

Refrigerated Gas Dryer

Model: R2000-WD
Refrigerant: R-404a
Serial #: 68270-F13B01

Voltage: 460V/3Ph/60Hz

Pioneer Air Systems Inc.

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For MSDS and other information go to our website @ www.pioneerair.com

CAUTION

The company does not test its products for breathing air or applications requiring FDA approval.
The user is advised to do its own testing.

Introduction

This manual contains information and recommendations for installing, operating, and servicing the Pioneer R-Series Dryers. Pioneer systems are designed and manufactured to the highest standards of quality. The self-contained units have been tested and inspected before shipment from the factory. Information in this manual is in accord with the data applicable to standard equipment at the time of printing (non-standard changes may not be included). The manufacturer reserves the right to make changes without notice and without incurring obligation. The customer should read this manual carefully before locating and installing the equipment.

Receiving and Inspection

After removing all packaging, examine the dryer for any external and internal damage. It is the customer's responsibility to notify the transportation agency of any damages immediately. Check the nameplate to ensure proper power supply. Inspect all pipe and tubing. Vibration during shipping may loosen connections. Standard refrigerated dryers are charged with refrigerant, operated, and tested before leaving the factory. Units are ready to run after proper servicing.

Location Recommendations

Pioneer R-Series Dryers are designed for installation in a protected area that is clean, dry, and has an ambient temperature range of 50 to 100°F (10 to 37°C). For installation in other temperatures consult factory.

Installation Recommendations

A refrigerated gas dryer is normally installed downstream of the receiver tank. A gas line should be connected from the receiver tank outlet to the gas dryer inlet. The outlet of the dryer is then piped into the gas distribution system. A bypass should always be installed to permit operation of the compressed gas system during dryer maintenance and servicing. Gas in/out and bypassing piping should be equal or larger than the in/out sizes provided on the dryer.

In the case of water cooled systems, make water connections to the dryer. Make sure water piping is large enough to handle the flow requirements. The factory recommends making the pipe size equal to or larger than the water connections on the dryer. The water drain should be connected to an appropriate drainage.

Heat Rejection:

Minimum water pressure 43.5 PSIG/3 BarG

Water cooled units: 150,000 BTU/Hr

Temperature °F	R Series Water flow per
40-90	10 GPM

Start-up Procedures

Purge clean all gas piping prior to installation and start up of the unit, to remove all pipe scale, weld sludge, rust, and free moisture. In a newly installed piping system, the prefilter element may need to be changed within a few days of installation to remove weld sludge, rust, and etc. After all power and connections have been made, the unit is ready for operation. The dryers are shipped with a charge of refrigerant, with all refrigeration service ports closed.

Start the dryer and observe the suction gauge pressure. Normal operating range is 55-65 PSIG (3.8 – 4.5 BarG) for R-404A units. The normal suction temperature range is between 25 to 30°F (-3.9 to -1.1°C). After the dryer has run for about ten minutes, open the compressed gas inlet and outlet valves, and close the bypass line valve, if equipped. Allow the unit to run for one hour with gas flow. Adjustment to the hot gas bypass valve or expansion valve may be necessary at this time to obtain the desired refrigeration suction temperature.

CAUTION:

Starting the unit immediately without following the above instructions may cause damage.

System Operation

Gas Circuit: The warm moist gas enters the Gas-Gas heat exchanger, where it is pre-cooled with outgoing cool gas. Pre-cooling allows use of a smaller refrigeration unit and lowers the cost of drying. The gas is further cooled to the 34°F-37°F range in the gas-water/glycol heat exchanger. Cooling the compressed gas causes condensation of moisture which is separated by a highly efficient coalator. An automatic drain periodically drains the condensate. Cold dry gas from the coalator flows through the Gas-Gas heat exchanger where it is reheated by the incoming warm gas. Reheating increases the volume of gas, pre-vents moisture condensation on the gas lines, and lowers the relative gas humidity. The clean dry gas is then available for use.

Refrigerant Circuit: The refrigerant compressor compresses cold refrigerant vapor into warm or hot high-pressure gaseous refrigerant. Because of compression, the refrigerant temperature is high enough to transfer heat to the water. Hot or warm refrigerant flows into the condenser where it is cooled and condensed into liquid, liquid refrigerant the flows through a filter dryer to an expansion valve. The expansion valve lowers the refrigerant pressure and temperature. This cold liquid refrigerant flows into the refrigerant-water/glycol heat exchanger where it cools the water/glycol, and evaporates into a cold vapor. Vaporized refrigerant flows to the accumulator. The gaseous refrigerant then flows to the compressor suction via the suction line filter. The function of the accumulator is to hold liquid refrigerant and pass on the gaseous refrigerant. The liquid and suction line filters functions are to protect the refrigerant system from foreign particles.

To provide relatively constant temperature in the gas-refrigerant heat exchanger, the refrigeration system is also equipped with a hot gas bypass valve. This mixes hot and cold refrigerant to give a stable suction pressure and temperature. Thus, near constant dew point is maintained at fluctuating load conditions.

Maintenance

WARNING:

Remove Gas pressure from the device under pressure before working on it.

To maximize system performance and reliability, the following maintenance procedure is required: Gas and water cooled condensers must be inspected and cleaned periodically. Inspect and replace pre-filter and after-filter elements periodically (recommended monthly). To avoid downtime, always keep spare elements in stock.

COMPONENT	WEEKLY	MONTHLY	OTHER
<u>DRAINS</u>	BLEED Y-STRAINER		CLEAN FLOAT DRAIN WHEN COALESCER FILTER IS REPLACED
<u>FILTERS</u>	CHECK DRYER PRESSURE DROP LESS THAN 6 PSIG		REPLACE AS NEEDED 3 TO 6 MONTHS MAX
<u>REFRIG.</u> COMPRESSOR SIGHT GLASS		CHECK OIL SIGHT GLASS (½ LEVEL) CHECK MOISTURE INDICATOR COLOR IS GREEN	

Automatic Drain Maintenance: Three step automatic drains come standard on all Pioneer R-Series Dryers. The drain must be cleaned periodically to ensure proper functionality. Remove gas pressure before loosening the separator bowl. It includes an isolation valve and a cleanable strainer. Close the isolation valve before removing and cleaning the strainer.

Heat Exchangers:

At regular intervals, dependant upon the contamination in the medium, inspect the tubes for fouling. The heat exchangers are designed with a fouling factor. This allows them to operate at the required capacity with a certain amount of fouling. However, the fouling factor should not be used to determine the cleaning frequency. Failure to keep the tubes clean will result in a loss of cooling capacity which could lead to increased tube strain and possible leakage. Use a commercially available cleaner to flush both the shell and tube side of the heat exchanger. Dupont Glycolic Acid and PPG Heat Exchanger Cleaner are both approved cleaners. Follow the recommended procedure for the solution being used. An initial inspection/cleaning should be performed at six months and the severity of the fouling will determine the regular cleaning frequency.

Gasket surfaces should be clean and free from defects. New gaskets should be used anytime they are removed. Bolts should be tightened uniformly, in the proper pattern and to the proper torque for the size and rating of the flange.

Filters:

The inlet and outlet filters will need to be changed regularly. The PLC monitors the differential pressure across both elements and will send an alarm when it is time to change the elements. The elements are replaceable cartridges. The system should be isolated and the gas pressure relieved through the bleed down valve located on the inlet filter housing.

CAUTION:

A refrigerant compressor operating under sustained overload conditions caused by excessive gas flow, high inlet Gas temperature, and/or ambient temperature will continue to work at a higher discharge pressure until either the compressor motor fails or the compressor cycles on high pressure cut-out control. If the dryer cycles for any reason, turn it off and contact factory; allowing it to cycle on high pressure will burn up the compressor motor. Because of higher pressure and electrical voltage, only qualified service personnel should work on the equipment. For critical applications, the factory recommends that the customer install a back-up system.

For service, repair or parts please contact:

Sam Basseen
Pioneer Air System
210 Flatfork Rd
Wartburg, TN 37887
(423) 346-6693
sales@pioneerair.com

Warranty:

18 (Eighteen) months from date of acceptance.

Troubleshooting

PROBLEM	REMEDY
1. Excessive Gas flow.	Check rated output capacity of Gas compressor; a larger system may be needed.
2. High outlet Gas temperature.	Check refrigeration system and glycol pump and level. A larger system may be needed (consult factory).
3. Dirty heat exchanger. (Shell and Tube)	Disconnect dryer inlet/outlet and flush with steam cleaner and copper solvent. (See Maintenance section)
4. High liquid level alarm	Drain malfunction. Clean or replace.
5. Not draining all moisture.	Check y-strainer.
6. Refrigerant compressor cycling due to high refrigerant pressure or overload a. Overloaded unit. (High water/glycol temp) b. Bad compressor.	Reduce load or install larger system. Replace compressor and liquid and suction line filters.
7. Refrigerant compressor cycling on low pressure a. Refrigerant low. b. Incorrect low pressure control setting. c. Low-pressure control malfunction.	Inspect for leaks, repair, evacuate and recharge. Consult factory. Correct to: R-404a: cut out 34 PSIG/2.3 BarG, cut in 54 PSIG/3.7 BarG Replace.
8. Refrigerant suction temperature too low/freeze up. a. Check condenser water solenoid. b. Ambient temperature too low.	Correct settings: R-404a: cut out 170 PSIG/11.7 BarG, cut in 225 PSIG/15.5 BarG Relocate unit to a heated room/install low ambient package. Consult factory.

Thank You!

Thank you for choosing Pioneer. We recognize that you had a choice. The fact that you chose Pioneer further inspires us to produce quality products of excellent value, performance, and reliability. A passionate dedication to excellence and innovation has always been the key to our success, along with our distributors and dealers who are the very best in our industry. Together, we are committed to providing you with superior quality products and services at affordable prices.

Sam Basseen
President and CEO

PIONEER MODEL R2000WD NARRATIVE FUNCTIONAL DESCRIPTION GAS DRYER – 5610A & 5610B

GENERAL

This summary describes the operation of the PIONEER Model R2000WD Cycling Digester Chiller system as defined by Pioneer Air Systems Inc. This operational summary describes the general workings of the system.

The gas dryer system includes skid mounted equipment with a local control panel located in the hazardous area and a main control panel with PLC and operator interface terminal (OIT) in a remote control room. This Allen Bradley Control Logix based system provides all monitoring and control functions for the dryer. An Allen Bradley panel view 600 series OIT is provided to display all parameters and alarms. This PLC system includes an Ethernet Modbus TCP module that communicates to an existing ABB distributed control system (DCS) control unit. The PLC transfers dryer status and alarms to and receives supervisory control commands from the ABB DCS.

Basic Operation:

Gas Circuit: The warm moist gas enters the gas-gas heat exchanger, where it is pre-cooled with outgoing cool gas. Pre-cooling allows use of a smaller refrigeration unit and lowers the cost of drying. The gas is further cooled to between 34°F-37°F range in the gas-water heat exchanger. Cooling the compressed gas causes condensation of moisture which is separated by a highly efficient moisture separator. An automatic drain periodically drains the condensate tank. Cold dry gas from the separator flows through the gas-gas heat exchanger where it is reheated by the incoming warm gas. Reheating increases the volume of gas, pre-vents moisture condensation on the gas lines, and lowers the relative gas humidity. The clean dry gas is then available for use.

Refrigerant Circuit: The refrigerant compressor compresses cold refrigerant vapor into hot high-pressure gaseous refrigerant. Because of compression, the refrigerant temperature is high enough to transfer heat to the atmosphere. Hot refrigerant flows into the condenser where it is cooled and condensed into liquid. Liquid refrigerant flows to the receiver. From the receiver, the liquid refrigerant flows through a filter dryer to an expansion valve. The function of the receiver is to assure availability of liquid refrigerant for expansion. The expansion valve lowers the refrigerant pressure and temperature. In a typical gas dryer system of 37°F PDP, the refrigerant temperature is lowered to the 30 to 34°F range. This cold liquid refrigerant flows into the refrigerant to water/glycol heat exchanger where it cools the water/ glycol, and evaporates into a cold vapor. Vaporized refrigerant flows to the accumulator. The gaseous refrigerant then flows to the compressor suction via the suction line filter. The function of the accumulator is to hold liquid refrigerant and pass on the gaseous refrigerant. The liquid and suction line filter functions are to protect the refrigerant system from foreign particles.

To provide relatively constant temperature in the refrigerant to water/glycol heat exchanger, the refrigeration system is also equipped with a hot gas bypass valve. These mix hot and cold refrigerant to give a stable suction pressure and temperature. Thus, near constant dew point is maintained at fluctuating load conditions.

MODES OF OPERATION:

There are two hard modes and two soft modes of operation. The hard modes Local and Remote may be selected via selector switch (SS1 LOCAL/REMOTE) on the Local Control Panel. The hard Local Mode is just used for testing. The dryer will only run when in Remote mode. The soft modes Computer and Local can be selected via the OIT on the gas dryer control panel.

Local Mode: When the Local/Remote switch (SS1) is on Local, the operator can jog the pump and compressor motors. The machine will not start in local mode. This is a test mode only to test the motors locally. Both motors will run for as long as the TEST pushbutton is held in. To test a motor individually, switch the disconnect off for the motor that is not being tested.

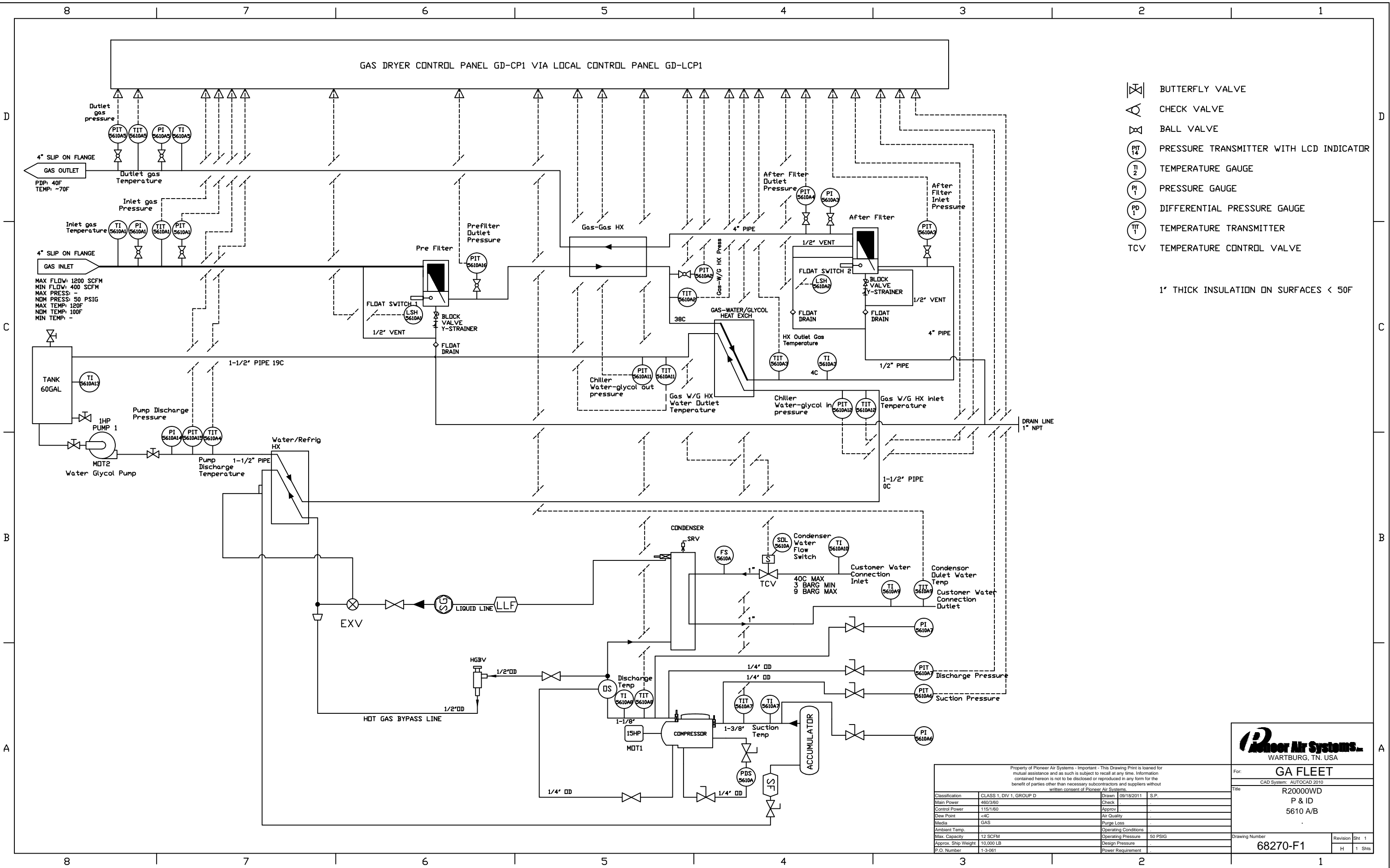
Remote Mode: When the Local/Remote switch (SS1) is on Remote, the Dryer may be operated by the touch screen or the ABB DCS. The dryer can not be operated locally when in remote. The local TEST pushbutton (PB1) will be inactive when in Remote.

Soft Computer Mode: The soft Computer mode is the normal mode of operation and can only be used when the Local/Remote switch (SS1) is in Remote. Computer mode can be selected on the OIT. In COMPUTER mode, the PLC shall respond to the ABB DCS supervisory controls commands to start and stop the dryer. The dryer will wait for the ABB DCS start signal when in this mode.

Soft Local Mode: The soft Local mode can only be used when the dryer is in Remote. This mode is to be used to control the machine with the OIT. There will be three buttons displayed on the OIT when in Local mode, DRYER START, DRYER STOP, and RESET. When in soft LOCAL Mode, (with the LCP switch in Remote) the OIT can be used by the operator to start and stop the dryer.

If the dryer is running in soft Computer mode and an Operator switches the mode to soft Local, the dryer will continue to run until DRYER STOP is selected.

If the dryer is running in soft Local mode and the Operator switches the mode to soft computer, depending upon process requirements, the ABB DCS will either keep the dryer running or stop it.



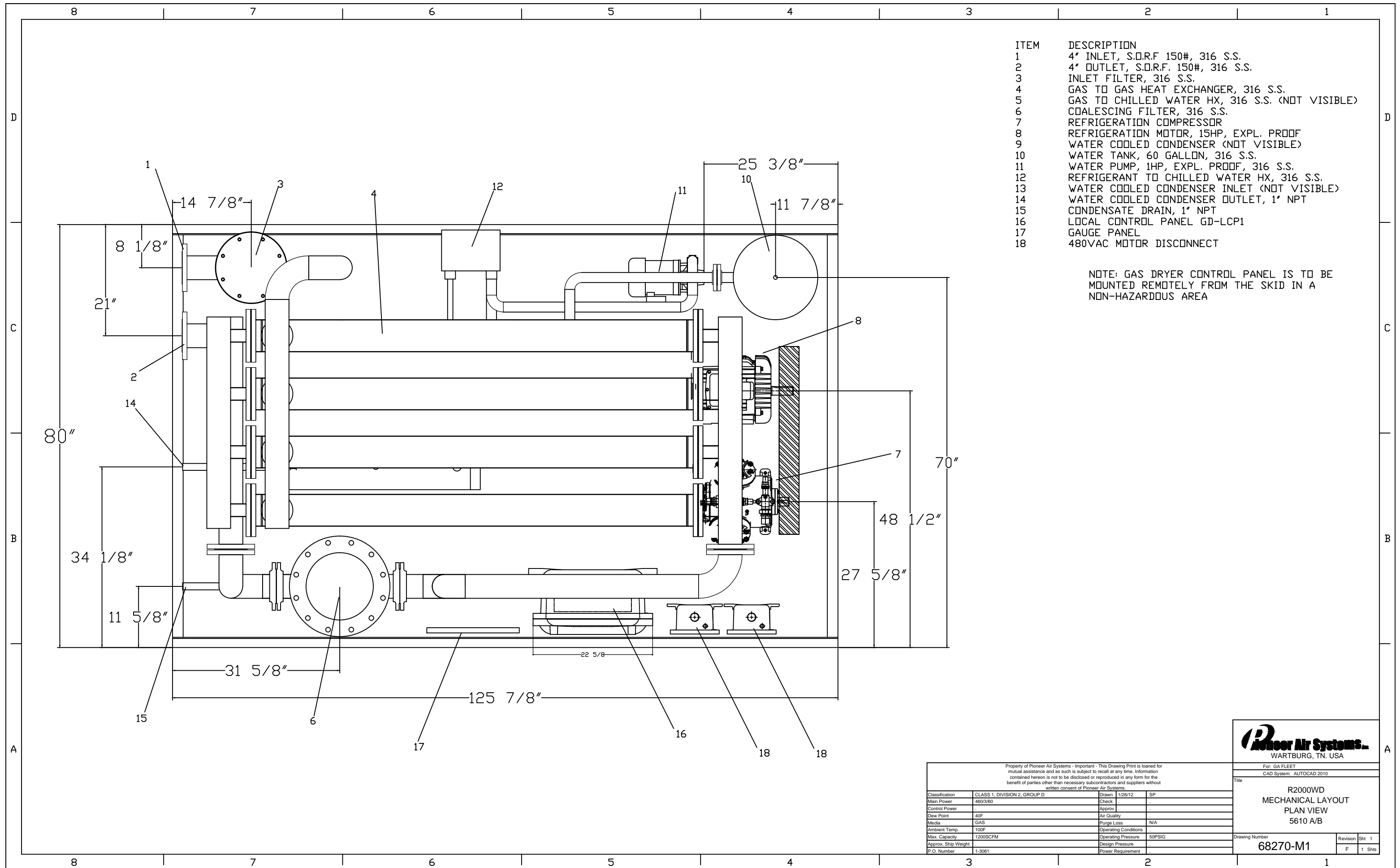
- BUTTERFLY VALVE
- CHECK VALVE
- BALL VALVE
- PRESSURE TRANSMITTER WITH LCD INDICATOR
- TEMPERATURE GAUGE
- PRESSURE GAUGE
- DIFFERENTIAL PRESSURE GAUGE
- TEMPERATURE TRANSMITTER
- TEMPERATURE CONTROL VALVE

1" THICK INSULATION ON SURFACES < 50F



For: GA FLEET	
CAD System: AUTOCAD 2010	
Title: R20000WD	Revision: 1
P & ID	Sheet: 1
5610 A/B	
Drawing Number: 68270-F1	Revision: H
	Sheet: 1

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Classification	CLASS 1, DIV 1, GROUP D	Drawn	09/16/2011
Main Power	460/3/60	Check	S.P.
Control Power	115/1/60	Approv	
Dew Point	<4C	Air Quality	
Media	GAS	Purge Loss	
Ambient Temp.		Operating Conditions	
Max. Capacity	12 SCFM	Operating Pressure	50 PSIG
Approx. Ship Weight	10,000 LB	Design Pressure	
P.O. Number	1-3-061	Power Requirement	



- | ITEM | DESCRIPTION |
|------|---|
| 1 | 4" INLET, S.D.R.F 150#, 316 S.S. |
| 2 | 4" OUTLET, S.D.R.F. 150#, 316 S.S. |
| 3 | INLET FILTER, 316 S.S. |
| 4 | GAS TO GAS HEAT EXCHANGER, 316 S.S. |
| 5 | GAS TO CHILLED WATER HX, 316 S.S. (NOT VISIBLE) |
| 6 | COALESCING FILTER, 316 S.S. |
| 7 | REFRIGERATION COMPRESSOR |
| 8 | REFRIGERATION MOTOR, 15HP, EXPL. PROOF |
| 9 | WATER COOLED CONDENSER (NOT VISIBLE) |
| 10 | WATER TANK, 60 GALLON, 316 S.S. |
| 11 | WATER PUMP, 1HP, EXPL. PROOF, 316 S.S. |
| 12 | REFRIGERANT TO CHILLED WATER HX, 316 S.S. |
| 13 | WATER COOLED CONDENSER INLET (NOT VISIBLE) |
| 14 | WATER COOLED CONDENSER OUTLET, 1" NPT |
| 15 | CONDENSATE DRAIN, 1" NPT |
| 16 | LOCAL CONTROL PANEL GD-LCP1 |
| 17 | GAUGE PANEL |
| 18 | 480VAC MOTOR DISCONNECT |

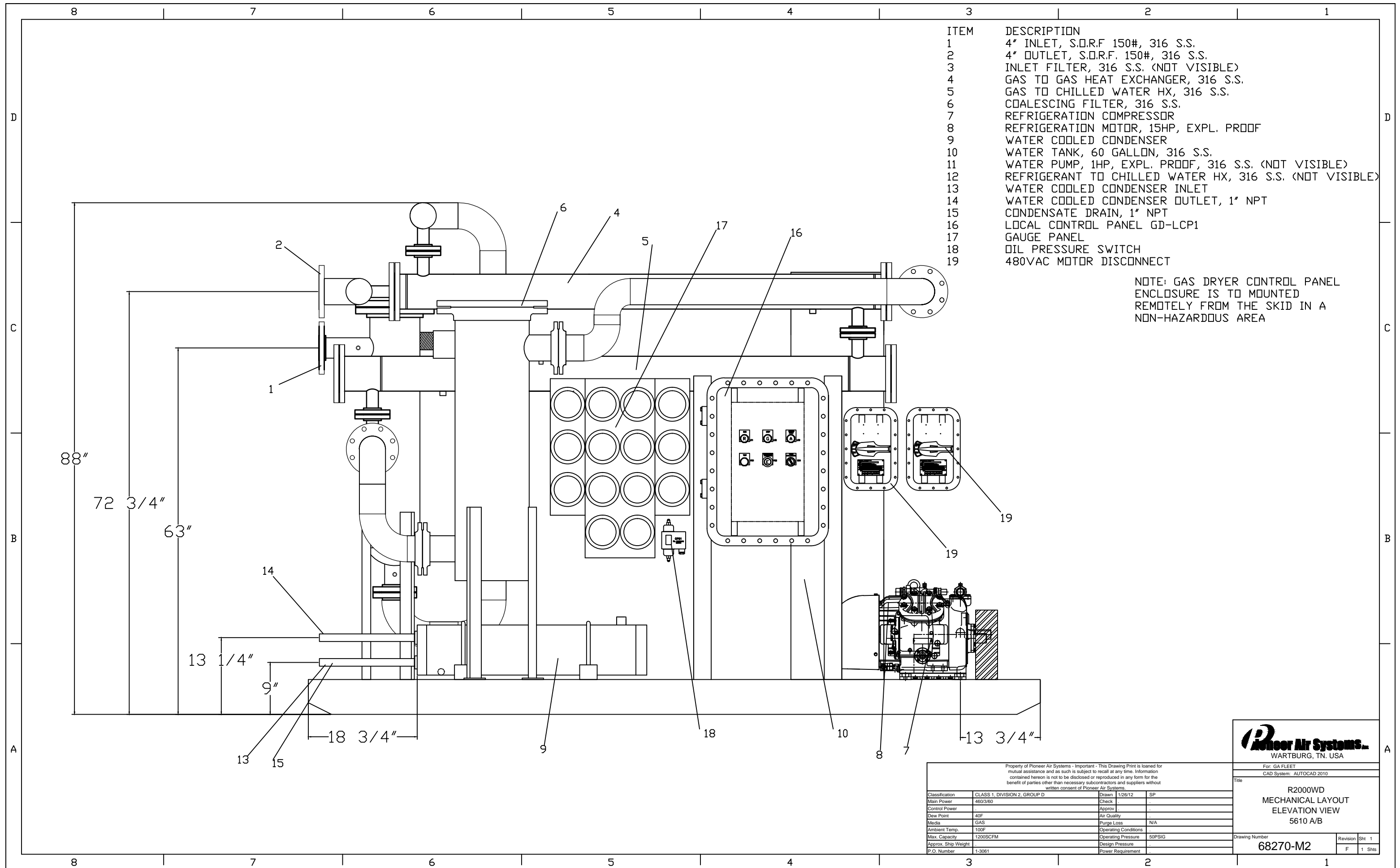
NOTE: GAS DRYER CONTROL PANEL IS TO BE MOUNTED REMOTELY FROM THE SKID IN A NON-HAZARDOUS AREA

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Classification	CLASS 1, DIVISION 2, GROUP D	Drawn	1/26/12	SP
Main Power	460/3/60	Check		
Control Power		Approv		
Dew Point	40F	Air Quality		
Media	GAS	Purge Loss		N/A
Ambient Temp.	100F	Operating Conditions		
Max. Capacity	1200SCFM	Operating Pressure		50PSIG
Approx. Ship Weight		Design Pressure		
P.O. Number	1-3061	Power Requirement		



For: GA FLEET	
CAD System: AUTOCAD 2010	
Title	
R2000WD MECHANICAL LAYOUT PLAN VIEW 5610 A/B	
Drawing Number	Revision
68270-M1	Sht 1
	F 1 Shts



- | ITEM | DESCRIPTION |
|------|---|
| 1 | 4" INLET, S.O.R.F. 150#, 316 S.S. |
| 2 | 4" OUTLET, S.O.R.F. 150#, 316 S.S. |
| 3 | INLET FILTER, 316 S.S. (NOT VISIBLE) |
| 4 | GAS TO GAS HEAT EXCHANGER, 316 S.S. |
| 5 | GAS TO CHILLED WATER HX, 316 S.S. |
| 6 | COALESCING FILTER, 316 S.S. |
| 7 | REFRIGERATION COMPRESSOR |
| 8 | REFRIGERATION MOTOR, 15HP, EXPL. PROOF |
| 9 | WATER COOLED CONDENSER |
| 10 | WATER TANK, 60 GALLON, 316 S.S. |
| 11 | WATER PUMP, 1HP, EXPL. PROOF, 316 S.S. (NOT VISIBLE) |
| 12 | REFRIGERANT TO CHILLED WATER HX, 316 S.S. (NOT VISIBLE) |
| 13 | WATER COOLED CONDENSER INLET |
| 14 | WATER COOLED CONDENSER OUTLET, 1" NPT |
| 15 | CONDENSATE DRAIN, 1" NPT |
| 16 | LOCAL CONTROL PANEL GD-LCP1 |
| 17 | GAUGE PANEL |
| 18 | OIL PRESSURE SWITCH |
| 19 | 480VAC MOTOR DISCONNECT |

NOTE: GAS DRYER CONTROL PANEL ENCLOSURE IS TO MOUNTED REMOTELY FROM THE SKID IN A NON-HAZARDOUS AREA

88"
72 3/4"
63"
13 1/4"
9"
18 3/4"
13 3/4"

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Classification	CLASS 1, DIVISION 2, GROUP D	Drawn	1/26/12	SP
Main Power	460/3/60	Check		
Control Power		Approv		
Dew Point	40F	Air Quality		
Media	GAS	Purge Loss		N/A
Ambient Temp.	100F	Operating Conditions		
Max. Capacity	1200SCFM	Operating Pressure		50PSIG
Approx. Ship Weight		Design Pressure		
P.O. Number	1-3061	Power Requirement		

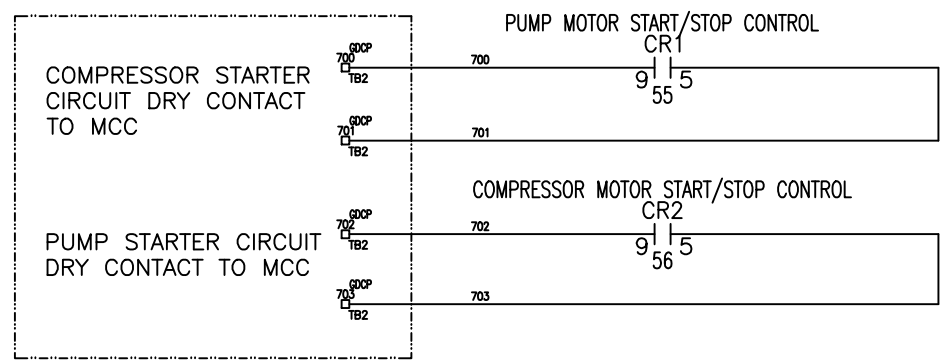
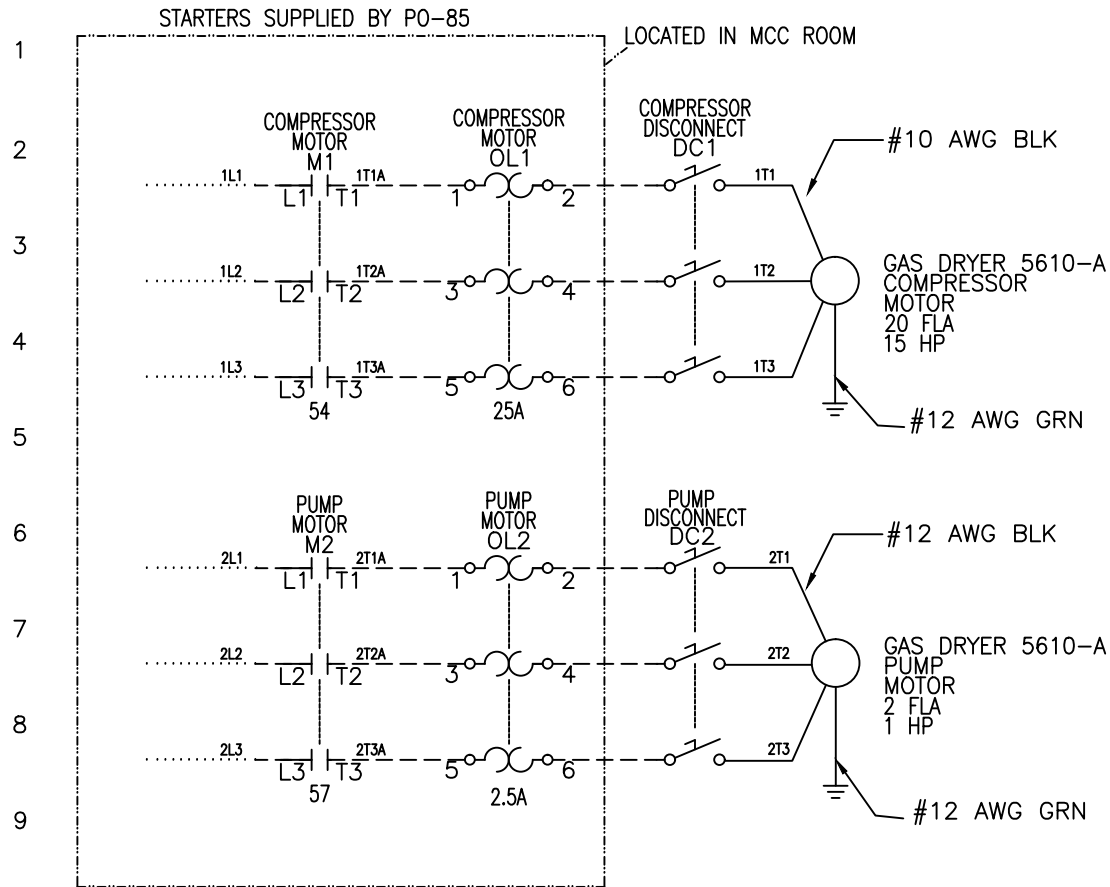
Pioneer Air Systems.
WARTBURG, TN, USA

For: GA FLEET
CAD System: AUTOCAD 2010

Title
R2000WD
MECHANICAL LAYOUT
ELEVATION VIEW
5610 A/B

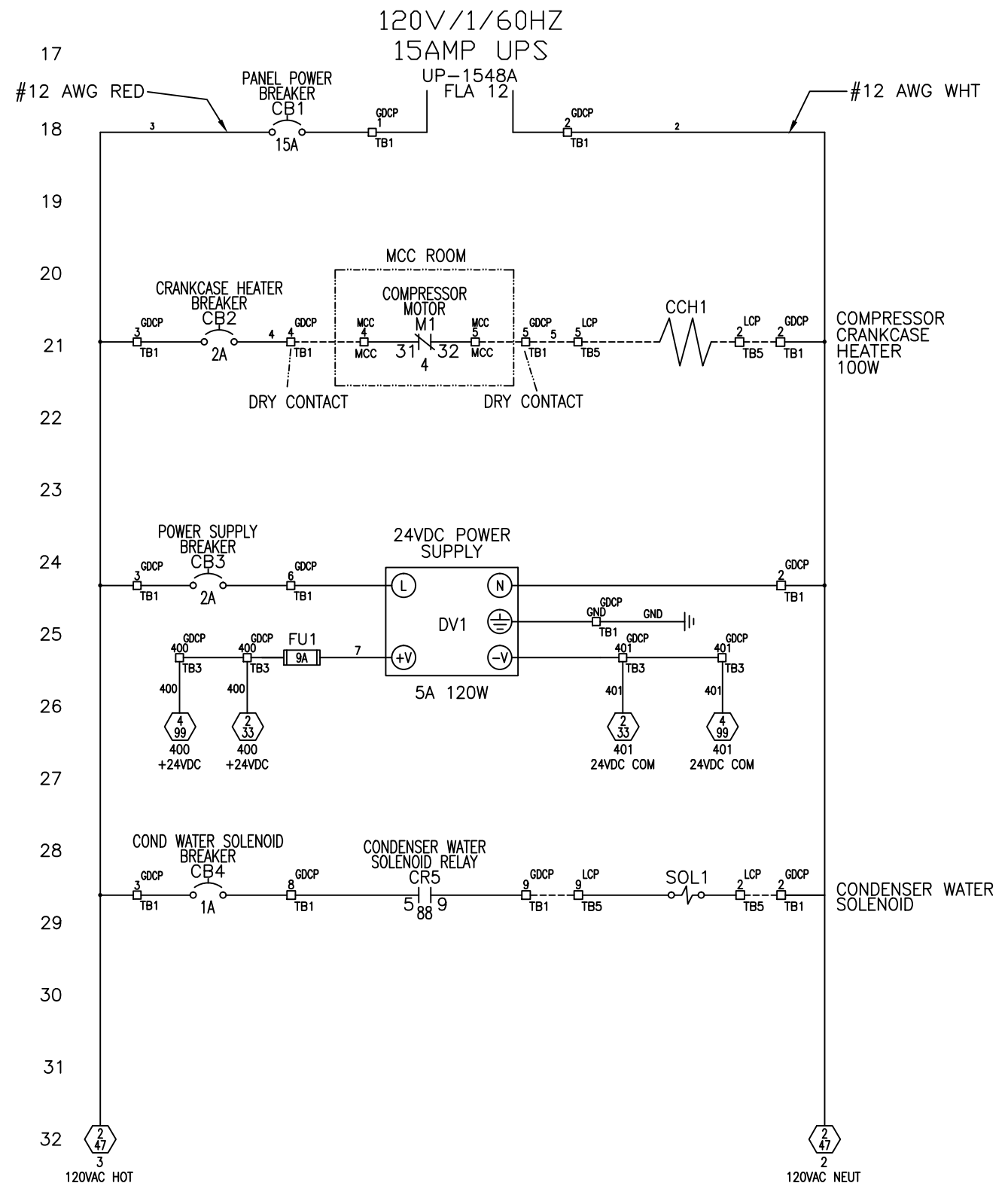
Drawing Number
68270-M2

Revision	Sht	1
F	1	Shts



NOTE:
SIMILAR SCHEMATIC FOR
GAS DRYER 5610-B

SIGNAL REFERENCES SHOW



Last 5 Changes			Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained hereon is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.		
No	Explanation Summary	Name / Date	Classification	Drawn	Checked
-	-	-	Main Power	460/3/60	03/26/2012
-	-	-	Control Power	115/1/60	AJS
-	-	-	Dew Point	8 @ 40/50	
-	-	-	Media	GAS	
-	-	-	Ambient Temp.	FEEDOUT CB'D	
-	-	-	Max. Capacity	1200 SCFM @ 50 PSIG	
-	-	-	Approx. Ship Weight	10,000 lbs.	
-	-	-	P.O. Number	1-3061	

Pioneer Air Systems.
WARTBURG, TN, USA

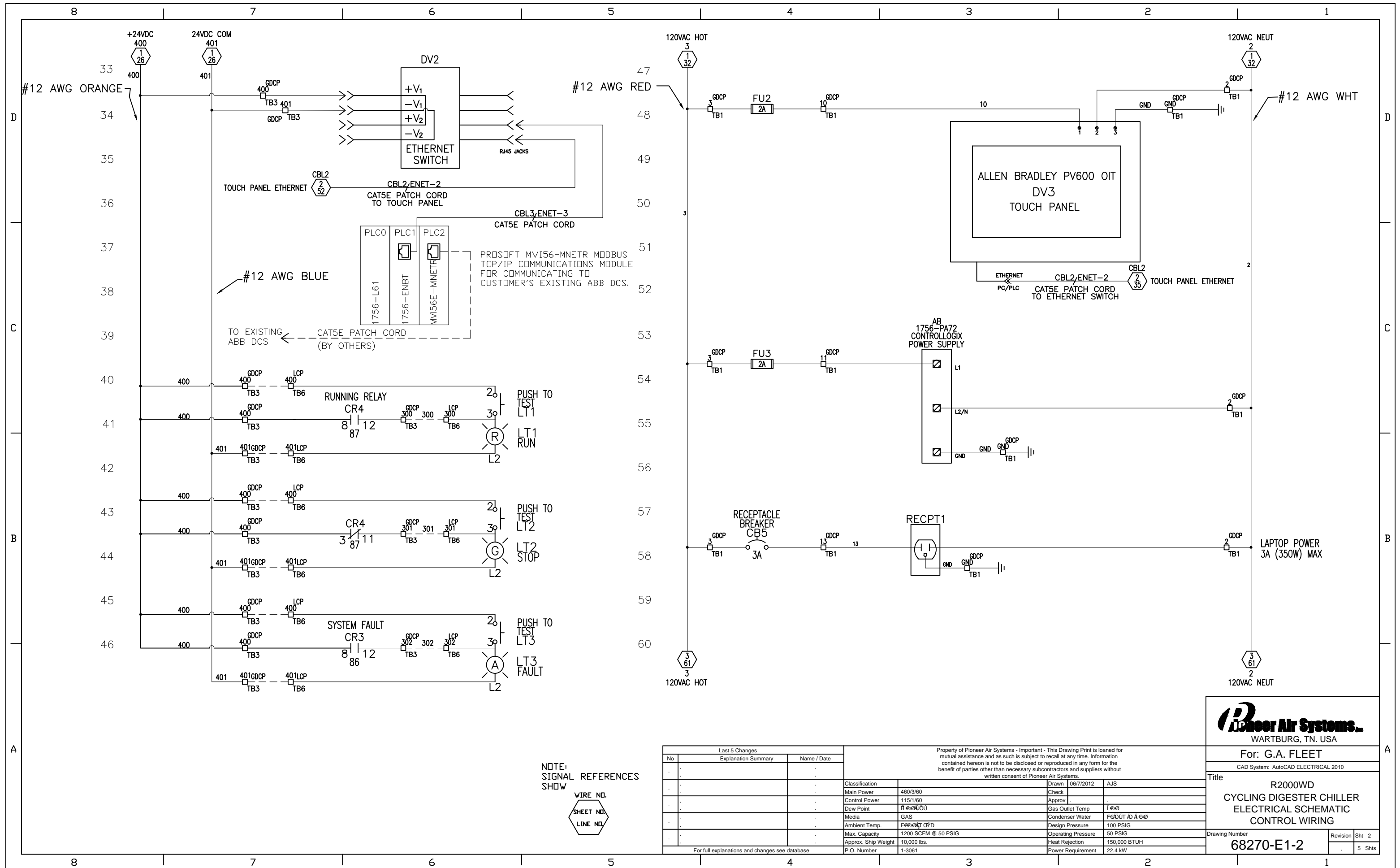
For: **G.A. FLEET**

CAD System: AutoCAD ELECTRICAL 2010

Title: **R2000WD
CYCLING DIGESTER CHILLER
ELECTRICAL SCHEMATIC**

Drawing Number: **68270-E1-1**

Revision: Sht 1
5 Shts



NOTE:
SIGNAL REFERENCES
SHOW



Last 5 Changes		
No	Explanation Summary	Name / Date

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Classification	Drawn	06/7/2012	AJS
Main Power	460/3/60	Check	
Control Power	115/1/60	Approv	
Dew Point	61.0/40.0	Gas Outlet Temp	1.0/0
Media	GAS	Condenser Water	FEEDOUT AD A.0
Ambient Temp.	FEEDOUT CB'D	Design Pressure	100 PSIG
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure	50 PSIG
Approx. Ship Weight	10,000 lbs.	Heat Rejection	150,000 BTUH
P.O. Number	1-3061	Power Requirement	22.4 kW

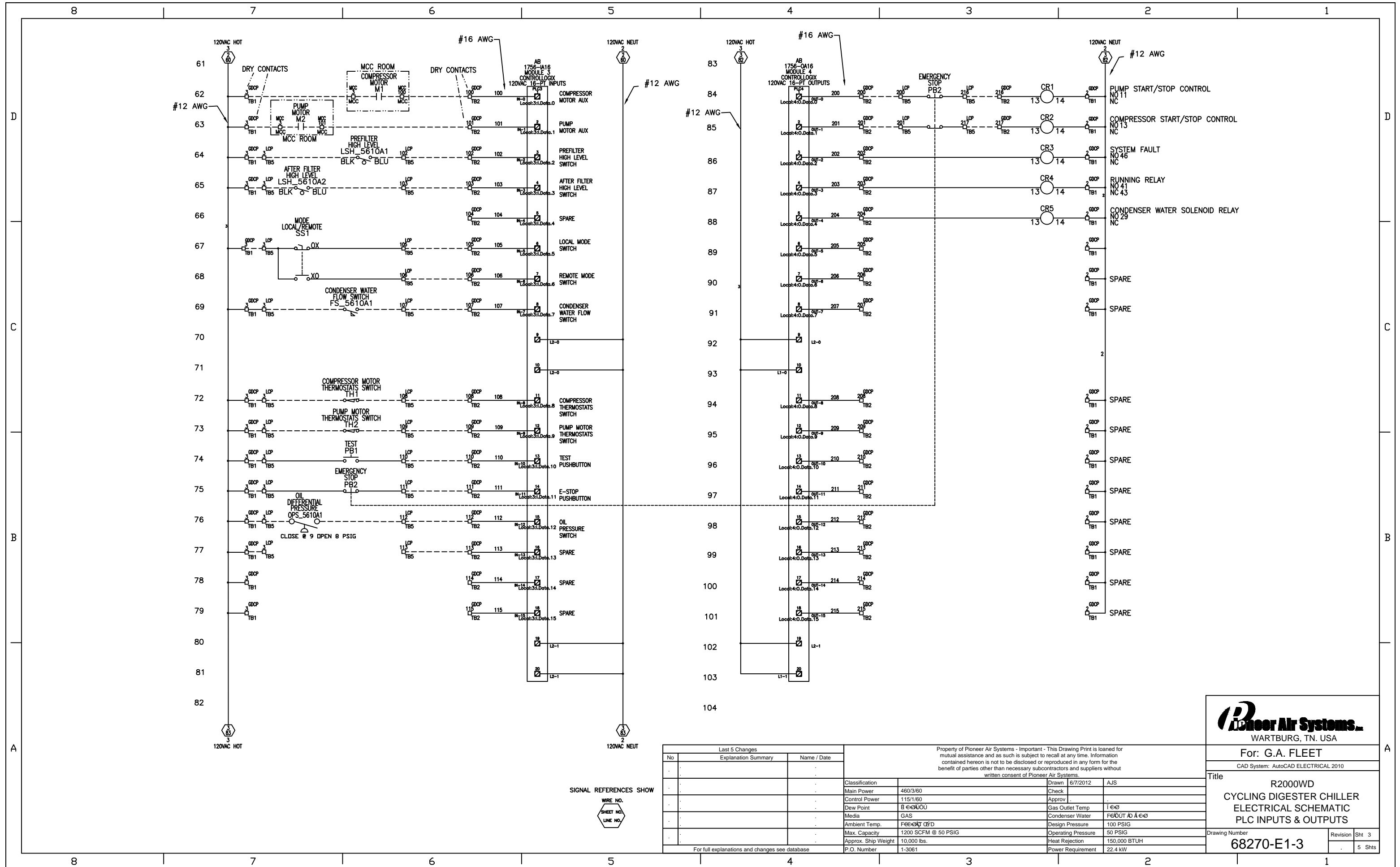
Pioneer Air Systems.
WARTBURG, TN. USA

For: **G.A. FLEET**
CAD System: AutoCAD ELECTRICAL 2010

Title
**R2000WD
CYCLING DIGESTER CHILLER
ELECTRICAL SCHEMATIC
CONTROL WIRING**

Drawing Number
68270-E1-2

Revision Sht 2
5 Shts



SIGNAL REFERENCES SHOW
 WIRE NO.
 SHEET NO.
 LINE NO.

Last 5 Changes		Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained herein is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.	
No	Explanation Summary	Name / Date	

Classification	460/3/60	Drawn	6/7/2012	AJS
Main Power	115/1/60	Check		
Control Power		Approv		
Dew Point		Gas Outlet Temp		
Media		Condenser Water		
Ambient Temp.		Design Pressure	100 PSIG	
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure	50 PSIG	
Approx. Ship Weight	10,000 lbs.	Heat Rejection	150,000 BTUH	
P.O. Number	1-3061	Power Requirement	22.4 kW	

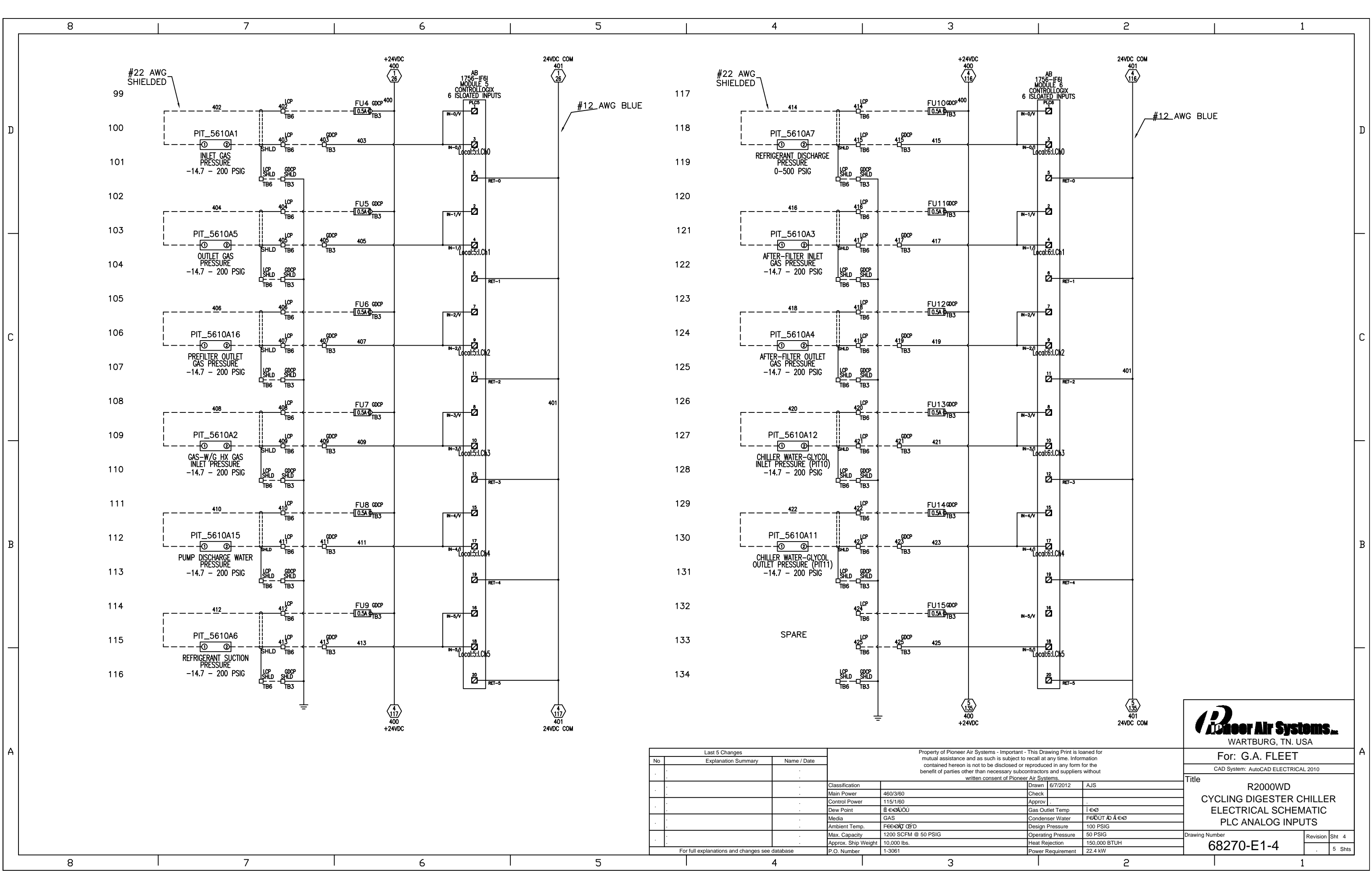
Pioneer Air Systems
 WARTBURG, TN, USA

For: **G.A. FLEET**
 CAD System: AutoCAD ELECTRICAL 2010

Title
**R2000WD
 CYCLING DIGESTER CHILLER
 ELECTRICAL SCHEMATIC
 PLC INPUTS & OUTPUTS**

Drawing Number
68270-E1-3

Revision 3
 5 Shts



Last 5 Changes		
No	Explanation Summary	Name / Date

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Classification	Drawn	6/7/2012
Main Power	460/3/60	Check
Control Power	115/1/60	Approv
Dew Point	60-70°F	Gas Outlet Temp
Media	GAS	Condenser Water
Ambient Temp.	60-70°F	Design Pressure
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure
Approx. Ship Weight	10,000 lbs.	Heat Rejection
P.O. Number	1-3061	Power Requirement

Pioneer Air Systems.
WARTBURG, TN, USA

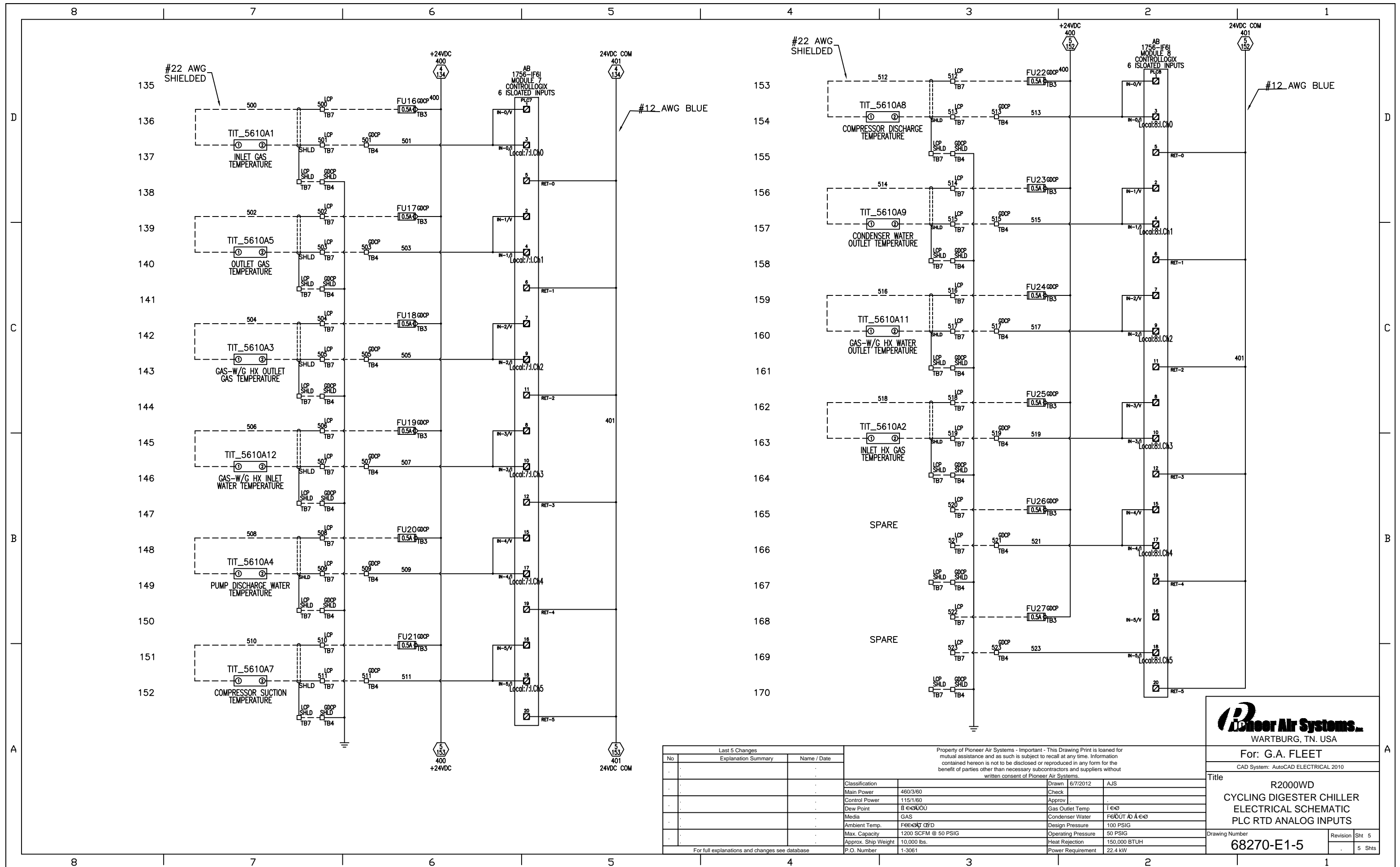
For: **G.A. FLEET**

CAD System: AutoCAD ELECTRICAL 2010

Title: **R2000WD
CYCLING DIGESTER CHILLER
ELECTRICAL SCHEMATIC
PLC ANALOG INPUTS**

Drawing Number: **68270-E1-4**

Revision: Sht 4
5 Shts



Last 5 Changes		
No	Explanation Summary	Name / Date
1		
2		
3		
4		
5		

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Classification	Drawn 6/7/2012 Check AJJS
Main Power	460/3/60
Control Power	115/1/60
Dew Point	B @ 40/0
Media	GAS
Ambient Temp.	F @ 40/0
Max. Capacity	1200 SCFM @ 50 PSIG
Approx. Ship Weight	10,000 lbs.
P.O. Number	1-3061
Operating Pressure	50 PSIG
Heat Rejection	150,000 BTUH
Power Requirement	22.4 kW

Pioneer Air Systems
WARTBURG, TN, USA

For: **G.A. FLEET**
CAD System: AutoCAD ELECTRICAL 2010

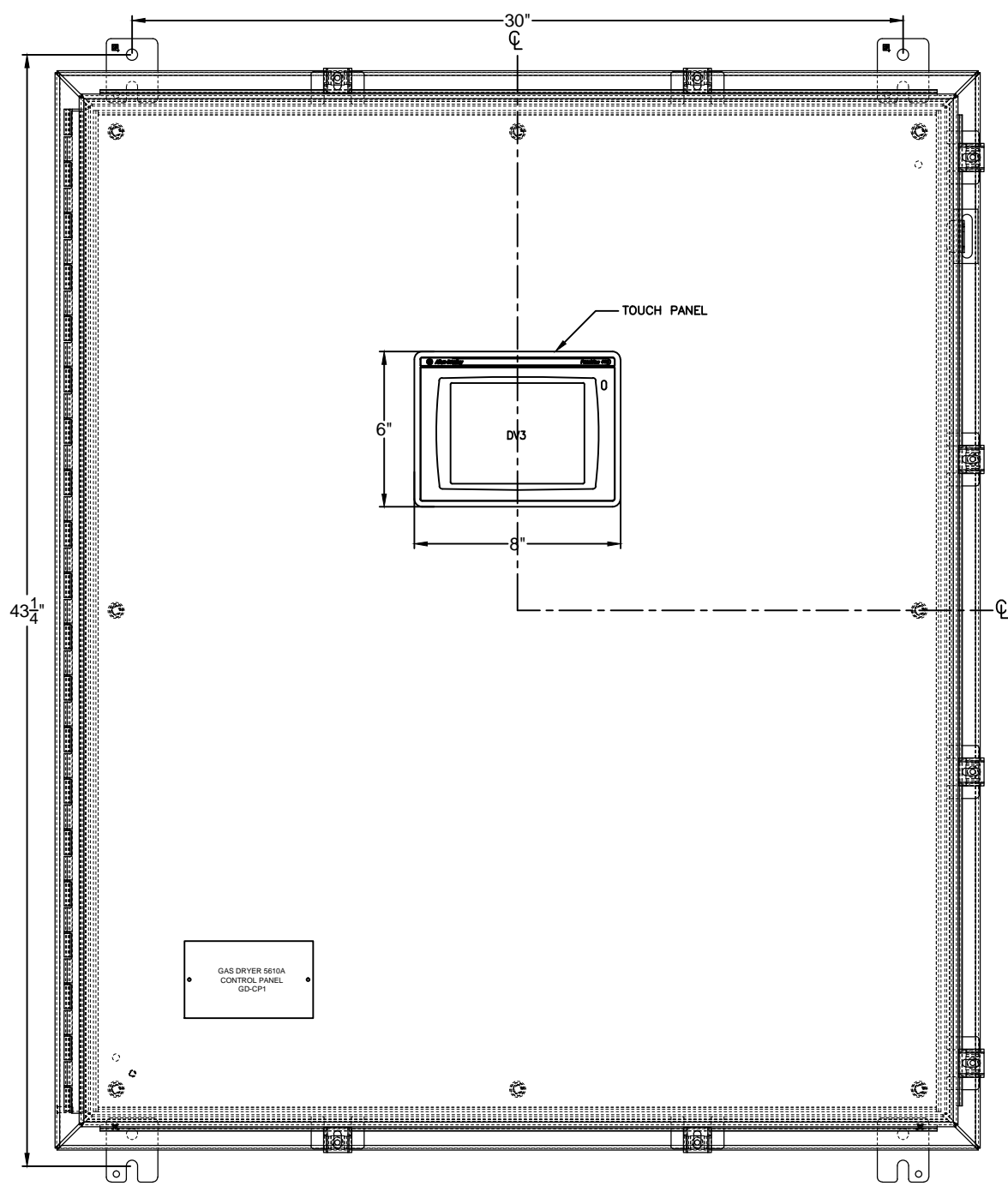
Title
**R2000WD
CYCLING DIGESTER CHILLER
ELECTRICAL SCHEMATIC
PLC RTD ANALOG INPUTS**

Drawing Number
68270-E1-5

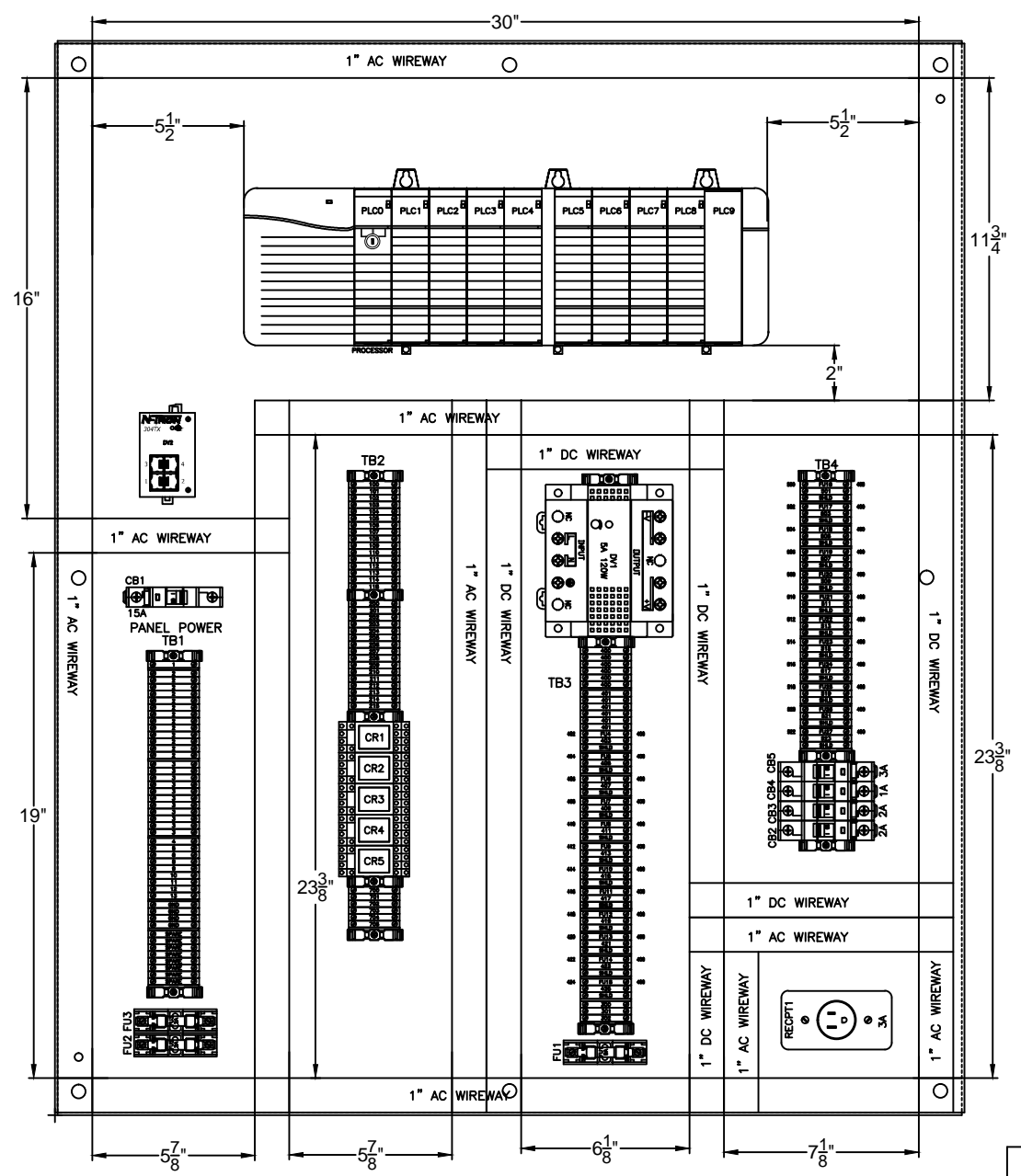
Revision Sht 5
5 Shts

For full explanations and changes see database

HOFFMAN A42H3608SSLP ENCLOSURE NEMA 4X IP66



HOFFMAN A42P36 PANEL



NOTE: MAIN ENCLOSURE MOUNTED REMOTELY FROM SKID IN NON-HAZARDOUS LOCATION.
NAMEPLATE FOR 5610B:
"5610B - CONTROL PANEL GD-CP2"

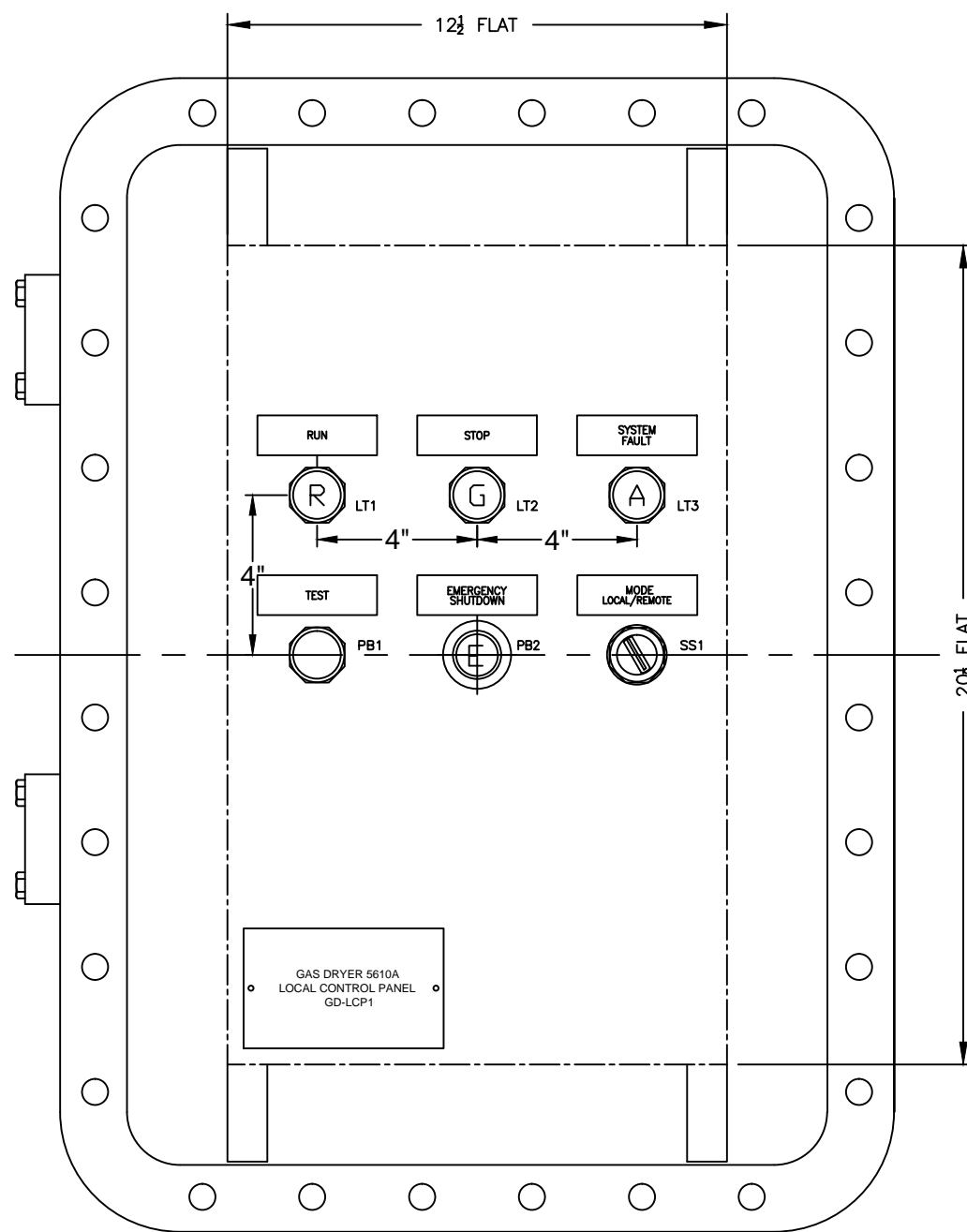
No	Explanation Summary	Name / Date
A	REARRANGED TERMINAL BLOCKS 3 & 4	AJS 5/15/2013

Last 5 Changes		Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained hereon is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.	
Classification	NEMA 4X	Drawn	3/26/2012
Main Power	460/3/60	Check	
Control Power	115/1/60	Approv	
Dew Point	8 @ 100	Gas Outlet Temp	1 @ 0
Media	GAS	Condenser Water	FEEDOUT @ 4 @ 0
Ambient Temp.	FEEDOUT @ 0	Design Pressure	100 PSIG
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure	50 PSIG
Approx. Ship Weight	10,000 lbs.	Heat Rejection	150,000 BTUH
P.O. Number	1-3061	Power Requirement	22.4 kW

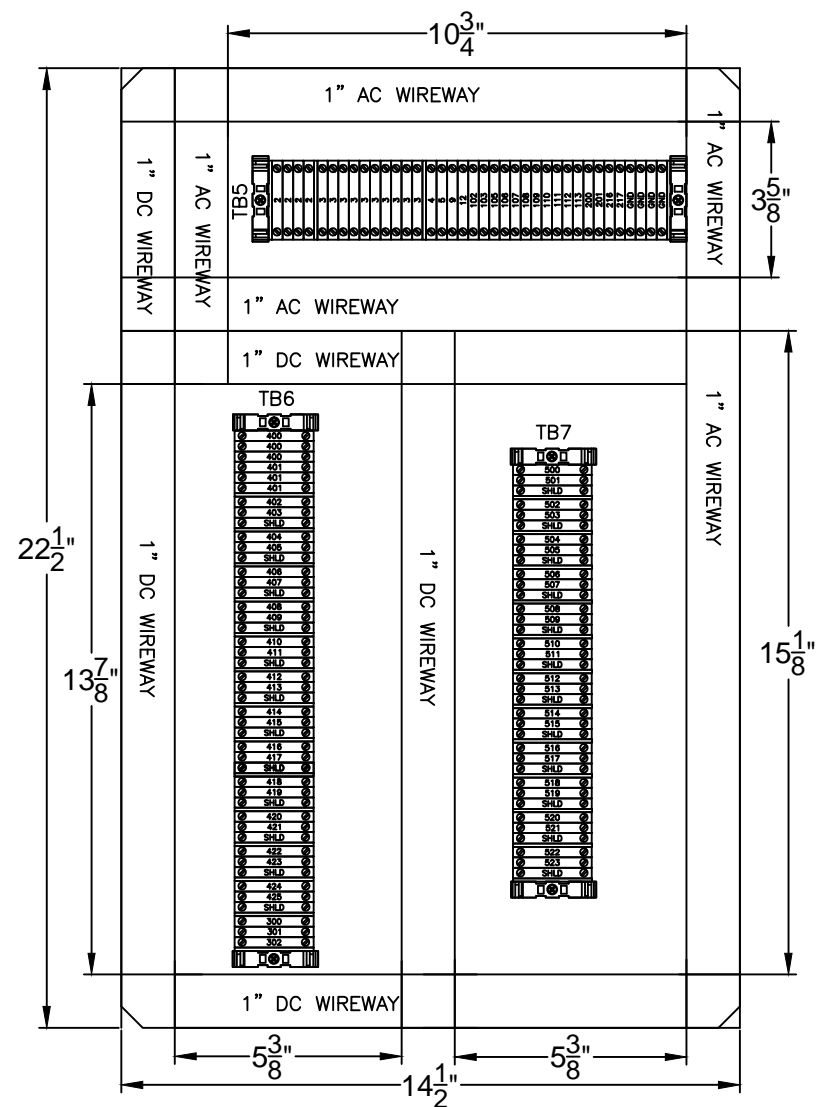


For: G.A. FLEET	
CAD System: AutoCAD ELECTRICAL 2010	
Title	
R2000WD CYCLING DIGESTER CHILLER GAS DRYER CONTROL PANEL LAYOUT	
Drawing Number	Revision Sht 1
68270-E2-1	A 4 Shts

ADALET XCE162408 ENCLOSURE NEMA 7



ADALET XSM1624 PANEL



NOTE: LOCAL CONTROL PANEL MOUNTED ON LOCAL SKID IN HAZARDOUS LOCATION.
NAMEPLATE FOR 5610B:
"5610B - LOCAL CONTROL PANEL GD-LCP2"

Last 5 Changes		
No	Explanation Summary	Name / Date
.	.	.
.	.	.
.	.	.
.	.	.

For full explanations and changes see database

Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained hereon is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.

