

# ROMTEC UTILITIES OPERATION & MAINTENANCE MANUAL

FOR:

## **BAE SYSTEM PLANT GWT-043012-01 (KINGSPORT, TN)**

**DATE:** November 5, 2013

**REVISION:** 0

**CUSTOMER CONTACT INFORMATION:**

Customer Name  
Company Name  
111 Company Address  
555-555-5555  
customername@company.com

**ENGINEER CONTACT INFORMATION:**

Customer Name  
Company Name  
111 Company Address  
555-555-5555  
customername@company.com



18240 North Bank Road ~ Roseburg ~ OR ~ 97470  
541.496.9678(ph) / 541.496.0804(fx)  
romtec3@romtecutilities.com

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## **1. INTRODUCTION**

This section contains the necessary information and procedures for the understanding and use of this document by the client and other parties of interest.

This section is structured as follows:

- 1.01 ABOUT THIS DOCUMENT
- 1.02 CONTACT INFORMATION
- 1.03 SCOPE OF SUPPLY

## 1.01

## ABOUT THIS DOCUMENT

### 1. Document Identification

The information in this document is the Operation & Maintenance Manual (O&M) provided by Romtec Utilities, Inc., herein referred to as Romtec Utilities for the project listed below:

Name (herein referred to as "the project"): BAE System Plant GWT-043012-01

Location (herein referred to as "the site"): Kingsport, Tennessee

Document Date: 11/5/13

Revision #: 0

### 2. Document Description

This document contains all the as-built drawings and operation, maintenance manuals & manufacturers warranties for the associated mechanical and electrical components of this project.

### 3. Document Delivery

One (1) hard copy (upon request) and one (1) CD Rom of the Romtec Utilities Operation & Maintenance Manual will be provided to the customer at start-up of the system.

Any request for additional copies will result in additional fees and a change order.

## 1.02 CONTACT INFORMATION

### **Pump Station Supplier:**

Romtec Utilities, Inc.  
18240 North Bank Rd.  
Roseburg, OR 97470  
541-496-3541; Fax: 541-496-0803  
romtec3@romtec.com; www.romtecutilities.com

### **Pump Skid Assembly:**

Ball Valves  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Ball Valves  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Pressure Switch & Gauge  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Swing Check Valves  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

## 1.02 CONTACT INFORMATION

Heat Trace  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Lewco Specialty Products  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Coating  
*Company Name*  
*111 Company Address*  
*555-555-5555*  
*name@company.com*

### **Pumps & Related Equipment:**

Pioneer Pump  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

Megator  
Company Name  
111 Company Address  
555-555-5555  
name@company.com

## 1.02 CONTACT INFORMATION

### Liquid Level Sensors:

Company Name  
111 Company Address  
555-555-5555  
name@company.com

*Company Name*  
*111 Company Address*  
*555-555-5555*  
*name@company.com*

### Electrical:

Control Panel Supplier:  
Romtec Utilities, Inc.  
18240 North Bank Rd.  
Roseburg, OR 97470  
541-496-3541; Fax: 541-496-0803  
romtec3@romtec.com; www.romtecutilities.com

## 1.03 SCOPE OF SUPPLY PRODUCTS SUPPLIED BY ROMTEC UTILITIES

### COMPLETE PUMP STATION INCLUDES:

#### PUMP SKID ASSEMBLY

QTY	ITEM	VENDOR/PART
3	PIPE STAND - 4in - FLANGE MOUNT	
3	PIPE STAND - 6in - FLANGE MOUNT	
3	PUMP ASSEMBLY P3 DIRECT DRIVE	PIONEER
1	SUMP SKIMMER COMPLETE (NOT SHOWN)	MEGATOR
1	SLIDING SHOE PUMP ASSEMBLY	MEGATOR
3	NIPPLE - 316SS - 3/4in SCH40 X 3in	
2	NIPPLE - 316SS - 3/4in SCH40 X 2in	
2	NIPPLE - 316SS - 1/2in SCH40 X 2in	
1	NIPPLE - 316SS - 3/4in SCH40 X 12in	
2	NIPPLE - 316SS - 3/4in SCH40 X 12in	
2	NIPPLE - 316SS - 1/2in SCH40 X 1.5in	
1	PRESSURE SWITCH	ASHCROFT
1	DIAPHRAGM SEAL - PRESSURE GAUGE	ASHCROFT
1	VALVE - BALL - 3/4in STAINLESS STEEL - 1/4 TURN	GRAINGER
1	VALVE - SWING CHECK - 3/4in - 316SS	GRAINGER
3	PLUG - 1/2in - 316SS - NPT	
1	VALVE - BALL - 1/2in 316SS - 1/4 TURN	GRAINGER
1	PRESSURE GUAGE - 3.5in 60PSI	ASHCROFT
4	PRESSURE GAUGE - 2.5in 60PSI - COMPOUND	MCMASTER CARR
3	VALVE - SWING CHECK - 4in - 316SS	VELAN
3	VALVE - KF BALL VALVE - 4in - WITH HANDLE	KF/CONTROMATICS
1	UNION - 3/4in - 316SS	
1	BUSHING - 3/4in X 1/4in - 316SS	MCMASTER CARR
3	REDUCER - 316SS - CONCENTRIC - 4in X 3in - RF	
1	FLANGE - 316SS - 6in - BLIND	
1	FLANGE - 316SS - 4in - BLIND WITH 3/4 NPT - RF	
3	SPOOL - FLG X FLG - 4in X 6in - 316SS	
1	ELBOW - 316SS - 3/4in SCH40 - FNPT	
6	ELBOW - 316SS - 3in - 90 DEG - FLG.ipt	
1	MANIFOLD ASSEMBLY - 6in	
1	TEE - 316SS - 3/4in SCH40 - NPT	
1	TEE - 316SS - 1/2in SCH40 - NPT	
12	GASKET - FLANGE - 3in X 1/8in - PTFE TEFLON	
13	GASKET - FLANGE - 4in X 1/8in - PTFE TEFLON	
1	GASKET - FLANGE - 6in X 1/8in - PTFE TEFLON	
1	SKID ASSEMBLY	
6	CAP - PIPE STAND	
14	TUBE - 3.5 X 3.5 X .25 (6 @ 28in)	

**1.03 SCOPE OF SUPPLY PRODUCTS  
SUPPLIED BY ROMTEC UTILITIES**

6	NC1in HEX NUT	
2	GROUNDING LUG - AU-2/0-B2	Included in skid assembly
1	BUSHING - 1/2in X 1/4in - 316SS	
1	CONTROL PANEL	see electrical bom
1	HEAT TRACE	
1	INSULATION	

**CONTROL PANEL/ELECTRICAL & COMMUNICATION**

<b>QTY</b>	<b>ITEM</b>	
1	ARC ARMOR PLC CONTROL PANEL	
1	PRESSURE TRANSDUCER - 23ft range -60ft cable	ATS
2	Nolta MS1C -65ft.	NOLTA
1	Level Sensing Junction Box	



**END  
OF  
SECTION**

## 2. GENERAL REQUIREMENTS

This section includes all general requirements including warranties, permits, and reports for this project.

This section is structured as follows:

### 2.01 WARRANTY

2.01.1 ROMTEC UTILITIES WARRANTY

2.01.2 PUMP WARRANTY

### 2.02 PERMITS

(Engineer/Contractor to insert permits related to this pump station when received)

### 2.03 START-UP REPORTS

(The Romtec Utilities Start-up Reports will be sent after the start-up is complete. Please insert in this section when received.)

### 2.04 ENGINEER/AGENCY INSPECTION REPORTS

(Engineer/Contractor to insert inspection reports related to this pump station when received)

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### Romtec Utilities Limited Warranty

Romtec Utilities, Inc. (herein referred to as "Romtec") warrants that the equipment supplied will be free from defects in material and workmanship under normal use and service, when used in accordance with Romtec's procedures as set forth below for a period of two years from date of acceptance (acceptance is defined as the date Romtec's "Start-Up" report is completed) or two years and six months from installation of the wet well (or delivery of the wet well or the date that the wet well was ready to deliver), whichever comes first. The obligation of Romtec under this warranty is limited to replacing or repairing any defective part (failure of other manufacturer supplied components will be addressed according to the individual manufacturer's warranty, the periods of which, and the manufacturer's obligations therein may differ from Romtec Utilities' Warranty). This warranty extends only to Romtec's direct customer (as named in the Romtec Purchase Order), herein called "CUSTOMER", and not to any person or entity with whom CUSTOMER has business relationships, or any party other than CUSTOMER.

**THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, WHICH IMPLIED WARRANTIES ARE EXCLUDED. ROMTEC SHALL NOT BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES.**

**Components Resold or Supplied with Romtec Materials.** Certain components are warrantable directly by the original manufacturer for periods between 90 days and 5 years. Specific details of such warranties are included with the Romtec Scope of Supply and Design Submittal document. Replacement for, repair or refund of defective workmanship or material under normal use shall be remunerated directly with the manufacturer of the component. Examples of components would be generators, manual cranes, pumps, pump controls, valves, etc.

**Warranty Voidable.** Start-up that is performed without the presence of Romtec's representative shall void all warranties.

**Claims of Defective Manufacture.** Claims that the merchandise was incorrectly manufactured or that is defective in any way must be made directly to Romtec on a product-by-product basis. All claims must be made within 72 hours of the defective condition, or the time when the defect should have been discovered, whichever is earlier. All claims must include the following:

1. A detailed description of the specific problem, failure, or other event giving rise to the claim; and
2. Supporting photographs or videos; and
3. Specific location; and
4. Names and phone numbers of individuals who can substantiate the claim, but who do not work for Contractor.

#### **Failure of Pump Station.**

Romtec Utilities pump stations pump all types of water containing all kinds of materials. Sometimes pumps may clog or power may be lost and the pump station will fail to operate. If your station fails to operate, Romtec Utilities will suggest a local service company to evaluate the problem. If it is a warranty issue, Romtec Utilities will repair and/or replace

## 2.01.1 ROMTEC UTILITIES LIMITED WARRANTY

per the terms of this warranty. If however, the pumps are simply “clogged” or the power is simply lost Romtec Utilities will advise you that it is not a warranty issue and you will simply pay for the service call and the associated services.

**Action in Event of Established Claim.** In the event it is determined that goods have been incorrectly manufactured or are defective, the liability of Romtec shall be limited to, at its option, repair or replacement of the goods. Romtec also reserves the right to establish reasonable time limits for completion of any specific installation tasks resulting from the replacement of defective merchandise.

**No Third Party Claims.** Under no circumstances shall Romtec be responsible for any damage claims by any party other than claims by Romtec direct customers.

**Release and Hold Harmless.** Contractor releases and agrees to defend, indemnify, and hold Romtec harmless from and against any and all claims, demands, actions, and causes of action for any matters arising out of or connected with the Materials whereby the Contractor is responsible for errors or omissions.

### FURTHER LIMITATIONS ON ROMTEC LIABILITY

#### 1. Specific Limitations.

Romtec’s liability under the foregoing warranty and under the transaction of which this document is a part is limited as follows:

- a. Romtec has designed the lift station supplied under this project to meet a specific design standard and specific set of parameters as dictated to Romtec by its CUSTOMER as set forth in the “Lift Station Design Form” located Tab 4 of the Romtec Utilities Scope of Supply and Design Submittal.
- b. Romtec’s Scope of Supply & Design Submittal is a part of and limited by CUSTOMER’S site civil and electrical plans.
- c. Romtec makes no guarantees that any of its supply will fit on CUSTOMER’S site and/or building. However, at CUSTOMER’S request, Romtec will provide suggested layouts for the CUSTOMER’S project. Ultimately, the CUSTOMER decides to accept or reject any given layout.
- d. Romtec cannot make final layout or equipment placement judgments at the site (i.e. generator or control panel “fit” in or out of a building). It is the responsibility of CUSTOMER’S site engineer and contractor to check dimensions, etc. If CUSTOMER has not accepted (or received) final dimensions, etc., please request further definition before approval. Romtec is not responsible for items that do not fit on the site.
- e. It is Romtec’s CUSTOMER’S responsibility and obligation to review Romtec’s Scope of Supply & Design Submittal to insure it meets with CUSTOMER approval relative to any CUSTOMER third party agreements.
- f. Romtec Utilities is not responsible for any aspect of the construction/installation of the Romtec Utilities lift station. The Contractor bears sole responsibility for installation of products manufactured by Romtec Utilities. The Romtec Utilities Scope of Supply and Design Submittal defines Romtec Utilities scope of supply relative to equipment, documentation, start-up services and warranty.

## 2.01.1 ROMTEC UTILITIES LIMITED WARRANTY

- g. If Romtec Utilities is on site during the construction/installation of the Romtec Utilities lift station it is only as an advisor. Romtec Utilities is never on site to perform any construction and/or installation tasks.

Romtec Utilities designs and prefabricates its lift station system to enable contractors to install the Romtec Utilities system quickly and completely. However, Romtec Utilities has made no representation and/or claims as to “how long” it will take to construct/install the Romtec Utilities system.

*Note: If any Romtec Utilities-supplied part is found to be defective and/or has been manufactured in error relative to this document, Romtec Utilities will repair and/or replace that part at Romtec Utilities' expense. Romtec Utilities does not offer, nor will Romtec Utilities accept, any charges and/or claims by anyone relative to the time it takes to install/construct the Romtec Utilities system and or claims for delays relative to a part that has to be repaired and/or replaced by Romtec Utilities.*

- h. Romtec Utilities' responsibility is to its direct customer. We want to help all parties, but we are ultimately responsible only to our direct customer.

If Romtec Utilities' direct customer has hired a sub-contractor Romtec Utilities will communicate with that sub-contractor through a representative of Romtec Utilities' direct customer. In other words, Romtec Utilities will not direct and/or advise any sub-contractor. Instead, Romtec Utilities will communicate directly with its “direct customer” and they will communicate with their sub-contractors, engineers, and/or owners.

- i. The Romtec Utilities design reflects all elevations and/or orientations to an accuracy of and/or minus .10'. Romtec Utilities does not claim to manufacture any aspect of its lift station systems to absolute elevations. It is simply not possible in the general underground construction world to meet absolutes. Therefore, any owner and/or installer of a Romtec Utilities system is accepting the Romtec Utilities system proposed herein to the plus or minus .10' offered by Romtec Utilities.

### 2. Performance Characteristics and Start-Up.

- a. The lift station is a sophisticated device that can be operated in many different ways. The Romtec Scope of Supply & Design Submittal defines Romtec's approach to the operation of the lift station.

*Note: While there are many ways to vary and/or adjust “operational parameters” within the overall lift station, Romtec is only prepared to start-up per its own parameters (as specified in the CUSTOMER'S design criteria, see attached).*

- b. Romtec's obligation is to show that the station can run as designed to meet specific design criteria as shown in its Scope of Supply & Design Submittal. It is understood that the regulating agency may want to test many other scenarios. This will not be part of the standard Romtec's start-up procedures and training. At start-up, Romtec will only prove that the station can run at the pre-specified design parameters.
- c. Romtec is not an operator, installer or an electrical interconnector for the lift stations and equipment it supplies.
- d. During start-up, Romtec is completely in charge. Romtec's start-up technician will start-up and “prove” the station per the approved Romtec Scope of Supply & Design

## 2.01.1 ROMTEC UTILITIES LIMITED WARRANTY

Submittal. After the lift station is accepted other parties may choose to adjust and/or vary the operational parameters to suit their specific preference. However, Romtec will not be involved with these issues either during or after start-up, and is not responsible for problems arising from any adjustments or variations by such other parties.

### 3. Training.

- a. Romtec will perform start-up and training at no additional cost as part of its scope of supply if the training is scheduled for the day after start-up and CUSTOMER wants training at no additional cost. If training is scheduled for any other time other than the day after start-up, Romtec will require prepayment of the additional costs incurred as a result of the need to reschedule

## **CAUTION!!!**

If equipment is stored more than twelve (12) months, some of the components or lubricants may have exceeded their maximum shelf life. These must be inspected and replaced as necessary prior to pump operation to ensure proper pump performance.

### **RECORDING MODEL & SERIAL NUMBERS**

Record the model and serial number for your **Pioneer Pump** in the spaces provided below. The factory will need this information when you require parts or service.

**Pump Model:** \_\_\_\_\_  
**Pump Serial Number:** \_\_\_\_\_  
**Engine/Motor Serial #:** \_\_\_\_\_  
**Engine/Motor Mgf:** \_\_\_\_\_

### **WARRANTY INFORMATION**

Pioneer Pump offers the following limited warranty and method for filing warranty claims.

#### **LIMITED WARRANTY**

Seller warrants for one year from the date of shipment Seller's manufactured products to the extent that Seller will replace those having defects in materials or workmanship when used for the purpose and in the manner which Seller recommends. If Seller's examination shall disclose to its satisfaction that the products are defective, and an adjustment is required, the amount of such adjustment shall not exceed the net sales price of the defective products and no allowance will be made for labor or expense of repairing or replacing defective products or workmanship or damage resulting from the same. Seller warrants the products which it sells of other manufacturers to the extent of the warranties of their respective makers. Where engineering design or fabrication work is supplied, buyer's acceptance of Seller's design or of delivery of work shall relieve Seller of all further obligation, other than as expressed in Seller's product warranty. **THIS IS SELLER'S SOLE WARRANTY. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE PRESIDENT OF THE MANUFACTURER.** Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factory, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instruction or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representative.

#### **WARRANTY CLAIMS**

Contact the factory to file a warranty claim, before shipping parts back. Parts returned to the factory without an RMA number on file will be scrapped upon arrival.



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(INSERT START-UP REPORTS IN THIS SECTION)**

**PAGE IS INTENTIONALLY LEFT BLANK  
(INSERT INSPECTION REPORTS IN THIS SECTION)**

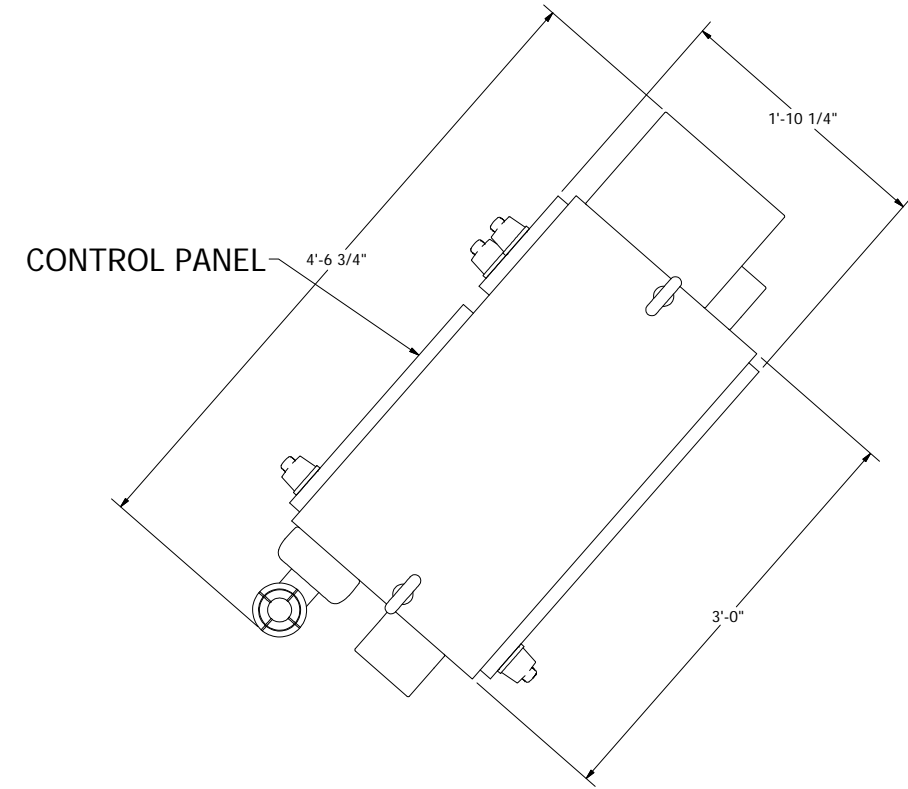
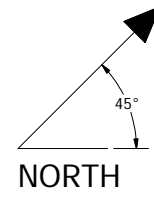
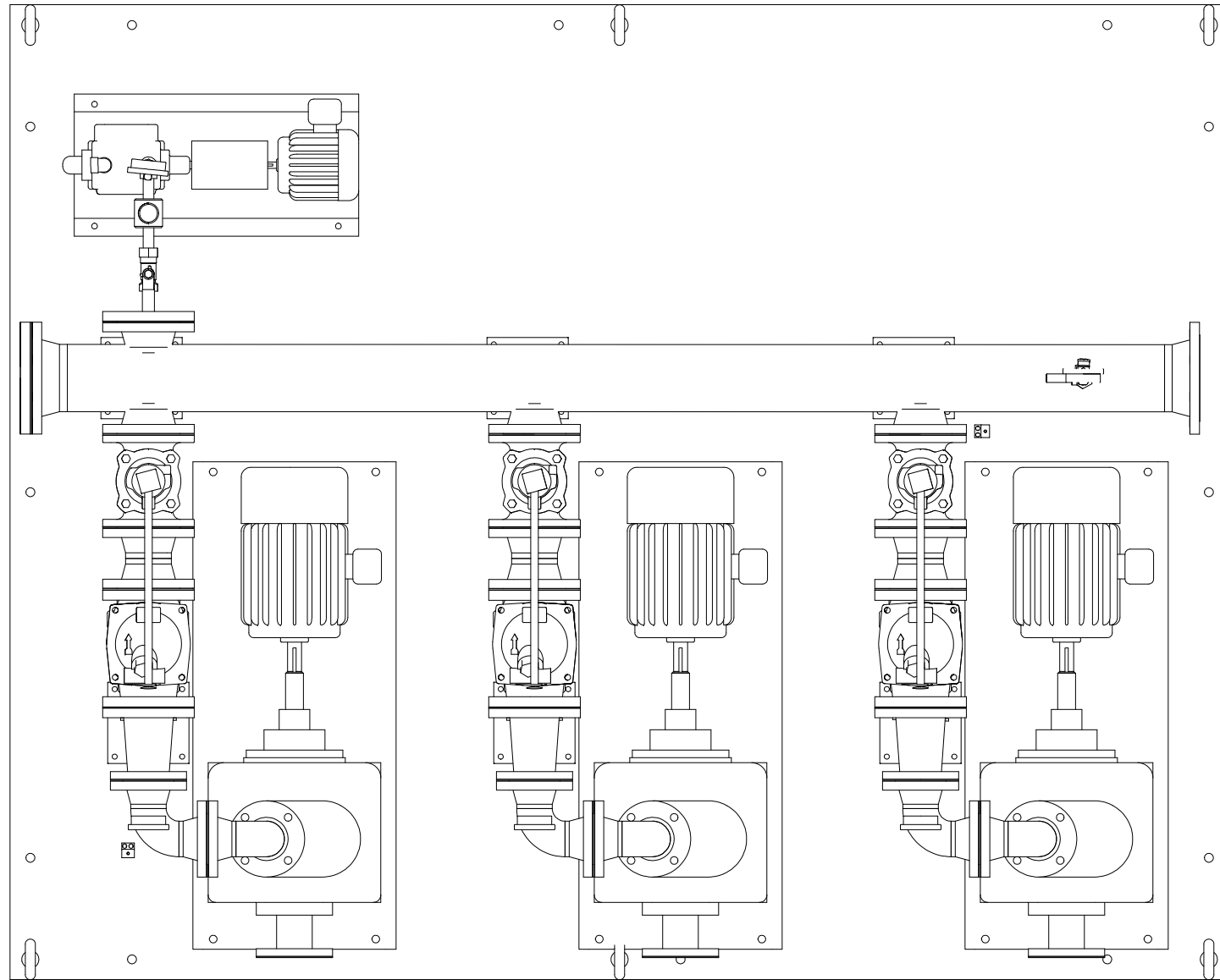
**END  
OF  
SECTION**

### **3. PUMP SKID ASSEMBLY**

This section contains information pertaining to the pump skid assembly. There is both technical information and related drawings necessary for the construction.

