- ④ Control power, metering KYZ and communications connections
- ⑤ Panel or DIN rail mounting
- ⑥ Removable terminal shield

Mounting and Connection Flexibility

The power meter's small size and variety of mounting configurations allow it to be readily installed in new equipment or retrofit into existing equipment. The power meter module can be mounted onto a 35mm DIN rail, or it can be mounted on any flat surface using its four mounting feet. For added simplicity in retrofit installations, the panel mounting hole patterns for both the power meter module and the optional power meter display match the conventional 4-inch ammeter/voltmeter spacing so the meter and the display can be mounted back-to-back on opposite sides of a panel surface. In metering installations of 600 V and below, the power meter provides additional savings in both cost and mounting space by eliminating the need for PTs and control power transformers.

The power meter accepts inputs from standard 5 A CTs and has full scale input of 10 A. The voltage inputs can be directly connected to 3 phase circuits of 600 V and below without the need for PTs. For higher voltage circuits, the power meter accepts a full range of PT primary values with control power derived from the PTs or from a separate source of ac or dc control power.

Versatile Display

The optional power meter display mounts in the same space as a conventional 4-inch ammeter and is connected to the power meter module with a communication cable. With the 2-line by 16-character LCD display, the user can view metering data, and access the password protected meter setup and resets menus. Since the power meter display can be mounted up to 50 feet away from the power meter module, power metering can now be installed in tight equipment spaces without sacrificing convenient and affordable local display. The power meter display cable connects to the meter using a standard RJ-11 connector which provides both communications and control power to the display. If local display is not required on every meter, one display can be used to setup any number of power meters to communicate with POWERLOGIC application software. The communications port on the power meter display is optically isolated from the 600 V metering connections.

Setup and resets are password protected and are easily done through the power meter display or via the network using System Manager™ 3000 software. From the optional display, POWERLOGIC or Modbus RTU protocols can be selected. No DIP switches or other hardware adjustments are required for setup. All readings are scaled to their actual values without the need for a multiplier.

Advanced Functionality

In addition to the basic metering functions, the power meter increases its value to you with advanced functionality features.

- **Power Quality Readings** – Total Harmonic Distortion (THD) for current and voltage readings indicate potential power quality problems, which unchecked, could disrupt critical processes or damage equipment.
- **Min/Max Readings** – Min/max readings provide measurements of extreme meter values needed for maintenance purposes. These readings can be viewed and reset from the display. Min/max resets are password protected.
- **Alarm/Relay Functions** – The PM-650 has onboard alarms. Alarm functions include over/under conditions for voltage, current, frequency, and phase unbalances. In addition, these alarms can be assigned to operate the solid-state output.

- **Event Logging** – When an alarm condition occurs, the PM-650 power meter logs the event in nonvolatile memory. These events can be viewed from the display or POWERLOGIC software.
 - **Data Logging** – As part of a comprehensive power monitoring system, the PM-650 expands metering capabilities with data logging. Values are stored in nonvolatile memory, preserving critical data for the interval between logging updates via communications with the system computer. All metered values are available for recording at user defined intervals, offering total flexibility. A typical log configuration is recording demand readings for KW, kVAR, and kVA, at hourly intervals, storing 3 days of information. The meter is pre-configured from the factory to log the following values:
 - Line-to-Line Voltages for Phases A-B, B-C, C-A
 - True Power Factor
 - Present Current Demand for Phases A, B, C, and neutral
 - kW Demand - 3 Phase Total
 - kVAR Power Demand - 3 Phase Total
 - kVA Power Demand - 3 Phase Total
- POWERLOGIC application software is used to customize data log configurations.

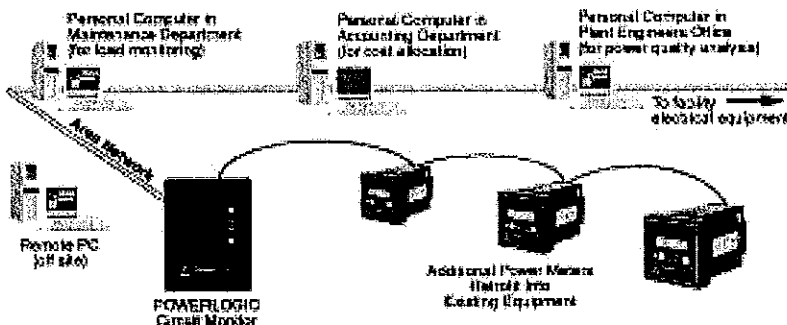
POWERLOGIC System Compatibility

The power meter supports standard POWERLOGIC RS-485 communications up to 19,200 Baud with communications links up to 10,000 feet. A meter can quickly be installed into any existing POWERLOGIC system. The power meter is fully integrated into the latest POWERLOGIC application software, System Manager 3000. SMS-3000 software enables users to manage their electrical distribution systems by providing tabular and graphical data displays, alarms, real time and historical time trend tables and graphs, and reports. Power meter setup, reset operations, and wiring diagnostics can also be performed from a remote personal computer using System Manager 3000 software.

POWERLOGIC power monitoring devices and systems assist in equipment monitoring for cost allocation, troubleshooting, predictive maintenance, planning, and more. The lower installed cost of the power meter makes it possible for facilities to monitor many smaller, less critical feeder circuits enabling whole facility power monitoring.

POWERLOGIC Power Meter Feature Comparison

Meter Feature	Values	Model PM-600	Model PM-620	Model PM-650
Current, per phase	A, B, C	●	●	●
Current, neutral	N		●	●
Volls, L-L	A-B, C-B, C-A	●	●	●
Volls, L-N	A-N, B-N, C-N	●	●	●
Real power (kW)	A, B, C, total	●	●	●
Reactive power (kVAR)	A, B, C, total	●	●	●
Apparent power (kVA)	A, B, C, total	●	●	●
Power factor (true)	A, B, C, total	●	●	●
Frequency		●	●	●
Real energy (kWh)	3 phase total	●	●	●
Reactive energy (kVARh)	3 phase total	●	●	●
Apparent energy (kVAh)	3 phase total	●	●	●
Energy accumulation modes	Signed, absolute, energy in, energy out	●	●	●
KYZ output		●	●	●
RS-485 POWERLOGIC and Modbus RTU communications		●	●	●
THD, voltage & current	A, B, C		●	●
Current demand	A, B, C, N, present & peak		●	●
Real power demand (kWd)	3 phase total, present & peak		●	●
Reactive power demand (kVARd)	3 phase total, present & peak		●	●
Apparent power demand (kVAd)	3 phase total, present & peak		●	●
Date/time stamping	Peak demands, power up/restart, resets		●	●
Predicted power demand	kW, kVAR, kVA			●
Onboard alarms	Under/over conditions, phase unbalance conditions			●
Min/max readings	Frequency, current, voltage, power, power factor, THD			●
Data and event logs				●
Advanced demand options	Synch to comms, sliding block calculation			●



Example of a POWERLOGIC Power Monitoring and Control System

POWERLOGIC Power Meter

Technical Specifications

Metering Specifications

Current Inputs

Current Range 0–10A ac
Nominal Current 5 A ac
Overcurrent Withstand 500 A, 1 second
Burden 0.15 VA

Voltage Inputs

Voltage Range 20–600 V ac
Nominal Voltage 208/120, 480/277,
600/347 V rms

Input Impedance >2 Megohms

Frequency Range

(50/60 Hz) 45–65 Hz

Accuracy

Current 0.25%[†]
Voltage 0.25%[†]
Power 0.50%[†]
Energy 0.50%[†]
Demand 0.50%[†]
Power Factor 1.00%
Frequency 50/60 Hz 0.02 Hz

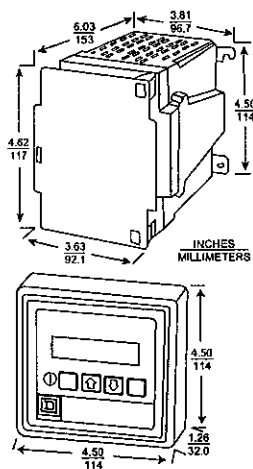
Control Power Input Specifications


Input Range, ac 90–600 V ac
Frequency Range 45–65 Hz
Input Range, dc 100–300 V dc
Burden 90 Vac–264 Vac 10 VA
265 Vac–600 Vac 30 VA

Temperature Specifications

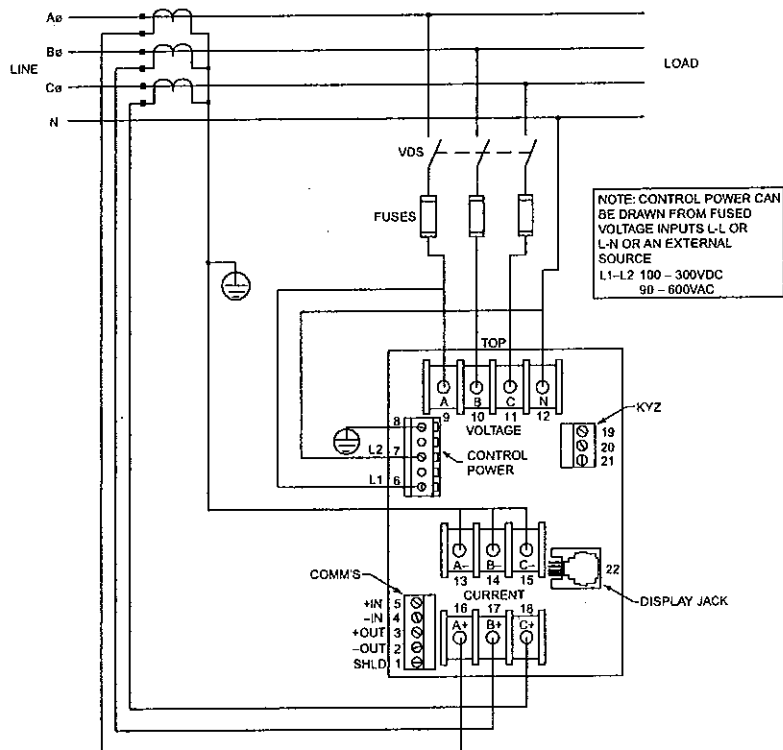
Meter Module (operating) . 0 to 60°C
Meter Display (operating) . 0 to 55°C

Power Meter Dimensions



POWERLOGIC, Square D, and  are registered trademarks of Square D Company. System Manager is a trademark of Square D Company. Modbus is a registered trademark of Schneider Automation, Inc.

Typical Wiring Diagram[†]



[†] 3-Phase, 4-Wire WYE. (3-Wire Delta and other system types supported.)

[†] For readings less than 20% nominal add $\pm 0.05\%$ full scale.

Ordering Information

Class	Type	Description
3020	PM600	Power Meter Module, Basic Instrumentation
3020	PM620	Power Meter Module, Basic Instrumentation, plus Demand, THD, D/T Stamping, Neutral Current
3020	PM650	Power Meter Module, Min/Max, Alarms, Event and Data Storage, plus PM-620 Features
3020	PMD32	Power Meter Display with 1 Foot Cable
3020	SC104	Optional 4 Foot Cable
3020	SC112	Optional 12 Foot Cable
3020	SC130	Optional 30 Foot Cable



SQUARE D
GROUPE SCHNEIDER



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM:

MAGNETIC STARTER

MANUFACTURER:	SQUARE D
MAX. HP RATINGS @ 550V:	10
NO. OF POLES:	3P, 550V
COIL VOLTAGE:	120V
CATALOG NO:	8536-SCO3V02S
QUANTITY:	2
AUXILLARY CONTACTS:	1 N.O. AND 1 N.C.
HEATER OVERLOAD 7-1/2HP:	B22
QUANTITY:	3
HEATER OVERLOAD 5HP:	B12.8
QUANTITY:	3
EQUIP ID:	MS1, 2

Full Voltage Starters — NEMA Selection – Class 8536

3-Pole Polyphase—600 Volt AC Max. 50/60 Hz—Three Thermal Units Required

NEMA Size	Continuous Current Ratings	Motor Volts	Max. HP	* Coil Voltage	Open Type	NEMA Type 1 General Purpose Enclosure	NEMA Type 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure (Size 0-5)†	NEMA Type 4X Watertight, Dusttight, Corrosion-Resistant Glass-Polyester Enclosure
					Type	Type	Type	Type
00	9	Separate Control		120	SAO12V02S	SAG12V02S	Use Size 0	Use Size 0
		200	1½	208	SAO12V08	SAG12V08		
		230	1½	240	SAO12V03	SAG12V03		
		460	2	480	SAO12V06	SAG12V06		
		575	2	600	SAO12V07	SAG12V07		
0	18	Separate Control		120	SBO2V02S	SBG2V02S	SBW12V02S	SBW22V02S
		200	3	208	SBO2V08	SBG2V08	SBW12V08	SBW22V08
		230	3	240	SBO2V03	SBG2V03	SBW12V03	SBW22V03
		460	5	480	SBO2V06	SBG2V06	SBW12V06	SBW22V06
		575	5	600	SBO2V07	SBG2V07	SBW12V07	SBW22V07
1	27	Separate Control		120	SCO3V02S	SCG3V02S	SCW13V02S	SCW23V02S
		200	7½	208	SCO3V08	SCG3V08	SCW13V08	SCW23V08
		230	7½	240	SCO3V03	SCG3V03	SCW13V03	SCW23V03
		460	10	480	SCO3V06	SCG3V06	SCW13V06	SCW23V06
		575	10	600	SCO3V07	SCG3V07	SCW13V07	SCW23V07
2	45	Separate Control		120	SDO1V02S	SDG1V02S	SDW11V02S	SDW21V02S
		200	10	208	SDO1V08	SDG1V08	SDW11V08	SDW21V08
		230	15	240	SDO1V03	SDG1V03	SDW11V03	SDW21V03
		460	25	480	SDO1V06	SDG1V06	SDW11V06	SDW21V06
		575	25	600	SDO1V07	SDG1V07	SDW11V07	SDW21V07
3	90	Separate Control		120	SEO1V02S	SEG1V02S	SEW11V02S	SEW21V02S
		200	25	208	SEO1V08	SEG1V08	SEW11V08	SEW21V08
		230	30	240	SEO1V03	SEG1V03	SEW11V03	SEW21V03
		460	50	480	SEO1V06	SEG1V06	SEW11V06	SEW21V06
		575	50	600	SEO1V07	SEG1V07	SEW11V07	SEW21V07
4	135	Separate Control		120	SFO1V02S	SFG1V02S	SFW11V02S	SFW21V02S
		200	40	208	SFO1V08	SFG1V08	SFW11V08	SFW21V08
		230	50	240	SFO1V03	SFG1V03	SFW11V03	SFW21V03
		460	100	480	SFO1V06	SFG1V06	SFW11V06	SFW21V06
		575	100	600	SFO1V07	SFG1V07	SFW11V07	SFW21V07
5	270	Separate Control		120	SGO1V02S	SGG1V02S	SGW11V02S	...
		200	75	208	SGO1V08	SGG1V08	SGW11V08	...
		230	100	240	SGO1V03	SGG1V03	SGW11V03	...
		460	200	480	SGO1V06	SGG1V06	SGW11V06	...
		575	200	600	SGO1V07	SGG1V07	SGW11V07	...
6	540	Separate Control		120	SHO2V02S	SHG2V02S	SHW2V02S	...
		200	150	208	SHO2V08	SHG2V08	SHW2V08	...
		230	200	240	SHO2V03	SHG2V03	SHW2V03	...
		460	400	480	SHO2V06	SHG2V06	SHW2V06	...
		575	400	600	SHO2V07	SHG2V07	SHW2V07	...
7	810	Separate Control		120	SJO2V02S	SJG2V02S	SJW2V02S	...
		200	—	208	SJO2V08	SJG2V08	SJW2V08	...
		230	300	240	SJO2V03	SJG2V03	SJW2V03	...
		460	600	480	SJO2V06	SJG2V06	SJW2V06	...
		575	600	600	SJO2V07	SJG2V07	SJW2V07	...

‡ Size 6 and 7 are rated NEMA Type 4 only.

† 120 Volt Polyphase starters are wired for separate control.

* Coil voltage code must be specified to order this product. Refer to standard coil voltage codes listed in selection table above or additional standard voltage codes below and insert as shown in the HOW TO ORDER block.

Coil Voltage Codes

Voltage		Code
60 Hz	50 Hz	
24▲	...	VO1
120	110	VO2
208	...	VO8
240	220	VO3
480	440	VO6
600	550	VO7
Specify	Specify	V99

▲ 24 V coils are not available on Sizes 4-7. On Sizes 00-3, where 24 V coils are available, Form S (separate control) must be specified.



File E78351
CCN NLDX



File LR60905
Class 3211-04



IEC 947-4-1
Sizes 00-5 only

How to Order:

To Order Specify:	Catalog Number			
• Class Number	Class	Type	Coil Voltage Code	Form(s)
• Type Number				
• Coil Voltage Code				
• Form(s)				
	8536	SBA2	VO2	P1S

Factory Modifications (FORMS)Refer to Catalog 9999CT9701
Application Data Pages 13-16
Dimensions Pages 17-20
Separate Enclosures (Class 9991)Refer to Catalog 9999CT9701
Replacement Parts (Class 9998)Refer to Catalog 9999CT9701
Type S Accessories (Class 9999)Refer to Catalog 9999CT9701





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM	FUSE AND FUSE BLOCKS
MANUFACTURER	BUSSMAN
FUSE AMPS RATINGS	2A
VOLTAGE RATINGS	600V
INTERRUPTING CAPACITY	200,000 A
CATALOG NO	FNQ-2
QUANTITY	6
CATALOG NO	FNQ-1
QUANTITY	3
CATALOG NO	LP-CC15
QUANTITY	3
FUSEBLOCKS AMPS RATINGS	30A
NO. OF POLE	3
CATALOG	BM6033B
QUANTITY	4
EQUIP ID	FB-5, 6, 9, 12



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**WINNIPEG WATER TREATMENT PROGRAM
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POWER SUPPLY UNIT

ITEM

FUSE AND FUSE BLOCKS

MANUFACTURER	BUSSMAN
FUSE AMPS RATINGS	3A
VOLTAGE RATINGS	600V
INTERRUPTING CAPACITY	200,000 A
CATALOG NO	FNQ-3
QUANTITY	2
FUSEBLOCKS AMPS RATINGS	30A
NO. OF POLE	2
CATALOG	BM6032B
QUANTITY	1
EQUIP ID	FB-3



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

FUSE AND FUSE BLOCKS

MANUFACTURER	BUSSMAN
FUSE AMPS RATINGS	8A
VOLTAGE RATINGS	250V
INTERRUPTING CAPACITY	200,000 A
CATALOG NO	FNM-8
QUANTITY	1
FUSEBLOCKS AMPS RATINGS	30A
NO. OF POLE	1
CATALOG	BM6031B
QUANTITY	1
EQUIP ID	FB-4



Fuji Electric Corporation of America

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Revision : 00
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

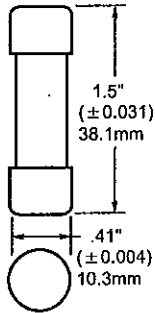
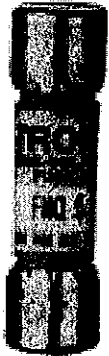
FUSE AND FUSE BLOCKS

MANUFACTURER	BUSSMAN
FUSE AMPS RATINGS	15A
VOLTAGE RATINGS	600V
INTERRUPTING CAPACITY	200,000 A
CATALOG NO	LP-CC15
QUANTITY	6
FUSEBLOCKS AMPS RATINGS	30A
NO. OF POLE	3
CATALOG	BC6033B
QUANTITY	2
EQUIP ID	FB-2, 8

Tron® Time-Delay Fuses

FNQ

**13/32" x 1-1/2" Midget
500 Volt, 1/10-30 Amps.**



- Fibre tube.
- Nickel plated brass endcaps.
- For motor control transformers and other circuits with in-rush currents.

CATALOG SYMBOL: FNQ (5AG)
 TIME-DELAY
 1/10 TO 30 AMPERES
 500 VOLTS AC (OR LESS)
 INTERRUPTING RATING—10,000A
 UL LISTED, STD 248-14, (GUIDE # JDYX, FILE # E19180)
 CSA CERTIFIED (CLASS 1422-01; FILE 53787)

Catalog Symbol and Ampere Ratings

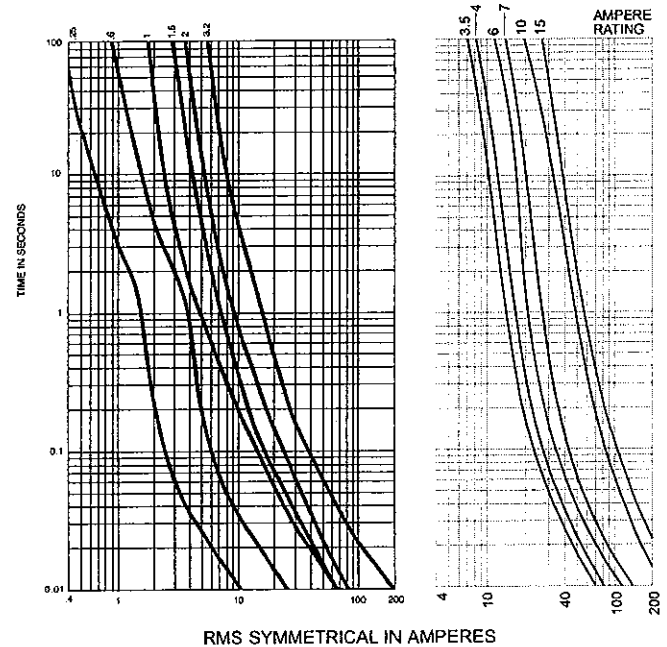
FNQ-1/10	FNQ-8/10	FNQ-3-2/10	FNQ-9
FNQ-1/8	FNQ-1	FNQ-3-1/2	FNQ-10
FNQ-15/100	FNQ-1-1/8	FNQ-4	FNQ-12
FNQ-3/16	FNQ-1-1/4	FNQ-4-1/2	FNQ-14
FNQ-2/10	FNQ-1-1/2	FNQ-5	FNQ-15
FNQ-1/4	FNQ-1-6/10	FNQ-5-6/10	FNQ-20
FNQ-3/10	FNQ-2	FNQ-6	FNQ-25
FNQ-4/10	FNQ-2-1/4	FNQ-6-1/4	FNQ-30
FNQ-1/2	FNQ-2-1/2	FNQ-7	—
FNQ-6/10	FNQ-3	FNQ-8	—

Carton Quantity and Weight

Ampere Ratings	Carton Qty	Weight*	
		Lbs.	Kg.
1-30	10	.180	.082

* Weight per carton.

Time-Current Characteristic Curve—Average Melt



Fuseblock Catalog Numbers

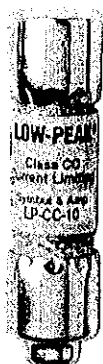
Poles	Terminal Type		
	Screw With Quick Connect	Pressure Plate w/Quick Connect	Box Lug
1	BM6031SQ	BM6031PQ	BM6031B
2	BM6032SQ	BM6032PQ	BM6032B
3	BM6033SQ	BM6033PQ	BM6033B

CE logo denotes compliance with European Union Low Voltage Directive (50-1000 VAC, 75-1500 VDC). Refer to BIF document #8002 or contact Bussmann Application Engineering at 636-527-1270 for more information.

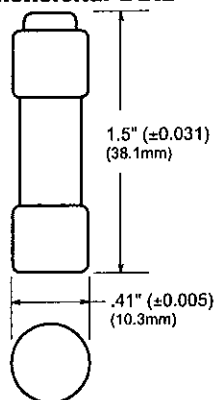
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LOW-PEAK® Time-Delay Fuses Class CC – 600 Volt, ½ to 30 Amps

LP-CC



Dimensional Data



Catalog Symbol: LP-CC

Time-Delay, Current-Limiting

Ampere Rating: ½ to 30 Amperes

AC Voltage Rating: 600 Volts (or less)

Interrupting Rating: 200,000A RMS Sym.

Agency Approvals:

U.L. Listed, Std. 248-4, Class CC, Guide JDDZ, File E4273

CSA Certified, C22.2 No. 248.4, Class 1422-02, File 53787

DC Voltage Rating: 300 Volt DC (or less)

½-2¼A and 20-30A, 20,000 AIR, U.L. 198L

150 Vdc or less 3-15A, 20,000 AIR, U.L. 198L

Catalog Numbers

LP-CC-½	LP-CC-1½	LP-CC-3	LP-CC-6	LP-CC-12
LP-CC-¾	LP-CC-1¾	LP-CC-3¾	LP-CC-6¾	LP-CC-15
LP-CC-1	LP-CC-1½	LP-CC-3½	LP-CC-7	LP-CC-20
LP-CC-1	LP-CC-2	LP-CC-4	LP-CC-7½	LP-CC-25
LP-CC-1½	LP-CC-2½	LP-CC-4½	LP-CC-8	LP-CC-30
LP-CC-1¾	LP-CC-2¾	LP-CC-5	LP-CC-9	—
LP-CC-1¾	LP-CC-2¾	LP-CC-5¾	LP-CC-10	—

Carton Quantity and Weight

Ampere Ratings	Carton Qty.	Weight*	
		Lbs.	Kg.
0-30	10	.193	.088

*Weight per carton.

Fuseblock Catalog Numbers

No. of Poles	Screw Terminal	Pressure Plate	Box Terminal	Screw Quick-Connect	Pressure Quick-Connect
1	BC6031S	BC6031P	BC6031B	BC6031SQ	BC6031PQ
2	BC6032S	BC6032P	BC6032B	BC6032SQ	BC6032PQ
3	BC6033S	BC6033P	BC6033B	BC6033SQ	BC6033PQ

General Information:

LP-CC LOW-PEAK Yellow™ Fuse

- A superior all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30 amps.
- Very compact; physical size is only 1½" x 1½" (10.3mm x 38.1mm) with rejection tip.
- The unique yellow color makes it easy to tell that the correct fuse type is installed.
- Faster response to damaging short-circuit currents and higher interrupting rating than mechanical overcurrent protective devices.

200,000 Ampere Interrupting Rating

- Maximum interrupting rating for available fault current in today's large capacity systems.
- Helps ensure that future growth will not obsolete the system.

Dual Characteristics

- Time-delay to avoid unwanted fuse openings from surge currents.
- Fast speed of response under short-circuit conditions for a high degree of current-limitation.
- **ADVANTAGE:** The LOW-PEAK® fuse can be sized close to full load ratings for maximum overload and short-circuit protection.
- **ADVANTAGE:** Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.

Superior Motor Protection

- For protection of small horsepower motor circuits.
- Proper sizing can provide Type "2" coordinated protection for NEMA and IEC motor controllers.
- Motors receive maximum protection against burnout from overloads and single phasing.

Current-Limiting Effects

Prospective Short-Circuit Current	*Let-Through Current (Apparent RMS Symmetrical)					
	1¼A	2¼A	15A	20A	25A	30A
1,000	100	135	240	305	380	435
3,000	140	210	350	440	575	580
5,000	165	255	420	570	690	710
10,000	210	340	540	700	870	1,000
20,000	260	435	680	870	1,090	1,305
30,000	290	525	800	1,030	1,300	1,520
40,000	315	610	870	1,150	1,390	1,700
50,000	340	650	915	1,215	1,520	1,820
60,000	350	735	1,050	1,300	1,650	1,980
80,000	390	785	1,130	1,500	1,780	2,180
100,000	420	830	1,210	1,600	2,000	2,400
200,000	525	1,100	1,600	2,000	2,520	3,050

*RMS Symmetrical Amperes Short-Circuit

NOTE: To calculate I_p (I_{peak}) multiply I_{RMS} value x 2.3.

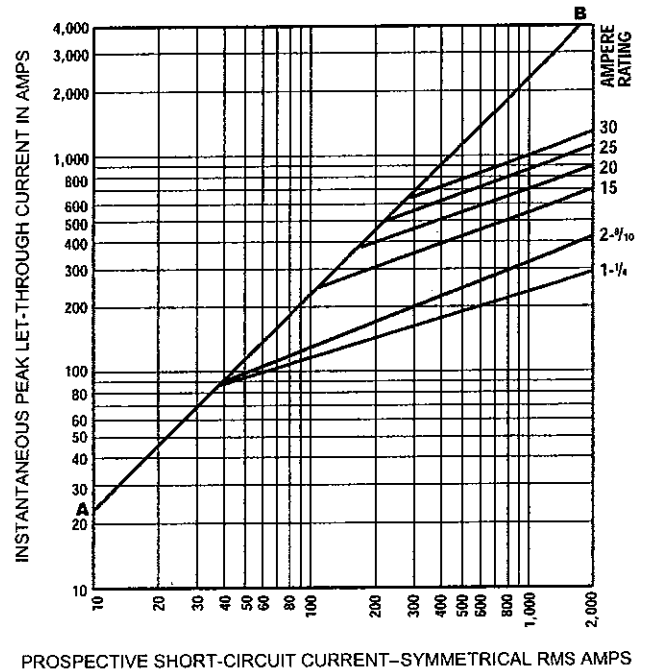
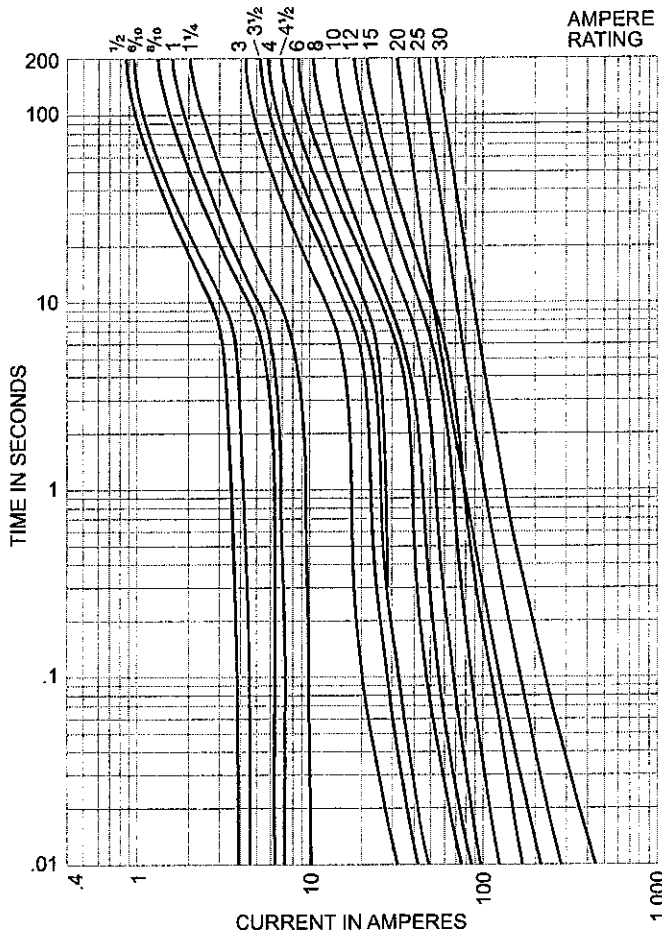
CE CE logo denotes compliance with European Union Low Voltage Directive (50-1000 Vac, 75-1500 Vdc). Refer to BIF document #8002 or contact Bussmann Application Engineering at 314-527-1270 for more information.

LOW-PEAK®

Time-Delay Fuses

Class CC - 600 Volt, 1/2 to 30 Amps

LP-CC

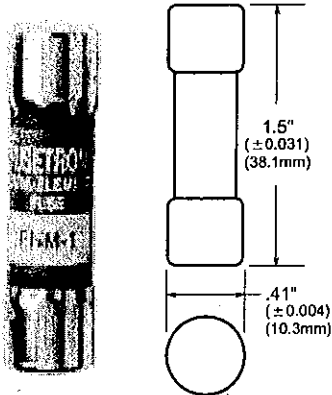


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Time-Delay Ferrule Fuse

13/32" x 1-1/2"

FNM



- Fibre tube.
- For circuits with high inrush currents.
- Formerly designated 5AB.
- Fusetron® Dual-Element fuse.

Fuseblock Catalog Numbers

Poles	Terminal Type		
	Screw With Quick Connect	Pressure Plate w/Quick Connect	Box Lug
1	BM6031SQ	BM6031PQ	BM6031B
2	BM6032SQ	BM6032PQ	BM6032B
3	BM6033SQ	BM6033PQ	BM6033B

CATALOG SYMBOL: FNM

TIME-DELAY

1/10 TO 30 AMPERES

INTERRUPTING RATING - SEE CHART BELOW

UL LISTED: STD. 248-14, 0-10/250V AC; 12-15/125V AC

FILE #E19180, GUIDE #JDYX

CSA CERTIFIED: 1-10/250V AC; CLASS 1422-01,

12-15/125V AC; FILE 53787

DC RATING: 1-15A rated 125V DC and 1.6 KAIC.

Electrical Ratings (Catalog Symbol and Amperes)

250 Volts AC		IR		250 Volts AC		IR		250 Volts AC		IR		125 Volts AC	
FNM-1/10		FNM-1-1/8		FNM-4		FNM-12	10,000						
FNM-1/8		FNM-1-1/4		FNM-4-1/2		FNM-15	@ 125V AC						
FNM-15/100		FNM-1-4/10		FNM-5									
FNM-2/10		FNM-1-1/2		FNM-5-6/10									
FNM-1/4	35A @	FNM-1-6/10	100A @	FNM-6		32 Volts AC							
FNM-3/10	250VAC	FNM-1-8/10	250VAC	FNM-6-1/4	200A @	FNM-20							
FNM-4/10	10,000	FNM-2	10,000	FNM-7	250VAC	FNM-25							
FNM-1/2	@ 125VAC	FNM-2-1/4	@ 125VAC	FNM-8	10,000 @	FNM-30							
FNM-6/10	125VAC	FNM-2-1/2	125VAC	FNM-9	125VAC								
FNM-3/4		FNM-2-8/10		FNM-10									
FNM-8/10		FNM-3											
FNM-1		FNM-3-2/10											
-		FNM-3-1/2											

If 250V AC is needed for 12-30 amps, use FNW series.

Carton Quantity and Weight

Ampere Ratings	Carton Qty	Weight	
		Lbs.	Kg.
0-30	10	.125	.057

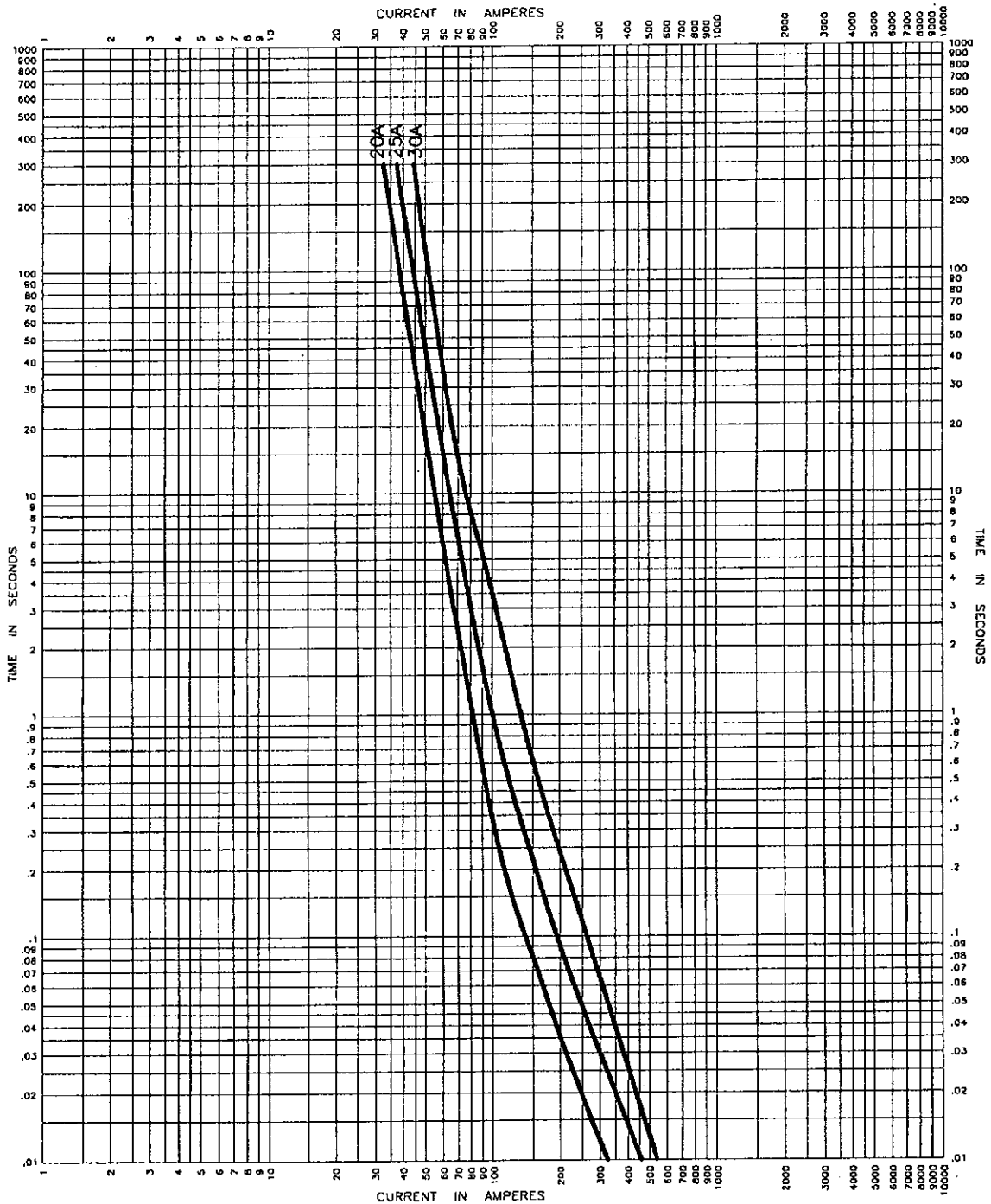
CE logo denotes compliance with European Union Low Voltage Directive (50-1000V AC, 75-1500V DC). Refer to BIF document #8002 or contact Bussmann Application Engineering at 636-527-1270 for more information.

Time-Delay Ferrule Fuse

13/32" x 1-1/2"

FNM

Time-Current Characteristic Curves—Average Melt



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Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

DOOR INTERLOCK (NON-LOCKING)

DESCRIPTIONS
MANUFACTURER
CATALOG NO
QUANTITY
EQUIP ID

DOOR INTERLOCK SAFETY SWITCH
SQUARE D
XCKJ10541
2
DS-3, 4

Rated Power

Conforms to IEC 947-5-1, duty categories AC15 and DC13.

Temperature range	-13° F to 158° F (-25° C to 70° C); optional -40° F to +248° F (-40° C to 120° C). The minimum temperatures listed are based on the absence of freezing moisture or water.
Enclosure rating	NEMA 1,2,3,4,12 IEC Type IP66
Vibration resistance	25 G (10-500 Hz), conforming to IEC 68-2-6
Shock resistance	50 G, conforming to IEC 68-2-27
Repeatability (max.)	0.0004" (0.01mm)
Cable entry	1/2" NPT standard

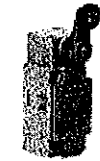
Contact Characteristics

Rated thermal current	10 A, conforming to UL 508, CSA C22-2 No.14, IEC 337-1, NFC 63-140, VDE 0660-200
Rated insulation voltage	Non-plug-in: 300 Vac (A300) and DC (Q300) Plug-in: 600 Vac (A600) and DC (Q600)
Contact resistance (max)	Non plug-in: 25 m Ω Plug-in: 45 m Ω
Cable (max.)	2 x #16 AWG (1.5 mm ²) per terminal—1 x #16 AWG for 2 SPDT (2 N.O. - 2 N.C.)
Short circuit protection	10 A fuse type SC; Form I Class J or equivalent. Outside US use type gl or N.

Complete Switches XCKJ

Non Plug-in Housings[▲]

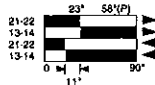
Description Functional Diagram	Operating Torque	Contact Type	Direct Opening [♦]	Catalog Number	Price
Lever operated					
DELTRIN roller lever adjustable in 5° or 45° increments (reversible mountings) ■					
33.3 in-oz		SPDT	(N.O. + N.C.)	Y	XCKJ10511 \$94.00
33.3 in-oz		2 SPDT	(2 N.O. + 2 N.C.)	N	XCKJ20511 99.00
Adjustable length DELTRIN roller lever adjustable in 5° or 90° increments					
33.3 in-oz		SPDT	(N.O. + N.C.)	Y	XCKJ10541 84.00
33.3 in-oz		2 SPDT	(2 N.O. + 2 N.C.)	N	XCKJ20541 99.00
Adjustable length—1/8" diameter steel rod adjustable in 5° or 45° increments					
33.3 in-oz		SPDT	(N.O. + N.C.)	Y	XCKJ10553 84.00
Adjustable length 1/4" plastic rod adjustable in 5° or 45° increments					
33.3 in-oz		SPDT	(N.O. + N.C.)	Y	XCKJ10559 91.00



XCKJ10511



XCKJ10541



- ▲ 2 or 3 subassemblies in a single referenced package. Other complete switches are available. Assembled switches can also be provided. Contact your Square D/Telemecanique representative for details.
- Reverse mounting: The higher increment (45° or 90°) is a positive opening contact feature which ensures no loss of mechanical effort between the actuation point and the moving contact bridge of the direct opening (N.C.) contact even if the lever is loosely mounted on the head shaft.
- ♦ Direct opening contacts meet IEC 947-5-1 requirements for positive opening contacts.

For additional information, reference Catalog #9006CT0101.



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

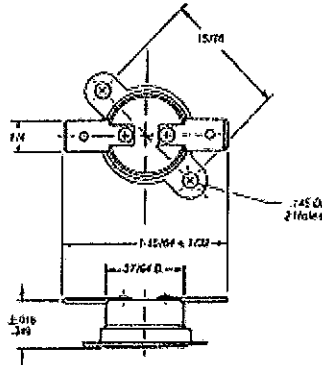
ITEM

TEMPERATURE SWITCH

TYPE:	BIMETALIC SNAP ACTION DISC
CONTACTS:	1 NC
TEMPERATURE RANGE:	OPENS @ 1100F
VOLTAGE:	120 VAC 15 AMP
SIZE:	115/64"W X .349"D
MANUFACTURER:	STANCOR
MODEL NO.:	STO-140
TAG NO.:	TS-1
QUANTITY:	1

STANCOR[®]

SNAP-ACTION DISC THERMOSTATS



- Automatic Reset
- 1/4" Quick-Connect Terminals
- 1/2" Bimetal Disc Thermostat
- Loose Ring
- Stainless Steel Mtg. Bracket
- Load Rating: 15A @ 120V, 10A @ 240V

Positive, instantaneous opening or closing of electrical circuits. All have differential of 30°F except type **STO-175** which has a differential of 15°F. Rated 8.7A at 277VAC load resistive. 0.250" (6.35).

Stock No.	Type	Set Point	Function
48F1359	STO-60	60°F ±5°F	Opens
48F1360	STO-85	85°F ±5°F	Opens
46F6505	STO-110	110°F ±5°F	Opens

46F6506	ST0-120	120°F ±5°F	Opens
46F6508	ST0-140	140°F ±5°F	Opens
46F6510	ST0-150	150°F ±5°F	Opens
46F6511	ST0-160	160°F ±5°F	Opens
46F6512	ST0-170	170°F ±5°F	Opens
46F6635	ST0-175	175°F ±5°F	Opens
97F7515	ST0-190	190°F ±5°F	Opens
98F4355	ST0-210	210°F ±5°F	Opens
98F6155	STC-100	100°F ±5°F	Closes
46F6507	STC-120	120°F ±7°F	Closes
46F6509	STC-140	140°F ±7°F	Closes



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

SURGE ARRESTER

MANUFACTURER:

SQUARE D

MODEL:

SDSA-3650

TYPE:

480V SURGE ARRESTER

QUANTITY:

1

TAG No.:

SUP-1

APPLICATION DATA

These secondary surge arresters are suitable for use in Category B and C locations. The threat at these locations is characterized by ANSI/IEEE C62.41-1991 as a 20,000 V potential and a 10,000 A current. The device clamps the voltage during surges while diverting transient current. Electronic equipment may need to be additionally protected at the point of use with transient voltage surge suppressors.

Electrical Characteristics

- Voltage rating:
 - SDSA1175: 144 Vac maximum phase-to-ground at 50/60 Hz
NOTE: Do not use on ungrounded systems.
 - SDSA3650: 600 Vac maximum phase-to-ground at 50/60 Hz
NOTE: Do not use on ungrounded systems.
- Typical clamping voltages: For 8/20 μ s combination wave surge current for each phase-to-ground with specified lead length:

	1 in. (25 mm) lead	3 in. (76 mm) lead	6 in. (152 mm) lead
SDSA1175			
1500 A surge current	500 V	550 V	575 V
5000 A surge current	625 V	675 A	725 A
10,000 A surge current	750 V	900 V	1075 V
SDSA3650			
1500 A surge current	1525 V	1750 V	1775 V
5000 A surge current	1700 V	2100 V	2125 V
10,000 A surge current	1925 V	2375 V	2400 V

	12 in. (305 mm) lead	18 in. (457 mm) lead
SDSA1175		
1500 A surge current	600 V	625 V
5000 A surge current	875 V	1050 V
10,000 A surge current	1250 V	1500 V
SDSA3650		
1500 A surge current	1800 V	1825 V
5000 A surge current	2325 V	2425 V
10,000 A surge current	2700 V	3000 V

Specifications

Electrical	
Intrinsic varistor response time	Less than 50 nanoseconds
Minimum life	2500 operations (for 1.5 kA 8/20 μ s wave for each line-to-ground)
Varistor surge current rating per phase	SDSA1175: 36,000 A peak (8/20 μ s wave) SDSA3650: 40,000 A peak (8/20 μ s wave)
Power consumption per phase	SDSA1175: Less than 500 milliwatts SDSA3650: Less than 600 milliwatts
Operating temperature range	-40 to +70 °C (-40 to +160 °F)
Surge energy capability per phase	SDSA1175: 560 Joules (8/20 μ s wave) SDSA3650: 2100 Joules (8/20 μ s wave)



Hard-Wired Surge Arresters Dimensions and Wiring Diagrams

Dimensions: 1.94 (49) x 2.25 (57) x 2.25 (57)

One SDSA1175 on 120/240 Vac Circuit

Two SDSA1175s on 208Y/120 Vac Circuit

NOTE: Systems shown must be solidly grounded. Do not use on ungrounded systems.

SDSA1175

Dimensions: 2.64 (67) x 3.60 (92) x 3.00 (76)

3 ϕ 4W
208Y/120Vac,
480Y/277Vac
and 600Y/347Vac

3 ϕ 4W
240/120Vac

3 ϕ 3W
(Grounded B Phase)
240Vac and 480Vac

NOTE: Systems shown must be solidly grounded. Do not use on ungrounded systems.

SDSA3650





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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

FUSE AND FUSE BLOCKS

MANUFACTURER

FERRAZ SHAWMUT

FUSE AMPS RATINGS

400A

VOLTAGE RATINGS

1000V

CATALOG NO

A70Q S800

QUANTITY

2

FUSEBLOCKS AMPS RATINGS

400A

CATALOG

P266A

QUANTITY

2

EQUIP ID

FB-10, FB-11

A70Q

SEMICONDUCTOR PROTECTION FUSES



A70Q Amp-trap® Semiconductor Protection fuses were developed for inverter applications requiring extremely low I²t. A70Q fuses provide the most responsive protection for applications not required to sustain heavy overloads. Typically used for replacement purposes.

Features/Benefits

- **Lowest I²t** of any fuse in this voltage rating for best overall protection
- **700V AC, 650V DC rating** allows protection of greater variety of circuits
- **Solid fill technology** for extra reliability in performance

Ratings

- **AC:** 35-600A
700VAC, 100kA I.R.
- **DC:** 35-600A
650VDC, 100kA I.R.
L/R=10ms

Approvals

- UL Recognized Component
- AC: Guide No. JFHR2
- DC: Tested to UL Standard 198L Parameters (35-600A)

HIGHLIGHTS:

- Extremely Fast Acting
- Current Limiting
- Lowest I²t

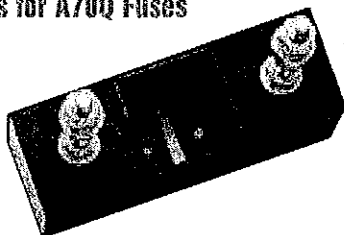
APPLICATIONS:

- Protection of inverters and other equipment requiring the best AC or DC protection in this voltage range



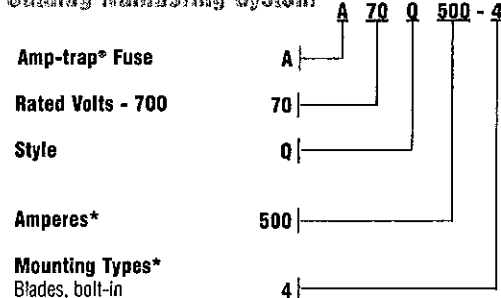
Single Pole Fuse Blocks for A70Q Fuses

FUSE AMPERE RATING	FUSE BLOCK CATALOG NUMBER
35-100	P243C
125-400	P266A
450-600	P266F



*Contact technical services for application data.

Catalog Numbering System



* For ampere ratings and types not listed, consult the factory.

A70Q

SEMICONDUCTOR PROTECTION FUSES

Standard Fuse Ampere Ratings, Catalog Numbers

AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER
35	A70Q35-4	100	A70Q100-4	350	A70Q350-4
40	A70Q40-4	125	A70Q125-4	400	A70Q400-4
50	A70Q50-4	150	A70Q150-4	450	A70Q450-4
60	A70Q60-4	175	A70Q175-4	500	A70Q500-4
70	A70Q70-4	200	A70Q200-4	600	A70Q600-4
80	A70Q80-4	250	A70Q250-4		
90	A70Q90-4	300	A70Q300-4		

For ampere ratings and styles not listed, call Technical Services.

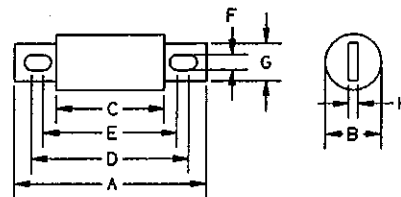


Figure 1



Dimensions

CATALOG NUMBER	MOUNTING TYPE	DIMENSIONS - INCHES (mm)							
		A	B	C	D	E	F	G	H
A70Q35 to 60	4	4.37 (111)	1.22 (31.0)	1.96 (49.8)	3.69 (93.7)	2.91 (73.9)	.34 (8.6)	1.00 (25.4)	.19 (4.8)
A70Q70 to 100	4	4.37 (111)	1.22 (31.0)	1.96 (49.8)	3.69 (93.7)	2.91 (73.9)	.41 (10.4)	1.00 (25.4)	.19 (4.8)
A70Q125 to 200	4	5.09 (129)	1.50 (38.1)	1.96 (49.8)	4.16 (106)	2.91 (73.9)	.41 (10.4)	1.00 (25.4)	.25 (6.4)
A70Q250 to 400	4	5.09 (129)	2.00 (50.8)	1.96 (49.8)	4.00 (102)	2.94 (74.7)	.56 (14.2)	1.50 (38.1)	.25 (6.4)
A70Q450 to 600	4	7.09 (180)	2.50 (63.5)	1.96 (49.8)	5.72 (145)	3.25 (82.6)	.56 (14.2)	2.00 (50.8)	.38 (9.7)



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT

ITEM

POWER DISTRIBUTION BLOCK

MANUFACTURER:

SQUARE D

NO. OF POLES:

3P

CATALOG NO:

9080-LBA362106

QUANTITY:

1

EQUIP ID:

DB-1

The Panel Expert

Innovative Control Solutions



SQUARE D

Square D is committed to serve as your full line, single source supplier of electrical components. Panel builders, OEMs and end users are experiencing a new and revitalized effort to provide value-added service. Our dedicated staff of trained sales representatives and service technicians also provide technical support, referral assistance and expert advice.

Included in our complete family of control and automation products, Square D offers a full line of power distribution blocks and fuseholders.

Fuseholders

Square D's line of fuseholders are designed for a broad range of industrial control applications. They are ideally suited for machine tool and plastic machinery, food processing equipment, HVACR systems and all control panels.

These fuseholders feature mechanical type terminals and a single piece, fully insulated, phenolic base. The fuse clips are constructed of a high conductivity, tin plated, copper alloy. At least two mounting holes are provided to prevent block rotation.

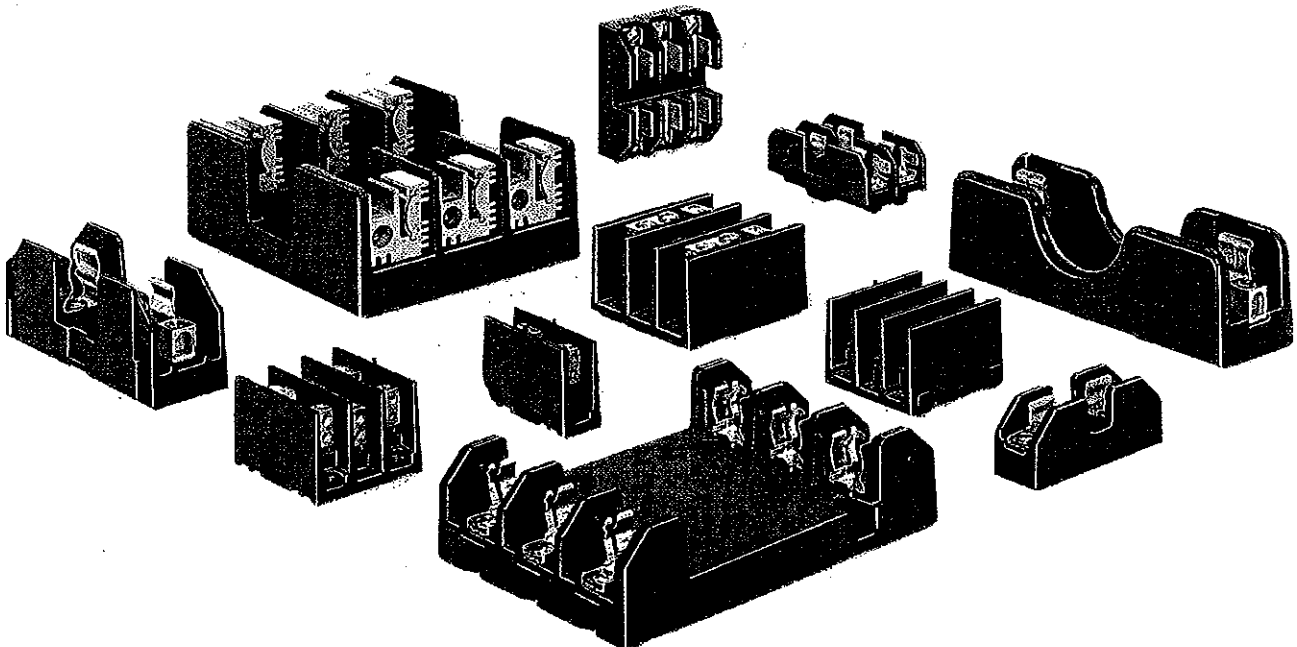
Power Distribution Blocks

Power distribution blocks provide a means of dividing a large circuit into smaller branch circuits. Typical applications are similar to fuseholder applications and are used in most control panels, whether machine or process control.

Power blocks feature one and three pole construction with either single or dual main feeder connections and one, two, four, six, eight or twelve branch wire connections. Individual poles are constructed from a single piece of tin plated copper or aluminum and are mounted on a fully insulated, phenolic base. Aluminum blocks are for use with either copper or aluminum conductors; copper blocks are for use with copper conductors, only.

Availability

Square D power distribution blocks and fuseholders are UL component recognized, CSA certified and available through your local Square D distributor at competitive prices. For more information, contact your local Square D distributor or sales office.

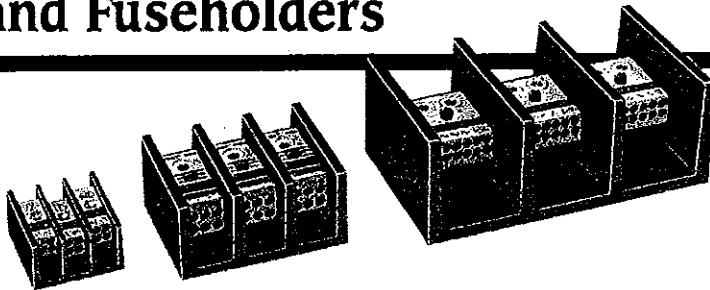


Power Blocks

Distribution Blocks and Fuseholders

Class 9080

Power Distribution Blocks and Fuseholders



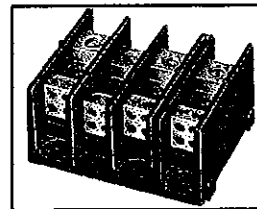
Power Distribution Blocks

These devices conform with UL Standard 1059 for terminal blocks and are UL component recognized (File number E81865) and CSA certified (File number LR19766-35M).

They are designed to offer a wide variety of main and branch configurations with 1 or 2 main connections and up to 12 branch connections.

Lug Wire Range *		Aluminum Conductor ▲		Copper Conductor ◆	
Main	Branch	One Pole Type	Three Pole Type	One Pole Type	Three Pole Type
(1) #14-2/0 (1) #14-2/0 (1) #18-1/0	(1) #14-2/0 (4) #14-4 (1) #18-1/0	LBA162101 LBA162104 —	LBA362101 LBA362104 —	— LBC162104 LBC162101	— LBC362104 LBC362101
(1) #6-250 MCM (1) #6-350 MCM (1) #4-600 MCM (1) #4-500 MCM (1) #6-400 MCM (1) #4-500 MCM (1) #6-400 MCM (1) #4-500 MCM (1) #6-400 MCM (1) #4-500 MCM	(1) #6-250 MCM (1) #6-350 MCM (1) #4-600 MCM (6) #14-2 (6) #14-2 (6) #14-2 (6) #14-2/0 (8) #14-2 (12) #14-2	— LBA163101 LBA164101 — LBA163106 LBA165106 LBA164108 LBA165112	— LBA363101 LBA364101 — LBA363106 LBA365106 LBA364108 LBA365112	— — — LBC163106 — — — —	— — — LBC363101 — — LBC363106 — — —
(2) #14-2/0 (2) #4-350 MCM (2) #4-500 MCM (2) #4-500 MCM (2) #4-500 MCM	(6) #14-4 (2) #4-350 MCM (2) #4-500 MCM (8) #14-2/0 (12) #14-4	LBA163206 LBA165202 LBA165202-1 LBA165208 LBA165212	LBA363206 LBA365202 LBA365202-1 LBA365208 LBA365212	LBC163206 — — LBA165208 LBA165212	LBC363206 — — LBA365208 LBA365212

- * Lugs suitable for use with 75°C conductors.
- ▲ Aluminum blocks will accept either Al or Cu conductors.
- ◆ Copper blocks will accept copper conductors, only.

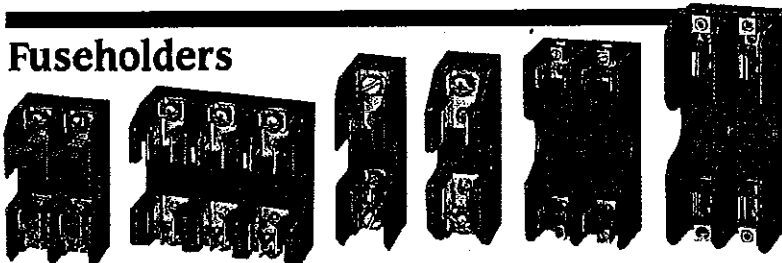


For space savings and assembly flexibility, Square D also offers a line of modular miniature blocks that can be interlocked to make the pole configuration you need for your application.

Modular Miniature Blocks

Lug Wire Range *		Aluminum Conductor ▲	
Main	Branch	One Pole Type	Three Pole Type
(1) #14-2 (1) #14-2	(1) #14-2 (4) #18-10	LBA161101 LBA161104	LBA361101 LBA361104

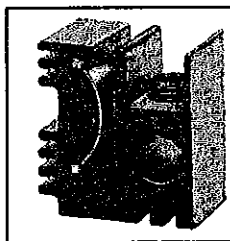
Fuseholders



Square D fuseholders conform with UL standard 512 for fuseholders and are UL listed (File number E75206) and CSA certified (File number LR21455-29M). Type M fuseholders are UL component recognized.

250 and 600 volt Class H and R fuseholders are available in 30, 60 and 100 ampere ratings in one, two and three pole construction. 200 ampere devices are available in one and three pole construction.

600 volt fuseholders which accept 30 ampere miniature fuses (13/32" x 1 1/2") are available in the non-current limiting Type M version, as well as the current limiting Class CC version. The Class CC fuseholder physically rejects non-current limiting miniature fuses.



For 100 and 200 amp fuseholders, Square D's one piece lug design with pressure spring allows easy insertion and removal of blade type fuses or knife blade switches, and reduces internal heat resistance.

Square D Company
Automation and Control Business
P. O. Box 27446, Raleigh, N.C. 27611, USA

Square D Canada
6675 Rexwood Road
Mississauga, Ontario L4V 1V1

SM857 5/91 DLC
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SQUARE D
GROUPE SCHNEIDER



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

CIRCUIT BREAKER

MANUFACTURER:	SQUARE D
AMPS:	2A
NO. OF POLES:	1P, 120V
CATALOG NO:	MG24501
MAGNETIC SETTING:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	3
EQUIP ID:	CB-202, 209, 211



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

CIRCUIT BREAKER

MANUFACTURER:

SQUARE D

AMPS:

6A

NO. OF POLES:

1P, 120V

CATALOG NO:

MG24504

MAGNETIC SETTINGS:

TO 14 TIMES AMP RATING

TYPE:

THERMAL MAGNETIC

FRAME SIZE:

63A

QUANTITY:

1

EQUIP ID:

CB-207



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**



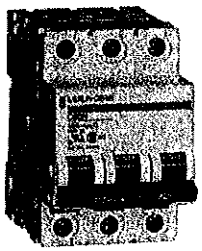
POWER SUPPLY UNIT - LCP PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	4A
NO. OF POLES:	1P, 120V
CATALOG NO:	MG24503
MAGNETIC SETTINGS:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	1
EQUIP ID:	CB-217

Circuit Breakers
 Supplementary Protectors
 Current-Limiting MULTI-9™ C60N

Class 860

5 CIRCUIT BREAKERS

	Ampere Rating	B Curve	C Curve	D Curve	List Price
	0.5	—	MG17411	MG17421	\$ 72.
	1	MG24110	MG24425	MG24500	60.
	1.2	MG17402	MG17412	MG17422	60.
	1.5	MG17403	MG17413	MG17423	60.
	2	MG24111	MG24426	MG24501	60.
	3	MG24112	MG24427	MG24502	60.
	4	MG24113	MG24428	MG24503	60.
	5	MG17404	MG17414	MG17424	60.
	6	MG24114	MG24430	MG24504	60.
	7	MG17405	MG17415	MG17425	60.
	8	MG24115	MG24431	MG24505	60.
	10	MG24116	MG24432	MG24506	60.
	13	MG24117	MG24433	MG24507	60.
	15	MG17406	MG17416	MG17426	60.
	16	MG24118	MG24434	MG24508	60.
	20	MG24119	MG24435	MG24509	60.
	25	MG24120	MG24436	MG24510	60.
	30	MG17407	MG17417	MG17427	60.
	32	MG24121	MG24437	MG24511	60.
35	MG17408	MG17418	MG17428	60.	
40	MG24122	MG24438	MG24512	66.	
50	MG24123	MG24439	MG24513	70.	
60	MG17409	MG17419	MG17429	74.	
63	MG24124	MG24440	MG24514	74.	
	1	MG24125	MG24442	MG24516	130.
	1.2	MG17432	MG17442	MG17452	130.
	1.5	MG17433	MG17443	MG17453	130.
	2	MG24126	MG24443	MG24517	130.
	3	MG24127	MG24444	MG24518	130.
	4	MG24128	MG24445	MG24519	130.
	5	MG17434	MG17444	MG17454	130.
	6	MG24129	MG24447	MG24520	130.
	7	MG17435	MG17445	MG17455	130.
	8	MG24130	MG24448	MG24521	130.
	10	MG24131	MG24449	MG24522	130.
	13	MG24132	MG24450	MG24523	130.
	15	MG17436	MG17446	MG17456	130.
	16	MG24133	MG24451	MG24524	130.
	20	MG24134	MG24452	MG24525	130.
	25	MG24135	MG24453	MG24526	130.
	30	MG17437	MG17447	MG17457	130.
	32	MG24136	MG24454	MG24527	130.
	35	MG17438	MG17448	MG17458	130.
40	MG24137	MG24455	MG24528	134.	
50	MG24138	MG24456	MG24529	143.	
60	MG17439	MG17449	MG17459	151.	
63	MG24139	MG24457	MG24530	151.	
	1	MG24140	MG24459	MG24532	189.
	2	MG24141	MG24460	MG24533	189.
	3	MG24142	MG24461	MG24534	189.
	4	MG24143	MG24462	MG24535	189.
	6	MG24144	MG24464	MG24536	189.
	8	MG24145	MG24465	MG24537	189.
	10	MG24146	MG24466	MG24538	189.
	13	MG24147	MG24467	MG24539	189.
	15	MG17461	MG17466	MG17471	189.
	16	MG24148	MG24468	MG24540	189.
	20	MG24149	MG24469	MG24541	189.
	25	MG24150	MG24470	MG24542	189.
	30	MG17462	MG17467	MG17472	189.
	32	MG24151	MG24471	MG24543	189.
	35	MG17463	MG17468	MG17473	189.
	40	MG24152	MG24472	MG24544	194.
	50	MG24153	MG24473	MG24545	202.
	60	MG17464	MG17469	MG17474	211.
	63	MG24154	MG24474	MG24546	211.

Application

Control and protection of circuits against overloads and short circuits in control circuit application.

Technical Data

- **Ampere Rating:**
0.5 to 63A at 25°C.
- **Interrupting Capacity:**
UL 1077/CSA 22.2/IEC 947-2

Rating	Poles	Voltage	Interrupting Capacity (A)
0.5 to 63	1, 2, 3, 4	240 Vac	10000
	1	277 Vac	5000
	2, 3, 4	480Y/277 Vac	5000
0.5 to 63	1	65 Vdc	10000
	2	125 Vdc	10000

- Positive contact indication
- Current-limiting
- Fast-closing contacts

MULTI 9 is a Trademark of Merlin Gerin.

- **Tripping characteristics:**
B Curve: magnetic setting between 3.2 and 4.8 times Ampere rating
C Curve: magnetic setting between 7 and 10 times Ampere rating
D Curve: magnetic setting between 10 and 14 times Ampere rating
- **Tropicalization:** treatment 2 (IEC) (relative humidity 95% at 55°C.)
- **Weight (oz/g):**

Type	1-pole	2-pole	3-pole	4-pole
	3.85/110	7.70/220	11.55/330	15.40/440

• Pressure terminals: Cable size (Cu)	
0.5 to 25A	#18 to #4 AWG
32 to 63A	#18 to #2 AWG





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

PILOT LIGHT

MANUFACTURER:

SQUARE D

MODEL:

9001KPKM35A31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

COLOR:

AMBER

QUANTITY:

1

TAG NO.:

PL1



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

EMERGENCY STOP BUTTON

MANUFACTURER:

SQUARE D

MODEL:

9001KR9R20H1

TYPE:

30MM, RED MUSHROOM BUTTON

CONTACT:

1 N/C

COLOR:

RED

QUANTITY:

1

TAG NO.:

PB-217

Push Buttons




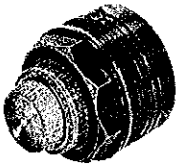
Type K – 30.5mm

Heavy Duty Pilot Lights

Class 9001

Pilot Lights – UL Types 4, 13/NEMA Type 4 & 13
 For use in hazardous locations – See Page 14-79.
 Legend Plates Not Included

14 PUSH BUTTONS

Description	Voltage	Style	With Red Fresnel Color Cap	With Green Fresnel Color Cap	With Other Color Cap	Price	Without Color Cap	Price
 Standard Pilot Light (Plastic fresnel Color Cap Shown)	110-120V, 50-60 Hz 220-240V, 50-60 Hz 24-28Vac-dc For Other Voltages See Table ①	Transformer Transformer Full Voltage Transformer, Flashing or LED ③ Full Voltage, Neon or Resistor ④	KP1R31 KP7R31 KP35R31 KP①R31 KP②R31	KP1G31 KP7G31 KP35G31 KP①G31 KP②G31	KP1 ⑤ KP7 ⑤ KP35 ⑤ KP ⑤⑤ KP ⑤⑤	\$64.20 64.20 52.20 64.20 52.20	KP1 KP7 KP35 KP ⑤ KP ⑤	\$60.00 60.00 48.00 60.00 48.00
 Push To Test Pilot Light (Glass Color Cap Shown)	110-120V, 50-60 Hz 220-240V, 50-60 Hz 24-28Vac-dc For Other Voltages See Table ①	Transformer Transformer Full Voltage Transformer, Flashing or LED ③ Full Voltage, Neon or Resistor ④	KT1R31 KT7R31 KT35R31 KT①R31 KT②R31	KT1G31 KT7G31 KT35G31 KT①G31 KT②G31	KT1 ⑤ KT7 ⑤ KT35 ⑤ KT ⑤⑤ KT ⑤⑤	82.20 82.20 70.20 82.20 70.20	KT1 KT7 KT35 KT ⑤ KT ⑤	78.00 78.00 66.00 78.00 66.00
 Remote Test Pilot Light (Glass Color Cap Shown)	120Vac Only 24-28Vac Only For Other Voltages See Table ①③	Resistor ④ Full Voltage ④ Full Voltage or Resistor ④	KTR38R31 KTR35R31 KTR①R31	KTR38G31 KTR35G31 KTR①G31	KTR38 ⑤ KTR35 ⑤ KTR ⑤⑤	82.20 82.20 82.20	KTR38 KTR35 KTR ⑤	78.00 78.00 78.00
 Pilot Light For Intrinsically Safe Circuits (NEMA Type 4X)	Intrinsically safe equipment must not release electrical or thermal energy capable of igniting certain explosive or combustible hazardous atmospheres, for which the equipment has been tested. These pilot lights are intrinsically safe when used with a suitable approved barrier or barrier relay (Class 8501 Type TO from Pages 19-22 and 19-23). These pilot lights are Factory Mutual (FM approved). Consult your local Square D Sales Office for further details. These pilot lights are fully encapsulated – there are no replaceable parts – except for the SK40 ring nut. Use KN100 series plastic legend plates as shown on Pages 14-81 and 14-82.		KP44R	KP44G	KP44Y (Yellow Color Cap)	75.00	—	—
	Operating Voltage Range	Nominal Current	V max. = 32V 1 max. = 165 ma.					
	20-30V AC/DC	25 ma.						

- ① Add the voltage assembly code as chosen from voltage assembly code table on Page 14-63.
EXAMPLE: KT(1)R31 with a 60VAC red LED voltage=KT37LRR31
- ② Add the color code as chosen from the color cap table. EXAMPLE: KP1(2) with a blue fresnel cap = KP1L31
- ③ The color cap must be the same color as the LED voltage chosen, i.e., green LED use a green color cap.
- ④ On neon voltages use clear color caps only.
- ⑤ On remote test pilot lights use only full voltage or resistor voltage assembly codes. Do not choose LED, neon or transformer codes. For AC use only.

Push-To-Test Ground Detector Pilot Light

(Contact Block Included – But NOT Legend Plate or Color Cap)

Used in pairs to indicate a grounded condition in a control circuit fed from a grounded center-tapped transformer. The Type KT50 is commonly used in press control circuits, and fulfills the requirements of the ground detector called for in ANSI B11.1 (1971), Par. E3.6.5. Consult local Square D Sales Office for proper application.

Voltage and Frequency	Type	Price
110-120 V, 50-60 Hz	KT50	\$108.00

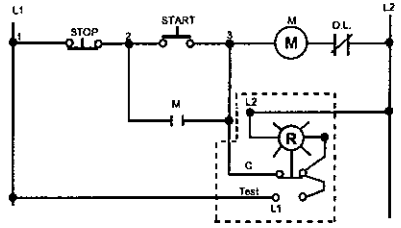
Color	(2) Plastic Fresnel	(2) Plastic Domed	(2) Glass
Amber	A31	A9	A6
Blue	L31	L9	L6
Clear	C31	C9	C6
Green	G31	G9	G6
Red	R31	R9	R6
White	W31	W9	W6
Yellow	Y31	Y9	Y6

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 For Boots Page 14-83
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 For Light Modules Pages 14-77
 For Outline Dimensions Pages 14-92 – 14-93
 For Replacement Parts Page 14-86
 For Ring Nuts Page 14-87

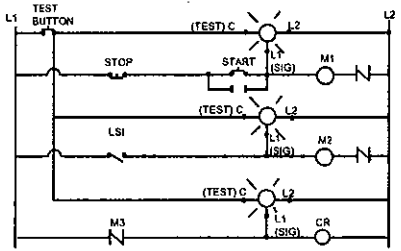
Voltage Assembly Codes

See Page 14-63

Typical Wiring Diagrams



Push-To-Test Pilot Light



Remote Test Pilot Light



Push Buttons






Type K – 30.5mm

Heavy Duty Operators

Class 9001

Non-Illuminated Momentary Push Button Operators – UL Types 4, 13/NEMA Types 4, 13

For use in hazardous locations – See Page 14-79.
Contact blocks and legend plate not included unless otherwise noted.

Description	Color	Operator With 1 N.O. and 1 N.C. Contact (KA1)	Price	Operator With 1 N.O. Contact (KA2)	Operator With 1 N.C. Contact (KA3)	Price	Operator Only With No Contacts (5)	Price	
	Black	KR1BH13	\$34.20	KR1BH5	KR1BH6	\$25.20	KR1B	\$16.20	
	Red	KR1RH13	34.20	KR1RH5	KR1RH6	25.20	KR1R	16.20	
	Green	KR1GH13	34.20	KR1GH5	KR1GH6	25.20	KR1G	16.20	
	Universal (1)	KR1UH13	34.20	KR1UH5	KR1UH6	25.20	KR1U	16.20	
	Other (2)	KR1(2)H13	34.20	KR1(2)H5	KR1(2)H6	25.20	KR1(2)	16.20	
	Black	KR3BH13	34.20	KR3BH5	KR3BH6	25.20	KR3B	16.20	
	Red	KR3RH13	34.20	KR3RH5	KR3RH6	25.20	KR3R	16.20	
	Green	KR3GH13	34.20	KR3GH5	KR3GH6	25.20	KR3G	16.20	
	Universal (1)	KR3UH13	34.20	KR3UH5	KR3UH6	25.20	KR3U	16.20	
	Other (2)	KR3(2)H13	34.20	KR3(2)H5	KR3(2)H6	25.20	KR3(2)	16.20	
	Black	KR2BH13	34.20	KR2BH5	KR2BH6	25.20	KR2B	16.20	
	Red	KR2RH13	34.20	KR2RH5	KR2RH6	25.20	KR2R	16.20	
	Green	KR2GH13	34.20	KR2GH5	KR2GH6	25.20	KR2G	16.20	
	Universal (1)	KR2UH13	34.20	KR2UH5	KR2UH6	25.20	KR2U	16.20	
	Other (2)	KR2(2)H13	34.20	KR2(2)H5	KR2(2)H6	25.20	KR2(2)	16.20	
	Snap-In Mushroom Button								
	Black	KR4BH13	52.20	KR4BH5	KR4BH6	43.20	KR4B	34.20	
	Red	KR4RH13	52.20	KR4RH5	KR4RH6	43.20	KR4R	34.20	
	Red (3)	KR4R05H13	54.20	KR4R05H5	KR4R05H6	45.20	KR4R05	36.20	
	Green	KR4GH13	52.20	KR4GH5	KR4GH6	43.20	KR4G	34.20	
	Other (4)	KR4(4)H13	52.20	KR4(4)H5	KR4(4)H6	43.20	KR4(4)	34.20	
	Screw-On Mushroom Button With Set Screw Security								
	Black	KR24BH13	52.20	KR24BH5	KR24BH6	43.20	KR24B	34.20	
	Red	KR24RH13	52.20	KR24RH5	KR24RH6	43.20	KR24R	34.20	
	Green	KR24GH13	52.20	KR24GH5	KR24GH6	43.20	KR24G	34.20	
	Other (4)	KR24(4)H13	52.20	KR24(4)H5	KR24(4)H6	43.20	KR24(4)	34.20	
		Snap-In Mushroom Button							
		Black	KR5BH13	52.20	KR5BH5	KR5BH6	43.20	KR5B	34.20
		Red	KR5RH13	52.20	KR5RH5	KR5RH6	43.20	KR5R	34.20
Red (3)		KR5R05H13	54.20	KR5R05H5	KR5R05H6	45.20	KR5R05	36.20	
Green		KR5GH13	52.20	KR5GH5	KR5GH6	43.20	KR5G	34.20	
Other (4)		KR5(4)H13	52.20	KR5(4)H5	KR5(4)H6	43.20	KR5(4)	34.20	
Screw-On Mushroom Button With Set Screw Security									
Black		KR25BH13	52.20	KR25BH5	KR25BH6	43.20	KR25B	34.20	
Red		KR25RH13	52.20	KR25RH5	KR25RH6	43.20	KR25R	34.20	
Green		KR25GH13	52.20	KR25GH5	KR25GH6	43.20	KR25G	34.20	
Other (4)		KR25(4)H13	52.20	KR25(4)H5	KR25(4)H6	43.20	KR25(4)	34.20	

- The universal push button operators contain one each of the following color inserts: black, red, green, yellow, orange, blue and white.
- See table below.
- Knob has the words "Emergency Stop" in raised letters highlighted in white for readability.
- See table below.
- These operators can be ordered complete with contact blocks – for maximum block usage – see Page 14-84. Add the "H" number chosen from Page 14-80 to the end of the operator type number and add the cost of the "H" number to the operator cost.
EXAMPLE: KR24B(34.20) + H2(2 - KA1)(36.00) = KR24BH2(70.20)

Color	(2) For KR1, 2, 3 Choose Color and Place Code in Type Number	(4) For KR4, 5, 24, 25 Choose Color and Place Color Code in Type Number
Blue	L	L
Yellow	Y	Y
White	W	-
Orange	S	S
Gray	E	-

Additional Information For Products Shown On Page 14-54:

For Basic Operators	Page 14-84
For Boots	Page 14-83
For Contact Blocks	Pages 14-78 – 14-79
For "H" Numbers	Page 14-80
For Legend Plates	Pages 14-81 – 14-82
For Lockouts	Page 14-83
For Outline Dimensions	Pages 14-92 – 14-93
For Ratings	Page 14-78
For Replacement Parts	Page 14-87
For Ring Nuts	Page 14-87

Additional Information For Products Shown On Page 14-55:

For Basic Operators	Page 14-84
For Boots	Page 14-83
For Contact Blocks	Pages 14-78 – 14-79
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14 PUSH BUTTONS



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

CONTROL RELAY

ACCESSORIES:

WITH PILOT LIGHTS

VOLTS:

24 VDC

NO. POLES:

DPDT

MANUFACTURER:

SQUARE D

CATALOG NO:

8501-KUD12P14V53

QUANTITY:

7

EQUIP. ID:

CR1 THRU CR7

ITEM:

RELAY SOCKET

MANUFACTURER:

SQUARE D

CATALOG NO:

8501-NR82

Class 8501 General Purpose Relays


Type K - Plug-in Relay

General and Order Information

Class 8501 Type K relays are designed for multipole switching applications at 240 volts or below. These relays have industry standard wiring and pin arrangements which allows for their use as replacements for many similar relays without wiring or hardware modifications.


- 10 or 15 Ampere Versions
- DPDT or 3PDT
- Manual Operator/
Pilot Light Options
- Horsepower Rated
- DPDT Latching Relay
- AC or DC Operation

Type KF – Flange Mounted – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KF12*
		3PDT		KF13*
	DC	DPDT	None Available	KFD12*
		3PDT		KFD13*

Socket is not required with Type KF relays.

Type KL – Latching Relay – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KL12*
	DC	DPDT	None Available	KLD12*

Stocked Relays.


Type	AC Voltage 50/60 Hz					Type	DC Voltage					
	6	12	24	120	240		6	12	24	48	110	125
Voltage Codes	V35	V36	V14	V20	V24	Voltage Codes	V50	V51	V53	V56	V60	V63
KP12	S	S	S	S	S	KPD12	S	S	S	S	S	S
KP12P14		S	S	S	S	KPD12P14		S	S		S	S
KP13		S	S	S	S	KPD13		S	S	S	S	S
KP13P14			S	S	S	KPD13P14			S			S
KU12		S	S	S	S	KUD12		S	S			
KU12M1						KUD12M1			S			
KU12P14			S	S		KUD12P14						
KU12M1P14			S	S	S	KUD12M1P14			S			
KU13		S	S	S	S	KUD13		S	S	S	S	
KU13M1						KUD13M1			S			
KU13P14			S	S		KUD13P14						
KU13M1P14			S	S	S	KUD13M1P14			S	S	S	S
KX12		S	S	S	NA	KXD12		S	S		S	
KX12M1				S	NA	KXD12M1		S	S			
KX12P14			S	S	NA	KXD12P14			S			
KX12M1P14			S	S	NA	KXD12M1P14		S	S			
KX13			S	S	NA	KXD13		S	S			
KX13M1			S	S	NA	KXD13M1						
KX13P14			S	S	NA	KXD13P14			S			
KX13M1P14			S	S	NA	KXD13M1P14		S	S		S	
KF12			S	S	S	KFD12		S	S			
KF13			S	S	S	KFD13		S	S			
KL12	NA	NA	S	S	S	KLD12		S	S		NA	NA

* Orders for Type K relays which are not stocked must call for a minimum quantity of 150 identical devices and will have a lead time of 16 weeks.
NA means Not Available.
* Voltage code must be specified to order this product. Refer to standard voltage codes listed above and insert as shown in How To Order.


How to Order:

To Order Specify:	Catalog Number		
<ul style="list-style-type: none"> • Class Number • Type Number • Voltage Code (See Stocked Relay Table above)	Class	Type	Voltage Code
	8501	KP12	V20


Type KP – Tubular Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KP12*
		DPDT	Pilot Light	KP12P14*
		3PDT	None	KP13*
		3PDT	Pilot Light	KP13P14*
	DC	DPDT	None	KPD12*
		DPDT	Pilot Light	KPD12P14*
		3PDT	None	KPD13*
		3PDT	Pilot Light	KPD13P14*

Type KU – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KU12*
		DPDT	Manual Operator	KU12M1*
		DPDT	Pilot Light	KU12P14*
		DPDT	Manual Operator and Pilot Light	KU12M1P14*
		3PDT	None	KU13*
		3PDT	Manual Operator	KU13M1*
		3PDT	Pilot Light	KU13P14*
		3PDT	Manual Operator and Pilot Light	KU13M1P14*
	DC	DPDT	None	KUD12*
		DPDT	Manual Operator	KUD12M1*
		DPDT	Pilot Light	KUD12P14*
		DPDT	Manual Operator and Pilot Light	KUD12M1P14*
		3PDT	None	KUD13*
		3PDT	Manual Operator	KUD13M1*
		3PDT	Pilot Light	KUD13P14*
		3PDT	Manual Operator and Pilot Light	KUD13M1P14*

Type KX – Spade Terminals

15 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KX12*
		DPDT	Manual Operator	KX12M1*
		DPDT	Pilot Light	KX12P14*
		DPDT	Manual Operator and Pilot Light	KX12M1P14*
		3PDT	None	KX13*
		3PDT	Manual Operator	KX13M1*
		3PDT	Pilot Light	KX13P14*
		3PDT	Manual Operator and Pilot Light	KX13M1P14*
	DC	DPDT	None	KXD12*
		DPDT	Manual Operator	KXD12M1*
		DPDT	Pilot Light	KXD12P14*
		DPDT	Manual Operator and Pilot Light	KXD12M1P14*
		3PDT	None	KXD13*
		3PDT	Manual Operator	KXD13M1*
		3PDT	Pilot Light	KXD13P14*
		3PDT	Manual Operator and Pilot Light	KXD13M1P14*

Pilot Light Option – Available on Types KP, KU, and KX. Internal pilot lights are available in both ac and dc versions for positive indication of power to the coil. 120V and 240V are neon, and below 90V are incandescent.
Manual Operator Option – Available on Type KU and KX only. To speed circuit testing a manual operator can be provided. With this feature the relay can be manually switched to simulate normal operation.

Application Data page 5
Dimensions page 5
Sockets page 6





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

TERMINAL BLOCKS

MANUFACTURER:
DESCRIPTIONS:
MODEL:
QUANTITY:
TAG NO.:

SQUARE-D
BOX LUG TYPE
AB1VV435UBLA
183
TB1, 2, 3, 4, 5

*WE REQUIRE FUSED DISCONNECT TERMINALS
FOR PLC 1/0 6TC. SEE SPECS.*

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for detailed design in the shop drawings rests with the contractor.

Responsibility for verifying the and correlation of field dimensions, materials and techniques of construction, and for the identification of all parts of the work with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT

NOT REVIEWED _____

Project No. 79538-C14-16

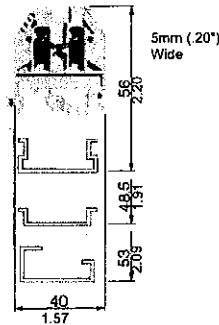
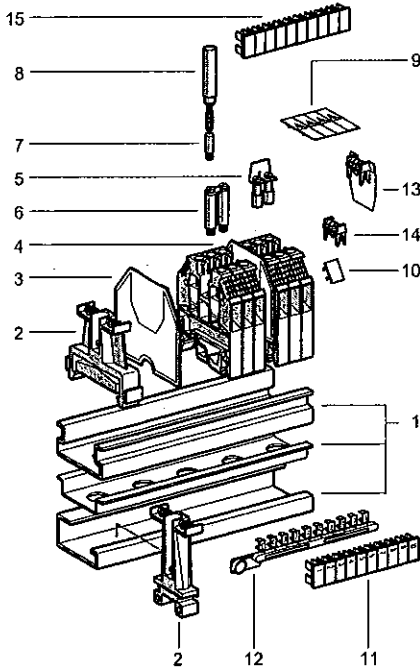
Date: 27/1/06 By: M. Jordan

IEC Sectional Terminal Blocks, Type AB1 Terminal Blocks Box Lug Termination

Color
Grey RAL 7032V0
Blue
Orange
Black
Red
Green
White

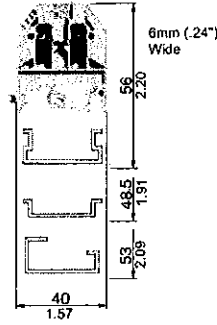
Catalog Number	Sold in lots of	Weight oz. (g)
AB1VV235U	100	.23 (6.5)
AB1VV235UBL	100	.23 (6.5)
AB1VV235UGE	100	.23 (6.5)

Catalog Number	Sold in lots of	Weight oz. (g)
AB1VV435U	100	.28 (7.8)
AB1VV435UBL	100	.28 (7.8)
AB1VV435UGE	100	.28 (7.8)
AB1VV435UNO	100	.28 (7.8)
AB1VV435URO	100	.28 (7.8)
AB1VV435UVE	100	.28 (7.8)
AB1VV435UBLA	100	.28 (7.8)



Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-12 AWG wire
Stranded wire without cable end: 0.5 to 2.5mm²
Stranded wire with cable end: 0.5 to 1.5mm²
Solid wire: 0.5 to 4.0mm²
UL 600V 20A
CSA 600V 25A
UTE, category C: ~ 500V, = 500V
VDE, group C: ~ 750V, = 900V, 26A
Tightening torque: 3.5-5.3 lb-in (0.4-0.6 N·m)
File E164359 CCN XCFR2
File LR89150 Class 6228 01
CE
DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, VDE, LCIE, SEV, FI, SEMKO, RINA, LR, CEBEC, OEVE, EEX



Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-10 AWG wire
Stranded wire without cable end: 0.5 to 4mm²
Stranded wire with cable end: 0.5 to 2.5mm²
Solid wire: 0.5 to 6mm²
UL 600V 30A
CSA 600V 35A
UTE, category C: ~ 500V, = 500V
VDE, group C: ~ 750V, = 900V, 34A
Tightening torque: 4.4-6.2 lb-in (0.5-0.7 N·m)
File E164359 CCN XCFR2
File LR89150 Class 6228 01
CE
DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, SEMKO, VDE, LCIE, SEV, FI, CEBEC, RINA, LR, OEVE, EEX

Accessories

Dimensions in mm

1 - 2.5 track	★
1 - 3 track	★
1 - 4 track	★
2 - Plastic end clamps	width 7.5 on 2.5 or 3
	width 8 on 2.5 or 3
2 - Metal end clamps	width 10 on 2.5 or 3
	width 8 on 2.5 or 3
3 - End barriers,	grey
thickness 3/3.5mm	blue
	orange
4 - Partition: thickness 3/3.5mm,	grey
5 - Jumpers with screws	non insulated
- for 2 poles	insulated
- for 10 poles	insulated
6 - Pivoting jumper bar for 2 blocks	
7 - Test plug socket, 3mm diameter	
8 - Test plug, 3mm diameter	
9 - "Danger" live terminals cover	
10 - Blank legend plate	
11 - Printed terminal marker strips	
12 - Printed terminal marker tag strips	
13 - Yellow partition for use between jumpers	
14 - Yellow protective cover for individual jumper	
15 - Yellow protective cover for 10 pole jumper	

▲ See pages 28 and 29.

★ See page 30.

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED● ★			
AM1D●● ★			
DZ5MB● ★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL2	80	10 3.70 (105)	
AB1ALN22	10	.07 (2.0)	
AB1ALN210	50	.35 (10)	
AB1BL2	50	.35 (10)	
AB1A2	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS2	100	.03 (0.8)	
AB1SA● ▲			
AB1B5●●● ▲			
AB1R● or G● ▲			
AB1CJ2	100	.01 (0.3)	
AB1CA2	100	.01 (0.1)	

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED● ★			
AM1D●● ★			
DZ5MB● ★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL4	70	10 5.11 (145)	
AB1ALN42	10	.10 (2.9)	
AB1ALN410	50	.51 (14.5)	
AB1BL4	50	.42 (12)	
AB1A4	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS4	100	.03 (0.9)	
AB1SA● ▲			
AB1B6●●● ▲			
AB1R● or G● ▲			
AB1CJ4	100	.01 (0.3)	
AB1CA4	100	.01 (0.1)	
AB1CA410ET	50	.04 (1.0)	

◆ Number of parallel connections (diagram reference 5).



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, quantities, materials, and methods of construction, in field construction. Position of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-CM-716

Date: 27/1/06 By: M. Foulon



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

POWER SUPPLY UNIT - LCP PANEL

ITEM:	PROGRAMMABLE LOGIC CONTROLLER	QTY
MANUFACTURER:	SQUARE-D, MODICON, QUANTUM	
BACLPLANE 10 SLOT:	140-XBP-010-00	1
I/O TERMINAL STRIPS:	140-XTS-001-00	5
PROCESSOR:	140-CPU-651-50	1
PLC POWER SUPPLY:	140-CPS-114-10	1
DISCRETE 24VDC 8 INPUTS:	140-DDI-353-10 (Source Inputs) *	1
DISCRETE INPUTS:	140-DAI-543-00 (120VAC, 16 Inputs) *	1
RELAY OUTPUT (N.O.):	140-DRA-840-00 ✓	1
ANALOG INPUTS:	140-AVI-030-00 ✗	1
ANALOG OUTPUTS:	140-ACO-020-00 (24VDC, 4 Outputs)	1
EQUIP ID:	PLC	

*USE THE CORRECT
I/O CARDS
AS SPECIFIED
AND ENSURE 20%
SPARE CAPACITY
IS AVAILABLE.*

Earth Tech (Canada) Inc.

Reviewed for general compliance with design and specifications. Revisions for any deviations noted in the review process will be noted on the drawing.

Responsible for the design and correlation of field dimensions and specifications. Includes parts of construction drawings and specifications of all parts of the work to be done by the contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538

Date: 27/1/06 By: [Signature]

Quantum Automation Platform

Backplanes

References, dimensions

References

Description	Number of slots	Reference	Weight kg (lb)
Racks for: Local I/O modules	2	140 XBP 002 00	0.230 (0.5)
Remote I/O modules	3	140 XBP 003 00	0.340 (0.75)
Distributed I/O modules	4	140 XBP 004 00	0.450 (1.0)
	6	140 XBP 006 00	0.640 (1.4)
	10	140 XBP 010 00	1.000 (2.2)
	16	140 XBP 016 00	1.600 (3.5)

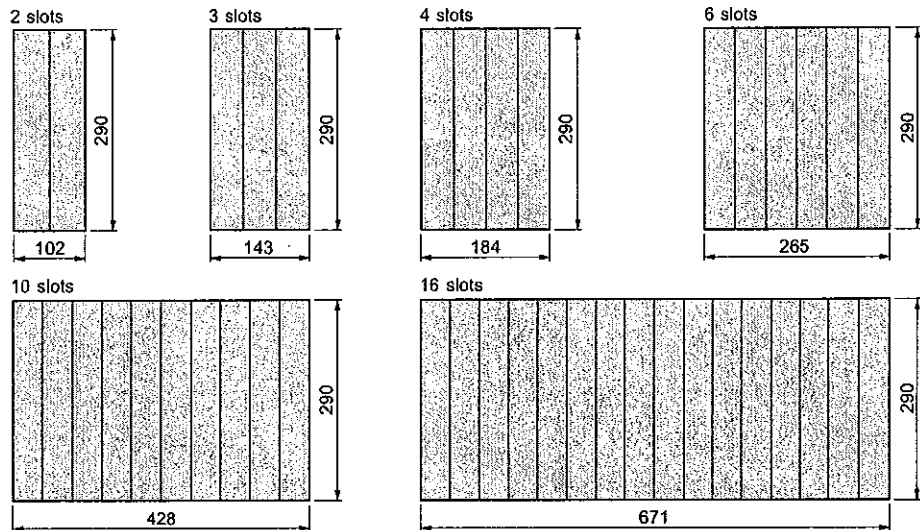
Backplane accessories

Description	Dimensions	Reference	Weight kg (lb)
Backplane expander	--	140 XBE 100 00	--
Backplane expander cables	1 m	140 XCA 717 03	--
	2 m	140 XCA 717 06	--
	3 m	140 XCA 717 09	--
19 in front rail mounting bracket for 140 XBP 010 00	125 mm (4.92 in) depth	140 XCP 401 00	--
19 in rear rail mounting bracket for 140 XBP 010 00	20 mm (0.79 in) depth	140 XCP 402 00	--

Dimensions

140 XBP 000 00

Front view



Depth with modules: 104 mm

Quantum Automation Platform

Power supply modules

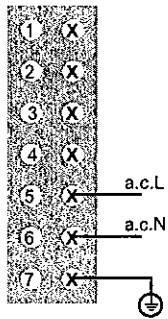
References, wiring

References

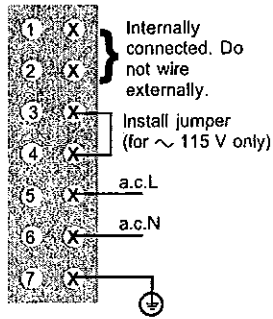
Power supplies			
Input Voltage/Power	Type	Reference	Weight kg (lb)
~ 120/230 V, 3 A	Standalone	140 CPS 111 00	0.650 (1.43)
~ 120/230 V, 8 A	Summable	140 CPS 114 10	0.650 (1.43)
~ 120/230 V, 8 A	Redundant	140 CPS 124 00	0.650 (1.43)
= 24 V, 3 A	Standalone	140 CPS 211 00	0.650 (1.43)
= 24 V, 8 A	Summable	140 CPS 214 00	0.650 (1.43)
= 24 V, 8 A	Redundant	140 CPS 224 00	0.650 (1.43)
= 48 ... 60 V, 8 A	Summable	140 CPS 414 00	0.650 (1.43)
= 48 ... 60 V, 8 A	Redundant	140 CPS 424 00	0.650 (1.43)
= 125 V, 3 A	Standalone	140 CPS 511 00	0.650 (1.43)
= 125 V, 8 A	Redundant	140 CPS 524 00	0.650 (1.43)
Accessories			
Power connector	IP20 rated	140 XTS 001 00	0.150 (0.33)

External wiring

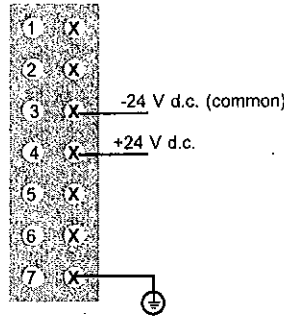
140 CPS 111 00



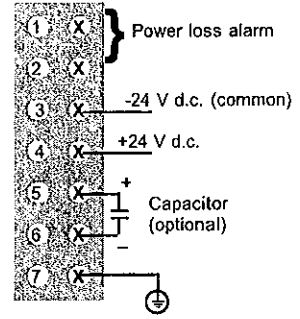
140 CPS 114 10
140 CPS 114/124 00



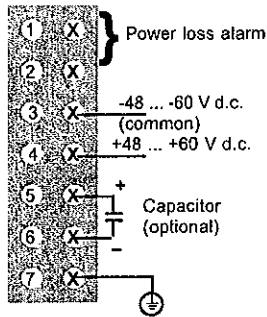
140 CPS 211 00



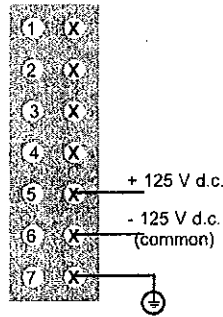
140 CPS 214/224 00



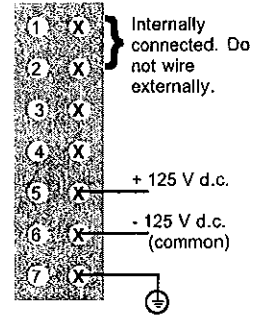
140 CPS 414/424 00



140 CPS 511 00






140 CPS 524 00



Quantum Automation Platform

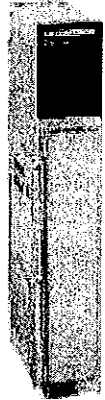
Discrete I/O

V d.c. input modules Selection guide

Type			
Input Voltage	5 V/TTL	24 V	
			
Number of Points	32		
Number of Groups	4		
Points/Common	8		
Isolation	by group		
Addressing Requirements	2 input words		
Bus Power Required	170 mA	330 mA	
Logic	Source	Sink	Source
Model	140 DDI 153 10	140 DDI 353 00	140 DDI 353 10
Page	48204/22		

15 V

230 V



16

32

16

32

16

2

4

16

4

1

8

1

8

individual points

by group

individual points

by group

1 input word

2 input words

1 input word

2 input words

180 mA

250 mA

180 mA

250 mA

140 DA1 540 00

140 DA1 543 00

140 DA1 553 00

140 DA1 740 00

140 DA1 753 00

			Relay	
--	--	--	-------	--

10 ... 60 V source	24 ... 125 V source	10 ... 30 V	Normally open	Normally open/ Normally closed
--------------------	---------------------	-------------	---------------	-----------------------------------



16	12	32	16	8
----	----	----	----	---

2	6	4	16	8
---	---	---	----	---

8	2	8	1	
---	---	---	---	--

2 A 6 A 12 A	0.75 A 3 A 6 A	0.5 A 4 A 16 A	2 A N/A N/A	5 A N/A N/A
--------------------	----------------------	----------------------	-------------------	-------------------

1 output word				0.5 output word
---------------	--	--	--	-----------------

160 mA	375 mA @ 6 points on 650 mA @ 12 points on	500 mA	1100 mA	560 mA
--------	---	--------	---------	--------

source				
--------	--	--	--	--

140 DDO 343-00	140 DDO 885-00	140 DVO 853-00	140 DRA 840-00	140 DRC 830-00
----------------	----------------	----------------	----------------	----------------

	48204/16	48204/16	48204/22	
--	----------	----------	----------	--

Quantum Automation Platform

Telefast® 2 pre-wired system

Modicon PLC and NUM numeric control I/O modules with interface sub-bases

Compatibility

I/O modules	Modicon PLCs										NUM numerical controls			
	984-A120-Compact					Quantum					NUM 1050/1060		NUM 1020	
	Inputs		Outputs			Discrete		Analogue			Inputs/Outputs		Inputs/Outputs	
	16		16			Inputs	Outputs	Inputs	Outputs		64 I	48 O	32 I	24 O
DEP 220	DEP 217	DAO 216	DAO 216	DAP 217	DDI 32	DDO 32	140 AVI 03000	140 AVO 02000	140 ACO 02000					
DEP 216		216	216		DDI 853		140 ACI 03000							
DEP 216														
Connection terminal blocks	Included										NUM cables not supplied			
Cabled connectors	ABF-M16 H●●0	M16 H●●1			M32 H●●0	M32 H●●1	M08 S201	M04 S200	M04 S201	-	-	-	-	
Splitter sub-bases	ABE-7-	-			-	-	-	-	-	ACC04	ACC05	ACC04	ACC05	

2

Connection sub-bases

8 channels	ABE-7H08R●●	(5)	(1)(2)		(1)	(2)					(2)		(2)	
	ABE-7H08S21	(5)									(2)		(2)	
12 channels	ABE-7H12R●●													
	ABE-7H12S21													
16 channels	ABE-7H16R●●		(1)											
	ABE-7H16S21													
	ABE-7H16R23					(1)								
	ABE-7H16F43													
	ABE-7H16S43					(3)								

Input adaptation sub-bases

16 channels	ABE-7S16E2●●													
	ABE-7P16F3●●													
	ABE-7P08T330						(2)							

Output adaptation sub-bases

8 channels	ABE-7S08S2●●													
	ABE-7R08S●●●						(2)							
	ABE-7P08T330						(2)							
16 channels	ABE-7R16S●●●													
	ABE-7R16T●●●													
	ABE-7P16T●●●													
	ABE-7S16S●●●													

Sub-bases for analogue/counter I/O

	ABE-7CPA01													
	ABE-7CPA02													
	ABE-7CPA03													
	ABE-7CPA21													
	ABE-7CPA31													

(1) With Telefast 2 sub-bases with no channel LED.