Classification	CLASS 1, DIV 1, GROUP D (NEMA 7)	Drawn	4/4/2012	AJS
Main Power	460/3/60	Check		
Control Power	115/1/60	Approv		
Dew Point	8 @ 40°F	Gas Outlet Temp		1 @ 0
Media	GAS	Condenser Water		FE @ 10 @ 1 @ 0
Ambient Temp.	FE @ 10 @ 0	Design Pressure		100 PSIG
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure		50 PSIG
Approx. Ship Weight	10,000 lbs.	Heat Rejection		150,000 BTUH
P.O. Number	1-3061	Power Requirement		22.4 kW

Pioneer Air Systems
WARTBURG, TN. USA

For: G.A. FLEET

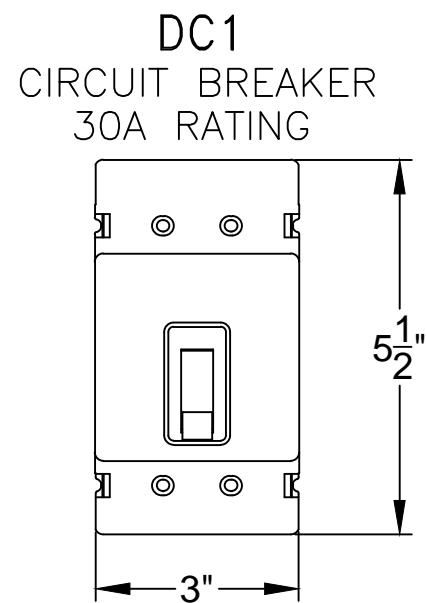
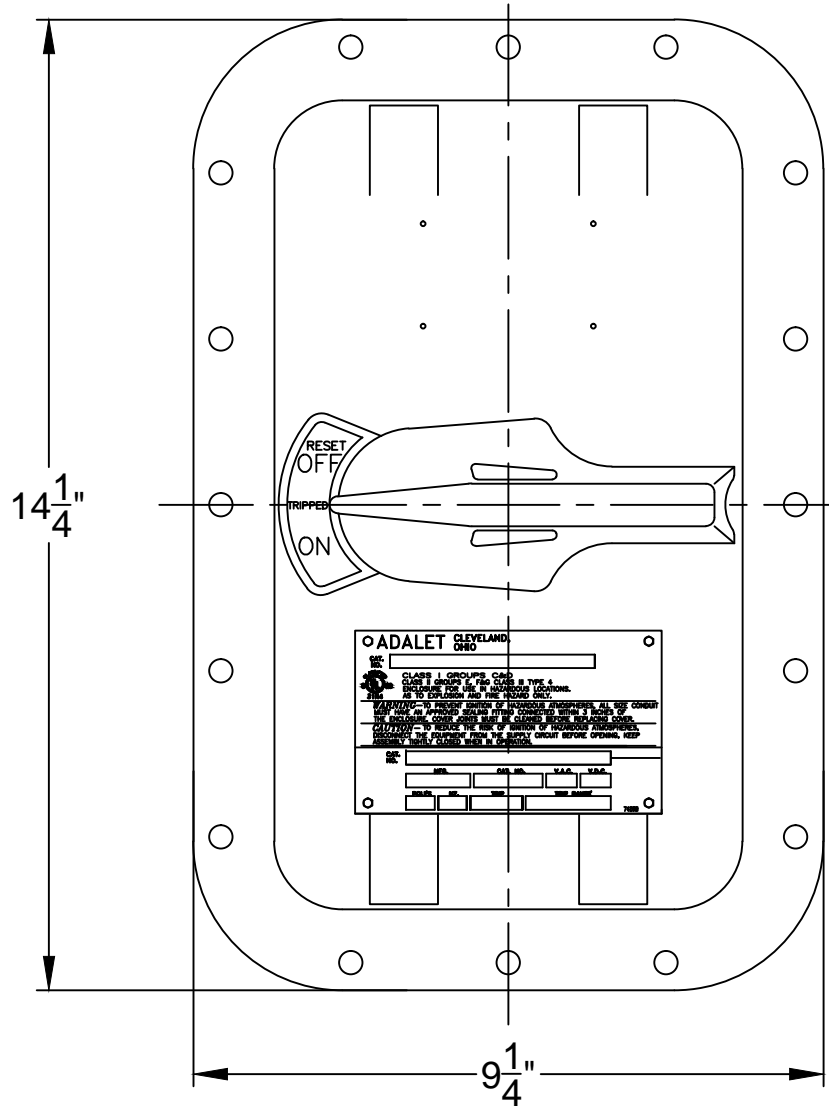
CAD System: AutoCAD ELECTRICAL 2010

Title
R2000WD
CYCLING DIGESTER CHILLER
LOCAL CONTROL
PANEL LAYOUT

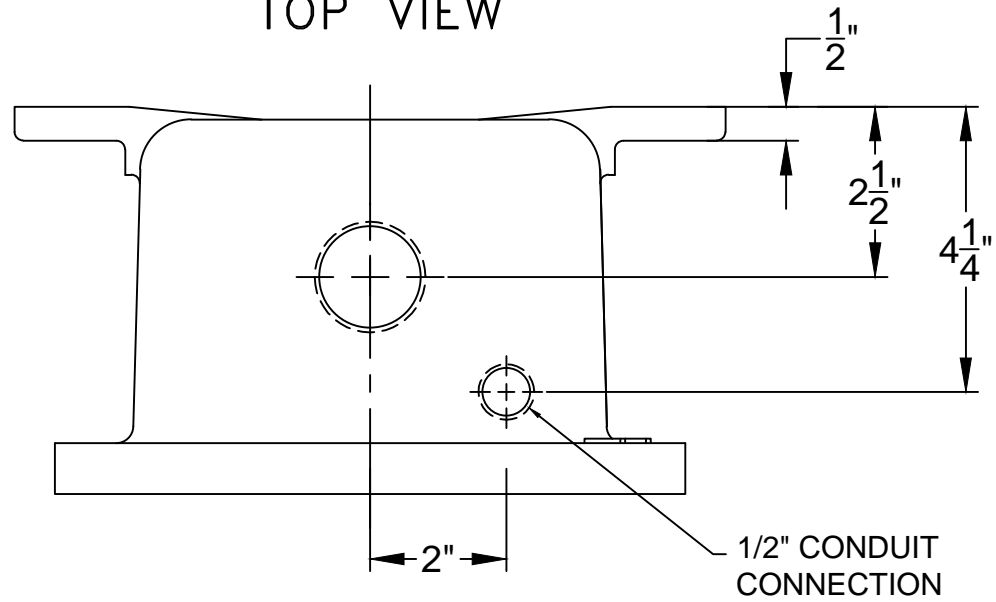
Drawing Number
68270-E2-2

Revision Sht 2
4 Shts

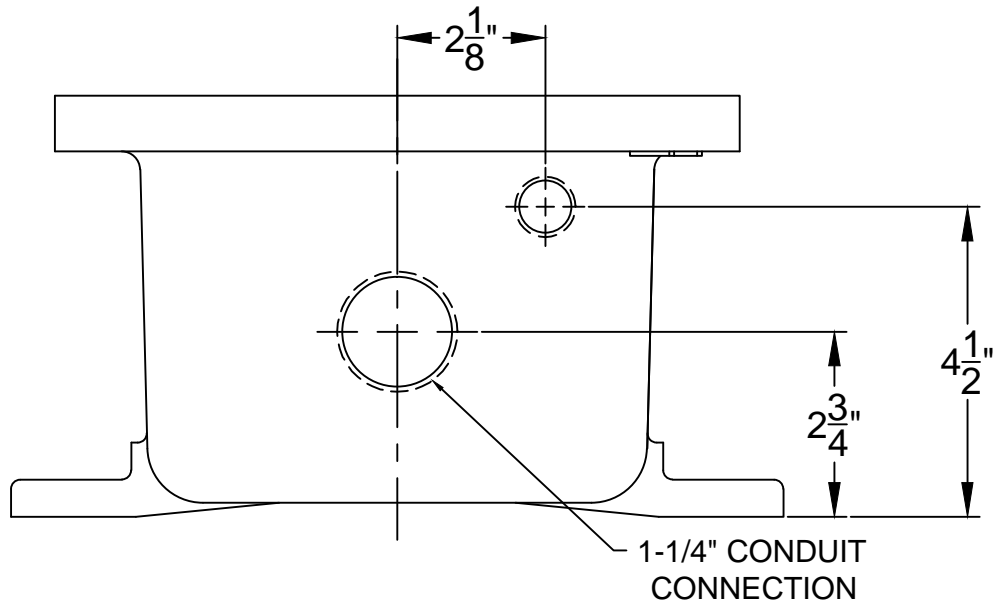
ADALET XCBA-N4-30E43W
ENCLOSURE
NEMA 7 IP66



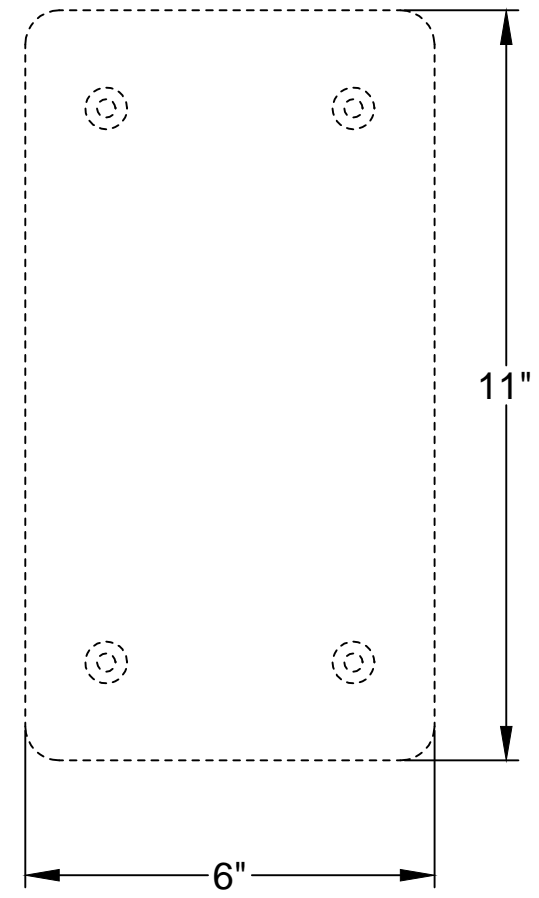
TOP VIEW



BOTTOM VIEW



ADALET PANEL



ENCLOSURE DEPTH - 5"

NOTE: DISCONNECT ENCLOSURE
MOUNTED ON LOCAL SKID IN
HAZARDOUS LOCATION. ONE
DISCONNECT FOR EACH MOTOR.

Last 5 Changes		Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained hereon is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.	
No	Explanation Summary	Name / Date	
-	-	-	Classification CLASS 1, DIV 1, GROUP D (NEMA 7)
-	-	-	Main Power 460/3/60
-	-	-	Control Power 115/1/60
-	-	-	Dew Point 85°F @ 100% RH
-	-	-	Media GAS
-	-	-	Ambient Temp. 100°F @ 100% RH
-	-	-	Max. Capacity 1200 SCFM @ 50 PSIG
-	-	-	Approx. Ship Weight 10,000 lbs.
-	-	-	P.O. Number 1-3061
-	-	-	Drawn 09/12/2011 JML
-	-	-	Check 09/12/2011 JS
-	-	-	Design Pressure 100 PSIG
-	-	-	Operating Pressure 50 PSIG
-	-	-	Heat Rejection 150,000 BTUH
-	-	-	Power Requirement 22.4 kW

Pioneer Air Systems.
WARTBURG, TN. USA

For: G.A. FLEET

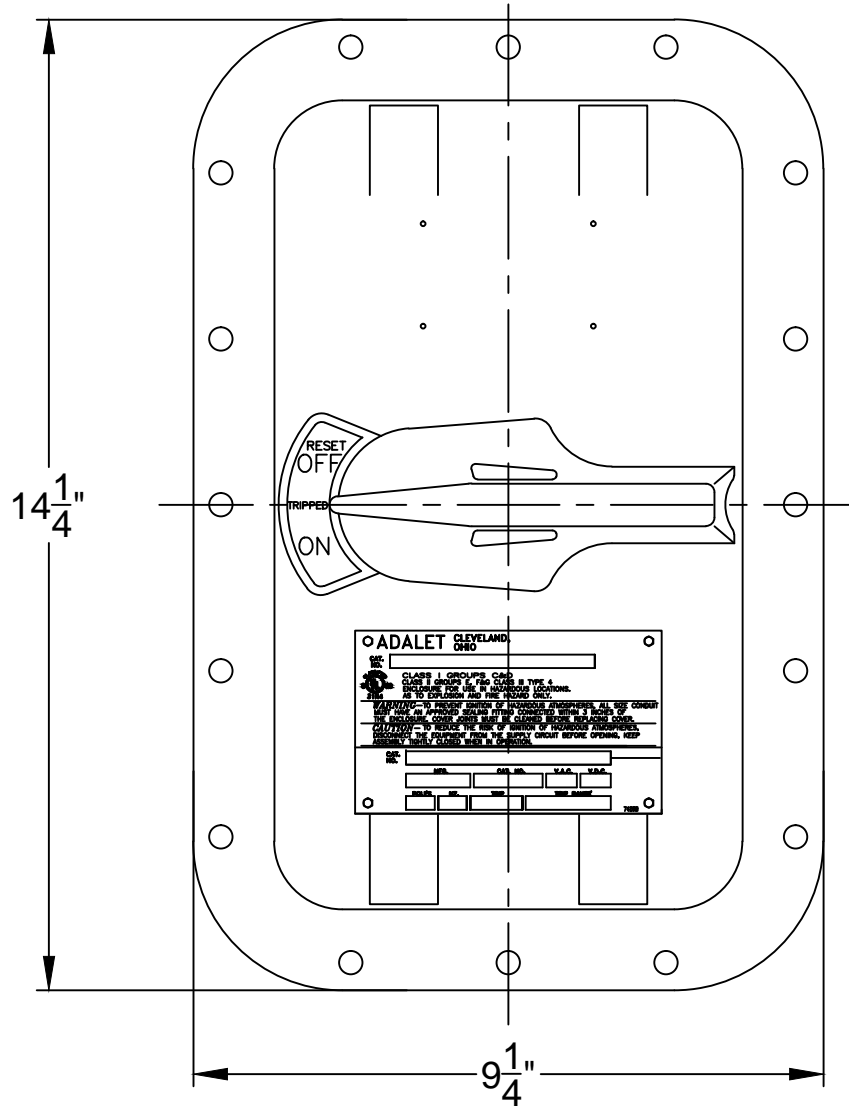
CAD System: AutoCAD ELECTRICAL 2010

Title: R2000WD
CYCLING DIGESTER CHILLER
PANEL LAYOUT
COMPR DISCONNECT ENCLOSURE

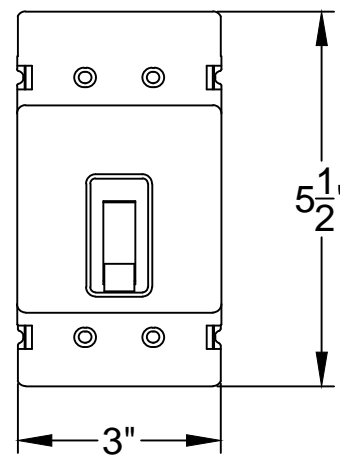
Drawing Number: 68270-E2-3

Revision: Sht 3
4 Shts

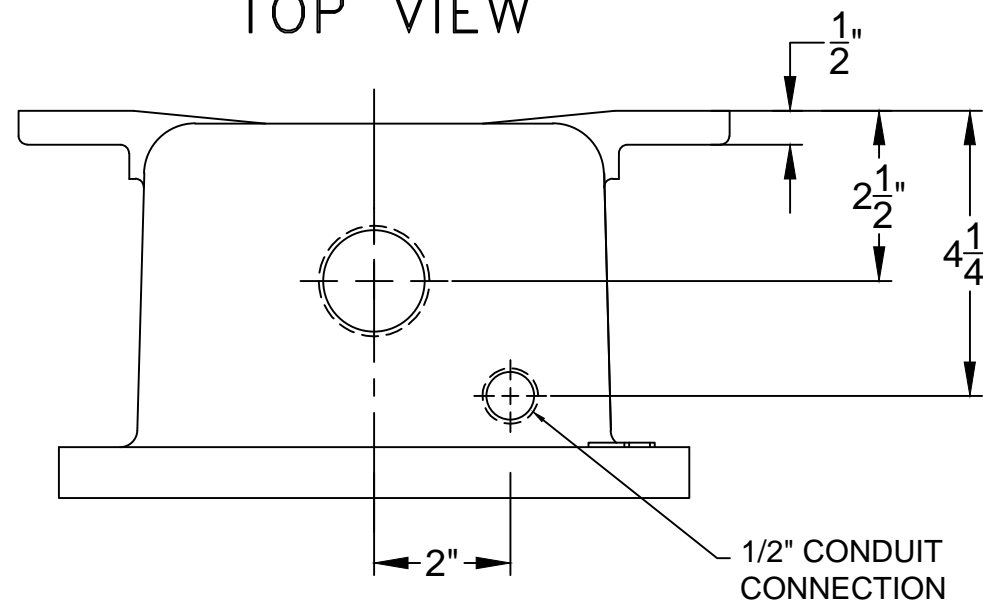
ADALET XCBA-N4-15E43W
ENCLOSURE
NEMA 7 IP66



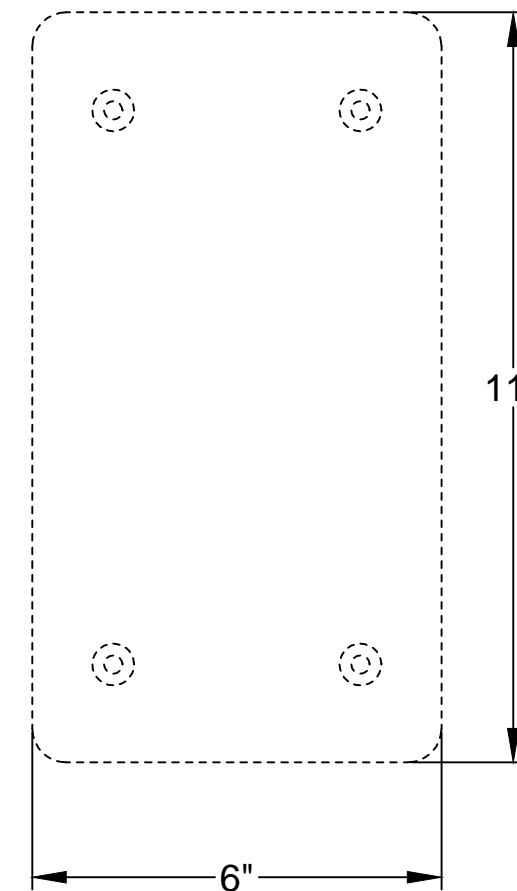
DC2
CIRCUIT BREAKER
15A RATING



TOP VIEW

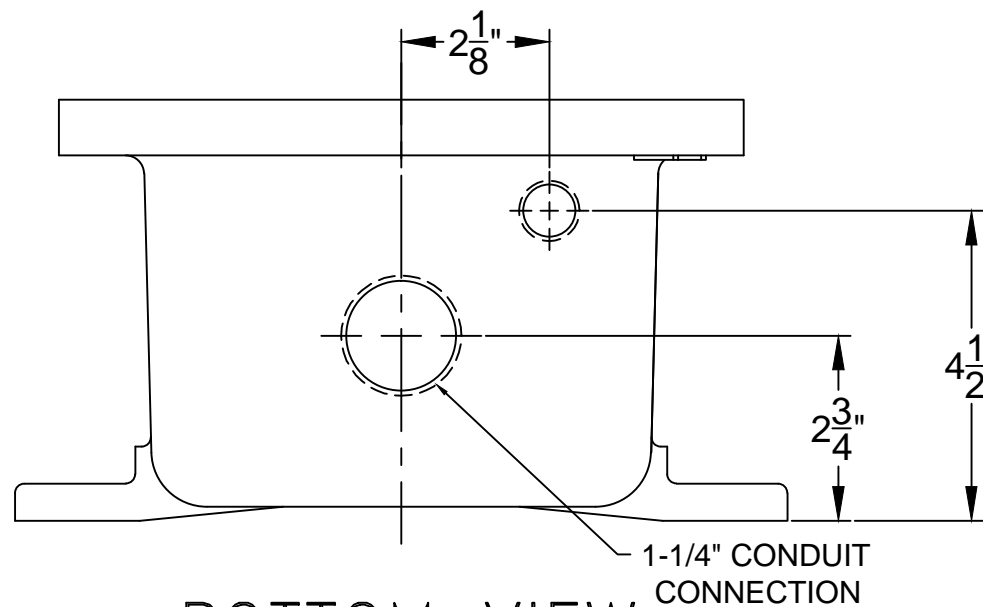


ADALET PANEL



ENCLOSURE DEPTH - 5"

BOTTOM VIEW

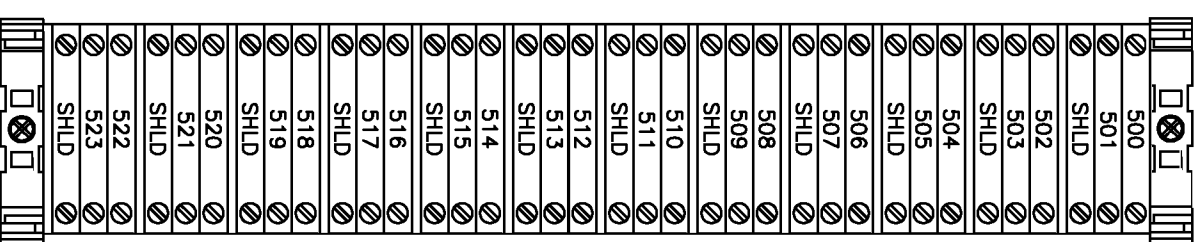
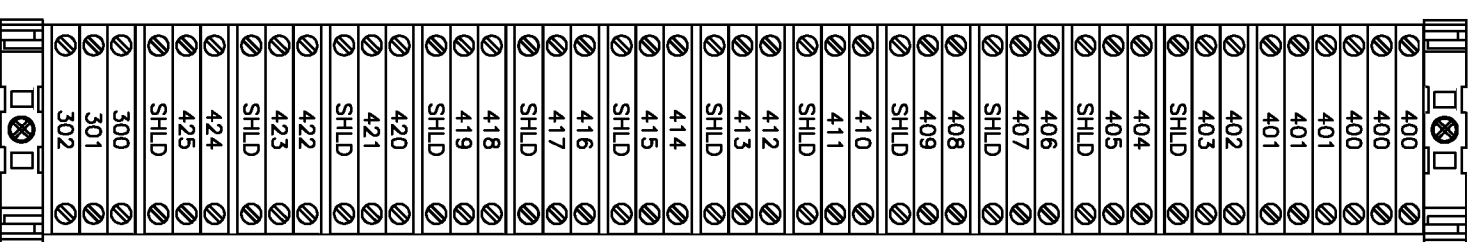
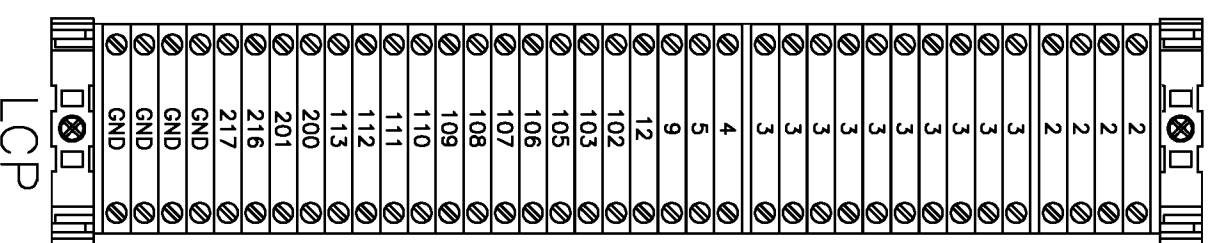
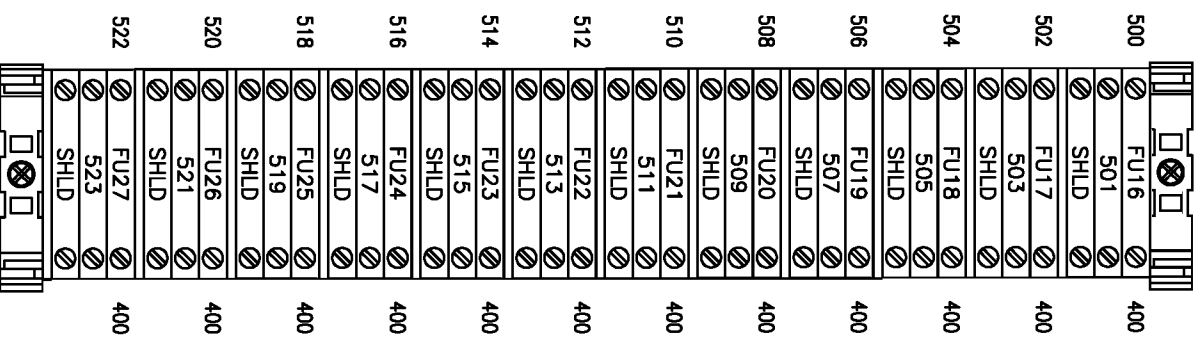
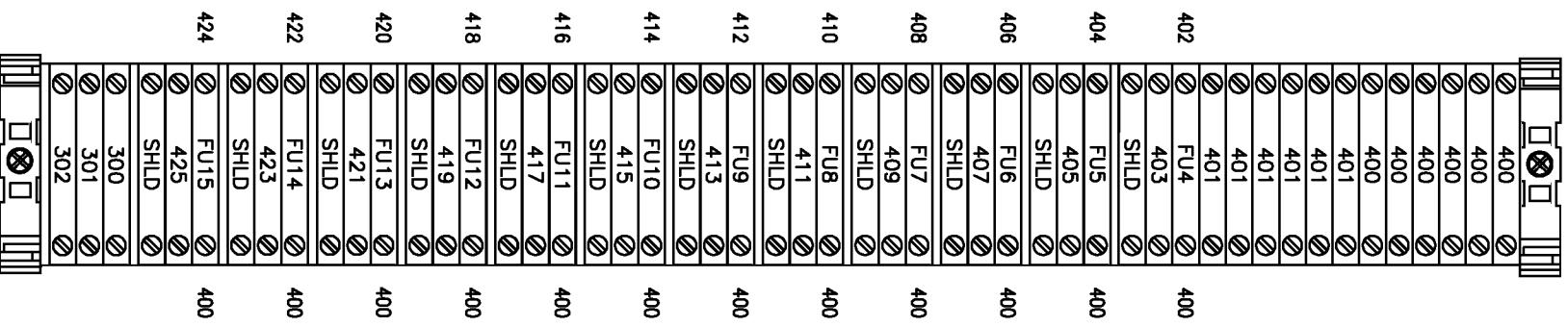
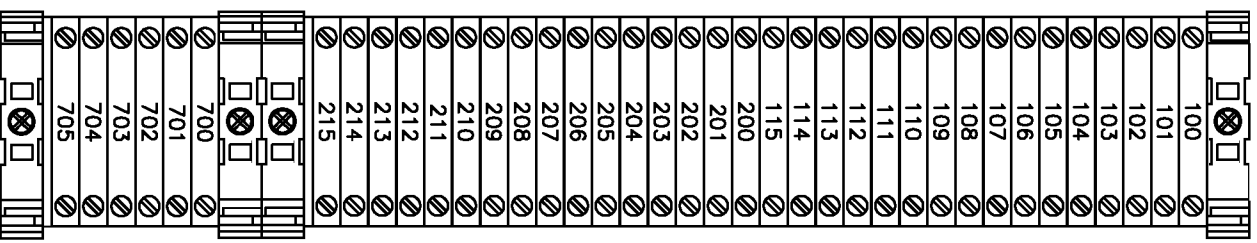
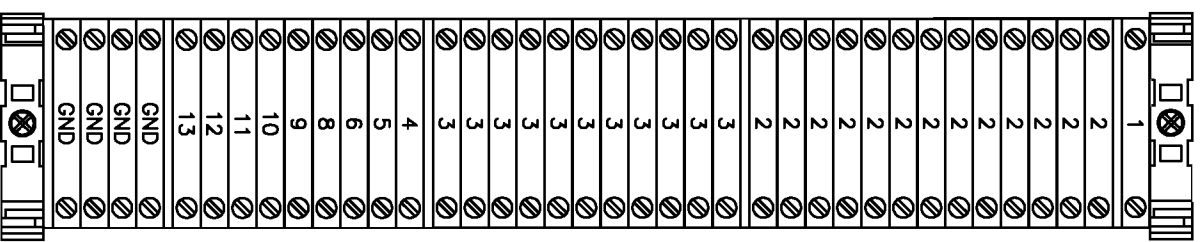


NOTE: DISCONNECT ENCLOSURE
MOUNTED ON LOCAL SKID IN
HAZARDOUS LOCATION

Last 5 Changes			Property of Pioneer Air Systems - Important - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained hereon is not to be disclosed or reproduced in any form for the benefit of parties other than necessary subcontractors and suppliers without written consent of Pioneer Air Systems.		
No	Explanation Summary	Name / Date	Classification	Drawn	Check
-	-	-	CLASS 1, DIV 1, GROUP D (NEMA 7)	09/12/2011	JML
-	-	-	Main Power	460/3/60	09/12/2011
-	-	-	Control Power	115/1/60	JS
-	-	-	Dew Point	50 F @ 100% RH	Approv
-	-	-	Media	GAS	Gas Outlet Temp
-	-	-	Ambient Temp.	50 F @ 50% RH	Condenser Water
-	-	-	Max. Capacity	1200 SCFM @ 50 PSIG	Design Pressure
-	-	-	Approx. Ship Weight	10,000 lbs.	Operating Pressure
-	-	-	P.O. Number	1-3061	Heat Rejection
-	-	-	-	-	Power Requirement



For: G.A. FLEET
CAD System: AutoCAD ELECTRICAL 2010
Title: R2000WD
CYCLING DIGESTER CHILLER
PANEL LAYOUT
PUMP DISCONNECT ENCLOSURE
Drawing Number: 68270-E2-4
Revision: Sht 4
4 Shts



GAS DRYER CP
ENCLOSURE

LCP
ENCLOSURE

No	Explanation Summary	Name / Date	Classification	Drawn	Check	Approved
A	REARRANGED TERMINAL BLOCKS 3 & 4	ALS 5/15/2013	4602/80 11/9/7/80 407F PDP GAS 100°F (MAX) 1200 SCFM @ 50 PSIG 10,000 lbs. 1-5081	8/7/2012		ALS

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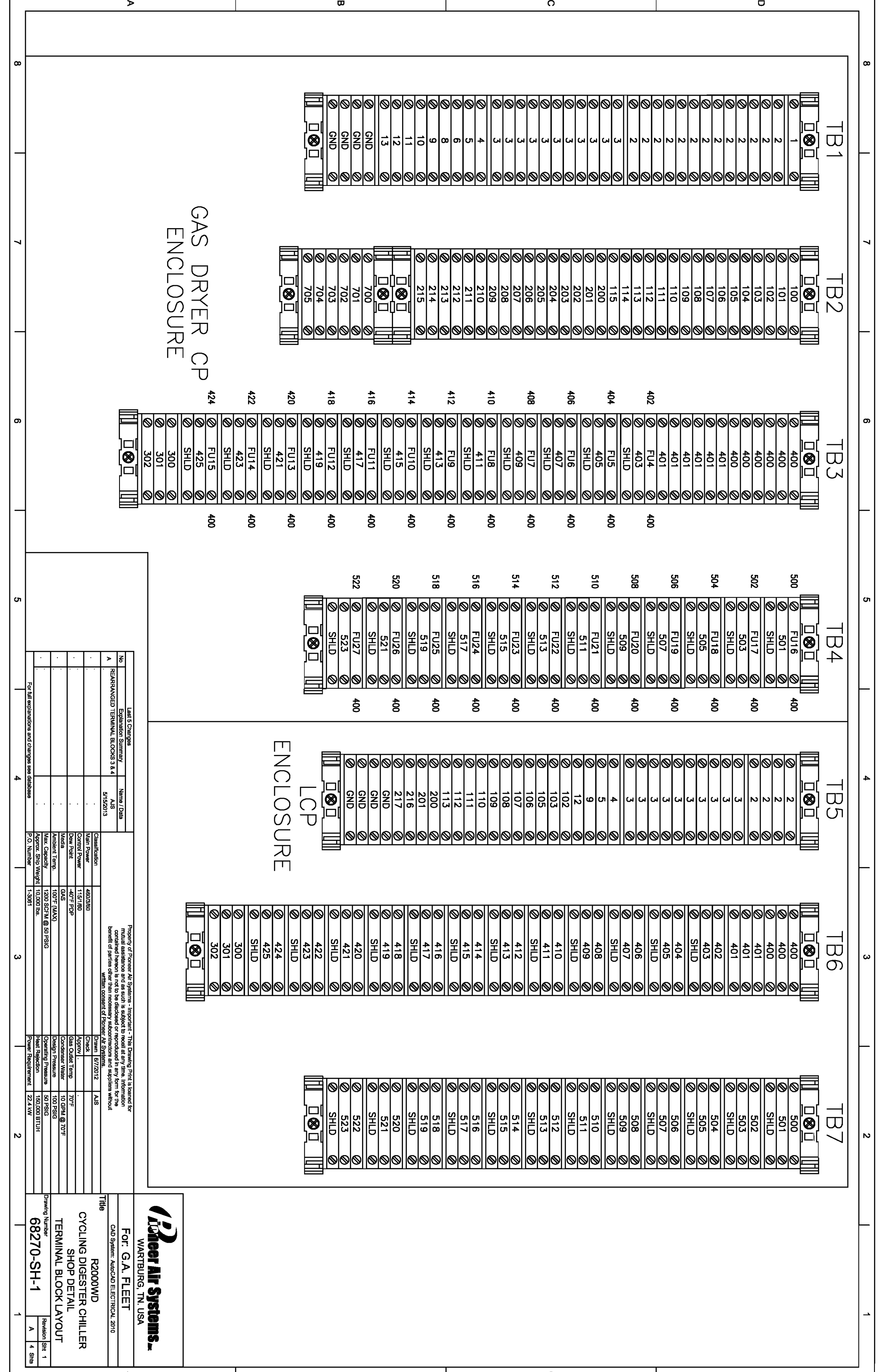
Pioneer Air Systems
WARTBURG, TN, USA

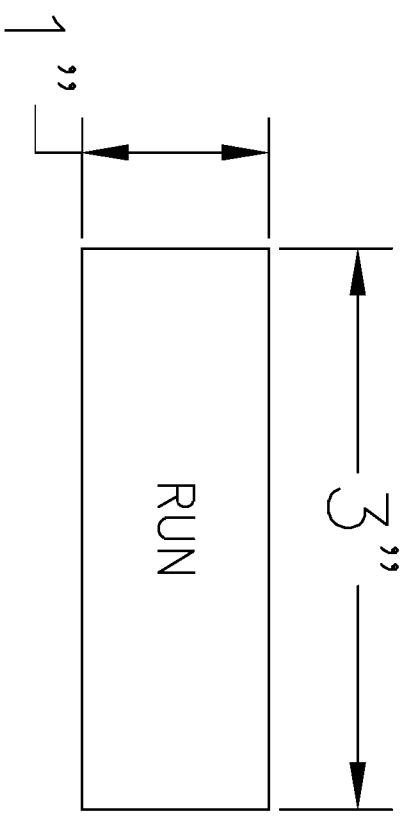
For: **G.A. FLEET**
CAD System: AutoCAD ELECTRICAL 2010

Title: **R2000WD
CYCLING DIGESTER CHILLER
SHOP DETAIL
TERMINAL BLOCK LAYOUT**

Drawing Number: **68270-SH-1**

Revision: **1**
A 4 SHS





RUN

STOP

SYSTEM
FAULT

TEST

EMERGENCY
SHUTDOWN

MODE
LOCAL/REMOTE

NOTE: STAINLESS STEEL CORROSION RESISTANT TAGS REQUIRED BY CUSTOMER FOR LOCAL PANEL

No	Explanation Summary	Name / Date
	Last 5 Changes	
	Explanation Summary	Name / Date

Classification	NEEA 7
Main Power	480/280
Control Power	115/7/60
Dew Point	-40°F FDP
Media	Gas
Ambient Temp.	100°F (MAX)
Max. Capacity	1200 SCFM @ 50 PSIG
Approx. Ship Weight	10,000 lbs.
P.O. Number	1-3061

Pioneer Air Systems
WARTBURG, TN, USA

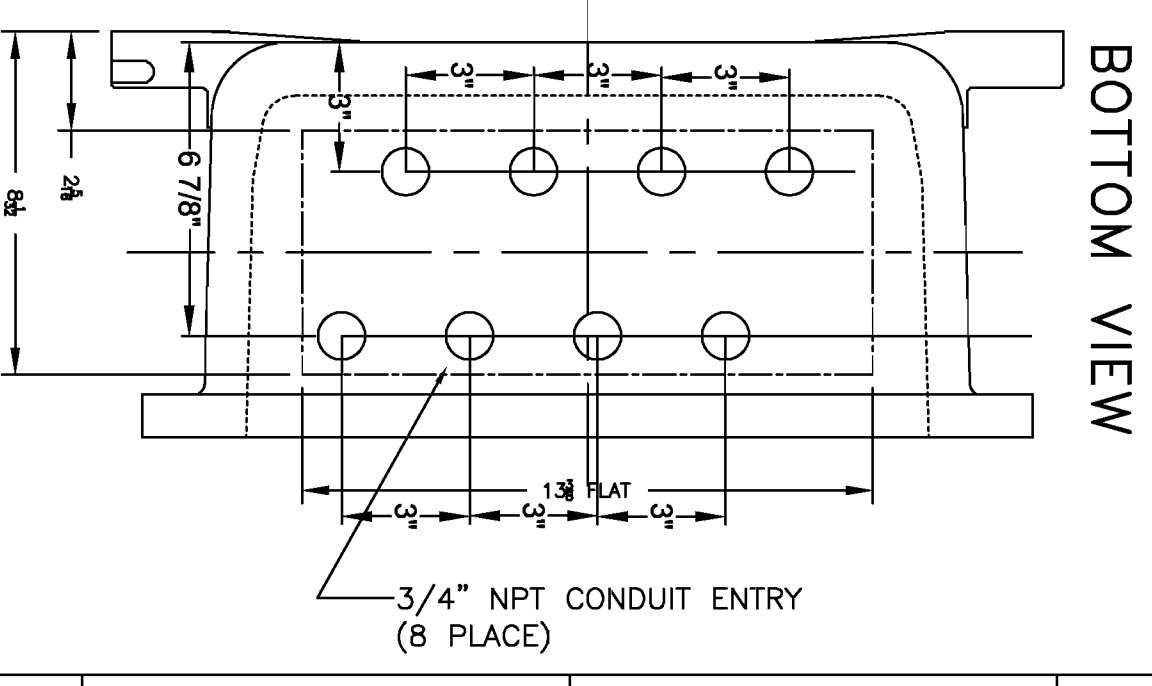
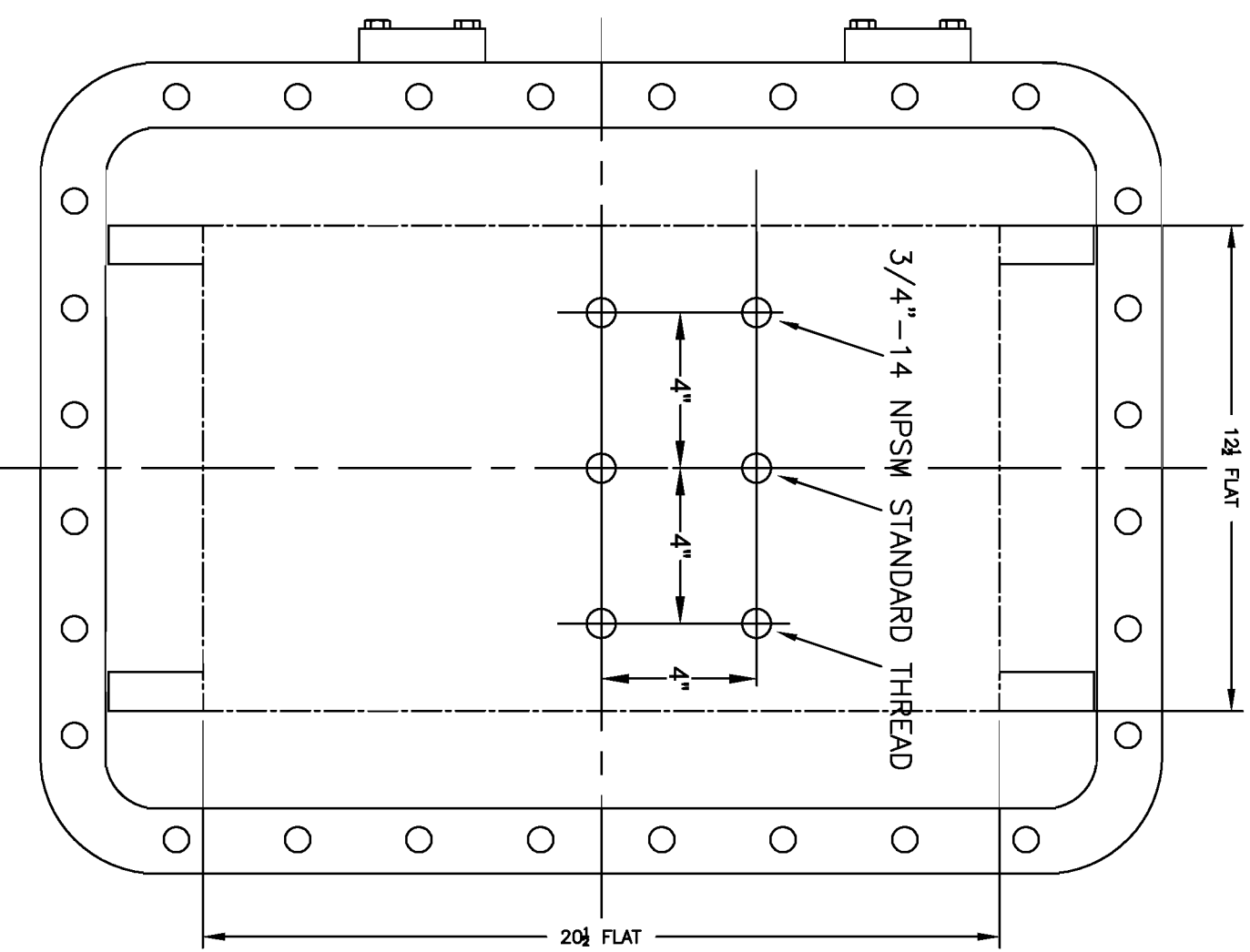
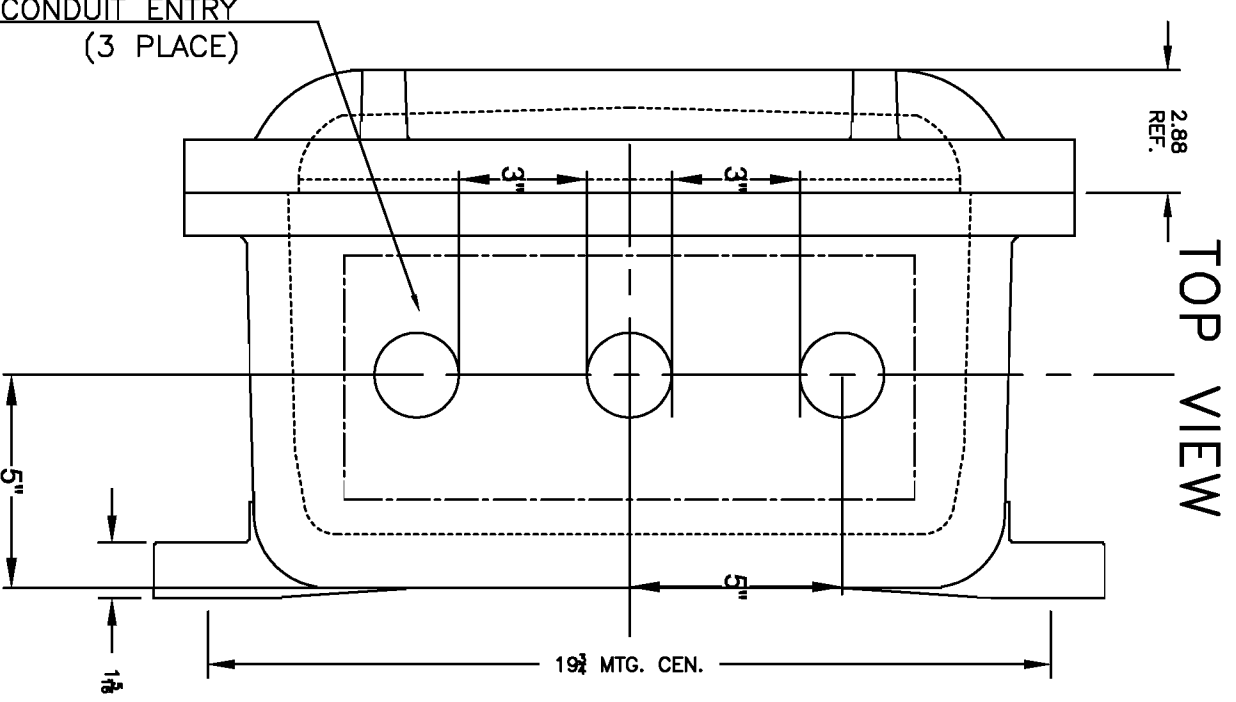
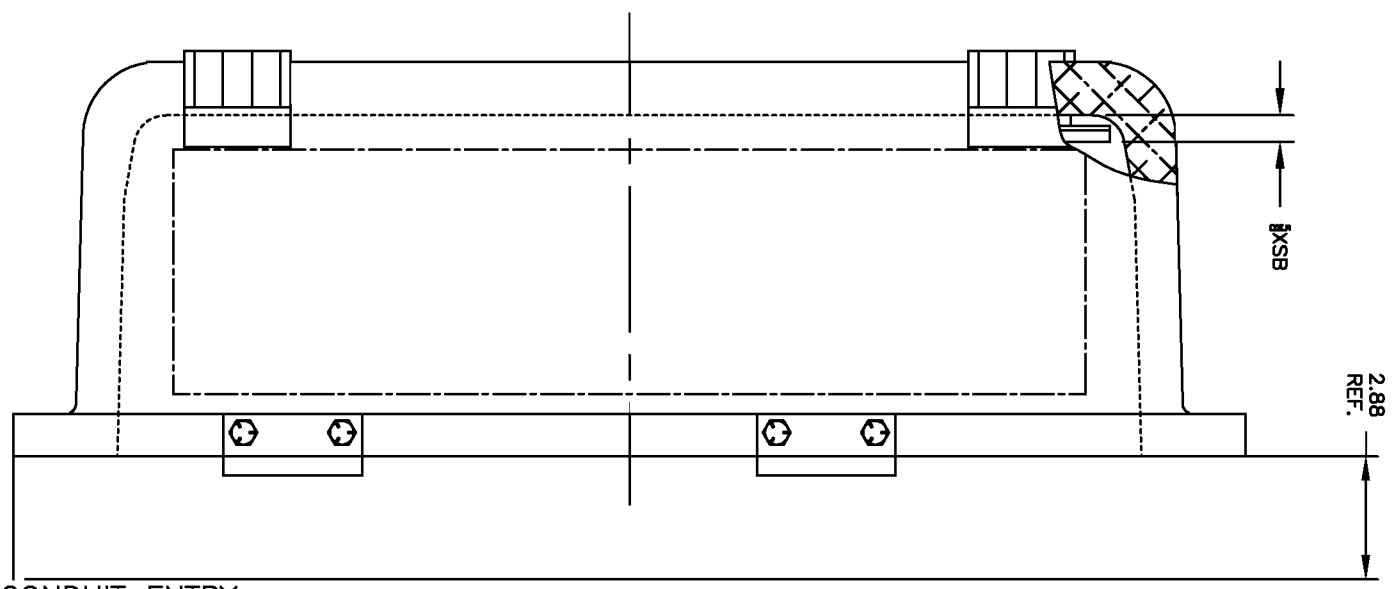
For: G.A. FLEET
CAD System: AutoCAD ELECTRICAL 2010

Title
R2000WD
CYCLING DIGESTER CHILLER
SHOP DETAIL
GD PANEL TAG LAYOUT

Drawing Number
68270-SH-2

Revision | Sht 2
4 Shts

ADALET XCE162408 ENCLOSURE NEMA 7 IP66



No	Explanation Summary	Name / Date
Last 5 Changes		
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	Classification	NEMA 7
	Main Power	480/280
	Control Power	115/180
	Dew Point	-40°F FDP
	Media	GAS
	Ambient Temp.	100°F (MAX)
	Max. Capacity	1200 SCFM @ 50 PSIG
	Approx. Ship Weight	10,000 lbs.
	P.O. Number	1-3081
	Drawn	8/7/2012
	Check	ALS
	Approv	
	Gas Outlet Temp	70°F
	Condenser Water	10 GPM @ 70°F
	Design Pressure	100 PSIG
	Operating Pressure	50 PSIG
	Heat Rejection	150,000 BTUH
	Power Requirement	22.4 KW

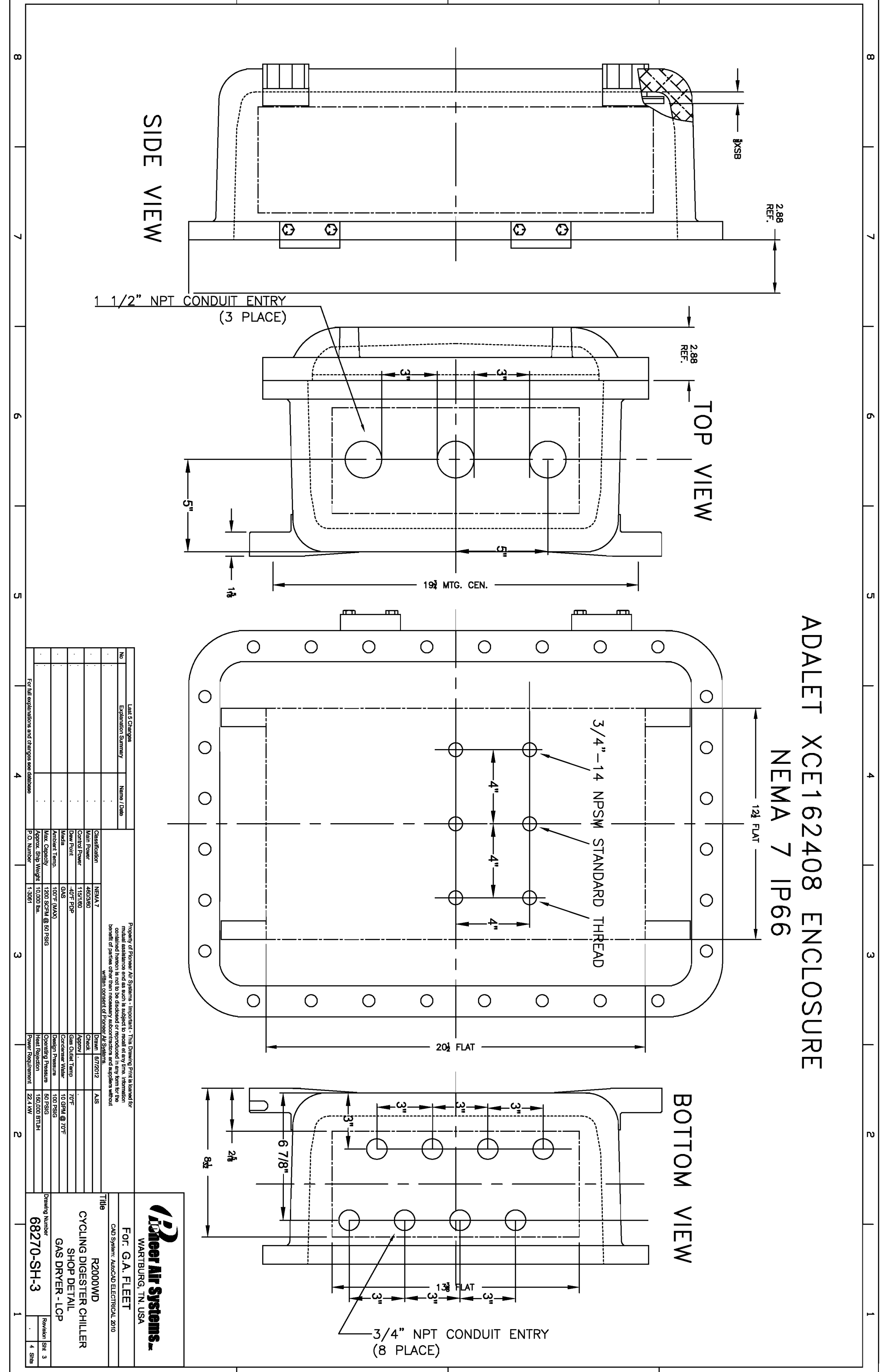
Pioneer Air Systems
WARTBURG, TN, USA

FOR: G.A. FLEET
CAD System: AutoCAD ELECTRICAL 2010

TYTLE
R20000WD
CYCLING DIGESTER CHILLER
SHOP DETAIL
GAS DRYER - LCP

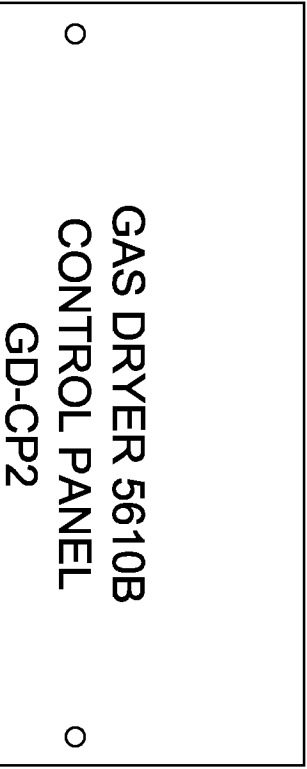
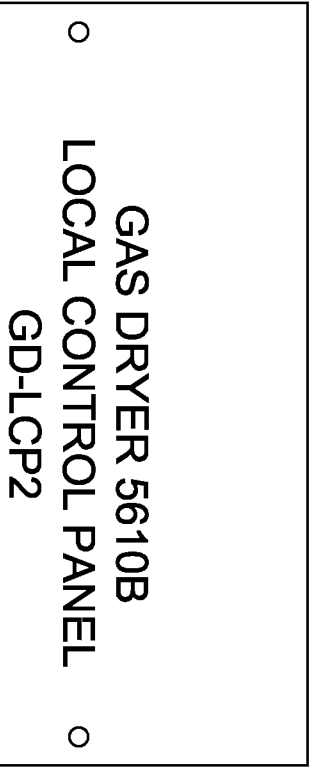
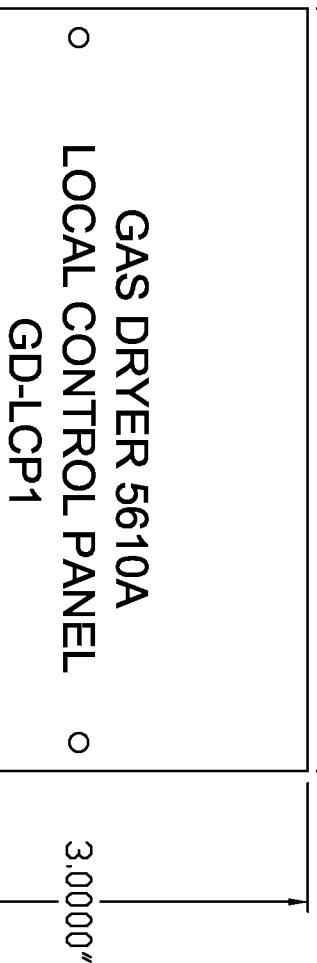
Drawing Number
68270-SH-3

Revision: SH 3
4 SHS



8 7 6 5 4 3 2 1

5.0000"



No	Explanation Summary	Name / Date

Property of Pioneer Air Systems - Important! - This Drawing Print is loaned for mutual assistance and as such is subject to recall at any time. Information contained herein is not to be disclosed or reproduced in any form for the benefit of parties other than the applicable recipient without written consent of Pioneer Air Systems.

Classification	NEEA 7	Drawn	8/7/2012	ALS
Main Power	480/280	Check		
Control Power	115/180	Approv		
Dew Point	-40F FDP	Gas Outlet Temp		70F
Media	GAS	Condenser Water		10 GPM @ 70F
Ambient Temp.	100F (MAX)	Design Pressure		100 PSIG
Max. Capacity	1200 SCFM @ 50 PSIG	Operating Pressure		50 PSIG
Approx. Ship Weight	10,000 lbs.	Heat Rejection		150,000 BTUH
P.O. Number	1-3081	Power Requirement		22.4 KW

For full explanations and changes see database



WARTBURG, TN, USA

For: G.A. FLEET

CAD System: AutoCAD ELECTRICAL 2010

Title	
R2000WD	
CYCLING DIGESTER CHILLER	
SHOP DETAIL	
TAG LAYOUT	
Drawing Number	
68270-SH-4	
Revision	SH 4
	4
	Shs

Pioneer Part Number	Description	Vendor Model # / Info
A8-00200-00162	SINGLE RECEPTACLE, 15A IVORY	LEVITON / 5015-I
A8-00200-00163	SINGLE RECEPTACLE COVER PLATE	STEEL CITY / 58C5
Z1-B2070-00043	3X5 304 SS STAMPING PLATE	MCMMASTER CARR / 1632T77
Z1-B2070-68186	1X3 SS TAG	MCMMASTER CARR / 1632T29
A8-00030-00102	RELAY SOCKET	MAGNECRAFT / 70-461-1
A8-00030-00107	4 POLE DOUBLE THROW ICE CUBE RELAY	MAGNECRAFT / 782XDX2C-120A
A8-00120-00300	UNIVERSAL TERMINAL BLOCK - UT 4	PHOENIX CONTACT / 3044102
A8-00120-00301	END PLATE/PARTITION - UT4	PHOENIX CONTACT / 3047028
A8-00120-00302	END BRACKET - E/NS 35 N	PHOENIX CONTACT / 800886
A8-00120-00303	UNIVERSAL GROUND TERMINAL BLOCK - UT 4-PE	PHOENIX CONTACT / 3044128
A8-00120-00304	UNIVERSAL TERMINAL BLOCK - UT 4-HESI	PHOENIX CONTACT / 3046032
A8-00120-00330	MINIATURE TIME DELAY FUSE 0.5AMP	BUSSMAN / GMC-500mA
A8-00120-11410	DIN RAIL	IDEC / BNDN1000
A8-00150-00085	WIREWAY COVER 1" GRAY	PANDUIT / C1LG6
A8-00150-00086	WIREWAY 1" GRAY	PANDUIT / G1x3LG6
Z1-68270-NE7SS	NEMA 7/9 SELECTOR SWITCH, MAINTAINED, SHORT LEVER, OPERATOR ONLY, WHITE INSERT, NON-ILLUMINATED, 2 POSITION, A CAM, SHORT BUSHING	SIEMENS / 51SA2AA
Z1-68270-NE7PB	NEMA 7/9 PUSHBUTTON, MOMENTARY, FLUSH, OPERATOR ONLY, BLACK, NON-ILLUMINATED, 2 POSITION, SHORT BUSHING	SIEMENS / 51PA8A1
Z1-68270-NE7ES	NEMA 7/9 PUSHBUTTON – PUSH-PULL, MAINTAINED, 2 1/2" PLASTIC, OPERATOR ONLY, RED, NON-ILLUMINATED, 2 POSITION, SHORT	SIEMENS / 51PA2E2
Z1-68270-NE7RL	PILOT LIGHT 24V SHORT BUSHING RED, LED	SIEMENS / 51PE6D2A
Z1-68270-NE7GL	PL PSH TO TEST SHORT BUSHING GRN 24V,LED	SIEMENS / 51PE6D3A
Z1-68270-NE7AL	PILOT LIGHT PUSH TO TEST AMBER, LED, FV	SIEMENS / 51PE6D9A
Z1-68270-CNONC	CONTACT BLOCK - CLASS 52 1 NO/ 1NC	SIEMENS / 52BJK
Z1-68270-C1NOB	(1NC) CONTACT BLOCK	SIEMENS / 52BAJ
Z1-68270-C1D1S	DIFFERENTIAL PRESSURE SWITCH	ASHCROFT / D7-63-V-XPM-15
Z1-68270-FLOWS	CLASS 1 DIV 1 FLOW SWITCH 316 SS	GEMS / FS200-27064-ET
Z1-68270-FLOAT	CLASS 1 DIV 1 FLOAT SWITCH 316 SS	YZ SYSTEMS, INC / L471-01

Pioneer Part Number	Description	Vendor Model # / Info
Z1-A8207-13603	ADALET – XCBA-N4-15E43W	NEMA 7 DISCONNECT / 15AMP CIRCUIT BREAKER
Z1-A8207-13602	ADALET – XCBA-N4-30E43W	NEMA 7 DISCONNECT / 30AMP CIRCUIT BREAKER
Z1-A8205-16248	ADELET – XCE162408 (SEE DWG# 68270-16X24X8.pdf)	NEMA 7 /16X24X8
Z1-A8200-00001	HOFFMAN – A42H3608SSLP	NEMA 4X / 42X36X8
Z1-A8204-42369	HOFFMAN – A42P36	HOFFMAN PANEL
Z1-C9020-02618	1756 CONTROL LOGIX PROCESSOR LOGIX5555	AB / 1756-L61
Z1-C9020-68216	1756 CONTROL LOGIX PLC DIGITAL AC OUTPUT MODULE	AB / 1756-OA16
Z1-C9020-68217	1756 CONTROL LOGIX PLC DIGITAL AC INPUT MODULE	AB / 1756-IA16
Z1-C9020-02603	1756 CONTROL LOGIX 6-CH ISOLATED ANALOG INPUT MODULE	AB / 1756-IF6I
Z1-C9020-68224	1756 CONTROL LOGIX HIGH CAPACITY ETHERNET/IP	AB / 1756-ENBT
Z1-C9020-68225	PROSOFT MODBUS TCP/IP COMMUNICATION MODULE	PROSOFT / MVI56-MNETR
Z1-C9020-50034	2711 PANELVIEW 550 GRAPHIC TOUCH PANEL	AB / PV550
Z1-C9020-02615	1756 CONTROL LOGIX CARD SLOT FILLER MODULE	AB / 1756-N2
Z1-C9020-02610	1756 10 SLOT RACK	AB / A10
Z1-C9020-02611	1756 CONTROL LOGIX POWER SUPPLY	AB / 1756-PA72
Z1-C9020-02624	JUMPER FOR PLC MODULES	AB / 1756-JMPR
Z1-C9020-02606	20 PIN REMOVABLE TERMINAL BLOCK	AB / 1756-TBNH
Z1-D2020-43152	3144P TEMPERATURE TRANSMITTER; WITH LCD; 4-20mA; EXPLOSION PROOF (XA -ASSEMBLED WITH SENSOR)	ROSEMOUNT / 3144PD5A1E5B4M5Q4XA
Z1-D2030-40004	0-500 PSIG PRESSURE TRANSMITTER; WITH LCD; 4-20mA; EXPLOSION PROOF	ROSEMOUNT / 3051CG5A22A1AE5M5
Z1-D2030-40003	-30"Hg-200 PSIG PRESSURE TRANSMITTER; WITH LCD; 4- 20mA; EXPLOSION PROOF	ROSEMOUNT / 3051CG4A22A1AE5M5
Z1-D2020-43153	THERMOWELL FOR ROSEMOUNT TRANSMITTER ½" NPT; 1" LENGTH STAINLESS STEEL	ROSEMOUNT / 0091A015T32T000PXA
Z1-D2020-43154	RTD SENSOR FOR ROSEMOUNT TRANSMITTER	ROSEMOUNT / 0068N21N00N025XA
Z1-A8130-17417	1 AMP SINGLE POLE BREAKER	EATON / WMS1C01
Z1-A8130-17411	2 AMP SINGLE POLE BREAKER	EATON / WMS1C02
Z1-A8130-17412	3 AMP SINGLE POLE BREAKER	EATON / WMS1C03
Z1-A8130-17418	15 AMP SINGLE POLE BREAKER	EATON / WMS1C15
Z1-C9020-50106	24 VDC POWER SUPPLY 24VDC 5 AMP OUTPUT	IDEC / PS5R-F24
A8-00140-00107	1 POLE FUSE BLOCK - CLASS CC	BUSSMANN / BC6031P
A8-00140-50090	9AMP CLASS CC FUSE	BUSSMANN / LP-CC-9
A8-00140-50020	2AMP CLASS CC FUSE	BUSSMANN / LP-CC-2
Z1-C9020-00304	ETHERNET SWITCH	NTRON / 304TX

PS5R Standard Series Switching Power Supplies

Key features of the PS5R standard series include:

- Wide power range: 7.5W-240W
- Universal input :
7.5W-50W: 85-264V AC/105-370V DC
100W: 85-132V AC/170-264V AC
240-370V DC (selectable)
75W, 120W, 240W: 85-264V AC/110-350V DC
- Overcurrent/overvoltage protection
- Power Factor Correction (75W, 120W, 240W models)
EN61000-3-3
EN61000-3-2
- Voltage adjustment +10%
- Spring-up screw terminal, IP20 (finger-safe)
- DIN rail or panel surface mount
- Approvals:
CE marked
UL 508 Listed
UL, c-UL
TÜV approved
EMC Directives:
EN50081-2
EN50082-2
EN61000-6-2
LVD EN60950:2000



Part Numbers

Item	Watts	Rated Voltage	Rated Current	Part Number	Item	Watts	Rated Voltage	Rated Current	Part Number
	7.5	5V DC	1.5A	PS5R-A05		75	24V DC	3.1A	PS5R-Q24
		12V DC	0.6A	PS5R-A12					
		24V DC	0.3A	PS5R-A24					
	15	5V DC	2.5A	PS5R-B05		100	24V DC	4.2A	PS5R-E24
		12V DC	1.2A	PS5R-B12					
		24V DC	0.6A	PS5R-B24					
	30	12V DC	2.5A	PS5R-C12		120	24V DC	5A	PS5R-F24
		24V DC	1.3A	PS5R-C24					
	50	24V DC	2.1A	PS5R-D24		240	24V DC	10A	PS5R-G24

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Specifications

Part Numbers	PS5R-A05	PS5R-B05*	—	—	—	—	—	
	PS5R-A12	PS5R-B12	PS5R-C12	—	—	—	—	
	PS5R-A24	PS5R-B24	PS5R-C24	PS5R-D24	PS5R-Q24	PS5R-E24	PS5R-F24	PS5R-G24
Output Capacity	7.5W	15W	30W	50W	75W	100W	120W	240W
Input Voltage (single-phase, 2-wire)	100 to 240V AC nominal (85 to 264V AC), 50/60Hz (47 to 63Hz) 110 to 340V DC nominal (105 to 370V DC)					100 to 120V AC, 50/60Hz 200 to 240V AC, 50/60Hz (jumper selectable) 240 to 370V DC	100 to 240V AC, 50/60Hz, 110 to 340V DC	
Input Current (typical)	0.17A at 100V AC	0.3A at 100V AC	0.68A at 100V AC	1.15A at 100V AC	1.1A at 100V AC	2.5A at 100V AC 1.5A at 200V AC	1.8A at 100V AC	4A at 100V AC
Internal Fuse Rating	2A	2A	3.15A	3.15A	3.15A	4A	4A	6.3A
Inrush Current	50A maximum (at cold start at 200V AC)				70A maximum (at cold start at 230V AC)	50A maximum (at cold start at 200V AC)	70A maximum (at cold start at 230V AC)	
Leakage Current (at no load)	0.75mA maximum (60Hz, measured in conformance with UL, CSA, VDE)							
Typical Efficiency	69% at 5V 75% at 12V 79% at 24V		75% at 12V 75% at 24V	79% at 24V	83% at 24V	85% at 24V	83% at 24V	
Oversoltage Protection	Outputs turns off at 105% (typical)							
Voltage and Current Ratings	5V, 1.5A 12V, 0.6A 24V, 0.3A	5V, 2.5A 12V, 1.2A 24V, 0.6A	12V, 2.5A 24V, 1.3A	24V, 2.1A	24V, 3.1A	24V, 4.2A	24V, 5A	24V, 10A
Voltage Adjustments	±10% (V.ADJ screw on top)							
Output Holding Time	20ms minimum (at full rated input and output)							
Rise Time	200ms maximum (at full rated input and output)							150ms max.
Line Regulation	0.4% maximum							
Load Regulation	1.5% maximum							
Fluctuation due to Ambient Temperature Change	0.05% maximum							
Ripple Voltage	2% peak to peak maximum (including noise)							
Overload Protection	120% typical (Zener-limiting)				120% typical, auto reset			
Operation Indicator	LED (green)							
Parallel Operation Allowed	PS5R-A	PS5R-B	PS5R-C	PS5R-D	PS5R-Q	PS5R-E	PS5R-F	PS5R-G
	No				Yes	No	Yes	
Dielectric Strength	Between input and output terminals: 3,000V AC, 1 minute Between input terminals and housing: 2,000V AC, 1 minute Between output terminal and housing: 500V AC, 1 minute							
Insulation Resistance	Between input and output terminals/input terminals and housing: 100MΩ minimum (500V DC megger)							
Operating Temperature	-10° to +60°C (14° to 140°F) (see derating curves)							
Storage Temperature	-30° to +85°C (-22° to 185°F)							
Operating Humidity	20 to 90% relative humidity (no condensation)							
Vibration Resistance	45m/s ² , 10 to 55Hz, 2 hours on each of 3 axes				10 to 50Hz, 0.75mm p-p, 2 hrs on each of 3 axes			
Shock Resistance	300m/s ² (30G), 3 shocks in each of 6 directions							
Approvals	Conforms to EMC Directives EN50081-2 & EN50082-2. LVD Directive EN60529 — Certified to EN60950. UL508 listed. UL, c-UL, TUV approved. CE marked. EN61000-3-2							
Weight	150g	170g	360g	390g	800g	600g	1200g	2000g
Termination	Spring-up, fingersafe terminals with captive M3.5 screws							
IP protection	IP20 (finger safe)							
Dimensions H x W x D (mm)	75 x 45 x 70	75 x 45 x 95	75 x 90 x 95	75 x 90 x 95	120 x 85 x 140	75 x 145 x 95	120 x 115 x 140	120 x 200 x 140
Dimensions H x W x D (inches)	2.95 x 1.77 x 2.76	2.95 x 1.77 x 3.74	2.95 x 3.54 x 3.74	2.95 x 3.54 x 3.74	4.72 x 3.35 x 5.52	2.95 x 5.71 x 3.74	4.72 x 4.53 x 5.52	4.72 x 7.87 x 5.51

1. For dimensions, see page 117.
2. For usage instructions, see page 116.
3. *12.5W for 5VDC model.

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Accessories

Part Numbers: PS5R Accessories

Appearance	Description	Part Number
	DIN rail (1000mm)	BNDN1000
	DIN rail end clip	BNL5

Installation Instructions

Time-Saving Spring-up Terminals

The innovative terminals on the PS5R series use a special, spring-loaded screw. This makes installation as easy as pushing down and turning with a screwdriver. Installation time is cut in half since the screws do not need to be backed out to install wiring. The screws are held captive once installed and are 100% finger-safe. Screw terminals accept bare wire or ring or fork connectors.

1. Insert the wire connector into the slot on the side of the power supply.



2. Using a flat head or Phillips screwdriver, push down and turn the screw.

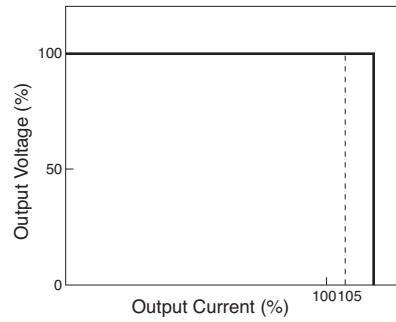
The wire is now connected, and the screw terminal is finger-safe!

Front Panel (terminals)

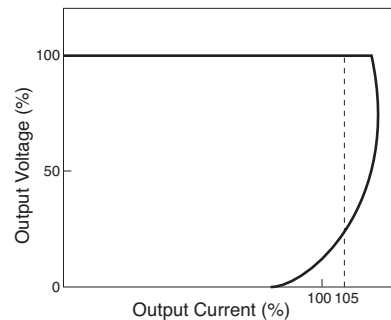
Markings	Name	Description
V. ADJ	Voltage adjustment	Adjusts within $\pm 10\%$; turn clockwise to increase output voltage
DC ON	Operation indicator	Green LED is lit when output voltage is on
+V, -V	DC output terminals	+V: Positive output Terminal -V: Negative output terminal
	Frame ground	Ground this terminal to reduce high-frequency currents caused by switching
L, N	Input terminals	Accept a wide range of voltages and frequencies (no polarity at DC input)
NC	No connection	Do not insert wires here, as this may damage the power supply

Overcurrent Protection Characteristics

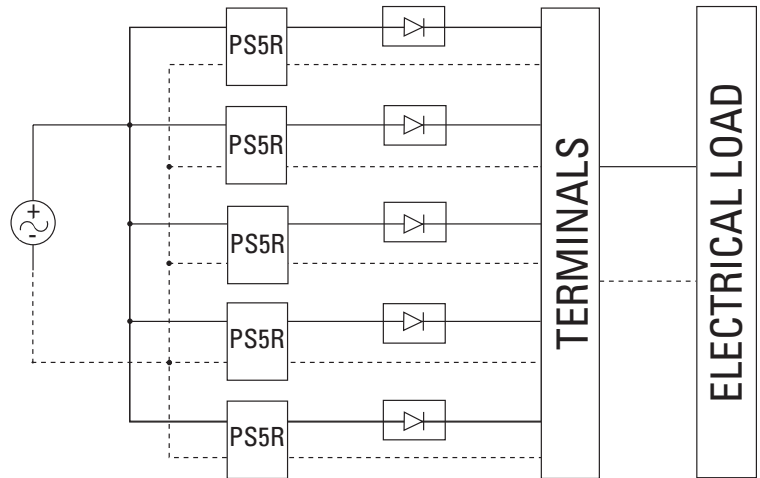
PS5R-A/B



PS5R-C/D/E



Parallel Operation



1. Parallel operation only recommended for PS5R-Q24, PS5R-F24 and PS5R-G24.
2. Factory recommended diode ST Microelectronics BYV54V-50, BYV54V-100, BYV54V-200, BYV541V-200 or with equivalent electrical specifications.
3. Using the voltage adjustment make sure out-voltage is the same for all power supplies.