This section is structured as follows:

- 3.01 COMPONENT DRAWING(S)
- 3.02 PUMP SKID ASSEMBLY RELATED DATA SHEETS
  - 3.02.1 BALL VALVE
  - 3.02.2 MANIFOLD ASSEMBLY
  - 3.02.3 PRESSURE GAUGE
  - 3.02.4 DIAPHRAGM SEAL
  - 3.02.5 GROUNDING LUG
  - 3.02.6 KF BALL VALVE
  - 3.02.7 PRESSURE SWITCH
  - 3.02.8 SWING CHECK VALVE VELAN
  - 3.02.9 SWING CHECK VALVE GRAINGER
  - 3.02.10 AMERCOAT & AMERSHIELD
  - 3.02.11 HEAT TRACE & INSULATION



WEIGHTS	
PARTS	WEIGHT
SKID ASSEMBLY PLATFORM	2270lbs
PIPING, PIPE SUPPORTS AND VALVES	1475lbs
SELF PRIMER PUMP ASSEMBLIES	3075lbs
OIL SKIMMER PUMP ASSEMBLY	260lbs
CONTROL PANEL	950lbs
TOTAL WEIGHT	8030lbs

NOTES:

CONTROL PANEL TO BE LOCATED OFF OF SKID. SHIP FOR FIELD MOUNTING PER DRAWING 7651-1360.2005.

DRAWING GEOMETRY IS ACCURATE AND CREATED AT 1:1 AND FIT TO THE SHEET. DO NOT SCALE THIS DRAWING.

REV	DESCRIPTION	DATE	APPROV
3	REVISION PER 5/16/13 COMMENTS	5-17-13	AD
2	REVISION PER 3/27/13 COMMENTS	4-9-13	AD
1	COMPONENT DRAWING	5-18-12	AD

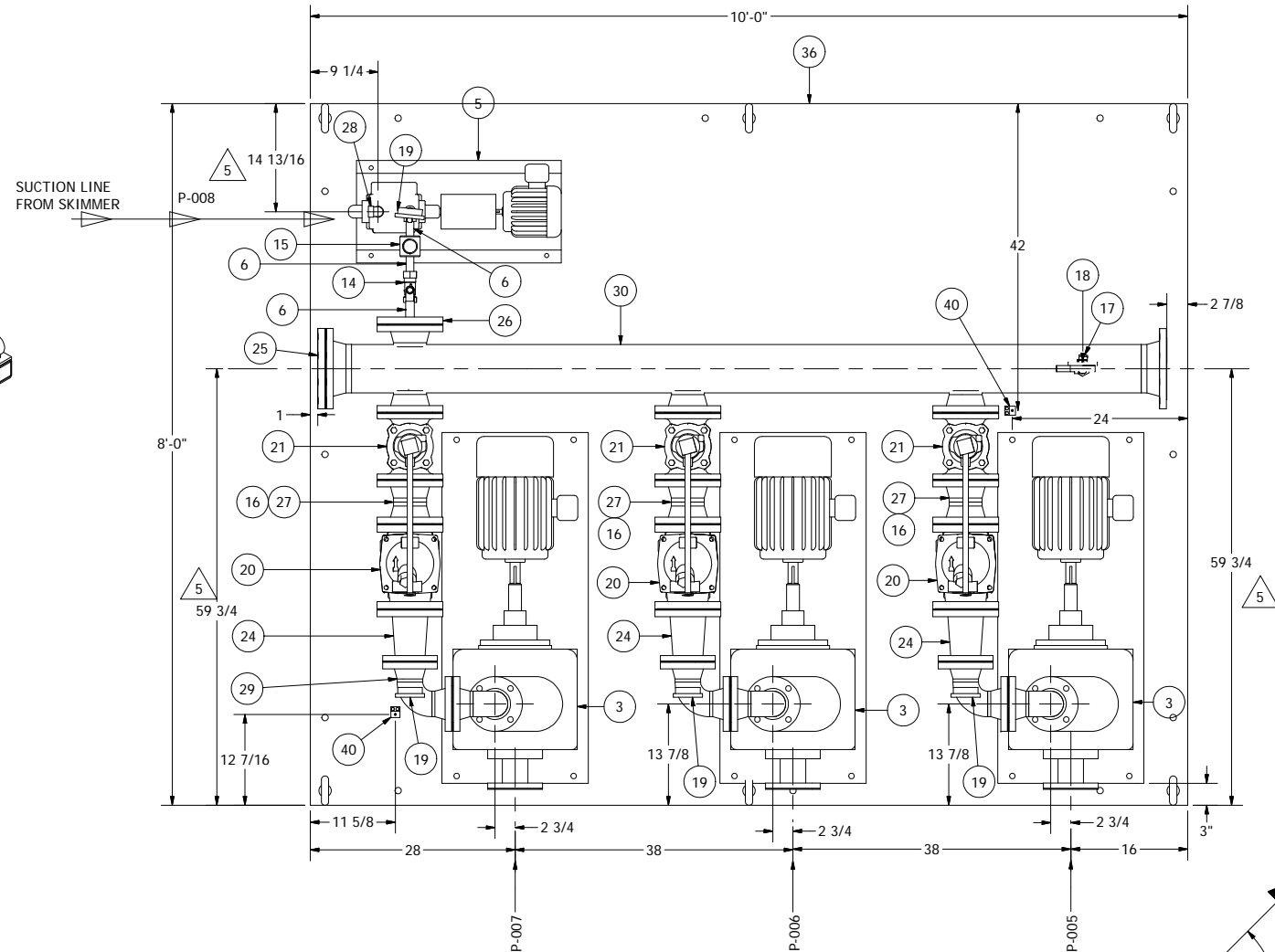
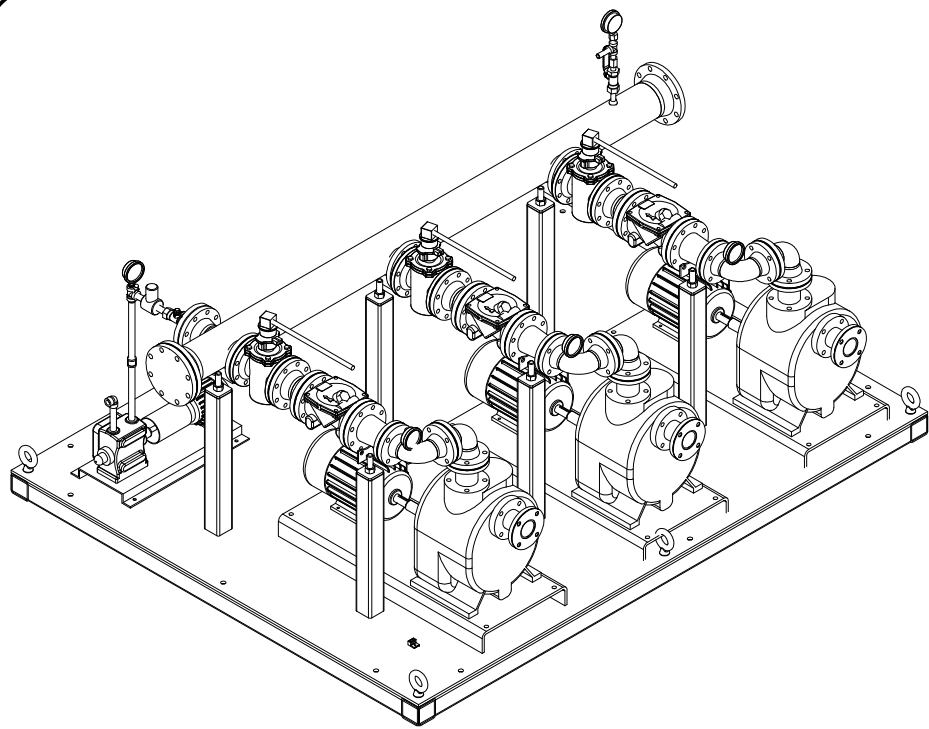
COMPONENT DRAWING

**ROMTEC UTILITIES**  
 18240 NORTH BANK ROAD  
 ROSEBURG, OREGON 97470  
 (541) 496-9678  
 FAX (541) 496-0804

BAE -ACETIC ACID PLANT  
 4" - 3 PUMP SKID LAYOUT

SHEET  
 1 OF 4

JOB NUMBER  
 RMTC  
 0000



Parts List			
ITEM	QTY	STOCK NUMBER	DESCRIPTION
1	3	25-6530	PIPE STAND - 4in - FLANGE MOUNT
2	3	25-6531	PIPE STAND - 6in - FLANGE MOUNT
3	3	30-XXXX	PUMP ASSEMBLY P3 DIRECT DRIVE
4	1	30-XXXX	SUMP SKIMMER COMPLETE (NOT SHOWN)
5	1	30-XXXX	SLIDING SHOE PUMP ASSEMBLY
6	3	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 3in
7	2	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 2in
8	2	40-XXXX	NIPPLE - 316SS - 1/2in SCH40 X 2in
9	1	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 12in
10	2	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 12in
11	2	40-XXXX	NIPPLE - 316SS - 1/2in SCH40 X 1.5in
12	1	41-XXXX	PRESSURE SWITCH
13	1	41-4151	DIAPHRAGM SEAL - PRESSURE GAUGE
14	1	41-4157	VALVE - BALL - 3/4in STAINLESS STEEL - 1/4 TURN
15	1	41-4700	VALVE - SWING CHECK - 3/4in - 316SS
16	3	41-4983	PLUG - 1/2in - 316SS - NPT
17	1	41-XXXX	VALVE - BALL - 1/2in 316SS - 1/4 TURN
18	1	41-6092	PRESSURE GAUGE - 3.5in 60PSI
19	4	41-XXXX	PRESSURE GAUGE - 2.5in 60PSI - COMPOUND
20	3	41-XXXX	VALVE - SWING CHECK - 4in - 316SS
21	3	41-XXXX	VALVE - KF BALL VALVE - 4in - WITH HANDLE
22	1	42-XXXX	UNION - 3/4in - 316SS
23	1	42-XXXX	BUSHING - 3/4in X 1/4in - 316SS
24	3	44-XXXX	REDUCER - 316SS - CONCENTRIC - 4in X 3in - RF
25	1	44-XXXX	FLANGE - 316SS - 6in - BLIND
26	1	44-XXXX	FLANGE - 316SS - 4in - BLIND WITH 3/4 NPT - RF
27	3	45-XXXX	SPOOL - FLG X FLG - 4in X 6in - 316SS
28	1	46-XXXX	ELBOW - 316SS - 3/4in SCH40 - FNPT
29	6	46-XXXX	ELBOW - 316SS - 3in - 90 DEG - FLG.ipt
30	1	46-XXXX	MANIFOLD ASSEMBLY - 6in
31	1	46-XXXX	TEE - 316SS - 3/4in SCH40 - NPT
32	1	46-XXXX	TEE - 316SS - 1/2in SCH40 - NPT
33	12	47-XXXX	GASKET - FLANGE - 3in X 1/8in - PTFE TEFLON
34	13	47-XXXX	GASKET - FLANGE - 4in X 1/8in - PTFE TEFLON
35	1	47-XXXX	GASKET - FLANGE - 6in X 1/8in - PTFE TEFLON
36	1	50-XXXX	SKID ASSEMBLY
37	6	50-XXXX	CAP - PIPE STAND
38	14	50-XXXX	TUBE - 3.5 X 3.5 X .25 (6 @ 28in)
39	6	50-XXXX	NCTin HEX NUT
40	2	62-4883	GROUNDING LUG - AU-2/0-B2

DRAWING GEOMETRY IS ACCURATE AND CREATED AT 1:1 AND FIT TO THE SHEET. DO NOT SCALE THIS DRAWING.

REVISION HISTORY	DATE	APPROV
7	10-14-13	NNA
6	9-20-13	AD
5	6-14-13	AD
4	5-31-13	AD
3	5-17-13	AD
2	4-9-13	AD
1	5-18-12	AD

**COMPONENT DRAWING**

**ROMTEC UTILITIES**  
 18240 NORTH BANK ROAD  
 ROSEBURG, OREGON 97470  
 (541) 496-9678  
 FAX (541) 496-0804

WEIGHTS	
PARTS	WEIGHT
SKID ASSEMBLY PLATFORM	2270lbs
PIPING, PIPE SUPPORTS AND VALVES	1475lbs
SELF PRIMER PUMP ASSEMBLIES	3075lbs
OIL SKIMMER PUMP ASSEMBLY	260lbs
CONTROL PANEL	950lbs
TOTAL WEIGHT	8030lbs

**COATING NOTES:**

ALL STAINLESS STEEL OR ALUMINUM PARTS DO NOT NEED ADDITIONAL COATING.

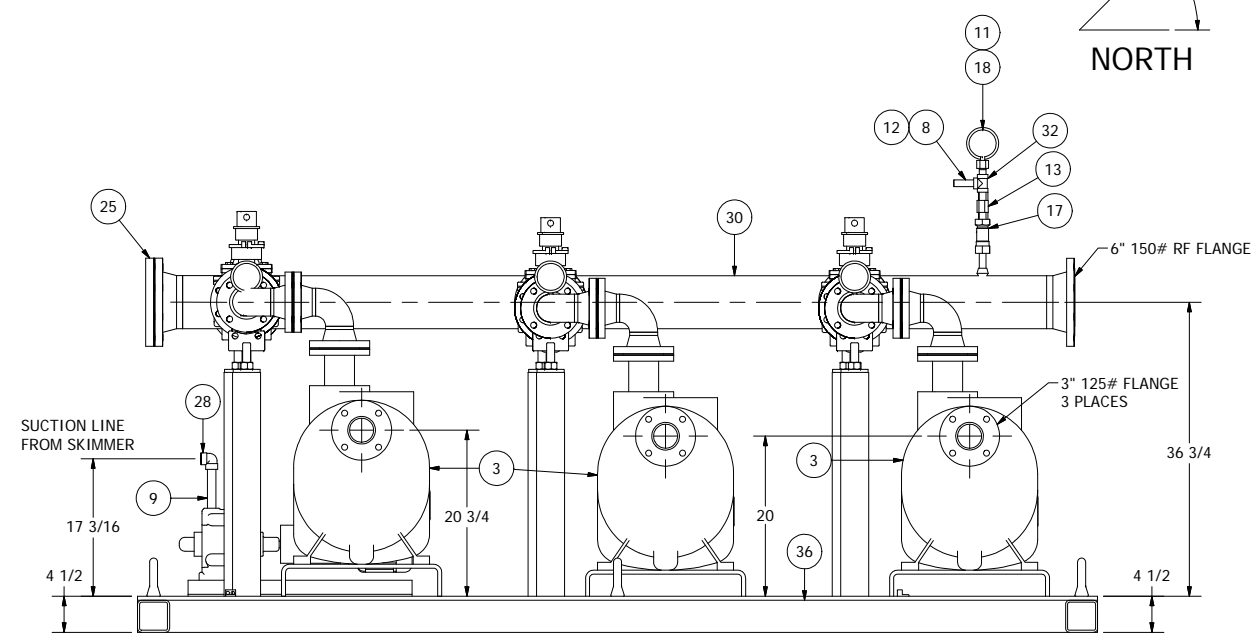
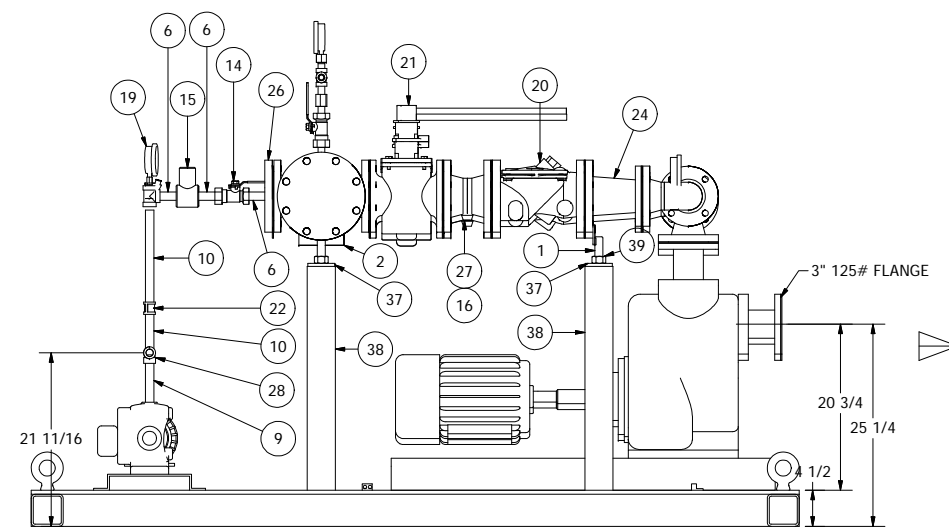
ALL PLAIN STEEL PARTS, SKID PLATFORM, AND PIPING STANDS IF NOT STAINLESS STEEL SHALL BE COATED (SHOP APPLIED) WITH:

- PRIME COAT - AMERCOAT 240
- FINISH COAT - AMERSHIELD (BLACK)

**NOTES:**

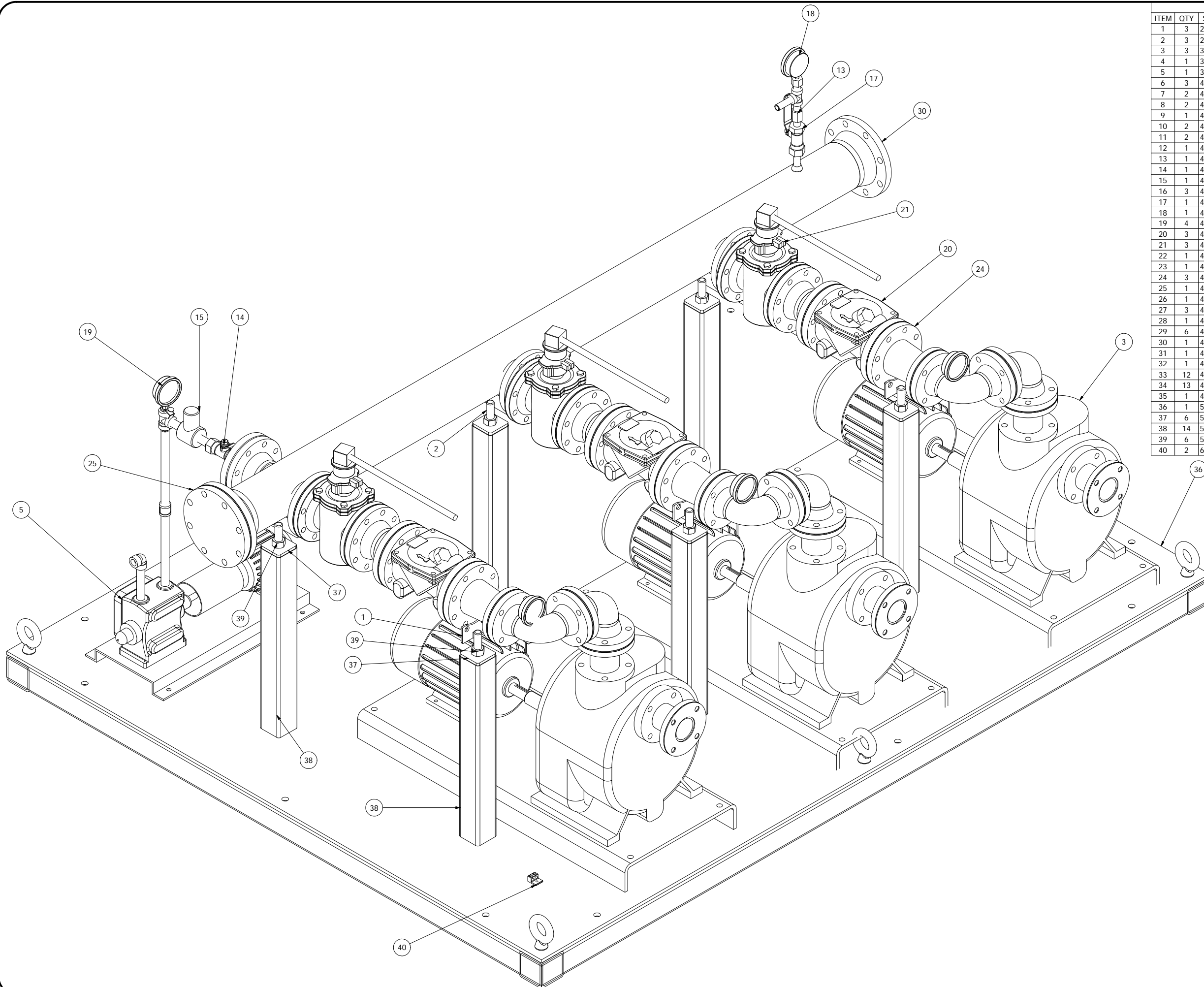
CONTROL PANEL TO BE LOCATED OFF OF SKID. SHIP FOR FIELD MOUNTING PER DRAWING 7651-1360.2005.