(2) With the splitter sub-base ABE-7ACC02.

(3) Only with module DDI 853.

(4) Only with module DDI 353

(5) With the splitter sub-base ABE-7ACC02 or with a cabled connector ABF-M16H●●1 directly.

Pre-wired cabled connectors

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions with shop drawings, coordination of construction, and final inspection of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

79538-C14-16

Date: 27/1/08

By: _____



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

OPERATOR TERMINALS

MANUFACTURER:
DESCRIPTIONS:

SQUARE-D
MAGELLIS 10.4" COLOR TOUCH SCREEN
SERIAL LINK

MODEL:
QUANTITY:
EQUIP. ID:

XBTF032110
1
HMI

Earth Tech (Canada) Inc.

Reviewed for general performance with design and
Requirements for the project in the attached drawings
made by the client.

It is noted that the design is in accordance with the
requirements of the project and the design is
approved for the project. The design is
approved for the project.

Date: 27/1/06

By: M. J. J. J.

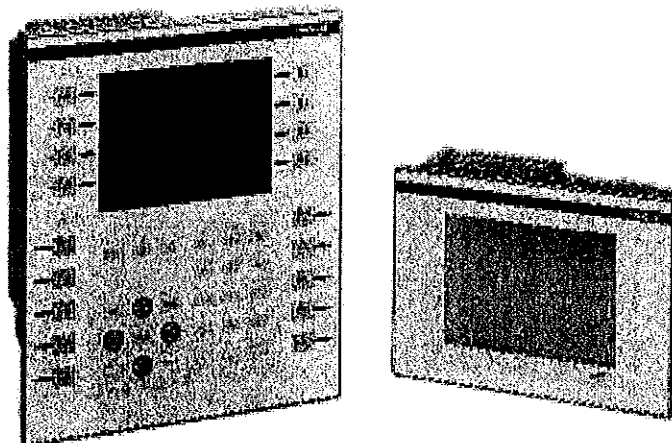
Project No. 79538-C14-16

Date: 27/1/06 By: M. J. J. J.

MAGELiS™ XBT-F Operator Terminals

MAGELiS XBT-F features also include:

- application and firmware storage on PCMCIA memory card
- screens:
 - back-lit grayscale LCD 5.7" or 9.5"
 - color resistive matrix STN, 5.7", 10.4" TFT
- multiple static and dynamic keys on keypad units
- serial link communication/Protocols for various types of PLCs
- easy configuration and operation providing three levels of password security
- compact design, spring mounting clips for fast installation
- customizable front panel design
- optional field bus communication for high speed networking
- wide variety of animated objects, alphanumeric variables, bargraphs, gauges, enumerated lists, and imported bitmaps
- custom help pages can be created using text, graphics, or dynamic objects
- alarm acknowledgement that can be prioritized, with ability to assign color attributes
- terminal simulation in software for verifying application programs with PC prior to PLC/terminal installation
- over 300 application, alarm, help, and recipe pages
- UL listed, CSA certified and with CE marking
- worldwide availability and fast delivery



Display, Modify, Control Your Application

MAGELiS XBT-F graphic units are an excellent match for your PLC, providing optimal functionality in a graphical operator terminal.

Combining up-to-date features with simple set-up and ease of use design techniques, the XBT-F will communicate with automation products from a variety of manufacturers. The MAGELiS display offers a compact economical solution in allowing data access and operator input meeting requirements for various applications.

MAGELiS display units connect directly to a PLC reducing programming within the PLC. A variety of PLC protocols are available and can be downloaded from your PC to the MAGELiS unit.

The Windows™-based configuration software allows you to easily create and modify messages and alarms. Alarms can be prioritized and assigned a large selection of colors. Printouts can include a time and date stamp.

Monochrome and color screens are available with a resolution of 320x240 or 640x480 pixels. Graphic terminals are available with static and dynamic keys, while the touch screens are resistive matrix tactile feedback. The XBT-F can provide animated objects, alphanumeric variables, bar graphs, gauges, enumerated lists, and a wide selection of imported bitmaps.

Designed to go wherever a push button or graphic display is needed, the XBT-F displays are rugged and dependable, providing an economical, multifunctional, and compact matrix interface.



Specifications

Environment

Temperature	
Operating	32°F to 113°F (0°C to 45°C)
Storage	-4°F to 140°F (-20°C to 60°C)
Degree of Protection	
Front Panel	IP 65, conforming to IEC 529, NEMA 4
Rear Panel	IP 20, conforming to IEC 529
Conforming to Standards	
	IEC 1132-2, IEC 801-2 level 3, IEC 801-3 and IEC 801-4 level 3 IEC 68-2-8, IEC 68-2-27 UL 508, CSA

Mechanical Specifications

Mounting	Flush-mounted, by pressure type fasteners (supplied) on .04 to .24 in (1.6 to 6 mm) thick panel
Enclosure	Polyphenylene oxide 10% glass fiber impregnated (PPO GFN1 SE1)
Front Panel	Hardened polyester anti-UV treated (Autoflex EB AG)
Weight	5.7", 3.5 lbs (1.6 kg) 10.4", 5.3 lbs (2.4 kg) 5.7", 4 lbs (1.8 kg) > Keypad only 10.4", 6 lbs (2.78 kg)


Electrical Specifications

Display	5.7" monochrome, back-lit with 16 levels of grey (keypad)	5.7" STN 256 colors, back-lit with resistive matrix tactile feedback (touch screen)	XBT-F023: 9.5" monochrome, back-lit with 16 levels of grey XBT-F024: 10.4" TFT 256 colors	10.4" TFT 256 colors with resistive matrix tactile feedback
Power Supply	Voltage	24 VDC		
	Voltage Limits	18-30 V		
	Ripple	5% maximum		
Consumption		35 W		

Product Selection

Terminals with graphic screen XBT-F

	Number of Key					Size of screen	Type of screen	Power supply = V	Part #
	Static Func.	Dyn Func.	Serv.	Alpha Num	Option				
XBT-F Keypad	10	8	12	15	no	5.7"	monochrome	24	XBT-F011110
	10	8	12	15	PCMCIA III	5.7"	monochrome	24	XBT-F011310
	12	10	12	15	no	9.5"	monochrome	24	XBT-F023110
	12	10	12	15	PCMCIA III	9.5"	monochrome	24	XBT-F023310
	12	10	12	15	no	10.4"	color	24	XBT-F024110
	12	10	12	15	PCMCIA III	10.4"	color	24	XBT-F024310
XBT-F Touch					no	5.7"	color	24	XBT-F032110
					PCMCIA III	5.7"	color	24	XBT-F032310
					no	10.4"	color	24	XBT-F034110
					PCMCIA III	10.4"	color	24	XBT-F034310

Square D and  are registered trademarks of Square D Company.

MAGELIS is a trademark of Schneider Electric, S.A.

Windows is a registered trademark of Microsoft Corporation.

Bulletin No. 9001HO9902

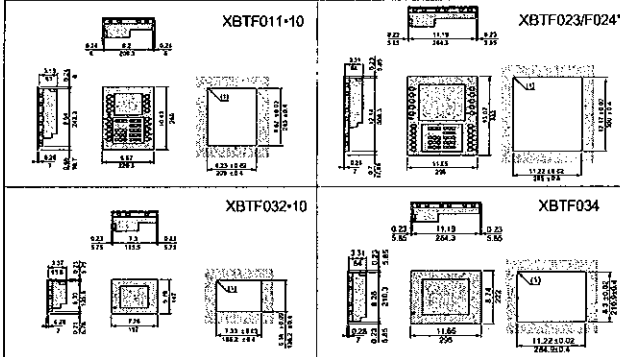


SQUARE D
Schneider Electric

Operating Characteristics

Keypad type communications	XBT-F011	XBT-F023/F024
Soft Keys	8 (with LED)	10 (with LED)
Static Keys	10 (with LED and re-usable labels)	12 (with LED and re-usable labels)
Service Keys	12	12
Alphanumeric Keys	12 + 3 for alphabetical access	12 + 3 for alphabetical access
Memory		
RAM	2.5 MB	
Application Pages	400 approximately	
Alarm Pages	400 approximately	
Application Memory	4, 8, 10 MB	
Transmission Medium	Asynchronous serial link RS232/RS485/RS422	
Real-Time Clock	Access to programmable controller real-time clock	
Printer Port	Asynchronous serial link RS232	
Power Supply Connection	5-pin plug-in terminal block	
Data Connection		
Serial Port	SUB-D 25-pin female connector	
Printer Port	SUB-D 9-pin male connector	
Configuration Software	Windows™- compatible program XBT-L100_U (sold separately)	
Downloadable Protocols	Popular communication protocols available (sold separately)	

Dimensions



* (1) r=0.14 in. (35mm), maximum; 0.08 in (2mm), minimum

Earth Tech (Canada) Inc.

Reviewed for general conformance with drawings.
Responsible for any errors or omissions in the drawings with
respect to the above.

Responsible for the accuracy and interpretation of all
dimensions, notes, and details shown on drawings
concerning the above. Responsible for all
parts of the work that are not shown on drawings.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 27/1/06 By: V. Yousef



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

POWER SUPPLY UNIT - LCP PANEL

ITEM:

RECEPTACLE

MANUFACTURER:

HUBBELL

DESCRIPTIONS:

2 POLE, 3 WIRE GROUNDINGS

MODEL:

GF5252I

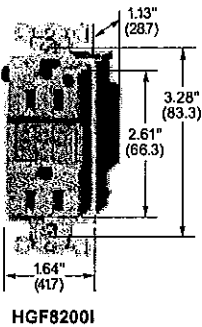
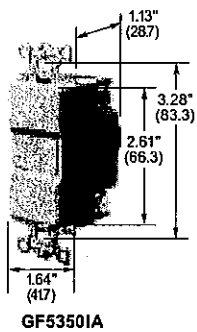
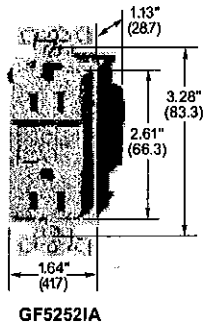
QUANTITY:

1

TAG NO.:

GFI-1

Safety Devices
 Ground Fault Circuit Interrupting Products
2 Pole 3 Wire Grounding
 15 and 20 Ampere, 120 Volt AC
**Straight Blade Commercial Specification Grade
 and Commercial Hospital Grade GFCI Duplex Receptacles**



**Circuit Guard®
 Commercial Specification Grade
 GFCI Duplex Receptacles**



NEMA 5-15R
 15A 125V
 UL CSA
 0.5 HP



NEMA 5-20R
 20A 125V
 UL Listed
 1 HP

Description	Color	Catalog Numbers	
Flush, polycarbonate face, side wired, slotted screws.	Brown	GF5252A	GF5352A
	Ivory	GF5252IA	GF5352IA
	Gray	GF5252GYA	GF5352GYA
	White	GF5252WA	GF5352WA
	Black	GF5252BKA	GF5352BKA

Circuit Guard Faceless GFCI

Description	Color	Catalog Number	
Flush	Ivory	-	GF5350IA

CSA Certified

**Circuit Guard
 Commercial Hospital Grade
 GFCI Duplex Receptacles**

Description	Color	Catalog Numbers	
Flush, polycarbonate face, side wired, slotted screws.	Brown	HGF8200	HGF8300
	Ivory	HGF8200I	HGF8300I
	Gray	HGF8200GY	HGF8300GY
	Red	HGF8200R	HGF8300R
	White	HGF8200W	HGF8300W

*Note: GFCI type receptacles should not be used in critical care patient areas or for electrical life support equipment applications because of the possibility of power interruption.
 All GFCI Receptacles listed above include matching nylon wallplates.*

Specifications

Trip Level	4 to 6 mA.
Trip Time	.025 sec. Nominal.
Frequency	60 Hz.
Voltage	120V AC +10% -15%.
Maximum Interrupting Capacity	2000A.
Operating Temperature	-35°C to +66°C or -30°F to +150°F.
Maximum Humidity	95%.
Listings & Standards	Meets UL 498 for Receptacles, UL 943 Class A for GFCIs UL File E41978. CSA Certified.
Codes	Meets all 1996 NEC requirements.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

POWER SUPPLY UNIT - LCP PANEL

ITEM:

POWER SUPPLY

MANUFACTURER:

SQUARE D

DESCRIPTIONS:

24 VDC, 2.5A POWER SUPPLY

MODEL:

ABL7RE2403

QUANTITY:

1

EQUIP. ID:

PS-209

ENSURE THAT REDUNDANT POWER SUPPLIES ARE AVAILABLE WITH DIODES IN O/P.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for the final design in the shop drawings rests with the Contractor.

Reviewed for accuracy and correlation of field data with design intent. Characteristics of construction materials and location of all parts of the work shall be verified by the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No.

79538-C14-16

Date:

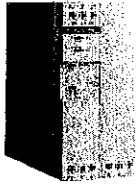
27/1/06

By:

[Signature]

PHASEO™ Power Supplies

Selection - Dimensions and Wiring



ABL7RE2405
ABL7RP2405
ABL7RP4803

Single Phase Regulated Switch Mode Power Supplies ABL7RE

Mains Input Voltage 47-63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac Single Phase Wide Range	24 Vdc	48 W	2 A	Auto	No	ABL7RE2402	1.14 lb (0.520 kg)
		72 W	3 A	Auto	No	ABL7RE2403	1.14 lb (0.520 kg)
		120 W	5 A	Auto	No	ABL7RE2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto	No	ABL7RE2410	4.85 lb (2.200 kg)

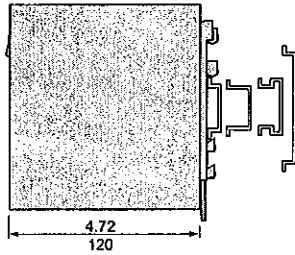
Single Phase Regulated Switch Mode Power Supplies ABL7RP

Mains Input Voltage 47-63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac 100 to 250 Vdc Single Phase Wide Range	12 Vdc	60 W	5 A	Auto/Man	Yes	ABL7RP1205	2.20 lb (1.000 kg)
	24 Vdc	72 W	3 A	Auto/Man	Yes	ABL7RP2403	1.14 lb (0.520 kg)
		120 W	5 A	Auto/Man	Yes	ABL7RP2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto/Man	Yes	ABL7RP2410	4.85 lb (2.200 kg)
	48 Vdc	144 W	3 A	Auto/Man	Yes	ABL7RP4803	2.2 lb (1.000 kg)

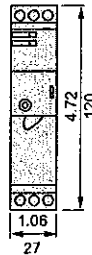
ABL7RE2402/ABL7RP4803

Common side view

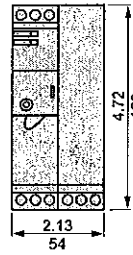
Clip-on mounting on 35 and 75 mm rails



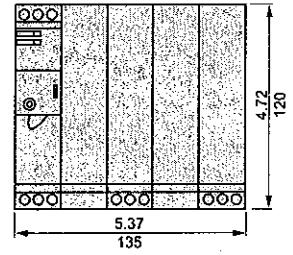
7RE2402/2403
7RP2403



7RE2405
7RP1205/2405/4803

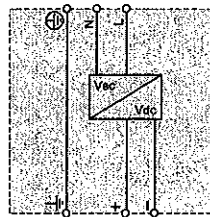


7RE2410
7RP2410

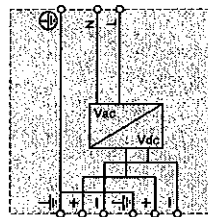


Dual Dimensions = $\frac{\text{in}}{\text{mm}}$

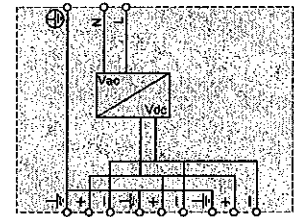
ABL7RE2402/2403



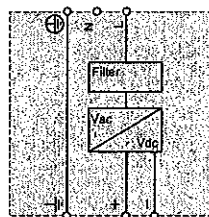
ABL7RE2405



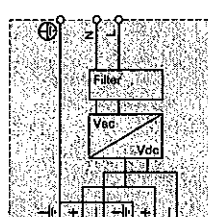
ABL7RE2410



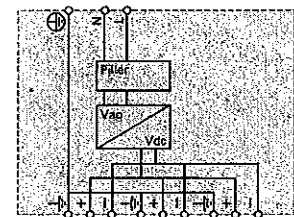
ABL7RE2403



ABL7RE1205/2405/4803



ABL7RE2410



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the subject matter rests with the Contractor.

Responsibility for verification and correction of field dimensions, materials, workmanship, and construction methods rests with the Contractor. This includes all parts of the work reviewed by the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06

By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE MASTER PLC PANEL

ITEM:	ENCLOSURE
MANUFACTURER:	HOFFMAN
MODEL:	A-907224FSD
TYPE:	SINGLE - DOOR, NEMA 12 ENCLOSURE (90" X 72" X 24")
COLOR:	FUJI BLUE <i>SEE PREVIOUS COMMENTS</i>
TYPE:	FULL SIZE, BACK PANEL (68" X 60")
MODEL:	A-90P72F1
QUANTITY:	1

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, layout, materials, techniques of construction, assembly and installation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

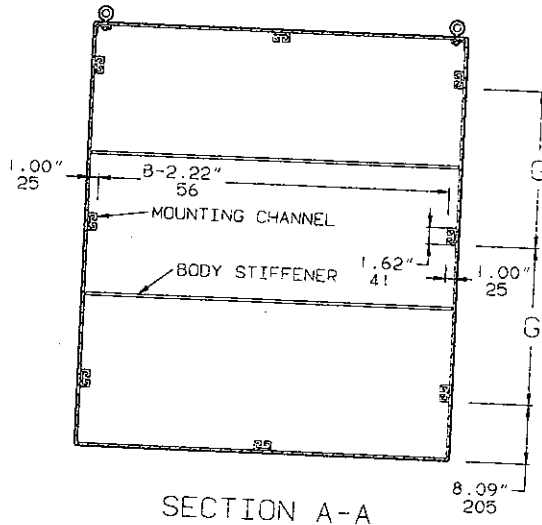
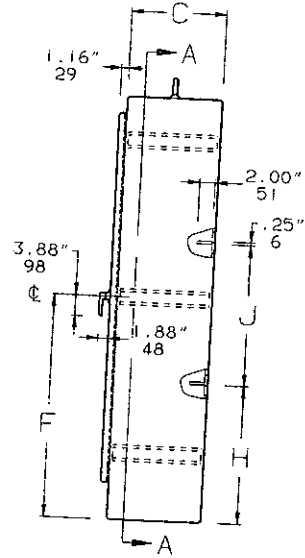
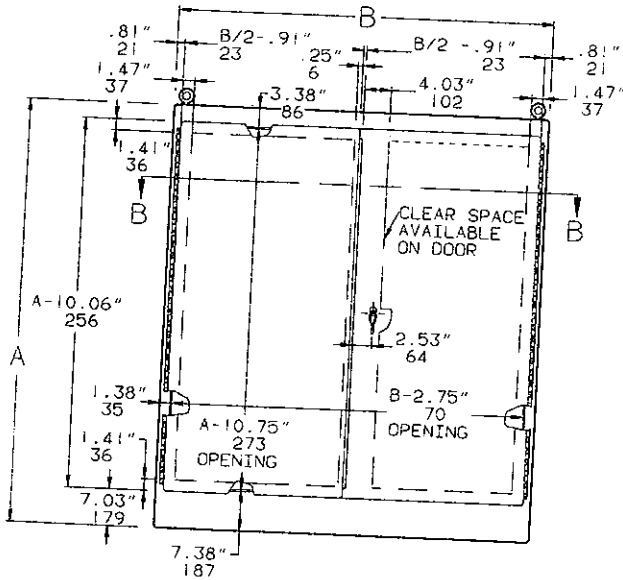
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: M. Johnson

Two-Door Single Access



C2489-

- NOTE:
1. Four lifting eyes are furnished if C = 30.06 (764) or more.
 2. See General Accessories for section views A-A and B-B showing accessories.
 3. Removable 12.00x12.00 (305x305) data pocket.

Inch
Millimeter

Standard Sizes Two-Door Single Access Free-Standing Type 12 Enclosures

Enclosure Catalog Number	Enclosure Size A x B x C		F		G		H		J	
	inch	(millimeter)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)
A-604818FSD	60.06 x 48.06 x 18.06	(1526 x 1221 x 472)	32.03	(814)	23.12	(587)	19.88	(505)	20.03	(509)
A-724818FSD	72.06 x 48.06 x 18.06	(1830 x 1221 x 472)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-726018FSD	72.06 x 60.06 x 18.06	(1830 x 1526 x 472)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-727218FSD	72.06 x 72.06 x 18.06	(1830 x 1830 x 472)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-904820FSD	90.06 x 48.06 x 20.06	(2288 x 1221 x 510)	47.03	(1195)	38.12	(968)	29.88	(759)	30.03	(763)
A-907220FSD	90.06 x 72.06 x 20.06	(2288 x 1830 x 510)	47.03	(1195)	38.12	(968)	29.88	(759)	30.03	(763)
A-724824FSD	72.06 x 48.06 x 24.06	(1830 x 1221 x 611)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-726024FSD	72.06 x 60.06 x 24.06	(1830 x 1526 x 611)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-727224FSD	72.06 x 72.06 x 24.06	(1830 x 1830 x 611)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-907224FSD	90.06 x 72.06 x 24.06	(2288 x 1830 x 611)	47.03	(1195)	38.12	(968)	29.88	(759)	30.03	(763)
A-726036FSD	72.06 x 60.06 x 36.06	(1830 x 1526 x 916)	38.03	(966)	29.12	(740)	23.88	(607)	24.03	(610)
A-907236FSD	90.06 x 72.06 x 36.06	(2288 x 1830 x 916)	47.03	(1195)	38.12	(968)	29.88	(759)	30.03	(763)

Millimeter dimensions () are for reference only; do not convert metric dimensions to inch.

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correction of field dimensions, workmanship, techniques of construction, and safety coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE MASTER PLC PANEL

ITEM:	PROGRAMMABLE LOGIC CONTROLLER	Qty:
MANUFACTURER:	SQUARE-D, MODICON, QUANTUM	
6 SLOT RACK:	140-XBP-006-00	2
PLC POWER SUPPLY:	140-CPS-124-00	4
UNITY PLC:	140-CPU-671-60	2
HOT STANDBY KIT:	140-CHS-210-00	1
ETHERNET MODULE:	140-NOE-771-00	2
REMOTE I/O PROCESSOR:	140-CRP-931-00	2
PLC 10-SLOT RACK:	140-XBP-010-00	1
PLC 16-SLOT RACK:	140-XBP-016-00	1
REMOTE I/O ADAPTER:	140-CRA-931-00	2
DISCRETE INPUTS:	140-DAI-543-00 (120VAC, 16 POINTS)	4
DISCRETE OUTPUTS:	140-DRA-840-00 (20-250VAC, 16 POINTS)	2
ANALOG INPUTS:	140-AVI-030-00 (1-5VDC, 4-20mA 8 POINTS)	8
ANALOG OUTPUTS:	140-ACO-020-00 (4-20Ma, VDC, 4 POINTS)	2
EQUIP ID:	PLC	

SEE PREVIOUS COMMENTS

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, field construction techniques, of construction, rest of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

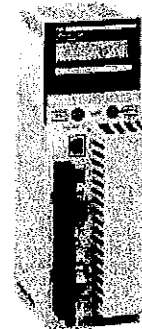
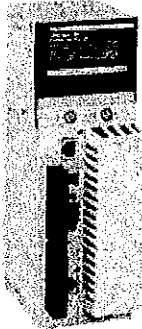
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]

Complex applications

Applications with redundancy (Hot Standby)



2 racks (1 main + 1 extension)	
31 stations with 2 racks (1 main + 1 extension)	
3 networks with 63 single-rack stations	
No limit (max. 26 slots)	
31,744 input channels and 31,744 output channels	
8000 input channels and 8000 output channels per network	
No limit (max. 26 slots)	
1984 input channels and 1984 output channels	
500 input channels and 500 output channels per network	
Intrinsically safe I/O, high-speed counter, axis control, interrupt inputs, serial link, accurate time stamping	

6

1 integrated RS 232/485 Modbus slave RTU/ASCII port	
Limited number on local rack (max. 26 slots), 4 on remote rack (RIO), 2 on distributed rack (DIO)	
Profibus DP/SERCOS MMS, 6 "option" modules on local rack	
1 integrated port, 6 "option" modules on local rack (3)	
1 integrated port (10BASE-T/100BASE-TX), 6 "option" modules on local rack	1 integrated 100BASE-FX Hot Standby port, 6 "option" modules on local rack
1 port reserved for programming PC	
20 to 60 programmable channels	> 60 programmable channels
Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules	> 60 programmable channels (5)
	Yes
512 Kb	768 Kb
128 Kb	
Up to 7168 Mb	
8192 Mb	

1/9

- (1) Modbus Plus modules: Only the first 2 of the 6 modules feature the full range of functions.
- (2) The number of loops is limited according to their complexity (volume of associated data to be transferred from Normal to Standby).
- (3) The maximum values for the number of discrete I/O and analog I/O are not cumulative.
- (4) Usage values, including memory resources and processor power.
- (5) Profibus DP modules by our partner Prosoft.

Quantum Automation Platform

Backplanes

References, dimensions

References

Description	Number of slots	Reference	Weight kg (lb)
Racks for: Local I/O modules	2	140 XBP 002 00	0.230 (0.5)
Remote I/O modules	3	140 XBP 003 00	0.340 (0.75)
Distributed I/O modules	4	140 XBP 004 00	0.450 (1.0)
	6	140 XBP 006 00	0.640 (1.4)
	10	140 XBP 010 00	1.000 (2.2)
	16	140 XBP 016 00	1.600 (3.5)

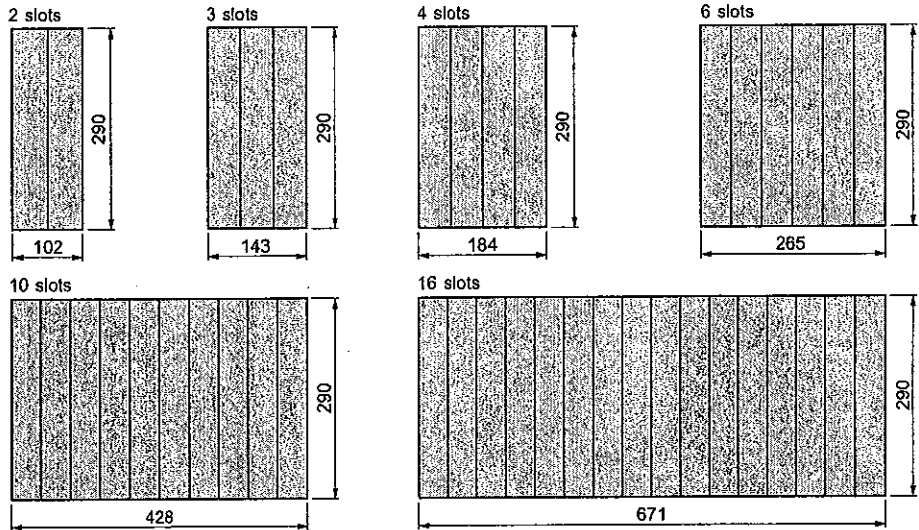
Backplane accessories

Description	Dimensions	Reference	Weight kg (lb)
Backplane expander	-	140 XBE 100 00	-
Backplane expander cables	1 m	140 XCA 717 03	-
	2 m	140 XCA 717 06	-
	3 m	140 XCA 717 09	-
19 in front rail mounting bracket for 140 XBP 010 00	125 mm (4.92 in) depth	140 XCP 401 00	-
19 in rear rail mounting bracket for 140 XBP 010 00	20 mm (0.79 in) depth	140 XCP 402 00	-

Dimensions

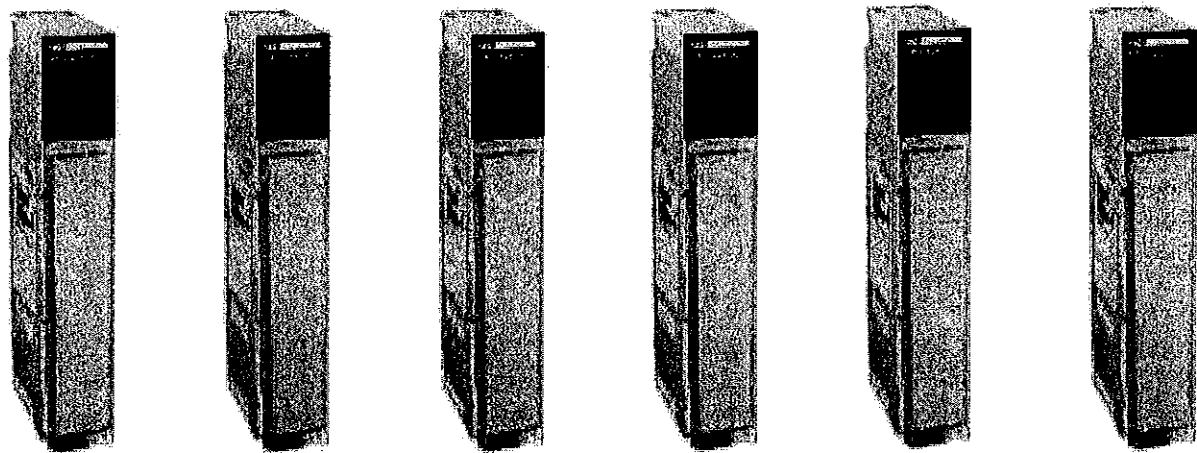
140 XBP 000 00

Front view



Depth with modules: 104 mm

Summable	Redundant
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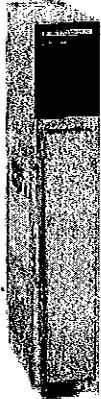


$\approx 20 \dots 30 \text{ V}$	$\approx 48 \dots 60 \text{ V}$	$\sim 93 \dots 138 \text{ V}$, or $\sim 170 \dots 276 \text{ V}$	$\approx 20 \dots 30 \text{ V}$	$\approx 48 \dots 60 \text{ V}$	$\approx 100 \dots 150 \text{ V}$
-	-	47 .. 63 Hz	-	-	-
3.8 A max.	3.8 A max.	1.1 A @ c 115 V 0.6 A @ c 230 V	3.8 A max.	3.8 A max.	0.5 A @ $\approx 125 \text{ V}$
8.0 A	8.0 A	8.0 A @ 60°C	8.0 A	8.0 A	8.0 A
5.0 A slow-blow	2.0 A medium time lag	2.0 A slow-blow	5.0 A slow-blow	2.0 A medium time lag	2.0 A slow-blow
1 ms	13 ms	8 ms	1 ms	13 ms	1 ms
Yes	Yes	No	Yes	Yes	No

140 CPS 214 00	140 CPS 414 00	140 CPS 124 00	140 CPS 224 00	140 CPS 424 00	140 CPS 524 00
----------------	----------------	----------------	----------------	----------------	----------------

115 V

230 V



16

32

16

32

16

2

4

16

4

1

8

1

8

individual points

by group

individual points

by group

1 input word

2 input words

1 input word

2 input words

180 mA

250 mA

180 mA

250 mA

140 DAI 540 00

140 DAI 543 00

140 DAI 553 00

140 DAI 740 00

140 DAI 753 00

Relay

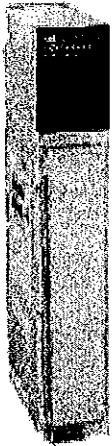
10...60 V source

24...125 V source

10...30 W

Normally open

Normally open/
Normally closed



16

12

32

16

8

2

6

4

16

8

8

2

8

1

2 A
6 A
12 A

0.75 A
3 A
6 A

0.5 A
4 A
16 A

2 A
N/A
N/A

5 A
N/A
N/A

1 output word

0.5 output word

160 mA

375 mA @ 6 points on
650 mA @ 12 points on

500 mA

1100 mA

560 mA

source

140 DDO 843 00

140 DDO 885 00

140 DVO 853 00

140 DRA 840 00

140 DRC 830 00

48204/16

48204/16

48204/22

Quantum Automation Platform

Telefast® 2 pre-wired system
Modicon PLC and NUM numeric control I/O modules with interface sub-bases

Compatibility

I/O modules	Modicon PLCs										NUM numerical controls			
	984-A120-Compact					Quantum					NUM 1050/1080		NUM 1020	
	Inputs		Outputs			Discrete		Analogue			Inputs/Outputs		Inputs/Outputs	
	16		16			32	32	8	4		64 I 48 O		32 I 24 O	
	DEP 220	DEP 217	DAO 216	DAO 216	DAP 217	DDI 353	DDO 353	140 AVI 03000	140 AVO 02000	140 ACO 02000				
	216		216	216		853		140 ACI 03000						
	DEP 216													
Connection terminal blocks	Included										NUM cables not supplied			
Cabled connectors	ABF-	M16 H00	M16 H01	M32 H00	M32 H01	M08 S201	M04 S200	M04 S201			-	-	-	-
Splitter sub-bases	ABE-7	-	-	-	-	-	-	-	-	-	ACC04	ACC05	ACC04	ACC05

Connection sub-bases

8 channels	ABE-7H08R00	(5)	(1), (5)		(1), (2)						(2)		(2)	
	ABE-7H08S21	(5)									(2)		(2)	
12 channels	ABE-7H12R00													
	ABE-7H12S21													
16 channels	ABE-7H16R00		(1)											
	ABE-7H16S21													
	ABE-7H16R23					(1)								
	ABE-7H16F43													
	ABE-7H16S43					(3)								

Input adaptation sub-bases

16 channels	ABE-7S16E200													
	ABE-7P16F300													
	ABE-7P08T330						(2)							

Output adaptation sub-bases

8 channels	ABE-7S08S200													
	ABE-7R08S000						(2)							
	ABE-7P08T330						(2)							
16 channels	ABE-7R16S000													
	ABE-7R16T000													
	ABE-7P16T000													
	ABE-7S16S000													

Sub-bases for analogue/counter I/O

	ABE-7CPA01													
	ABE-7CPA02													
	ABE-7CPA03													
	ABE-7CPA21													
	ABE-7CPA31													

(1) With Telefast 2 sub-bases with no channel LED.

(2) With the splitter sub-base ABE-7ACC02.

(3) Only with module DDI 853.

(4) Only with module DDI 353

(5) With the splitter sub-base ABE-7ACC02 or with a cabled connector ABF-M16H01 directly.

Pre-wired cabled connectors

2

Quantum Automation Platform

Hot standby modules

References

References

Description	Components	Reference	Weight kg (lb)
Hot Standby module	-	140 CHS 110 00	1.06 (2.33)
Hot Standby kit	2 CHS hot standby processors 1 fiber optic (3m) hot standby cable 1 CHS loadable software package 1 S908 terminator kit CHS installation manual	140 CHS 210 00	-
Quantum Hot Standby	System Planning and Installation Guide	840 USE 106 00	-

Quantum Automation Platform

I/O architectures

Remote I/O Characteristics

Head-end adapter and drop adapter characteristics

Model		140 CRP 931 00	140 CRP 932 00	140 CRA 931 00	140 CRA 932 00
Drop type		Quantum, 200 series, 500 series, 800 series, or Symax (any mix)		-	
I/O type		-		Quantum	
Modules/drop		31 max		28 max	
Words/drop		64 in /64 out words			
ASCII		2 ports per drop, 32 ports (16 drops), max. (Requires use of AS-P892-000, AS-J892-101/102, or AS-J290-0X0 at the RIO drops).		-	
Coax termination	Ω	Internal 75			
Coax shield		Tied to chassis ground		Capacitor to ground	
Data transfer rate	mb	1.544			
Dynamic range	dB	35			
Isolation	---	500 V coaxial cable, center conductor to ground			
Cable connections					
Single cable		One "F" type female connector with a right angle adapter			
Redundant cable		Two "F" type female connectors with a right angle adapter			
General	Holdup time	-		Software configurable NOTE: In the event of a communication loss with the remote processor, output modules during this time will retain their last operating state. Input module data will be held in the system controlling CPU. After this time, output modules will assume their predefined timeout states and inputs will be zeroed by the CPU.	
	Diagnostics	Power Up Dual port memory check LAN controller check		Power Up and Runtime Executive checksum RAM address/data	
	Maximum number of CRPs supported by the controller	1			
	Bus current requirement	mA	Single channel: 600		
		mA	Dual channel: 750		
	Power dissipation	W	Single channel: 3		
		W	Dual channel: 3.8		

Fiber optic cable considerations

If you are using a fiber optic link in your RIO network, consider the following when selecting fiber optic cable from a vendor:

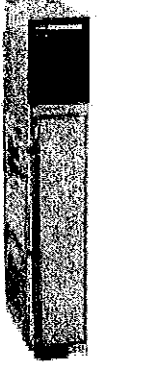
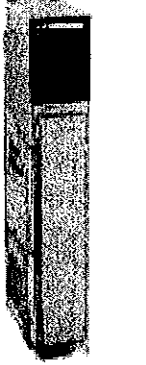

For most applications, 62.5/125 mm cable is recommended because of its relatively low loss and low signal distortion. However, in high optical power applications, such as those that use splitters or star couplers, the 100/140 mm cable should be used.

Wherever possible, select a multiconductor cable. It is inexpensive; it provides a backup path in case a cable gets cut in the process of pulling it; and you can use the extra path for voice, video, or other communications.

Quantum Automation Platform

Communications modules

Selection guide

Types	▶	TCP/IP, Modbus, Ethernet		MMS, Ethernet
				
Module function	▶	I/O scanner	Embedded web server	
Cable Port	▶	One RJ45 port for twisted-pair cable One ST port for fiber optic cable	One ST for fiber optic cable	One RJ45 for twisted-pair cable
Quantum CPU types	▶	All Quantum CPUs, controller, executive 2.0 or greater		
Data transfer frequency	▶	10/100 M bits/s base T, twisted pair cable 100 M bits/s base FX, fiber optic cable	10 M bits/s	
Bus current required	▶	1000 mA		
Compatibility	▶	Concept version 2.0 or higher ProWORX NxT version 2.0 or higher		ProWORX NxT version 2.0 or higher
Model	▶	140 NOE 771 00	140 NOE 771 10	140 NOE 251 00
Page	▶	48216/3		48214/3

Earth Tech (Canada) Inc.

Reviewed for general conformance with design and
Responsibility for detailed design in the shop or
tests with the Contractor.

Responsibility for interpretation and correlation of field
dimensions, construction, etc., and details of
construction, and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06

By: M. Paulsen



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	16A
NO. OF POLES:	1P,120V
CATALOG NO:	MG24508
MAGNETIC SETTINGS:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	2
EQUIP ID:	CB-3205, 6



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	2A
NO. OF POLES:	1P, 120V
CATALOG NO:	MG24501
MAGNETIC SETTING:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	7
EQUIP ID:	CB-3215, 19, 55, 61, 67, 89, 91



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	3A
NO. OF POLES:	1P;120V
CATALOG NO:	MG24502
MAGNETIC SETTINGS:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	3
EQUIP ID:	CB-3208, 10, 67



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	1A
NO. OF POLES:	1P,120V
CATALOG NO:	MG24500
MAGNETIC SETTINGS:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	4
EQUIP ID:	CB-3277, 79, 81, 83



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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	6A
NO. OF POLES:	1P,120V
CATALOG NO:	MG24504
MAGNETIC SETTINGS:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	2
EQUIP ID:	CB-3212, 14

Circuit Breakers

Supplementary Protectors

Current-Limiting MULTI-9™ C60N

Class 860

5 CIRCUIT BREAKERS



	Ampere Rating	B Curve	C Curve	D Curve	List Price
1-pole	0.5	—	MG17411	MG17421	\$ 72.
	1	MG24110	MG24425	MG24500	60.
	1.2	MG17402	MG17412	MG17422	60.
	1.5	MG17403	MG17413	MG17423	60.
	2	MG24111	MG24426	MG24501	60.
	3	MG24112	MG24427	MG24502	60.
	4	MG24113	MG24428	MG24503	60.
	5	MG17404	MG17414	MG17424	60.
	6	MG24114	MG24430	MG24504	60.
	7	MG17405	MG17415	MG17425	60.
	8	MG24115	MG24431	MG24505	60.
	10	MG24116	MG24432	MG24506	60.
	13	MG24117	MG24433	MG24507	60.
	15	MG17406	MG17416	MG17426	60.
	16	MG24118	MG24434	MG24508	60.
	20	MG24119	MG24435	MG24509	60.
	25	MG24120	MG24436	MG24510	60.
	30	MG17407	MG17417	MG17427	60.
	32	MG24121	MG24437	MG24511	60.
35	MG17408	MG17418	MG17428	60.	
40	MG24122	MG24438	MG24512	66.	
50	MG24123	MG24439	MG24513	70.	
60	MG17409	MG17419	MG17429	74.	
63	MG24124	MG24440	MG24514	74.	
2-pole	1	MG24125	MG24442	MG24516	130.
	1.2	MG17432	MG17442	MG17452	130.
	1.5	MG17433	MG17443	MG17453	130.
	2	MG24126	MG24443	MG24517	130.
	3	MG24127	MG24444	MG24518	130.
	4	MG24128	MG24445	MG24519	130.
	5	MG17434	MG17444	MG17454	130.
	6	MG24129	MG24447	MG24520	130.
	7	MG17435	MG17445	MG17455	130.
	8	MG24130	MG24448	MG24521	130.
	10	MG24131	MG24449	MG24522	130.
	13	MG24132	MG24450	MG24523	130.
	15	MG17436	MG17446	MG17456	130.
	16	MG24133	MG24451	MG24524	130.
	20	MG24134	MG24452	MG24525	130.
	25	MG24135	MG24453	MG24526	130.
	30	MG17437	MG17447	MG17457	130.
	32	MG24136	MG24454	MG24527	130.
	35	MG17438	MG17448	MG17458	130.
40	MG24137	MG24455	MG24528	134.	
50	MG24138	MG24456	MG24529	143.	
60	MG17439	MG17449	MG17459	151.	
63	MG24139	MG24457	MG24530	151.	
3-pole	1	MG24140	MG24459	MG24532	189.
	2	MG24141	MG24460	MG24533	189.
	3	MG24142	MG24461	MG24534	189.
	4	MG24143	MG24462	MG24535	189.
	6	MG24144	MG24464	MG24536	189.
	8	MG24145	MG24465	MG24537	189.
	10	MG24146	MG24466	MG24538	189.
	13	MG24147	MG24467	MG24539	189.
	15	MG17461	MG17466	MG17471	189.
	16	MG24148	MG24468	MG24540	189.
	20	MG24149	MG24469	MG24541	189.
	25	MG24150	MG24470	MG24542	189.
	30	MG17462	MG17467	MG17472	189.
	32	MG24151	MG24471	MG24543	189.
	35	MG17463	MG17468	MG17473	189.
	40	MG24152	MG24472	MG24544	194.
	50	MG24153	MG24473	MG24545	202.
	60	MG17464	MG17469	MG17474	211.
	63	MG24154	MG24474	MG24546	211.

Application

Control and protection of circuits against overloads and short circuits in control circuit application.

Technical Data

- **Ampere Rating:**
0.5 to 63A at 25°C.
- **Interrupting Capacity:**
UL 1077/CSA 22.2/IEC 947-2

Rating	Poles	Voltage	Interrupting Capacity (A)
0.5 to 63	1, 2, 3, 4	240 Vac	10000
	1	277 Vac	5000
	2, 3, 4	480Y/277 Vac	5000
0.5 to 63	1	65 Vdc	10000
	2	125 Vdc	10000

- Positive contact indication
- Current-limiting
- Fast-closing contacts

MULTI 9 is a Trademark of Merlin Gerin.

- **Tripping characteristics:**
B Curve: magnetic setting between 3.2 and 4.8 times Ampere rating
C Curve: magnetic setting between 7 and 10 times Ampere rating
D Curve: magnetic setting between 10 and 14 times Ampere rating
- **Tropicalization: treatment 2 (IEC)**
(relative humidity 95% at 55°C.)
- **Weight (oz/g):**

Type	1-pole	2-pole	3-pole	4-pole
		3.85/110	7.70/220	11.55/330	15.40/440

- **Pressure terminals: Cable size (Cu)**

Rating	Cable size (Cu)
0.5 to 25A	#18 to #4 AWG
32 to 63A	#18 to #2 AWG





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:

PILOT LIGHT

MANUFACTURER:

SQUARE D

MODEL:

9001KPKM1W31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

COLOR:

WHITE

QUANTITY:

1

TAG NO.:

PL-3204





Push Buttons

Type K – 30.5mm

Heavy Duty Pilot Lights

Class 9001

Pilot Lights – UL Types 4, 13/NEMA Type 4 & 13
 For use in hazardous locations – See Page 14-79.
 Legend Plates Not Included

Description	Voltage	Style	With Red Fresnel Color Cap	With Green Fresnel Color Cap	With Other Color Cap	Price	Without Color Cap	Price
 Standard Pilot Light (Plastic Fresnel Color Cap Shown)	110-120V, 50-60 Hz 220-240V, 50-60 Hz 24-28Vac-dc For Other Voltages See Table ①	Transformer Transformer Full Voltage Transformer, Flashing or LED ② Full Voltage, Neon or Resistor ③	KP1R31 KP7R31 KP35R31 KP0R31 KP0R31	KP1G31 KP7G31 KP35G31 KP0G31 KP0G31	KP1 ④ KP7 ④ KP35 ④ KP ④④ KP ④④	\$64.20 64.20 52.20 64.20 52.20	KP1 KP7 KP35 KP ④ KP ④	\$60.00 60.00 48.00 60.00 48.00
 Push To Test Pilot Light (Glass Color Cap Shown)	110-120V, 50-60 Hz 220-240V, 50-60 Hz 24-28Vac-dc For Other Voltages See Table ①	Transformer Transformer Full Voltage Transformer, Flashing or LED ② Full Voltage, Neon or Resistor ③	KT1R31 KT7R31 KT35R31 KT0R31 KT0R31	KT1G31 KT7G31 KT35G31 KT0G31 KT0G31	KT1 ④ KT7 ④ KT35 ④ KT ④④ KT ④④	82.20 82.20 70.20 82.20 70.20	KT1 KT7 KT35 KT ④ KT ④	78.00 78.00 66.00 78.00 66.00
 Remote Test Pilot Light (Glass Color Cap Shown)	120Vac Only 24-28Vac Only For Other Voltages See Table ①, ②	Resistor ④ Full Voltage ④ Full Voltage or Resistor ④	KTR38R31 KTR35R31 KTR0R31	KTR38G31 KTR35G31 KTR0G31	KTR38 ④ KTR35 ④ KTR ④④	82.20 82.20 82.20	KTR38 KTR35 KTR ④	78.00 78.00 78.00
 Pilot Light For Intrinsically Safe Circuits (NEMA Type 4X)	Intrinsically safe equipment must not release electrical or thermal energy capable of igniting certain explosive or combustible hazardous atmospheres, for which the equipment has been tested. These pilot lights are intrinsically safe when used with a suitable approved barrier or barrier relay (Class 8501 Type TO from Pages 19-22 and 19-23). These pilot lights are Factory Mutual (FM approved). Consult your local Square D Sales Office for further details. These pilot lights are fully encapsulated – there are no replaceable parts – except for the SK40 ring nut. Use KN100 series plastic legend plates as shown on Pages 14-81 and 14-82.		KP44R	KP44G	KP44Y (Yellow Color Cap)	75.00	—	—
	Operating Voltage Range	Nominal Current	V max. = 32V 1 max. = 165 ma.					
	20-30V AC/DC	25 ma.						

- ① Add the voltage assembly code as chosen from voltage assembly code table on Page 14-63.
 EXAMPLE: KT(1)R31 with a 60VAC red LED voltage=KT37LRR31
- ② Add the color code as chosen from the color cap table. EXAMPLE: KP1(2) with a blue fresnel cap = KP1L31
- ③ The color cap must be the same color as the LED voltage chosen, i.e., green LED use a green color cap.
- ④ On neon voltages use clear color caps only.
- ⑤ On remote test pilot lights use only full voltage or resistor voltage assembly codes. Do not choose LED, neon or transformer codes. For AC use only.

Push-To-Test Ground Detector Pilot Light

(Contact Block Included — But NOT Legend Plate or Color Cap)

Used in pairs to indicate a grounded condition in a control circuit fed from a grounded center-tapped transformer. The Type KT50 is commonly used in press control circuits, and fulfills the requirements of the ground detector called for in ANSI B11.1 (1971), Par. E3.6.5. Consult local Square D Sales Office for proper application.

Voltage and Frequency	Type	Price
110-120 V, 50-60 Hz	KT50	\$108.00

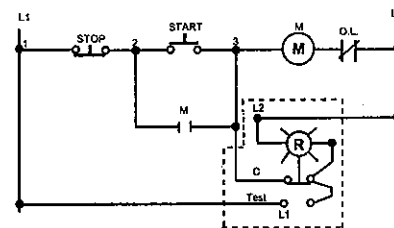
Color	(2) Plastic Fresnel	(2) Plastic Domed	(2) Glass
Amber	A31	A9	A6
Blue	L31	L9	L6
Clear	C31	C9	C6
Green	G31	G9	G6
Red	R31	R9	R6
White	W31	W9	W6
Yellow	Y31	Y9	Y6

For Basic Operators	Page 14-84
For Boots	Page 14-83
For Lamps	Page 14-77
For Legend Plates	Pages 14-81 – 14-82
For Light Modules	Pages 14-77
For Outline Dimensions	Pages 14-92 – 14-93
For Replacement Parts	Page 14-86
For Ring Nuts	Page 14-87

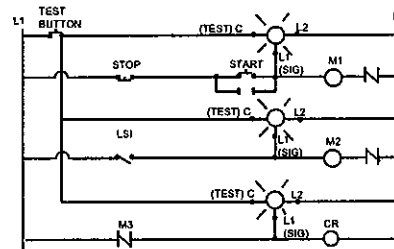
Voltage Assembly Codes

See Page 14-63

Typical Wiring Diagrams



Push-To-Test Pilot Light



Remote Test Pilot Light



14 PUSH BUTTONS



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:

CONTROL RELAY

ACCESSORIES:

WITH PILOT LIGHTS

VOLTS:

120 VDC

NO. POLES:

DPDT

MANUFACTURER:

SQUARE D

CATALOG NO:

8501-KUD13P14V53

QUANTITY:

20

EQUIP. ID:

CR1 THRU CR20

ITEM:

RELAY SOCKET

MANUFACTURER:

SQUARE D

CATALOG NO:

8501- NR82

QUANTITY:

20

Class 8501 General Purpose Relays


Type K - Plug-in Relay

General and Order Information

Class 8501 Type K relays are designed for multipole switching applications at 240 volts or below. These relays have industry standard wiring and pin arrangements which allows for their use as replacements for many similar relays without wiring or hardware modifications.


- 10 or 15 Ampere Versions
- DPDT or 3PDT
- Manual Operator/ Pilot Light Options
- Horsepower Rated
- DPDT Latching Relay
- AC or DC Operation

Type KF – Flange Mounted – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KF12*
		3PDT		KF13*
	DC	DPDT	None Available	KFD12*
		3PDT		KFD13*

Socket is not required with Type KF relays.

Type KL – Latching Relay – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KL12*
	DC	DPDT	None Available	KLD12*

Stocked Relays.


Type	AC Voltage 50/60 Hz					Type	DC Voltage						
	6	12	24	120	240		6	12	24	48	110	125	
Voltage Codes	V35	V36	V14	V20	V24	Voltage Codes	V50	V51	V53	V56	V60	V63	
KP12	S	S	S	S	S	KPD12	S	S	S	S	S	S	
KP12P14	S	S	S	S	S	KPD12P14	S	S	S	S	S	S	
KP13	S	S	S	S	S	KPD13	S	S	S	S	S	S	
KP13P14	S	S	S	S	S	KPD13P14	S	S	S	S	S	S	
KU12	S	S	S	S	S	KUD12	S	S	S	S	S	S	
KU12M1	S	S	S	S	S	KUD12M1	S	S	S	S	S	S	
KU12P14	S	S	S	S	S	KUD12P14	S	S	S	S	S	S	
KU12M1P14	S	S	S	S	S	KUD12M1P14	S	S	S	S	S	S	
KU13	S	S	S	S	S	KUD13	S	S	S	S	S	S	
KU13M1	S	S	S	S	S	KUD13M1	S	S	S	S	S	S	
KU13P14	S	S	S	S	S	KUD13P14	S	S	S	S	S	S	
KU13M1P14	S	S	S	S	S	KUD13M1P14	S	S	S	S	S	S	
KX12	S	S	S	NA	NA	KXD12	S	S	S	S	S	S	
KX12M1	S	S	S	NA	NA	KXD12M1	S	S	S	S	S	S	
KX12P14	S	S	S	NA	NA	KXD12P14	S	S	S	S	S	S	
KX12M1P14	S	S	S	NA	NA	KXD12M1P14	S	S	S	S	S	S	
KX13	S	S	S	NA	NA	KXD13	S	S	S	S	S	S	
KX13M1	S	S	S	NA	NA	KXD13M1	S	S	S	S	S	S	
KX13P14	S	S	S	NA	NA	KXD13P14	S	S	S	S	S	S	
KX13M1P14	S	S	S	NA	NA	KXD13M1P14	S	S	S	S	S	S	
KF12	S	S	S	S	S	KFD12	S	S	S	S	S	S	
KF13	S	S	S	S	S	KFD13	S	S	S	S	S	S	
KL12	NA	NA	S	S	S	KLD12	S	S	S	NA	NA	NA	

- Orders for Type K relays which are not stocked must call for a minimum quantity of 150 identical devices and will have a lead time of 16 weeks.
- NA means Not Available.
- Voltage code must be specified to order this product. Refer to standard voltage codes listed above and insert as shown in How To Order.


How to Order:

To Order Specify:	Catalog Number		
• Class Number	Class	Type	Voltage Code
• Type Number	8501	KP12	V20
• Voltage Code			
(See Stocked Relay Table above)			


Type KP – Tubular Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KP12*
		DPDT	Pilot Light	KP12P14*
		3PDT	None	KP13*
		3PDT	Pilot Light	KP13P14*
	DC	DPDT	None	KPD12*
		DPDT	Pilot Light	KPD12P14*
		3PDT	None	KPD13*
		3PDT	Pilot Light	KPD13P14*

Type KU – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KU12*
		DPDT	Manual Operator	KU12M1*
		DPDT	Pilot Light	KU12P14*
		DPDT	Manual Operator and Pilot Light	KU12M1P14*
		3PDT	None	KU13*
		3PDT	Manual Operator	KU13M1*
		3PDT	Pilot Light	KU13P14*
		3PDT	Manual Operator and Pilot Light	KU13M1P14*
	DC	DPDT	None	KUD12*
		DPDT	Manual Operator	KUD12M1*
		DPDT	Pilot Light	KUD12P14*
		DPDT	Manual Operator and Pilot Light	KUD12M1P14*
		3PDT	None	KUD13*
		3PDT	Manual Operator	KUD13M1*
		3PDT	Pilot Light	KUD13P14*
		3PDT	Manual Operator and Pilot Light	KUD13M1P14*

Type KX – Spade Terminals

15 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KX12*
		DPDT	Manual Operator	KX12M1*
		DPDT	Pilot Light	KX12P14*
		DPDT	Manual Operator and Pilot Light	KX12M1P14*
		3PDT	None	KX13*
		3PDT	Manual Operator	KX13M1*
		3PDT	Pilot Light	KX13P14*
		3PDT	Manual Operator and Pilot Light	KX13M1P14*
	DC	DPDT	None	KXD12*
		DPDT	Manual Operator	KXD12M1*
		DPDT	Pilot Light	KXD12P14*
		DPDT	Manual Operator and Pilot Light	KXD12M1P14*
		3PDT	None	KXD13*
		3PDT	Manual Operator	KXD13M1*
		3PDT	Pilot Light	KXD13P14*
		3PDT	Manual Operator and Pilot Light	KXD13M1P14*

Pilot Light Option – Available on Types KP, KU, and KX. Internal pilot lights are available in both ac and dc versions for positive indication of power to the coil. 120V and 240V are neon, and below 90V are incandescent.

Manual Operator Option – Available on Type KU and KX only. To speed circuit testing a manual operator can be provided. With this feature the relay can be manually switched to simulate normal operation.

Application Data page 5
 Dimensions page 5
 Sockets page 6





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE MASTER PLC PANEL

ITEM:	POWER SUPPLY
MANUFACTURER:	SQUARE D
DESCRIPTIONS:	24 VDC, 2.5A POWER SUPPLY
MODEL:	ABL7RE2403
QUANTITY:	2
EQUIP. ID:	PS-3212, 14

SEE PREVIOUS COMMENTS

Earth Tech (Canada) Inc.	
Reviewed for general conformance with design intent. Responsibility for correct design in the shop drawings rests with the Designer.	
Responsible for verification and correlation of field drawings with the design and techniques of construction, and the installation of all parts of the work, rests with the Contractor.	
REVIEWED	_____
REVIEWED AS MODIFIED	_____ ✓
REVISE AND RE-SUBMIT	_____
NOT REVIEWED	_____
Project No.	79538-014-16
Date: 27/1/06	By: <i>[Signature]</i>

PHASEO™ Power Supplies

Selection - Dimensions and Wiring



ABL7RE2405
ABL7RP2405
ABL7RP4803

Single Phase Regulated Switch Mode Power Supplies ABL7RE

Mains Input Voltage 47-63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac Single Phase Wide Range	24 Vdc	48 W	2 A	Auto	No	ABL7RE2402	1.14 lb (0.520 kg)
		72 W	3 A	Auto	No	ABL7RE2403	1.14 lb (0.520 kg)
	240 W	120 W	5 A	Auto	No	ABL7RE2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto	No	ABL7RE2410	4.85 lb (2.200 kg)

Single Phase Regulated Switch Mode Power Supplies ABL7RP

Mains Input Voltage 47-63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac 100 to 250 Vdc Single Phase Wide Range	12 Vdc	60 W	5 A	Auto/Man	Yes	ABL7RP1205	2.20 lb (1.000 kg)
	24 Vdc	72 W	3 A	Auto/Man	Yes	ABL7RP2403	1.14 lb (0.520 kg)
		120 W	5 A	Auto/Man	Yes	ABL7RP2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto/Man	Yes	ABL7RP2410	4.85 lb (2.200 kg)
	48 Vdc	144 W	3 A	Auto/Man	Yes	ABL7RP4803	2.2 lb (1.000 kg)

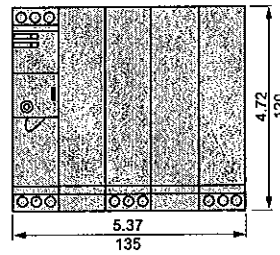
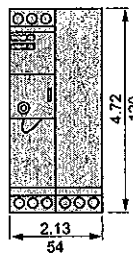
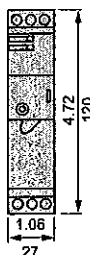
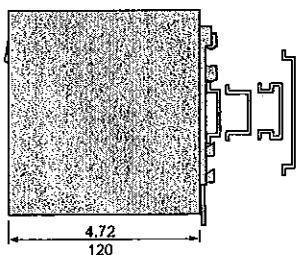
ABL7RE2402/ABL7RP4803

Common side view
Clip-on mounting on 35 and 75 mm rails

7RE2402/2403 7RP2403

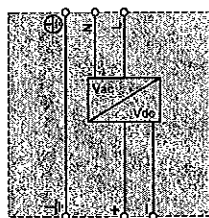
7RE2405 7RP1205/2405/4803

7RE2410 7RP2410

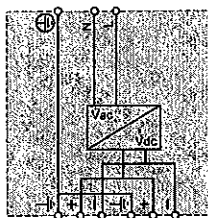


Dual Dimensions = $\frac{\text{in}}{\text{mm}}$

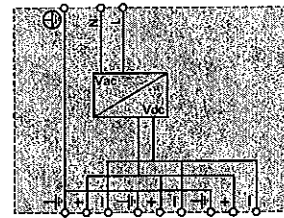
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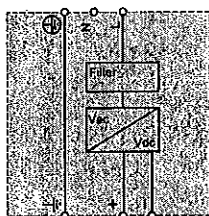
ABL7RE2405



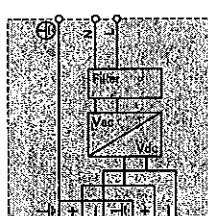
ABL7RE2410



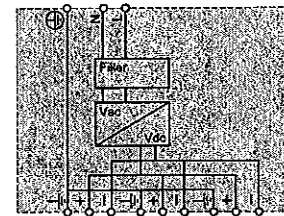
ABL7RE2403



ABL7RE1205/2405/4803



ABL7RE2410





Fuji Electric Corporation of America

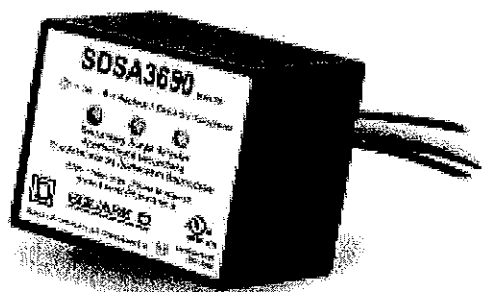
Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	SURGE SUPPRESSOR
MANUFACTURER:	SQUARE-D
DESCRIPTIONS:	120V
MODEL:	SDSA1175
QUANTITY:	1
TAG NO.:	SUP-1

SQUARE D SDSA Secondary Surge Arresters



Designed to the highest standards of reliability in the industry for protection against lightning and high current surges up to 40,000 amps

SQUARE D SDSA secondary surge arresters include two models, SDSA1175 and SDSA3650, which include the following distinctive features:

- UL and cUL Listed to UL 1449-Second Edition as TVSS and secondary surge arresters
- Designed to meet ANSI/IEEE C62.11-1987 for surge arresters
- Suitable for use in Category B and C locations, for use on grounded systems only
- Metal oxide varistor (MOV) design for faster response and lower clamping voltages than traditional gas tube arresters
- Response time of less than 50 nanoseconds
- LED status indicator for easy visual indication of the device's operational status
- Non-replaceable internal fuse link for protection against varistor-damaging sustained overvoltages
- Housing made of high-temperature thermoplastic to ensure reliable performance in both indoor and outdoor applications
- Maintenance-free, long-life design.

Application Data

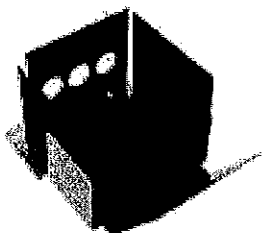
The SDSA1175 is designed for use on 120/240 Vac, 50/60 Hz electrical services. Two of these devices can be used to protect 208Y/120 Vac three-phase, four-wire services.

The SDSA3650 is designed to be used where maximum phase-to-ground system voltage does not exceed 600 Vac. Other applications include surge protection of irrigation pumps, oil pumps and motors operating below 600 V.

Both the SDSA1175 and SDSA3650 must be used on grounded systems only.



QOSAMK
Surge Arrester
Mounting Kit



MMSAMK
Surge Arrester
Mounting Kit

Selection Information

	1 in. (25 mm) lead	3 in. (76 mm) lead	6 in. (152 mm) lead	12 in. (305 mm) lead	18 in. (457 mm) lead
SDSA1175					
1,500 A surge current	500V	550V	575V	600V	625V
5,000 A surge current	625V	675V	725V	875V	1050V
10,000 A surge current	750V	900V	1075V	1250V	1500V
SDSA3650					
1,500 A surge current	1525V	1750V	1775V	1800V	1825V
5,000 A surge current	1700V	2100V	2125V	2325V	2425V
10,000 A surge current	1925V	2375V	2400V	2700V	3000V

Merlin Gerin

Modicon

Square D

Telemecanique

Schneider Electric Brands



SQUARE D
Schneider Electric

SQUARE D SDSA

A design force focused on your needs for superior reliability and performance. Schneider Electric offers a wide selection of quality surge protective devices engineered and tested to meet your specific design and application requirements. All of our design and testing is based on years of proven expertise, including extensive testing and qualification in the industry's most advanced facilities.

In addition to SQUARE D SDSA secondary surge arresters, you can also depend on a comprehensive range of Schneider Electric Surge Protective Devices (SPDs) designed for a variety of surge protection needs:



SURGELOGIC™ XR Surge Protective Devices – Surge suppression protection with the added benefits of noise filtration capabilities in a compact, hardwired package for protection from surges up to 40,000 amps on single-phase power systems.



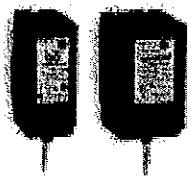
SURGELOGIC™ XW Surge Protective Devices – Available for three-phase power systems up to 600V, the XW is a hardwired TVSS capable of withstanding surges as high as 100,000 amps. The XW comes standard in a Type 1 enclosure with status lights, audible alarm and dry contacts.



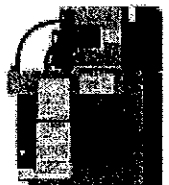
SURGELOGIC™ LC Surge Protective Devices – A hybrid device (surge suppression and noise filtration) with up to 40,000 amps surge protection and -75dB of noise filtration; ideal for custom control and other applications with microprocessors, PLCs and motion control.



MERLIN GERIN Multi 9 SPD Surge Protective Devices – A DIN-rail mountable, compact device for MERLIN GERIN applications offering multiple configurations for single- and three-phase power systems with surge protection capacities from 20,000 amps to 80,000 amps.



SURGEBREAKER® Secondary Surge Arresters – Specifically designed for QO or HOMELINE load centers, these SPDs easily plug into place for a secure fit, providing surge protection up to 40,000 amps.



SURGELOGIC™ I-LINE® Surge Protective Devices (TVSS) – Designed as the perfect match for I-LINE panelboards and switchboards offering three-phase protection that easily snaps into place in retrofit or new installations; surge protection up to 160,000 amps and 240,000 amps.





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE MASTER PLC PANEL

ITEM:	TERMINAL BLOCKS
MANUFACTURER:	SQUARE-D
DESCRIPTIONS:	BOX LUG TYPE
MODEL:	AB1VV435UBLA
TAG NO.	TB-1, X

SEE PREVIOUS COMMENTS

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

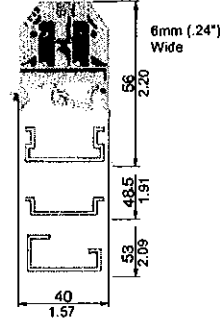
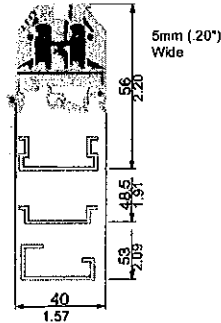
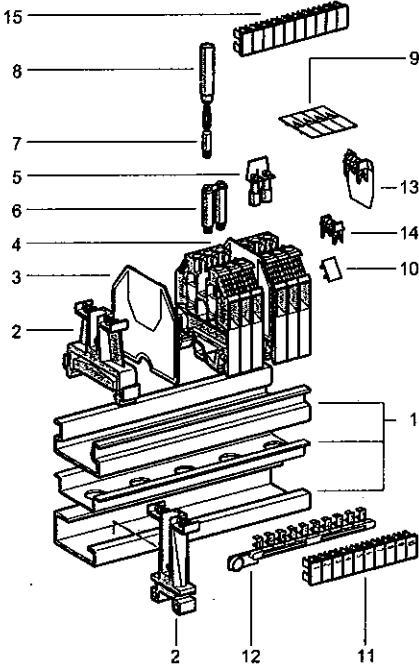
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: [Signature]

IEC Sectional Terminal Blocks, Type AB1 Terminal Blocks Box Lug Termination

Color	Catalog Number	Sold in lots of	Weight oz. (g)	Catalog Number	Sold in lots of	Weight oz. (g)
Grey RAL 7032V0	AB1VV235U	100	.23 (6.5)	AB1VV435U	100	.28 (7.8)
Blue	AB1VV235UBL	100	.23 (6.5)	AB1VV435UBL	100	.28 (7.8)
Orange	AB1VV235UGE	100	.23 (6.5)	AB1VV435UGE	100	.28 (7.8)
Black				AB1VV435UNO	100	.28 (7.8)
Red				AB1VV435URO	100	.28 (7.8)
Green				AB1VV435UVE	100	.28 (7.8)
White				AB1VV435UBLA	100	.28 (7.8)



Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-12 AWG wire
Stranded wire without cable end: 0.5 to 2.5mm²
Stranded wire with cable end: 0.5 to 1.5mm²
Solid wire: 0.5 to 4.0mm²
UL 600V 20A
CSA 600V 25A
UTE, category C : ~ 500V, = 500V
VDE, group C : ~ 750V, = 900V, 26A
Tightening torque: 3.5-5.3 lb-in (0.4-0.6 N·m)
File E164359 CCN XCFR2
File LR89150 Class 6228 01
CE
DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, VDE, LCIE, SEV, FI, SEMKO, RINA, LR, CEBEC, OEVE, EEX

Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-10 AWG wire
Stranded wire without cable end: 0.5 to 4mm²
Stranded wire with cable end: 0.5 to 2.5mm²
Solid wire: 0.5 to 6mm²
UL 600V 30A
CSA 600V 35A
UTE, category C : ~ 500V, = 500V
VDE, group C : ~ 750V, = 900V, 34A
Tightening torque: 4.4-6.2 lb-in (0.5-0.7 N·m)
File E164359 CCN XCFR2
File LR89150 Class 6228 01
CE
DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, SEMKO, VDE, LCIE, SEV, FI, CEBEC, RINA, LR, OEVE, EEX

Accessories

Dimensions in mm

1 - 2.5 track ★	
1 - 3 track ★	
1 - 4 track ★	
2 - Plastic end clamps	width 7.5 on 2.5
	width 8 on 2.5 or 3.5
2 - Metal end clamps	width 10 on 2.5
	width 8 on 2.5 or 3.5
3 - End barriers,	grey
thickness 3/3.5mm	blue
	orange
4 - Partition: thickness 3/3.5mm, grey	
5 - Jumpers with screws	non insulated
- for 2 poles	insulated
- for 10 poles	insulated
6 - Pivoting jumper bar for 2 blocks	
7 - Test plug socket, 3mm diameter	
8 - Test plug, 3mm diameter	
9 - "Danger" live terminals cover	
10 - Blank legend plate	
11 - Printed terminal marker strips	
12 - Printed terminal marker tag strips	
13 - Yellow partition for use between jumpers	
14 - Yellow protective cover for individual jumper	
15 - Yellow protective cover for 10 pole jumper	

▲ See pages 28 and 29.

★ See page 30.

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED★			
AM1D★★			
DZ5MB★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL2	80	3.70 (105)	
AB1ALN22	10	.07 (2.0)	
AB1ALN210	50	.35 (10)	
AB1BL2	50	.35 (10)	
AB1A2	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS2	100	.03 (0.8)	
AB1SA▲			
AB1B5●●●▲			
AB1R● or G●▲			
AB1CJ2	100	.01 (0.3)	
AB1CA2	100	.01 (0.1)	

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED★			
AM1D★★			
DZ5MB★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL4	70	5.11 (145)	
AB1ALN42	10	.10 (2.9)	
AB1ALN410	50	.51 (14.5)	
AB1BL4	50	.42 (12)	
AB1A4	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS4	100	.03 (0.9)	
AB1SA▲			
AB1B6●●●▲			
AB1R● or G●▲			
AB1CJ4	100	.01 (0.3)	
AB1CA4	100	.01 (0.1)	
AB1CA410ET	50	.04 (1.0)	

◆ Number of parallel connections (diagram reference 5).



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsible for field design in the shop drawings
read with the Contract.

Responsible for inspection and correlation of field
dimensions, location, grades, techniques of
construction, and other information of all
parts of the work with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06

By: [Signature]



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:

RECEPTACLE

MANUFACTURER:

HUBBELL

DESCRIPTIONS:

2 POLE, 3 WIRE GROUNDINGS

MODEL:

GF 5261

QUANTITY:

1

Safety Devices
Ground Fault Circuit Interrupting Products

2 Pole 3 Wire Grounding

15 and 20 Ampere, 120 Volt AC

**Straight Blade Heavy Duty, Industrial Specification Grade
and Hospital Grade Duplex Receptacles**



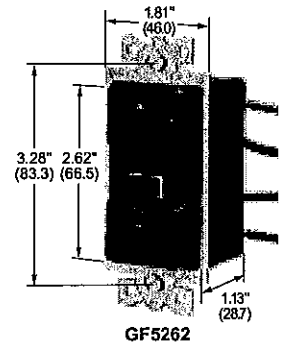
NEMA 5-15R
15A 125V
UL CSA
0.5 HP



NEMA 5-20R
20A 125V
UL Listed
1 HP

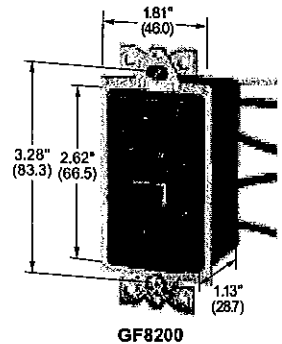
**Circuit Guard® Heavy Duty
Specification Grade GFCI Duplex Receptacles**

Description	Color	Catalog Numbers	
Flush nylon face with wire leads.	Brown	GF5262	GF5362
	Ivory	GF5262I	GF5362I
	Gray	GF5262GY	GF5362GY
	Red	GF5262R	GF5362R
	White	GF5262W	GF5362W



**Circuit Guard Heavy Duty Hospital Grade,
GFCI Duplex Receptacles**

Description	Color	Catalog Numbers	
Flush nylon face with wire leads.	Brown	GF8200	GF8300
	Ivory	GF8200I	GF8300I
	Gray	GF8200GY	GF8300GY
	Red	GF8200R	GF8300R
	White	GF8200W	GF8300W



Note: GFCI type receptacles should not be used in critical care patient areas or for electrical life support equipment applications because of the possibility of power interruption.

All GFCI receptacles listed above are furnished with the proper color nylon wall plate, and in addition, an S-26 302/304 super stainless steel wall plate.

Specifications

Trip Level	4 to 6 mA.
Trip Time	.025 sec. Nominal.
Frequency	60 Hz.
Voltage	120V AC +10% - 15%.
Maximum Interrupting Capacity	2000A.
Operating Temperature	-35°C to +66°C or -30°F to +150°F.
Maximum Humidity	95%.
Listings & Standards	Meets UL 498 for Receptacles, UL 943 Class A for GFCIs UL File E41978, CSA Certified.
Codes	Meets all 1996 NEC requirements.





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE MASTER PLC PANEL

ITEM:	COMPUTER
MANUFACTURER:	SQUARE D
MODEL:	MPCBN05NAA00N
PROCESSOR:	PENTIUM III 850 Mhz
RAM:	128mb
HARD DRIVE CAPACITY:	20 GB
ETHERNET:	10/100
QUANTITY:	1
MODEL:	MPCYN00RAM128
DESCRIPTION:	128mb RAM EXPANSION
QUANTITY:	1
MODEL:	MPCNT50NNN00N
DESCRIPTION:	FRONT PANEL 15" COLOR & TOUCH SCREEN
QUANTITY:	1

PLEASE PROVIDE MORE INFORMATION FOR THIS EQUIPMENT, IE MOUNTING ARRANGEMENT, LOCATION, WHAT IS RUNNING ON IT. ETC.

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions with the shop drawings, and coordination of construction with the design and intent of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 27/1/06 By: M. Paulson



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE MASTER PLC PANEL

ITEM:	ENCLOSURE LIGHT W/ DOOR SWITCH
MANUFACTURER:	HOFFMAN
DESCRIPTIONS:	120VAC, 50/60HZ, 15AMPS
MODEL:	A-LTDB1
QUANTITY:	1

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

responsibility for verification and correlation of field dimensions. Interpretation, practices, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____ ✓

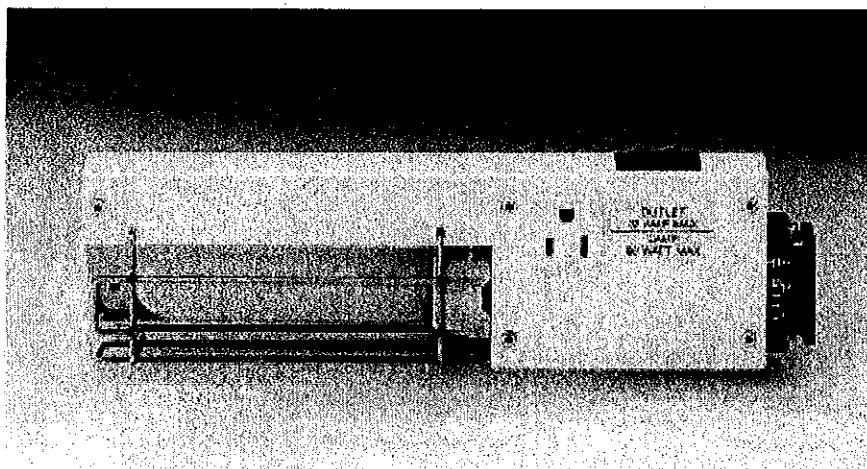
REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 30/1/06 By: M. Paula



Incandescent Lighting Package



Designed to illuminate the interior of an electrical enclosure. Models are available with a door-activated switch or a manually operated switch. A terminal block is provided for connection to the electrical supply circuit. A convenience outlet is also provided for ease of servicing components mounted within the enclosure. Lighting package mounts at the top of the enclosure door opening and protrudes into the opening less than one inch (25mm). A removable wire guard protects the bulb from damage.

Maintains UL/CSA Type 4 when properly installed on a Hoffman enclosure.

Construction

- 60 watt incandescent T-10 style bulb
- Terminal block has three 6-32 screw terminals with barriers labeled for power and ground connections
- Operates on 120 volts, 50/60 Hz
- 120 volt convenience outlet with ground, 12 amp maximum rating
- 20 gauge sheetmetal construction
- Stainless steel wire guard snaps in place for easy bulb replacement
- Includes two self-sealing installation screws

Industry Standards

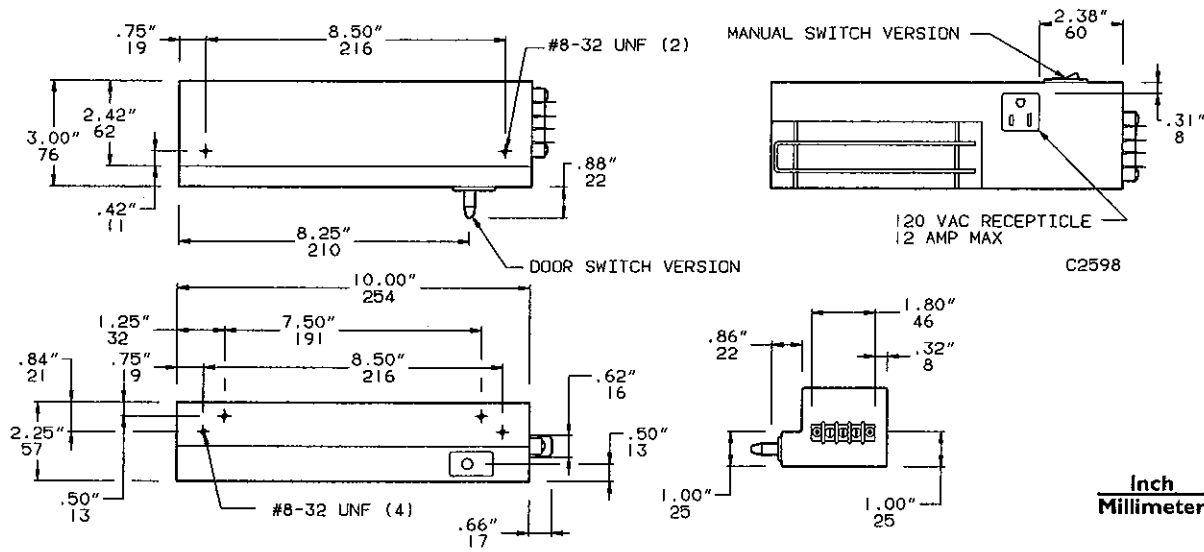
UL Component Recognized  
Certified by Canadian Standards Association

Finish

Lighting Package is white. Wire guard is stainless steel.

Installation

Designed to be mounted in most Hoffman Type 4, 12, 13, 3, and 3R enclosures. Front mounting holes are used on most applications. Two .173-inch (4mm) holes must be drilled in the enclosure. Lighting Package should be installed with two sealing screws which are included.



Catalog Number	Description	VAC	Hz	Amps
A-LTMB1	Manual switch with terminal block	120	50/60	15
A-LTDB1	Door switch with terminal block	120	50/60	15



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

ITEM:

DESTRUCT PANEL

MANUFACTURER:

HOFFMAN

MODEL:

A-36H3012SSLP

TYPE:

SINGLE DOOR, NEMA 4X

QUANTITY:

1

COLOR:

FUJI BLUE

TYPE:

SUB PANEL

MODEL:

A-36P30

QUANTITY:

1

SEE
PREVIOUS
COMMENTS

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, installation process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 30/1/06

By: M. Taylor



A Pentair Company

Stainless Steel Type 4X Enclosures

Standard Sizes Stainless Steel Type 4X Enclosures (Cont.)

Catalog Number Type 304	Catalog Number Type 316L	Enclosure Size A x B x C	* Steel Panel Catalog Number	* Stainless Steel Panel Catalog Number	Panel Size D x E	F	Clamps qty	Data Pocket	Stiffener Body
A-36H2408SSLP	◇ A-36H2408SS6LP	36.00 x 24.00 x 8.00 (914 x 610 x 203)	A-36P24	◇ A-36P24SS6	33.00 x 21.00 (838 x 533)	3.00 (76)	5	Large	—
A-36H3008SSLP	A-36H3008SS6LP	36.00 x 30.00 x 8.00 (914 x 762 x 203)	A-36P30	A-36P30SS6	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large	—
A-42H3608SSLP	◇ A-42H3608SS6LP	42.00 x 36.00 x 8.00 (1067 x 914 x 203)	A-42P36	◇ A-42P36SS6	39.00 x 33.00 (991 x 838)	3.00 (76)	8	Large	1
A-48H3608SSLP	◇ A-48H3608SS6LP	48.00 x 36.00 x 8.00 (1219 x 914 x 203)	A-48P36	A-48P36SS6	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large	1
A-20H1610SSLP	◇ A-20H1610SS6LP	20.00 x 16.00 x 10.00 (508 x 406 x 254)	A-20P16	A-20P16SS6	17.00 x 13.00 (432 x 330)	3.00 (76)	4	Small	—
A-24H2010SSLP	◇ A-24H2010SS6LP	24.00 x 20.00 x 10.00 (610 x 508 x 254)	A-24P20	A-24P20SS6	21.00 x 17.00 (533 x 432)	3.00 (76)	5	Small	—
—	◇ A-30H2410SS6LP	30.00 x 24.00 x 10.00 (762 x 610 x 254)	A-30P24	A-30P24SS6	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large	—
A-36H2410SSLP	◇ A-36H2410SS6LP	36.00 x 24.00 x 10.00 (914 x 610 x 254)	A-36P24	◇ A-36P24SS6	33.00 x 21.00 (838 x 533)	3.00 (76)	5	Large	—
A-36H3010SSLP	◇ A-36H3010SS6LP	36.00 x 30.00 x 10.00 (914 x 762 x 254)	A-36P30	A-36P30SS6	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large	1
A-42H3010SSLP	◇ A-42H3010SS6LP	42.00 x 30.00 x 10.00 (1067 x 762 x 254)	A-42P30	◇ A-42P30SS6	39.00 x 27.00 (991 x 686)	3.00 (76)	8	Large	1
—	◇ A-48H3610SS6LP	48.00 x 36.00 x 10.00 (1219 x 914 x 254)	A-48P36	A-48P36SS6	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large	1
A-24H2412SSLP	◇ A-24H2412SS6LP	24.00 x 24.00 x 12.00 (610 x 610 x 305)	A-24P24	A-24P24SS6	21.00 x 21.00 (533 x 533)	3.00 (76)	5	Small	—
A-30H2412SSLP	A-30H2412SS6LP	30.00 x 24.00 x 12.00 (762 x 610 x 305)	A-30P24	A-30P24SS6	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large	—
A-36H3012SSLP	A-36H3012SS6LP	36.00 x 30.00 x 12.00 (914 x 762 x 305)	A-36P30	A-36P30SS6	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large	1
A-36H3612SSLP	◇ A-36H3612SS6LP	36.00 x 36.00 x 12.00 (914 x 914 x 305)	A-36P36	◇ A-36P36SS6	33.00 x 33.00 (838 x 838)	3.00 (76)	7	Large	1
A-48H3612SSLP	◇ A-48H3612SS6LP	48.00 x 36.00 x 12.00 (1219 x 914 x 305)	A-48P36	A-48P36SS6	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large	1
A-60H3612SSLP	◇ A-60H3612SS6LP	60.00 x 36.00 x 12.00 (1524 x 914 x 305)	A-60P36	◇ A-60P36SS6	57.00 x 33.00 (1448 x 838)	3.00 (76)	9	Large	1
A-30H2416SSLP	◇ A-30H2416SS6LP	30.00 x 24.00 x 16.00 (762 x 610 x 406)	A-30P24	A-30P24SS6	27.00 x 21.00 (686 x 533)	3.00 (76)	5	Large	—
A-36H3016SSLP	◇ A-36H3016SS6LP	36.00 x 30.00 x 16.00 (914 x 762 x 406)	A-36P30	A-36P30SS6	33.00 x 27.00 (838 x 686)	3.00 (76)	7	Large	1
A-48H3616SSLP	A-48H3616SS6LP	48.00 x 36.00 x 16.00 (1219 x 914 x 406)	A-48P36	A-48P36SS6	45.00 x 33.00 (1143 x 838)	3.00 (76)	8	Large	1
—	◇ A-60H3616SS6LP	60.00 x 36.00 x 16.00 (1524 x 914 x 406)	A-60P36	◇ A-60P36SS6	57.00 x 33.00 (1448 x 838)	3.00 (76)	9	Large	1

Millimeter dimensions () are for reference only; do not convert metric dimensions to inch.

* Panels must be ordered separately. Optional aluminum and composite panels are available for many sizes. See General Accessories.

◇ Standard product available for shipment within 10 working days.

Panels

Panels for Type 3R, 4, 4X, 12 and 13 Enclosures

Steel panels are 12 gauge and have a white finish. Larger panels have flanges on two sides or four sides (see table). Some larger steel panels are 10 gauge and include extra holes for panel lifting (see table). Aluminum panels are 5052-H32 aluminum alloy. Larger panels have

flanges on four sides (see table). Aluminum panels are protected on one side with a plastic film. Stainless steel panels are Type 316 stainless steel. Panel mounting hardware is furnished with all enclosures which accept these panels.

Steel Panel Catalog Number	Panel Thickness (ga.) or Flange Thickness ("T")	Aluminum Panel Catalog Number	Panel Thickness ("T")	Stainless Steel Panel Catalog Number	Panel Thickness (ga.)	Panel Size D x E		Number of Holes	Edge Flanges
						inch	(millimeter)		
A-12DLP12	12 ga.	—	—	—	—	9.00 x 9.00	(229 x 229)	4	None
A-16P12	12 ga.	A-16P12AL	0.10 (3)	A-16P12SS6	12 ga.	13.00 x 9.00	(330 x 229)	4	None
A-20P12	12 ga.	—	—	—	—	17.00 x 9.00	(432 x 229)	4	None
A-16P16	12 ga.	A-16P16AL	0.10 (3)	◇ A-16P16SS6	12 ga.	13.00 x 13.00	(330 x 330)	4	None
A-20P16	12 ga.	A-20P16AL	0.10 (3)	A-20P16SS6	12 ga.	17.00 x 13.00	(432 x 330)	4	None
A-24P16	12 ga.	—	—	◇ A-24P16SS6	12 ga.	21.00 x 13.00	(533 x 330)	4	None
A-30P16	0.75 (19)	—	—	—	—	27.00 x 13.00	(686 x 330)	4	2
A-20P20	12 ga.	A-20P20AL	0.75 (19)	◇ A-20P20SS6	12 ga.	17.00 x 17.00	(432 x 432)	4	None*
A-24P20	0.75 (19)	A-24P20AL	0.75 (19)	A-24P20SS6	12 ga.	21.00 x 17.00	(533 x 432)	4	2
A-30P20	0.75 (19)	—	—	◇ A-30P20SS6	12 ga.	27.00 x 17.00	(686 x 432)	4	2
A-12P24	12 ga.	—	—	—	—	9.00 x 21.00	(229 x 533)	4	None
A-24P24	0.75 (19)	A-24P24AL	0.75 (19)	A-24P24SS6	12 ga.	21.00 x 21.00	(533 x 533)	4	2*
A-30P24	0.75 (19)	A-30P24AL	0.75 (19)	A-30P24SS6	12 ga.	27.00 x 21.00	(686 x 533)	4	2*
A-36P24	0.75 (19)	A-36P24AL	0.75 (19)	◇ A-36P24SS6	12 ga.	33.00 x 21.00	(838 x 533)	6	2*
A-42P24	0.75 (19)	—	—	—	—	39.00 x 21.00	(991 x 533)	6	2
A-48P24	0.75 (19)	—	—	—	—	45.00 x 21.00	(1143 x 533)	6	2
A-30P30	0.75 (19)	—	—	◇ A-30P30SS6	12 ga.	27.00 x 27.00	(686 x 686)	4	4
A-36P30	0.75 (19)	A-36P30AL	0.75 (19)	A-36P30SS6	12 ga.	33.00 x 27.00	(838 x 686)	6	4
A-40P30	0.75 (19)	—	—	—	—	37.00 x 29.00	(940 x 737)	4***	4
A-42P30	0.75 (19)	—	—	◇ A-42P30SS6	12 ga.	39.00 x 27.00	(991 x 686)	6	4
A-48P30	0.75 (19)	—	—	—	—	45.00 x 27.00	(1143 x 686)	6	4
A-60P30	0.75 (19)	—	—	—	—	57.00 x 27.00	(1448 x 686)	6	4
A-36P36	0.75 (19)	—	—	◇ A-36P36SS6	12 ga.	33.00 x 33.00	(838 x 838)	8	4
A-42P36	0.75 (19)	—	—	◇ A-42P36SS6	12 ga.	39.00 x 33.00	(991 x 838)	8	4
A-48P36	0.75 (19)	A-48P36AL	0.75 (19)	A-48P36SS6	12 ga.	45.00 x 33.00	(1143 x 838)	8	4
A-60P36	0.75 (19)	A-60P36AL	0.75 (19)	◇ A-60P36SS6	12 ga.	57.00 x 33.00	(1448 x 838)	8	4
A-72P36	0.75 (19)	—	—	—	—	69.00 x 33.00	(1753 x 838)	8	4
A-42P42	0.75 (218)	—	—	—	—	39.00 x 39.00	(991 x 991)	8	4
A-48P42	0.75 (19)	—	—	—	—	45.00 x 39.00	(1143 x 991)	8	4
A-54P42	0.75 (19)	—	—	—	—	50.00 x 38.00	(1270 x 965)	8	4
† A-60FP42	0.88 (22)	—	—	—	—	56.00 x 38.00	(1422 x 965)	10**	4
† A-48P48	0.88 (22)	—	—	—	—	44.00 x 44.00	(1118 x 1118)	8	4
† A-60P48	0.88 (22)	—	—	—	—	56.00 x 44.00	(1422 x 1118)	12**	4
† A-60P60	0.88 (22)	—	—	—	—	56.00 x 56.00	(1422 x 1422)	10**	4
† A-72P60	0.88 (22)	—	—	—	—	68.00 x 56.00	(1727 x 1422)	12**	4
† A-72P72	0.88 (22)	—	—	—	—	68.00 x 68.00	(1727 x 1727)	10**	4

Millimeter dimensions () are for reference only; do not convert metric dimensions to inch.

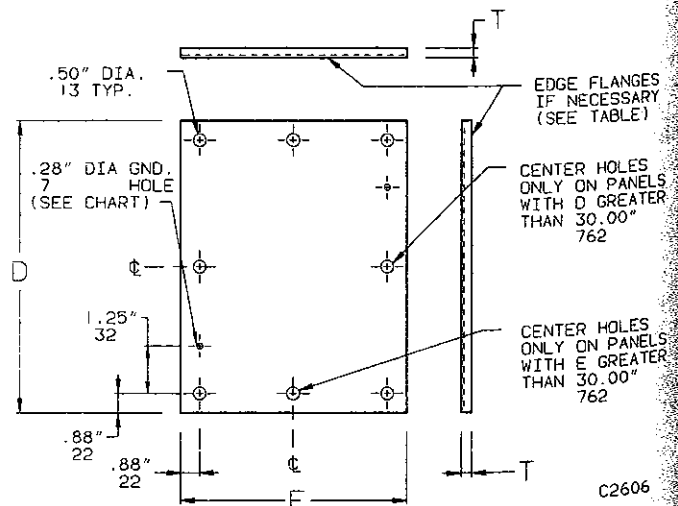
* Aluminum panels have four flanges.

** Extra holes are for panel lifting.

*** This panel is an exception to the illustration note regarding center holes on dimension "D".

† Panels are 10 gauge steel.

◇ Standard product available for shipment within 10 working days.



Inch
Millimeter

C2606



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	DISCONNECT HANDLE ASSEMBLY
MANUFACTURER:	SQUARE D
CATALOG NO:	LC46
QUANTITY:	1
SHAFT	LS12

Class 9421 Devices



3" Handle Assembly

Class 9421 Type L Circuit Breaker Mechanisms

Type L door-mounted, variable-depth operating mechanisms feature heavy duty, all metal construction with trip indication. All can be padlocked in the "OFF" position when the enclosure door is open. Further, the handle assemblies can be locked "OFF" with up to three padlocks, which also locks the door closed. (The 3" handle accepts one padlock.)

Complete Kits

Complete kits are rated for NEMA Type 1, 3R and 12 enclosures, and a door-drilling template is supplied to ease installation. They include a handle assembly, operating mechanism, and shaft assembly.



Standard Handle Assembly

Complete Kit Does Not Include Circuit Breaker.			Includes: Operating Mechanism Standard 6" Handle Standard Shaft Kit		Includes: Operating Mechanism Standard 6" Handle Long Shaft Kit		Includes: Operating Mechanism Short 3" Handle Long Shaft Kit	
Use With			Type	Mounting Depth [▲] Min.-Max.	Type	Mounting Depth [▲] Min.-Max.	Type	Mounting Depth [▲] Min.-Max.
GJL	3	75, 100	LG1	5 1/2-10 1/4	LG4	5 1/2-20 7/8	LG3	5 1/2-20 7/8
FAL, FCL, FHL	2-3	100	LN1	5 1/2-10 7/16	LN4	5 1/2-21	LN3	5 1/2-21
KAL, KCL, KHL	2-3	250	LP1	6 1/4-11 3/16	LP4	6 1/4-21 3/4	LP3	6 1/4-21 3/4
LAL, LHL, Q4L	2-3	400	LR1	6 3/16-10 7/8	LR4	6 3/16-21 1/2	3" handles are not recommended for use with these circuit breakers.	
MEL, MXL	2-3	800	LT1†	7 3/16-11 5/8	LT4†	7 3/16-22 1/4		
MAL, MHL	2-3	1000	LT1†	7 3/16-11 5/8	LT4†	7 3/16-22 1/4		
NAL, NCL, NEL, NXL	2-3	1200	LX1†	8 1/4-12 3/4	LX4†	8 1/4-23 3/8		

▲ Mounting depth measured from circuit breaker mounting surface (control panel) to outside of enclosure door in inches.

† Types LT1, LT4, LX1, and LX4 include an 8" handle rather than a 6" handle.

Component Parts

Component parts kits are rated for NEMA Type 1, 3, 3R, 4, 4X, and 12 enclosures. All handle assemblies are painted (the handle is flat black and the base ring is silver).



Operating Mechanism (includes lockout)

Use With			3" Handle Assemblies Type 1, 3R, 12	Std. Handle Assemblies Type 1, 3R, 12	Operating Mechanism Includes Lockout	Standard Shaft (Support Bracket Not Required)		Long Shaft (Support Bracket Included)	
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (Amps)	Type	Type	Type	Mounting Depth [■] Min.-Max.	Type	Mounting Depth [■] Min.-Max.	Type
GJL	3	75 100	LH3	LH6	LG7	5 1/2-10 7/16	LS8	5 1/2-21	LS12
FAL, FCL, FHL	2-3	100	LH3	LH6	LF1	5 1/2-10 7/16	LS8	5 1/2-21	LS12
KAL, KCL, KHL	2-3	250	LH3	LH6	LK1	6 1/4-11 3/16	LS8	6 1/4-21 3/4	LS12
LAL, LHL, Q4L	2-3	400	3" handles are not recommended for use with these circuit breakers.	LH6	LL1	6 5/16-10 7/8	LS8	6 5/16-21 1/2	LS10
MEL, MXL	2-3	800		LH8	LM1	7 3/16-11 5/8	LS8	7 3/16-22 1/4	LS10
MAL, MHL	2-3	1000		LH8	LM1	7 3/16-11 5/8	LS8	7 3/16-22 1/4	LS10
NAL, NCL, NEL, NXL	2-3	1200		LH8	LX7	8 1/4-12 3/4	LS8	8 1/4-23 3/8	LS10

■ Mounting depth measured from circuit breaker mounting surface (control panel) to outside of enclosure door in inches.