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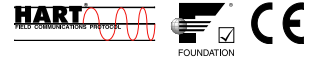
Sensors

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Rosemount 3051 Pressure Transmitter

THE PROVEN INDUSTRY LEADER IN PRESSURE MEASUREMENT

- *Best-in-Class performance with 0.04% High Accuracy option*
- *Industry first installed five-year stability*
- *Unmatched Dynamic Performance*
- *Coplanar™ platform enables integrated pressure, flow, and level solutions*
- *Advanced PlantWeb® Functionality to increase plant productivity*



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Fieldbus Protocol	page 15
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HART Protocol C1 Option Configuration Data Sheet	page 41

Setting the Standard for Pressure Measurement

Industry's best total performance, a flexible *Coplanar* platform, and installed five-year stability, has made the Rosemount 3051 the standard in pressure measurement.

Industry's best-in-class total performance of $\pm 0.15\%$

Total performance is the true measure of "real-world" transmitter performance. Using superior sensor technology and engineered for optimal performance, the 3051 delivers unprecedented $\pm 0.04\%$ reference accuracy, resulting in total operating performance of $\pm 0.15\%$. Superior total performance equates to reduced variability and improved plant safety.

Installed five-year stability of $\pm 0.125\%$

Transmitter stability is a critical measure of transmitter performance over time. Through aggressive simulation testing beyond standard IEC 770 testing, the 3051 has proven its ability to maintain performance over a five year period under the most demanding process conditions. Superior transmitter stability reduces calibration frequency to save operation and maintenance costs.

Unmatched dynamic performance

In dynamic applications, speed of measurement is as important as repeatability. The 3051 responds up to eight times faster than the typical pressure transmitter to detect and control variations quickly and efficiently. Superior dynamic response yields more accurate measurements to reduce variability and increase profitability.

Coplanar platform enables complete point solutions

The versatile *Coplanar* platform design enables the best process connection for pressure, flow and level applications. Right out of the box, the solution arrives factory calibrated, pressure-tested, and ready to install. Only the 3051 has a flexible design to reduce engineering and inventory costs.

Advanced *PlantWeb* Functionality



The 3051 powers the *PlantWeb* architecture by delivering the best sensor and transmitter, best installation practices, and best in class field intelligence. One component is the enhanced diagnostic capabilities in *FOUNDATION* fieldbus that provide an increase in process visibility, enabling proactive maintenance, improving process availability and plant productivity.

Rosemount Pressure Solutions

Rosemount 3051S Series of Instrumentation

Scalable pressure, flow and level measurement solutions improve installation and maintenance practices.

Rosemount 3095MV Mass Flow Transmitter

Accurately measures differential pressure, static pressure and process temperature to dynamically calculate fully compensated mass flow.

Rosemount 305 and 306 Integral Manifolds

Factory-assembled, calibrated and seal-tested manifolds reduce on-site installation costs.

Rosemount 1199 Diaphragm Seals

Provides reliable, remote measurements of process pressure and protects the transmitter from hot, corrosive, or viscous fluids.

Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections

A comprehensive offering of orifice plates, flange unions and meter sections that is easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

Annubar[®] Flowmeter Series: Rosemount 3051SFA, 3095MFA, and 485

The state-of-the-art, fifth generation Rosemount 485 *Annubar* combined with the 3051S or 3095MV MultiVariable transmitter creates an accurate, repeatable and dependable insertion-type flowmeter.

Compact Orifice Flowmeter Series: Rosemount 3051SFC, 3095MFC, and 405

Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. In tight fit applications, a conditioning orifice plate version is available, requiring only two diameters of straight run upstream.

ProPlate[®] Flowmeter Series: Rosemount *ProPlate*, Mass *ProPlate*, and 1195

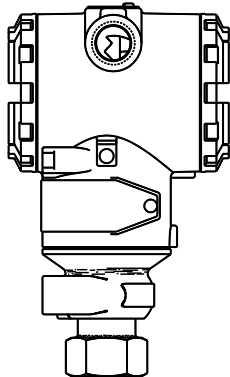
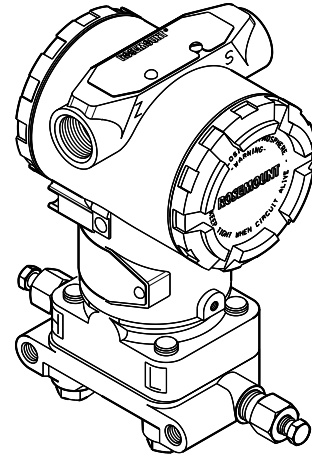
These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

Product Offering

Rosemount 3051C Differential, Gage, and Absolute

See ordering information on page 25.

- Performance up to 0.04% accuracy
- Installed five-year stability of 0.125%
- *Coplanar* platform enables integrated manifold, primary element and diaphragm seal solutions
- Calibrated spans/ranges from 0.1 inH₂O to 4000 psi (0,25 mbar to 276 bar)
- 316L SST, *Hastelloy*[®] C276, *Monel*[®], Tantalum, Gold-plated *Monel*, or Gold-plated 316L SST process isolators



~~Rosemount 3051T Gage and Absolute~~

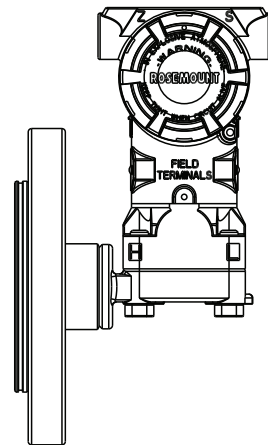
See ordering information on page 29.

- Performance up to 0.04% accuracy
- Installed five-year stability of 0.125%
- Calibrated spans from 0.3 to 10000 psi (10,3 mbar to 689 bar)
- Multiple process connections available
- 316L SST and *Hastelloy* C276 process isolators

~~Rosemount 3051L Liquid Level~~

See ordering information on page 31.

- Performance up to 0.075% accuracy
- Welded fill fluid system provides best-in-class system reliability
- Flush and extended diaphragms
- Multiple fill fluids and wetted materials available



Specifications

PERFORMANCE SPECIFICATIONS

Total Performance is based on combined errors of reference accuracy, ambient temperature effect, and static pressure effect. This product data sheet covers both HART and fieldbus protocols unless specified.

Conformance To Specification ($\pm 3\sigma$ (Sigma))

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least $\pm 3\sigma$.

Reference Accuracy⁽¹⁾

Models	Standard	High Accuracy Option
3051CD, 3051CG	Range 0 (CD) $\pm 0.10\%$ of span For spans less than 2:1, accuracy = $\pm 0.05\%$ of URL Range 1 $\pm 0.10\%$ of span For spans less than 15:1, accuracy = $\pm \left[0.025 + 0.005 \left(\frac{URL}{Span} \right) \right] \%$ of Span Ranges 2-5 $\pm 0.065\%$ of span For spans less than 10:1, accuracy = $\pm \left[0.015 + 0.005 \left(\frac{URL}{Span} \right) \right] \%$ of Span	Ranges 2-4 High Accuracy Option, P8 $\pm 0.04\%$ of span For spans less than 5:1, accuracy = $\pm \left[0.015 + 0.005 \left(\frac{URL}{Span} \right) \right] \%$ of Span
3051T	Ranges 1-4 $\pm 0.065\%$ of span For spans less than 10:1, accuracy = $\pm \left[0.0075 \left(\frac{URL}{Span} \right) \right] \%$ of Span Range 5 $\pm 0.075\%$ of span For spans less than 10:1, accuracy = $\pm \left[0.0075 \left(\frac{URL}{Span} \right) \right] \%$ of Span	Ranges 2-4 High Accuracy Option, P8 $\pm 0.04\%$ of span For spans less than 5:1, accuracy = $\pm \left[0.0075 \left(\frac{URL}{Span} \right) \right] \%$ of Span
3051CA	Ranges 1-4 $\pm 0.065\%$ of span For spans less than 10:1, accuracy = $\pm \left[0.0075 \left(\frac{URL}{Span} \right) \right] \%$ of Span	Ranges 2-4 High Accuracy Option, P8 $\pm 0.04\%$ of span For spans less than 5:1, accuracy = $\pm \left[0.0075 \left(\frac{URL}{Span} \right) \right] \%$ of Span
3051H/3051L	All Ranges $\pm 0.075\%$ of span For spans less than 10:1, accuracy = $\pm \left[0.025 + 0.005 \left(\frac{URL}{Span} \right) \right] \%$ of Span	

(1) For FOUNDATION fieldbus transmitters, use calibrated range in place of span. For zero based spans, reference conditions, silicone oil fill, SST materials, Coplanar flange (3051C) or 1/2 in. - 18 NPT (3051T) process connections, digital trim values set to equal range points.

Total Performance

For $\pm 50^\circ\text{F}$ (28°C) temperature changes, up to 1000 psi (6,9 MPa) line pressure (CD only), from 1:1 to 5:1 rangedown.

Models	Total Performance
3051C	Ranges 2-5 $\pm 0.15\%$ of span
3051T	Ranges 1-4 $\pm 0.15\%$ of span

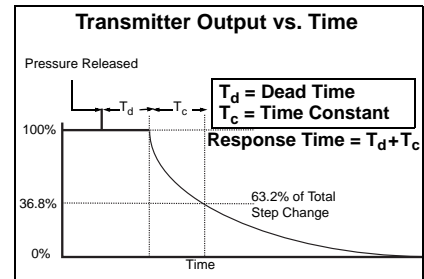
Long Term Stability

Models	Long Term Stability
3051C	Ranges 2-5 $\pm 0.125\%$ of URL for 5 years $\pm 50^\circ\text{F}$ (28°C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
3051CD Low/Draft Range	Ranges 0-1 $\pm 0.2\%$ of URL for 1 year
3051T	Ranges 1-4 $\pm 0.125\%$ of URL for 5 years $\pm 50^\circ\text{F}$ (28°C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
Rosemount 3051H	Ranges 2-3 $\pm 0.1\%$ of URL for 1 year Ranges 4-5 $\pm 0.2\%$ of URL for 1 year

Dynamic Performance

	4 - 20 mA (HART protocol) ⁽¹⁾	Fieldbus protocol ⁽³⁾	Typical HART Transmitter Response Time
Total Response Time ($T_d + T_c$)⁽²⁾:			
3051C , Ranges 2-5:	100 ms	152 ms	
Range 1:	255 ms	307 ms	
Range 0:	700 ms	752 ms	
3051T :	100 ms	152 ms	
3051H/L :	Consult factory	Consult factory	
Dead Time (T_d)	45 ms (nominal)	97 ms	
Update Rate	22 times per second	22 times per second	

(1) Dead time and update rate apply to all models and ranges; analog output only
 (2) Nominal total response time at 75°F (24°C) reference conditions.
 (3) Transmitter fieldbus output only, segment macro-cycle not included.



Line Pressure Effect per 1000 psi (6,9 MPa)

For line pressures above 2000 psi (13,7 MPa) and Ranges 4-5, see user manual (Rosemount publication number 00809-0100-4001).

Models	Line Pressure Effect
3051CD	Zero Error ⁽¹⁾ Range 0 $\pm 0.125\%$ of URL/100 psi (6,89 bar) Range 1 $\pm 0.25\%$ of URL/1000 psi (68,9 bar) Ranges 2-3 $\pm 0.05\%$ of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa) Span Error Range 0 $\pm 0.15\%$ of reading/100 psi (6,89 bar) Range 1 $\pm 0.4\%$ of reading/1000 psi (68,9 bar) Ranges 2-3 $\pm 0.1\%$ of reading/1000 psi (68,9 bar)
3051HD	Zero Error ⁽¹⁾ All Ranges $\pm 0.1\%$ of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa) Span Error All Ranges $\pm 0.1\%$ of reading/1000 psi (68,9 bar)

(1) Can be calibrated out at line pressure.

Ambient Temperature Effect per 50°F (28°C)

Models	Ambient Temperature Effect
3051CD/CG	<p>Range 0 $\pm(0.25\% \text{ URL} + 0.05\% \text{ span})$</p> <p>Range 1 $\pm(0.1\% \text{ URL} + 0.25\% \text{ span})$</p> <p>Ranges 2-5 $\pm(0.0125\% \text{ URL} + 0.0625\% \text{ span})$ from 1:1 to 5:1 $\pm(0.025\% \text{ URL} + 0.125\% \text{ span})$ from 5:1 to 100:1</p>
3051T	<p>Range 1 $\pm(0.025\% \text{ URL} + 0.125\% \text{ span})$ from 1:1 to 10:1 $\pm(0.05\% \text{ URL} + 0.125\% \text{ span})$ from 10:1 to 100:1</p> <p>Range 2-4 $\pm(0.025\% \text{ URL} + 0.125\% \text{ span})$ from 1:1 to 30:1 $\pm(0.035\% \text{ URL} + 0.125\% \text{ span})$ from 30:1 to 100:1</p> <p>Range 5 $\pm(0.1\% \text{ URL} + 0.15\% \text{ span})$</p>
3051CA	<p>All Ranges $\pm(0.025\% \text{ URL} + 0.125\% \text{ span})$ from 1:1 to 30:1 $\pm(0.035\% \text{ URL} + 0.125\% \text{ span})$ from 30:1 to 100:1</p>
3051H	<p>All Ranges $\pm(0.025\% \text{ URL} + 0.125\% \text{ span} + 0.35 \text{ inH}_2\text{O})$ from 1:1 to 30:1 $\pm(0.035\% \text{ URL} + 0.125\% \text{ span} + 0.35 \text{ inH}_2\text{O})$ from 1:1 to 30:1</p>
3051L	See Rosemount Inc. Instrument Toolkit® software.

Mounting Position Effects

Models	Mounting Position Effects
3051C	Zero shifts up to $\pm 1.25 \text{ inH}_2\text{O}$ (3,11 mbar), which can be calibrated out. No span effect.
3051H	Zero shifts up to $\pm 5 \text{ inH}_2\text{O}$ (12,43 mbar), which can be calibrated out. No span effect.
3051L	With liquid level diaphragm in vertical plane, zero shift of up to $1 \text{ inH}_2\text{O}$ (2,49 mbar). With diaphragm in horizontal plane, zero shift of up to $5 \text{ inH}_2\text{O}$ (12,43 mbar) plus extension length on extended units. All zero shifts can be calibrated out. No span effect.
3051T/CA	Zero shifts up to $2.5 \text{ inH}_2\text{O}$ (6,22 mbar), which can be calibrated out. No span effect.

Vibration Effect

All Models

Measurement effect due to vibrations is negligible except at resonance frequencies. When at resonance frequencies, vibration effect is less than $\pm 0.1\%$ of URL per g when tested between 15 and 2000 Hz in any axis relative to pipe-mounted process conditions.

Power Supply Effect

All Models

Less than $\pm 0.005\%$ of calibrated span per volt.

RFI Effects

All Models

$\pm 0.1\%$ of span from 20 to 1000 MHz and for field strength up to 30 V/m.

Transient Protection (Option Code T1)

All Models:

Meets IEEE C62.41, Category B

6 kV crest (0.5 μs - 100 kHz)

3 kV crest (8 \times 20 microseconds)

6 kV crest (1.2 \times 50 microseconds)

Meets IEEE C37.90.1, Surge Withstand Capability

SWC 2.5 kV crest, 1.25 MHz wave form

General Specifications:

Response Time: < 1 nanosecond

Peak Surge Current: 5000 amps to housing

Peak Transient Voltage: 100 V dc

Loop Impedance: < 25 ohms

Applicable Standards: IEC61000-4-4,

IEC61000-4-5

NOTE:

Calibrations at 68 °F (20 °C) per ASME Z210.1 (ANSI)

FUNCTIONAL SPECIFICATIONS

Range and Sensor Limits

TABLE 1. 3051CD, 3051CG, 3051L, and 3051H Range and Sensor Limits

Range	Minimum Span		Range and Sensor Limits					
	3051CD ⁽¹⁾ , CG, L, H	Upper (URL)	3051C Differential	3051C/ Gage	Lower (LRL)			
					3051L Differential	3051L Gage	3051H Differential	3051H Gage
0	0.1 inH ₂ O (0,25 mbar)	3.0 inH ₂ O (7,47 mbar)	-3.0 inH ₂ O (-7,47 mbar)	NA	NA	NA	NA	NA
1	0.5 inH ₂ O (1,2 mbar)	25 inH ₂ O (62,3 mbar)	-25 inH ₂ O (-62,1 mbar)	-25 inH ₂ O (-62,1 mbar)	NA	NA	NA	NA
2	2.5 inH ₂ O (6,2 mbar)	250 inH ₂ O (0,62 bar)	-250 inH ₂ O (-0,62 bar)	-250 inH ₂ O (-0,62 bar)	-250 inH ₂ O (-0,62 bar)	-250 inH ₂ O (-0,62 bar)	-250 inH ₂ O (-0,62 bar)	-250 inH ₂ O (-0,62 bar)
3	10 inH ₂ O (24,9 mbar)	1000 inH ₂ O (2,49 bar)	-1000 inH ₂ O (-2,49 bar)	0.5 psia (34,5 mbar abs)	-1000 inH ₂ O (-2,49 bar)	0.5 psia (34,5 mbar abs)	-1000 inH ₂ O (-2,49 bar)	0.5 psia (34,5 mbar abs)
4	3 psi (0,20 bar)	300 psi (20,6 bar)	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)
5	20 psi (1,38 bar)	2000 psi (137,9 bar)	-2000 psi (-137,9 bar)	0.5 psia (34,5 mbar abs)	NA	NA	-2000 psi (-137,9 bar)	0.5 psia (34,5 mbar abs)

(1) Range 0 only available with 3051CD. Range 1 only available with 3051CD or 3051CG.

TABLE 2. Range and Sensor Limits

Range	3051CA			3051T			
	Minimum Span	Upper (URL)	Lower (LRL)	Minimum Span	Upper (URL)	Lower (LRL)	Lower ⁽¹⁾ (LRL) (Gage)
1	0.3 psia (20,6 mbar)	30 psia (2,07 bar)	0 psia (0 bar)	0.3 psi (20,6 mbar)	30 psi (2,07 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
2	1.5 psia (0,103 bar)	150 psia (10,3 bar)	0 psia (0 bar)	1.5 psi (0,103 bar)	150 psi (10,3 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
3	8 psia (0,55 bar)	800 psia (55,2 bar)	0 psia (0 bar)	8 psi (0,55 bar)	800 psi (55,2 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
4	40 psia (2,76 bar)	4000 psia (275,8 bar)	0 psia (0 bar)	40 psi (2,76 bar)	4000 psi (275,8 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
5				2000 psi (137,9 bar)	10000 psi (689,4 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)

(1) Assumes atmospheric pressure of 14.7 psig.

Zero and Span Adjustment Requirements (HART and Low Power)

Zero and span values can be set anywhere within the range limits stated in Table 1 and Table 2.

Span must be greater than or equal to the minimum span stated in Table 1 and Table 2.

Service

Liquid, gas, and vapor applications

4–20 mA (Output Code A)

Output

Two-wire 4–20 mA, user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

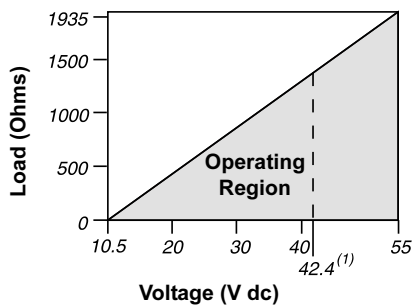
Power Supply

External power supply required. Standard transmitter (4–20 mA) operates on 10.5 to 55 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

$$\text{Max. Loop Resistance} = 43.5 (\text{Power Supply Voltage} - 10.5)$$



Communication requires a minimum loop resistance of 250 ohms.

(1) For CSA approval, power supply must not exceed 42.4 V.

FOUNDATION fieldbus (output code F) and Profibus (output code W)

Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 V dc transmitter terminal voltage.

Current Draw

17.5 mA for all configurations (including LCD display option)

FOUNDATION fieldbus Function Block Execution Times

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	30 milliseconds
PID	45 milliseconds
Input Selector	30 milliseconds
Arithmetic	35 milliseconds
Signal Characterizer	40 milliseconds
Integrator	35 milliseconds

FOUNDATION fieldbus Parameters

Schedule Entries	7 (max.)
Links	20 (max.)
Virtual Communications Relationships (VCR)	12 (max.)

Standard Function Blocks

Resource Block

Contains hardware, electronics, and Link diagnostic information.

Transducer Block

Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD Block

Configures the local display.

2 Analog Input Blocks

Processes the measurements for input into other function blocks. The output value is in engineering units or custom and contains a status indicating measurement quality.

PID Block

Contains all logic to perform PID control in the field including cascade and feedforward.

Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

Advanced Control Function Block Suite (Option Code A01)

Input Selector Block

Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average or first "good."

Arithmetic Block

Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal Characterizer Block

Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator Block

Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

FOUNDATION fieldbus Diagnostics Suite (Option Code D01)

The 3051C FOUNDATION fieldbus Diagnostics provide Abnormal Situation Prevention (ASP) indication. The integral statistical process monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second. The 3051C ASP algorithm uses these values and highly flexible configuration options for customization to many user-defined or application specific abnormal situations. The detection of plugged impulse lines is the first available predefined application.

Low Power (Output Code M)

Output

Three wire 1–5 V dc or 0.8–3.2 V dc (Option Code C2) user-selectable output. Also user selectable for linear or square root output configuration. Digital process variable superimposed on voltage signal, available to any host conforming to the *HART* protocol. Low-power transmitter operates on 6–12 V dc with no load.

Power Consumption

3.0 mA, 18–36 mW

Minimum Load Impedance

100 kΩ (V_{out} wiring)

Indication

Optional 5-digit LCD display

Overpressure Limits

Rosemount 3051CD/CG

- Range 0: 750 psi (51,7 bar)
- Range 1: 2000 psig (137,9 bar)
- Ranges 2–5: 3626 psig (250 bar)
4500 psig (310,3 bar) for option code P9

Rosemount 3051CA

- Range 1: 750 psia (51,7 bar)
- Range 2: 1500 psia (103,4 bar)
- Range 3: 1600 psia (110,3 bar)
- Range 4: 6000 psia (413,7 bar)

Rosemount 3051H

- All Ranges: 3626 psig (25 MPa)

Rosemount 3051TG/TA

- Range 1: 750 psi (51,7 bar)
- Range 2: 1500 psi (103,4 bar)
- Range 3: 1600 psi (110,3 bar)
- Range 4: 6000 psi (413,7 bar)
- Range 5: 15000 psi (1034,2 bar)

For 3051L or Level Flange Option Codes FA, FB, FC, FD, FP, and FQ, limit is 0 psia to the flange rating or sensor rating, whichever is lower.

TABLE 3. 3051L and Level Flange Rating Limits

Standard	Type	CS Rating	SST Rating
ANSI/ASME	Class 150	285 psig	275 psig
ANSI/ASME	Class 300	740 psig	720 psig
ANSI/ASME	Class 600	1480 psig	1440 psig
<i>At 100 °F (38 °C), the rating decreases with increasing temperature.</i>			
DIN	PN 10–40	40 bar	40 bar
DIN	PN 10/16	16 bar	16 bar
DIN	PN 25/40	40 bar	40 bar
<i>At 248 °F (120 °C), the rating decreases with increasing temperature.</i>			

Static Pressure Limit

Rosemount 3051CD Only

Operates within specifications between static line pressures of 0.5 psia and 3626 psig (4500 psig (310, 3 bar) for Option Code P9).

Range 0: 0.5 psia and 750 psig (3, 4 bar and 51, 7 bar)

Range 1: 0.5 psia and 2000 psig (3, 4 bar and 137, 9 bar)

Burst Pressure Limits

Burst pressure on *Coplanar*, traditional, or 3051H process flange is 10000 psig (69 MPa).

Burst pressure for the 3051T is

Ranges 1–4: 11000 psi (75,8 MPa)

Range 5: 26000 psig (179 MPa)

Failure Mode Alarm

Output Code A

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 3.75 mA or to 21.75 mA to alert the user. NAMUR-compliant values are available, option code C4. High or low alarm signal is user-selectable by internal jumper.

Output Code M

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 0.94 V or above 5.4 V to alert the user (below 0.75 V or above 4.4 V for Option C2). High or low alarm signal is user-selectable by internal jumper.

Output Code F and W

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable.

Temperature Limits

Ambient

–40 to 185 °F (–40 to 85 °C)

With LCD display⁽¹⁾: –4 to 175 °F (–20 to 80 °C)

Storage

–50 to 230 °F (–46 to 110 °C)

With LCD display: –40 to 185 °F (–40 to 85 °C)

Process

At atmospheric pressures and above. See Table 4

(1) LCD display may not be readable and LCD updates will be slower at temperatures below –4 °F (–20 °C).

Rosemount 3051

TABLE 4. 3051 Process Temperature Limits

3051CD, 3051CG, 3051CA	
Silicone Fill Sensor ⁽¹⁾	
with Coplanar Flange	-40 to 250 °F (-40 to 121 °C) ⁽²⁾
with Traditional Flange	-40 to 300 °F (-40 to 149 °C) ⁽²⁾⁽³⁾
with Level Flange	-40 to 300 °F (-40 to 149 °C) ⁽²⁾
with 305 Integral Manifold	-40 to 300 °F (-40 to 149 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	0 to 185 °F (-18 to 85 °C) ⁽⁴⁾⁽⁵⁾
3051H (Process Fill Fluid)	
D.C.® Silicone 200 ⁽¹⁾	-40 to 375 °F (-40 to 191 °C)
Inert ⁽¹⁾	-50 to 350 °F (-45 to 177 °C)
Neobee M-20 ⁽¹⁾	0 to 375 °F (-18 to 191 °C)
3051T (Process Fill Fluid)	
Silicone Fill Sensor ⁽¹⁾	-40 to 250 °F (-40 to 121 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	-22 to 250 °F (-30 to 121 °C) ⁽²⁾
3051L Low-Side Temperature Limits	
Silicone Fill Sensor ⁽¹⁾	-40 to 250 °F (-40 to 121 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	0 to 185 °F (-18 to 85 °C) ⁽²⁾
3051L High-Side Temperature Limits (Process Fill Fluid)	
Syltherm® XLT	-100 to 300 °F (-73 to 149 °C)
D.C. Silicone 704®	32 to 400 °F (0 to 205 °C)
D.C. Silicone 200	-40 to 400 °F (-40 to 205 °C)
Inert	-50 to 350 °F (-45 to 177 °C)
Glycerin and Water	0 to 200 °F (-18 to 93 °C)
Neobee M-20	0 to 400 °F (-18 to 205 °C)
Propylene Glycol and Water	0 to 200 °F (-18 to 93 °C)

- (1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio (0.6:1 ratio for the 3051H).
- (2) 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.
- (3) 3051CD0 process temperature limits are -40 to 212 °F (-45 to 100 °C)
- (4) 160 °F (71 °C) limit in vacuum service.
- (5) Not available for 3051CA.

Humidity Limits

0–100% relative humidity

Turn-On Time

Performance within specifications less than 2.0 seconds (10.0 s for Profibus protocol) after power is applied to the transmitter

Volumetric Displacement

Less than 0.005 in³ (0,08 cm³)

Damping

Analog output response to a step input change is user-selectable from 0 to 36 seconds for one time constant. This software damping is in addition to sensor module response time.

PHYSICAL SPECIFICATIONS

Electrical Connections

¹/₂–14 NPT, PG 13.5, G¹/₂, and M20 × 1.5 (CM20) conduit. HART interface connections fixed to terminal block.

Process Connections

All Models except 3051L and 3051T

¹/₄–18 NPT on 2¹/₈-in. centers

¹/₂–14 NPT on 2-, 2¹/₈-, or 2¹/₄-in. centers

Rosemount 3051L

High pressure side: 2-, 3-, or 4-in., ASME B 16.5 (ANSI) Class 150, 300 or 600 flange; 50, 80 or 100 mm, PN 40 or 10/16 flange

Low pressure side: ¹/₄–18 NPT on flange ¹/₂–14 NPT on adapter

Rosemount 3051T

¹/₂–14 NPT female. A DIN 16288 Male (available in SST for

Range 1–4 transmitters only), or Autoclave type F-250-C

(Pressure relieved ⁹/₁₆–18 gland thread; ¹/₄ OD high pressure tube 60° cone; available in SST for Range 5 transmitters only).

Process-Wetted Parts

Drain/Vent Valves

316 SST, Hastelloy C276, or Monel material (Monel not available with 3051L or 3051H)

Process Flanges and Adapters

Plated carbon steel, SST cast CF-8M (cast version of 316 SST, material per ASTM-A743), C-Type cast alloy CW12MW, or Monel cast alloy M30C

Wetted O-rings

Glass-filled PTFE or Graphite-filled PTFE

Process Isolating Diaphragms

Isolating Diaphragm Material	3051CD/CG	3051T	3051CA	3051H
316L SST	•	•	•	•
Hastelloy C276	•	•	•	•
Monel	•		•	
Tantalum	•			•
Gold-plated Monel	•		•	
Gold-plated SST	•		•	

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Rosemount 3051L Process Wetted Parts

Flanged Process Connection (Transmitter High Side)

Process Diaphragms, Including Process Gasket Surface

- 316L SST, *Hastelloy C276*, or Tantalum

Extension

- CF-3M (Cast version of 316L SST, material per ASTM-A743), or *Hastelloy C276*. Fits schedule 40 and 80 pipe.

Mounting Flange

- Zinc-cobalt plated CS or SST

Reference Process Connection (Transmitter Low Side)

Isolating Diaphragms

- 316L SST or *Hastelloy C276*

Reference Flange and Adapter

- CF-8M (Cast version of 316 SST, material per ASTM-A743)

Non-Wetted Parts

Electronics Housing

Low-copper aluminum or CF-3M (Cast version of 316L SST, material per ASTM-A743). NEMA 4X, IP 65, IP 66

Coplanar Sensor Module Housing

CF-3M (Cast version of 316L SST, material per ASTM-A743)

Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)

ASTM F593G, Condition CW1 (Austenitic 316 SST)

ASTM A193, Grade B7M (zinc plated alloy steel)

Monel K-500

Sensor Module Fill Fluid

Silicone oil (D.C. 200) or Fluorocarbon oil (Halocarbon or Fluorinert® FC-43 for 3051T)

Process Fill Fluid (3051L and 3051H only)

3051L: Syltherm XLT, D.C. Silicone 704,

D.C. Silicone 200, inert, glycerin and water, Neobee M-20 or propylene glycol and water

3051H: inert, Neobee M-20, or D.C. Silicone 200

Paint

Polyurethane

Cover O-rings

Buna-N

Shipping Weights

Refer to "Shipping Weights" on page 38

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA
Emerson Process Management GmbH & Co. — Wessling, Germany
Emerson Process Management Asia Pacific Private Limited — Singapore
Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)

All 3051 transmitters comply with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)

3051CA4; 3051CG2, 3, 4, 5; 3051CD2, 3, 4, 5
(also with P9 option); 3051HD2, 3, 4, 5; 3051HG2, 3, 4, 5;
3051PD2, 3; and 3051PG2, 3, 4, 5 Pressure Transmitters
— QS Certificate of Assessment - EC No. PED-H-100
Module H Conformity Assessment

All other 3051/3001 Pressure Transmitters

— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold

— Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (2004/108/EC)

All 3051 Pressure Transmitters meet all of the requirements of EN61326: 1997 - A1, A2, and A3 and NAMUR NE-21

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

HART PROTOCOL

Hazardous Locations Certifications

North American Certifications

FM Approvals

- E5** Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II, Division 1, Groups E, F, and G. Dust-Ignition-Proof for Class III, Division 1. Factory Sealed, Enclosure Type 4X
- I5** Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 when connected per Rosemount drawing 03031-1019; Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code:T4 (Ta = 40 °C), T3 (Ta = 85 °C), Enclosure Type 4X
For input parameters see control drawing 03031-1019.

Canadian Standards Association (CSA)

- E6** Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D for indoor and outdoor hazardous locations. Enclosure type 4X, factory sealed
- C6** Explosion-Proof and intrinsically safe approval. Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C. Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D hazardous locations. Enclosure type 4X, factory sealed
For input parameters see control drawing 03031-1024.

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European Certifications


- I1** ATEX Intrinsic Safety and Dust
Certification No.: BAS 97ATEX1089X  II 1 GD
EEx ia IIC T4 ($-60 \leq T_a \leq +70$ °C)
Dust Rating: T80 °C ($-20 \leq T_a \leq 40$ °C) IP66
CE 1180

TABLE 5. Input Parameters

$$U_i = 30V$$


$$I_i = 200 \text{ mA}$$

$$P_i = 0.9W$$

$$C_i = 0.012 \mu F$$


Special Conditions for Safe Use (X):

When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

- N1** ATEX Type n and Dust
Certification No.: BAS 00ATEX3105X  II 3 GD
 $U_i = 55 \text{ Vdc max}$
EEx nL T5 ($-40^\circ\text{C} \leq T_{\text{amb}} \leq 70^\circ\text{C}$)
Dust rating: T80 °C ($-20 \leq T_a \leq 40$ °C) IP66
CE

Special Conditions for Safe Use (X):

When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding a 500V r.m.s. test to case. This must be taken into account on any installation in which it is used, for example by assuring that the supply to the apparatus is galvanically isolated.

- E8** ATEX Flame-Proof and Dust
Certification No.: KEMA 00ATEX2013X  II 1/2 GD
EEx d IIC T6 ($-50 \leq T_a \leq 65$ °C)
Dust rating T90 °C, IP66
CE 1180
 $V_{\text{max}} = 55 \text{ V dc}$

Special Conditions for Safe Use (X):

This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

Japanese Certifications

- E4** TIIS Flame-Proof
Ex d IIC T6

Certificate	Description
C15850	3051C/D/1 4–20 mA HART — no display
C15851	3051C/D/1 4–20 mA HART — with display
C15854	3051T/G/1 4–20 mA HART, SST, Silicon — no display
C15855	3051T/G/1 4–20 mA HART, Hastelloy C276, Silicon — no display
C15856	3051T/G/1 4–20 mA HART, SST, Silicon — with display
C15857	3051T/G/1 4–20 mA HART, Hastelloy C276, Silicon — with display

- I4** TIIS Intrinsic Safety
Ex ia IIC T4

Certificate	Description
C16406	3051CD/CG

Australian Certifications

- I7** SAA Intrinsic Safety
Certification No.: AUS Ex 1249X
Ex ia IIC T4 ($T_{\text{amb}} = 70$ °C)
IP66

When connected per Rosemount drawing 03031-1026

TABLE 6. Input Parameters

$$U_i = 30V$$

$$I_i = 200 \text{ mA}$$

$$I_i = 160 \text{ mA (output code A with T1)}$$

$$P_i = 0.9W$$

$$C_i = 0.01 \mu F$$

$$C_i = 0.042 \mu F \text{ (output code M)}$$

$$L_i = 10 \mu H$$

$$L_i = 1.05 \text{ mH (output code A with T1)}$$

$$L_i = 0.75 \text{ mH (output code M with T1)}$$

Special Conditions for Safe Use (X):

The apparatus may only be used with a passive current limited power source Intrinsic Safety application. The power source must be such that $P_o \leq (U_o * I_o) / 4$. Modules using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm² minimum cross-sectional area.

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E7 SAA Explosion-Proof (Flame-Proof)
Certification No.: AUS Ex 03.1347X
Ex d IIC T6 ($T_{amb} = 40\text{ }^{\circ}\text{C}$)
DIP A21 T6 ($T_{amb} = 40\text{ }^{\circ}\text{C}$)
IP66

Special Conditions for Safe Use (X):

It is a condition of safe use for transmitter enclosures having cable entry thread other than metric conduit thread that the equipment be utilized with an appropriate certified thread adaptor.

N7 SAA Type n (Non-sparking)
Certification No.: AUS Ex 1249X
Ex n IIC T4 ($T_{amb} = 70\text{ }^{\circ}\text{C}$)
IP66

Special Conditions for Safe Use (X):

Where the equipment is installed such that there is an unused conduit entry, it must be sealed with a suitable blanking plug to maintain the IP66 degree of protection. Any blanking plug used with the equipment shall be of a type which requires the use of a tool to effect its removal. Voltage source shall not exceed 55V dc.

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

- K5** E5 and I5 combination
- KB** K5 and C6 combination
- KD** K5, C6, I1, and E8 combination
- K6** C6, I1, and E8 combination
- K8** E8 and I1 combination
- K7** E7, I7, and N7 combination

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FIELDBUS PROTOCOL

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II, Division 1, Groups E, F, and G. Dust-Ignition-Proof for Class III, Division 1.

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 when connected per Rosemount drawing 03031-1019; Non-incendive for Class I, Division 2, Groups A, B, C, and D.

Temperature Code:T4 (Ta = 60 °C), T3 (Ta = 85 °C), Enclosure Type 4X

For input parameters see control drawing 03031-1019.

Canadian Standards Association (CSA)

E6 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D for indoor and outdoor hazardous locations. Enclosure type 4X, factory sealed

C6 Explosion-Proof and intrinsically safe approval. Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C.

Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D hazardous locations. Enclosure type 4X, factory sealed

For input parameters see control drawing 03031-1024.

European Certifications


I1 ATEX Intrinsic Safety and Dust
Certification No.: BAS 98ATEX1355X  II 1 GD
EEx ia IIC T4 (T_{amb} = -60 to +60 °C)
Dust Rating: T70 °C (T_{amb} -20 to 40 °C) IP66
CE 1180

TABLE 7. Input Parameters

U_i = 30V


I_i = 300 mA

P_i = 1.3 W

C_i = 0 μF

Special Conditions for Safe Use (X):

The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

IA ATEX FISCO Intrinsic Safety
Certification No.: BAS 98ATEX1355X  II 1 G
EEx ia IIC T4 (T_{amb} = -60 to +60 °C)
IP66

CE 1180

TABLE 8. Input Parameters

U_i = 17.5 V

I_i = 380 mA


P_i = 5.32 W

C_i = ≤ 5 μF

L_i = ≤ 10 μH


Special Conditions for Safe Use (X):

The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

N1 ATEX Type n and Dust
Certification No.: BAS 98ATEX3356X  II 3 GD
U_i = 40 Vdc max
EEx nL IIC T5 (T_a = -40°C to 70 °C)
Dust rating: T80 °C (T_{amb} = -20 to 40 °C) IP66

Special Conditions for Safe Use (X):

The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

E8 ATEX Flame-Proof and Dust
Certification No.: KEMA 00ATEX2013X  II 1/2 GD
EEx d IIC T6 (T_{amb} = -50 to 65 °C)
Dust rating T90 °C, IP66
CE 1180
V_{max} = 55 V dc

Special Conditions for Safe Use (X):

This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

Rosemount 3051

Japanese Certifications

E4 TIIS Flame-Proof
Ex d IIC T6

Certificate	Description
C15852	3051C/D/1 FOUNDATION Fieldbus — no display
C15853	3051C/D/1 FOUNDATION Fieldbus — with display
C15858	3051T/G/1 FOUNDATION Fieldbus, SST, Silicon — no display
C15859	3051T/G/1 FOUNDATION Fieldbus, Hastelloy C276, Silicon — no display
C15860	3051T/G/1 FOUNDATION Fieldbus, SST, Silicon — with display
C15861	3051T/G/1 FOUNDATION Fieldbus, Hastelloy C276, Silicon — with display

Australian Certifications

I7 SAA Intrinsic Safety
Certification No.: AUS Ex 1249X
Ex ia IIC T4 (T_{amb} = 60 °C)
IP66

When connected per Rosemount drawing 03031-1026.

TABLE 9. Input Parameters

U_i = 30 V

I_i = 300 mA

P_i = 1.3 W

C_i = 0 µF

L_i = 0 µH

Special Conditions for Safe Use (X):

The apparatus may only be used with a passive current limited power source Intrinsic Safety application. The power source must be such that $P_o \leq (U_o * I_o) / 4$. Modules using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm² minimum cross-sectional area.

E7 SAA Explosion-Proof (Flame-Proof)
Certification No.: AUS Ex 1347X
Ex d IIC T6 (T_{amb} = 40 °C)
DIP A21 T6 (T_{amb} = 40 °C)
IP66

Special Conditions for Safe Use (X):

It is a condition of safe use for transmitter enclosures having cable entry thread other than metric conduit thread that the equipment be utilized with an appropriate certified thread adaptor.

N7 SAA Type n (Non-sparking)
Certification No.: AUS Ex 1249X
Ex n IIC T4 (T_{amb} = 70 °C)
IP66

Special Conditions for Safe Use (X):

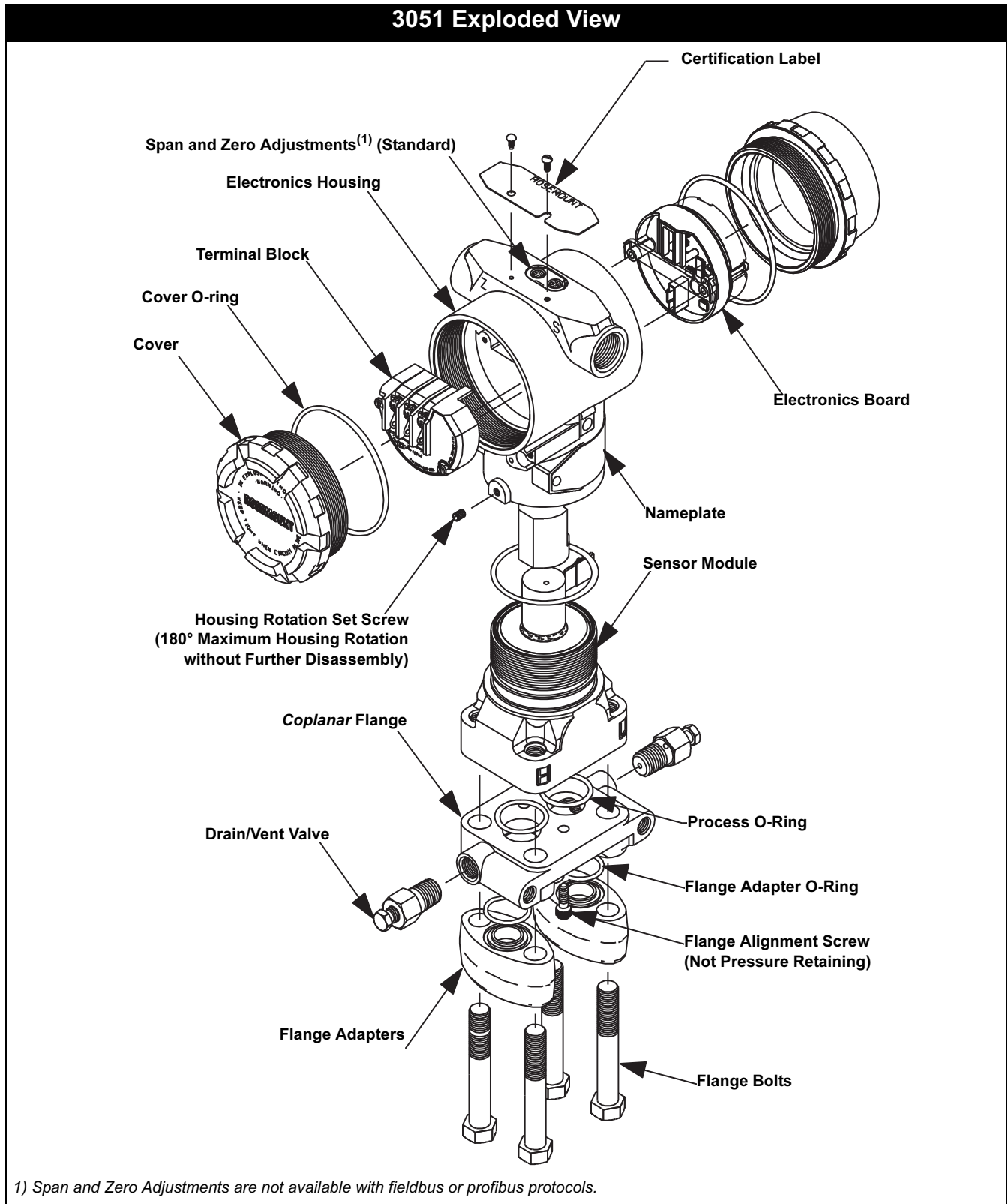
Where the equipment is installed such that there is an unused conduit entry, it must be sealed with a suitable blanking plug to maintain the IP40 degree of protection. Any blanking plug used with the equipment shall be of a type which requires the use of a tool to effect its removal. Voltage source shall not exceed 35V dc.

Combinations of Certifications

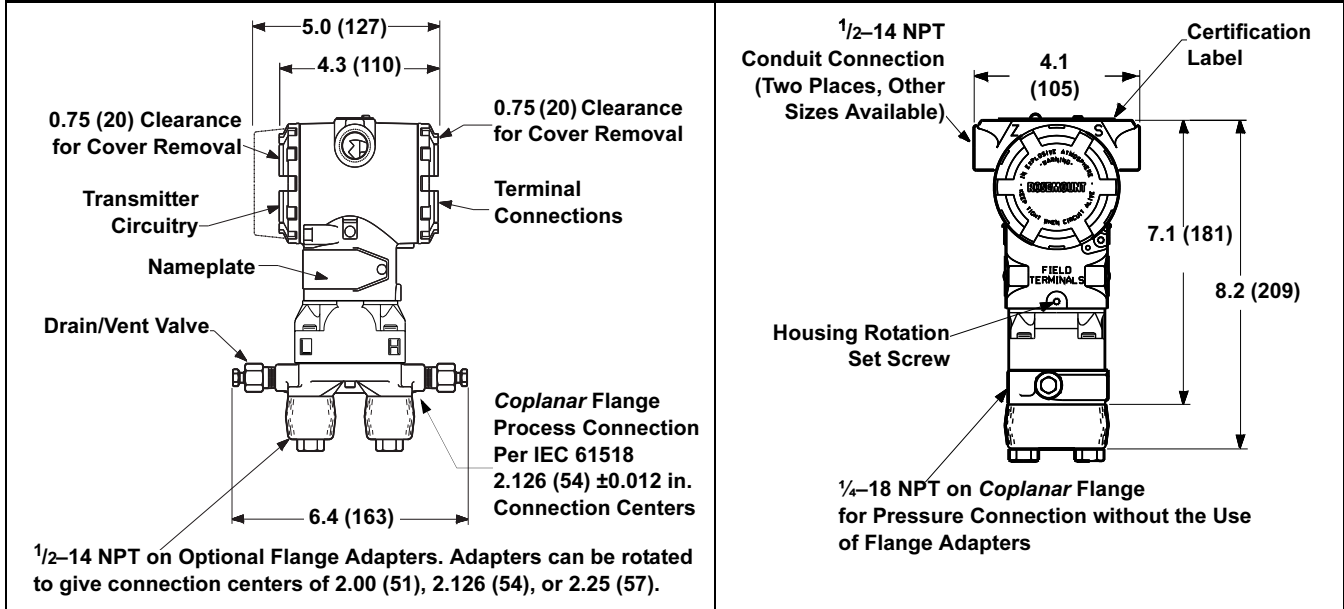
Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

- K5** E5 and I5 combination
- KB** K5 and C6 combination
- KD** K5, C6, I1, and E8 combination
- K6** C6, I1, and E8 combination
- K8** E8 and I1 combination
- K7** E7, I7, and N7 combination

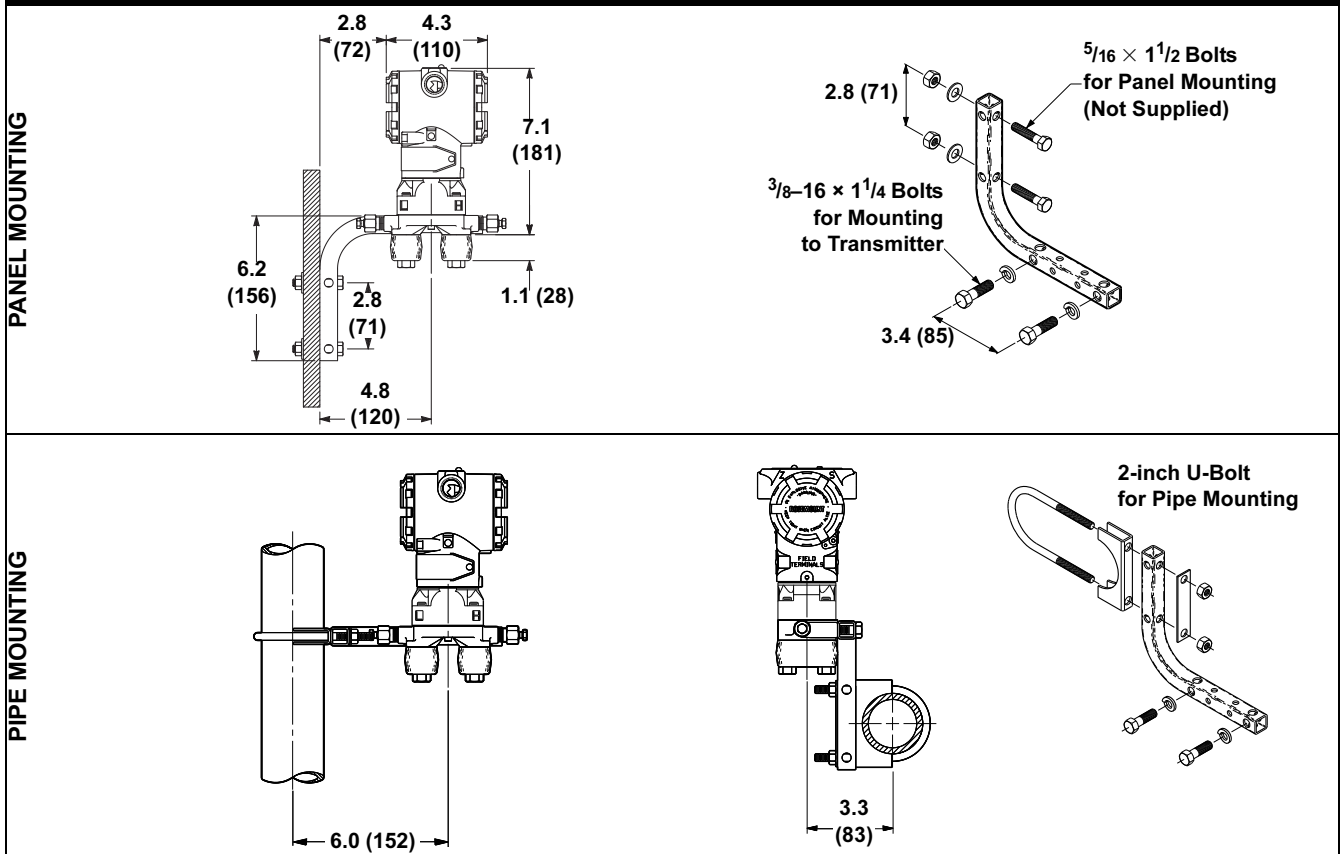
Dimensional Drawings



3051C Coplanar Flange Dimensional Drawing (Differential Pressure Transmitter Shown)



Coplanar Flange Mounting Configurations with Optional Bracket (B4) for 2-in. Pipe or Panel Mounting



Dimensions are in inches (millimeters)

Ordering Information

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Model	Transmitter Type (Select One)			CD	CG	CA
3051CD	Differential Pressure Transmitter			•	—	—
3051CG	Gage Pressure Transmitter			—	•	—
3051CA	Absolute Pressure Transmitter			—	—	•
Code	Pressure Ranges (Range/Min. Span)			CD	CG	CA
	3051CD	3051CG⁽¹⁾	3051CA			
0 ⁽²⁾	–3 to 3 inH ₂ O/0.1 inH ₂ O (–7,5 to 7,5 mbar/0,25 mbar)	Not Applicable	Not Applicable	•	—	—
1	–25 to 25 inH ₂ O/0.5 inH ₂ O (–62,2 to 62,2 mbar/1,2 mbar)	–25 to 25 inH ₂ O/0.5 inH ₂ O (–62,1 to 62,2 mbar/1,2 mbar)	0 to 30 psia/0.3 psia (0 to 2,1 bar/20,7 mbar)	•	•	•
2	–250 to 250 inH ₂ O/2.5 inH ₂ O (–623 to 623 mbar/6,2 mbar)	–250 to 250 inH ₂ O/2.5 inH ₂ O (–621 to 623 mbar/6,2 mbar)	0 to 150 psia/1.5 psia (0 to 10,3 bar/0,1 bar)	•	•	•
3	–1000 to 1000 inH ₂ O/10 inH ₂ O (–2,5 to 2,5 bar/25 mbar)	–393 to 1000 inH ₂ O/10 in H ₂ O (–0,98 to 2,5 bar/25 mbar)	0 to 800 psia/8 psia (0 to 55,2 bar/0,55 bar)	•	•	•
4	–300 to 300 psi/3 psi (–20,7 to 20,7 bar/0,2 bar)	–14.2 to 300 psi/3 psi (–0,98 to 20,7 bar/0,2 bar)	0 to 4000 psia/40 psia (0 to 275,8 bar/2,8 bar)	•	•	•
5	–2000 to 2000 psi/20 psi (–137,9 to 137,9 bar/1,4 bar)	–14.2 to 2000 psig/20 psi (–0,98 to 137,9 bar/1,4 bar)	Not Applicable	•	•	—
Code	Output			CD	CG	CA
A	4–20 mA with Digital Signal Based on HART Protocol			•	•	•
M ⁽³⁾	Low-Power, 1–5 V dc with Digital Signal Based on HART Protocol (See Option C2 for 0.8–3.2 V dc)			•	•	•
F	FOUNDATION fieldbus Protocol			•	•	•
W	Profibus — PA			•	•	•
Code	Materials of Construction			CD	CG	CA
	Process Flange Type	Flange Material	Drain/Vent			
2	Coplanar	SST	SST	•	•	•
3 ⁽⁴⁾	Coplanar	Alloy C	Hastelloy C276	•	•	•
4	Coplanar	Monel	Monel	•	•	•
5	Coplanar	Plated CS	SST	•	•	•
7 ⁽⁴⁾	Coplanar	SST	Hastelloy C276	•	•	•
8 ⁽⁴⁾	Coplanar	Plated CS	Hastelloy C276	•	•	•
0	Alternate Flange—See Options on page 26			•	•	•
Code	Isolating Diaphragm			CD	CG	CA
2⁽⁴⁾	316L SST			•	•	•
3 ⁽⁴⁾	Hastelloy C276			•	•	•
4	Monel			•	•	•
5	Tantalum (Available on 3051CD and CG, Ranges 2–5 only. Not available on 3051CA)			•	•	—
6	Gold-plated Monel (Use in combination with O-ring Option Code B.)			•	•	•
7	Gold-plated SST			•	•	•
Code	O-ring			CD	CG	CA
A	Glass-filled PTFE			•	•	•
B	Graphite-filled PTFE			•	•	•
Code	Fill Fluid			CD	CG	CA
1	Silicone			•	•	•
2	Inert fill (Halocarbon)			•	•	—

Rosemount 3051

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Code	Housing Material	Conduit Entry Size	CD	CG	CA
A	Polyurethane-covered Aluminum	½–14 NPT	•	•	•
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)	•	•	•
C	Polyurethane-covered Aluminum	PG 13.5	•	•	•
D	Polyurethane-covered Aluminum	G½	•	•	•
J	SST	½–14 NPT	•	•	•
K	SST	M20 × 1.5 (CM20)	•	•	•
L	SST	PG 13.5	•	•	•
M	SST	G½	•	•	•
Code	PlantWeb Functionality (Optional)		CD	CG	CA
A01	Advanced Control Function Block Suite		•	•	•
D01	FOUNDATION fieldbus Diagnostics Suite		•	•	•
Code	Alternate Flange Options (Requires Materials of Construction Code 0)		CD	CG	CA
H2	Traditional Flange, 316 SST, SST Drain/Vent		•	•	•
H3 ⁽⁴⁾	Traditional Flange, Alloy C, Hastelloy C276 Drain/Vent		•	•	•
H4	Traditional Flange, Monel, Monel Drain/Vent		•	•	•
H7 ⁽⁴⁾	Traditional Flange, 316 SST, Hastelloy C276 Drain/Vent		•	•	•
HJ	DIN Compliant Traditional Flange, SST, 1/16 in. Adapter/Manifold Bolting		•	•	•
HK	DIN Compliant Traditional Flange, SST, 10 mm Adapter/Manifold Bolting		•	•	•
HL	DIN Compliant Traditional Flange, SST, 12mm Adapter/Manifold Bolting (Not available on 3051CD0)		•	•	•
FA	Level Flange, SST, 2 in., ANSI Class 150, Vertical Mount		•	•	•
FB	Level Flange, SST, 2 in., ANSI Class 300, Vertical Mount		•	•	•
FC	Level Flange, SST, 3 in., ANSI Class 150, Vertical Mount		•	•	•
FD	Level Flange, SST, 3 in., ANSI Class 300, Vertical Mount		•	•	•
FP	DIN Level Flange, SST, DN 50, PN 40, Vertical Mount		•	•	•
FQ	DIN Level Flange, SST, DN 80, PN 40, Vertical Mount		•	•	•
Code	Integral Mount Manifold Options (Requires Materials of Construction Code 0)		CD	CG	CA
S5 ⁽⁵⁾	Assemble to Rosemount 305 Integral Manifold (specified separately, see the Rosemount 305 and 306 Integral Manifolds PDS (document number 00813-0100-4733))		•	•	•
S6 ⁽⁵⁾	Assemble to Rosemount 304 Manifold or connection system		•	•	•
Code	Integral Mount Primary Elements (Optional)		CD	CG	CA
S4 ⁽⁵⁾	Factory Assembly to Rosemount Primary Element (Rosemount Annubar or Rosemount 1195 Integral Orifice) <i>(With the primary element installed, the maximum operating pressure will equal the lesser of either the transmitter or the primary element. Option is available for factory assembly to range 1–4 transmitters only)</i>		•	—	—
S3 ⁽⁵⁾	Factory Assembly to Rosemount 405 Primary Element		•	—	—
Code	Diaphragm Seal Assemblies (Optional)		CD	CG	CA
NOTE: Standard flange and adapter bolts are austenitic 316 SST.					
S1 ⁽⁵⁾	One Diaphragm Seal (Direct Mount or Capillary Connection Type)		•	•	•
S2 ⁽⁵⁾	Two Diaphragm Seals (Direct Mount or Capillary Connection Type)		•	—	—
Code	Optional All Welded Diaphragm Seal Systems (for high vacuum applications)		CD	CG	CA
NOTE: Standard flange and adapter bolts are austenitic 316 SST.					
S7 ⁽⁵⁾	One Diaphragm Seal, All-Welded System (Capillary Connection Type)		•	•	•
S8 ⁽⁵⁾	Two Diaphragm Seals, All-Welded System (Capillary Connection Type)		•	—	—
S0 ⁽⁵⁾	One Diaphragm Seal, All-Welded System (Direct Mount Connection Type)		•	•	•
S9 ⁽⁵⁾	Two Diaphragm Seals, All-Welded System (One Direct Mount and One Capillary Connection Type)		•	—	—

Product Data Sheet

00813-0100-4001, Rev HA

March 2008

Rosemount 3051

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Code	Mounting Bracket Options	CD	CG	CA
B4	Coplanar Flange Bracket for 2-in. Pipe or Panel Mounting, all SST	•	•	•
B1	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	•	•	•
B2	Traditional Flange Bracket for Panel Mounting, CS Bolts	•	•	•
B3	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	•	•	•
B7	B1 Bracket with Series 300 SST Bolts	•	•	•
B8	B2 Bracket with Series 300 SST Bolts	•	•	•
B9	B3 Bracket with Series 300 SST Bolts	•	•	•
BA	SST B1 Bracket with Series 300 SST Bolts	•	•	•
BC	SST B3 Bracket with Series 300 SST Bolts	•	•	•
Code	Hazardous Locations Certification Options	CD	CG	CA
E5	FM Explosionproof Approval	•	•	•
I5	FM Non-incendive and Intrinsic Safety Approval	•	•	•
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only	•	•	•
K5	FM Explosionproof and Intrinsic Safety Approval	•	•	•
I1 ⁽⁶⁾	ATEX Intrinsic Safety	•	•	•
N1 ⁽⁶⁾	ATEX Type N and Dust Certification	•	•	•
E8	ATEX Flame-proof and Dust Certification	•	•	•
E4 ⁽⁶⁾	TIIS Flame-proof Certification	•	•	•
I4	TIIS Intrinsic Safety Certification (Only available with HART Option Code A)	•	•	—
C5 ⁽⁷⁾	Measurement Canada Accuracy Approval (Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative)	•	•	•
C6	CSA Explosion-proof and Intrinsic Safety Approval	•	•	•
K6 ⁽⁶⁾	CSA and ATEX Explosion-proof and Intrinsic Safety Approval (combination of C6 and K8)	•	•	•
KB	FM and CSA Explosion-proof and Intrinsic Safety Approvals (combination of K5 and C6)	•	•	•
K7	SAA Flame-proof and Intrinsic Safety Approvals (combination of I7, N7, and E7)	•	•	•
K8 ⁽⁶⁾	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)	•	•	•
KD ⁽⁶⁾	FM, CSA, and ATEX Explosion-proof and Intrinsically Safe combination of K5, C6, I1, and E8	•	•	•
I7	SAA Intrinsic Safety Certification	•	•	•
E7	SAA Flame-proof Certification	•	•	•
N7	SAA Type N Certification	•	•	•
IA	ATEX Intrinsic Safety for FISCO; for FOUNDATION fieldbus protocol only	•	•	•
Code	Bolting Options	CD	CG	CA
L4	Austenitic 316 SST Bolts	•	•	•
L5	ASTM A 193, Grade B7M Bolts	•	•	•
L6	Monel Bolts	•	•	•
Code	Display Options	CD	CG	CA
M5	LCD display for Aluminum Housing (Housing Codes A, B, C, and D only)	•	•	•
M6	LCD display for SST Housing (Housing Codes J, K, L, and M only)	•	•	•

3051C Differential/Gage Pressure Transmitter Range Limits										
Units	Range 1 Span		Range 2 Span		Range 3 Span		Range 4 Span		Range 5 Span	
	min	max	min	max	min	max	min	max	min	max
inH ₂ O	0.5	25	2.5	250	10	1000	83.040	8304	553.60	55360
inHg	0.03678	1.8389	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04
ftH ₂ O	0.04167	2.08333	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31
mmH ₂ O	12.7	635.5	63.553	6355	254	25421	2110.95	211095	14073	1407301
mmHg	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
psi	0.01806	0.903	0.0902	9.03183	0.36127	36.127	3	300	20	2000
bar	0.00125	0.06227	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895
mbar	1.2454	62.2723	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895
g/cm ²	1.26775	63.3875	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614
kg/cm ²	0.00127	0.0635	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614
Pa	124.545	6227.23	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500
kPa	0.12545	6.2272	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5
torr	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
atm	0.00123	0.06146	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

3051L/3051H Pressure Transmitter Range Limits									
Units	Range 2 Span		Range 3 Span		Range 4 Span		Range 5 Span		
	min	max	min	max	min	max	min	max	
inH ₂ O	2.5	250	10	1000	83.040	8304	553.60	55360	
inHg	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04	
ftH ₂ O	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31	
mmH ₂ O	63.553	6355	254	25421	2110.95	211095	14073	1407301	
mmHg	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430	
psi	0.0902	9.03183	0.36127	36.127	3	300	20	2000	
bar	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895	
mbar	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895	
g/cm ²	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614	
kg/cm ²	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614	
Pa	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500	
kPa	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5	
torr	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430	
atm	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092	

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.



Modbus TCP/IP Communication Module for Remote Chassis

MVI56-MNETR

The MVI56 Modbus TCP/IP Communication Module with Reduced Data Block allows Rockwell Automation ControlLogix I/O compatible processors to interface easily with other Modbus TCP/IP protocol compatible devices. Compatible devices include not only Modicon processors (which support the Modbus TCP/IP protocol) but also a wide assortment of other clients and server devices.

This module uses a small I/O data area for data transfer between the module and the ControlLogix processor, making it ideal for ControlNet or Ethernet applications with the module in a remote rack.

Features and Benefits

The MVI56-MNETR module is a single slot solution that provides a powerful connection between Rockwell Automation's ControlLogix processor and Modbus TCP/IP network applications.

The TCP/IP Modbus network applications include those networks hosted by Modicon Quantum processors, networks controlled by operator interface software packages, and the growing number of manufactured devices that support this protocol. The MVI56-MNETR module acts as an input/output module between the Modbus TCP/IP network and the Rockwell Automation backplane. The data transfer from the processor is asynchronous from the actions on the Modbus TCP/IP network. A 5000-word register space in the module exchanges data between the processor and the Modbus TCP/IP network.

- Support for the storage and transfer of up to 5000 registers to/from the ControlLogix processor using the block transfer or side-connect interface
- User-definable module memory usage
- 10/100 MB Ethernet compatible interface
- Configurable parameters for the client including a minimum response delay of 0 to 65535 mSec and floating point support

General Specifications

- Single Slot – 1756 backplane compatible
- The module is recognized as an Input/Output module and has access to processor memory for data transfer between processor and module

Modbus TCP/IP Communication Module for Remote Chassis MVI56-MNETR

With the growing trend of Ethernet technology in the industrial marketplace, this product has a wide variety of application uses.

- Food processing
- Petrochemical
- Pulp and paper
- Automobile manufacturing

How to Contact Us: Sales and Support

All ProSoft Technology products are backed with unlimited technical support. Contact our worldwide Technical Support team directly by phone or email:

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Languages spoken include: English, Spanish

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Languages spoken include: Spanish, English

Brasil

+55-11.5084.5178, eduardo@prosoft-technology.com
Languages spoken include: Portuguese, English

- Ladder Logic is used for data transfer between module and processor. Sample ladder file included.
- Configuration data obtained from configuration text file downloaded to module. Sample configuration file included
- Local or remote rack

Hardware Specifications

Specification	Description
Form Factor:	Single Slot 1756 Chassis Compatible Local or Remote Rack
Backplane Current Load	800 mA @ 5 V
Operating Temperature	0 to 60°C (32 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Shock:	30g Operational 50g non-operational Vibration: 5 g from 10 to 150 Hz
Relative Humidity	5 to 95% (non-condensing)
LED Indicators:	Module Status Backplane Transfer Status Application Status Serial Activity
Application port (Ethernet)	
Ethernet Port (Ethernet modules)	10/100M RJ45 Connector Link and activity LED indicators
Shipped with Unit	RJ45 to DB-9M cables for each port 6-foot RS-232 configuration cable
Debug/Configuration port (CFG)	
CFG Port (CFG)	RJ45 (DB-9M with supplied cable) RS-232 only No hardware handshaking

Functional Specifications

Some of the general specifications include:

- Support for the storage and transfer of up to 5000 registers to/from the ControlLogix processor's controller tags
- Module memory usage that is completely user definable
- 10/100 MB Ethernet compatible interface
- Configurable parameters for the client include
 - Minimum Command Delay
 - Pass-Through Mode.
- The ControlLogix processor can be programmed to control the activity on the client by actively selecting commands from the command list to execute or issue commands directly from the ladder logic.

- The module supports 10 servers for Modbus TCP/IP (Port 502) and 10 servers for MNET (Port 2000)
- One hundred commands are supported on each port.
- A client configured as a virtual Modbus master device on the MVI56-MNETR module will actively issue Modbus TCP/IP commands to other nodes on the Modbus TCP/IP network.
- The servers permit remote clients to interact with all data contained in the module. This data can be derived from other Modbus clients on the network through the client on the module or from the ControlLogix processor.
- The module can be configured to pass write commands (functions 5, 6, 15 and 16) directly from the remote host to the processor.
- Accepts Modbus function code commands of 1, 2, 3, 4, 5, 6, 7, 15, 16, 22 and 23 from an attached Modbus TCP/IP client.

Additional Products

ProSoft Technology offers a full complement of hardware and software solutions for a wide variety of industrial communication platforms.

Visit our web site at <http://www.prosoft-technology.com> for a complete list of products.

Ordering Information

To order this product, please use the following:

MVI56-MNETR Modbus TCP/IP
Communication Module for Remote
Chassis

To place an order, please contact your local ProSoft Technology distributor. For a list of ProSoft distributors near you, go to <http://www.prosoft-technology.com>

Distributors:

Place your order by email or fax to:

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fax to +1 661.716.5101

Europe

europe@prosoft-technology.com,
fax to +33 (0) 5.61.78.40.52

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January 12, 2007

The N-Tron® 304TX is an unmanaged four port Industrial Ethernet Switch. It is housed in a ruggedized DIN-RAIL enclosure and is designed for use in industrial data acquisition, control, and Ethernet I/O applications.

PRODUCT FEATURES

- Compact Size, Small Footprint
- Full IEEE 802.3 and 1613 Compliance
- NEMA TS1/TS2 Compliance
- American Bureau of Shipping (ABS) Type Approval
- Extended Environmental Specifications
- Four 10/100 BaseTX RJ-45 Ports
- Supports Full/Half Duplex Operation
- LED Link/Activity Status Indication
- Store-and-Forward Technology
- Auto Senses Speed and Flow Control
- MDIX Auto Cable Sensing (RJ-45)
- Up to 1.0 Gb/s Maximum Throughput
- Rugged Industrial DIN-RAIL Enclosure
- Redundant Power Inputs (10-30 VDC)
- N-View™ OPC Switch Monitoring Option



PRODUCT OVERVIEW

N-Tron's 304TX Industrial Network Switch is designed to meet and exceed the most demanding industrial communication requirements while providing high throughput and minimum downtime.

The 304TX provides four RJ-45 auto sensing 10/100BaseTX ports. All ports are full/half duplex capable, using state-of-the-art Ethernet switching technology. The 304TX auto-negotiates the speed and flow control capabilities of the TX copper port connection, and configures itself automatically.

The 304TX is auto sensing, so there will be no need to make extensive wiring changes if upgrades are made to host computers, plant systems, or Ethernet I/O modules. The switching fabric simply scales up or down automatically to match network environments.

The 304TX supports up to 4,000 MAC addresses, enabling these products to support extremely sophisticated and complex network architectures.

The 304TX is an ideal candidate for upgrading existing hubs and repeaters, in order to provide increased bandwidth and determinism by virtually eliminating network collisions. The product provides a cost effective solution while maintaining the plug & play simplicity of an unmanaged hub.

The 304TX simplifies plant wiring by eliminating the need to bring data acquisition and control network connections back to a climate controlled environment. The 304TX has extended operating environmental specifications to meet the harsh needs of the industrial environment. For cost savings and convenience the network switch can be DIN-RAIL mounted alongside Ethernet I/O or other Industrial Equipment.

The unique compact size provides a small footprint, conserving space in the most critical dimension. The 304TX can also be panel mounted if desired. To increase reliability, the 304TX contains redundant power inputs. LED's are provided to display power on/off status as well as the link status and activity of each port.

N-VIEW OPC PORT MONITORING (With -N Option Only)

The N-Tron N-View OLE for Process Control (OPC) Server Software can be combined with popular HMI software packages to add network traffic monitoring, trending and alarming to any application using N-Tron switches configured with the N-View option. N-View OPC Server collects 41 different traffic variables per port and five system level variables per switch. This information can provide a complete overview of the network load, service quality, and packet traffic. OPC client software can use N-View OPC Server data to resolve network problems quickly and improve system reliability.

SPECIFICATIONS

Case Dimensions

Height:	3.1"	(7.9 cm)
Width:	2.1"	(5.4 cm)
Depth:	3.4"	(8.7 cm)
Weight:	0.75 lbs	(0.3 kg)

Electrical

Input Voltage:	10-30 VDC
Input Current:	250 mA@24V
Inrush:	8.0Amp/0.6ms@24V

Environmental

Operating Temperature:	-40°C to 70°C
Storage Temperature:	-40°C to 85°C
Operating Humidity:	10% to 95% (Non Condensing)
Operating Altitude:	0 to 10,000 ft.

Shock and Vibration (bulkhead mounting)

Shock:	200g @ 10ms
Vibration/Seismic:	50g, 5-200Hz, Triaxial

Network Media

10BaseT:	≥Cat3 Cable
100BaseTX:	≥Cat5 Cable

Connectors

10/100BaseTX:	Four (4) RJ-45 TX Ports
---------------	-------------------------

Recommended Wiring Clearance

Front:	2" (5.08 cm)
Top:	1" (2.54 cm)

Regulatory Approvals

FCC Part 15 Class A
UL Listed 1604 (US and Canada)
CLASS I, DIV 2, GROUPS A,B,C,D,T4A
CE: EN61000-6-2,4, EN55011, EN61000-4-2,3,4,5,6
ABS Type Approval for Shipboard Applications
IEEE 1613 for Electric Utility Substations
GOST-R Certified
RoHS Compliant

BENEFITS

Industrial Network Switch

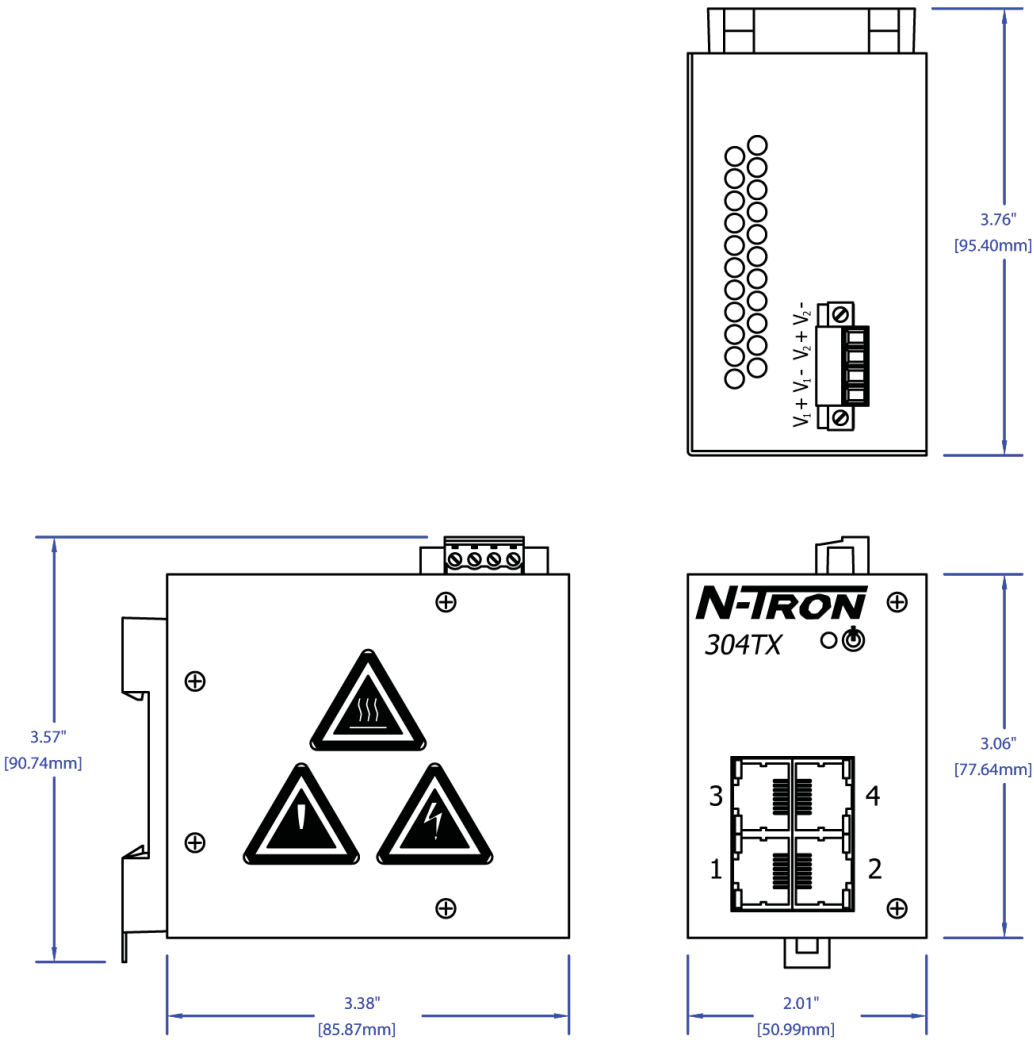
- Compact Size, Small Footprint
- High Reliability/Availability
- Extended Environmental Specifications
- Ruggedized DIN-RAIL Enclosure
- High Performance
- High MTBF >2M Hours (measured)

Ease of Use

- Plug & Play Operation
- 4 Auto Sensing 10/100BaseTX RJ-45 Ports
- Auto Sensing Duplex, Speed, and Cable Type
- Unmanaged Operation
- Compact DIN-RAIL Package

Increased Performance

- Full Wire Speed Capable
- Full Duplex Capable
- Eliminates Network Collisions
- Increases Network Determinism
- N-View Switch Viewing Option



ORDERING INFORMATION

PART NUMBER	DESCRIPTION
304TX-N	4-port 10/100BaseTX Industrial Ethernet Switch, DIN-Rail with N-View Firmware Option
304TX.....	4-port 10/100BaseTX Industrial Ethernet Switch, DIN-Rail

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QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO 9001:2008 ==

1756 ControlLogix Chassis Specifications

Catalog Numbers 1756-A4/B, 1756-A7/B, 1756-A10/B, 1756-A13/B, 1756-A17/B, 1756-A4LXT, 1756-A5XT, 1756-A7LXT, 1756-A7XT

Topic	Page
Standard ControlLogix Chassis Specifications	2
ControlLogix-XT Chassis Specifications	3
Spacing Requirements	5
ControlLogix Chassis with Standard Power Supplies Mounting Dimensions	6
ControlLogix Chassis with Redundant Power Supplies Mounting Dimensions	10
ControlLogix Chassis Accessories	12
Additional Resources	13

The ControlLogix® system is a modular system that requires a 1756 ControlLogix chassis. All of the chassis are designed for horizontal-only, back-panel mounting. Place any module into any slot. The backplane provides a high-speed communication path between modules.