PIPE AND FITTINGS WILL HAVE HEAT TRACE AND INSULATION AS PER SPECIFICATIONS



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NOTE: ALL DIMENSIONS AND ELEVATIONS SHOWN ARE NOMINAL DIMENSIONS. IT IS THE RESPONSIBILITY OF THE ON-SITE CONTRACTOR OR ROMTEC UTILITIES CUSTOMER (NOT ROMTEC UTILITIES) TO VERIFY THE ACCURACY OF ANY CRITICAL DIMENSIONS OR ELEVATIONS PRIOR TO SETTING OR INSTALLING ANY EQUIPMENT.



Parts List			
ITEM	QTY	STOCK NUMBER	DESCRIPTION
1	3	25-6530	PIPE STAND - 4in - FLANGE MOUNT
2	3	25-6531	PIPE STAND - 6in - FLANGE MOUNT
3	3	30-XXXX	PUMP ASSEMBLY P3 DIRECT DRIVE
4	1	30-XXXX	SUMP SKIMMER COMPLETE (NOT SHOWN)
5	1	30-XXXX	SLIDING SHOE PUMP ASSEMBLY
6	3	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 3in
7	2	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 2in
8	2	40-XXXX	NIPPLE - 316SS - 1/2in SCH40 X 2in
9	1	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 12in
10	2	40-XXXX	NIPPLE - 316SS - 3/4in SCH40 X 12in
11	2	40-XXXX	NIPPLE - 316SS - 1/2in SCH40 X 1.5in
12	1	41-XXXX	PRESSURE SWITCH
13	1	41-4151	DIAPHRAGM SEAL - PRESSURE GAUGE
14	1	41-4157	VALVE - BALL - 3/4in STAINLESS STEEL - 1/4 TURN
15	1	41-4700	VALVE - SWING CHECK - 3/4in - 316SS
16	3	41-4983	PLUG - 1/2in - 316SS - NPT
17	1	41-XXXX	VALVE - BALL - 1/2in 316SS - 1/4 TURN
18	1	41-6092	PRESSURE GAUGE - 3.5in 60PSI
19	4	41-XXXX	PRESSURE GAUGE - 2.5in 60PSI - COMPOUND
20	3	41-XXXX	VALVE - SWING CHECK - 4in - 316SS
21	3	41-XXXX	VALVE - KF BALL VALVE - 4in - WITH HANDLE
22	1	42-XXXX	UNION - 3/4in - 316SS
23	1	42-XXXX	BUSHING - 3/4in X 1/4in - 316SS
24	3	44-XXXX	REDUCER - 316SS - CONCENTRIC - 4in X 3in - RF
25	1	44-XXXX	FLANGE - 316SS - 6in - BLIND
26	1	44-XXXX	FLANGE - 316SS - 4in - BLIND WITH 3/4 NPT - RF
27	3	45-XXXX	SPOOL - FLG X FLG - 4in X 6in - 316SS
28	1	46-XXXX	ELBOW - 316SS - 3/4in SCH40 - FNPT
29	6	46-XXXX	ELBOW - 316SS - 3in - 90 DEG - FLG.ipt
30	1	46-XXXX	MANIFOLD ASSEMBLY - 6in
31	1	46-XXXX	TEE - 316SS - 3/4in SCH40 - NPT
32	1	46-XXXX	TEE - 316SS - 1/2in SCH40 - NPT
33	12	47-XXXX	GASKET - FLANGE - 3in X 1/8in - PTFE TEFLON
34	13	47-XXXX	GASKET - FLANGE - 4in X 1/8in - PTFE TEFLON
35	1	47-XXXX	GASKET - FLANGE - 6in X 1/8in - PTFE TEFLON
36	1	50-XXXX	SKID ASSEMBLY
37	6	50-XXXX	CAP - PIPE STAND
38	14	50-XXXX	TUBE - 3.5 X 3.5 X .25 (6 @ 28in)
39	6	50-XXXX	NC1in HEX NUT
40	2	62-4883	GROUNDING LUG - AU-2/0-B2

DRAWING GEOMETRY IS ACCURATE AND CREATED AT 1:1 AND FIT TO THE SHEET DO NOT SCALE THIS DRAWING

REV	DESCRIPTION	DATE	APPROV
7	PUMP PLATES	10-14-13	NINA
6	UPDATED PIPE STANDS	9-20-13	AD
5	AS BUILT MANIFOLD DIMENSION CHANGE	6-14-13	AD
4	REVISED FOR PRODUCTION LAUNCH	5-31-13	AD
3	REVISION PER 5/16/13 COMMENTS	5-17-13	AD
2	REVISION PER 3/27/13 COMMENTS	4-9-13	AD
1	COMPONENT DRAWING	5-18-12	AD

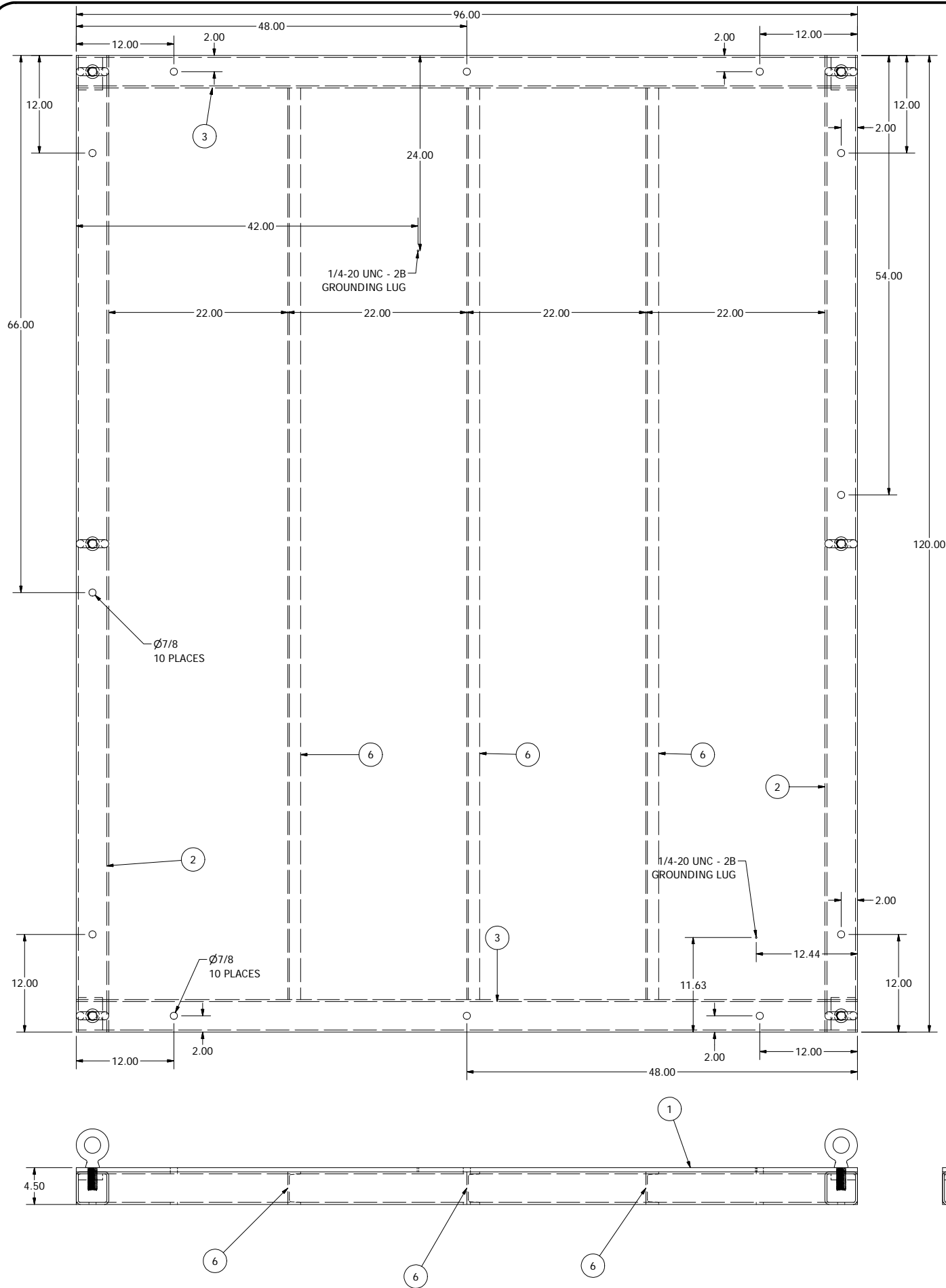
**ROMTEC UTILITIES**  
 18240 NORTH BANK ROAD  
 ROSEBURG, OREGON 97470  
 (541) 496-9678  
 FAX (541) 496-0804

**BAE - ACETIC ACID PLANT**  
 3D VIEW

SHEET  
**3 OF 4**

JOB NUMBER  
**RMTC 0000**





Parts List			
ITEM	QTY	STOCK NUMBER	DESCRIPTION
1	1	50-XXXX	PLATE - 1/2in A36 STEEL - 96in X 120in - 1633.54lbs
2	2	50-XXXX	TUBE - 4 X 4 X .250 X 120in - 244lbs
3	2	50-XXXX	TUBE - 4 X 4 X .250 X 96in - 195.2lbs
4	4	50-4845	DOUBLER - .75 X 3 X 4 - 10.2lbs
5	6	50-XXXX	1-1/8in EYE BOLT - STEEL - 30lbs
6	28	50-XXXX	CHANNEL - 4in X 5.4lb (3 @ 112in) - 151.2lbs
7	10	50-XXXX	ANCHOR BOLTS - 3/4in X 9.5in - 316 SS ALL THREAD
8	10	50-XXXX	ANCHOR BOLT NUTS AND WASHERS - 316SS
9	1	51-XXXX	PRIME COAT - AMERCOAT 240
10	1	51-XXXX	FINISH COAT - AMERSHIELD (BLACK)
11	1	51-XXXX	ANCHORING EPOXY - UNITEX PRO POXY 400 - ONE CARTRIDGE

TOTAL SKID WEIGHT AS SHOWN APPROXIMATE 2270lbs

NOTES:

- ALL STRUCTURAL MATERIAL IS PLAIN STEEL.
- SEE COATING NOTE BELOW.
- HOLD DOWN ANCHOR BOLTS TO BE 3/4in 316 STAINLESS STEEL

COATING NOTES:

- ALL STAINLESS STEEL OR ALUMINUM PARTS DO NOT NEED ADDITIONAL COATING.
- ALL PLAIN STEEL PARTS, SKID PLATFORM, AND PIPING STANDS IF NOT STAINLESS STEEL SHALL BE COATED WITH:
  - PRIME COAT - AMERCOAT 240
  - FINISH COAT - AMERSHIELD (BLACK)

DRAWING GEOMETRY IS ACCURATE AND CREATED AT 1:1 AND FIT TO THE SHEET. DO NOT SCALE THIS DRAWING.

REV	DESCRIPTION	DATE	APPROV
1	REVISED PER PRODUCTION LAUNCH	5-31-13	AD

**ROMTEC UTILITIES**  
 18240 NORTH BANK ROAD  
 ROSEBURG, OREGON 97470  
 (541) 496-9678  
 FAX (541) 496-0804

BAE ACETIC ACID PLANT  
 SKID FRAME DETAIL

SHEET  
 4 OF 4

JOB NUMBER  
 RMTC  
 0000

**3.02**

**PUMP SKID ASSEMBLY RELATED DATA  
SHEETS**

**PAGE IS INTENTIONALLY LEFT BLANK**

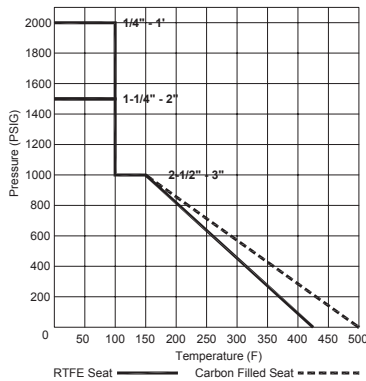
# Figure 220 STAINLESS STEEL BALL VALVES



## 2 PC FULL PORT 2000 WOG

### Features:

- 2000 WOG\*
- 150 WSP (with Carbon Filled Seats)
- Full Port
- Blow-out Proof Stem
- Adjustable Packing
- Investment Cast Body & End Caps
- Threaded NPT Ends
- Stainless Steel Handle with Vinyl Grip
- Locking Device
- Actuator Mounting Pad
- Optional Carbon Filled Seats



### Figure Number Matrix

FNW 2 2 0 SEAT X			
SEAT TYPE		SIZE CODES	
BLANK = STANDARD RTFE	C = CARBON FILLED TFE	1/4 = B	1-1/4 = H
		3/8 = C	1-1/2 = J
		1/2 = D	2 = K
		3/4 = F	2-1/2 = L
		1 = G	3 = M

For other valve materials or configurations, contact FNW Valve at (503) 287-8383 for sales assistance.

\*1/4" to 1" - 2000 WOG

1-1/4" to 2" - 1500 WOG

2-1/2" to 3" - 1000 WOG

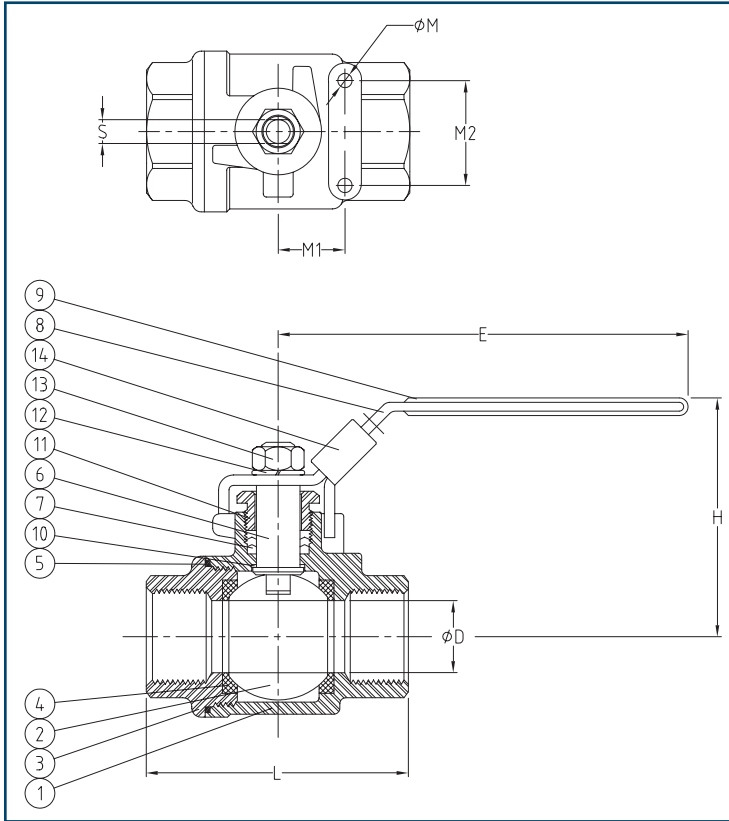
### Cv & Weights

Size	Cv	Wt. (Lbs)
1/4	6	0.7
3/8	12	0.7
1/2	19	1.0
3/4	37	1.2
1	64	2.5
1-1/4	103	3.1
1-1/2	143	4.9
2	360	8.2
2-1/2	440	16.5
3	520	24.5

### Torque

Size	Torque (in-lbs)
1/4	60
3/8	60
1/2	80
3/4	150
1	200
1-1/4	250
1-1/2	320
2	500
2-1/2	680
3	800

## 2 PC FULL PORT 2000 WOG



### Standard Materials

Ref. No.	Description	Material		Qty
		220	220C	
1	Body	ASTM A351 Gr. CF8M		1
2	Ball	316SS		1
3	End Cap	ASTM A351 Gr. CF8M		1
4	Seat	RTFE	Carbon Filled TFE	2
5	Body Seal	PTFE	Carbon Filled TFE	1
6	Stem	316SS		1
7	Stem Packing	PTFE	Carbon Filled TFE	1 Set
8	Handle	304SS		1
9	Handle Cover	Vinyl		1
10	Thrust Washer	PTFE	Carbon Filled TFE	1
11	Gland Nut	304SS		1
12	Handle Washer	304SS		1
13	Handle Nut	304SS		1
14	Locking Pad	304SS		1

### Dimensions (Inches)

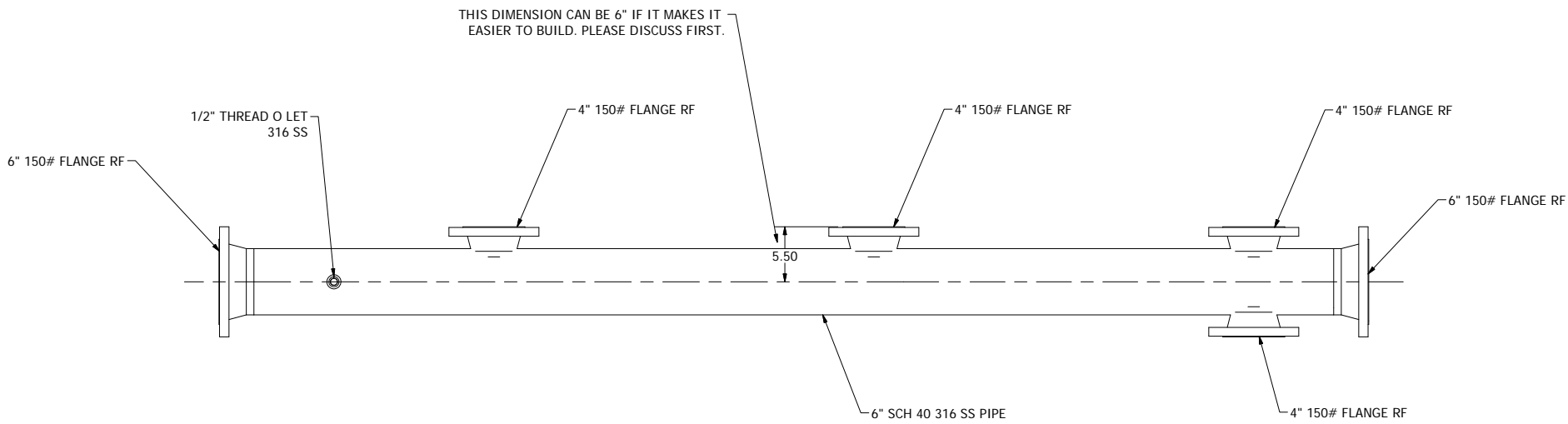
Size	ØD	E	L	H	S	M1	M2	M
1/4	0.39	3.74	2.17	2.52	0.196	0.50	1.12	10-24UNC
3/8	0.47	3.74	2.17	2.52	0.196	0.50	1.12	10-24UNC
1/2	0.62	4.92	2.55	2.52	0.255	0.50	1.12	10-24UNC
3/4	0.78	4.92	3.03	2.64	0.255	0.88	1.38	10-24UNC
1	0.98	5.51	3.46	3.27	0.314	0.88	1.38	10-24UNC
1-1/4	1.25	5.51	4.01	3.50	0.314	1.00	1.50	1/4 -20UNC
1-1/2	1.57	7.87	4.33	3.93	0.393	1.00	1.50	1/4 -20UNC
2	1.96	7.87	4.92	4.25	0.393	1.00	1.50	1/4 -20UNC
2-1/2	2.55	9.84	6.45	5.91	0.472	1.18	2.76	1/4 -20UNC
3	3.14	9.84	7.12	6.34	0.472	1.18	2.76	1/4 -20UNC