NEMA Type 3 and 4 Handle Assemblies*

Use With			Standard Handle Assemblies		Special 3" Version	
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (Amps)	NEMA Type 3, 4 (Painted)	NEMA Type 3, 4, 4X (Chrome Plated)	NEMA Type 3, 4 (Painted)	NEMA Type 3, 4, 4X (Chrome Plated)
			Type	Type	Type	Type
GJL	3	75	LH46	LC46	LH43	LC43
FAL, FCL, FHL	2-3	100	LH46	LC46	LH43	LC43
KAL, KCL, KHL	2-3	250	LH46	LC46	LH43	LC43
LAL, LHL, Q4L	2-3	400	LH46	LC46	3" handles are not recommended for use with these circuit breakers.	
MEL, MXL	2-3	800	LH48	LC48		
MAL, MHL	2-3	1000	LH48	LC48		
NAL, NCL, NEL, NXL	2-3	1200	LH48	LC48		

* Due to gasketing, NEMA Type 3 & 4 handle assemblies are NOT trip indicating.



IEC-Style Handle (for use with 9421LG8, see page 11)



File E62922
CCN: DIHS2





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	TEMPERATURE INDICATING CONTROLLER
MANUFACTURER:	WATLOW
MODEL:	96A0-CAAA-AARR
TYPE:	PID CONTROLLER
INPUT #1:	UNIVERSAL PROCESS, 4-20 MA
INPUT #2:	UNIVERSAL PROCESS, 4-20 MA
OUTPUT #1:	UNIVERSAL PROCESS, 4-20 MA
VOLTAGE:	120 VAC, 60 HZ
DISPLAY:	RED/RED
QUANTITY:	1
TAG No.:	TIC-1

Ordering Information

(2201)

Series 96

9 6

Microprocessor-based
 $\frac{1}{16}$ DIN with universal input 1.
 Options include software, power supply, input 2, four outputs and display color

Power Supply

- A = 100-240V \approx (ac/dc)
- B = 24-28V \approx (ac/dc)

Input 2

- 0 = None
- 1 = Event input & 0-5V \approx (dc)/4-20mA (remote set point input)

Output 1

- C = Switched dc/open collector
- D = Electromechanical relay, Form C, 2A, without RC suppression
- F = Universal Process, range selectable: 0-20mA, 4-20mA, 0-5V \approx (dc), 1-5V \approx (dc), 0-10V \approx (dc)
- K = 0.5A solid-state relay without RC suppression

Output 2

- A = None
- C = Switched dc/open collector
- D = Electromechanical relay, Form C, 2A, without RC suppression
- F = Universal Process, range selectable: 0-20mA, 4-20mA, 0-5V \approx (dc), 1-5V \approx (dc), 0-10V \approx (dc)
- K = 0.5A solid-state relay without RC suppression

Output 3

- A = None
- D = Electromechanical relay, Form C, 2A, without RC suppression

Output 4

- A = None
- D = Electromechanical relay, Form C, 2A, without RC suppression
- R = 232 Communications
- U = 485 Communications
- M = Universal Retransmit, range selectable: 0-20mA, 4-20mA, 0-5V \approx (dc), 1-5V \approx (dc), 0-10V \approx (dc)

Software/Preset Parameters

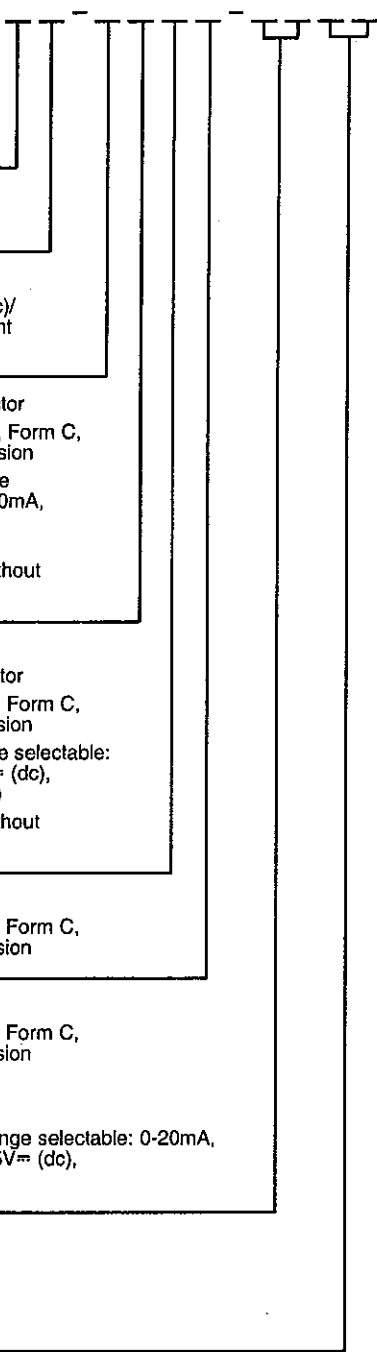
- 00 = Standard software
- AA = Ramping
- XX = Custom software
- XX = Preset parameters

Standard Display/Overlay

	Upper Display	Lower Display
RR	Red	Red
RG	Red	Green
GR	Green	Red
GG	Green	Green

Ramping Display/Overlay

	Upper Display	Lower Display
BA	Red	Red
BB	Red	Green
BC	Green	Red
BD	Green	Green





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

SELECTOR SWITCH

MANUFACTURER:

SQUARE D

MODEL:

9001SKS11BH1

TYPE:

30MM, 2 POSITION SELECTOR SWITCH

CONTACT:

(1) NO, NC

COLOR:

UNIVERSAL

QUANTITY:

1

TAG No.:

HS-2



Fuji Electric Corporation of America

Date : 1/13/06
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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

SELECTOR SWITCH

MANUFACTURER:

SQUARE D

MODEL:

9001SKS43BH2

TYPE:

30MM, 3 POSITION SELECTOR SWITCH

CONTACT:

(2) NO, NC

COLOR:

UNIVERSAL

QUANTITY:

2

TAG No.:

HS-3, 1



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

PILOT LIGHT

MANUFACTURER:

SQUARE D

MODEL:

9001SKP1A31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

COLOR:

AMBER

QUANTITY:

1

TAG NO.:

L3



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

PILOT LIGHT

MANUFACTURER:

SQUARE D

MODEL:

9001SKP1W31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

COLOR:

WHITE

QUANTITY:

1

TAG NO.:

L1



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

PILOT LIGHT

MANUFACTURER:

SQUARE D

MODEL:

9001SKP1R31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

COLOR:

RED

QUANTITY:

2

TAG NO.:

L2, L4



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

PUSH BUTTON

MANUFACTURER:

SQUARE D

MODEL:

9001SKR1UH2

TYPE:

30MM, MOMENTARY PUSH BUTTON

CONTACT:

1 N/O

COLOR:

UNIVERSAL

QUANTITY:

2

TAG NO.:

PB-2, 3



Fuji Electric Corporation of America

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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

PUSH BUTTON

MANUFACTURER:

SQUARE D

MODEL:

9001SKP1G31

TYPE:

30MM, PUSH-TO-TEST PILOT LIGHT

LIGHT MODULE:

110-120V, 60 HZ, TRANSFORMER TYPE

CONTACT:

1 N/C

COLOR:

GREEN

QUANTITY:

1

TAG:

L5

Push Buttons – Corrosion Resistant Selector Switches

Type SK – 30.5 mm
Class 9001

Square D
www.squared.com
FOR CURRENT INFORMATION

Non-Illuminated 2 Position Selector Switch Operators – UL Types 4, 4X, 13 NEMA Types 4, 4X, 13

For use in hazardous locations – See Page 16-78.
Legend plate and contact block not included unless noted.



Standard Knob
Selector Switch
9001SKS

Contact Block Required				1 – Contact Closed 0 – Contact Open				
Contact Block Position	Quantity and Type		Mount on Side		↖ ↗	↖ ↗	↖ ↗	
	Left	Right	Left	Right	Left	Right	Left	Right
 Top View	KA1	KA3	KA1 #2	KA3 #2	1	0	0	1
	or	KA2		KA2 #2	0	1	1	0
	KA1	KA3	KA1 #1	KA3 #1	1	0	0	1
	or	KA2		KA2 #1	0	1	1	0
CAM				E	D			

Non-Illuminated Operators	Type	Type	Price
Manual Return			
Operator Only ■			
Without Knob	SKS11	SKS12	\$ 19.00
With Standard Black Knob	SKS11B	SKS12B	23.40
With Other Color Knob (See Table) ▲	SKS11▲	SKS12▲	23.40
With Contact Block(s)			
With Standard Black Knob (See Table for Other Colors, Replace B in Type Number with Other Color Code)			
With 1 KA1 on Side #2 (H13)	SKS11BH13	–	42.40
With 1 KA1 on Side #1 (H1)	SKS11BH1	–	42.40
With 1 KA1 on Side #1 and 1 KA1 on Side #2 (H2)	SKS11BH2	–	61.00
Spring Return from Left			
Operator Only ■			
Without Knob	SKS25	–	31.70
With Standard Black Knob	SKS25B	–	36.10
With Other Color Knob (See Table) ▲	SKS25▲	–	36.10
Spring Return From Right			
Operator Only ■			
Without Knob	–	SKS34	31.70
With Standard Black Knob	–	SKS34B	36.10
With Other Color Knob (See Table) ▲	–	SKS34▲	36.10

- These operators can be ordered complete with contact blocks, for maximum block usage see Page 16-84. Add the "H" number chosen from Page 16-79 to the end of the operator type number and add the cost of the "H" number to the operator cost.
Example: SKS11FB(23.40)+H13(KA1-Side 2)(19.00) = SKS11FBH13(42.40)
- ▲ Add the color code as chosen from knob color table below.
Example: SKS11▲ with a green gloved hand knob = SKS11FG

Selector Switch Knobs




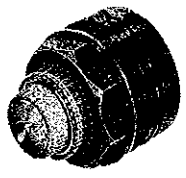
Color	Standard Knob		Gloved Hand Knob		Coin Operated		Price
	▲ Knob Code	Type	▲ Knob Code	Type	▲ Knob Code	Type	
Black	B	B11	FB	B25	TB	B18	\$ 4.40
Red	R	R8	FR	R24	TR	R16	
Green	G	G8	FG	G24	TG	G16	
Yellow	Y	Y8	FY	Y24	TY	Y16	
Orange	S	S11	FS	S25	–	–	
Blue	L	L8	FL	L24	TL	L16	
White	W	W8	FW	W24	–	–	
Amber	A	A8	FA	A24	–	–	
Clear	C	C8	FC	C24	TC	C16	

16 PUSH BUTTONS AND OPERATOR INTERFACE

For additional information, reference: Catalog Number 9001CT9701 or D-Fax™ #1548 and #1549.


Pilot Lights - UL Types 4, 4X, 13/NEMA Types 4, 4X, 13

For use in hazardous locations - See Page 16-78.
Legend plate not included.

Description	Voltage	Style	With Red Fresnel Color Cap	With Green Fresnel Color Cap	With Other Color Cap	Price	Without Color Cap	Price
 9001SKP1	110-120 V, 50-60 Hz	Transformer	SKP1R31	SKP1G31	SKP1▲	\$ 68.00	SKP1	\$ 63.60
	220-240 V, 50-60 Hz	Transformer	SKP7R31	SKP7G31	SKP7▲	68.00	SKP7	63.60
	24-28 Vac-dc	Full Voltage	SKP35R31	SKP35G31	SKP35▲	55.00	SKP35	50.70
	For other voltages see Table ■	Transformer, Flashing or LED ●	SKP■R31	SKP■G31	SKP■▲	68.00	SKP■	63.60
		Full Voltage, Neon or Resistor ♦	SKP■R31	SKP■G31	SKP■▲	55.00	SKP■	50.70
 9001SKT1	110-120 V, 50-60 Hz	Transformer	SKT1R31	SKT1G31	SKT1▲	87.00	SKT1	82.00
	220-240 V, 50-60 Hz	Transformer	SKT7R31	SKT7G31	SKT7▲	87.00	SKT7	82.00
	24-28 Vac-dc	Full Voltage	SKT35R31	SKT35G31	SKT35▲	74.00	SKT35	70.00
	For other voltages see Table ■	Transformer, Flashing or LED ●	SKT■R31	SKT■G31	SKT■▲	87.00	SKT■	82.00
		Full Voltage, Neon or Resistor ♦	SKT■R31	SKT■G31	SKT■▲	74.00	SKT■	70.00
 9001SKTR38	120 Vac Only	Resistor	SKTR38R31	SKTR38G31	SKTR38▲	87.00	SKTR38	82.00
	24-28 Vac Only	Full Voltage	SKTR35R31	SKTR35G31	SKTR35▲	87.00	SKTR35	82.00
	For other voltages see Tables ■▲▼	Full Voltage or Resistor ▼	SKTR■R31	SKTR■G31	SKTR■▲	87.00	SKTR■	82.00
 Pilot Light For Intrinsically Safe Circuits (NEMA 4X)	Intrinsically safe equipment must not release electrical or thermal energy capable of igniting certain explosive or combustible hazardous atmosphere, for which the equipment has been tested. These pilot lights are intrinsically safe when used with a suitable approved barrier or barrier relay. These pilot lights are Factory Mutual (FM approved). Consult your local Square D Sales Office for further details. These pilot lights are fully encapsulated - there are no replaceable parts - except for the SK40 ring nut. Use KN100 series plastic legend plates as shown on Pages 16-80 and 16-81.		KP44R	KP44G	KP44Y (Yellow Color Cap)	79.00	-	-
	Operating Voltage Range	Nominal Current	V max = 32V I max = 165 ma.					
	20-30 Vac/dc	25 ma.						

- Add the voltage assembly code as chosen from voltage assembly code table, Page 16-76.
EXAMPLE: SKT■R31 with a 60 Vac red LED voltage = SKT37LRR31.
- ▲ Add the color code as chosen from the color cap table below.
EXAMPLE: SKP1▲ with a blue fresnel cap = SKP1L31.
- The color cap must be the same color as the LED voltage chosen, i.e., green LED use a green color cap.
- ♦ On neon voltages use clear color caps only.
- ▼ Use only full voltage or resistor voltage assembly codes on remote test pilot lights. Do not choose LED, or neon transformer codes. For AC use only.

Color Caps

Color	▲ Plastic Fresnel	▲ Plastic Domed
		
Amber	A31	A9
Blue	L31	L9
Clear	C31	C9
Green	G31	G9
Red	R31	R9
White	W31	W9
Yellow	Y31	Y9

Light Modules Page 16-76
 Contact Blocks Page 16-77
 H Contact Block Assembly Codes Page 16-79
 Legend Plates Page 16-80
 Accessories Page 16-82
 Replacement Parts Page 16-83

For additional information, reference: Catalog Number 9001CT9701 or D-Fax™ #1548 and #1549.





Fuji Electric Corporation of America

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**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

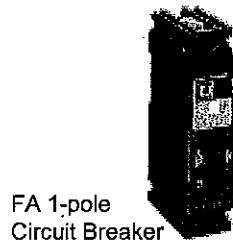
OZONE DESTRUCT SYSTEM

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	20A
NO. OF POLES:	3P, 600V
CATALOG NO:	FCL34020
INTERRUPTING CAPACITY:	65,000
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	100A
QUANTITY:	1
OPERATING MECHANISM:	LF1
EQUIP ID:	CB-1

Class 650 Thermal-Magnetic Molded Case Circuit Breakers

FA, FH and FC Circuit Breakers

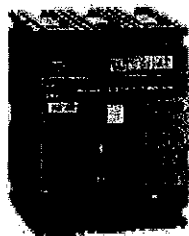
Description



FA 1-pole
Circuit Breaker



FA 2-pole
Circuit Breaker



FA 3-pole
Circuit Breaker

100-ampere frame circuit breakers rated 15 through 100 amperes with the following features:

- **1-, 2- and 3-pole construction**
FC circuit breaker has 2- and 3-pole construction available in a 3-pole module. FA and FH are available in 1-, 2- and 3-pole modules.
- **Push-to-trip**
Yellow push-to-trip button mechanically trips the circuit breaker.
- **Trip indication**
The handle moves to the center position when the circuit breaker trips.
- **ON/OFF indication**
ON/OFF markings are on the face of the circuit breaker along with the international I/O markings.
- **Endurance (switching operations)**
6,000 full-load operations
4,000 no-load operations
- **Thermal trip element**
Thermal trip elements are factory calibrated for 40°C per the UL 489 Standard. Calibration for 50°C is also available without the UL Listing.
- **Magnetic trip element**
The magnetic trip elements are factory sealed to provide instantaneous trip protection at high fault levels.
- **Mounting**
All FA, FH and FC circuit breakers can be mounted and operated in any position and are not limited to vertical or horizontal mounting.

Continued on next page

Ampere Interrupting Ratings (AIR)

Catalog Number Prefix		No. of Poles	Cont. Ampere Rating	UL Listed Ampere Interrupting Ratings (AIR) RMS Symmetrical Amperes						DC Volts			Federal Specs. W-C-375B/ GEN	IEC Ultimate Rating 415/240V 50/60 Hz	
Unit-mount	I-LINE®			AC Volts, 50/60 Hz						125	250	500		157-1	947-2
				120	240	277	480Y/ 277	480	600						
FAL 240V	FA 240V	1	15-100	10K	—	—	—	—	—	5K	—	—	11a	—	—
		2	15-100	10K	10K	—	—	—	—	5K	5K	—	11b, 12b	—	—
		3	15-100	10K	10K	—	—	—	—	5K	5K	—	11b, 12b	—	—
FAL 480V	FA 480V	1	15-100	25K	18K	18K	—	—	—	10K	—	—	11a, 12a, 13a	18K	—
		2	15-100	25K	25K	—	18K	18K	—	10K	10K	—	13b	18K	—
		3	15-100	25K	25K	—	18K	18K	—	10K	10K	—	13b	18K	—
FAL 600V	FA 600V	2	15-100	25K	25K	—	18K	18K	14K	10K	10K	—	18a	18K	—
		3	15-100	25K	25K	—	18K	18K	14K	10K	10K	—	18a	18K	—
FHL [▲]	FH [▲]	1	15-30	65K	65K	65K	—	—	—	10K	—	—	13a	25K	—
		1	35-100	65K	25K	25K	—	—	—	10K	—	—	13a	25K	—
		2, 3	15-100	65K	65K	—	25K	25K	18K	10K	10K	—	22a	25K	—
FHL-DC [●]	—	3	—	—	—	—	—	—	—	—	20K	—	—	—	
FCL	FC	2, 3	15-100	100K	100K	—	65K	65K	—	—	—	—	22a	65K	—

[▲] Separate UL ratings available for 240V and 480V grounded B single-phase systems.

[●] UL Listed for 500 Vdc nom., 600 Vdc max. rating. The circuit breakers are suitable only for use with UPS (uninterruptible power supplies) and ungrounded systems.



SQUARE D
GROUPE SCHNEIDER

Class 650 Thermal-Magnetic Molded Case Circuit Breakers

Description—Continued

Accessories

Accessory	Field Installable	Factory Installed Only
Shunt Trip [▲]		FA,FH,FC
Ground-fault Shunt Trip ^{▲*}		FA,FH,FC
Undervoltage Trip [▲]		FA,FH,FC
1A1B, 2A2B Auxiliary Switches [▲]		FA,FH,FC
N.O. or N.C. Bell Alarm [▲]		FA,FH,FC
Handle Tie	FA	
Handle Padlock Attachment	FA,FH,FC	
Ground-fault Module	FA,FH,FC	
Walking Beam	FA,FH	
Cylinder Lock (3-pole Only) [●]		FA,FH
Electrical Motor Operator	FA,FH,FC	

[▲]UL Listed accessory.

[●]Not available on MAG-GARD[®] circuit breakers and molded case switches.

*For use with GFM100FA Ground Fault Module.

■ I-LINE[®] construction

All FA, FH and FC circuit breakers and molded case switches are available in I-LINE[®] plug-on construction.

■ Molded case switches

Automatic molded case switches are available in FH 2- and 3-pole construction. *Molded case switches provide no overcurrent protection.*

■ MAG-GARD[®] circuit breakers

The FA MAG-GARD circuit breakers comply with requirements for *instantaneous trip* circuit breakers.

■ Marine applications

FA, FH and FC 2- and 3-pole, 15–100 ampere circuit breakers are available for use on vessels over 65 feet in length.

■ Mining applications

FA 3-pole 30, 50 and 100 ampere circuit breakers are available.

■ DC applications

FA and FH circuit breakers are suitable for use on 125 and 250 Vdc systems.

FHL-DC 3-pole 30, 50 and 100 ampere circuit breakers are suitable only for use with uninterruptible power supplies and ungrounded systems rated 500 Vdc nominal, 600 Vdc maximum.

See AIR table on page 1 for ratings.

■ Ratings

HACR – FA and FH 2- and 3-pole

SWD – FY 1-pole 15 and 20 ampere

AIR – See table on page 1

■ Standards/Files

Circuit breakers

UL 489/E10027

CSA C22.2 No. 5.1/LR40970

IEC 157-1

Molded case switches

UL 1087/E87159

CSA C22.2 No. 5.2/LR40970

MAG-GARD[®] UL Recognized Component

UL489/E10027

CSA C22.2 No. 5.1/LR40969

Marine circuit breakers

UL489/E85161

■ Rerating

Circuit breakers can be rerated for:

- Ambient temperatures below 25°C or above 40°C
- DC magnetic trip level
- 400 Hz applications

For more information see application guide SD361R1, "Determining Current Carrying Capacity in Special Applications."

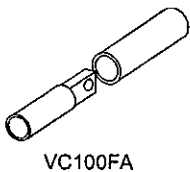
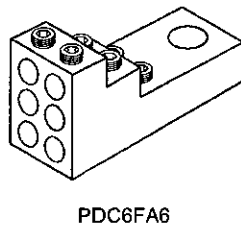
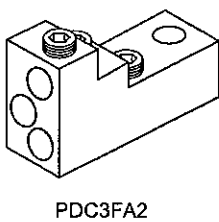
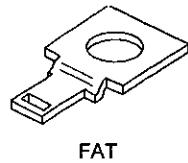
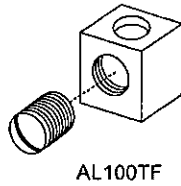
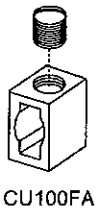
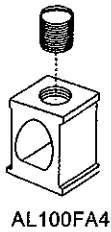
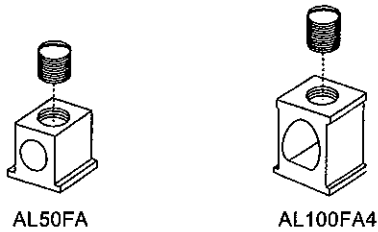
Class 650 Thermal-Magnetic Molded Case Circuit Breakers

Terminations

Circuit breakers and molded case switches are provided with mechanical lugs for copper or aluminum conductors. Optional lugs are also available.

■ Reverse connection

All FA, FH and FC circuit breakers are UL Listed, CSA Certified and IEC Rated for reverse connection without restrictions.



Mechanical Lug Kit Information

Kit Catalog Number (Three lugs per kit)	Circuit Breaker Application		Conductor Size and Type ^{▲●} (one wire per lug) AWG (mm ²)
	Circuit Breaker	Standard Ampere Rating	
AL50FA	FA, FH	3-30	#14-#4 (2.5-25) Cu Str #12-#4 (2.5-25) Al Str #12-#10 (2.5-6) Al Sol #14-#10 (2.5-6) Cu Sol
AL100FA	FA, FH	3-100	#14-#1/0 (2.5-50) Cu Str #12-#1/0 (2.5-50) Al Str #12-#10 (2.5-6) Al Sol #14-#10 (2.5-6) Cu Sol
CU100FA	FA, FH, FC	3-100	#14-#10 (2.5-6) Cu Str/Sol #8-#1 (10-50) Cu Str
AL100FA4	FC	15-100	#14-#3 (2.5-35) Cu Str #14-#1 (2.5-50) Cu Sol #8-#1 (10-50) Al Str #12-#1 (2.5-50) Al Sol
CU30FA4	FC	15-30	#14-#10 (2.5-6) Cu Str/Sol
AL100TF*	FA, FH	15-100	#12-#3 (2.5-35) Cu Str #12-#10 (2.5-6) Cu Sol
CU100TF*	FA, FH	15-100	#12-#3 (2.5-35) Cu Str #12-#10 (2.5-6) Cu Sol
AL150FA	FA	15-30	#1/0-#2/0 (50-70) Cu/Al Str
FAT	FA, FH, FC	15-30	N/A

Power Distribution Lugs

Lug Kit (Three lugs per kit)	Circuit Breaker Applications	Conductor Size and Type ^{▲●} AWG (mm ²)
PDC3FA2**	FA, FH, FC	(3) #14-#2 (2.5-35) Cu Sol
PDC6FA6**	FA, FH, FC	(6) #14-#6 (2.5-16) Cu

Crimp Lugs

Lug Kit (Three lugs per kit)	Circuit Breaker Applications	Conductor Size and Type ^{▲●} (one wire per lug) AWG (mm ²)
VC100FA	FA, FH, FC	#8-#1/0 (10-50) Al/Cu Str
CVC100FA	FA, FH, FC	#6-#1/0 (16-50) Cu Str

▲ Str = Stranded Wire; Sol = Solid Wire

● Circuit breakers rated 30 amperes or less are marked "Suitable for use with 60°/75°C rated conductors." Circuit breakers rated above 30 amperes are marked "Use 75°C rated conductors only."

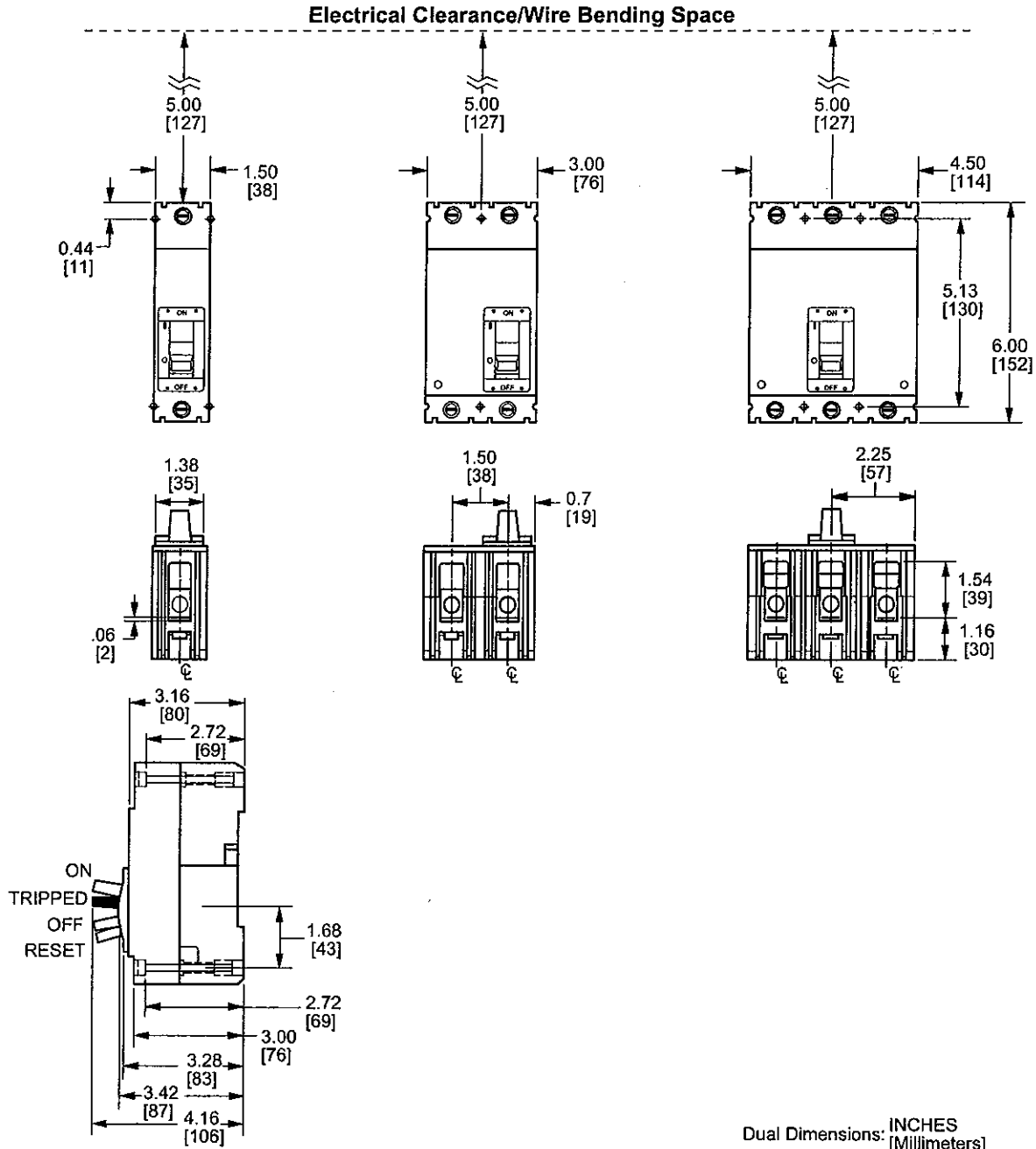
* Top feed lugs may be used on the OFF end only, when the OFF end is the load end.

♦ For use in UL 580 Industrial Control applications only.


Class 650 Thermal-Magnetic Molded Case Circuit Breakers

Dimensions

Note: Two-pole FC circuit breakers have the same dimensions as three-pole FC circuit breakers



FA1002A.0

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Order No. 0601HO9601





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

•OZONE DESTRUCT SYSTEM

ITEM:

FUSE AND FUSE BLOCKS

MANUFACTURER:	BUSSMAN
FUSE AMPS RATINGS:	6A
VOLTAGE RATINGS:	600V
INTERRUPTING CAPACITY:	200,000 A
CATALOG NO:	FNQ-R-10
QUANTITY:	3
FUSEBLOCKS AMPS RATINGS:	10A
CATALOG NO:	FNQ-R-25
QUANTITY:	3
FUSEBLOCKS AMPS RATINGS:	20A
NO. OF POLE:	3
CATALOG:	BM6033B
QUANTITY:	2
EQUIP ID:	FB-5, FU-VFD



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	FUSE AND FUSE BLOCKS
MANUFACTURER:	BUSSMAN
FUSE AMPS RATINGS:	2 A
VOLTAGE RATINGS:	600V
INTERRUPTING CAPACITY:	200,000 A
CATALOG NO:	FNQ-R-3
QUANTITY:	2
FUSEBLOCKS AMPS RATINGS:	3A
NO. OF POLE:	2
CATALOG NO.:	BM6032B
QUANTITY:	1
EQUIP ID:	FB-3

CC-TRON®

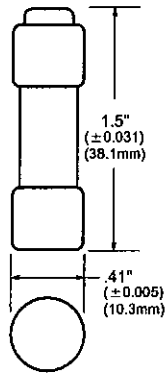
FNQ-R

Time-Delay Fuses

1 3/32" x 1 1/2", 600 Volt, 1/4 to 30 Amps



Dimensional Data



Catalog Symbol: FNQ-R

Time-Delay

Application: Circuit Transformer Protection

Ampere Rating: 1/4 to 30 Amperes

Voltage Rating: 600 Volts AC (or less)†

Interrupting Rating: 200,000A RMS Sym. (U.L.)

Agency Approvals:

U.L. Listed, Std. 248-4, Class CC, Guide JDDZ, File E4273

CSA Certified, Class CC CSA, Class 1422-01,

File 53787-HRC-MISC

†12-30 amp is 300 Vdc and 10 KAIC.

General Information:

- The Bussmann CC-TRON® (FNQ-R) was designed to meet the needs of control circuit transformer protection.
- Current-limitation protects down stream components against damaging thermal and magnetic effects of short-circuit currents.
- Rejection feature. FNQ-R fuses meet the U.L. 508, paragraph 19.2.4 requirement that control circuit fuses used in equipment listed for use with more than 10,000 ampere available must have an adequate interrupting rating and must be rejection type.
- High inrush time-delay. Control circuit transformers can experience inrush currents up to 85 times their full-load current rating. FNQ-R fuses can be sized according to NEC and U.L. requirements and still allow the high inrush currents, with significantly more time-delay than the U.L. minimum value of 12 seconds at 200% for Class CC fuses.
- Melamine tube. Albaloy-plated brass endcaps.

Maximum Acceptable Rating of Overcurrent Device*

Rated Primary Current (Amperes)	Maximum Rating of Overcurrent Protective Device Expressed As A Percent of Transformer Primary Current Rating
Less than 2A	500**
2A to less than 9A	167
9A or more	125

*U.L. 508, Table 19.3.

**300% for other than motor control applications.

Electrical Ratings (Catalog Symbol and Amperes)

FNQ-R-1/4	FNQ-R-1 1/10	FNQ-R-3 3/10	FNQ-R-10
FNQ-R-3/10	FNQ-R-1 1/10	FNQ-R-3 1/2	FNQ-R-12
FNQ-R-1/10	FNQ-R-1 1/2	FNQ-R-4	FNQ-R-15
FNQ-R-1/2	FNQ-R-1 9/10	FNQ-R-5	FNQ-R-17 1/2
FNQ-R-9/10	FNQ-R-1 9/10	FNQ-R-6	FNQ-R-20
FNQ-R-3/4	FNQ-R-2	FNQ-R-6 1/4	FNQ-R-25
FNQ-R-9/10	FNQ-R-2 1/4	FNQ-R-7	FNQ-R-30
FNQ-R-1	FNQ-R-2 1/2	FNQ-R-7 1/2	---
FNQ-R-1 1/4	FNQ-R-2 9/10	FNQ-R-8	---
FNQ-R-1 1/2	FNQ-R-3	FNQ-R-9	---

Carton Quantity and Weight

Ampere Ratings	Carton Qty.	Weight*	
		Lbs.	Kg.
1/4-30	10	.200	.091

*Weight per carton

CE CE logo denotes compliance with European Union Low Voltage Directive (50-1000 Vac, 75-1500 Vdc). Refer to BIF document #8002 or contact Bussmann Application Engineering at 314-527-1270 for more information.



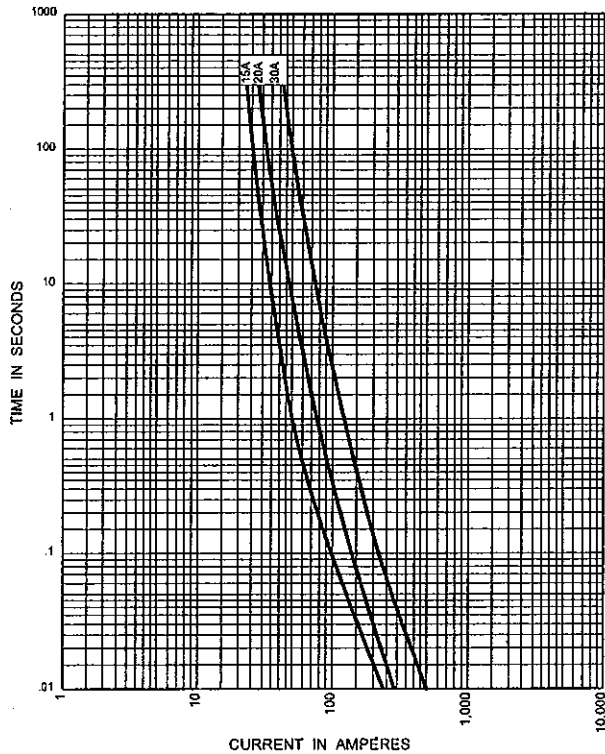
CC-TRON®

FNQ-R

Time-Delay Fuses

1 3/32" x 1 1/2", 600 Volt, 1/4 to 30 Amps

Time-Current Characteristics—Total Clear



Fuseblock Catalog Numbers

No. of Poles	Screw Terminal	Pressure Plate	Box Terminal	Screw Quick-Connect	Pressure Quick-Connect
1	BC6031S	BC6031P	BC6031B	BC6031SQ	BC6031PQ
2	BC6032S	BC6032P	BC6032B	BC6032SQ	BC6032PQ
3	BC6033S	BC6033P	BC6033B	BC6033SQ	BC6033PQ

See Also OPTIMA - Overcurrent Protection Modules

Catalog Number	Fuse Switch with indication	BIF Document No.
OPM-SW	Fuse Switch with indication	1101
OPM-CC	Fuse Module with indication	1100

This bulletin is intended to clearly present comprehensive product data and provide technical information that will help the end user with design applications. Bussmann reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Bussmann also reserves the right to change or update, without notice, any technical information contained in this bulletin. Once a product has been selected, it should be tested by the user in all possible applications.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

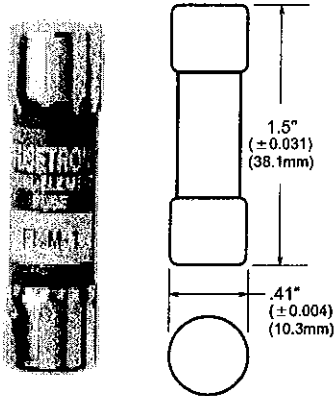
FUSE AND FUSE BLOCKS

MANUFACTURER:	BUSSMAN
FUSE AMPS RATINGS:	8A
VOLTAGE RATINGS:	250V
INTERRUPTING CAPACITY:	200,000 A
CATALOG NO:	FNM-8
QUANTITY:	1
FUSEBLOCKS AMPS RATINGS:	30A
NO. OF POLE:	1
CATALOG:	BM6031B
QUANTITY:	1
EQUIP ID:	FB-4

Time-Delay Ferrule Fuse

13/32" x 1-1/2"

FNM



- Fibre tube.
- For circuits with high inrush currents.
- Formerly designated 5AB.
- Fusetron® Dual-Element fuse.

Fuseblock Catalog Numbers

Poles	Terminal Type		
	Screw With Quick Connect	Pressure Plate w/Quick Connect	Box Lug
1	BM6031SQ	BM6031PQ	BM6031B
2	BM6032SQ	BM6032PQ	BM6032B
3	BM6033SQ	BM6033PQ	BM6033B

CATALOG SYMBOL: FNM
 TIME-DELAY
 1/10 TO 30 AMPERES
 INTERRUPTING RATING - SEE CHART BELOW
 UL LISTED: STD. 248-14, 0-10/250V AC; 12-15/125V AC
 FILE #E19180, GUIDE #JDYX
 CSA CERTIFIED: 1-10/250V AC; CLASS 1422-01,
 12-15/125V AC; FILE 53787
 DC RATING: 1-15A rated 125V DC and 1.6 KAIC.

Electrical Ratings (Catalog Symbol and Amperes)

250 Volts AC	IR	250 Volts AC	IR	250 Volts AC	IR	125 Volts AC
FNM-1/10		FNM-1-1/8		FNM-4		FNM-12 10,000
FNM-1/8		FNM-1-1/4		FNM-4-1/2		FNM-15 @ 125V AC
FNM-15/100		FNM-1-4/10		FNM-5		-
FNM-2/10		FNM-1-1/2		FNM-5-6/10		-
FNM-1/4	35A @	FNM-1-6/10	100A @	FNM-6		32 Volts AC
FNM-3/10	250VAC	FNM-1-8/10	250VAC	FNM-6-1/4	200A @	FNM-20
FNM-4/10	10,000	FNM-2	10,000	FNM-7	250VAC	FNM-25
FNM-1/2	@	FNM-2-1/4	@	FNM-8	10,000 @	FNM-30
FNM-6/10	125VAC	FNM-2-1/2	125VAC	FNM-9	125VAC	-
FNM-3/4		FNM-2-8/10		FNM-10		-
FNM-8/10		FNM-3		-		-
FNM-1		FNM-3-2/10		-		-
-		FNM-3-1/2		-		-

If 250V AC is needed for 12-30 amps, use FNW series.

Carton Quantity and Weight

Ampere Ratings	Carton Qty	Weight	
		Lbs.	Kg.
0-30	10	.125	.057

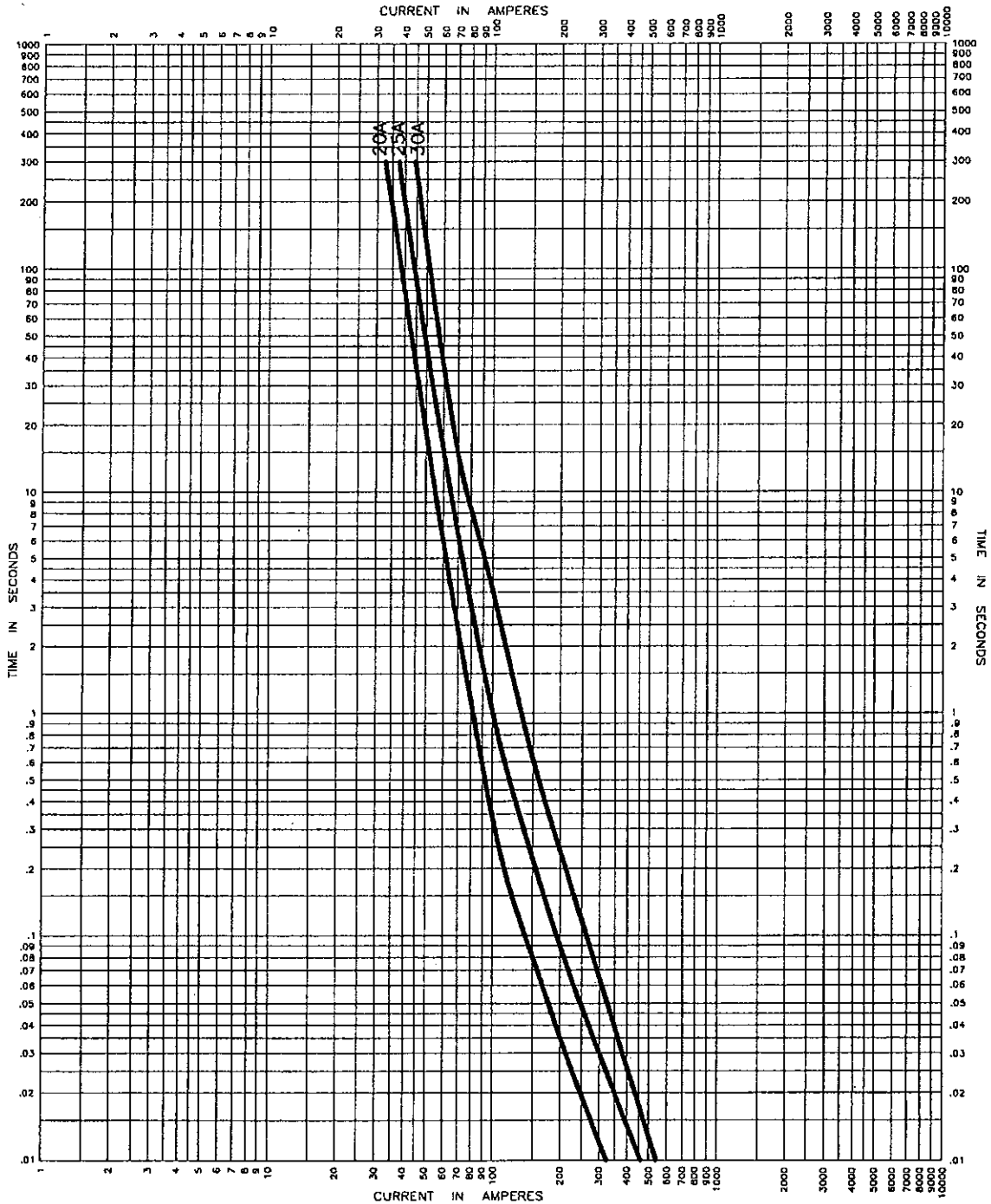
CE CE logo denotes compliance with European Union Low Voltage Directive (50-1000V AC, 75-1500V DC). Refer to BIF document #8002 or contact Bussmann Application Engineering at 636-527-1270 for more information.

Time-Delay Ferrule Fuse

13/32" x 1-1/2"

FNM

Time-Current Characteristic Curves—Average Melt



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Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

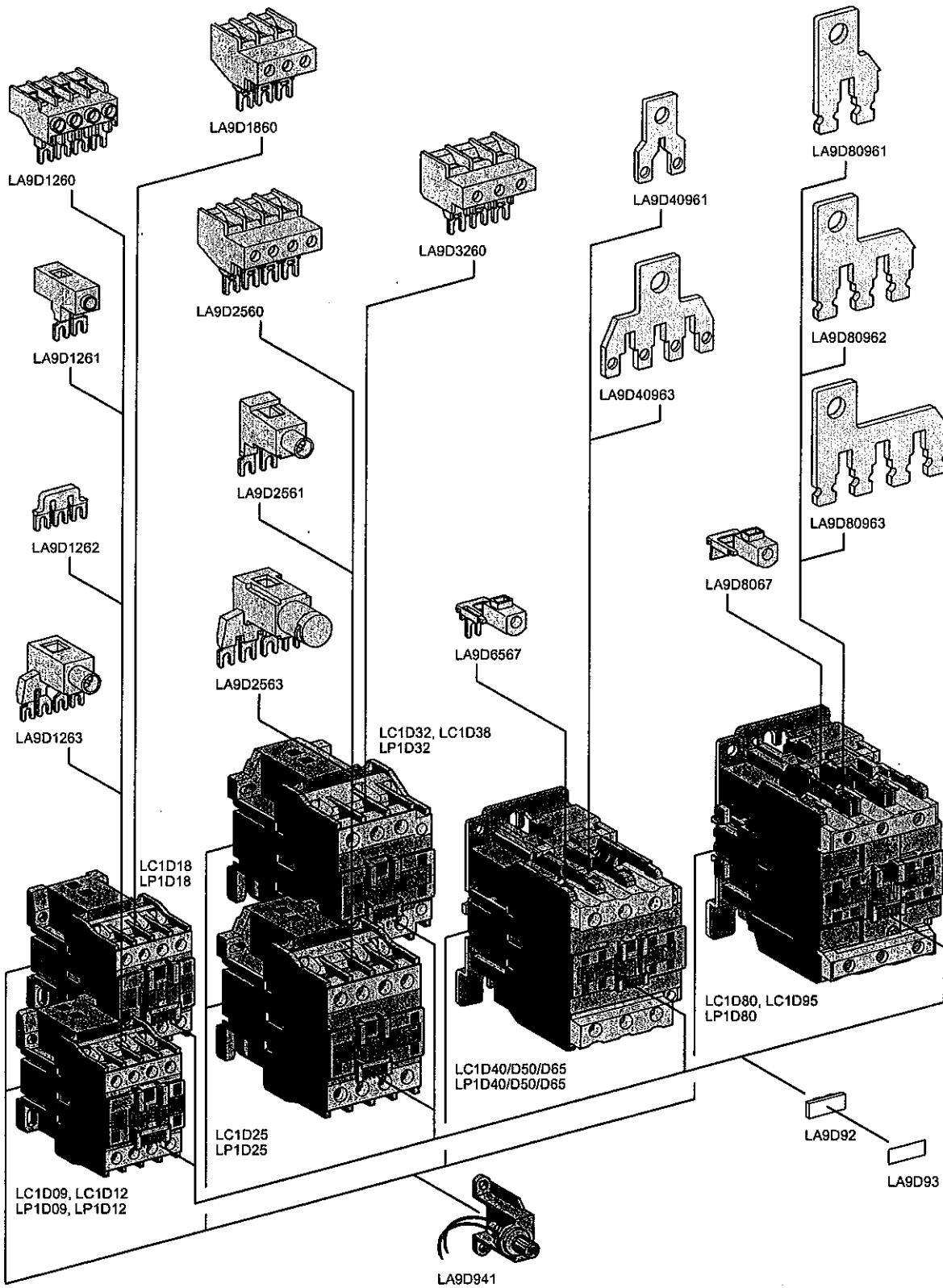
**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	LINE CONTACTOR
MANUFACTURER:	SQUARE D
MAX. HP RATINGS @ 480V:	75
NO. OF POLES:	3P, 600V
COIL VOLTAGE:	120V
AUXILLARY CONTACTS:	1NO
CATALOG NO:	LC1D0910G6
QUANTITY:	1
EQUIP ID:	HC

D-line Contactors, Enclosed Starters, Overload Relays, and Accessories

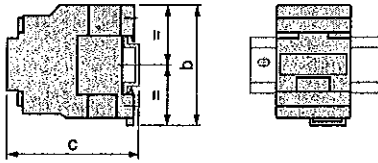
Selection of Contactors and Reversing Contactors



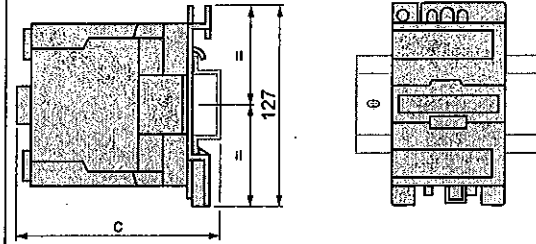
D-line Contactors, Enclosed Starters, Overload Relays, and Accessories

Mounting Information for Type LC1D and LP1D Contactors

LC1D09 to LC1D38, LP1D09 to LP1D32.
On mounting rail AM1DP200 or AM1DE200 (width 35mm).

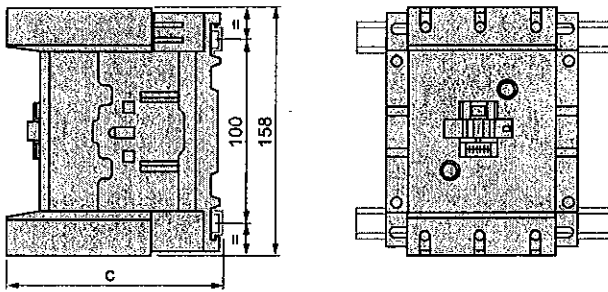


LC1D40 to LC1D95, LP1D40 to LP1D80.
On mounting rail AM1DL200 or DL201 (width 75 mm).
For LC1 on mounting rail AM1ED*** or AM1DE200 (width 35 mm).



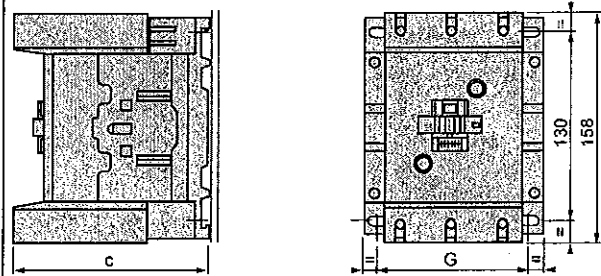
	LC1D09	LC1D12	LC1D18	LC1D25	LC1D32	LC1D38		LC1D40	LC1D50	LC1D65	LC1D80	LC1D95
b	74	74	74	84	84	84	c (AM1DL200)	131	131	131	142	142
c (AM1DP200)	82	82	87	95	100	100	c (AM1DL201)	121	121	11	132	132
c (AM1DE200)	90	90	95	103	108	108	c (AM1ED*** or AM1DE200)	121	121	121	132	132
	LP1D09	LP1D12	LP1D18	LP1D25	LP1D32			LP1D40	LP1D50	LP1D65	LP1D80	
c (AM1DP200)	117	117	122	132	137		c (AM1DL200)	188	188	188	198	
c (AM1DE200)	125	125	130	140	145		c (AM1DL201)	178	178	178	198	

LC1D115, LC1D150.
On mounting rail AM1DP200 or AM1DE200 (width 35mm).



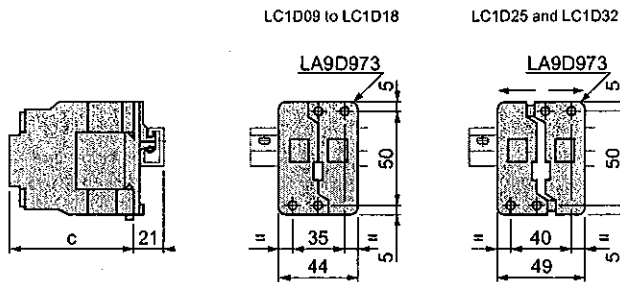
	LC1D11500	LC1D150006
c (AM1DP200 or AM1DR200)	134.5	117.5
c (AM1DE*** or AM1ED***)	142.5	125.5

LC1D115, LC1D150.
Panel mounted with 1/4" screws.

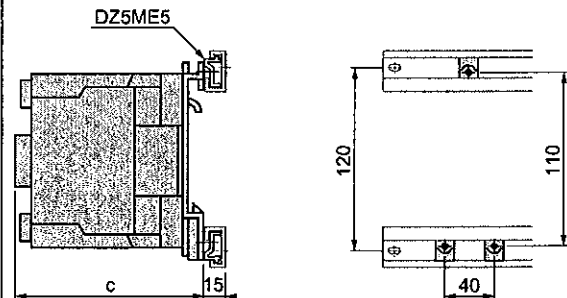


	LC1D-11500	LC1D-115006	LC1D-15000	LC1D-150006
c	132	115	132	115
G (3-poles)	96/110	96/110	96/110	96/110
G (4-poles)	130/144	130/144	-	-

LC1D09 to LC1D38, LP1D09 to LP1D32.
On 1 mounting rail DZ5MB and clip-on mounting plate LA9D973.



LC1D40 to LC1D95, LP1D40 to LP1D80.
On 2 mounting rails DZ5ME5 on 120 mm centers.



	LC1D09	LC1D12	LC1D18	LC1D25	LC1D32	LC1D38		LC1D40	LC1D50	LC1D65	LC1D80	LC1D95
c	80	80	85	93	98	98	c	114	114	114	125	125
	LP1D09	LP1D12	LP1D18	LP1D25	LP1D32			LP1D40	LP1D50	LP1D65	LP1D80	
c	115	115	120	130	135		c	171	171	171	181	

Dimensions shown in millimeters (millimeters x 0.0394 = inches)





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

ITEM:

POWER SUPPLY

MANUFACTURER:
DESCRIPTIONS:
MODEL:
QUANTITY:
EQUIP. ID:

SQUARE D
24 VDC, 2.5A POWER SUPPLY
ABL7RE2403
1
PS-209

ENSURE REDUNDANT
SUPPLIES WITH DIODES
ARE PROVIDED

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for design in the shop drawings
rests with the contractor.

Responsible for installation and correction of field
discrepancies. Includes verification of
correct installation and operation of all
parts of the work ready for the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16

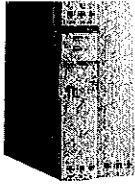
Date:

30/1/06

By:

PHASEO™ Power Supplies

Selection - Dimensions and Wiring



ABL7RE2405
ABL7RP2405
ABL7RP4803

Single Phase Regulated Switch Mode Power Supplies ABL7RE

Mains Input Voltage 47-63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac Single Phase Wide Range	24 Vdc	48 W	2 A	Auto	No	ABL7RE2402	1.14 lb (0.520 kg)
		72 W	3 A	Auto	No	ABL7RE2403	1.14 lb (0.520 kg)
	240 W	120 W	5 A	Auto	No	ABL7RE2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto	No	ABL7RE2410	4.85 lb (2.200 kg)

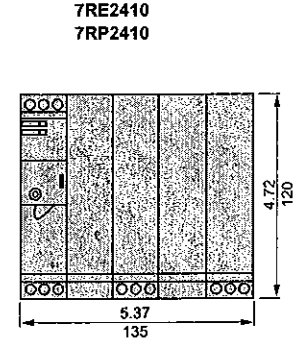
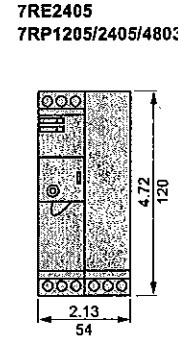
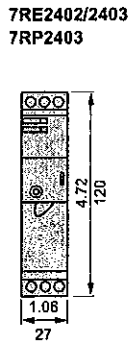
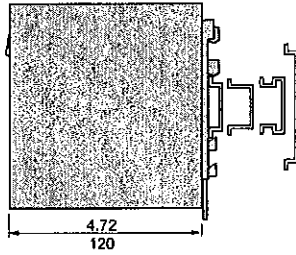
Single Phase Regulated Switch Mode Power Supplies ABL7RP

Mains Input Voltage 47 -63 Hz	Output Voltage	Nominal Power	Nominal Current	Automatic Protection Reset	Complies with Standard EN-61000-3-2	Catalog Number	Weight lb (kg)
100 to 240 Vac 100 to 250 Vdc Single Phase Wide Range	12 Vdc	60 W	5 A	Auto/Man	Yes	ABL7RP1205	2.20 lb (1.000 kg)
		72 W	3 A	Auto/Man	Yes	ABL7RP2403	1.14 lb (0.520 kg)
	240 W	120 W	5 A	Auto/Man	Yes	ABL7RP2405	2.20 lb (1.000 kg)
		240 W	10 A	Auto/Man	Yes	ABL7RP2410	4.85 lb (2.200 kg)
	48 Vdc	144 W	3 A	Auto/Man	Yes	ABL7RP4803	2.2 lb (1.000 kg)

ABL7RE24●●/ABL7RP●●●●

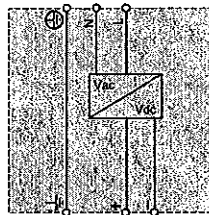
Common side view

Clip-on mounting on 35 and 75 mm rails

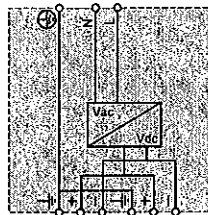


Dual Dimensions = $\frac{\text{in}}{\text{mm}}$

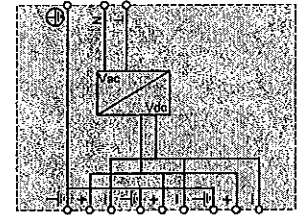
ABL7RE2402/2403



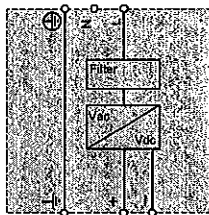
ABL7RE2405



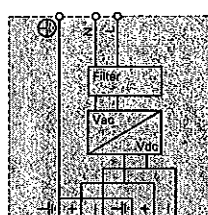
ABL7RE2410



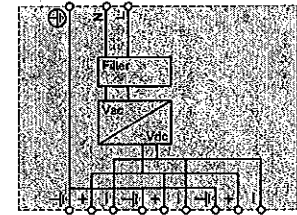
ABL7RE2403



ABL7RE1205/2405/4803



ABL7RE2410





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

VARIABLE SPEED DRIVE

MANUFACTURE:
HORSE POWER:
NO. OF POLES:
VFD CATALOG #:
KEYPAD DOOR MTG KIT:
QUANTITY:
EQUIP ID:

~~SQUARE D~~ *USE ABB DRIVE*
5 HP
3P
ATV28U72N4U
VW3A-28101
1
VFD

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the contractor.

Reviewed for general location and correlation of field
data with design. This review does not constitute a
guarantee of the work and is not intended to be a part of all
parts of the work rests with the Contractor.

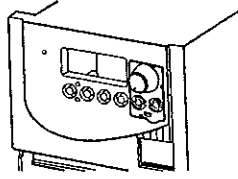
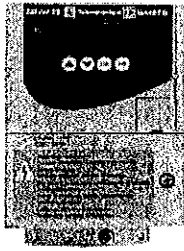
REVIEWED _____
REVIEWED AS MODIFIED _____
REVISE AND RE-SUBMIT _____
NOT REVIEWED _____

Project No. 79538-C14-16

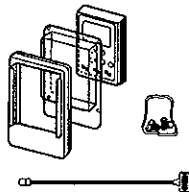
Date: 30/1/06 By: [Signature]

ALTIVAR 28

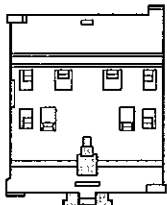
Selection and Pricing



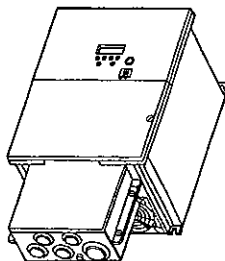
Local Operator Kit



Keypad Remote Mount Kit



DIN Rail Mount Kit



Conduit Entrance Kit

Input Line Voltage 50/60 Hz ± 5% (Volts)	Three Phase Motor Power ▲		Output Current ■ (Amperes)		Frame Size	Catalog Number	Price
	kW	Hp	Continuous	Transient			
208 - 15% to 230 + 10% Single Phase	0.37	0.5	3.3	3.6	1	ATV28HU09M2U ATV28HU18M2U ATV28HU29M2U ATV28HU41M2U	\$ 458. 519. 608. 644.
	0.75	1	4.8	6	1		
	1.5	2	7.8	10.9	2		
	2.2	3	11	15	3		
208 - 15% to 230 + 10% Three Phase	3	...	13.7	18.5	3	ATV28HU54M2U ATV28HU72M2U ATV28HU90M2U ATV28HD12M2U	880. 1017. 1340. 1629.
	4	5	17.5	24.6	3		
	5.5	7.5	27.5	38	4		
	7.5	10	33	49.5	4		
400 - 15% to 460 + 10% Three Phase	0.75	1	2.3	3.5	2	ATV28HU18N4U ATV28HU29N4U ATV28HU41N4U ATV28HU54N4U ATV28HU72N4U ATV28HU90N4U ATV28HD12N4U ATV28HD16N4U ATV28HD23N4U	719. 810. 886. 1000. 1136. 1492. 1853. 2328. 2892.
	1.5	2	4.1	6.2	2		
	2.2	3	5.5	8.3	3		
	3	...	7.1	10.6	3		
	4	5	9.5	14.3	3		
	5.5	7.5	14.3	21.5	4		
575 ± 15% Three Phase	0.75	1	1.7	2.6	2	ATV28HU18S6XU ATV28HU28S6XU ATV28HU41S6XU ATV28HU72S6XU ATV28HU90S6XU ATV28HD12S6XU ATV28HD16S6XU ATV28HD23S6XU	744. 838. 917. 1176. 1373. 1705. 2142. 2605.
	1.5	2	2.7	4.1	2		
	2.2	3	3.9	5.9	3		
	4	5	6.1	9.2	3		
	6	7.5	9.0	13.5	4		
	7.5	10	11.0	16.5	4		
11	15	17.0	25.5	5			
15	20	22.0	33.0	5			

- ▲ These power ratings are for a maximum ATV28 switching frequency of 4 kHz in continuous operation.
- Rated output currents shown are for ATV28 switching frequencies between 2 to 4 kHz. Above 4 kHz and up to 12 kHz, derate continuous output current by 10%. Above 12 kHz, derate current by 20%.
- ♦ A 3% line reactor should be used with each 575 V installation.

Options - Field Installed Kits

Description	For Drives	Catalog Number	Price	
Local Operator Kit Replacement ATV28 faceplate with speed potentiometer and run/stop controls	ATV28 all ranges	VW3A28100	\$ 50.	
Keypad Remote Mount Kit Includes keypad, remote mount hardware and 3 meter cable, IP65 rated	ATV28 all ranges	VW3A28101	175.	
Modbus Communications Kit Includes register mapping guide and 3 meter cable with 9-pin Sub-D connector	ATV28 all ranges	VW3A28301U	45.	
PowerSuite Test and Commissioning Software Kit Software on CD-ROM (no cable)	ATV28 all ranges	VW3A8104	150.	
PC Cable for Test and Commissioning Software	ATV28 all ranges	VW3A8106	75.	
Pocket PC PowerSuite Pack—Includes an HP Jornada 545 pocket PC with AC charger, serial cable, stylus pen, carrying case, Powersuite software VW3A8104, and connection kit VW3A8111.	ATV28 all ranges	VW3A8108US	895.	
Compact Flash Modules Pocket PC Connection Kit. MAGELIS Terminal	ATV28 all ranges ATV28 all ranges ATV28 all ranges	VW3A8110 VW3A8111 XBTH-M017010AA8	225. 95. 890.	
DIN Rail Mount Kit	ATV28HU09M2U - U18M2U	VW3A28851	25.	
Conduit Entrance Kit Multiple knockout sizes Installation of conduit entrance kit and retention of grey adhesive cover on top of drive controller provides ATV28 with Type 1 rating	ATV28HU09M2U - U18M2U	VW3A28811A	45.	
	ATV28HU29M2U	VW3A28812A		
	ATV28HU18N4U - U29N4U	VW3A28812A		
	ATV28HU41M2U - U72M2U	VW3A28813A		
	ATV28HU41N4U - U72N4U	VW3A28813A		
	ATV28HU90M2U - D12M2U	VW3A28814A		
	ATV28HU90N4U - D12N4U	VW3A28814A		
	ATV28HD16N4 - D23N4U	VW3A28815		
	ATV28HU09M2U - U18M2U	VW3A28821A		
	ATV28HU29M2U	VW3A28822		
ATV18 Replacement Kit This kit contains two brackets that adapt the spacing of the ATV28 mounting holes to be equivalent to that of the ATV18. This will permit the ATV28 to be secured to the panel holes and mounting hardware already in place for the ATV18.	ATV28HU18N4U - U29N4U	VW3A28822	25.	
	ATV28HU41M2U - U72M2U	VW3A28823		
	ATV28HU41N4U - U72N4U	VW3A28823		
	ATV28HU90M2U - D12M2U	VW3A28824		
	ATV28HU90N4U - D12N4U	VW3A28824		
	ATV28HD16N4 - D23N4U	VW3A28825		
	ATV28HU09M2U	VW3A66711		422.
	ATV28HU18N4U - U72N4U	VW3A66711		422.
	ATV28HU18M2U - U41M2U	VW3A66712		633.
	ATV28HU90N4U - D12N4U	VW3A66712		633.
ATV28HU54M2U - U72M2U	VW3A66713	950.		
ATV28HD16N4U - D23N4U	VW3A66713	950.		
ATV28HU90M2U - D12M2U	VW3A66714	1266.		
Line Reactors and other filters	See page 24-32			
RFI Input Filter For compliance with European (CE) conducted emissions standard 55022 Class B (Class A filter built into ATV28 drive)	ATV28HU09M2U - U18M2U	VW3A28401	130.	
	ATV28HU29M2U	VW3A28402	180.	
	ATV28HU18N4U - U29N4U	VW3A28403	200.	
	ATV28HU41M2U	VW3A28404	225.	
	ATV28HU54M2U - U72M2U	VW3A28405	335.	
	ATV28HU41N4U - U72N4U	VW3A28405	335.	
	ATV28HU90M2U - D12M2U	VW3A28406	365.	
	ATV28HU90N4U - D12N4U	VW3A28406	365.	
ATV28HD16N4 - D23N4U	VW3A28407	415.		





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	SOLID STATE POWER CONTROLLER
MANUFACTURER:	WATLOW
MODEL:	DB20-2060-C000
TYPE:	3-PHASE POWER CONTROLLER
AMPERAGE:	20A
OUTPUT VOLTAGE:	277 TO 600 VAC
INPUT TYPE:	SINGLE VDC INPUT
QUANTITY:	1
TAG NO.:	SCR-1

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correction of field dimensions, field test results, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 30/1/06 By: M. Paulson

DIN-A-MITE B Ordering Information (2176)

To order, complete the code number on the right with the information below:

Style B = solid-state power controller

D B

Phase

- 1 = single-phase, 1 controlled leg
- 2 = 3-phase, 2 controlled legs
- 3 = 3-phase, 3 controlled legs (for 4-wire wye)
- 8 = 2 independent zones (input control C or K)
- 9 = 3 independent zones (input control C or K)

Cooling and Current Rating Per Pole

- 0 = Natural convection standard DIN rail or panel heatsink

Line and Load Voltage

- 02 = 24 to 48 V~ (ac)
- 24 = 120 to 240 V~ (ac)
- 60 = 277 to 600 V~ (ac)

Input Control Signal

- C0 = 4.5 to 32 V~ (dc) contactor
- K1 = 22 to 26 V~ contactor
- K2 = 100 to 120 V~ contactor
- K3 = 200 to 240 V~ contactor
- F[] = Proportional
 - 0 = 4 to 20 mA
 - 1 = 12 to 20 mA

Alarm

- 0 = No alarm
- S = Shorted SCR Alarm

User Manual Language

- 0 = English
- 1 = German
- 2 = Spanish
- 3 = French

Custom Part Numbers

- 00 = Standard part
- XX = Any letter or number, custom options, labeling, etc.

Current Rating Table

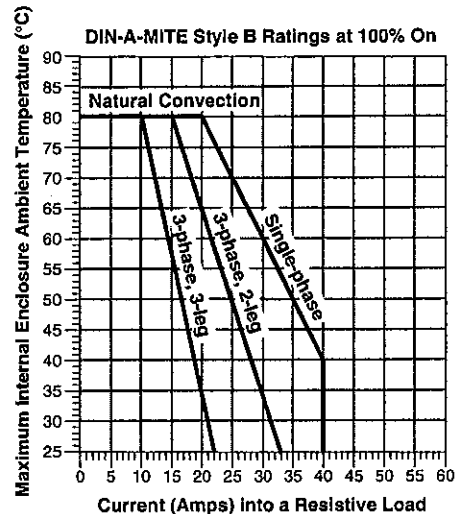
Phase	Cooling	Current at 50°C
1	0	35 A
2, 8	0	25 A
3, 9	0	17 A

Recommended Semiconductor Fuse and Fuse Holders

Fuse Part Number			
DIN-A-MITE Model	Watlow	Bussmann	Ferraz
15A	17-8020	FWC20A10F	PFZ-K330013
20A	17-8025	FWC25A10F	PFZ-L330014
30A	17-8040	FWC40A14F	PFZ-A93909
40A	17-8050	FWC50A14F	PFZ-B93910

Fuse Holder Part Number			
DIN-A-MITE Model	Watlow	Bussmann	Ferraz
15A	17-5110	CHM1G	PFZ-G81219
20A	17-5110	CHM1G	PFZ-G81219
30A	17-5114	CH141G	PFZ-J081221
40A	17-5114	Ch141G	PFZ-J081221

Output Rating Curves





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

TRANSFORMER

MANUFACTURER:

SQUARE D

POWER:

500 VA

STEP-DOWN VOLTAGE:

240 /480 V TO 120V

CATALOG NO:

9070-T1000D1

QUANTITY:

1

EQUIP ID:

TX1

DIMENSIONS

Table 17: Dimensions for Type T

VA	A		B		C		E		F		Slots				Figure	FINGERSAFE®		
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm		Catalog Number	D* IN mm	
Voltage Codes: D1; D3; D4; D5; D6; D17; D24; D31; D33; D37; D51; D55; D57; D58; D60; D84; D85; D86; D93; D100; D101; D102; D103																		
25	3.09	79	3.00	76	2.58	66	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84 98
50	3.09	79	3.00	76	2.58	65	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84 98
75	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09 104
100	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09 104
150	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34 110
200	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34 110
250	5.25	133	3.75	95	3.25	83	2.88	73	3.13	80	0.20	5	X	0.38	10	2	FSC-2	6.05 154
300	4.70	119	4.50	114	3.80	97	2.56	65	3.75	95	0.20	5	X	0.38	10	2	FSC-2	5.50 140
350	5.09	129	4.50	114	3.80	97	3.00	76	3.75	95	0.20	5	X	0.38	10	2	FSC-C	5.89 150
500	5.46	139	4.50	114	3.80	97	3.56	90	3.75	95	0.20	5	X	0.38	10	2	FSC-2	6.26 159
750	5.66	144	5.25	133	4.43	113	3.43	87	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.46 164
1000	6.04	153	5.25	133	4.43	113	4.31	110	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.84 174
1500	5.81	148	7.06	179	6.16	157	4.13	105	5.81	148	0.28	7	X	0.56	14	2	FSC-2	6.61 168
2000	7.04	179	7.06	179	6.16	157	4.56	116	5.81	148	0.28	7	X	0.56	14	2	FSC-2	7.84 199
Voltage Codes: D1; D5; D6; D17; D24; D84; D85; D102;																		
3000	6.86	174	9	229	8.46	215	4.63	118	7.63	194	0.44	11	X	0.69	18	3	FSC-2	7.26 184
5000	8.73	222	9	229	8.46	215	6.56	167	7.63	194	0.44	11	X	0.69	18	3	FSC-2	9.13 232
Voltage Codes: D31; D33; D37; D55; D57; D58; D60																		
3000	5.79	147	9	229	7.88	200	4.63	118	7.63	194	0.44	11	X	0.69	18	2	FSC-2	6.59 167
5000	7.66	195	9	229	7.88	200	6.56	167	7.63	194	0.44	11	X	0.69	18	2	FSC-2	8.46 215
Voltage Codes: D3; D4; D51; D88; D93; D100; D101; D103																		
3000	5.79	147	9	229	7.88	200	4.63	118	7.63	194	0.44	11	X	0.69	18	2	FSC-2	6.59 167
5000	8.73	222	9	229	8.46	215	6.56	167	7.63	194	0.44	11	X	0.69	18	3	FSC-2	9.13 232

* Dimension when FINGERSAFE covers are field installed

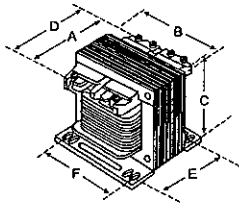


Figure 1

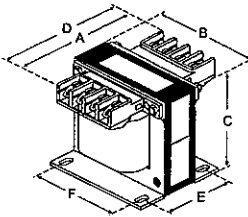


Figure 2

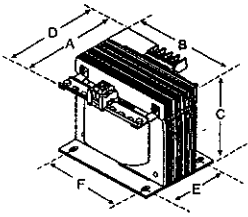


Figure 3

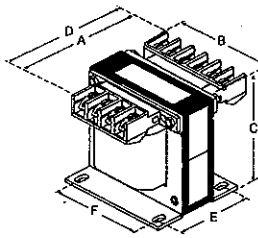


Figure 4

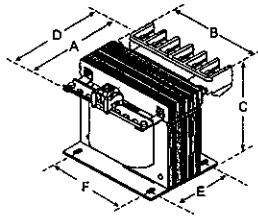


Figure 5

Table 18: Dimensions for Type T

VA	A		B		C		E		F		Slots				Figure	FINGERSAFE®		
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm		Catalog Number	D* IN mm	
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																		
25	3.09	79	3.00	76	2.58	66	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84 98
50	3.09	79	3.00	76	2.58	65	2.00	51	2.50	64	0.20	5	X	0.38	10	1	FSC-1	3.84 98
75	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09 104
100	3.34	85	3.38	86	2.89	73	2.38	61	2.81	71	0.20	5	X	0.48	12	1	FSC-1	4.09 104
150	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-1	4.34 110
200	3.59	91	3.75	95	3.20	81	2.88	73	3.13	80	0.20	5	X	0.38	10	1	FSC-2	4.34 110
250	5.25	133	3.75	95	3.25	83	2.88	73	3.13	80	0.20	5	X	0.38	10	2	FSC-2	6.05 154
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																		
350	5.09	129	4.50	114	3.80	97	3.00	76	3.75	95	0.20	5	X	0.38	10	2	FSC-2	5.89 150
500	5.46	139	4.50	114	3.80	97	3.56	90	3.75	95	0.20	5	X	0.38	10	2	FSC-2	6.26 159
Voltage Codes: D21; D38																		
350	6.15	156	4.50	114	4.38	111	3.00	76	3.75	95	0.20	5	X	0.38	10	3	FSC-2	6.55 166
500	6.52	166	4.50	114	4.38	111	3.56	90	3.75	95	0.20	5	X	0.38	10	3	FSC-2	6.92 176
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D66; D88; D89; D92																		
750	6.72	171	5.25	133	5.01	127	3.43	87	4.38	111	0.28	7	X	0.56	14	3	FSC-2	7.12 181
1000	7.10	180	5.25	133	5.01	127	4.31	110	4.38	111	0.28	7	X	0.56	14	3	FSC-2	7.50 190.5
Voltage Codes: D63; D64; D78																		
750	5.66	144	5.25	133	4.43	113	3.43	87	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.46 164
1000	6.04	153	5.25	133	4.43	113	4.31	110	4.38	111	0.28	7	X	0.56	14	2	FSC-2	6.84 174
Voltage Codes: D2; D13; D14; D16; D21; D23; D25; D36; D38; D52; D54; D56; D59; D61; D63; D64; D66; D78; D88; D89; D92																		
1500	6.86	174	7.06	179	6.74	171	4.13	105	5.81	148	0.28	7	X	0.56	14	3	FSC-2	7.26 184
2000	8.11	206	7.06	179	6.74	171	4.56	116	5.81	148	0.28	7	X	0.56	14	3	FSC-2	8.51 216

* Dimension when FINGERSAFE covers are field installed





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

CONTROL RELAY

ACCESSORIES:

WITH PILOT

VOLTS:

115 V

NO. POLES:

DPDT

MANUFACTURER:

SQUARE-D

CATALOG NO:

8501-KU12P14V20

QUANTITY:

7

EQUIP. ID:

CR1 THRU CR6 & BC1

ITEM:

RELAY SOCKETS

MANUFACTURER:

SQUARE-D

CATALOG NO:

8501-NR82B

QUANTITY:

7

Class 8501 General Purpose Relays


Type K - Plug-in Relay

General and Order Information

Class 8501 Type K relays are designed for multipole switching applications at 240 volts or below. These relays have industry standard wiring and pin arrangements which allows for their use as replacements for many similar relays without wiring or hardware modifications.


- 10 or 15 Ampere Versions
- DPDT or 3PDT
- Manual Operator/ Pilot Light Options
- Horsepower Rated
- DPDT Latching Relay
- AC or DC Operation

Type KF – Flange Mounted – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KF12*
		3PDT		KF13*
	DC	DPDT	None Available	KFD12*
		3PDT		KFD13*

Socket is not required with Type KF relays.

Type KL – Latching Relay – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None Available	KL12*
	DC	DPDT	None Available	KLD12*

Stocked Relays*


Type	AC Voltage 50/60 Hz					Type	DC Voltage					
	6	12	24	120	240		6	12	24	48	110	125
Voltage Codes	V35	V36	V14	V20	V24	Voltage Codes	V50	V51	V53	V56	V60	V63
KP12	S	S	S	S	S	KPD12	S	S	S	S	S	S
KP12P14		S	S	S	S	KPD12P14		S	S		S	S
KP13		S	S	S	S	KPD13		S	S	S	S	S
KP13P14			S	S	S	KPD13P14			S			S
KU12		S	S	S	S	KUD12		S	S			
KU12M1						KUD12M1			S			
KU12P14			S	S		KUD12P14						
KU12M1P14			S	S	S	KUD12M1P14			S			
KU13		S	S	S	S	KUD13		S	S		S	S
KU13M1						KUD13M1			S			
KU13P14			S	S		KUD13P14						
KU13M1P14			S	S	S	KUD13M1P14			S		S	S
KX12		S	S	S	NA	KXD12		S	S		S	
KX12M1				S	NA	KXD12M1		S	S			
KX12P14			S	S	NA	KXD12P14			S			
KX12M1P14				S	NA	KXD12M1P14		S	S			
KX13			S	S	NA	KXD13		S	S			
KX13M1			S	S	NA	KXD13M1						
KX13P14			S	S	NA	KXD13P14			S			
KX13M1P14			S	S	NA	KXD13M1P14		S	S		S	
KF12			S	S	S	KFD12		S	S			
KF13			S	S	S	KFD13		S	S			
KL12	NA	NA	S	S	S	KLD12		S	S		NA	NA

- * Orders for Type K relays which are not stocked must call for a minimum quantity of 150 identical devices and will have a lead time of 16 weeks.
- NA means Not Available.
- * Voltage code must be specified to order this product. Refer to standard voltage codes listed above and insert as shown in How To Order.


How to Order:

To Order Specify:	Catalog Number		
<ul style="list-style-type: none"> • Class Number • Type Number • Voltage Code (See Stocked Relay Table above)	Class	Type	Voltage Code
	8501	KP12	V20


Type KP -- Tubular Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KP12*
		DPDT	Pilot Light	KP12P14*
		3PDT	None	KP13*
		3PDT	Pilot Light	KP13P14*
	DC	DPDT	None	KPD12*
		DPDT	Pilot Light	KPD12P14*
		3PDT	None	KPD13*
		3PDT	Pilot Light	KPD13P14*

Type KU – Spade Terminals

10 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KU12*
		DPDT	Manual Operator	KU12M1*
		DPDT	Pilot Light	KU12P14*
		DPDT	Manual Operator and Pilot Light	KU12M1P14*
		3PDT	None	KU13*
		3PDT	Manual Operator	KU13M1*
		3PDT	Pilot Light	KU13P14*
		3PDT	Manual Operator and Pilot Light	KU13M1P14*
		DC	DPDT	None	KUD12*
	DPDT		Manual Operator	KUD12M1*
	DPDT		Pilot Light	KUD12P14*
	DPDT		Manual Operator and Pilot Light	KUD12M1P14*
	3PDT		None	KUD13*
	3PDT		Manual Operator	KUD13M1*
	3PDT		Pilot Light	KUD13P14*
	3PDT		Manual Operator and Pilot Light	KUD13M1P14*

Type KX – Spade Terminals

15 AMPS	Input Voltage	Contact Arrangement	Options	Type
	AC 50/60 Hz	DPDT	None	KX12*
		DPDT	Manual Operator	KX12M1*
		DPDT	Pilot Light	KX12P14*
		DPDT	Manual Operator and Pilot Light	KX12M1P14*
		3PDT	None	KX13*
		3PDT	Manual Operator	KX13M1*
		3PDT	Pilot Light	KX13P14*
		3PDT	Manual Operator and Pilot Light	KX13M1P14*
		DC	DPDT	None	KXD12*
	DPDT		Manual Operator	KXD12M1*
	DPDT		Pilot Light	KXD12P14*
	DPDT		Manual Operator and Pilot Light	KXD12M1P14*
	3PDT		None	KXD13*
	3PDT		Manual Operator	KXD13M1*
	3PDT		Pilot Light	KXD13P14*
	3PDT		Manual Operator and Pilot Light	KXD13M1P14*

Pilot Light Option – Available on Types KP, KU, and KX. Internal pilot lights are available in both ac and dc versions for positive indication of power to the coil. 120V and 240V are neon, and below 90V are incandescent.

Manual Operator Option – Available on Type KU and KX only. To speed circuit testing a manual operator can be provided. With this feature the relay can be manually switched to simulate normal operation.

Application Data page 5
 Dimensions page 5
 Sockets page 6





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

TEMPERATURE RELAY

MANUFACTURER:

WATLOW

MODEL:

LVC6KW00321112A

VOLTAGE:

120V

QUANTITY:

1

TAG NO.:

TSH-1

Basic Temperature and Limit Controller Solutions at Our Most Economical Price

Watlow's new family of microprocessor based temperature and limit controllers provide an economical solution for applications requiring simple on-off control. These controllers and limits are available in a broad range of packaging options, allowing users to select the best version for their individual application. The controllers and limits are available with or without an operator interface and can be ordered in square 1/2" DIN panel mount, DIN-rail mount or open board design configurations.

The new temperature and limit family incorporates a microprocessor design platform. This design provides significant improvements in the performance, repeatability and accuracy offered by Watlow's current line of analog basic temperature and limit controllers.

The variable options, SERIES CV (controller) and SERIES LV (limit), include an operator interface for viewing and selecting the set point. A red, four-character seven segment LED displays the set point with a push to show process option. The set point selection is made with a continuous turn rotary encoder. Operating range temperature values are customer definable in the product configuration part number.

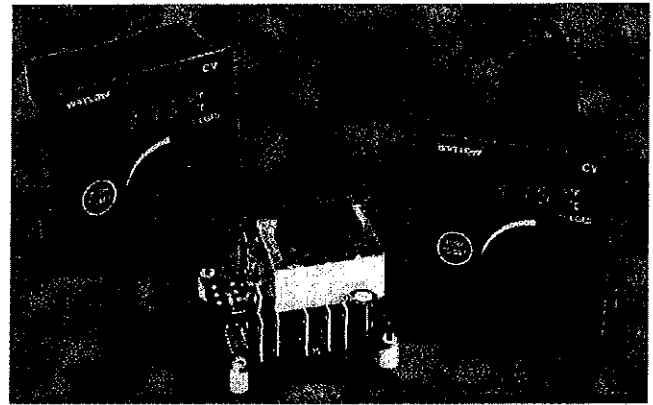
The fixed options, SERIES CF (controller) and SERIES LF (limit), offer fixed set points and are supplied without an operator interface. Operating set point temperature values are customer definable in the product configuration part number. The SERIES TM-temperature indicator is available as an additional order option.

The new temperature controllers are UL® recognized and include CE approvals. The limit controllers are FM approved with special UL® approval for the open board potted versions. Watlow's basic temperature and limit controllers include industry leading service and support and are backed by a three-year warranty.

Applications

- Food preparation
- Industrial machinery
- Packaging
- Plastics processing

UL® is a registered trademark of Underwriter's Laboratories, Inc.



Features and Benefits

Fixed or adjustable set points

- Provide tamper-proof operation
- Offer control flexibility

Four character LED display

- Improves set point selection accuracy

Multiple mounting options

- Minimize installation time

Heat or cool operation

- Provides application flexibility

High or low limit with auto or manual reset

- Provides application flexibility

Fahrenheit or celsius operation with indication

- Offers application flexibility

Sensor break protection

- Provides positive system shutdown

Agency approvals

- Meet certification requirements/compliance

Microprocessor based technology

- Ensures accurate repeatable control



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e-mail: info@watlow.com

WIN-BTLC-0604

ISO 9001



Specifications

On-off Controller

- Microprocessor based, on-off control mode
- Nominal switching hysteresis, typically 1.7°C (3°F)
- Input filter time: 1 second

Limit Controller

- Microprocessor based, limit controller
- Nominal switching hysteresis, typically 1.7°C (3°F)
- High or low limit, factory selectable
- Latching output requires manual reset upon over or under temperature condition
- Manual or automatic reset on power loss, factory selectable
- Internal front panel or external customer supplied momentary reset switch
- Input filter time: 1 second

Operator Interface

- Four digit, seven segment LED displays, 7 mm (0.28 in.) high
- °F or °C indicator LED
- Load/Alarm indicator LED
- Continuous turn, velocity sensitive rotary encoder for set point adjustment
- Front panel key on push for set point or push for show process options (on-off controller only)
- Front panel SET/RESET key on variable set point models (limit controller only)
- No operator interface on fixed set point models

Standard Conditions For Specifications

- Rated line voltage, 50 to 60Hz, 0 to 90 percent RH non-condensing, 15-minute warm-up
- Calibration ambient range: 25°C (77°F) ±3°C

Sensor Input

Thermocouple

- Grounded or ungrounded
- Type E, J, K, T thermocouple types
- >10 MΩ input impedance
- 250 nV input referenced error per 1Ω source resistance

RTD

- 2-wire platinum, 100Ω
- DIN curve (0.00385 curve)
- 125 μA nominal RTD excitation current

Input Accuracy Span Range

Type E:	-200 to 800°C	or	-328 to 1470°F
Type J:	0 to 750°C	or	32 to 1382°F
Type K:	-200 to 1250°C	or	-328 to 2282°F
Type T:	-200 to 350°C	or	-328 to 662°F
RTD (DIN)	-200 to 800°C	or	-328 to 1472°F

Thermocouple Input

- Calibration accuracy: ±1 percent of input accuracy span, ±1° at standard conditions and actual calibration ambient
Exception: Type T, ±2.4 percent of input accuracy span for -200 to 0°C (-328 to 32°F)
- Temperature stability: ±0.3 degree per degree change in ambient

RTD Input

- Calibration accuracy ±1 percent of input accuracy span ±1° at standard conditions and actual calibration ambient
- Temperature stability: ±0.2 degree per degree change in ambient

Allowable Operating Ranges

Type E:	-200 to 800°C	or	-328 to 1470°F
Type J:	-210 to 1038°C	or	-346 to 1900°F
Type K:	-270 to 1370°C	or	-454 to 2500°F
Type T:	-270 to 400°C	or	-454 to 750°F
RTD (DIN)	-200 to 800°C	or	-328 to 1472°F

Output Types

Switched dc (non-isolated, on-off controller only)

- Supply voltage maximum: 24V=(dc) into an infinite load
- Supply voltage minimum: 5V=(dc) at 10mA
- Minimum load impedance: 500Ω

Electromechanical Relay, Form C

- Minimum load current: 100mA
- 8 A @ 240V~(ac) or 30V=(dc) maximum, resistive
- 250VA pilot duty, 120/240V~(ac) maximum, inductive
- Use RC suppression for inductive loads
- Electrical life 100,000 cycles at rated current

External Reset Switch (limit controller only)

- Momentary, dry contact closure

Agency Approvals (on-off controller only)

- UL® 873 Recognized Temperature Controller and Indicator, File # E43684
- UL® 197 Reviewed for use in food service appliances
- ANSI Z21.23 Gas Appliance Thermostat approval
- Temperature Control and Indicator CSA 22.2 No. 24, File # 30586
- CE^①

Agency Approvals (limit controller only)

SERIES LF (potted version only)

- UL® 991 recognized temperature limit for food service industry

SERIES LV and SERIES LF (including potted version)

- UL® 873 recognized temperature regulator, File # E43684
- UL® 197 reviewed for use in food service appliances
- ANSI Z21.23 Gas appliance thermostat approval
- CSA C22.2#24 approved temperature control, File # 30586
- FM Class 3545 temperature limit switches, File # 3017239
- CE^①

Terminals

- 6.3 mm (0.25 in.) quick connect, push on terminal or removable screw style terminal block

Power

- 24V~(ac) +10 percent; -15 percent; 50/60Hz, ±5 percent
- 120V~(ac) +10 percent; -15 percent; 50/60Hz, ±5 percent
- 230 to 240V~(ac) +10 percent; -15 percent; 50/60Hz, ±5 percent
- 187 to 264V~(ac) SERIES LF and CF only
- 10VA maximum power consumption
- Data retention upon power failure via nonvolatile memory

Operating Environment

- 0 to 70°C (32 to 158°F)
- 0 to 90 percent RH, non-condensing
- Storage temperature: -40 to 85°C (-40 to 185°F)

Dimensions

- DIN-rail model can be DIN-rail or chassis mount
DIN-rail spec DIN 50022, 35 mm x 7.5 mm (1.38 in. x 0.30 in.)

Style	Width	Height	Depth
Open Board	61.7 mm (2.43 in.)	61.7 mm (2.43 in.)	45.1 mm (1.78 in.)
Potted	70.1 mm (2.76 in.)	102.9 mm (4.05 in.)	46.6 mm (1.84 in.)
DIN-Rail	78.1 mm (3.08 in.)	112.3 mm (4.42 in.)	90.7 mm (3.57 in.)
Square ½ DIN Panel	72.4 mm (2.85 in.)	72.4 mm (2.85 in.)	Behind panel 51.7 mm (2.04 in.)

^①See declaration of conformity.

Ordering Information

T M A A A A A A A A

Indicator only, four character,
seven segment display

Power Supply

B = 120V~(ac)
D = 230 to 240V~(ac)
F = 24V~(ac)

Package

1 = Panel mount, 1/8" DIN square -
spade terminals
2 = DIN-rail mount - spade terminals
5 = Panel mount, 1/8" DIN square -
screw terminals
6 = DIN-rail mount - screw terminals

Sensor Type and Scale

H = T/C Type J Fahrenheit (-346 to 1900°F)
J = T/C Type J Celsius (-210 to 1038°C)
K = T/C Type K Fahrenheit (-454 to 2500°F)
L = T/C Type K Celsius (-270 to 1370°C)
M = T/C Type T Fahrenheit (-454 to 750°F)
N = T/C Type T Celsius (-270 to 400°C)
P = RTD Fahrenheit (-328 to 1472°F)
R = RTD Celsius (-200 to 800°C)
S = T/C Type E Fahrenheit (-328 to 1470°F)
T = T/C Type E Celsius (-200 to 800°C)

Overlay/Customs Options

A = Standard with Watlow logo
1 = Standard without Watlow logo

Ordering Information

L F A A A A

Limit control with eight amp
relay output. Fixed set point,
no user interface

Power Supply

C = 120V~(ac)
E = 230 to 240V~(ac)
G = 24V~(ac)

Package

1 = Panel mount, 1/8" DIN square -
spade terminals
2 = DIN-rail mount - spade terminals
3 = Open, non potted - spade
terminals
4 = Potted case - spade terminals
5 = Panel mount, 1/8" DIN square -
screw terminals
6 = DIN-rail mount - screw terminals
7 = Open, non potted - screw
terminals

Sensor Type and Scale

H = T/C Type J Fahrenheit
(-346 to 1900°F)
J = T/C Type J Celsius
(-210 to 1038°C)
K = T/C Type K Fahrenheit
(-454 to 2500°F)
L = T/C Type K Celsius
(-270 to 1370°C)
M = T/C Type T Fahrenheit
(-454 to 750°F)
N = T/C Type T Celsius
(-270 to 400°C)
P = RTD Fahrenheit (-328 to 1472°F)
R = RTD Celsius (-200 to 800°C)
S = T/C Type E Fahrenheit
(-328 to 1470°F)
T = T/C Type E Celsius
(-200 to 800°C)

Limit Type

U = High limit manual reset
W = High limit auto reset
Y = Low limit manual reset
Z = Low limit auto reset

Fixed Set Point Temperature Value[ⓐ]

Overlay/Customs Options

A = Standard with Watlow logo
1 = Standard without Watlow logo

[ⓐ]A (-) is used in the left most digit of the fixed
set point indicates a negative temperature value

Ordering Information

L V

Limit control with eight amp
relay output. Rotary set point,
adjustment, four character,
seven segment display,
reset switch

Power Supply

C = 120V~(ac)
E = 230 to 240V~(ac)
G = 24V~(ac)

Package

1 = Panel mount, 1/8" DIN square -
spade terminals
2 = DIN-rail mount - spade
terminals
5 = Panel mount, 1/8" DIN square -
screw terminals
6 = DIN-rail mount - screw
terminals

Sensor Type and Scale

H = T/C Type J Fahrenheit
(-346 to 1900°F)
J = T/C Type J Celsius
(-210 to 1038°C)
K = T/C Type K Fahrenheit
(-454 to 2500°F)
L = T/C Type K Celsius
(-270 to 1370°C)
M = T/C Type T Fahrenheit
(-454 to 750°F)
N = T/C Type T Celsius
(-270 to 400°C)
P = RTD Fahrenheit
(-328 to 1472°F)
R = RTD Celsius
(-200 to 800°C)
S = T/C Type E Fahrenheit
(-328 to 1470°F)
T = T/C Type E Celsius
(-200 to 800°C)

Limit Type

U = High limit manual reset
W = High limit auto reset
Y = Low limit manual reset
Z = Low limit auto reset

Low Set Point Operating Range Value[ⓐ]

High Set Point Operating Range Value[ⓐ]

Overlay/Customs Options

A = Standard with Watlow logo
1 = Standard without Watlow logo

[ⓐ]A (-) is used in the left most digit of the fixed
set point indicates a negative temperature value

Your Authorized Watlow Distributor is:

Ordering Information

C F A A A A

On-off controller, fixed set point, no user interface

Power Supply

- B = 120V~(ac), switched dc output
- C = 120V~(ac), eight amp relay output
- D = 230 to 240V~(ac), switched dc output
- E = 230 to 240V~(ac), eight amp relay output
- F = 24V~(ac), switched dc output
- G = 24V~(ac), eight amp relay output

Package

- 1 = Panel mount, 1/8" DIN square - spade terminals
- 2 = DIN-rail mount - spade terminals
- 3 = Open board, non potted - spade terminals
- 4 = Potted case - spade terminals
- 5 = Panel mount, 1/8" DIN square - screw terminals
- 6 = DIN-rail mount - screw terminals
- 7 = Open board, non potted - screw terminals

Sensor Type and Scale

- H = T/C Type J Fahrenheit (-346 to 1900°F)
- J = T/C Type J Celsius (-210 to 1038°C)
- K = T/C Type K Fahrenheit (-454 to 2500°F)
- L = T/C Type K Celsius (-270 to 1370°C)
- M = T/C Type T Fahrenheit (-454 to 750°F)
- N = T/C Type T Celsius (-270 to 400°C)
- P = RTD Fahrenheit (-328 to 1472°F)
- R = RTD Celsius (-200 to 800°C)
- S = T/C Type E Fahrenheit (-328 to 1470°F)
- T = T/C Type E Celsius (-200 to 800°C)

Control Type

- H = Heat
- C = Cool

Fixed Set Point Temperature Value[ⓐ]

Overlay/Customs Options

- A = Standard with Watlow logo
- 1 = Standard without Watlow logo

[ⓐ]A (-) is used in the left most digit of the fixed set point indicates a negative temperature value

Ordering Information

C V

On-off controller rotary set point adjustment, four character, seven segment display

Power Supply

- B = 120V~(ac), switched dc output
- C = 120V~(ac), eight amp relay output
- D = 230 to 240V~(ac), switched dc output
- E = 230 to 240V~(ac), eight amp relay output
- F = 24V~(ac), switched dc output
- G = 24V~(ac), eight amp relay output

Package

- 1 = Panel mount, 1/8" DIN square - spade terminals
- 2 = DIN-rail mount - spade terminals
- 5 = Panel mount, 1/8" DIN square - screw terminals
- 6 = DIN-rail mount - screw terminals

Sensor Type and Scale

- H = T/C Type J Fahrenheit (-346 to 1900°F)
- J = T/C Type J Celsius (-210 to 1038°C)
- K = T/C Type K Fahrenheit (-454 to 2500°F)
- L = T/C Type K Celsius (-270 to 1370°C)
- M = T/C Type T Fahrenheit (-454 to 750°F)
- N = T/C Type T Celsius (-270 to 400°C)
- P = RTD Fahrenheit (-328 to 1472°F)
- R = RTD Celsius (-200 to 800°C)
- S = T/C Type E Fahrenheit (-328 to 1470°F)
- T = T/C Type E Celsius (-200 to 800°C)

Control Type

- H = Heat
- C = Cool

Low Set Point Operating Range Value[ⓐ]

High Set Point Operating Range Value[ⓐ]

Overlay/Customs Options

- A = Standard with Watlow logo
- B = Push to show process with Watlow logo
- C = Push to adjust set point with Watlow logo
- D = Show process push to adjust set point with Watlow logo
- 1 = Standard without Watlow logo
- 2 = Push to show process without Watlow logo
- 3 = Push to adjust set point without Watlow logo
- 4 = Show process push to adjust set point without Watlow logo

[ⓐ]A (-) is used in the left most digit of the fixed set point indicates a negative temperature value

To be automatically connected to the nearest North American Technical and Sales Office call:

1-800-WATLOW2

International Technical and Sales Offices: Australia, +61 (39) 335-6449 • China, +86 (21) 6277-2138 • France, +33 (01) 3073-2425 • Germany, +49 (0) 7253-9400-0 • Italy, +39 (02) 458-8841 • Japan, +81 (03) 5403-4688 • Korea, +82 (02) 575-9804 • Malaysia, +60 (4) 641-5977 • Mexico, +52 (442) 217-6235 • Singapore, +65 6773-9488 • Spain, +34 916 759 192 • Sweden, +46 31 7014959 • Taiwan, +886 (0) 7-288-5168 • Sweden, +46 31 7014959 • United Kingdom, +44 (0) 115-964-0777



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**


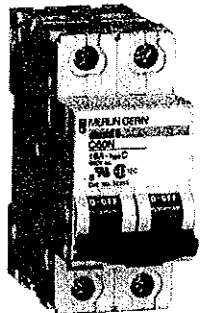
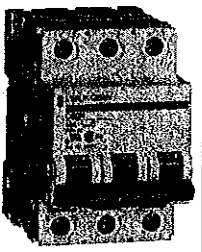
OZONE DESTRUCT SYSTEM

ITEM:	CIRCUIT BREAKER
MANUFACTURER:	SQUARE D
AMPS:	2A
NO. OF POLES:	1P, 120V
CATALOG NO:	MG24501
MAGNETIC SETTING:	10 TO 14 TIMES AMP RATING
TYPE:	THERMAL MAGNETIC
FRAME SIZE:	63A
QUANTITY:	2
EQUIP ID:	CB-2220, 2239

Circuit Breakers
 Supplementary Protectors
 Current-Limiting MULTI-9™ C60N

Class 860

5 CIRCUIT BREAKERS

	Ampere Rating	B Curve	C Curve	D Curve	List Price
	0.5	—	MG17411	MG17421	\$ 72.
	1	MG24110	MG24425	MG24500	60.
	1.2	MG17402	MG17412	MG17422	60.
	1.5	MG17403	MG17413	MG17423	60.
	2	MG24111	MG24426	MG24501	60.
	3	MG24112	MG24427	MG24502	60.
	4	MG24113	MG24428	MG24503	60.
	5	MG17404	MG17414	MG17424	60.
	6	MG24114	MG24430	MG24504	60.
	7	MG17405	MG17415	MG17425	60.
	8	MG24115	MG24431	MG24505	60.
	10	MG24116	MG24432	MG24506	60.
	13	MG24117	MG24433	MG24507	60.
	15	MG17406	MG17416	MG17426	60.
	16	MG24118	MG24434	MG24508	60.
	20	MG24119	MG24435	MG24509	60.
25	MG24120	MG24436	MG24510	60.	
30	MG17407	MG17417	MG17427	60.	
32	MG24121	MG24437	MG24511	60.	
35	MG17408	MG17418	MG17428	60.	
40	MG24122	MG24438	MG24512	66.	
50	MG24123	MG24439	MG24513	70.	
60	MG17409	MG17419	MG17429	74.	
63	MG24124	MG24440	MG24514	74.	
	1	MG24125	MG24442	MG24516	130.
	1.2	MG17432	MG17442	MG17452	130.
	1.5	MG17433	MG17443	MG17453	130.
	2	MG24126	MG24443	MG24517	130.
	3	MG24127	MG24444	MG24518	130.
	4	MG24128	MG24445	MG24519	130.
	5	MG17434	MG17444	MG17454	130.
	6	MG24129	MG24447	MG24520	130.
	7	MG17435	MG17445	MG17455	130.
	8	MG24130	MG24448	MG24521	130.
	10	MG24131	MG24449	MG24522	130.
	13	MG24132	MG24450	MG24523	130.
	15	MG17436	MG17446	MG17456	130.
	16	MG24133	MG24451	MG24524	130.
	20	MG24134	MG24452	MG24525	130.
	25	MG24135	MG24453	MG24526	130.
30	MG17437	MG17447	MG17457	130.	
32	MG24136	MG24454	MG24527	130.	
35	MG17438	MG17448	MG17458	130.	
40	MG24137	MG24455	MG24528	134.	
50	MG24138	MG24456	MG24529	143.	
60	MG17439	MG17449	MG17459	151.	
63	MG24139	MG24457	MG24530	151.	
	1	MG24140	MG24459	MG24532	189.
	2	MG24141	MG24460	MG24533	189.
	3	MG24142	MG24461	MG24534	189.
	4	MG24143	MG24462	MG24535	189.
	6	MG24144	MG24464	MG24536	189.
	8	MG24145	MG24465	MG24537	189.
	10	MG24146	MG24466	MG24538	189.
	13	MG24147	MG24467	MG24539	189.
	15	MG17461	MG17466	MG17471	189.
	16	MG24148	MG24468	MG24540	189.
	20	MG24149	MG24469	MG24541	189.
	25	MG24150	MG24470	MG24542	189.
	30	MG17462	MG17467	MG17472	189.
	32	MG24151	MG24471	MG24543	189.
	35	MG17463	MG17468	MG17473	189.
	40	MG24152	MG24472	MG24544	194.
50	MG24153	MG24473	MG24545	202.	
60	MG17464	MG17469	MG17474	211.	
63	MG24154	MG24474	MG24546	211.	