AutoCAD product drawings are available at <http://www.rockwellautomation.com/en/e-tools/drawings.html>.



Standard ControlLogix Chassis Specifications

The chassis backplane provides a high-speed communication path between modules and distributes power to each of the modules within the chassis.

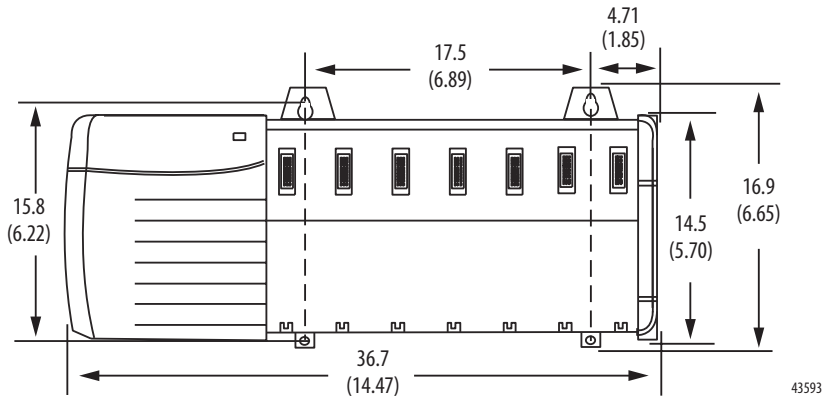
Table 1 - Technical Specifications - ControlLogix Standard Chassis

Attribute	1756-A4	1756-A7	1756-A10	1756-A13	1756-A17
Backplane current, chassis/slot max @ 1.2V DC	1.5 A/-				
Backplane current, chassis/slot max @ 3.3V DC	4 A/4 A				
Backplane current, chassis/slot max @ 5.1V DC	15 A/6 A				
Backplane current, chassis/slot max @ 24V DC	2.8 A/2.8 A				
Power dissipation, max	4 W	4.5 W	5 W	5.4 W	6 W
Isolation voltage	Determined by installed power supply and modules				
Slots	4	7	10	13	17
Mounting method	Horizontal only				
Cabinet size (HxWxD), min	50.8 x 50.8 x 20.3 cm (20 x 20 x 8 in.)	50.8 x 60.9 x 20.3 cm (20 x 24 x 8 in.)	50.8 x 76.2 x 20.3 cm (20 x 30 x 8 in.)	60.9 x 76.2 x 20.3 cm (24 x 30 x 8 in.)	76.2 x 91.4 x 20.3 cm (30 x 36 x 8 in.)
Weight, approx	0.75 kg (1.7 lb)	1.10 kg (2.4 lb)	1.45 kg (3.2 lb)	1.90 kg (4.2 lb)	2.20 kg (4.8 lb)
Location	Panel				
Wire size	Functional Earth Ground - 8.3 mm ² (8 AWG) solid or stranded copper wire rated at 90 °C (194 °F) or greater Protective Earth Ground - 2.1 mm ² (14 AWG) solid or stranded copper wire rated at 90 °C (194 °F) or greater				
North American temperature code	T5				
IEC temperature code	T6				
Enclosure type rating	None (open-style)				

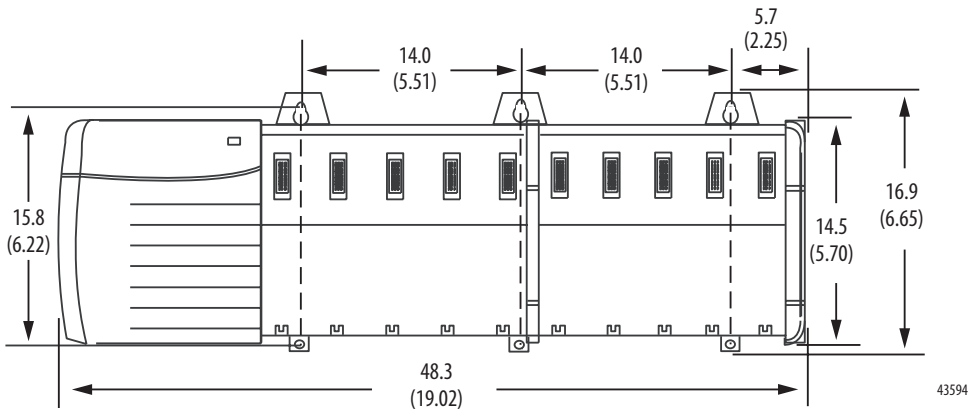
Table 2 - Environmental Specifications - ControlLogix Standard Chassis

Attribute	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

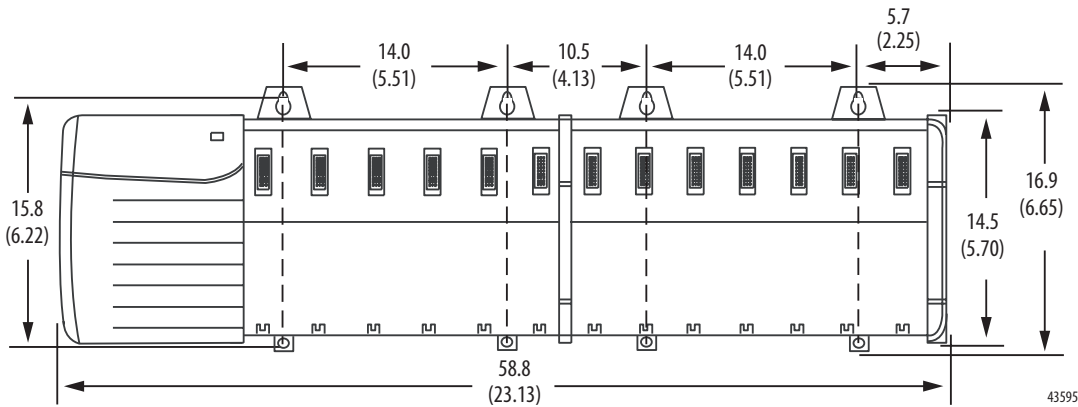
1756-A7 Chassis and Power Supply



1756-A10 Chassis and Power Supply



1756-A13 Chassis and Power Supply



Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this publication are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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1756-0A16

ControlLogix AC (74...265V) output module

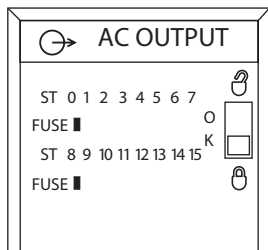
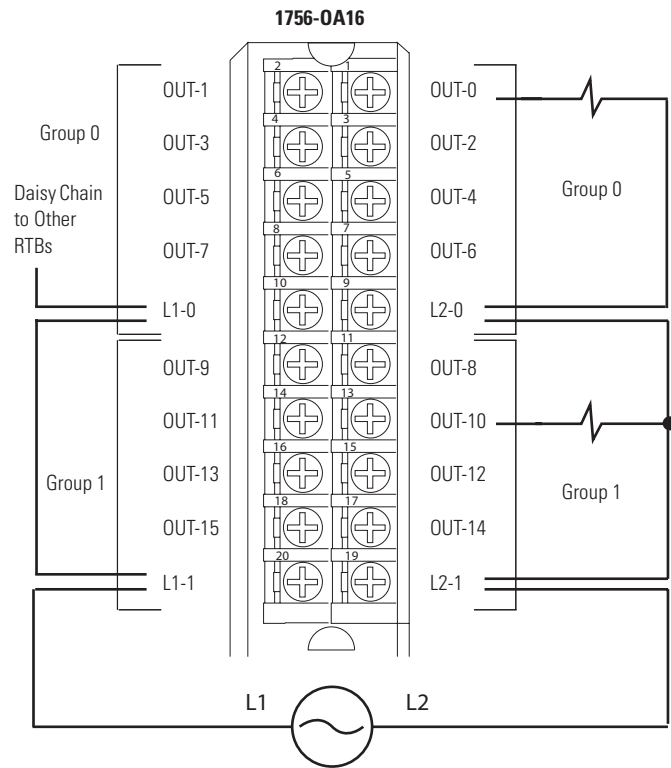
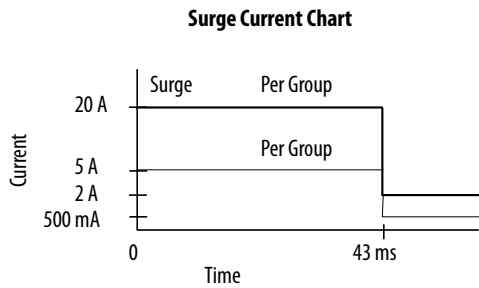
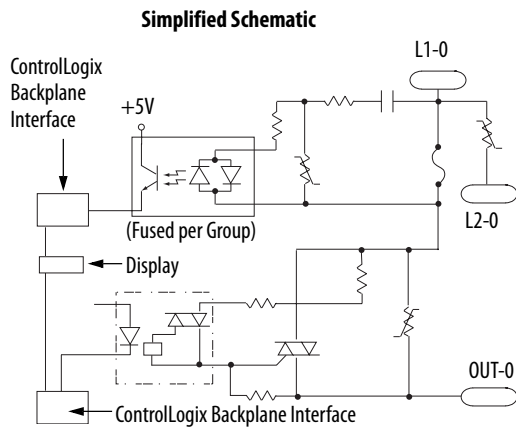


Table 107 - Diagnostic Specifications - 1756-0A16

Attribute	1756-0A16
Time stamp of diagnostics	±1 ms
Fuse blown	1 fuse and indicator/group

Table 108 - Technical Specifications - 1756-0A16

Attribute	1756-0A16
Outputs	16 mechanically fused/group (8 points/group)
Pilot duty	0.5 A
Voltage category	120/240V AC
Operating voltage range	74...265V AC 47...63 Hz
Output delay time Off to On	9.3 ms @ 60 Hz 11 ms @ 50 Hz
On to Off	9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	400 mA
Current draw @ 24V	2 mA
Total backplane power	2.1 W
Power dissipation, max	6.5 W @ 60 °C (140 °F)
Thermal dissipation	22.17 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	1.5V @ 0.5 A 5.7V @ load current < 50 mA
Current per point, max	0.5 A @ 60 °C (140 °F)
Current per group, max	2 A @ 60 °C (140 °F)
Current per module, max	4 A @ 60 °C (140 °F)
Surge current per point	5 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Surge current per group	15 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Commutating voltage	4V/μs for loads > 50 mA 0.2V/μs for loads < 50 mA ⁽¹⁾
Scheduled outputs	Synchronization within 16.7 s max, reference to the Coordinated System Time
States in Fault mode per point	Hold last state, On or Off (Off is default)
States in Program mode per point	Hold last state, On or Off (Off is default)
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Inhibit voltage, max	Zero crossing 60V peak
Module keying	Electronic, software configurable
Fusing	Mechanically fused/group, 3.15 A @ 250V AC slow blow, 1500 A interruption current, Littelfuse p/n H2153.15
Removable terminal block	1756-TBNH 1756-TBSH
RTB keying	User-defined mechanical
Slot width	1

Table 108 - Technical Specifications - 1756-0A16 (continued)

Attribute	1756-0A16
Wire category	1 ⁽²⁾
North American temperature code	T4
Enclosure type	None (open style)

- (1) The commutating dv/dt of the output voltage (OUTPUT to L2) should not exceed 0.2V/ms for loads under 50 mA. The commutating dv/dt rating of the module for loads 50...500 mA (OUTPUT to L2) is 4V/ms maximum. If the commutating dv/dt rating of the TRIAC is exceeded, the TRIAC could latch on. If the commutating dv/dt rating is exceeded in the 10...50 mA range, a resistor may be added AC cross the output and L2. The purpose of this resistor is to increase the total output current to 50 mA ($I=V/R$). At 50 mA and above, the module has a higher commutating dv/dt rating. When adding a resistor for the output to L2, be sure it is rated for the power that it will dissipate ($P=(V^{**2})/R$). If the commutating dv/dt rating is exceeded in the 50...500 mA range, the L1 AC waveform could be at fault. Be sure the waveform is a good sinusoid, void of any anomalies such as distorted or flattened sections.
- (2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Table 109 - Environmental Specifications - 1756-0A16

Attribute	1756-0A16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

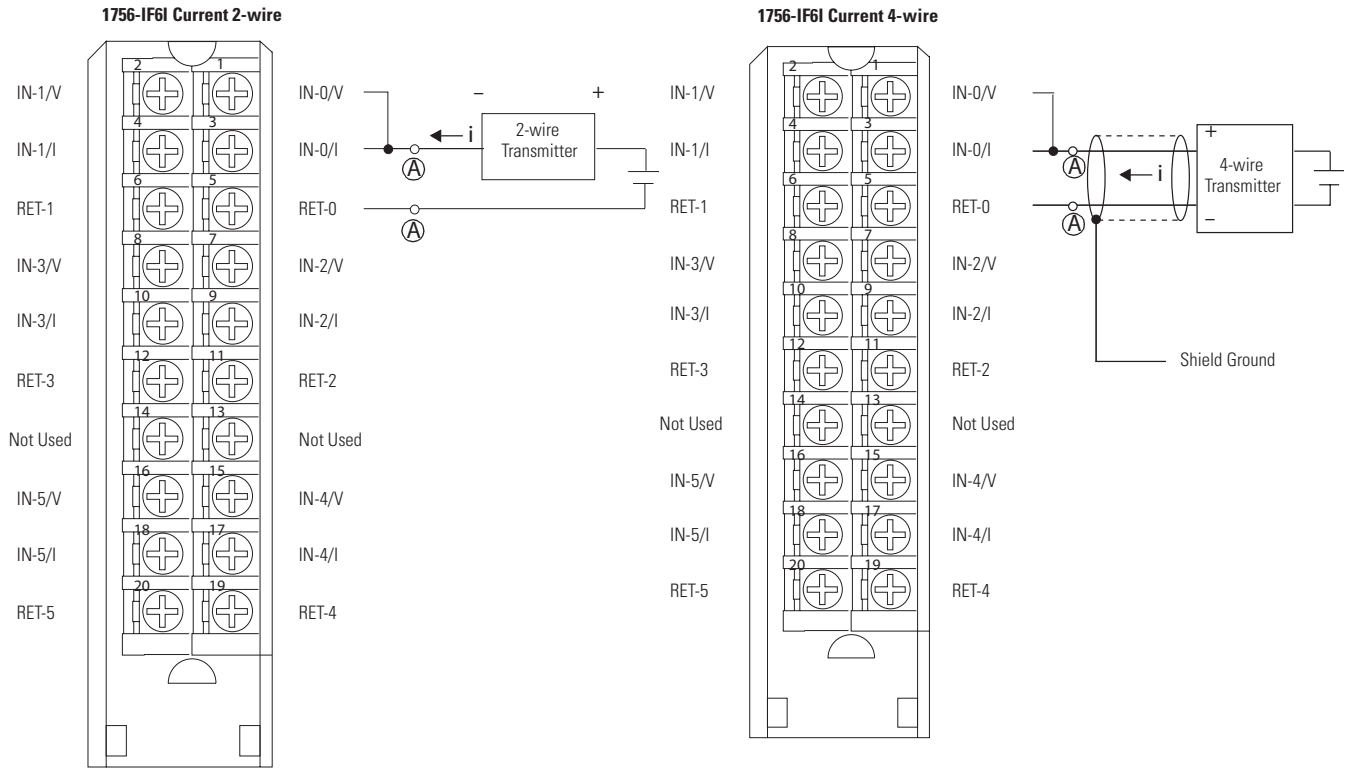
Table 110 - Certifications - 1756-0A16

Certification⁽¹⁾	1756-0A16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

1756-IF6I

ControlLogix isolated voltage/current analog input module



Place additional loop devices (such as strip chart recorders) at either A location.

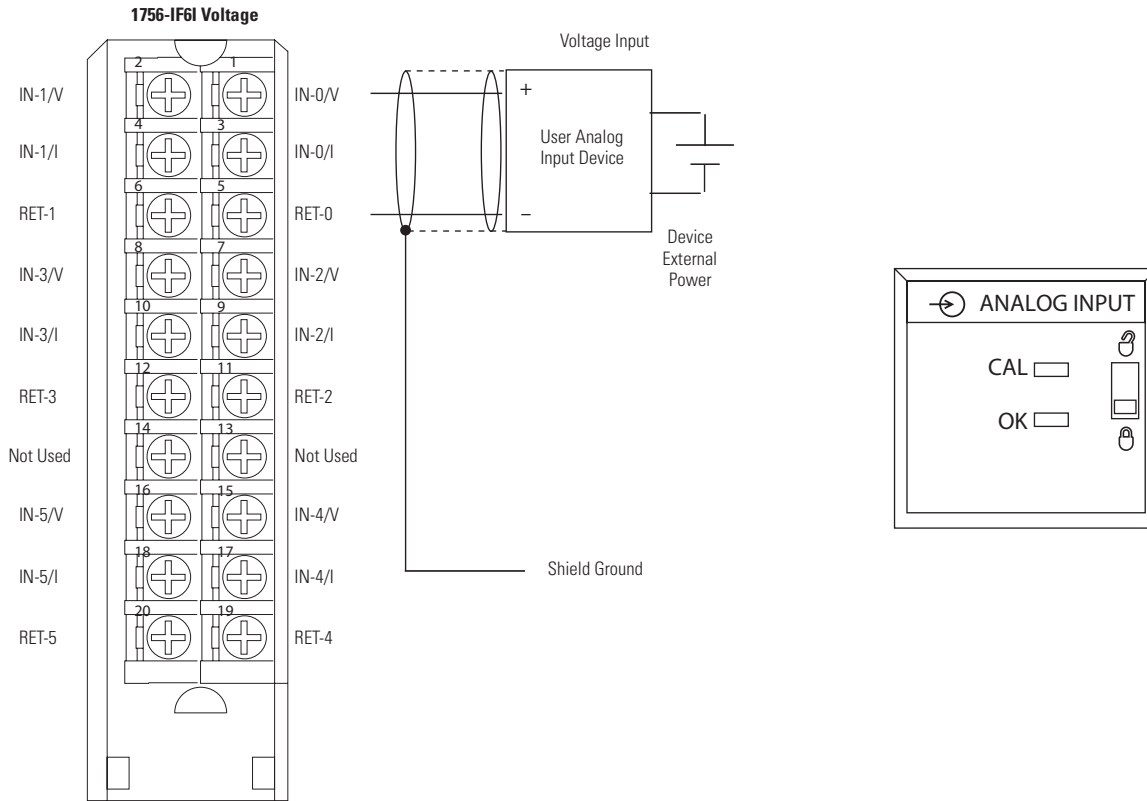


Table 40 - Signal and User Counts - 1756-IF6I

Range	Low Signal and User Counts	High Signal and User Counts
±10V	-10.54688V -32768 counts	10.54688V 32767 counts
0...10V	0V -32768 counts	10.54688V 32767 counts
0...5V	0V -32768 counts	5.27344V 32767 counts
0...20 mA	0 mA -32768 counts	21.09376V 32767 counts

Table 41 - Technical Specifications - 1756-IF6I

Attribute	1756-IF6I
Inputs	6 individually isolated
Input range	±10.5V 0...10.5V 0...5.25V 0...21 mA (over-range indication when exceeded)
Resolution	16 bits 10.5V: 343 µV/bit 0...10.5V: 171 µV/bit 0...5.25V: 86 µV/bit 0...21 mA: 0.34 µA/bit
Current draw @ 5.1V	250 mA
Current draw @ 24V	100 mA

Table 41 - Technical Specifications - 1756-IF6I (continued)

Attribute	1756-IF6I
Total backplane power	3.7 W
Power dissipation, max	Voltage: 3.7 W Current: 4.3 W
Thermal dissipation	Voltage: 12.62 BTU/hr Current: 14.32 BTU/hr
Input impedance	Voltage: > 10 M Ω Current: 249 Ω
Open circuit detection time	Positive full scale reading within 5 s
Overvoltage protection, max	Voltage: 120V AC/DC Current: 8V AC/DC (with on-board current resistor)
Normal mode noise rejection	60 dB @ 60 Hz ⁽¹⁾
Common mode noise rejection	120 dB @ 60 Hz 100 dB @ 50 Hz
Channel bandwidth	15 Hz (-3 dB) ⁽¹⁾
Settling time	<80 ms to 5% of full scale ⁽¹⁾
Calibrated accuracy 25 °C (77 °F)	Better than 0.1% of range
Calibration interval	6 months
Offset drift	2 μ V/°C
Gain drift with temperature	Voltage: 35 ppm/°C, 80 ppm/°C max Current: 45 ppm/°C, 90 ppm/°C max
Module error	0.54% of range
Module input scan time, min	25 ms min – floating point 10 ms min – integer ⁽¹⁾
On-board data alarming	Yes
Scaling to engineering units	Yes
Real-time channel sampling	Yes
Data format	Integer mode (left justified, 2s complement) IEEE 32-bit floating point
Module conversion method	Sigma-Delta
Isolation voltage	250V (continuous), basic insulation type, input channels-to-backplane, and input channel-to-channel Routine tested at 1350V AC for 2 s
Module keying	Electronic, software configurable
Removable terminal block	1756-TBNH 1756-TBSH
RTB keying	User-defined mechanical
Slot width	1
Wire category	2 ⁽²⁾
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Notch filter dependent.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Table 42 - Environmental Specifications - 1756-IF6I

Attribute	1756-IF6I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on shielded signal ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on shielded signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz on shielded signal ports

Table 43 - Certifications - 1756-IF6I

Certification⁽¹⁾	1756-IF6I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: <ul style="list-style-type: none"> • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X Gc
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

1756-IA16

ControlLogix AC (79...132V) input module

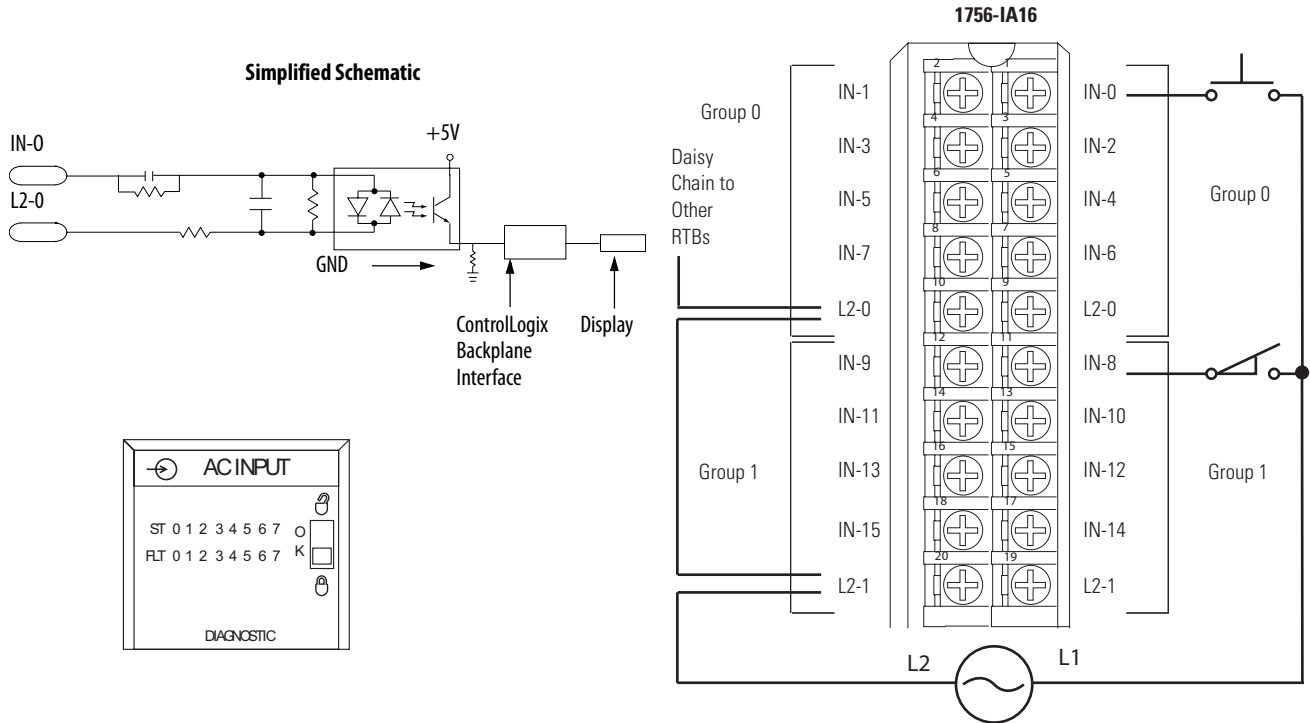


Table 5 - Technical Specifications - 1756-IA16

Attribute	1756-IA16
Inputs	16 (8 points/group)
Voltage category	120V AC
Operating voltage range	74...132V AC, 47...63 Hz
Input voltage, nom	120V AC
Input delay time (screw to backplane)	
Off to On	Hardware delay: 10 ms max + filter time User-selectable filter time: 1 or 2 ms
On to Off	Hardware delay: 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	2 mA
Total backplane power	0.58 W
Power dissipation, max	5.8 W @ 60 °C (140 °F)
Thermal dissipation	18.41 BTU/hr
Off-state voltage, max	20V
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 74V AC
On-state current, max	13 mA @ 132V AC

Table 5 - Technical Specifications - 1756-IA16 (continued)

Attribute	1756-IA16
Inrush current, max	250 mA peak (decaying to <37% in 22 ms, without activation)
Input impedance, max	10.15 k Ω @ 132V AC, 60 Hz
Cyclic update time	200 μ s . . . 750 ms
Change of state	Software configurable
Timestamp of inputs	\pm 200 μ s
Isolation voltage	125V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1200V AC for 2 s
Module keying	Electronic, software configurable
Removable terminal block housing	1756-TBNH 1756-TBSH
RTB keying	User-defined mechanical
Slot width	1
Wire category	1 ⁽¹⁾
North American temperature code	T4
Enclosure type	None (open-style)

(1) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Table 6 - Environmental Specifications - 1756-IA16

Attribute	1756-IA16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 . . . 60 °C (32 . . . 140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40 . . . 85 °C (-40 . . . 185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5 . . . 95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10 . . . 500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80 . . . 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000 . . . 2700 MHz

Table 6 - Environmental Specifications - 1756-IA16 (continued)

Attribute	1756-IA16
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz . . . 80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Table 7 - Certifications - 1756-IA16

Certification ⁽¹⁾	1756-IA16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

Rosemount 3144P

Rosemount 3144P Temperature Transmitter



The industry-leading Rosemount 3144P Single Point temperature transmitter delivers unmatched field reliability and innovative process measurement solutions and diagnostics

Transmitter features include:

- Dual and Single Sensor Input Capabilities
- Transmitter-Sensor Matching (Option Code C2)
- Integral Transient Protector (Option Code T1)
- IEC 61508 Safety Certificate of Compliance (Option Code QT)
- Advanced Sensor and Process Diagnostics (Option Code D01)
- Large, Easy to Read LCD Display (Option Code M5)
- “Assemble to Sensor” option (Option Code XA)

Table 1. Rosemount 3144P Temperature Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product Description			
3144P	Temperature Transmitter			
Housing Style		Material	Conduit Entry Size	
Standard				Standard
D1	Field Mount Housing, Dual-Compartment Housing	Aluminum	1/2-14 NPT	★
D2	Field Mount Housing, Dual-Compartment Housing	Aluminum	M20 x 1.5 (CM20)	★
D3	Field Mount Housing, Dual-Compartment Housing	Aluminum	PG 13.5 (PG11)	★
D4	Field Mount Housing, Dual-Compartment Housing	Aluminum	JIS G 1/2	★
D5	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	1/2-14 NPT	★
D6	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	M20 x 1.5 (CM20)	★
D7	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	PG 13.5 (PG11)	★
D8	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	JIS G 1/2	★
Transmitter Output				
Standard				Standard
A	4-20 mA with digital signal based on HART protocol			★
F	FOUNDATION fieldbus digital signal (includes 3 AI function block and Backup Link Active Scheduler)			★
Measurement Configuration				
Standard				Standard
1	Single-Sensor Input			★
2	Dual-Sensor Input			★
Product Certifications				
Standard				Standard
NA	No Approval			★
E5	FM Explosion-proof, Dust Ignition-Proof, and Non-incendive approval			★
I5 ⁽¹⁾	FM Intrinsically Safe and Non-incendive (includes standard IS and FISCO for fieldbus units)			★
K5 ⁽¹⁾	FM IS, Non-incendive & Explosion-proof combo (includes standard IS and FISCO for fieldbus units)			★
KB ⁽¹⁾	FM and CSA IS, Explosion-proof, and Non-incendive combo (includes standard IS and FISCO for FF units)			★
I6 ⁽¹⁾	CSA Intrinsically Safe/FISCO and Division 2 (includes standard IS and FISCO for fieldbus units)			★
K6 ⁽¹⁾	CSA IS, FISCO Division 2 and Explosion-proof combo (includes standard IS, FISCO for fieldbus units)			★
E1	ATEX Flameproof approval			★
N1	ATEX type n approval			★
I1 ⁽¹⁾	ATEX intrinsic safety approval (includes standard IS and FISCO for fieldbus units)			★

Temperature
3144P

Product Data Sheet

00813-0100-4021, Rev LA
Catalog 2011 - 2012

Rosemount 3144P

Table 1. Rosemount 3144P Temperature Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

K1 ⁽¹⁾	ATEX IS, Flameproof, Dust Ignition-Proof and type n combo (includes standard IS and FISCO for fieldbus units)	★
ND	ATEX Dust Ignition-Proof approval	★
KA ⁽¹⁾	ATEX/CSA intrinsic safety, Explosion-proof combo (includes standard IS and FISCO for fieldbus units)	★
E7	IECEX Flameproof approval	★
N7	IECEX Type 'n' approval	★
I7 ⁽¹⁾⁽²⁾	IECEX Intrinsic Safety	★
K7 ⁽¹⁾⁽²⁾	IECEX Intrinsic Safety, Flameproof, Dust Ignition-Proof and Type n combination	★
E2 ⁽²⁾	INMETRO Flameproof	★
I2 ⁽²⁾⁽⁵⁾	INMETRO Intrinsic safety	★
E4 ⁽²⁾	TIIS Flameproof approval	★
E3 ⁽²⁾	NEPSI Flameproof approval	★
I3 ⁽¹⁾⁽²⁾	NEPSI Intrinsic safety	★

Options (Include with selected model number)

PlantWeb Control Functionality		
Standard		Standard
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	★
PlantWeb Advanced Diagnostic Functionality		
Standard		Standard
D01	Diagnostics Suite: Statistical Process Monitoring (SPM), Thermocouple Diagnostic, Min/Max Tracking – FOUNDATION fieldbus only	★
Mounting Bracket		
Standard		Standard
B4	Universal Mounting Bracket for 2-inch pipe and panel mounting—SST bracket and bolts	★
B5	Universal "L" Mounting Bracket for 2-inch pipe mounting—SST bracket and bolts	★
Display		
Standard		Standard
M5	LCD Display	★
External Ground		
Standard		Standard
G1	External Ground Lug Assembly (See "External Ground Screw Assembly" on page 9.)	★
Transient Protector		
Standard		Standard
T1	Integral Transient Protector	★
Software Configuration		
Standard		Standard
C1 ⁽³⁾	Custom Configuration of Date, Descriptor and Message (Requires CDS with order)	★
Line Filter		
Standard		Standard
F5	50 Hz Line Voltage Filter	★
Alarm Level Configuration		
Standard		Standard
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★
Low Alarm		
Standard		Standard
C8	Low Alarm (Standard Rosemount Alarm and Saturation Values)	★
Sensor Trim		
Standard		Standard
C2	Transmitter-Sensor Matching – Trim to Specific Rosemount RTD Calibration Schedule (CVD constants)	★
Expanded		
C7	Trim to Non-Standard Sensor (Special Sensor—Customer must provide sensor information)	
5-Point Calibration		
Standard		Standard
C4	5-Point Calibration (Requires the Q4 option code to generate a Calibration Certificate)	★

Temperature

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Rosemount 3144P

Table 1. Rosemount 3144P Temperature Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Calibration Certification		
Standard		Standard
Q4	Calibration Certificate (3-Point Calibration)	★
QP	Calibration Certificate and Tamper Evident Seal	★
Dual-Input Custom Configuration (only with measurement type option code 2)		
Standard		Standard
U1 ⁽⁴⁾	Hot Backup	★
U2 ⁽⁵⁾	Average temperature with Hot Backup and Sensor Drift Alert – warning mode	★
U3 ⁽⁵⁾	Average temperature with Hot Backup and Sensor Drift Alert – alarm mode	★
U5	Differential temperature	★
U6 ⁽⁴⁾	Average temperature	★
U7 ⁽⁴⁾	First good temperature	★
Expanded		
U4	Two independent sensors	
Quality Certification for Safety		
Standard		Standard
QS	Prior-use certificate of FMEDA data (HART Only)	★
QT	Safety-certified to IEC 61508 with certificate of FMEDA data (HART only)	★
Conduit Electrical Connector		
Standard		Standard
GE ⁽⁶⁾	M12, 4-pin, Male Connector (<i>euromast</i> [®])	★
GM ⁽⁶⁾	A size Mini, 4-pin, Male Connector (<i>minifast</i> [®])	★
Assemble To Options		
Standard		Standard
XA	Sensor Specified Separately and Assembled to Transmitter	★
Typical Model Number: 3144P D1 A 1 E5 B4 M5		

(1) When IS approval is ordered on a FOUNDATION fieldbus, both standard IS and FISCO IS approvals apply. The device label is marked appropriately.

(2) Consult factory for availability when ordering with HART or FOUNDATION fieldbus models.

(3) Consult factory for availability when ordering with FOUNDATION fieldbus models.

(4) Codes U1 and U6 for HART transmitters will not have drift alert enabled; option codes U1, U6, U7, U8, and U9 for FOUNDATION fieldbus transmitters will have drift alert enabled.

(5) Not available for FOUNDATION Fieldbus.

(6) Available with Intrinsically Safe approvals only. For FM Intrinsically Safe or non-incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain 4X rating.

Temperature
3144P

Hardware Tag

- No charge
- 2 lines of 28 characters (56 characters total)
- Tags are stainless steel
- Permanently attached to transmitter
- Character height is $\frac{1}{16}$ -in. (1.6mm)
- A wire-on tag is available upon request. 5 lines of 12 characters (60 characters total)

Software Tag

- HART transmitter can store up to 8 characters. FOUNDATION fieldbus transmitters can store up to 32 characters.
- Can be ordered with different software and hardware tags.
- If no software tag characters are specified, the first 8 characters of the hardware tag are the default.

Transmitter Accuracy

Sensor Options	Sensor Reference	Input Ranges		Minimum Span ⁽¹⁾		Digital Accuracy ⁽²⁾		D/A Accuracy ⁽³⁾⁽⁴⁾
		°C	°F	°C	°F	°C	°F	
2-, 3-, 4-wire RTDs								
Pt 100 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	10	18	±0.10	±0.18	±0.02% of span
Pt 200 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	10	18	±0.22	±0.40	±0.02% of span
Pt 500 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	10	18	±0.14	±0.25	±0.02% of span
Pt 1000 ($\alpha = 0.00385$)	IEC 751	-200 to 300	-328 to 572	10	18	±0.10	±0.18	±0.02% of span
Pt 100 ($\alpha = 0.003916$)	JIS 1604	-200 to 645	-328 to 1193	10	18	±0.10	±0.18	±0.02% of span
Pt 200 ($\alpha = 0.003916$)	JIS 1604	-200 to 645	-328 to 1193	10	18	±0.22	±0.40	±0.02% of span
Ni 120	Edison Curve No. 7	-70 to 300	-94 to 572	10	18	±0.08	±0.14	±0.02% of span
Cu 10	Edison Copper Winding No. 15	-50 to 250	-58 to 482	10	18	±1.00	±1.80	±0.02% of span
Pt 50 ($\alpha=0.00391$)	GOST 6651-94	-200 to 550	-328 to 1022	10	18	±0.20	±0.36	±0.02% of span
Pt 100 ($\alpha=0.00391$)	GOST 6651-94	-200 to 550	-328 to 1022	10	18	±0.10	±0.18	±0.02% of span
Cu 50 ($\alpha=0.00426$)	GOST 6651-94	-50 to 200	-122 to 392	10	18	±0.34	±0.61	±0.02% of span
Cu 50 ($\alpha=0.00428$)	GOST 6651-94	-185 to 200	-365 to 392	10	18	±0.34	±0.61	±0.02% of span
Cu 100 ($\alpha=0.00426$)	GOST 6651-94	-50 to 200	-122 to 392	10	18	±0.17	±0.31	±0.02% of span
Cu 100 ($\alpha=0.00428$)	GOST 6651-94	-185 to 200	-365 to 392	10	18	±0.17	±0.31	±0.02% of span
Thermocouples⁽⁵⁾								
Type B ⁽⁶⁾	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	25	45	±0.75	±1.35	±0.02% of span
Type E	NIST Monograph 175, IEC 584	-50 to 1000	-58 to 1832	25	45	±0.20	±0.36	±0.02% of span
Type J	NIST Monograph 175, IEC 584	-180 to 760	-292 to 1400	25	45	±0.25	±0.45	±0.02% of span
Type K ⁽⁷⁾	NIST Monograph 175, IEC 584	-180 to 1372	-292 to 2502	25	45	±0.25	±0.45	±0.02% of span
Type N	NIST Monograph 175, IEC 584	-200 to 1300	-328 to 2372	25	45	±0.40	±0.72	±0.02% of span
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	±0.60	±1.08	±0.02% of span
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	±0.50	±0.90	±0.02% of span
Type T	NIST Monograph 175, IEC 584	-200 to 400	-328 to 752	25	45	±0.25	±0.45	±0.02% of span
DIN Type L	DIN 43710	-200 to 900	-328 to 1652	25	45	±0.35	±0.63	±0.02% of span
DIN Type U	DIN 43710	-200 to 600	-328 to 1112	25	45	±0.35	±0.63	±0.02% of span
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	32 to 3632	25	45	±0.70	±1.26	±0.02% of span
GOST Type L	GOST R 8.585-2001	-200 to 800	-392 to 1472	25	45	±0.25	±0.45	±0.02% of span
Other Input Types								
Millivolt Input		-10 to 100 mV		3 mV		±0.015 mV		±0.02% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		20 ohm		±0.35 ohm		±0.02% of span

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.

(2) Digital accuracy: Digital output can be accessed by the Field Communicator.

(3) Total Analog accuracy is the sum of digital and D/A accuracies.

(4) Applies to HART / 4-20 mA devices.

(5) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.25 °C (0.45 °F) (cold junction accuracy).

(6) Digital accuracy for NIST Type B is ±3.0 °C (±5.4 °F) from 100 to 300 °C (212 to 572 °F).

(7) Digital accuracy for NIST Type K is ±0.50 °C (±0.9 °F) from -180 to -90 °C (-292 to -130 °F).

WMS

Product Selection



Single-Pole



2-Pole



3-Pole

Table 45-333. Product Selection — Single-Pole

Ampere Rating	B Curve – 3 to 5 I _n Catalog Number	Price U.S. \$	C Curve – 5 to 10 I _n Catalog Number	Price U.S. \$	D Curve – 10 to 20 I _n Catalog Number	Price U.S. \$
0.5	—		WMS1C00		WMS1D00	
1	—		WMS1C01		WMS1D01	
2	—		WMS1C02		WMS1D02	
3	—		WMS1C03		WMS1D03	
4	—		WMS1C04		WMS1D04	
5	—		WMS1C05		WMS1D05	
6	WMS1B06		WMS1C06		WMS1D06	
7	WMS1B07		WMS1C07		WMS1D07	
8	WMS1B08		WMS1C08		WMS1D08	
10	WMS1B10		WMS1C10		WMS1D10	
13	WMS1B13		WMS1C13		WMS1D13	
15	WMS1B15		WMS1C15		WMS1D15	
16	WMS1B16		WMS1C16		WMS1D16	
20	WMS1B20		WMS1C20		WMS1D20	
25	WMS1B25		WMS1C25		WMS1D25	
30	WMS1B30		WMS1C30		WMS1D30	
32	WMS1B32		WMS1C32		WMS1D32	
40	WMS1B40		WMS1C40		WMS1D40	
50	WMS1B50		WMS1C50		—	
60	WMS1B60		WMS1C60		—	

Table 45-334. Product Selection — 2-Pole

Ampere Rating	B Curve – 3 to 5 I _n Catalog Number	Price U.S. \$	C Curve – 5 to 10 I _n Catalog Number	Price U.S. \$	D Curve – 10 to 20 I _n Catalog Number	Price U.S. \$
0.5	—		WMS2C00		WMS2D00	
1	—		WMS2C01		WMS2D01	
2	—		WMS2C02		WMS2D02	
3	—		WMS2C03		WMS2D03	
4	—		WMS2C04		WMS2D04	
5	—		WMS2C05		WMS2D05	
6	WMS2B06		WMS2C06		WMS2D06	
7	WMS2B07		WMS2C07		WMS2D07	
8	WMS2B08		WMS2C08		WMS2D08	
10	WMS2B10		WMS2C10		WMS2D10	
13	WMS2B13		WMS2C13		WMS2D13	
15	WMS2B15		WMS2C15		WMS2D15	
16	WMS2B16		WMS2C16		WMS2D16	
20	WMS2B20		WMS2C20		WMS2D20	
25	WMS2B25		WMS2C25		WMS2D25	
30	WMS2B30		WMS2C30		WMS2D30	
32	WMS2B32		WMS2C32		WMS2D32	
40	WMS2B40		WMS2C40		WMS2D40	
50	WMS2B50		WMS2C50		—	
60	WMS2B60		WMS2C60		—	

Table 45-335. Product Selection — 3-Pole

Ampere Rating	B Curve – 3 to 5 I _n Catalog Number	Price U.S. \$	C Curve – 5 to 10 I _n Catalog Number	Price U.S. \$	D Curve – 10 to 20 I _n Catalog Number	Price U.S. \$
0.5	—		WMS3C00		WMS3D00	
1	—		WMS3C01		WMS3D01	
2	—		WMS3C02		WMS3D02	
3	—		WMS3C03		WMS3D03	
4	—		WMS3C04		WMS3D04	
5	—		WMS3C05		WMS3D05	
6	WMS3B06		WMS3C06		WMS3D06	
7	WMS3B07		WMS3C07		WMS3D07	
8	WMS3B08		WMS3C08		WMS3D08	
10	WMS3B10		WMS3C10		WMS3D10	
13	WMS3B13		WMS3C13		WMS3D13	
15	WMS3B15		WMS3C15		WMS3D15	
16	WMS3B16		WMS3C16		WMS3D16	
20	WMS3B20		WMS3C20		WMS3D20	
25	WMS3B25		WMS3C25		WMS3D25	
30	WMS3B30		WMS3C30		WMS3D30	
32	WMS3B32		WMS3C32		WMS3D32	
40	WMS3B40		WMS3C40		WMS3D40	
50	WMS3B50		WMS3C50		—	
60	WMS3B60		WMS3C60		—	

Discount Symbol **SP-1**

Motor Control Explosionproof Circuit Breakers - Disconnect Switches

8B-1

EXPLOSIONPROOF AND DUST-IGNITIONPROOF CLASS I, GROUPS B, C & D; CLASS II, GROUPS E, F & G; NEMA 7 & 9



Optional XCBH 2-2 handle shown; standard handle is XBO.

BREAKERS: Circuit breakers are thermal magnetic type and are available in frame sizes ranging from 15 to 1200 amperes. Also available as non-automatic circuit interrupters, without automatic overload trip elements for load switching and isolation. In this application short circuit and overload protection must be provided by separate protection device. Breakers also available for magnetic trip only.

The units can be set up for GE, Cutler-Hammer (Westinghouse), Square-D and ITE (Siemens) brand circuit breakers. Consult factory for other brands. Holes for Cutler-Hammer circuit breakers are drilled directly into back wall.

ENCLOSURES: The housings are copper-free cast aluminum alloy. The enclosures are Adalet XCE series with precision ground cover and body joints.

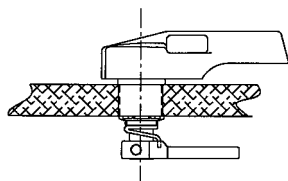
The enclosure design offers sufficient space for wire bending and ease of installation and maintenance. XCBC and larger units are furnished with hinges, and stainless steel cover bolts. The covers are removable for clear access to breakers. For XCBA and XCBB units, hinge and mounting pan are optional.

The front mounted circuit breaker handle is padlockable in either "on" or "off" position.

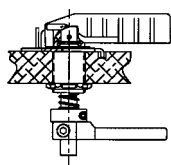
High interrupting capacity breakers are also available in comparable size.

Approvals:
Enclosure Certifications

Compliances:
Class I, Groups B, C, D
Class II, Groups E, F, G
NEMA 4, 7, 9
UL Classified Enclosure



Optional XCBH Style
"Classic", larger handle.
Special 1" – 1 1/2" NPSM opening required for installation.



Standard XBO Style
"New", spring loaded, compact adjustable design, ease of assembly and less expensive.
Standard 3/4 – 14 NPSM opening required for installation.

Enclosure	UL Classified Enclosure Rating
XCBA, XCBB, XCBC, XCBD, XCBE, XCBF, XCBG	Class 1, Grps BCD
XCBA N4, XCBB N4, XCBC N4, XCBD N4, XCBE N4, XCBF N4, XCBGN4	Class 1, Grps CD

Motor Control Explosionproof Circuit Breakers - Disconnect Switches

Molded Case Circuit Breaker Enclosures (Breaker Included)

Breaker Frame Size	Breaker Interrupting Rating	Volts	Amp Rating	Catalog No.	
				2 Pole Non-Interchangeable	3 Pole Non-Interchangeable
100/150	14,000 Amperes Interrupting Capacity at 480 Volt AC	480	15	XCBA-N4-15E42*	XCBA-N4-15E43*
			20	XCBA-N4-20E42*	XCBA-N4-20E43*
			30	XCBA-N4-30E42*	XCBA-N4-30E43*
			40	XCBA-N4-40E42*	XCBA-N4-40E43*
			50	XCBA-N4-50E42*	XCBA-N4-50E43*
			60	XCBA-N4-60E42*	XCBA-N4-60E43*
			70	XCBA-N4-70E42*	XCBA-N4-70E43*
			80	XCBB-N4-80E42*	XCBB-N4-80E43*
			90	XCBB-N4-90E42*	XCBB-N4-90E43*
			100	XCBB-N4-100E42*	XCBB-N4-100E43*
			110	XCBB-N4-110E42*	XCBB-N4-110E43*
			125	XCBB-N4-125E42*	XCBB-N4-125E43*
			150	XCBB-N4-150E42*	XCBB-N4-150E43*
			400/150	14,000 Amperes Interrupting Capacity at 600 Volt AC	600
20	XCBA-N4-20E62*	XCBA-N4-20E63*			
30	XCBA-N4-30E62*	XCBA-N4-30E63*			
40	XCBA-N4-40E62*	XCBA-N4-40E63*			
50	XCBA-N4-50E62*	XCBA-N4-50E63*			
60	XCBA-N4-60E62*	XCBA-N4-60E63*			
70	XCBA-N4-70E62*	XCBA-N4-70E63*			
80	XCBB-N4-80E62*	XCBB-N4-80E63*			
90	XCBB-N4-90E62*	XCBB-N4-90E63*			
100	XCBB-N4-100E62*	XCBB-N4-100E63*			
110	XCBB-N4-110E62*	XCBB-N4-110E63*			
125	XCBB-N4-125E62*	XCBB-N4-125E63*			
150	XCBB-N4-150E62*	XCBB-N4-150E63*			
225/250	18,000 Amperes Interrupting Capacity at 600 Volt AC	600			
			90	XCBC-N4-90JN2*	XCBC-N4-90JN3*
			100	XCBC-N4-100JN2*	XCBC-N4-100JN3*
			125	XCBC-N4-125JN2*	XCBC-N4-125JN3*
			150	XCBC-N4-150JN2*	XCBC-N4-150JN3*
			175	XCBC-N4-175JN2*	XCBC-N4-175JN3*
			200	XCBC-N4-200JN2*	XCBC-N4-200JN3*
			225	XCBC-N4-225JN2*	XCBC-N4-225JN3*
			250	XCBC-N4-250JN2*	XCBC-N4-250JN3*

* Circuit breaker brand suffix:

W-Cutler-Hammer (Westinghouse)

G-General Electric

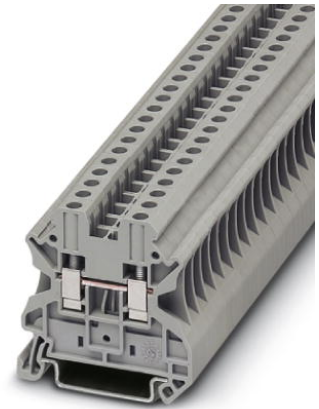
S-Square-D

T-I.T.E. (Siemens)

8B-2

UT 4

Order No.: 3044102

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3044102>Universal terminal block with screw connection, cross section: 0,14 - 4 mm², AWG: 26 - 10, width: 6.2 mm, color: Gray

Commercial data	
EAN	4017918960391
Pack	50 Pcs.
Customs tariff	85369010
Weight/Piece	0.009424 KG
Catalog page information	Page 27 (CL-2007)

Product notes

WEEE/RoHS-compliant since:
01/01/2003

<http://www.download.phoenixcontact.com>
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data**General**

Number of levels	1
Number of connections	2
Color	gray

Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	47.7 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Technical data

Maximum load current	41 A (with 6 mm ² conductor cross section)
Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I _N	32 A (with 4 mm ² conductor cross section)
Nominal voltage U _N	1000 V
Open side panel	ja

Connection data

Conductor cross section solid min.	0.14 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section stranded min.	0.14 mm ²
Conductor cross section stranded max.	6 mm ²
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	10
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	4 mm ²
2 conductors with same cross section, solid min.	0.14 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²

2 conductors with same cross section, stranded min.	0.14 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Type of connection	Screw connection
Stripping length	9 mm
Internal cylindrical gage	A4
Screw thread	M 3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals

Approval logo



CSA

Nominal voltage U _N	600 V
Nominal current I _N	30 A
AWG/kcmil	26-10

CUL

Nominal voltage U _N	600 V
Nominal current I _N	30 A
AWG/kcmil	26-10

UL

Nominal voltage U _N	600 V
Nominal current I _N	30 A
AWG/kcmil	26-10

Certification	CB, CSA, CUL, DNV, GL, LR, UL, VDE-PZI
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requested approbations

Certification Ex:	IECEX, KEMA-EX
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Accessories

Item	Designation	Description
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Assembly

3047167	ATP-UT	Partition plate, for visual and electrical separation of terminal groups, width: 2 mm, color: gray
3047028	D-UT 2,5/10	Cover, for terminal block UT and UT...-PE, width 2.2 mm, color: Gray
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1207640	NS 35/ 7,5 PERF 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207653	NS 35/ 7,5 PERF 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1207666	NS 35/ 7,5 PERF 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: Steel, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1207679	NS 35/15 PERF 755MM	NS 35 DIN rail, height 15 mm, length 755 mm
1207682	NS 35/15 PERF 955MM	NS 35 DIN rail, height 15 mm, length 955 mm
1207695	NS 35/15 PERF 1155MM	NS 35 DIN rail, height 15 mm, length 1155 mm
1201730	NS 35/15 PERF 2000MM	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m

Bridges

3030336	FBS 2-6	Plug-in bridge for cross-connections in the terminal center, 2-pos., color: Red
3030242	FBS 3-6	Plug-in bridge for cross-connections in the terminal center, 3-pos., color: Red

3030255	FBS 4-6	Plug-in bridge for cross-connections in the terminal center, 4-pos., color: Red
3030349	FBS 5-6	Plug-in bridge for cross-connections in the terminal center, 5-pos., color: Red
3030271	FBS 10-6	Plug-in bridge for cross-connections in the terminal center, 10-pos., color: Red
3030365	FBS 20-6	Plug-in bridge for cross-connections in the terminal center, 20-pos., color: Red
3032224	FBS 50-6	Plug-in bridge for cross-connections in the terminal center, 50-pos., color: Red

General

3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
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Marking

0811228	X-PEN 0,35	Marker pen without ink cartridge, for manual labeling of markers, labeling extremely wipe-proof, line thickness 0.35 mm
1051016	ZB 6,LGS:FORTL.ZAHLEN	Zack strip, 10-section, printed horizontally: with the numbers, 1-10, 11-20 etc. up to 991-1000, color: white
5060935	ZB 6/WH-100:UNBEDRUCKT	Zack strip, unprinted: For individual labeling with M-PEN, ZB-T or CMS system, large batch, sufficient for labeling 1000 terminal blocks, for a terminal width of 6.2 mm, color: White
1050499	ZB 6:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

Plug/Adapter

0201689	MPS-IH BU	Insulating sleeve (blue), for MPS metal part to be ordered separately (0201744)
0201676	MPS-IH RD	Insulating sleeve (red), for MPS metal part to be ordered separately (0201744)
0201663	MPS-IH WH	Insulating sleeve (white), for MPS metal part to be ordered separately (0201744)
0201744	MPS-MT	Test plug, consisting of: Metal part for 2.3 mm diameter socket hole
3030925	PAI-4	Test adapter, for 4 mm diameter test plug PS and safety test plug, makes contact in the bridge shaft
3030996	PS-6	Modular test plug, for individual assembly of test plug strips, for UT, ST, DT and QT terminal blocks, can be labeled with ZBF 6, color: Red

Tools

1205053	SZS 0,6X3,5	Screwdriver, bladed, matches all screw terminal blocks up to 4.0 mm ² connection cross section, blade: 0.6 x 3.5 mm, without VDE approval
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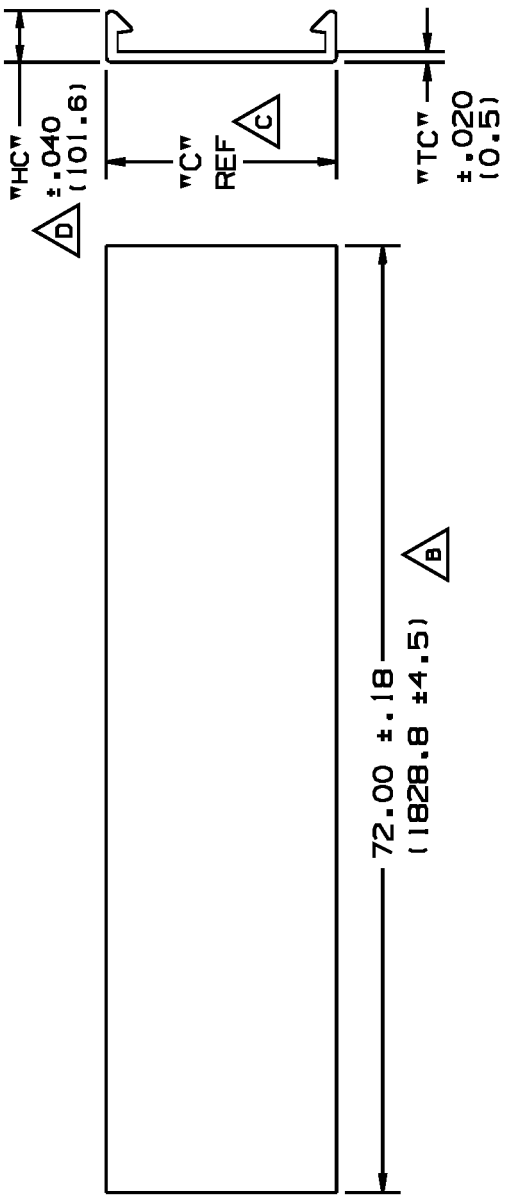
C1LG6



- Choose from 16 sizes of *PANDUIT* covers from 0.5" to 6" (25mm to 100mm). The non-slip design snaps onto the duct to conceal the wiring and improve the appearance of your control panel.
- Non-slip cover design incorporates integral high friction lining to inhibit cover movement
- Cover flush with base provides greater wire capacity and improves aesthetics
- Easy cover removal makes changes to wiring quick and easy
- Available in various colors

• Part Number	C1LG6
• RoHS Compliancy Status	Compliant
• Part Description	Covers duct to protect wires, improve aesthetics and provides greater wire capacity.
• Material	Lead-free PVC
• Color	Light Gray
• Length (ft.)	6
• Length (m)	1.82
• Pricing Description	Duct Cover, PVC, 1"W X 6', LGray
• Min. Order UOM	FT
• Min. Order Qty.	6
• BOM Qty. (# of Pkgs.)	

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NOMINAL DUCT SIZE (W)	C in (mm)	TC in (mm)	HC in (mm)
.5	.69 (17.5)	.040 (1.0)	.230 (5.8)
.75	.94 (23.8)	.050 (1.3)	.240 (6.1)
1	1.25 (31.8)	.060 (1.5)	.350 (8.9)
1.5	1.75 (44.5)	"	"
2	2.25 (57.2)	"	"
2.5	2.75 (69.8)	"	"
3	3.25 (82.8)	.085 (2.1)	.370 (9.4)
4	4.25 (108.0)	"	"
6	6.25 (158.8)	.080 (2.0)	"

PART NO. SYSTEM COVER EXAMPLE
 TYPE C L5 L6 G
 WIDTH COLOR LENGTH (ft)

- SEE CURRENT CATALOG FOR ADDITIONAL PART NUMBER SUFFIXES TO INDICATE COLOR AND OR PACKAGE QUANTITY.
- DIMENSIONS IN PARENTHESIS ARE METRIC.

CAD FILE NAME: D34518BA_PVC_COVER_02A

PANDUIT				CORP. TINLEY PARK, ILLINOIS			
WIRING DUCT COVER FOR				DUCT TYPES "S", "D", "E", "F", "G"			
CUSTOMER DRAWING				SCALE: NONE			
UNLESS OTHERWISE SPECIFIED, DIMENSIONAL TOLERANCES ARE: (.X) : (.XXX) : (.XX) : ANGLES :				UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE GIVEN IN INCHES, THIRD ANGLE PROJECTION.			
				DRAWN BY: DW		DATE: 10-29-93	
2	8-24-01	JCG	JCG	JCG	JCG	JCG	JCG
1	2/11/00	JHNL	HIW	HIW	HIW	HIW	HIW
R	10-29-93	DW	CEF	CEF	CEF	CEF	CEF
REV	DATE	BY	CHK	ECN	R	CUST	SUP
				DESCRIPTION			

34518-17
 A
 SIZE

D15 Series — Freedom 600V Multipole

DC/AC Interface Module (Continued)

Table 49-70. Controller Coil Voltage Ranges

Controller Catalog Number Prefix	Controller Size or Rating	Coil Range Volts AC
AE16, AE17, AE56, AE57, CE15, CE55	A – F G – K L – N	24 – 240 48 – 240 110 – 240
AN16, AN56, CN15, CN55	00 – 0 1 – 2 3	24 – 240 48 – 240 110 – 240
CN35	10 – 30A 60A 100A	24 – 240 48 – 240 110 – 240

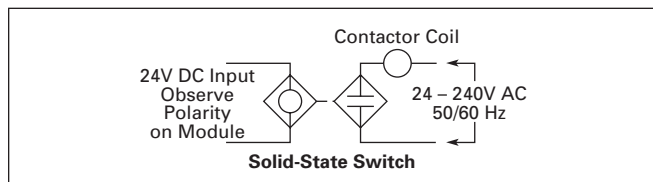


Figure 49-62. Typical Application

Dimensions

Table 49-71. Approximate Dimensions in Inches (mm) and Shipping Weights.

Description	Dimension C in Inches (mm)	Shipping Weights Lbs. (kg)
Relay Only	3.30 (83.8)	1.3 (0.6)
Relay with Timer Attachment	5.55 (141.0)	1.5 (0.7)
Relay with Front Contact Pole Deck	4.66 (118.4)	1.7 (0.8)

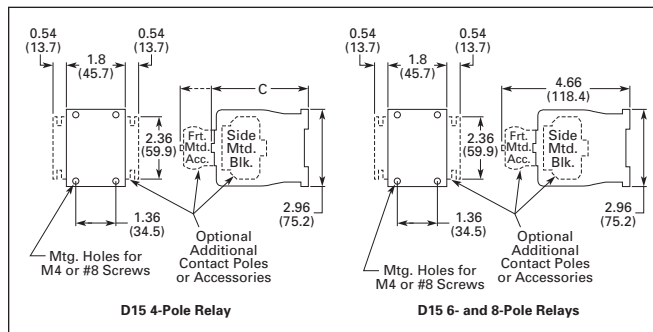


Figure 49-63. Approximate Dimensions in Inches (mm)



Product Selection

When Ordering Specify

- Catalog Number and Magnet Coil Code Letter. Example For a 4-pole relay having 4NO contacts with a 120V 60 Hz coil, order Catalog Number D15CR40AB.

Table 49-72. Factory Assembled Multipole Relays

Number of Poles	Type of Contacts		Open Type Catalog Number ^①	Price U.S. \$
	NO	NC		
4	4	0	D15CR40_B	80.50
	3	1	D15CR31_B	80.50
	2	2	D15CR22_B	80.50
	1	3	D15CR13_B	80.50
	0	4	D15CR04_B	80.50
6 (4-Pole Relay with 2-Pole Front-Mounted Deck)	6	0	D15CR60_B	109.00
	5	1	D15CR51_B	109.00
	4	2	D15CR42_B	109.00
	3	3	D15CR33_B	109.00
	2	4	D15CR24_B	109.00
	1	5	D15CR15_B ②	109.00
	0	6	D15CR06_B ②	109.00
8 (4-Pole Relay with 4-Pole Front-Mounted Deck)	8	0	D15CR80_B	134.00
	7	1	D15CR71_B	134.00
	6	2	D15CR62_B	134.00
	5	3	D15CT53_B	134.00
	4	4	D15CR44_B	134.00
	3	5	D15CR35_B ②	134.00
	2	6	D15CR26_B ②	134.00

① Underscore indicates missing code suffix for magnet coil — see Selection Table below.

② Not all Suffix Codes available: consult Customer Support Center.

Table 49-73. Additional Contact Poles

Description	Catalog Number	Price U.S. \$
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Front Contact Pole Deck

1NO-1NC	C320KGT3	27.00
2NO	C320KGT4	27.00
2NC	C320KGT5	27.00
1NO (E.C.) – 1NC (L.O.)	C320KGT7	27.00
4NO	C320KGT13	54.50
3NO-1NC	C320KGT14	54.50
2NO-2NC	C320KGT15	54.50
1NO-3NC	C320KGT16	54.50
4NC	C320KGT17	54.50

Side-Mounted Contact Blocks

1NO-1NC	C320KGS3	27.00
2NO	C320KGS4	27.00
2NC	C320KGS5	27.00
1NO (E.C.) – 1NC (L.O.)	C320KGS7	27.00

E.C. = Early Closing L.O. = Late Opening

Table 49-74. Magnet Coil Selection Table

AC Coils Volts and Hertz	Code Suffix	AC Coils Volts and Hertz	Code Suffix	DC Coils Volts	Code Suffix
120/60 or 110/50	A	208/60	E	12	R1
240/60 or 220/50	B	277/60	H	24	T1
480/60 or 440/50	C	208 – 240/60	J	48	W1
600/60 or 550/50	D	24/60	T	120	A1

Discount Symbol 1CD1

D15 Series — Freedom 600V Multipole

Contents

Description	Page
Machine Tool Relays	
Freedom 600V Multipole . . .	49-34
Fixed Contact	
Industrial Control	49-37
Convertible Contact	
Industrial Control	49-41
Type M — 600V AC	
Multipole with	
Convertible Contacts	49-45
Type M — DC	
Multipole with	
Convertible Contacts	49-48

D15 Series — Freedom 600V Multipole



4-Pole Relay



4-Pole Relay with Front Contact Pole Deck Assembled

Product Description

Contact poles on the D15 relay are of the fixed design and are not convertible. The basic 4-pole relay will accept a front-mounted contact pole deck and/or side-mounted contact blocks (one per side). In addition, a side-mounted solid-state timer or a front-mounted pneumatic timer can be added to the relay. Only one front-mounted attachment can be added to the basic relay.

Application Description

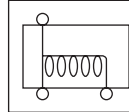
Side-mounted contact blocks can be used to provide additional poles in applications where a pneumatic timer is installed on the front of the relay. They can also be used where panel depth is restricted.

The maximum number of contacts recommended per relay is 8, 6 of which can be NC. When a pneumatic timer is used, the maximum recommended number of NC contacts is 3.

Relays with DC coils are supplied with a coil clearing NC contact mounted on the side of the relay.

Features

- 600V, 10A continuous thermal current
- State indicator visually shows relay ON or OFF status
- Relay base has mounting holes on 35 x 60 mm centers, permitting direct replacement of competitive relays
- Relay also mounts on 35 mm DIN rail as standard
- Magnet coil has three terminals, permitting either top or diagonal wiring — easy to replace European or U.S. relays without changing wiring layout
- Contact pole terminals have captive, backed-out, self-lifting pressure plates with ± screws — reduced wiring time
- All terminals are shrouded or “finger-proofed” to reduce possibility of electrical shock
- Designed to meet or exceed UL, NEMA, IEC, CSA, VDE, BS and other international standards



Standards and Certifications



Terminal Marking

Relay terminals are identified by a two digit number in accordance with International Standards approved by CENELEC (European Committee for Electrotechnical Standardization). The number is marked on the relay and is used to identify location and status of the contacts.

The first digit indicates the location of the contact on the relay. The numbering begins with 1 and continues without a break from left to right.

The second digit indicates the status of the contacts (NO or NC). Terminal marking 1 and 2 mean NC and 3 and 4 mean NO.

Example of marking with 2NO and 2NC contacts:

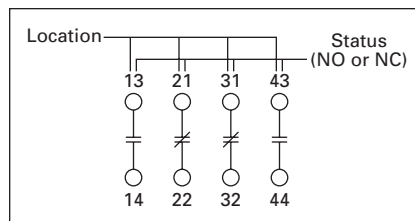


Figure 49-61. Terminal Marking

Technical Data

Table 49-59. Contact Ratings

NEMA A600		
Continuous Thermal Rating: 10A		
AC Volts	Make	Break
120	60	6.0
240	30	3.0
480	15	1.5
600	12	1.2

NEMA P300	
Continuous Thermal Rating: 5A	
DC Volts	Make/Break Amperes
125	1.1
250	0.55

Table 49-60. Magnet Coil Data

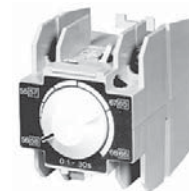
AC Voltage	Pick-Up		Sealed	
	VA	Watts	VA	Watts
12 – 600V	80	49	7.5	2.4

DC Voltage	Pick-Up		Sealed	
	Amps	Watts	VA	Watts
12	6.4	76.8	0.28	3.36
24	3.2	76.8	0.14	3.36
48	1.6	76.8	0.07	3.36
120	0.64	76.8	0.028	3.36

Accessories

Pneumatic Timer Attachment

Attachment mounts on top of any Freedom Series relay (top-mounted auxiliary contacts can not be installed on device when timer is used). Timer unit has DPST timed contacts — circuits in each pole must be the same polarity. Units are convertible from OFF to ON Delay or vice-versa.



C320 Pneumatic Timer Attachment

Table 49-61. Pneumatic Timer Attachment

Timing Range	Catalog Number	Price U.S. \$
0.1 to 30 Seconds	C320TP1	162.
10 to 180 Seconds	C320TP2	162.

Table 49-62. Maximum Ampere Ratings

Description	Volts AC			
	120	240	480	600
Make	30	15	7.5	6
Break	3	1.5	0.75	0.6



Discount Symbol 1CD1

Pushbutton Units and Indicator Lights



Class 51, Hazardous Location NEMA Type 7 & 9 Devices

Push to test complete units

Selection and ordering data

Version	Color of operator	Contacts	Short bushing Order No.	List Price \$ 1 unit	Long bushing Order No.	List Price \$ 1 unit	Pack Unit	
 <p>Push to test full voltage</p> <p>Push to test/Illuminated pushbutton with glass lens - Full voltage type AC/DC ^{1) 3)} Operators with Incandescent Lamp 6V with 755 type lamp</p>	Red	1NO + 1NC	51PC6B2A		51PC6B2ALB		1	
	Green	1NO + 1NC	51PC6B3A		51PC6B3ALB		1	
	Amber	1NO + 1NC	51PC6B9A		51PC6B9ALB		1	
	Less lens	1NO + 1NC	51PC6BNA		51PC6BNALB		1	
	24V with 757 type lamp	Red	1NO + 1NC	51PC6D2A		51PC6D2ALB		1
	Amber	1NO + 1NC	51PC6D3A		51PC6D3ALB		1	
	Green	1NO + 1NC	51PC6D9A		51PC6D9ALB		1	
	Less lens	1NO + 1NC	51PC6DNA		51PC6DNALB		1	
	Operators with LED Lamp ²⁾ 6-8V with BA9 type LED	Red	1NO + 1NC	51PE6B2A		51PE6B2ALB		1
	Green	1NO + 1NC	51PE6B3A		51PE6B3ALB		1	
	Amber	1NO + 1NC	51PE6B9A		51PE6B9ALB		1	
	24V with BA9 type LED	Red	1NO + 1NC	51PE6D2A		51PE6D2ALB		1
Green	1NO + 1NC	51PE6D3A		51PE6D3ALB		1		
Amber	1NO + 1NC	51PE6D9A		51PE6D9ALB		1		
 <p>Push to test transformer type</p> <p>Push to test/Illuminated pushbutton with glass lens - Transformer type (50/60 Hz) ^{1) 3)} Operators with Incandescent Lamp 120V with 6V 755 type lamp</p>	Red	1NO + 1NC	51PC6G2A		51PC6G2ALB		1	
	Green	1NO + 1NC	51PC6G3A		51PC6G3ALB		1	
	Amber	1NO + 1NC	51PC6G9A		51PC6G9ALB		1	
	Less lens	1NO + 1NC	51PC6GNA		51PC6GNALB		1	
	240V with 6V 755 type lamp	Red	1NO + 1NC	51PC6H2A		51PC6H2ALB		1
	Green	1NO + 1NC	51PC6H3A		51PC6H3ALB		1	
	Amber	1NO + 1NC	51PC6H9A		51PC6H9ALB		1	
	Less lens	1NO + 1NC	51PC6HNA		51PC6HNALB		1	
	480V with 6V 755 type lamp	Red	1NO + 1NC	51PC6J2A		51PC6J2ALB		1
	Green	1NO + 1NC	51PC6J3A		51PC6J3ALB		1	
	Amber	1NO + 1NC	51PC6J9A		51PC6J9ALB		1	
	Less lens	1NO + 1NC	51PC6JNA		51PC6JNALB		1	
	600V with 6V 755 type lamp	Red	1NO + 1NC	51PC6K2A		51PC6K2ALB		1
	Green	1NO + 1NC	51PC6K3A		51PC6K3ALB		1	
	Amber	1NO + 1NC	51PC6K9A		51PC6K9ALB		1	
	Less lens	1NO + 1NC	51PC6KNA		51PC6KNALB		1	
	Operators with LED Lamp ²⁾ 120V with 6V BA9 type LED	Red	1NO + 1NC	51PE6G2A		51PE6G2ALB		1
	Green	1NO + 1NC	51PE6G3A		51PE6G3ALB		1	
	Amber	1NO + 1NC	51PE6G9A		51PE6G9ALB		1	
	240V with 6V BA9 type LED	Red	1NO + 1NC	51PE6H2A		51PE6H2ALB		1
	Green	1NO + 1NC	51PE6H3A		51PE6H3ALB		1	
	Amber	1NO + 1NC	51PE6H9A		51PE6H9ALB		1	
	480V with 6V BA9 type LED	Red	1NO + 1NC	51PE6J2A		51PE6J2ALB		1
	Green	1NO + 1NC	51PE6J3A		51PE6J3ALB		1	
Amber	1NO + 1NC	51PE6J9A		51PE6J9ALB		1		
600V with 6V BA9 type LED	Red	1NO + 1NC	51PE6K2A		51PE6K2ALB		1	
Green	1NO + 1NC	51PE6K3A		51PE6K3ALB		1		
Amber	1NO + 1NC	51PE6K9A		51PE6K9ALB		1		

Overload reset operators with reset legend plate

Version	Color	Legend Inscription	Order No.	List Price \$ 1 unit
 <p>Single unit 7/8" diameter reset pad, 10" shaft can be cut to length.</p>	Red	Reset	51AAS	
 <p>Multi unit For use with multi push operation requirements.</p>	Red	Reset	51AAM	

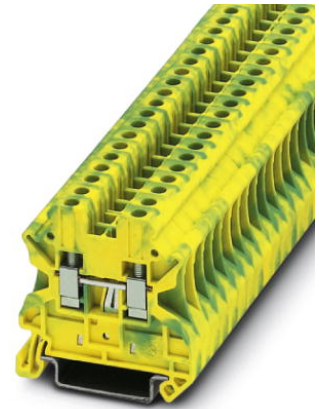
1) For other colors not listed, order operator less lens and separate lens from page 10/127.