DOC: FNWBV22005 Ver. 7/05

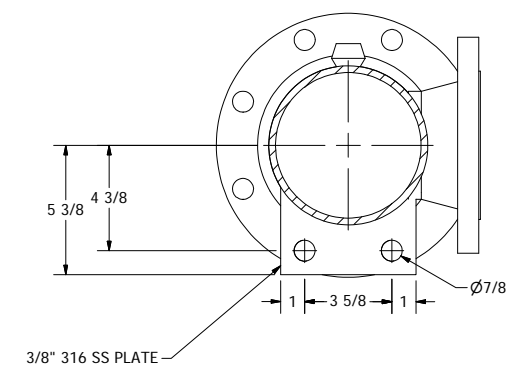
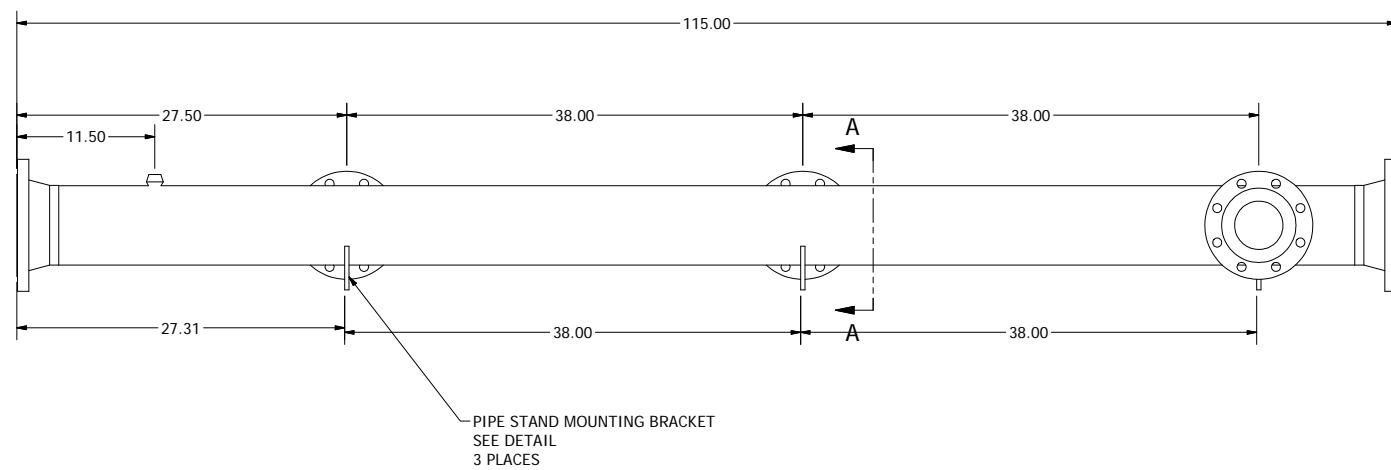
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MATERIAL: ALL 316 STAINLESS STEEL



SECTION A-A  
SCALE 1/4  
PIPE STAND  
MOUNTING BRACKET

VERIFY SCALE  
BAR IS ONE INCH ON ORIGINAL DRAWING

0 IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

1" 1"

DSN - AD	REV	DESCRIPTION	DATE	APPROV
DRN - AD	1			
CKD - AD				
DATE - 4-10-13				

**ROMTEC UTILITIES**  
18240 NORTH BANK ROAD  
ROSEBURG, OREGON 97470  
(541) 496-9678  
FAX (541) 496-0804

6in STAINLESS STEEL MANIFOLD  
DETAIL

SHEET  
1 OF 1

JOB NUMBER  
RMTC  
0000

## Duralife® Pressure Gauge Type 1009, ASME B 40.1 Grade 1A (±1% of span)

### DESIGNED FOR SAFETY AND LONGER LIFE

- 5-year limited warranty
- Patented PowerFlex™ movement isolates movement from shock and vibration for longer life
- All stainless, all-welded construction for long life
- ASME Grade 1A, 1% accuracy full scale
- True Zero™ pointer indication – no stop pin to mask false zero reading – ensures safety and process control

The following Table is *not* for conversion purposes.

STANDARD RANGES <sup>(3)(4)(5)</sup>		
Pressure psi	kg/cm <sup>2</sup> - bar	kPa
0/15	0/1	0/100
0/30	0/1.6	0/160
0/60	0/2.5	0/250
0/100		
0/160	0/4	0/400
0/200	0/6	0/600
0/300	0/10	0/1000
0/400	0/16	0/1600
0/600	0/25	0/2500
0/800	0/40	0/4000
0/1000	0/60	0/6000
0/1500	0/100	0/10,000
0/2000	0/160	0/16,000
0/3000	0/250	0/25,000
0/4000	0/400	0/40,000
0/5000	0/600	0/60,000
0/6000	0/1000	0/100,000
0/7500		
0/10,000		
0/15,000		
<b>Vacuum</b>		
30 in./0 in.Hg	-1/0	-100/0
<b>Compound</b>		
30 in.Hg/15 psi	-1/0/1.5	-100/0/150
30 in.Hg /30 psi	-1/0/3	-100/0/300
30 in.Hg /60 psi	-1/0/5	-100/0/500
30 in.Hg /100 psi	-1/0/9	-100/0/900
30 in.Hg /150 psi	-1/0/15	-100/0/1500
30 in.Hg /300 psi	-1/0/24	-100/0/2400

- New PLUS!™ Performance Option:
  - Liquid-filled performance in a dry gauge
  - Fights vibration and pulsations without liquid-fill headaches
  - See pages 6-7 for details
  - Order as option XLL

### OTHER FEATURES:

Available in 2½" and 3½" dial sizes, Duralife® pressure gauges are liquid fillable and field convertible for panel mounting. Both zero and span adjustments are standard.

The gauge is available dry, liquid-filled weatherproof or hermetically sealed and now with PLUS!™ performance option. A five year limited warranty is standard with the Duralife® 1009.



### BOURDON SYSTEM SELECTION <sup>(1)</sup>

Ordering Code	Bourdon Tube & Tip Material <sup>(1)</sup>	Socket Material	Tube Type	Range Selection Limits (psi)	NPT Conn. <sup>(6)</sup>
AW	316 stainless steel	Bronze	C-Tube	Vac/600	¼
AW	316 stainless steel	Bronze	Helical	1000	¼
SW	316 stainless steel	316 stainless steel	C-Tube	Vac/600	¼ & ½ <sup>(2)</sup>
SW	316 stainless steel	316 stainless steel	Helical	800/15,000	¼ & ½ <sup>(2)</sup>

(1) For selection of the correct Bourdon system material, see the media application table on page 243.

(2) ½ NPT available 3½" lower SW system only.

(3) Type 1009 gauges may be ordered with metric single-scale dial: kPa, bar or kg/cm<sup>2</sup>.

(4) Dual-scale dials will be supplied with standard metric inner scale and equivalent psi outer scale or with standard psi inner scale and equivalent metric outer scale—please specify.

(5) Special logos and scales available upon request.

(6) ¼" JIS, BSP or DIN threads available on SW systems.

### TO ORDER THIS 1009 DURALIFE PRESSURE GAUGE:

Select:

1. Dial size—2½" 3½" 35 1009 SW (L) 04 XXX 60PSI

2. Case type—1009

3. Tube and socket material

4. Liquid filled (glycerin), leave blank if dry ←

5. Connection size—¼ (01), ½ (02) ½ (04)

6. Connection location—Lower (L), Back (B)

7. Optional Features—see page 176

8. Standard pressure range—1000 psi

Accessories: see pages 233-238

- All welded metal construction, prevents leakage of process media
- No gaskets or bolts
- For use on pressure gauges up to 3½" from vacuum to 1000 psi and 4½" gauges 100 psi to 1000 psi
- Top housing material 316L stainless steel standard
- Diaphragm materials in 316L stainless steel, hastelloy C and tantalum
- Bottom housing materials in 316L stainless steel and hastelloy C
- ¼ NPT or ½ NPT female, ¼-½ NPT male process connections
- ¼ NPT or ½ NPT instrument connections
- Type 312 furnished with ⅛ NPT flushing connection
- Not available in male process connections


**SELECTION TABLES**
**Table A – Process Connection**

Process Connection	Size	Code
Threaded – male NPT	¼	02
Threaded – male NPT	½	04
Threaded – male NPT	¾	06
Threaded – male NPT	1	08
Threaded – female NPT	¼	25
Threaded – female NPT	½	50

**Table B – Type**

Description	Code
All welded midi-seal	311
All welded midi-seal w/flushing connection	312

**Table C – Diaphragm Materials**

Materials	Code
316L stainless steel	S
tantalum	U
Hastelloy C-276	H

**Table D – Bottom Housing Materials**

Materials	Code
316L stainless steel	S
Hastelloy C-276	H

**Table E – Instrument Connection**

Instrument Connection	Size	Code
Threaded – female NPT	¼ NPT	02T
Threaded – female NPT	½ NPT	04T

**Table F – Filling Fluid**

Fill	Service	Connection to Instrument	Temperature Range °F	Code
Glycerin	Pressure	Direct Only	0/400	CG
Silicone	Pressure/Vacuum	Direct or Flexible Line	-40/600	CK
Halocarbon	Pressure/Vacuum in presence of strong oxidizing agent	Direct or Flexible Line	-70/300	CF
Syltherm	Pressure	Direct or Flexible Line	-40/750	HA

**TO ORDER THIS TYPE 311/312 MIDI-SEAL ASSEMBLY:**

1. From **Table A**...select PROCESS CONNECTION SIZE (e.g., 50 for ½" female NPT)
2. From **Table B**...select TYPE (e.g., 311 for all welded midi-seal)
3. From **Table C**...select DIAPHRAGM MATERIAL (e.g., U for Tantalum)
4. From **Table D**...select BOTTOM HOUSING MATERIAL (e.g., H for Hastelloy C)
5. From **Table E**...select INSTRUMENT CONNECTION SIZE (e.g., 02T for ¼" female NPT)
6. From **Table F**...select FILLING FLUID, if diaphragm seal will be attached to instrument (e.g., Glycerin – CG)

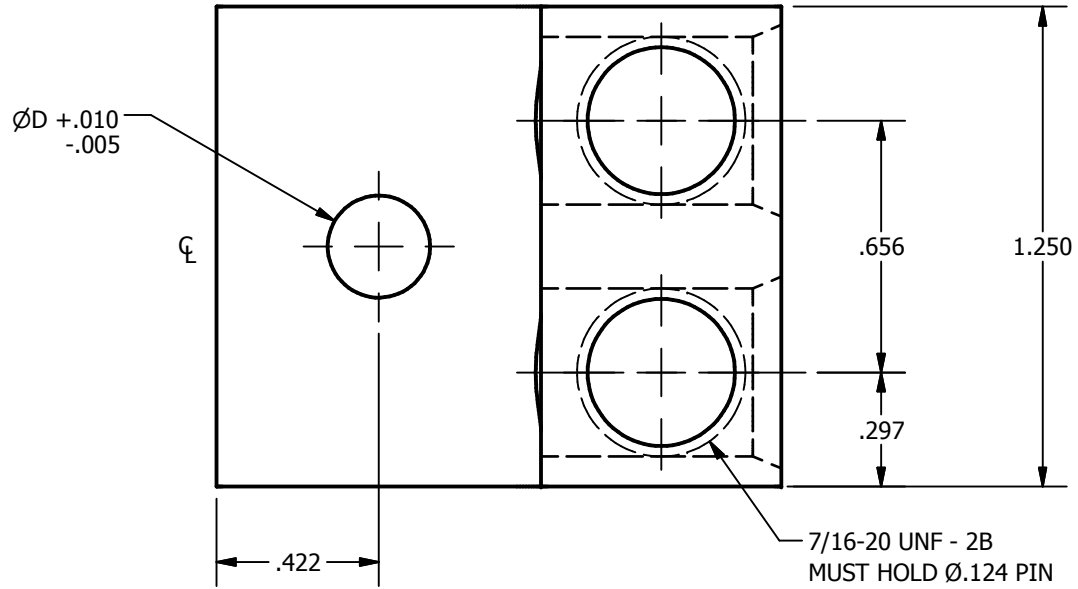
**Coded order:** 50-311-UH-02T-CG

**50-312-SS-04T-CG**

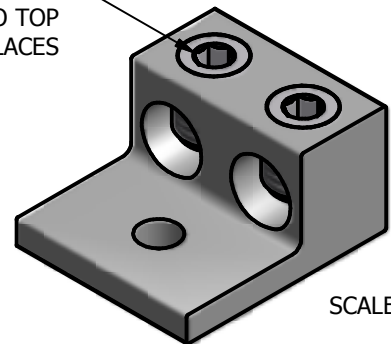
SCREW: E0950	MATERIAL:ALUMINUM, X0031	TOLERANCES-UNLESS OTHERWISE SPECIFIED 2 PL. DEC. ±.015 TRUE C.L. ±.015 3 PL. DEC. ±.015 ANGLES ±1		DWG. NO. <b>D2057</b>	
CAT. NO.:	PLATING: EL-TIN	DRAWN BY:CLH	SCALE: 2:1	SHEET 1 OF 1	
MASS:SEE CHART	MARKING: SEE CHART	DATE:1/16/2008	SIZE: A		
SURFACE AREA: SEE CHART <sup>2</sup>		CELL:AMP	REV.	DESCRIPTION	

REV.	DESCRIPTION
E	

Cat #: AU-2/0  
AU-2/0-B2



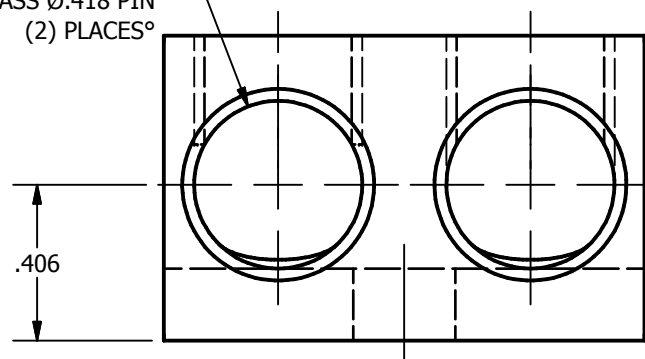
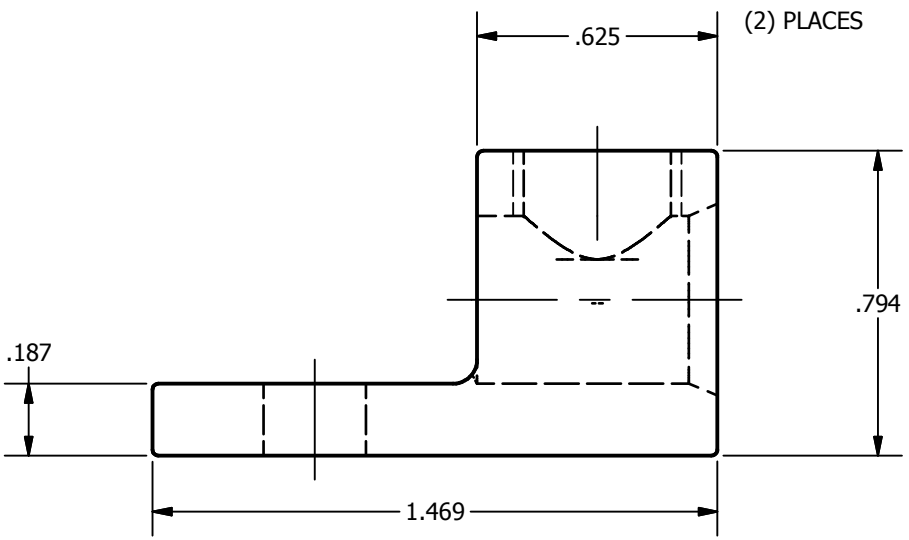
E0950 FLUSH TO TOP (2) PLACES




SCALE 1 : 1

7/16-20 UNF - 2B  
MUST HOLD Ø.124 PIN WITH NO LEAD GAGE (2) PLACES

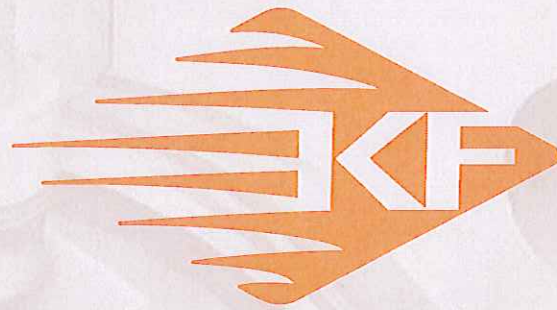
✓ Ø.437±.005  
✓ Ø.499±.040 X 45°  
MUST PASS Ø.418 PIN (2) PLACES°



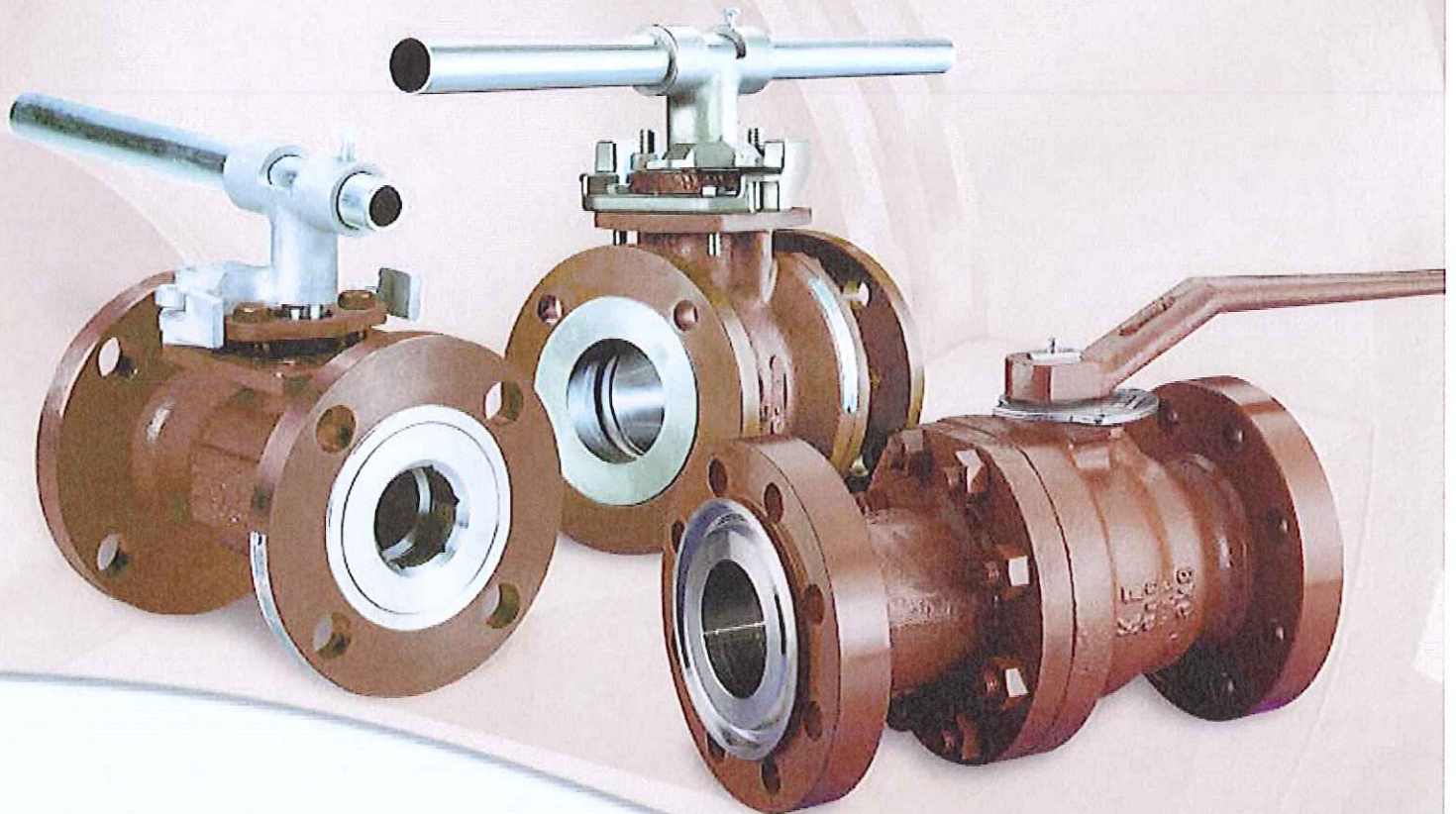
DEV	D	MASS LBS.	SURFACE AREA IN <sup>2</sup>	MARKING
-22	.272	.0555	8.0048	ILSCO, D2057, AU-2/0, 2/0-14, AL9CU 



# KF Series F Flanged Floating Ball Valves



**KF Industries**



Superior Fluid Control Products for the Petrochemical and Industrial Markets

A Brand of **CIRCOR** Energy Products, Inc.





# KF Series F

KF Series F Flanged Floating Ball Valves are a prime example of KF's reliability, performance, manufacturing and superior engineering techniques at work. Featuring a unibody or two-piece bolted design.

## General Design Features

- NACE MR0175 - (ISO 15156)  
(Stainless Steel ball/stem configuration)
- Blowout proof stem
- Weather Seal (Class 600 and higher)
- Actuator mounting pad (4 bolt machined)
- API 6D
- API 607 4th Edition\* (O-Ring & Graphite)
- Secondary Metal-to-Metal Sealing
- Full rated bi-directional dead end service
- Antistatic Device
- Lockable handle
- O-Ring design (standard)
- Graphite or Teflon® packing (optional)

\*Not applicable to Teflon® packed.

## Applicable Standards

### API-American Petroleum Institute

- Spec. 6D Specification for pipeline valves.
- Spec. RP6F Recommended practice for fire testing valves.
- Std. 598 Valve inspection and test.\*\*
- Std. 607 Fire test for soft seated quarter-turn valves.

### ASME/ANSI-American National Standard

- B16.5 Steel pipe flanges and flanged fittings.
- B16.10 Face-to-face and end-to-end dimensions of ferrous valves.
- B16.34 Steel valves- Flanged and butt welding ends.

### EC-European Community

CE Marked (P.E.D. 97/23/EC, Cat. 3)\*\*

### ISO-International Org. for Standardization

- ISO 9001: Quality systems-Model for quality assurance  
2000 in design/development, production, installation and servicing.
- ISO 15156 Materials for use in H2S containing environments in oil and gas production.