Application

Control and protection of circuits against overloads and short circuits in control circuit application.

Technical Data

- **Ampere Rating:**
0.5 to 63A at 25°C.
- **Interrupting Capacity:**
UL 1077/CSA 22.2/IEC 947-2

Rating	Poles	Voltage	Interrupting Capacity (kA)
0.5 to 63	1, 2, 3, 4	240 Vac	10000
	1	277 Vac	5000
	2, 3, 4	480Y/277 Vac	5000
0.5 to 63	1	65 Vdc	10000
	2	125 Vdc	10000

- Positive contact indication
- Current-limiting
- Fast-closing contacts

MULTI 9 is a Trademark of Merlin Gerin.

- **Tripping characteristics:**
B Curve: magnetic setting between 3.2 and 4.8 times Ampere rating
C Curve: magnetic setting between 7 and 10 times Ampere rating
D Curve: magnetic setting between 10 and 14 times Ampere rating
- **Tropicalization:** treatment 2 (IEC)
(relative humidity 95% at 55°C.)
- **Weight (oz/g):**

Type	1-pole	2-pole	3-pole	4-pole
	3.85/110	7.70/220	11.55/330	15.40/440

• **Pressure terminals: Cable size (Cu)**

0.5 to 25A	#18 to #4 AWG
32 to 63A	#18 to #2 AWG





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

ITEM:

TERMINAL BLOCKS

MANUFACTURER:
DESCRIPTIONS:
MODEL:
QUANTITY:
TAG NO.

SQUARE-D
~~BOX LUG TYPE~~
AB1VV435UBLA
50
TB-1

*Provide fused
DISCONNECT FOR
I/O*

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the contractor.

Responsible for coordination and correlation of field data with design intent. Provide originals of contract documents and specifications of all parts of the work reviewed by the contractor.

REVIEWED _____

REVISABLE AS NOTIFIED _____

REVISE AND RE-SUBMIT

NOT REVIEWED _____

Project No. 79538-C14716

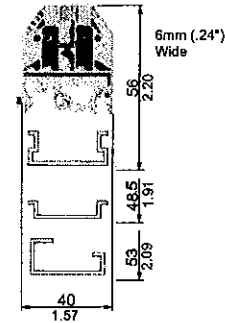
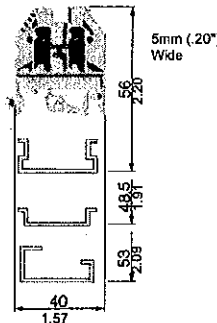
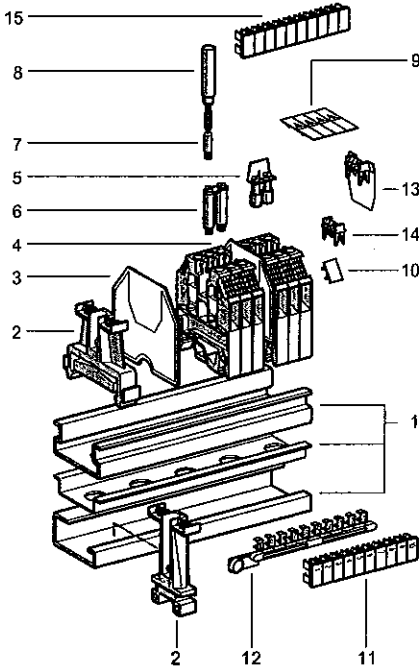
Date: 30/1/06 By: M. Paul

IEC Sectional Terminal Blocks, Type AB1 Terminal Blocks Box Lug Termination

Color
Grey RAL 7032V0
Blue
Orange
Black
Red
Green
White

Catalog Number	Sold in lots of	Weight oz. (g)
AB1VV235U	100	.23 (6.5)
AB1VV235UBL	100	.23 (6.5)
AB1VV235UGE	100	.23 (6.5)

Catalog Number	Sold in lots of	Weight oz. (g)
AB1VV435U	100	.28 (7.8)
AB1VV435UBL	100	.28 (7.8)
AB1VV435UGE	100	.28 (7.8)
AB1VV435UNO	100	.28 (7.8)
AB1VV435URO	100	.28 (7.8)
AB1VV435UVE	100	.28 (7.8)
AB1VV435UBLA	100	.28 (7.8)



Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-12 AWG wire
Stranded wire without cable end: 0.5 to 2.5mm²
Stranded wire with cable end: 0.5 to 1.5mm²
Solid wire: 0.5 to 4.0mm²

UL 600V 20A
CSA 600V 25A
UTE, category C: ~ 500V, --- 500V
VDE, group C: ~ 750V, --- 900V, 26A
Tightening torque: 3.5-5.3 lb-in (0.4-0.6 N·m)

File E164359 CCN XCFR2
File LR89150 Class 6228 01

CE

DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, VDE, LCIE, SEV, FI, SEMKO, RINA, LR, CEBEC, OEVE, EEX

Wire strip length 0.35" / 9mm

Solid or stranded copper wire
22-10 AWG wire
Stranded wire without cable end: 0.5 to 4mm²
Stranded wire with cable end: 0.5 to 2.5mm²
Solid wire: 0.5 to 6mm²

UL 600V 30A
CSA 600V 35A
UTE, category C: ~ 500V, --- 500V
VDE, group C: ~ 750V, --- 900V, 34A
Tightening torque: 4.4-6.2 lb-in (0.5-0.7 N·m)

File E164359 CCN XCFR2
File LR89150 Class 6228 01

CE

DEMKO (500V), NEMKO (500V), GL, LROS, DNV, USSR, KEMA, SEMKO, VDE, LCIE, SEV, FI, CEBEC, RINA, LR, OEVE, EEX

Accessories

Dimensions in mm	
1 - 2.5 track ★	
1 - 3 track ★	
1 - 4 track ★	
2 - Plastic end clamps	width 7.5 on 2.5 width 8 on 2.5 or 3
2 - Metal end clamps	width 10 on 2.5 width 8 on 2.5 or 3
3 - End barriers,	grey
thickness 3/3.5mm	blue
	orange
4 - Partition: thickness 3/3.5mm, grey	
5 - Jumpers with screws	non insulated
- for 2 poles	insulated
- for 10 poles	insulated
6 - Pivoting jumper bar for 2 blocks	
7 - Test plug socket, 3mm diameter	
8 - Test plug, 3mm diameter	
9 - "Danger" live terminals cover	
10 - Blank legend plate	
11 - Printed terminal marker strips	
12 - Printed terminal marker tag strips	
13 - Yellow partition for use between jumpers	
14 - Yellow protective cover for individual jumper	
15 - Yellow protective cover for 10 pole jumper	

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED★			
AM1D★★			
DZ5MB★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL2	80	10 3.70 (105)	
AB1ALN22	10	.07 (2.0)	
AB1ALN210	50	.35 (10)	
AB1BL2	50	.35 (10)	
AB1A2	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS2	100	.03 (0.8)	
AB1SA▲			
AB1B5●●●▲			
AB1R● or G●▲			
AB1CJ2	100	.01 (0.3)	
AB1CA2	100	.01 (0.1)	

Catalog Number	Number of points	Sold in lots of	Unit weight oz. (g)
AM1ED★			
AM1D★★			
DZ5MB★			
AB1AB7P32	100	.15 (4.2)	
AB1AB8P35	100	.21 (5.9)	
AB1AB10M32	100	.23 (6.5)	
AB1AB8M35	100	.25 (7.0)	
AB1AC24	50	.07 (1.9)	
AB1AC24BL	50	.07 (1.9)	
AB1AC24GE	50	.07 (1.9)	
AB1AS24	50	.09 (2.5)	
AB1AL4	70	10 5.11 (145)	
AB1ALN42	10	.10 (2.9)	
AB1ALN410	50	.51 (14.5)	
AB1BL4	50	.42 (12)	
AB1A4	50	.02 (0.5)	
AB1AT1	50	.06 (1.7)	
AB1CS4	100	.03 (0.9)	
AB1SA▲			
AB1B6●●●▲			
AB1R● or G●▲			
AB1CJ4	100	.01 (0.3)	
AB1CA4	100	.01 (0.1)	
AB1CA410ET	50	.04 (1.0)	

◆ Number of parallel connections (diagram reference 5).





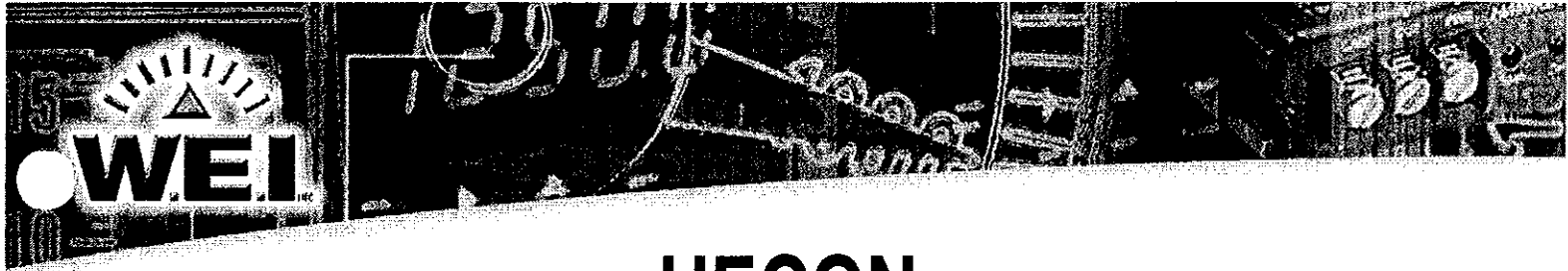
Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:	ELASPED TIME METER
MANUFACTURER:	HECON
MODEL No.:	0891204
MODEL SIZE:	1-1/2"
POWER CONSUMPTION:	.5 WATTS
QUANTITY:	1
TAG No.:	ETM-1

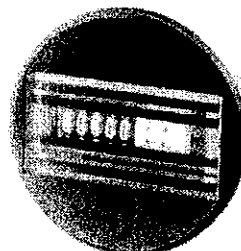
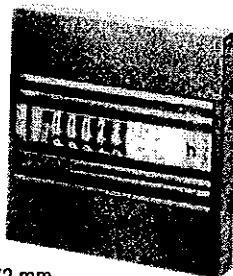
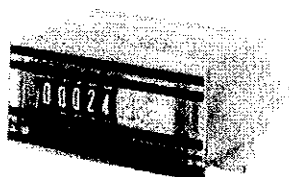


HECON



Time Counter
with DIN dimensions for AC and DC Operation

Type 891

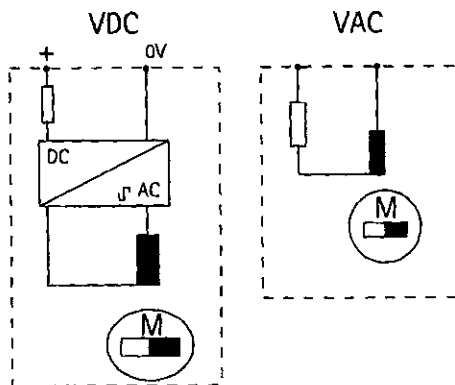


- Low-cost
- DIN dimensions 24 x 48 mm, 48 x 48 mm or 72 x 72 mm
- Highly legible display
- Simple installation
- No reset

Technical data

Display	7 digit, 0 ... 99999.99 h
Digit height	5 mm, visual
Supply voltage Vop	acc. to order information + 10 % (230 VAC + 15 %)
Power consumption	0.5 VA or 85 - 750 mW on DC
Operating temperature	- 10 ... + 50 degrees C
Storage temperature	- 20 ... + 70 degrees C
El. connection	screw terminals for cables of max. 2.5 mm ² and AMP connector 6.3 x 0.8 mm
Mounting	with clamping frame (Ordering code 2 891 016)
Mounting position	roller axis horizontal
Protection class (IEC 144)	front IP 66; screw terminals IP 20, AMP connector IP 00
Vibro stability	30 m/s ² (10 ... 500 Hz) acc. to IEC 068-2-6
Shock stability	800 m/s ² (6 ms) acc. to IEC 068-2-27
General design	acc. to DIN VDE 0700
Weight	approx. 50 g.
Approvals	UL : 130453 (M)
Reset	none

Connection diagram

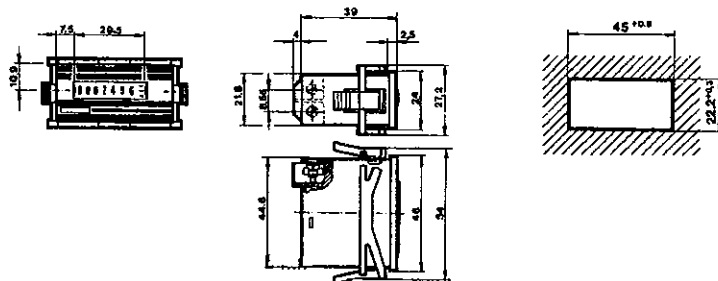


HECON

Dimensional Drawings

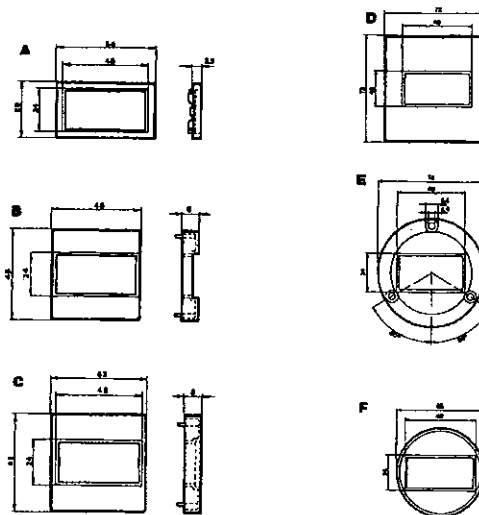
(62.5 on DC)

Type 891 Counter



Seal: Ordering code 2 405 231 (0.5 mm)

Type 891 Installation Frame



Dimensions in mm

Order Information

Counter

Voltage	50 Hz	60 Hz	Voltage	DC
24 VAC	0 891 201	0 891 202	12-24 VDC	0 891 321
115 VAC	0 891 203	0 891 204	36-60 VDC	0 891 322
230 VAC	0 891 211	0 891 206	110 VDC	0 891 323
100 VAC	0 891 213	0 891 214		
200 VAC	0 891 215	0 891 216		

Installation Frame

	Size	Installation cutout	Frame Ordering code	Seal Ordering code
A	54 x 29 mm	50 x 25 mm	2 405 218	2 405 232
B	48 x 48 mm	45 x 45 mm	2 405 219	2 405 233
C	52 x 52 mm	? 50 mm	2 405 220	2 405 234
D	72 x 72 mm	68 x 68 mm	1 405 672	2 405 235
E	? 73 mm	? 50 mm	2 405 223	2 405 237
F	? 58 mm	? 50 mm	2 405 224	2 405 236

Ordering codes printed in bold have priority delivery handling.



Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

**WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA**

OZONE DESTRUCT SYSTEM

ITEM:

SURGE ARRESTER

MANUFACTURER:

SQUARE D

MODEL:

6671-SDSA3650

TYPE:

600V SURGE ARRESTER

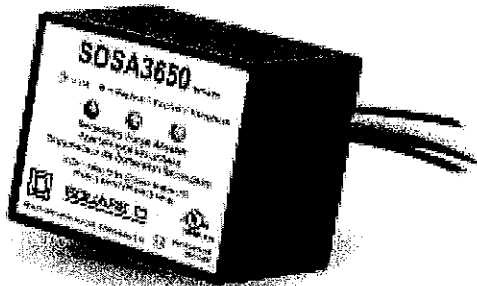
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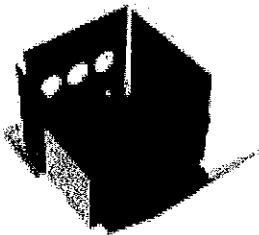
TAG No.:

SA-1

SQUARE D SDSA Secondary Surge Arresters



QOSAMK
Surge Arrester
Mounting Kit



MMSAMK
Surge Arrester
Mounting Kit

Designed to the highest standards of reliability in the industry for protection against lightning and high current surges up to 40,000 amps

SQUARE D SDSA secondary surge arresters include two models, SDSA1175 and SDSA3650, which include the following distinctive features:

- UL and cUL Listed to UL 1449-Second Edition as TVSS and secondary surge arresters
- Designed to meet ANSI/IEEE C62.11-1987 for surge arresters
- Suitable for use in Category B and C locations, for use on grounded systems only
- Metal oxide varistor (MOV) design for faster response and lower clamping voltages than traditional gas tube arresters
- Response time of less than 50 nanoseconds
- LED status indicator for easy visual indication of the device's operational status
- Non-replaceable internal fuse link for protection against varistor-damaging sustained overvoltages
- Housing made of high-temperature thermoplastic to ensure reliable performance in both indoor and outdoor applications
- Maintenance-free, long-life design.

Application Data

The SDSA1175 is designed for use on 120/240 Vac, 50/60 Hz electrical services. Two of these devices can be used to protect 208Y/120 Vac three-phase, four-wire services.

The SDSA3650 is designed to be used where maximum phase-to-ground system voltage does not exceed 600 Vac. Other applications include surge protection of irrigation pumps, oil pumps and motors operating below 600 V.

Both the SDSA1175 and SDSA3650 must be used on grounded systems only.

Selection Information

	1 in. (25 mm) lead	3 in. (76 mm) lead	6 in. (152 mm) lead	12 in. (305 mm) lead	18 in. (457 mm) lead
SDSA1175					
1,500 A surge current	500V	550V	575V	600V	625V
5,000 A surge current	625V	675V	725V	875V	1050V
10,000 A surge current	750V	900V	1075V	1250V	1500V
SDSA3650					
1,500 A surge current	1525V	1750V	1775V	1800V	1825V
5,000 A surge current	1700V	2100V	2125V	2325V	2425V
10,000 A surge current	1925V	2375V	2400V	2700V	3000V



SQUARE D SDSA

A design force focused on your needs for superior reliability and performance. Schneider Electric offers a wide selection of quality surge protective devices engineered and tested to meet your specific design and application requirements. All of our design and testing is based on years of proven expertise, including extensive testing and qualification in the industry's most advanced facilities.

In addition to SQUARE D SDSA secondary surge arresters, you can also depend on a comprehensive range of Schneider Electric Surge Protective Devices (SPDs) designed for a variety of surge protection needs:



SURGELOGIC™ XR Surge Protective Devices – Surge suppression protection with the added benefits of noise filtration capabilities in a compact, hardwired package for protection from surges up to 40,000 amps on single-phase power systems.



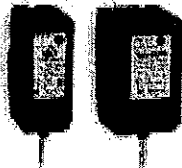
SURGELOGIC™ XW Surge Protective Devices – Available for three-phase power systems up to 600V, the XW is a hardwired TVSS capable of withstanding surges as high as 100,000 amps. The XW comes standard in a Type 1 enclosure with status lights, audible alarm and dry contacts.



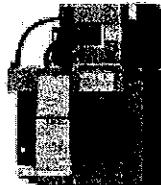
SURGELOGIC™ LC Surge Protective Devices – A hybrid device (surge suppression and noise filtration) with up to 40,000 amps surge protection and -75dB of noise filtration; ideal for custom control and other applications with microprocessors, PLCs and motion control.



MERLIN GERIN Multi 9 SPD Surge Protective Devices – A DIN-rail mountable, compact device for MERLIN GERIN applications offering multiple configurations for single- and three-phase power systems with surge protection capacities from 20,000 amps to 80,000 amps.



SURGEBREAKER® Secondary Surge Arresters – Specifically designed for QO or HOMELINE load centers, these SPDs easily plug into place for a secure fit, providing surge protection up to 40,000 amps.



SURGELOGIC™ I-LINE® Surge Protective Devices (TVSS) – Designed as the perfect match for I-LINE panelboards and switchboards offering three-phase protection that easily snaps into place in retrofit or new installations; surge protection up to 160,000 amps and 240,000 amps.





Fuji Electric Corporation of America

Date : 1/13/06
Revision : 00
Project No. : WPMB-1105

WINNIPEG WATER TREATMENT PROGRAM
MANITOBA, CANADA

OZONE DESTRUCT SYSTEM

ITEM:

ENCLOSURE LIGHT

MANUFACTURER:

HOFFMAN

DESCRIPTIONS:

120VAC, 50/60HZ, 15AMPS

MODEL:

A-LTDB1

QUANTITY:

1

Earth Tech (Canada) Inc.

Reviewed for use with the intent of the drawings and completion of field work.

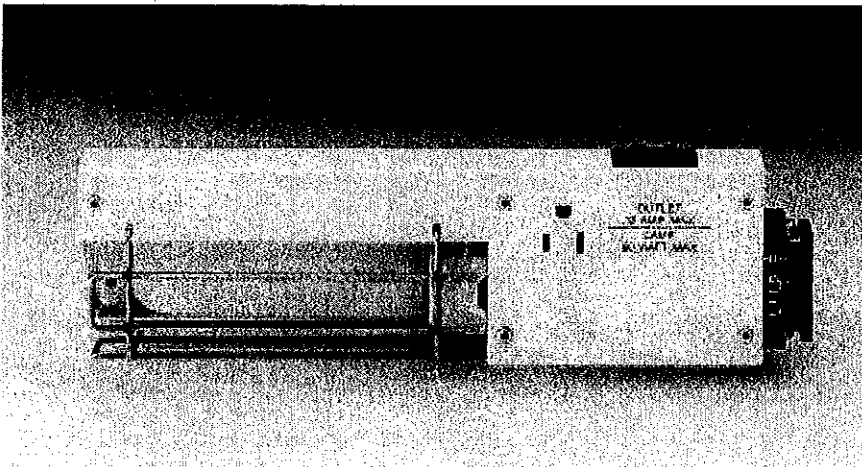
Reviewed by: _____ Date: _____

Checked by: _____ Date: _____

NOT REVIEWED

Project No. 79538

Date: 30/1/06 By: [Signature]



Incandescent Lighting Package



Designed to illuminate the interior of an electrical enclosure. Models are available with a door-activated switch or a manually operated switch. A terminal block is provided for connection to the electrical supply circuit. A convenience outlet is also provided for ease of servicing components mounted within the enclosure. Lighting package mounts at the top of the enclosure door opening and protrudes into the opening less than one inch (25mm). A removable wire guard protects the bulb from damage.

Maintains UL/CSA Type 4 when properly installed on a Hoffman enclosure.

Construction

- 60 watt incandescent T-10 style bulb
- Terminal block has three 6-32 screw terminals with barriers labeled for power and ground connections
- Operates on 120 volts, 50/60 Hz
- 120 volt convenience outlet with ground, 12 amp maximum rating
- 20 gauge sheetmetal construction
- Stainless steel wire guard snaps in place for easy bulb replacement
- Includes two self-sealing installation screws

Industry Standards

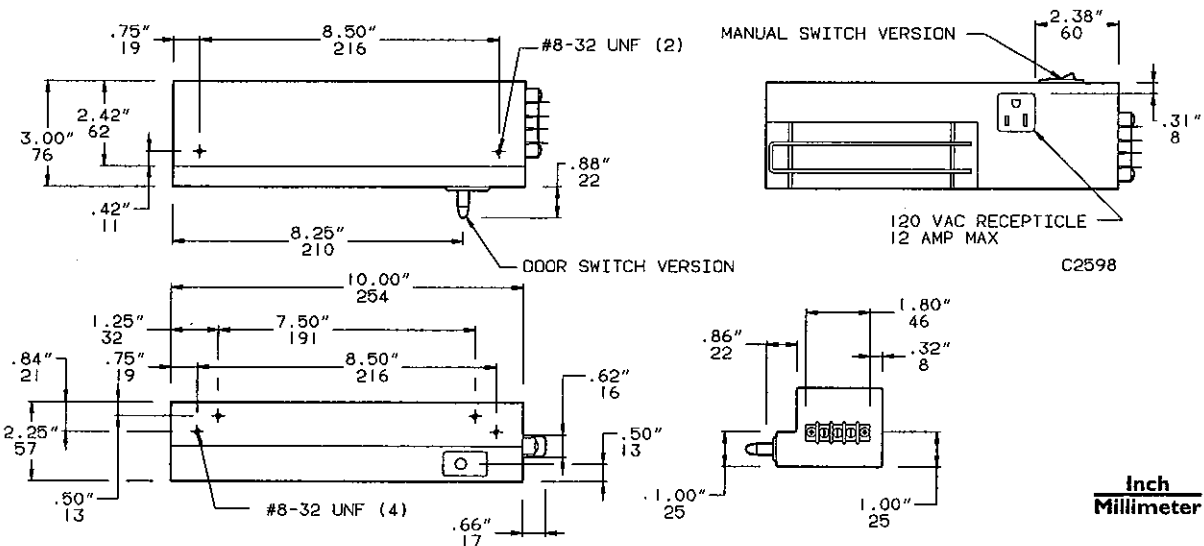
UL Component Recognized  
Certified by Canadian Standards Association

Finish

Lighting Package is white. Wire guard is stainless steel.

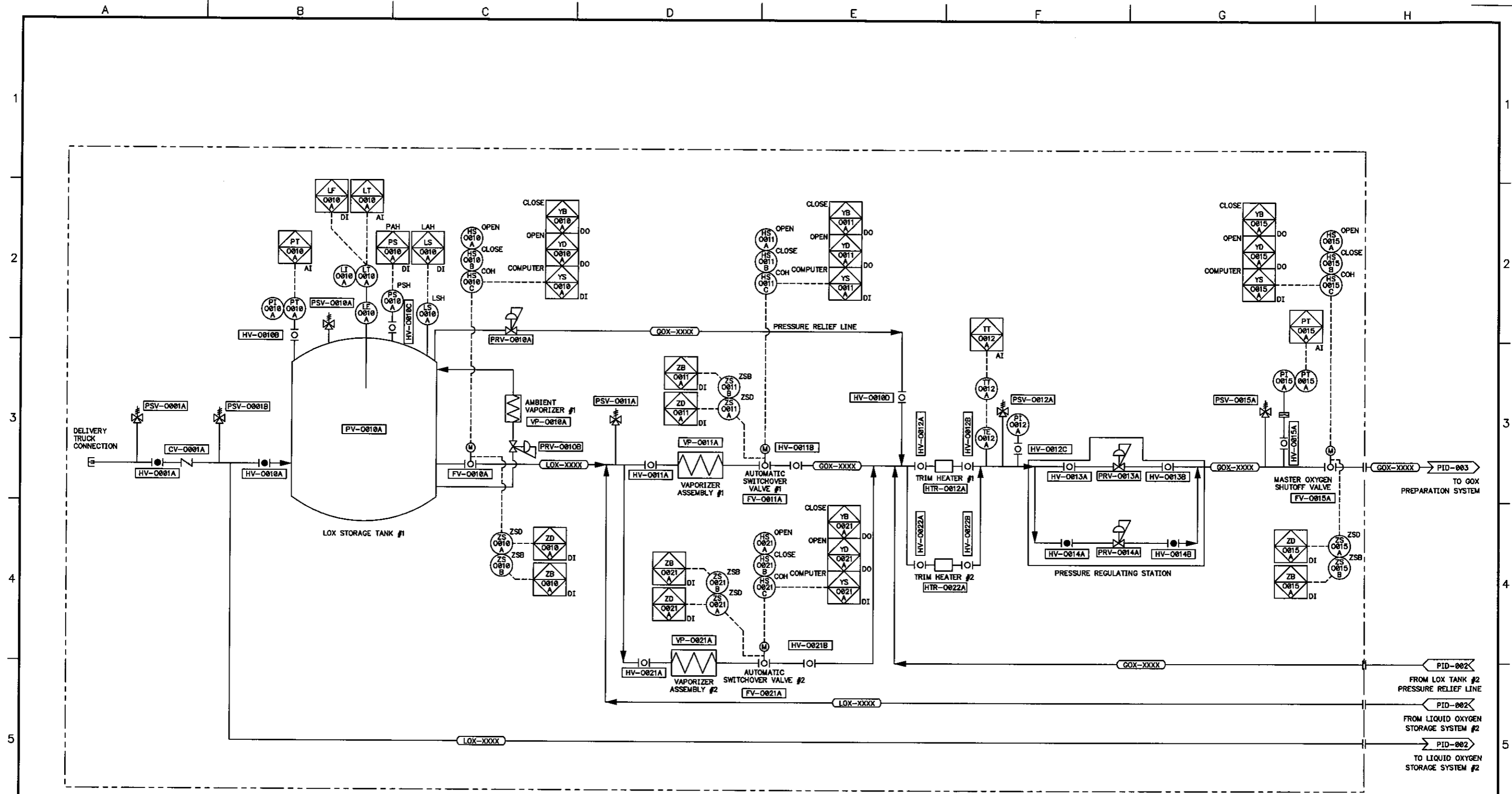
Installation

Designed to be mounted in most Hoffman Type 4, 12, 13, 3, and 3R enclosures. Front mounting holes are used on most applications. Two .173-inch (4mm) holes must be drilled in the enclosure. Lighting Package should be installed with two sealing screws which are included.



Inch
Millimeter

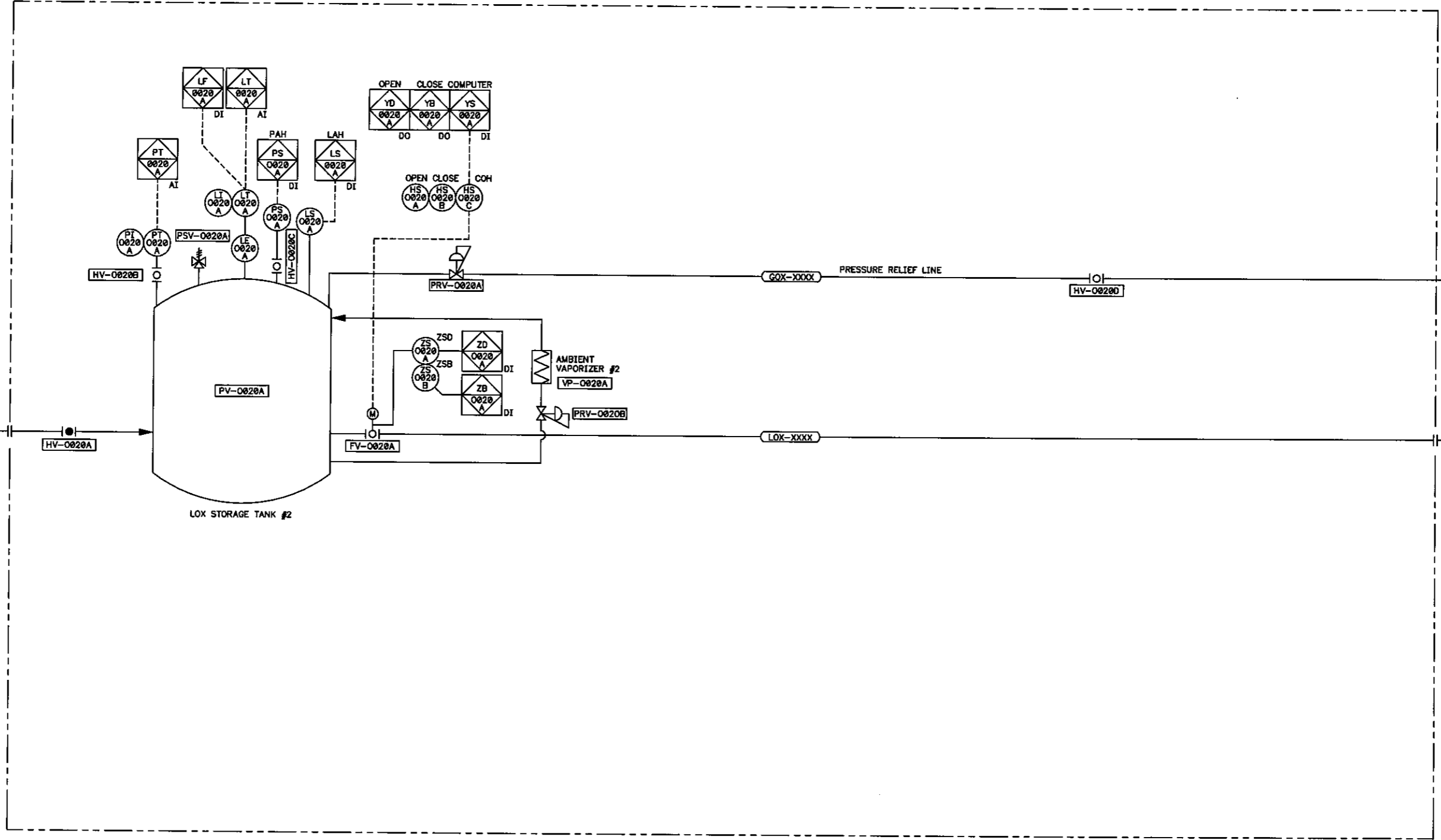
Catalog Number	Description	VAC	Hz	Amps
A-LTMB1	Manual switch with terminal block	120	50/60	15
A-LTDB1	Door switch with terminal block	120	50/60	15



NOT FUJI SCOPE OF SUPPLY

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05		12/08/05	S.L.A.

Fuji Electric Co., Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION	Dwg. No. WPMB-PID-001/WO-P0001
		PROCESS & INSTRUMENTATION DIAGRAM LOX SYSTEM #1		Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

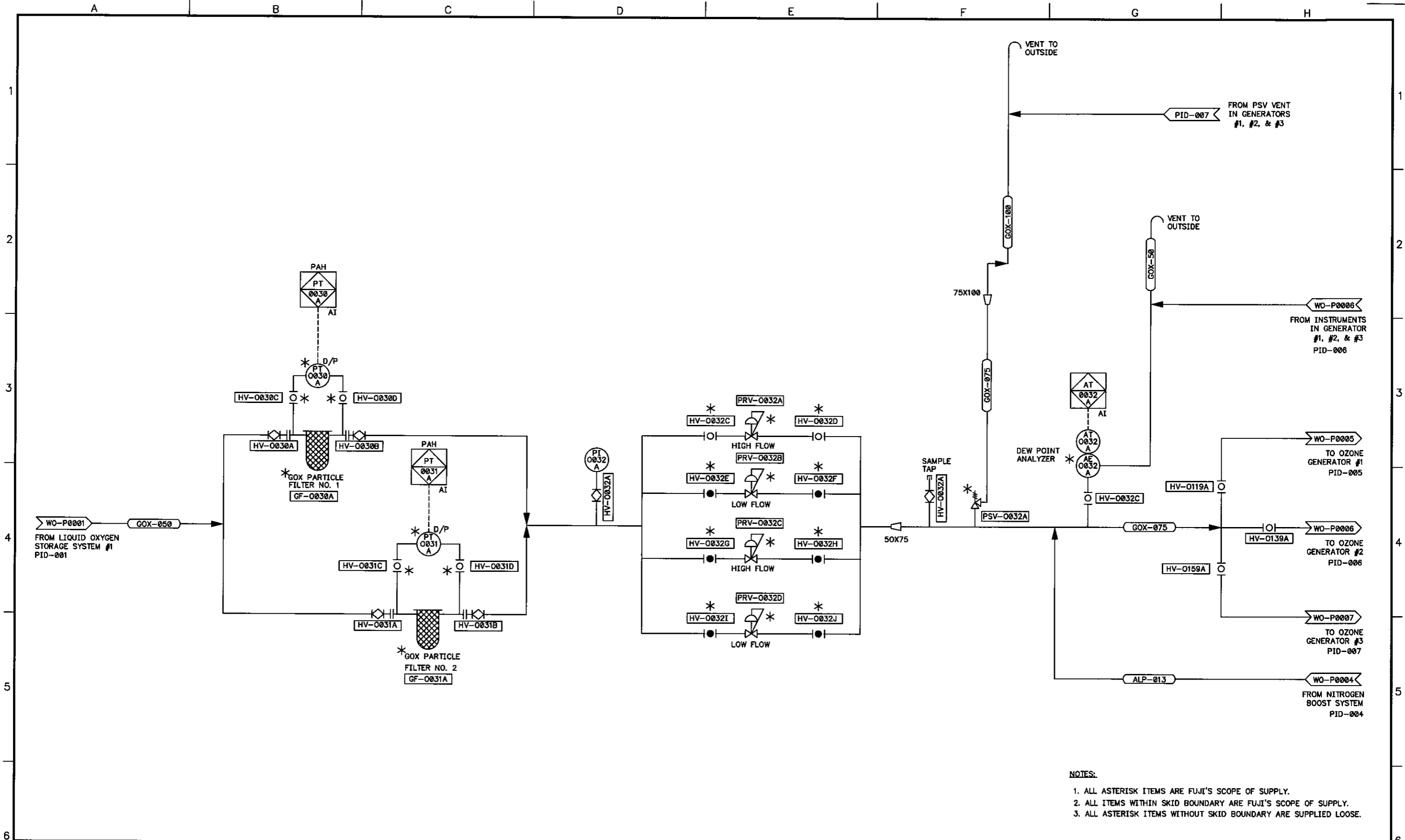


NOT FUJI SCOPE OF SUPPLY

Revisions					Date	Name	Fuji Electric Co., Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg. No.	WPMB-PID-002/WO-P0002
	Rev. No.	Description	By	Date	Drawn						
REV 1	PER ENGR COMMENTS	S.L.A.		12/08/05	D.L.V.						
Rev. No.	Description	By	Date								

PROCESS & INSTRUMENTATION DIAGRAM
LOX SYSTEM #2

Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



- NOTES:
1. ALL ASTERISK ITEMS ARE FUJI'S SCOPE OF SUPPLY.
 2. ALL ITEMS WITHIN SKID BOUNDARY ARE FUJI'S SCOPE OF SUPPLY.
 3. ALL ASTERISK ITEMS WITHOUT SKID BOUNDARY ARE SUPPLIED LOOSE.

Revisions	Rev. No.	Description	By	Date	Date	Name
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05		

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION PROCESS & INSTRUMENTATION DIAGRAM GOX SYSTEM	WPMB-PID-003 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

A B C D E F G H

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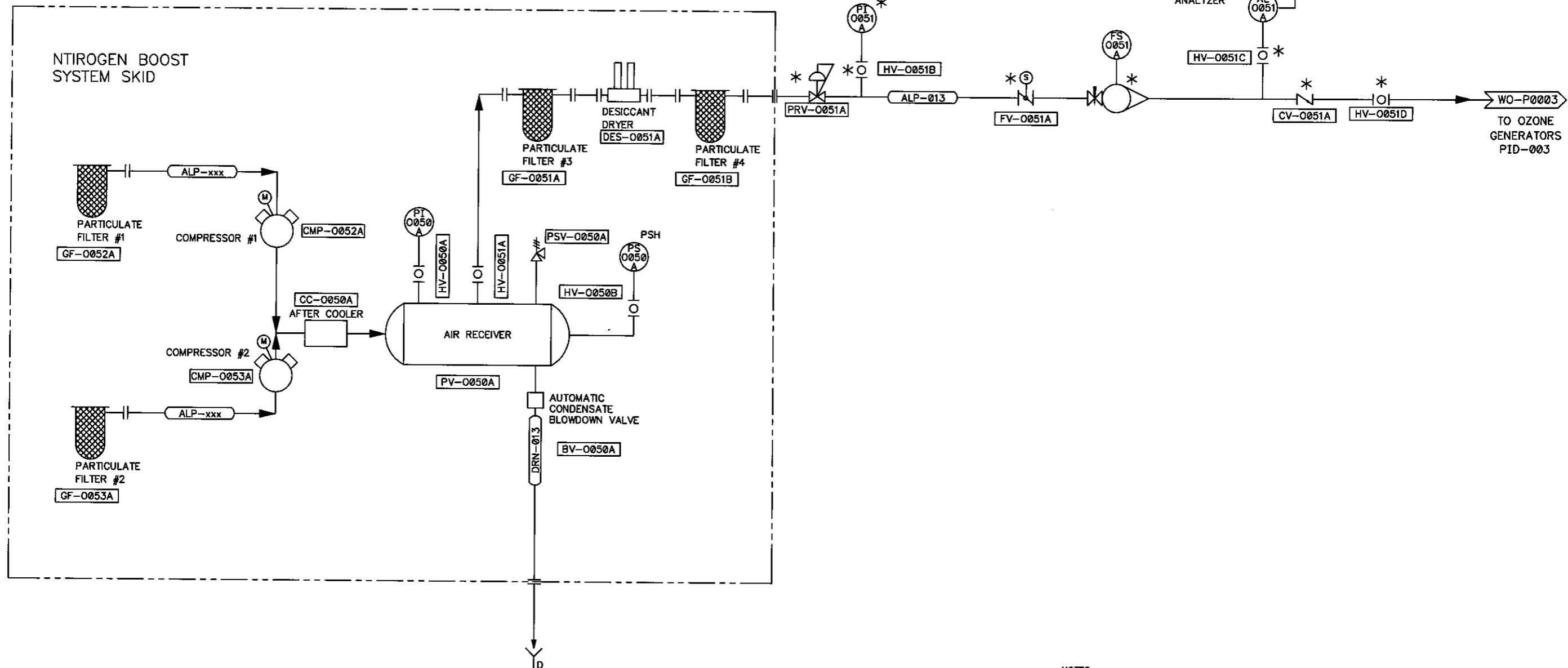
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3

4

5

6

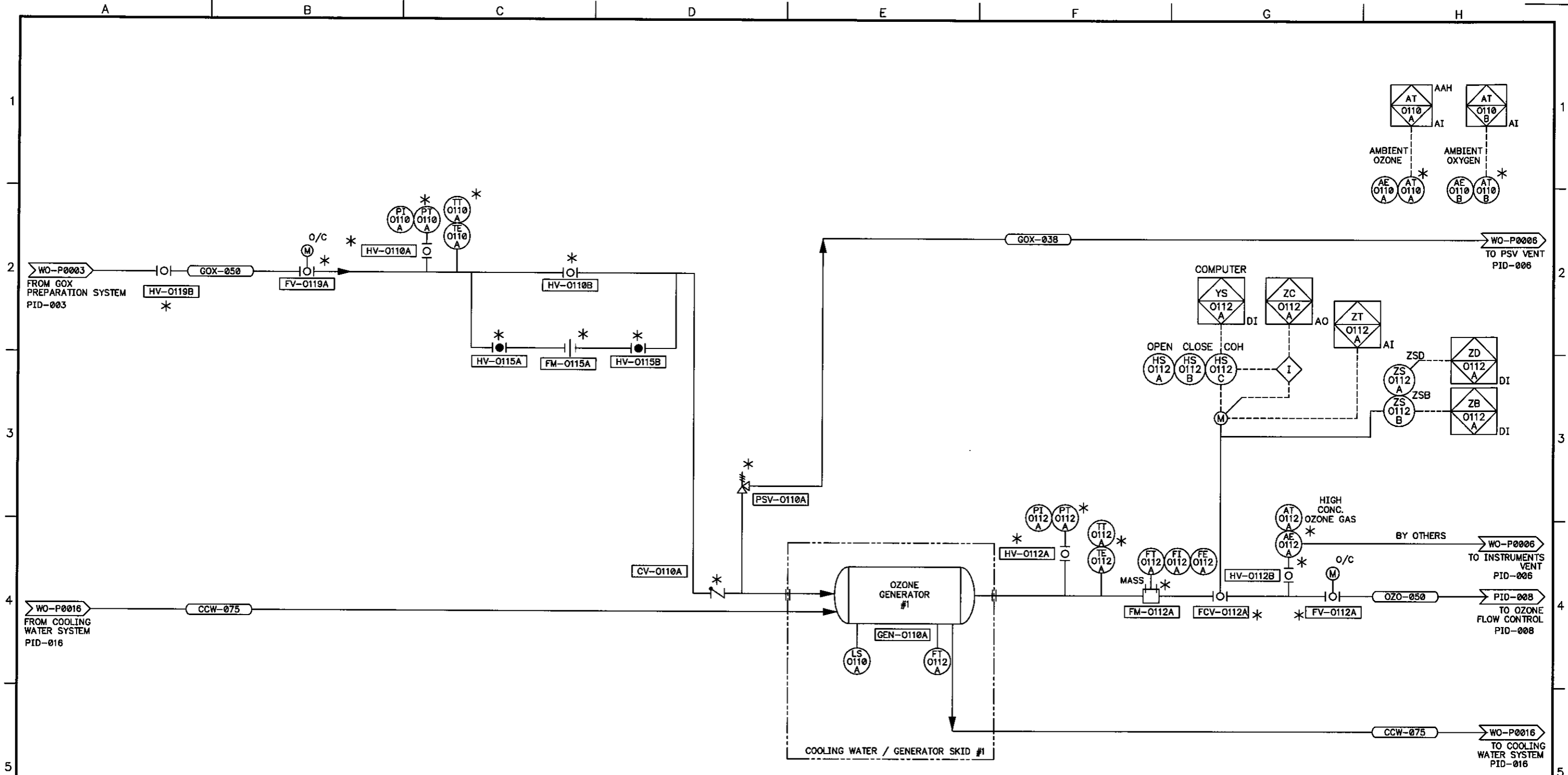


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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn		12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked			

Fuji Electric Co.,Ltd.				
Title PROCESS & INSTRUMENTATION DIAGRAM NITROGEN BOOST SYSTEM			Dwg.No. WPMB-PID-004	
Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005				

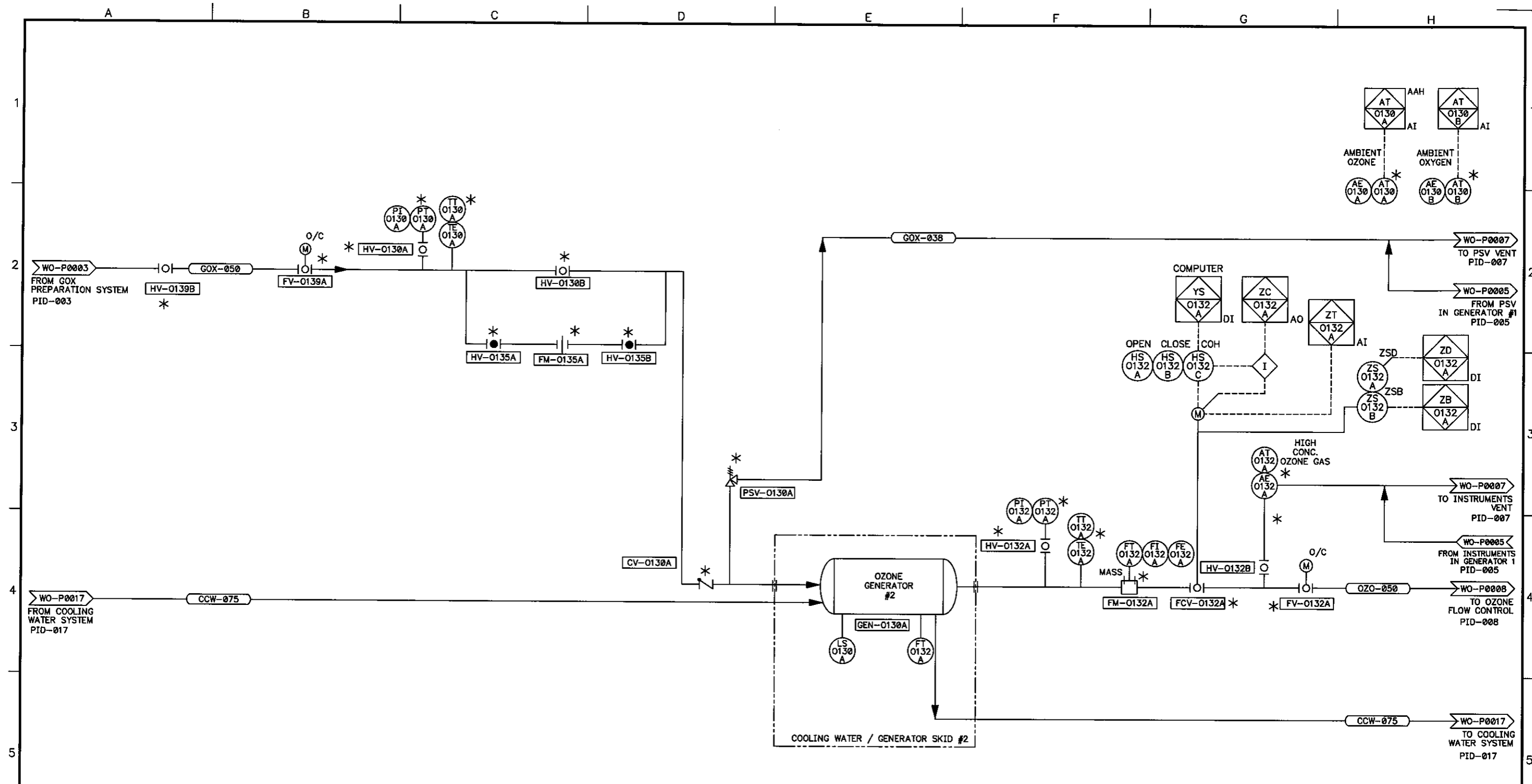
A B C D E F G H



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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05 S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked	

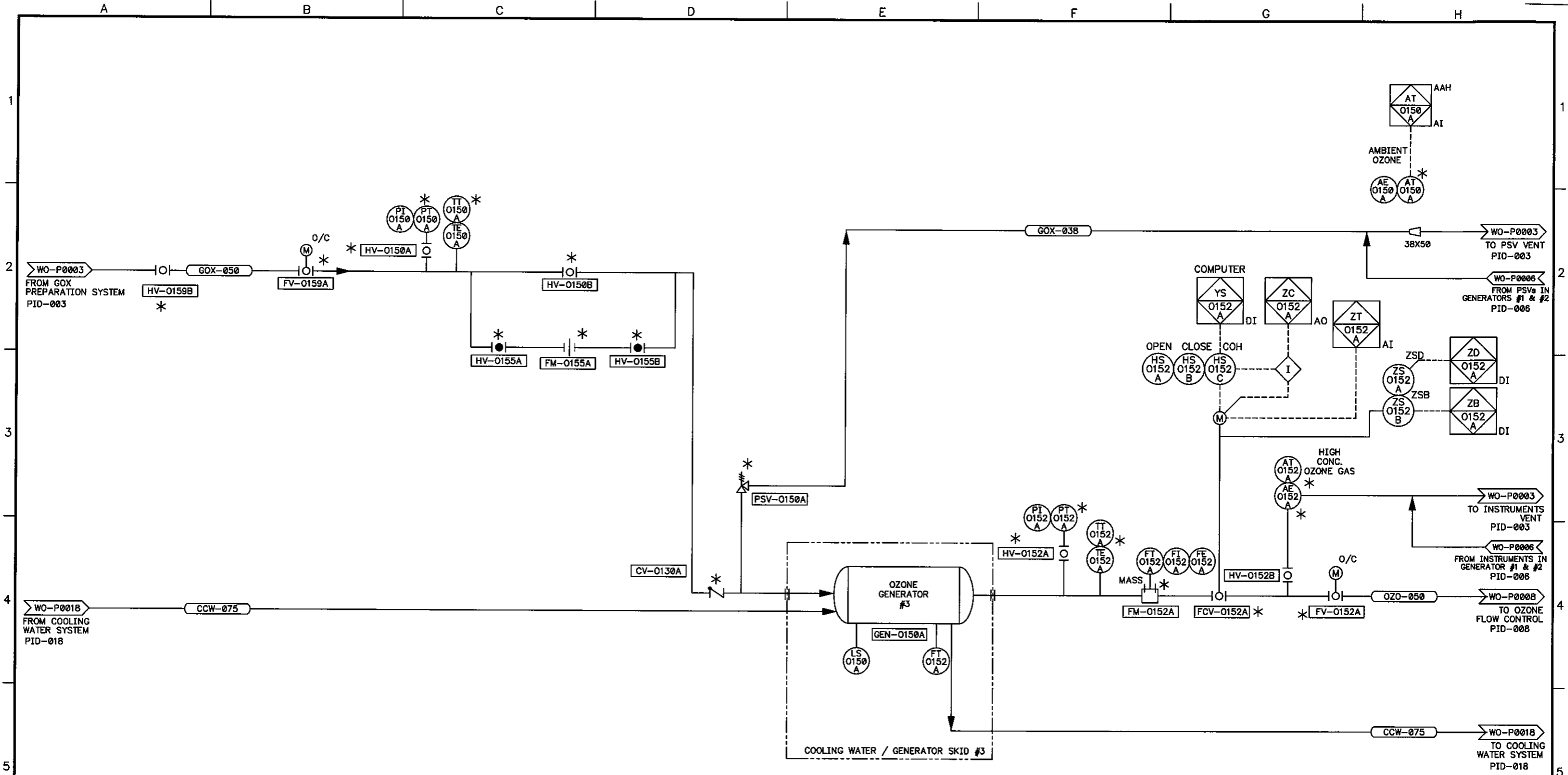
Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION		Dwg. No. WPMB-PID-005
		Title PROCESS & INSTRUMENTATION DIAGRAM GENERATOR NO. 1		



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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05		

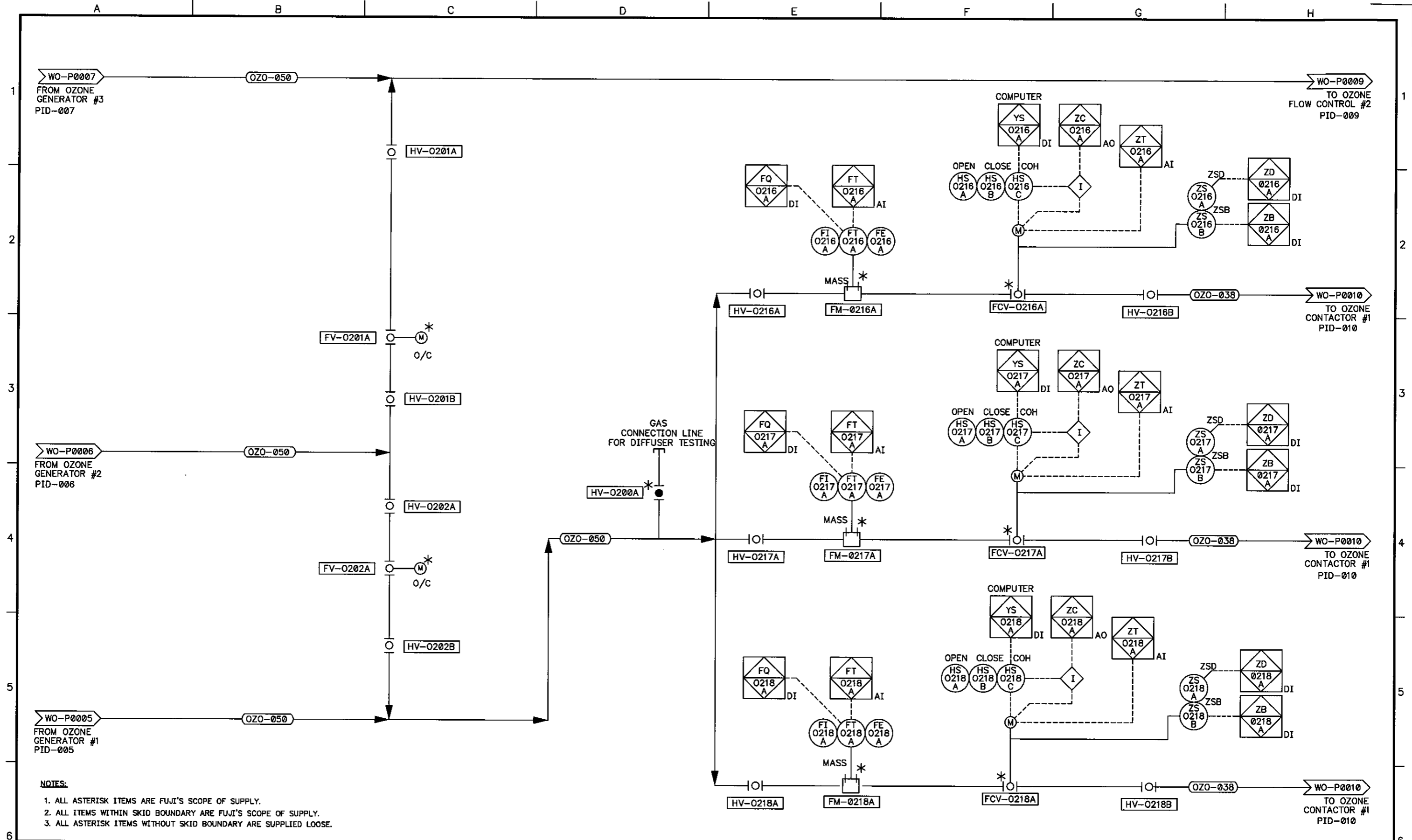
Fuji Electric Co.,Ltd.			THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Title PROCESS & INSTRUMENTATION DIAGRAM GENERATOR NO. 2	Dwg.No. WPMB-PID-006
					Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



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Revisions	Rev. No.	Description	By	Date	Date	Name	
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg. No.: WPMB-PID-007
		PROCESS & INSTRUMENTATION DIAGRAM GENERATOR NO. 3		



- NOTES:**
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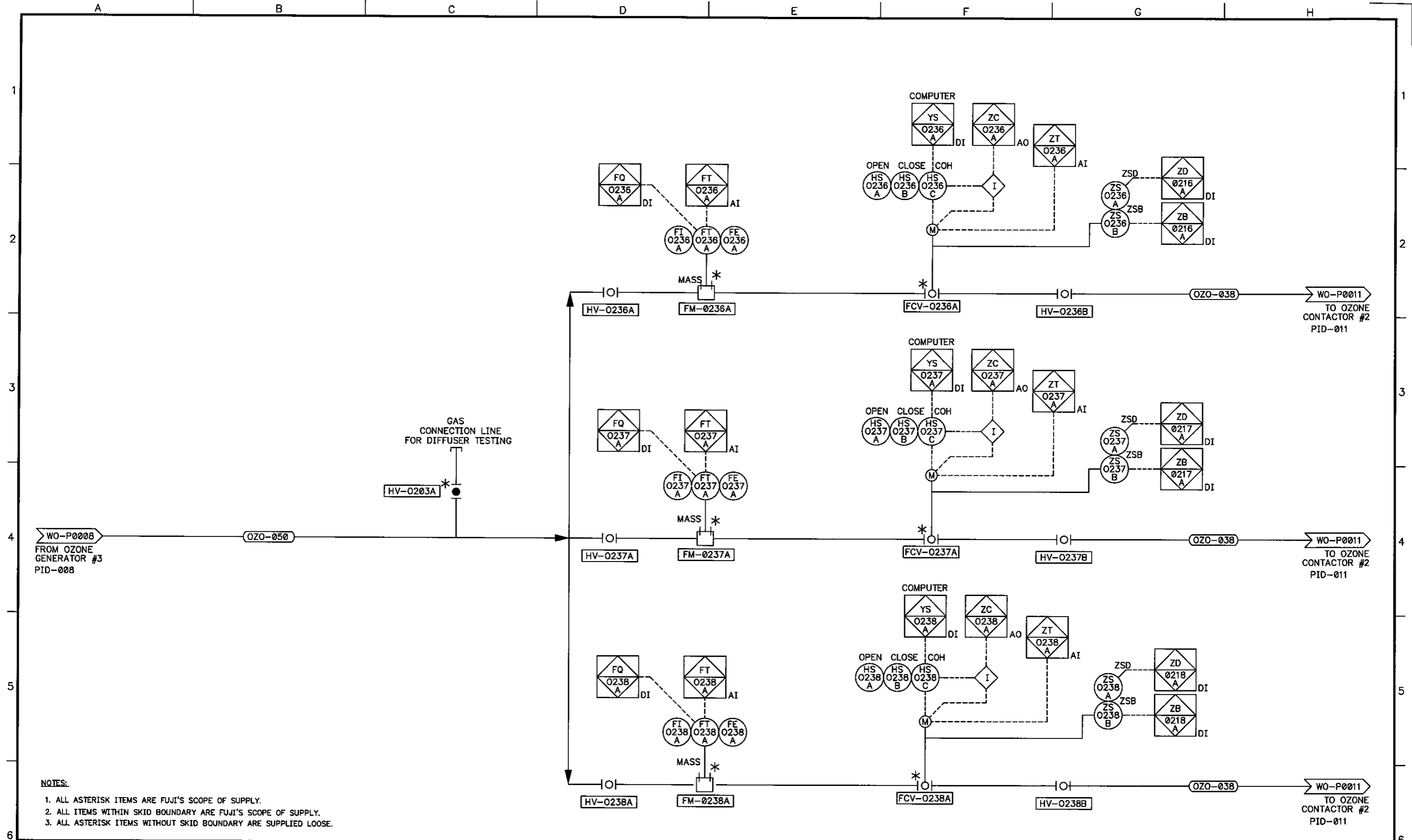
Fuji Electric Co.,Ltd

THE CITY OF WINNIPEG
Winnipeg WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

WPMB-PID-008

**PROCESS & INSTRUMENTATION DIAGRAM
FLOW CONTROL #1**

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



- NOTES:**
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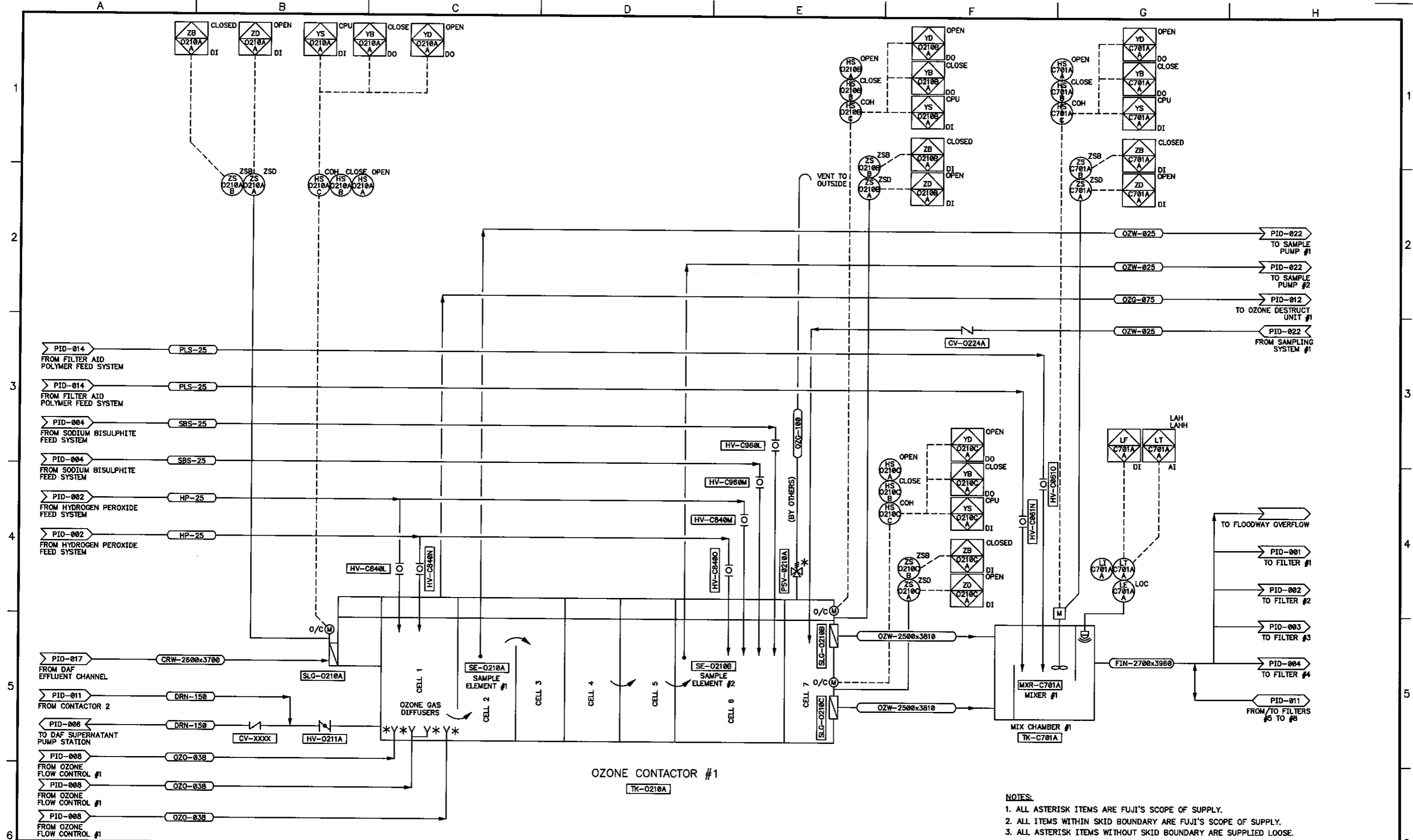
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	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

WPMB-PID-009

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



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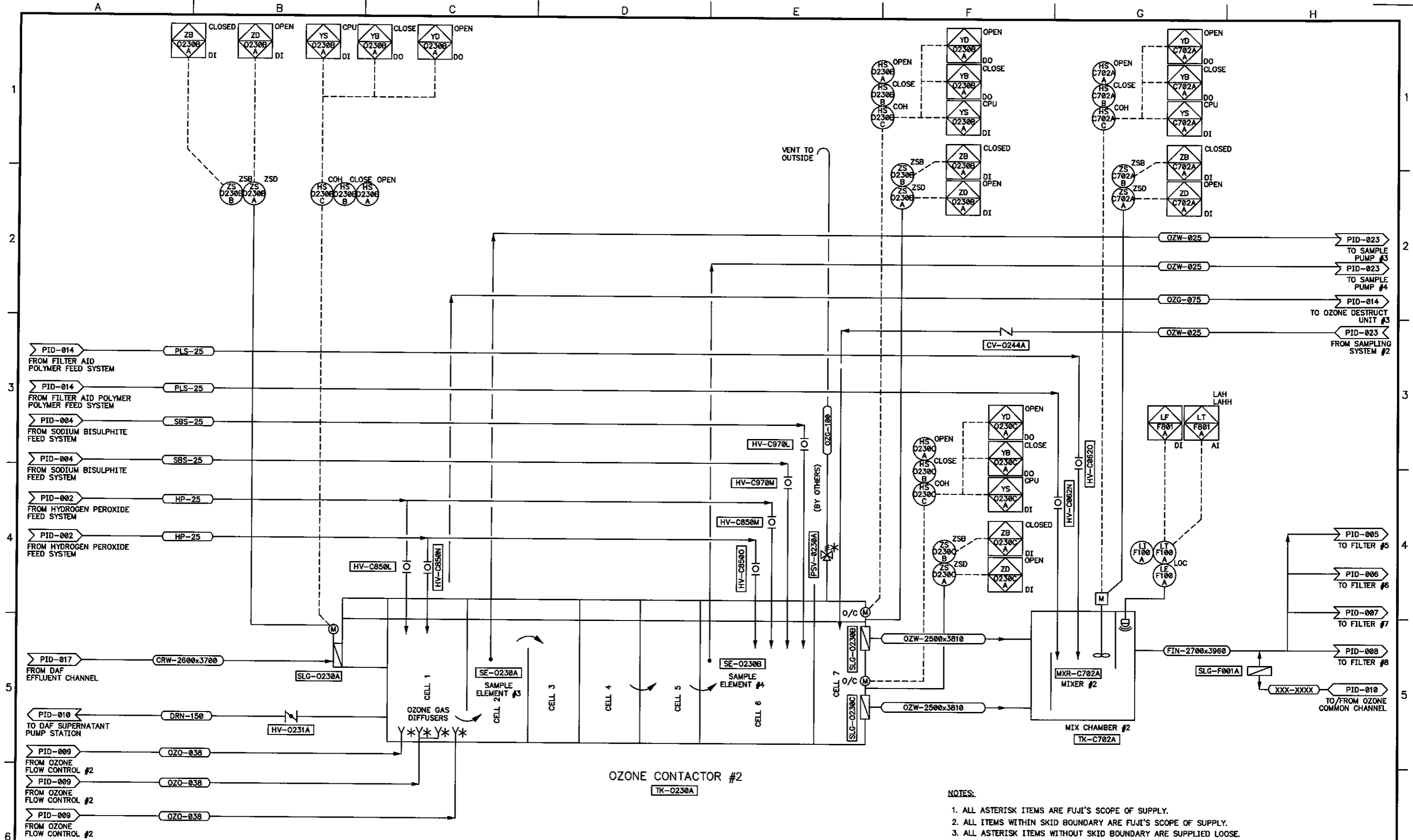
Rev. No.	Description	By	Date

Date	Name
Drawn 12/08/05	S.L.A.
Checked	

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 Winnipeg ENGINEERING DIVISION
PROCESS & INSTRUMENTATION DIAGRAM
CONTACTOR #1

WPMB-PID-010
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005



- NOTES:
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Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
					Drawn	12/08/05	S.L.A.
					Checked		

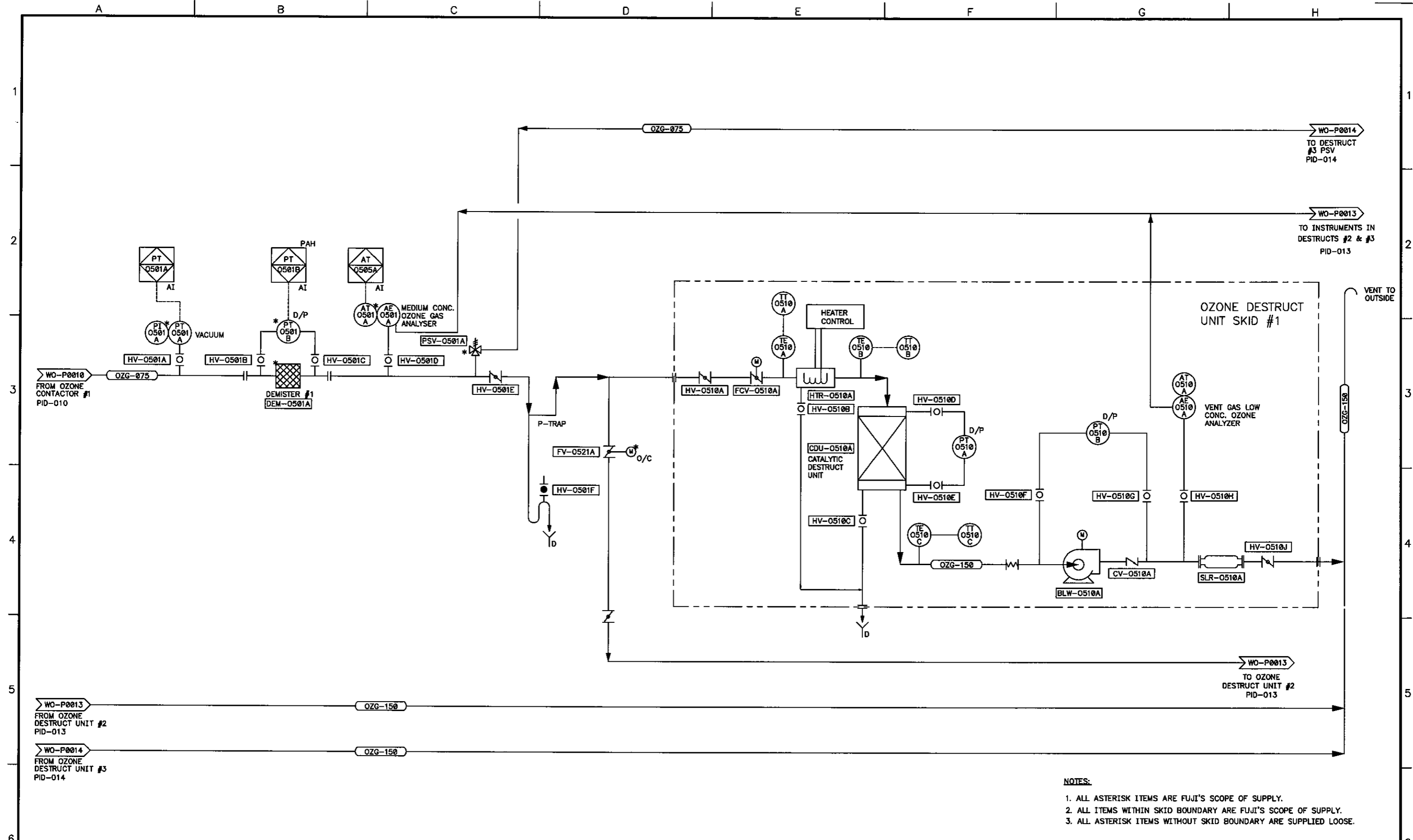
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

WPMB-PID-011

PROCESS & INSTRUMENTATION DIAGRAM
CONTACTOR #2

Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



WO-P0010
FROM OZONE
CONTACTOR #1
PID-010

WO-P0013
FROM OZONE
DESTRUCT UNIT #2
PID-013

WO-P0014
FROM OZONE
DESTRUCT UNIT #3
PID-014

WO-P0014
TO DESTRUCT
#3 PSV
PID-014

WO-P0013
TO INSTRUMENTS IN
DESTRUCTS #2 & #3
PID-013

OZONE DESTRUCT
UNIT SKID #1

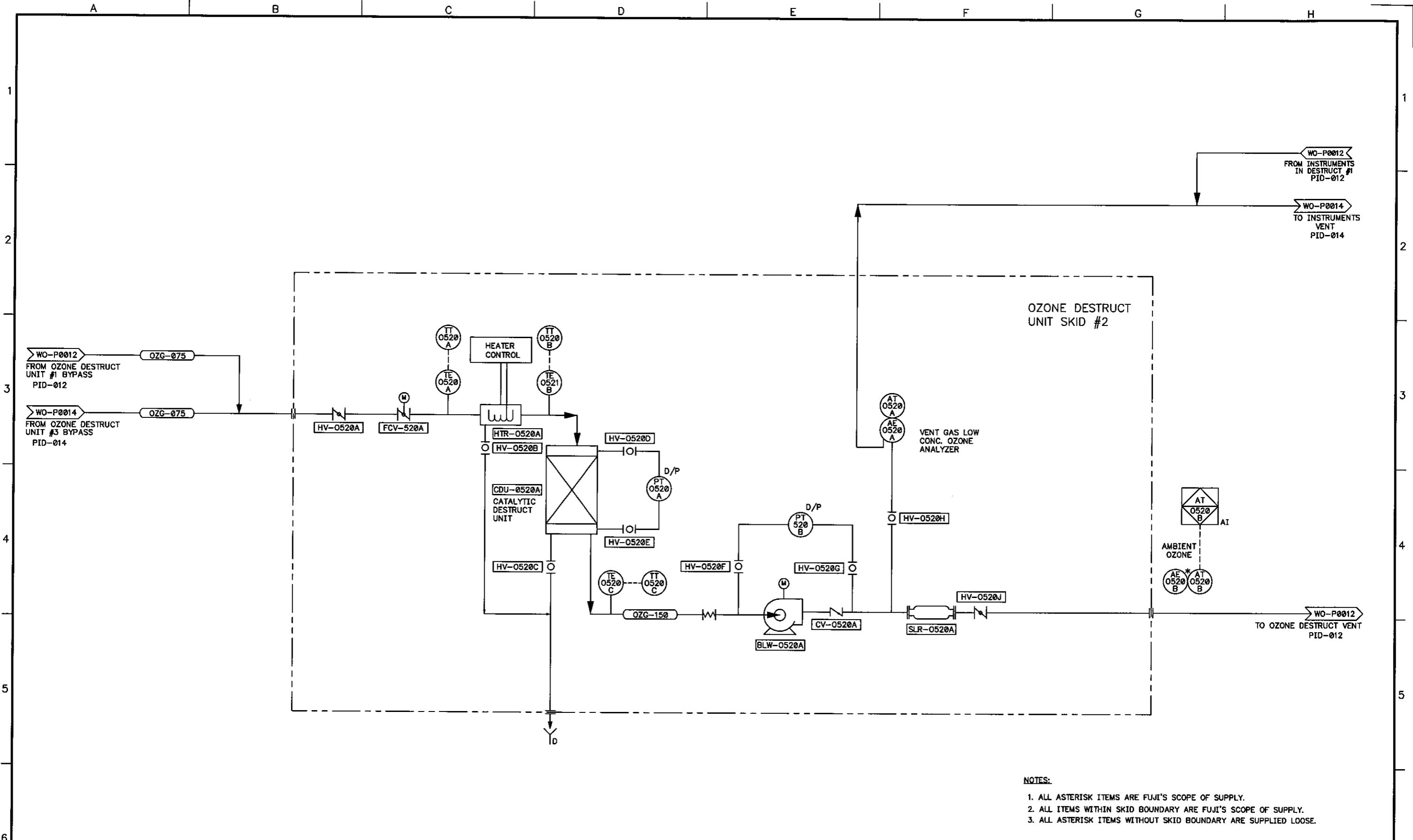
VENT GAS LOW
CONC. OZONE
ANALYZER

WO-P0013
TO OZONE
DESTRUCT UNIT #2
PID-013

- NOTES:**
1. ALL ASTERISK ITEMS ARE FUJI'S SCOPE OF SUPPLY.
 2. ALL ITEMS WITHIN SKID BOUNDARY ARE FUJI'S SCOPE OF SUPPLY.
 3. ALL ASTERISK ITEMS WITHOUT SKID BOUNDARY ARE SUPPLIED LOOSE.

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06			12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05				

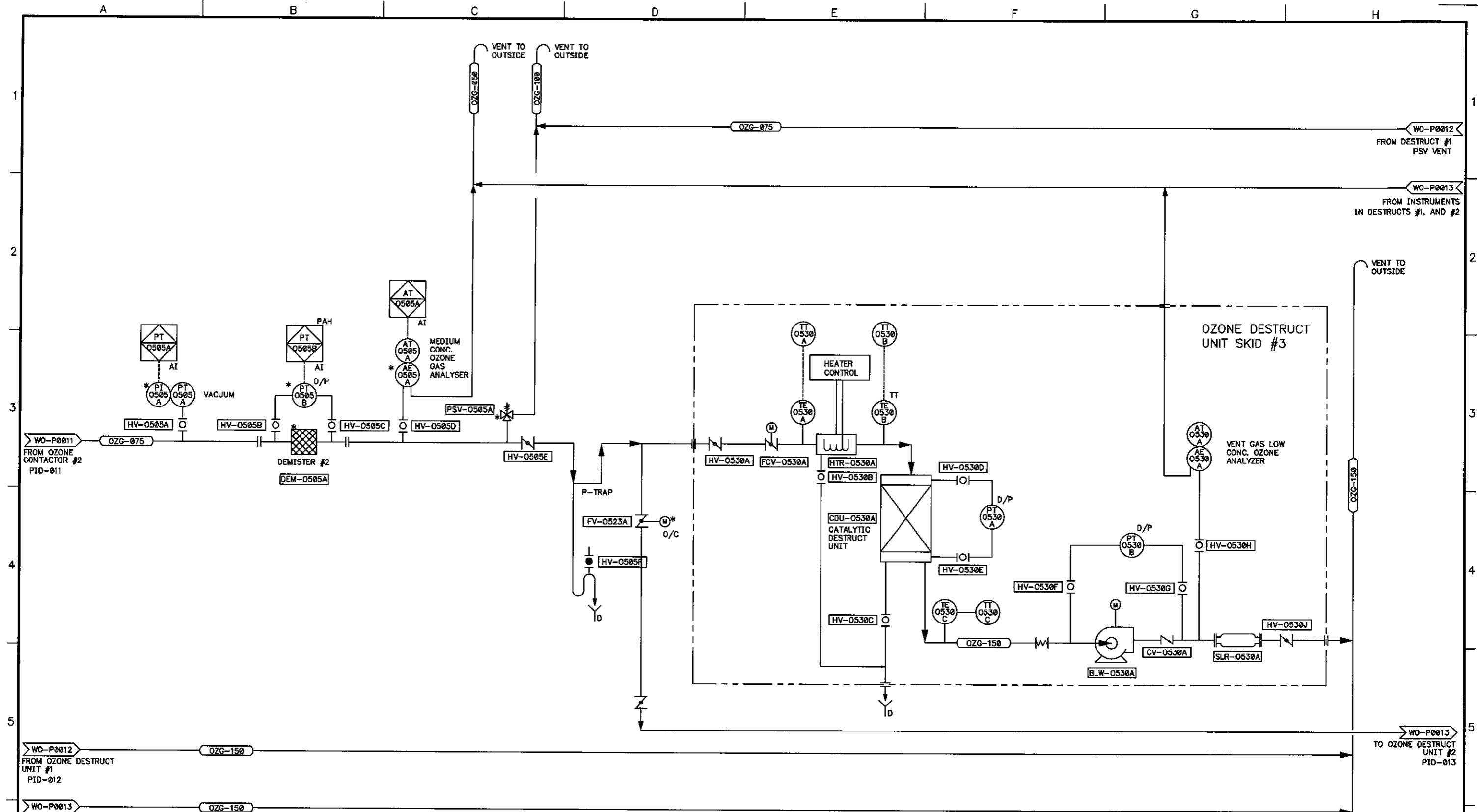
Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION		Dwg.No. WPMB-PID-012
		PROCESS & INSTRUMENTATION DIAGRAM DESTRUCT UNIT #1		



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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn		12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked			

Fuji Electric Co.,Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION	Dwg.No. WPMB-PID-013
		PROCESS & INSTRUMENTATION DIAGRAM DESTRUCT UNIT #2	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



- NOTES:**
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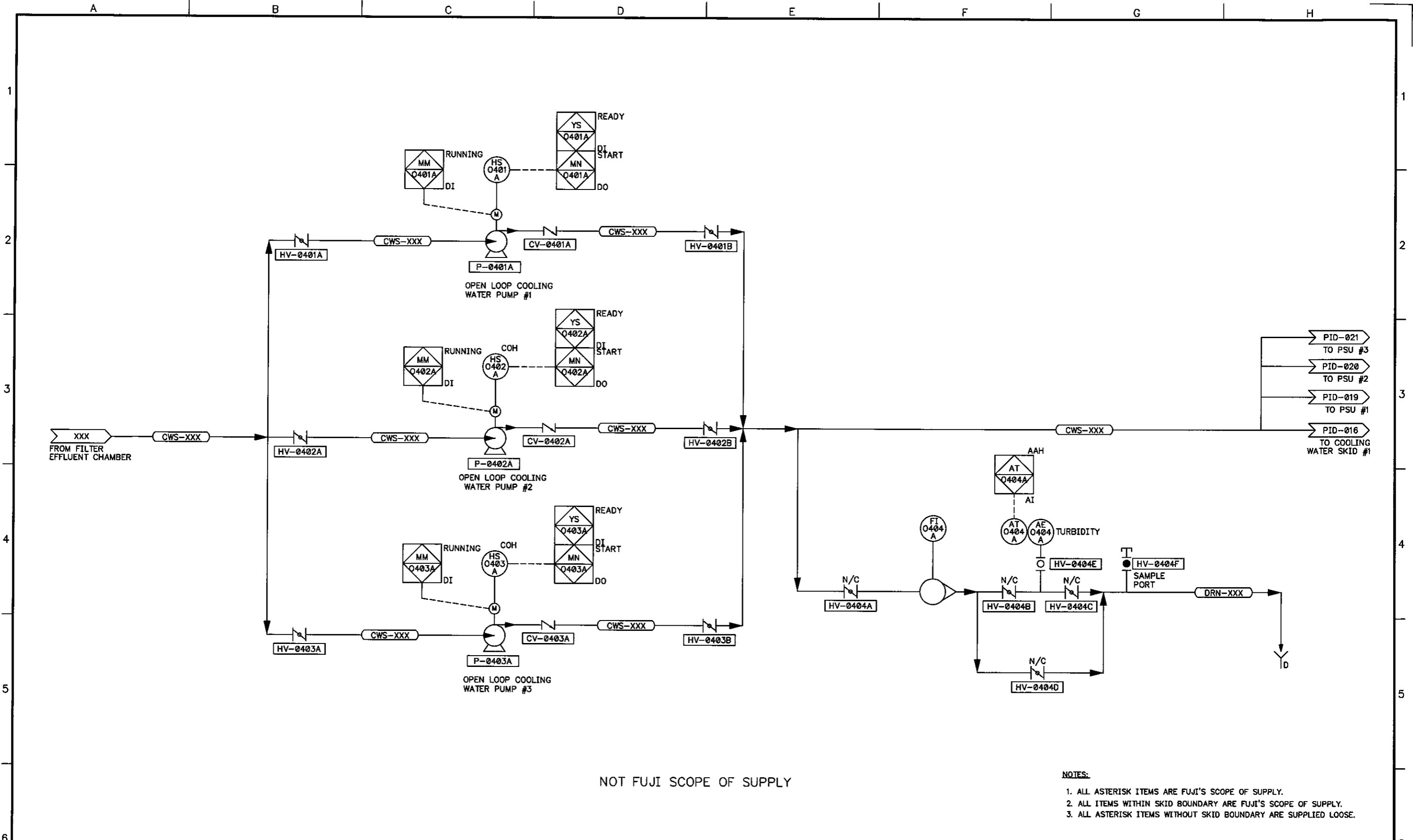
Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co.,Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
Winnipeg ENGINEERING DIVISION

WPMB-PID-014

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005

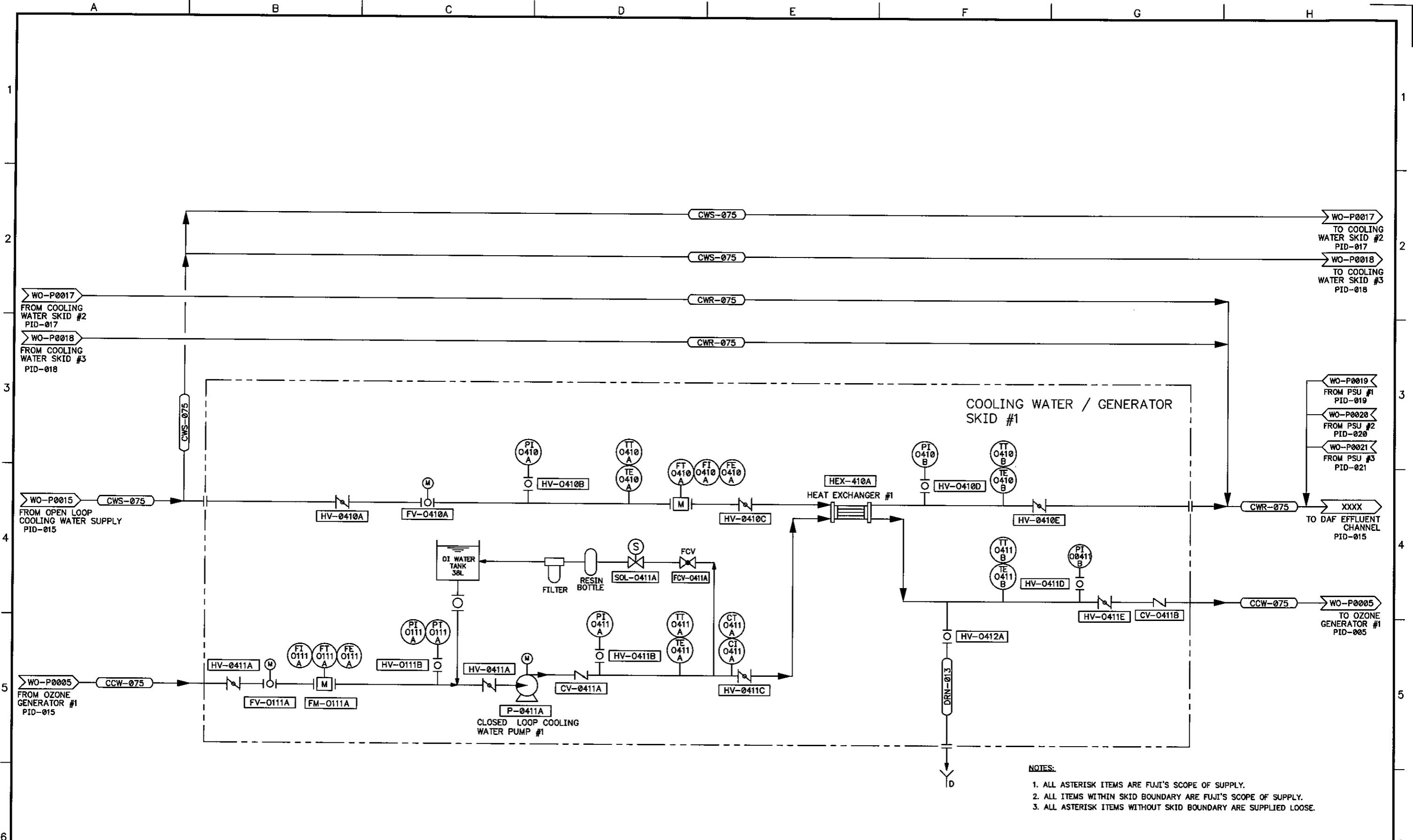


NOT FUJI SCOPE OF SUPPLY

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Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked	12/08/05	S.L.A.

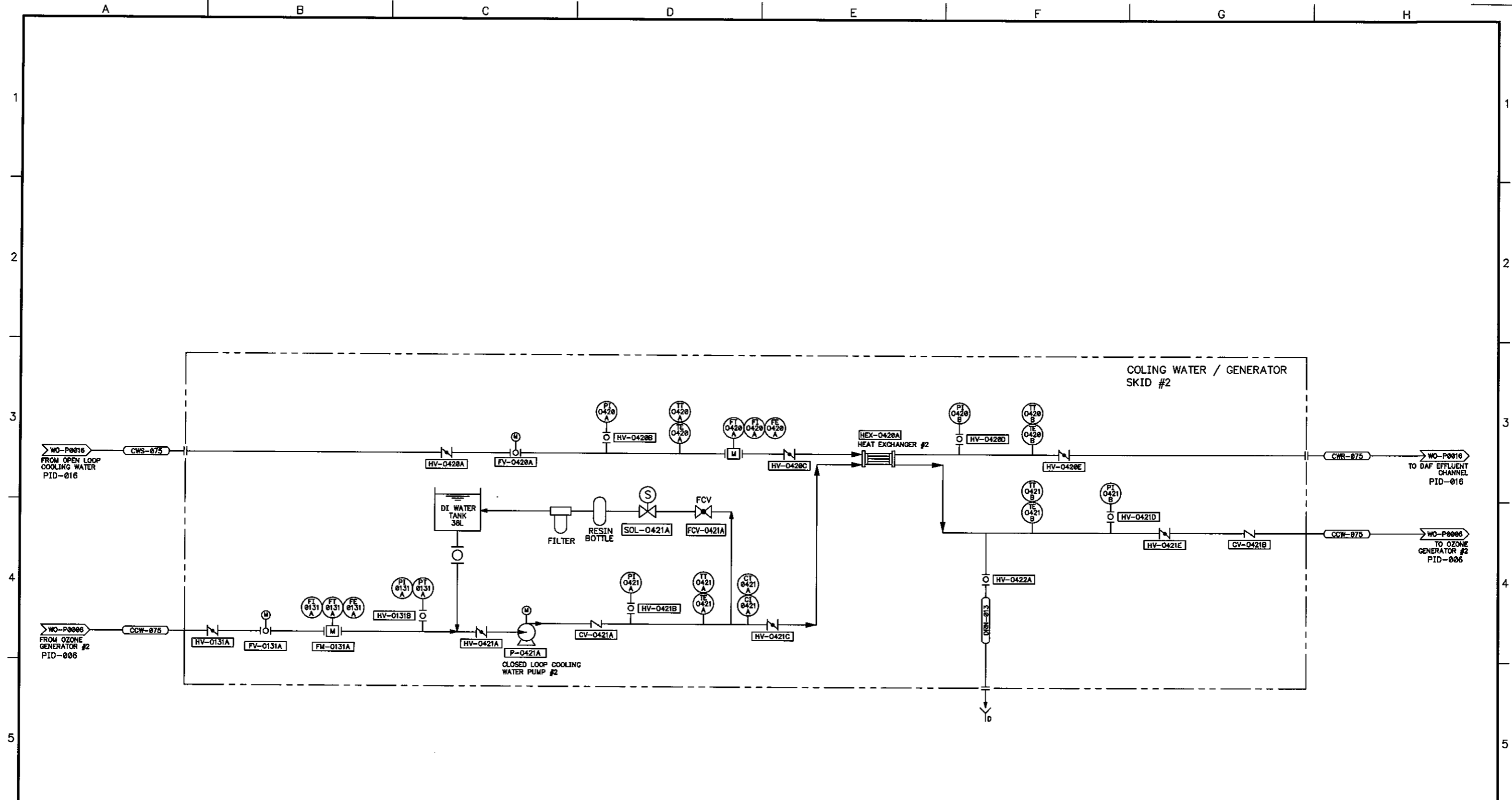
Fuji Electric Co.,Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-PID-015/WO-P0015
	PROCESS & INSTRUMENTATION DIAGRAM OPEN LOOP COOLING WATER	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



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	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

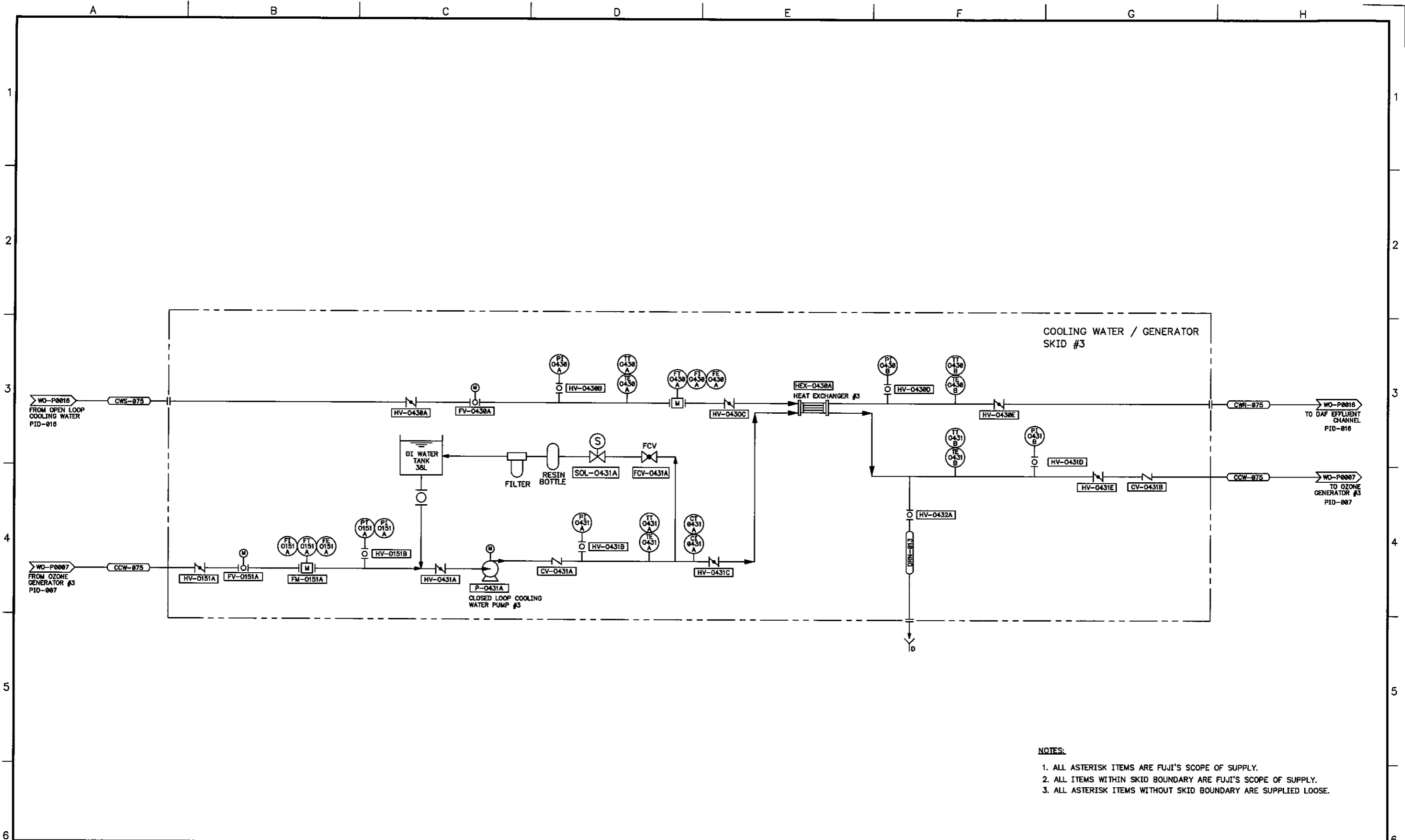
Fuji Electric Co.,Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg. No. WPMB-PID-016
	Title PROCESS & INSTRUMENTATION DIAGRAM COOLING WATER SKID #1	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



- NOTES:**
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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co.,Ltd.	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-PID-017
	PROCESS & INSTRUMENTATION DIAGRAM COOLING WATER SKID #2	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



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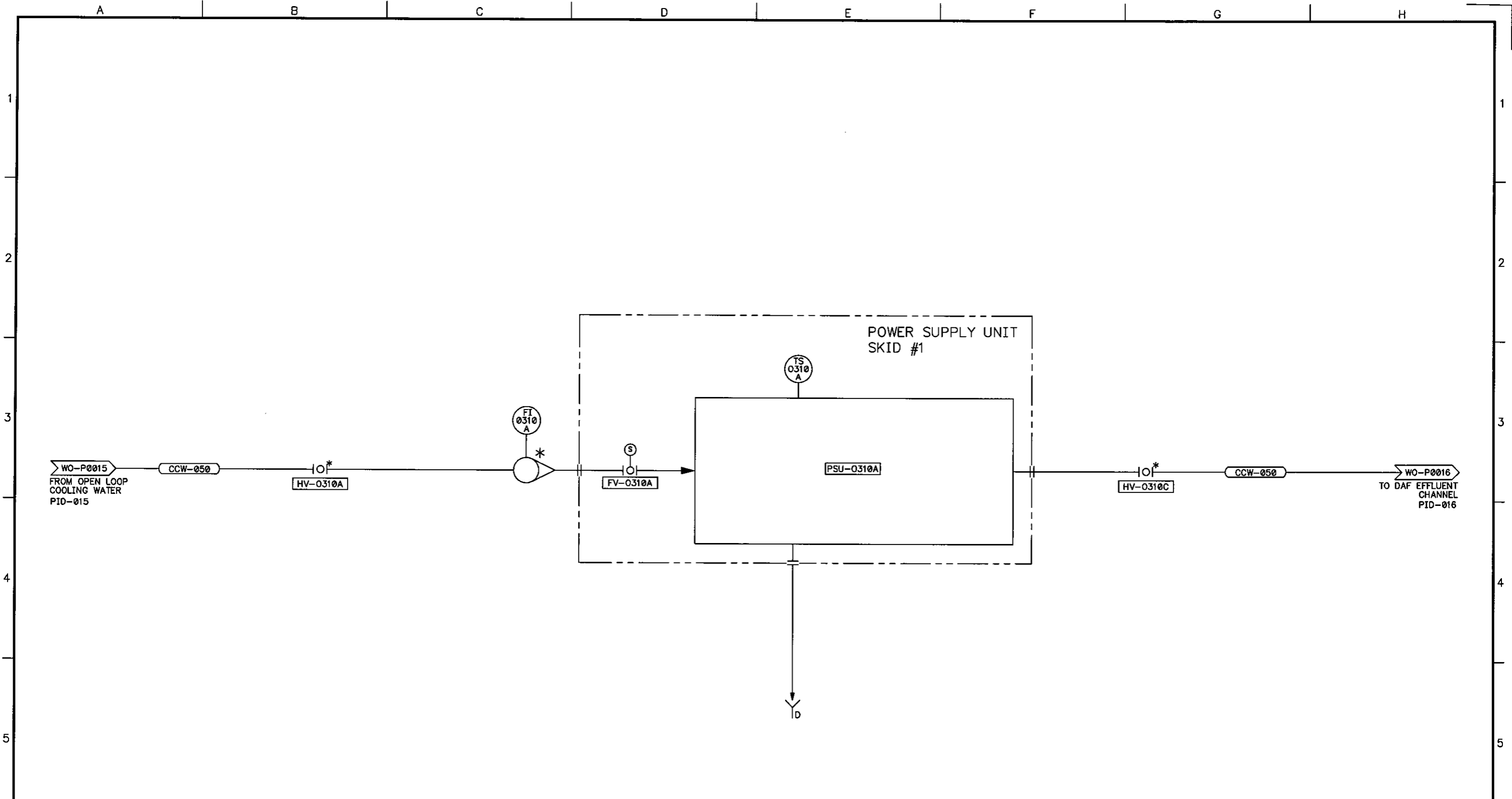
Revisions					Date	Name	Title	Dwg.No.	Ref.
	Rev. No.	Description	By	Date					
REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Drawn	12/08/05	S.L.A.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION PROCESS & INSTRUMENTATION DIAGRAM COOLIGN WATER SKID #3	WPMB-PID-018 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	
				Checked					

Fuji Electric Co.,Ltd.



THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 Winnipeg ENGINEERING DIVISION
PROCESS & INSTRUMENTATION DIAGRAM
COOLIGN WATER SKID #3

Dwg.No.
WPMB-PID-018
Ref.
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005



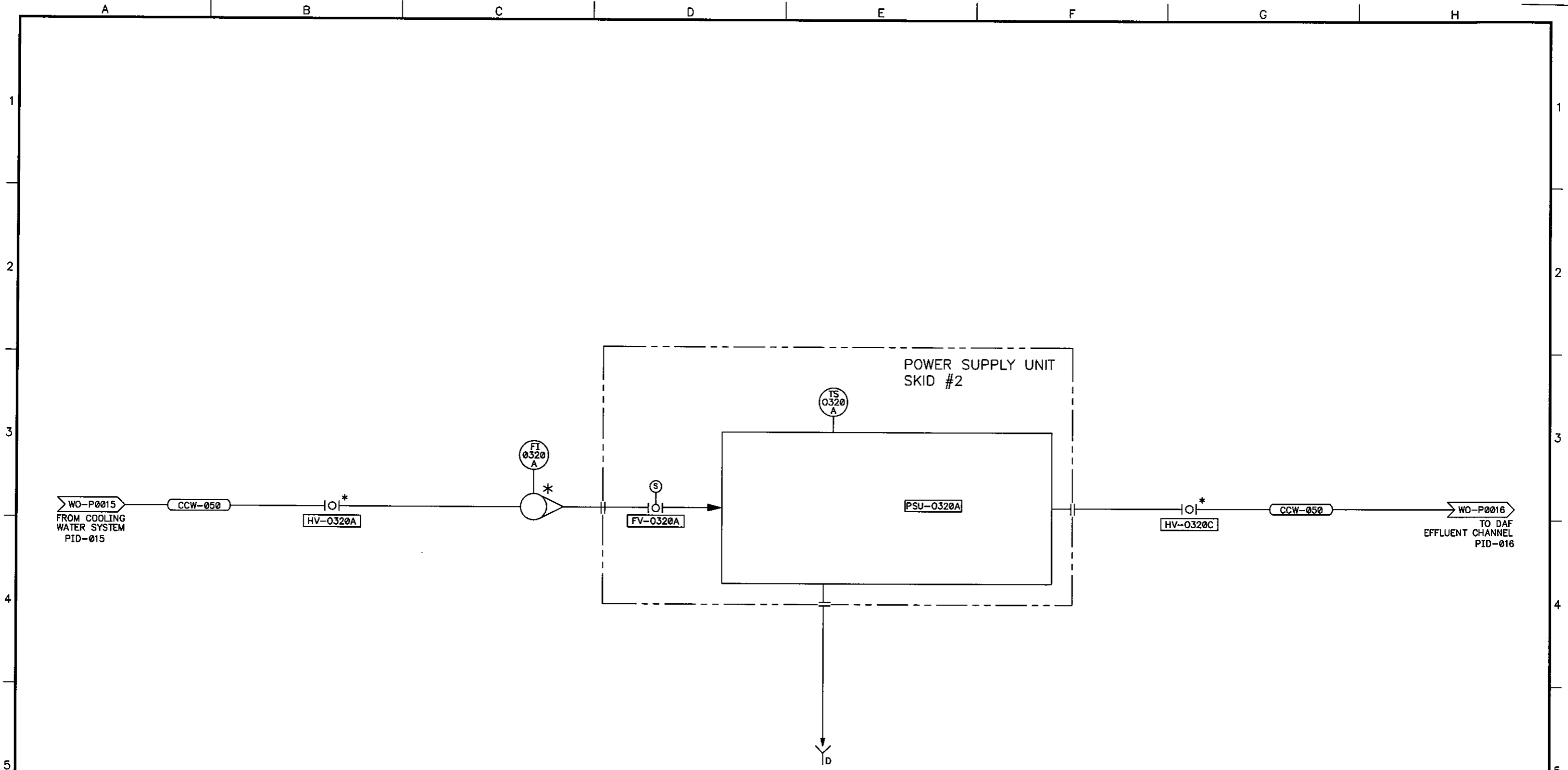
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	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co.,Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
PROCESS & INSTRUMENTATION DIAGRAM
POWER SUPPLY UNIT #1

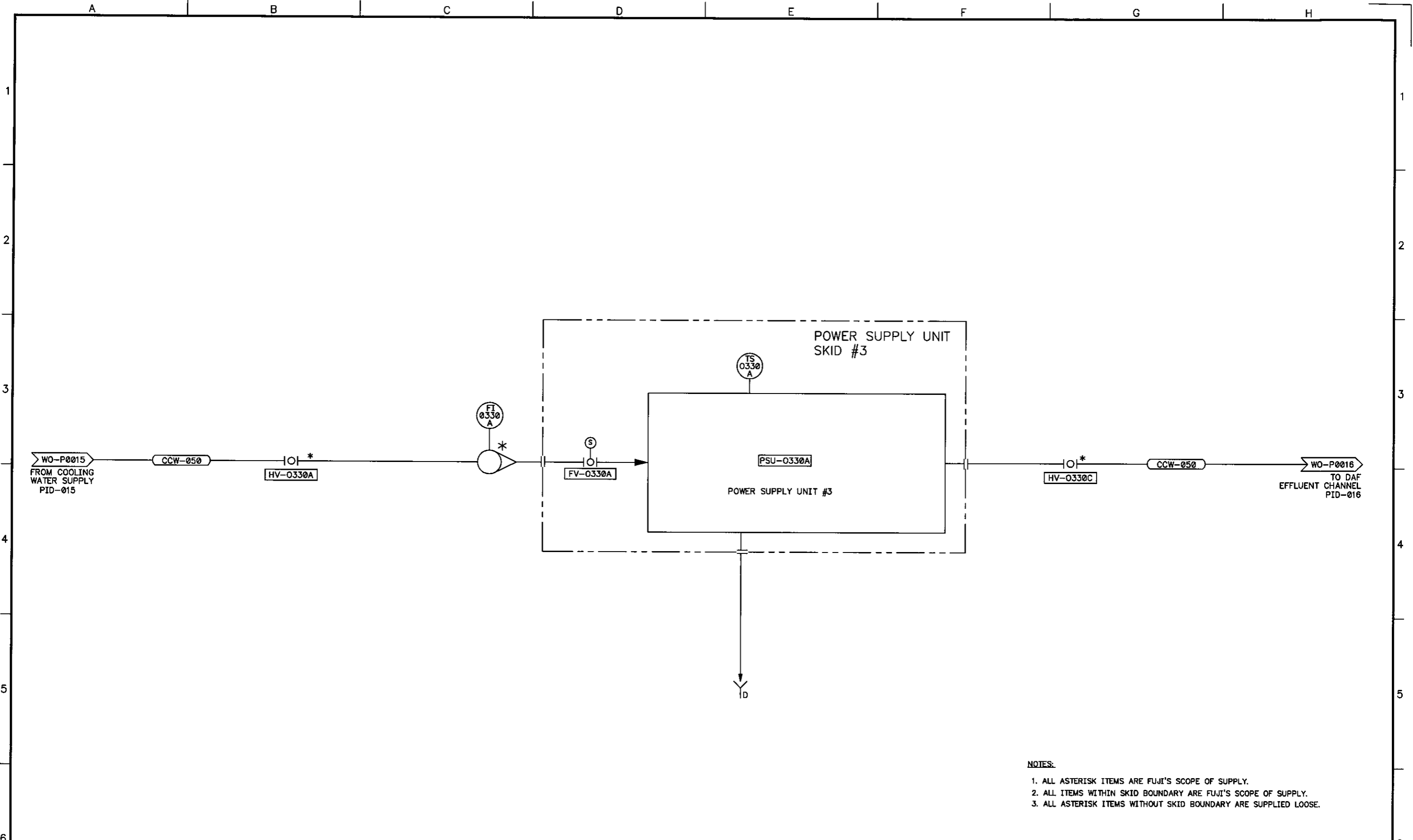
Dwg.No. WPMB-PID-019
Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



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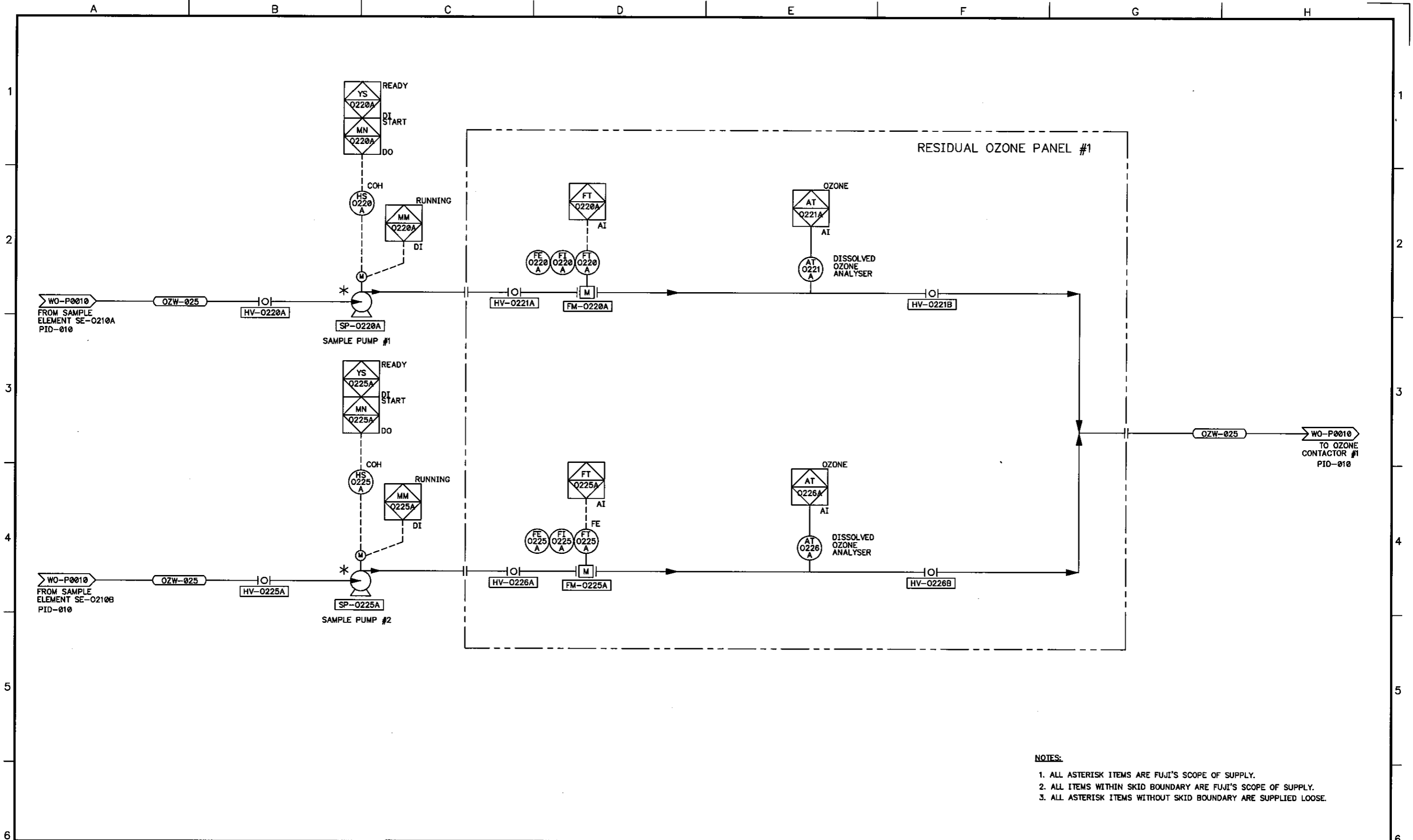
Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05	S.L.A.
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked		

Fuji Electric Co.,Ltd.			 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-PID-020 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
PROCESS & INSTRUMENTATION DIAGRAM POWER SUPPLY UNIT #2				



- NOTES:**
1. ALL ASTERISK ITEMS ARE FUJI'S SCOPE OF SUPPLY.
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Revisions								Fuji Electric Co.,Ltd.	Title PROCESS & INSTRUMENTATION DIAGRAM POWER SUPPLY UNIT #3	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No. WPMB-PID-021
	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05	S.L.A.				
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked						
	Rev. No.	Description	By	Date							
									Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked	
	Rev. No.	Description	By	Date		

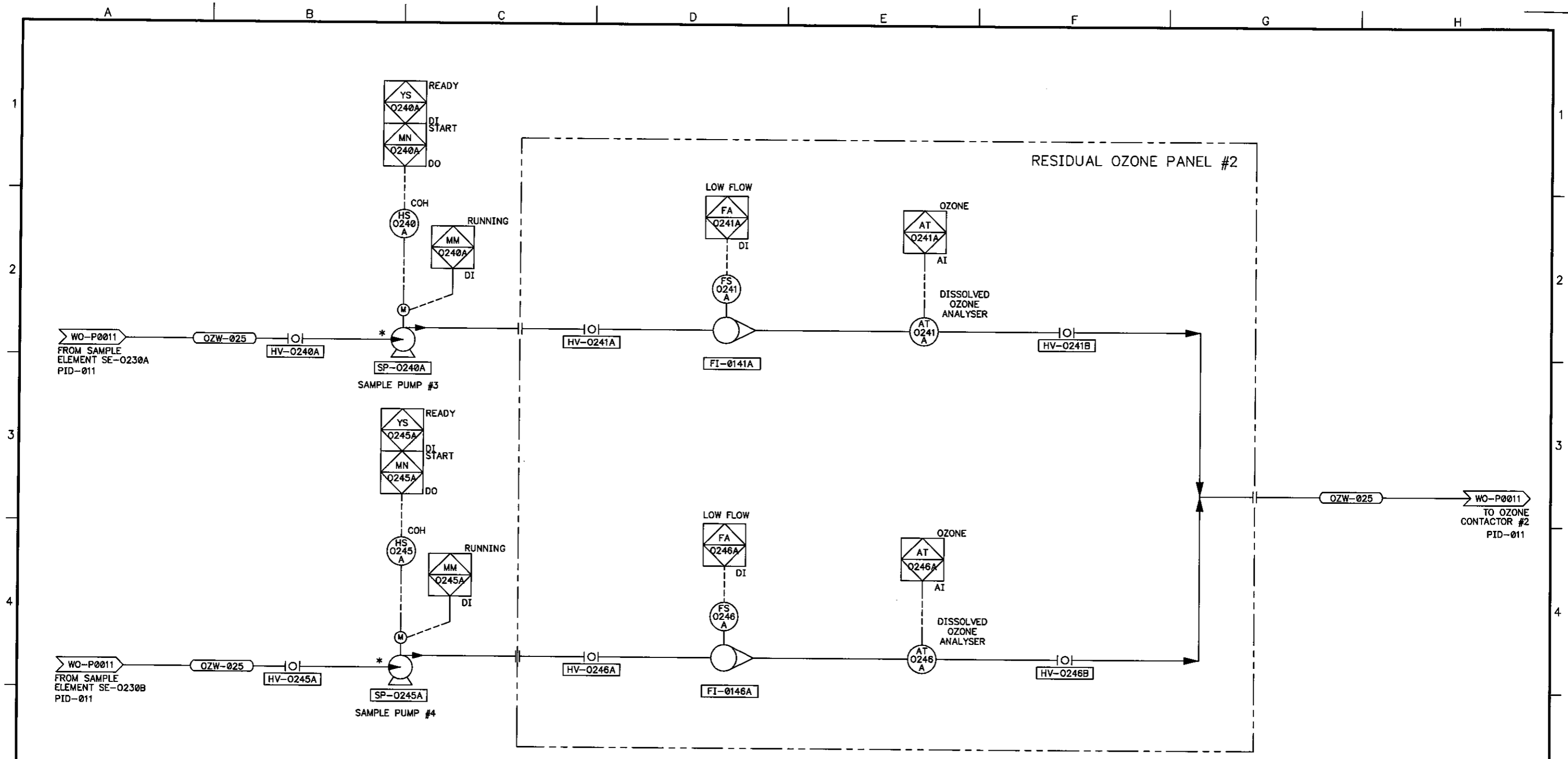
Fuji Electric Co.,Ltd

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

WPMB-PID-022

PROCESS & INSTRUMENTATION DIAGRAM
DISSOLVED OZONE SYSTEM #1

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



- NOTES:**
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	REV 2	PER ENGR COMMENTS	D.L.V.	1/4/06	Drawn	12/08/05
	REV 1	PER ENGR COMMENTS	S.L.A.	12/14/05	Checked	
	Rev. No.	Description	By	Date		

Fuji Electric Co.,Ltd.

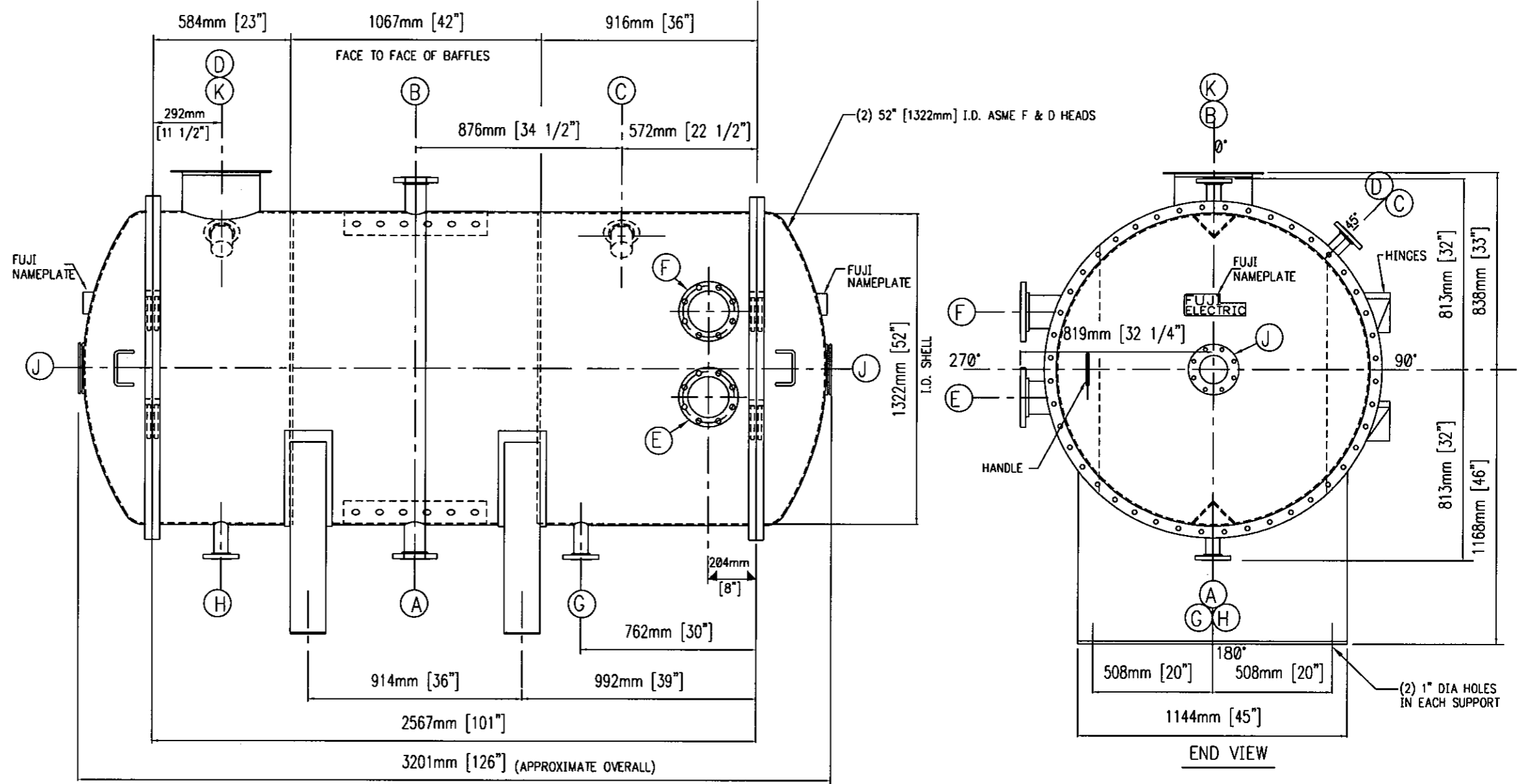
THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
PROCESS & INSTRUMENTATION DIAGRAM
 DISSOLVED OZONE SYSTEM #2

WPMB-PID-023
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Material Specification	
Unless otherwise noted, the following are the recommended minimum materials of construction for Ozone Generator.	
Shell and Heads	SA-240-316L
Baffle Plates, Tube Sheet	SA-240-316L
Plate Flanges	SA-240-316L
Nozzle Necks	SA-312-316L
Flanges	SA-182-316L
Saddle Wear Plate	SA-240-304
Saddle	SA-36
Hinges and High Voltage Box	SA-240-304
Sight Glass	Annealed Pyrex
Head Gaskets	Hypalon
Pressure Bolting	SA-193-B8 / SA-194-8

Design Requirements	
Working Pressure	15 psig (103.4 kPa)
Design Pressure	25 psig (172.4 kPa)
Design Temperature	180 deg. F (82 deg. C)
Minimum Working Temperature	32 deg. F (0 deg. C)
Test Pressure	PER ASME CODE
Corrosion Allowance	None

- Notes:
- Generator shall be designed and fabricated in accordance with the latest ASME code (Section VIII Division 1).
 - ASME Code stamp is required.
 - All bolt holes to straddle vertical and horizontal centerlines
 - Slip-on flanges are permitted.
 - Inside of Generator shall be free of oil, grease and other foreign matters.
 - Generator to be installed at Winnipeg, Manitoba Canada.



ELEVATION

END VIEW

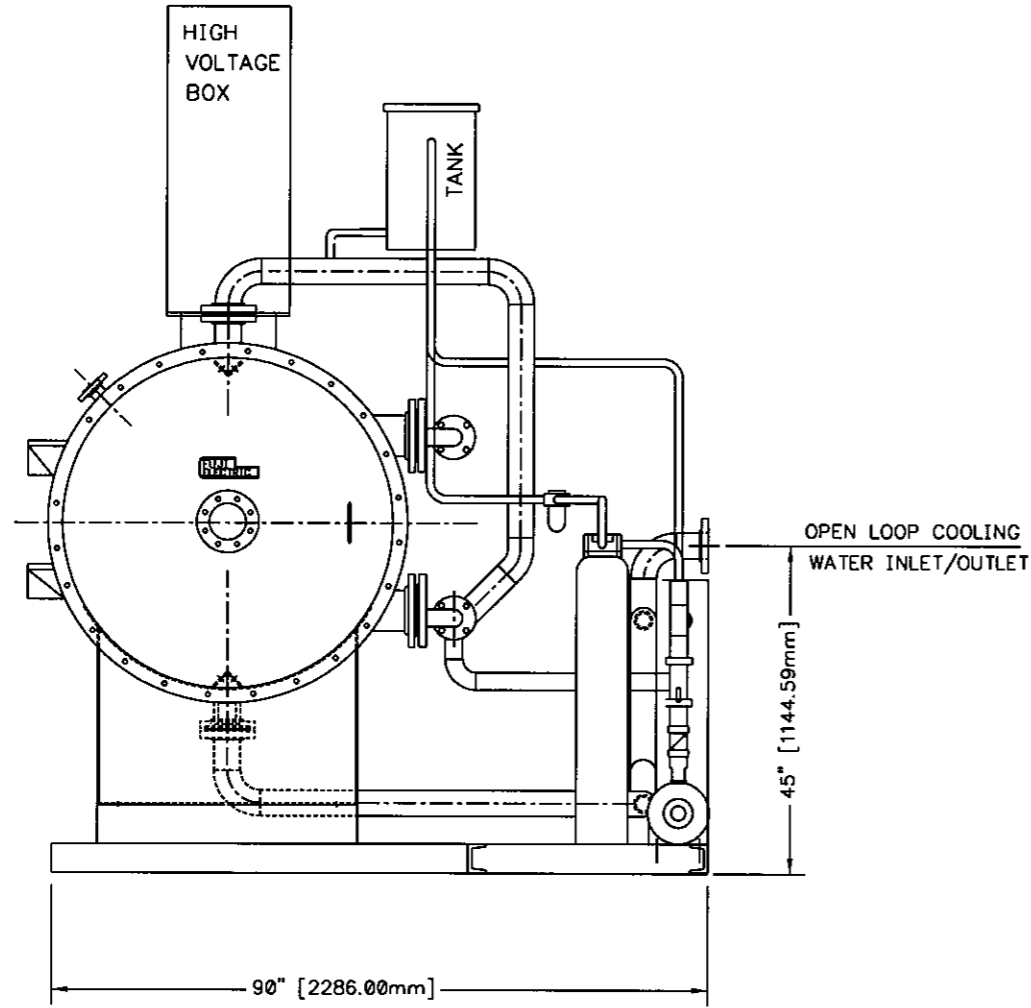
Table of Connections						
Symbol	No. Req'd	Size	Rating	Face	Service	
A	1	3" (75 mm)	150#	RF	Cooling Water Inlet	
B	1	3" (75 mm)	150#	RF	Cooling Water Outlet	
C	1	2" (50 mm)	150#	RF	Oxygen Gas Inlet	
D	1	2" (50 mm)	150#	RF	Ozone Gas Outlet	
E	1	5" (125 mm)	150#	RF	DI Cooling Water Inlet	
F	1	5" (125 mm)	150#	RF	DI Cooling Water Outlet	
G	1	2" (50 mm)	150#	RF	Float Switch Port	
H	1	2" (50 mm)	150#	RF	Float Switch Port	
J	2	5" (125 mm)	Special	Special	Sight Glass	
K	1	13" (325 mm)	Special	Special	High Voltage	

EST'D WEIGHT EMPTY: 1,409 Kg. [3,100 Lb.]
 EST'D OPERATING WEIGHT: 2,864 Kg. [6,300 Lb.]

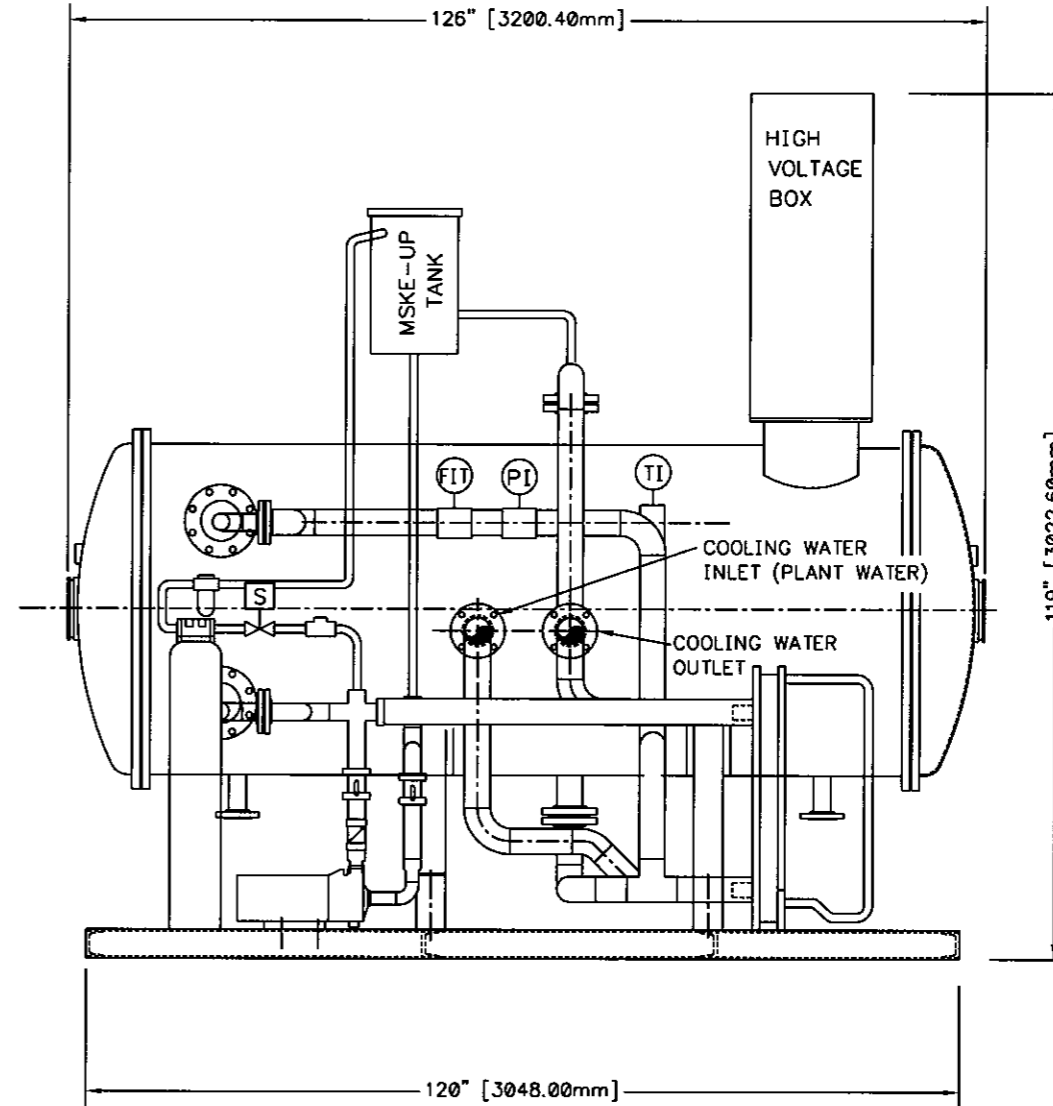
Revisions					Date	Name	Fuji Electric Co., Ltd. THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT WINNIPEG ENGINEERING DIVISION	Dwg. No.	WPMB-M-100 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
					Drawn	D.L.V.			
					Checked				
Rev. No.	Description	By	Date				Title	Ref.	
							OZONE GENERATOR SHELL ASSEMBLY		

NOTES

- 1) SKID TO BE PAINTED TO FUJI PAINT SYSTEM. COLOR FUJI BLUE.
- 2) THE FRAME SUPPORT BEAMS ARE TO BE UNIFORMLY SUPPORTED.. USE 5000 PSI MINIMUM COMPRESSIVE STRENGTH NON-SHRINK GROUT.
- 3) A SPREADER FRAME MUST BE USED DURING LIFTING.
- 4) GENERATOR SKID AND COOLING WATER SKID TO BE JOINED TOGETHER AND PLACED ON THE SAME CONCRETE PAD.
- 5) PIPING PUPPORT NOT SHOWN FOR CLARITY.
- 6) PIPING SPOOL TO BE REMOVED FOR SHIPPING.
- 7) ALL COOLING WATER PIPING TO BE TYPPE 304 SS.



SKID FRONT VIEW



RIGHT SIDE VIEW

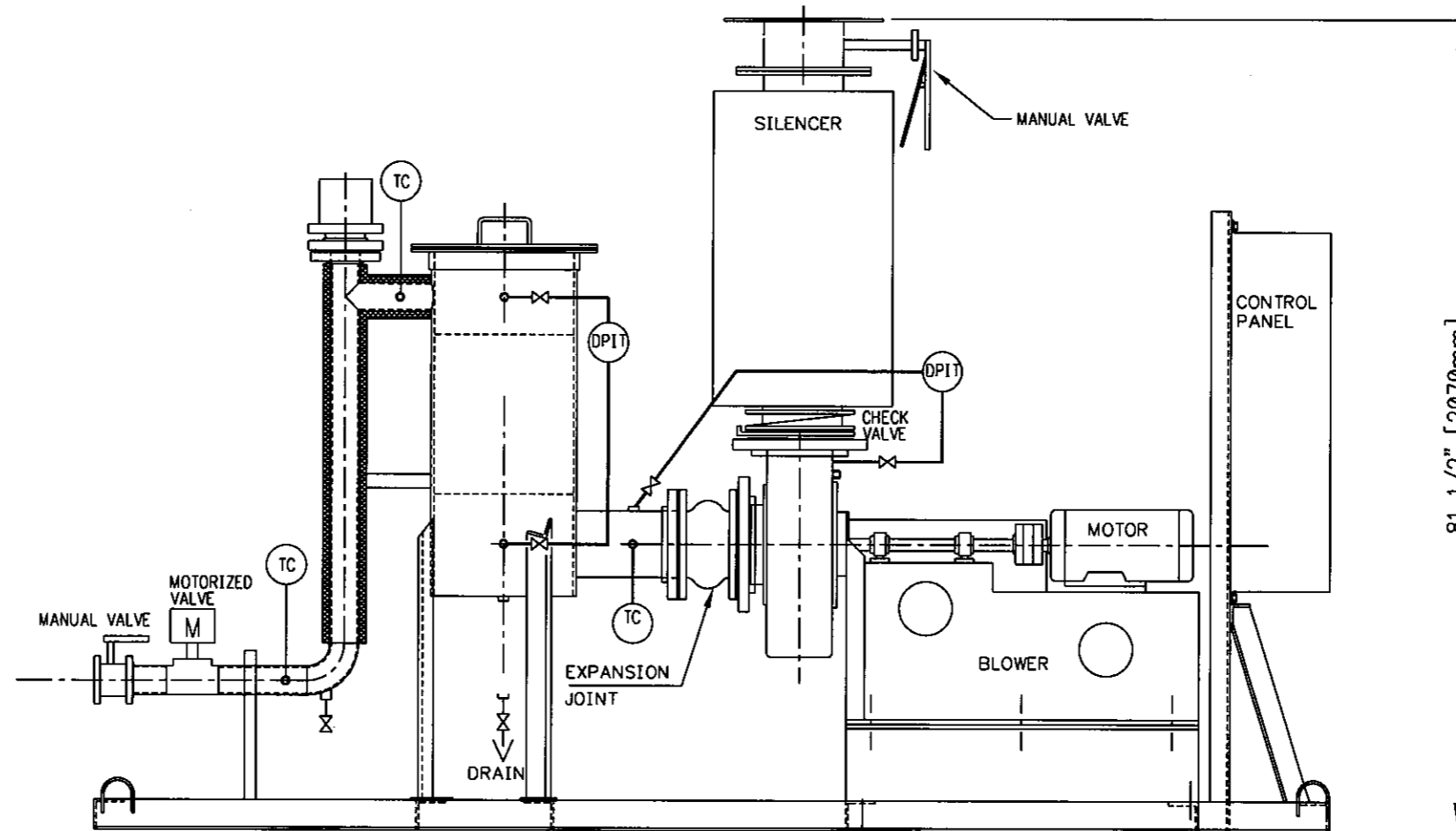
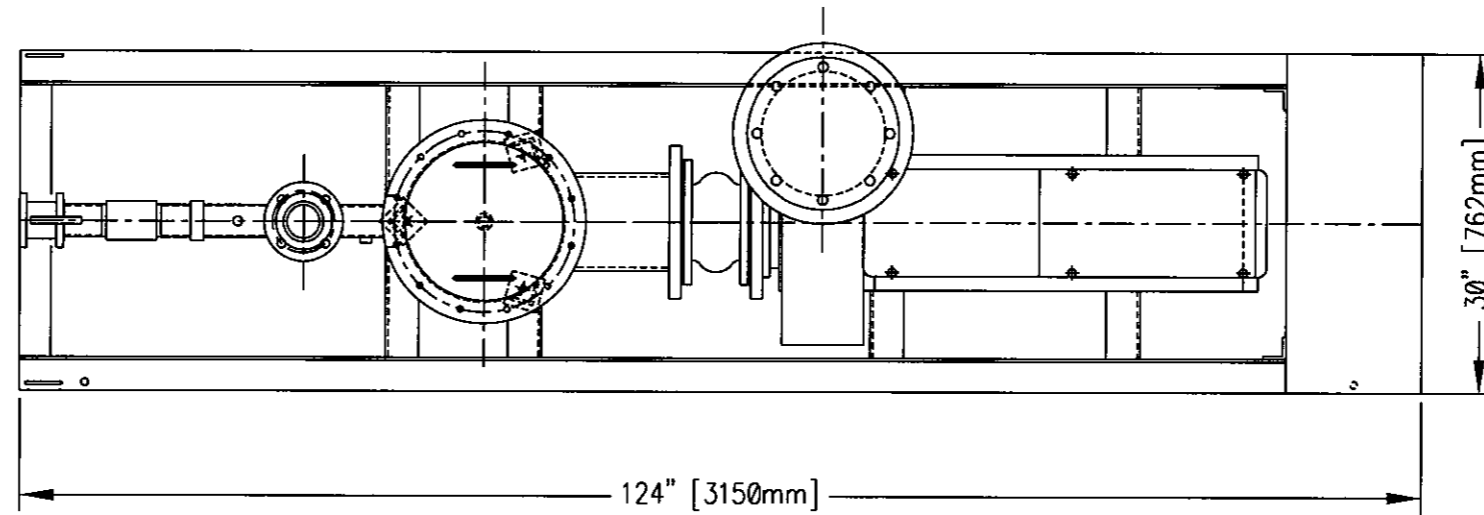
EST SKID WEIGHT (EMPTY) = 2500 kg (5500 lbs)

EST SKID WEIGHT (OPERATING) = 3900 kg (8600 lbs)

Revisions				Date	Name	Fuji Electric Co.,Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-M-101	
				Drawn	12/08/05					S.L.A.
				Checked						
Rev. No.	Description	By	Date				Title	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	

NOTES

- 1) SKID BASE MATERIAL OF CONSTRUCTION TO BE CARBON STEEL.
- 2) CARBON STEEL COMPONENTS TO BE PAINTED.
- 3) EQUIPMENT TO BE ATTACHED TO SKID BY FABRICATORS.
- 4) PIPING TO BE STAINLESS STEEL SCHEDULE 10.
- 5) PLATE FLANGES ARE PERMITTED EXCEPT WHERE OTHERWISE NOTED. PLATE FLANGES TO HAVE ANSI HOLE PATTERN.
- 6) SHIMS ARE PERMITTED BETWEEN BLOWER AND BASE FOR ALIGNMENT.



EST. WEIGHT = 1090 kg (2,400 lbs)
EST. POWER DRAW = 8.2 kw

Revisions	Date	Name
Drawn	12/08/05	S.L.A.
Checked		

Rev. No.	Description	By	Date

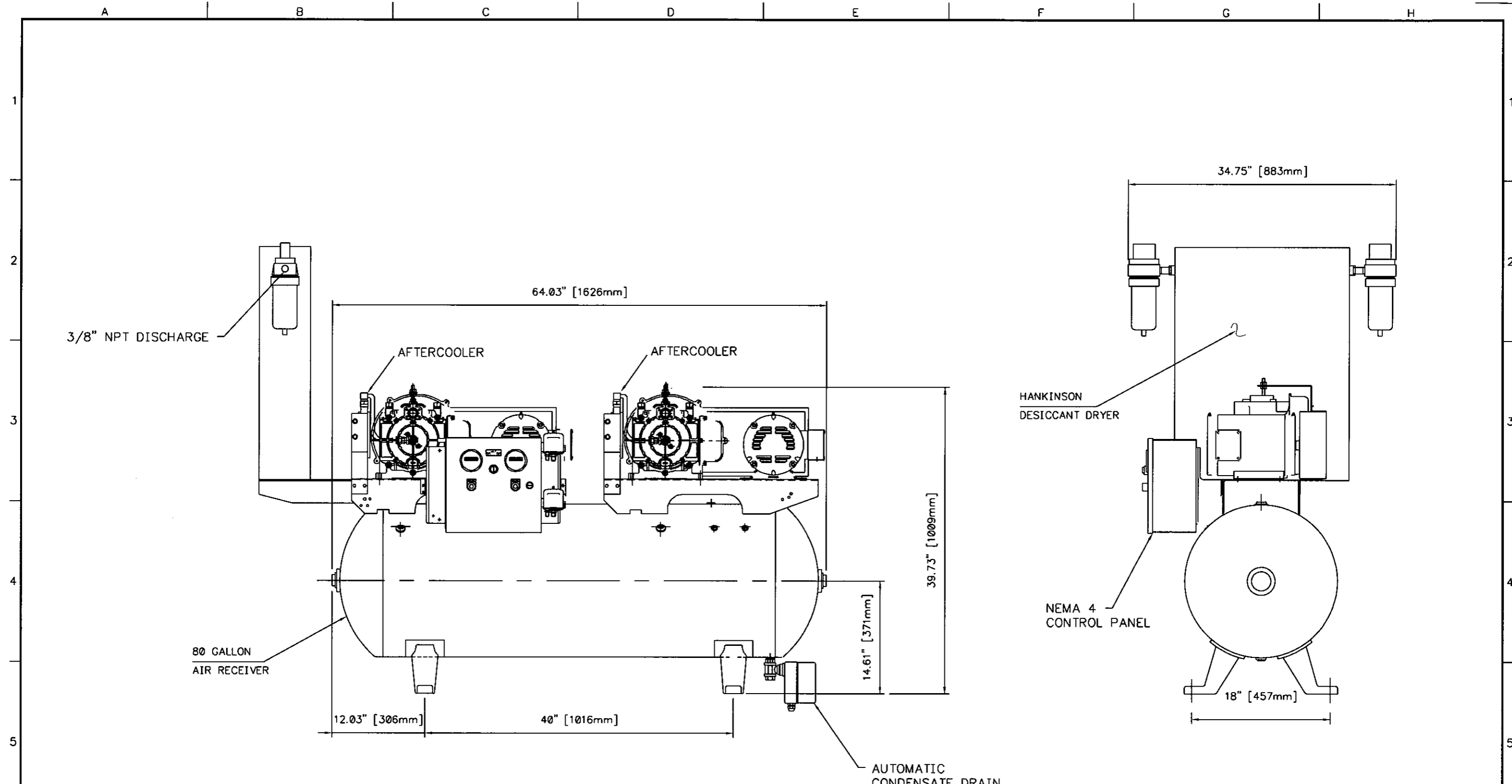
Fuji Electric Co.,Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

**OZONE DESTRUCT UNIT
SKID LAYOUT**

Dwg.No. **WPMB-M-200**

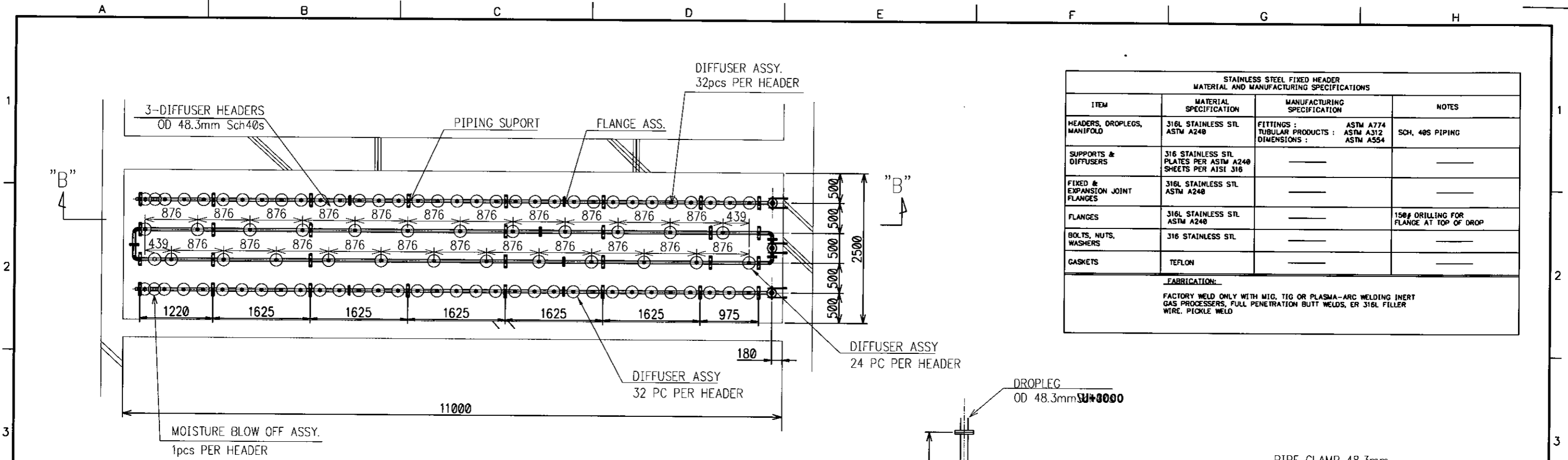
Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



NOTES

1. BASE MODEL NO. IS POWEREX STD0203.
2. WEIGHT = 273kg (600 lbs)
3. EST. POWER DRAW = 3.5 kw

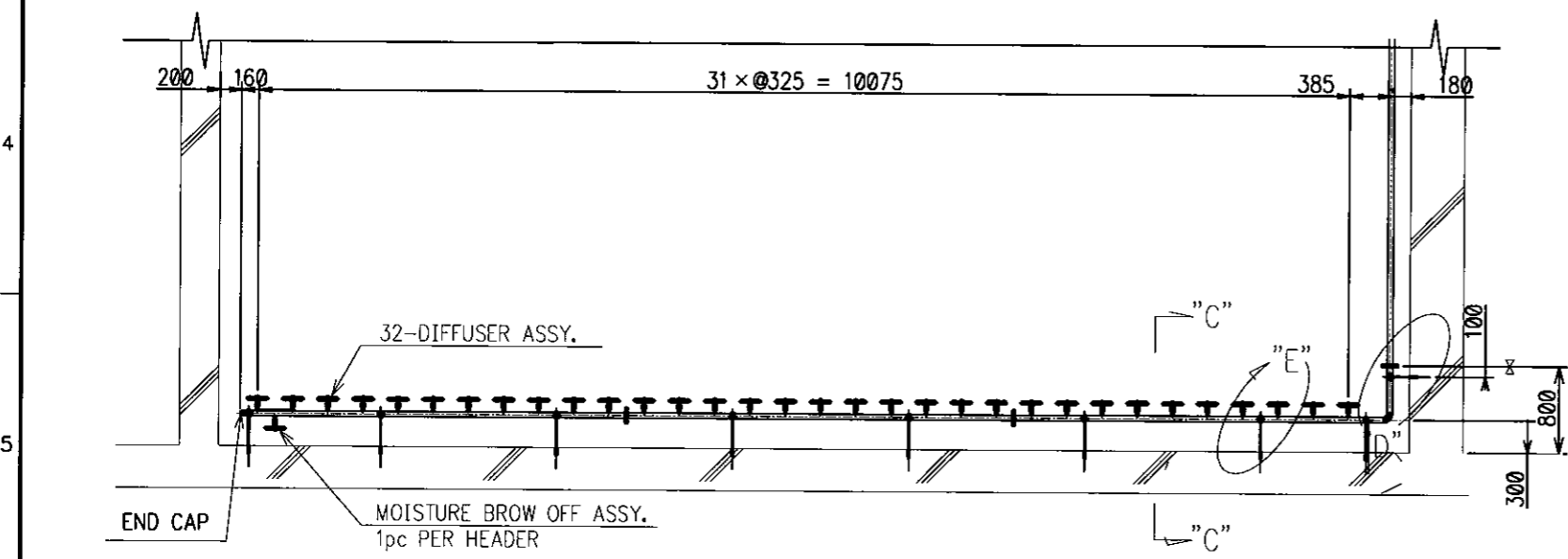
Revisions					Date	Name	Fuji Electric Co.,Ltd.	Title	WINNIPEG WT PROGRAM PROCESS & INSTRUMENTATION DIAGRAM SUPPLEMENTAL AIR SUPPLY UNIT	Dwg.No.	WPMB-M-300	
					Drawn	D.L.V.					Ref.	City of Winnipeg 428-2005
	Rev. No.	Description	By	Date	Checked							
	A	B	C	D	E	F	G	H				



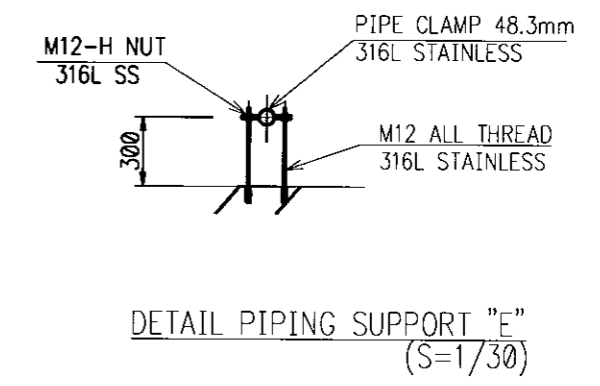
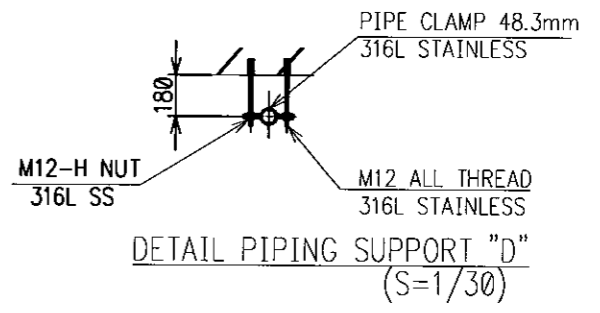
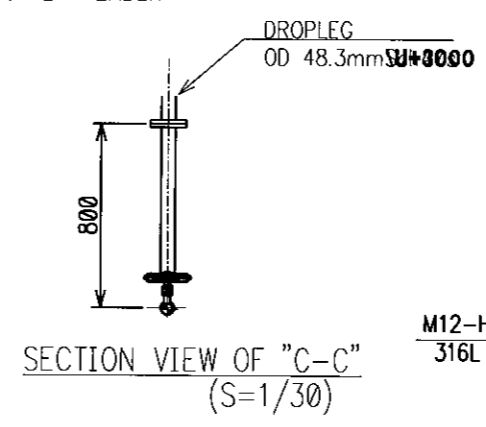
STAINLESS STEEL FIXED HEADER MATERIAL AND MANUFACTURING SPECIFICATIONS			
ITEM	MATERIAL SPECIFICATION	MANUFACTURING SPECIFICATION	NOTES
HEADERS, DROPLEGS, MANIFOLD	316L STAINLESS STL ASTM A240	FITTINGS : TUBULAR PRODUCTS : DIMENSIONS : ASTM A774 ASTM A312 ASTM A554	SCH. 40S PIPING
SUPPORTS & DIFFUSERS	316 STAINLESS STL PLATES PER ASTM A240 SHEETS PER AISI 316	---	---
FIXED & EXPANSION JOINT FLANGES	316L STAINLESS STL ASTM A240	---	---
FLANGES	316L STAINLESS STL ASTM A240	---	150# DRILLING FOR FLANGE AT TOP OF DROP
BOLTS, NUTS, WASHERS	316 STAINLESS STL	---	---
GASKETS	TEFLON	---	---

FABRICATION:
FACTORY WELD ONLY WITH MIG, TIG OR PLASMA-ARC WELDING INERT GAS PROCESSERS, FULL PENETRATION BUTT WELDS, ER 316L FILLER WIRE, PICKLE WELD

PLAN VIEW OF CELL No.1



SECTION VIEW OF "B-B"



<NOTE>
NUMBER OF DIFFUSERS PLACEMENT ARE FOLLOWS.
32pcs/HEADER x 3HEADERS = 96pcs PER 1CELL

Revisions					Drawn	1/9/06	SML	Fuji Electric Co.,Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION Winnipeg	Dwg.No.	WPMB-M140
	Rev. No.	Description	By	Date	Checked							Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

Wiring Requirement List for Ozone Generation System for Shipped Loose Items

for Winnipeg Project (Project No. WPMB-1105)

As of 1/09/06

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.	Power Req'ment	Number of Cables Required	Location
GOX System								
1		PT-O030A	Pressure Differential Transmitter	Transmitter	WPMB-PID-003	24 VDC	1 Shielded twisted pair	MCP
2		PT-O031A	Pressure Differential Transmitter	Transmitter	WPMB-PID-003	24 VDC	1 Shielded twisted pair	MCP
3		AT-O032A	Dew Point Indicator/Analyzer	Monitor	WPMB-PID-003	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
Nitrogen Boost System								
4		FV-O051A	Solenoid Valve	Valve	WPMB-PID-004	120 VAC	120 VAC, 3 wires	MCP
5		FS-O051A	Flow Signal	Signal	WPMB-PID-004	24 VDC	2-Wires(120VAC)	MCP
6		AT-O051A	Dew Point Indicator/Analyzer	Monitor	WPMB-PID-004	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
Ozone Generation System								
7		FV-O119A	Motorized Valve	Valve	WPMB-PID-005	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #1 Skid/PSU #1 Panel
8		PT-O110A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-005	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
9		TT-O110A	Temperature Indicator/Transmitter	Transmitter	WPMB-PID-005	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
10		FT-O112A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-005	24 VDC	120VAC,1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
11		FCV-O112A	Flow Control Valve	Valve	WPMB-PID-005	120 VAC	120 VAC, 2 wires for remote, 2-Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
12		PT-O112A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-005	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
13		TT-O112A	Temperature Transmitter	Transmitter	WPMB-PID-005	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
14		AT-O112A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-005	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	GEN #1 Skid/PSU #1 Panel
15		FV-O112A	Motorized Valve	Valve	WPMB-PID-005	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #1 Skid/PSU #1 Panel
16		AT-O110A	Ambient Ozone Monitor	Monitor	WPMB-PID-005	120 VAC	120 VAC, 1 Shielded twisted pair, 2wires for alarm switch	MCP
17		AT-O110B	Ambient Oxygen Monitor	Monitor	WPMB-PID-005	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
18		FV-O139A	Motorized Valve	Valve	WPMB-PID-006	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #2 Skid/PSU #2 Panel
19		PT-O130A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-006	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
20		TT-O130A	Temperature Indicator/Transmitter	Transmitter	WPMB-PID-006	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
21		FT-O132A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-006	24 VDC	120 VAC,1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
22		FCV-O132A	Flow Control Valve	Valve	WPMB-PID-006	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #2 Skid/PSU #2 Panel
23		PT-O132A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-006	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
24		TT-O132A	Temperature Transmitter	Transmitter	WPMB-PID-006	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
25		AT-O132A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-006	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	GEN #2 Skid/PSU #2 Panel
26		FV-O132A	Motorized Valve	Valve	WPMB-PID-006	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #2 Skid/PSU #2 Panel
27		AT-O130A	Ambient Ozone Monitor	Monitor	WPMB-PID-006	120 VAC	120 VAC, 1 Shielded twisted pair, 2wires for alarm switch	MCP
28		AT-O130B	Ambient Oxygen Monitor	Monitor	WPMB-PID-006	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
29		FV-O159A	Motorized Valve	Valve	WPMB-PID-007	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #3 Skid/PSU #3 Panel
30		PT-O150A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-007	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
31		TT-O150A	Temperature Indicator/Transmitter	Transmitter	WPMB-PID-007	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
32		FT-O152A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-007	24 VDC	120 VAC,1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
33		FCV-O152A	Flow Control Valve	Valve	WPMB-PID-007	120 VAC	120 VAC, 2 wires for remote, 2-Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
34		PT-O152A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-007	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
35		TT-O152A	Temperature Transmitter	Transmitter	WPMB-PID-007	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
36		AT-O152A	High O3 Analyzer/Transmitter	Monitor	WPMB-PID-007	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	GEN #3 Skid/PSU #3 Panel
37		FV-O0152A	Motorized Valve	Valve	WPMB-PID-007	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #3 Skid/PSU #3 Panel

38		AT-O150A	Ambient Ozone Monitor	Monitor	WPMB-PID-005	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
Flow Control								
39		FV-O201A	Motorized Valve	Valve	WPMB-PID-008	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	MCP
40		FV-O202A	Motorized Valve	Valve	WPMB-PID-008	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	MCP
41		FT-O216A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008	24 VDC	120 VAC, 1 Shielded twisted pair	MCP
42		FT-O217A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008	24 VDC	120 VAC, 1 Shielded twisted pair	MCP
43		FT-O218A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-008	24 VDC	1 Shielded twisted pair	MCP
44		FCV-O216A	Flow Control Valve	Valve	WPMB-PID-008	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
45		FCV-O217A	Flow Control Valve	Valve	WPMB-PID-008	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
46		FCV-O218A	Flow Control Valve	Valve	WPMB-PID-008	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
47		FT-O236A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009	24 VDC	120 VAC, 1 Shielded twisted pair	MCP
48		FT-O237A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009	24 VDC	120 VAC, 1 Shielded twisted pair	MCP
49		FT-O238A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-009	24 VDC	120 VAC, 1 Shielded twisted pair	MCP
50		FCV-O236A	Flow Control Valve	Valve	WPMB-PID-009	120 VAC	120 VAC, 2 wires for remote, 2-Shielded twisted pair	MCP
51		FCV-O237A	Flow Control Valve	Valve	WPMB-PID-009	120 VAC	120 VAC, 2 wires for remote, 2-Shielded twisted pair	MCP
52		FCV-O238A	Flow Control Valve	Valve	WPMB-PID-009	120 VAC	120 VAC, 2 wires for remote, 2-Shielded twisted pair	MCP
Off-gas Line								
53		PT-O501A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	MCP
54		PT-O501B	Pressure Differential Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	MCP
55		AT-O501A	Medium O3 Analyzer/Transmitter	Monitor	WPMB-PID-012	120 VAC	120 VAC, 1 Shielded twisted pair	MCP
56		FV-O521A	Motorized Valve	Valve	WPMB-PID-012	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	MCP
57		PT-O505A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	MCP
58		PT-O505B	Pressure Differential Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	MCP
59		AT-O505A	Medium O3 Analyzer/Transmitter	Monitor	WPMB-PID-014	120 VAC	120 VAC, 1 Shielded twisted pair, 2wires for alarm switch	MCP
60		FV-O523A	Motorized Valve	Valve	WPMB-PID-014	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	MCP
61		AT-O520B	Ambient Ozone Monitor	Monitor	WPMB-PID-013	120 VAC	120 VAC, 1 Shielded twisted pair, 2wires for alarm switch	MCP
Flow Control System								
62		SP-O220A	Sample Pump #1	Pump	WPMB-PID-022	1HP, 120 VAC	120VAC, 3-Wires, 1-Wire Gnd	MCP
63		SP-O225A	Sample Pump #2	Pump	WPMB-PID-022	1HP, 120 VAC	120VAC, 3-Wires, 1-Wire Gnd	MCP
64		SP-O240A	Sample Pump #3	Pump	WPMB-PID-023	1HP, 120 VAC	120VAC, 3-Wires, 1-Wire Gnd	MCP
65		SP-O245A	Sample Pump #4	Pump	WPMB-PID-023	1HP, 120 VAC	120VAC, 3-Wires, 1-Wire Gnd	MCP

Wiring Requirement List for Ozone Generation System for Skid Mounted Itmes

for Winnipeg Project (Project No. WPMB-1105)

As of 1/09/06

Item No.	Fuji Tag No.	Customer Tag No.	Description	Category	P & ID No.	Power Req'ment	Number of Cables Required	Location
Cooling Water/Generator Skid #1								
1		FV-O410A	Motorized Butterfly Valve	Valve	WPMB-PID-016	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #1 Skid/PSU #1 Panel
2		TT-O410A	Temperature Transmitter	Transmitter	WPMB-PID-016	120 VAC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
3		FT-O410A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-016	120 VAC	120 VAC, 1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
4		TT-O410B	Temperature Transmitter	Transmitter	WPMB-PID-016	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
5		FV-O111A	Motorized Butterfly Valve	Valve	WPMB-PID-016	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #1 Skid/PSU #1 Panel
6		FT-O111A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-016	24 VDC	120 VAC, 1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
7		PT-O111A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-016	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
8		P-O411A	Closed Loop C.W. Pump #1	Pump	WPMB-PID-016	7-1/2HP,480 VAC,3PH	480 VAC, 3 wires, 10 wires for Remote,Start/Stop,Run and Failed	GEN #1 Skid/PSU #1 Panel
9		TT-O411A	Temperature Transmitter	Transmitter	WPMB-PID-016	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
10		FV-O411A	Solenoid Valve	Valve	WPMB-PID-016	120 VAC	120 VAC, 2 wires for open/close command	GEN #1 Skid/PSU #1 Panel
11		CT-O118A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-016	24 VDC	(1)-3-conductor shielded cable	GEN #1 Skid/PSU #1 Panel
12		TT-O411B	Temperature Transmitter	Transmitter	WPMB-PID-016	24 VDC	1 Shielded twisted pair	GEN #1 Skid/PSU #1 Panel
13		LS-O110A	Level Switch	Switch	WPMB-PID-005	120Vac	120 VAC, 2 wires	GEN #1 Skid/PSU #1 Panel
14		LS-O112A	Level Switch	Switch	WPMB-PID-005	120Vac	120 VAC, 2 wires	GEN #1 Skid/PSU #1 Panel
Cooling Water/Generator Skid #2								
1		FV-O420A	Motorized Butterfly Valve	Valve	WPMB-PID-017	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #2 Skid/PSU #2 Panel
2		TT-O420A	Temperature Transmitter	Transmitter	WPMB-PID-017	120 VAC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
3		FT-O420A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-017	120 VAC	120 VAC, 1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
4		TT-O420B	Temperature Transmitter	Transmitter	WPMB-PID-017	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
5		FV-O131A	Motorized Butterfly Valve	Valve	WPMB-PID-017	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #2 Skid/PSU #2 Panel
6		FT-O131A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-017	24 VDC	120 VAC, 1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
7		PT-O131A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-017	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
8		P-O421A	Closed Loop C.W. Pump #1	Pump	WPMB-PID-017	7-1/2HP,480 VAC,3PH	480 VAC, 3 wires, 10 wires for Remote,Start/Stop,Run and Failed	GEN #2 Skid/PSU #2 Panel
9		TT-O421A	Temperature Transmitter	Transmitter	WPMB-PID-017	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
10		FV-O421A	Solenoid Valve	Valve	WPMB-PID-017	120 VAC	120 VAC, 2 wires for open/close command	GEN #2 Skid/PSU #2 Panel
11		CT-O128A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-017	24 VDC	(1)-3-conductor shielded cable	GEN #2 Skid/PSU #2 Panel
12		TT-O421B	Temperature Transmitter	Transmitter	WPMB-PID-017	24 VDC	1 Shielded twisted pair	GEN #2 Skid/PSU #2 Panel
13		LS-O130A	Level Switch	Switch	WPMB-PID-006	120Vac	120 VAC, 2 wires	GEN #2 Skid/PSU #2 Panel
14		LS-O132A	Level Switch	Switch	WPMB-PID-006	120Vac	120 VAC, 2 wires	GEN #2 Skid/PSU #2 Panel
Cooling Water/Generator Skid #3								
1		FV-O430A	Motorized Butterfly Valve	Valve	WPMB-PID-018	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #3 Skid/PSU #3 Panel
2		TT-O430A	Temperature Transmitter	Transmitter	WPMB-PID-018	120 VAC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
3		FT-O430A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-018	120 VAC	120 VAC, 1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
4		TT-O430B	Temperature Transmitter	Transmitter	WPMB-PID-018	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
5		FV-O151A	Motorized Butterfly Valve	Valve	WPMB-PID-018	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	GEN #3 Skid/PSU #3 Panel
6		FT-O151A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-018	24 VDC	120 VAC, 1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
7		PT-O151A	Pressure Indicator/Transmitter	Transmitter	WPMB-PID-018	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel

8		P-O431A	Closed Loop C.W. Pump #1	Pump	WPMB-PID-018	7-1/2HP,480 VAC,3PH	480 VAC, 3 wires, 10 wires for Remote,Start/Stop,Run and Failed	GEN #3 Skid/PSU #3 Panel
9		TT-O431A	Temperature Transmitter	Transmitter	WPMB-PID-018	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
10		FV-O431A	Solenoid Valve	Valve	WPMB-PID-018	120 VAC	120 VAC, 2 wires for open/close command	GEN #3 Skid/PSU #3 Panel
11		CT-O138A	Conductivity Indicator/Transmitter	Transmitter	WPMB-PID-018	24 VDC	(1)-3-conductor shielded cable	GEN #3 Skid/PSU #3 Panel
12		TT-O431B	Temperature Transmitter	Transmitter	WPMB-PID-018	24 VDC	1 Shielded twisted pair	GEN #3 Skid/PSU #3 Panel
13		LS-O150A	Level Switch	Switch	WPMB-PID-007	120Vac	120 VAC, 2 wires	GEN #3 Skid/PSU #3 Panel
14		LS-O152A	Level Switch	Switch	WPMB-PID-007	120Vac	120 VAC, 2 wires	GEN #3 Skid/PSU #3 Panel
Nitrogen Boost System Skid								
1		CMP-O052A	Compressor #1	Motor	WPMB-PID-004	7-1/2HP,575 VAC,3PH	480 VAC, 3 wires, 1wire Gnd,2 wires for fail	Local Control Panel
2		CMP-O053A	Compressor #2	Motor	WPMB-PID-004	7-1/2HP,575 VAC,3PH	480 VAC, 3 wires, 1wire Gnd,2 wires for fail	Local Control Panel
3		PS-O050A	Pressure Switch	Switch	WPMB-PID-004	120 VAC	2-wires(120vac)	Local Control Panel
4		DES-O051A	Desiccant Dryer	Dryer	WPMB-PID-004	120 VAC		Local Control Panel
5		BV-O050A	Blowdown Valve	Valve	WPMB-PID-004	120 VAC		Local Control Panel
Ozone Destruct Unit Skid #1								
1		FCV-O510A	Motorized Valve	Valve	WPMB-PID-012	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	Local Control Panel
2		TT-O510A	Temperature Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	Local Control Panel
3		HTR-O510A	Preheater	Heater	WPMB-PID-012	3KW,575V,3PH	Fui's Internal Wiring	Local Control Panel
4		TT-O510B	Temperature Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	Local Control Panel
5		PT-O510A	Differential Pressure Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	Local Control Panel
6		TT-O510C	Temperature Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	Local Control Panel
7		PT-O510B	Differential Pressure Transmitter	Transmitter	WPMB-PID-012	24 VDC	1 Shielded twisted pair	Local Control Panel
8		BLW-O510A	Blower	Motor	WPMB-PID-012	5HP,575 VAC,3PH	Fui's Internal Wiring	Local Control Panel
9		AT-O510A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-012	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	Local Control Panel
Ozone Destruct Unit Skid #2								
1		FCV-O520A	Motorized Valve	Valve	WPMB-PID-013	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	Local Control Panel
2		TT-O520A	Temperature Transmitter	Transmitter	WPMB-PID-013	24 VDC	1 Shielded twisted pair	Local Control Panel
3		HTR-O520A	Preheater	Heater	WPMB-PID-013	3KW,575V,3PH	Fui's Internal Wiring	Local Control Panel
4		TT-O520B	Temperature Transmitter	Transmitter	WPMB-PID-013	24 VDC	1 Shielded twisted pair	Local Control Panel
5		PT-O520A	Differential Pressure Transmitter	Transmitter	WPMB-PID-013	24 VDC	1 Shielded twisted pair	Local Control Panel
6		TT-O520C	Temperature Transmitter	Transmitter	WPMB-PID-013	24 VDC	1 Shielded twisted pair	Local Control Panel
7		PT-O520B	Differential Pressure Transmitter	Transmitter	WPMB-PID-013	24 VDC	1 Shielded twisted pair	Local Control Panel
8		BLW-O520A	Blower	Motor	WPMB-PID-013	5HP,575 VAC,3PH	Fui's Internal Wiring	Local Control Panel
9		AT-O520A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-013	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	Local Control Panel
Ozone Destruct Unit Skid #3								
1		FCV-O530A	Motorized Valve	Valve	WPMB-PID-014	120 VAC	120 VAC, 10 wires for remote, open/close command and switches	Local Control Panel
2		TT-O530A	Temperature Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	Local Control Panel
3		HTR-O530A	Preheater	Heater	WPMB-PID-014	3KW,575V,3PH	Fui's Internal Wiring	Local Control Panel
4		TT-O530B	Temperature Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	Local Control Panel
5		PT-O530A	Differential Pressure Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	Local Control Panel
6		TT-O530C	Temperature Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	Local Control Panel
7		PT-O530B	Differential Pressure Transmitter	Transmitter	WPMB-PID-014	24 VDC	1 Shielded twisted pair	Local Control Panel

8		BLW-O530A	Blower	Motor	WPMB-PID-014	5HP,575 VAC,3PH	Fui's Internal Wiring	Local Control Panel
9		AT-O530A	Vent Gas Ozone Monitor	Monitor	WPMB-PID-014	120 VAC	120 VAC, 1 Shielded twisted pair, 2 wires for alarm switches	Local Control Panel
Power Supply Unit Cooling Water #1								
1		FV-O310A	Solenoid Valve	Valve	WPMB-PID-019	120VAC	120 VAC, 2 wires for open/close command	GEN #1 Skid/PSU #1 Panel
2		TS-O310A	Temperature Switch	Switch	WPMB-PID-019	120VAC	2-wires(120vac)	GEN #1 Skid/PSU #1 Panel
Power Supply Unit Cooling Water #2								
1		FV-O320A	Solenoid Valve	Valve	WPMB-PID-020	120VAC	120 VAC, 2 wires for open/close command	GEN #2 Skid/PSU #2 Panel
2		TS-O320A	Temperature Switch	Switch	WPMB-PID-020	120VAC	2-wires(120vac)	GEN #2 Skid/PSU #2 Panel
Power Supply Unit Cooling Water #3								
1		FV-O330A	Solenoid Valve	Valve	WPMB-PID-021	120VAC	120 VAC, 2 wires for open/close command	GEN #3 Skid/PSU #3 Panel
2		TS-O330A	Temperature Switch	Switch	WPMB-PID-021	120VAC	2-wires(120vac)	GEN #3 Skid/PSU #3 Panel
Residual Ozone Monitoring Panel #1								
1		FT-O220A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022	24 VDC	1 Shielded twisted pair	MCP
2		AT-O221A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022	24 VDC	1 Shielded twisted pair	MCP
3		FT-O225A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-022	24 VDC	1 Shielded twisted pair	MCP
4		AT-O226A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-022	24 VDC	1 Shielded twisted pair	MCP
Residual Ozone Monitoring Panel #2								
1		FT-O240A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-023	24 VDC	1 Shielded twisted pair	MCP
2		AT-O241A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-023	24 VDC	1 Shielded twisted pair	MCP
3		FT-O245A	Flow Indicator/Transmitter	Transmitter	WPMB-PID-023	24 VDC	1 Shielded twisted pair	MCP
4		AT-O246A	Dissolved Ozone Analyzer	Monitor	WPMB-PID-023	24 VDC	1 Shielded twisted pair	MCP
			Destruct Panel No.1			575VAC, 3PH, 60HZ, 16Kw	4-wires (575Vac)	MCC
			Destruct Panel No.1			575VAC, 3PH, 60HZ, 16Kw	10-Wires for Remote,Start,Stop, Run and Common Alarm	MCP
			Destruct Panel No.2			575VAC, 3PH, 60HZ, 16Kw	4-wires (575Vac)	MCC
			Destruct Panel No.2			575VAC, 3PH, 60HZ, 16Kw	10-Wires for Remote,Start,Stop, Run and Common Alarm	MCP
			Destruct Panel No.3			575VAC, 3PH, 60HZ, 16Kw	4-wires (575Vac)	MCC
			Destruct Panel No.3			575VAC, 3PH, 60HZ, 16Kw	10-Wires for Remote,Start,Stop, Run and Common Alarm	MCP
			Air Compressor Control Panel No.1			575VAC, 3PH,60HZ, 4Kw	4-wires(575vac)	MCC
			Air Compressor Control Panel No.2			575VAC, 3PH,60HZ, 4Kw	4-wires(575vac)	MCC
			Power Supply Panel #1			575 VAC, 3PH, 60Hz, 200KVA	4-Wires for 575Vac	MCC
			Power Supply Panel #1			575 VAC, 3PH, 60Hz, 200KVA	1 Ethernet cable	PSU/LCP
			Power Supply/LCP Panel #1			120VAC,3KVA,PLC LOAD	120Vac, 3-Wires	(PSU/LCP)External UPS Power by Ohters
			Power Supply Panel #2			575 VAC, 3PH, 60Hz, 200KVA	4-Wires for 575Vac	MCC
			Power Supply Panel #2			575 VAC, 3PH, 60Hz, 200KVA	1 Ethernet cable	PSU/LCP

			Power Supply/LCP Panel #2			120VAC,3KVA,PLC LOAD	120Vac, 3-Wires	(PSU/LCP)External UPS Power by Ohters
			Power Supply Panel #3			575 VAC, 3PH, 60Hz, 200KVA	4-Wires for 575Vac	MCC
			Power Supply Panel #3			575 VAC, 3PH, 60Hz, 200KVA	1 Ethernet cable	PSU/LCP
			Power Supply/LCP Panel #3			120VAC,3KVA,PLC LOAD	120Vac, 3-Wires	(PSU/LCP)External UPS Power by Ohters
			Ozone Generator No.1			15KV	4 wires-(2)15KV Shielded High Voltage Cable, and (2) Non-Shielded HV Cable in Non Magnetic cable tray.	GEN1 Skid--PSU1 Pnl
			Ozone Generator No.2			15KV	4 wires-(2)15KV Shielded High Voltage Cable, and (2) Non-Shielded HV Cable in Non Magnetic cable tray.	GEN1 Skid--PSU1 Pnl
			Ozone Generator No.3			15KV	4 wires-(2)15KV Shielded High Voltage Cable, and (2) Non-Shielded HV Cable in Non Magnetic cable tray.	GEN1 Skid--PSU1 Pnl
			Master Control Panel			120Vac, 3.6KW	120Vac,3-Wires	(MCP)External UPS Power by Ohters
			Master Control Panel			120Vac, 3.6KW	1-Ethernet Cable	MCC-PSU/LCP

NOTES

A. CABLE ENTRY POINT FOR HIGH VOLTAGE CABLES
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY
LOCATION OF ENTRY

B. CABLE ENTRY POINT FOR ALL CONTROL WIRING.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER IS TO
VERIFY LOCATION OF CONTROL CONDUITS.

C. CABLE ENTRY LOCATION FOR INCOMING 480V POWER.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY
LOCATION OF ENTRY.

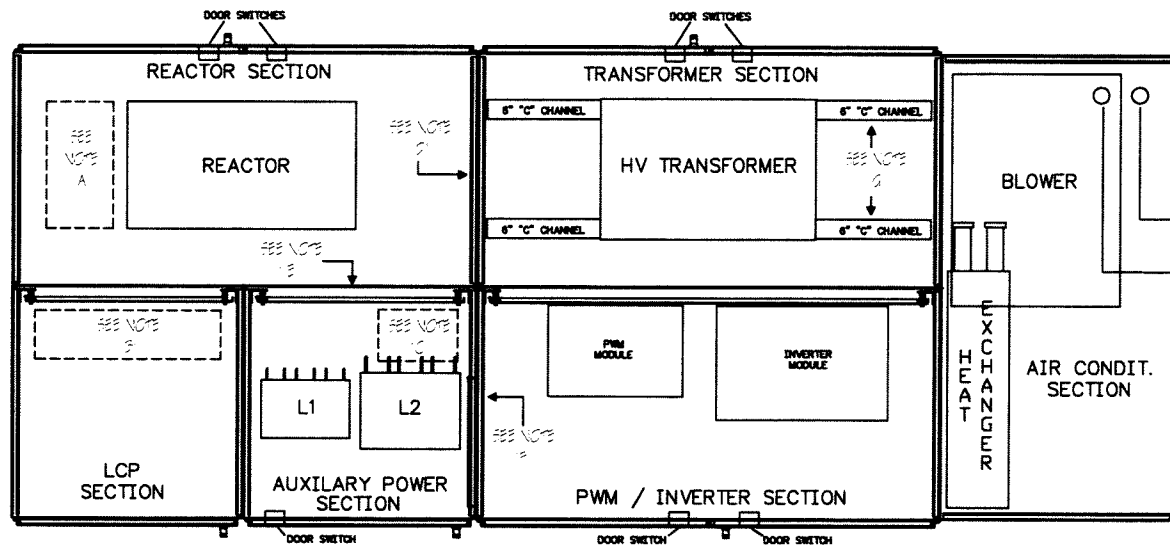
D. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE AT FLOOR LEVEL
FOR VENTILATION.

E. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF
PANEL FOR VENTILATION.

F. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF
PANEL FOR VENTILATION.

G. MOUNT HIGH VOLTAGE TRANSFORMER ON 6" C CHANNEL.

TOP VIEW



CHILLER OUTLET
2.5" FPT SS COUPLING

CHILLER INLET
2.5" FPT SS COUPLING

Earth Tech (Canada) Inc.

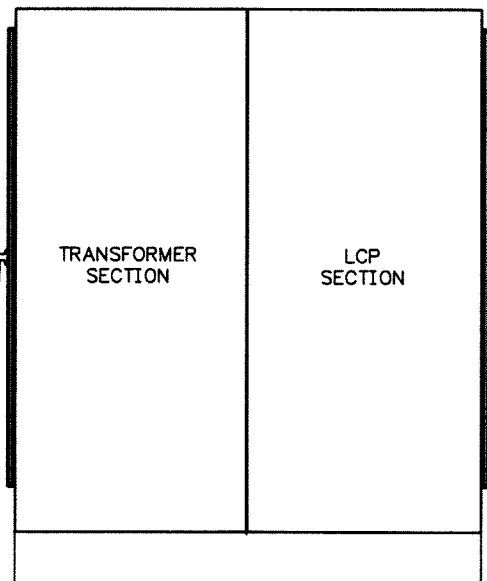
Reviewed for general conformance with design intent.
Responsibility for detail design in the shop drawings
rests with the Contractor.

Reviewed for general conformance with design intent.
Responsibility for detail design in the shop drawings
rests with the Contractor.

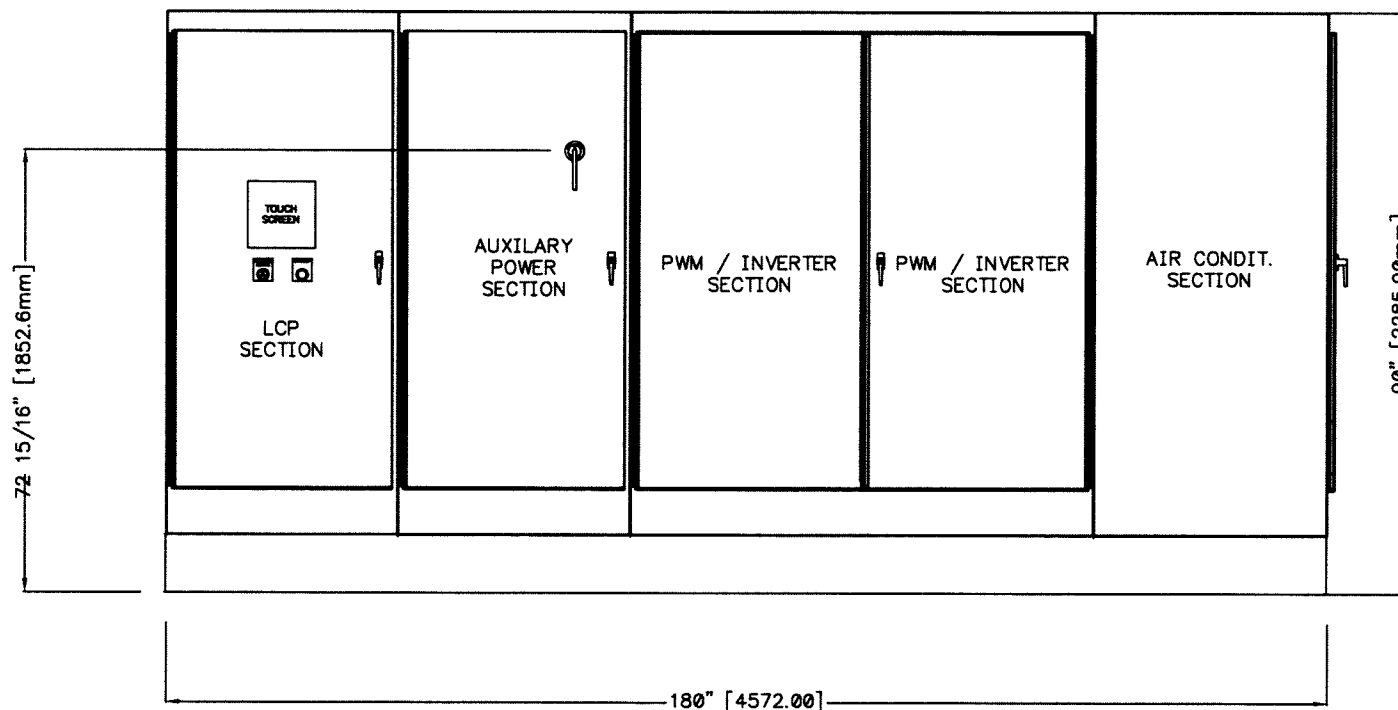
REVIEWED
REVIEWED AS NOTED
REVISE AND RE-SUBMIT
NOT REVIEWED

Project No. 79538-C14-16
Date: 23/1/06 By: M. Jones

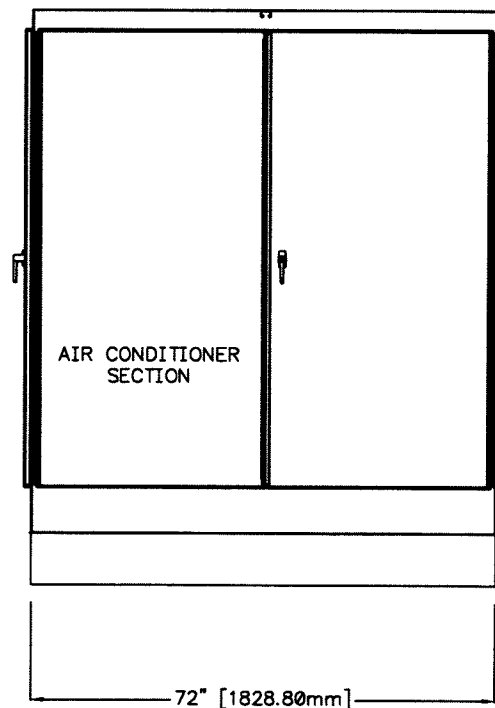
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW

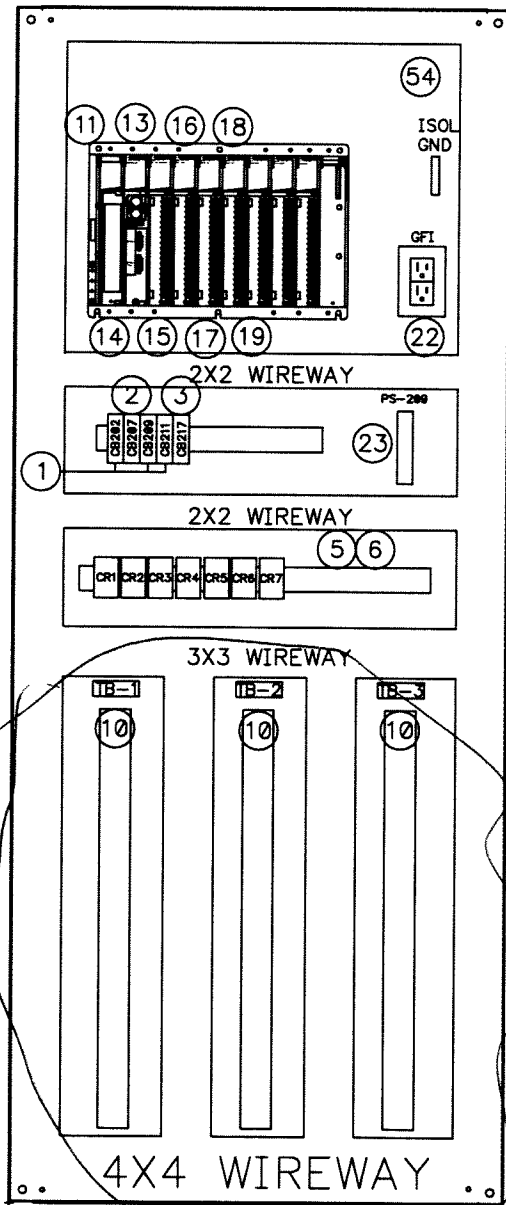


THE INCOMING POWER TO THE PSU WILL BE 480 VOLTS.

EST. WEIGHT: 6,900kg (15,000 LBS)

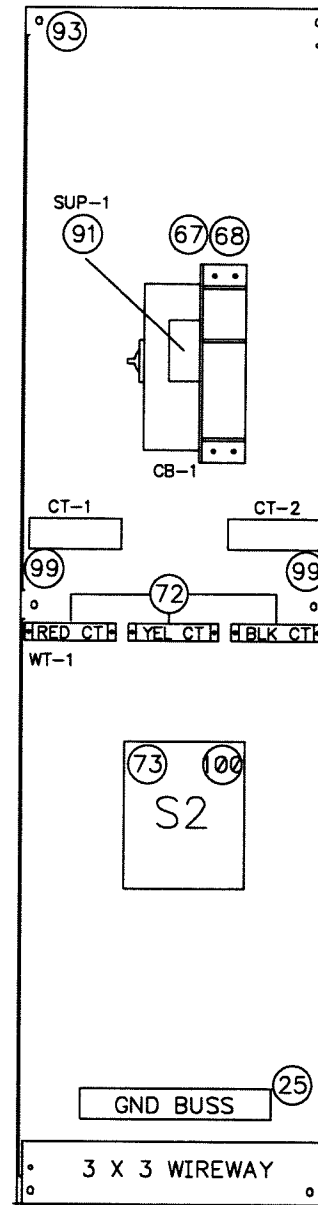
Revisions					Date	Name	Fuji Electric Co.,Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT WINNIPEG ENGINEERING DIVISION	Dwg.No.	WPMB-E100
					Drawn	D.L.V.					
					Checked						
Rev. No.	Description	By	Date							Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

LCP SECTION
REAR PANEL

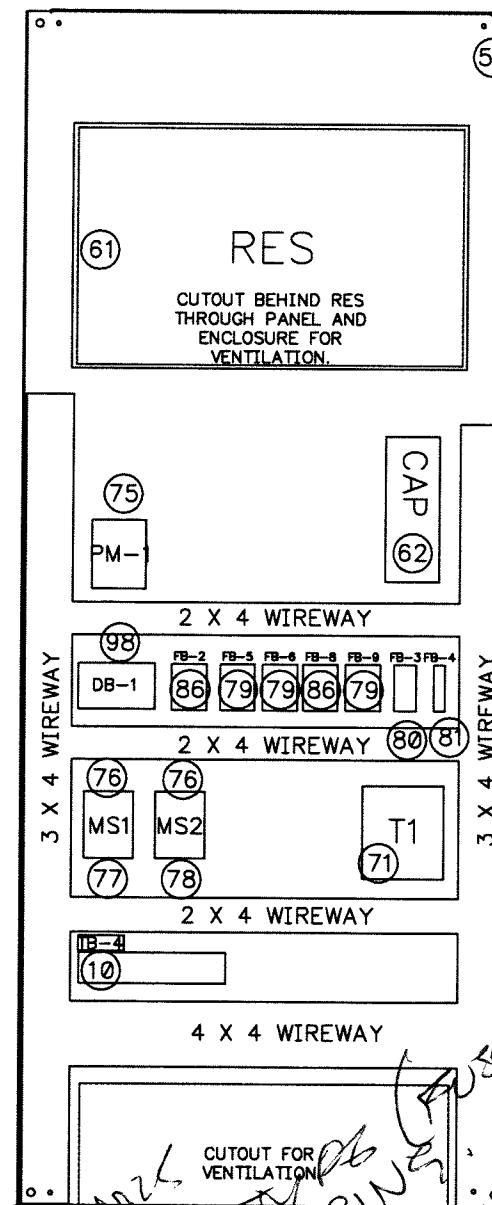


NOTE:
MOUNT MODICON "T"
TAP ON RIGHT SIDE
WALL OF LCP

AUXILIARY POWER
LEFT SIDE PANEL



AUXILIARY POWER
REAR PANEL



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, materials and installation of construction, and location and identification of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____


Project No. 79538-C14-16

Date: 21/01/06 By: [Signature]

*PLEASE ENSURE
THAT THESE TERMINALS
ARE DISCONNECTED
FOR FIELD WIRING*

Revisions					Date	Name	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No. WPMB-E100A
					Drawn	SML			
					Checked				
	Rev. No.	Description	By	Date			Title POWER SUPPLY UNIT NO. 1 SUBPANEL LAYOUT	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDORS
1	CB-202,9,11	3	SQUARE D	MG24501	1-POLE,2A,120V,CIRCUIT BREAKER	FD LAWRENCE
2	CB-207	1	SQUARE D	MG24504	1-POLE,6A,120V,CIRCUIT BREAKER	FD LAWRENCE
3	CB-217	1	SQUARE D	MG24503	1-POLE, 4A,120V,CIRCUIT BREAKER	FD LAWRENCE
4						
5	CR1-7	7	SQUARE D	KUD12P14V53	24VDC,CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
6		7	SQUARE D	NR82	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS FOR ITEM4	FD LAWRENCE
7	PL1	1	SQUARE D	9001KPKM35A31	30MM,24VDC AMBER PILOT LIGHT	FD LAWRENCE
8						
9	PB-217	1	SQUARE D	9001KR9R20H1	30 MM, RED MUSHROOM BUTTON,PUSH PULL MAINTAIN	FD LAWRENCE
10	TB1,2, 3, 4, 5	183	SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS, <i>PROVIDE FUSES</i>	PANEL FABRICATOR
11	PLC	1	MODICON	140XBPO1000	BACKPLANE 10 SLOT <i>DISCONNECT TERMINALS</i>	FD LAWRENCE
12		5	MODICON	140XTS00100	QUANTUM I/O TERMINAL STRIPS <i>FOR RIGID WIRING CONNECTIONS</i>	FD LAWRENCE
13		1	MODICON	140CPU65150	UNITY CPU, 256K, 1MB, 1MB+	FD LAWRENCE
14		1	MODICON	140CPS11410	PLC POWER SUPPLY	FD LAWRENCE
15		1	MODICON	140DDI35310	DC INPUT 24V X 32 SOURCE	FD LAWRENCE
16		1	MODICON	140DAI54300	AC INPUT, 120V X 16	FD LAWRENCE
17		1	MODICON	140DRA84000	RELAY OUTPUT (N.O.), ISOLATED 16 POINTS	FD LAWRENCE
18		2	MODICON	140AVI03000	24VDC,8 ANALOG INPUTS	FD LAWRENCE
19		1	MODICON	140ACO02000	24VDC,4 ANALOG OUTPUTS	FD LAWRENCE
20	HMI	1	MAGELLIS	XBTF032110	5.7" COLOR TOUCH SCREEN SERIAL LINK	FD LAWRENCE
21				XBTZ29710	MAGELLIS TO QUANTUM COMMUNICATION CABLE	FD LAWRENCE
22	GFI-1	1	HUBBELL	GF-5252I	GFI RECEPTACLE	PANEL FABRICATOR
23	PS-209	1	SQUARE D	ABL7-RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
24						
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Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Fuji Electric Co.,Ltd	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E101
					Checked						
								Title	POWER SUPPLY UNIT NO. 1 LOCAL CONTROL PANEL - BILL OF MATERIALS	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for details of construction drawings rests with the client.

Responsibility for the design and construction of field elements rests with the contractor. Responsibility for coordination of all parts of the work rests with the contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓


REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 21/01/06 By: M. Paulson

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDORS
51		3	HOFFMAN	A-907236FS	ENCLOSURE, 90" X 72" X 36", TWO DOOR, NEMA 12	FD LAWRENCE
52		2	HOFFMAN	A-903636FS	ENCLOSURE, 90" X 36" X 36", ONE DOOR, NEMA 12	FD LAWRENCE
53		1	HOFFMAN	A-90P72F1	SUBPANEL, FULL SIZE, 78" X 68"	FD LAWRENCE
54		2	HOFFMAN	A-90P36F1	SUBPANEL, FULL SIZE, 78" X 32"	FD LAWRENCE
55	DS-1 - DS-2	2	SQUARE D	XCSTE5533	DOOR SAFETY SWITCH (LOCKING)	FD LAWRENCE
56		2	SQUARE D	XCSZ12	ACTUATING KEYS FOR ITEM 55	FD LAWRENCE
57	PWM	1	FUJI ELECTRIC		PWM MODULE	FUJI ELECTRIC
58	INV-11	1	FUJI ELECTRIC		INVERTER MODULE	FUJI ELECTRIC
59	L1	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
60	L2	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
61	RES	1	FUJI ELECTRIC		RESISTOR PACK	FUJI ELECTRIC
62	CAP	1	FUJI ELECTRIC		CAPACITOR	FUJI ELECTRIC
63	RU1,2 RV1,2 RW1,2	6	FUJI ELECTRIC		RESISTOR	FUJI ELECTRIC
64	T5-11	1	FUJI ELECTRIC		HIGH VOLTAGE TRANSFORMER	FUJI ELECTRIC
65	T6-11	1	FUJI ELECTRIC		HIGH VOLTAGE REACTOR	FUJI ELECTRIC
66	TS-3	1	HOFFMAN	A-TEMNO	TEMPERATURE SWITCH N.O.	PANEL FAB.
67	CB-1	1	SQUARE D	LCL36300	CIRCUIT BREAKER 480V 300A	FD LAWRENCE
68		1	SQUARE D	9421-LK1	DOOR OPERATING MECHANISMS FOR ITEM 67	FD LAWRENCE
69	SV-224	1	ASCO	8221-G11	COOLING WATER SOLENOID VALVE 120 VAC	PANEL FAB.
70	PT-2, PT-3	2	FUJI ELECTRIC		TRANSFORMER, 480/5 VAC	FUJI ELECTRIC
71	T1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120V 1KVA	FD LAWRENCE
72	WT-1	1	SQUARE D	H8044-0400-3	POWER TRANSDUCER	FD LAWRENCE
73	S2,S3	2	SQUARE D	LC1F300F7	CONTACTOR, 3 POLES, 300,120 VAC COIL, W/ 1 N.O.AUXILIARY CONTACT	FD LAWRENCE
74	PMD-1	1	SQUARE D	3020-PMD32	POWERLOGIC POWER METER DISPLAY UNIT	FD LAWRENCE
75	PM-1	1	SQUARE D	3020-PM600	POWERLOGIC POWER METER BASE UNIT	FD LAWRENCE
76	MS1, MS2	2	SQUARE D	8536-SC03V02S	MOTOR STARTER SIZE 1 120 VAC COIL	FD LAWRENCE
77		3	SQUARE D	B12.8	HEATERS FOR 5 HP	FD LAWRENCE
78		3	SQUARE D	B22	HEATERS FOR 7-1/2 HP	FD LAWRENCE
79	FB-5, 6, 9, 12	4	BUSSMANN	BM6033B	3 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
80	FB-3	1	BUSSMANN	BM6032B	2 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
81	FB-4	1	BUSSMANN	BM6031B	1 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
82		6	BUSSMANN	FNQ-2	FUSE, 500V, 2A TIME DELAYED	FD LAWRENCE
83		2	BUSSMANN	FNQ-3	FUSE, 500V, 3A TIME DELAYED	FD LAWRENCE
84		1	BUSSMANN	FNM-8	FUSE, 250V, 8A	FD LAWRENCE
85		9	BUSSMANN	LP-CC15	FUSE, 600V, 15A	FD LAWRENCE
86	FB-2, 8	2	BUSSMANN	BC6033B	3 POLE FUSEBLOCK, CLASS CC, 600V, 30A	FD LAWRENCE
87	DS-3 - DS-4	2	SQUARE D	XCKJ10541	DOOR SAFETY SWITCH (NON-LOCKING)	FD LAWRENCE
88	TS-1	1	STANCOR	STO-140	ENCLOSURE HIGH TEMPERATURE SWITCH	PANEL FAB.
89		1			BLOWER & MOTOR ASSEMBLY	TRANE
90		1			AIR/WATER HEAT EXCHANGER	TRANE
91	SUP-1	1	SQUARE D	SDSA3650	480 VAC SURGE SUPPRESSOR	FD LAWRENCE
92		3	BUSSMANN	FNQ-1	FUSE, 500V, 1A TIME DELAYED	FD LAWRENCE
93		1	HOFFMAN	A-90SMP20	SIDE MOUNTED PANEL, 78" X 20"	FD LAWRENCE
94						
95						
96	FB-10, FB-11	2	FERRAZ SHAWMUT	P266A	FUSE BLOCK (STUD TYPE) 1000 VOLTS, 400 AMPS	PANEL FAB.
97		2	GOULD SHAWMUT	A70Q S800	400 AMP FUSE	
98	DB-1	1	SQUARE D	9080, LBA362106	DISTRIBUION BLOCK, 3 POLE, (1) 6-2/0 AWG IN, (6) 14-10 AWG OUT	FD LAWRENCE
99	CT-1, CT-2	1	SQUARE D	4210-100R-401	CURRENT TRANSFORMERS 400:5	
100		2	SQUARE D	DZ2FG6	LUG KIT FOR ITEM 73	

Revisions						Fuji Electric Co.,Ltd. 	Dwg.No.	WPMB-E102 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	
			Drawn	1/9/06	Name				SML
	Rev. No.	Description	By	Date	Checked					Ref.