2) LED color must match lens color.

3) All illuminated devices come with std. Touch-safe shield per UL stds.

UT 4-PE

Order No.: 3044128



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3044128>

Universal terminal block with screw connection, cross section: 0.14 - 4 mm², AWG: 26 - 10, width: 6.2 mm, color: Green-yellow



Commercial data	
EAN	4017918960407
Pack	50 Pcs.
Customs tariff	85369010
Weight/Piece	0.01325 KG
Catalog page information	Page 33 (CL-2007)

Product notes

WEEE/RoHS-compliant since:
01/01/2003



<http://www.download.phoenixcontact.com>
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Number of levels	1
Number of connections	2
Color	green-yellow

Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	47.7 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Technical data

Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-2
Open side panel	ja

Connection data

Conductor cross section solid min.	0.14 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section stranded min.	0.14 mm ²
Conductor cross section stranded max.	6 mm ²
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	10
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	4 mm ²
2 conductors with same cross section, solid min.	0.14 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.14 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²

2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Type of connection	Screw connection
Stripping length	9 mm
Internal cylindrical gage	A4
Screw thread	M 3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals

Approval logo



CSA

AWG/kcmil	26-10
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CUL

AWG/kcmil	26-10
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UL

AWG/kcmil	26-10
Certification	CB, CSA, CUL, DNV, GL, LR, UL, VDE-PZI

requested approbations

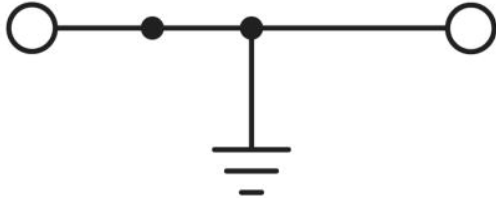
Certification Ex:	IECEX, KEMA-EX
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Accessories		
Item	Designation	Description
Assembly		
3047167	ATP-UT	Partition plate, for visual and electrical separation of terminal groups, width: 2 mm, color: gray
3047028	D-UT 2,5/10	Cover, for terminal block UT and UT...-PE, width 2.2 mm, color: Gray
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1207640	NS 35/ 7,5 PERF 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207653	NS 35/ 7,5 PERF 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1207666	NS 35/ 7,5 PERF 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: Steel, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1207679	NS 35/15 PERF 755MM	NS 35 DIN rail, height 15 mm, length 755 mm
1207682	NS 35/15 PERF 955MM	NS 35 DIN rail, height 15 mm, length 955 mm
1207695	NS 35/15 PERF 1155MM	NS 35 DIN rail, height 15 mm, length 1155 mm
1201730	NS 35/15 PERF 2000MM	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
Bridges		
3030336	FBS 2-6	Plug-in bridge for cross-connections in the terminal center, 2-pos., color: Red
3030242	FBS 3-6	Plug-in bridge for cross-connections in the terminal center, 3-pos., color: Red
3030255	FBS 4-6	Plug-in bridge for cross-connections in the terminal center, 4-pos., color: Red
3030349	FBS 5-6	Plug-in bridge for cross-connections in the terminal center, 5-pos., color: Red
3030271	FBS 10-6	Plug-in bridge for cross-connections in the terminal center, 10-pos., color: Red

3030365	FBS 20-6	Plug-in bridge for cross-connections in the terminal center, 20-pos., color: Red
3032224	FBS 50-6	Plug-in bridge for cross-connections in the terminal center, 50-pos., color: Red
General		
3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
Marking		
0811228	X-PEN 0,35	Marker pen without ink cartridge, for manual labeling of markers, labeling extremely wipe-proof, line thickness 0.35 mm
1051016	ZB 6,LGS:FORTL.ZAHLEN	Zack strip, 10-section, printed horizontally: with the numbers, 1-10, 11-20 etc. up to 991-1000, color: white
5060935	ZB 6/WH-100:UNBEDRUCKT	Zack strip, unprinted: For individual labeling with M-PEN, ZB-T or CMS system, large batch, sufficient for labeling 1000 terminal blocks, for a terminal width of 6.2 mm, color: White
1050499	ZB 6:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements
Plug/Adapter		
0201689	MPS-IH BU	Insulating sleeve (blue), for MPS metal part to be ordered separately (0201744)
0201676	MPS-IH RD	Insulating sleeve (red), for MPS metal part to be ordered separately (0201744)
0201663	MPS-IH WH	Insulating sleeve (white), for MPS metal part to be ordered separately (0201744)
0201744	MPS-MT	Test plug, consisting of: Metal part for 2.3 mm diameter socket hole
3030925	PAI-4	Test adapter, for 4 mm diameter test plug PS and safety test plug, makes contact in the bridge shaft
3030996	PS-6	Modular test plug, for individual assembly of test plug strips, for UT, ST, DT and QT terminal blocks, can be labeled with ZBF 6, color: Red
Tools		
1205053	SZS 0,6X3,5	Screwdriver, bladed, matches all screw terminal blocks up to 4.0 mm ² connection cross section, blade: 0.6 x 3.5 mm, without VDE approval

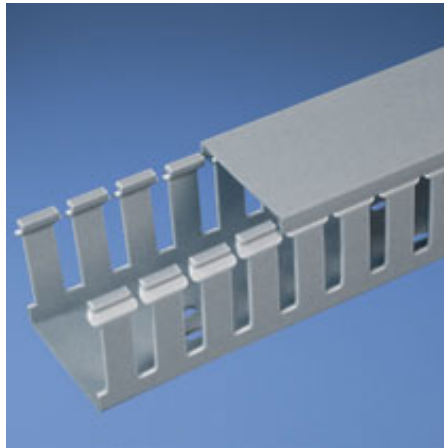
Drawings

Circuit diagram





G1X3LG6

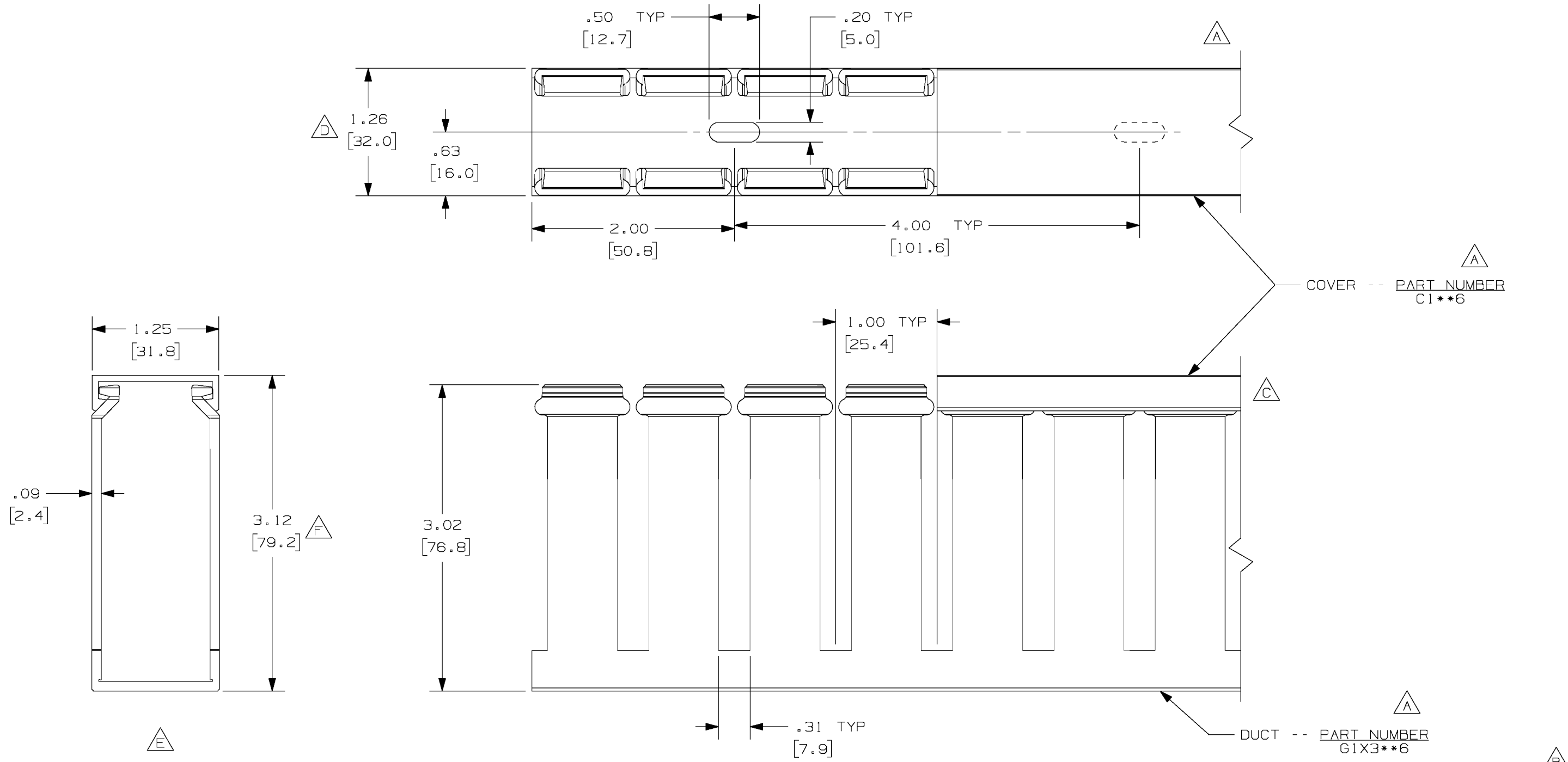


- Choose from 36 sizes of *PANDUIT*® Type G Wiring Duct from 0.5 "x 0.5" up to 6.0" x 4.0" in popular colors. Used for general purpose control panel wiring and to route and protect wiring in communication closets. The non-slip cover conceals all wiring and is easy to install. The duct and cover form a flush sidewall providing increased capacity and improved aesthetics.
- **Specifications**
 - Made of lead-free PVC
 - UL Recognized continuous use temperature: 122 °F (50°C)
 - UL94 Flammability Rating of V-0
 - Conforms with NFPA 79-2002 section 14.3.1 requirement for flame retardant material
 - Provided with mounting holes
- **Features and Benefits**
 - Wide finger/slot design provides greater sidewall rigidity and can be used with a wide range of wire bundle sizes
 - *PANDUIT*® exclusive rounded edges protects hands and wiring/cabling from abrasion
 - Non-slip cover stays in place during shipment, vibration and when in vertical orientation, eliminating rework
 - Flush cover design holds 10-12% more wires than traditional duct designs
 - Double scoreline allows quick modification for larger cabling bundles saving installation time leading to a lower installed cost
 - Specially formulated lead-free material eliminates health concerns associated with PVC that contains lead
 - Restricted slot design retains wire in slot for fast, easy wire installation or removal
- Base and cover sold separately.

■ Part Number	G1X3LG6
■ RoHS Compliancy Status	Compliant
■ Part Description	Wide finger, slotted wiring duct.
■ Material	Lead-Free PVC
■ Color	Light Gray
■ CSA Certified	Yes
■ UL Recognized (File No. E147128)	Yes
■ Length (ft.)	6
■ CE Marking	Yes
■ Duct Size W x H (In.)	1.26 x 3.12
■ Duct Size W x H (mm)	32.0 x 79.2
■ Mounting Method	Standard Mounting Holes
■ Pricing Description	Slotted Duct, PVC, 1"X3"X6',LGRY
■ Slot Width (In.)	.31
■ Slot Width (mm)	7.9

▪ Cover Part Number	C1LG6
▪ Min. Order UOM	FT
▪ Min. Order Qty.	6
▪ BOM Qty. (# of Pkgs.)	

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△ △ G

- NOTE.
1. ALL DIMENSIONS ARE REFERENCE ONLY.
 2. DIMENSIONS IN PARENTHESES ARE METRIC.
 3. THE ** DENOTE COLOR.
 4. DUCT AND COVER ARE AVAILABLE IN 6 FT [1828.8] LENGTHS.

REV	DATE	BY	CHK	DESCRIPTION
2	7/6/07	JCST	MKBE	G. ADDED LENGTH NOTE F. CORRECTED DIMENSION
1	4/29/04	JCST	MKBE	E. DELETED DIMENSION D. ADDED DIMENSION B. CHANGED DRAWING SIZE C. CHANGED VIEW A. ADDED TOP VIEW, LABELS, AND NOTE
R	3/5/03	JCST	JGG	DRAWING RELEASED

CAD FILENAME/LAYERS		D11000Q1_DC/00C	
PANDUIT CORP., TINLEY PARK, ILLINOIS			
WIRING DUCT - TYPE G WITH COVER 1 X 3 MARKETING DRAWING			
DRAWN BY JCST	MAT'L: PVC	SCALE FULL	DWG B
DATE 3/5/03		DRAWING NO. 36897-696	SIZE B
CHECKED BY JGG			

UT 4-HESI (5X20)

Order No.: 3046032



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3046032>

Fuse terminal block for cartridge fuse insert, cross section: 0.14 - 4 mm², AWG: 26 - 10, width: 6.2 mm, color: Black

Commercial data

EAN	4017918956578
Pack	50 Pcs.
Customs tariff	85369010
Weight/Piece	0.018103 KG
Catalog page information	Page 44 (CL-2007)

Product notes

WEEE/RoHS-compliant since:
01/01/2003



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Technical data

General

Number of levels	1
Number of connections	2
Color	black
Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	57.8 mm
Height NS 35/7,5	73 mm
Height NS 35/15	80.5 mm

Technical data

Fuse	G / 5 x 20
Fuse type	Glass
Rated surge voltage	4 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-3
Nominal current I_N	6.3 A
Nominal voltage U_N	500 V (if used as fuse terminal block)
	500 V (if used as disconnect terminal block)

Connection data

Conductor cross section solid min.	0.14 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section stranded min.	0.14 mm ²
Conductor cross section stranded max.	6 mm ²
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	10
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	4 mm ²
2 conductors with same cross section, solid min.	0.14 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.14 mm ²

2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
Type of connection	Screw connection
Stripping length	9 mm
Internal cylindrical gage	A4
Screw thread	M 3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals

Approval logo



CSA

Nominal voltage U _N	600 V
Nominal current I _N	6.3 A
AWG/kcmil	26-10

CUL

Nominal voltage U _N	600 V
Nominal current I _N	6.3 A
AWG/kcmil	26-10

UL

Nominal voltage U _N	600 V
Nominal current I _N	6.3 A
AWG/kcmil	26-10
Certification	CSA, CUL, DNV, GL, KEMA, LR, UL

Accessories		
Item	Designation	Description
Assembly		
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1207640	NS 35/ 7,5 PERF 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207653	NS 35/ 7,5 PERF 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1207666	NS 35/ 7,5 PERF 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: Steel, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1207679	NS 35/15 PERF 755MM	NS 35 DIN rail, height 15 mm, length 755 mm
1207682	NS 35/15 PERF 955MM	NS 35 DIN rail, height 15 mm, length 955 mm
1207695	NS 35/15 PERF 1155MM	NS 35 DIN rail, height 15 mm, length 1155 mm
1201730	NS 35/15 PERF 2000MM	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
3004207	VS	Connection pin, for coupling disconnect knives, in plastic, 1 m long
Bridges		
3030336	FBS 2-6	Plug-in bridge for cross-connections in the terminal center, 2-pos., color: Red
3030242	FBS 3-6	Plug-in bridge for cross-connections in the terminal center, 3-pos., color: Red
3030255	FBS 4-6	Plug-in bridge for cross-connections in the terminal center, 4-pos., color: Red
3030349	FBS 5-6	Plug-in bridge for cross-connections in the terminal center, 5-pos., color: Red
3030271	FBS 10-6	Plug-in bridge for cross-connections in the terminal center, 10-pos., color: Red
3030365	FBS 20-6	Plug-in bridge for cross-connections in the terminal center, 20-pos., color: Red

General

3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
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Marking

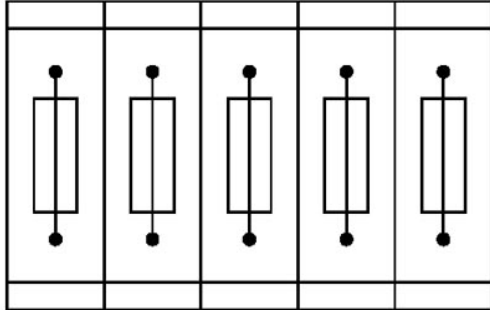
0811228	X-PEN 0,35	Marker pen without ink cartridge, for manual labeling of markers, labeling extremely wipe-proof, line thickness 0.35 mm
1050004	ZB 5 :UNBEDRUCKT	Zack strip, unprinted, 10-section, for individual labeling with M-PEN, ZB-T or CMS system, pack is sufficient for 100 terminal blocks, for a terminal width of 5.2 mm, color: White
1050017	ZB 5,LGS:FORTL.ZAHLEN	Zack strip, 10-section, printed horizontally: with the numbers, 1-10, 11-20 etc. up to 991-1000, color: white
1050020	ZB 5,QR:FORTL.ZAHLEN	Zack strip, 10-section, printed vertically: with consecutive numbers, 1-10, 11-20 a.s.o. up to 991-1000, color: white
5060906	ZB 5/WH-100:UNBEDRUCKT	Zack strip, unprinted: 10-section, for individual labeling with M-PEN, ZB-T or CMS system, large batch, sufficient for labeling 1000 terminal blocks, for a terminal width of 5.2 mm, color: White
1050295	ZB 5:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements
1051016	ZB 6,LGS:FORTL.ZAHLEN	Zack strip, 10-section, printed horizontally: with the numbers, 1-10, 11-20 etc. up to 991-1000, color: white
5060935	ZB 6/WH-100:UNBEDRUCKT	Zack strip, unprinted: For individual labeling with M-PEN, ZB-T or CMS system, large batch, sufficient for labeling 1000 terminal blocks, for a terminal width of 6.2 mm, color: White
1050499	ZB 6:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

Tools

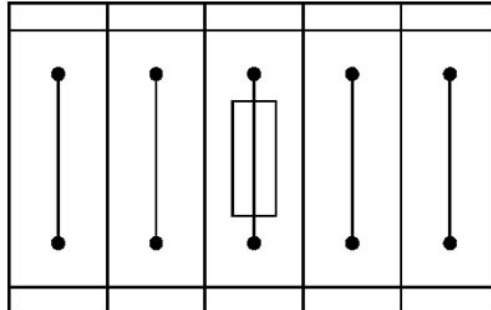
1205053	SZS 0,6X3,5	Screwdriver, bladed, matches all screw terminal blocks up to 4.0 mm ² connection cross section, blade: 0.6 x 3.5 mm, without VDE approval
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Drawings

Application drawing

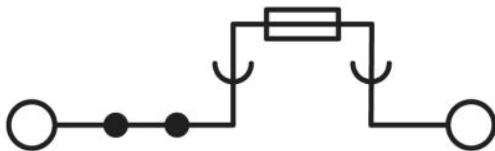


Fuse terminal blocks in interconnected arrangement, block consisting of 5 fuse terminal blocks



Fuse terminal block in single arrangement, block consisting of one fuse terminal block and 4 feed-through terminal blocks

Circuit diagram



Advantages of a Full Featured 700 Series Relay

Since the launch of the 700 series relays in 2000, this product line has continuously evolved both functionally and visually. The 700 series product line has the perfect mix of historical Magnecraft relay quality combined with a dynamic arsenal of options. When mated with the Magnecraft sockets and accessories, these RoHs compliant relays provide a complete modular system that will meet all your plug-in relay requirements in a package that is both visually appealing and functionally outstanding.

- Offers a “one stop solution” for your power management system.
- Several Contact configurations and materials to meet your individual needs.
- Plug-In switching capabilities from 10 mA to 20 Amps.
- Several Feature Code and Operation combinations available for all budgets.
- Ejector clips, ribbed relay housings and space-saving sockets allow for easy removal from crowded DIN rails.
- Color and appearance designed for high visibility in all environments.
- Wiring diagrams include NEMA and IEC standards.
- Engineering availability allows for customized relay solutions.



Removable Lock-Down Door

When Activated, Locks Push Button and Contacts in the Powered Position.

Color-Coded Push Button

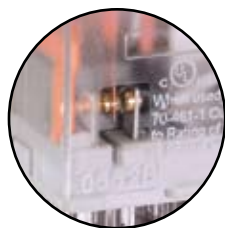
Allows Manual Operation of Relay.
AC Coils Red or DC Coils Blue.

Finger Grip Cover

Easy Removal of Relay from Socket.

Gold Flashed Contacts

Prevents Premature Oxidation and Increases Shelf-life.



Contact Viewing Window

Shows Position of Contacts.

Isolated Input and Output Terminals

Separates Control Circuits from Load Circuits.



Slim Design

Minimizes Space on DIN Rail.

Module Compatible

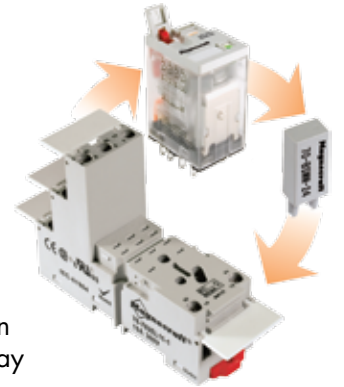
Allows for Optional Protection or LED Modules to be Used With Sockets.



2-Way Side or DIN Rail Mounting System

Retrofits Existing Panel Mounting and 35mm DIN Rail.

The Complete System Solution!



Flag Indicator
Shows Relay Status in Manual or Powered Condition.



Bi-Polar LED Status Lamp
Shows Coil "ON" or "OFF" Status.

I.D. Tag/Write-On Plastic Label
Used for Identification of Relays in Multi-Relay Circuits.

Mating Hold-Down Clip Available
Safely Secures Relay to Socket.



Finger-Safe
Protects Operators from Live Circuits.

I.D. Tag/Write-On Plastic Label
Used to Match Wire Identification Tags with Socket Connections.

Internal Coil Bus Jumper System
Allows Connection to Adjacent Sockets Without Additional Wiring.



Advantages of a Plain Cover 700 Series Relay

The Plain Cover Super Series relays support budget minded applications with premium performance. Maintaining the same ratings and internal components as the Full Feature Series; the Plain Cover Series perform as well as premium relays while maintaining low costs by offering several option configurations.

- Offers a “one stop solution” for your power management system.
- Several Contact configurations and materials to meet your individual needs.
- Plug-In switching capabilities from 10 mA to 20 Amps.
- Several Feature Code and Operation combinations available for all budgets.
- Ejector clips, ribbed relay housings and space-saving sockets allow for easy removal from crowded DIN rails.
- Color and appearance designed for high visibility in all environments.
- Wiring diagrams include NEMA and IEC standards.
- Engineering availability allows for customized relay solutions.



Contact Viewing Window
Shows Position of Contacts.

Gold Flashed Contacts
Prevents Premature Oxidation and Increases Shelf-life.

Isolated Input and Output Terminals
Separates Control Circuits from Load Circuits.



Slim Design
Minimizes Space on DIN Rail.

Module Compatible
Allows for Optional Protection or LED Modules to be Used With Sockets.



2-Way Side or DIN Rail Mounting System
Retrofits Existing Panel Mounting and 35mm DIN Rail.

Finger Grip Cover
Easy Removal of Relay from Socket.

The Complete System Solution!

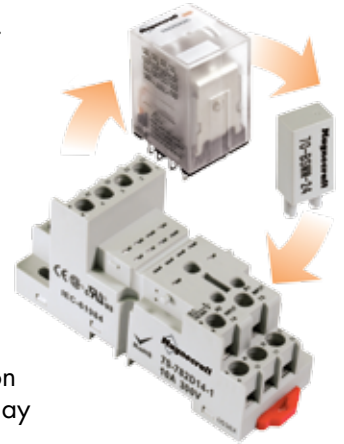
Flag Indicator
Shows Relay Status in Manual or Powered Condition.



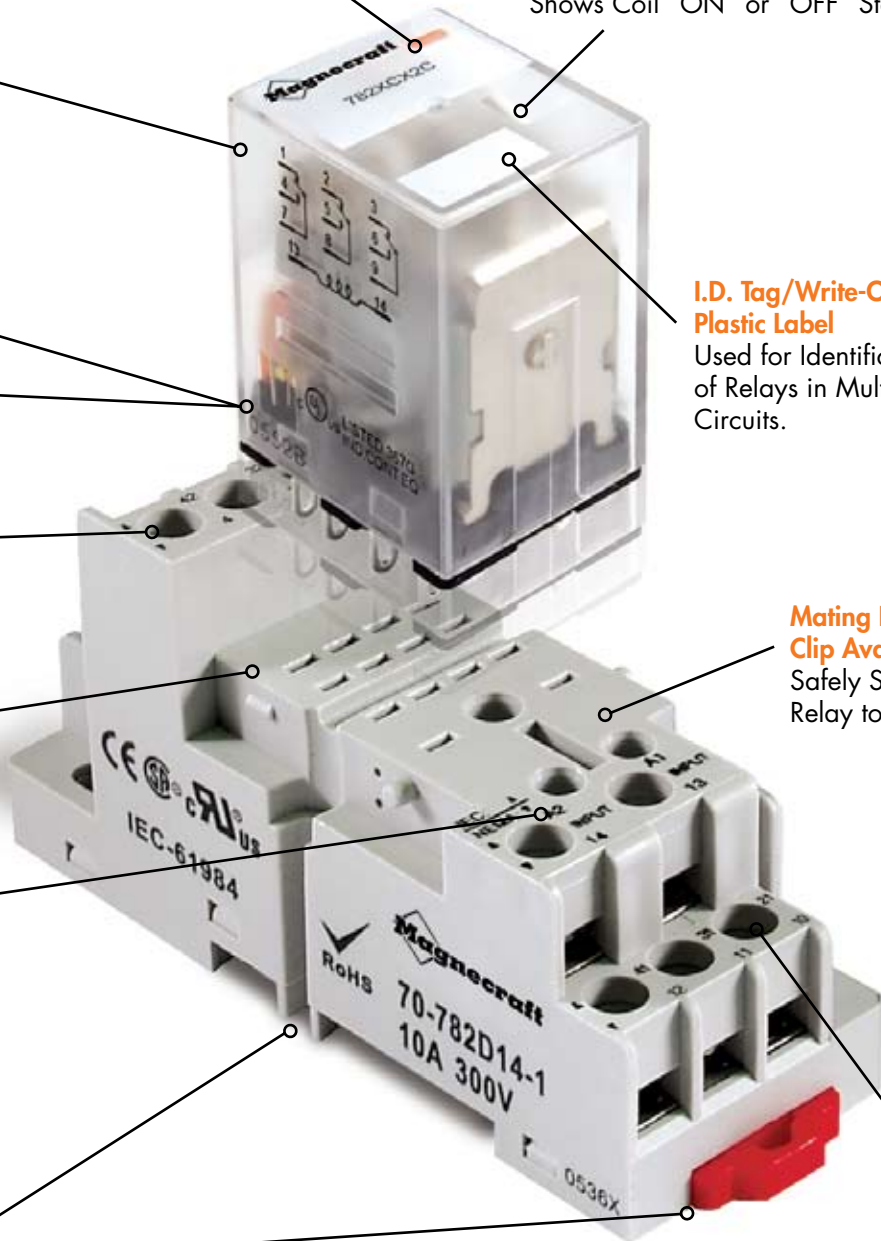
Optional Bi-Polar LED Status Lamp
Shows Coil "ON" or "OFF" Status.

I.D. Tag/Write-On Plastic Label
Used for Identification of Relays in Multi-Relay Circuits.

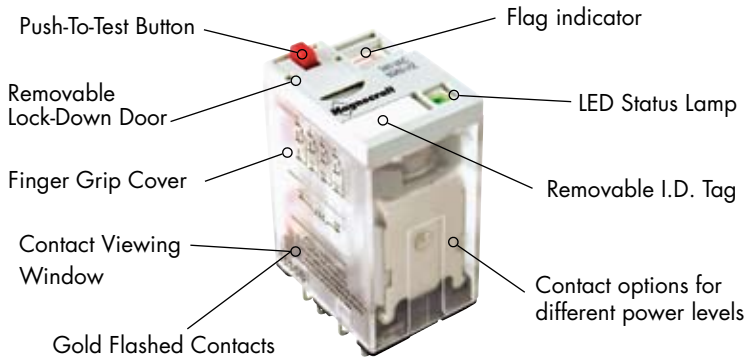
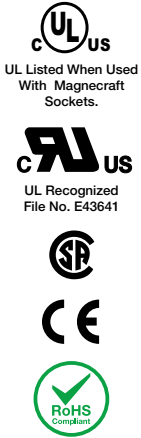
Mating Hold-Down Clip Available
Safely Secures Relay to Socket.



Finger-Safe
Protects Operators from Live Circuits.

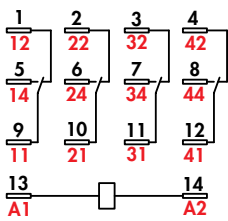


782 Ice Cube Relays/4PDT, 3-10 Amp Rating (DC & AC)



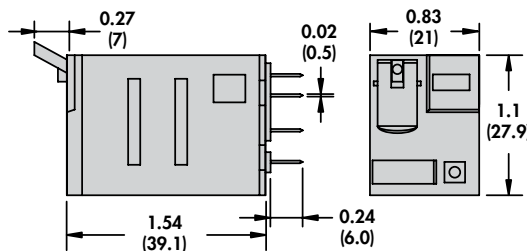
General Specifications		(UL 508)	782XDX1	782XDX2	782XDX3
Contact Characteristics		Units	Low Level	Standard	Low Level
Number and type of Contacts			4PDT	4PDT	4PDT
Contact materials			Fine Silver, Gold Diffused	Silver Alloy	Bifurcated
Thermal (Carrying) Current		A	3	10	3
Maximum Switching Voltage		V	240	300	240
Switching Current @ Voltage	~	Resistive	3A @120V 50/60Hz	10A @120V 50/60Hz	3A @120V 50/60Hz
	~	Resistive	3A @240V 50/60Hz	8A @277V 50/60Hz	3A @240V 50/60Hz
	~	Resistive	3A @30V	8A @28V	3A @30V
	~	HP	1/10 @120VAC	1/3 @120VAC	1/16 @120VAC
			HP	1 @277 VAC	
			Pilot Duty	B300	
Minimum Switching Requirement		mA	3 @17VDC (.04W)	100 @5VDC (.5W)	3 @17VDC (.04W)
Coil Characteristics					
Voltage Range	~	V	6...240	6...240	6...240
	~	V	6...125	6...125	6...125
Operating Range	% of Nominal	~	85% to 110%	85% to 110%	85% to 110%
		~	80% to 110%	80% to 110%	80% to 110%
Average consumption	~	VA	1.2	1.2	1.2
	~	W	0.9	0.9	0.9
Drop-out voltage threshold	~		15%	15%	15%
	~		10%	10%	10%
Performance Characteristics					
Electrical Life (UL508)	Operations @ Rated Current	(Resistive)	200,000	200,000	200,000
Mechanical Life	Unpowered		10,000,000	10,000,000	10,000,000
Operating time (response time)		ms	20	20	20
Dielectric strength	Between coil and contact	~	V(rms) 1500	1500	1500
	Between poles	~	V(rms) 1500	1500	1500
	Between contacts	~	V(rms) 1500	1500	1500
Environment					
Product certifications	Standard version		UL, CSA, CE	UL, CSA, CE	UL, CSA, CE
Ambient air temperature around the device	Storage	°C	-40...+85	-40...+85	-40...+85
	Operation	°C	-40...+55	-40...+55	-40...+55
Vibration resistance	Operational	g-n	3, 10 - 55 Hz	3, 10 - 55 Hz	3, 10 - 55 Hz
Shock resistance		g-n	10	10	10
Degree of protection			IP 40	IP 40	IP 40
Weight		grams	36	36	36

782XDX1, 2, 3

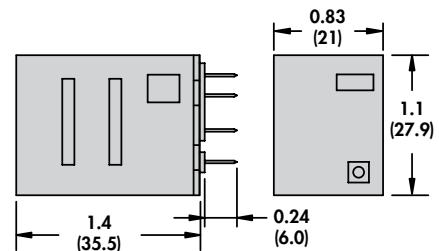


NEMA IEC
Wiring Diagram
Bottom View

Full Featured Dimensions



Plain Cover Dimensions





Full Featured



Plain Cover

Standard Part Numbers

BOLD-FACED PART NUMBERS ARE NORMALLY STOCKED

Nominal Voltage	Coil Resistance	4PDT Part Number (Full Feature) 10 Amp	4PDT Part Number (Plain Cover) 10 Amp	4PDT Part Number (Full Feature) 3 Amp, Bi-Furcated
AC Operated				
6 VAC 50/60 Hz	9.6 Ohms	782XDX2M4L-6A	782XDX2C-6A	782XDX3M4L-6A
12 VAC 50/60 Hz	46 Ohms	782XDX2M4L-12A	782XDX2C-12A	782XDX3M4L-12A
24 VAC 50/60 Hz	180 Ohms	782XDX2M4L-24A	782XDX2C-24A	782XDX3M4L-24A
120 VAC 50/60 Hz	4430 Ohms	782XDX2M4L-120A	782XDX2C-120A	782XDX3M4L-120A
220-230 VAC 50/60 Hz	15000 Ohms	782XDX2M4L-220/230A	782XDX2C-220/230A	782XDX3M4L-220/230A
240 VAC 50/60 Hz	15720 Ohms	782XDX2M4L-240A	782XDX2C-240A	782XDX3M4L-240A
DC Operated				
6 VDC	40 Ohms	782XDX2M4L-6D	782XDX2C-6D	782XDX3M4L-6D
12 VDC	160 Ohms	782XDX2M4L-12D	782XDX2C-12D	782XDX3M4L-12D
24 VDC	650 Ohms	782XDX2M4L-24D	782XDX2C-24D	782XDX3M4L-24D
48 VDC	2600 Ohms	782XDX2M4L-48D	782XDX2C-48D	782XDX3M4L-48D
110-125 VDC	11000 Ohms	782XDX2M4L-110/125D	782XDX2C-110/125D	782XDX3M4L-110/125D

Custom Relay Part Number Builder

Series	Contact Config.	Contact Code	Cover Options	Terminal Style	Feature Options	Coil Voltage
782	XDX = 4PDT	3 Amp Fine Silver, Gold Diffused = 1 10 Amp Silver Alloy = 2 3 Amp Bifurcated = 3	Full Feature = No Code Plain Cover = C	Plug In = No Code PC terminal = T	Side Push Button = M Locking Push Button = M4 Bi-Polar LED = L	VAC = 6 - 240A VDC = 6 - 125D

For other mating sockets, see Section 2: 70-782EL14-1, 70-782E14-1, 70-461-1, 70-378-1, 70-379-1

Relay Adapters



16-782C1

Section 3, p.14-16

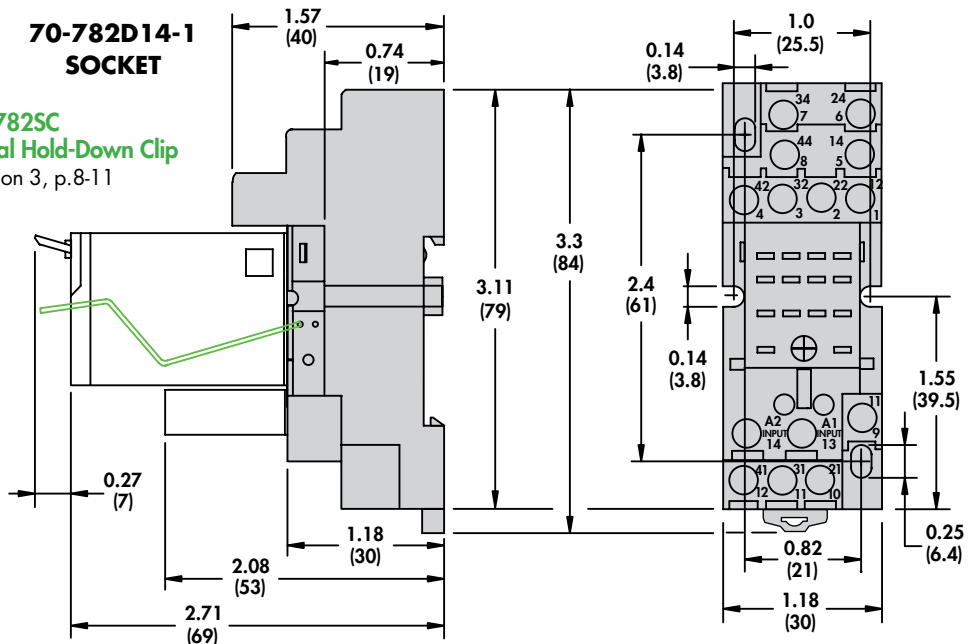


16-782C

Section 3, p.14-16

70-782D14-1
SOCKET

16-782SC
Metal Hold-Down Clip
Section 3, p.8-11



Cooper Bussmann

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LP-CC-2

Class CC, Time Delay Fuse

Product Information

Product Type:	Fuse
Product Family:	Electrical Power
Brand:	Cooper Bussmann
Sub-brand:	Low-Peak
Class:	CC

Recommended Products

Rec. Fuse Block:	BC603 Series
Rec. Panel-mount Fuse Holder:	HPS-RR
Rec. Modular Fuse Holder:	CHCC Series
Rec. Disconnect Switch:	CFD30CC Series
Rec. Cover:	SAMI-7 Series

Physical Properties

Dimensions:	1.5in.(L) × 0.406in.(W) × 0in.(H)
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Certifications

[UL Listed](#)
[CSA Certified](#)

Electrical Properties

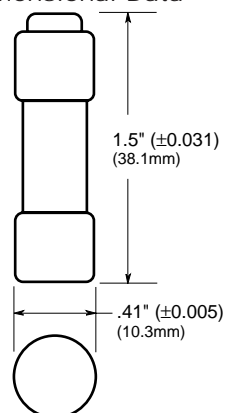
Maximum AC Voltage:	600
Maximum DC Voltage:	300
Amperage Rating:	2
AC Interrupting Ratings:	<ul style="list-style-type: none"> 200000 at 600V
DC Interrupting Ratings:	<ul style="list-style-type: none"> 20000 at 300V
Fuse Class:	Class CC
Time Delay:	Yes

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 30A
 AC Voltage Rating: 600V (or less)
 Interrupting Rating: 200,000A RMS Sym.
 Agency Information:
 UL 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: 300Vdc (or less)
 ½-2¾₁₀A and 20-30A, 20,000 AIR, UL 198L
 150Vdc or less 3-15A, 20,000 AIR, UL 198L


Catalog Numbers

LP-CC-½	LP-CC-1½	LP-CC-3	LP-CC-6	LP-CC-12
LP-CC-¾ ₁₀	LP-CC-1¾ ₁₀	LP-CC-3¾ ₁₀	LP-CC-6¾ ₄	LP-CC-15
LP-CC-¾ ₁₀	LP-CC-1¾ ₁₀	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-1¼	LP-CC-2¼	LP-CC-4½	LP-CC-8	LP-CC-30
LP-CC-1¼	LP-CC-2½	LP-CC-5	LP-CC-9	—
LP-CC-1¾ ₁₀	LP-CC-2¾ ₁₀	LP-CC-5¾ ₁₀	LP-CC-10	—

Carton Quantity and Weight

Ampere Ratings	Carton Qty.	Weight*	
		Lbs.	Kg.
0-30	10	.193	.088

*Weight per carton.



Recommended fuseblocks/fuseholders for Class CC 600V fuses
 See Data Sheets listed below

- Open fuseblocks - 1105
- Finger-safe fuseholders - 1109, 1102, 1103, 1151
- Panel-mount fuseholders - 2114, 2113
- In-line fuseholders - 2126

General Information:

LP-CC LOW-PEAK Yellow™ Fuse

- A superior all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact; physical size is only 1¾" 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.

200,000A 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	2¾ ₁₀ A	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

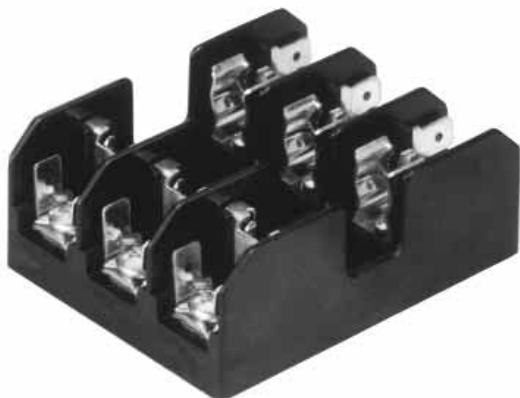
*RMS Symmetrical Amperes Short-Circuit
 NOTE: To calculate I_p (I_{peak}) multiply I_{RMS} value x 2.3.

CE

Class CC Fuseblocks

600 Volt, 30 Amps

BC Series



Catalog Symbol: BC Series

Class CC Fuseblocks

For use with Class CC Fuses (Bussmann LP-CC, KTK-R, and FRQ-R)

Ampere Rating: 1/10 to 30A

Voltage Rating: 600V

Withstand Rating: 200,000A RMS Sym.

Agency Information:

UL Listed, UL 512, Guide IZLT, File E14853

CSA Certified, C22.2 No. 39, Class 6225-01, File 47235

UL Flammability: 94VO

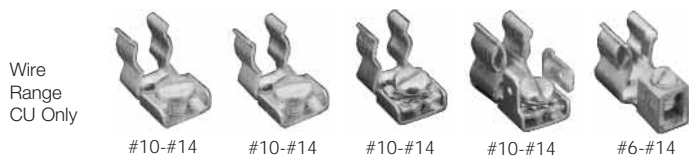
Materials: Base - Thermoplastic

Clips - Bright tin-plated bronze

DIN-RAIL Adapters: DRA-1 and DRA-2

Catalog Data

Amps	Poles	Terminal Type				
		Screw	Screw with Quick Connect*	Pressure Plate	Pressure Plate w/ Quick Connect*	Box Lug
1/10 to 30	1	BC6031S	BC6031SQ	BC6031P	BC6031PQ	BC6031B
	2	BC6032S	BC6032SQ	BC6032P	BC6032PQ	BC6032B
	3	BC6033S	BC6033SQ	BC6033P	BC6033PQ	BC6033B

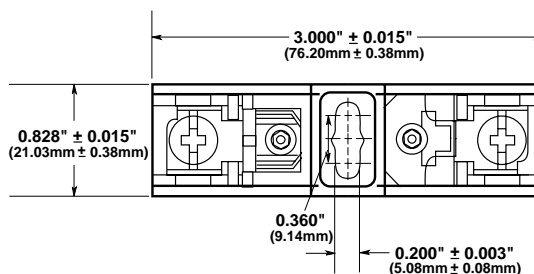


* QUICK CONNECT RATED FOR 20A MAXIMUM.

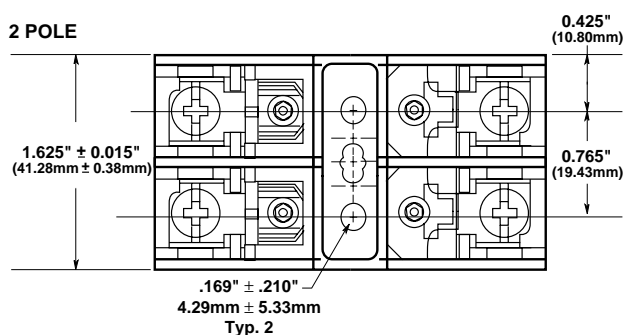
CE logo denotes compliance with European Union Low Voltage Directive (50-1000 Vac, 75-1500 Vdc). Refer to Data Sheet: 8002 or contact Bussmann Application Engineering at 636-527-1270 for more information.

Dimensional Data

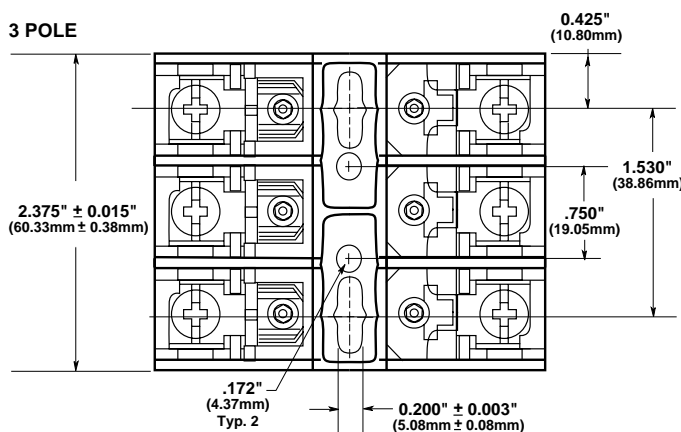
1 POLE



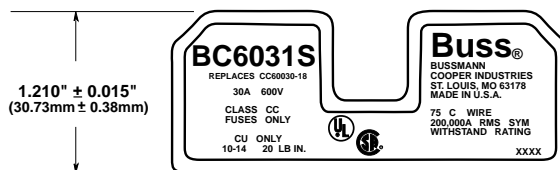
2 POLE



3 POLE



FUSEBLOCK LABEL (EXAMPLE SHOWN)



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Description

- Medium time delay, low breaking capacity
- 5mm x 20mm physical size
- Glass tube, nickel-plated brass endcap construction
- Optional axial leads are .032" x 1.5" copper tinned
- Optional sleeve is flexible flouropolymer (U.L. flammability rating VW-1)
- Designed to UL/CSA 248-14



ELECTRICAL CHARACTERISTICS		
Rated Current	% of Amp Rating	Opening Time
63mA - 10A	100%	None
	135%	60 minutes maximum
	200%	2 minutes maximum

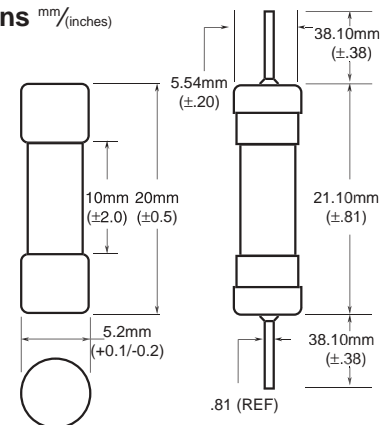
Approvals

- UL Listed, Guide JDYX, File E75865, 63mA-6.3A
- UL Recognition, Guide JDYX2, File E75865, 7A-8A
- CSA Certified, Class 1422-01, File E65063, 63mA-6.3A

Ordering

- Specify product code, option code and packaging code

Dimensions mm/(inches)



SPECIFICATIONS

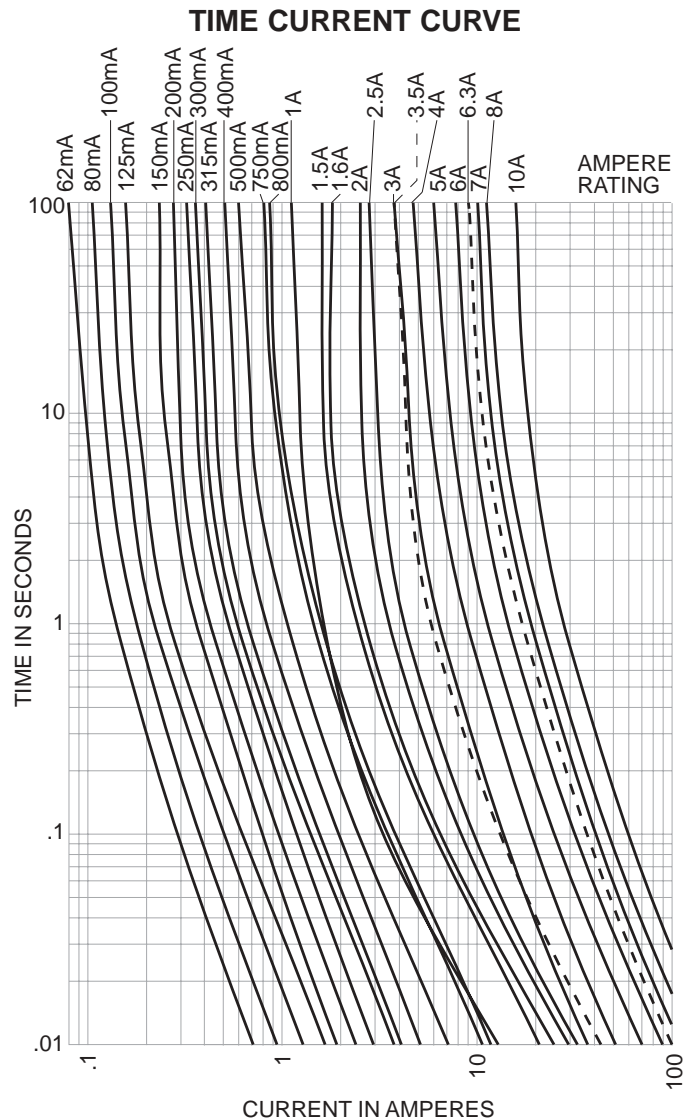
Product Code	Voltage Rating AC	AC Interrupting Rating*		Typical DC Cold Resistance (ohms)**	Typical Pre-Arc I ² t AC†	Maximum Voltage Drop (mV)‡
		250V	125V			
GMC-63mA	250V	35A	10,000A	10.350	0.0027	1400
GMC-80mA	250V	35A	10,000A	-	0.0050	1400
GMC-100mA	250V	35A	10,000A	4.775	0.0094	1200
GMC-125mA	250V	35A	10,000A	3.400	0.014	1000
GMC-150mA	250V	35A	10,000A	2.555	0.022	800
GMC-160mA	250V	35A	10,000A	2.295	0.022	730
GMC-200mA	250V	35A	10,000A	1.395	0.032	650
GMC-250mA	250V	35A	10,000A	0.965	0.046	490
GMC-300mA	250V	35A	10,000A	0.838	0.081	580
GMC-315mA	250V	35A	10,000A	0.685	0.081	480
GMC-400mA	250V	35A	10,000A	0.615	0.18	510
GMC-500mA	250V	35A	10,000A	0.335	0.41	370
GMC-600mA	250V	35A	10,000A	0.282	0.60	360
GMC-630mA	250V	35A	10,000A	0.246	0.66	360
GMC-700mA	250V	35A	10,000A	0.213	0.85	340
GMC-750mA	250V	35A	10,000A	0.213	0.85	320
GMC-800mA	250V	35A	10,000A	0.180	0.85	290
GMC-1A	250V	35A	10,000A	0.156	1.8	250
GMC-1.25A	250V	100A	10,000A	0.098	3.4	200
GMC-1.5A	250V	100A	10,000A	0.076	5.4	190
GMC-1.6A	250V	100A	10,000A	0.067	5.8	160
GMC-2A	250V	100A	10,000A	0.043	8.9	130
GMC-2.5A	250V	100A	10,000A	0.035	13	130
GMC-3A	250V	100A	10,000A	0.026	19	130
GMC-3.15A	250V	100A	10,000A	0.025	23	130
GMC-3.5A	125V	-	10,000A	0.022	25	130
GMC-4A	125V	-	10,000A	0.019	36	120
GMC-5A	125V	-	10,000A	0.014	58	120
GMC-6A	125V	-	10,000A	0.013	88	120
GMC-6.3A	125V	-	10,000A	0.012	110	120
GMC-7A	125V	-	200A	0.012	150	120
GMC-8A	125V	-	200A	0.009	200	110
GMC-10A	125V	-	200A	0.007	300	110

* Interrupting ratings: Interrupting ratings for 63mA - 6.3A were measured at 70% - 80% power factor on AC. The interrupting ratings for 7A - 10A were measured at 100% power factor on AC.

** DC Cold Resistance (Measured at <10% of rated current)

† Typical Pre-Arching I²t (I²t was measured at listed interrupting rating and rated voltage)

‡ Maximum Voltage drop (Voltage drop was measured at 20°C ambient temperature at rated current)



OPTION CODE	
Option Code	Description
S	Sealed with a flouropolmer sleeve to withstand aqueous cleaning
V	Axial leads - copper tinned wire with nickel plated brass overcaps



PACKAGING CODE	
Packaging Code	Description
BK	100 pieces of fuses packed into a cardboard carton with flaps folded
BK1	1,000 pieces of fuses packed into a poly bag
TR2	1,500 pieces of fuses packed into tape on a reel

Pushbutton Units and Indicator Lights

Class 51, Hazardous Location NEMA Type 7 & 9 Devices

Selector switch operators

Selection and ordering data

Version	Lever type	Color of insert	Cam Code ^{1) 2)}	Short bushing Order No.	List Price \$ 1 unit	Long bushing Order No.	List Price \$ 1 unit	Pack Unit
	Short lever, non-Illuminated	White	A	51SA2AA		51SA2AALB		1
	Long lever, non-Illuminated	White	A	51SB2AA		51SB2AALB		1
Spring return from right operation	Short lever, non-Illuminated	White	A	51SA2AC		51SA2ACLB		1
	Long lever, non-Illuminated	White	A	51SB2AC		51SB2ACLB		1
	Short lever, non-Illuminated	White	B	51SA2BA		51SA2BALB		1
	Long lever, non-Illuminated	White	B	51SB2BA		51SB2BALB		1
	Short lever, non-Illuminated	White	C	51SA2CA		51SA2CALB		1
	Long lever, non-Illuminated	White	C	51SB2CA		51SB2CALB		1
	Short lever, non-Illuminated	White	D	51SA2DA		51SA2DALB		1
	Long lever, non-Illuminated	White	D	51SB2DA		51SB2DALB		1
	Short lever, non-Illuminated	White	E	51SA2EA		51SA2EALB		1
	Long lever, non-Illuminated	White	E	51SB2EA		51SB2EALB		1
	Short lever, non-Illuminated	White	G	51SA2GA		51SA2GALB		1
	Long lever, non-Illuminated	White	G	51SB2GA		51SB2GALB		1
Spring return from right operation	Short lever, non-Illuminated	White	B	51SA2BC		51SA2BCLB		1
	Long lever, non-Illuminated	White	B	51SB2BC		51SB2BCLB		1
	Short lever, non-Illuminated	White	C	51SA2CC		51SA2CCLB		1
	Long lever, non-Illuminated	White	C	51SB2CC		51SB2CCLB		1
	Short lever, non-Illuminated	White	D	51SA2DC		51SA2DCLB		1
	Long lever, non-Illuminated	White	D	51SB2DC		51SB2DCLB		1
	Short lever, non-Illuminated	White	E	51SA2EC		51SA2ECLB		1
	Long lever, non-Illuminated	White	E	51SB2EC		51SB2ECLB		1
	Short lever, non-Illuminated	White	G	51SA2GC		51SA2GCLB		1
	Long lever, non-Illuminated	White	G	51SB2GC		51SB2GCLB		1
Spring return from left operation	Short lever, non-Illuminated	White	B	51SA2BB		51SA2BBLB		1
	Long lever, non-Illuminated	White	B	51SB2BB		51SB2BBLB		1
	Short lever, non-Illuminated	White	C	51SA2CB		51SA2CBLB		1
	Long lever, non-Illuminated	White	C	51SB2CB		51SB2CBLB		1
	Short lever, non-Illuminated	White	D	51SA2DB		51SA2DBLB		1
	Long lever, non-Illuminated	White	D	51SB2DB		51SB2DBLB		1
	Short lever, non-Illuminated	White	E	51SA2EB		51SA2EBLB		1
	Long lever, non-Illuminated	White	E	51SB2EB		51SB2EBLB		1
	Short lever, non-Illuminated	White	G	51SA2GB		51SA2GBLB		1
	Long lever, non-Illuminated	White	G	51SB2GB		51SB2GBLB		1
Spring return from left and right operation	Short lever, non-Illuminated	White	B	51SA2BD		51SA2BDLB		1
	Long lever, non-Illuminated	White	B	51SB2BD		51SB2BDLB		1
	Short lever, non-Illuminated	White	C	51SA2CD		51SA2CDLB		1
	Long lever, non-Illuminated	White	C	51SB2CD		51SB2CDLB		1
	Short lever, non-Illuminated	White	D	51SA2DD		51SA2DDLb		1
	Long lever, non-Illuminated	White	D	51SB2DD		51SB2DDLb		1
	Short lever, non-Illuminated	White	E	51SA2ED		51SA2EDLB		1
	Long lever, non-Illuminated	White	E	51SB2ED		51SB2EDLB		1
	Short lever, non-Illuminated	White	G	51SA2GD		51SA2GDLB		1
	Long lever, non-Illuminated	White	G	51SB2GD		51SB2GDLB		1

1) C cam limited to 4 single or double pole blocks on spring return operators.






2) For contact operation, see cam selection chart on page 10/125.

Pushbutton Units and Indicator Lights

Class 51, Hazardous Location NEMA Type 7 & 9 Devices

Operators only

Selection and ordering data

	Version	Color of operator	Contacts	Short bushing Order No.	List Price \$ 1 unit	Long bushing Order No.	List Price \$ 1 unit	Pack Unit	
Pushbutton with flat cap 	Pushbutton with flush cap	Black		51PA8A1	90.00	51PA8A1LB	90.00	1	
		Red		51PA8A2	90.00	51PA8A2LB	90.00	1	
		Green		51PA8A3	90.00	51PA8A3LB	90.00	1	
Pushbutton with extended cap 	Pushbutton with extended cap	Black		51PA8B1	90.00	51PA8B1LB	90.00	1	
		Red		51PA8B2	90.00	51PA8B2LB	90.00	1	
		Green		51PA8B3	90.00	51PA8B3LB	90.00	1	
Dual pushbutton 	Dual Pushbutton	Flush Black		51PD8A1B2	183.00	51PD8A1B2LB	183.00	1	
	Pushbutton with mushroom cap 1 5/8"(41.3mm)	Black		51PA9D1	113.70	51PA9D1LB	113.70	1	
		Red		51PA9D2	113.70	51PA9D2LB	113.70	1	
		Green		51PA9D3	113.70	51PA9D3LB	113.70	1	
	Pushbutton with mushroom cap 2 1/2"(63.5mm)	Black		51PA9E1	121.40	51PA9E1LB	121.40	1	
		Red		51PA9E2	121.40	51PA9E2LB	121.40	1	
		Green		51PA9E3	121.40	51PA9E3LB	121.40	1	
		Less head		51PA9	106.00	51PA9LB	106.00	1	
2 position push-pull 	2 Position Push Pull Maintained, Non Illuminated Small Plastic Mushroom Head, 1 5/8" (41.3 mm)	Black		51PA2D1	271.70	51PA2D1LB	271.70	1	
		Red		51PA2D2	271.70	51PA2D2LB	271.70	1	
		Green		51PA2D3	271.70	51PA2D3LB	271.70	1	
	Large Plastic Mushroom Head, 2 1/4" (57.2 mm)	Black		51PA2E1	279.40	51PA2E1LB	279.40	1	
		Red		51PA2E2	279.40	51PA2E2LB	279.40	1	
		Green		51PA2E3	279.40	51PA2E3LB	279.40	1	
		Less head		51PA2	264.00	51PA2LB	264.00	1	
	2 Position Push Pull Maintained, Non Illuminated Small Mushroom Head, 1 5/8"(41.3mm)	Black	1NC + 1NO		51PA2D1A	294.40	51PA2D1LBA	294.40	1
		Red	1NC + 1NO		51PA2D2A	294.40	51PA2D2LBA	294.40	1
		Green	1NC + 1NO		51PA2D3A	294.40	51PA2D3LBA	294.40	1
Large Mushroom Head, 2 1/2"(63.5mm)	Black	1NC + 1NO		51PA2E1A	302.60	51PA2E1LBA	302.60	1	
	Red	1NC + 1NO		51PA2E2A	302.60	51PA2E2LBA	302.60	1	
	Green	1NC + 1NO		51PA2E3A	302.60	51PA2E3LBA	302.60	1	
3 position push-pull 	3 Position Push Pull Momentary, Non Illuminated Small Mushroom Head, 1 5/8"(41.3mm)	Black	1NC + 1NO	51PA3A1U	295.00	51PA3A1ULB	295.00	1	
		Red	1NC + 1NO	51PA3A2U	295.00	51PA3A2ULB	295.00	1	
		Green	1NC + 1NO	51PA3A3U	295.00	51PA3A3ULB	295.00	1	

1756 ControlLogix Communication Modules Specifications

Standard ControlLogix Catalog Numbers 1756-EN2F, 1756-EN2T, 1756-EN2TR, 1756-EN3TR, **1756-ENBT**, 1756-EWEB, 1756-CN2, 1756-CN2R, 1756-CNB, 1756-CNBR, 1756-DNB, 1756-DHRIO, 1756-RIO, 1756-DH485, 1756-SYNCH, 1756-EN2TXT, 1756-CN2RXT, 1756-DHRIOXT, 1757-FFLD2, 1757-FFLD4, 1757-FFLDC2, 1757-FFLDC4

ControlLogix-XT Catalog Numbers 1756-EN2TXT, 1756-CN2RXT, 1756-DHRIOXT

Linking Device Catalog Numbers 1757-FFLD2, 1757-FFLD4, 1757-FFLDC2, 1757-FFLDC4

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Separate communication-interface modules are available for different networks. Install multiple communication-interface modules into the ControlLogix® backplane to configure a gateway to bridge or route control and information data between different networks. You do not need a ControlLogix controller in the chassis.



Additional Resources

These documents contain additional information concerning related products from Rockwell Automation®.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1 .	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation sales representative.

Available Communication Modules

Network	Cat. No.	Description	Page
EtherNet/IP	1756-EN2F	EtherNet/IP bridge, fiber, 256 Logix connections	4
	1756-EN2T	EtherNet/IP bridge, copper, 256 Logix connections	4
	1756-EN2TR	EtherNet/IP bridge, embedded switch, copper Supports as many as 8 axis of motion	4
	1756-EN3TR	EtherNet/IP bridge, embedded switch, copper Supports as many as 128 axis of motion	4
	1756-ENBT	EtherNet/IP bridge, copper, 128 Logix connections	4
	1756-EWEB	Ethernet web server, 128 Logix connections, Class 3 messaging only	4
	1756-EN2TXT	ControlLogix-XT™, EtherNet/IP bridge, copper, 256 Logix connections	6
ControlNet	1756-CN2/B, 1756-CN2R/B	ControlNet bridge, 128 Logix connections ⁽¹⁾	11
	1756-CNB, 1756-CNBR	ControlNet bridge, 64 connections; recommend using only 40 . . . 48 Logix connections for I/O	11
	1756-CN2RXT	ControlLogix-XT, ControlNet bridge, 128 Logix connections ⁽¹⁾	11
DeviceNet	1756-DNB/E	DeviceNet bridge	17
Data Highway Plus™	1756-DHRIO	Data Highway Plus/Remote I/O module	21
	1756-DHRIOXT	ControlLogix-XT, Data Highway Plus/Remote I/O module	23
Remote I/O	1756-DHRIO	Data Highway Plus/Remote I/O module	21
	1756-RI0/B	Remote I/O module	21
	1756-DHRIOXT	ControlLogix-XT, Data Highway Plus/Remote I/O module	23
Foundation Fieldbus	1757FFLD2, 1757-FFLD4	Foundation Fieldbus linking device bridges from an Ethernet network to either two or four H1 ports	25
	1757-FFLDC2, 1757-FFLDC4	Foundation Fieldbus linking device bridges from a ControlNet network to either two or four H1 ports	25
Serial	1756-DH485	Compatible with RS-232 serial communication, supports the DF1 protocol, send and receive messages, does not support remote programming and monitoring	28
SynchLink™	1756-SYNCH	SynchLink fiber-optic communication link	31

(1) 128 connections are available for standard use. An additional three connections are reserved for redundant control.

Communication Connections

A ControlLogix system uses connections to establish communication links between devices. The types of connections include the following:

- Controller-to-local I/O modules or local communication modules
- Controller-to-remote I/O or remote communication modules
- Controller-to-remote I/O (rack-optimized) modules
- Produced and consumed tags
- Messages
- Controller access by RSLogix™ 5000 software
- Controller access by RSLinx® software for HMI or other applications

You indirectly determine the number of connections the controller uses by configuring the controller to communicate with other devices in the system. The limit of connections may ultimately reside in the communication module you use for the connection. If a message path routes through a communication module, the connection related to the message also counts towards the connection limit of that communication module.

EtherNet/IP Network



The Ethernet Industrial (EtherNet/IP) network protocol is an open industrial-networking standard that supports both real-time I/O messaging and message exchange. The EtherNet/IP network uses off-the-shelf Ethernet communication chips and physical media.

If you need to	Select this interface
<ul style="list-style-type: none"> • Control I/O modules and drives • Act as an adapter for I/O on remote EtherNet/IP links • Communicate with other EtherNet/IP devices (messages and HMI) • Bridge EtherNet/IP links to route messages to devices on other networks 	1756-EN2F bridge 1756-EN2T bridge 1756-ENBT bridge
Support device level ring (DLR) and linear topologies	1756-EN2TR bridge 1756-EN3TR bridge
Provide control in environments where temperatures range from -25...70 °C (-13...158 °F)	1756-EN2TXT bridge
<ul style="list-style-type: none"> • Use an Internet browser to remotely access tags in a ControlLogix controller • Communicate with other EtherNet/IP or generic Ethernet devices (messaging only; no I/O control) • Bridge EtherNet/IP links to route messages to devices on other networks 	1756-EWEB web server

Table 1 - Technical Specifications - 1756 EtherNet/IP Modules

Attribute	1756-EN2F	1756-EN2T	1756-EN2TR, 1756-EN3TR	1756-ENBT	1756-EWEB
EtherNet/IP communication rate	100 Mbps	10/100 Mbps	10/100 Mbps	10/100 Mbps	10/100 Mbps
Logix communication connections	256			128	
TCP/IP communication connections	128			64	
Current draw @ 5.1V DC	1.2 A	1 A	1 A	700 mA	
Current draw @ 24V DC	3 mA	3 mA	3 mA	3 mA	
Power dissipation	6.2 W	5.1 W	5.1 W	3.65 W	
Isolation voltage	No isolation between USB and system	30V (continuous), basic insulation type, Ethernet network to backplane No isolation between USB and backplane Type tested @ 510V AC for 60 s	30V (continuous), basic insulation type, Ethernet network to backplane No isolation between USB and backplane Type tested @ 853V AC for 60 s	30V (continuous), basic insulation type, Ethernet network to backplane Type tested @ 707V DC for 60 s	
Slot width	1				
Module location	Chassis-based, any slot				
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17				
Power supply, standard	1756-PA72/C, 1756-PA75/B, 1756-PB72/C, 1756-PB75/B, 1756-PC75/B, 1756-PH75/B				
Power supply, redundant	1756-PA75R, 1756-PB75R, 1756-PSCA2				
Ethernet port	1 Ethernet fiber	1 Ethernet RJ45 Category 5		1 Ethernet RJ45 Category 5	
Ethernet cable	Multimode fiber, LC connector	802.3 compliant shielded or unshielded twisted pair			
USB port ⁽¹⁾	USB 1.1, full speed (12 Mbps)			—	
Wire category ⁽²⁾	3 - on USB ports	2 - on Ethernet ports 3 - on USB ports		2 - on Ethernet ports	
North American temperature code	T4A				
IEC temperature code	T4				
Enclosure type rating	None (open-style)				
Transmitter launch power at Beginning of Life (BOL), min Allow -1 dB at End of Life (EOL)	-19 dBm into 62.5/125 μ m fiber, N/A = 0.275 -22.5 dBm into 50/125 μ m fiber, N/A = 0.20	—			

(1) The USB port is intended for temporary local programming purposes only and not intended for permanent connection. Do not use the USB port in hazardous locations.

(2) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Table 2 - Environmental Specifications - 1756 EtherNet/IP Modules

Attribute	1756-EN2F	1756-EN2T	1756-EN2TR, 1756-EN3TR	1756-ENBT, 1756-EWEB
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)			
Temperature, surrounding air, max	60 °C (140 °F)			
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)			
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged damp heat)	5...95% noncondensing			
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz			
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g			
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g			
Emission CISPR 11	Group 1, Class A			
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges			
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz			10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 1V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	—	±2 kV at 5 kHz on Ethernet ports	±3 kV at 5 kHz on Ethernet ports	±2 kV at 5 kHz on Ethernet ports
Surge transient immunity IEC 61000-4-5	—	±2 kV line-earth (CM) on Ethernet ports		
Conducted RF immunity IEC 61000-4-6	—	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz		

Table 3 - Certifications - 1756 EtherNet/IP Modules

Certification ⁽¹⁾	1756-EN2F, 1756-EN2T	1756-EN2TR, 1756-EN3TR	1756-ENBT	1756-EWEB
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.			
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.	—	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.	—
CE	European Union 2004/108/IEC EMC Directive, compliant with: <ul style="list-style-type: none"> EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) 			
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS CISPR 11; Industrial Emissions			
Ex	European Union 94/9/EC ATEX Directive, compliant with the following: <ul style="list-style-type: none"> EN 60079-15; Potentially Explosive Atmospheres, Protection "n" EN 60079-0; General Requirements II 3 G Ex nA IIC T4X 			
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations			
TÜV	—	—	TÜV Certified for Functional Safety: Capable of SIL 2	—
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications			

(1) When product is marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

Table 4 - Technical Specifications - 1756 EtherNet/IP-XT Module

Attribute	1756-EN2TXT
EtherNet/IP communication rate	10/100 Mbps
Logix communication connections	256
TCP/IP communication connections	128
Current draw @ 5.1V DC	1 A
Current draw @ 24V DC	3 mA
Power dissipation	5.2 W
Power consumption	17.7 BTU/hr
Isolation voltage	30V (continuous), basic insulation type, Ethernet network to backplane No isolation between USB and backplane Type tested @ 853V AC for 60 s
Slot width	1
Module location	Chassis-based, any slot
Chassis	1756-A4LXT, 1756-A5XT, 1756-A7LXT
Power supply, standard	1756-PAXT, 1756-PBXT
Power supply, redundant	None
Ethernet port	1 Ethernet RJ45 Category 5
Ethernet cable	802.3 compliant shielded or unshielded twisted pair
USB port ⁽¹⁾	USB 1.1, full speed (12 Mbps)

Table 4 - Technical Specifications - 1756 EtherNet/IP-XT Module (Continued)

Attribute	1756-EN2TXT
Wire category ⁽²⁾	2 - on Ethernet ports 3 - on USB ports
North American temperature code	T4A
IEC temperature code	T4
Enclosure type rating	None (open-style)

(1) The USB port is intended for temporary local programming purposes only and not intended for permanent connection. Do not use the USB port in hazardous locations.

(2) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Table 5 - Environmental Specifications - 1756 EtherNet/IP-XT Module

Attribute	1756-EN2TXT
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-25...70 °C (-13...158 °F)
Temperature, surrounding air, max	70 °C (158 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged damp heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8k V air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on Ethernet ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on Ethernet ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Table 6 - Certifications - 1756 EtherNet/IP-XT Module

Certification ⁽¹⁾	1756-EN2TXT
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/IEC EMC Directive, compliant with the following: <ul style="list-style-type: none"> EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with the following: <ul style="list-style-type: none"> EN 60079-15; Potentially Explosive Atmospheres, Protection "n" EN 60079-0; General Requirements II 3 G Ex nA IIC T4X
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications

(1) When product is marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

Accessories—Ethernet Network

Cat. No.	Description	Specifications
1585J-M8PBJM-x	Ethernet RJ45 patchcord x = 2 (2 m), 5 (5 m), or 10 (10 m)	8-conductor, Teal Riser PVC Cable (flex Rated cable also available)
1585J-M8CC-H	RJ45 insulation displacement connector (IDC)	0.128...0.325 mm ² (26...22 AWG), Cat. 6, IDC, no tool required
1585J-M8CC-C	RJ45 crimp connector with boot, qty = 50 pieces	0.128...0.205 mm ² (26...24 AWG), Cat. 5e, requires crimp tool for assembly
1585A-JCRIMP	Crimp tool	—
9300-RADES	Remote access dial-in kit	56 Kbps modem connection to devices on an Ethernet network

INSTRUCTION MANUAL

E L E C T R I C L E V E L C O N T R O L S

LINC-L471 • ~~LINC-L471SC~~ • ~~LINC-LV471~~ • ~~LINC-L971~~

*Recognized as a
world-class leader in
Electric & Pneumatic
level control switches,
flow indicators,
chemical metering
pumps, and
allied products.*

ELECTRIC LEVEL CONTROLS

PRODUCT DESCRIPTION

Scope Of This Manual:

This manual describes and provides instructions and parts lists for the LINC-L471, LINC-L471SC, LINC-LV471 and LINC-L971 Series Electric Level Controls.

Product Description:

Used as a high & low level control, the L471 & L471SC can activate alarms, provide a switch input for control systems, or perform a variety of desired electrical switch operations actuated by a liquid or liquid interface.

Operation:

As the float is moved by varying liquid height, a magnet is moved closer to or further away from a switch enclosure. As the magnet moves closer, a reed switch in the enclosure closes. As the magnet moves further away, the switch opens. The arm containing the magnet also acts as a counterweight for the float.

The float is small and will operate in liquids with a specific gravity as low as 0.4. The interface type float will operate with a specific gravity differential as low as 0.1. The small float permits an economical installation in locations where other controls would be cost prohibitive. With the optional relay mounted in an explosion-proof case, the control of larger electrical loads can be obtained. The manual override option allows the operator to manually move the float arm to the test switch position.

The SC Series is designed to eliminate the threaded control connection in mounting with the use of a bolted ring per API recommended practice RP14E. The external cage allows for installation of the control at any elevation.

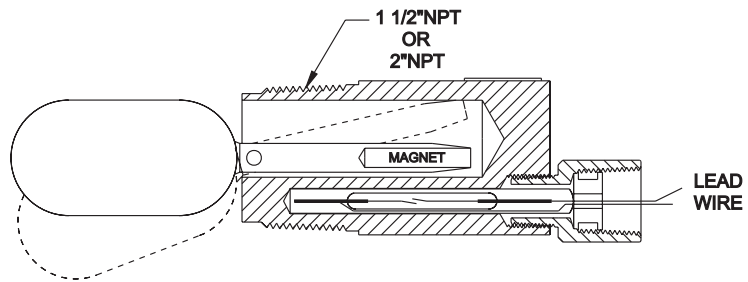


Figure 1

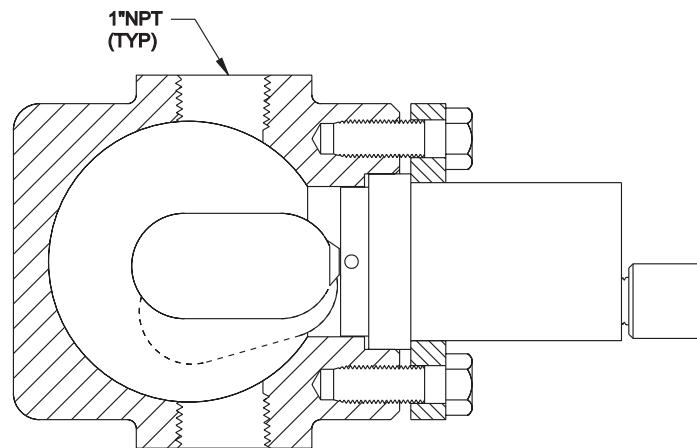


Figure 2

Features:

- All wetted parts isolated from the environment. These level controls are safe even in the event of fire.
- ***Certified as explosion proof for Hazardous Locations: Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; & Class III, Div. 1.**
- **All 316 stainless steel wetted parts provide corrosion resistance.** Also available in Monel, Kynar and other plastics.
- Our sealed switch assembly prevents dust, dirt, or moisture from affecting the level control's operation. Classified "Factory Sealed" by CSA/NRTL/C.
- Cartridge switch assembly provides easy field replacement and servicing.
- High or low alarm, normally open or normally closed operation simply by inverting the level control.