### MSS-Manufacturers Standardization Society

- SP 6 Std. finishes for contact faces of pipe flanges and connecting- end flanges of valves and fittings.
- SP 25 Standard marking system for valves, fittings, flanges and unions.
- SP 44 Steel pipeline flanges.
- SP 55 Quality standard for steel castings visual method.

### NACE-National Assoc. of Corrosion Engineers

- MR0175 Sulfide stress cracking resistant metallic materials for oilfield equipment. (Superseded by ISO 15156)

\*\*P.O.A. consult factory.

## Size Range and Design Availability

Size (in.)	Class/Configuration				
	150	300	600	900	1500
1 FP	▲	▲	▲	▲	▲
1 1/2 FP	▲	▲	▲	—	—
2 RP	■	■	▲	▲	—
2 FP	▲	▲	▲	▲	—
2 1/2 RP	▲	▲	▲	—	—
3 RP	■	■	▲	—	—
3 FP	▲	▲	▲	—	—
4 RP	■	■	▲	—	—
4 FP	▲	▲	▲	—	—
6 RP	■	■	▲	—	—
6 FP	▲	▲	▲	—	—
8 RP	▲	▲	▲	—	—
8 FP	▲	▲	—	—	—
10 RP	▲	▲	—	—	—
10 FP	▲	—	—	—	—
12 RP	▲	—	—	—	—

■ Unibody

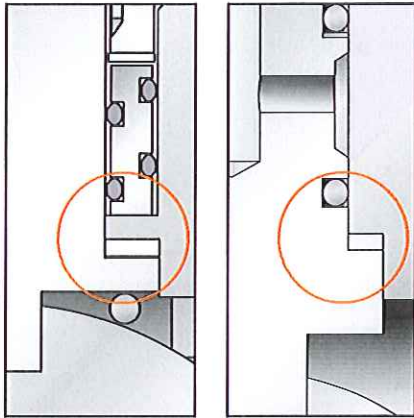
▲ Split Body

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## KF Series F Design Features

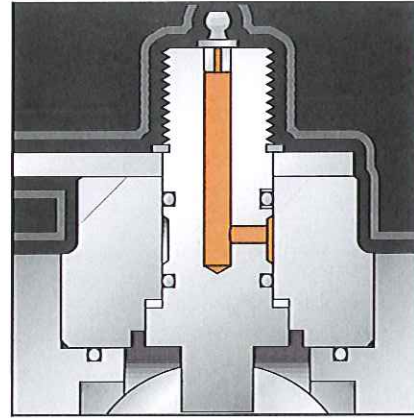


Class 150 & 300

Class 600 & higher

### Blowout Proof Stem

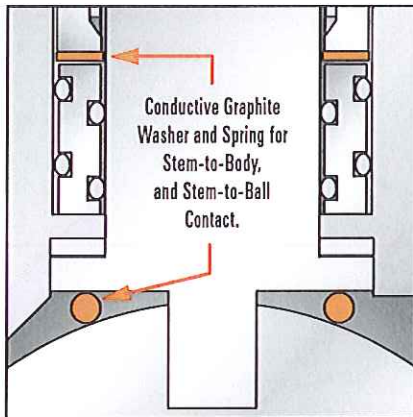
Internally inserted, "backseated" stem assures fire safety and blow-out prevention by retaining stem in the valve at all pressures.



Class 600 & higher

### Stem Journal Lubrication

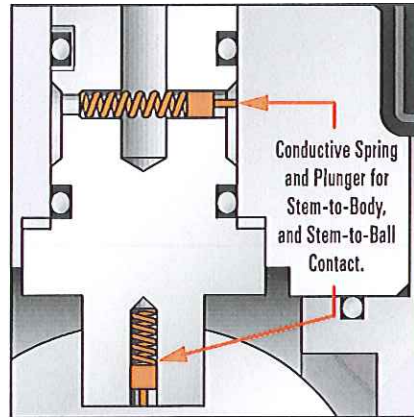
All valves incorporate external stem lubrication. A vented weather seal allows safe pressure relief in event of excessive grease gun pressure.



Class 150 & 300  
(O-Ring shown, packing also available.)

### Antistatic Device

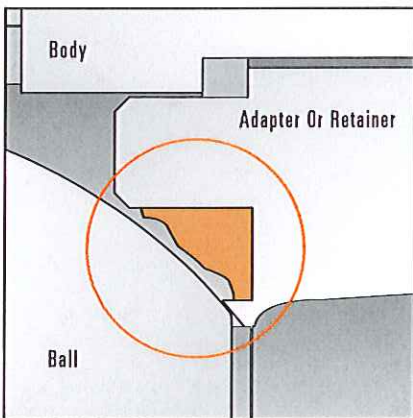
A conductive spring and a graphite washer provide antistatic continuity throughout the valve.



Class 600 & higher

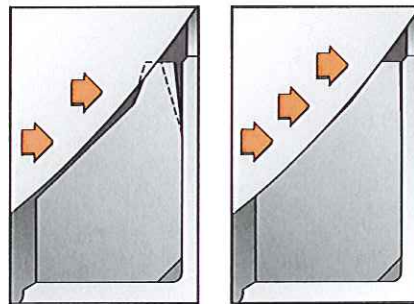
### Antistatic Device

1" bore - 4" bore, cl. 600, 900 & 1500 use spring-loaded pins between the ball, stem, and body to provide antistatic continuity throughout the valve.



### Firesafe Seat Sealing

In event of fire and seat destruction, ball floats downstream to effectively provide metal-to-metal seat sealing.



Low Pressure Sealing

High Pressure Sealing

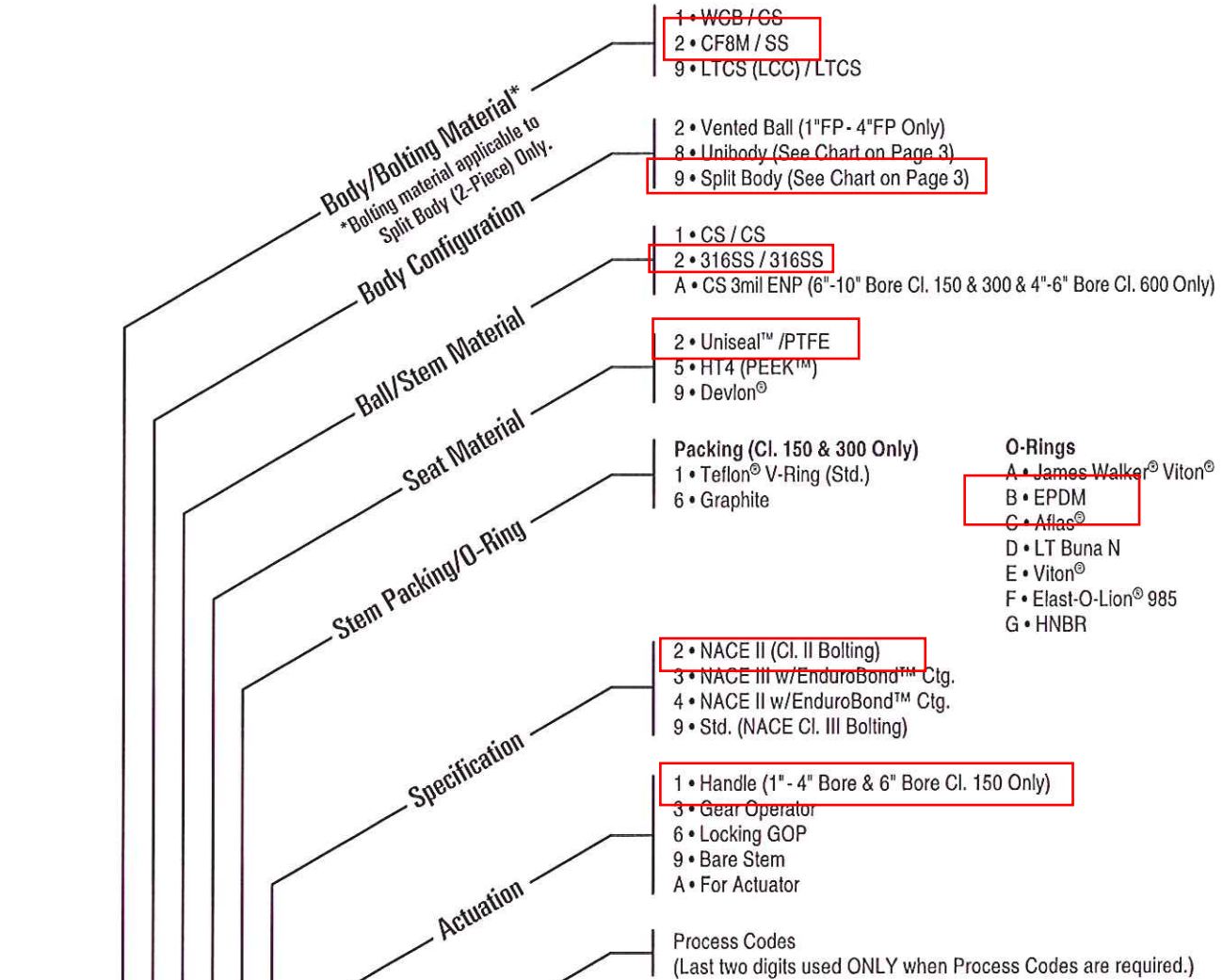
### Positive Low & High Pressure Sealing For Devlon® and HT4 Seats

A special *integral seat lip* provides positive low pressure "bubble-tight" sealing between the ball and seat with minimal operating torque. The KF *seat lip* defects slightly at higher pressures to ensure full seat contact with the ball. The seat's "memory-action" provides "bubble-tight" sealing at both low and high pressures. This "self compensation for swell" feature results in low torque and long life operation.





# KF Series F Part Number Codes



Assembly Base No.

GXXXX-X X X X X X X XX

Viton® is a registered trademark of DuPont Dow Elastomers.  
Teflon® is a registered trademark of DuPont.  
Enduro-Bond™ is a registered trademark of Energy & Environmental Services.  
James Walker® and Elast-O-Lion® are registered trademarks of James Walker.  
Devlon® is a registered trademark of Devol Engineering, Ltd.  
PEEK™ is a trademark of Victrex Plc.  
Atlas® is a registered trademark of Asahi Glass.

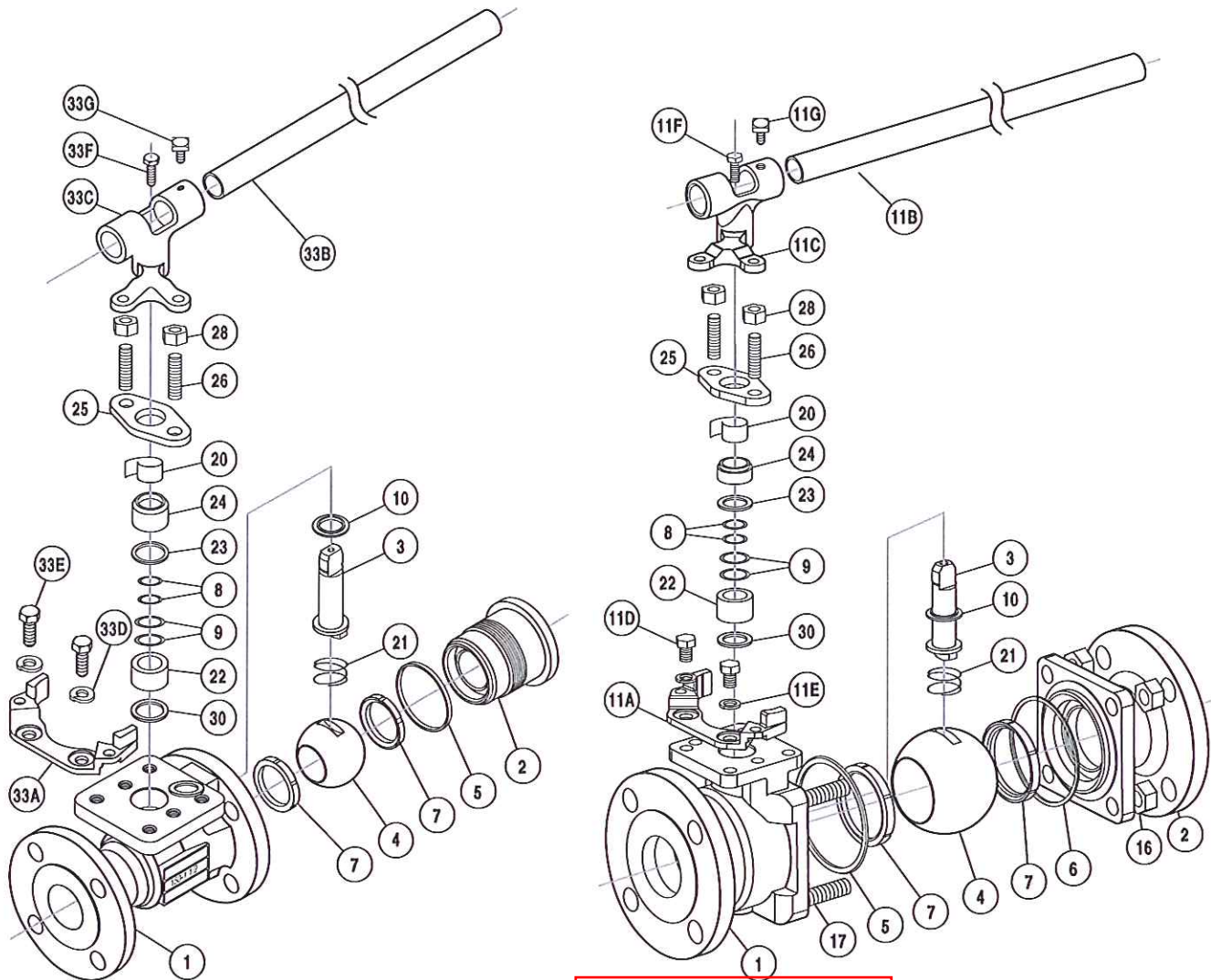
## Assembly Base Numbers — 1"FP - 12"RP G2156-2 9 2 2 B 2 1

Size (in.)	Class/End Connection							
	150RF	300RF	600RF	600RTJ	900RF	900RTJ	1500RF	1500RTJ
1 FP	G2147	G2297	G2597	G2607	G3348	G3349	G3348	G3349
1 1/2 FP	G2149	G2299	G2599	G2609	—	—	—	—
2 RP	G2150	G2300	G2600	G2610	G2900	G2910	—	—
2 1/2 RP	G2152	G2302	G2602	G2612	—	—	—	—
2 FP	G2151	G2301	G2601	G2611	G2901	G2911	—	—
3 RP	G2153	G2303	G2603	G2613	—	—	—	—
3 FP	G2154	G2304	G2604	G2614	—	—	—	—
4 RP	G2155	G2305	G2605	G2615	—	—	—	—

Size (in.)	Class/End Connection							
	150RF	300RF	600RF	600RTJ	900RF	900RTJ	1500RF	1500RTJ
4 FP	G2156	G2306	G2606	G2616	—	—	—	—
6 RP	G2157	G2307	G2618	G2617	—	—	—	—
6 FP	G1720	G1724	G1728	G1730	—	—	—	—
8 RP	G1721	G1725	G1729	G1731	—	—	—	—
8 FP	G1722	G1726	—	—	—	—	—	—
10 RP	G1723	G1727	—	—	—	—	—	—
10 FP	G1752	—	—	—	—	—	—	—
12 RP	G1753	—	—	—	—	—	—	—



# KF Series F Component Parts, Class 150 & 300



## Parts List, Unibody

Part No.	Description
1	Body
2	Seat Retainer
3	Stem
4	Ball
5	Body Seal
7	Seat
8	Inner Stem O-Rngs***
9	Outer Stem O-Rngs***
10	Thrust Washer
20	Liner
21	Ground Spring
22	Stem Seal: Gland or Packing
23	Ground Washer*

\*Not required with Graphoil® packing in Firesafe valves.  
 \*\*Required in 2" and larger packed valves only.  
 \*\*\*Not used in packed stem valves.

## Parts List, Split Body

Part No.	Description
1	Body
2	Adapter
3	Stem
4	Ball
5	Body Gasket
6	Body O-Ring***
7	Seat
8	Inner Stem O-Rngs***
9	Outer Stem O-Rngs***
10	Thrust Bearing
11A	Lock Plate
11B	T-Handle Tube
11C	T-Handle Hub
11D	Lock Plate Screw

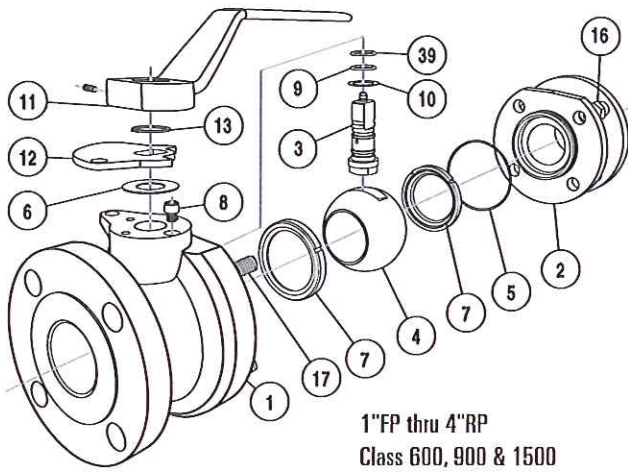
\*Not required with Graphoil® packing in Firesafe valves.  
 \*\*Required in 2" and larger packed valves only.  
 \*\*\*Not used in packed stem valves.

Part No.	Description
11E	Lock Plate Lock Washer
11F	Handle Hub Screw
11G	Tube Lock Screw
16	Hex Nut
17	Stud
20	Follower Liner
21	Ground Spring
22	Stem Seal: Gland or Packing
23	Ground Washer*
24	Packing Follower
25	Packing Retainer
26	Packing Stud
28	Packing Nut
30	Stem Washer**





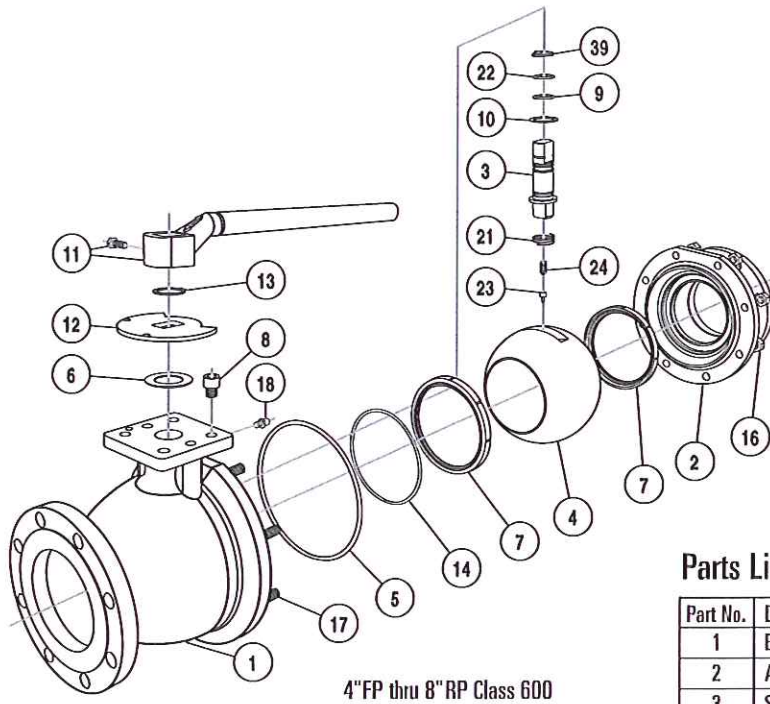
# KF Series F Component Parts, Class 600, 900 & 1500



## Parts List

Part No.	Description
1	Body
2	Adapter
3	Stem
4	Ball
5	Body Seal
6	Stem Bearing
7	Seat
8	Stop Screw

Part No.	Description
9	Stem Seal
10	Thrust Bearing
11	Handle Assembly
12	Stop Plate
13	Retainer
16	Hex Nut
17	Stud
39	Weather Seal



## Parts List

Part No.	Description
1	Body
2	Adapter
3	Stem
4	Ball
5	Body Seal
6	Stem Bearing*
7	Seat
8	Stop Screw*
9	Stem Seal
10	Thrust Bearing
11	Handle Assembly*

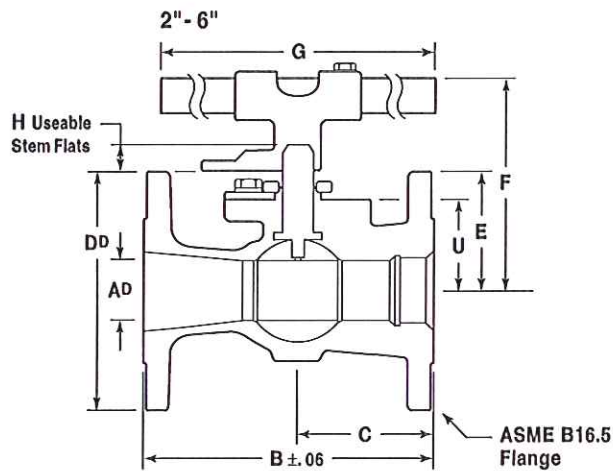
Part No.	Description
12	Stop Plate*
13	Retainer*
14	Adapter Pilot Seal
16	Hex Nut
17	Stud
18	Lube Fitting
21	Ground Spring**
22	Firesafe Stem Packing
23	Ground Plunger*
24	Ground Spring*
39	Weather Seal