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent.
Responsible for the accuracy of the drawings
rests with the drafter.

Responsible for the accuracy of field
dimensions and the accuracy of
construction details and all
parts of the work shown on the drawing.

REVIEWED _____

REVIEWED AS NOTED _____

REVIEW APPROVED _____

NOT REVIEWED _____

Project No. _____

Date: _____ By: _____

Earth Tech (Canada) Inc.

Reviewed for general compliance with the code book.
Responsibility for design and construction details rests with the contractor.

Responsibility for the accuracy of field dimensions and the quality of construction rests with the contractor. All parts of the work shall be in accordance with the code book.

REVIEWED _____ ✓

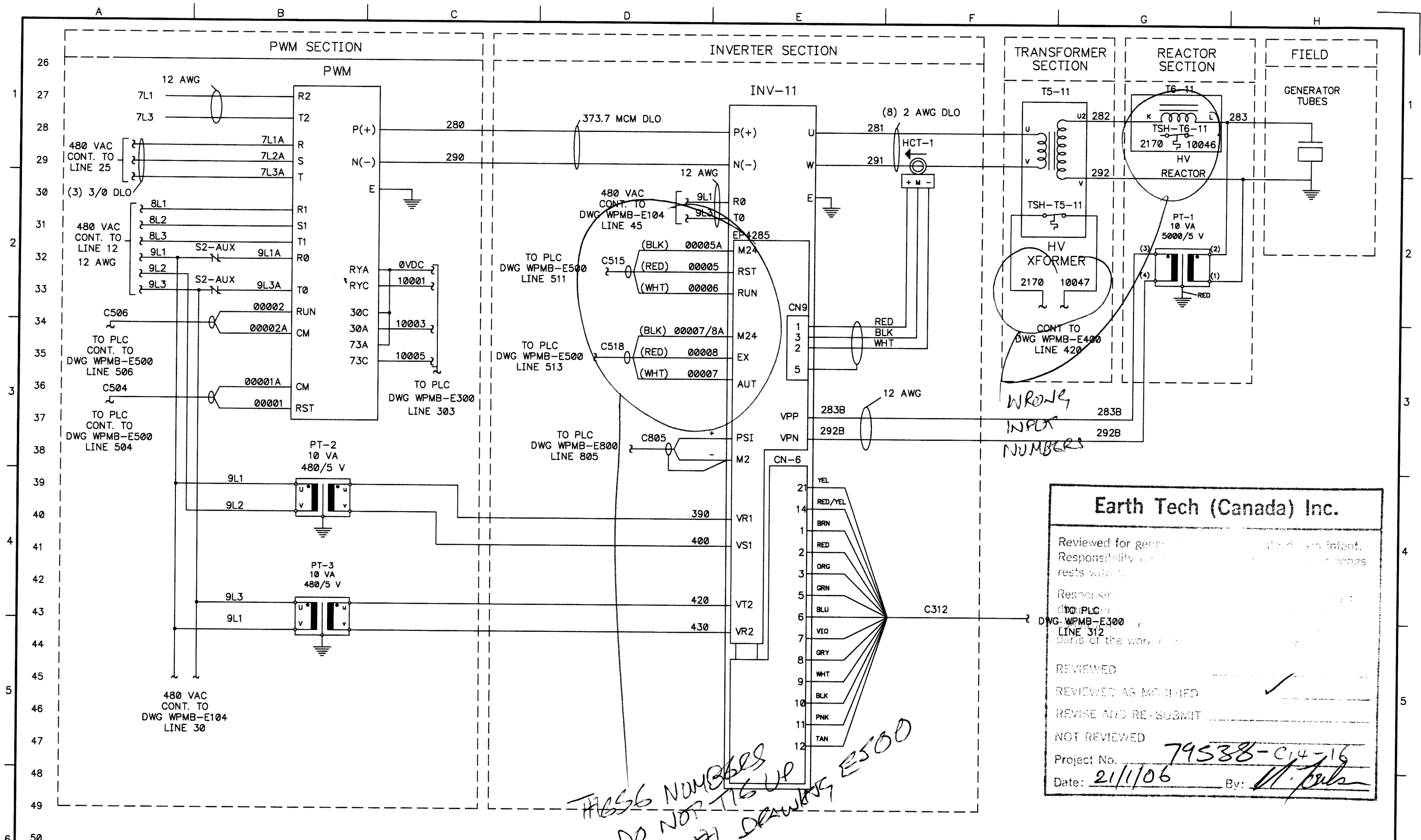
REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 71538-C14-16

Date: 21/01/06 By: M. J. Poulson



Earth Tech (Canada) Inc.

Reviewed for general use and intent. Responsibility for the accuracy of the drawings rests with the client.

Responsible: _____

Reviewed: _____

Reviewed as mentioned: _____ ✓

Revise and re-submit: _____

Not reviewed: _____

Project No. 795388-C14-16

Date: 21/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Date	Name
					1/9/06	SML

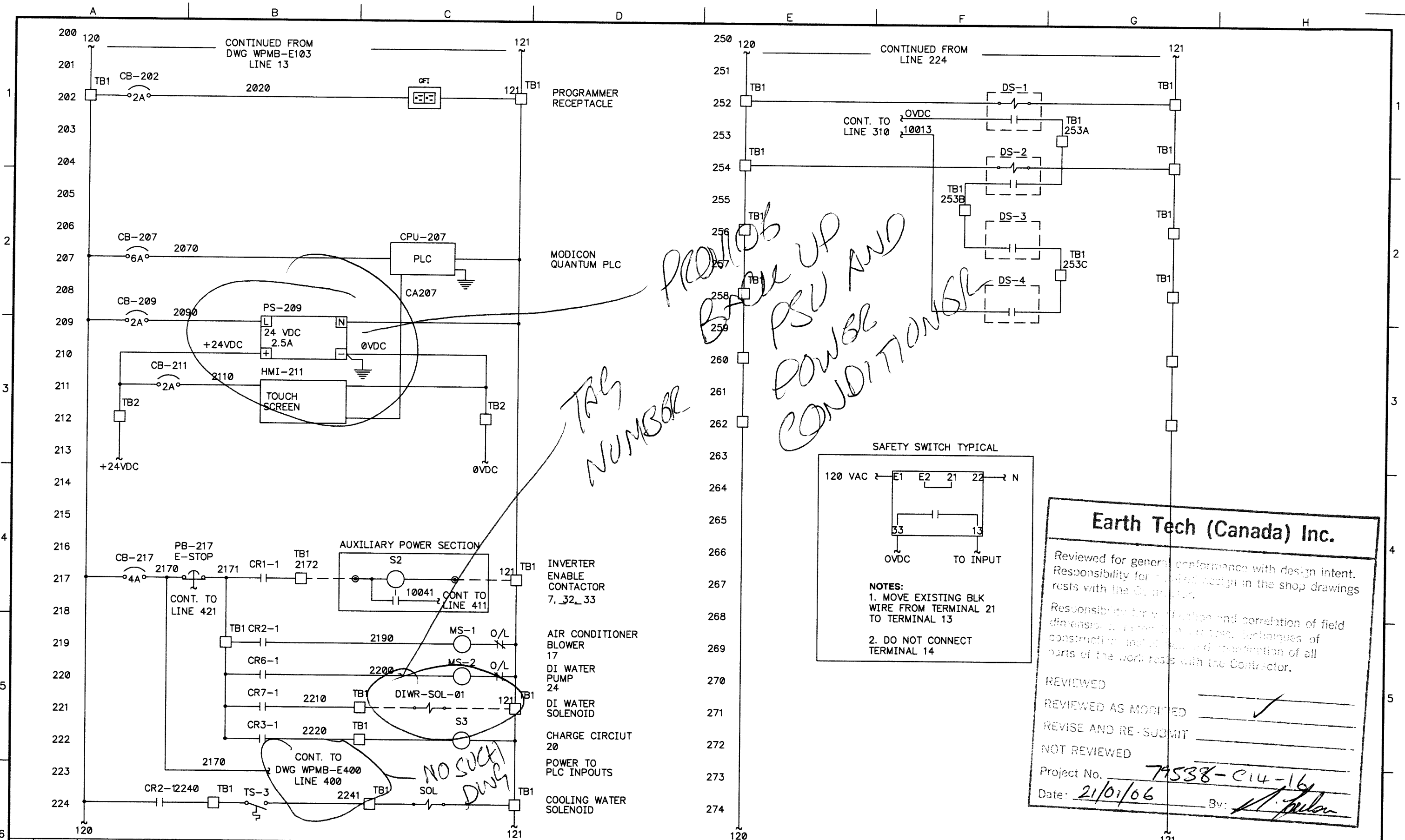
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

**POWER SUPPLY UNIT NO. 1
480V POWER DISTRIBUTION**

Dwg. No. **WPMB-E104**

Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, quantities, materials, techniques of construction and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

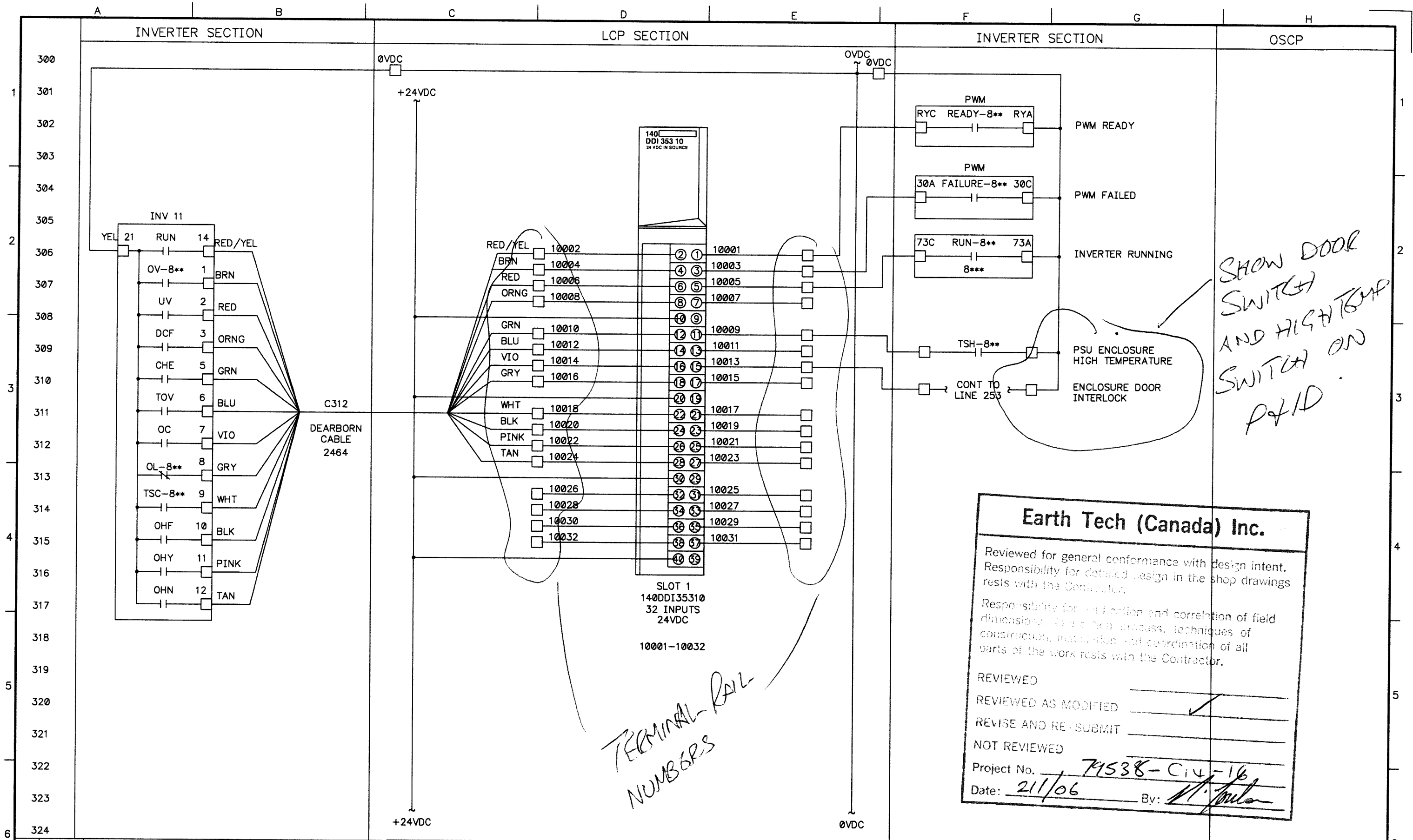
Project No. 79538-C14-16

Date: 21/01/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.

<p>THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION</p> <p>POWER SUPPLY UNIT NO. 1 120V DISTRIBUTION</p>	<p>Dwg. No. WPMB-E200</p> <p>Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005</p>
--	--



*TERMINAL RAIL
NUMBERS*

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, installation process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

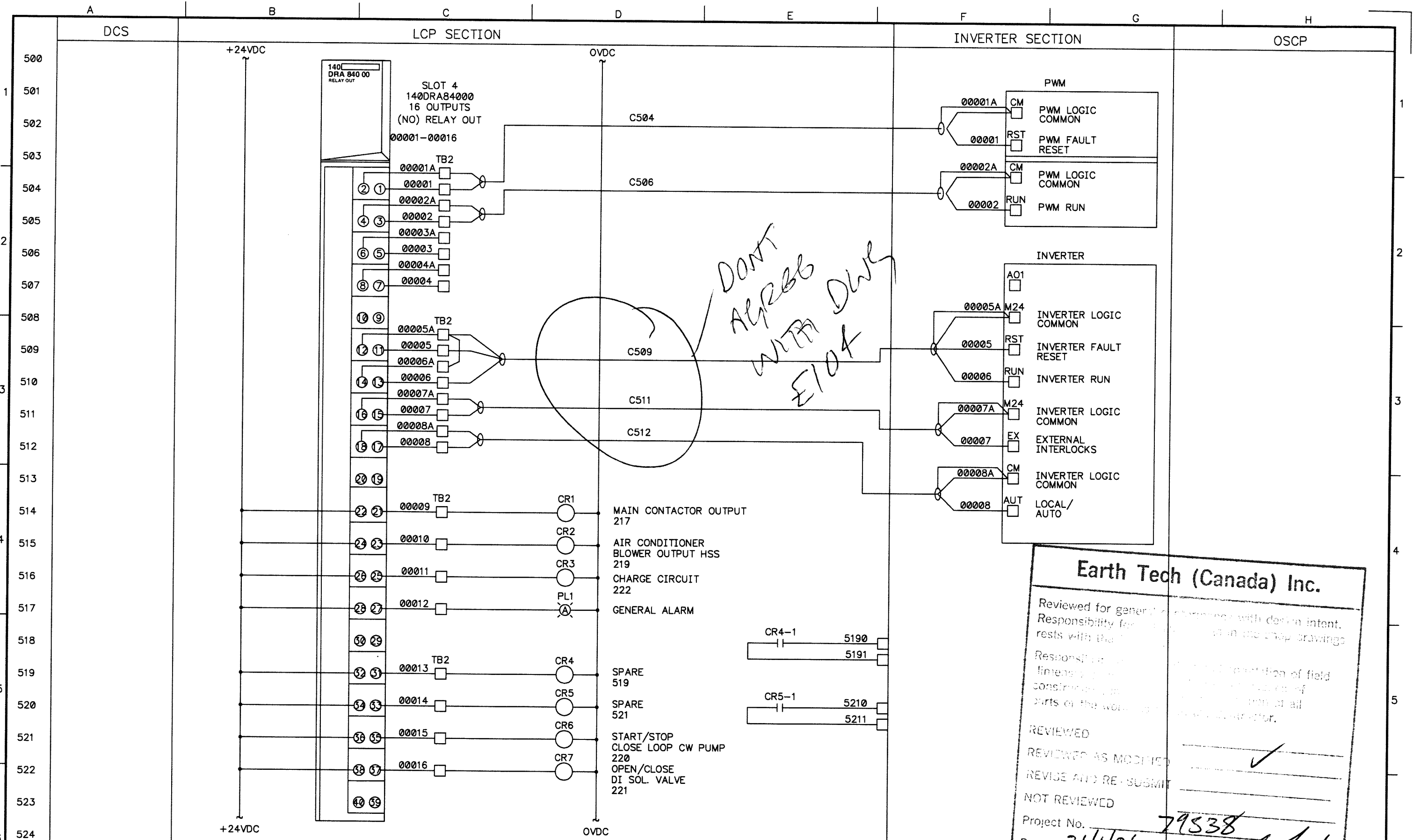
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 71538-C14-16

Date: 2/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Date	Name	Title	Dwg. No.	Ref.
					Drawn	Checked			
					1/9/06	SML	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E300



Rev. No.	Description	By	Date

Fuji Electric Co., Ltd.
 Drawn: 1/9/06, Name: SML
 Checked: _____

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
POWER SUPPLY UNIT NO. 1
DIGITAL I/O

Project No.: 79538
 Date: 21/1/06
 By: *[Signature]*
WPMB-E500
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for any errors rests with the designer. All in the shop drawings.

Responsible for the linear portion of construction. I am not responsible for any parts of the work done by the contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

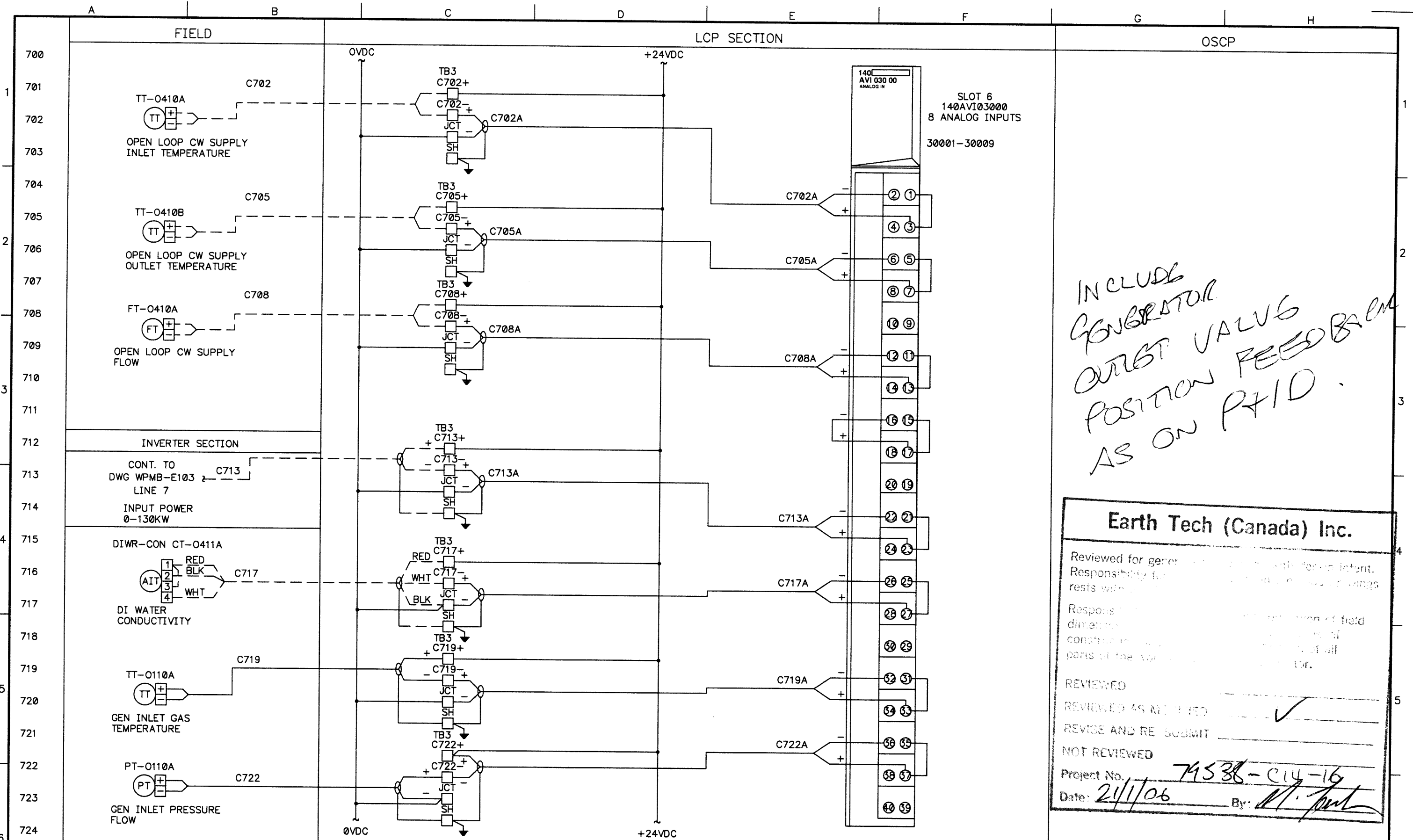
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538

Date: 21/1/06

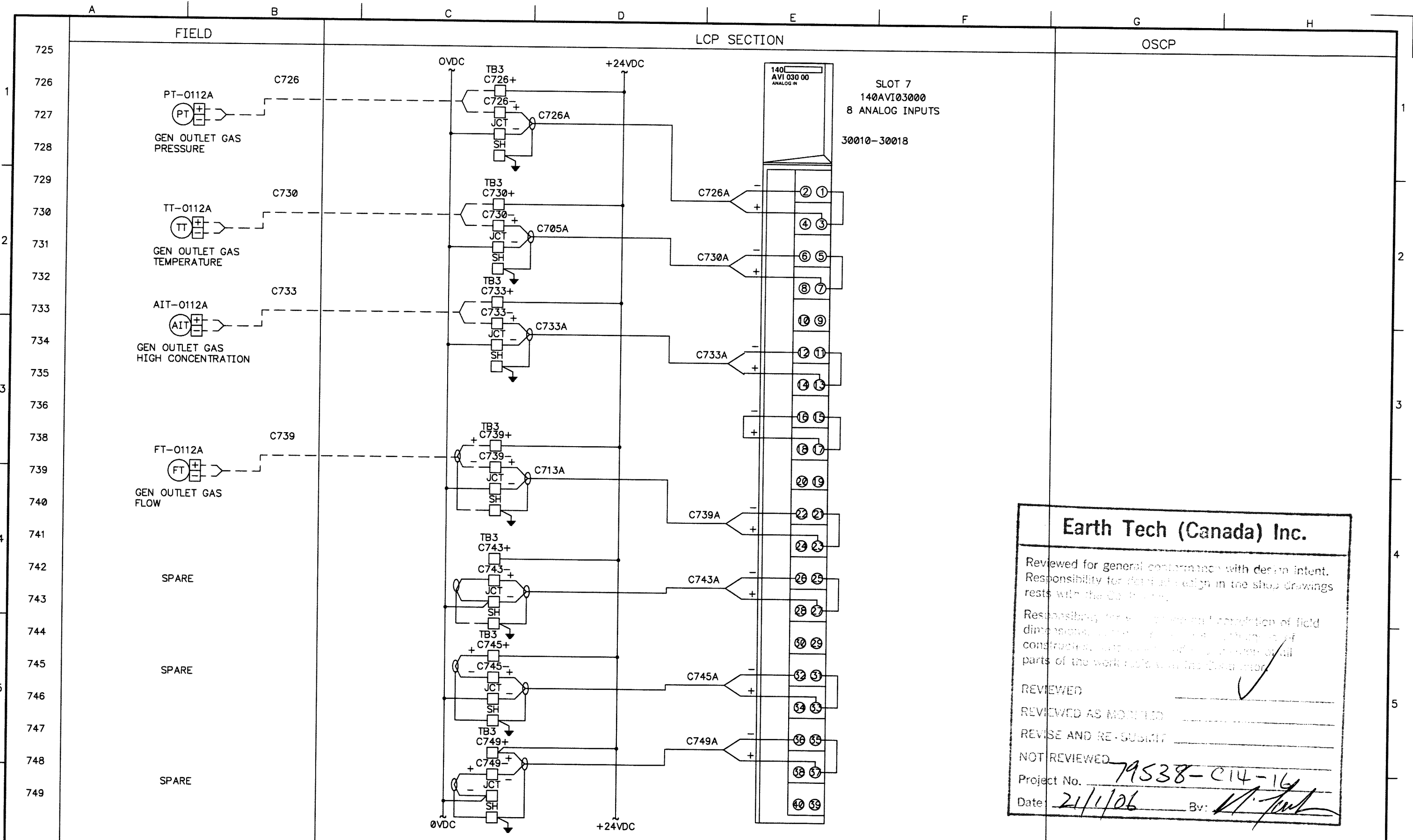
By: *[Signature]*



INCLUDE GENERATOR OUTPUT VALVE POSITION FEEDBACK AS ON P&ID.

Earth Tech (Canada) Inc.	
Reviewed for general use only. Responsibility for correct installation rests with the user.	
Response to field dimensions and construction of all parts of the system is the user's responsibility.	
REVIEWED	_____
REVIEWED AS NOTIFIED	_____ ✓
REVISE AND RE-SUBMIT	_____
NOT REVIEWED	_____
Project No.	79538-C14-16
Date: 2/1/06	By: <i>[Signature]</i>

Revisions						Fuji Electric Co., Ltd. THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION POWER SUPPLY UNIT NO. 1 ANALOG I/O	Dwg. No. WPMB-E700 Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
Rev. No.	Description	By	Date	Checked	Date		



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for the proper installation of field dimensions, including the proper construction and installation of all parts of the work shall remain with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____

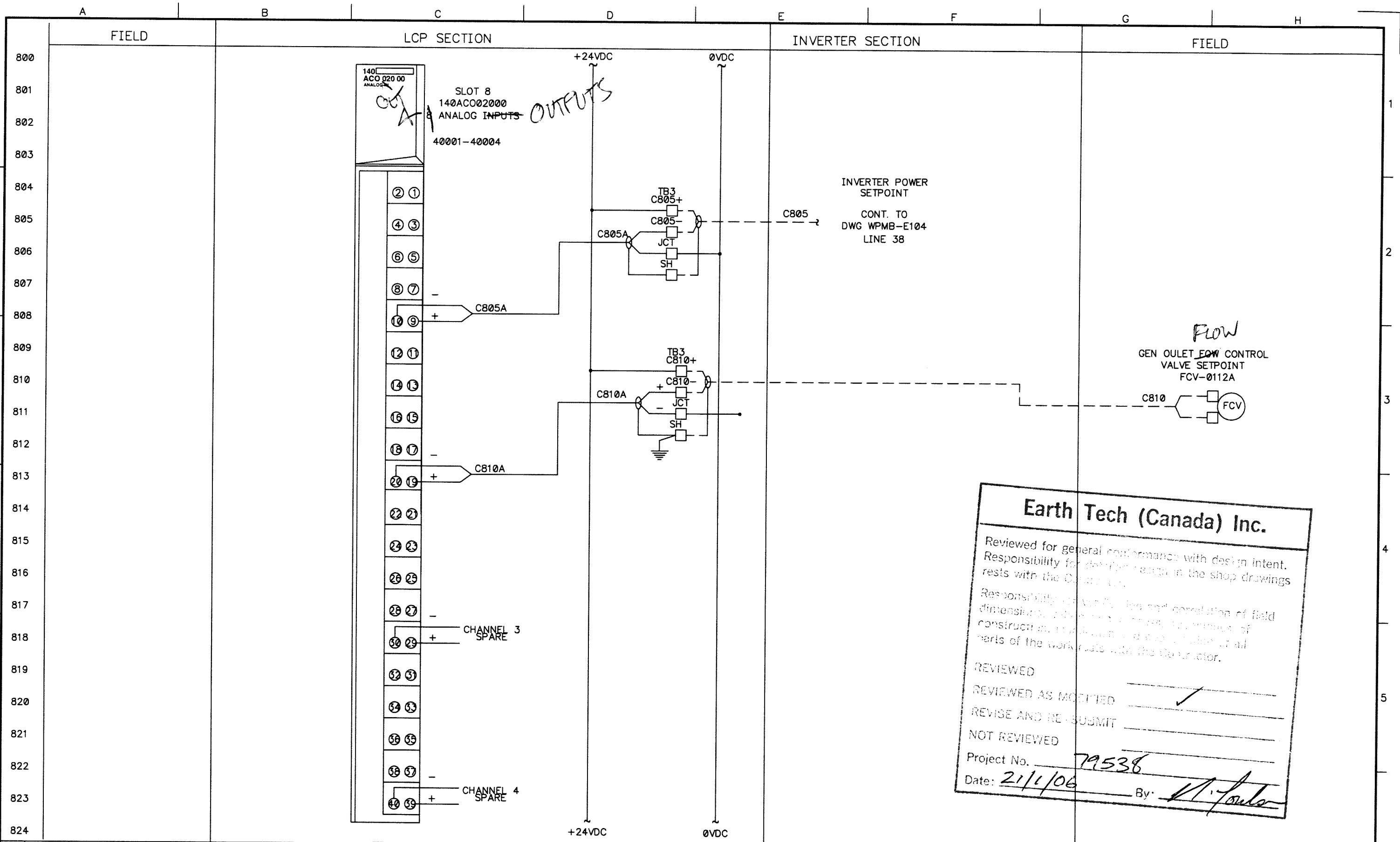
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date 21/1/06 By: [Signature]

Revisions				Date			Name			Title		
Rev. No.	Description	By	Date	Drawn	1/9/06	SML	Fuji Electric Co., Ltd.			THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		
				Checked			POWER SUPPLY UNIT NO. 1 ANALOG I/O			WPMB-E701		
							Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005					



Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					Drawn	1/9/06	SML
					Checked		

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION
POWER SUPPLY UNIT NO. 1
ANALOG I/O

Dwg. No. **WPMB-E800**
Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005

NOTES

A. CABLE ENTRY POINT FOR HIGH VOLTAGE CABLES
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY LOCATION OF ENTRY

B. CABLE ENTRY POINT FOR ALL CONTROL WIRING.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER IS TO VERIFY LOCATION OF CONTROL CONDUITS.

C. CABLE ENTRY LOCATION FOR INCOMING 480V POWER.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY LOCATION OF ENTRY.

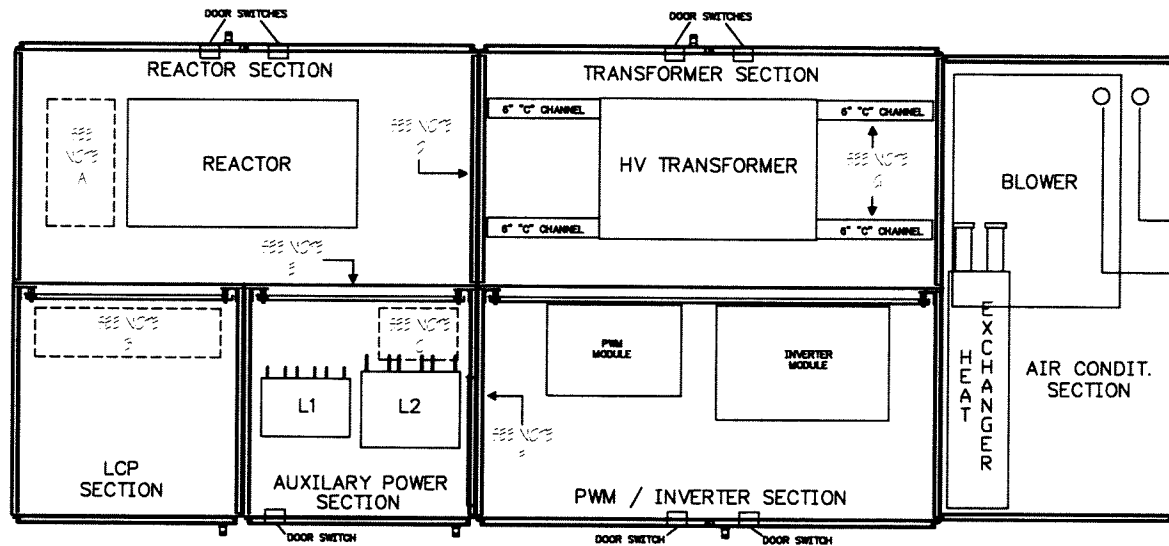
D. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE AT FLOOR LEVEL FOR VENTILATION.

E. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF PANEL FOR VENTILATION.

F. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF PANEL FOR VENTILATION.

G. MOUNT HIGH VOLTAGE TRANSFORMER ON 6" C CHANNEL.

TOP VIEW



CHILLER OUTLET
2.5" FPT SS COUPLING
CHILLER INLET
2.5" FPT SS COUPLING

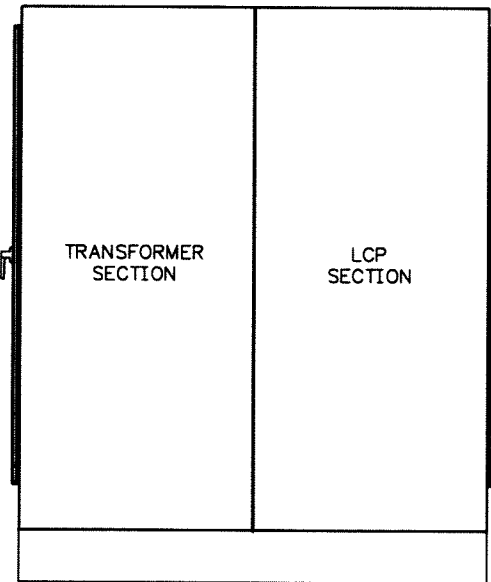
Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for any errors or omissions rests with the client. This drawing is not to be used for construction without the approval of the original designer.

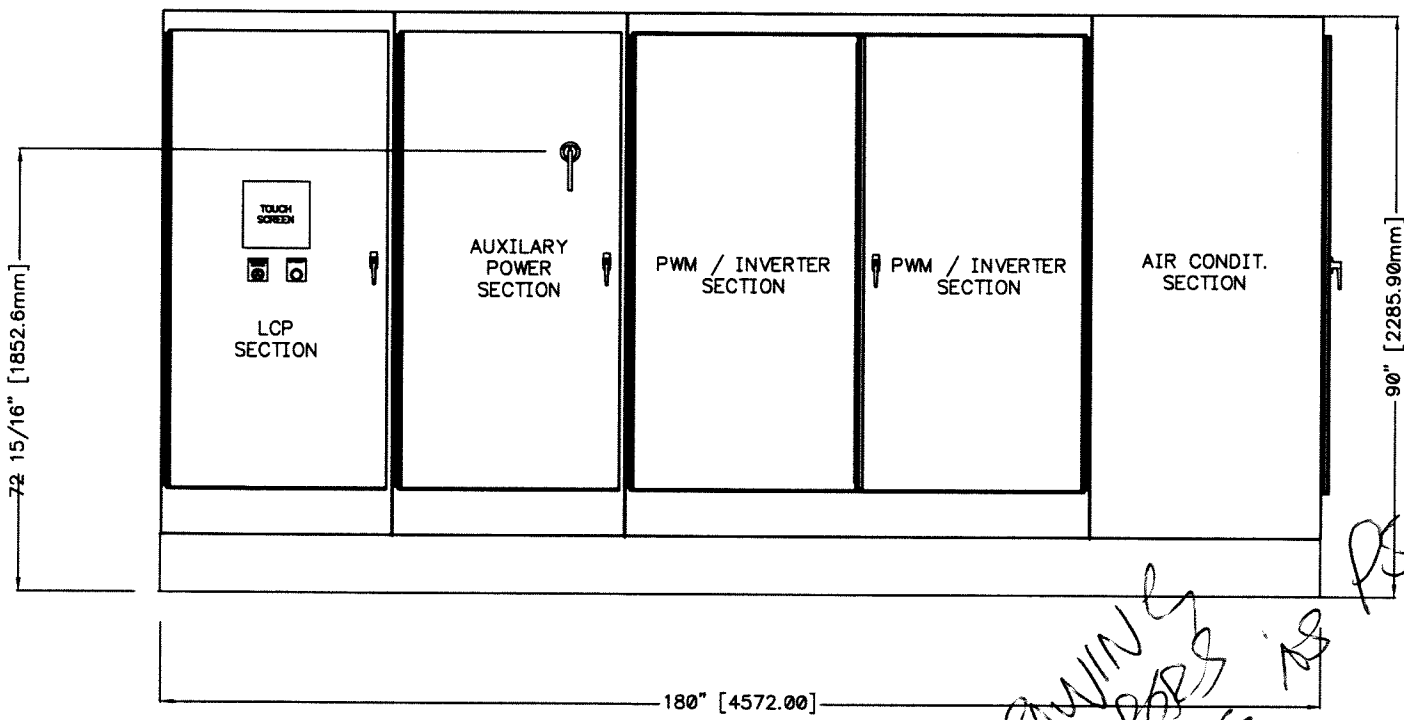
REVIEWED _____
 REVIEWED AS MODIFIED ✓
 REVISE AND RE-SUBMIT _____
 NOT REVIEWED _____

Project No. 79538-C14-16
 Date: 21/1/06 By: [Signature]

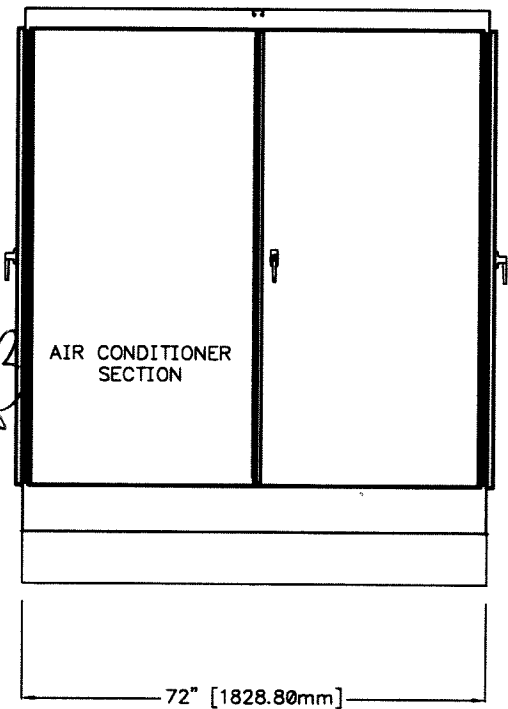
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW



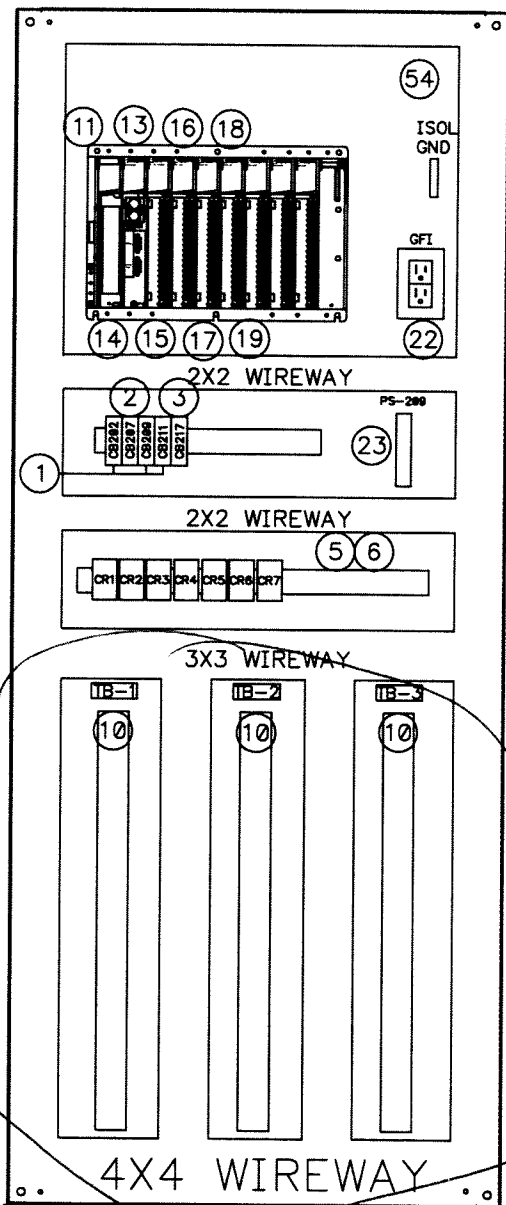
THE INCOMING POWER TO THE PSU WILL BE 480 VOLTS.

DRAWING NUMBERS ARE THE SAME AS PSU 1 & 2

EST. WEIGHT: 6,900kg (15,000 LBS)

Revisions						Fuji Electric Co.,Ltd.	Title	THE CITY OF WINNIPEG Winnipeg WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E100	
Rev. No.	Description	By	Date	Checked	Date					Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

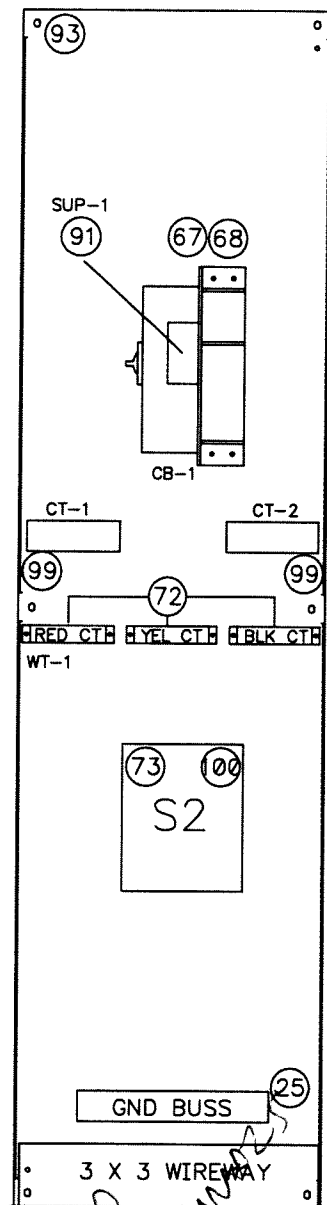
LCP SECTION
REAR PANEL



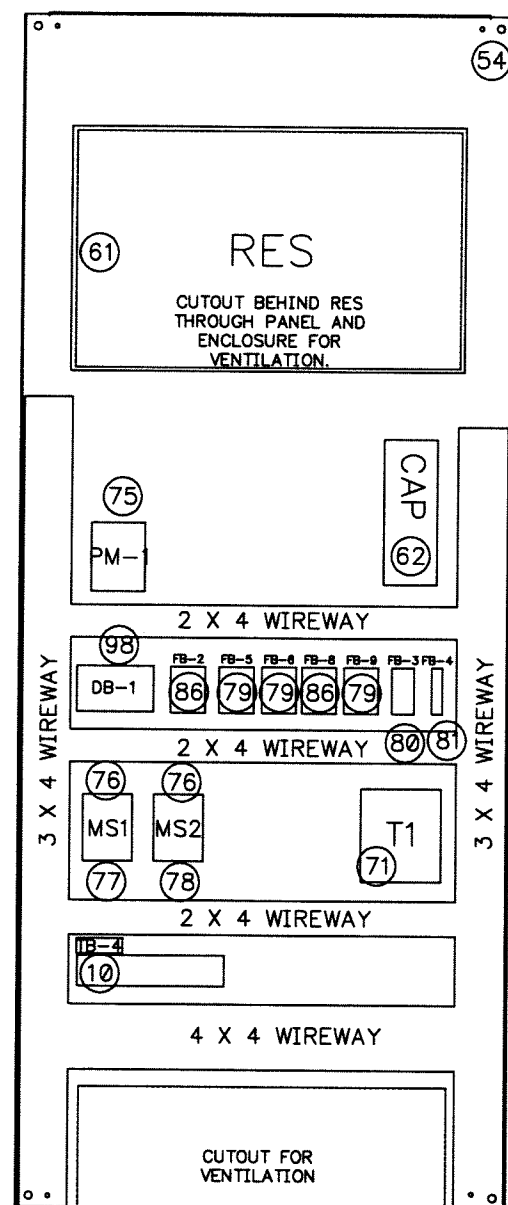
NOTE:
MOUNT MODICON "T"
TAP ON RIGHT SIDE
WALL OF LCP

*ENSURE
THAT ALL ARE FIELD
DISCONNECT TERMINALS
FOR ALL I/O*

AUXILIARY POWER
LEFT SIDE PANEL



AUXILIARY POWER
REAR PANEL



Earth Tech (Canada) Inc.

Reviewed for general compliance with the requirements of the Manitoba Electrical Code, Responsibility rests with the reviewer.

Responsible for design, dimensioning, construction, and installation of the work.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79338-C14-16

Date: 21/01/06 By: [Signature]

*DRAWING
NUMBERS*

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

WPMB-E100A

POWER SUPPLY UNIT NO. 2
SUBPANEL LAYOUT

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformity with design intent.
Responsibility for design and construction drawings
rests with the client.

Responsible for design and construction and
discrepancies between design and construction
conformity with design intent.
Some of the work is subject to change.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No.

79538-C14-16


Date: 2/1/06

By:

[Signature]

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDORS
51		3	HOFFMAN	A-907236FS	ENCLOSURE, 90" X 72" X 36", TWO DOOR, NEMA 12	FD LAWRENCE
52		2	HOFFMAN	A-903636FS	ENCLOSURE, 90" X 36" X 36", ONE DOOR, NEMA 12	FD LAWRENCE
53		1	HOFFMAN	A-90P72F1	SUBPANEL, FULL SIZE, 78" X 68"	FD LAWRENCE
54		2	HOFFMAN	A-90P36F1	SUBPANEL, FULL SIZE, 78" X 32"	FD LAWRENCE
55	DS-1 - DS-2	2	SQUARE D	XCSTE5533	DOOR SAFETY SWITCH (LOCKING)	FD LAWRENCE
56		2	SQUARE D	XCSZ12	ACTUATING KEYS FOR ITEM 55	FD LAWRENCE
57	PWM	1	FUJI ELECTRIC		PWM MODULE	FUJI ELECTRIC
58	INV-11	1	FUJI ELECTRIC		INVERTER MODULE	FUJI ELECTRIC
59	L1	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
60	L2	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
61	RES	1	FUJI ELECTRIC		RESISTOR PACK	FUJI ELECTRIC
62	CAP	1	FUJI ELECTRIC		CAPACITOR	FUJI ELECTRIC
63	RU1,2 RV1,2 RW1,2	6	FUJI ELECTRIC		RESISTOR	FUJI ELECTRIC
64	T5-11	1	FUJI ELECTRIC		HIGH VOLTAGE TRANSFORMER	FUJI ELECTRIC
65	T6-11	1	FUJI ELECTRIC		HIGH VOLTAGE REACTOR	FUJI ELECTRIC
66	TS-3	1	HOFFMAN	A-TEMNO	TEMPERATURE SWITCH N.O.	PANEL FAB.
67	CB-1	1	SQUARE D	LCL36300	CIRCIUT BREAKER 480V 300A	FD LAWRENCE
68		1	SQUARE D	9421-LK1	DOOR OPERATING MECHANISMS FOR ITEM 67	FD LAWRENCE
69	SV-224	1	ASCO	8221-G11	COOLING WATER SOLENOID VALVE 120 VAC	PANEL FAB.
70	PT-2, PT-3	2	FUJI ELECTRIC		TRANSFORMER, 480/5 VAC	FUJI ELECTRIC
71	T1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120V 1KVA	FD LAWRENCE
72	WT-1	1	SQUARE D	H8044-0400-3	POWER TRANSDUCER	FD LAWRENCE
73	S2,S3	2	SQUARE D	LC1F300F7	CONTACTOR, 3 POLES, 300.120 VAC COIL, W/ 1 N.O.AUXILIARY CONTACT	FD LAWRENCE
74	PMD-1	1	SQUARE D	3020-PMD32	POWERLOGIC POWER METER DISPLAY UNIT	FD LAWRENCE
75	PM-1	1	SQUARE D	3020-PM600	POWERLOGIC POWER METER BASE UNIT	FD LAWRENCE
76	MS1, MS2	2	SQUARE D	8536-SCO3V02S	MOTOR STARTER SIZE 1 120 VAC COIL	FD LAWRENCE
77		3	SQUARE D	B12.8	HEATERS FOR 5 HP	FD LAWRENCE
78		3	SQUARE D	B22	HEATERS FOR 7-1/2 HP	FD LAWRENCE
79	FB-5, 6, 9	3	BUSSMANN	BM6033B	3 POLE FUSEBLOCK, CLASS CC.600V, 30A	FD LAWRENCE
80	FB-3	1	BUSSMANN	BM6032B	2 POLE FUSEBLOCK, CLASS CC.600V, 30A	FD LAWRENCE
81	FB-4	1	BUSSMANN	BM6031B	1 POLE FUSEBLOCK, CLASS CC.600V, 30A	FD LAWRENCE
82		6	BUSSMANN	FNQ-2	FUSE, 500V, 2A TIME DELAYED	FD LAWRENCE
83		2	BUSSMANN	FNQ-3	FUSE, 500V, 3A TIME DELAYED	FD LAWRENCE
84		1	BUSSMANN	FNM-8	FUSE, 250V, 8A	FD LAWRENCE
85		6	BUSSMANN	LP-CC15	FUSE, 600V, 15A	FD LAWRENCE
86	FB-2, 8	2	BUSSMANN	BC6033B	3 POLE FUSEBLOCK, CLASS CC. 600V, 30A	FD LAWRENCE
87	DS-3 - DS-4	2	SQUARE D	XCKJ10541	DOOR SAFETY SWITCH (NON-LOCKING)	FD LAWRENCE
88	TS-1	1	STANCOR	STO-140	ENCLOSURE HIGH TEMPERATURE SWITCH	PANEL FAB.
89		1			BLOWER & MOTOR ASSEMBLY	TRANE
90		1			AIR/WATER HEAT EXCHANGER	TRANE
91	SUP-1	1	SQUARE D	SDSA3650	480 VAC SURGE SUPPRESSOR	FD LAWRENCE
92		3	BUSSMANN	FNQ-1	FUSE, 500V, 1A TIME DELAYED	FD LAWRENCE
93		1	HOFFMAN	A-90SMP20	SIDE MOUNTED PANEL, 78" X 20"	FD LAWRENCE
94						
95						
96	FB-10, FB-11	2	FERRAZ SHAWMUT	P266A	FUSE BLOCK (STUD TYPE) 1000 VOLTS, 400 AMPS	PANEL FAB.
97		2	GOULD SHAWMUT	A70Q S800	400 AMP FUSE	
98	DB-1	1	SQUARE D	9080, LBA362106	DISTRBUTION BLOCK, 3 POLE, (1) 6-2/0 AWG IN, (6) 14-10 AWG OUT	FD LAWRENCE
99	CT-1, CT-2	1	SQUARE D	4210-100R-401	CURRENT TRANSFORMERS 400:5	
100		2	SQUARE D	DZ2FG6	LUG KIT FOR ITEM 73	

*Draws
NUMBERS*

Revisions				Date	Name	Fuji Electric Co.,Ltd.	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E102 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	
				Drawn	1/9/06					SML
				Checked						
Rev. No.	Description	By	Date				Title POWER SUPPLY UNIT NO. 2 POWER SECTION - BILL OF MATERIALS	Ref.		

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsible for the accuracy of the drawings
lists with the

Remember that the purpose of field
measurements is to verify the accuracy of
the design. All measurements should be taken
in accordance with the specifications of the
contract documents.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 74538-C14-16

Date: 11/21/06

By: [Signature]

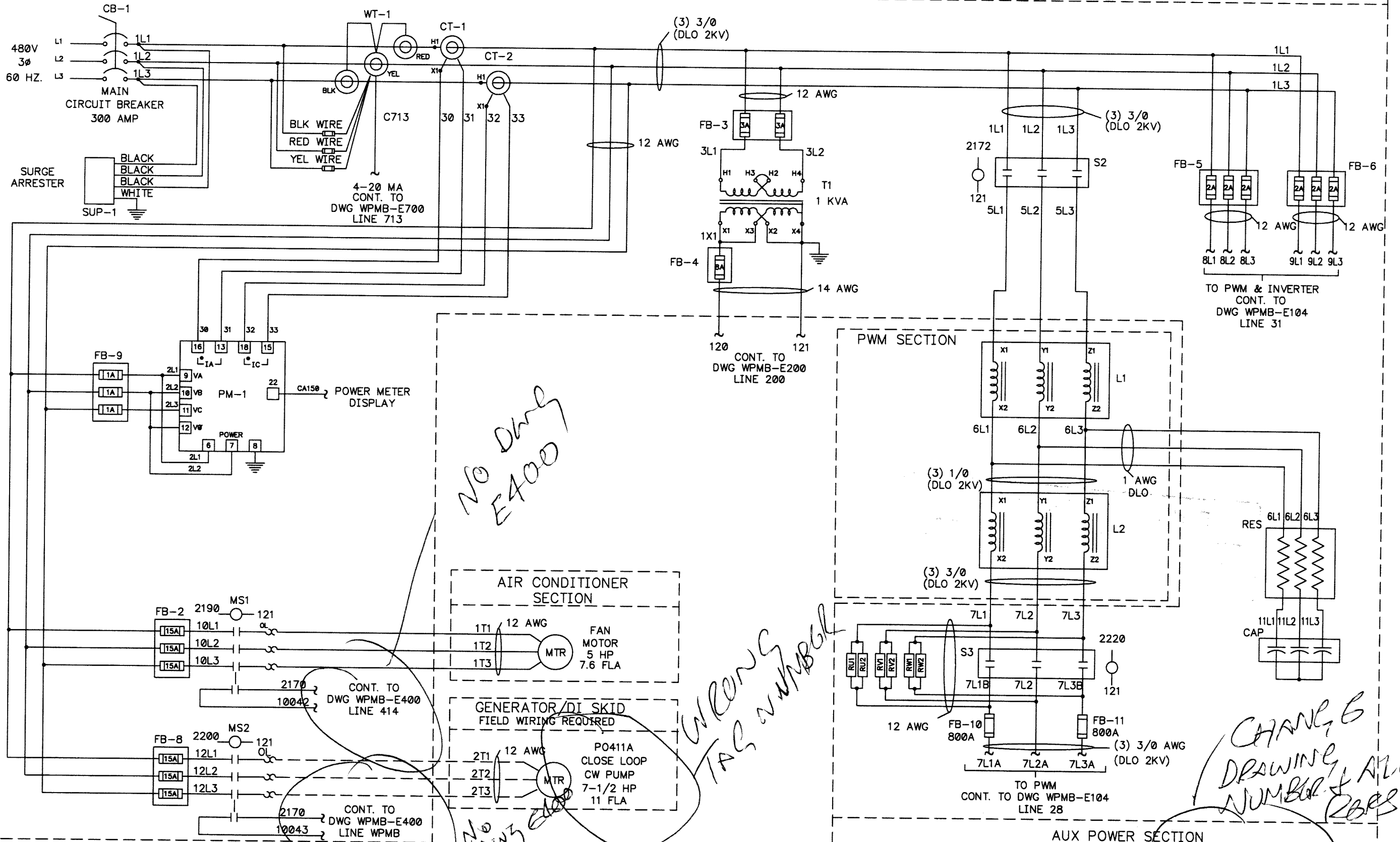
AUXILIARY POWER SECTION

PWM SECTION

AIR CONDITIONER SECTION

GENERATOR/DI SKID FIELD WIRING REQUIRED

AUX POWER SECTION



Revisions	Date	Name	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg. No.
	1/9/06	SML	Fuji Electric Co., Ltd.		WPMB-E103
Rev. No.	Description	By	Date	Title	Ref.
				POWER SUPPLY UNIT NO. 2 480V POWER DISTRIBUTION	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

CHANGE DRAWING & ALL NUMBER & RES

Earth Tech (Canada) Inc.

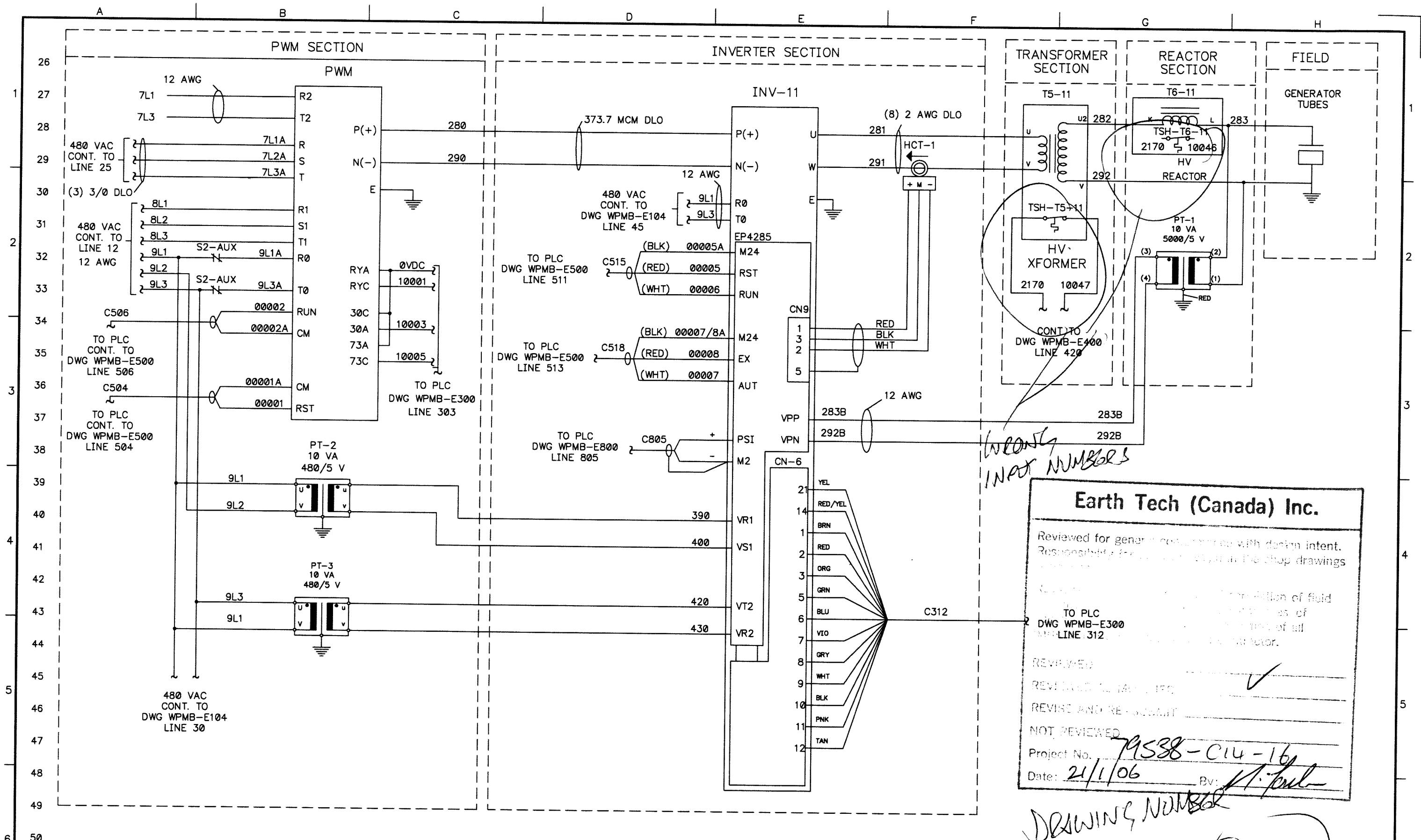
Reviewed for general
Yes for site specific
No for site specific

Reviewed for
No for site specific
Yes for site specific

REVIEWED ✓

NOT REVIEWED

Project No. 79538-C14-1b
Date: 23/1/06 By: M. Joubert



Earth Tech (Canada) Inc.

Reviewed for general requirements with design intent. Responsibility for accuracy of data in the shop drawings remains with the client.

Reviewed for accuracy of information of field conditions. Responsibility for accuracy of information of all conditions remains with the client.

REVIEWED _____

REVISOR: M. J. [Signature]

REVISED AND RE-DESIGNED _____

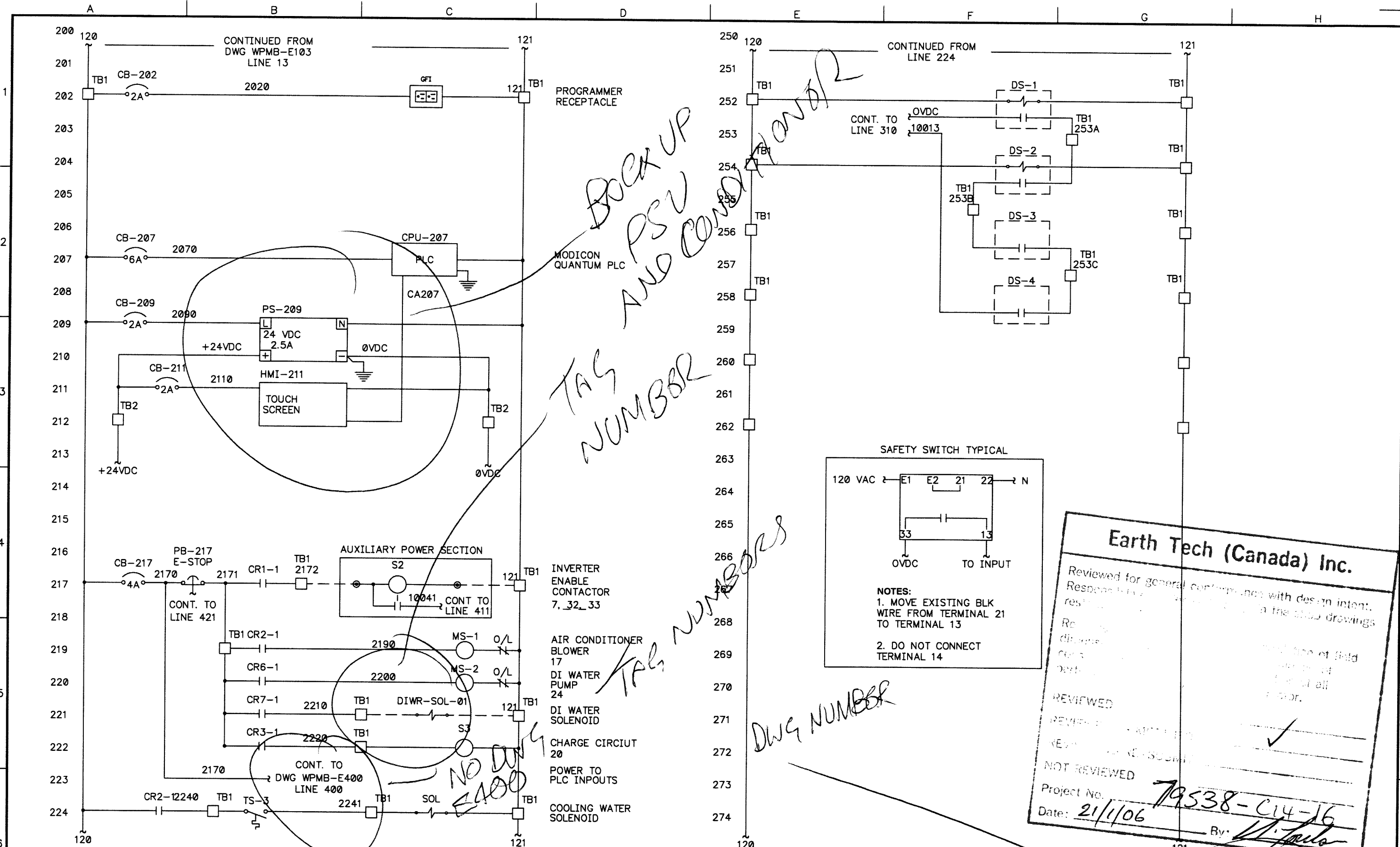
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 21/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E104
POWER SUPPLY UNIT NO. 2 480V POWER DISTRIBUTION		Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



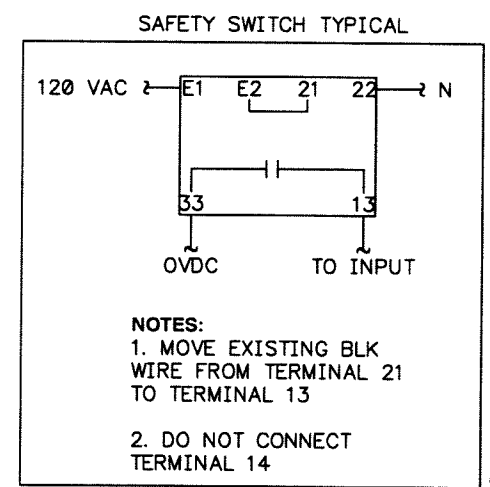
*BACK UP
PSU
AND COND.
HANDL*

*TAG
NUMBERS*

*TAG
NUMBERS*

DWG NUMBER

*NO DOW
E400*



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
 Responsible for the accuracy of the drawings
 and the field work.
 REVISIONS
 REVISIONS
 REVISIONS
 NOT REVIEWED

Project No. **79538-C14-16**
 Date: **21/1/06**
 By: *[Signature]*

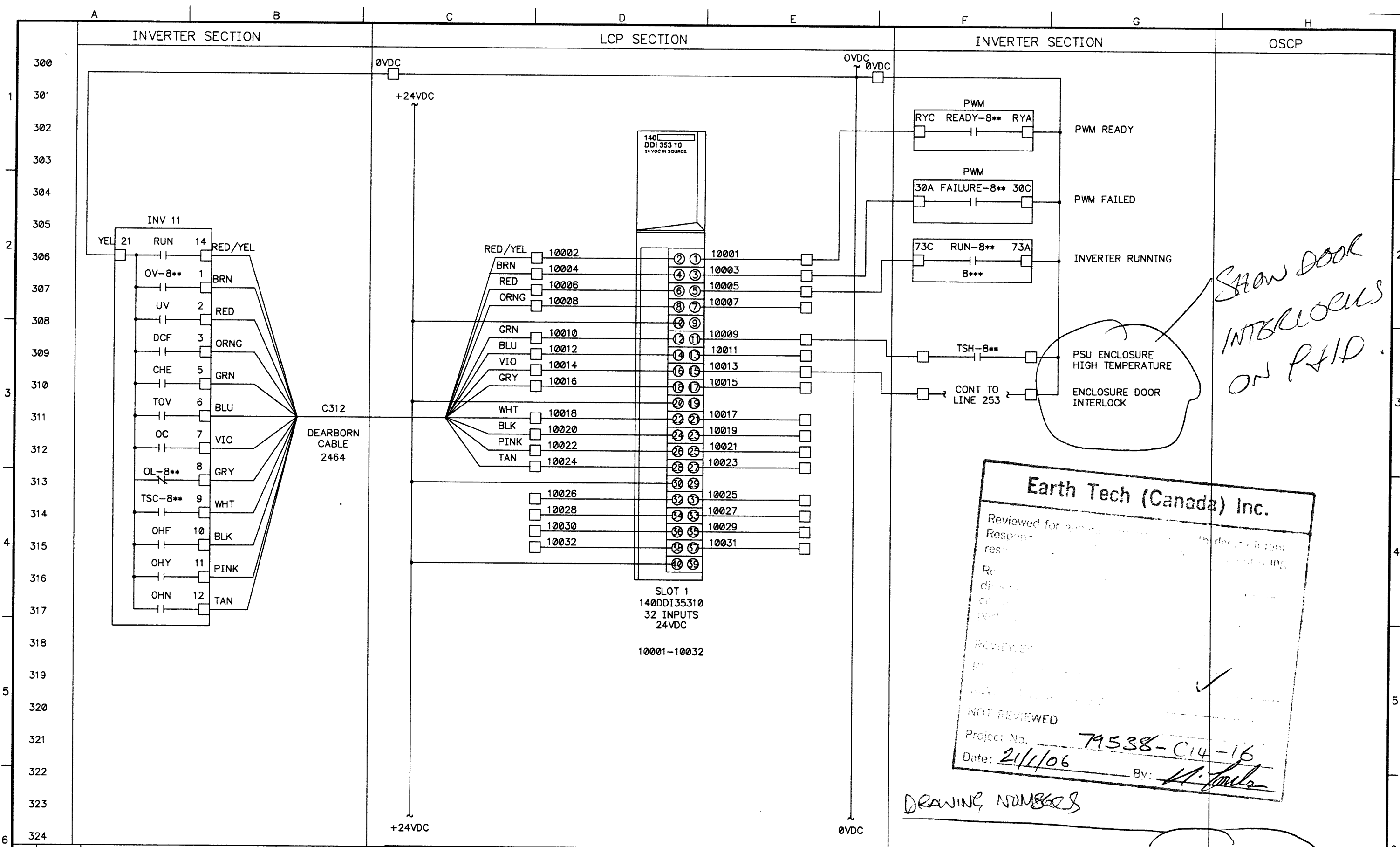
Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION

WPMB-E200
 POWER SUPPLY UNIT NO. 2
 120V DISTRIBUTION

Ref. Dwg. No. **WPMB-E200**
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for compliance with design intent
 Respected the design intent
 Respected the design intent
 Respected the design intent
 Respected the design intent

REVIEWED
 PROJECT NO. 79538-C14-16
 DATE: 2/1/06
 BY: *[Signature]*

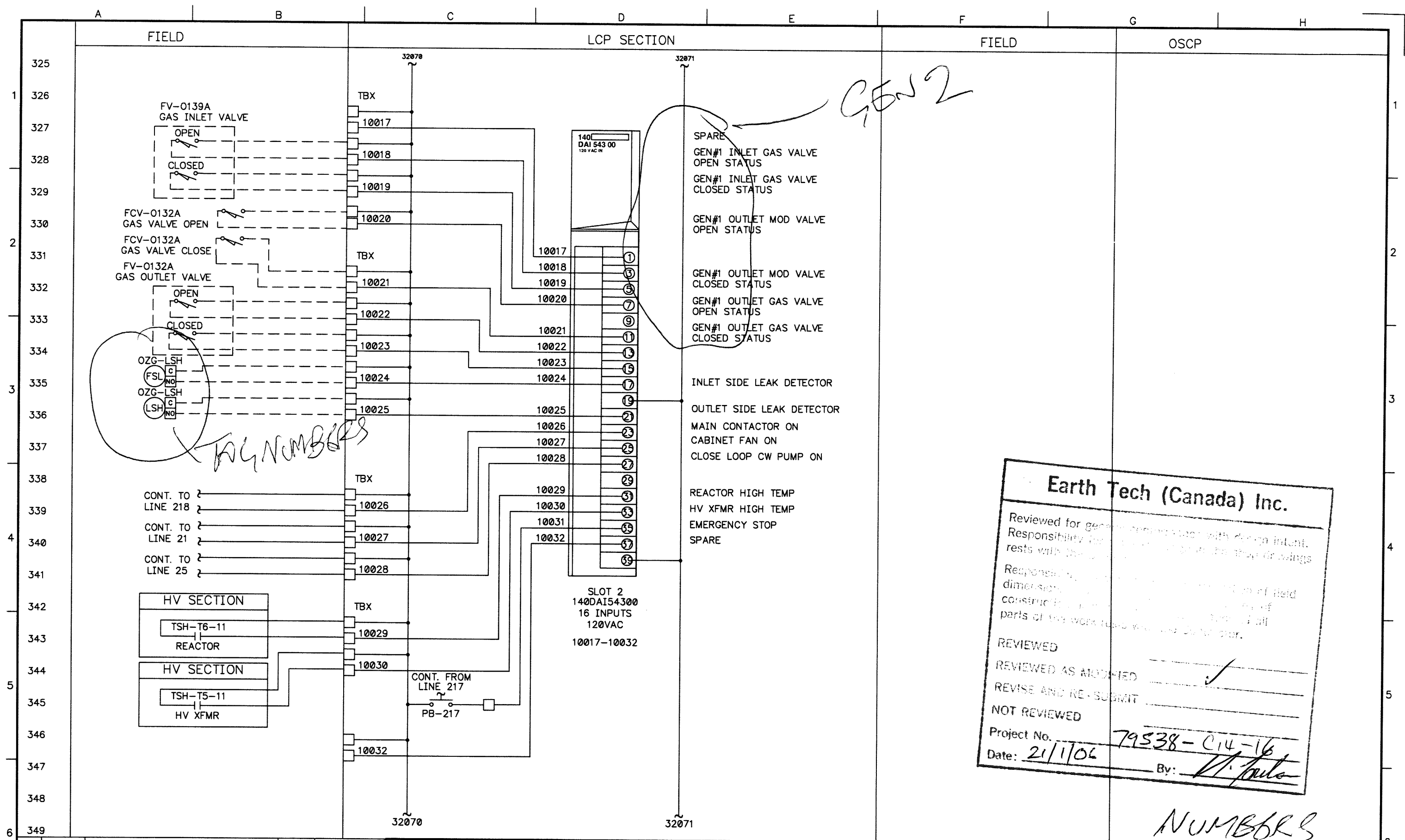
NOT REVIEWED

DRAWING NUMBER

Revisions	Rev. No.	Description	By	Date	Date	Name
					1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E300 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
Title: POWER SUPPLY UNIT NO. 2 DIGITAL I/O	Ref. Dwg. No.



Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for the accuracy of the drawings rests with the designer.

Responsibility for the accuracy of field dimensions and construction of all parts of the work rests with the contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

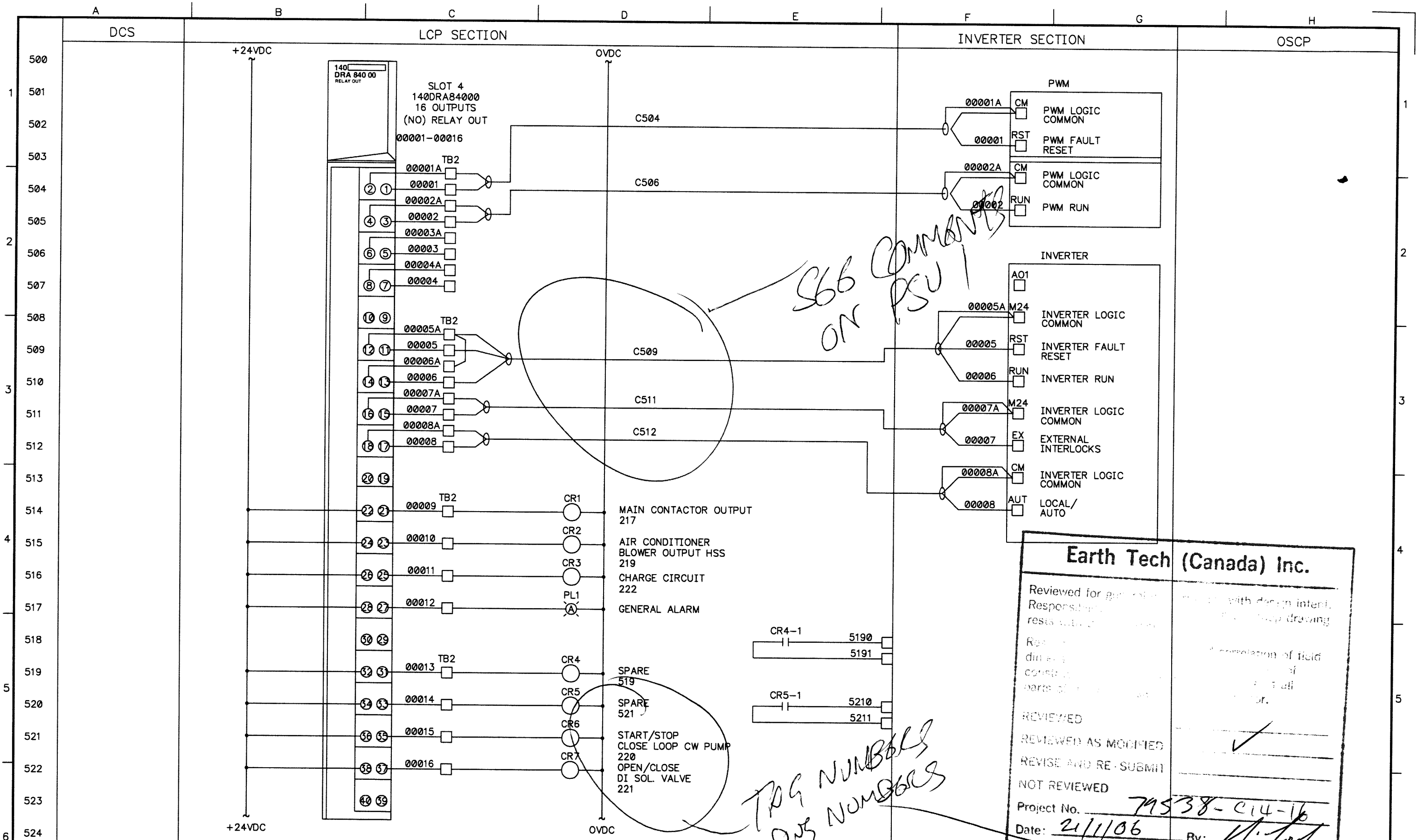
Date: 2/1/06

By: *[Signature]*

NUMBERS

Revisions	Rev. No.	Description	By	Date	Checked	Name	Date
						SML	1/9/06

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	
POWER SUPPLY UNIT NO. 2 DIGITAL I/O		WPMB-E301 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent.	Responsible for design.
Reviewed for compliance with design intent.	Responsible for design.
Reviewed for compliance with design intent.	Responsible for design.
REVIEWED	
REVIEWED AS MODIFIED	
REVISE AND RE-SUBMIT	
NOT REVIEWED	
Project No. <u>79538-C14-16</u>	By: <u>[Signature]</u>
Date: <u>21/1/06</u>	

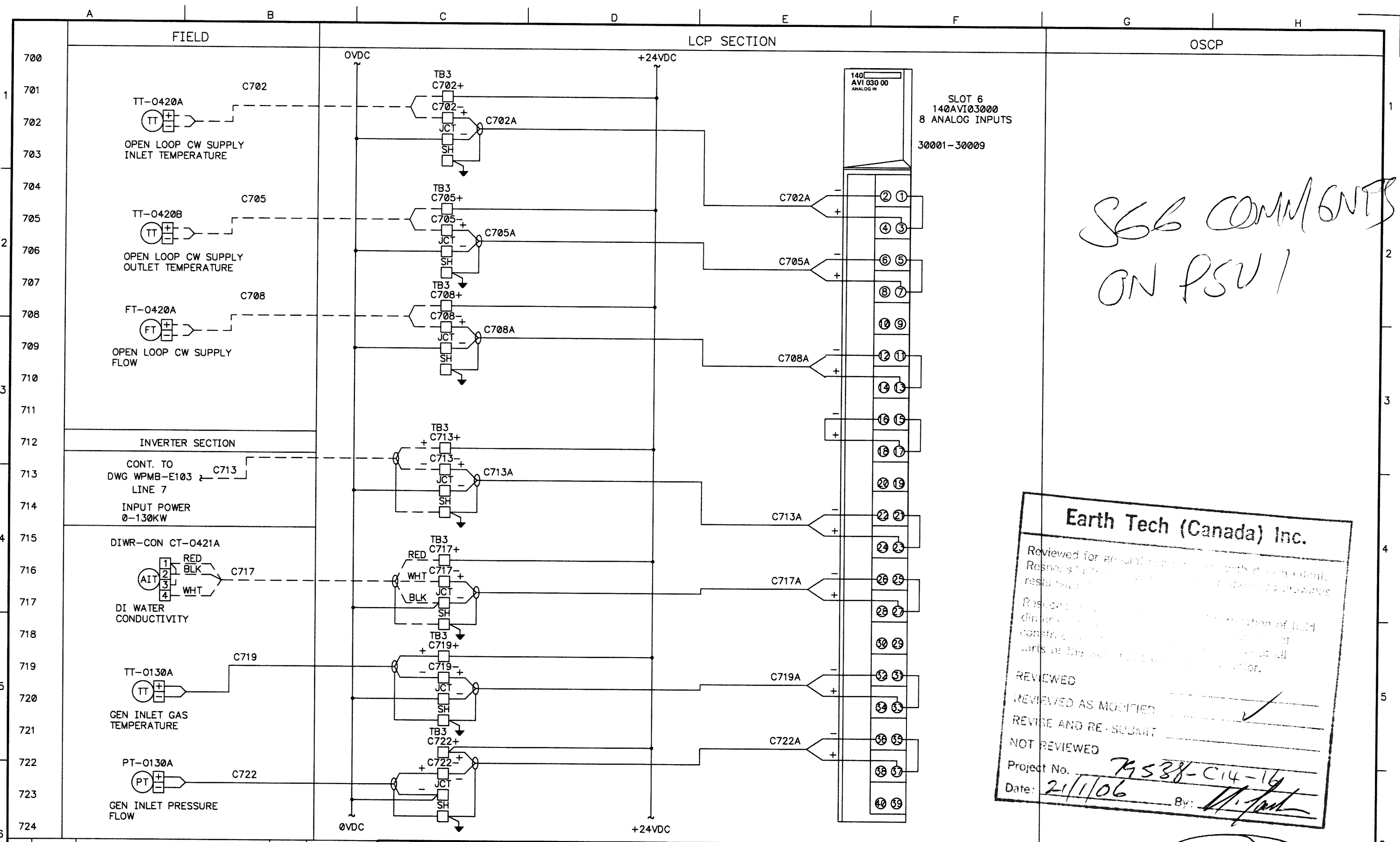
Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

POWER SUPPLY UNIT NO. 2
DIGITAL IO

WPMB-E500
Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for preparation of drawings with a limited responsibility. The reviewer is not responsible for the design or construction of the project.

REVIEWED _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 7538-C14-16

Date: 2/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.

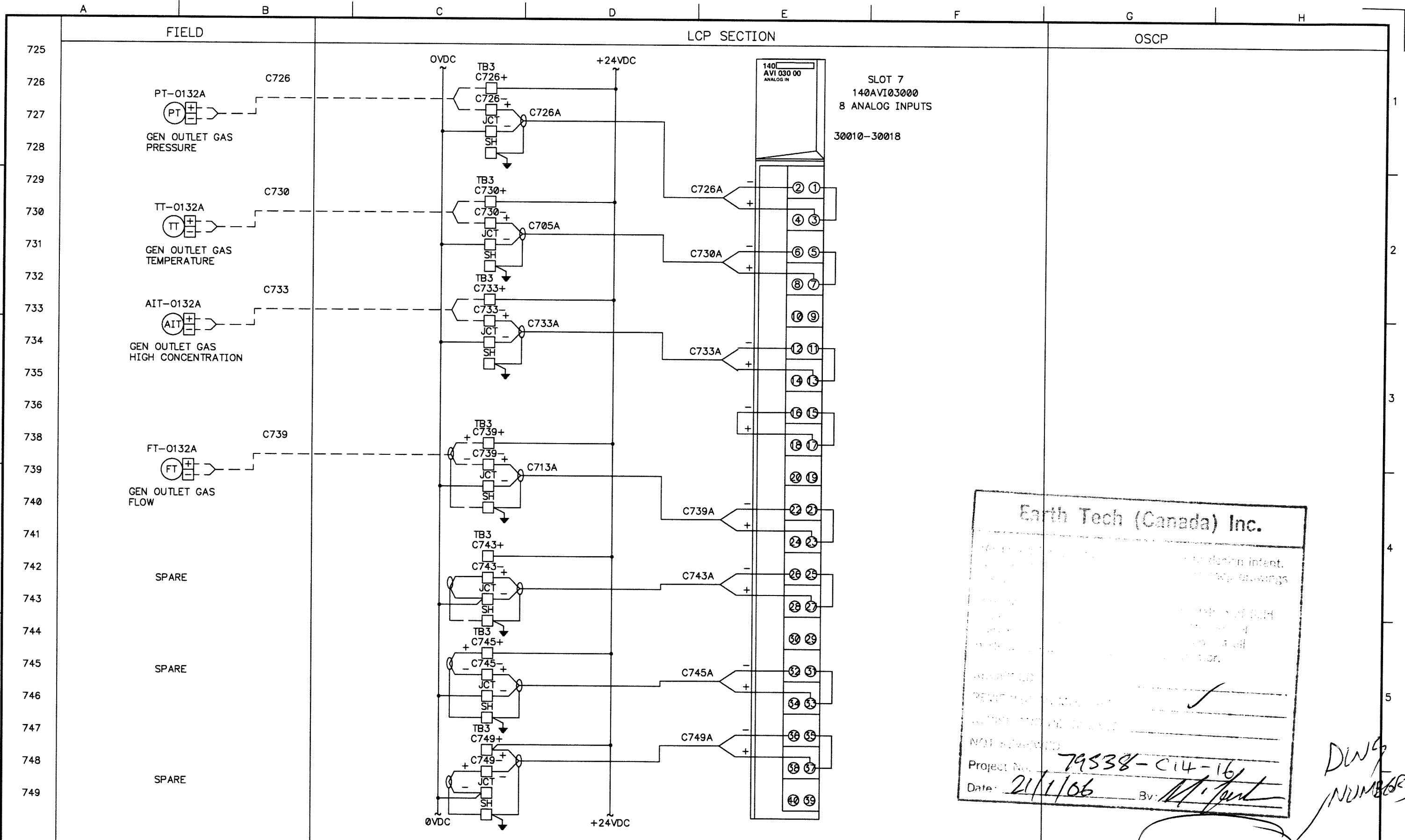
THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION

Title: **POWER SUPPLY UNIT NO. 2
 ANALOG I/O**

Dwg. No.: **WPMB-E700**

Ref.: **Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005**

Drawings Numbers



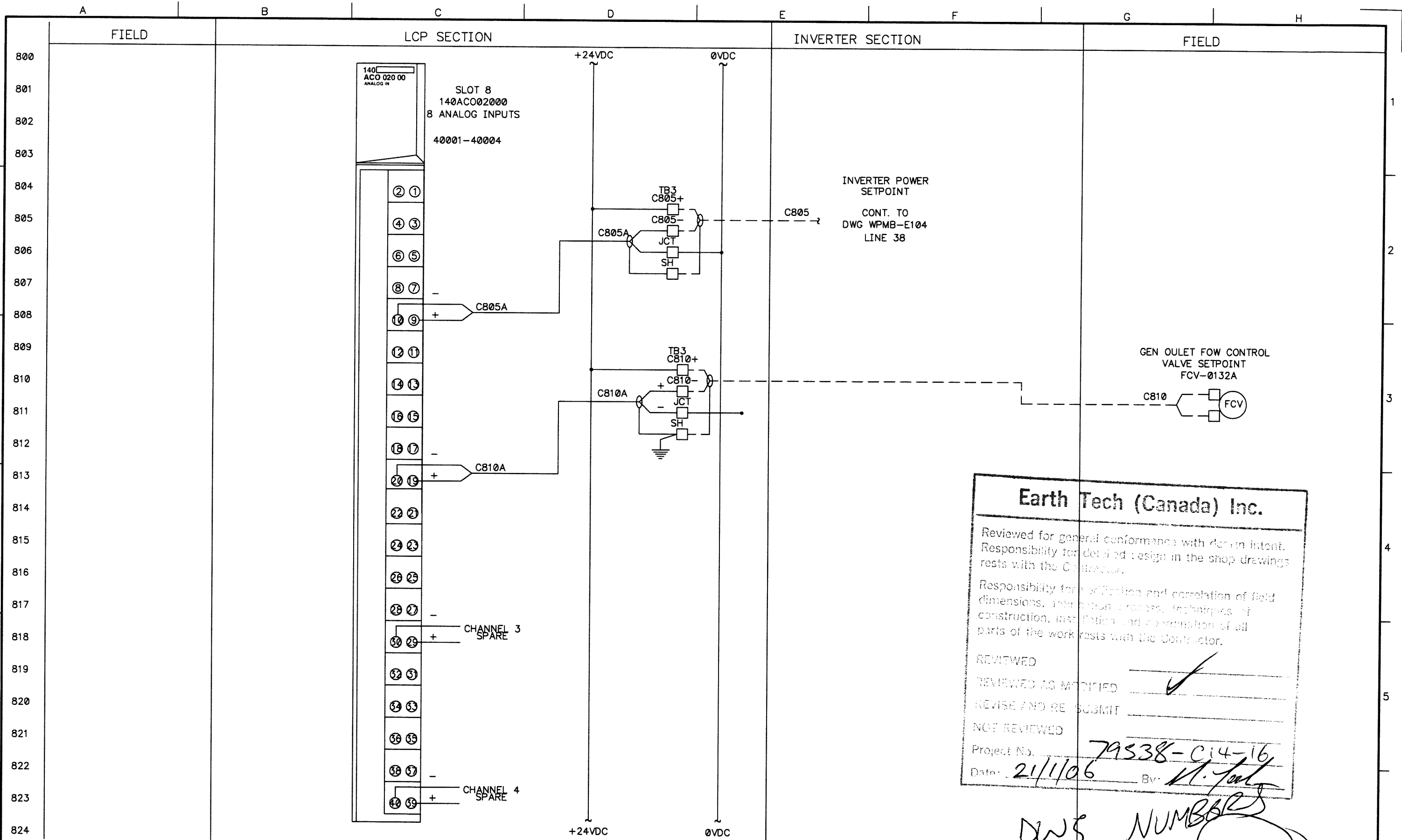
Earth Tech (Canada) Inc.

I have read and understand the design intent.
 I have reviewed the drawings.
 I have checked the calculations.
 I have checked the dimensions.
 I have checked the materials.
 I have checked the workmanship.
 I have checked the finish.
 I have checked the quantity.
 I have checked the location.
 I have checked the date.
 I have checked the signature.

Project No. 79538-C14-16
 Date: 21/1/06 By: M. J. [Signature]

*DWG
NUMBERS*

Revisions	Date	Name				Title	Dwg.No.	Ref.		
Rev. No.	Description	By	Date	Checked	Drawn	1/9/06	SML	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION POWER SUPPLY UNIT NO. 2 ANALOG I/O	WPMB-E701 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, information, process, techniques, etc. construction, installation and operation of all parts of the work rests with the Contractor.

REVIEWED _____
 REVIEWED AS MODIFIED _____
 REVISE AND RE-SUBMIT _____
 NOT REVIEWED _____

Project No. 79538-C14-16
 Date: 2/1/06 By: M. J. [Signature]

DWG NUMBERS

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					Drawn	1/9/06	SML
					Checked		

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	
POWER SUPPLY UNIT NO. 2		Dwg. No. WPMB-E800	
ANALOG I/O		Ref. Fuji Project No: WPMB-1105 City of Winnipeg 428-2005	

NOTES

A. CABLE ENTRY POINT FOR HIGH VOLTAGE CABLES
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY LOCATION OF ENTRY

B. CABLE ENTRY POINT FOR ALL CONTROL WIRING.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER IS TO VERIFY LOCATION OF CONTROL CONDUITS.

C. CABLE ENTRY LOCATION FOR INCOMING 480V POWER.
PANEL FABRICATOR DOES NOT CUT HOLE. INSTALLER TO VERIFY LOCATION OF ENTRY.

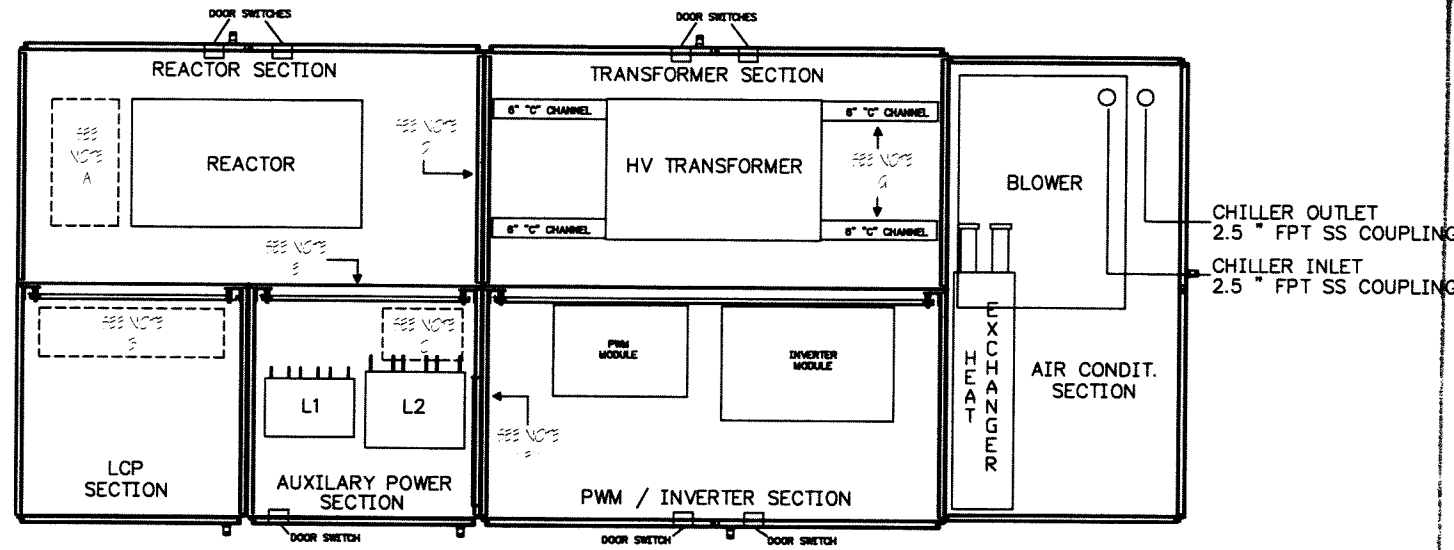
D. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE AT FLOOR LEVEL FOR VENTILATION.

E. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF PANEL FOR VENTILATION.

F. PANEL FABRICATOR TO CUT 6 SQ. FT. HOLE NEAR TOP OF PANEL FOR VENTILATION.

G. MOUNT HIGH VOLTAGE TRANSFORMER ON 6" C CHANNEL.

TOP VIEW



Earth Tech (Canada) Inc.

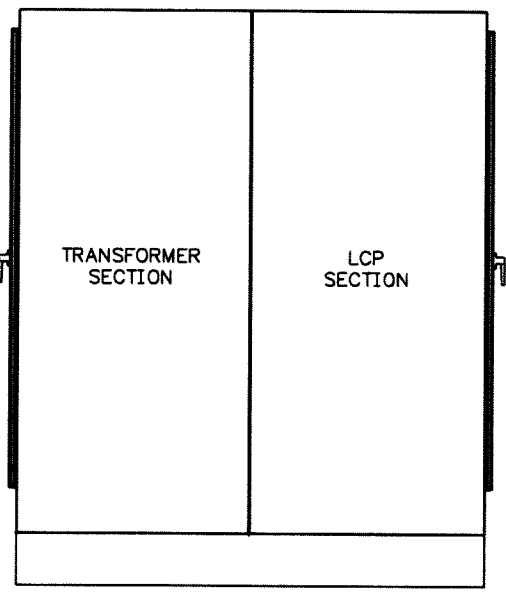
Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and completion of field dimensions, field measurements, and the cost of construction, if any, shall rest with the Contractor. Responsibility for the cost of all parts of the work rests with the Contractor.

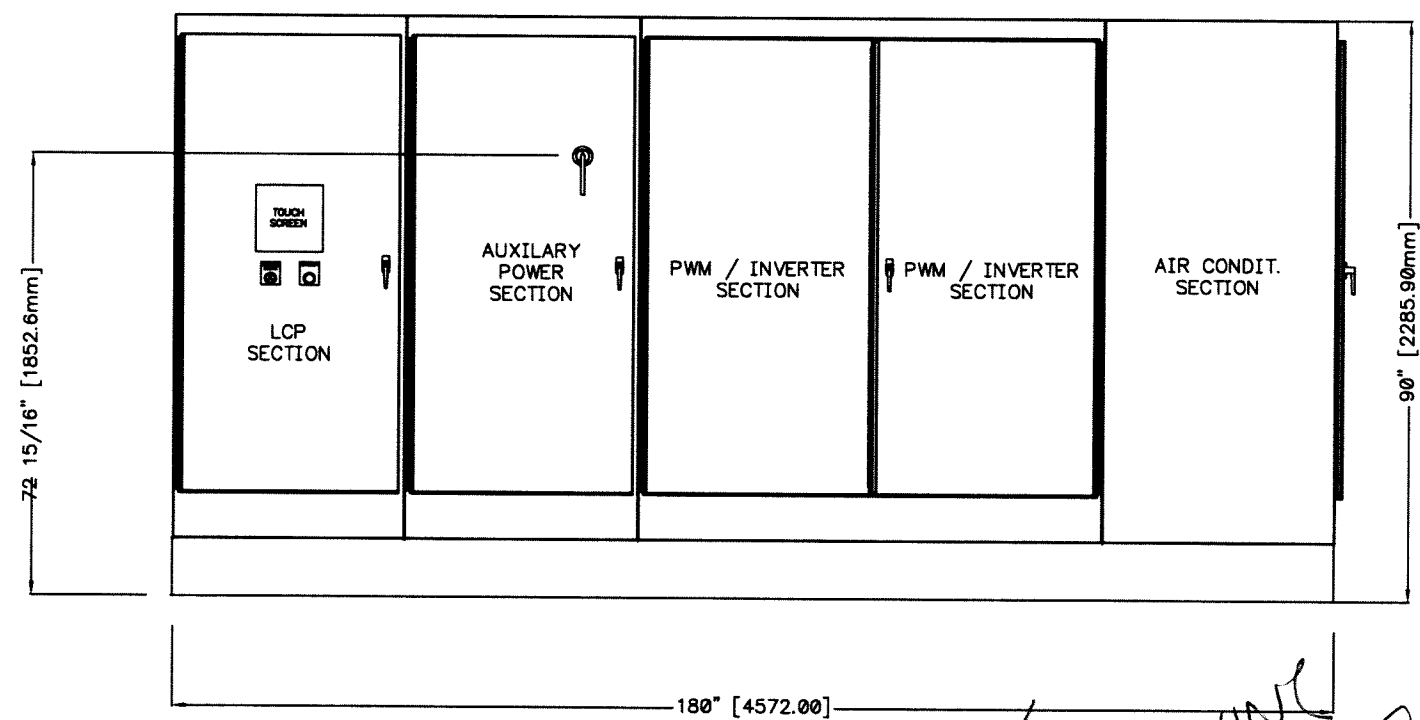
REVIEWED _____
 REVIEWED AS MODIFIED _____
 REVISE AND RE-SUBMIT _____
 NOT REVIEWED _____

Project No. 79538-C14-16
 Date: 21/1/06 By: M. Jones

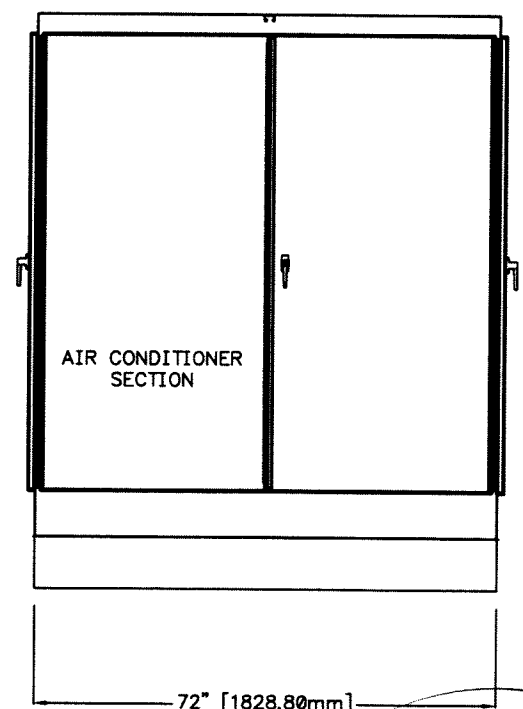
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW



THE INCOMING POWER TO THE PSU WILL BE 480 VOLTS.