*When a relay assembly is used, Class I, Div. 1, is limited to groups C and D.

LINC

LEVEL CONTROL

ELECTRIC LEVEL CONTROLS

I N S T A L L A T I O N

Installation

Before installing the level control, inspect the unit for any damage. The float arm must pivot freely. Thread the level control into the desired connection. See Figure 3 for suggested installations. The float requires a minimum clearance of 1 1/4" from the center line of the unit for proper operation. For operation as a high level alarm, the conduit connection must be positioned to the lowest possible location. For operation as a low level alarm, the conduit connection must be positioned to the highest possible location. Wiring connections may now be made. Do not allow the wiring connections to pull on the switch assembly.

Caution: Do not exceed switch ratings.

LINC-L471, LINC-L471SC:
SPST, 100 VA AC with 3
AMP inrush capability,
maximum 250 volts.

Breakdown voltage is 300 volts. Electrical ratings are given for resistive loads. For inductive loads, de-rate the switch rating by 50% and do not exceed the VA ratings on the inrush current. If the applied load is inductive, such as a relay or coil, then a protective device should be used to prevent "inductive

kick," which may burn the switch contacts. The protective device recommended is dependent on the voltage used. For DC operation, a diode similar to an IN34A should be wired in parallel with the switch. See Figure 4, wiring schematic. For AC operation, a Varistor should be wired in parallel with the switch. Recommended Varistor for

110 VAC is a G.E. #V150-LA1 and for 220 VAC a G.E. #V300-LA2. See Figure 4, Wiring Schematic.

For SPDT Switch Cartridge Wiring:

White - Common
Black - Normally Closed
Red - Normally Open

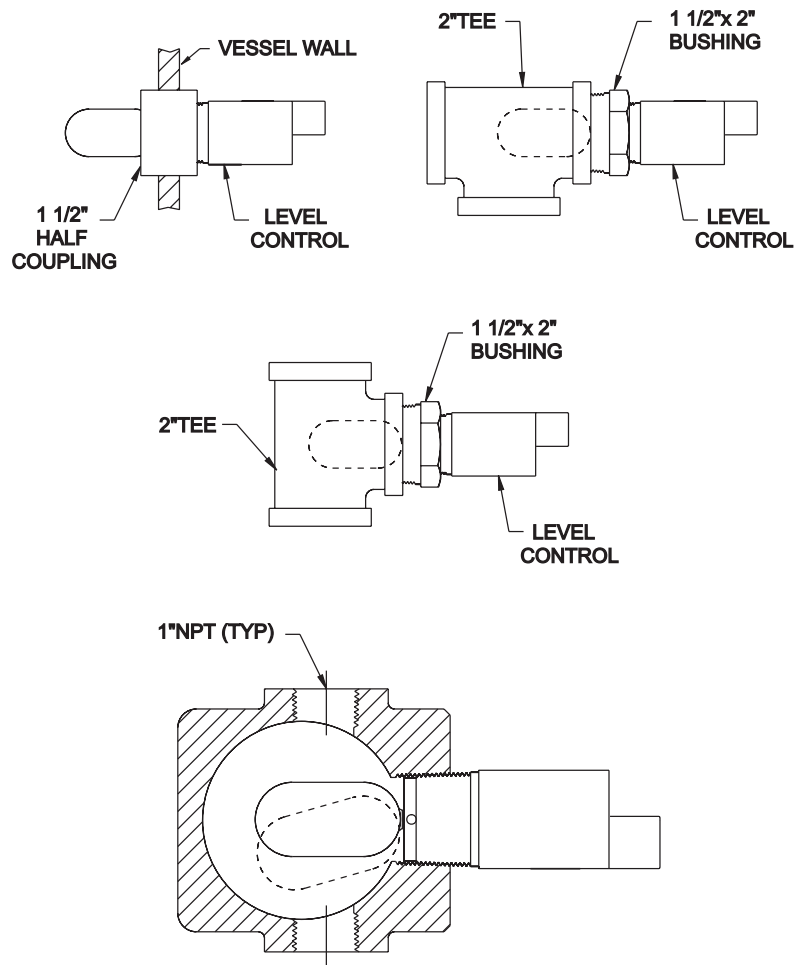


Figure 3

ELECTRIC LEVEL CONTROLS

M A I N T E N A N C E

Maintenance:

The LINC-L471 and LINC-L471SC Series electric level controls have been designed to be as maintenance free as possible. However, the component parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depend upon the severity of service conditions. Instructions are provided in this section for maintaining the controls as units, i.e., float and float arm, relay and switch cartridge.

All the maintenance procedures below assume that the control has been removed from service. The switch and relay can be serviced with the control installed. The power must be disconnected before removing the relay enclosure cover or opening the conduit fitting.

Float & Float Arm:

Check the physical clearance for float operation. The float must swing freely. Solvent cleaning of the float arm chamber may be required if used in viscous or dirty liquids. If the float has collapsed or is perforated, unscrew the float from the float arm and replace with a new float. Use Loctite® to secure the float to the float arm. To remove the float arm,

drive out the pivot pin using a 1/8" punch. When installing the float arm, make certain that the threaded offset of the float arm is against the thick wall of the body.

Relay:

To test for proper relay function, disconnect the switch leads from the relay socket. Apply appropriate voltage to the coil terminals and observe the relay contact closure with an ohmmeter connected across the common and normally closed contacts. Interrupt the coil power supply several times while observing the ohmmeter. No movement indicates a defective relay, coil or contacts. This procedure should be repeated for each set of contacts in service.

To remove a defective relay, simply pull the relay from the socket and replace with a new relay.

When ordering a replacement relay, be certain to specify coil voltage. After installing a new relay, reconnect the switch leads.

Switch:

To test for switch malfunction, connect an ohmmeter across the electrical leads and observe the meter as the float assembly is mechanically operated. No meter move-

ment indicates a switch failure.

To replace a switch on the LINC-L471 or LINC-L471SC Series, pull out the switch cartridge along with the grommet through the conduit adapter. Slide the new switch cartridge into the body. Route the switch wired through the grommet and seat the grommet in the conduit adapter.

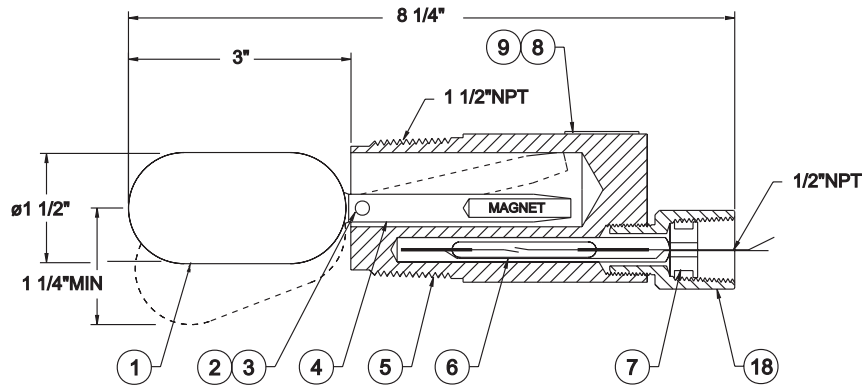
LINC

LEVEL CONTROL

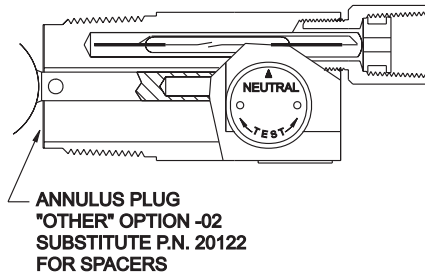
® Loctite is a trademark of the Loctite Corporation

ELECTRIC LEVEL CONTROLS

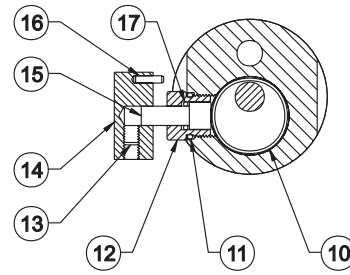
L I N C - L 4 7 1 - 0 1



Model LINC-L471-01



ANNULUS PLUG
"OTHER" OPTION -02
SUBSTITUTE P.N. 20122
FOR SPACERS



MANUAL OVERRIDE, STANDARD BODY
Body Style -2, -4

Model	L471-01	L471-21	Description	Material	Qty
1	10245	10245	Float	316 ss	1
2	20120	20120	Pin	316 ss	1
3	20121	20121	Spacer	316 ss	2
4	20853	24883	Float Arm Assembly	316 ss	1
5	30313	30715	Body	316 ss	1
6*	20495	20495	Switch Cartridge	304 ss	1
7	10087	10087	Grommet	Nitrile	1
8	10012	10012	Name Plate	316 ss	1
9	10324	10324	Drive Screw (not shown)	18-8 ss	4
10		24885	Ring Weldment	316 ss	1
11		10996	O-Ring	Fluorocarbon	1
12		22271	Packing Gland	316 ss	1
13		10621	Set Screw	18-8 ss	1
14		22577	Knob	303 ss	1
15		24875	Stem	316 ss	1
16		11192	Roll Pin	18-8 ss	3
17		10108	O-Ring	Fluorocarbon	1
18	20119	20119	Conduit Adapter	303 ss	1
19		11193	Name Plate (not shown)	Sealed	1
20	24834	24834	Switch Cartridge SPST 500°F (Optional)	Sealed	1
21	24835	24835	Switch Cartridge SPDT 500°F (Optional)	Sealed	1
22	24836	24836	Switch Cartridge SPDT 400°F (Optional)	Sealed	1

*Recommended spare

LINC
LEVEL CONTROL

ELECTRIC LEVEL CONTROLS

ELECTRIC RELAYS

Installation & Maintenance:

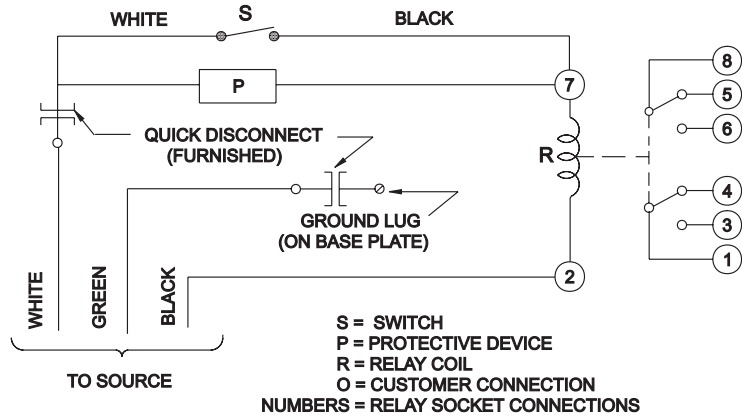
- AC Voltage DPDT Plug-In Type Relay Or DC Voltage DPDT Plug-In Type Relay:
 1. Check the relay coil to assure it is rated for your source voltage.
 2. Connect one side of the source to the white wire within the enclosure using accepted electrical practices. Connect the other side of the source (black wire) terminal #2.
 3. The load may now be wired to terminals #1, #3, #4 and #8, #5 and #6.
 4. Secure the enclosure cover prior to applying source voltage.
 5. Apply source voltage.

For use in an SPDT function, follow the above instructions, except omit connections for the load to terminals #8, #5, and #6.

Caution: On DC applications, the protective device is directional. If polarity is reversed, the switch could be damaged.

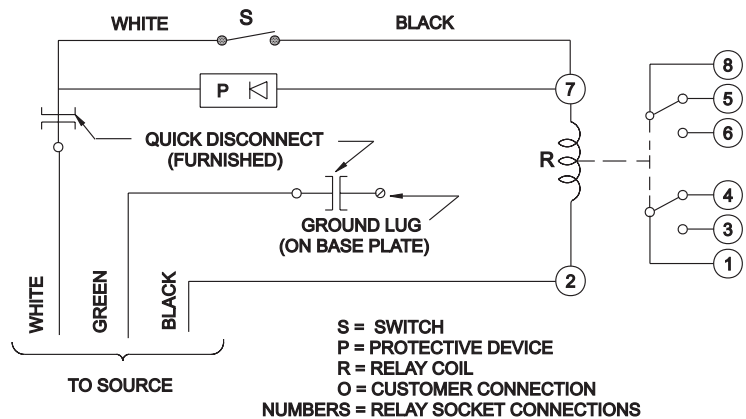
WIRING SCHEMATIC

FOR AC VOLTAGE DPDT, PLUG-IN TYPE RELAY

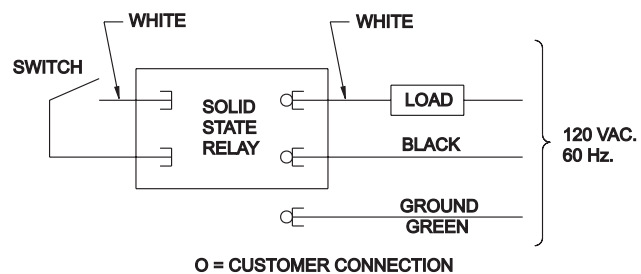


WIRING SCHEMATIC

FOR DC VOLTAGE DPDT, PLUG-IN TYPE RELAY



SOLID STATE RELAY WIRING SCHEMATIC



LINC

LEVEL CONTROL

FS-200 Series – General Purpose, Straight-Through Flow Path



Flow Rate Settings: Fixed: 0.5 GPM to 100.0 GPM
Adjustable: 1.0 GPM to 15.0 GPM

Port Size: 1" NPT to 2" NPT

Primary Construction Material: Bronze or Stainless Steel

Setting Type: Fixed or Adjustable

The FS-200 Series offers accurate flow detection, with 1% repeatability, over a broad range of flow settings and port sizes. Its durable construction delivers long-life reliability in either water or oil. Generous flow paths keep pressure drop low. These switches are ideal for detection of improper flow rates in high volume lubrication, cooling or process systems.

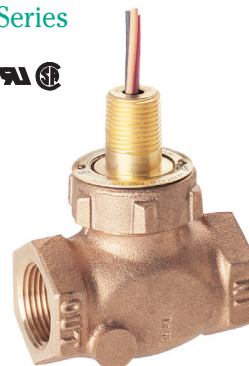
FS-200 Adjustable Series switches offer the same accuracy and are as rugged as those with fixed settings, but provide one additional feature: external adjustability. With these versatile switches your choice of flow settings is diverse within a given range. An ordinary, flat-blade screwdriver is all that's required for the actuation adjustment.

Specifications

Wetted Materials	
Housing	
FS-200	Bronze or 316 Stainless Steel
FS-200 Adjustable	Bronze
Shuttle	
	Teflon®
Bonnet	
	Bronze or Stainless Steel
Spring	
	316 Stainless Steel
Other Wetted Parts	
	Viton®, Ceramic
Pressure Rating	
Operating	400 PSIG (27.6 bar) @ 100°F (37.8°C)
Proof	800 PSIG (55.2 bar) @ 100°F (37.8°C)
Operating Temperature	
FS-200	-20°F to +300°F (-29°C to +148.9°C)
FS-200 Adjustable	-20°F to +200°F (-29°C to +93.3°C)
Repeatability	1% Maximum Deviation
Set Point Accuracy	±10%
Set Point Differential	15% Maximum
Switch*	SPDT, 20 VA
Electrical Termination	No. 18 AWG, 24" L., Polymeric Lead Wires Red NC, Black Common, Orange NO

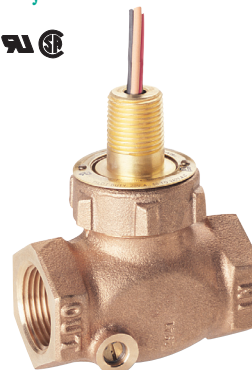
*See "Electrical Data" on Page X-5 for more information.

FS-200 Series



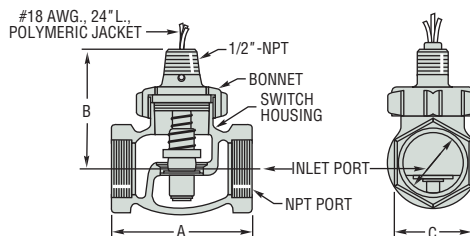
U.L. Recognized
File No. E31926
CSA Listed —
File No. LR30200
and LR22666
FM Approved —
File No. 0A8A3.AE
and 1H3A2.AX

FS-200 Adjustable



U.L. Recognized
File No. E31926
CSA Listed —
File No. LR22666
FM Approved —
File No. 0Q2A8.AE

Dimensions



Model	Port Size NPT	A inch (mm)	B inch (mm)	C Hex inch (mm)
FS-200 and FS-200 Adjustable	1"	3-1/4 (82.6)	3 (76.2)	1-25/32 (45.2)
	1-1/4"	4 (101.6)	3-3/16 (80.9)	2-3/16 (55.5)
	1-1/4" ss	4-1/2 (114.3)	3-3/16 (80.9)	2-3/16 (55.5)
	1-1/2"	4-1/2 (114.3)	3-1/2 (88.9)	2-1/2 (63.5)
	2"	5-3/8 (136.5)	4 (101.6)	3-3/32 (78.5)

Notes:

- Adjustable versions available in 1 inch port sizes only.
- Standard calibration is in water with units in a horizontal position.
- Viscosity changes will affect setpoints. Typically, as viscosity increases setpoints will decrease.
- Consult Gems for special applications.

How To Order – Standard Models

Specify Part Number for the FS-200 Series based on desired housing material, port size and flow setting, or based on flow setting range for FS-200 Adjustable versions.

FS-200 Series

Port Size NPT	Flow Setting GPM	Part Numbers	
		Bronze	Stainless Steel
1"	0.5	27051 ⚡	27059 ⚡
	1	27052 ⚡	27060
	2	27053 ⚡	27061
	3	27054 ⚡	27062
	4	27055 ⚡	27063
	5	27056 ⚡	27064
	6	27057 ⚡	27065
	8	27058 ⚡	27066
1-1/4"	1	27067 ⚡	27076
	2	27068	27077
	4	27069	27078
	6	27070	27079
	8	27071	27080
	10	27072	27081
	12	27073	27082
	16	27074	27083
20	27075	27084	

Port Size NPT	Flow Setting GPM	Part Numbers	
		Bronze	Stainless Steel
1-1/2"	1.5	27085 ⚡	27093
	3	27086	27094
	5	27087	27095
	7.5	27088	27096
	10	27089	27097
	15	27090	27098
	20	27091	27099
	30	27092	27100
2"	2	27101 ⚡	27109
	4	27102	27110
	5	27103	27111
	10	27104	27112
	15	27105	27113
	25	27106	27114
	35	27107	27115
	50	27108	27116

FS-200 Adjustable

Port Size NPT	Flow Setting Adjustment Range GPM	Part Numbers
1"	1.0-6.0	26615 ⚡
	5.0-15.0	26616 ⚡
	2.0-8.0	26838 ⚡

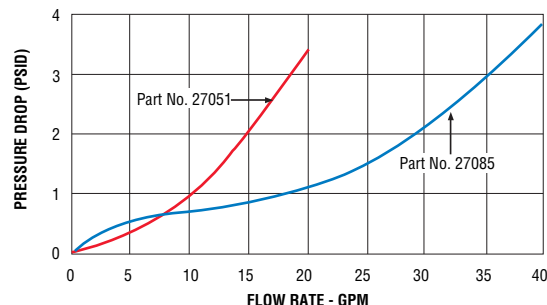
Notes:

- Flow settings for fixed versions are calibrated using water at +70°F on increasing flow, with units in a horizontal position (lead wires up). Consult factory regarding special flow setting calibration, or liquids other than water. Temperature changes will slightly affect the flow settings listed. Oil flow settings will vary with viscosity.
- Adjustable units that are set to customer specification are subject to GEMS test stand accuracy.
- Use of 150 micron filtration is recommended.
- Minimum 5 PSI line pressure required.

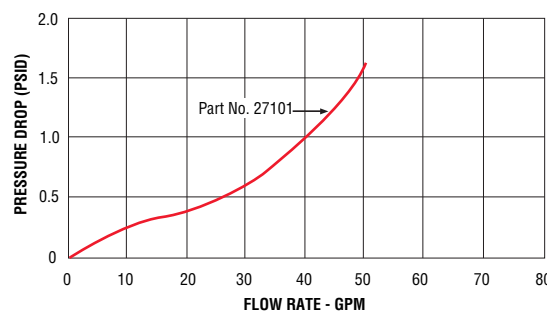
⚡ – Stock Items.

Pressure Drop - Typical

1" NPT and 1-1/2" NPT Ports



2" NPT Ports



Tests conducted with units in horizontal position (lead wires up) with water at +70°F (21°C).

FS-200 Series Flow Switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous areas.



They are also available with FM-approved, explosion-proof junction box for Class I, Division 1, Group D hazardous locations. Units must be completely assembled at GEMS.

U.L. Approved — File No. E183854

For Remote Alarms – See Page E-30

- Adjustable Volume
- Indoor Outdoor
- Solid-State



B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic



FEATURES

B-Series switches have proven reliable in such harsh environments as:

- Offshore oil rigs
- Chemical and petrochemical plants
- Pulp and paper mills
- Steel mills
- Power plants
- Water and sewage-treatment plants
- Other corrosive environments

Ashcroft Inc. supplies highly reliable Ashcroft® switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Ashcroft's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away.

The Ashcroft B-Series switch line is designed to satisfy most switch requirements. Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than 20 years of service in the world's plants and mills. Special designs are available for fire safety, NACE, limit control and other more stringent requirements. Simplicity and ease of use are stressed to improve reliability of the installation.

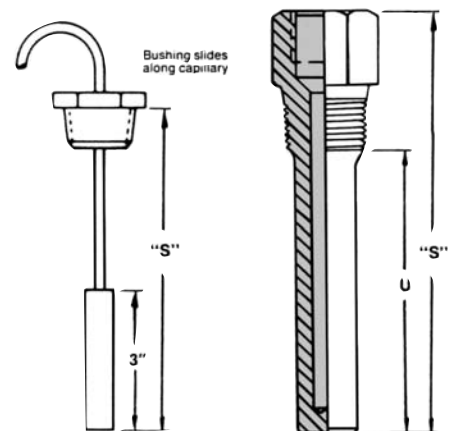
Applications include: pumps, compressors, washers, filters, degreasers, evaporators, recovery systems, food processing, ground support equipment, reverse osmosis systems, heat exchangers, hydraulic systems, lubrication systems, marine equipment, textile machinery, heating and air conditioning equipment.

Thermowells

Thermowells must be used on any application where the stem of the temperature switch may be exposed to pressure, corrosive fluids or high velocity. Additionally, the use of a thermowell permits instrument interchange or calibration check without disturbing or closing down the process.

Ashcroft temperature switches have bulb diameters to match $\frac{3}{8}$ " nominal bore thermowells. The bulbs have a sensitive portion length of 2" which can be used with $2\frac{1}{2}$ " "U" dimensioned thermowells or longer. For maximum accuracy, a thermowell's "U" dimension should be selected to permit complete immersion of the sensitive portion plus 1" when measuring the temperature of liquids; an extra 3" should be allowed when measuring the temperature of gases.

Thermowell bushings should be used with remote mount temperature switches. We recommend the standard 3" bulb and code 69 Series bushings for use with any thermowell "U" dimension. A split rubber grommet allows easy installation and "S" dimension adjustment.



B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Temperature Switches

B-Series temperature switches feature a SAMA Class II vapor pressure thermal system. This system provides quick, accurate response to process temperature changes with negligible ambient temperature effects. This is inherent in the design due to the precise relation-

ship that exists between temperature and pressure according to the vapor pressure laws. A wide selection of sensing bulb and armored capillary lengths is available. The vapor pressure system design features small bulb sizes, making installation easy and cost-effective.

All models feature $\pm 1.0\%$ percent of

span setpoint repeatability with very high overtemperature ratings.

These standard designs perform well in applications where shock and vibration could be a problem and should be used with Ashcroft thermowells for bulb protection and ease of installation and maintenance.

STANDARD TEMPERATURE RANGE SELECTION

Nominal Range ⁽¹⁾		Maximum Temperature	Approximate Deadband ⁽¹⁾ Switch Element				
°F	°C		°F	20, 26, 27	21, 24, 31	50	22
-40 to 60	-40 to 16	400	1.0-2.0	3.0-8.0	1.5-5.5	1.4-6.0	8.0-16.0
0 to 100	-20 to 40	400	1.5-3.0	5.0-12.0	2.2-8.5	1.5-7.5	9.0-20.0
75 to 205	20 to 95	400	1.5-3.5	8.0-16.0	2.5-12.0	2.0-9.0	10.0-24.0
150 to 260	65 to 125	400	1.5-3.0	5.0-12.0	2.2-8.5	2.0-9.0	10.0-24.0
235 to 375	110 to 190	500	1.5-3.5	5.0-12.0	2.5-8.5	2.0-9.0	10.0-24.0
350 to 525 ⁽³⁾	175 to 275	700	2.0-4.5	8.0-16.0	3.2-12.0	2.5-10.0	15.0-34.0
500 to 750 ⁽²⁾	260 to 400	900	4.0-8.0	16.0-30.0	7.2-24.0	5.0-23.0	30.0-50.0

NOTES:

- 1 All deadbands given in °F.
- 2 Available with remote mount thermal systems only.
- 3 Not available with 2 $\frac{3}{4}$ " stem.
- 4 Dual switch element multiply single switch element value by 1.6 for approximate deadband.
- 5 Set and reset points must fall within the adjustable range.

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Pressure & Differential Pressure Switches

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for

of construction.

All standard models feature ± 1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in applications where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

maximum reliability. This design is available in 316 SS or Monel. Differential pressure models use a unique, dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H₂O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials

PRESSURE/VACUUM SWITCHES

Nominal Range ⁽¹⁾			Overpressure Ratings		Approximate Deadband ⁽²⁾ Switch Element				
			Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32, 42
Vacuum									
-30" Hg	-760mm Hg	-100 kPa	250	400	0.3-0.7	1.5-3.0	0.5-2.2	0.4-1.5	2.1-4.2
Compound									
-15" H ₂ O	-375mm H ₂ O	-3.7 kPa	20	35	0.15-.75/	1.5-2.5/	0.45-2.0/	0.5-1.2/	2.1-3.5/
15" H ₂ O	375mm H ₂ O	3.7 kPa			0.15-.75	1.5-2.5	0.45-2.0	0.5-1.2	2.1-3.5
-30" H ₂ O	-760mm H ₂ O	-7.5 kPa	20	35	0.30-.60/	1.5-2.5/	0.45-2.0/	0.5-1.5/	2.1-3.5/
30" H ₂ O	760mm H ₂ O	7.5 kPa			0.30-.60	1.5-2.5	0.45-2.0	0.5-1.5	2.1-3.5
-30" Hg	-760mm Hg	-100 kPa			0.5-1.0/	2.0-3.0/	0.75-2.5/	0.7-1.8/	2.8-4.2/
15 psi	1.0 kg/cm ²	100 kPa	250	400	0.3-0.7	0.5-1.5	0.5-1.0	0.7-1.4	0.7-2.1
-30" Hg	-760mm Hg	-100 kPa			1.0-1.5/	3.0-6.0/	1.2-4.5/	1.4-2.4	4.2-8.4/
30 psi	2.0 kg/cm ²	200 kPa	250	400	0.3-0.8	1.0-2.0	0.7-1.5	0.4-1.3	1.4-2.8
-30" Hg	-760mm Hg	-100 kPa			2.0-3.0/	5.0-9.0/	2.5-7.0/	2.8-4.5	7.0-12.0/
60 psi	4.0 kg/cm ²	400 kPa	250	400	0.7-1.5	3.0-5.0	1.1-4.0	1.0-2.3	4.2-7.0
Pressure									
10" H ₂ O	250mm H ₂ O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30" H ₂ O	750mm H ₂ O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60" H ₂ O	1500mm H ₂ O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100" H ₂ O	2500mm H ₂ O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150" H ₂ O	3750mm H ₂ O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15 psi	1.0 kg/cm ²	100 kPa	500	1500	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30 psi	2.0 kg/cm ²	200 kPa	500	1500	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60 psi	4.0 kg/cm ²	400 kPa	500	1500	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100 psi	7.0 kg/cm ²	700 kPa	1000	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200 psi	14 kg/cm ²	1400 kPa	1000	3000	1-3	5-13	2-9	3.0-7.5	7.0-18.2
400 psi	28 kg/cm ²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600 psi	42 kg/cm ²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	12.6-42
1000 psi	70 kg/cm ²	7000 kPa	12000	18000	7-30	30-110	18-70	15-80	42-154
3000 psi	210 kg/cm ²	2100 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-329

DIFFERENTIAL PRESSURE SWITCHES

Nominal Range ⁽¹⁾			Pressure Ratings		Approximate Deadband ⁽²⁾ Switch Element				
			Static Working Pressure	Proof psi	20, 26, 27	21, 24, 31	50	22	32, 42
30" H ₂ O	750mm H ₂ O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60" H ₂ O	1500mm H ₂ O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100" H ₂ O	2500mm H ₂ O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150" H ₂ O	3750mm H ₂ O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0
15 psid	1.0 kg/cm ²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0
30 psid	2.0 kg/cm ²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0
60 psid	4.0 kg/cm ²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5
100 psid	7.0 kg/cm ²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0
200 psid	14.0 kg/cm ²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0
400 psid	28.0 kg/cm ²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0
600 psid	42.0 kg/cm ²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	112.0-210.0

Values shown are for zero static working pressure.

NOTES:

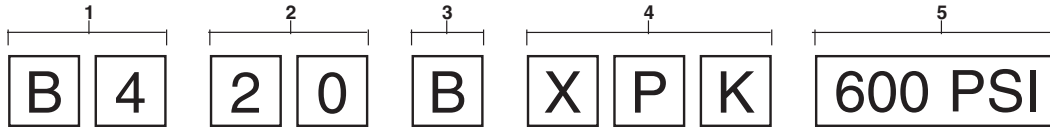
- Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where setpoints must be lower.
- All deadbands are given in English units as shown in the nominal range column. Deadbands shown are for switches with Buna N diaphragm. Approximate deadbands for optional diaphragms:

Viton: Multiply Buna N value by 1.4
Teflon: Multiply Buna N value by 1.2
Stainless Steel: Multiply Buna N value by 1.7
Monel: Multiply Buna N value by 1.7
Dual Switch Element: Multiply single switch element value by 1.6 for approximate deadband.

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES PRESSURE AND DIFFERENTIAL PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.



1 – ENCLOSURE	
B4	Pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
B7	Pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.
D4	Differential pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
D7	Differential pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION		
Order Code	Switch Elements UL/CSA Listed SPDT	
20⁽⁷⁾	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22⁽⁶⁾	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24⁽¹⁾	General purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc; 6A, 30 Vdc
25⁽²⁾	Heavy duty dc	10A, 125 Vac or dc, 1/8 HP, 125 Vac or dc
26⁽⁷⁾	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28⁽⁵⁾	Manual reset trip on increasing	15A, 125/250 Vac
29⁽⁵⁾	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A, 125 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed switch, gold contacts	1A, 125 Vac
50	Variable deadband	15A, 125/250 Vac

3 – ACTUATOR SEAL					
Code and Material	Process Temperature Limits °F ⁽⁹⁾	Range			
		Vac. "H ₂ O	0-600 psi	1000 psi	3000 psi
B – Buna-N	0 to 150	•	•	•	•
V – Viton	20 to 300	•	•	•	
T – Teflon	0 to 150	•	•	•	•
S – 316L ⁽⁸⁾	0 to 300		•	•	
P – Monel ⁽⁸⁾	0 to 300		•	•	

4 – OPTIONS
Use table from page 6

5 – RANGE
Select from table on page 4

UL/CSA Listed Dual (2 SPDT)		
61⁽⁷⁾	Dual narrow deadband	15A, 125/250 Vac
62⁽⁷⁾	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
67^(4,6)	Dual hermetically sealed switch, narrow deadband	5A, 125/250 Vac
68⁽⁴⁾	Dual hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
70	Dual low level gold contacts	1A, 125 Vac
71⁽⁴⁾	Dual hermetically sealed switch, gold contacts	1A, 125 Vac

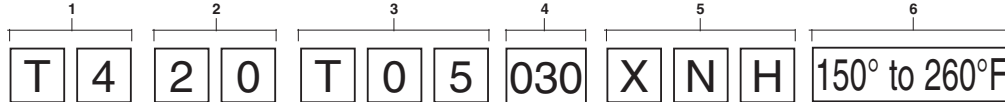
NOTES:

- Standard switch.
- Not available with psid ranges.
- Dual switches are 2 SPDT snap-action switches, not independently adjustable.
- Wires cannot be terminated inside B400 switch enclosure.
- Not available with type 700 enclosure.
- Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
- Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
- Available on pressure only.
- Ambient operating temperature limits –20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70°F reference.

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES TEMPERATURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.



1 – ENCLOSURE	
T4	Temperature switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
T7	Temperature switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION		
Order Code	Switch Elements UL/CSA Listed SPDT	
20⁽⁷⁾	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22⁽⁶⁾	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24⁽¹⁾	General purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc; 6A, 30 Vdc
25	Heavy duty dc	10A, 125 Vac or dc, ⅛ HP, 125 Vac or dc
26⁽⁷⁾	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28⁽⁵⁾	Manual reset trip on increasing	15A, 125/250 Vac
29⁽⁵⁾	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A, 125 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed gold contacts	1A, 125 Vac
50	Variable deadband	15A, 125/250 Vac
UL/CSA Listed Dual (2 SPDT)		
61⁽⁷⁾	Dual narrow deadband	15A, 125/250 Vac
62⁽⁷⁾	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
67^(4,6)	Dual hermetically sealed switch, narrow deadband	5A, 125/250 Vac
68⁽⁴⁾	Dual hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
70	Dual low level gold contacts	1A, 125 Vac
71⁽⁴⁾	Dual hermetically sealed switch, gold contacts	1A, 125 Vac

3 – THERMAL SYSTEM SELECTION			
Direct Mount			
Order Code	System Material	Style	
TS	316 SS	Rigid	
Remote Mount			
Order Code	System Material	Line Length	Style ⁽⁹⁾
T05	316 SS	5'	Capillary with 302 SS Spring Armor
T10	316 SS	10'	
T15	316 SS	15'	
T20	316 SS	20'	
T25	316 SS	25'	

4 – BULB LENGTH SELECTION		
Direct Mount		
Order Code	“S” Dimension	Minimum Thermowell “U” Dimension
027⁽⁸⁾	2¾”	–
040	4”	2½”
060	6”	4½”
090	9”	7½”
120	12”	10½”
Remote Mount		
030⁽⁹⁾	3”	2½”

5 – OPTIONS
Use table on page 7

6 – STANDARD TEMPERATURE RANGE SELECTION	
Adjustable Range	
°F	°C
–40 to 60	–40 to 16
0 to 100	–40 to 40
75 to 205	20 to 95
150 to 260	65 to 125
235 to 375	110 to 190
350 to 525	175 to 275
500 to 750 ⁽²⁾	260 to 400

NOTES:

- 1 Standard switch.
- 2 Available with remote mount thermal systems only.
- 3 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
- 4 Wires cannot be terminated inside T400 switch enclosure.
- 5 Not available with Type 700 enclosure.
- 6 Estimated dc rating, 2.5A, 28 Vdc (not UL listed).
- 7 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
- 8 Not available on 350 to 525°F.
- 9 Consult factory on remote mount for bulb lengths other than 3”.

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

B-SERIES HYDRAULIC PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.



1 – ENCLOSURE	
H4	Hydraulic pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION		
Order Code	Switch Elements UL/CSA Listed SPDT	
20⁽³⁾	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24⁽¹⁾	General purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc; 6A, 30 Vdc
25	Heavy duty dc	10A, 125 Vac or dc, 1/8 HP, 125 Vac or dc
26⁽³⁾	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28	Manual reset trip on increasing	15A, 125/250 Vac
29	Manual reset trip on decreasing	15A, 125/250 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed switch, gold contacts	1A, 125 Vac
UL/CSA Listed Dual (2 SPDT)		
61⁽³⁾	Dual narrow deadband	15A, 125/250 Vac
62⁽³⁾	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
70	Dual low level, gold contacts	1A, 125 Vac

3 – ACTUATOR SEAL		
Code and Material	Process Temperature Limits °F ⁽⁴⁾	
V – Viton	20 to 300	Viton O-Ring, Stainless Steel Pressure Connection

4 – OPTIONS
Use table from page 7

5 – STANDARD PRESSURE RANGE		
Range psi	Adjustable Setpoint Limits psi	Proof Pressure psi
1000	150-1000	12,000
2000	300-2000	12,000
3000	450-3000	12,000
5000	750-5000	10,000
7500	1125-7500	100,000

NOTES:

- Standard switch.
- Dual switches are 2 SPDT snap-action switches, not independently adjustable.
- Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
- Ambient operating temperature limits –20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70° F reference.

B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

OPTIONAL FEATURES AND ACCESSORIES

B-SERIES SWITCH OPTIONS								
Code	Description	Applicable Switch Series						
		Pressure		Differential Pressure		Temp-erature	H	Notes
		(psi)	(in. H ₂ O)	(psi)	(in. H ₂ O)	All Ranges		
XBP	Wall Mounting Bracket in. H ₂ O		•		•			
XBX	1/2" Male NPT Bushing					•		
XCH	Chained Cover	•	•	•	•	•	•	
XC8	CSA Approval	•	•	•	•	•	•	11
XCN	ATEX Directive 94/9/EC EEx d IIC T6	•	•	•	•	•		
XFM	FM Approval – Single Element	•	•	•	•			17
	FM Approval – Dual Element	•	•	•	•			17
XFP	Fungus Proofing	•	•	•	•	•	•	
XFS	Factory Adjusted Setpoint	•	•	•	•	•	•	2
XG3	Belleville Actuator	•						16,17
XG5	UL Limit Control to 150" H ₂ O				•			1, 17
XG6	UL Limit Control to 600 psi	•						1, 17
XG7	Secondary Chamber with Vent	•						13
XG8	Steam Limit Control to 300 psi	•						7
XG9	Fire Safe Welded Actuator	•						7
XHS	High Static Differential Pressure			•				15
XHX	High Pressure, 40 psi, (static) d/p only		•		•			
	160 psi (proof) d/p only							
	100 psi (proof) pressure only (" H ₂ O)							
XJK	Left Conduit Connection	•	•	•	•	•	•	9
XJL	3/4" to 1/2" Reducing Bushing	•	•	•	•	•	•	
XJM	Metric Electrical Conduit Connection M20 x 1.5	•	•	•	•	•	•	
XK3	Terminal Block (700 Series only)	•	•	•	•	•		6
XLE	6 foot Leads on the Micro Switch	•	•	•	•	•	•	
XNH	Tagging Stainless Steel	•	•	•	•	•	•	
XNN	Paper Tag	•	•	•	•	•	•	
XPK	Pilot Light(s) Top Mounted	•	•	•	•	•	•	4
XPM	3/4" Sealed Conduit Connection with 16" Lead Wires	•	•	•	•	•	•	
XTA	316 Stainless Steel Pressure Connection for in. H ₂ O Range		•		•			
XTM	2" Pipe Mounting Bracket	•	•	•	•	•		
XUD	316 Stainless Steel Pressure Conn.			•				
X06	Pressure Connection: 1/2 NPT Male, 1/4 NPT Female	•	•	•	•			5
	316 Stainless Steel (Combination)							
X07	1/2 NPTF Press. Conn., 316 SS	•	•	•	•			10
X6B	Cleaned for Oxygen Service	•	•	•				3
	Diaphragm Seal	•	•	•	•			

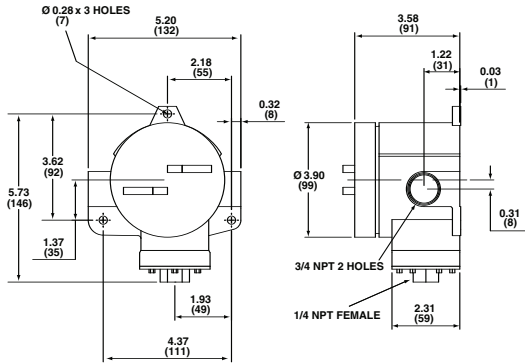
NOTES:

- 1 Buna N and Viton diaphragm.
- 2 Advise static or working pressure for differential pressure switches.
- 3 Buna N cannot be cleaned for oxygen service.
- 4 N/A on 700 Series.
- 5 Standard with 1000 and 3000 psi ranges. Bottom connection only on DP in H₂O ranges.
- 6 Terminal Blocks standard with 700 dual switches.
- 7 Stainless steel diaphragm only.
- 8 Pressure connection 1/4 NPTF.
- 9 Standard on 700 Series. N/A with DPDT element on 400 Series.
- 10 N/A with Monel diaphragm.
- 11 Standard on 400 Series.
- 12 N/A on 3000 psi range. Available with Teflon diaphragm only.
- 13 SS diaphragm required. Teflon diaphragm is the backup. NEMA 7 only.
- 14 Available in ranges vacuum to 600 psi. Not available with stainless steel or Monel diaphragm.
- 15 Buna N and Viton diaphragm – 15#D & 30#D only.
- 16 24, 32, 64 or 68 element only.
- 17 N/A on all combinations.
- 18 700 Series only.

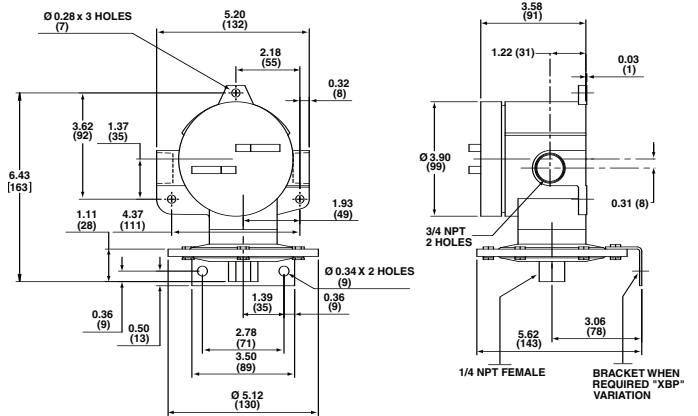
B-Series Switches – Pressure, Differential Pressure, Temperature & Hydraulic

Dimensions – 700 Series

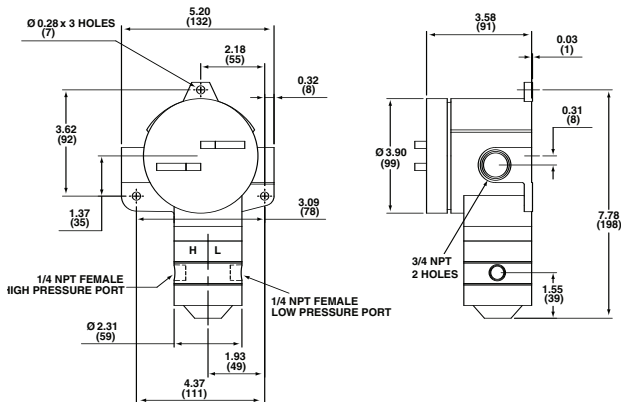
Pressure switch – psi ranges



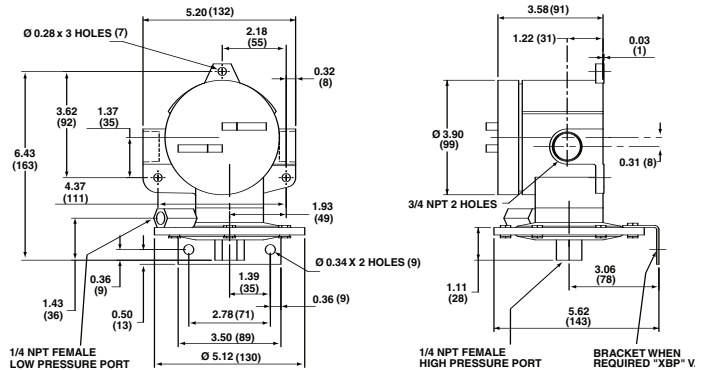
Pressure switch – inches of water ranges



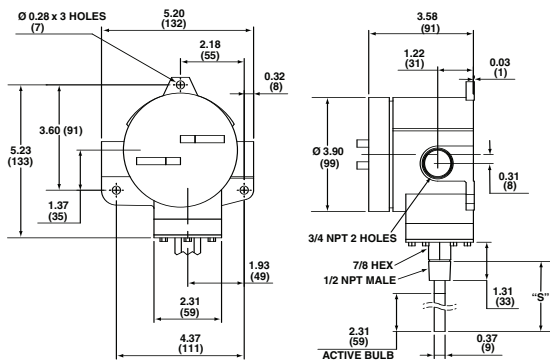
Differential pressure switch – psi differential ranges



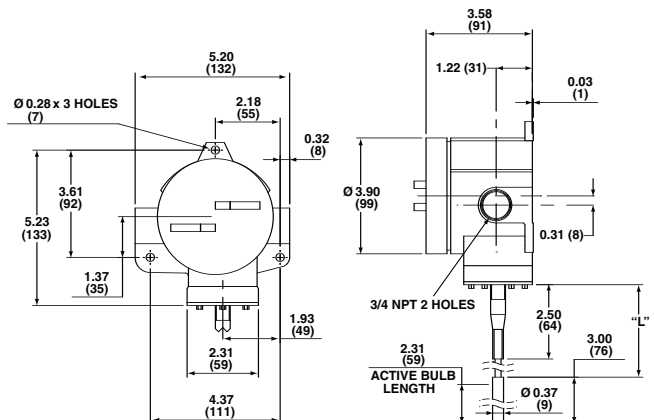
Differential pressure switch – inches of water ranges



Temperature switch – direct mount



Temperature switch – remote mount



Before You Begin

Before you begin using your ControlLogix controller, verify that you have the applications required to configure and program the controller.

Required Software

Use this table to identify the minimum software versions required to use your ControlLogix controller.

Table 3 - Required Software for Controller Use

Cat. No.	Studio 5000 Environment	RSLogix 5000 Software	RSLinX® Classic
1756-L61/A	—	Version 12.06.00 or later	Any version
1756-L61/B	—	Version 13.04.00 or later	
1756-L62/A	—	Version 12.06.00 or later	
1756-L62/B	—	Version 13.04.00 or later	
1756-L63/A	—	<ul style="list-style-type: none"> • If not using a CompactFlash card, version 10.07.00 or later • If using a CompactFlash card, version 11.16.00 or later 	
1756-L63/B	—	Version 13.04.00 or later	
1756-L63XT/B	—	Version 13.04.00 or later	Version 2.55.00 or later
1756-L64/B	—	Version 16.03.00 or later	Any version
1756-L65/B	—	Version 17.01.02 or later	
1756-L71/A	Version 21.00.00 or later	Version 20.01.02	Version 2.59.00 or later
1756-L72/A	Version 21.00.00 or later	Version 19.01.00 or later	Version 2.57.00 or later
1756-L73/A	Version 21.00.00 or later	Version 19.01.00 or later	
1756-L73XT/A	Version 21.00.00 or later	Version 19.01.00 or later	
1756-L74/A	Version 21.00.00 or later	Version 19.01.00 or later	
1756-L75/A	Version 21.00.00 or later	Version 19.01.00 or later	

ControlLogix Controller Features

The ControlLogix controllers are part of the Logix5000 family of controllers offered by Rockwell Automation. The sections that follow describe the differentiating features of the ControlLogix controllers.

System, Communication, and Programming Features

This table lists the system, communication, and programming features available with ControlLogix controllers.

Table 11 - ControlLogix Controller Features

Feature	1756-L61, 1756-L62, 1756-L63, 1756-L64, 1756-L65	1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75
Controller tasks	<ul style="list-style-type: none"> • 32 tasks • 100 programs/task • Event tasks: all event triggers 	
Communication ports	1 port - RS-232 serial	1 port - USB, 2.0 full-speed, Type B
Communication options	<ul style="list-style-type: none"> • EtherNet/IP • ControlNet • DeviceNet • Data Highway Plus™ • Remote I/O • SynchLink • Third-party process and device networks 	
Serial port communication	<ul style="list-style-type: none"> • ASCII • DF1 full/half-duplex • DF1 radio modem • DH-485 • Modbus via logic 	N/A
Controller connections supported, max	250	500
Network connections, per network module	<ul style="list-style-type: none"> • 100 ControlNet (1756-CN2/A) • 40 ControlNet (1756-CNB) • 256 EtherNet/IP; 128 TCP (1756-EN2x) • 128 EtherNet/IP; 64 TCP (1756-ENBT) 	
Controller redundancy	Full support except for motion applications	
Integrated motion	<ul style="list-style-type: none"> • Integrated Motion on the EtherNet/IP network • SERCOS interface • Analog options: <ul style="list-style-type: none"> – Encoder input – LDT input – SSI input 	
Programming languages	<ul style="list-style-type: none"> • Relay ladder • Structured text • Function block • Sequential Function Chart (SFC) 	

Memory Options

The ControlLogix controller is available in different combinations of user memory. Use this table to determine which controller meets your memory requirements.

Table 12 - ControlLogix Controller Memory Options

Controller	Memory for Data and Logic	I/O	Back-up Memory
1756-L61	2 MB	478 KB	CompactFlash card ⁽¹⁾
1756-L62	4 MB		
1756-L63, 1756-L63XT	8 MB		
1756-L64	16 MB		
1756-L65	32 MB		
1756-L71	2 MB	0.98 MB (1006 KB)	SD card
1756-L72	4 MB		
1756-L73, 1756-L73XT	8 MB		
1756-L74	16 MB		
1756-L75	32 MB		

(1) These nonvolatile memory cards are optional and do not come with the controller.

IMPORTANT The 1756-L7x controllers ship with an SD card installed. We recommend that you leave the SD card installed, so if a fault occurs, diagnostic data is automatically written to the card and can be used by Rockwell Automation to troubleshoot the anomaly.

IMPORTANT We recommend that you use the SD cards available from Rockwell Automation (catalog numbers 1784-SD1 or 1784-SD2).

While other SD cards may be used with the controller, Rockwell Automation has not tested the use of those cards with the controller. If you use an SD card other than those available from Rockwell Automation, you may experience data corruption or loss.

Also, SD cards not provided by Rockwell Automation may not have the same industrial, environmental, and certification ratings as those available from Rockwell Automation and may not survive in the same industrial environments as the industrially rated versions available from Rockwell Automation.

PRODUCT PROFILE

PanelView Plus 400 & 600 Family

Operator Interface

Advantages

- Provides maximum flexibility, inventory reduction, and easy upgrades
- Able to communicate with complete Logix suite of controllers
- Integrated with FactoryTalk View Machine Edition for advanced functionality including trending, expressions, data logging, advanced graphics, and direct browsing of Logix addresses
- Includes keypad, touch screen, or keypad/touch screen combination terminals for convenient and flexible operator input choices
- Includes CompactFlash card slot for transferring files, logging data, or system upgrades
- Includes complete package for immediate startup
- Offers unit level immediate exchange program to reduce downtime
- Powerful graphics providing clear and crisp visuals



Overview

PanelView Plus gives operators a clear view into monitoring and controlling applications. With FactoryTalk View Machine Edition already installed and activated, development time is greatly reduced. The PanelView Plus family of products provides a broad range of rugged terminals that offer premier integration with Integrated Architecture and common development software.

PanelView Plus 400 and 600 terminals combine a 4 or 6-inch display, logic module, memory, and power (AC or DC) together in the base unit. Powerful graphics are displayed via 18 bit color or 32 level grayscale displays. Flexible operator input is available through keypad, touch screen, or a keypad/touch screen combination.

All terminals offer an RS232 and USB port, plus an optional Ethernet port. Additional communication options allow you to take advantage of Remote I/O, DH485, DH+, DeviceNet, ControlNet and Isolated RS232.

Take advantage of these additional features on all units:

- Unique mounting mechanism requiring only a single die-cut and no special tools for installation
- Replaceable bezel ID labels for custom terminal or system identification
- Function key legend kit and software for customizing the function key legends of the PanelView Plus 600 keypad terminal

PRODUCT SPECIFICATIONS

	PanelView Plus 400 Grayscale	PanelView Plus 400 Color	PanelView Plus 600 Grayscale	PanelView Plus 600 Color
Display Type	Monochrome Passive Matrix, Film Compensated Super-Twist Nematic (FSTN)	Color Active Matrix Thin Film Transistor (TFT)	Monochrome Passive Matrix, Film Compensated Super-Twist Nematic (FSTN)	Color Active Matrix Thin Film Transistor (TFT)
Display Size	77 x 58 mm (3.7 in.)	71 x 53 mm (3.5 in.)	112 x 84 mm (5.5 in.)	112 x 84 mm (5.5 in.)
Resolution	320 x 240, 32 level grayscale	320 x 240, 18 bit color graphics	320 x 240, 32 level grayscale	320 x 240, 18 bit color graphics
Operator Input	Keypad	Keypad or Keypad/Touch Screen Combination	Keypad, Touch Screen, or Keypad/Touch Screen Combination	
Function Keys	8 (F1 - F8)	8 (F1 - F8)	10 (F1 - F10)	
Real Time Clock	Battery-backed time clock timestamps critical data. Accuracy +/- 2 minutes per month			
Memory Options Available Flash / RAM	Standard 64 MB / 64 MB, Not Expandable			
Electrical Communication Port	RS232 and (1) USB Only or Ethernet, RS232, (1) USB, plus optional DH485, DH+, or Remote I/O modules, ControlNet and DeviceNet modules			
Power Requirements	18-30V dc or 85-264V ac @ 47-63 Hz			
Power Consumption	dc Power: 25 Watts max. (1.0A @ 24V dc) ac Power: 60 VA max.			
Programming	FactoryTalk View Studio for Machine Edition or FactoryTalk View Studio Enterprise Series			
Environmental Operating Temperature	0-55° C (32-131° F)			
Storage Temperature	-25 - 70° C (-13 - 158° F)			
Humidity	5-95%, noncondensing @ 0-55° C			
Ratings	NEMA 12, 13, 4X, IP54, IP65			
Certifications	cUL certified; UL listed; Class I, Div 2, Groups A,B,C,D; Class II, Div 2, Groups F, G, Class III, T4, Class I Zone 2 Group IIC			
Mechanical Weight Keypad or Key / Touch	.563 kg (1.24 lb)	.635 kg(1.40lb)	.930 kg (2.05 lb)	.930 kg (2.05 lb)
Weight Touch only	N/A	N/A	.789 kg (1.74 lb)	.789 kg (1.74 lb)
Dimensions Overall (H x W x D)	Keypad: 152 x 185 x 90 mm (6.0 x 7.28 x 3.54 in)	Keypad or Keypad/Touch: 152 x 185 x 90 mm (6.0 x 7.28 x 3.54 in)	Keypad or Keypad/Touch: 167 x 266 x 98 mm (6.58 x 10.47 x 3.86 in) Touch only: 152 x 185 x 98 mm (6.0 x 7.28 x 3.86 in)	
Cutout Dimensions	Keypad: 123 x 156 mm (4.86 x 6.15 in)	Keypad or Keypad/Touch: 123 x 156 mm (4.86 x 6.15 in)	Keypad or Keypad/Touch: 142 x 241 mm (5.61 x 9.50 in); Touch Only: 123 x 156 mm (4.86 x 6.15 in)	

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Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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
H	40.6	-	-	-	-	238910	-	238914

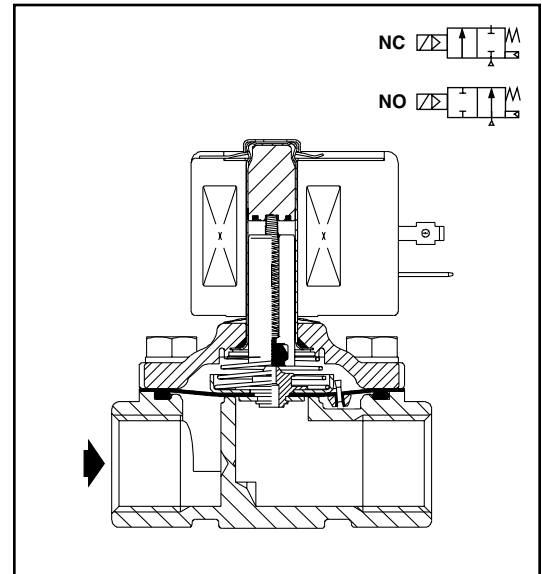
Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I.

Optional: RedHat 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 8210B057, 8210B058, and 8210B059, which are not available with Explosionproof enclosures.)
See *Optional Features Section* for other available options.



Nominal Ambient Temp. Ranges

RedHat II/
RedHat AC: 32°F to 125°F (0°C to 52°C)

RedHat II DC: 32°F to 104°F (0°C to 40°C)
RedHat DC: 32°F to 77°F (0°C to 25°C)
(104°F/40°C occasionally)

8210G227 AC: 32°F to 130°F (0°C to 54°C)
DC: 32°F to 90°F (0°C to 32°C)

Refer to *Engineering Section* for details.

Approvals

UL listed as indicated. CSA certified.
RedHat 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 Insulation ⑦	
			Min.	Max. AC			Max. DC			AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU										
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	3/8	1.5	①	150	125	-	40	40	-	180	150	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G093	5D	○	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G001	6D	○	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G006	5D	○	-	-	-	17.1/F	-
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G094	5D	○	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G087	7D	●	17.1/F	11.6/F
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G002	6D	○	-	-	-	6.1/F	11.6/F
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G007	5D	○	-	-	-	17.1/F	-
1/2	3/4	4	5	-	300	-	-	300	-	130	90	8210G227	5D	○ †	-	-	-	17.1/F	40.6/H
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G088	7D	●	17.1/F	11.6/F
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G009	9D	○	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G095	8D	○	-	-	-	10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G003	11D	○	-	-	-	6.1/F	11.6/F
3/4	3/4	6	0	-	-	-	200	180	180	-	77	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-
1	1	13	0	-	-	-	100	100	80	-	77	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H
1	1	13	0	150	125	125	-	-	-	180	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-
1	1	13	5	150	150	100	125	125	125	180	150	8210G004	12D	○	-	-	-	6.1/F	11.6/F
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B055 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	1 1/8	15	0	150	125	125	-	-	-	180	-	8210G055	43D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G008	16D	○	-	-	-	6.1/F	11.6/F
1 1/2	1 1/4	22.5	0	-	-	-	100	100	80	-	77	8210B056 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022	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	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G011 ⑥ ⑧	39D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G034	23D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G030	37D	●	10.1/F	11.6/F
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G012 ⑥ ⑧	39D	●	-	-	-	10.1/F	11.6/F
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G035	25D	●	-	-	-	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G038	38D	●	10.1/F	11.6/F
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C013	24D	●	-	-	-	-	16.8/F
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G013	46D	●	-	-	-	16.1/F	-
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑥ ⑧	34D	●	-	-	-	20/F	-
1	1	13	5	-	-	-	125	125	125	-	180	8210D014	26D	●	-	-	-	-	16.8/F
1	1	13	5	150	150	125	-	-	-	180	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑥ ⑧	35D	●	-	-	-	20/F	-
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑥ ⑧	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G032	49D	●	-	-	-	16.1/F	-
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210 103	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	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/F	-

③ 5 psi on Air; 1 psi 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.

† UL listed for fire protection systems per UL429A.

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	
			Min.	Max. AC			Max. DC			AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU										
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	10	1.3	①	10	9	-	3	3	-	82	65	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	16	2.6	0	10	10	-	3	3	-	82	65	8210G093	5D	○	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	14	10	9	9	7	7	82	65	8210G001	6D	○	-	-	-	6.1/F	11.6/F
3/8	16	2.6	0.3	21	21	21	-	-	-	79	-	8210G006	5D	○	-	-	-	17.1/F	-
1/2	11	1.9	①	10	9	-	3	3	-	82	65	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	16	3.4	0	10	10	-	3	3	-	82	65	8210G094	5D	○	-	-	-	10.1/F	11.6/F
1/2	16	3.4	0	10	10	9	3	3	-	79	65	-	-	-	8210G087	7D	●	17.1/F	11.6/F
1/2	16	3.4	0.3	14	10	9	9	7	7	82	65	8210G002	6D	○	-	-	-	6.1/F	11.6/F
1/2	16	3.4	0.3	21	21	21	-	-	-	79	-	8210G007	5D	○	-	-	-	17.1/F	-
1/2	19	3.4	0.3	-	21	-	-	21	-	54	32	8210G227	5D	○ †	-	-	-	17.1/F	40.6H
3/4	16	3.9	0	10	10	9	3	3	-	79	65	-	-	-	8210G088	7D	●	17.1/F	11.6/F
3/4	19	4.3	0.3	9	9	9	7	6	5	82	65	8210G009	9D	○	-	-	-	6.1/F	11.6/F
3/4	19	4.3	0	10	10	-	3	3	-	82	65	8210G095	8D	○	-	-	-	10.1/F	11.6/F
3/4	19	5.6	0.3	17	10	7	9	9	9	82	65	8210G003	11D	○	-	-	-	6.1/F	11.6/F
3/4	19	5.1	0	-	-	-	14	12	12	-	25	8210B026 ② †	10P	-	-	-	-	-	30.6/H
3/4	19	5.1	0	24	21	14	-	-	-	93	-	8210G026 ② †	40P	●	-	-	-	16.1F	-
1	25	11	0	-	-	-	7	7	6	-	25	8210B054 †	31D	-	8210D089	15D	-	-	30.6/H
1	25	11	0	10	9	9	-	-	-	82	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-
1	25	11	0.3	10	10	7	9	9	9	82	65	8210G004	12D	○	-	-	-	6.1/F	11.6/F
1	25	11.5	0	21	16	8	-	-	-	93	-	8210G027 †	42P	●	-	-	-	20.1/F	-
1	25	11.5	0.7	21	21	21	-	-	-	79	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	29	13	0	-	-	-	7	7	6	-	25	8210B055 †	32D	-	-	-	-	-	30.6/H
1 1/4	29	13	0	10	9	9	-	-	-	82	-	8210G055	43D	●	-	-	-	16.1/F	-
1 1/4	29	13	0.3	10	10	7	9	9	9	82	65	8210G008	16D	○	-	-	-	6.1/F	11.6/F
1 1/2	32	19.5	0	-	-	-	7	7	6	-	25	8210B056 †	33D	-	-	-	-	-	30.6/H
1 1/2	32	19.5	0	10	9	9	-	-	-	82	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	32	19.5	0.3	10	10	7	9	9	9	82	65	8210G022	18D	●	-	-	-	6.1/F	11.6/F
2	44	37	0.3	10	9	6	3	3	3	82	65	8210G100	20P	●	-	-	-	6.1/F	11.6/F
2 1/2	44	39	0.3	10	9	6	3	3	3	82	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	2.6	0.0	10	10	9	9	9	6	82	65	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	17	14	14	17	14	14	82	82	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
1/2	16	3.4	0	10	10	9	9	9	6	82	65	8210G034	23D	●	-	-	-	10.1/F	11.6/F
1/2	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G030	37D	●	10.1/F	11.6/F
1/2	16	3.4	0.3	17	14	14	17	14	14	82	82	8210G012 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
3/4	19	4.7	0	10	10	9	9	9	6	82	65	8210G035	25D	●	-	-	-	10.1/F	11.6/F
3/4	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G038	38D	●	10.1/F	11.6/F
3/4	19	5.6	0.3	-	-	-	17	14	14	-	82	8210C013	24D	●	-	-	-	-	16.8/F
3/4	19	5.6	0.3	17	14	14	-	-	-	82	-	8210G013	46D	●	-	-	-	16.1/F	-
1	25	11	0	9	9	9	-	-	-	82	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	25	11	0.3	-	-	-	9	9	9	-	82	8210D014	26D	●	-	-	-	-	16.8/F
1	25	11	0.3	10	10	9	-	-	-	82	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	29	13	0	9	9	9	-	-	-	82	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	29	13	0.3	-	-	-	9	9	9	-	82	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	29	13	0.3	10	10	9	-	-	-	82	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	32	19.5	0	9	9	9	-	-	-	82	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	32	19.5	0.3	-	-	-	9	9	9	-	82	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	32	19.5	0.3	10	10	9	-	-	-	82	-	8210G032	49D	●	-	-	-	16.1/F	-
2	44	37	0.3	-	-	-	9	9	9	-	65	8210 103	30P	●	-	-	-	-	16.8/F
2	44	37	0.3	9	9	9	-	-	-	82	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	44	39	0.3	-	-	-	9	9	9	-	65	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	44	39	0.3	9	9	9	-	-	-	82	-	8210G104	51P	●	-	-	-	16.1/F	-

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.

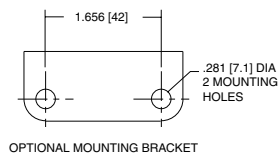
⑥ Valves not available with Explosionproof enclosures.
 ⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
 ⑧ AC construction also has PA seating.
 ⑨ No disc-holder.
 ⑩ Stainless steel disc-holder.
 † Must have solenoid mounted vertical and upright.

† UL listed for fire protection systems per UL429A.

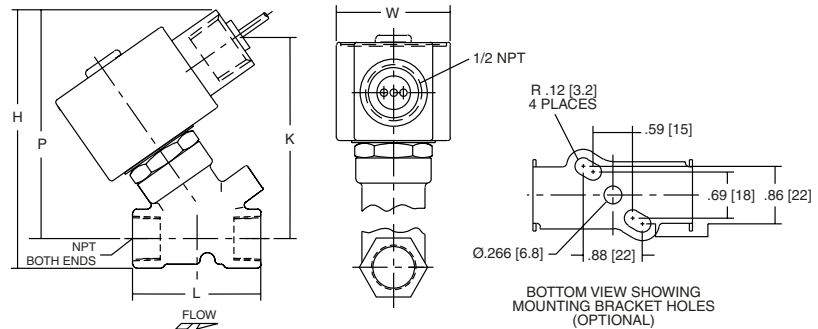
Dimensions: inches (mm)

Const. Ref.		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
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
13	ins.	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
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

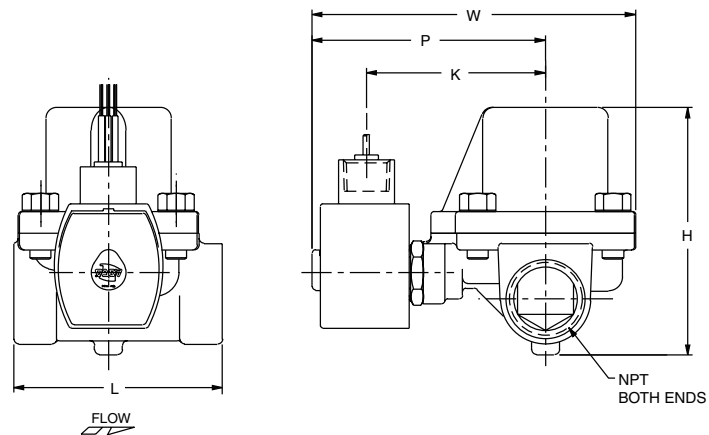
* DC dimensions slightly larger.

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

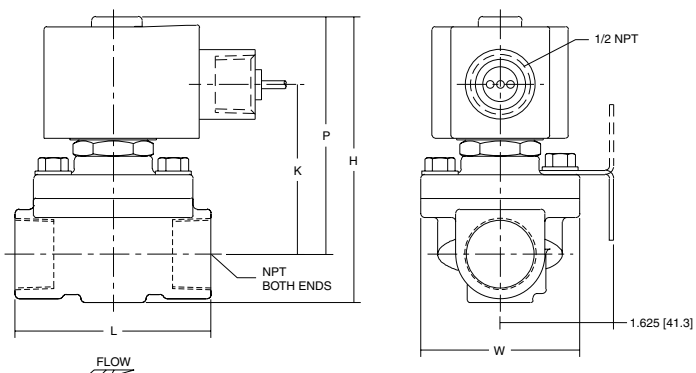
Const. Ref. 1, 2



Const. Ref. 13



Const. Ref. 5-9, 11, 20, 21, 23, 25, 37,38

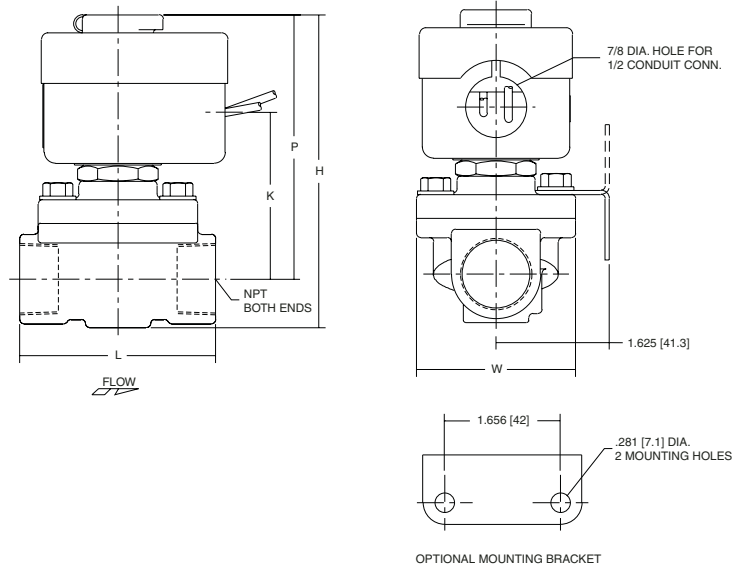


Dimensions: inches (mm)

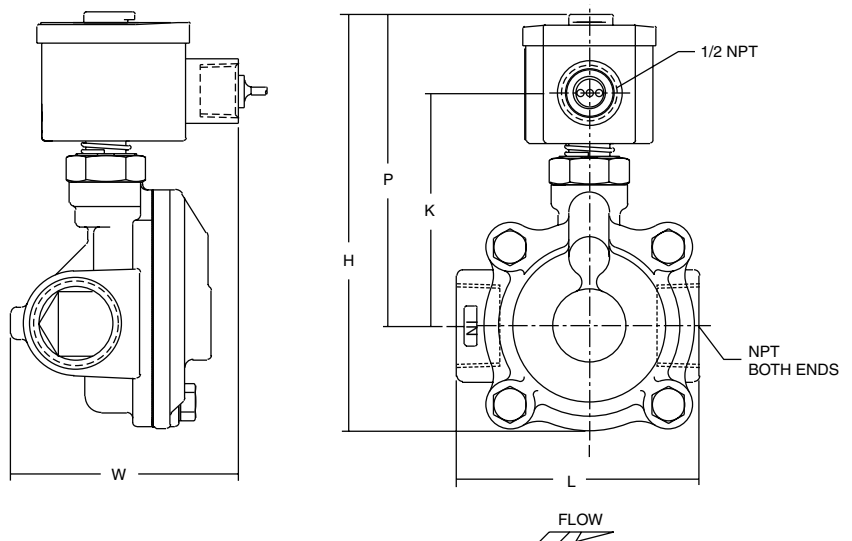
Const. Ref.		H	K	L	P	W
30	ins.	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	ins.	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	ins.	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	ins.	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	ins.	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	ins.	7.34	X	3.66	6.34	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.

Const. Ref. 10, 15, 24, 26-36

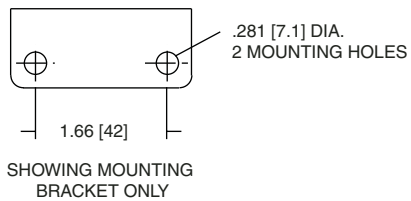
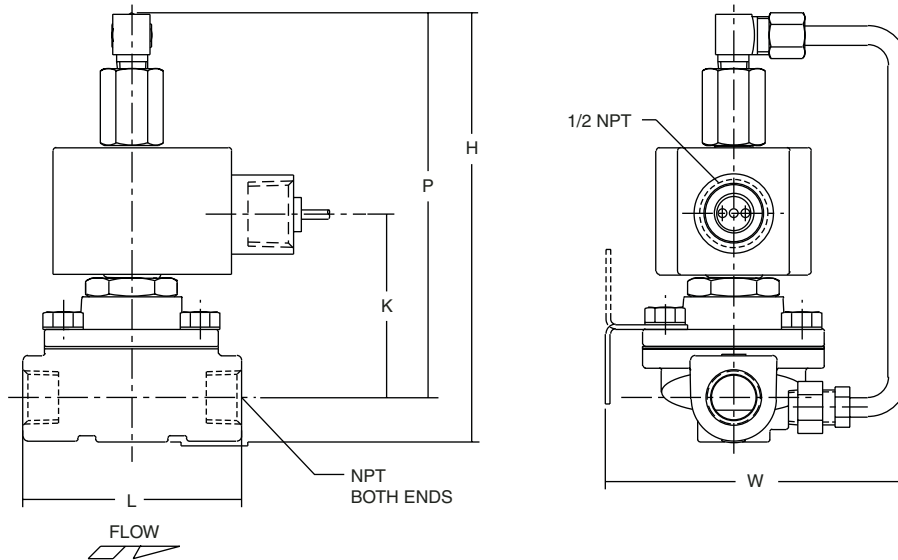


Const. Ref. 12, 16, 18

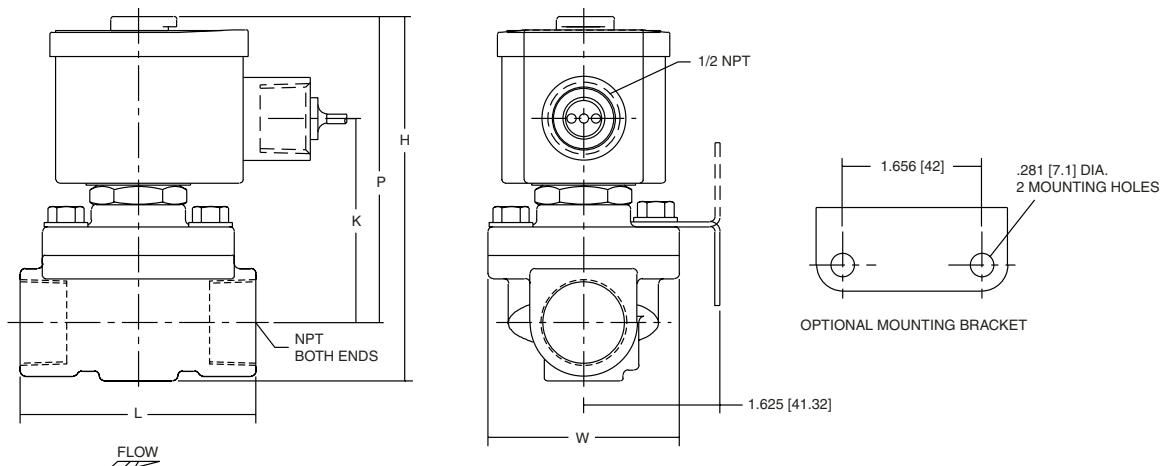


Dimensions: inches (mm)

Const. Ref. 39



Const. Ref. 40-51



Solenoid Enclosures

ASCO offers two types of enclosures, each for a variety of applications: a one-piece molded epoxy construction called the RedHat II solenoid and a conventional RedHat metallic construction. Both meet ICS-6 ANSI/NEMA, and UL Standards 429, 508, and/or 1002. These standards define enclosure protection levels and the tests passed to earn each Type designation. (See Page 469 for RedHat Next Generation Solenoid Enclosures).