\*4" Bore Only

\*\*6" Bore Only



# KF Series F Unibody, Dimensional Data (in.), Class 150 & 300



## Dimensional Data (in.), 2"-6", Class 150, Reduced Port

Size (in.)	Dimension (in.)									Wt. (lbs.)
	A	B	C	D	E	F	G	H	U	
2	1.50	7.00	3.27	6.00	3.69	5.36	17.00	.70	2.31	17.6
3	2.42	8.00	3.46	7.50	4.38	6.05	17.00	.70	3.06	31.5
4	3.00	9.00	4.10	9.00	6.75	8.83	22.00	1.38	4.43	54.2
6	4.50	10.50	5.25	11.00	8.56	10.55	22.00	1.44	6.02	137.0

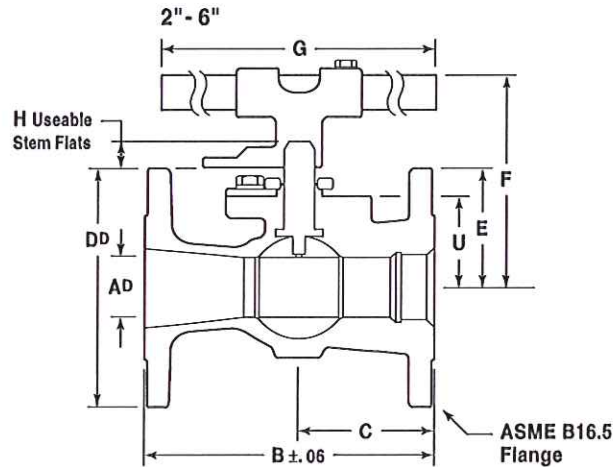
## Dimensional Data (in.), 2"-6", Class 300, Reduced Port

Size (in.)	Dimension (in.)									Wt. (lbs.)
	A	B	C	D	E	F	G	H	U	
2	1.50	8.50	3.27	6.50	3.69	5.36	17.00	.70	2.31	26.0
3	2.42	11.12	3.96	8.25	4.38	6.05	17.00	.70	3.06	46.0
4	3.00	12.00	4.10	10.00	6.75	8.83	22.00	1.38	4.43	70.0
6	4.50	15.88	5.25	12.50	8.56	10.55	22.00	1.44	6.02	157.0





## KF Series F Unibody, Dimensional Data (mm), Class 150 & 300



### Dimensional Data (mm), 2"-6", Class 150, Reduced Port

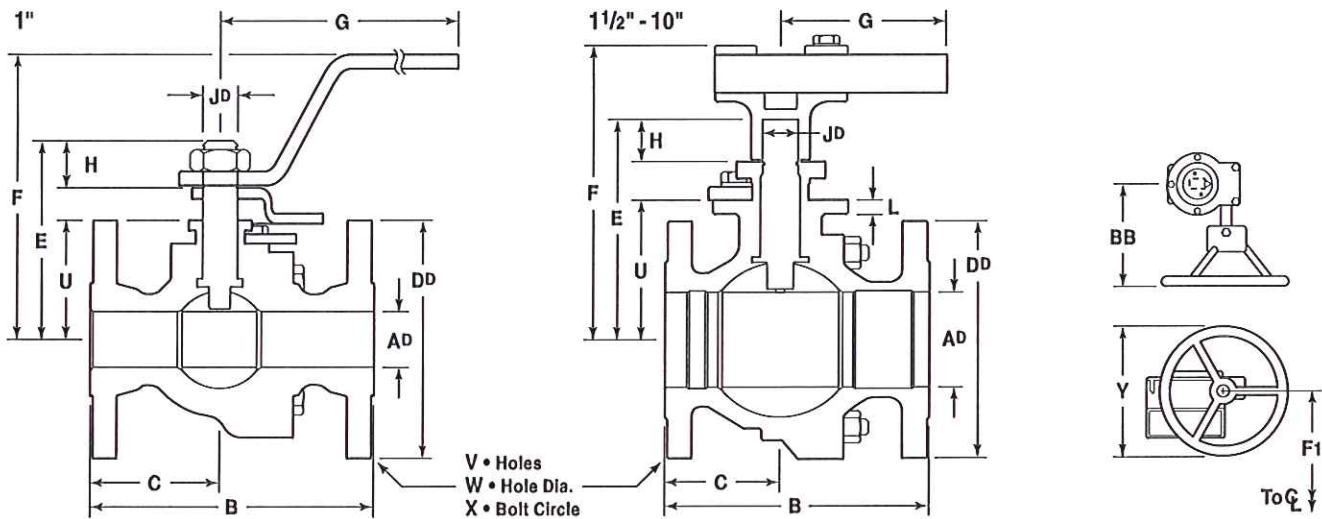
Size (in.)	Dimension (mm)									Wt. (kg)
	A	B	C	D	E	F	G	H	U	
2	38.1	177.8	83.1	152.4	93.7	136.1	431.8	17.8	58.7	7.98
3	61.5	203.2	87.9	190.5	111.3	153.7	431.8	17.8	77.7	14.29
4	76.2	228.6	104.1	228.6	171.5	224.3	558.8	35.1	112.5	24.58
6	114.3	266.7	133.4	279.4	217.4	268.0	558.8	36.6	152.9	62.14

### Dimensional Data (mm), 2"-6", Class 300, Reduced Port

Size (in.)	Dimension (mm)									Wt. (kg)
	A	B	C	D	E	F	G	H	U	
2	38.1	215.9	83.1	165.1	93.7	136.1	431.8	17.8	58.7	11.79
3	61.5	282.4	100.6	209.6	111.3	153.7	431.8	17.8	77.7	20.87
4	76.2	304.8	104.1	254	171.5	224.3	558.8	35.1	112.5	31.75
6	114.3	403.4	133.4	317.5	217.4	268.0	558.8	36.6	152.9	71.21



# KF Series F Split Body, Dimensional Data (in.), Class 150 & 300



## Dimensional Data (in.), 1"- 12", Class 150

Size (in.)	Dimension (in.)																	Wt. (lbs.)
	A	B	C	D	E	F	F1	G	H	J	L	U	V	W	X	Y	BB	
1 x 1	1.00	5.00	2.31	4.25	3.50	5.44	—	6.31	1.32	.586	—	1.69	4	.63	3.13	—	—	17.0
1 1/2 x 1 1/2	1.50	6.50	2.96	5.00	3.69	5.75	7.37	15.50	.640	.705	.38	2.31	4	.63	3.88	6.00	6.50	12.8
2 x 2	2.00	7.00	3.02	6.00	4.51	6.56	8.20	15.50	.640	.705	.44	3.14	4	.75	4.75	6.00	6.50	17.6
2 1/2 x 2*	2.00	7.50	2.94	7.00	4.38	6.06	—	8.50	1.00	.873/.871	—	3.06	4	.75	5.50	—	—	37.5
3 x 3	3.00	8.00	3.50	7.50	6.81	10.25	11.63	20.00	1.28	1.067/1.062	.44	4.43	4	.75	6.00	6.00	6.50	31.5
4 x 4	4.00	9.00	4.00	9.00	8.40	11.00	13.08	20.00	1.28	1.321/1.316	.62	5.88	8	.75	7.50	8.00	9.00	54.2
6 x 6	6.00	15.50	7.75	11.00	10.81	11.12	15.63	20.00	1.45	1.515/1.510	.75	8.00	8	.88	9.50	8.00	9.50	137
8 x 6	6.00	11.50	5.13	13.50	10.81	11.12	15.63	20.00	1.45	1.515/1.510	.75	8.00	8	.88	9.50	8.00	9.50	210
8 x 8	8.00	18.00	9.00	13.50	14.25	—	18.26	—	2.27	1.997/1.994	.62	9.64	8	.88	9.50	12.00	9.50	477
10 x 8	8.00	13.00	6.50	16.00	14.25	—	18.26	—	2.27	1.997/1.994	.62	9.64	12	1.00	14.25	12.00	9.50	557
10 x 10	10.00	21.00	10.50	16.00	17.41	—	22.53	—	3.06	2.497/2.493	.62	11.91	12	1.00	14.25	16.00	11.50	685
12 x 10	10.00	14.00	7.00	19.00	17.41	—	22.53	—	3.06	2.497/2.493	.62	11.91	12	1.00	17.00	16.00	11.50	806

\*For design artwork, refer to page 12.

## Dimensional Data (in.), 1"- 10", Class 300

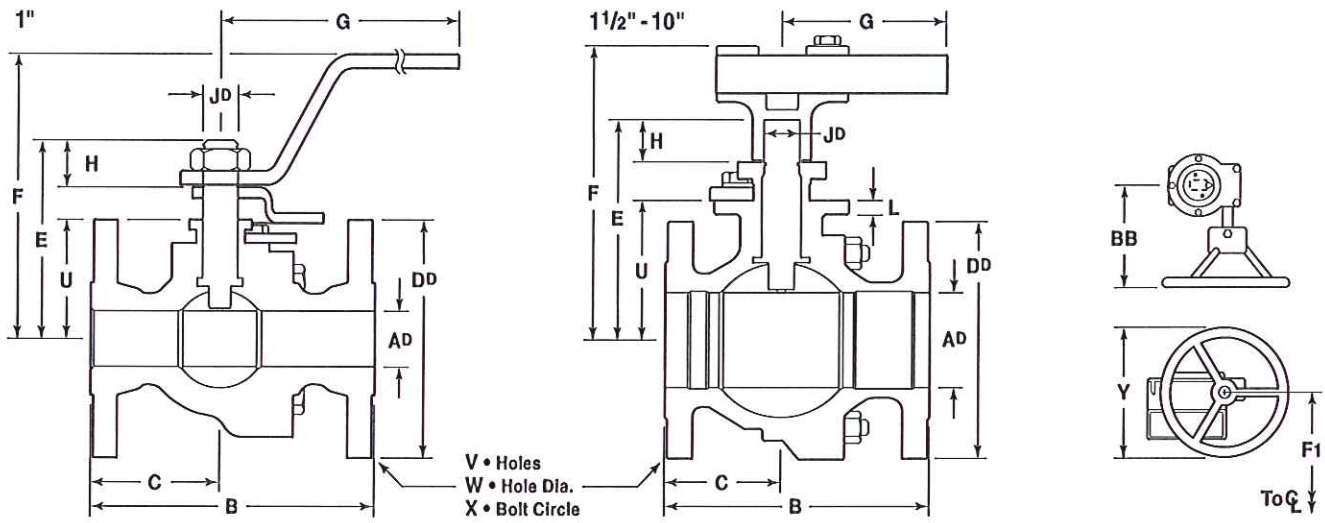
Size (in.)	Dimension (in.)																	Wt. (lbs.)
	A	B	C	D	E	F	F1	G	H	J	L	U	V	W	X	Y	BB	
1 x 1	1	6.50	3.50	4.88	3.50	5.44	—	6.31	1.32	.586	—	1.69	4	.75	3.50	—	—	22.0
1 1/2 x 1 1/2	1.50	7.50	3.53	6.13	3.69	5.75	7.37	15.50	.640	.705	.38	2.31	4	.88	4.50	6.00	6.50	20.0
2 x 2	2.00	8.50	4.25	6.50	4.51	6.56	8.20	15.50	.640	.705	.44	3.14	8	.75	5.00	6.00	6.50	26.0
2 1/2 x 2*	2.00	9.50	4.69	7.50	4.38	6.06	—	8.50	1.00	.873/.871	—	3.06	8	.88	5.88	—	—	43.7
3 x 3	3.00	11.13	5.82	8.25	6.81	10.25	11.63	20.00	1.28	1.067/1.062	.44	4.43	8	.88	6.63	6.00	6.50	46.0
4 x 4	4.00	12.00	6.00	10.00	8.40	11.00	13.08	20.00	1.28	1.321/1.316	.62	5.88	8	.88	7.88	8.00	9.00	70.0
6 x 6	6.00	15.88	7.94	12.50	12.75	—	15.63	—	2.27	1.950/1.945	.62	8.12	12	.88	10.63	12.00	9.50	157.0
8 x 6	6.00	16.50	6.63	15.00	12.75	—	15.63	—	2.27	1.950/1.945	.62	8.12	12	1.00	13.00	12.00	9.50	275
8 x 8	8.00	19.75	9.88	15.00	16.00	—	21.14	—	3.06	2.497/2.492	.62	10.52	12	1.00	13.00	16.00	11.50	624
10 x 8	8.00	18.00	6.25	17.50	16.00	—	21.14	—	3.06	2.497/2.492	.62	10.52	16	1.13	15.25	16.00	11.50	724

\*For design artwork, refer to page 12.





# KF Series F Split Body, Dimensional Data (mm), Class 150 & 300



## Dimensional Data (mm), 1" - 12", Class 150

Size (in.)	Dimension (mm)																	Wt. (kg)
	A	B	C	D	E	F	F <sub>1</sub>	G	H	J	L	U	V	W	X	Y	BB	
1 x 1	25.4	127	58.7	108.0	88.9	138.2	—	160.3	33.5	14.9	—	42.9	4	16.0	79.5	—	—	7.7
1 1/2 x 1 1/2	38.1	165.1	75.2	127	93.7	146.1	187.2	393.7	16.3	17.9	9.7	58.7	4	16.0	98.6	152.4	165.1	5.8
2 x 2	50.8	177.8	76.7	152.4	115.0	166.6	208.3	393.7	16.3	17.9	11.2	79.8	4	19.1	120.7	152.4	165.1	8.0
2 1/2 x 2*	50.8	190.5	74.7	177.8	111.3	153.9	—	215.9	25.4	22.17/22.12	—	77.7	4	19.1	139.7	—	—	17.0
3 x 3	76.2	203.2	88.9	190.5	173.0	260.4	295.4	508	32.5	27.10/26.97	11.2	112.5	4	19.1	152.4	152.4	165.1	14.3
4 x 4	101.6	228.6	101.6	203.2	213.4	279.4	332.2	508	32.5	33.55/33.43	15.7	149.4	8	19.1	190.5	203.2	228.6	24.6
6 x 6	152.4	393.7	196.9	279.4	274.6	282.4	397.0	508	36.8	38.48/38.35	19.1	203.2	8	22.4	241.3	203.2	241.3	62.1
8 x 6	152.4	292.1	130.3	279.4	274.6	282.4	397.0	508	36.8	38.48/38.35	19.1	203.2	8	22.4	241.3	203.2	241.3	95.3
8 x 8	203.2	457.2	228.6	342.9	362.0	—	463.8	—	57.7	50.72/50.65	15.7	244.9	8	22.4	241.3	304.8	241.3	216.4
10 x 8	203.2	330.2	165.1	406.4	362.0	—	463.8	—	57.7	50.72/50.65	15.7	244.9	12	25.4	362.0	304.8	241.3	252.7
10 x 10	254	533.4	266.7	406.4	442.2	—	572.3	—	77.7	63.42/63.32	15.7	302.5	12	25.4	362.0	406.4	292.1	310.7
12 x 10	254	355.6	177.8	482.6	442.2	—	572.3	—	77.7	63.42/63.32	15.7	302.5	12	25.4	431.8	406.4	292.1	365.6

\*For design artwork, refer to page 12.

## Dimensional Data (mm), 1" - 10", Class 300

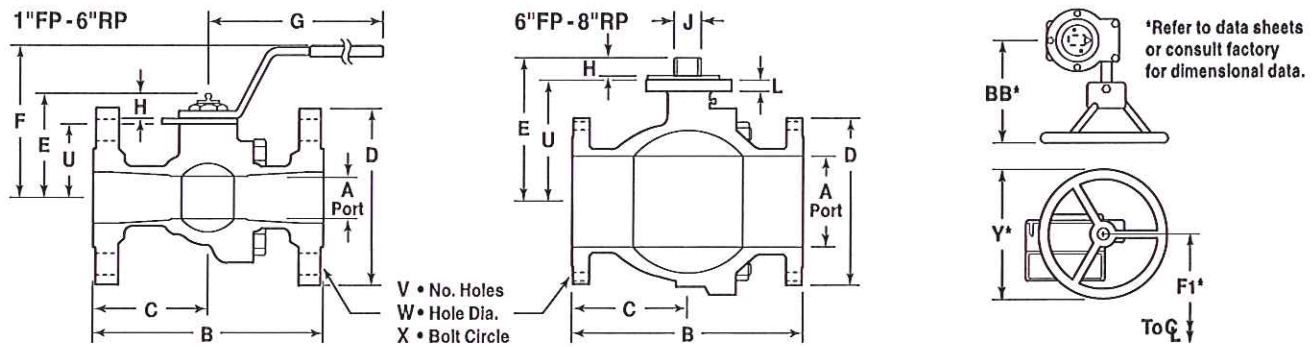
Size (in.)	Dimension (mm)																	Wt. (kg)
	A	B	C	D	E	F	F <sub>1</sub>	G	H	J	L	U	V	W	X	Y	BB	
1 x 1	25.4	165.1	88.9	124.0	88.9	138.2	—	160.3	33.5	14.9	—	42.9	4	19.1	88.9	—	—	10.0
1 1/2 x 1 1/2	38.1	190.5	89.7	155.7	93.7	146.1	187.2	393.7	16.3	17.9	9.7	58.7	4	22.4	114.3	152.4	165.1	9.1
2 x 2	50.8	215.9	108.0	165.1	115.0	166.6	208.3	393.7	16.3	17.9	11.2	79.8	8	19.1	127	152.4	165.1	11.8
2 1/2 x 2*	50.8	241.3	119.1	190.5	111.3	153.9	—	215.9	25.4	22.17/22.12	—	77.7	8	22.4	149.4	—	—	19.8
3 x 3	76.2	282.7	147.8	210.0	173.0	260.4	295.4	508	32.5	27.10/26.97	11.2	112.5	8	22.4	168.4	152.4	165.1	20.9
4 x 4	101.6	304.8	152.4	254	213.4	279.4	332.2	508	32.5	33.55/33.43	15.7	149.4	8	22.4	200.2	203.2	228.6	31.8
6 x 6	152.4	403.4	201.7	317.5	323.9	—	397.0	—	57.7	49.53/49.40	15.7	206.2	12	22.4	270.0	304.8	241.3	71.2
8 x 6	152.4	419.1	168.4	381	323.9	—	397.0	—	57.7	49.53/49.40	15.7	206.2	12	25.4	330.2	304.8	241.3	124.7
8 x 8	203.2	501.7	251.0	381	406.4	—	537.0	—	77.7	63.42/63.30	15.7	267.2	12	25.4	330.2	406.4	292.1	283.0
10 x 8	203.2	457.2	158.8	444.5	406.4	—	537.0	—	77.7	63.42/63.30	15.7	267.2	6	28.7	387.4	406.4	292.1	328.4

\*For design artwork, refer to page 12.





# KF Series F Split Body, Dimensional Data (in., mm), Class 600, 900 & 1500



Dimensional Data (in., mm), 1"FP-8"RP, Class 600

Size (in.)	Dimension (in.)																	Wt. (lbs.)	Ring Groove
	A	B/RF	B/RTJ	C/RF	C/RTJ	D	E	F	G	H	J	L	U	V	W	X			
1FP	1	8 1/2	8 1/2	3 3/4	3 3/4	4 7/8	3	4 3/16	5 7/8	13/16	.623/.621	—	1 11/16	4	3/4	3 1/2	25	R-16	
1 1/2FP	1 1/2	9 1/2	9 1/2	3 7/8	3 7/8	6 1/8	3 15/16	5 5/8	8 1/2	1	.873/.871	—	2 5/8	4	7/8	4 1/2	30.4	R-20	
2RP	1 1/2	11 1/2	11 5/8	4 7/16	4 1/2	6 1/2	3 15/16	5 5/8	8 1/2	1	.873/.871	—	2 5/8	8	3/4	5	35	R-23	
2FP	2	11 1/2	11 5/8	4 7/16	4 1/2	6 1/2	4 3/8	6 1/16	8 1/2	1	.873/.871	—	3 1/16	8	3/4	5	41.5	R-23	
2 1/2RP	2	13	13 1/8	4 15/16	5	7 1/2	4 3/8	6 1/16	8 1/2	1	.873/.871	—	3 1/16	8	7/8	5 7/8	52.9	R-26	
3RP	2	14	14 1/8	6	6 1/16	8 1/4	4 3/8	6 1/16	8 1/2	1	.873/.871	—	3 1/16	8	7/8	6 5/8	61.6	R-31	
3FP	3	14	14 1/8	5 3/4	5 13/16	8 1/4	5 21/32	7 1/4	15	1 1/4	1.248/1.246	—	4	8	7/8	6 5/8	89.1	R-31	
4RP	3	17	17 1/8	7 3/4	7 13/16	10 3/4	5 21/32	7 1/4	15	1 1/4	1.248/1.246	—	4	8	1	8 1/2	133.8	R-37	
4FP	4	17	17 1/8	8 1/2	8 9/16	10 3/4	8 19/32	9 1/2	48	1 11/16	1.791/1.773	1/2	6.5	8	1	8 1/2	167	R-37	
6RP	4	22	22 1/8	11	11 1/16	14	8 19/32	9 1/2	48	1 11/16	1.791/1.773	1/2	6.5	12	1 1/8	11 1/2	345	R-45	
6FP	6	22	22 1/8	11	11 1/16	14	11 3/4	—	—	2 7/8	2.499/2.492	5/8	8 25/32	12	1 1/8	11 1/2	427	R-45	
8RP	6	26	26 1/8	13	13 1/16	16 1/2	11 3/4	—	—	2 7/8	2.499/2.492	5/8	8 25/32	12	1 1/4	13 3/4	672	R-49	

Size (in.)	Dimension (mm)																	Wt. (kg)	Ring Groove
	A	B/RF	B/RTJ	C/RF	C/RTJ	D	E	F	G	H	J	L	U	V	W	X			
1FP	25.4	215.9	215.9	95.3	95.3	123.8	76.2	106.4	149.2	20.6	15.82/15.77	—	42.9	4	19.1	88.9	11.3	R-16	
1 1/2FP	38.1	241.3	241.3	98.4	98.4	155.6	100.0	142.9	215.9	25.4	22.17/22.12	—	66.7	4	22.2	114.3	13.8	R-20	
2RP	38.1	292.1	295.3	112.7	114.3	165.1	100.0	142.9	215.9	25.4	22.17/22.12	—	66.7	8	19.1	127.0	15.9	R-23	
2FP	50.8	292.1	295.3	112.7	114.3	165.1	111.1	154.0	215.9	25.4	22.17/22.12	—	77.8	8	19.1	127.0	18.8	R-23	
2 1/2RP	50.8	330.2	333.4	125.4	127	190.5	111.1	154.0	215.9	25.4	22.17/22.12	—	77.8	8	22.2	149.2	24.0	R-26	
3RP	50.8	355.6	358.8	152.4	154.0	209.6	111.1	154.0	215.9	25.4	22.17/22.12	—	77.8	8	22.2	168.3	27.9	R-31	
3FP	76.2	355.6	358.8	146.1	147.6	209.6	143.7	184.2	381.0	31.8	31.70/31.65	—	101.6	8	22.2	168.3	40.4	R-31	
4RP	76.2	431.8	435.0	196.9	198.4	273.1	143.7	184.2	381.0	31.8	31.70/31.65	—	101.6	8	25.4	215.9	60.7	R-37	
4FP	101.6	431.8	435.0	215.9	217.5	273.1	218.3	241.3	1219.2	42.9	45.49/45.03	12.7	165.1	8	25.4	215.9	75.7	R-37	
6RP	101.6	558.8	562.0	279.4	281.0	355.6	218.3	241.3	1219.2	42.9	45.49/45.03	12.7	165.1	12	28.6	292.1	156	R-45	
6FP	152.4	558.8	562.0	279.4	281.0	355.6	298.5	—	—	73.0	63.47/63.30	15.9	223.0	12	28.6	292.1	194	R-45	
8RP	152.4	660.4	663.6	330.2	331.8	419.1	298.5	—	—	73.0	63.47/63.30	15.9	223.0	12	31.8	349.3	305	R-49	

Note: Sizes 1"FP-6"RP is weight w/handle.  
 Sizes 6"FP-8"RP is weight w/gear operator.