ALL COMMENTS ON PSU APPLY HERE
DRAWING NUMBERS

EST. WEIGHT: 6,900kg (15,000 LBS)

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					Drawn	1/9/06	D.L.V.
					Checked		

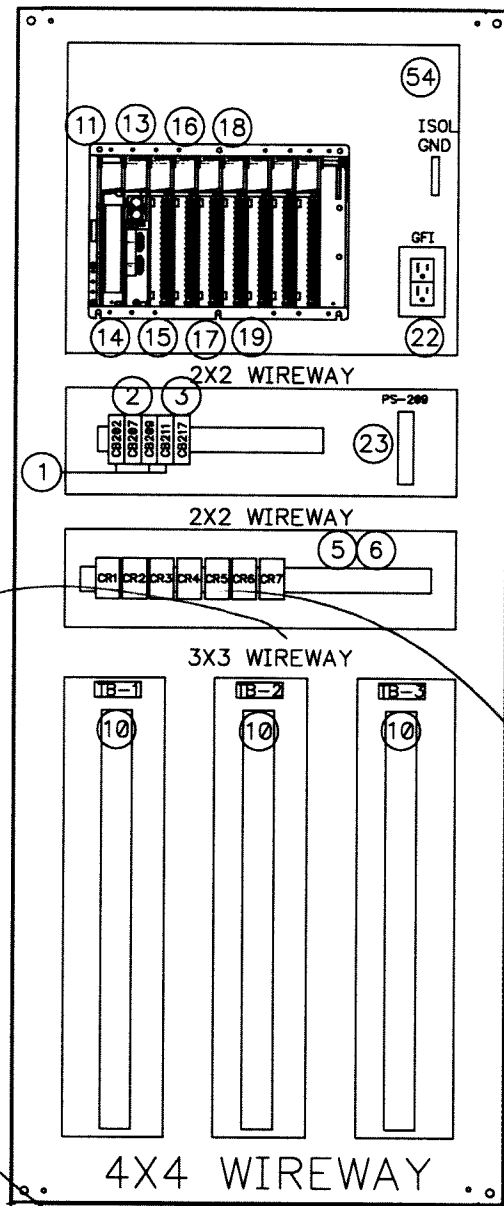
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION

POWER SUPPLY UNIT NO. 3
 PANEL LAYOUT

Dwg. No. **WPMB-E100**
 Ref. Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

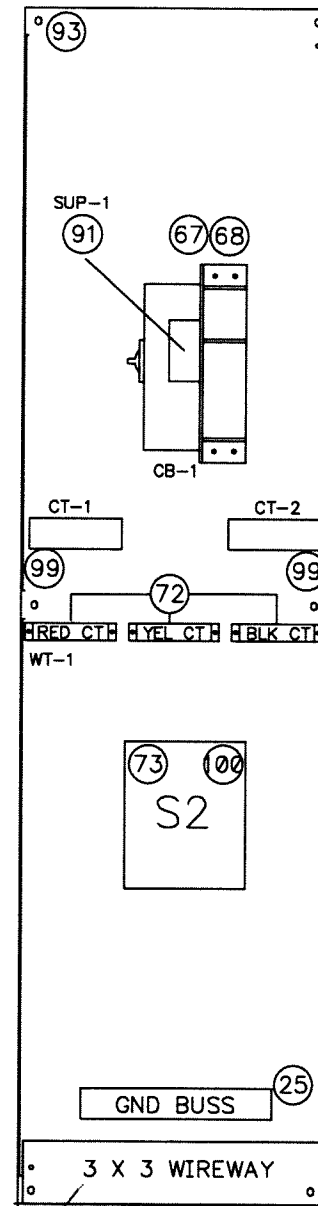
LCP SECTION
REAR PANEL



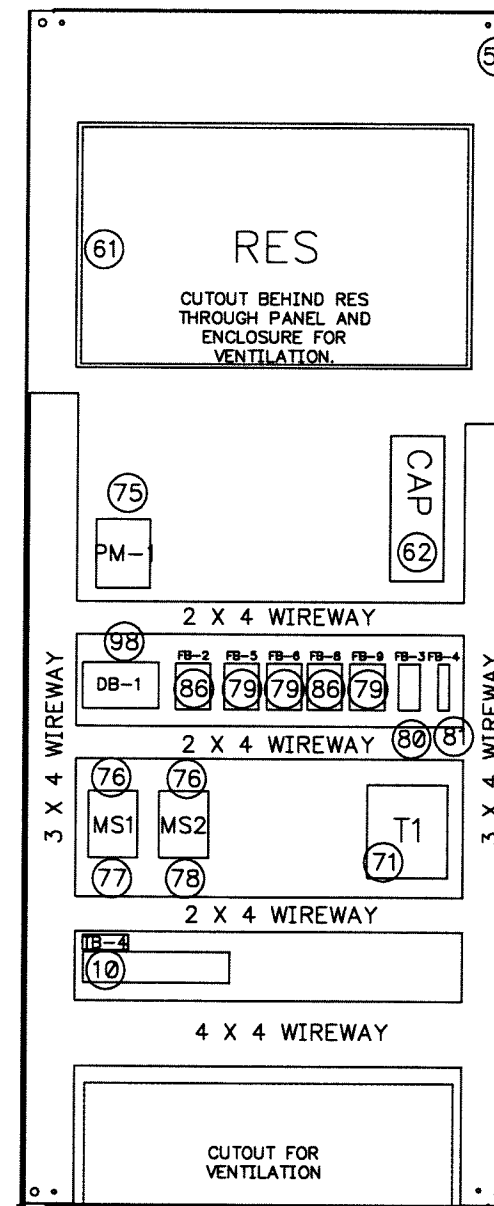
NOTE:
MOUNT MODICON "T"
TAP ON RIGHT SIDE
WALL OF LCP

*PROVIDES
FUSED DISCONNECT
TERMINALS*

AUXILIARY POWER
LEFT SIDE PANEL



AUXILIARY POWER
REAR PANEL



Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for all details left to the client and their consultants.

Responsible for the design and construction of field installations. The contractor shall be responsible for all parts of the work not shown on this drawing.

REVIEWED _____
 DEVELOPED AND MODIFIED _____ ✓
 REVISIONS AND COMMENTS _____
 NOT REVIEWED _____
 Project No. 79538-C14-16
 Date: 21/1/06

DWS NUMBERS

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					Drawn	1/9/06	SML
					Checked		

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION

WPMB-E100A

Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

A B C D E F G H

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDORS
1	CB-202,9,11	3	SQUARE D	MG24501	1-POLE,2A,120V,CIRCUIT BREAKER	FD LAWRENCE
2	CB-207	1	SQUARE D	MG24504	1-POLE,6A,120V,CIRCUIT BREAKER	FD LAWRENCE
3	CB-217	1	SQUARE D	MG24503	1-POLE, 4A,120V,CIRCUIT BREAKER	FD LAWRENCE
4						
5	CR1-7	7	SQUARE D	KUD12P14V53	24VDC,CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
6		7	SQUARE D	NR82	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS FOR ITEM4	FD LAWRENCE
7	PL1	1	SQUARE D	9001KPKM35A31	30MM,24VDC AMBER PILOT LIGHT	FD LAWRENCE
8						
9	PB-217	1	SQUARE D	9001KR9R20H1	30 MM, RED MUSHROOM BUTTON,PUSH PULL MAINTAIN	FD LAWRENCE
10	TB1,2, 3, 4, 5	183	SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS. <i>PROVIDE POSGO DISCONNECT TERMINALS.</i>	PANEL FABRICATOR
11	PLC	1	MODICON	140XBPO1000	BACKPLANE 10 SLOT	FD LAWRENCE
12		5	MODICON	140XTS00100	QUANTUM I/O TERMINAL STRIPS	FD LAWRENCE
13		1	MODICON	140CPU65150	UNITY CPU, 256K, 1MB, 1MB+	FD LAWRENCE
14		1	MODICON	140CPS11410	PLC POWER SUPPLY	FD LAWRENCE
15		1	MODICON	140DDI35310	DC INPUT 24V X 32 SOURCE	FD LAWRENCE
16		1	MODICON	140DAI54300	AC INPUT, 120V X 16	FD LAWRENCE
17		1	MODICON	140DRA84000	RELAY OUTPUT (N.O.), ISOLATED 16 POINTS	FD LAWRENCE
18		2	MODICON	140AVI03000	24VDC,8 ANALOG INPUTS	FD LAWRENCE
19		1	MODICON	140ACO02000	24VDC,4 ANALOG OUTPUTS	FD LAWRENCE
20	HMI	1	MAGELLIS	XBTF032110	5.7" COLOR TOUCH SCREEN SERIAL LINK	FD LAWRENCE
21				XBTZ29710	MAGELLIS TO QUANTUM COMMUNICATION CABLE	FD LAWRENCE
22	GFI-1	1	HUBBELL	GF-5252I	GFI RECEPTACLE	PANEL FABRICATOR
23	PS-209	1	SQUARE D	ABL7-RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
24						
25						
26						
27						
28						
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31						
32						
33						
34						
35						
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39						
40						

DWG NUMBERS

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Fuji Electric Co.,Ltd.	Title POWER SUPPLY UNIT NO. 3 LOCAL CONTROL PANEL - BILL OF MATERIALS	Dwg.No. WPMB-E101	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
					Checked						

A B C D E F G H

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and certification of field
dimensions, fabrication, erection, and completion of
construction, including installation of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____


Project No. 79538-C14-16

Date: 21/1/06 S. M. Joubert

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDORS
51		3	HOFFMAN	A-907236FS	ENCLOSURE, 90" X 72" X 36", TWO DOOR, NEMA 12	FD LAWRENCE
52		2	HOFFMAN	A-903636FS	ENCLOSURE, 90" X 36" X 36", ONE DOOR, NEMA 12	FD LAWRENCE
53		1	HOFFMAN	A-90P72F1	SUBPANEL, FULL SIZE, 78" X 68"	FD LAWRENCE
54		2	HOFFMAN	A-90P36F1	SUBPANEL, FULL SIZE, 78" X 32"	FD LAWRENCE
55	DS-1 - DS-2	2	SQUARE D	XCSTE5533	DOOR SAFETY SWITCH (LOCKING)	FD LAWRENCE
56		2	SQUARE D	XCSZ12	ACTUATING KEYS FOR ITEM 55	FD LAWRENCE
57	PWM	1	FUJI ELECTRIC		PWM MODULE	FUJI ELECTRIC
58	INV-11	1	FUJI ELECTRIC		INVERTER MODULE	FUJI ELECTRIC
59	L1	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
60	L2	1	FUJI ELECTRIC		LINE FILTER	FUJI ELECTRIC
61	RES	1	FUJI ELECTRIC		RESISTOR PACK	FUJI ELECTRIC
62	CAP	1	FUJI ELECTRIC		CAPACITOR	FUJI ELECTRIC
63	RU1,2 RV1,2 RW1,2	6	FUJI ELECTRIC		RESISTOR	FUJI ELECTRIC
64	TS-11	1	FUJI ELECTRIC		HIGH VOLTAGE TRANSFORMER	FUJI ELECTRIC
65	T6-11	1	FUJI ELECTRIC		HIGH VOLTAGE REACTOR	FUJI ELECTRIC
66	TS-3	1	HOFFMAN	A-TEMNO	TEMPERATURE SWITCH N.O.	PANEL FAB.
67	CB-1	1	SQUARE D	LCL36300	CIRCUIT BREAKER 480V 300A	FD LAWRENCE
68		1	SQUARE D	9421-LK1	DOOR OPERATING MECHANISMS FOR ITEM 67	FD LAWRENCE
69	SV-224	1	ASCO	8221-G11	COOLING WATER SOLENOID VALVE 120 VAC	PANEL FAB.
70	PT-2, PT-3	2	FUJI ELECTRIC		TRANSFORMER, 480/5 VAC	FUJI ELECTRIC
71	T1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120V 1KVA	FD LAWRENCE
72	WT-1	1	SQUARE D	H8044-0400-3	POWER TRANSDUCER	FD LAWRENCE
73	S2,S3	2	SQUARE D	LC1F300F7	CONTACTOR, 3 POLES, 300,120 VAC COIL, W/ 1 N.O.AUXILIARY CONTACT	FD LAWRENCE
74	PMD-1	1	SQUARE D	3020-PMD32	POWERLOGIC POWER METER DISPLAY UNIT	FD LAWRENCE
75	PM-1	1	SQUARE D	3020-PM600	POWERLOGIC POWER METER BASE UNIT	FD LAWRENCE
76	MS1, MS2	2	SQUARE D	8536-SCO3V02S	MOTOR STARTER SIZE 1 120 VAC COIL	FD LAWRENCE
77		3	SQUARE D	B12.8	HEATERS FOR 5 HP	FD LAWRENCE
78		3	SQUARE D	B22	HEATERS FOR 7-1/2 HP	FD LAWRENCE
79	FB-5, 6, 9	3	BUSSMANN	BM6033B	3 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
80	FB-3	1	BUSSMANN	BM6032B	2 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
81	FB-4	1	BUSSMANN	BM6031B	1 POLE FUSEBLOCK, CLASS CC,600V, 30A	FD LAWRENCE
82		6	BUSSMANN	FNQ-2	FUSE, 500V, 2A TIME DELAYED	FD LAWRENCE
83		2	BUSSMANN	FNQ-3	FUSE, 500V, 3A TIME DELAYED	FD LAWRENCE
84		1	BUSSMANN	FNM-8	FUSE, 250V, 8A	FD LAWRENCE
85		6	BUSSMANN	LP-CC15	FUSE, 600V, 15A	FD LAWRENCE
86	FB-2, 8	2	BUSSMANN	BC6033B	3 POLE FUSEBLOCK, CLASS CC, 600V, 30A	FD LAWRENCE
87	DS-3 - DS-4	2	SQUARE D	XCKJ10541	DOOR SAFETY SWITCH (NON-LOCKING)	FD LAWRENCE
88	TS-1	1	STANCOR	STO-140	ENCLOSURE HIGH TEMPERATURE SWITCH	PANEL FAB.
89		1			BLOWER & MOTOR ASSEMBLY	TRANE
90		1			AIR/WATER HEAT EXCHANGER	TRANE
91	SUP-1	1	SQUARE D	SDSA3650	480 VAC SURGE SUPPRESSOR	FD LAWRENCE
92		3	BUSSMANN	FNQ-1	FUSE, 500V, 1A TIME DELAYED	FD LAWRENCE
93		1	HOFFMAN	A-90SMP20	SIDE MOUNTED PANEL, 78" X 20"	FD LAWRENCE
94						
95						
96	FB-10, FB-11	2	FERRAZ SHAWMUT	P266A	FUSE BLOCK (STUD TYPE) 1000 VOLTS, 400 AMPS	PANEL FAB.
97		2	GOULD SHAWMUT	A70Q S800	400 AMP FUSE	
98	DB-1	1	SQUARE D	9080, LBA362106	DISTRBUTION BLOCK, 3 POLE, (1) 6-2/0 AWG IN, (6) 14-10 AWG OUT	FD LAWRENCE
99	CT-1, CT-2	1	SQUARE D	4210-100R-401	CURRENT TRANSFORMERS 400:5	
100		2	SQUARE D	DZ2FG6	LUG KIT FOR ITEM 73	

Revisions	Rev. No.	Description	By	Date	Date	Name
					1/9/06	SML

Fuji Electric Co.,Ltd


THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
POWER SUPPLY UNIT NO. 3
POWER SECTION - BILL OF MATERIALS

WPMB-E102
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

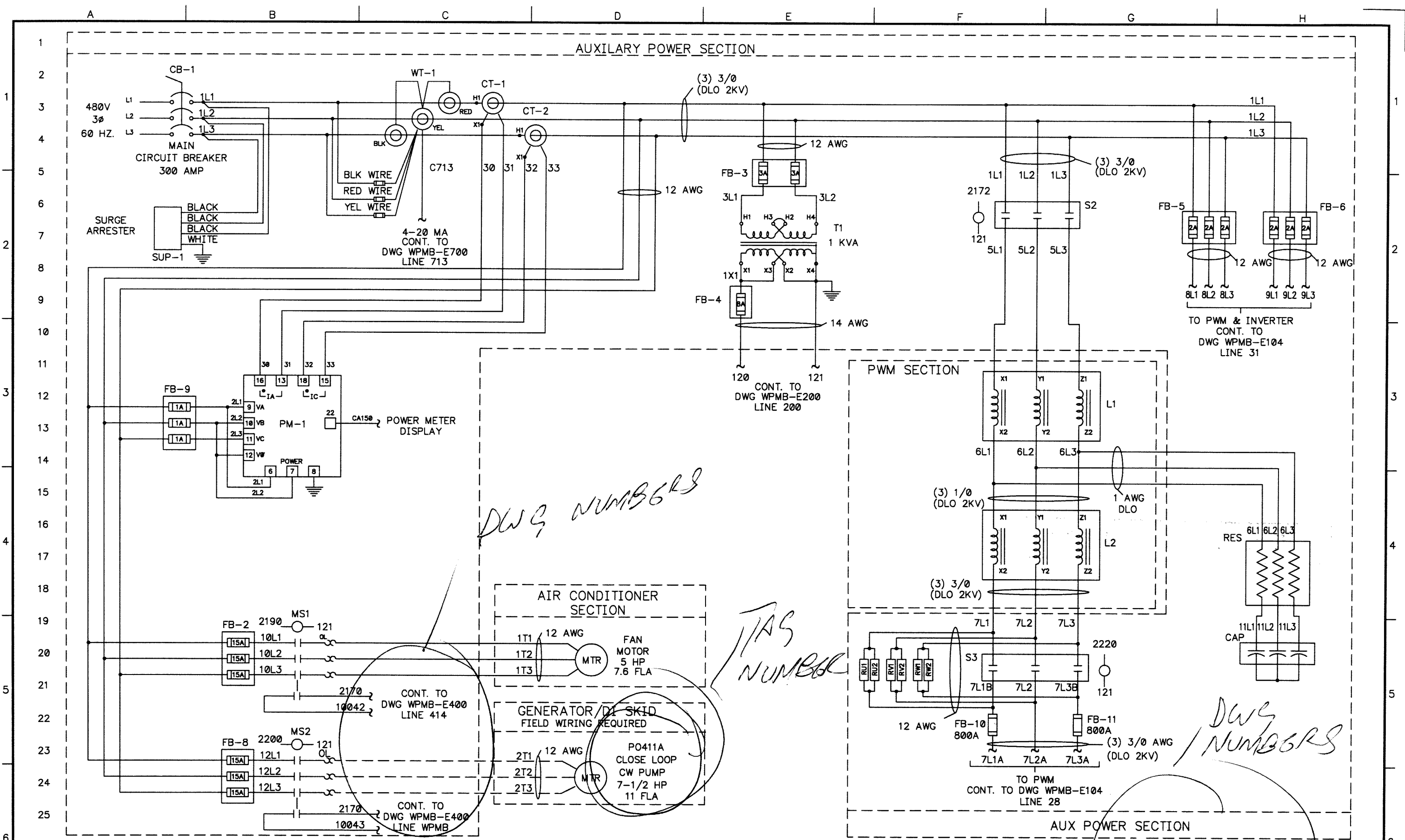
REVIEWED AS MODIFIED ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 74538-C14-16

Date: 21/1/06 By: [Signature]



DWG NUMBERS

TAS NUMBER

DWG NUMBERS

Revisions	Date	Name	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg No.
	1/9/06	SML	Fuji Electric Co., Ltd. Title: POWER SUPPLY UNIT NO. 3 480V POWER DISTRIBUTION		WPMB-E103 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
Rev. No.	Description	By				Date

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for data and design in the shop drawings rests with the Contractor.

Responsibility for verification and completion of field dimensions, field construction techniques, and construction methods rests with the Contractor.

REVIEWED _____

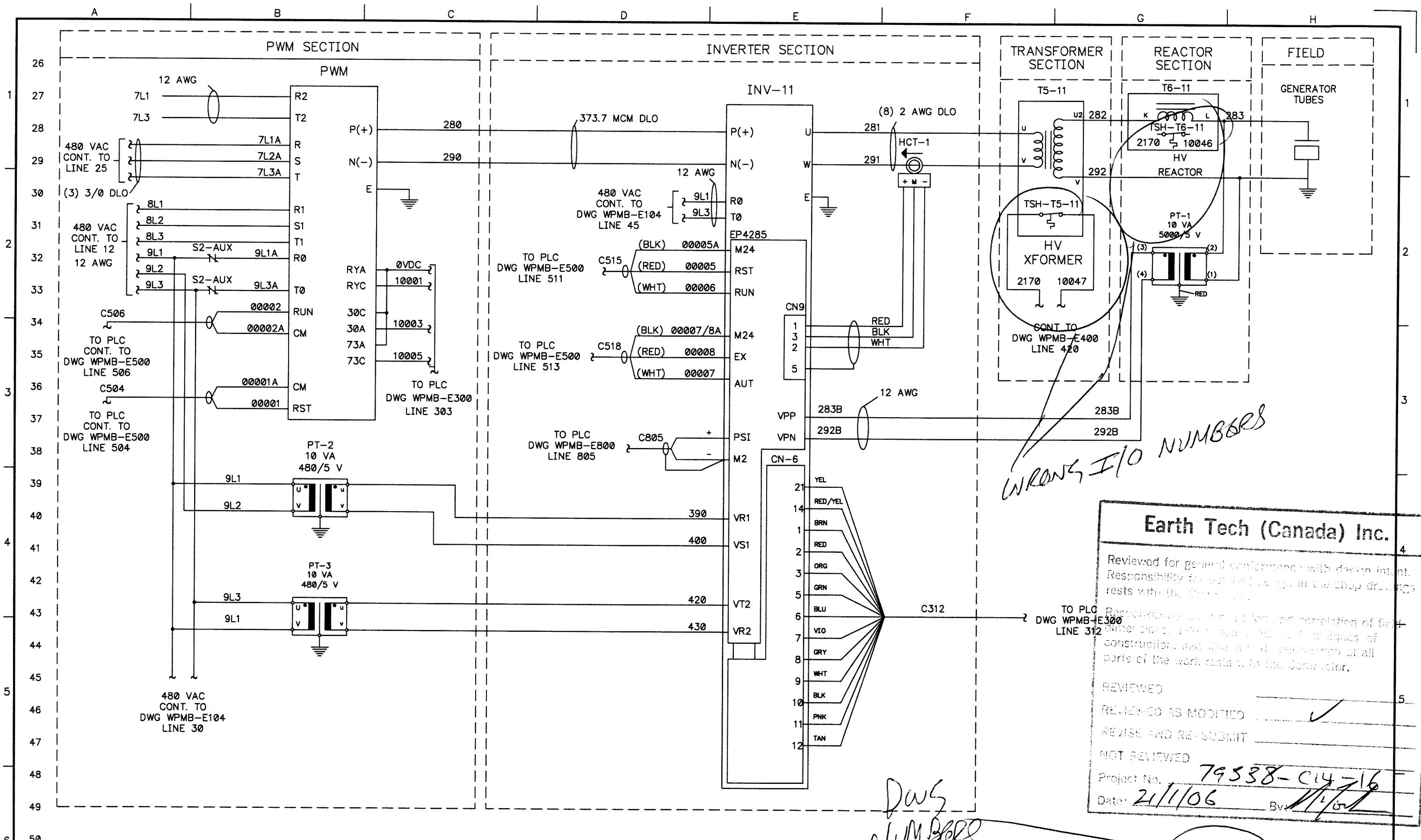
REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 7/02/06 By: [Signature]



Earth Tech (Canada) Inc.

Reviewed for general performance with design intent. Responsibility for what is not shown in the shop drawings rests with the Contractor.

Reviewed for correlation of field dimensions with drawings. Responsibility for discrepancies of construction, not for a full verification of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

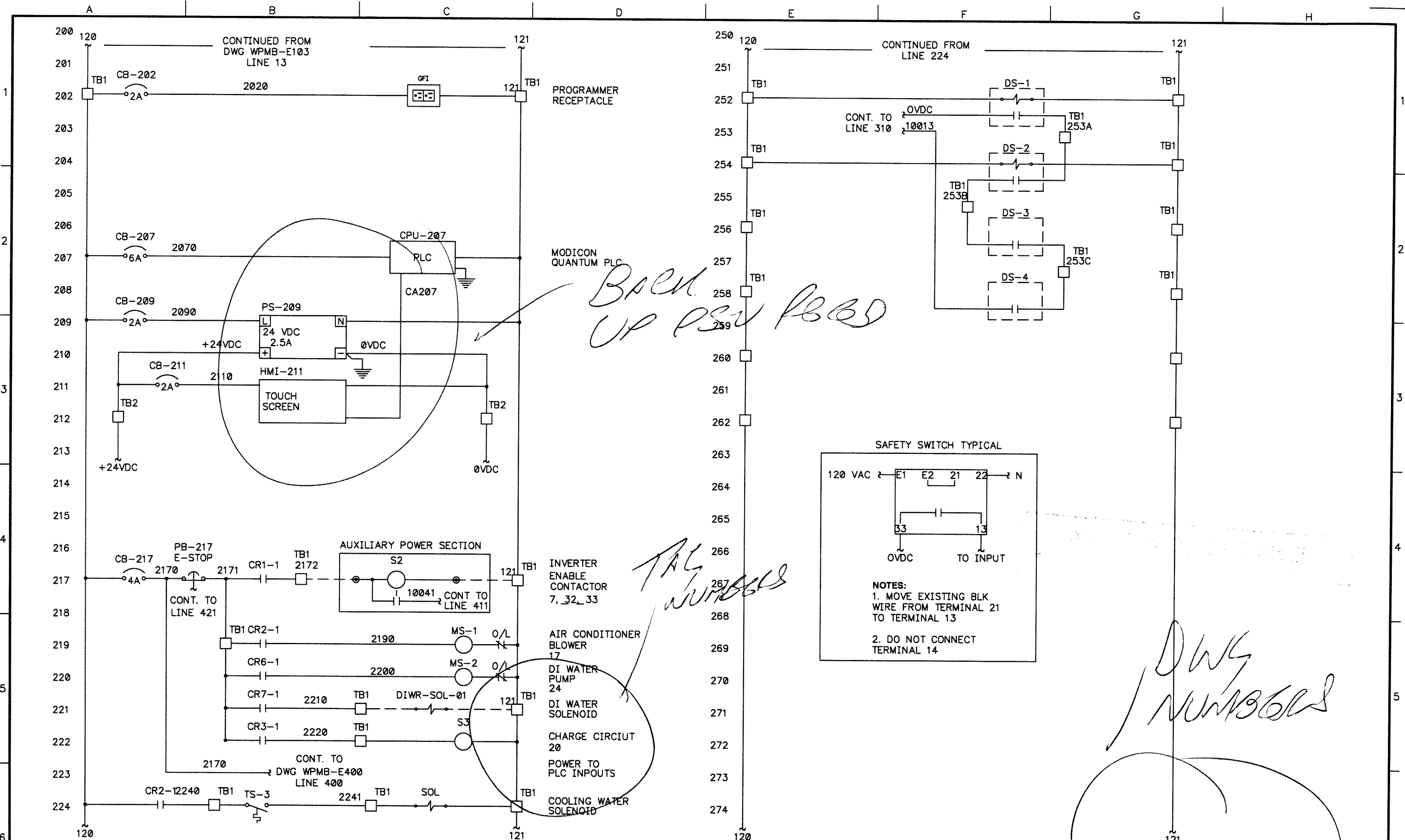
Project No. 79538-C14-16

Date: 2/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E104 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
POWER SUPPLY UNIT NO. 3 480V POWER DISTRIBUTION	



Back up per P&ID

TAG NUMBERS

DWG NUMBERS

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
POWER SUPPLY UNIT NO. 3
 120V DISTRIBUTION

WPMB-E200
 Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
For 30% stability for existing design with the proposed
design. See the Contract.

was responsible for verification and completion of field
work. Please refer to the contract for details of
inspection, and to the contract for details of all
work on the work, refer to the Contract.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVIEWED AND RE-SUBMIT _____

NOT REVIEWED _____

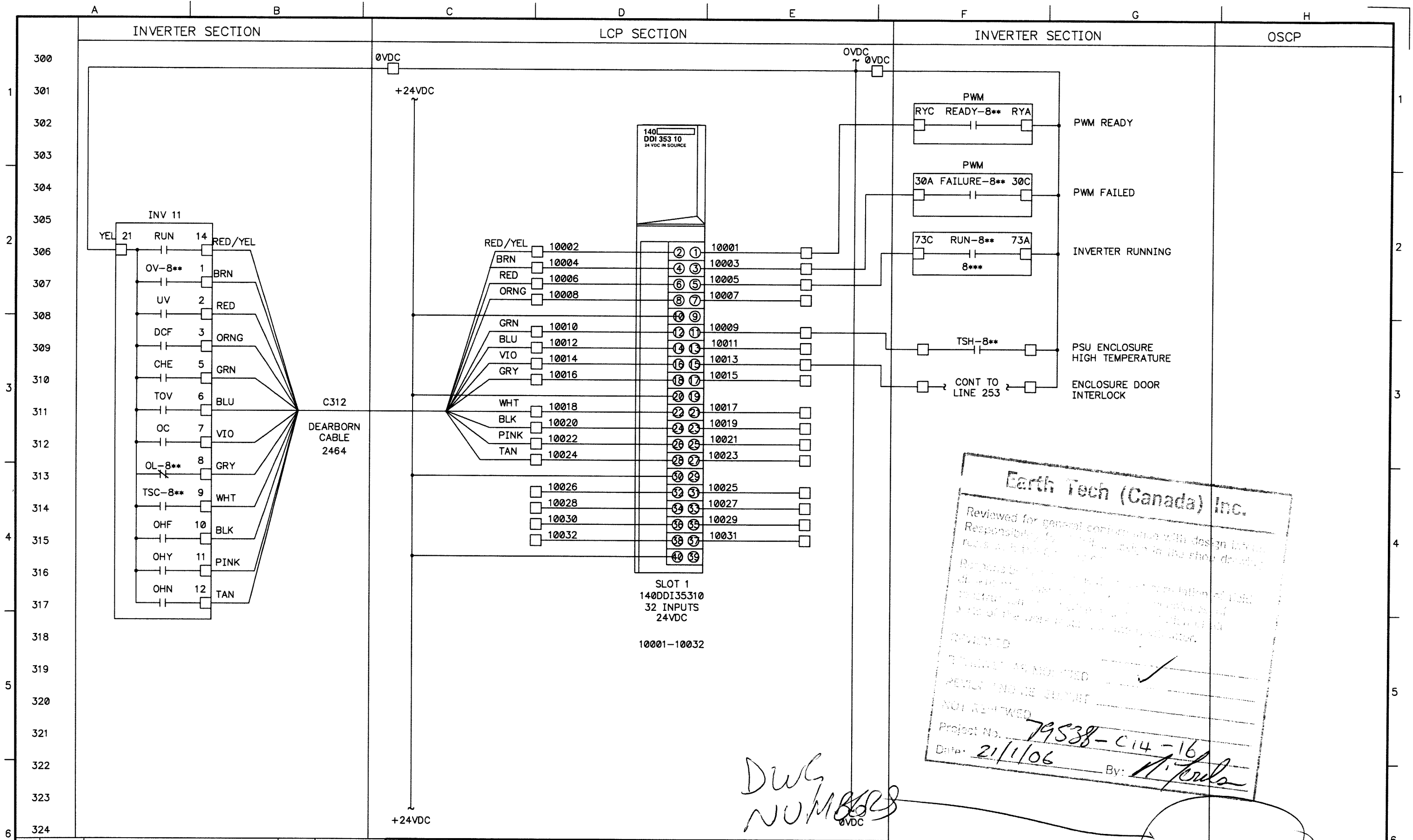
PROJECT NO. _____

79538

DATE: 07/20/06

BY

M. J. J. J.



Earth Tech (Canada) Inc.

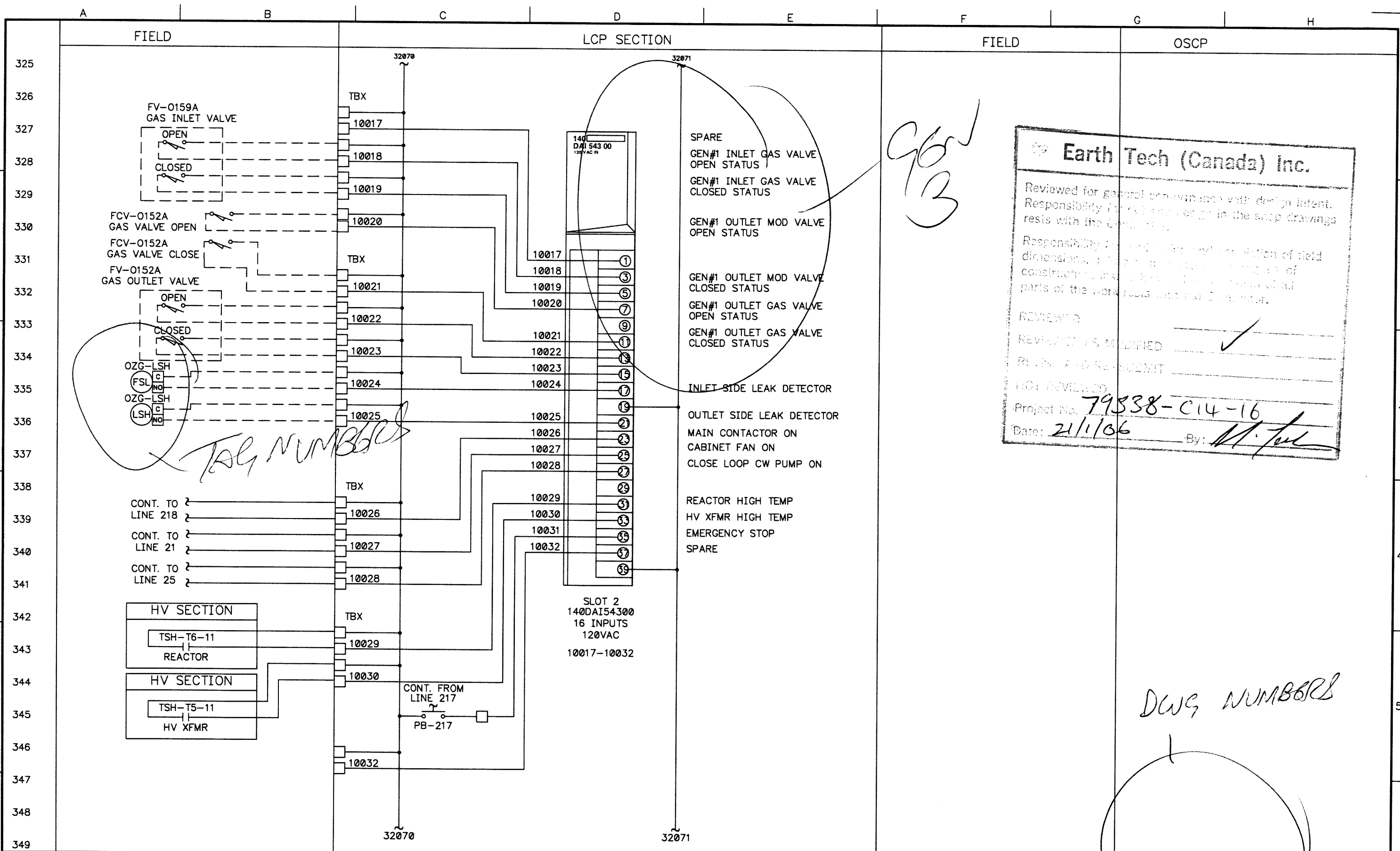
Reviewed for general conformance with design intent.
 Responsibility for the design is the responsibility of the client.
 Responsibility for the design is the responsibility of the client.
 Responsibility for the design is the responsibility of the client.
 Responsibility for the design is the responsibility of the client.

APPROVED: _____
 TOLERANCE ADJUSTED ✓
 REVISED AND RE-DESIGNED
 NOT REVISED

Project No. 79538-C14-16
 Date: 21/1/06 By: M. Ford

*DWG
 NUMBERS*

Revisions					Date	Name	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION POWER SUPPLY UNIT NO. 3 DIGITAL I/O	Dwg. No. WPMB-E300 Ref. Fuji Project No.: WPMB-1108 City of Winnipeg 428-2005	
					Drawn	1/9/06				SML
					Checked					
Rev. No.	Description	By	Date							



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for accuracy of the shop drawings rests with the Contractor.

Responsibility for the selection of field dimensions, materials, and construction of all parts of the work rests with the Contractor.

REVIEWED _____

REVISIONS MODIFIED ✓

REVISIONS APPROVED _____

NOT REVIEWED _____

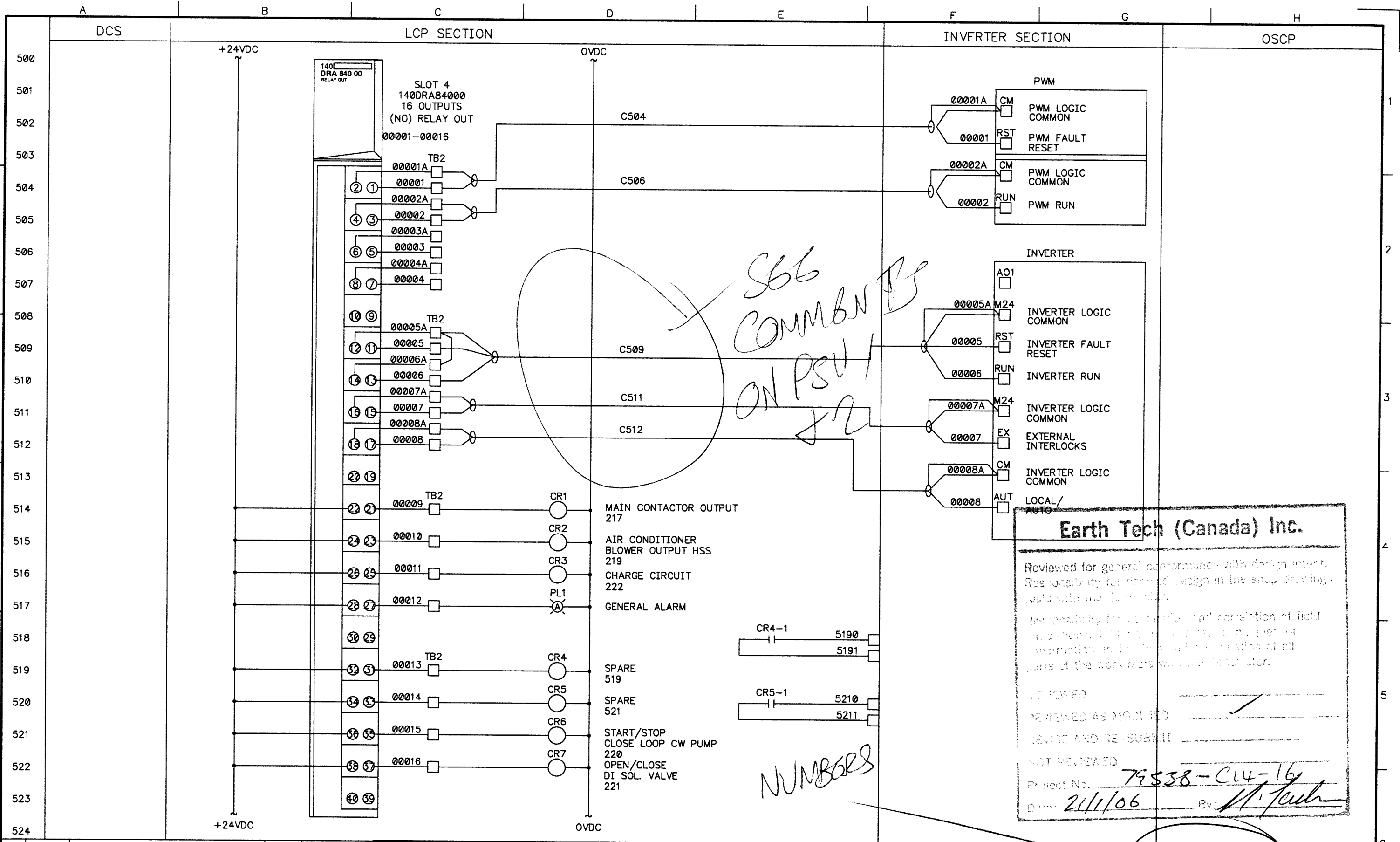
Project No. **79338-C14-16**

Date: **21/1/06** By: *M. J. [Signature]*

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E301 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
POWER SUPPLY UNIT NO. 3 DIGITAL I/O	



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the contractor.

Availability for up to 15% and correction of field work items. Responsibility for detailed design and construction rests with the contractor.

APPROVED _____

REVIEWED AS MODIFIED _____

REVISED AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-CU-16

Date: 2/1/06 By: M. Paul

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name

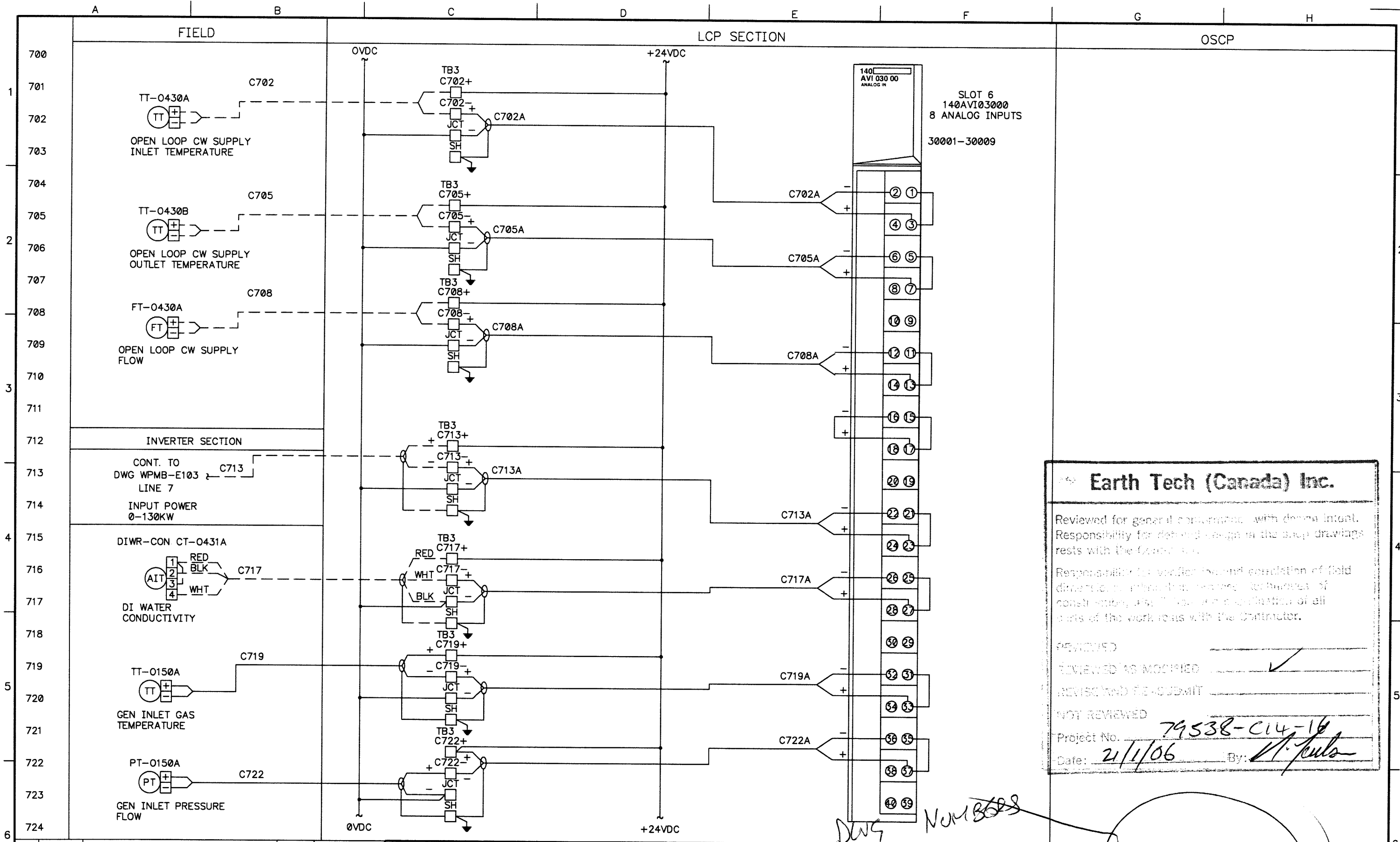
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

POWER SUPPLY UNIT NO. 3
DIGITAL I/O

WPMB-E500

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, materials, and construction techniques of construction, and the proper installation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISIONS AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 2/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name

Fuji Electric Co., Ltd.

Drawn: 1/9/06, SML

Checked: _____

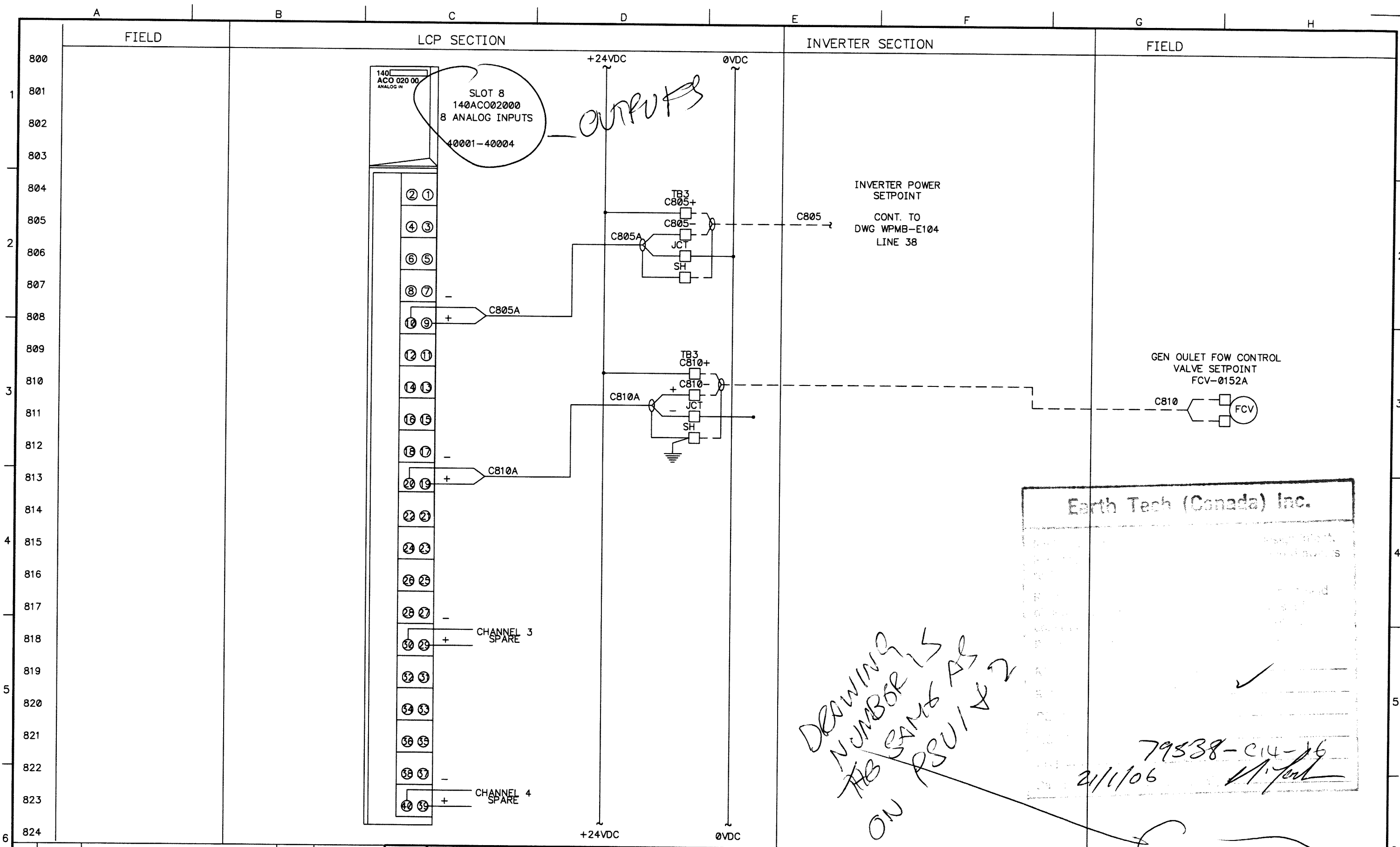
THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 Winnipeg ENGINEERING DIVISION

Title: **POWER SUPPLY UNIT NO. 3 ANALOG I/O**

WPMB-E700

Ref. Dwg. No. Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

DWG NUMBER



Earth Tech (Canada) Inc.

79538-C14-16
2/1/06

[Signature]

DRAWING NUMBER IS THE SAME AS 2 ON PSU 1 & 2

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

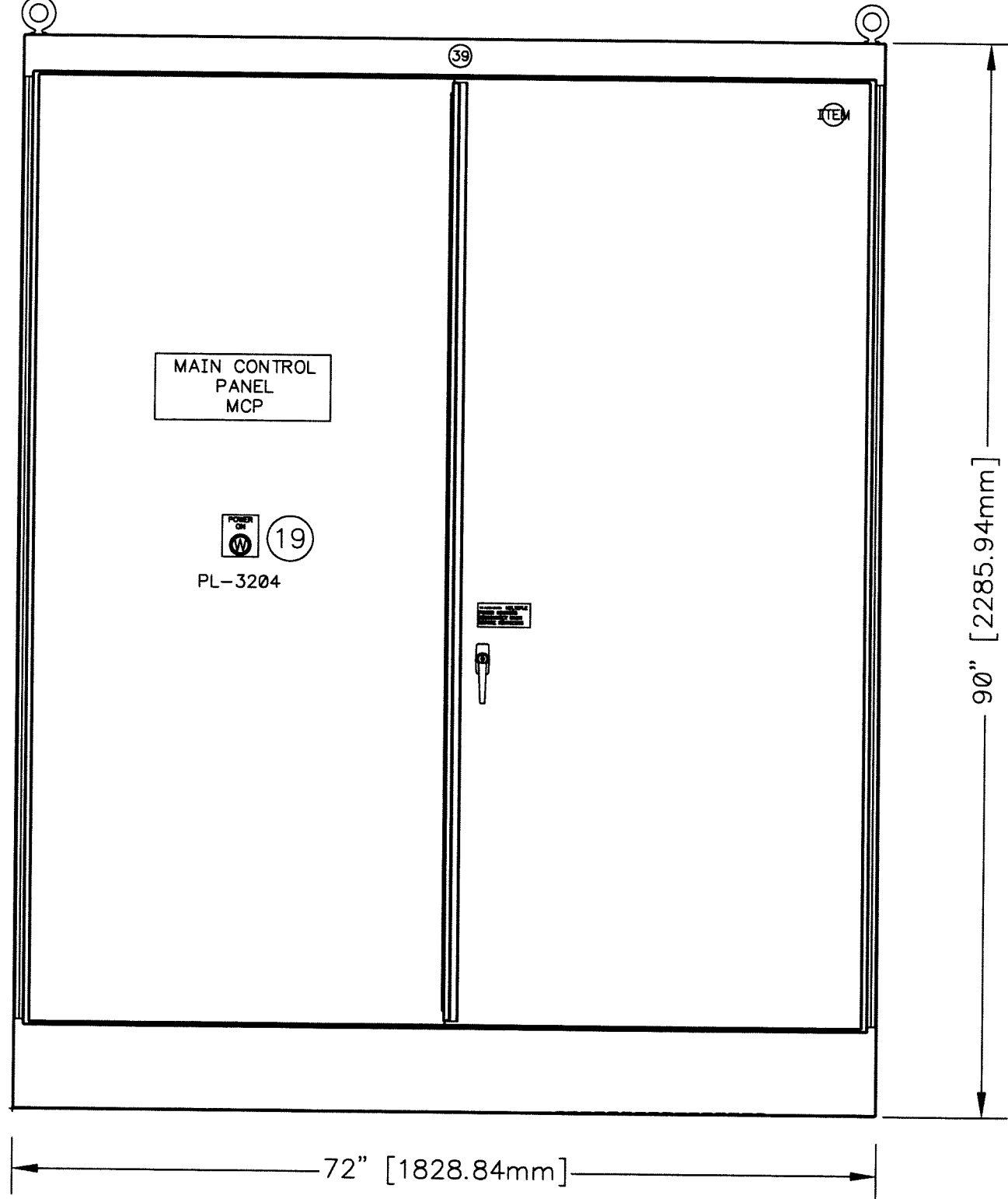
POWER SUPPLY UNIT NO. 3
ANALOG I/O

WPMB-E800

Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005

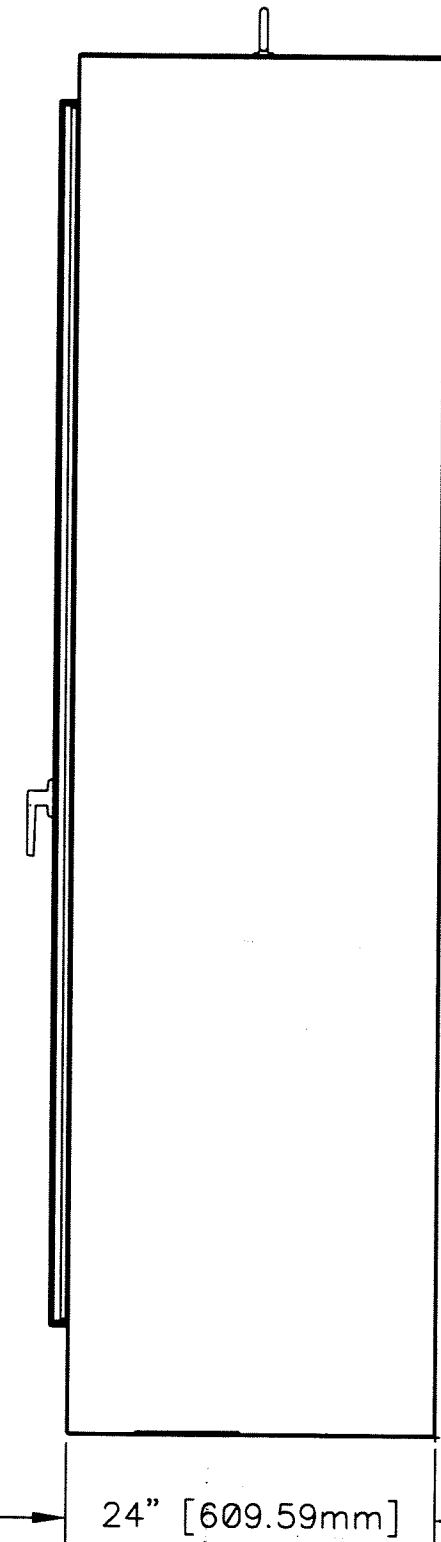
OZONE MASTER PLC PANEL
 (OSCP) — WHATS THIS ACRONYM FOR
 FRONT VIEW

OZONE MASTER PLC PANEL
 (OSCP)
 SIDE VIEW



90" [2285.94mm]

72" [1828.84mm]



24" [609.59mm]


WHAT'S
 IS TOUCH
 SCREEN
 ON LAYOUT

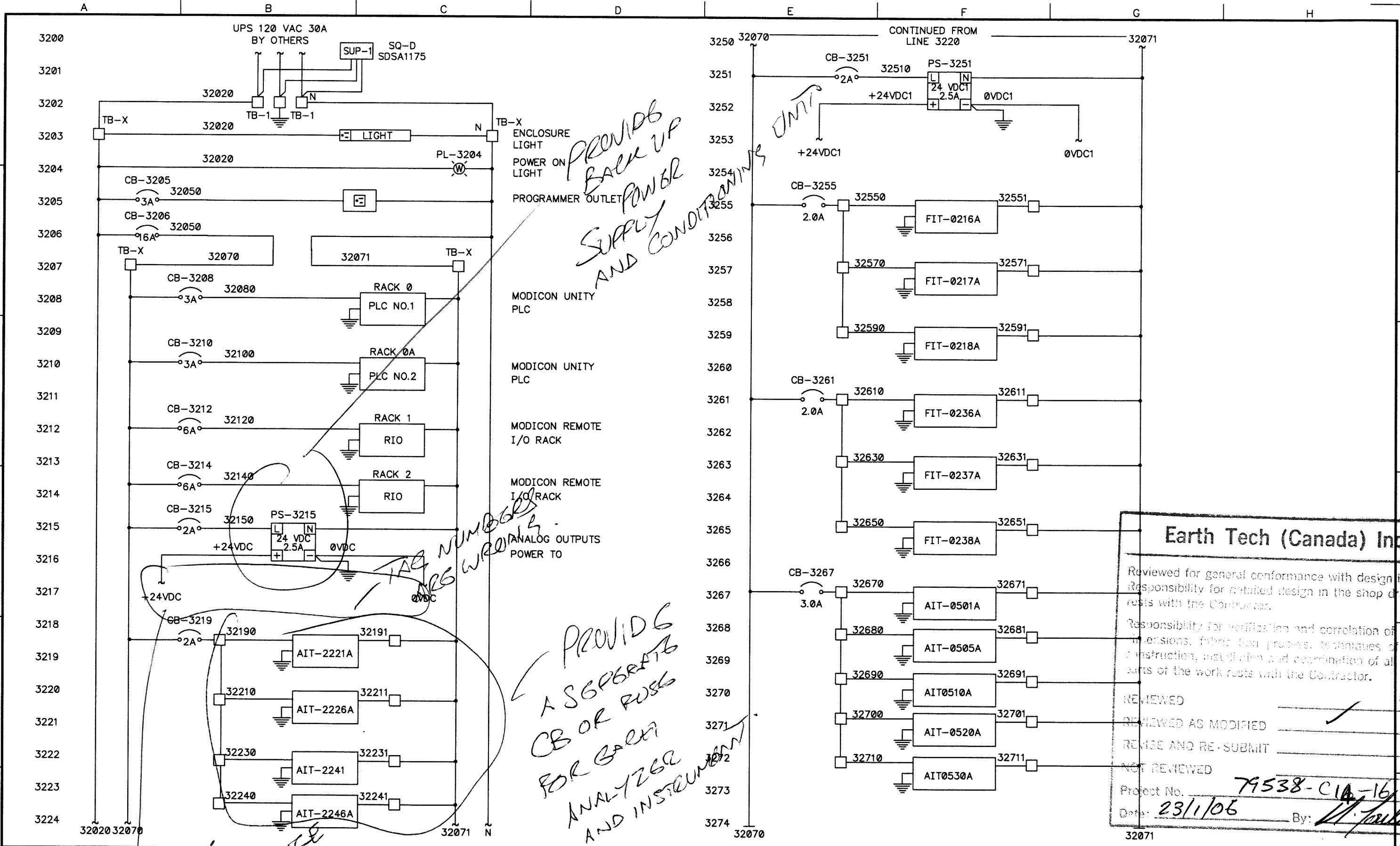
Revisions					Date	Name	Fuji Electric Co.,Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION Winnipeg	Dwg. No. WPMB-E3100
					Drawn	SML			
					Checked				
Rev. No.	Description	By	Date					Title OZONE MASTER PLC PANEL LAYOUT	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDOR
1		1	HOFFMAN	A-907224FSD	ENCLOSURE.90" X 72" X 24". SINGLE-DOOR. NEMA 12	FD LAWRENCE
2		1	HOFFMAN	A-90P72F1	SUBPANEL, FULL SIZE, 68" X 60"	FD LAWRENCE
3		1	MODICON	140-XBP-016-00	QUANTUM 16 SLOT RACK	
4		2	MODICON	140-XBP-006-00	6 SLOT RACK	NORTHWEST CONTROL
5		4	MODICON	140-CPS-124-00	QUANTUM POWER SUPPLY	NORTHWEST CONTROL
6		2	MODICON	140-CPU-67160	UNITY PLC	NORTHWEST CONTROL
7		1	MODICON	140-CHS-210-00	QUANTUM HOT STANDBY KIT	NORTHWEST CONTROL
8		2	MODICON	140-NOE-771-00	QUANTUM ETHERNET MODULE	NORTHWEST CONTROL
9		2	MODICON	140-CRP-931-00	QUANTUM REMOTE I/O PROCESSOR	NORTHWEST CONTROL
10		1	MODICON	140-XBP-010-00	QUANTUM 10 SLOT RACK	NORTHWEST CONTROL
11		2	MODICON	140-CRA-931-00	QUANTUM REMOTE I/O ADAPTER	NORTHWEST CONTROL
12		4	MODICON	140-DAI-543-00	QUANTUM DISCRETE INPUT, 120VAC, 16 POINT	NORTHWEST CONTROL
13		2	MODICON	140-DRA-840-00	QUANTUM DISCRETE OUTPUT, 20-250 VAC,16 POINTS	NORTHWEST CONTROL
14		8	MODICON	140-AVI--030-00	QUANTUM ANALOG INPUT, 1-5VDC, 4-20mA, 8 POINTS	NORTHWEST CONTROL
15		3	MODICON	140-AC0-020-00	QUANTUM ANALOG OUTPUT, 4-20 mA, 4 POINTS	NORTHWEST CONTROL
16	CB3205,6	2	SQUARE D	MG24508	CIRCUIT BREAKER, 120 VAC 16A	FD LAWRENCE
17	CB3215, 19, 55, 61, 67, 89, 91	7	SQUARE D	MG24501	CIRCUIT BREAKER, 120 VAC 2A	FD LAWRENCE
18	CB3208, 10, 67	3	SQUARE D	MG24502	CIRCUIT BREAKER, 120 VAC 3A	FD LAWRENCE
19	PL-3204	1	SQUARE D	9001KPKM1W31	30MM, STANDARD PILOT LIGHT, 120VAC TRANSFORMER TYPE, WHITE LENS	FD LAWRENCE
20	CR1-CR20	20	SQUARE D	8501-KUD13P14V53	24 VDC, CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
21		20	SQUARE D	8501-NR82	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS	FD LAWRENCE
22		AR	SQUARE D	999-NT13	35 mm DIN RAIL	PANEL FABRICATOR
23	CB-3277, 79, 81, 83	4	SQUARE D	MG24500	CIRCUIT BREAKER, 120VAC 1A	FD LAWRENCE
24	PS-3212, 14	2	SQUARE D	ABL7RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
25	SUP-1	1	SQUARE D	SDSA1175	120 VAC SURGE SUPPRESSOR	FD LAWRENCE
26	CB3212, 14	2	SQUARE D	MG24504	CIRCUIT BREAKER, 120 VAC 6A	FD LAWRENCE
27						FD LAWRENCE
28						FD LAWRENCE
29						
30						
31	TB-1,X		SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS,	PANEL FABRICATOR
32		1	HUBBELL	5261	SINGLE RECEPTACLE	FD LAWRENCE
33	COMP-1	1	SQUARE D	MPCBN05NAA00N	IPC CONTROL BOX,PENTIUM III 850 Mhz,128Mb RAM,20Gb,CO ROM,10/100 ETHERNET	FD LAWRENCE
34		1	SQUARE D	MPCYN00RAM128	IPC RAM 128 RAM EXPANSION	FD LAWRENCE
35		1	SQUARE D	MPCNT50NNN00N	IPC FRONT PANEL 15" COLOR AND TOUCH SCREEN	EDCO
36						
37						EDCO
38		1	ITE	GB10	PANEL GROUND BUSS	PANEL FABRICATOR
39		1	HOFFMAN	A-LTDB1	ENCLOSURE LIGHT WITH DOOR SWITCH	FD LAWRENCE
40						ATR DISTRIBUTOR

*619016 X6EN1175
these are also used in
14066*

*WHICH ARE COMPONENTS
these components
on a later
DRAWING*

Revisions				Date	Name	Fuji Electric Co.,Ltd	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E3101	
				Drawn	1/9/06					SML
				Checked						
Rev. No.	Description	By	Date				Title	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	



PROVIDES BACK UP SUPPLY AND CONDITIONING

TAG NUMBERS ARE WRONG

PROVIDES A SEPARATE CB OR FUSE FOR EACH ANALYZER AND INSTRUMENT

PROVIDES ESDS RELEASE

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

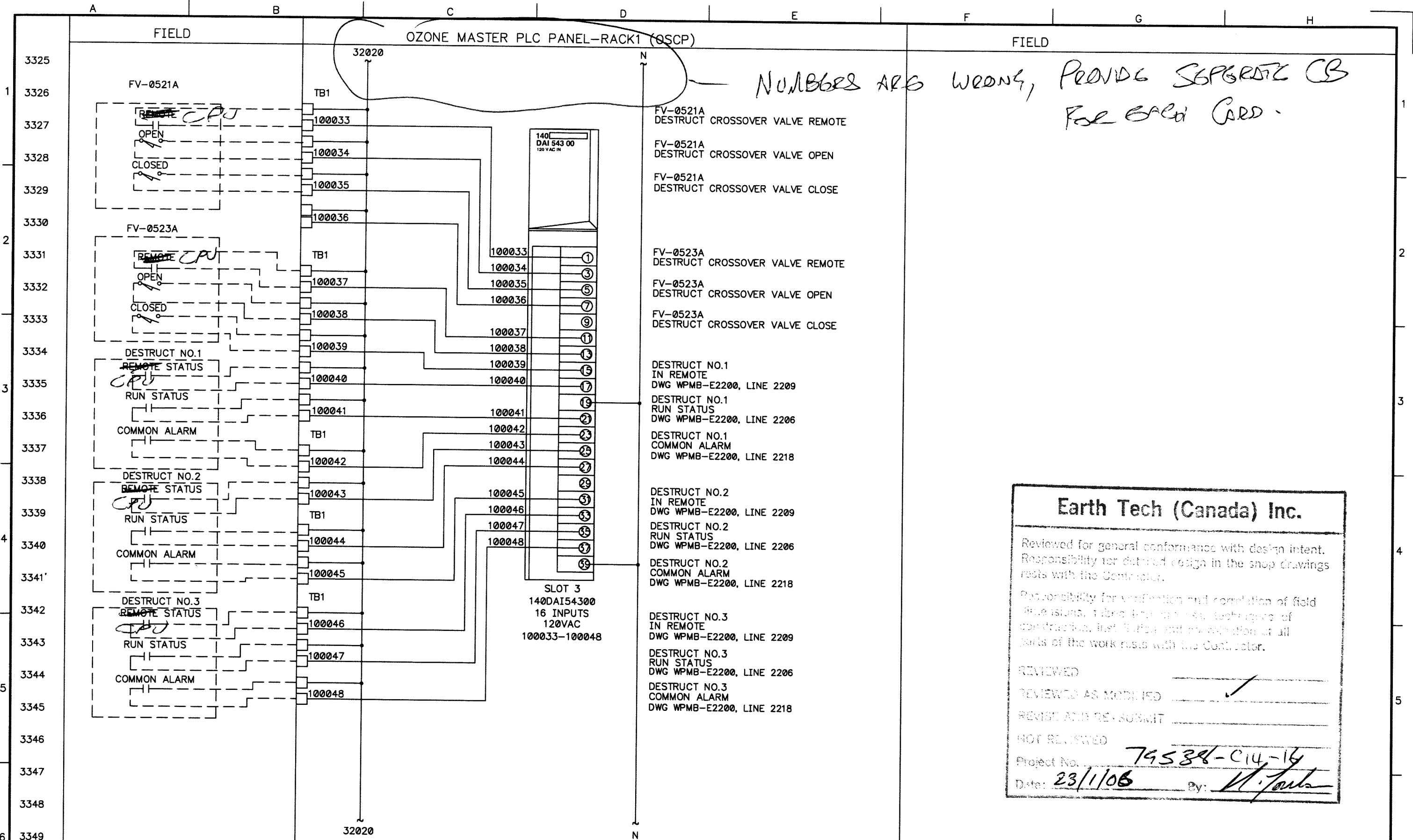
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C1A-16

Date: 23/1/06 By: [Signature]

Revisions	Date	Name	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg.No.
Rev. No.	Description	By	Date	Fuji Electric Co., Ltd.	WPMB-E3200
			Drawn 1/9/06 SML	OZONE MASTER PLC PANEL 120V DISTRIBUTION	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
			Checked		



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrications and techniques of construction, first 90 days and coordination at all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

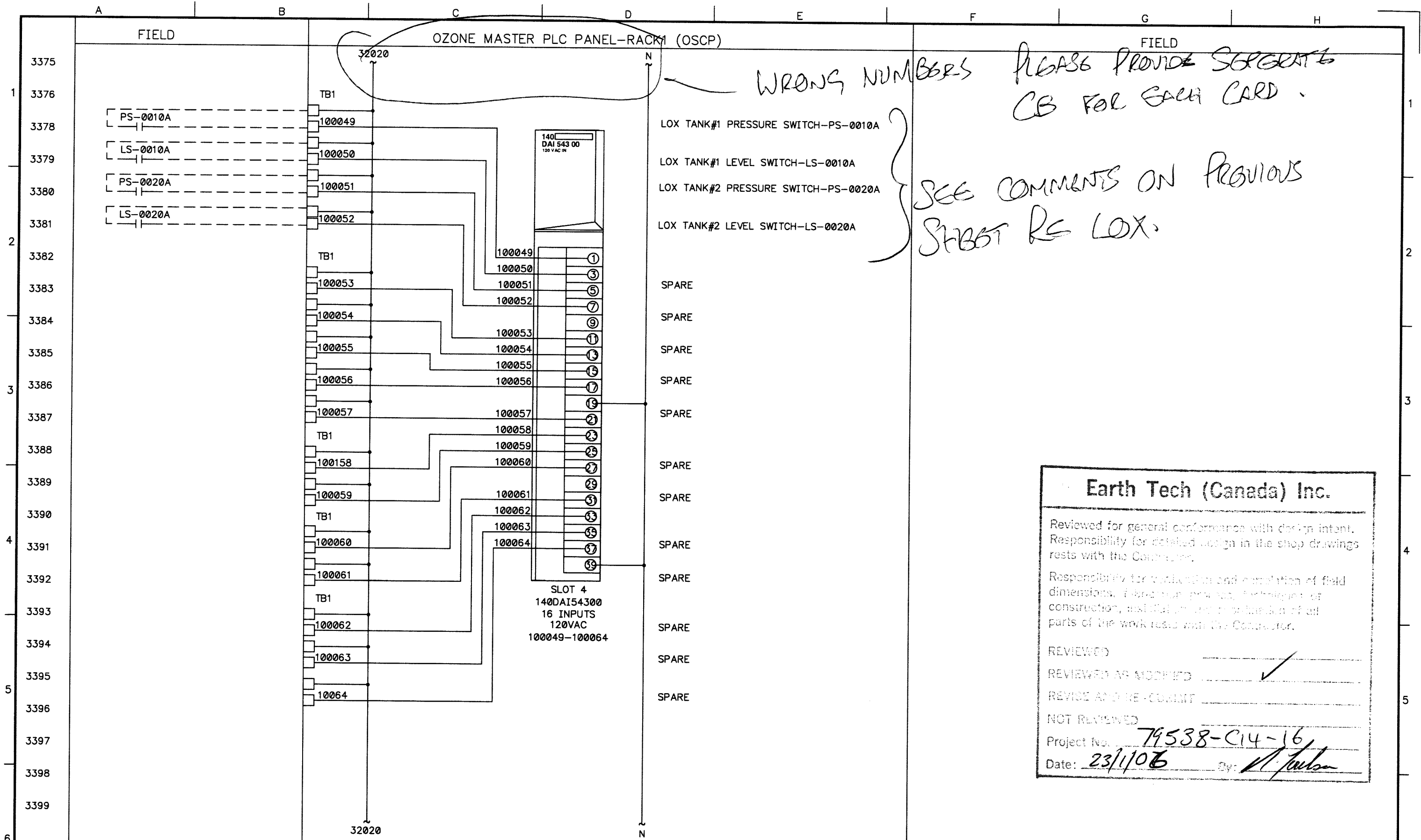
REVISED AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Janku

Revisions	Rev. No.	Description	By	Date	Date	Name	Title	Dwg.No.	Ref.
					1/9/06	SML	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG Winnipeg WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E3302
								OZONE MASTER PLC PANEL DIGITAL I/O	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general performance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and completion of field dimensions, field run, provide, techniques of construction, and final approval of installation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

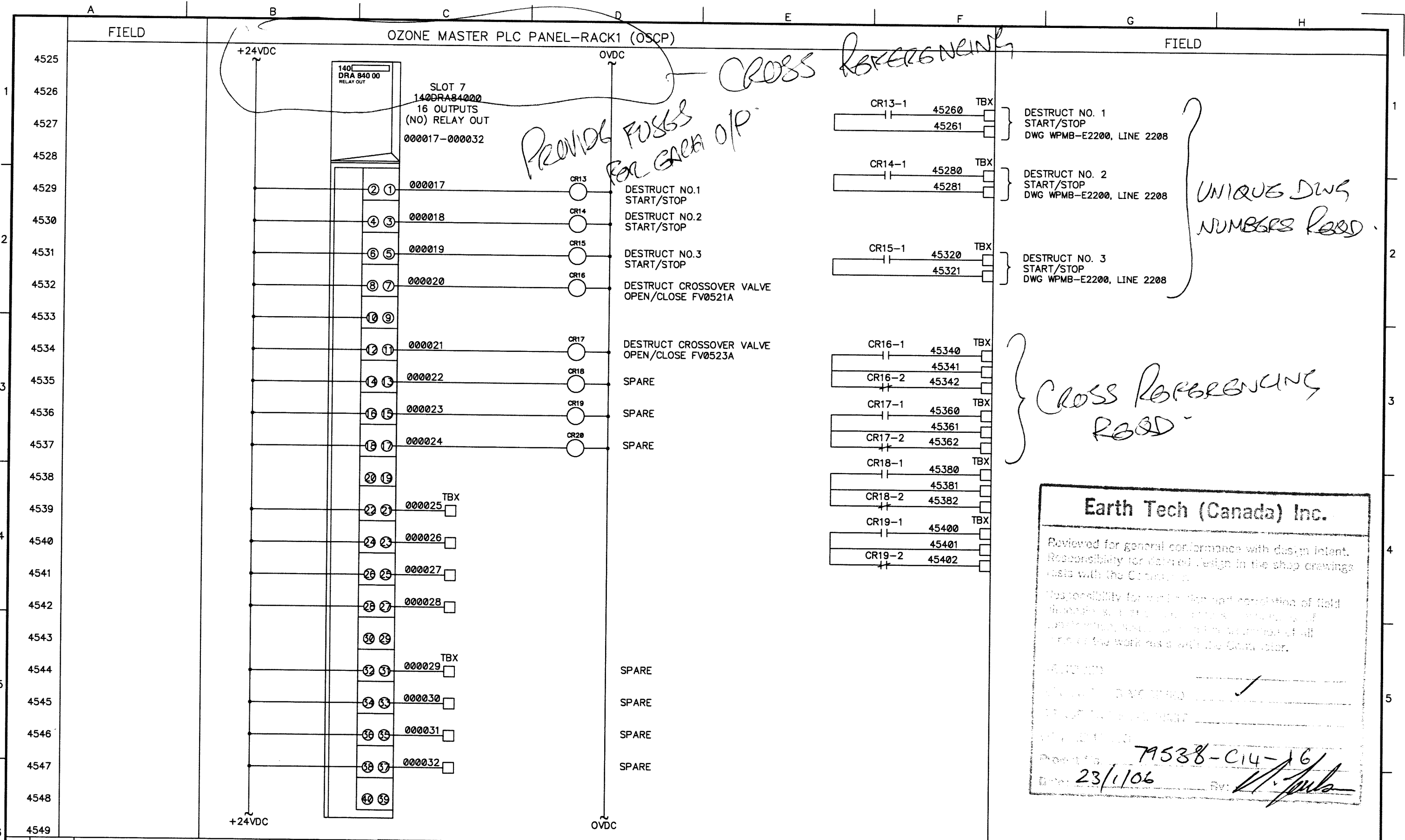
REVISE AND RE-COUNT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Revisions						Fuji Electric Co., Ltd.	 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg. No.	WPMB-E3303
	Drawn	Date	Name	1/9/06	SML				
	Checked	Date	Name						
Rev. No.	Description	By	Date	Checked	Date	Title	OZONE MASTER PLC PANEL DIGITAL I/O	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

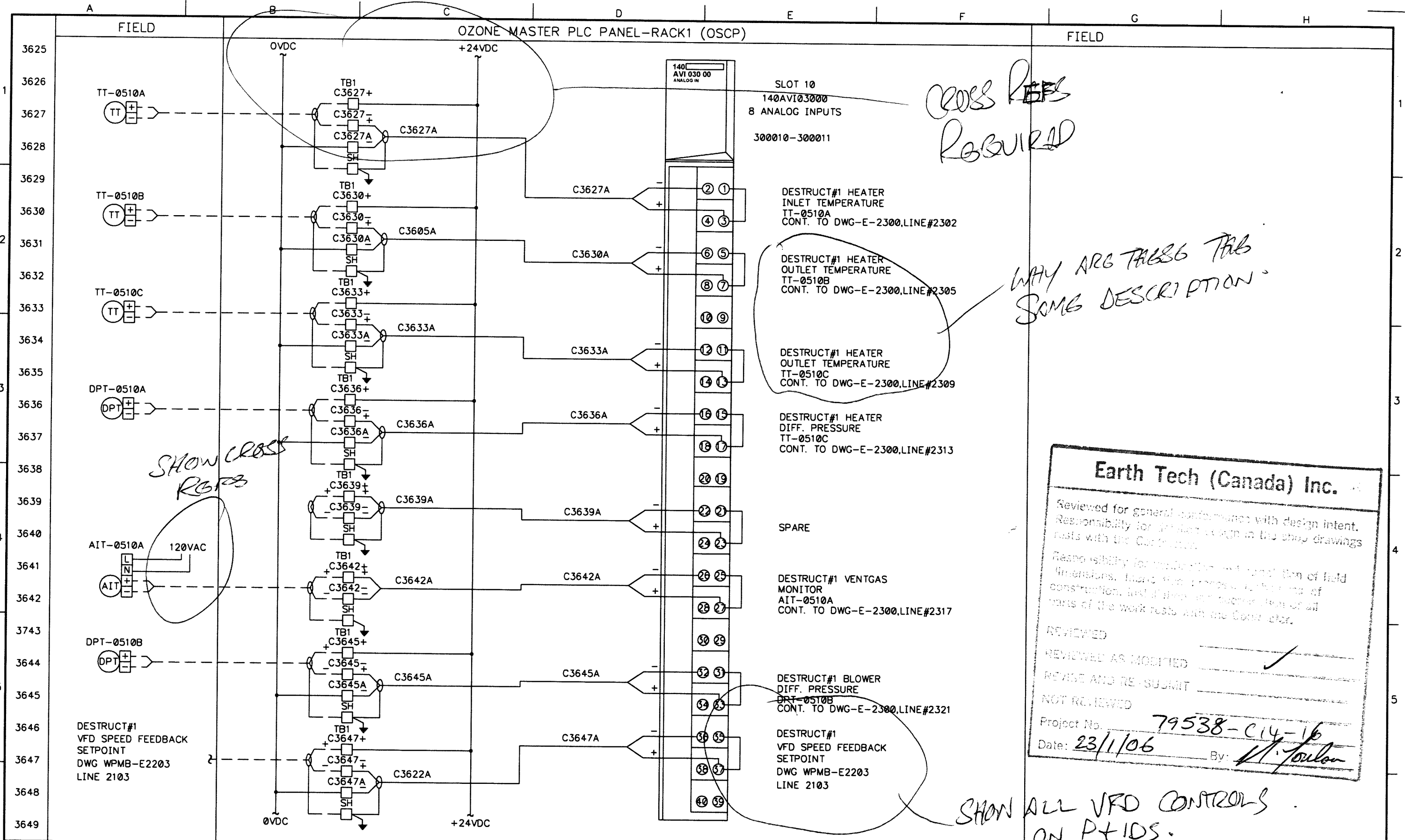
Responsibility for installation and completion of field work rests with the Contractor. The Contractor is responsible for all work on the work as a whole with the Contractor.

Project No. **79538-C14-16**

Date: **23/1/06**

By: *[Signature]*

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Title	Company	Dwg. No.	Ref.
					Drawn	1/9/06	SML		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E3501	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
					Checked				Fuji Electric Co., Ltd.	OZONE MASTER PLC PANEL DIGITAL I/O	



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for any design in this shop drawings rests with the Contractor.

Responsibility for modification and installation of field dimensions. Make field changes at the time of construction. Test all work and equipment of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					Drawn		1/9/06	SML
					Checked			

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
Winnipeg ENGINEERING DIVISION

OZONE MASTER PLC PANEL ANALOG I/O

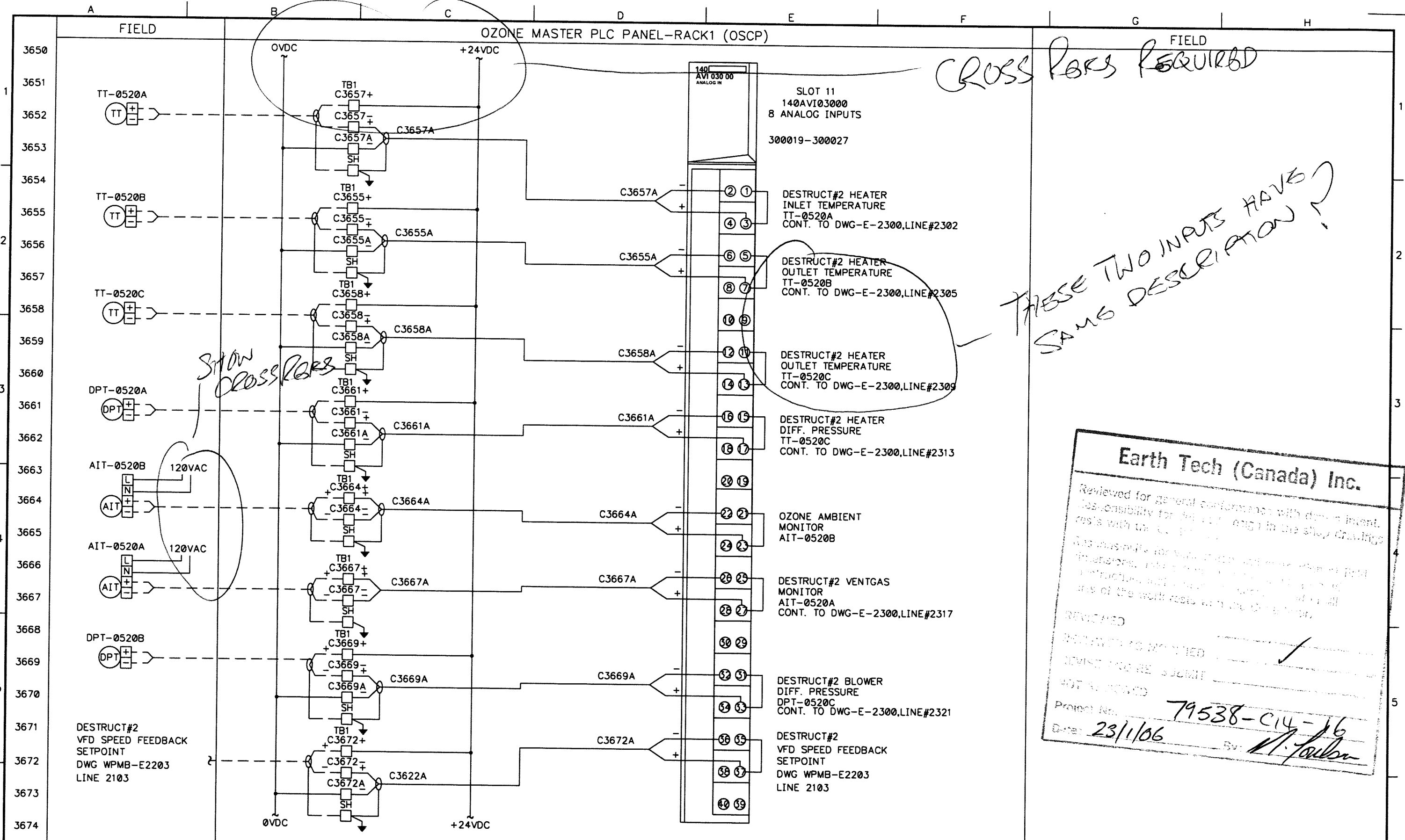
Dwg No. WPMB-E3601

Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005

CROSS PORS REQUIRED

THESE TWO INPTS HAVE SAME DESCRIPTION?

SHOW CROSS PORS



Earth Tech (Canada) Inc.

Reviewed for general conformance with drawings. Responsibility for the accuracy of the drawings rests with the client.

Not responsible for any errors or omissions in the drawings, specifications, or conditions of the work resulting from the drawings.

REVIEWED _____

DESIGNED BY MONYED _____

REVISED AND RE-SUBMITTED _____

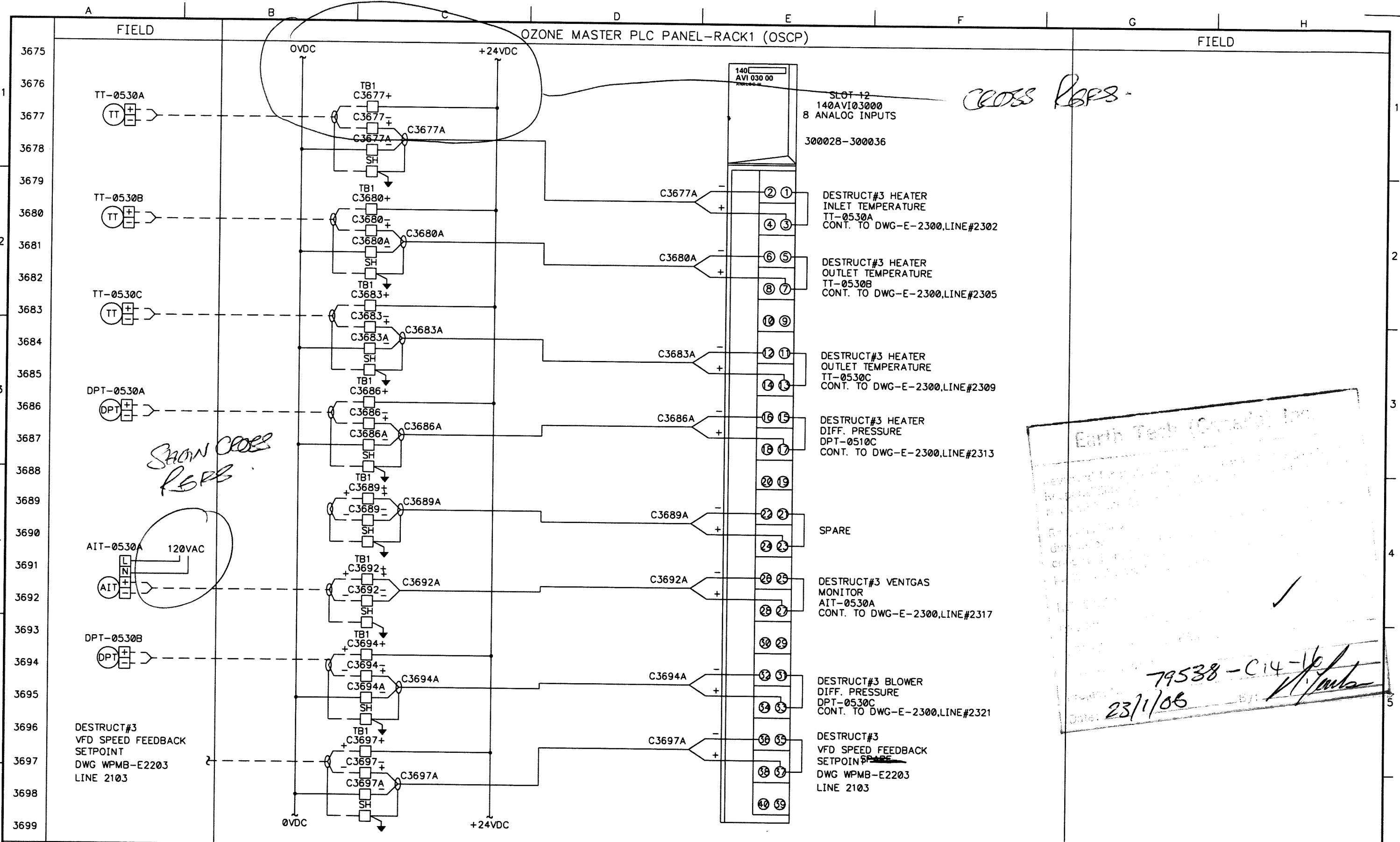
NOT RECORDED _____

Project No. **79538-C14-16**

Date: **23/1/06** By: *M. Taylor*

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.			THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg. No.	WPMB-E3602
			OZONE MASTER PLC PANEL ANALOG I/O		Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



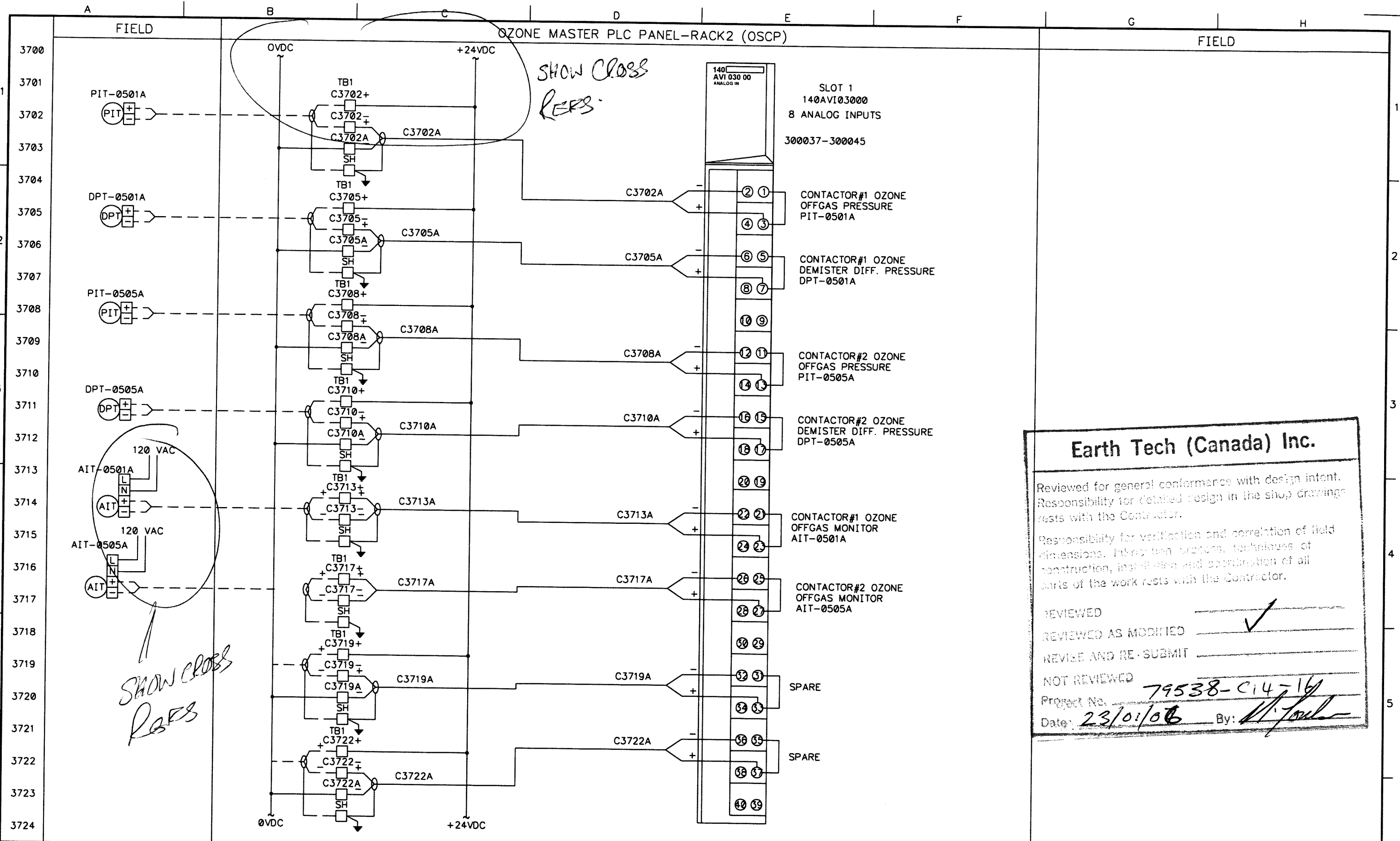
Earth Tech (Canada) Inc.

79538-C14-16

Date: 23/1/06

[Signature]

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name	Title	THE CITY OF WINNIPEG		Dwg.No.	Ref.
									WATER AND WASTE DEPARTMENT				WPMB-E3603
						1/9/06	SML	Fuji Electric Co.,Ltd.	Winnipeg ENGINEERING DIVISION			Fuji Project No.: WPMB-1105
									OZONE MASTER PLC PANEL ANALOG I/O			City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, instrumentation, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/01/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
					Drawn	1/9/06	SML
					Checked		

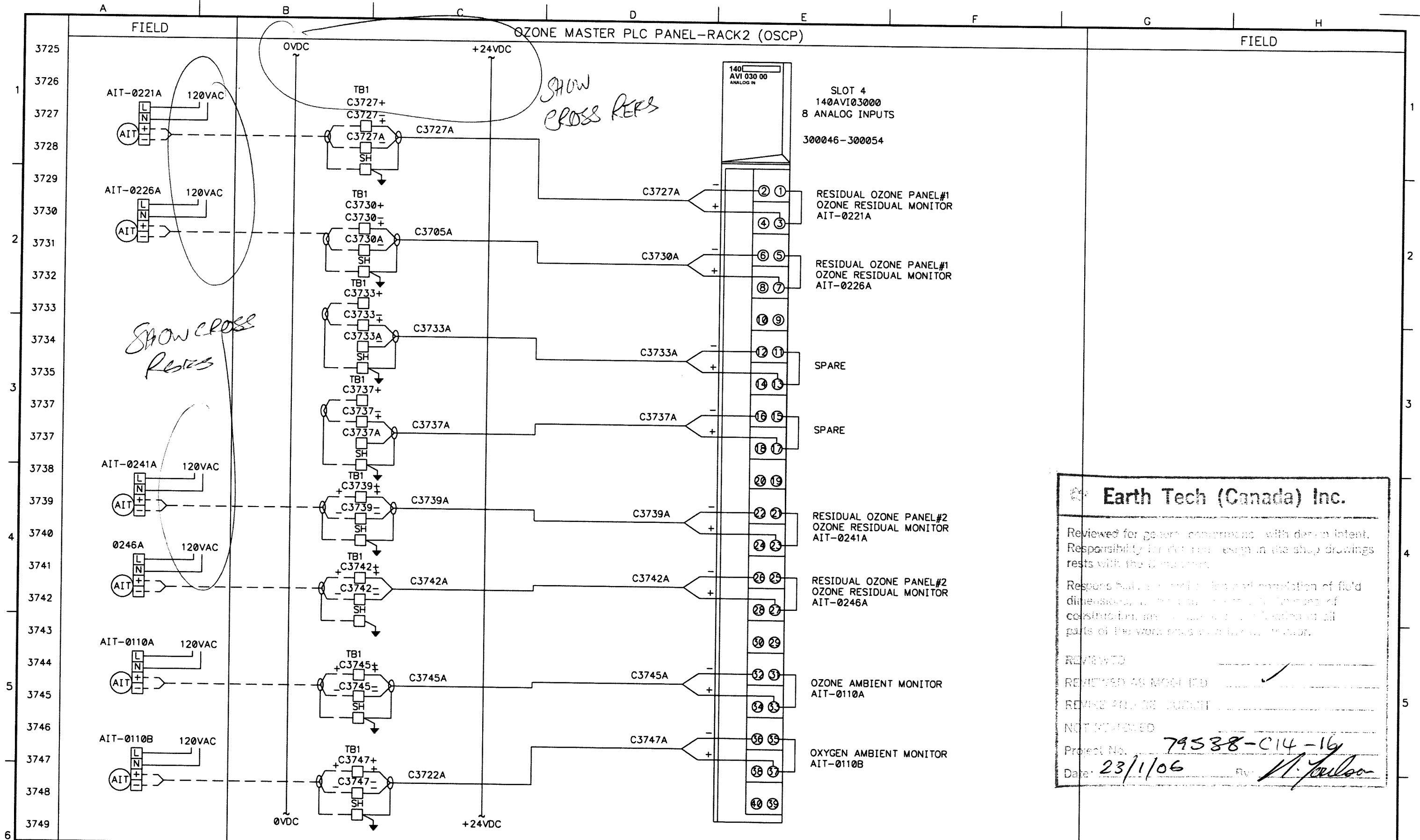
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
Winnipeg ENGINEERING DIVISION

OZONE MASTER PLC PANEL ANALOG I/O

Dwg. No. **WPMB-E3700**

Ref. Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general compliance with design intent. Responsibility for design errors in the shop drawings rests with the Designer.

Responsibility for the interpretation of field dimensions, and the accuracy of the dimensions of construction, and the accuracy of the location of all parts of the work rests with the Contractor.