RedHat II

RedHat II solenoid enclosures are of one-piece molded epoxy construction, with an integral 1/2" NPT conduit hub. This epoxy encapsulation serves as the enclosure. The magnetic frame is molded into the coil.

RedHat II solenoids are offered as Type 1 General Purpose or Type 7 (A, B, C, and D) Explosionproof.

Type 1 – Solenoids are green and come equipped with three 18" long leads (the green lead is a ground wire). Also available as options are 1/4" spade connectors, screw terminals, and DIN-type terminals meeting ISO 4400 and DIN Standard 43650.

An optional junction box/terminal coil construction is also available for use with spade and screw terminal constructions. Refer to the "Optional Features" Section for details.

Type 7 – Solenoids are black and are available only in the leaded construction.

All RedHat II solenoids also meet the requirements for Types 2 Dripproof, 3 and 3S Raintight, and 4 and 4X Watertight-Corrosion Resistant.

The Following wattages carry Type 7 and Type 9 approvals as shown; for

Wattage	Type 7 Class I, Div. 1 & 2 Gas Groups	Type 9 Class II, Div. 1 Dust Groups
6.1, 10.1, 17.1	A, B, C, D	E, F, G
16.1, 20.1	A, B, C, D	E, F
10.6, 11.6	A, B, C, D	E, F, G

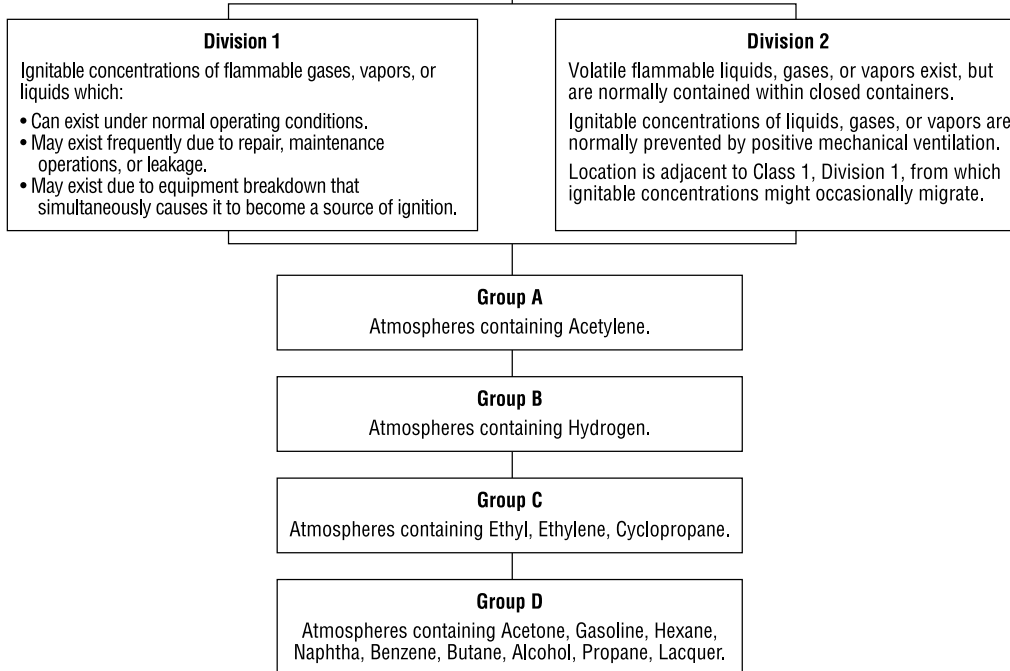
Enclosure Classifications and Types

Type 1	General Purpose	Intended for indoor use, primarily to provide protection for enclosed parts in locations without unusual service conditions.
Type 2	Dripproof	Intended for indoor use, primarily to provide protection against limited amounts of falling water or dirt.
Type 3	Raintight, Dusttight, and Sleet (Ice) Resistant	Intended for outdoor use, primarily to provide protection against wind-blown dust, rain, and sleet; undamaged by the formation of ice on the enclosure.
Type 3S	Raintight, Dusttight, and Sleet (Ice) Resistant	Intended for outdoor use, primarily to provide protection against wind-blown dust, rain, and sleet; external mechanism remains operable when ice laden.
Type 3R	Rainproof, Sleet (Ice) Resistant	Intended for outdoor use, primarily to provide protection against falling rain and sleet; undamaged by the formation of ice on the enclosure.
Type 4	Watertight and Dusttight	Intended for indoor or outdoor use to provide protection against splashing water, water seepage, falling or hose-directed water, and severe external condensation; undamaged by the formation of ice on the enclosure.
Type 4X	Watertight, Dusttight, and Corrosion Resistant	Same as Type 4, but provides additional protection to resist corrosion.
Type 6	Submersible	Intended for indoor or outdoor use to provide protection against entry of water during submersion at a limited depth. (Tested to 6' for 30 minutes.)
Type 6P	Submersible	Same as Type 6 Enclosure, but provides prolonged submersion protection at a limited depth. (Tested to 6' for 24 hours.)
Type 7 & Type 9	Refer to charts on next page.	

Type 7 (A, B, C, and D)

Explosionproof enclosures are designed to contain an internal explosion, without causing an external hazard, when installed in the following atmospheres or locations:

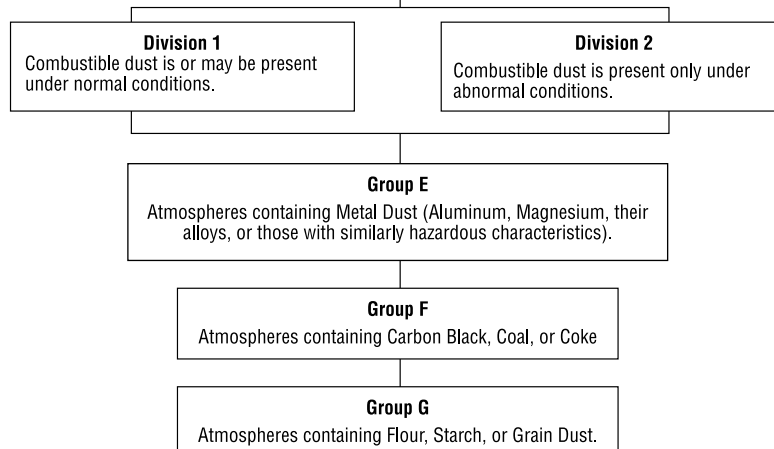
Class 1 Gasses or Vapors



Type 9 (E, F, and G)

Dust-ignitionproof enclosures are designed to prevent the entrance of dust, and the enclosed devices do not produce sufficient heat to cause external surface temperatures capable of igniting dust on the enclosure or in the surrounding atmosphere.

Class II Dust



RedHat Metallic Enclosures

Conventional metallic enclosures are offered to meet Type I General Purpose enclosure applications and Type 7 (C and D) Explosionproof enclosure applications.

Type 1 — General Purpose metallic enclosures are epoxy-painted, zinc-coated steel with a 7/8" diameter hole to accept standard conduit hubs or connectors.

Type 7 (C and D) — Explosionproof metallic enclosures are epoxy-painted, zinc-plated steel or die-cast aluminum with a 1/2" threaded conduit hub.

Type 7 enclosures also meet Type 3 (Raintight) requirements as well as some also meet Type 7 (C and D) Explosionproof and Type 9 (E, F, and G) Dust-Ignitionproof requirements for Class I, Division 1, Groups C and D; Class I, Division 2, Groups C and D; and Class II, Division 1, Groups E, F, and G. *Please contact your local ASCO sales office for details.*

Also available as options are: Type 3R (Rainproof), Type 4 and 4X (Watertight), Type 6 (Submersible), Type 7B (Explosionproof for Hydrogen Atmospheres, Class I, Division 1, Group B), as well as Splice Box enclosures. *Please contact your local ASCO sales office for details on these options.*

Note: Metallic solenoid enclosures provide part of the magnetic circuit for the solenoid. Removal will affect valve operation.

Hazardous Location Solenoid Temperature Range Codes

Hazardous location solenoids are marked to indicate the maximum exposed surface temperature or temperature indicating code. This temperature is based on the maximum obtained in the temperature or burnout (blocked core) tests, whichever is higher, at a minimum ambient of 104°F (40°C) or at the rated maximum ambient temperature.

To prevent ignition of hazardous atmospheres, do not install in areas where vapors or gases having ignition temperatures lower than the marked temperatures are present.

The operating temperatures for each indicating code are shown in the following chart:

Operating Temp. Range Indicating Code No.

Maximum Temperature		Code Number
Degrees in C	Degrees in F	
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

Note: Except where otherwise noted in specific Series, all RedHat metallic enclosure solenoids have temperature range Code T3C.

Most RedHat II solenoids and/or solenoid valves are marked:

"To prevent fire or explosion, do not install where ignition temperature of hazardous atmosphere is less than 329°F (165°C). Open circuit before disassembly."
This corresponds to code number T3B.

Valves with Class H solenoids and valves used on steam service are marked:

"To prevent fire or explosion, do not install where ignition temperature of hazardous atmosphere is less than 356°F (180°C). Open circuit before disassembly."
This corresponds to code number T3A.

The Class II, Group F, Dust Location designation is not applicable for solenoids and/or solenoid valves used for steam service, or when a Class H solenoid is used.

RedHat II Explosionproof solenoids include an internal, non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed valve, excessive ambient temperature, shorted coil, etc. This unique feature is standard only in RedHat II solenoids.

When used on valves having fluid temperature ratings exceeding 250°F (121°C), consult ASCO for applicable enclosure class, groups and temperature range codes. For temperature range codes of optional solenoids and features, or if a better temperature range code is desired, consult your local ASCO sales office.

Company: Industrial OEM Specialists, Inc.

Name:

Date: 10/24/2011

WATER/GLYCOL PUMP



Pump:

Size: 13-5.0-1.2x1.0
 Type: Endsuct-Open
 Synch speed: 3600 rpm
 Curve: 40.000.135
 Specific Speeds:
 Dimensions: Suction: 1.25 in
 Discharge: 1 in

Search Criteria:

Flow: 38 US gpm Head: 23 ft

Fluid:

30% Ethylene glycol
 SG: 1.049
 Viscosity: 4.272 cP
 NPSHa: ---
 Temperature: 30 °F
 Vapor pressure: 0.08114 psi a
 Atm pressure: 14.7 psi a

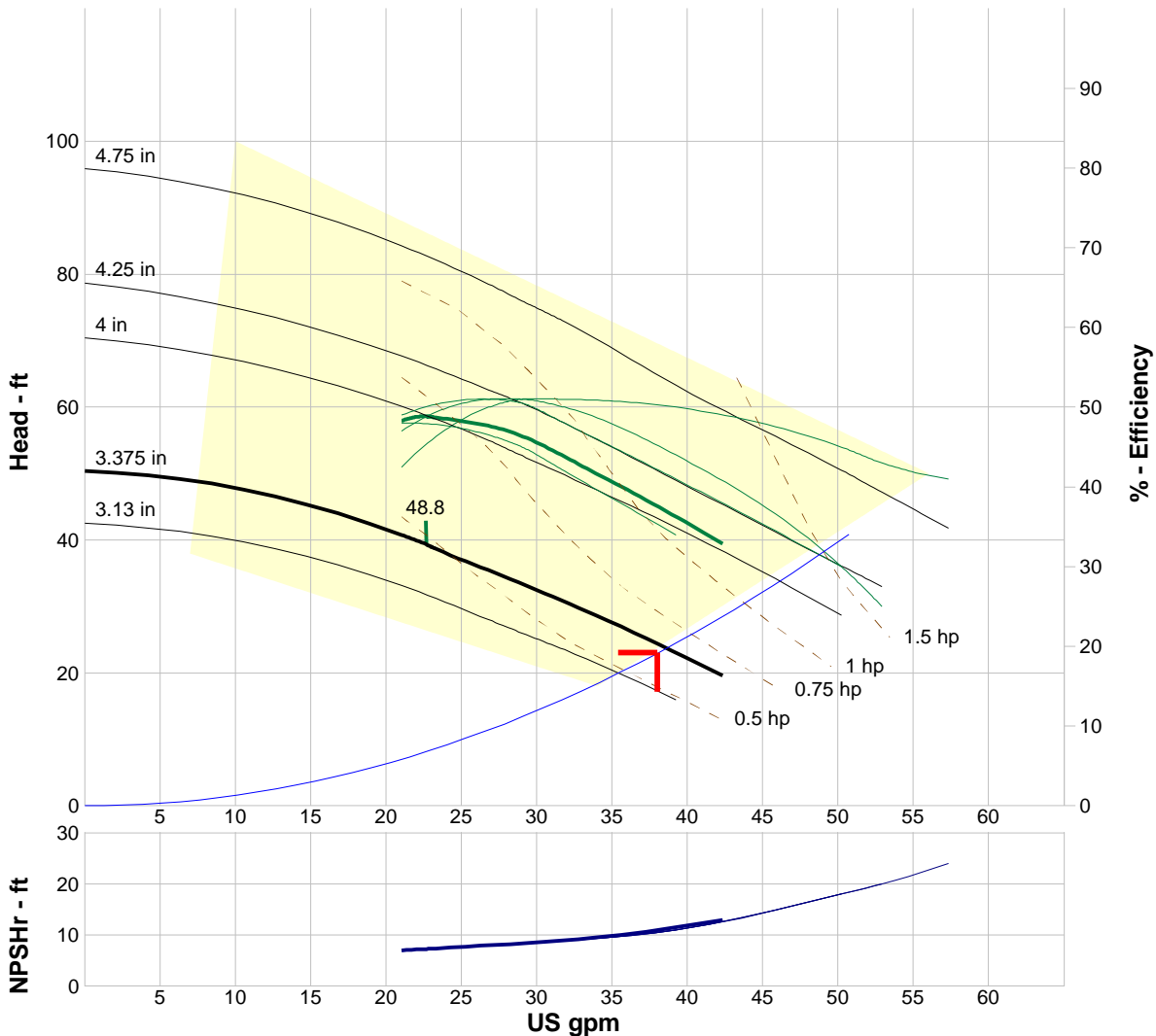
Motor:

Standard: NEMA
 Enclosure: TEFC
 Sizing criteria: Max Power on Design Curve
 Size: 0.75 hp
 Speed: 3600
 Frame: 56

Pump Limits:

Temperature: 300 °F
 Pressure: 150 psi g
 Sphere size: ---
 Power: ---
 Eye area: ---

---- Data Point ----	
Flow:	38 US gpm
Head:	24.2 ft
Eff:	37%
Power:	0.641 hp
NPSHr:	11.2 ft
---- Design Curve ----	
Shutoff head:	50.4 ft
Shutoff dP:	22.8 psi
Min flow:	---
BEP:	49% @ 22.6 US gpm
NOL power:	0.667 hp @ 42.3 US gpm
-- Max Curve --	
Max power:	1.55 hp @ 57.3 US gpm

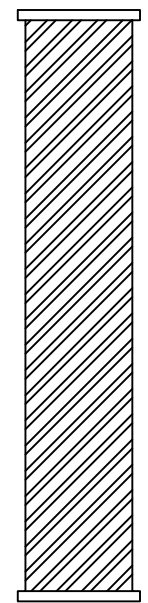
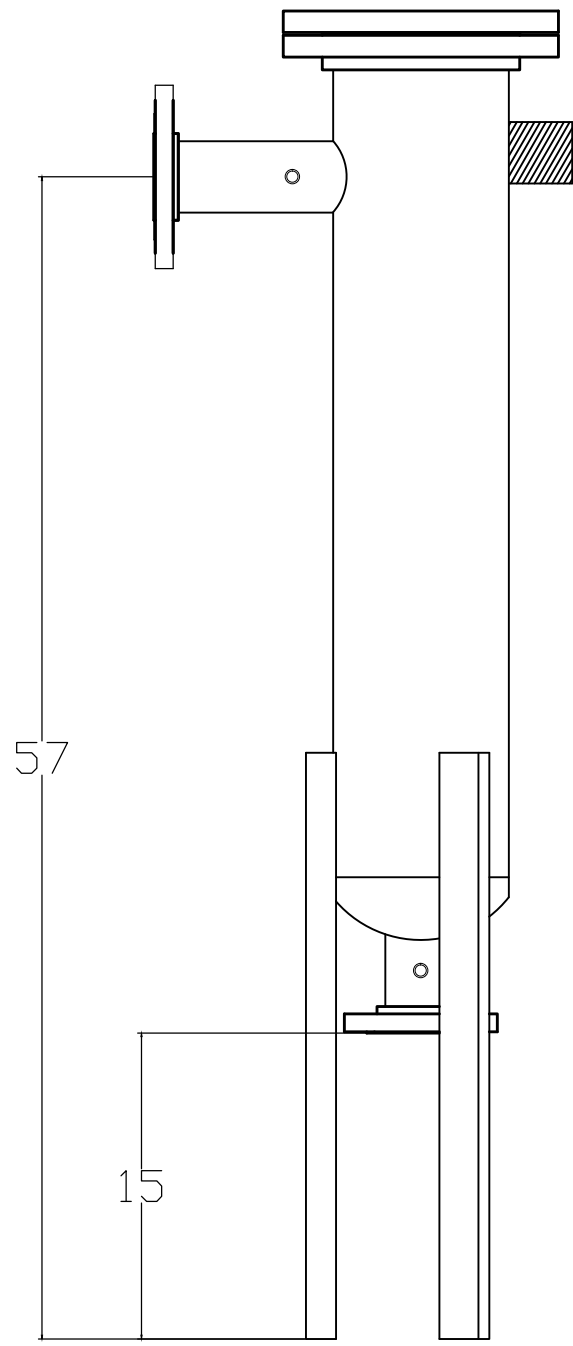


Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
45.6	3500	---	---	---	---
38	3500	24.2	37	0.641	11.2
30.4	3500	32	45	0.572	8.73
22.8	3500	39.2	49	0.484	7.31
15.2	3500	43.4	46	0.423	6

INLET/PRE-FILTER

Inlet Filter	
Shell Diameter	8-5/8"
Shell Length	40"
Number of Elements	1
Material	316 S.S.
Inlet/Outlet	4" S.O.R.F., 150#



EPS 2600
 Flow Direction: Out to In
 Flow Rating: 2600 SCFM
 Mounting: Vertical



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Classification	Drawn		
Main Power	Check		
Control Power	Approv		
Dew Point	Air Quality		
Media	Purge Loss		
Ambient Temp.	Operating Conditions		
Max. Capacity	Operating Pressure		
Approx. Ship Weight	Design Pressure		
P.O. Number	Power Requirement		

For: GA FLEET	
CAD System: AUTOCAD 2010	
Title	
PARTICULATE PRE FILTER	
Drawing Number	Revision Sht 1
68270-PS	0 1 Shts

COMPRESSOR MOTOR

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Product Information Packet

EM7054T-I

15//10HP,1765//1470RPM,3PH,60//50HZ,254T

Part Detail							
Revision:	B	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Prod. Type:	0942M	Elec. Spec:	09WGW980	CD Diagram:	
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	09F369	Layout:	
Frame:	254T	Mounting:	F1	Poles:	04	Created Date:	06-15-2010
Base:	RG	Rotation:	R	Insulation:	F	Eff. Date:	05-02-2012
Leads:	9#12	Literature:		Elec. Diagram:		Replaced By:	

Nameplate NP0977XP									
NO.		TEMP CODE	T3C						
SPEC.	09F369W980G2	DE BRG	6309						
CAT.NO.	EM7054T-I	ODE BRG	6208						
HP	15//10	GREASE	POLYREX EM						
VOLTS	230/460//190/380	MOTOR WEIGHT	370						
AMPS	36/18//28.8/14.4	NEMA-NOM-EFF	92.4						
RPM	1765//1470	FL PF	84						
CYCLE	60//50	PH	3	CL	F	FRAME	254T		
SER.F.	1.15	DES	B	CODE	H	CC	010A		
SER.									
RATING	40C AMB-CONT								
USABLE AT 208V	37								

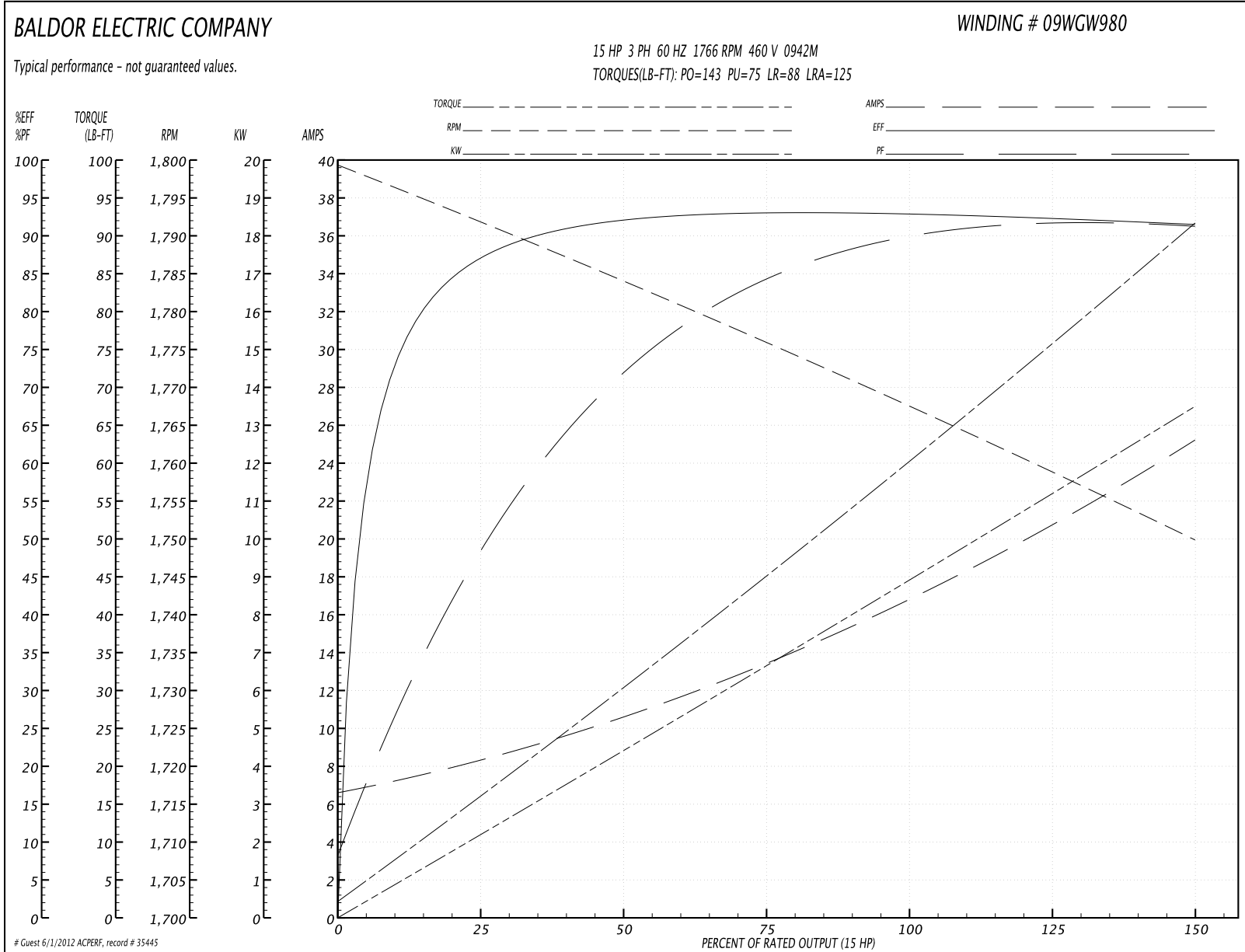
Parts List		
Part Number	Description	Quantity
SA198801	SA 09F369W980G2	1.000 EA
RA186157	RA 09F369W980G2	1.000 EA
MJ5000A01	SEALANT, CHICO A COMPOUND	0.050 LB
09CB1003A01	CONDUIT BOX MACH. GROUP C MTRS	1.000 EA
10XN3118K24	5/16-18 X 1.50" HEX HD, GRADE 5	4.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	4.000 EA
WD1000B25	BURNDY TERMINAL L125HP	1.000 EA
10XN3118K12	5/16-18 X .75 GRADE 5, ZINC PLATED	1.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	1.000 EA
09EP1700A33P	FR ENDPLATE, MACH, XPFC W/DRN HW4505A02	1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN	1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
HW5100A08	W3118-035 WVY WSHR (WB)	1.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P	4.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000 EA
09EP1707A16P	PU E.P., MACH. W/DRAIN HW4505A02 W/PRIME	1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN	1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
09FH1004A03	FAN COVER, MACH	1.000 EA
10XN2520K12	1/4-20 X.75 GRD 5	3.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	3.000 EA
HA2066A01	SLINGER, ALUM (AUTO)	1.000 EA

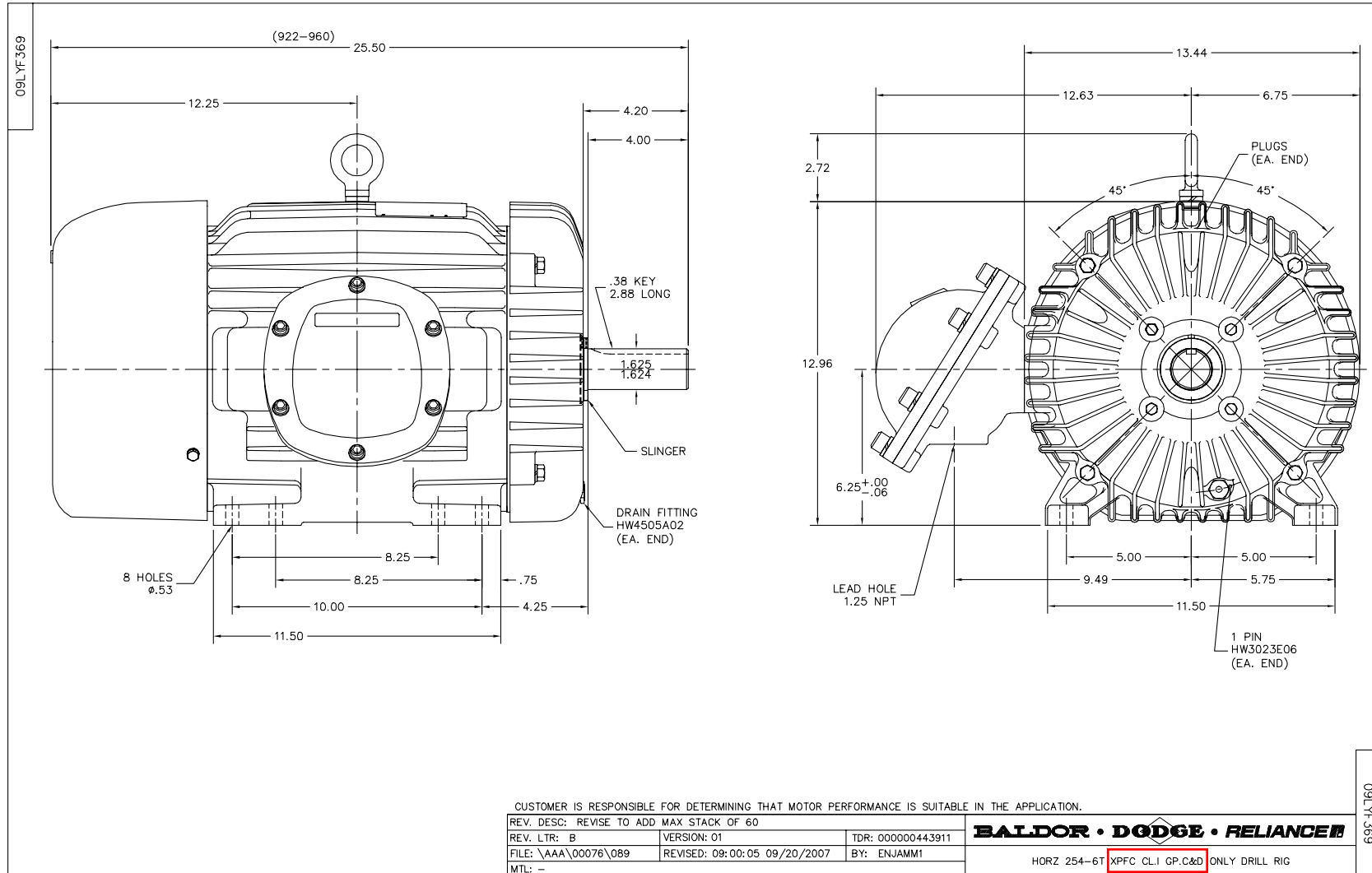
Parts List (continued)		
Part Number	Description	Quantity
80XN1032A07	SET SCREW, HEX XOCK, ZN	1.000 EA
09CB1502A01	CONDUIT BOX LID MACH. GROUP C MTRS	1.000 EA
84XN5013J24	1/2-13 X 1-1/2 HEX SOCKET HD CAP SCREW	6.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT, .879 OD, .509 I	6.000 EA
HW2501G25	KEY, 3/8 SQ X 2.875	1.000 EA
LB1115	LABEL,LIFTING DEVICE	1.000 EA
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
HW4505A02	BREATHER/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON	0.080 LB
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
HW4505A02	BREATHER/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
09FN3001D01SP	EXTERNAL FAN, PLASTIC	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HXWSSLD SERTYB	1.000 EA
MG1025G05	PAINT 789.201	0.050 GA
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000 EA
LB1081	LABEL CSA XPROOF	1.000 EA
LB5040	INSTRUCTION TAG, AC & DC	1.000 EA
LB1119	WARNING LABEL	1.000 EA
LB1125C02	SUPER-E (STOCK CTN LABEL SUPER-E WITH FL	4.000 EA
LB1357	ENERGY GUIDE LABEL (BOX LABEL)	1.000 SH
LC0145B01	CONNECTION LABEL	1.000 EA
NP0977XP	BR XP UL CSA CC CL-I GP-C&D	1.000 EA
40PA1005	PACKAGING GROUP, 09 STD	1.000 EA

Performance Data at 460V, 60Hz, 15.0HP (Typical performance - Not guaranteed values)

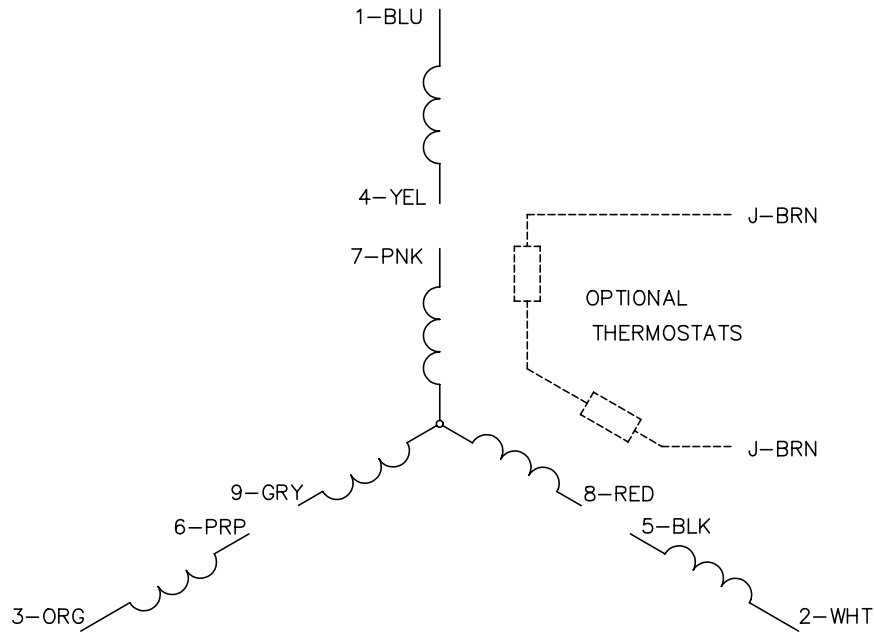
General Characteristics							
Full Load Torque:	45.0 LB-FT			Start Configuration:	DOL		
No-Load Current:	6.95 Amps			Break-Down Torque:	143.0 LB-FT		
Line-line Res. @ 25°C.:	0.577 Ohms A Ph / 0.0 Ohms B Ph			Pull-Up Torque:	75.0 LB-FT		
Temp. Rise @ Rated Load:	47 C			Locked-Rotor Torque:	88.0 LB-FT		
Temp. Rise @ S.F. Load:	56 C			Starting Current:	125.0 Amps		
Load Characteristics							
% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor:	49.0	71.0	81.0	86.0	88.0	89.0	87.0
Efficiency:	87.9	92.1	93.0	92.8	92.3	91.5	92.5
Speed:	1792.0	1784.0	1776.0	1766.0	1759.0	1750.0	1762.0
Line Amperes:	7.9	10.5	13.7	17.2	21.0	25.0	19.5

Performance Graph at 460V, 60Hz, 15.0HP Typical performance - Not guaranteed values

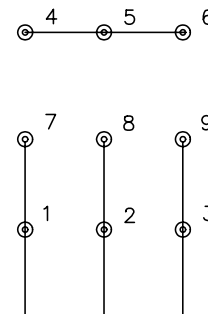




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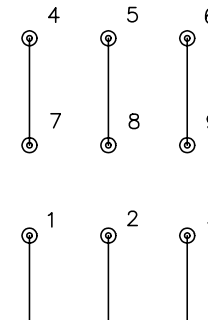


LOW VOLTAGE
(2Y)



LINE

HIGH VOLTAGE
(1Y)



LINE

NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
90000		FILE: AAA00005140	MDL: -
		MTL: -	

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

CD0005

TABLE 1

Insulation System Class	A	B	F	H
Temperature Rating in Degrees Centigrade	105°	130°	155°	180°
Temperature Rise Allowance by Resistance (Based on 40° C Ambient Temperature)				
All Motors with 1.15 Service Factor (Hot Spot Allowance)	70 *	90 *	115 *	—
Totally Enclosed Fan Cooled Motors (Hot Spot Allowance)	60 (5)	80 (10)	105 (10)	125 (15)
Totally Enclosed Non-Ventilated Motors (Hot Spot Allowance)	65 (0)	85 (5)	110 (5)	135 (5)
Motors other than those listed above (Hot Spot Allowance)	60 (5)	80 (10)	105 (10)	125 (15)

* When operating at service factor loading the hot spot temperatures can actually exceed the insulation rating resulting in shortened motor life.

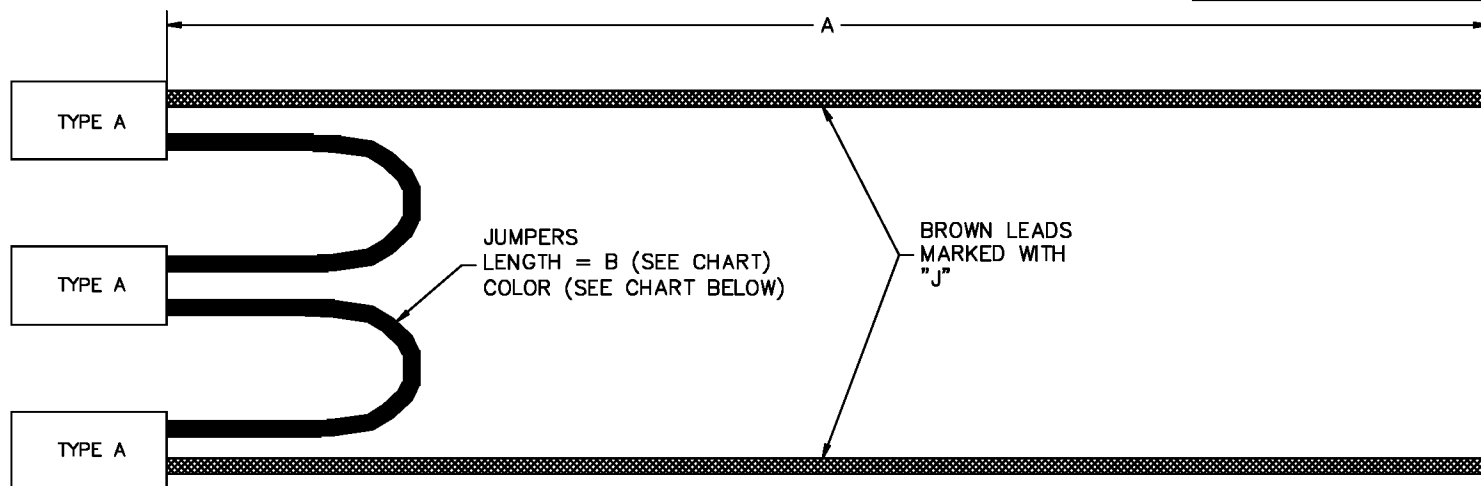
TABLE 2**Temperature Related Life-Shortening Factors**

PROBLEMS	SYMPTOMS	CURES
Low Voltage	Overload Tripping High current Short motor life	Correct power supply or match motor to actual power supply voltage rating.
High Voltage	Overload tripping High Current Short Motor Life	Correct power supply or match motor to actual power supply voltage rating
Unbalanced Voltage	Unbalanced phase currents Overload tripping	Determine why voltages are unbalanced and correct.
Overload	Overload tripping High current Short motor life	Determine reason for overload. Increase motor size or decrease load speed.
High Ambient Temperatures	Short motor life	* Rewind motor to higher class of insulation. Oversize motor to reduce temperature rise. Ventilate area to reduce ambient temperature.
Blocked Ventilation	Short motor life Runs hot Amperage o.k.	Clean lint and debris from air passageways or use proper motor enclosure for application.
Frequent Starts	Short motor life	** Use a reduced voltage starting method. Upgrade class of insulation.
High Inertia Loads	Short motor life Overload tripping during starting	Oversize motor frame Use higher class of insulation. ** Use a reduced voltage starting method.

* Bearing lubrication must also be matched to high operating temperature.

** Reduced voltage starting method and motor characteristics must be matched to the load requirement.

TP5050



PART# SUFFIX	TEMPERATURE	JUMPER LEAD COLOR	SLEEVE MATERIAL	TI PART#	A	B	BALDOR MODEL
A01	135°C	YELLOW	.006" MYLAR	7AM034A5	28.00"	5.00"	35, 36, 37, 305, 306, 307
A02	150°C	BLACK	.006" MYLAR	7AM037A5	28.00"	5.00"	35, 36, 37, 305, 306, 307
A03	110°C	WHITE	.006" MYLAR	7AM029A5	28.00"	5.00"	35, 36, 37, 305, 306, 307

NOTES:

1. THERMOSTATS: TI 7AMxxx DEVICES, NUMBER, AND TEMPERATURE SPECIFIED BY ASSEMBLY
2. ALL LEADS TO BE 18 GAGE, 150°C, 600V, XLPE
3. THERMOSTATS TO BE MARKED WITH TI PART NUMBER AND OPENING TEMPERATURE.
4. ALL LEADS TO BE UL RECOGNIZED
5. ALL LEADS TO BE CSA CERTIFIED, OR UL RECOGNIZED FOR CANADA

REV. DESC: REVISED NOTES TO MATCH UL REQUIREMENTS

REV. LTR: B	VERSION: 02	TDR: 000000465431
FILE: \AAA\00106\872	REVISED: 10:58:16 05/19/2008	
MTL: -	BY: ENBRAMO	

BALDOR • DODGE • RELIANCE

3 THERMOSTAT ASSEMBLY DRAWING

SH 1 of 1

TP5050

PUMP MOTOR

BALDOR
A MEMBER OF THE ABB GROUP

BALDOR® • **RELIANCE** 

Product Information Packet

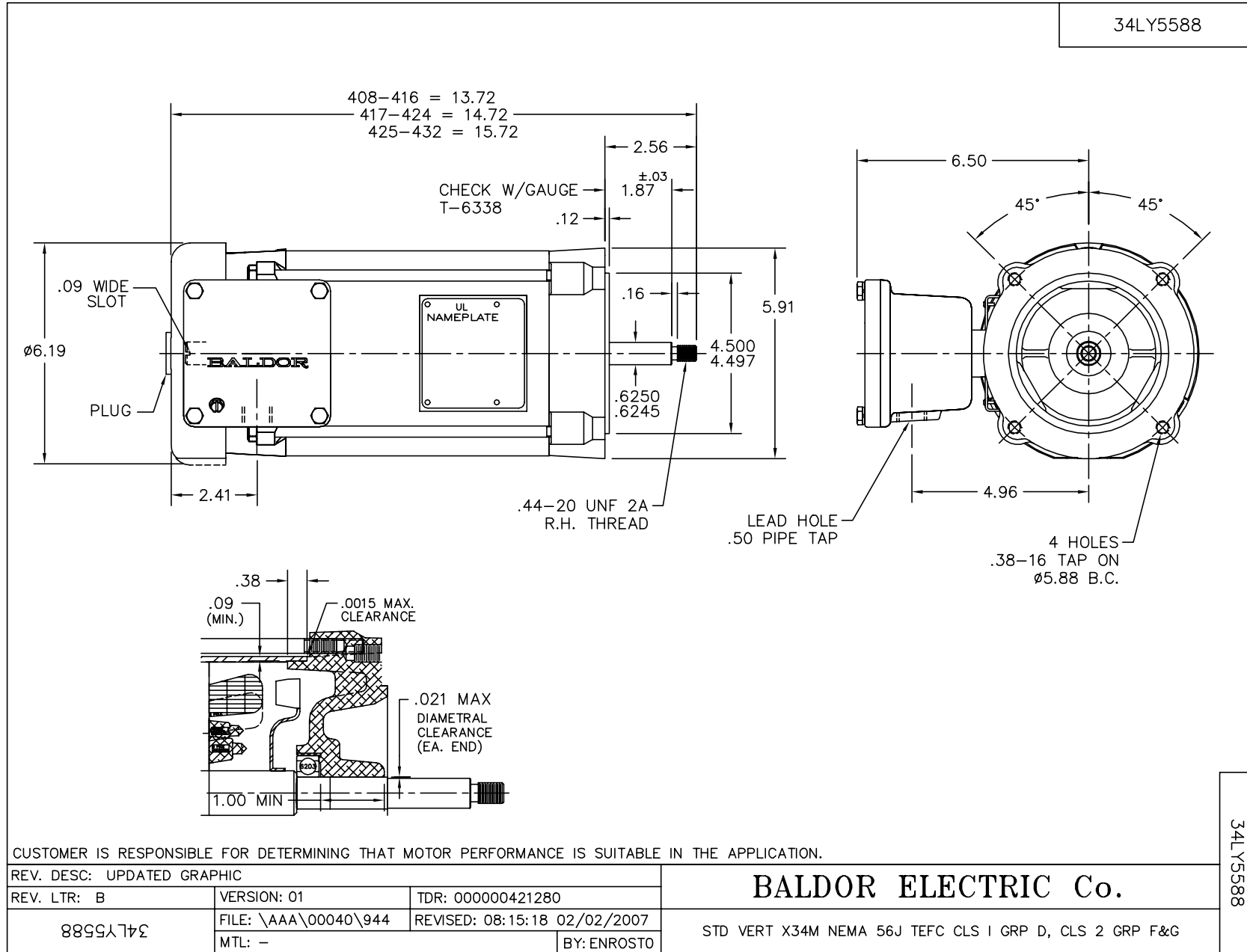
JM7013

1HP,3450RPM,3PH,60HZ,56J,X3416M,XPFC,F1

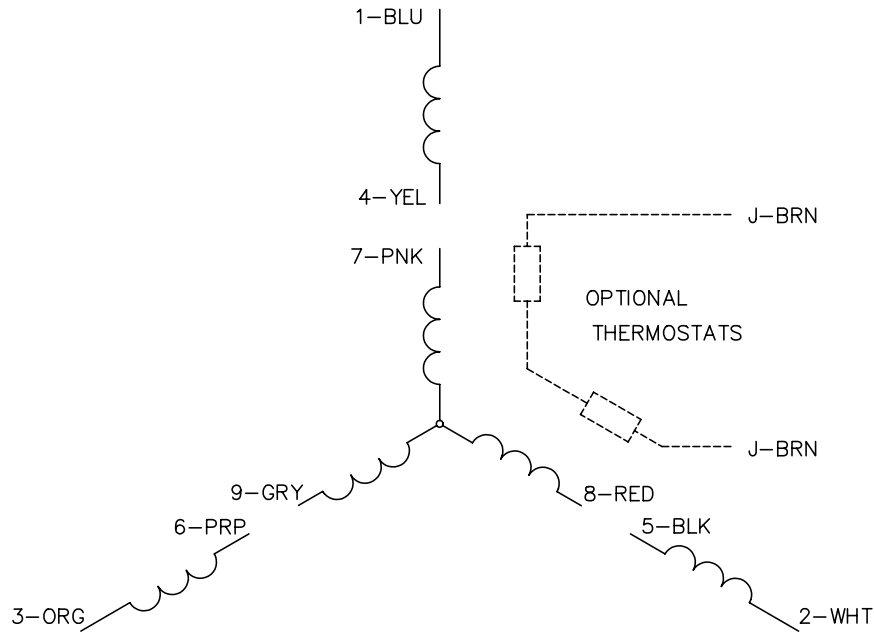
Part Detail							
Revision:	Z	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Prod. Type:	3416M	Elec. Spec:	34WG0282	CD Diagram:	
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	34-5588	Layout:	
Frame:	56J	Mounting:	F1	Poles:	02	Created Date:	
Base:	N	Rotation:	R	Insulation:	B	Eff. Date:	06-27-2011
Leads:	9#18	Literature:		Elec. Diagram:		Replaced By:	
Nameplate NP1426XP							
NO.				CC			
SER.							
SPEC.		34-5588-282					
CAT.NO.		JM7013					
HP	1			T. CODE		T3C	
VOLTS		230/460					
AMPS		3.6/1.8					
RPM		3450					
HZ	60			PH	3	CL	B
SER.F.	1.00			DES	B	CODE	H
RATING		40C AMB-CONT					
FRAME	56J			NEMA-NOM-EFF	75.5	PF	71
USABLE AT 208V		4.1					

Parts List		
Part Number	Description	Quantity
SA009077	SA 34-5588-282	1.000 EA
RA005524	RA 34-5588-282	1.000 EA
MJ5000A01	SEALANT, CHICO A COMPOUND	0.050 LB
35CB3001A01SP	EXPL CONDUIT BOX, MACH, 1/2" PIPE TAP LE	1.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
HW3001B01	003SS CUP WASHER, FOR #8 SCREW	1.000 EA
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	2.000 EA
34EP3703A01	FR ENDPLATE, MACH XP	1.000 EA
HW4002A02	1-11.5X2LG PIPE NIPPLE (F/S)	1.000 EA
HA1025A13	WSHR,FELT,.38" THICK F-26 CLASS	1.000 EA
HW3021E06	1/8 DIA X 5/8 ROLLPIN (F/S)	1.000 EA
HW5100A03SP	WAVY WASHER (W1543-017)	1.000 EA
34EP3705A01SP	PU ENDPLATE, MACH	1.000 EA
34FN3002A01SP	EXTERNAL FAN, PLASTIC, .637/.639 HUB W/	1.000 EA
34FH4002A03SP	IEC FH NO GREASER W/.88 DIA SHAFT HOLE	1.000 EA
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000 EA
WD4100A81	CAPLUG BPF-7/8, FOR .86-.88 HOLE	1.000 EA
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000 EA
51XN2520A16	SCREW, HEX WS SLT, ZN, 1/4-20 X 1.00	4.000 EA
MG1025G29	PAINT 789.205 DARK GRAY METALLIC (USE W/	0.014 GA
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000 EA
NP0018	NP- XP CONDUIT BOX DO NOT MAKE SELLABLE	1.000 EA
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	11.000 EA
SP5037A01	TERMINAL PLATE ASS'Y MODEL 34 - 3 PHASE	1.000 EA

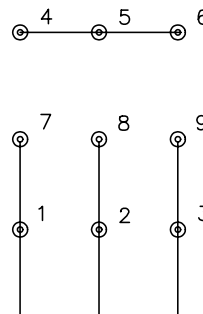
Parts List (continued)		
Part Number	Description	Quantity
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	11.000 EA
HA3104A03	THRUBOLT 5/16-18 X 7.625 W QTE#457	4.000 EA
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	1.000 EA
LB1119	WARNING LABEL	1.000 EA
LC0145B01	CONNECTION LABEL	1.000 EA
NP1426XP	UL/CSA, CLI GP-D,CLII GP-F&G,CC	1.000 EA
34PA1005	PACKING GROUP, BALDOR	1.000 EA
PK3083T	STYROFOAM PACKING CRADLE W/TAPE	1.000 EA



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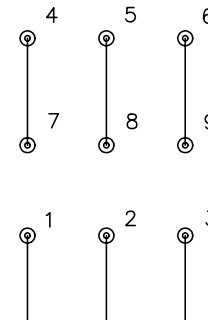


LOW VOLTAGE
(2Y)



LINE

HIGH VOLTAGE
(1Y)



LINE

NOTES:

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REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
900000		FILE: AAA00005140	MDL: -
		MTL: -	

BALDOR ELECTRIC Co.

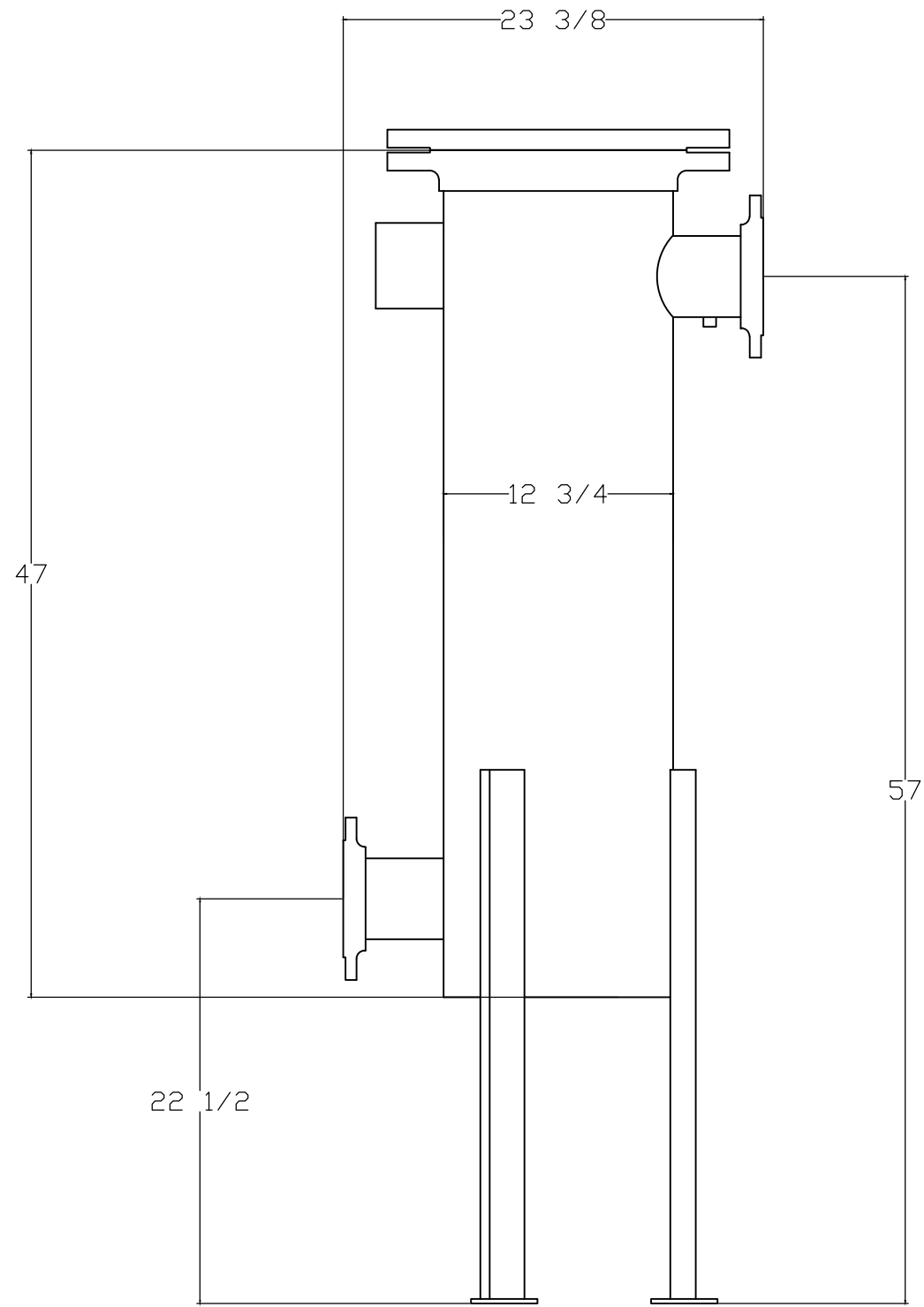
3PH, DV, 9 LEADS

CD0005

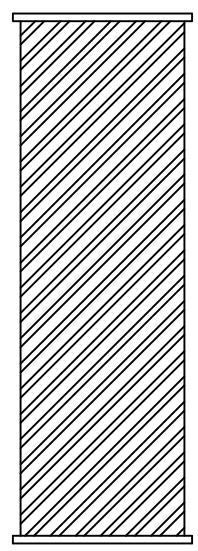
GAS TO WATER/GLYCOL HEAT EXCHANGER

Gas Flow	1200.00	SCFM
Pressure	50.00	PSIG
Temp	120.00	F
Gas Density	0.06	lb/ft3
Specific Heat	0.40	
Gas-Glycol HX		
Overall HTC (U)	16.00	
Inlet Temp (Thi)	100.00	F
Outlet Temp (Tho)	40.00	F
Glycol In (Tci)	32.00	F
Glycol Out (Tco)	37.80	F
Enthalpy in	34.33	BTU/lb
Enthalpy out	11.00	BTU/lb
Delta Enthalpy	23.33	BTU/lb
Gas Weight	4320.00	lb/hr
Heat Load	100785.60	BTUH
LMTD	26.43	
Area, required	238.36	ft2
Gas-Gas HX		
Overall HTC (U)	8.00	
Warm Gas In (Thi)	120.00	F
Warm Gas Out (Tho)	100.00	F
Cool Gas In (Tci)	40.00	F
Cool Gas Out (Tco)	80.00	F
Enthalpy in	47.53	BTU/lb
Enthalpy out	34.33	BTU/lb
Delta Enthalpy	13.20	BTU/lb
Gas Weight	4320.00	lb/hr
Heat Load	57024.00	BTUH
LMTD	49.33	
Area, required	144.51	ft2

AFTER FILTER/SEPARATOR



Coalescer/Separator	
Shell Diameter	12-3/4"
Shell Length	45"
Number of Elements	1
Material	316 S.S.
Inlet/Outlet	4" S.O.R.F., 150#



ECS 2100

ECS 2100

Flow Direction: Out to In
 Flow Rating: 2100 SCFM
 Mounting: Vertical

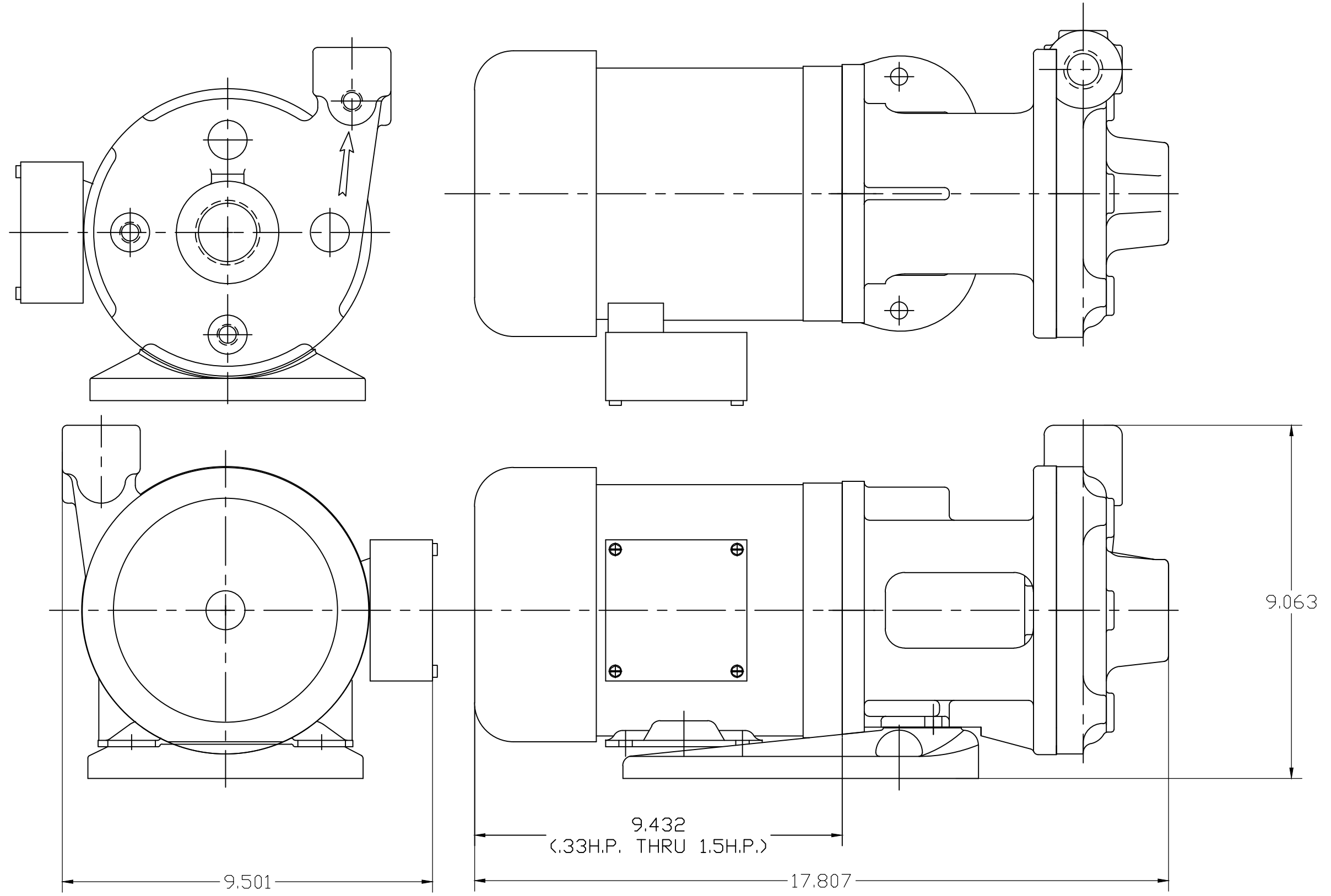


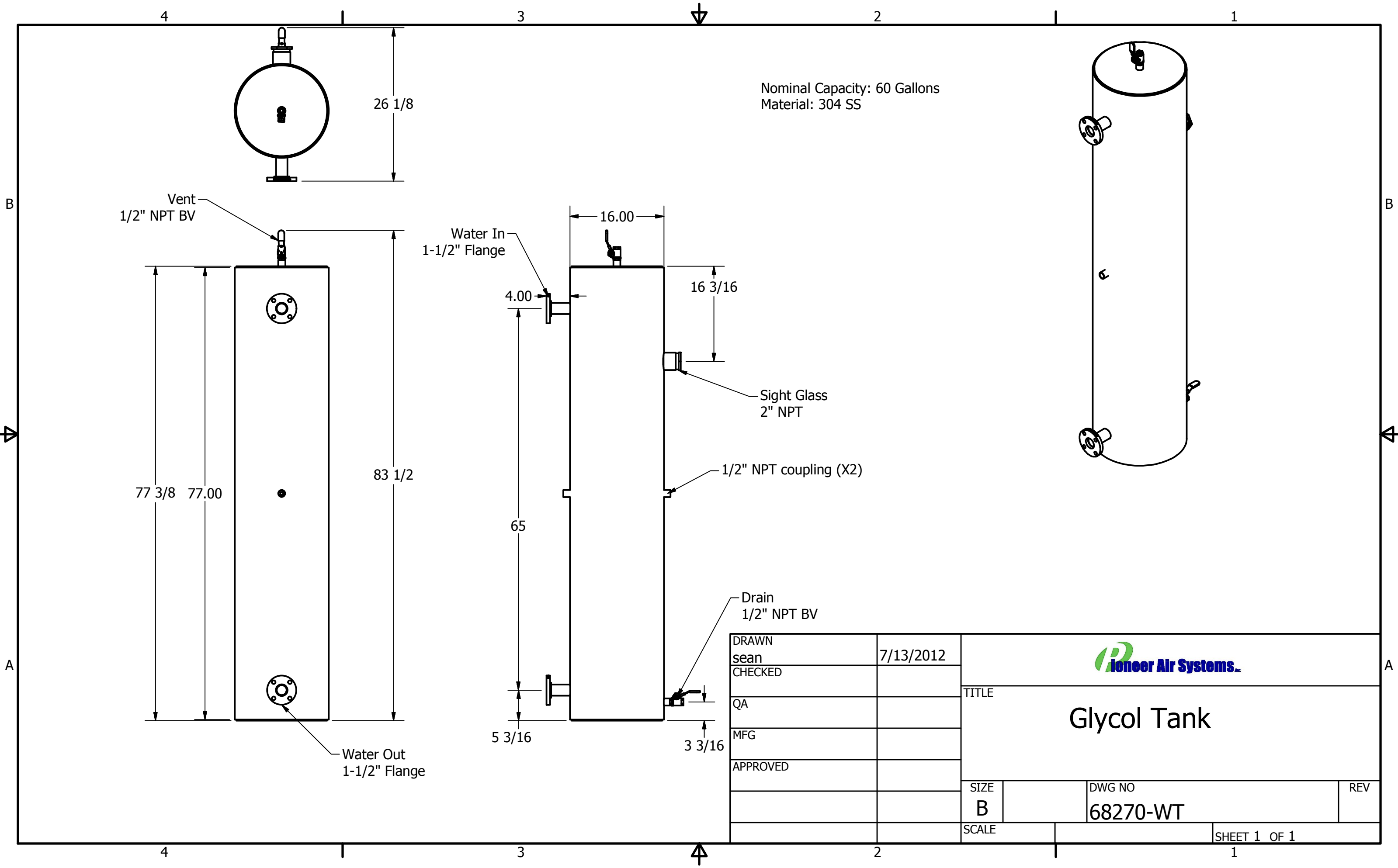
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Classification	Drawn		
Main Power	Check		
Control Power	Approv		
Dew Point	Air Quality		
Media	Purge Loss		
Ambient Temp.	Operating Conditions		
Max. Capacity	Operating Pressure		
Approx. Ship Weight	Design Pressure		
P.O. Number	Power Requirement		

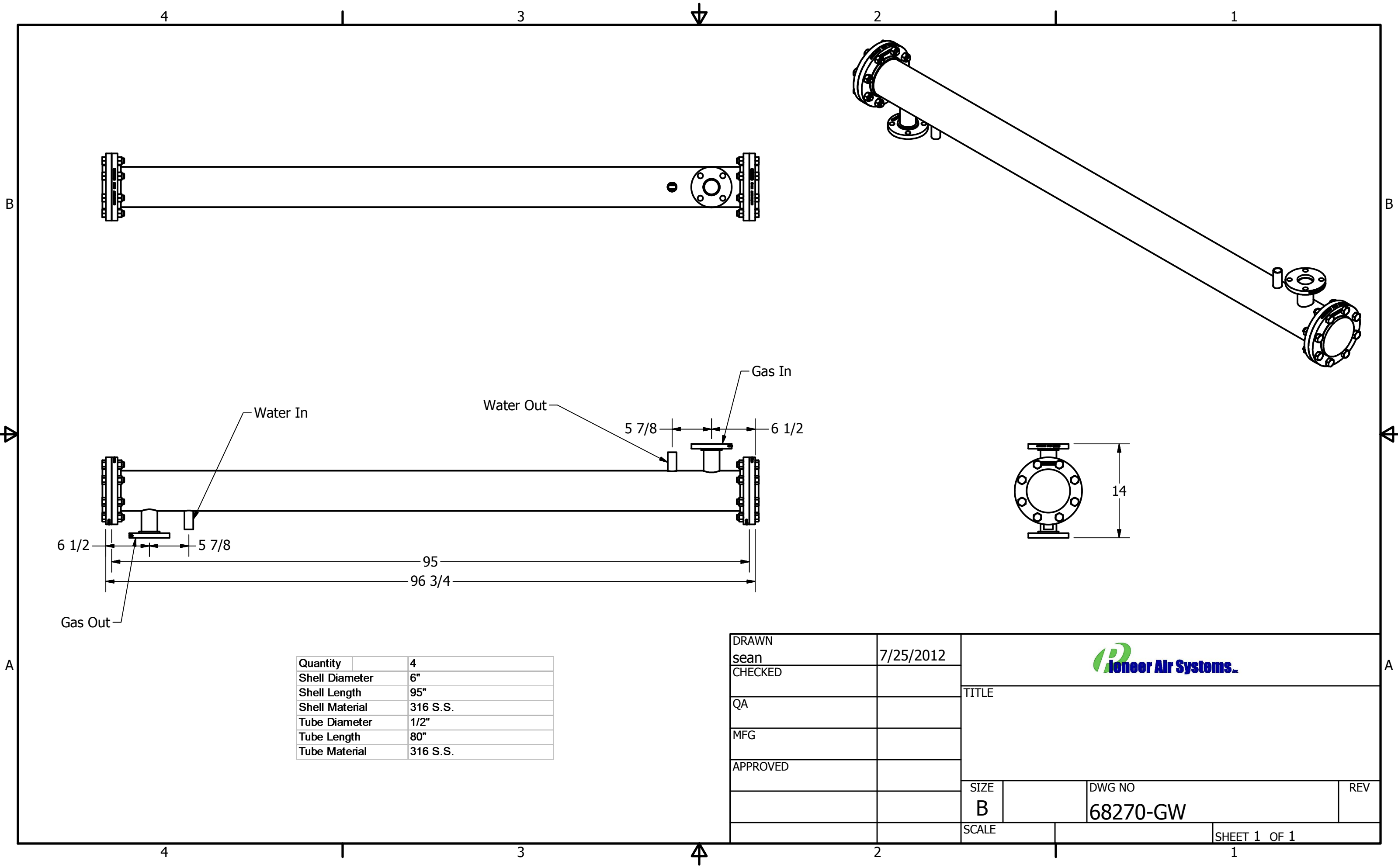
For: GA FLEET	
CAD System: AUTOCAD 2010	
Title	
COALATOR COALESCING AFTER FILTER	
Drawing Number	Revision Sht 1
68270-CR	0 1 Shts

Model 13S, AS (316 SS) 1 x $\frac{1}{2}$ IPT, 3.38 Amp., VN-SC/SC Seal,
1HP, 3/60/230/460V, 3500 RPM, Baldor Class 1, Group D Explosion Proof Motor with thermostats
and Class F Insulation with Class B rise






DRAWN sean	7/13/2012			
CHECKED				
QA		TITLE Glycol Tank		
MFG				
APPROVED				
		SIZE B	DWG NO 68270-WT	REV
		SCALE	SHEET 1 OF 1	



Quantity	4
Shell Diameter	6"
Shell Length	95"
Shell Material	316 S.S.
Tube Diameter	1/2"
Tube Length	80"
Tube Material	316 S.S.

DRAWN	sean	7/25/2012			
CHECKED					
QA			TITLE		
MFG					
APPROVED					
			SIZE	DWG NO	REV
			B	68270-GW	
			SCALE	SHEET 1 OF 1	



GEA PHE Systems North America, Inc.
100 GEA Drive
York, PA 17406 USA
Ph: (717) 268-6200
FAX: (717) 268-6163
Website: www.gea-phe.com/usa

Notes

- To ensure proper part-load operation, the use of a hot-gas-bypass (HGBP) is recommended for this application. Contact factory for details.

Ratings at Varying Conditions

Percent difference	-15%	-7½%	0%	7½%	15%
Pressure drop (psi) (Side A)	0.6	0.7	0.7	0.8	0.9
Pressure drop (psi) (Side B)	1.7	1.7	1.7	1.7	1.7
Cooling rate (Btu/h)	93,500	101,750	110,000	118,250	126,500
Fluid flow rate (GPM) (Side B)	38.0	38.0	38.0	38.0	38.0
Fluid mass flow rate (lb/min) (Side B)	317.2	317.2	317.1	317.1	317.1
Entering fluid temp. (°F) (Side B)	36.9	37.3	37.8	38.2	38.6
Leaving fluid temp. (°F) (Side B)	32.0	32.0	32.0	32.0	32.0
Oversurface percent	27.2	24.7	22.5	20.6	18.8

Disclaimer

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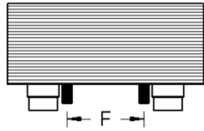
Dimension Sheet Brazed Plate Heat Exchanger



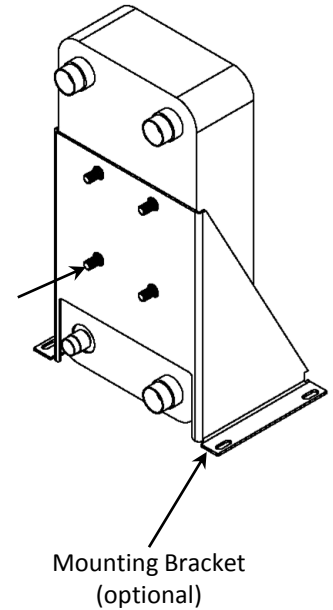
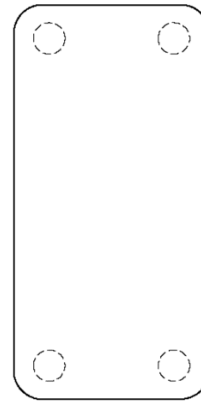
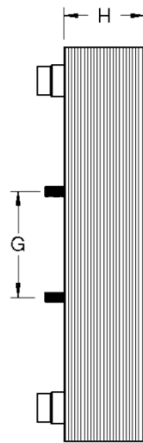
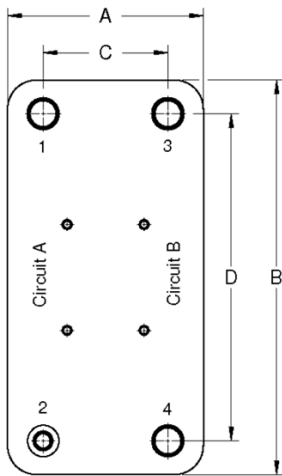
GEA Heat Exchangers

Contact:	Selection ID: NUG6H5X3P
Customer / Project: Project Created 3/12/2012 2:02 PM	
Model Nomenclature: CH30G (DX-B)	

Dimensions - inches (mm): Reference only



A:	11.06 (280.9)
B:	21.38 (543.1)
C:	7.80 (198.1)
D:	18.11 (460.0)
F:	4.00 (101.6)
G:	5.50 (139.7)
H:	7.73 (196.3)



Connections

Circuit A

Circuit B

Position 1	Position 2	Position 3	Position 4
2-1/8" IDS	1-1/8" IDS	2-1/8" IDS	2-1/8" IDS

Volume per BPHE

Circuit A

Circuit B

0.350 ft ³ (9.900 L)	0.360 ft ³ (10.191 L)
---------------------------------	----------------------------------

Net Weight: 106.0 lb (48.1 kg)

Installation Notes:

- Pipe in counter flow direction.
- Water strainer should be installed in the fluid inlet circuit to protect the heat exchanger from blockage (20-40 mesh).
- Solder / Sweat Connections – Use 45% silver solder (minimum), AWS grade Bag-24 or equivalent.

Technical Data

Standard construction materials:

Braze Alloy:	Copper 99.9%
Connector:	304 Stainless Steel
Plate:	316L Stainless Steel

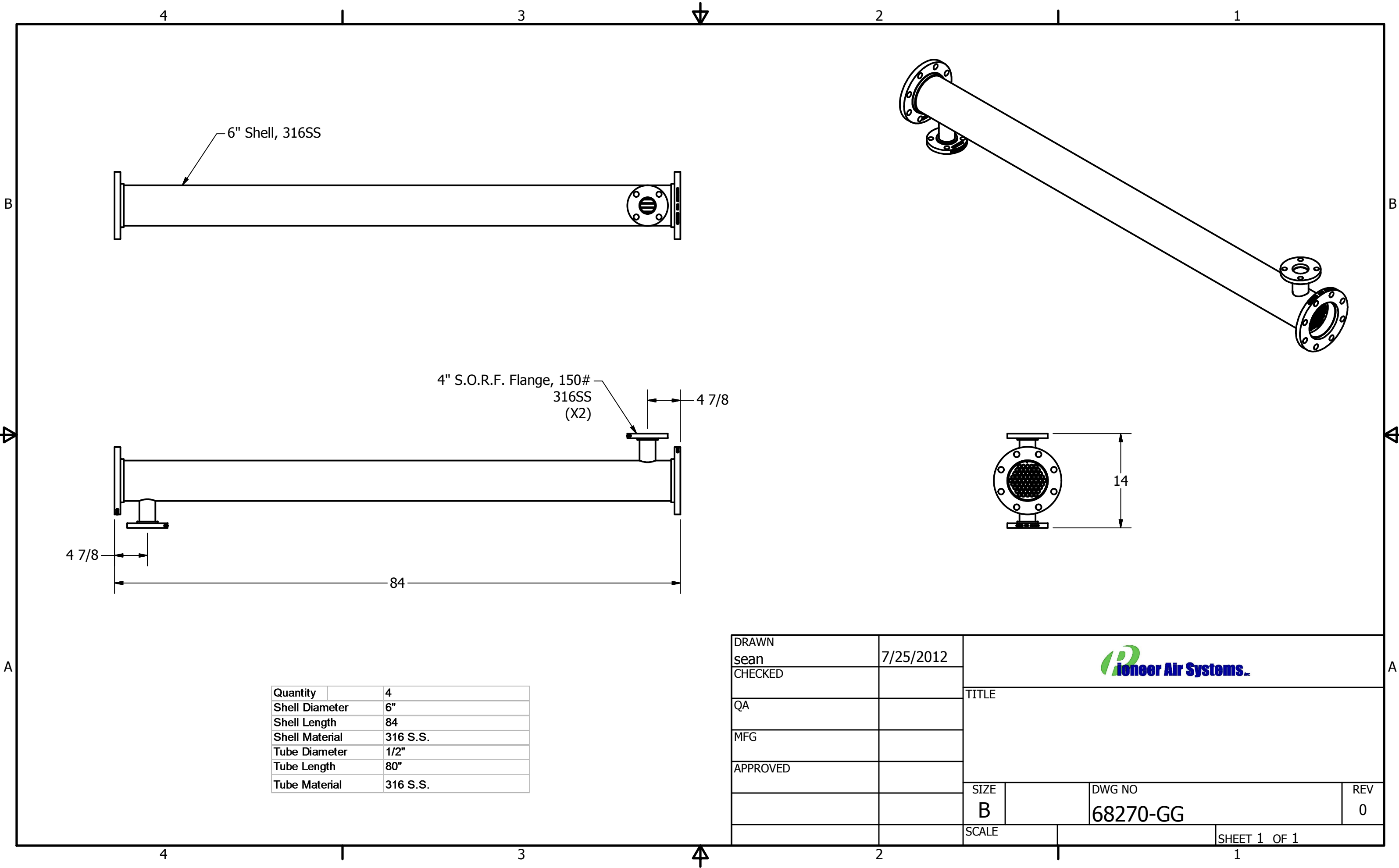
Code Approvals: UL Pending

Allowable Working Pressure and Temperature:

Max pressure	Circuit A: 450 psig (31.0 bar ga) Circuit B: 450 psig (31.0 bar ga)
Max temperature	350.0 °F (176.7 °C)
Min temperature	-320.0 °F (-195.6 °C)

GEA PHE Systems North America, Inc.
100 GEA Drive, York, PA 17406
Toll Free: 1-800-774-0474
Phone: 1-717-268-6200
Fax: 1-717-268-6163
www.gea-phe.com
E-mail: info.geaphena@geagroup.com

Note: Code approval applies to heat exchangers only.