Dimensional Data (in., mm), 1"FP-2"FP, Class 900 & 1"FP, Class 1500

Size (in.)	Dimension (in.)																	Wt. (lbs.)	Ring Groove
	A	B/RF	B/RTJ	C/RF	C/RTJ	D	E	F	G	H	J	L	U	V	W	X			
1FP	1	10	10	4 3/4	4 3/4	5 7/8	3 1/16	4 1/2	5 7/8	1 1/8	.623/.621	—	2	4	1	4	28	R-16	
2RP	1 1/2*	14 1/2*	14 5/8*	7 1/4*	7 5/16*	8 1/2*	3 15/16*	5 5/8*	8 1/2*	1 1/16*	.873/.871*	—	2 5/8*	8*	1*	6 1/2*	42.9*	R-24*	
2FP	2*	14 1/2*	14 5/8*	7 1/4*	7 5/16*	8 1/2*	4 3/8*	6 1/16*	8 1/2*	1 1/16*	.873/.871*	—	3 1/16*	8*	1*	6 1/2*	51.2*	R-24*	

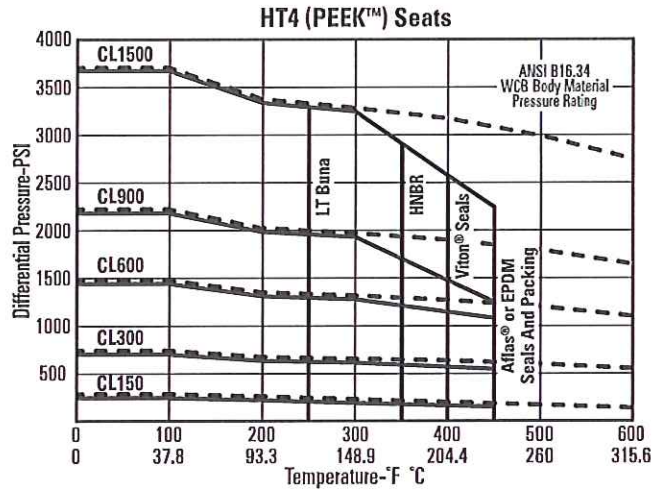
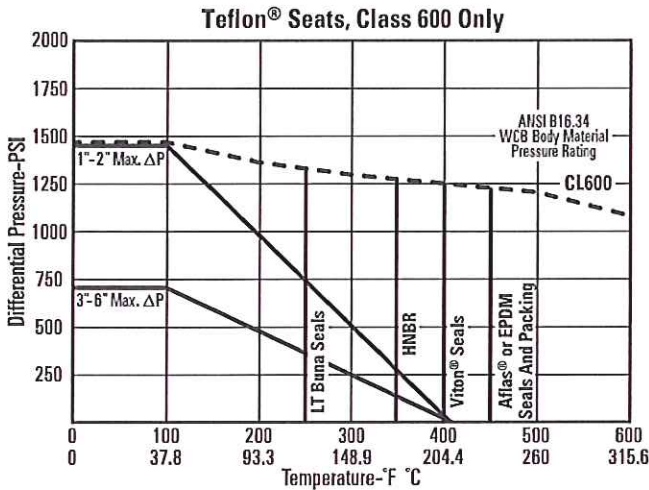
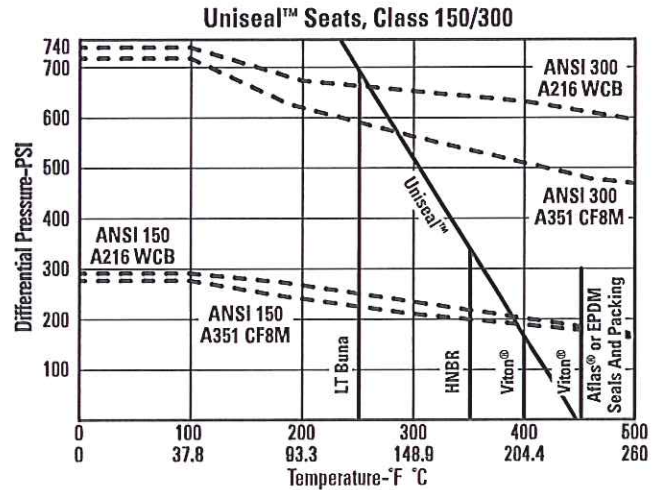
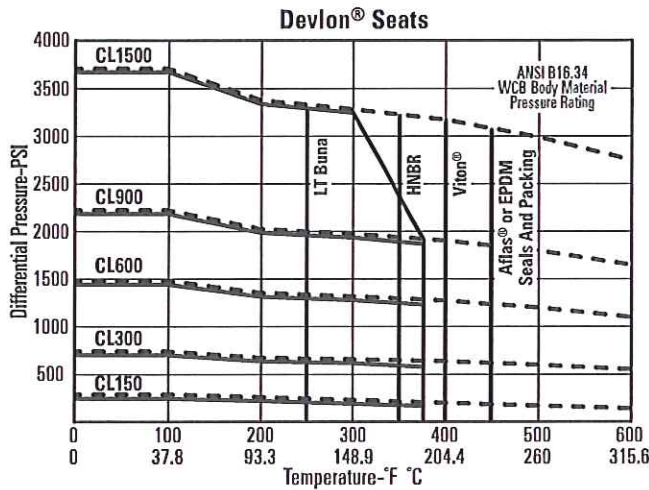
Size (in.)	Dimension (mm)																	Wt. (kg)	Ring Groove
	A	B/RF	B/RTJ	C/RF	C/RTJ	D	E	F	G	H	J	L	U	V	W	X			
1FP	25.4	254.0	254.0	120.7	120.7	149.2	77.8	114.3	149.2	28.6	15.82/15.77	—	50.8	4	25.4	101.6	12.7	R-16	
2RP	38.1*	368.3*	371.5*	184.2*	185.7*	215.9*	100.0*	142.9*	215.9*	27.0*	22.17/22.12*	—	66.7*	8*	25.4*	165.1*	19.5*	R-24*	
2FP	50.8*	368.3*	371.5*	184.2*	85.7*	1215.9*	111.1*	154.0*	215.9*	27.0*	22.17/22.12*	—	77.8*	8*	25.4*	165.1*	23.2*	R-24*	

Note: Weight is w/handle.  
 \*Class 900 Only.





# KF Series F Engineering Data • Pressure Temperature (sizes listed on Teflon® chart indicate bore size)



## Low Temperature Limits

Body Material	°F	°C
WCC	-20°	-28.9
LCC	-50°	-45.6
WCB	-20°	-28.9
CF8M	-50°	-45.6

Seat Material	°F	°C
Devlon® V	-50°	-45.6
Teflon®	-50°	-45.6
HT4 (PEEK™)	-50°	-45.6

Seal Material	°F	°C
TFE/GRF Packing	-50°	-45.6
Low Temp Buna N	-50°	-45.6
Viton®	-20°	-28.9
Elast-O-Lion 985	-50°	-45.6

Seal Material	°F	°C
J. Walker® Viton®	+10°	-12.2
HNBR	-40°	-40
Aflas®	+32°	0
EPDM	-50°	-45.6

## Flow Coefficient (C<sub>v</sub>)

Class	Valve Size (In.)															
	1FP	1 1/2FP	2RP	2FP	2 1/2RP	3RP	3FP	4RP	4FP	6RP	6FP	8RP	8FP	10RP	10FP	12RP
150	98	265	125	470	220	430	1240	600	2470	1010	5249	2500	10,750	5000	17,775	8400
300	98	265	125	420	220	430	1050	600	2000	1010	5100	2400	10,300	4825	—	—
600	93	308	140	365	220	185	1000	570	1800	900	4600	2235	—	—	—	—
900/1500	90	—	135*	350*	—	—	—	—	—	—	—	—	—	—	—	—

\*Class 900 only.

## Method of Calculating Flow

The Flow Coefficient "C<sub>v</sub>" of a valve is the flow rate of water (gallons/minute) through a fully opened valve, with a pressure drop of 1 psi across the valve. To find the flow of liquid through valve from the C<sub>v</sub>, use the following formulas:

### Liquid Flow

QL = flow rate of liquid (gal./min.)  
 ΔP = differential pressure across the valve (psi)  
 G = specific gravity of liquid (for water, G=1)

$$QL = C_v \sqrt{\frac{\Delta P}{G}}$$

### Gas Flow

Qg = flow rate of gas (CFH at STP)  
 P2 = outlet pressure (psia)  
 g = Specific gravity of gas (for air, g=1.000)

$$Q_g = 61 C_v \sqrt{\frac{P_2 \Delta P}{g}}$$

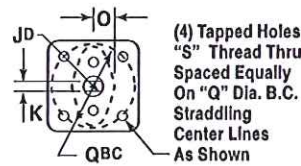
For non-critical flow  
 $\left\{ \frac{\Delta P}{P_2} < 1.0 \right\}$



# KF Series F • Topworks (in.) & Stem Torque (in.-lbs)

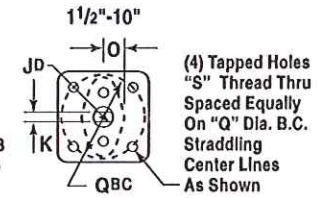
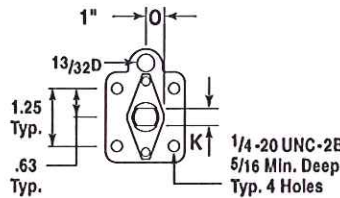
## KF Unibody Ball Valves, Class 150 & 300

Size (in.)	Class	Dimension (in.)				
		J	K	O	Q	S
2	150/300	.705	.376/.373	.81	3.25	3/8-16 UNC
3	150/300	.705	.376/.373	.81	3.25	3/8-16 UNC
4	150/300	1.06	.674/.670	1.36	4.13	3/8-16 UNC
6	150/300	1.32	.865/.861	1.36	4.41	1/2-13 UNC



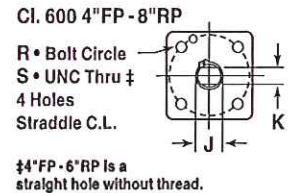
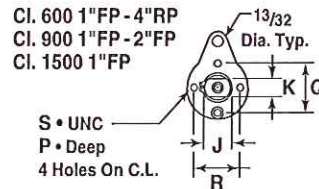
## KF Split Body Ball Valves, Class 150 & 300

Size (in.)	Class	Dimension (in.)				
		J	K	O	Q	S
1 x 1	150/300	.586	.371/.369	.56	—	1/4-20 UNC
1 1/2 x 1 1/2	150/300	.705	.376/.373	.76	3.25	3/8-16 UNC
2 x 2	150/300	.705	.376/.373	.76	3.25	3/8-16 UNC
2 1/2 x 2	150/300	.873/.871	.560/.556	—	1.75	1/4-20 UNC
3 x 3	150/300	1.067/1.062	.674/.670	1.36	4.13	3/8-16 UNC
4 x 4	150/300	1.321/1.316	.865/.861	1.36	4.41	1/2-13 UNC
6 x 6	150	1.515/1.510	1.065/1.061	1.36	5.13	5/8-11 UNC
6 x 6	300	1.950/1.945	1.249/1.245	1.58	5.13	5/8-11 UNC
8 x 6	150	1.575/1.570	1.065/1.061	1.36	5.13	5/8-11 UNC
8 x 6	300	1.950/1.945	1.249/1.245	1.58	5.13	5/8-11 UNC
8 x 8	150	1.997/1.992	1.247/1.243	1.58	5.13	5/8-11 UNC
8 x 8	300	2.497/2.492	1.747/1.743	2.10	6.75	3/4-10 UNC
10 x 8	150	1.997/1.992	1.247/1.243	1.58	5.13	5/8-11 UNC
10 x 8	300	2.497/2.492	1.747/1.743	2.10	6.75	3/4-10 UNC
10 x 10	150	2.497/2.492	1.747/1.743	2.10	6.75	3/4-10 UNC
12 x 10	150	2.497/2.492	1.747/1.743	2.10	6.75	3/4-10 UNC



## KF Series F Ball Valves, Class 600, 900 & 1500

Size (in.)	Class	Dimension (in.)					
		J	K	P	Q	R	S
1FP	600	.623/.621	.372/.370	5/16	1 1/4	1 1/4	1/4-20 UNC
1FP	900	.623/.621	.372/.370	5/16	1 1/4	1 1/4	1/4-20 UNC
1FP	1500	.623/.621	.372/.370	5/16	1 1/4	1 1/4	1/4-20 UNC
1 1/2 FP	600	.873/.871	.560/.556	3/8	1 3/4	1 3/4	1/4-20 UNC
2 RP	600/900	.873/.871	.560/.556	3/8	1 3/4	1 3/4	1/4-20 UNC
2 1/2 RP	600	.873/.871	.560/.556	3/8	1 3/4	1 3/4	1/4-20 UNC
2 FP	600/900	.873/.871	.560/.556	3/8	1 3/4	1 3/4	1/4-20 UNC
3 RP	600	.873/.871	.560/.556	3/8	1 3/4	1 3/4	1/4-20 UNC
3 FP	600	1.248/1.245	.622/.618	5/8	3 1/8	2 1/4	5/16-18 UNC
4 RP	600	1.248/1.245	.622/.618	5/8	3 1/8	2 1/4	5/16-18 UNC
4 FP	600	1.781/1.773	1.247/1.243	thru	—	4 1/4	7/16
6 RP	600	1.781/1.773	1.247/1.243	thru	—	4 1/4	7/16
6 FP	600	2.489/2.492	1.749/1.745	thru	—	6 3/4	3/4-10 UNC
8 RP	600	2.489/2.492	1.749/1.745	thru	—	6 3/4	3/4-10 UNC



## Design Torques for Actuator Sizing (in.-lbs.)\*

Class/Work. Press. (psi)	Valve Size (In.)															
	1FP	1 1/2 FP	2 RP	2 FP	2 1/2 RP	3 RP	3 FP	4 RP	4 FP	6 RP	6 FP	8 RP	8 FP	10 RP	10 FP	12 RP
150/285	180	280	240	440	600	520	600	600	1440	1440	5500	5500	12,000	12,000	23,000	23,000
300/740	180	280	240	500	960	590	1000	1000	2500	2500	12,000	12,000	27,000	27,000	—	—
600/1480	600	900	900	1200	1200	1200	2700	2700	5280	5280	27,000	27,000	—	—	—	—
900/2220	780	—	1320	1800	—	—	—	—	—	—	—	—	—	—	—	—
1500/3705	1200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

\*There is no safety factor in the above torques. KF recommends at least a 25% safety factor be added.

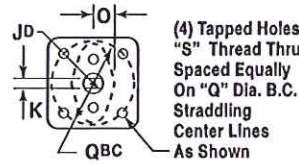




# KF Series F • Topworks (mm) & Stem Torque (Nm)

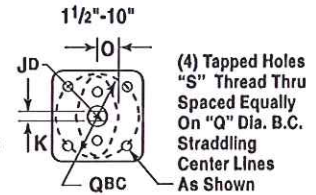
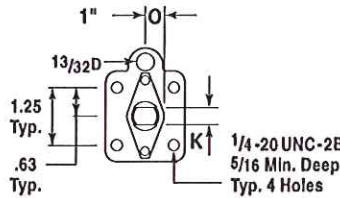
## KF Unibody Ball Valves, Class 150 & 300

Size (in.)	Class	Dimension (mm)				
		J	K	O	Q	S
2	150/300	17.9	9.55/9.47	20.6	82.6	3/8-16 UNC
3	150/300	17.9	9.55/9.47	20.6	82.6	3/8-16 UNC
4	150/300	26.9	17.12/17.02	34.5	104.9	3/8-16 UNC
6	150/300	33.5	21.97/21.87	34.5	112.0	1/2-13 UNC



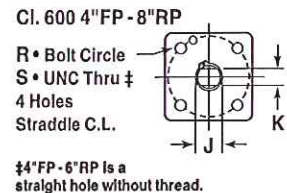
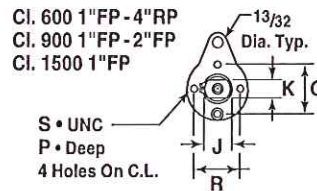
## KF Split Body Ball Valves, Class 150 & 300

Size (in.)	Class	Dimension (mm)				
		J	K	O	Q	S
1 x 1	150/300	14.9	9.42/9.37	14.2	—	1/4-20 UNC
1 1/2 x 1 1/2	150/300	17.9	9.55/9.47	19.3	82.6	3/8-16 UNC
2 x 2	150/300	17.9	9.55/9.47	19.3	82.6	3/8-16 UNC
2 1/2 x 2	150/300	22.17/22.12	14.22/14.12	—	44.5	1/4-20 UNC
3 x 3	150/300	27.10/26.97	17.12/17.02	34.5	104.9	3/8-16 UNC
4 x 4	150/300	33.55/33.43	21.97/21.87	34.5	112.0	1/2-13 UNC
6 x 6	150	38.48/38.35	27.05/26.95	34.5	130.3	5/8-11 UNC
6 x 6	300	49.53/49.40	31.72/31.62	40.13	130.3	5/8-11 UNC
8 x 6	150	40.01/39.88	21.97/21.87	34.5	130.3	5/8-11 UNC
8 x 6	300	49.53/49.40	31.72/31.62	40.13	130.3	5/8-11 UNC
8 x 8	150	50.72/50.60	31.67/31.57	40.13	130.3	5/8-11 UNC
8 x 8	300	63.42/63.30	44.37/44.27	53.3	171.5	3/4-10 UNC
10 x 8	150	50.72/50.60	31.67/31.57	40.13	130.3	5/8-11 UNC
10 x 8	300	63.42/63.30	44.37/44.27	53.3	171.5	3/4-10 UNC
10 x 10	150	63.42/63.30	44.37/44.27	53.3	171.5	3/4-10 UNC
12 x 10	150	63.42/63.30	44.37/44.27	53.3	171.5	3/4-10 UNC



## KF Series F Ball Valves, Class 600, 900 & 1500

Size (in.)	Class	Dimension (mm)					
		J	K	P	Q	R	S
1FP	600	15.82/15.77	9.45/9.40	7.9	31.8	31.8	1/4-20 UNC
1FP	900	15.82/15.77	9.45/9.40	7.9	31.8	31.8	1/4-20 UNC
1FP	1500	15.82/15.77	9.45/9.40	7.9	31.8	31.8	1/4-20 UNC
1 1/2 FP	600	22.17/22.12	14.22/14.12	9.5	44.5	44.5	1/4-20 UNC
2 RP	600/900	22.17/22.12	14.22/14.12	9.5	44.5	44.5	1/4-20 UNC
2 1/2 RP	600	22.17/22.12	14.22/14.12	9.5	44.5	44.5	1/4-20 UNC
2 FP	600/900	22.17/22.12	14.22/14.12	9.5	44.5	44.5	1/4-20 UNC
3 RP	600	22.17/22.12	14.22/14.12	9.5	44.5	44.5	1/4-20 UNC
3 FP	600	31.70/31.65	15.80/15.70	15.9	79.4	57.2	5/16-18 UNC
4 RP	600	31.70/31.65	15.80/15.70	15.9	79.4	57.2	5/16-18 UNC
4 FP	600	45.49/45.03	31.67/31.57	thru	—	108.0	11.1
6 RP	600	45.49/45.03	31.67/31.57	thru	—	108.0	11.1
6 FP	600	63.47/63.30	44.42/44.32	thru	—	171.5	3/4-10 UNC
8 RP	600	63.47/63.30	44.42/44.32	thru	—	171.5	3/4-10 UNC



## Design Torques for Actuator Sizing (Nm)\*

Class/Work. Press. (psi)	Valve Size (In.)															
	1FP	1 1/2FP	2RP	2FP	2 1/2RP	3RP	3FP	4RP	4FP	6RP	6FP	8RP	8FP	10RP	10FP	12RP
150/285	20.3	31.6	27.1	49.7	67.8	58.8	67.8	67.8	162.7	162.7	621.4	621.4	1355.8	1355.8	2598.7	2598.7
300/740	20.3	31.6	27.1	56.5	108.5	66.7	113.0	113.0	282.5	282.5	1355.8	1355.8	3050.6	3050.6	—	—
600/1480	67.8	101.7	101.7	135.6	135.6	135.6	305.1	305.1	596.6	596.6	3050.6	3050.6	—	—	—	—
900/2220	88.1	—	149.1	203.4	—	—	—	—	—	—	—	—	—	—	—	—
1500/3705	135.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

\*There is no safety factor in the above torques, KF recommends at least a 25% safety factor be added.