REVIEWED _____

REVISOR AS MODIFIED _____

REVISION APPROVED _____

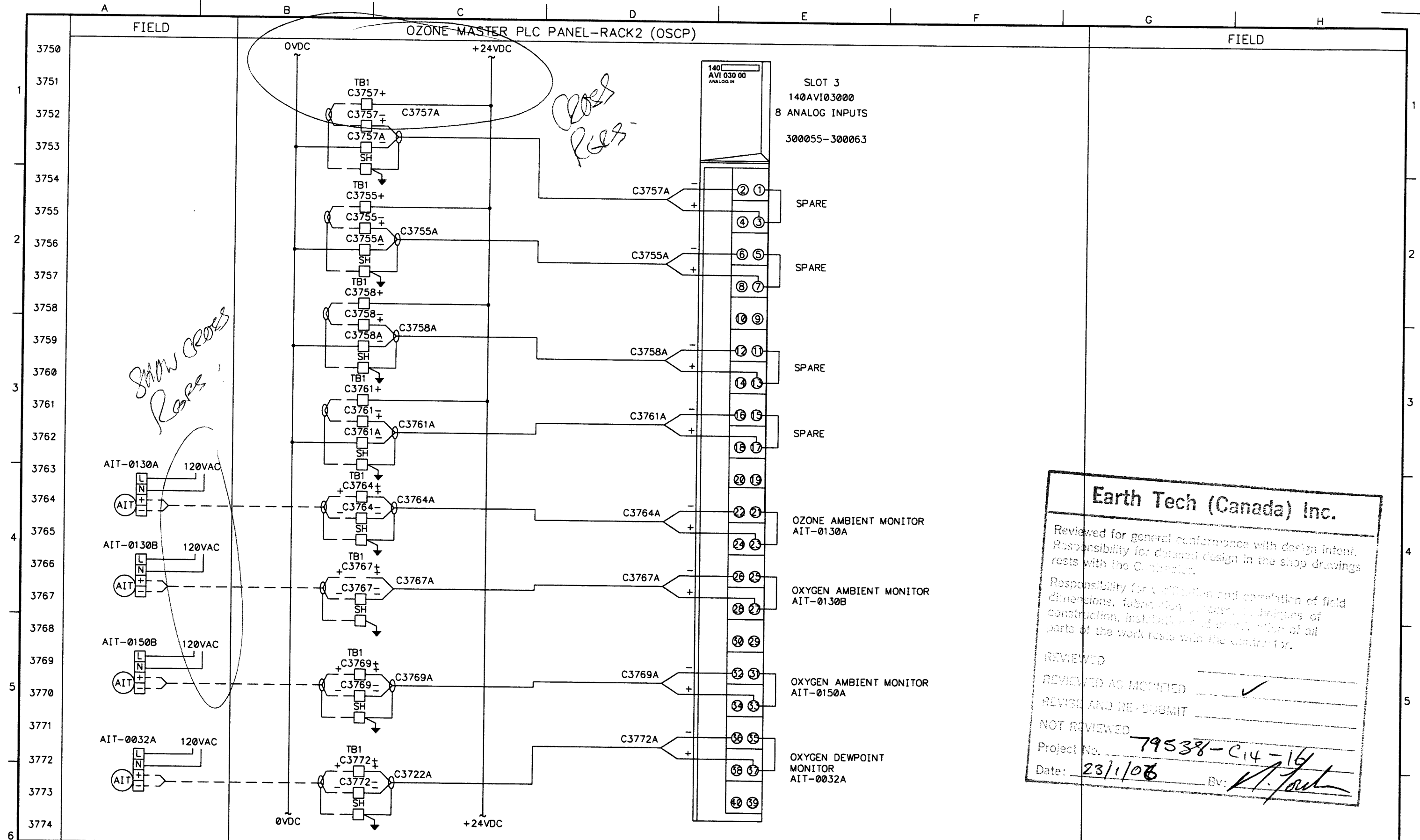
NOT REVISIONED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. J. Wilson

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
					Drawn	1/9/06	SML
					Checked		

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT Winnipeg ENGINEERING DIVISION	Dwg. No. WPMB-E3701
		Title OZONE MASTER PLC PANEL ANALOG I/O	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and completion of field dimensions, fabrication, erection, and inspection of construction, installation and operation of all parts of the work rests with the contractor.

REVIEWED _____

REVIEWED AS MODIFIED

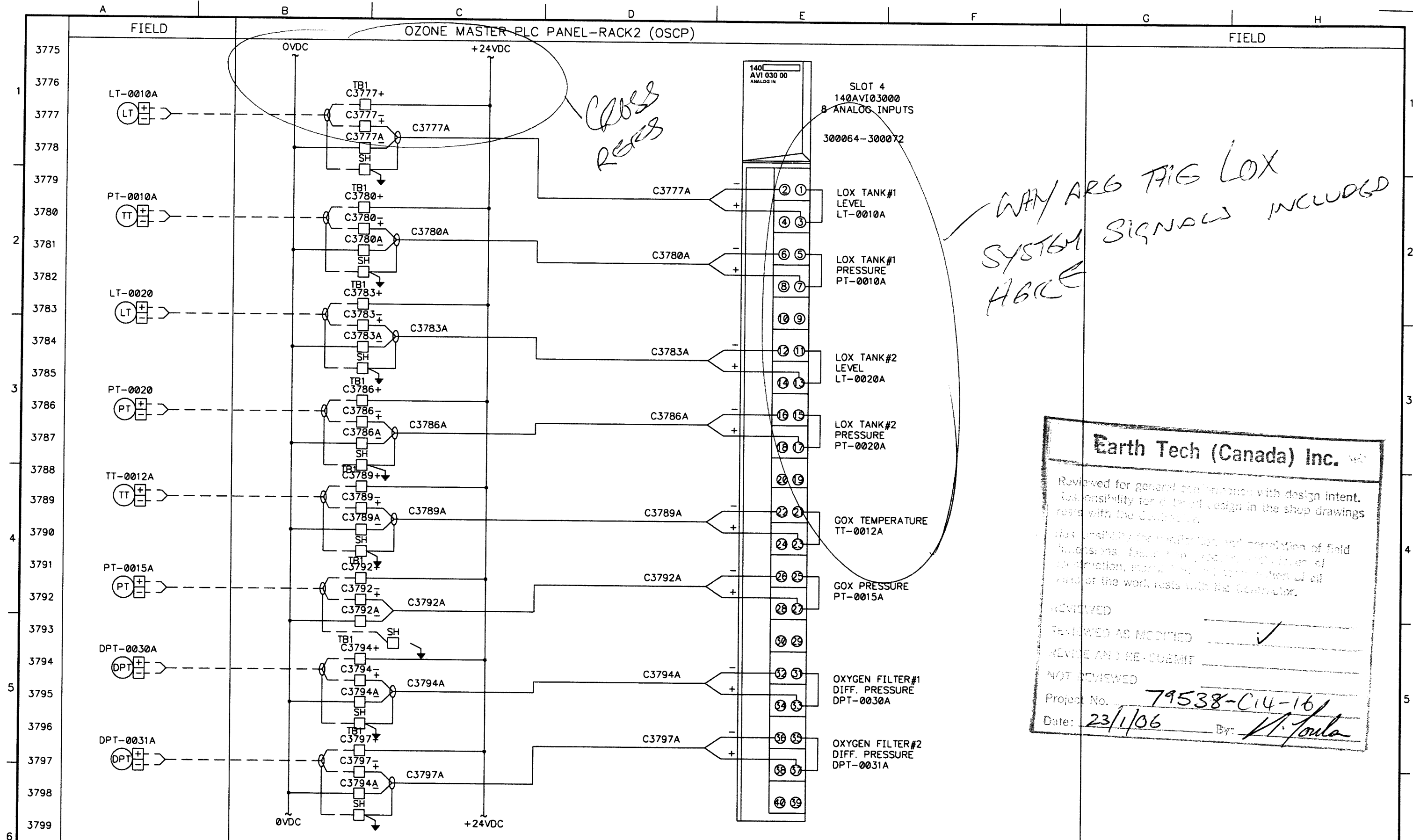
REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Date	Name	Title	Dwg.No.	Ref.
					1/9/06	SML	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E3702



WHY ARE THIS LOX SYSTEM SIGNALS INCLUDED HERE

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for modification and coordination of field dimensions, field test, pressure, installation of construction, including the termination of all work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

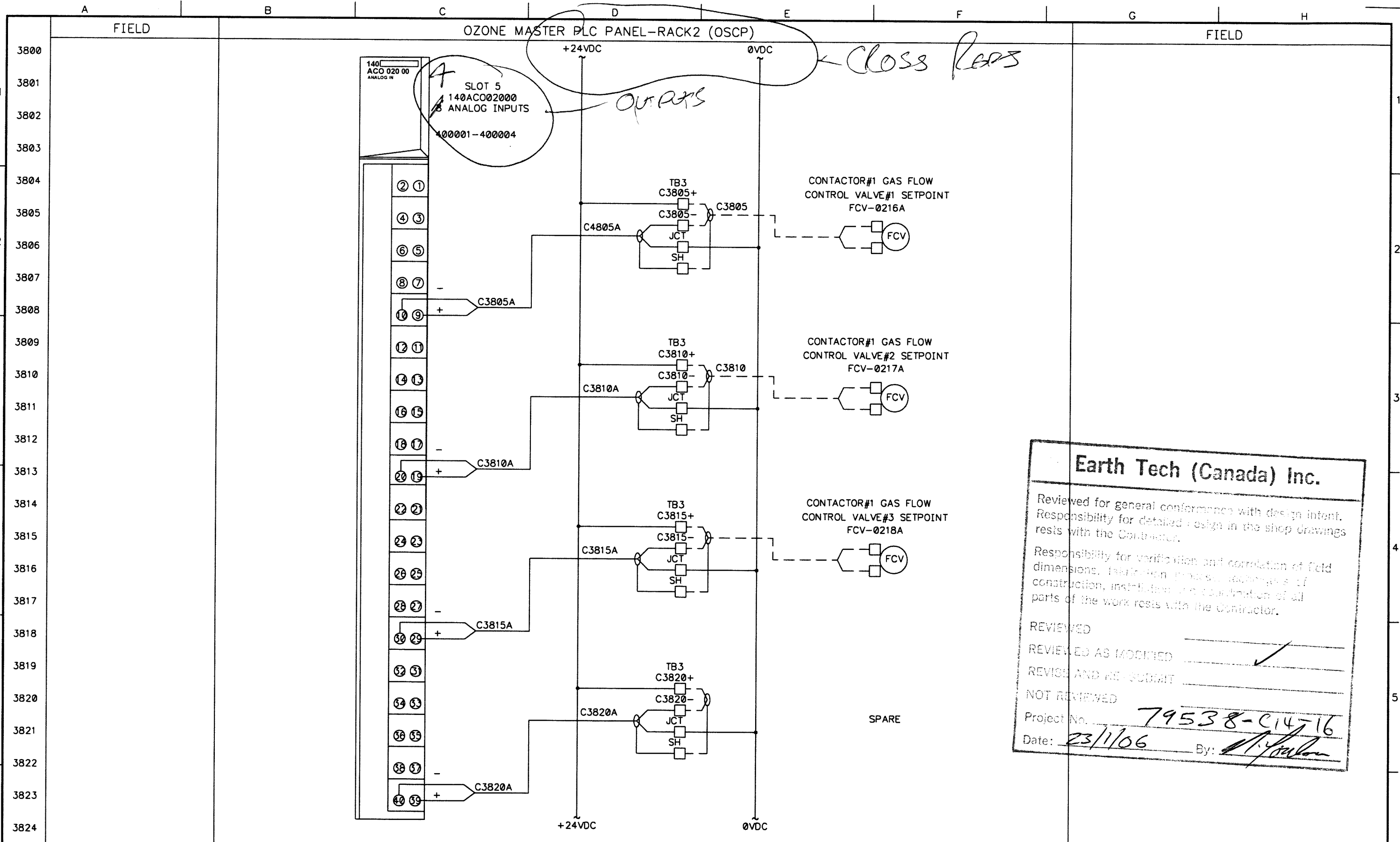
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Joubert

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name
						1/9/06	SML

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg. No. WPMB-E3703
Title: OZONE MASTER PLC PANEL ANALOG I/O		Ref: Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005		



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication, installation, and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

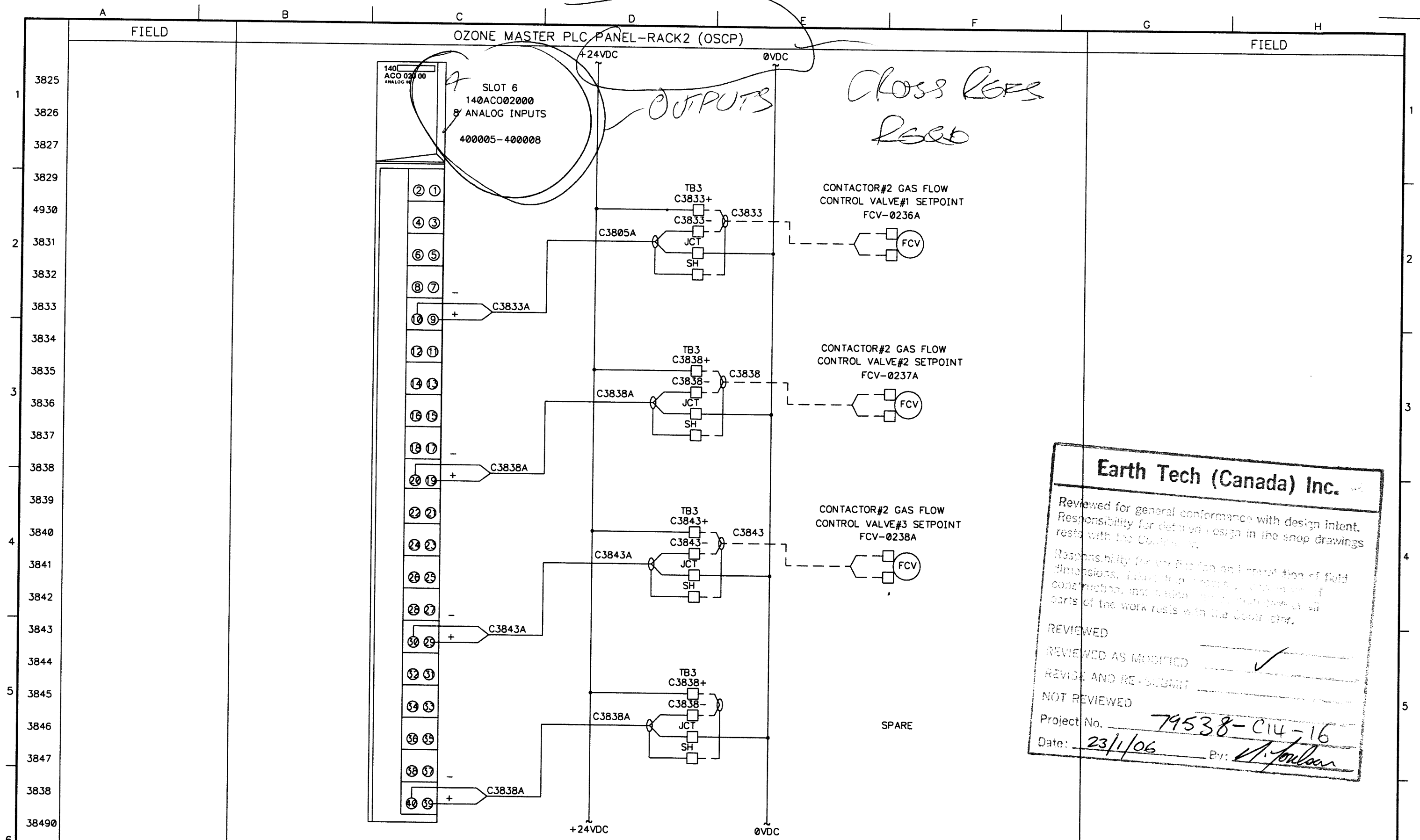
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Rev. No.	Description	By	Date	Checked	Date	Name
					1/9/06	SML

Revisions Rev. No. Description By Date Checked	Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg. No. WPMB-E3800
			Title OZONE MASTER PLC PANEL ANALOG I/O	Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the snap drawings rests with the Contractor.

Responsibility for verification and operation of field dimensions, installation, and maintenance of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

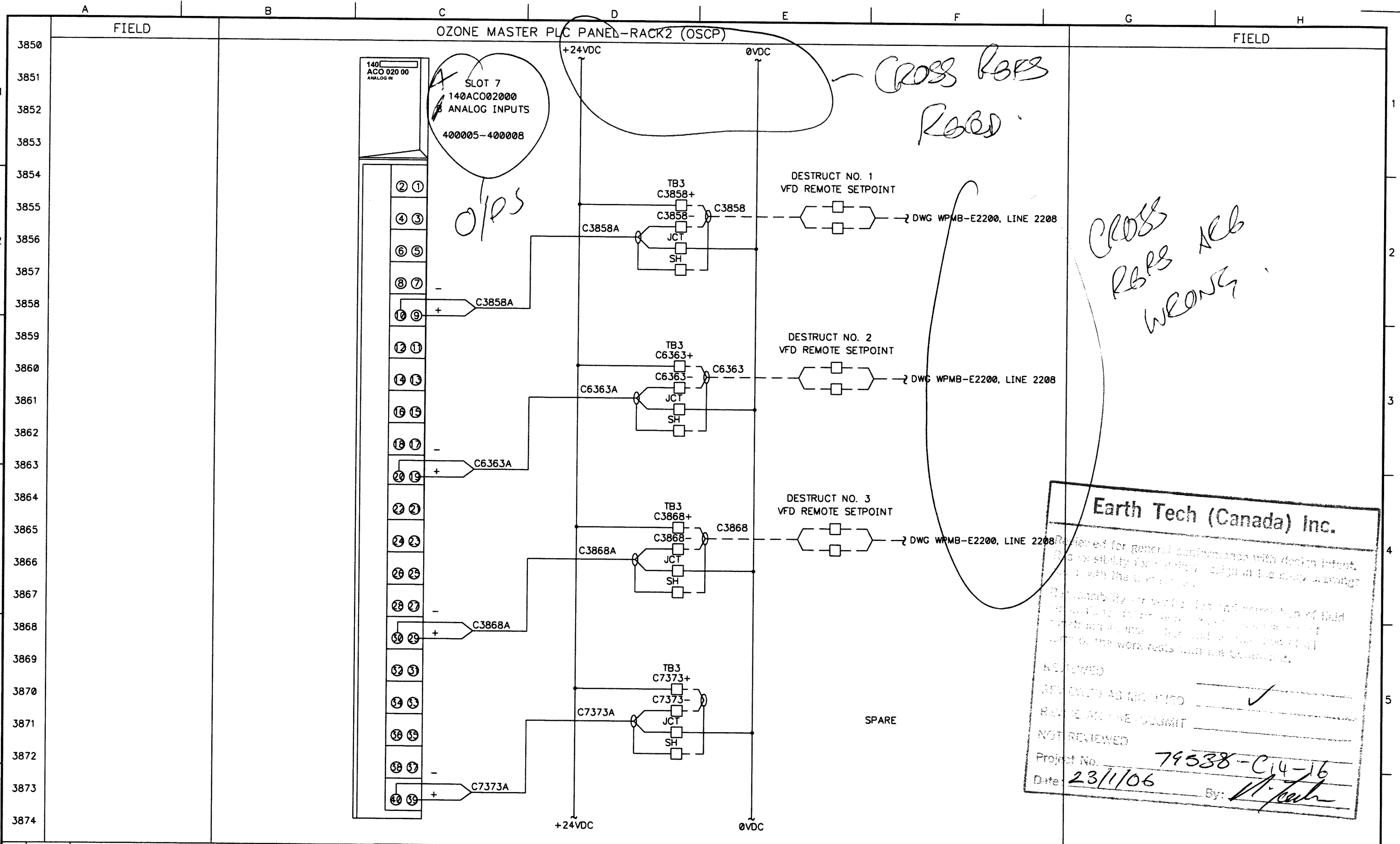
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Joubert

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Checked	Checked	Date	Name
						1/9/06	SML				

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		WPMB-E3801	
Title OZONE MASTER PLC PANEL ANALOG I/O		Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005			



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
This responsibility for the design is not a design warranty
with the City of Winnipeg.

Reviewed for general conformance with design intent.
This responsibility for the design is not a design warranty
with the City of Winnipeg.

Reviewed for general conformance with design intent.
This responsibility for the design is not a design warranty
with the City of Winnipeg.

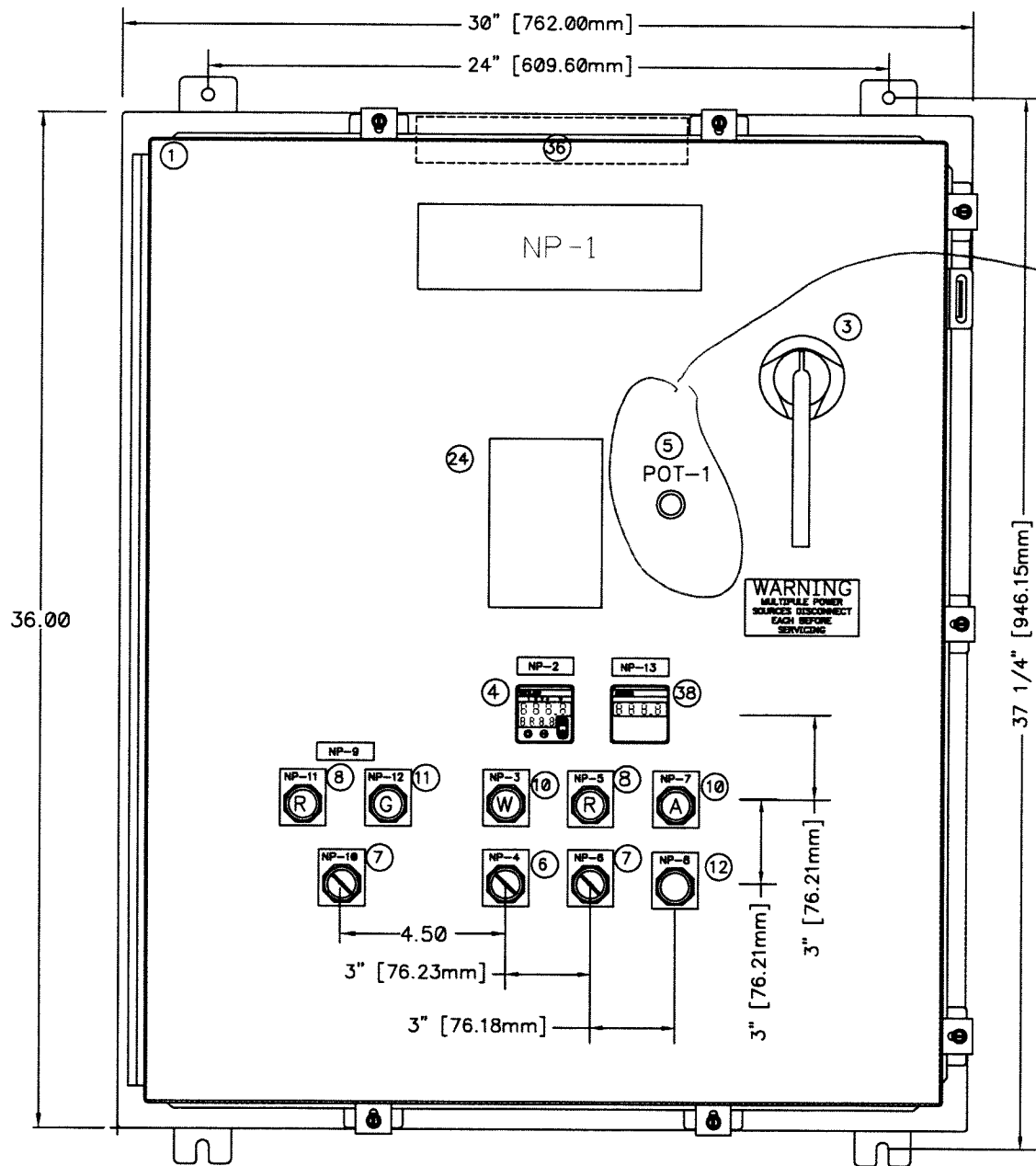
REVIEWED _____
 APPROVED AS NOTIFIED _____
 REVIEW AND SIGNATURE _____
 NOT REVIEWED _____

Project No. **79538-C14-16**
 Date **23/1/06** By: *[Signature]*

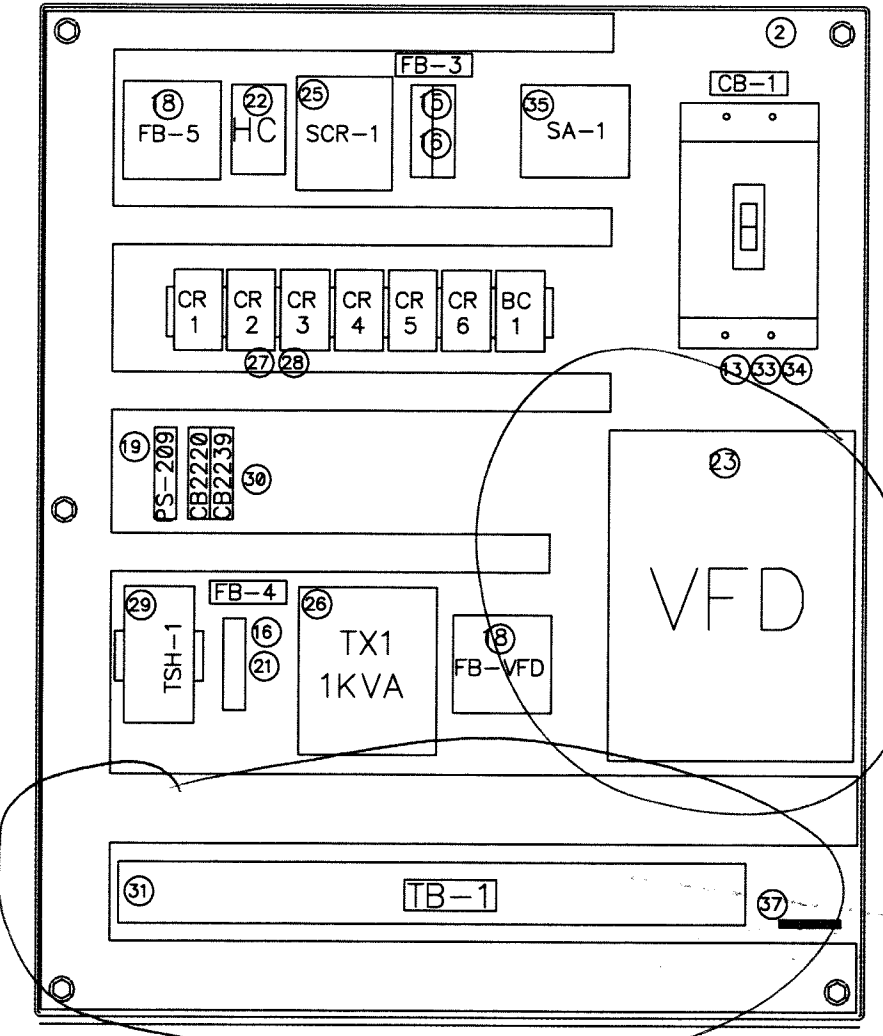
Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E3802
OZONE MASTER PLC PANEL ANALOG I/O	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005



WHY HAVE
DOT WHEN
KEYPAD IS
INSTALLED.



PLEASE
USE ABB
VFD AS
SPECIFIED
ABB 800

USE BUSB DISCONNECT TERMINALS
FOR FOLD WIRING CONNECTIONS.

NAMEPLATES		
DESTRUCT UNIT NO. 1		
	FIRST LINE	SECOND LINE
NP-1	DESTRUCT UNIT NO.1	
NP-2	HEATER	TEMPERATURE
NP-3	CONTROL POWER	ON
NP-4	CONTROL POWER	OFF ON
NP-5	DESTRUCT	ON
NP-6	OFF	ON REMOTE
NP-7	DESTRUCT	COMMON ALARM
NP-8	VACUUM VALVE	CONTROL
NP-9	VALVE ECV-0510A	CONTROL
NP-10	OPEN	CLOSE REMOTE
NP-11	OPEN	
NP-12	CLOSE	
NP-13	ELAPSED TIME	

VACUUM

Revisions	Rev. No.	Description	By	Date

Date	Name
1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
Title OZONE DESTRUCT UNIT NO. 1
 PANEL LAYOUT

Dwg. No. WPMB-E2100
Ref. Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correction of field
dimensions, fabrication, erection, installation of
construction, inspection and completion of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

79538-04-16

Date: _____

23/1/06

By: _____

[Signature]

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDOR
1		1	HOFFMAN	A-36H3012SSLP	ENCLOSURE, 36" X 30" X 12", TYPE 304 STAINLESS STEEL SINGLE DOOR, NEMA 4X	FD LAWRENCE
2		1	HOFFMAN	A-36P30	SUBPANEL, FULL SIZE, 33" X 27"	FD LAWRENCE
3		1	SQUARE D	LC46	DISCONNECT HANDLE ASSEMBLY, NEMA 4X	FD LAWRENCE
4	TIC-1	1	WATLOW - NEW STYLE	96A0-CAAA-AARR	SERIES 96, TEMPERATURE CONTROLLER	FD LAWRENCE
5	POT-1	1	SQUARE D	9001-K37	POTENTIOMETER METER	FD LAWRENCE
6	HS-2	1	SQUARE D	9001SKS11BH1	30MM, NEMA 4X NON-ILLUMINATED 2 POSITION SELECTOR SWITCH, (1) NO/NC BLOCKS	FD LAWRENCE
7	HS-1, 3	2	SQUARE D	9001SKS43BH2	30MM, NEMA 4X NON-ILLUMINATED 3 POSITION SELECTOR SWITCH, (2) NO/NC BLOCKS	FD LAWRENCE
8	L2,L4	2	SQUARE D	9001SKP1R31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, RED LENS	FD LAWRENCE
9		1	SQUARE D	KA2	CONTACT BLOCKS	FD LAWRENCE
10	L1	1	SQUARE D	9001SKP1W31	30MM, NEMA 4X STANDARD PILOT LIGHT, 120VAC TRANSFORMER TYPE, WHITE LENS	FD LAWRENCE
11	L3	1	SQUARE D	9001SKP1A31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, AMBER LENS	PANEL FAB
12	PB-2, 3	2	SQUARE D	9001SKR1UH2	30MM, NEMA 4X NON-ILLUMINATED MOMENTARY PUSHBUTTON, BLACK	FD LAWRENCE
13	CB-1	1	SQUARE D	FCL34020	CIRCUIT BREAKER 480V 20A	FD LAWRENCE
14		3	BUSSMAN	FNQ-R-10	FUSE, 600V, 10A TIME DELAYED FUSE	FD LAWRENCE
15	FB-3	1	BUSSMAN	BC6032B	2 POLE FUSEBLOCK, 600V, 200,000A	FD LAWRENCE
16	FB-4	1	BUSSMAN	BM6031B	1 POLE FUSEBLOCK, 600V, 30A	FD LAWRENCE
17						
18	FB-5,FB-VFD	2	BUSSMAN	BC6033B	3 POLE FUSEBLOCK,600V,200,000A	FD LAWRENCE
19	PS-209	1	SQUARE D	ABL7 RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
20		2	BUSSMAN	FNQ-R-3	FUSE, 600V, 3.0A TIME DELAYED FUSE	FD LAWRENCE
21		1	BUSSMAN	FNM-8	FUSE, 250V, 8A	FD LAWRENCE
22	HC	1	SQUARE D	LC1D0910G6	CONTACTOR, 4 POLE, 120VAC COIL	FD LAWRENCE
23	VFD	1	SQUARED	ATV28U72N4U	3-POLE VARIABLE SPEED DRIVE <i>USE ABB DRIVE.</i>	FD LAWRENCE
24	KEYPAD	1	SQUARED	VW3A-28101	KEYPAD MOUNTING KIT FOR VFD	FD LAWRENCE
25	SCR-1	1	WATLOW	DB20-2060-C000	DIN-A-MITE, SOLID STATE POWER CONTROLLER	WATLOW
26	TX1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120 V, 1KVA	FD LAWRENCE
27	CR1-6 & BC1	7	SQUARE D	8501-KU12P14V20	120VAC, CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
28		7	SQUARE D	8501-NR82B	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS FOR ITEM4	FD LAWRENCE
29	TSH-1	1	WATLOW	LVC6KW00321112A	SERIES 146 HIGH TEMPERATURE LIMIT RELAY	WATLOW
30	CB2220,2239	2	SQUARE D	MG24501	CIRCUIT BREAKER, 120-VAC 2A	FD LAWRENCE
31	TB-1	50	SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS, <i>ENSURE THE DISCONNECT TYPE</i>	PANEL FAB.
32		3	BUSSMAN	FNQ-R-20	FUSE, 600V, 20A TIME DELAYED FUSE <i>TERMINALS ARE USED FOR FIELD CONNECTIONS</i>	FD LAWRENCE
33		1	SQUARE D	9421LF1	OPERATING MECHANISM FOR FCL BREAKER	FD LAWRENCE
34		1	SQUARE D	9421LS12	LONG SHAFT FOR DISCONNECT MECHANISM	FD LAWRENCE
35	SA-1	1	SQUARE D	6671-SDSA3650	SURGE ARRESTER, 480 VAC	FD LAWRENCE
36		1	HOFFMAN	A-LTDB1	PANEL LIGHT	FD LAWRENCE
37		1	ITE	GB5	GROUND BUSS	PANEL FAB.
38	ETM-1	1	HECON	0891204	DESTRUCT ELAPSED TIME METER	FD LAWRENCE
39	L5	1	SQUARE D	9001SKP1G31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, GREEN LENS	FD LAWRENCE
40						FD LAWRENCE
41						FD LAWRENCE
42						FD LAWRENCE
43						FD LAWRENCE
44						FD LAWRENCE
45						FD LAWRENCE

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Fuji Electric Co.,Ltd.	Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E2101	
					Checked	1/9/06	SML						
										OZONE DESTRUCT UNIT NO. 1 BILL OF MATERIALS		Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	

Earth Tech (Canada) Inc.

(Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

(Responsibility for verification and correlation of field dimensions, foundation anchors, installation of construction materials and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

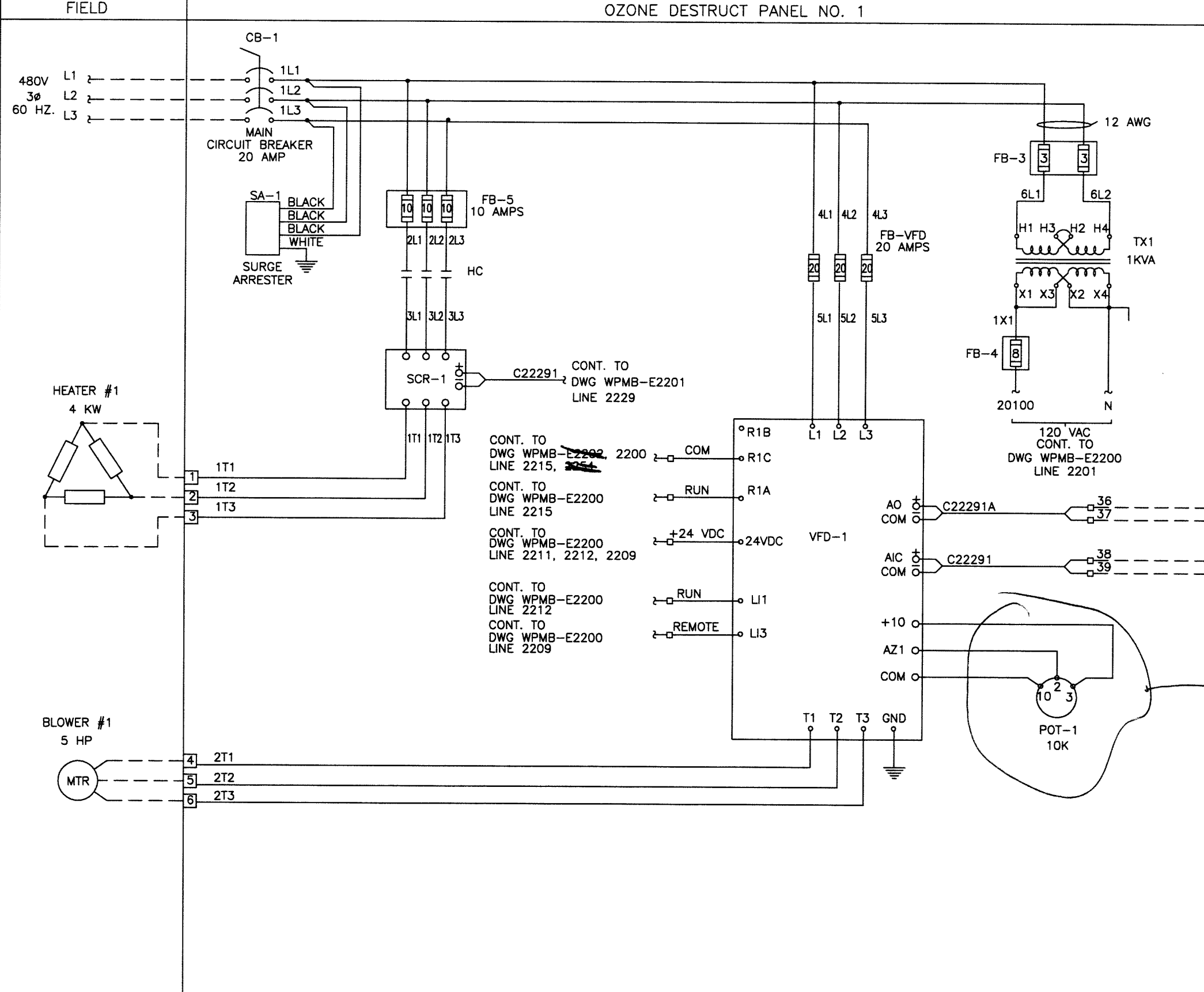
NOT REVIEWED _____

Project No. 79338-C14-16

Date: 23/1/06 By: M. Joubert

A B C D E F G H

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Earth Tech (Canada) Inc.

Reviewed for general performance with design intent. Responsibility for the design in the shop drawings rests with the contractor.

Review for the correlation of field to design. Responsibility for the correlation of field to design rests with the contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14716

Date: 23/1/06 By: [Signature]

SPEED FEEDBACK
DWG WPMB-E3601, LINE 3647

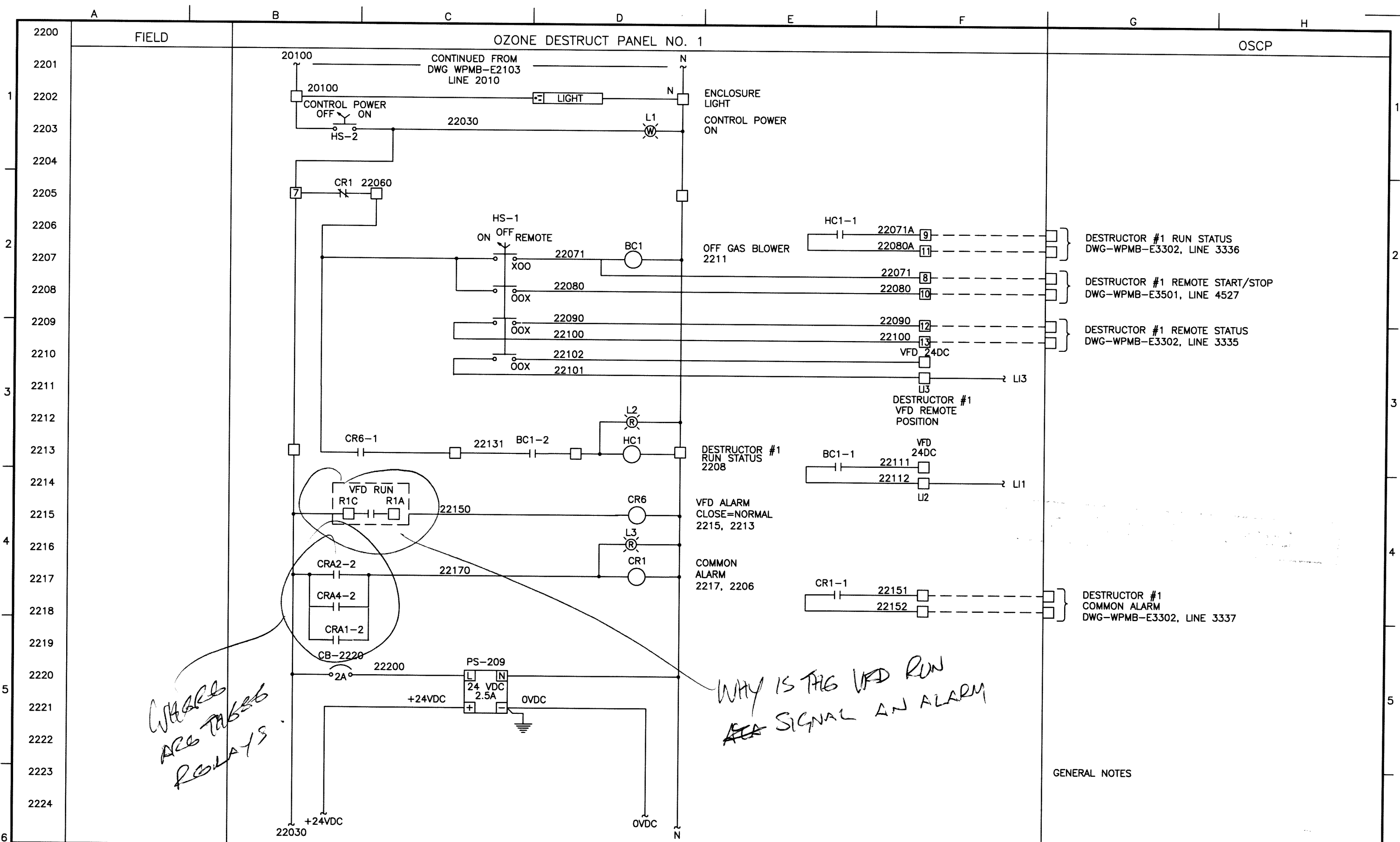
REMOTE SPEED SETPOINT
DWG WPMB-E3802, LINE 3857

*REMOVING POT
IF KEY/PAD
AVAILABLE*

GENERAL NOTES

Revisions	Date	Name	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg.No.
	1/9/06	SML	Fuji Electric Co., Ltd.		WPMB-E2103
Rev. No.	Description	By	Date	Title	Ref.
				OZONE DESTRUCT UNIT NO. 1 480V POWER DISTRIBUTION	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

A B C D E F G H



WHERE ARE THESE RELAYS?

WHY IS THIS VFD RUN SIGNAL AN ALARM?

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	
Title OZONE DESTRUCT UNIT NO. 1 CONTROLS		Dwg.No. WPMB-E2200	
		Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication, erection, tolerances of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____

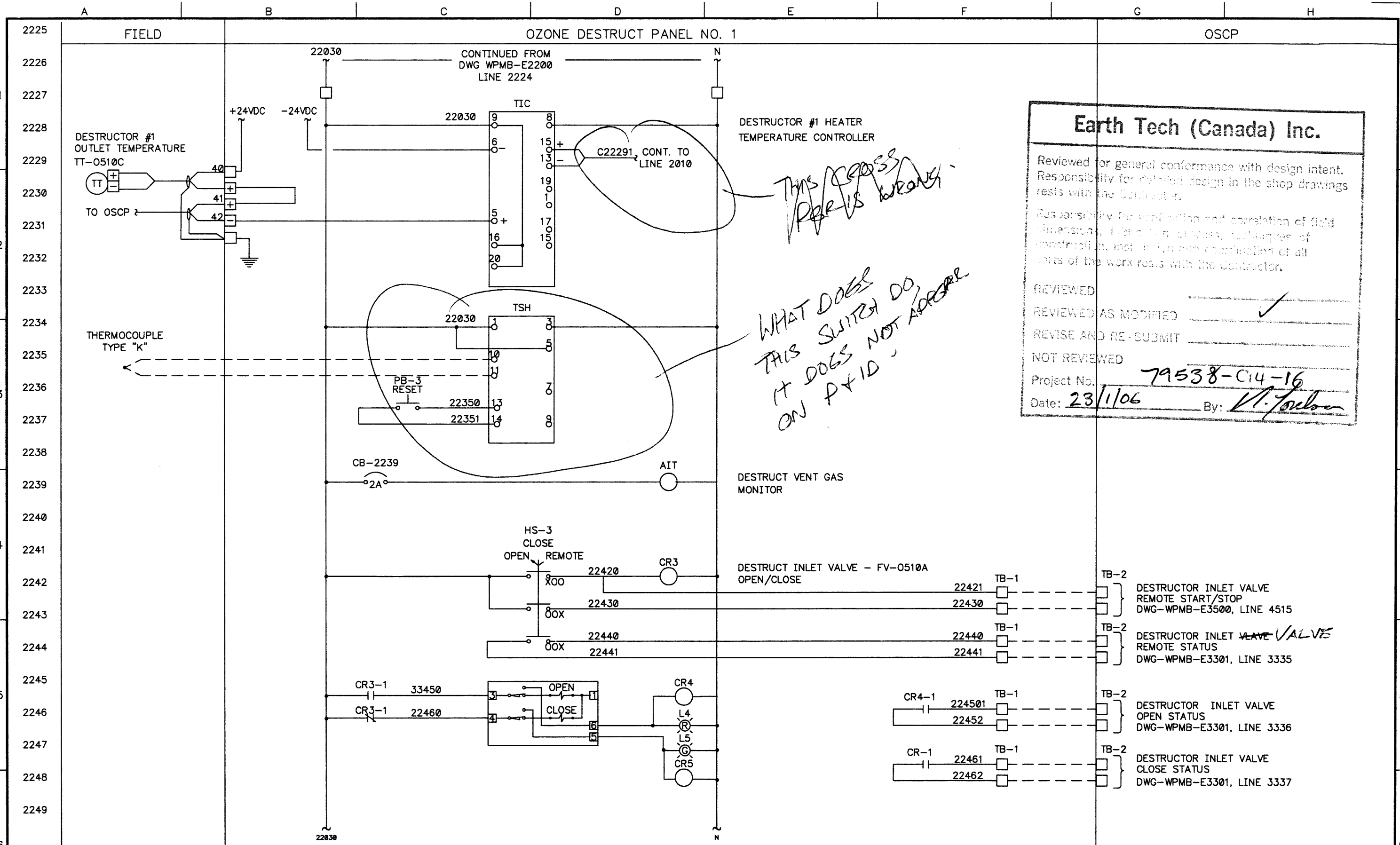
REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-1/6

Date: 23/1/06 By: M. Pells



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication details, and degrees of construction, not including coordination of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

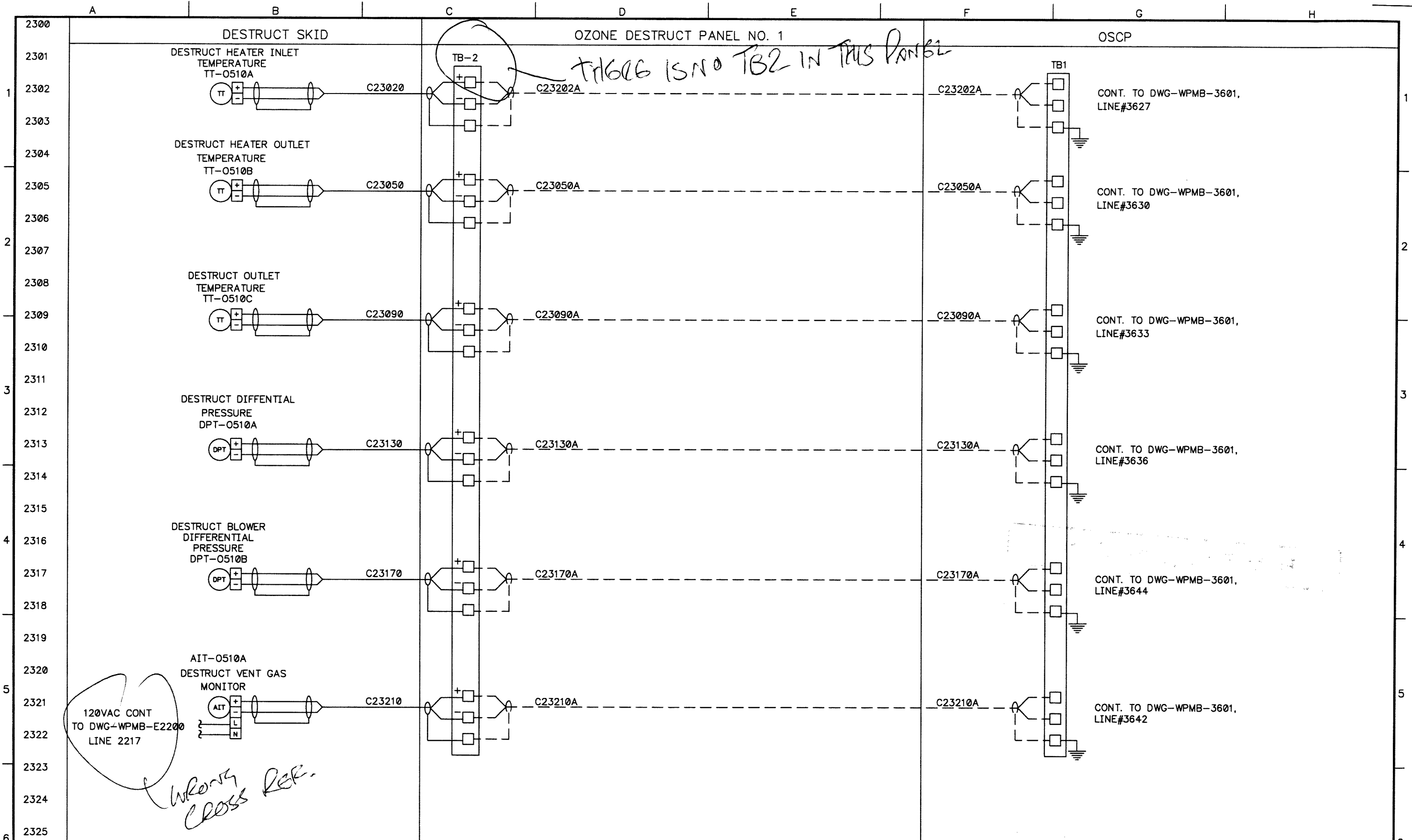
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Checked	Date	Name
					SML		1/9/06	SML

Fuji Electric Co., Ltd.			THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION			WPMB-E2201		
OZONE DESTRUCT UNIT NO. 1 CONTROLS			Ref. Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005					



Rev. No.	Description	By	Date

Date	Name
1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
**OZONE DESTRUCT UNIT NO. 1
 CONTROLS**

Dwg. No. **WPMB-E2300**
 Ref. Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correction of field
dimensions, fabric, shop orders, field area of
construction, install, and maintenance of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

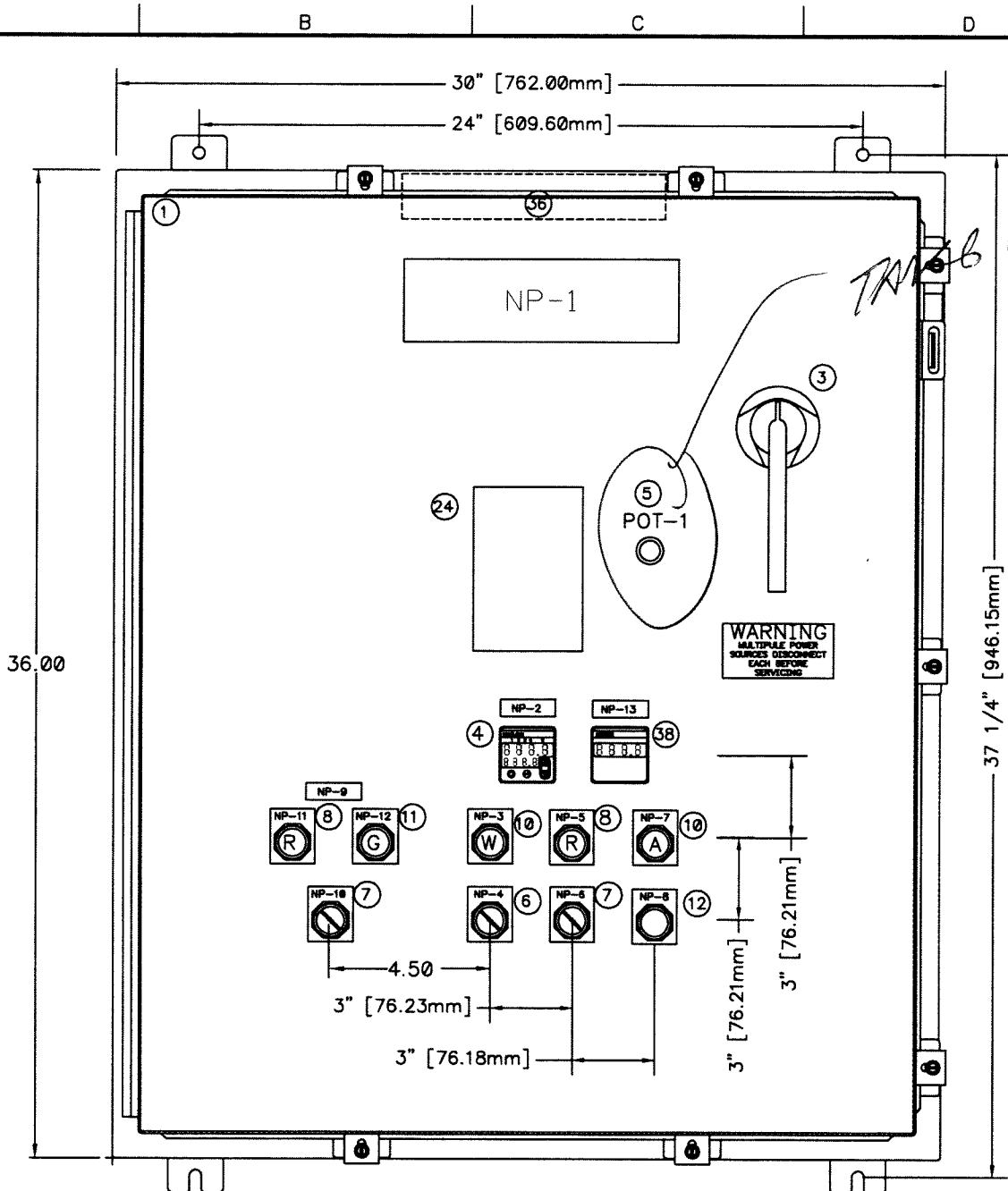
79538-C14-16

Date: _____

23/1/06

By: _____

M. Fowler



TRIM OUT POT

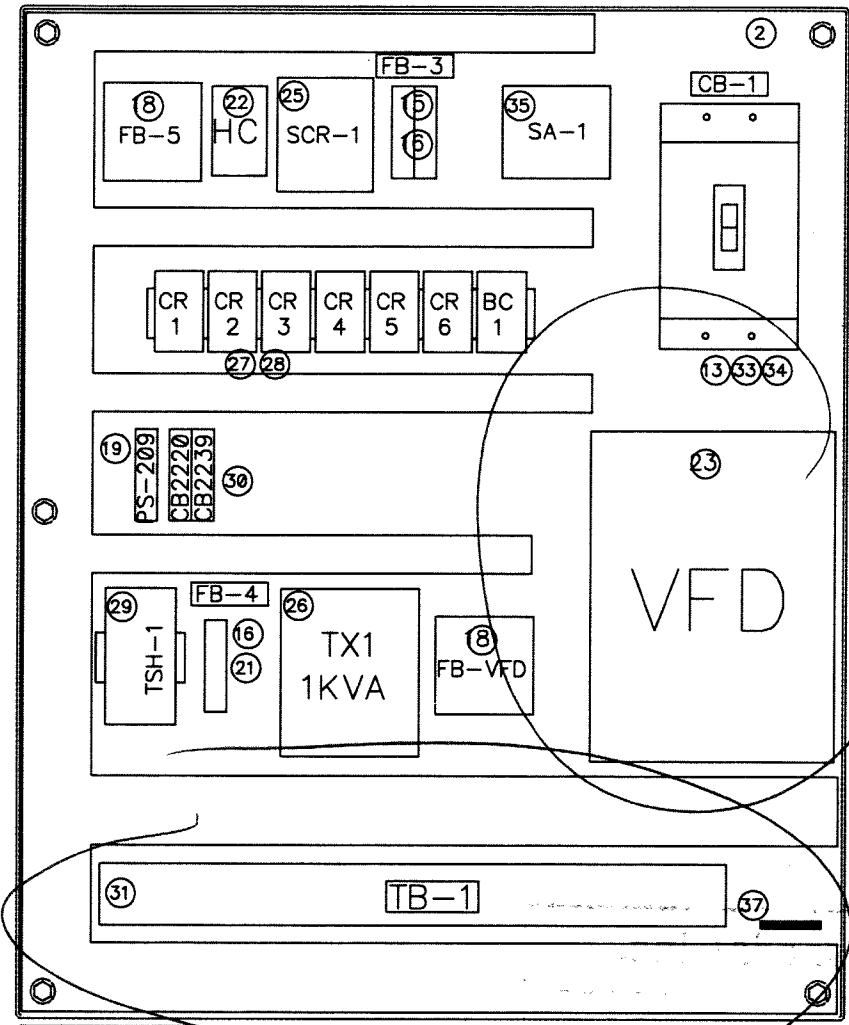


ABB VFD R6CD

USE DISCONNECT TERMINALS

PROVIDE A UNIQUE DRAWING NUMBER

NAMEPLATES		
	FIRST LINE	SECOND LINE
NP-1	DESTRUCT UNIT	NO.2
NP-2	HEATER	TEMPERATURE
NP-3	CONTROL POWER	ON
NP-4	CONTROL POWER	OFF ON
NP-5	DESTRUCT	ON
NP-6	OFF	ON REMOTE
NP-7	DESTRUCT	COMMON ALARM
NP-8	VACUMN VALVE	CONTROL
NP-9	VALVE FCV-0520A	CONTROL
NP-10	OPEN	CLOSE REMOTE
NP-11	OPEN	
NP-12	CLOSE	
NP-13	ELAPSED TMIE	

Revisions	Rev. No.	Description	By	Date	Checked	Date	Name

Fuji Electric Co.,Ltd

THE CITY OF WINNIPEG
 WATER AND WASTE DEPARTMENT
 ENGINEERING DIVISION
**OZONE DESTRUCT UNIT NO. 2
 PANEL LAYOUT**

Dwg.No. **WPMB-E2100**
 Ref. Fuji Project No.: WPMB-1105
 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and coordination of all parts of the work rests with the Contractor.

REVIEWED _____ / _____

REVIEWED AS MODIFIED _____

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Pulson

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDOR
1		1	HOFFMAN	A-36H3012SSLP	ENCLOSURE, 36" X 30" X 12", TYPE 304 STAINLESS STEEL SINGLE DOOR, NEMA 4X	FD LAWRENCE
2		1	HOFFMAN	A-36P30	SUBPANEL, FULL SIZE, 33" X 27"	FD LAWRENCE
3		1	SQUARE D	LC46	DISCONNECT HANDLE ASSEMBLY, NEMA 4X	FD LAWRENCE
4	TIC-1	1	WATLOW - NEW STYLE	96A0-CAAA-AARR	SERIES 96, TEMPERATURE CONTROLLER	FD LAWRENCE
5	POT-1	1	SQUARE D		POTENTIOMETER METER	FD LAWRENCE
6	HS-2	1	SQUARE D	9001SKS11BH1	30MM, NEMA 4X NON-ILLUMINATED 2 POSITION SELECTOR SWITCH, (1) NO/NC BLOCKS	FD LAWRENCE
7	HS-1, 3	2	SQUARE D	9001SKS43BH2	30MM, NEMA 4X NON-ILLUMINATED 3 POSITION SELECTOR SWITCH, (2) NO/NC BLOCKS	FD LAWRENCE
8	L2,L4	2	SQUARE D	9001SKP1R31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, RED LENS	FD LAWRENCE
9		1	SQUARE D	KA2	CONTACT BLOCKS	FD LAWRENCE
10	L1	1	SQUARE D	9001SKP1W31	30MM, NEMA 4X STANDARD PILOT LIGHT, 120VAC TRANSFORMER TYPE, WHITE LENS	FD LAWRENCE
11	L3	1	SQUARE D	9001SKP1A31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, AMBER LENS	PANEL FAB
12	PB-2, 3	2	SQUARE D	9001SKR1UH2	30MM, NEMA 4X NON-ILLUMINATED MOMENTARY PUSHBUTTON, BLACK	FD LAWRENCE
13	CB-1	1	SQUARE D	FCL34020	CIRCUIT BREAKER 480V 20A	FD LAWRENCE
14		3	BUSSMAN	FNQ-R-10	FUSE, 600V, 10A TIME DELAYED FUSE	FD LAWRENCE
15	FB-3	1	BUSSMAN	BC6032B	2 POLE FUSEBLOCK, 600V, 200,000A	FD LAWRENCE
16	FB-4	1	BUSSMAN	BM6031B	1 POLE FUSEBLOCK, 600V, 30A	FD LAWRENCE
17						
18	FB-5, FB-VFD	2	BUSSMAN	BC6033B	3 POLE FUSEBLOCK, 600V, 200,000A	FD LAWRENCE
19	PS-209	1	SQUARE D	ABL7 RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
20		2	BUSSMAN	FNQ-R-3	FUSE, 600V, 3.0A TIME DELAYED FUSE	FD LAWRENCE
21		1	BUSSMAN	FNQ-R-8	FUSE, 250V, 8A	FD LAWRENCE
22	HC	1	SQUARE D	LC1D0910G6	CONTACTOR, 4 POLE, 120VAC COIL	FD LAWRENCE
23	VFD	1	SQUARED	ATV28U72N4U	3-POLE VARIABLE SPEED DRIVE <i>ABB VFD (3000)</i>	FD LAWRENCE
24	KEYPAD	1	SQUARED	VW3A-28101	KEYPAD MOUNTING KIT FOR VFD	FD LAWRENCE
25	SCR-1	1	WATLOW	DB20-2060-C000	DIN-A-MITE, SOLID STATE POWER CONTROLLER	WATLOW
26	TX1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120 V, 1KVA	FD LAWRENCE
27	CR1-6 & BC1	7	SQUARE D	8501-KU12P14V20	120VAC, CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
28		7	SQUARE D	8501-NR82B	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS FOR ITEM4	FD LAWRENCE
29	TSH-1	1	WATLOW	LVC6KW00321112A	SERIES 146 HIGH TEMPERATURE LIMIT RELAY	WATLOW
30	CB2220, 2239	2	SQUARE D	MG24501	CIRCUIT BREAKER, 120 VAC 2A	FD LAWRENCE
31	TB-1	50	SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS, <i>DISCONNECT TERMINALS ROAD</i>	PANEL FAB.
32		3	BUSSMAN	FNQ-R-20	FUSE, 600V, 20A TIME DELAYED FUSE	FD LAWRENCE
33		1	SQUARE D	9421LF1	OPERATING MECHANISM FOR FCL BREAKER	FD LAWRENCE
34		1	SQUARE D	9421LS12	LONG SHAFT FOR DISCONNECT MECHANISM	FD LAWRENCE
35	SA-1	1	SQUARE D	6671-SDSA3650	SURGE ARRESTER, 480 VAC	FD LAWRENCE
36		1	HOFFMAN	A-LTDB1	PANEL LIGHT	FD LAWRENCE
37		1	ITE	GB5	GROUND BUSS	PANEL FAB.
38	ETM-1	1	HECON	0891204	DESTRUCT ELAPSED TIME METER	FD LAWRENCE
39	L5	1	SQUARE D	9001SKP1G31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, GREEN LENS	FD LAWRENCE
40						FD LAWRENCE
41						FD LAWRENCE
42						FD LAWRENCE
43						FD LAWRENCE
44						FD LAWRENCE
45						FD LAWRENCE

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	
					1/9/06	SML		
					Checked			
Fuji Electric Co., Ltd.								
					THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		Dwg. No.	WPMB-E2101
					Title OZONE DESTRUCT UNIT NO. 2 BILL OF MATERIALS		Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

Earth Tech (Canada) Inc.

Reviewed for general conformance, with due intent,
responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and completion of field
measurements, if any, from project, completion of
structure, and duration and collection of all
parts of the work rests with the Contractor.

REVIEWED _____

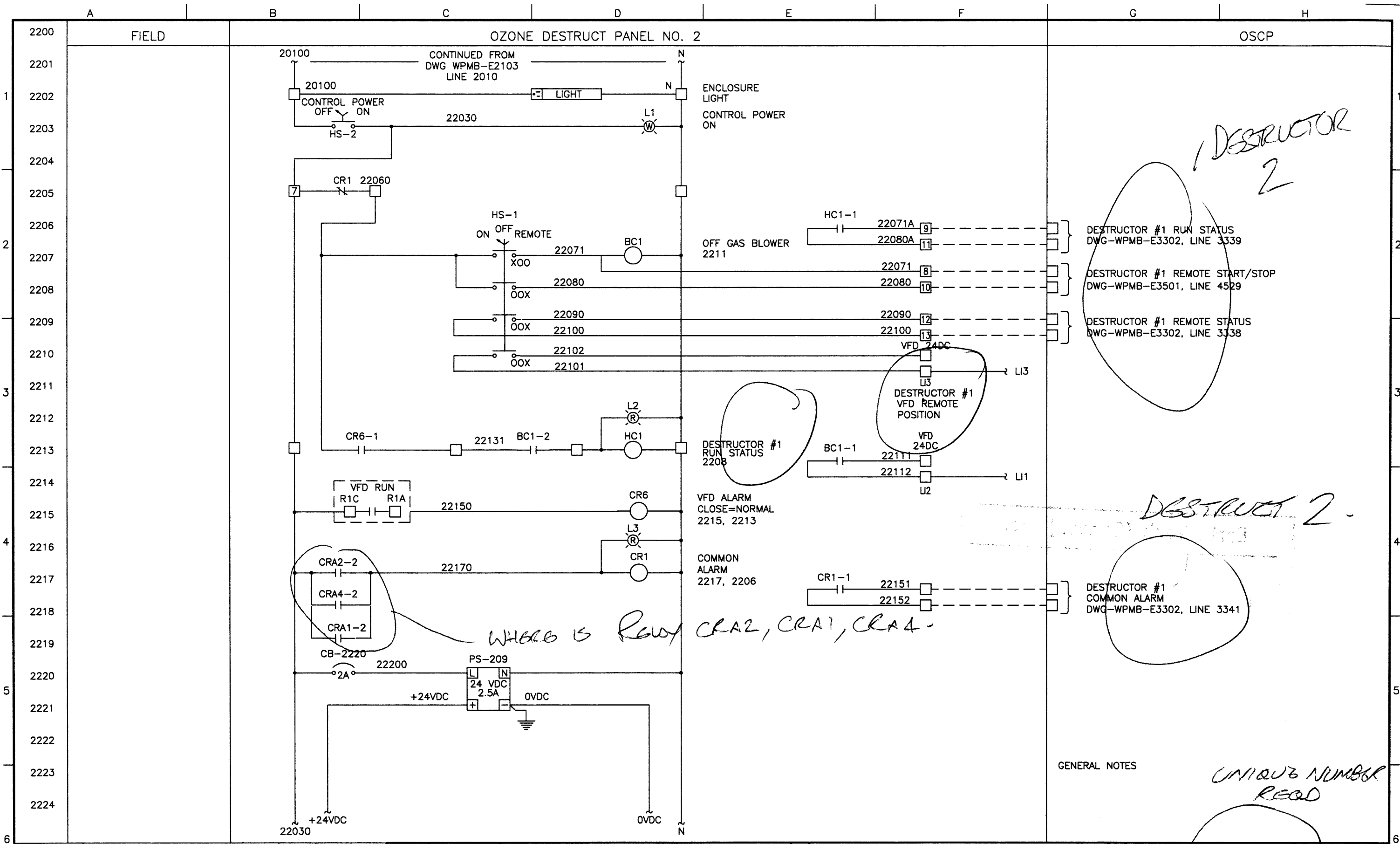
REVIEWED AS NOTIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: V. Jordan



Revisions						Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT WINNIPEG ENGINEERING DIVISION OZONE DESTRUCT UNIT NO. 2 CONTROLS	Dwg. No.: WPMB-E2200	Ref.: Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
Rev. No.	Description	By	Date	Checked	Date				

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, confirmation of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. _____

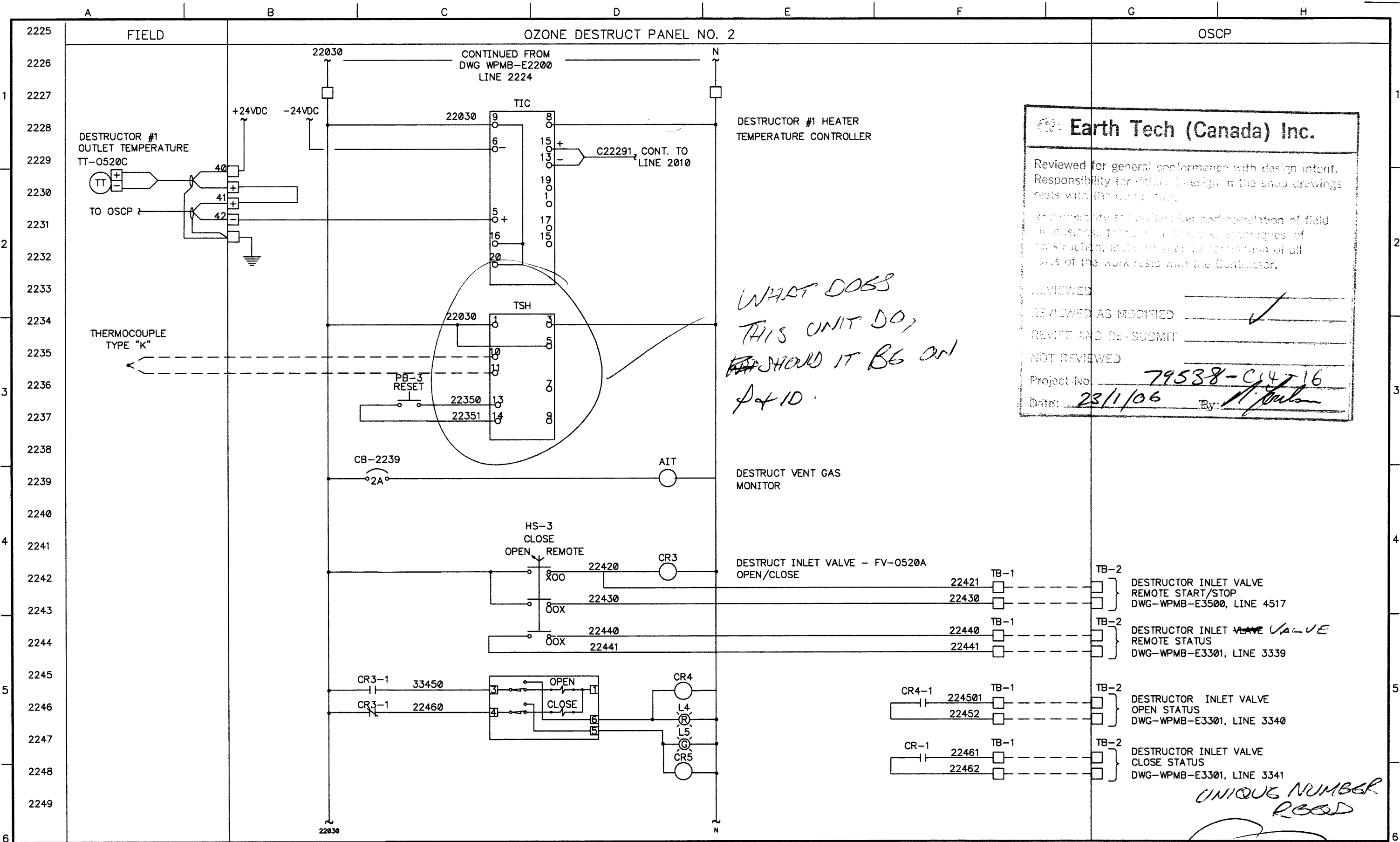
79538-C14-16

Date: _____

23/1/06

By: _____

M. Paulson



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detail design in the shop drawings rests with the Contractor.

Responsibility for installation and commissioning of field instruments, piping, and electrical connections of the structure, and sufficient understanding of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

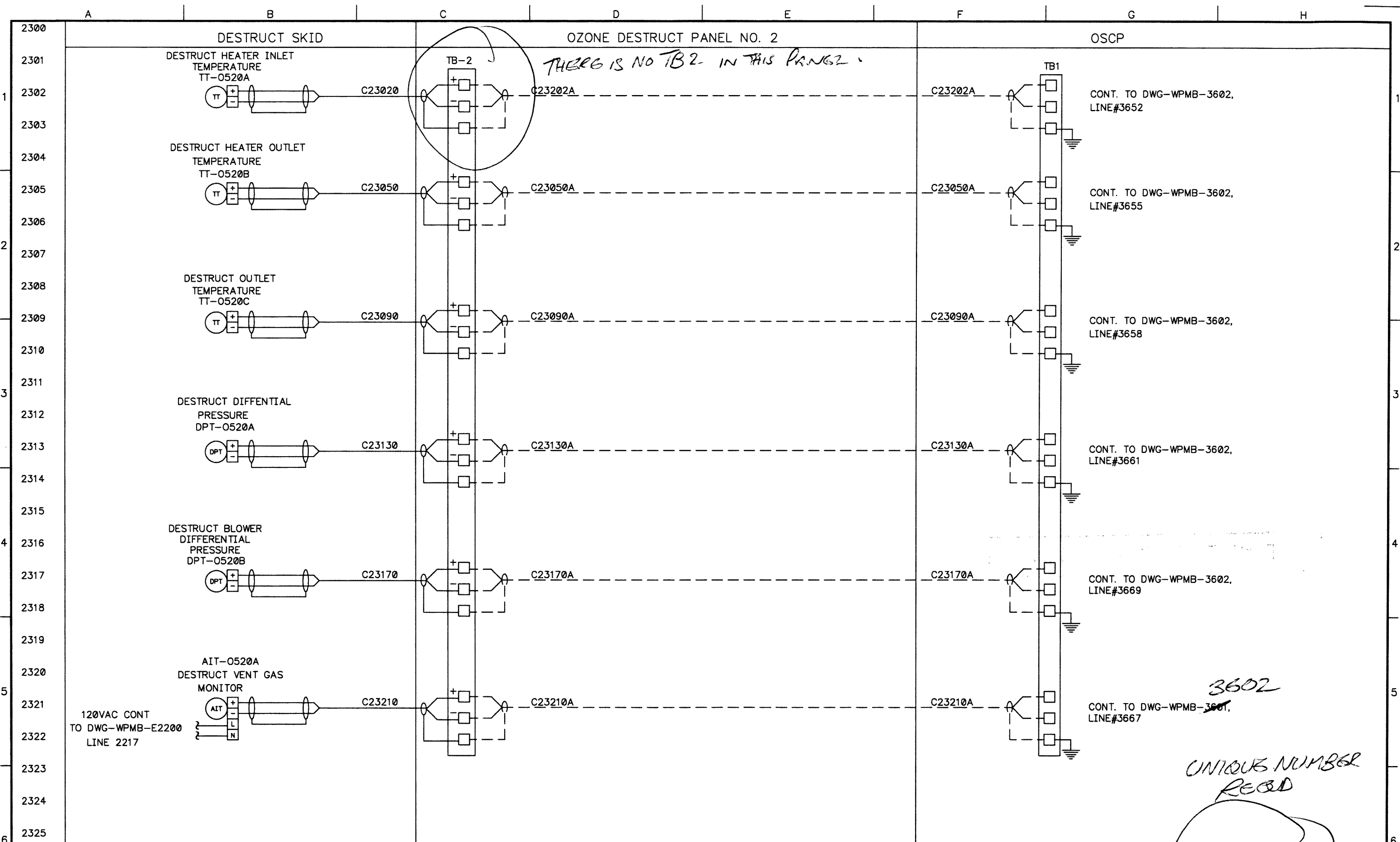
NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name	Title	Dwg No.	Ref.
					Drawn	1/9/06	SML	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E2201
					Checked					
								OZONE DESTRUCT UNIT NO. 2 CONTROLS	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	

UNIQUE NUMBER READ



Revisions					Date	Name	Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	Dwg.No.	WPMB-E2300	
					Drawn	1/9/06					SML
					Checked						
Rev. No.	Description	By	Date					Title	Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005	

Earth Tech ((Canada)) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, fabrication process, techniques of construction, installation and erection for all parts of the work rests with the Contractor.

REVIEWED _____

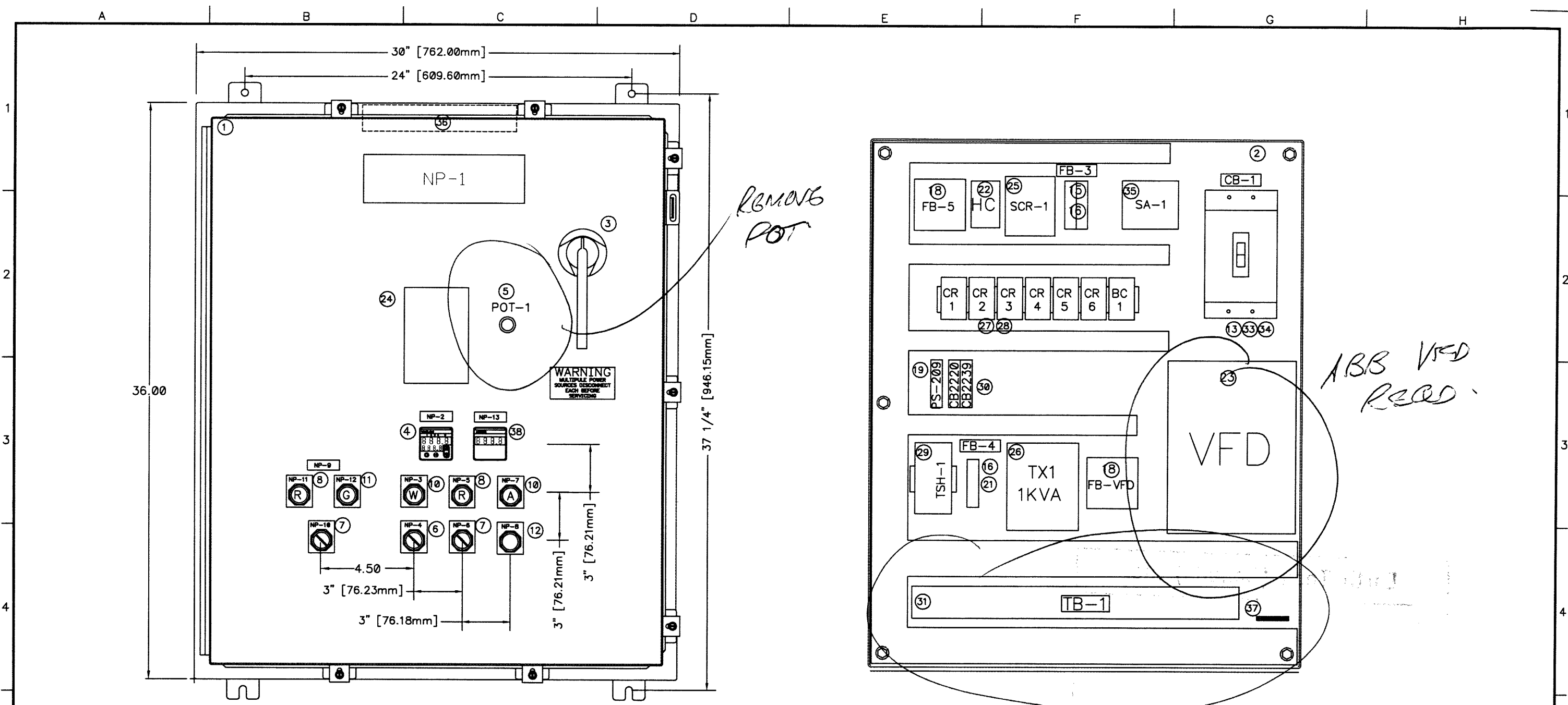
REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Paulson



NAMEPLATES		
DESTRUCT UNIT NO. 3		
	FIRST LINE	SECOND LINE
NP-1	DESTRUCT UNIT	NO.3
NP-2	HEATER	TEMPERATURE
NP-3	CONTROL POWER	ON
NP-4	CONTROL POWER	OFF ON
NP-5	DESTRUCT	ON
NP-6	OFF	ON REMOTE
NP-7	DESTRUCT	COMMON ALARM
NP-8	VACUMN VALVE	CONTROL
NP-9	VALVE FCV-0530A	CONTROL
NP-10	OPEN	CLOSE REMOTE
NP-11	OPEN	
NP-12	CLOSE	
NP-13	ELAPSED TIME	

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION	WPMB-E2100 Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005
OZONE DESTRUCT UNIT NO. 3 PANEL LAYOUT	

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, techniques of
construction, installation and coordination of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06

By: [Signature]

ITEM	TAG #	QTY	MANF	CAT #	DESCRIPTION	VENDOR
1		1	HOFFMAN	A-36H3012SSLP	ENCLOSURE, 36" X 30" X 12". TYPE 304 STAINLESS STEEL SINGLE DOOR, NEMA 4X	FD LAWRENCE
2		1	HOFFMAN	A-36P30	SUBPANEL, FULL SIZE, 33" X 27"	FD LAWRENCE
3		1	SQUARE D	LC46	DISCONNECT HANDLE ASSEMBLY, NEMA 4X	FD LAWRENCE
4	TIC-1	1	WATLOW - NEW STYLE	96A0-CAAA-AARR	SERIES 96, TEMPERATURE CONTROLLER	FD LAWRENCE
5	POT-1	1	SQUARE D	9001-K37	POTENTIOMETER METER	FD LAWRENCE
6	HS-2	1	SQUARE D	9001SKS11BH1	30MM, NEMA 4X NON-ILLUMINATED 2 POSITION SELECTOR SWITCH, (1) NO/NC BLOCKS	FD LAWRENCE
7	HS-1, 3	2	SQUARE D	9001SKS43BH2	30MM, NEMA 4X NON-ILLUMINATED 3 POSITION SELECTOR SWITCH, (2) NO/NC BLOCKS	FD LAWRENCE
8	L2,L4	2	SQUARE D	9001SKP1R31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, RED LENS	FD LAWRENCE
9		1	SQUARE D	KA2	CONTACT BLOCKS	FD LAWRENCE
10	L1	1	SQUARE D	9001SKP1W31	30MM, NEMA 4X STANDARD PILOT LIGHT, 120VAC TRANSFORMER TYPE, WHITE LENS	FD LAWRENCE
11	L3	1	SQUARE D	9001SKP1A31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, AMBER LENS	PANEL FAB
12	PB-2, 3	2	SQUARE D	9001SKR1UH2	30MM, NEMA 4X NON-ILLUMINATED MOMENTARY PUSHBUTTON, BLACK	FD LAWRENCE
13	CB-1	1	SQUARE D	FCL34020	CIRCUIT BREAKER 480V 20A	FD LAWRENCE
14		3	BUSSMAN	FNQ-R-10	FUSE, 600V, 10A TIME DELAYED FUSE	FD LAWRENCE
15	FB-3	1	BUSSMAN	BC6032B	2 POLE FUSEBLOCK, 600V, 200,000A	FD LAWRENCE
16	FB-4	1	BUSSMAN	BM6031B	1 POLE FUSEBLOCK, 600V, 30A	FD LAWRENCE
17						
18	FB-5, FB-VFD	2	BUSSMAN	BC6033B	3 POLE FUSEBLOCK, 600V, 200,000A	FD LAWRENCE
19	PS-209	1	SQUARE D	ABL7 RE2403	POWER SUPPLY 24VDC, 2.5A	FD LAWRENCE
20		2	BUSSMAN	FNQ-R-3	FUSE, 600V, 3.0A TIME DELAYED FUSE	FD LAWRENCE
21		1	BUSSMAN	FNQ-R-8	FUSE, 250V, 8A	FD LAWRENCE
22	HC	1	SQUARE D	LC1D0910G6	CONTACTOR, 4 POLE, 120VAC COIL	FD LAWRENCE
23	VFD	1	SQUARED	ATV28U72N4U	3-POLE VARIABLE SPEED DRIVE <i>ABB VFD REQD.</i>	FD LAWRENCE
24	KEYPAD	1	SQUARED	VW3A-28101	KEYPAD MOUNTING KIT FOR VFD	FD LAWRENCE
25	SCR-1	1	WATLOW	DB20-2060-C000	DIN-A-MITE, SOLID STATE POWER CONTROLLER	WATLOW
26	TX1	1	SQUARE D	9070-T1000D1	TRANSFORMER, 240/480V : 120 V, 1KVA	FD LAWRENCE
27	CR1-6 & BC1	7	SQUARE D	8501-KU12P14V20	120VAC, CONTROL RELAY WITH PILOT LIGHT	FD LAWRENCE
28		7	SQUARE D	8501-NR82B	11-PIN SPADE TERMINAL DOUBLE TIER RELAY SOCKETS FOR ITEM4	FD LAWRENCE
29	TSH-1	1	WATLOW	LVC6KW00321112A	SERIES 146 HIGH TEMPERATURE LIMIT RELAY	WATLOW
30	CB2220, 2239	2	SQUARE D	MG24501	CIRCUIT BREAKER, 120 VAC 2A	FD LAWRENCE
31	TB-1	50	SQUARE D	AB1VV435UBLA	BOX LUG TYPE TERMINAL BLOCKS, <i>USE DISCONNECT TERMS</i>	PANEL FAB.
32		3	BUSSMAN	FNQ-R-20	FUSE, 600V, 20A TIME DELAYED FUSE	FD LAWRENCE
33		1	SQUARE D	9421LF1	OPERATING MECHANISM FOR FCL BREAKER	FD LAWRENCE
34		1	SQUARE D	9421LS12	LONG SHAFT FOR DISCONNECT MECHANISM	FD LAWRENCE
35	SA-1	1	SQUARE D	6671-SDSA3650	SURGE ARRESTER, 480 VAC	FD LAWRENCE
36		1	HOFFMAN	A-LTDB1	PANEL LIGHT	FD LAWRENCE
37		1	ITE	GB5	GROUND BUSS	PANEL FAB.
38	ETM-1	1	HECON	0891204	DESTRUCT ELAPSED TIME METER	FD LAWRENCE
39	L5	1	SQUARE D	9001SKP1G31	30MM, NEMA 4X PUSH-TO-TEST PILOT LIGHT, 120VAC TRANSFORMER TYPE, GREEN LENS	FD LAWRENCE
40						FD LAWRENCE
41						FD LAWRENCE
42						FD LAWRENCE
43						FD LAWRENCE
44						FD LAWRENCE
45						FD LAWRENCE

UNIQUE NUMBER REQUIRED

Rev. No.	Description	By	Date

Drawn	Date	Name
	1/9/06	SML
Checked		

Fuji Electric Co., Ltd.

Title	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION
	OZONE DESTRUCT UNIT NO. 3 BILL OF MATERIALS

Dwg. No.	WPMB-E2101
Ref.	Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005

EarthTech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsible for detailed design in the shop drawing
phase with the Contractor.

Responsibility for verification and correlation of field
work with design, including all aspects of construction
and coordination of all
parts of the work with the Contractor.

REVIEWED

REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT

NOT REVIEWED

Project No. 79538-C14-16

Date: 23/1/06 By: K. Toulon

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and coordination of field dimensions, materials, and construction techniques of construction, including the procurement of all parts of the work, rests with the Contractor.

REVIEWED _____

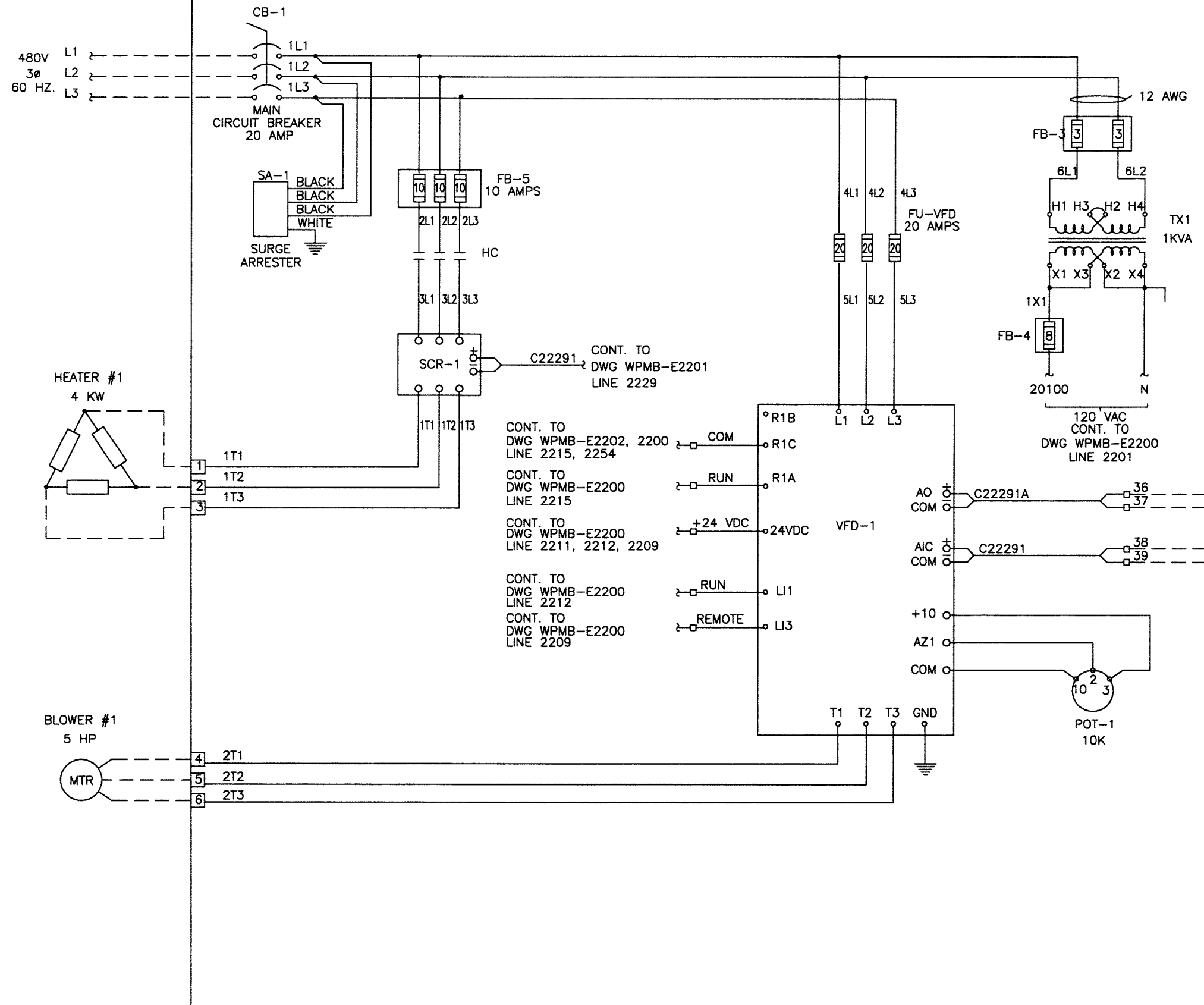
REVIEWED AS MODIFIED

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]



SPEED FEEDBACK
DWG WPMB-E3603, LINE 3697

REMOTE SPEED SETPOINT
DWG WPMB-E3802, LINE 3865

*SEE COMMENTS
ON DESTRUCT 1#*

GENERAL NOTES

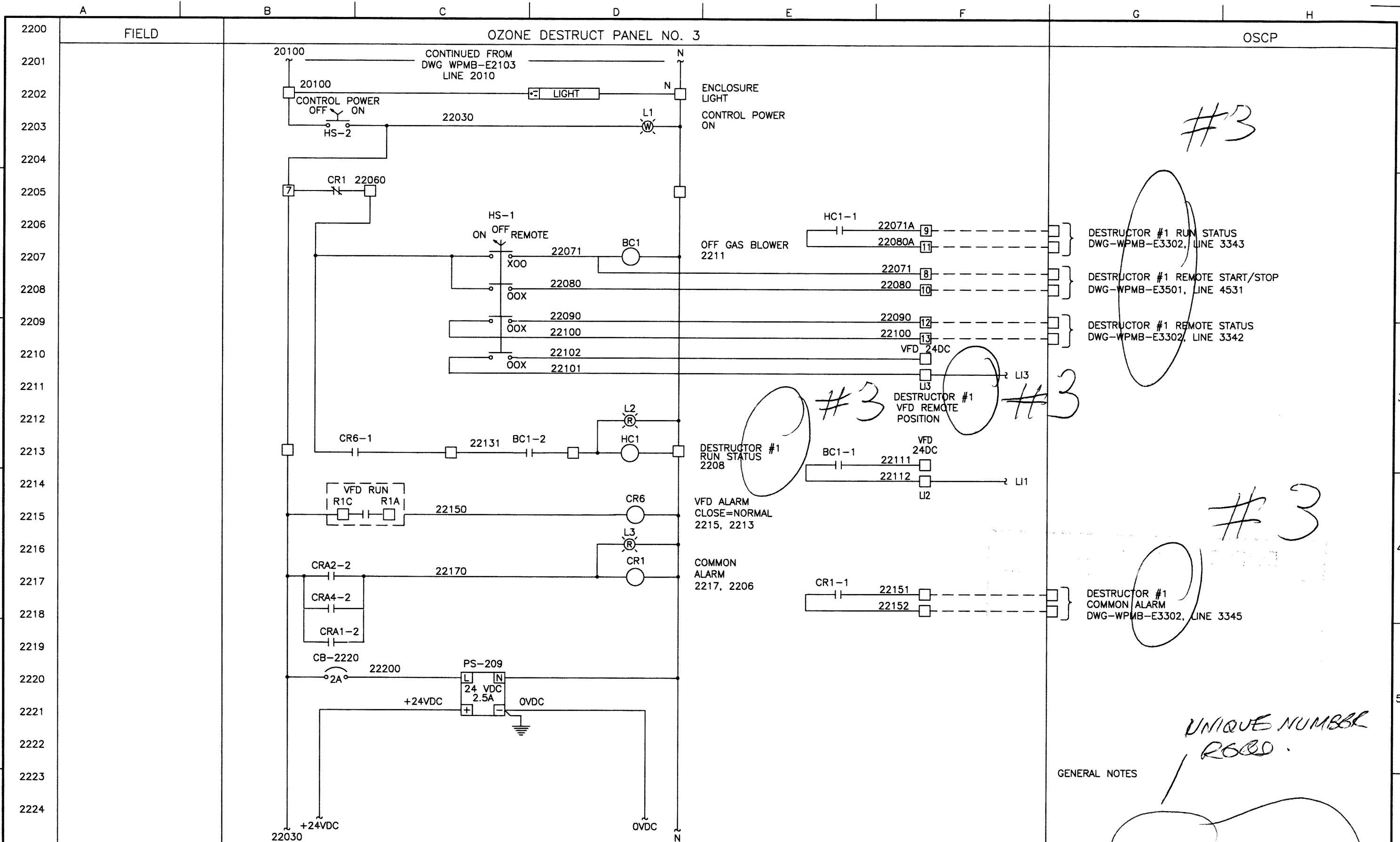
*UNIQUE NUMBER
REQUIRED*

Revisions	Rev. No.	Description	By	Date

Date: 1/9/06
Name: SML
Fuji Electric Co., Ltd.

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION
OZONE DESTRUCT UNIT NO. 3
480V POWER DISTRIBUTION

Dwg. No.: WPMB-E2103
Fuji Project No.: WPMB-1105
City of Winnipeg 428-2005



#3

#3

#3

#3

UNIQUE NUMBER
R680

GENERAL NOTES

Revisions						Fuji Electric Co., Ltd.	THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION OZONE DESTRUCT UNIT NO. 3 CONTROLS	WPMB-E2200	
Rev. No.	Description	By	Date	Checked	Date				

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication process, techniques of
construction, material and method of installation of all
parts of the work rests with the Contractor.

REVIEWED _____

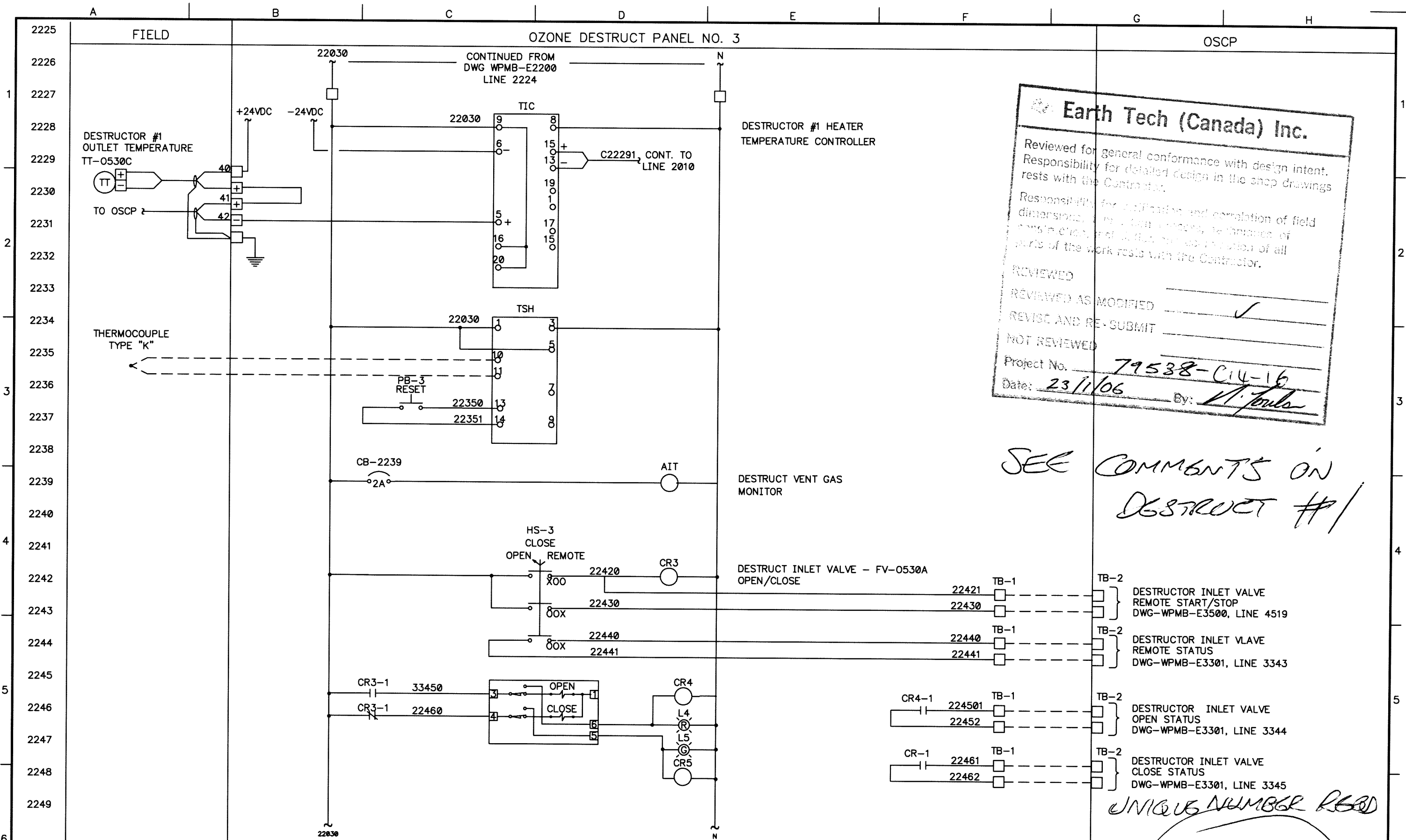
REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: M. Jackson



Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent. Responsibility for detailed design in the shop drawings rests with the Contractor.

Responsibility for verification and correlation of field dimensions, materials, and processes, to drawings of construction, and for the installation of all parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]

SEE COMMENTS ON DESTRUCT #1

UNIQUE NUMBER READ

Revisions	Rev. No.	Description	By	Date	Drawn	Date	Name
					SML	1/9/06	SML

Fuji Electric Co., Ltd.		THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION		WPMB-E2201
Title: OZONE DESTRUCT UNIT NO. 3 CONTROLS		Ref.: Fuji Project No.: WPMB-1105 City of Winnipeg 428-2005		

Earth Tech (Canada) Inc.

Reviewed for general conformance with design intent.
Responsibility for detailed design in the shop drawings
rests with the Contractor.

Responsibility for verification and correlation of field
dimensions, fabrication, erection, mechanics of
construction, installation and completion of all
parts of the work rests with the Contractor.

REVIEWED _____

REVIEWED AS MODIFIED _____ ✓

REVISE AND RE-SUBMIT _____

NOT REVIEWED _____

Project No. 79538-C14-16

Date: 23/1/06 By: [Signature]