6" Shell, 316SS

4" S.O.R.F. Flange, 150#
316SS
(X2)


4 7/8

4 7/8

84

14

Quantity	4
Shell Diameter	6"
Shell Length	84
Shell Material	316 S.S.
Tube Diameter	1/2"
Tube Length	80"
Tube Material	316 S.S.

DRAWN sean	7/25/2012			
CHECKED				
QA		TITLE		
MFG				
APPROVED				
		SIZE B	DWG NO 68270-GG	REV 0
		SCALE	SHEET 1 OF 1	

OH-85 Improvements to the Fuel Gas System

Gas Inlet	4" S.O.R.F. Flange
Gas Outlet	4" S.O.R.F. Flange
MCW Inlet	1" NPT
MCW Outlet	1" NPT
Condensate Drain	1" NPT

Inlet

Rated Flow	1200 SCFM
Max Press	65 PSIG
Nom Press	50 PSIG
Max Temp	120F
Design Temp	85F

Outlet

PDP	<37F
Temp	70F
Max Press Drop	5 PSID

Gas-Gas Heat Exchanger

Quantity	4
Shell Diameter	6"
Shell Length	84
Shell Material	316 S.S.
Tube Diameter	1/2"
Tube Length	80"
Tube Material	316 S.S.

Gas-Chilled Water Heat Exchanger

Quantity	4
Shell Diameter	6"
Shell Length	95"
Shell Material	316 S.S.
Tube Diameter	1/2"
Tube Length	80"
Tube Material	316 S.S.

Inlet Filter

Shell Diameter	8-5/8"
Shell Length	41"
Number of Elements	1
Material	316 S.S.

Coalescer/Separator

Shell Diameter	12-3/4"
Shell Length	41"
Number of Elements	1
Material	316 S.S.

Glycol Tank

Quantity	1
Nominal Capacity	60 Gallon
Material	304 S.S.



Gas Actuated Thermometers

CBM, Lower, and Adjustable Angle Connection

Remote and Direct Reading

Type TI.R45

Thermometers

Application

Power transformers, paper mills, refineries, petrochemical, food & pharmaceutical

Size

4 1/2" (114.3 mm)

Accuracy

(+/-) 1% of full span

Standard Features

Case

Drawn stainless steel, aluminum, Phenolic/GRP

Case Connection

CBM, Lower, and Adjustable Angle

Process connection

Plain or union

Bulb

3/8" diameter X 3" active length, plain or bendable extension

Capillary

316 stainless steel; SS spring armor or SS interlocking armor; up to 99 feet

Dials

White coated aluminum with black markings

Pointer

Adjustable, balance, aluminum with matte black finish

Ambient Error

0.25% at midscale of span per 25° F change in ambient temperature

Window

Glass, acrylic, shatterproof glass

Over Range

50% of span above top of range or 1300° F, which ever is lower.

Operating Temperature

Middle 2/3 of the dial scale



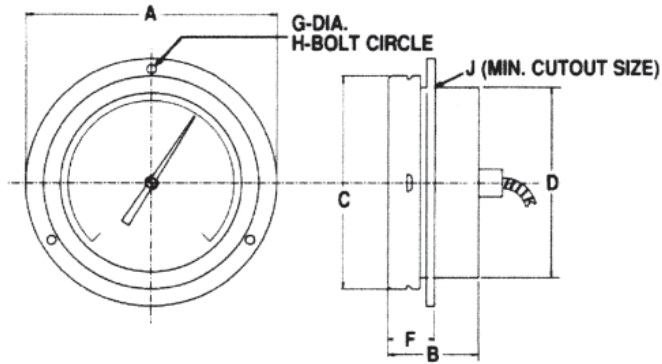
Ranges	
Dual Scale F & C	
-320/100 F	-200/40 C
-120/120 F	-80/50 C
0/120 F	-20/50 C
0/160 F	-20/70 C
-40/180 F	-40/80 C
20/240 F	-10/115 C
0/300 F	-20/150 C
50/550 F	0/300 C
*400/1200 F	200/650 C
50/400 F	0/200 C

*Requires High Temperature Option

Dimensions:

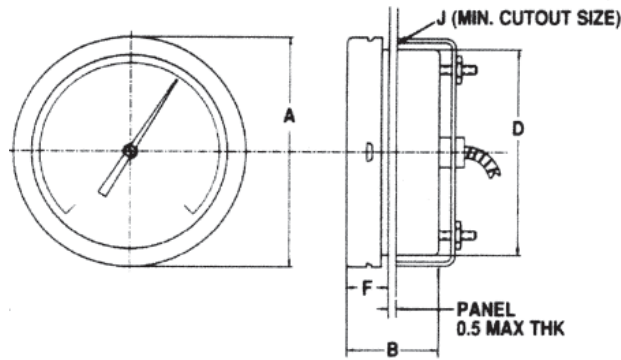
Stainless Steel Semi-Flush Front Flange Case with Bayonet Ring

Code S Dimensions		A	B	C	E	F	G	H	J
Size	Type No.	5.88	2.15	5.04	4.51	1.00	0.22	5.38	4.56
4-1/2"	R 45 S								



~~Stainless Steel "U" Clamp Case with Bayonet Ring~~

Code U Dimensions		A	B	D	F	J
Size	Type No.	5.04	2.00	4.51	0.88	4.56
4-1/2"	R 45 U					



The STAS is a replaceable core Filter Drier for CFC, HCFC, and HFC refrigerants for use in large commercial air conditioning and refrigeration systems.

Features

- Slotted cover/unique internal hardware for hassle-free installation
- Full flow fittings for low pressure drop
- Corrosion resistant epoxy powder paint finish
- Sturdy steel shells for long life
- Solid copper connections
- 100 mesh outlet screen



Nomenclature example: STAS 489T

STAS	48	9	T
Steel Take-Apart Series	Unit Size (in cu. in.)	Connection Size (in 1/8")	System Service T = Liquid Line Service SV = Suction Line Service

Specifications

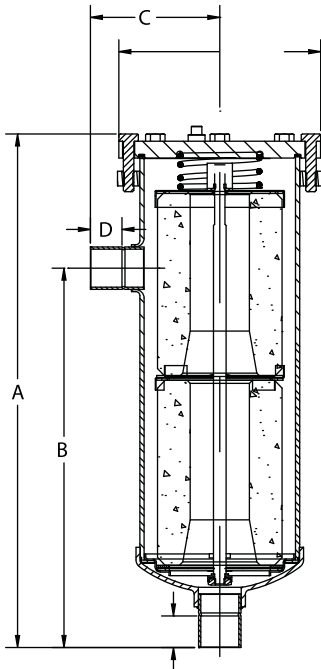
- Filtration (with core): 40 microns
- Maximum working pressure: SV version = 500 psig
T version = 680 psig
- UL/CUL file number: SA7175

053005-Liquid Line Filter

053007-Suction Line Filter

STAS Models are shipped without filter or filter drier cores. See filter or filter drier cores for availability.

Dimensional Data



Ordering Information

PCN	Description	Connection Size	Number Of 48 in ³ Cores	Desiccant Volume (Cu. In.)	Dimensions (in)					
					A	B	C	D		
053001	STAS-485T	5/8 ODF	1	48	9.94	6.00	3.78	0.63		
053003	STAS-487T	7/8 ODF			9.69	6.25	3.75	0.78		
053005	STAS-489T	1 1/8 ODF			9.75	6.31	3.84	0.94		
053007	STAS-4811T	1 3/8 ODF			9.84	6.44	3.97	0.94		
053043	STAS-4813S-V ¹	1 5/8 ODF			9.88	6.02	4.03	1.13		
053044	STAS-4817S-V ¹	2 1/8 ODF			10.06	6.56	4.56	1.34		
053045	STAS-4821S-V ¹	2 5/8 ODF			10.44	7.03	4.75	1.04		
053375	STAS-4813T	1 5/8 ODF			9.88	6.50	4.03	1.13		
053938	STAS-4811SV	1 3/8 ODF			9.84	6.44	3.97	0.94		
053010	STAS-967T	7/8 ODF			2	96	15.19	11.72	3.75	0.78
053012	STAS-969T	1 1/8 ODF	15.22	11.78			3.84	0.94		
053014	STAS-9611T	1 3/8 ODF	15.31	11.91			3.97	1.03		
053017	STAS-9613T	1 5/8 ODF	15.38	11.97			4.03	1.13		
053018	STAS-9617T	2 1/8 ODF	15.56	12.03			4.56	1.34		
053047	STAS-9617S-V ¹	2 1/8 ODF	15.56	12.03			4.56	1.34		
053048	STAS-9621S-V ¹	2 5/8 ODF	15.94	12.50			4.75	1.50		
059739	STAS-9625 SV ¹	3 1/8 ODF	16.54	12.63			5.44	1.66		
053020	STAS-1449T	1 1/8 ODF	3	144			21.25	17.38	3.84	0.94
053022	STAS-14411T	1 3/8 ODF					21.34	17.53	3.97	1.03
053024	STAS-14413T	1 5/8 ODF			21.38	17.59	4.03	1.13		
053025	STAS-14417T	2 1/8 ODF			21.56	17.63	4.56	1.34		
053028	STAS-19211T	1 3/8 ODF	4	192	26.91	23.00	3.97	1.03		
053030	STAS-19213T	1 5/8 ODF			26.94	23.17	4.03	1.13		
053031	STAS-19217T	2 1/8 ODF			27.13	23.13	4.56	1.34		
056213	STAS-1927/5T	7/8 X 5/8			26.50	6.00	3.69	0.78/0.63		

¹"SV" style include stainless steel bolts and access valve.

NOTE: "T" style can be used for suction by removing pipe plug and installing X-11562-2.

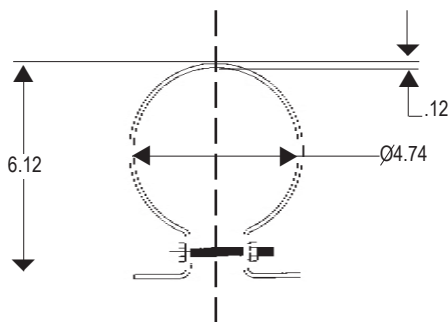
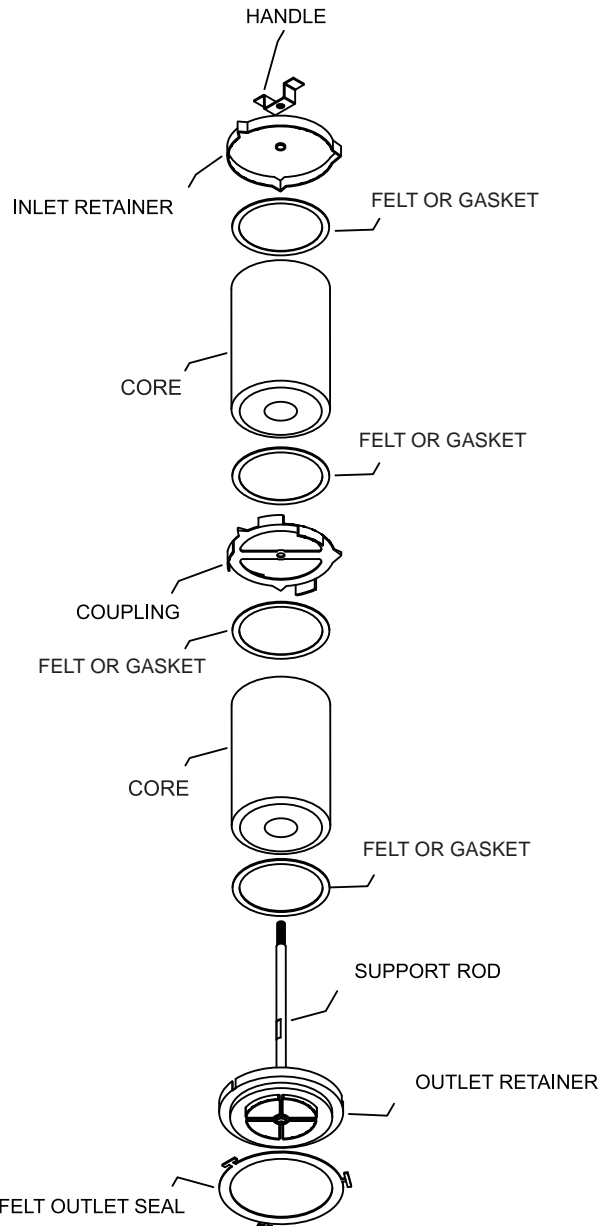
Description	Connections	Liquid Flow Capacity Tons @ 1 psi ΔP ^{1,2,3}						
		R-12	R-134a	R-22	R-407C	R-404A/507	R-502	R-410A
STAS-485T	5/8 ODF	16	21	22	21	15	14	22
STAS-487T	7/8 ODF	29	38	41	39	27	25	41
STAS-489T	1 1/8 ODF	42	53	58	56	38	36	58
STAS-4811T	1 3/8 ODF	48	75	81	78	53	41	81
STAS-4813T	1 5/8 ODF	67	81	89	85	58	58	89
STAS-967T	7/8 ODF	33	42	45	43	30	27	45
STAS-969T	1 1/8 ODF	49	65	71	68	47	42	71
STAS-9611T	1 3/8 ODF	62	80	87	83	57	54	87
STAS-9613T	1 5/8 ODF	67	92	100	95	65	58	100
STAS-1449T	1 1/8 ODF	48	66	72	69	47	41	72
STAS-14411T	1 3/8 ODF	69	92	100	96	65	60	100
STAS-14413T	1 5/8 ODF	77	93	101	97	66	66	101
STAS-14417T	2 1/8 ODF	88	110	120	115	78	76	120
STAS-19211T	1 3/8 ODF	75	94	102	98	67	64	102
STAS-19213T	1 5/8 ODF	81	103	113	108	74	69	113
STAS-19217T	2 1/8 ODF	91	113	123	117	80	78	123

¹ All ratings in accordance with ARI Standard 710-04. 86°F liquid refrigerant temperature
 • 5°F saturated vapor temperature
 • 3.1 lbs./min./ton for R-134a
 • 2.9 lbs./min./ton for R-22 and R-407C
 • 4.0 lbs./min./ton for R-404A/507 and R-12
² For 2 PSI ΔP , Multiply values by 1.4
³ For kW, multiply by 3.5

Replacement Parts For STAS

Flange Cover Assembly	Description	PCN
All STAS Driers - Include Flange Cover, Compression Spring, Pipe Plug, and Grade 5 Bolts	X12176-3	054046
Shell Strainer Assembly		
STAS-48	X27458-1	060274
STAS-96	X27458-2	060275
STAS-144	X27458-3	060276
STAS-192	X27458-4	060277
Miscellaneous Parts		
Cover Bolts (Stainless Steel - suction line service)	X25787-7	053121
Access Valve (V Option)	X11562-2	037409
Gasket Set (Includes cover gasket)	X11983-1	027453
Handle	26446-1	053812
Inlet Retainer	26477-1	053813
Spring	26439-1	060258
Felt Set (1 Core Set)	27394-1	060278
Mounting Bracket	X28747-1	061715

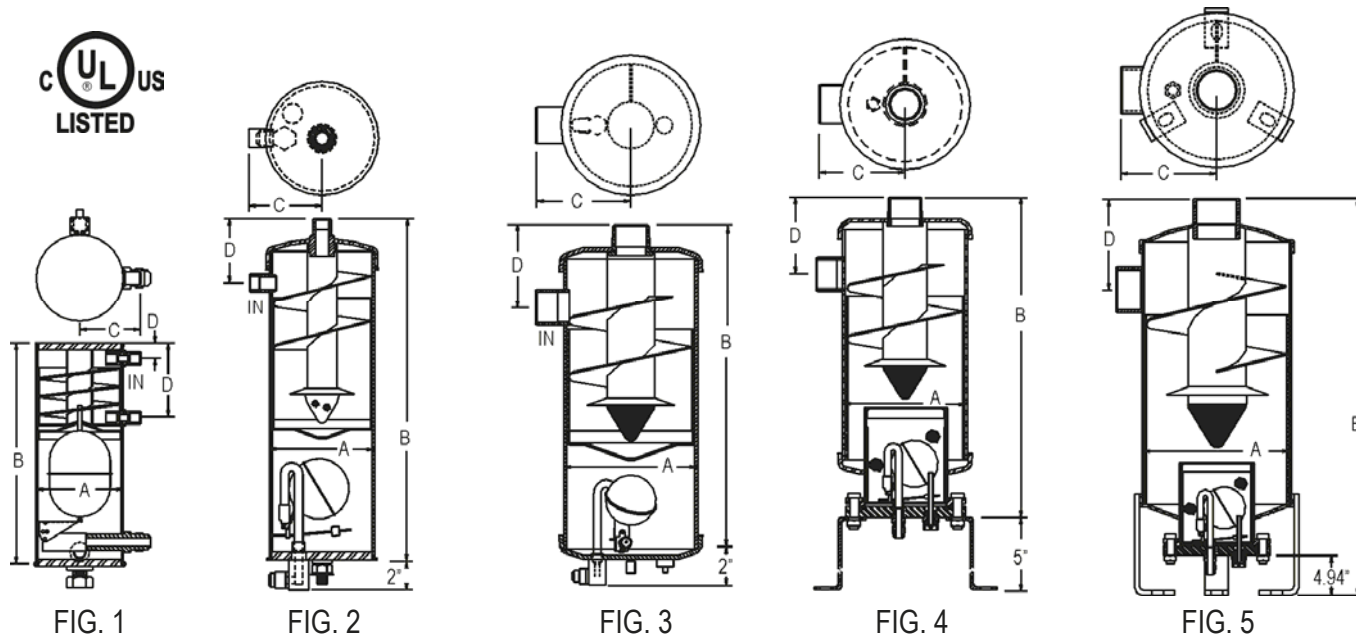
Exploded View



Mounting Bracket for STAS 48*

*More than one mounting bracket may be required for shell sizes 96 and above.

HELICAL OIL SEPARATORS



Catalog Number	Fig. No.	Size Conn. ODS	Dimensions in Inches					Capacity in Tons of Ref. at Evap. Temp. (Nominal)						Nom. DCFM	Pre-Charge Oil (oz)
			A	B	C	D		R-134a		R-22		R-404a/R-507			
						-40°F	+40°F	-40°F	+40°F	-40°F	+40°F				
S-5180	1	1/4"	2.5	6.38	1.75	0.44	2.12	0.40	0.50	0.55	0.60	0.50	0.60	0.5	14
S-5181	1	3/8"	2.5	7.5	1.75	0.5	3.25	0.90	1.00	1.20	1.40	1.00	1.20	1.1	14
S-5182	2	1/2"	4	13	2.75	2.44		1.30	1.50	1.80	2.00	1.50	1.90	1.7	14
S-5185	2	5/8"	4	15	2.75	2.5		2.40	2.90	3.60	4.00	3.00	3.70	3.4	14
S-5187	2	7/8"	4	17	3	2.94		4.70	5.70	6.80	7.60	5.70	7.00	6.5	14
S-5188	2	1 1/8"	4	19	3	3.06		8.00	9.50	11.40	12.70	9.30	11.50	10.7	14
S-5190	3	1 3/8"	6	15	4.25	3.69		11.60	13.90	16.40	18.40	13.60	16.40	15.5	40
S-5192	3	1 5/8"	6	17	4.25	3.95		16.40	19.10	22.90	25.60	18.60	22.90	21.4	40
S-5194	3	2 1/8"	6	17	4.38	4.19		24.90	29.40	35.40	39.10	28.60	35.40	33.0	40
S-5290	4	1 3/8"	6	15	4.25	3.69		11.60	13.90	16.40	18.40	13.60	16.40	15.5	25
S-5292	4	1 5/8"	6	17	4.25	3.95		16.40	19.10	22.90	25.60	18.60	22.90	21.4	25
S-5294	4	2 1/8"	6	17	4.38	4.19		24.90	29.40	35.40	39.10	28.60	35.40	33.0	25
S-5202	5	2 1/8"	8	24	5.38	5.06		29.40	35.00	41.80	46.60	34.30	42.10	39.2	25
S-5203	5	2 5/8"	10	27	6.5	5.63		48.60	58.10	70.10	78.10	58.10	71.60	66.6	25
S-5204	5	3 1/8"	12	30	7.75	6.45		71.60	85.10	102.60	114.60	85.10	105.10	97.6	25

DCFm & Tonnage Ratings revised for optimal oil separation and minimal pressure drop. Replacement components on page 9.

U.S. patents #5,113,671 #5,404,730 #5,271,245; Mexico 173552; Denmark, France, Great Britain, Italy 0 487 959; Germany P69106849.6-08; Taiwan UM-74863; & other U.S. & foreign patents pending. Standard 3/8" flare oil return connection & 1/8" FPT oil drain; 3/8" O.D.S. oil return connection available by ordering an "X" suffix (i.e. S-5292X). All the capacities shown are based on 105°F condensing. See page 4 for sizing instructions.

OIL SEPARATORS

Sizing Charts



Min/Max DCFMs shown below for various common refrigerants at specific conditions. For other conditions and refrigerants please consult the factory.

Catalog Number	R404a, -40F Evap. 105F Cond.				R22, 40F Evap. 105F Cond.			
	MINIMUM DCFM	MAXIMUM DCFM	MINIMUM TONS	MAXIMUM TONS	MINIMUM DCFM	MAXIMUM DCFM	MINIMUM TONS	MAXIMUM TONS
S-5180	0.46	0.55	0.41	0.49	0.45	0.63	0.49	0.69
S-5181	0.60	1.58	0.54	1.41	0.61	1.84	0.66	2
S-5182	1.17	2.18	1.05	1.95	1.15	2.53	1.25	2.75
S-5185	3.0	3.6	2.7	3.2	3.0	4.2	3.3	4.5
S-5187	4.6	8.1	4.1	7.2	4.5	9.5	4.9	10.3
S-5188	6.0	14.8	5.4	13.2	6.1	17.3	6.6	18.8
S-5190	8.5	21.9	7.6	19.6	8.4	25.4	9.1	27.6
S-5192	10.7	30.9	9.6	27.6	10.7	36.4	11.6	39.6
S-5194	16.9	47.1	15.1	42.1	16.6	55.3	18.1	60.1
S-5290	8.5	21.9	7.6	19.6	8.4	25.4	9.1	27.6
S-5292	10.7	30.9	9.6	27.6	10.7	36.4	11.6	39.6
S-5294	16.9	47.1	15.1	42.1	16.6	55.3	18.1	60.1
*S-5202	21.9	54.6	19.6	48.9	22.2	63.6	24.1	69.1
*S-5203	46.0	84.0	41.1	75.1	45.2	98.5	49.1	107.1
*S-5204	70.6	119.8	63.1	107.1	70.9	139.9	77.1	152.1

Catalog Number	R134a, 40F Evap. 105F Cond.				R407c, 40F Evap. 105F Cond.			
	MINIMUM DCFM	MAXIMUM DCFM	MINIMUM TONS	MAXIMUM TONS	MINIMUM DCFM	MAXIMUM DCFM	MINIMUM TONS	MAXIMUM TONS
S-5180	0.46	0.76	0.33	0.54	0.46	0.58	0.44	0.56
S-5181	0.60	2.19	0.43	1.56	0.60	1.68	0.58	1.62
S-5182	1.19	3.01	0.85	2.15	1.14	2.34	1.1	2.25
S-5185	3.01	4.98	2.15	3.55	3.02	3.85	2.9	3.7
S-5187	4.63	11.22	3.3	8	4.58	8.63	4.4	8.3
S-5188	6.03	20.61	4.3	14.7	6.03	15.81	5.8	15.2
S-5190	8.55	30.29	6.1	21.6	8.42	22.98	8.1	22.1
S-5192	10.66	42.91	7.6	30.6	10.50	33.38	10.1	32.1
S-5194	16.97	65.35	12.1	46.6	17.26	50.80	16.6	48.85
S-5290	8.55	30.29	6.1	21.6	8.42	22.98	8.1	22.1
S-5292	10.66	42.91	7.6	30.6	10.50	33.38	10.1	32.1
S-5294	16.97	65.35	12.1	46.6	17.26	50.80	16.6	48.85
*S-5202	22.23	75.86	15.85	54.1	21.94	57.82	21.1	55.6
*S-5203	45.01	117.93	32.1	84.1	45.86	90.58	44.1	87.1
*S-5204	71.66	167.01	51.1	119.1	70.82	128.02	68.1	123.1

- *Rates also apply to Guardian Separator/Reservoir S-53** types.
- Minimum DCFM & tons should be met in order to ensure proper oil separation.
- Maximum DCFM & tons should not be exceeded due to pressure drop will become greater than 0.5 psi.

TFE R-22 Series

Thermal Expansion Valves

The TFE R-22 series is designed for large tonnage heat pump, air conditioning, and commercial refrigeration applications.

Features

- Stainless steel power element eliminates corrosion and prevents valve failure
- Replaceable power element
- External superheat adjustment
- ODF connections
- Balanced port construction compensates for changes in operating pressures due to varying ambients, or widely varying evaporator loads
- Bi-Flow capability for heat pump applications
- External equalizer



Specifications

- Maximum working pressure: 450 psig

TFE Nominal* Capacity Table in Tons

R-134a	R-22/R-407C	R-502, R-404a/R-507
6	8	5
8	10	7
10	12	9
15	20	14

*See Extended Capacity Tables for ratings at a wide range of conditions per ARI standard 750

Nomenclature example: TFES 10 HCA 5/8 x 7/8 ODF S/T

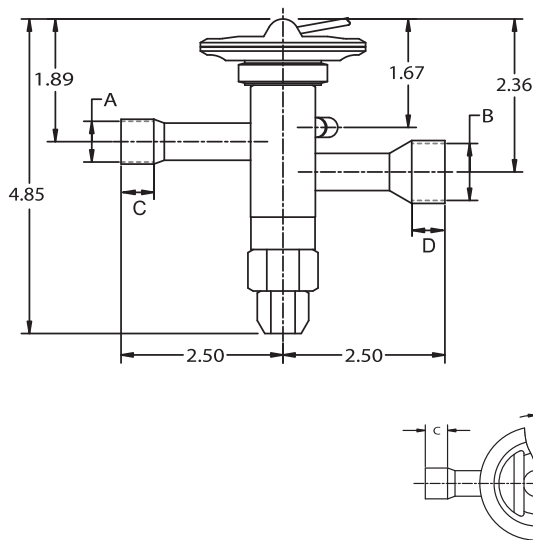
TF	E	S	10	H	CA	5/8 x 7/8	ODF	S/T
Valve Series Balanced Port, Replaceable Power Assembly	Equalizer E=External 1/4" ODF	Connection Type S = solder (Only)	Capacity Nominal Rating in Tons (See nominal capacity table below)	Refrigerant Code • H = R-22 • M = R-134a • N = R-407C • P = R-507 • R = R-502 • S = R-404A	Charge Code C = medium temp CA = heat pump	Inlet x Outlet Connection Sizes (See ordering information table below)	Connection Type ODF=solder	Configuration S/T = Straight- thru

* = R-507, R-502 and R-404A are interchangeable refrigerant charges, • = R-22 and R-407C are interchangeable refrigerant charges

Ordering Information

Valve Series	Capacity Tons* (R-22 Nominal)	Connections	PCN HCA Charge (R-22 Heat Pump)
TFES	8	5/8 X 7/8 ODF S/T 6A ODF EE	061608
	10	5/8 X 7/8 ODF S/T 6A ODF EE	061610
	12	5/8 X 7/8 ODF S/T 6A	061609
	20	5/8 X 7/8 ODF S/T 6A	064493

Dimensional Data (in)



Inlet/Outlet Fittings Dimensional Data (in)

Connections		Inlet		Outlet		Equalizer	
Inlet	Outlet	A	B	C MIN	D MIN.	1/4 ODF	SAE
1/4 ODF	3/8 ODF	0.25	0.38	0.31	0.31	1.70	1.65
	1/2 ODF	0.25	0.50		0.37		
	5/8 ODF	0.25	0.63		0.50		
3/8 ODF	3/8 ODF	0.38	0.38		0.31		
	1/2 ODF	0.38	0.50		0.37		
	5/8 ODF	0.38	0.63		0.50		
1/2 ODF	7/8 ODF	0.38	0.88	0.76			
	1/2 ODF	0.50	0.50	0.37	0.37		
	5/8 ODF	0.50	0.63	0.37	0.50		
5/8 ODF	7/8 ODF	0.50	0.88	0.37	0.76		
	5/8 ODF	0.63	0.63	0.50	0.50		
	7/8 ODF	0.63	0.88	0.50	0.76		
7/8 ODF	1-1/8 ODF	0.63	1.13	0.50	0.91		
	7/8 ODF	0.88	0.88	0.76	0.76		
	1-1/8 ODF	0.88	1.13	0.76	0.91		

Remote Bulb

Charge	Tubing Length (Ft)	F	G
C,A,Z	2, 2-1/2, 5	3.06	0.63
	10	3.56	
	15, 20, 30	4.81	
	40, 50	6.19	
CA, AA	2-1/2, 5, 10	2.31	0.76

Replacement Parts

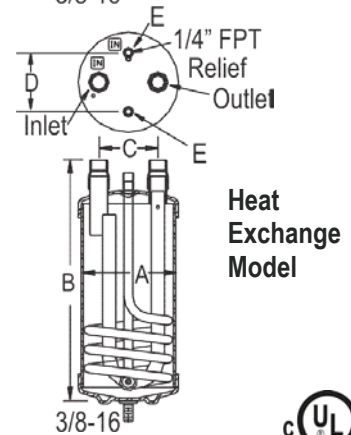
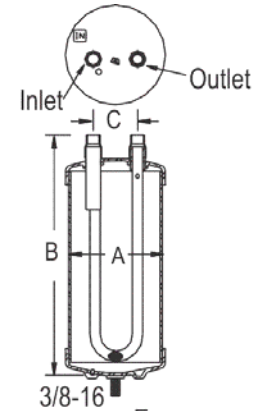
	Description	PCN
Power Assembly	X-28458 HCA-2	063414
	X-28458 HW100-2	063416
	X-28458 SW45-2	065298
Seal Nut	27676-1	058707

VERTICAL SUCTION

Line Accumulators



Max Working Pressure 450 PSI



Heat Exchange Model



Catalog Number			Dimensions in Inches						ODS *E
STD.	Heat Ex.	Heat Pump	ODS Conn.	Dia. A	B	C	D		
S-7043	—	S-7043HP	5/8	4	6.38	1.88	N/A	N/A	
S-7044	—	S-7044HP	1/2	4	10.38	1.88	N/A	N/A	
S-7045	S-7045HE	S-7045HP	5/8	4	10.38	2.50	2.50	3/8	
S-7046	S-7046HE	S-7046HP	3/4	4	10.38	2.50	2.50	3/8	
S-7057	S-7057HE	S-7057HP	7/8	5	13	2.25	2.75	1/2	
S-7061	S-7061HE	S-7061HP	1-1/8	6	15	3	2.88	5/8	
S-7063S	—	—	1-3/8	6	20.25	3	N/A	N/A	
S-7063	S-7063HE	S-7063HP	1-3/8	6	24.75	3	2.88	5/8	
S-7065	S-7065HE	S-7065HP	1-5/8	6	24.75	3	2.88	3/4	

Catalog Number	Refrigerant Holding Cap. (Lbs. 0°F sat.)			Refrigerant Recommended Tons Refrigeration at Suction Evaporating Temperature (°F)														
	R134a	R22	R404a / R507	R-134a					R-22					R-404a / R-507				
				+40°	+20°	0°	-20°	-40°	+40°	+20°	0°	-20°	-40°	+40°	+20°	0°	-20°	-40°
S-7043	2.3	2.1	1.9	Max. 1.4	0.8	0.5	0.3	0.2	1.9	1.3	0.9	0.6	0.4	2.1	1.4	0.9	0.6	0.3
				Min. 0.3	0.2	0.1	0.1	0.4	0.4	0.3	0.2	0.1	0.1	0.5	0.3	0.2	0.1	0.1
S-7044	4.4	4.1	3.7	Max. 0.7	0.4	0.3	0.2	0.1	1.0	0.7	0.5	0.3	0.2	1.1	0.7	0.5	0.3	0.2
				Min. 0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.3
S-7045	4.4	4.1	3.7	Max. 1.4	0.8	0.5	0.3	0.2	1.9	1.3	0.9	0.6	0.4	2.1	1.4	0.9	0.6	0.3
				Min. 0.3	0.2	0.1	0.1	0.4	0.4	0.3	0.2	0.1	0.1	0.5	0.3	0.2	0.1	0.1
S-7046	4.4	4.1	3.7	Max. 1.9	1.1	0.7	0.4	0.2	2.7	1.8	1.2	0.8	0.5	2.9	1.9	1.2	0.8	0.5
				Min. 0.4	0.2	0.2	0.1	0.5	0.6	0.4	0.3	0.2	0.1	0.6	0.4	0.3	0.2	0.1
S-7057	9.2	8.5	7.7	Max. 3.2	1.9	1.2	0.7	0.4	4.5	3.1	2.1	1.3	0.8	4.8	3.2	2.1	1.3	0.8
				Min. 0.6	0.4	0.2	0.1	0.1	0.9	0.6	0.4	0.3	0.2	0.9	0.6	0.4	0.3	0.2
S-7061	12.7	11.8	10.7	Max. 6.6	3.9	2.4	1.4	0.8	9.3	6.5	4.3	2.7	1.7	10.0	6.6	4.3	2.6	1.6
				Min. 1.0	0.6	0.4	0.2	0.1	1.5	1.0	0.7	0.4	0.3	1.6	1.0	0.7	0.4	0.2
S-7063S	17.1	15.4	14.0	Max. 11.0	6.4	4.0	2.4	1.3	15.4	10.7	7.0	4.5	2.8	16.5	10.9	7.0	4.4	2.6
				Min. 2.1	1.2	0.8	0.5	0.3	3.0	2.0	1.4	0.9	0.5	3.2	2.1	1.4	0.9	5.5
S-7063	21.8	20.1	18.2	Max. 11.0	6.4	4.0	2.4	1.3	15.4	10.7	7.0	4.5	2.8	16.5	10.9	7.0	4.4	2.6
				Min. 2.1	1.2	0.8	0.5	0.3	3.0	2.0	1.4	0.9	0.5	3.2	2.1	1.4	0.9	5.5
S-7065	21.8	20.1	18.2	Max. 19.3	11.3	7.0	4.2	2.4	27.2	18.8	12.4	7.9	4.8	29.1	19.1	12.4	7.7	4.6
				Min. 3.7	2.1	1.3	0.8	0.5	5.1	3.6	2.4	1.5	0.9	5.5	3.6	2.4	1.5	0.9



Industrial & Commercial Refrigeration Products 800.96.HENRY

R22

Open Drive
Reciprocating
Compressors

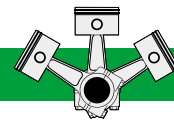
2T.2(Y) .. 6F.2(Y)
W2TA .. W6FA

Compresseurs
ouverts à piston

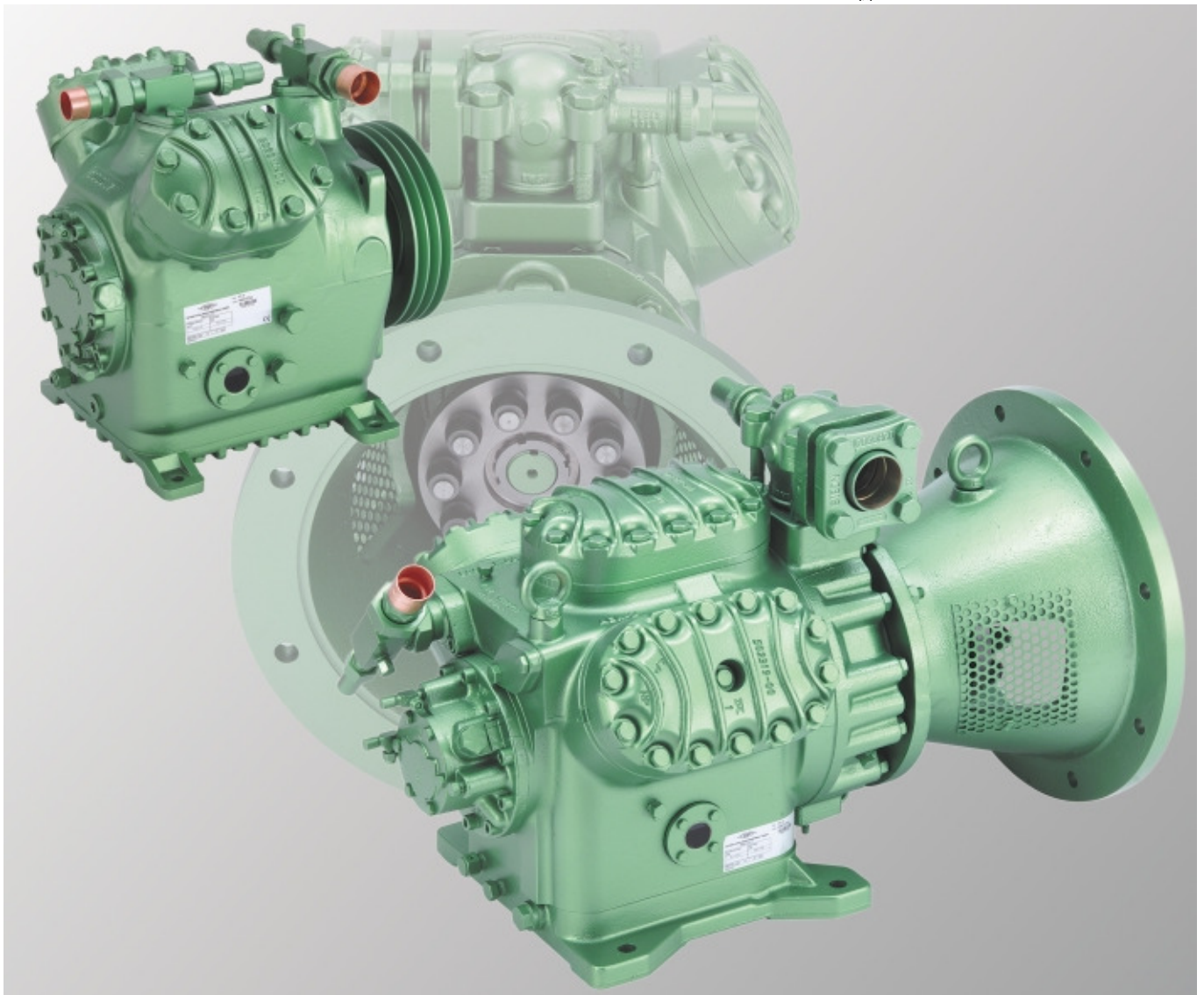
2T.2(Y) .. 6F.2(Y)
W2TA .. W6FA

Compresores a
pistón abierto

2T.2(Y) .. 6F.2(Y)
W2TA .. W6FA



KP-525-3



R134a ■ R404A/R507A ■ R22 ■ NH₃

IP Units / 60 Hz

Open compressors for direct drive and belt drive .2-Generation

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Compresores abiertos para acoplamiento directo y para accionamiento por correa Generación .2

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General Technical highlights

BITZER is the way forward with the .2-Generation.

One common compressor series for chlorine free HFC refrigerants and the HCFC's.

Due to the highly efficient and especially robust design the standard compressors have the design features for operation with chlorinated as well as with chlorine free refrigerants.

The only difference in case of chlorine free substitutes is the use of **Polyol-Ester oils** approved by BITZER and a new shaft seal for 2T.2Y to 4N.2Y.

In addition to that a compressor series is offered for **Ammonia (NH₃)** which is especially optimized for this refrigerant.

The deciding features

- Suitable for direct and belt drive.
- The flange on the drive shaft side enables the direct fitting of the motor (NEMA) by means of a coupling housing (accessory).
- Lightweight design and careful balancing of the moving mechanical parts ensure a minimum of vibration and running-noise.

Généralités Les atouts techniques

Avec la **Génération .2** BITZER a pris de nouveau une longueur d'avance.

Une série de compresseurs commune pour fluides frigorigènes HFC sans chlore et HCFC.

Par leur construction particulièrement robuste et hautement efficiente, les compresseurs standards sont prédisposés au fonctionnement avec les fluides frigorigènes chlorés et les HFC sans chlore.

Unique différence en cas de fluides frigorigènes HFC: Emploi d'une **huile polyolester** autorisée par BITZER et une garniture d'étanchéité nouvelle de 2T.2Y à 4N.2Y.

En plus une série des compresseurs est disponible pour l'**ammoniac (NH₃)** spécialement optimisée pour ce fluide frigorigène.

Les points marquants

- Prevu pour accouplement direct et entraînement par courroies.
- Surface de flasque côté passage de l'arbre permet le montage direct du moteur (NEMA) par l'intermédiaire de l'accouplement (accessoire)
- Construction légère de l'attelage des pistons et un équilibrage soigné permettent d'obtenir une régularité de fonctionnement remarquable.

En general Acentos técnicos

Con la **generación .2** BITZER ha vuelto a sacar una ventaja decisiva:

La única serie de compresores para refrigerantes HFC sin cloro y HCFC.

Gracias a la construcción de alta eficiencia y especial robustez los compresores estándar cumplen todos los requisitos para el funcionamiento con los refrigerantes clorados y con los HFC sin cloro.

La única diferencia en el caso de sustitutos sin cloro es la utilización de un **aceite poliol-éster** autorizado por BITZER y un nuevo sello del eje para 2T.2Y a 4N.2Y.

Además se ofrece para **amoníaco (NH₃)** una serie de modelos de compresores optimizada especialmente para este refrigerante.

Los rasgos decisivos

- Apropriados para el accionamiento por acoplamiento y para el accionamiento por correa.
- Superficie de brida en el lado del paso de eje permite el montaje directo del motor (NEMA) mediante la caja de acoplamiento (accessorio).
- Ligera construcción y cuidadosa compensación equilibradora del mecanismo de cigüeñal dan como resultado el mínimo de vibración y silencio de marcha.

- ❑ Crankshaft with special surface finish, optimized piston shape and chromium-plated piston rings guarantee low frictional losses and long service life.
- ❑ Highly efficient, extremely robust valve plate design as the result of newly developed valve construction being equipped with components proven over many years.
- ❑ Pressure oil lubrication by means of reversible gear pump.
- ❑ Special oil return system to ensure extremely low oil carry-over.
- ❑ Shaft seal cooled by a pressurized oil stream and also by the return gas flow resulting in excellent stability and insignificant thermal load.
- ❑ Easy maintenance due to good accessibility, no special tools needed.

Optional extras

Among others, crankcase heater, integrated start unloading and capacity control, additional fan, differential oil pressure switch, water-cooled cylinder heads, discharge gas temperature sensor. Special design for marine operation upon request.

Extent of delivery and accessories
refer to Price List.

- ❑ Vilebrequins subissent un traitement thermique superficiel; la forme des pistons a été optimisée; les segments sont chromés. Tous ces éléments garantissent une réduction des pertes par frottement et une longévité maximale.
- ❑ Construction de plaques à clapets, efficaces et robustes, est le résultat d'une recherche s'étendant sur de longues années pour obtenir des éléments hautement efficaces et très robustes, d'une conception nouvelle, mais basée sur une technique éprouvée.
- ❑ Lubrification se fait par une pompe à engrenages réversible.
- ❑ Système de retour d'huile spécifique réduit au maximum les éjections d'huile.
- ❑ Garniture d'étanchéité refroidie par le passage de l'huile sous pression et par le courant de gaz d'aspiration ayant pour conséquence une faible charge thermique et une très bonne stabilité.
- ❑ Entretien facile, rendu possible par sa bonne accessibilité, sans aucun outil spécial.

Accessoires livrables en option

Résistance de carter, démarrage à vide et régulation de puissance intégrés, ventilateur additionnel, pressostat différentiel d'huile, têtes de culasses refroidies à eau, sonde de température du gaz au refoulement. Version spéciale pour opération marine sur demande.

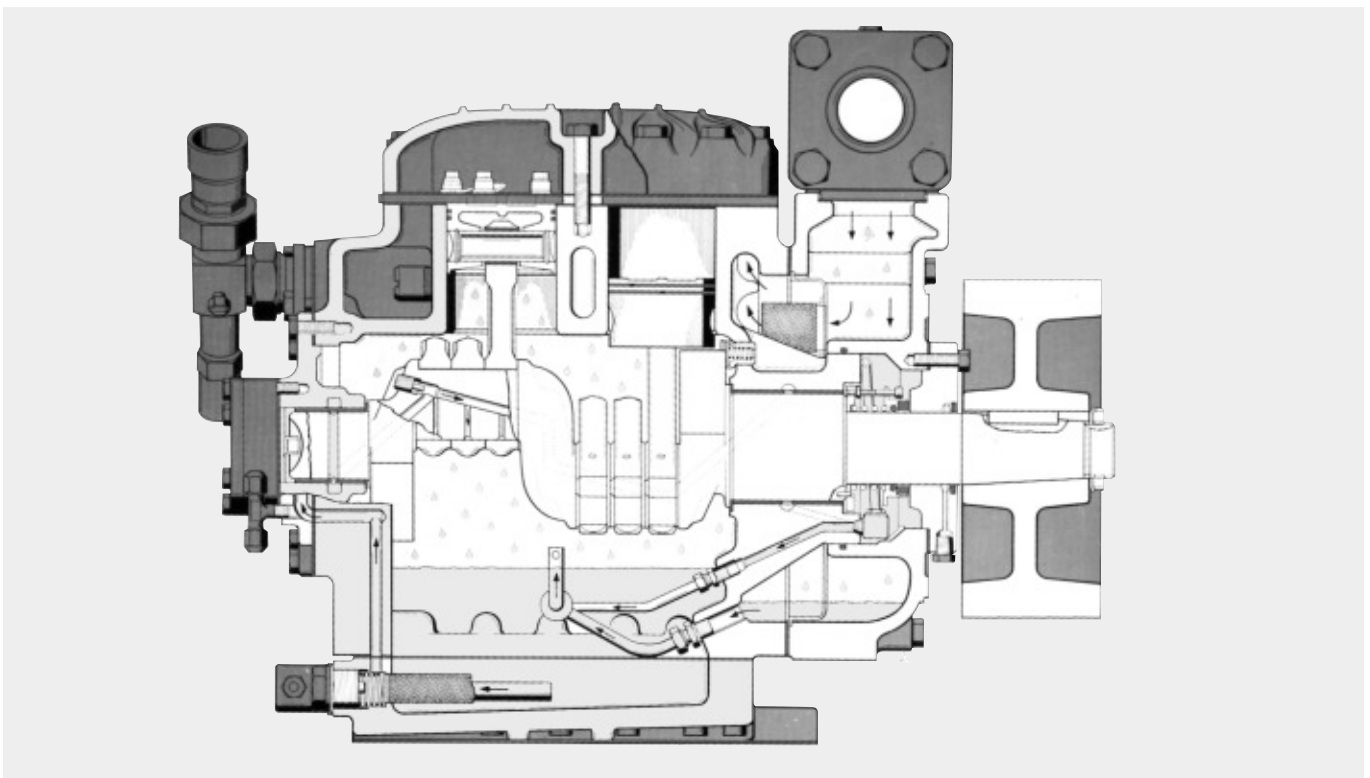
Etendue de la fourniture et accessoires
se reporter à notre Tarif.

- ❑ Cigüeñal con acabado superficial especial, la optimizada forma del pistón y los anillos de pistón con recubrimiento de cromo garantizan bajas pérdidas de energía por fricción y una larga duración.
- ❑ Alta eficiencia y sumamente robusta construcción de los platos de válvula son el resultado de una fabricación de válvulas de reciente desarrollo en la forma de ejecución - pero equipada con elementos de construcción probados desde hace mucho.
- ❑ Lubricación de aceite a presión mediante bomba reversible de engranes.
- ❑ Sistema especial de recirculación de aceite consigue un desecho de aceite extremadamente bajo.
- ❑ Sello del eje enfriado por un chorro a presión de aceite y también por un flujo de gas aspirado, lo cual resulta en una excelente estabilidad y cargas térmicas insignificantes.
- ❑ Fácil mantenimiento gracias a una buena accesibilidad. No se requieren herramientas especiales.

Equipamiento especial

Entre otros, resistencia de cárter, arranque en vacío y regulación de rendimiento integrados, ventilador adicional, conector de presión diferencial de aceite, cabezas de los cilindros refrigeradas por agua, sensor de temperatura del gas comprimido. Por encargo también diseños especiales para operación marinera.

Alcance de suministro y accesorios
Véase la lista de precios





Performance data

Performance data are based on the latest edition of ARI 540 and motor speed 1750 RPM (60 Hz).

Saturated suction and condensing temperatures correspond to dew point conditions (saturated vapor). With zeotropic blends this leads to a change in the basic parameters (pressure levels, liquid temperatures) compared with data based on "mean temperatures" used so far. As a consequence this results in a lower numerical value for cooling capacity and efficiency (EER).

All data do **not** include liquid subcooling. Therefore the rated cooling capacity and efficiency (EER) show lower values in comparison to data based on 15°F subcooling.

For further information see Refrigerant Report (A-501).

Performance data for motor speed of 1450 RPM (50 Hz) see BITZER Software.

Données de puissance

Les données de puissance se basent sur la vitesse du moteur 1750 min⁻¹ (60 Hz) et l'édition la plus actuelle du ARI 540.

Les températures d'évaporation et de condensation se réfèrent aux valeurs du point de rosée (conditions de vapeurs saturées). Par conséquent, pour les mélanges zéotropes, les paramètres de référence (pressions, températures du liquide) changent, car jusqu'à présent, les données se référaient communément aux "températures moyennes". Il en résulte des valeurs plus faibles (numériquement) pour la puissance frigorifique et l'indice de performance. Toutes les données sont établies **sans** sous-refroidissement.

Ainsi apparaissent des différences importantes lors de la comparaison avec les données pour lesquelles, 15°F de sous-refroidissement ont été pris en considération.

Pour plus d'informations voir "Refrigerant Report" (A-501).

Données de puissance pour vitesse du moteur de 1450 min⁻¹ (50 Hz) voir BITZER Software.

Datos de rendimiento

Todos los datos de rendimiento se basan en la velocidad del giro del motor 1750 min⁻¹ (60 Hz) y en la última edición de ARI 540.

Las temperaturas de evaporación y de condensación se refieren a los valores del punto de rocío (condiciones de vapor saturado). En caso de mezclas zeotropas los parámetros de referencia (niveles de presión, temperaturas del líquido) cambian comparado con los datos que hasta ahora normalmente se han referido a las "temperaturas medias". Como consecuencia resulten valores inferiores (numéricamente) para la potencia refrigeradora y el índice de eficacia.

Todos los datos **no** toman en consideración el subenfriamiento del líquido. Debido a ello existen diferencias importantes comparado con los datos, en los que se toma en consideración un subenfriamiento de 15°F para la potencia refrigeradora.

Para más informaciones véase "Refrigerant Report" (A-501).

Datos de rendimiento para la velocidad de giro del motor de 1450 min⁻¹ (50 Hz) véase BITZER Software.

Conversion factors: Facteurs de conversion: Factores de conversión :	1 BTUH = 0.293 Watt 1 Watt = 3.41 BTUH	1 PS = 0.736 kW 1 kW = 1.36 PS	1 kcal/h = 1.163 Watt 1 Watt = 0.86 kcal/h
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Explanation of type designation

Example

W 4 H .2 Y – S 230

Only in case of water cooled cylinder heads as standard (NH₃)

W 4 H .2 Y – S 230

Index for number of cylinders

W 4 **H** .2 Y – S 230

Identification letter for bore x stroke

W 4 H .**2** Y – S 230

.2 Series code

A R717/NH₃ - Design

W 4 H .2 **Y** – S 230

Identification letter for ester oil charge

W 4 H .2 Y – **S** 230

S Belt drive

K Direct drive

W 4 H .2 Y – S **230**

Only in case of belt drive (ø motor pulley)

Explication de la désignation des types

Exemple

W 4 H .2 Y – S 230

Seulement en cas de culasses à refroidissement par eau

W 4 H .2 Y – S 230

Chiffre-indice pour le nombre de cylindres

W 4 **H** .2 Y – S 230

Indicatif pour alésage x course

W 4 H .**2** Y – S 230

.2 Numéro de référence

A Modèles - R717/NH₃

W 4 H .2 **Y** – S 230

Code pour charge d'huile ester

W 4 H .2 Y – **S** 230

S Commande par courroie

K Accouplement direct

W 4 H .2 Y – S **230**

Seulement à commande par courroie (ø poulie moteur)

Explicación de la designación de tipos

Ejemplo

W 4 H .2 Y – S 230

Sólo para cabezas de los cilindros refrigeradas por agua como estándar (NH₃)

W 4 H .2 Y – S 230

Código para número de cilindros

W 4 **H** .2 Y – S 230

Letra característica para diámetro x carrera

W 4 H .**2** Y – S 230

.2 Código de serie

A Ejecución R717/NH₃

W 4 H .2 **Y** – S 230

Letra característica para carga de aceite de éster

W 4 H .2 Y – **S** 230

S Accionamiento por correa

K Acoplamiento directo

W 4 H .2 Y – S **230**

Sólo para accionamiento por correa (ø polea del motor)

Application limits

relating to

- 65°F return gas temperature for R134a, R404A/R507A and R22
- 10°F suction superheat for NH₃

Limites d'application

se référant à

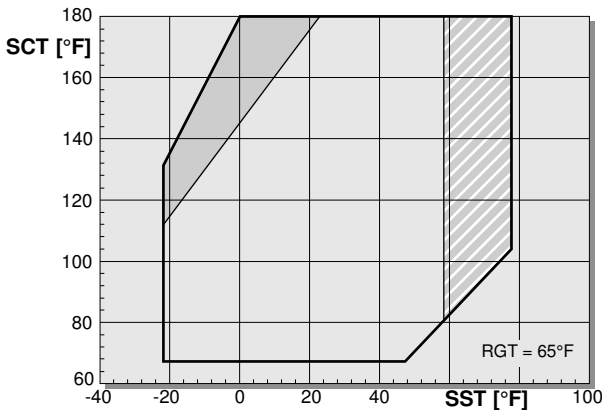
- une température de gaz aspiré de 65°F en cas de R134a, R404A/R507A et R22
- 10°F surchauffe à l'aspiration pour NH₃

Límites de aplicación

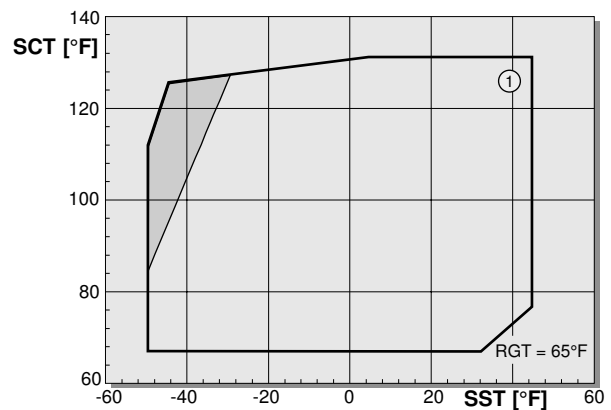
Referidos a

- 65°F de temperatura de gas aspirado para R134a, R404A/R507A y R22
- 10°F sobrecalentamiento de gas aspirado para NH₃

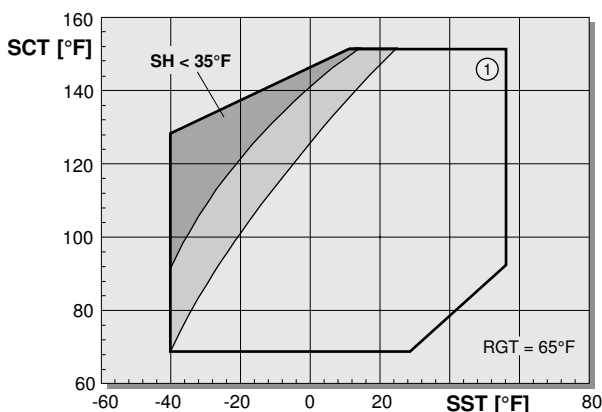
R134a ②



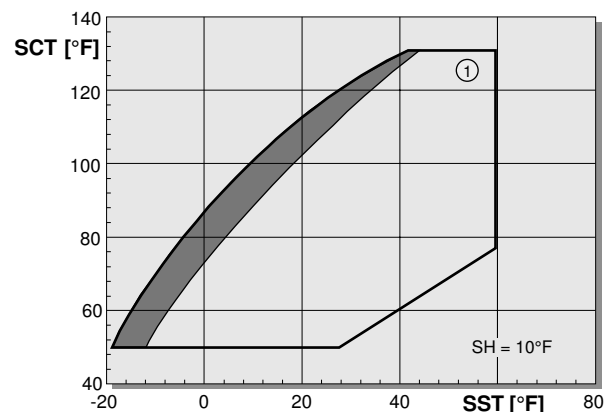
R404A ■ R507A



R22



NH₃



R407A, R407B and R407C

Application limits and performance data upon request.

R407A, R407B et R407C

Limites d'application et les donnés de puissance sur demande.

R407A, R407B y R407C

Límites de aplicación y de rendimiento por encargo.

SST Saturated suction temperature (°F)
 RGT Return gas temperature (°F)
 SH Suction superheat (°F)
 SCT Saturated condensing temperature (°F)

- ▨ Suction superheat = 10°F
- ▨ Additional cooling
- ▨ Additional cooling & limited return gas temperature
- ▨ Water-cooled cylinder heads

① Additional limits für 6G.2(Y), 6F.2(Y), W6GA and W6FA due to maximum power requirement. See performance data page 9, 11 and 13.

② For R134a and SCT > 130°F the oil ÖI BSE55 has to be used (instead of BSE32).

SST Température d'évaporation (°F)
 RGT Température de gaz aspiré (°F)
 SH Surchauffe à l'aspiration (°F)
 SCT Température de condensation (°F)

- ▨ Surchauffe à l'aspiration = 10°F
- ▨ Refroid. additionnel reduite
- ▨ Refroid. additionnel + surchauffe aspiration limitée
- ▨ Têtes de culasse refroidies à l'eau

① Restrictions additionnelles pour 6G.2(Y), 6F.2(Y), W6GA et W6FA due à une force nécessaire maximum. Voir données de puissance pages 9, 11 et 13.

② Pour R134a et SCT > 130°F il faut utiliser l'huile BSE55 (en lieu de BSE32).

SST Temperatura de evaporación (°F)
 RGT Temperatura del gas aspirado (°F)
 SH Sobrecalentamiento del gas aspirado
 SCT Temperatura de condensación (°F)

- ▨ Sobrecalentamiento del gas aspirado = 10°F
- ▨ Refrigeración adicional
- ▨ Refrigeración adicional + temperatura del gas aspirado limitada
- ▨ Cabezas de cilindros refrigeradas por agua

① Limitaciones adicionales para 6G.2(Y), 6F.2(Y), W6GA y W6FA debido a consumo de potencia máximo. Véase los datos de rendimiento en páginas 9, 11 y 13.

② Con R134a a SCT > 130°F utilizar el aceite BSE55 (en vez de BSE32).



Cooling capacity in BTUH
relating to 65°F return gas temperature, without liquid subcooling
motor speed 1750 RPM (60 Hz)

Puissance frigorifique en BTUH
se référant à une température de gaz aspiré de 65°F sans sous-refroidissement de liquide, vitesse du moteur 1750 min⁻¹ (60 Hz)

Potencia refrigeradora en BTUH
se refiere a la temperatura del gas aspirado de 65°F, sin subenfriamiento de líquido, velocidad del motor 1750 min⁻¹ (60 Hz)

Compressor type	Motor pulley	Displacement	Motor required			Cond. temp.	Cooling capacity											
							Puissance frigorifique										Q ₀	[BTUH]
							Potencia refrigeradora											
Compressor type	Poullie du moteur	Volume balayé	Moteur de commande nécessaire			Temp. de cond.	Saturated suction temperature °F			Température d'évaporation °F			Temperatura de evaporación °F					
Tipo de compresor	Polea del motor	Volumen desplaz.	Motor de accionamiento necesario			Temp. de cond.	°F			°F			°F					
		CFH	H	M	L	°F	45	35	25	20	10	0	-5	-10	-20	-25	-30	-40
2T.2Y-	S190	674	5.5	5.5	3.7	90	78700	64900	53200	48000	43200	34650	30900	24300	18730	16310	14110	10320
			6.6	6.6	5.5	110	66400	54900	44900	40500	36400	29100	25850	20150	15310	13190	11270	7920
			6.6	6.6	5.5	130	53300	44100	36100	32500	29150	23150	20500	15740	11700	9920	8290	
	S210	749	6.6	6.6	5.5	90	86000	70900	58100	52400	47200	37900	33800	26550	20450	17830	15430	11270
			6.6	6.6	5.5	110	72600	59900	49100	44250	39750	31800	28250	22000	16730	14420	12310	8650
			11.0	6.6	5.5	130	58300	48200	39450	35500	31850	25300	22400	17200	12790	10840	9050	
	S230 K	839	6.6	6.6	5.5	90	94200	77700	63700	57400	51700	41500	37000	29050	22400	19530	16900	12350
			11.0	6.6	5.5	110	79500	65700	53800	48500	43550	34800	30950	24100	18320	15800	13490	9480
			11.0	11.0	6.6	130	63900	52800	43200	38900	34900	27750	24550	18840	14010	11870	9920	
2N.2Y-	S190	960	6.6	6.6	6.6	90	114900	94800	77600	70000	62900	50500	44950	35250	27100	23550	20300	14730
			11.0	11.0	6.6	110	96000	79200	64700	58300	52300	41750	37100	28800	21850	18820	16050	11270
			11.0	11.0	11.0	130	76600	63300	51700	46550	41700	33100	29300	22500	16770	14260	11960	
	S210	1067	11.0	11.0	6.6	90	125400	103400	84700	76300	68700	55000	49050	38450	29550	25700	22150	16070
			11.0	11.0	6.6	110	104700	86400	70600	63600	57100	45550	40450	31400	23850	20500	17510	12290
			14.7	11.0	6.6	130	83600	69000	56400	50800	45500	36100	31950	24550	18300	15550	13050	
	S230 K	1195	11.0	11.0	6.6	90	136900	112900	92500	83400	75000	60100	53500	42000	32300	28050	24200	17550
			14.7	11.0	6.6	110	114400	94300	77100	69500	62400	49750	44150	34300	26050	22400	19120	13420
			14.7	14.7	11.0	130	91300	75400	61600	55400	49700	39450	34900	26800	19980	16990	14250	
4T.2Y-	S190	1348	14.7	11.0	11.0	90	157300	129800	106400	96000	86400	69300	61800	48550	37450	32600	28200	20650
			14.7	14.7	11.0	110	132800	109700	89800	81000	72800	58200	51700	40250	30600	26400	22550	15830
			14.7	14.7	11.0	130	106700	88200	72200	65000	58300	46300	41000	31500	23400	19840	16570	
	S210	1498	14.7	14.7	11.0	90	171900	141900	116300	104900	94400	75800	67500	53100	40950	35650	30850	22550
			14.7	14.7	11.0	110	145100	119900	98200	88500	79500	63600	56500	44000	33450	28850	24600	17300
			18.4	14.7	14.7	130	116600	96400	78900	71000	63700	50600	44800	34400	25550	21700	18110	
	S230 K	1678	14.7	14.7	11.0	90	188300	155400	127300	114900	103400	83000	74000	58100	44850	39050	33800	24700
			18.4	14.7	14.7	110	159000	131300	107600	96900	87100	69600	61900	48200	36650	31600	27000	18960
			18.4	18.4	14.7	130	127700	105600	86400	77800	69800	55500	49050	37700	28000	23750	19840	
4P.2Y-	S190	1614	14.7	14.7	11.0	90	188500	155600	127500	115000	103500	83100	74000	58200	44900	39100	33800	24700
			18.4	14.7	14.7	110	159200	131500	107700	97000	87200	69700	62000	48250	36700	31600	27000	18970
			18.4	14.7	14.7	130	127800	105700	86500	77900	69900	55500	49100	37700	28000	23750	19840	
	S210	1794	14.7	14.7	14.7	90	205600	169700	139000	125400	112900	90600	80800	63500	48950	42650	36900	26950
			18.4	14.7	14.7	110	173600	143400	117400	105800	95100	76000	67600	52600	40000	34500	29450	20700
			18.4	18.4	14.7	130	139400	115300	94400	85000	76200	60500	53600	41100	30550	25900	21650	
	S230 K	2009	18.4	14.7	14.7	90	224500	185300	151800	137000	123200	98900	88200	69300	53500	46550	40300	29450
			18.4	18.4	14.7	110	189600	156600	128200	115600	103900	83000	73800	57500	43700	37650	32150	22600
			22.1	18.4	14.7	130	152300	125900	103100	92800	83200	66100	58500	44900	33400	28300	23600	
4N.2Y-	S190	1921	14.7	14.7	14.7	90	229900	189700	155300	140000	125900	101000	89900	70500	54200	47100	40650	29500
			18.4	18.4	14.7	110	192100	158400	129500	116700	104700	83600	74200	57600	43700	37650	32100	22550
			18.4	18.4	14.7	130	153300	126600	103500	93100	83500	66300	58600	45050	33550	28500	23950	
	S210	2135	18.4	18.4	14.7	90	250800	206900	169400	152700	137400	110100	98100	76900	59100	51400	44350	32150
			18.4	18.4	14.7	110	209500	172800	141300	127200	114200	91100	80900	62900	47700	41050	35050	24600
			22.1	18.4	14.7	130	167200	138100	112900	101600	91100	72300	63900	49100	36600	31100	26100	
	S230 K	2390	18.4	18.4	14.7	90	273900	225900	185000	166800	150000	120300	107100	84000	64600	56100	48400	35100
			22.1	18.4	14.7	110	228800	188700	154300	139000	124800	99500	88400	68700	52100	44850	38250	26850
			22.1	22.1	18.4	130	182600	150800	123300	110900	99400	78900	69800	53600	40000	34000	28500	



choose a model
MSE-1500

Model Number: **MSE-1500**
Noml HP clean: 22
Fouled: 15 1/2
Pumpdown capacity (lbs): 49
Waterflow (gpm) min: 7.38
max: 73.84
Water pressure drop (psf): 4.9
Shipping weight (lbs): 181

- Marine service
- Heavy duty, horizontal, shell and tube design
- Nominal ratings and sizes to handle the most demanding requirements
- Epoxy coated solid cupronickel tube sheets to prevent pitting caused by galvanic action
- Removable, solid cupronickel or brass water plates to facilitate cleaning
- All 90/10 cupronickel, heavy wall, straight tube water channels
- Sacrificial zinc anode available upon request
- Generous pumpdown capacities
- Dual refrigerant outlets, provide liquid seal in heavy seas
- Custom designs to 500 horsepower on request
- 18 MSE stock models, 1 thru 125 horsepower

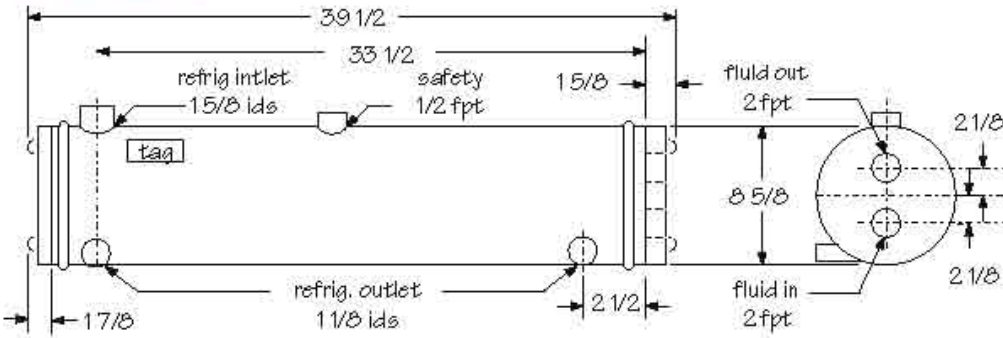
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Working Pressure:
400 psf shell (refrigerant) side
150 psf tube (fluid) side



Alfa Laval | 321 Foster Avenue Wood Dale, IL 60191 | phone: +1 708 345-5400 | fax: +1 708 345-3513

AP/Armaflex® AP/Armaflex® FS

Sheet & Roll Insulation

Fiber Free

The original, fiber-free, flexible elastomeric pipe, valve and duct insulation for reliable protection against condensation, mold and energy loss



- Fiber-free, formaldehyde-free, low VOC and non-particulating formulation protects indoor air quality
- Closed-cell structure provides excellent condensation control
- Built-in vapor barrier eliminates need for additional vapor retarder
- Microban® antimicrobial product protection provides exceptional mold resistance
- 25/50 rated for use in air plenums up to 1" thickness in AP Armaflex and 1-1/2" and 2" thickness in AP Armaflex FS
- Thickness up to 2" with R-value up to R-8

**armacell**
advanced insulation



Technical Data: AP Armaflex® and AP Armaflex® FS Sheet and Roll Insulation

Description:

Black flexible closed-cell elastomeric thermal insulation in sheet and roll form

Specifications Compliance:

ASTM C 534, Type II — Sheet Grade 1 ASTM C 1534 ASTM D 1056, 2B1	ASTM E 84, NFPA 255, UL723 ASTM G21/C1338 ASTM G22 CAN/ULC S102 ¹	MEA 107-89M MIL-P-15280J, FORM S ² MIL-C-3133C (MIL STD 670B) Grade SBE 3 ²	NFPA 90A, 90B UL 181 UL 94 5V-A, V-0, File E55798 City of LA – RR 7642
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Approvals, Certifications, Compliances:

- GREENGUARD® Children & Schools Indoor Air Quality certified.
- Made with EPA registered Microban® antimicrobial product protection.
- Manufactured without CFCs, HFCs, HCFCs, PBDEs, or Formaldehyde.
- All Armacell facilities in North America are ISO 9001:2008 certified.

Typical Properties

Specifications:	Values			Test Method:
	AP Armaflex Through 1"	AP Armaflex FS 1-1/2" & 2"	AP Armaflex 1-1/2" & 2"	
Thermal Conductivity: Btu • in./h • ft ² • °F (W/mK)				
75°F Mean Temperature (24°C)	0.25 (0.036)	0.28 (0.040)	0.25 (0.036)	ASTM C 177 or C 518
90°F Mean Temperature (32°C)	0.256 (0.037)	0.286 (0.041)	0.256 (0.037)	
Water Vapor Permeability: Perm-in. [Kg/(s • m • Pa)]	0.05 (0.725 x 10 ⁻¹³)	0.08 (1.16 x 10 ⁻¹³)	0.05 (0.725 x 10 ⁻¹³)	ASTM E 96, Procedure A
Flame Spread and Smoke Developed Index:	25/50 rated	25/50 rated	Does not pass	ASTM E 84 CAN/ULC S102 ¹
Water Absorption, % by Volume:	0.2%	0.2%	0.2%	ASTM C 209
Mold Growth: Fungi Resistance: Bacterial Resistance:	Passed	Passed	Passed	UL181 ASTM G21/C1338 ASTM G22
Upper Use Limit: ³	220°F (105°C)	220°F (105°C)	220°F (105°C)	ASTM C534
Lower Use Limit: ⁴	-297°F (-183°C) ⁵	-297°F (-183°C) ⁵	-297°F (-183°C) ⁵	ASTM C534
Ozone Resistance:	GOOD	GOOD	GOOD	Ozone Chamber Test

R-Value:	R-1.6	R-2.1	R-3.1	R-4.2	R-6	R-8
Thickness:	3/8"	1/2"	3/4"	1"	1-1/2"	2"

Sizes:

Sheet: Width x Length Thickness (nominal)	36" x 48" (.915m x 1.22m) 1/8", 1/4", 3/8", 1/2", 3/4", 1", 1-1/2" & 2" (3, 6, 10, 13, 19, 25, 38 & 50mm)		
Roll: Width Thickness (nominal) x Length	48" wide (1.22m) 3/8" x 100' (10mm x 30.5m) 1/2" x 70' (13mm x 21.4m) 3/4" x 50' (19mm x 15.2m)	1" x 35' (25mm x 10.7m) 1-1/2" x 25' (38mm x 7.6m) 2" x 18' (50mm x 5.4m)	

¹ AP Armaflex meets CAN/ULC S102 through 1" thickness.

² AP Armaflex meets MIL-P-15280J, FORM S and MIL-C-3133C (MIL STD 670B) Grade SBE through 1" thickness.

³ On the heating cycle, AP Armaflex Pipe Insulation will withstand temperatures as high as 220°F (105°C). 520, 520 Black or 520 BLV Adhesive may be used with pipe insulation applications up to 220°F (105°C).

⁴ At temperatures below -20°F (-29°C), elastomeric insulation starts to become less flexible. However, this characteristic does not affect thermal efficiency and resistance to water vapor permeability of Armaflex insulation.

⁵ For applications of -40°F to -297°F (-40°C to -183°C), contact Armacell.

ARMACELL LLC

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www.armacell.us

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AP Armaflex & FS	Sheet Roll	Submittal	015	Eng/USA	1/2013
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