# Worldwide Sales Offices



**KF Industries, a leading brand of CIRCOR Energy Products, Inc.  
reaches into every corner of the globe serving the oil & gas and industrial marketplace.**

**Supplying an extensive range of product offerings  
through a worldwide network of manufacturer representatives and distributors,  
KF Industries is the right choice for all your flow control needs.**

## **World Headquarters**

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[www.circorenergy.com](http://www.circorenergy.com)



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authorities.



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**VALVE CERTIFICATION**

1500 S.E. 89TH STREET  
OKLAHOMA CITY, OK 73149

PAGE 1 OF 2



SOLD TO:	CASSEL & ASSOCIATES	KF TICKET	349123	QTY	3	TAG NO.:	
SHIPPED TO:	ROMTEE UTILITIES	CUSTOMER PO	12593	ITEM NO.	1		
PART NO.:	G2156-2922B21	REF. PO					

VALVE DESCRIPTION		VALVE REQUIREMENTS	
VALVE SIZE (IPS)	4"FP	NON NACE: [ ]	NACE-MRO175-2002 edition [ X ]
VALVE PRESSURE CLASS	ANSI CL150		NACE-MRO175-2003 / ISO15156 [ ]
VALVE END CONNECTION	RF X RF	FIRE SAFE CERTIFIED:	API 607 [ X ] API 6A [ ]
			API 6FA [ ] API 6FD [ ]

VALVE COMPONENT PARTS	VALVE COMPONENT MATERIAL	OPTIONS	CERTIFICATE OF CONFORMANCE
BODY	STAINLESS STEEL	ANTI-STATIC STEM	IT IS CERTIFIED THAT THE ABOVE REFERENCED PRODUCTS HAVE BEEN MANUFACTURED, INSPECTED AND TESTED IN ACCORDANCE WITH ALL APPLICABLE SPECIFICATIONS, DRAWINGS AND/OR OTHER PURCHASE ORDER REQUIREMENTS.
ADAPTER	STAINLESS STEEL	BARE STEM:	
SEAT	TEFLON	HANDLE:	
SEALS	EPDM	GEAR OPERATOR:	
		ACTUATION:	
		INTERNAL COATING:	CERTIFICATE OF ORIGIN IT IS CERTIFIED THAT PRODUCT(S) FURNISHED FOR ABOVE REFERENCED ORDER WERE PRODUCED IN THE USA FROM GLOBALLY SOURCED PARTS..
		EXTERNAL COATING:	

CERTIFIED TEST RECORD		API 6D [ X ]	API 6A [ ]	API 598 [ ]	ANSI B16.34 [ ]	OTHER / SPECIFY [ ]	49 CFR Ch.1 PART192 CLASS 3 [ X ]	
TEST TYPE	PRESSURE (PSIG)	TIME IN MINUTES	TEST MEDIA	TEST RESULTS	INSPECTION	INSPECTION RESULTS		
HYDROSTATIC SHELL	425 PSI	2 MIN	WATER W/INHIBITOR [ X ]	ZERO LEAKAGE	DIMENSIONAL	GOOD		
HYDROSTATIC SEAT	325 PSI	2 MIN	SAME	SAME	VISUAL	GOOD		
AIR SEAT	N/A		SAME	SAME	OPERATIONAL	GOOD		

IT IS CERTIFIED THAT THE ABOVE INFORMATION IS TRUE AND CORRECT AS CONTAINED IN THE RECORDS OF KF INDUSTRIES, INC.

KF QUALITY ASSURANCE: *Tim Medford*

CUSTOMER INSPECTOR: \_\_\_\_\_ DATE: **9/5/13**

DATE: \_\_\_\_\_

P.O. Box 95249  
 1500 S.E. 89th STREET  
 OKLA. CITY, OK 73143

CIRCOR ENERGY PRODUCTS  
 VALVE CERTIFICATION

3.1.B MATERIAL CERTIFICATION  
 ISO 10474  
 DIN EN 10204

PAGE 2 OF 2

<b>PART NO.:</b>	<b>G2156-2922B21</b>	<b>QTY:</b>	<b>3</b>	<b>ITEM NO.:</b>	<b>1</b>	<b>KF SHIP TKT NO:</b>	<b>349123</b>
------------------	----------------------	-------------	----------	------------------	----------	------------------------	---------------

COMPONENT HEAT CODES							
	VALVE S/N	BODY	ADAPTER	VALVE S/N	BODY	ADAPTER	
1	541239	T6333	T6283				VALVE S/N
2	541240	T6333	T6338				BODY
3	541241	T6275	T6333				ADAPTER
4							VALVE S/N
5							BODY
6							ADAPTER
7							VALVE S/N
8							BODY
9							ADAPTER
10							VALVE S/N
11							BODY
12							ADAPTER
13							VALVE S/N
14							BODY
15							ADAPTER
16							VALVE S/N
17							BODY
18							ADAPTER
19							VALVE S/N
20							BODY
21							ADAPTER
22							VALVE S/N
23							BODY
24							ADAPTER
25							VALVE S/N
26							BODY
27							ADAPTER
28							VALVE S/N
29							BODY
30							ADAPTER
31							VALVE S/N
32							BODY
33							ADAPTER
34							VALVE S/N
35							BODY
36							ADAPTER
37							VALVE S/N
38							BODY
39							ADAPTER
40							VALVE S/N
41							BODY
42							ADAPTER
43							VALVE S/N
44							BODY
45							ADAPTER
46							VALVE S/N
47							BODY
48							ADAPTER
49							VALVE S/N
50							BODY

IT IS CERTIFIED THAT THE ABOVE INFORMATION IS TRUE AND CORRECT AS CONTAINED IN THE RECORDS OF KF INDUSTRIES, INC.

**KF QUALITY ASSURANCE:** *Timie N. Johnston* **DATE:** 9/5/13

**CUSTOMER INSPECTOR:** \_\_\_\_\_ **DATE:** \_\_\_\_\_



KF INDUSTRIES, INC.  
 1500 S.E. 89TH STREET  
 OKLAHOMA CITY, OK 73149  
 405-631-1533

**MATERIAL TEST REPORT**

SECTION 3 OF 3

KF PART NO.	kfb01552-212(01552-212)
KF P.O. NO.	w4590
QUANTITY	2
HEAT CODE/NO.	t6333
VENDOR NO.	8622

DATE	5/17/2013
INDUSTRY SPEC.	ASTM A351 Gr. CF8M
MATERIAL TYPE	ss
CERTIFICATE NO	201342860
(BODY)	kfb01552-212

**CHEMICAL TEST RESULTS**

C	MN	SI	P	S	CR	NI	MO	V	CU	W	CE
0.061	0.95	0.52	0.032	0.009	18.32	9.28	2.26				4.954

**NEW CHEMICAL TEST RESULTS**


**PHYSICAL TEST RESULTS**

TENSILE (PSI)	75980
YIELD (PSI)	35670
% ELONGATION	43
% REDUCTION OF AREA	

**HARDNESS**

(BHN) BRINNELL	150
(RB) ROCKWELL B SCALE	
(RC) ROCKWELL C SCALE	

**CHARPY IMPACT TEST RESULTS (FT-LBS), (IF APPLICABLE)**

TEST TEMP.	1	2	3

**HEAT TREATMENT OR HEAT TREAT CONDITION (IF APPLICABLE)**

Temp. up to 2012F 3Hours, retaining 2012F 4Hours water cooling

C H E C K E D  
 5/20/2013  
 KF QC

*Suzanne Dumas*  
 \_\_\_\_\_  
 AUTHORIZED SIGNATURE





KF INDUSTRIES, INC.  
1500 S.E. 89TH STREET  
OKLAHOMA CITY, OK 73149  
405-631-1533

**MATERIAL TEST REPORT**

SECTION 3 OF 3

KF PART NO.	kfb01552-212(01552-212)
KF P.O. NO.	w4291
QUANTITY	1
HEAT CODE/NO.	t6275
VENDOR NO.	8622

DATE	8/10/2012
INDUSTRY SPEC.	ASTM A351 Gr. CF8M
MATERIAL TYPE	ss
CERTIFICATE NO	201231158
(BODY)	kfb01552-212

**CHEMICAL TEST RESULTS**

C	MN	SI	P	S	CR	NI	MO	V	CU	W		CE
0.047	1.04	0.69	0.033	0.006	18.4	9.23	2.16					4.948
<b>NEW CHEMICAL TEST RESULTS</b>												

**PHYSICAL TEST RESULTS**

TENSILE (PSI)	76270
YIELD (PSI)	35235
% ELONGATION	44
% REDUCTION OF AREA	

**HARDNESS**

(BHN) BRINNELL	153
(RB) ROCKWELL B SCALE	
(RC) ROCKWELL C SCALE	

**CHARPY IMPACT TEST RESULTS (FT-LBS),(IF APPLICABLE)**

TEST TEMP.	1	2	3

**HEAT TREATMENT OR HEAT TREAT CONDITION (IF APPLICABLE)**

Temp. up to 2012F 3Hours, retaining 2012F 4Hours water cooling

**C H E C K E D**  
8/15/2012  
KF QC

*Tim Millstone*

AUTHORIZED SIGNATURE



KF INDUSTRIES, INC.  
1500 S.E. 89TH STREET  
OKLAHOMA CITY, OK 73149  
405-631-1533

**MATERIAL TEST REPORT**

SECTION 3 OF 3

KF PART NO.	kfa01592-219(01592-219)
KF P.O. NO.	w4272
QUANTITY	1
HEAT CODE/NO.	t6283
VENDOR NO.	8622

DATE	7/26/2012
INDUSTRY SPEC.	ASTM A351 Gr. CF8M
MATERIAL TYPE	ss
CERTIFICATE NO	201230429
(ADAPTER)	kfa01592-219

**CHEMICAL TEST RESULTS**

C	MN	SI	P	S	CR	NI	MO	V	CU	W	CE
0.057	1.03	0.66	0.036	0.009	18.5	9.31	2.19				4.987
<b>NEW CHEMICAL TEST RESULTS</b>											

**PHYSICAL TEST RESULTS**

TENSILE (PSI)	77865
YIELD (PSI)	36540
% ELONGATION	39
% REDUCTION OF AREA	

**HARDNESS**

(BHN) BRINNELL	159
(RB) ROCKWELL B SCALE	
(RC) ROCKWELL C SCALE	

**CHARPY IMPACT TEST RESULTS (FT-LBS),(IF APPLICABLE)**

TEST TEMP.	1	2	3

**HEAT TREATMENT OR HEAT TREAT CONDITION (IF APPLICABLE)**

Temp. up to 2012F 3Hours, retaining 2012F 4Hours water cooling

**C H E C K E D**  
7/31/2012  
KF QC

*Tim Millstone*

AUTHORIZED SIGNATURE



KF INDUSTRIES, INC.  
 1500 S.E. 89TH STREET  
 OKLAHOMA CITY, OK 73149  
 405-631-1533

**MATERIAL TEST REPORT**

SECTION 3 OF 3

KF PART NO.	kfa01592-219(01592-219)
KF P.O. NO.	w4590
QUANTITY	1
HEAT CODE/NO.	t6333
VENDOR NO.	8622

DATE	5/17/2013
INDUSTRY SPEC.	ASTM A351 Gr. CF8M
MATERIAL TYPE	ss
CERTIFICATE NO	201342862
(ADAPTER)	kfa01592-219

**CHEMICAL TEST RESULTS**

C	MN	SI	P	S	CR	NI	MO	V	CU	W	CE
0.061	0.95	0.52	0.032	0.009	18.32	9.28	2.26				4.954

**NEW CHEMICAL TEST RESULTS**


**PHYSICAL TEST RESULTS**

TENSILE (PSI)	75980
YIELD (PSI)	35670
% ELONGATION	43
% REDUCTION OF AREA	

**HARDNESS**

(BHN) BRINNELL	150
(RB) ROCKWELL B SCALE	
(RC) ROCKWELL C SCALE	

**CHARPY IMPACT TEST RESULTS (FT-LBS),(IF APPLICABLE)**

TEST TEMP.	1	2	3

**HEAT TREATMENT OR HEAT TREAT CONDITION (IF APPLICABLE)**

Temp. up to 2012F 3Hours, retaining 2012F 4Hours water cooling

C H E C K E D  
 5/20/2013  
 KF QC

*Edward Dumas*  
 \_\_\_\_\_  
 AUTHORIZED SIGNATURE



KF INDUSTRIES, INC.  
 1500 S.E. 89TH STREET  
 OKLAHOMA CITY, OK 73149  
 405-631-1533

**MATERIAL TEST REPORT**

SECTION 3 OF 3

KF PART NO.	kfa01592-219(01592-219)
KF P.O. NO.	w4590
QUANTITY	1
HEAT CODE/NO.	t6338
VENDOR NO.	8622

DATE	5/17/2013
INDUSTRY SPEC.	ASTM A351 Gr. CF8M
MATERIAL TYPE	SS
CERTIFICATE NO	201342862
(ADAPTER)	kfa01592-219

**CHEMICAL TEST RESULTS**

C	MN	SI	P	S	CR	NI	MO	V	CU	W	CE
0.053	1.07	0.68	0.032	0.008	18.4	9.36	2.18				4.971

**NEW CHEMICAL TEST RESULTS**

--	--	--	--	--

**PHYSICAL TEST RESULTS**

TENSILE (PSI)	76995
YIELD (PSI)	36975
% ELONGATION	38
% REDUCTION OF AREA	

**HARDNESS**

(BHN) BRINNELL	153
(RB) ROCKWELL B SCALE	
(RC) ROCKWELL C SCALE	

**CHARPY IMPACT TEST RESULTS (FT-LBS),(IF APPLICABLE)**

TEST TEMP.	1	2	3

**HEAT TREATMENT OR HEAT TREAT CONDITION (IF APPLICABLE)**

Temp. up to 2012F 3Hours, retaining 2012F 4Hours water cooling

C H E C K E D  
 5/20/2013  
 KF QC

*Sword Dross*  
 \_\_\_\_\_  
 AUTHORIZED SIGNATURE

## P-Series Differential Pressure, Pressure & Temperature Switches



### FEATURES

- *Explosion Proof and Watertight Enclosure – N7 Models*
- *Easy-to-read scale for approximate setpoint indication ( $\pm 5\%$  accuracy)*
- *Stainless steel internal parts*
- *Easy setpoint adjustment(s) capability*
- *Diaphragm-sealed piston actuator for long life is standard for most ranges*

Ashcroft® switches and controls are highly reliable for your 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 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 P-Series switch line is designed for uncompromising end user reliability and safety.

Die cast aluminum enclosure is available in NEMA 7/9 (explosion-proof enclosure Class I, Div. 1 & 2, Groups B, C, & D and Class II, Div. 1 & 2, Groups E, F and G). Dual chamber design allows setpoint changes to be made safely even with power connected. 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 twenty years of service in plants and mills throughout the world. Multiple features such as dual setpoints and adjustable deadbands are offered. Special designs are available for fire safety, limit control and other more stringent requirements. Ease of use is stressed to improve the reliability of the installation.

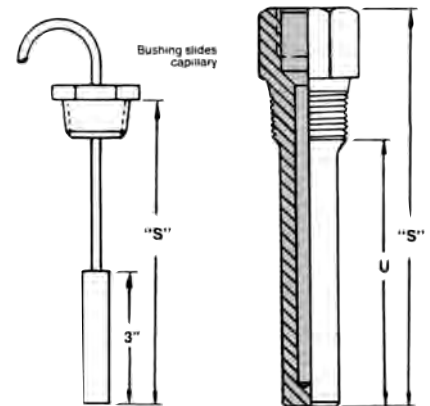
P-Series switches are currently being successfully used in refineries, chemical and petrochemical plants, water and sewage treatment plants, steel mills and other tough applications. Typical applications are on blowers, compressors, boilers, burners, turbines and reverse osmosis systems.

### 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.





# P-Series Differential Pressure, Pressure & Temperature Switches

## Temperature Switches

P-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 relationship that exists between temperature

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

All models feature  $\pm 1\%$  percent of span set point 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

### APPROXIMATE DEADBAND

NOMINAL RANGE		MAX. TEMP. °F	APPROXIMATE DEADBAND								
			PTA <sup>(4)</sup>			PTS <sup>(4)</sup>			PTD <sup>(4)</sup>		
°F	°C		SWITCH ELEMENT								
			J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP
-40 to 60	-40 to 16	400	18-90	2-10	9-18	1-2	1-5	2-10	9-18	1-2	1-5
0 to 100	-20 to 40	400	30-90	2-15	10-30	1-3	1.5-7	2-15	10-30	1.5-3	1.5-7
75 to 205	20 to 95	400	34-120	2-17	10-34	1.5-3.5	1.5-8	2-17	10-34	1.5-3.5	1.5-8
150 to 260	65 to 125	400	25-100	2.5-12	9-25	1-2.5	1-7	2.5-12	9-25	1-2.5	1-7
235 to 375	110 to 190	500	35-130	2-18	10-35	1-3.5	1.5-8	2-18	10-35	1-3.5	1.5-8
350 to 525 <sup>(6)</sup>	175 to 275	700	40-165	3-25	15-40	2-4.5	2.5-11	3-25	15-40	2-4.5	2.5-11
500 to 750 <sup>(5)</sup>	260 to 400	900	50-200	20-36	36-60	5-10	6-21	20-36	36-60	5-10	6-21

- NOTES:**
- 1 All deadbands are in °F.
  - 2 Switches can be set at increase or decrease throughout the nominal range.
  - 3 Deadbands for PTA models are adjustable between the values shown.
  - 4 Deadbands for PTS and PTD models are fixed within the range of values shown. Manufacturing and parts variances result in variation from one unit to another as shown.
  - 5 Available with remote mount thermal systems only.
  - 6 Not available with 2 3/4" stem.

# P-Series Differential Pressure, Pressure & Temperature Switches

## Pressure & Differential Pressure Switches

P-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 a choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi

for 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 H<sub>2</sub>O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice

of materials 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 with Ashcroft® diaphragm seals in extreme services such as slurries or abrasive process fluids.

## PRESSURE/VACUUM SWITCHES

APPROXIMATE DEADBAND<sup>(2)</sup> (BUNA-N DIAPHRAGM)

NOMINAL RANGE <sup>(1)</sup>			Overpressure Ratings		PPA <sup>(3)</sup>		PPS <sup>(4)</sup>					PPD <sup>(4)</sup>		
			Proof psi	Burst psi	SWITCH ELEMENT									
					J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP	
VACUUM	-30" Hg	-760mm Hg	-100 Kpa	250	400	7-26	3-5	3-6.5	1-2	1-2.5	3-5	3-6.5	1-2	1-2.5
COMPOUND	30" Hg/ 15 psi	760mm Hg/ 1.0 Kg/cm <sup>2</sup>	-100 Kpa 100 Kpa	250	400	10-25 4-13	3-5 1-2	2.5-3.5 1-3	1-2 0.5-1	1-2.5 0.5-1.2	3-5 2-4	2.5-4.5 1-3	1-2 0.5-1	1-2.5 0.5-1.2
PRESSURE	30" H <sub>2</sub> O	750mm H <sub>2</sub> O	7.5 Kpa	20	35	4-27	1.5-3.5	2-5	0.5-1	0.5-2	1.5-3.5	2-5	0.5-1	0.5-2
	60" H <sub>2</sub> O	1500mm H <sub>2</sub> O	15 Kpa	20	35	5-54	1.5-3.5	2.5-5	0.5-1.3	1-2	1.5-3.5	2.5-5	0.5-1.3	1-2
	100" H <sub>2</sub> O	2500mm H <sub>2</sub> O	25 Kpa	20	35	8.5-90	4-6	4-8.5	1-2	1-3	4-7	4-8.5	1-2	1-3
	150" H <sub>2</sub> O	3750mm H <sub>2</sub> O	37 Kpa	20	35	18-135	5-11	10-18	1.5-3	2-6	8-14	10-18	1.5-3	2-6
	15 psi	1.0 kg/cm <sup>2</sup>	100 Kpa	500	1000	2.5-13	1-2	1-3	0.5-1	0.5-1.2	1-2	1-3	0.5-1	0.5-1.2
	30 psi	2.0 kg/cm <sup>2</sup>	200 Kpa	500	1500	3-26	1-2.5	2-4.5	0.5-1.5	0.5-1.5	1-2.5	2-4.5	0.5-1.5	0.5-1.5
	60 psi	4.0 kg/cm <sup>2</sup>	400 Kpa	500	1500	5-54	2-4	4-7	1-2	1-2.5	2-4	4-7	1-2	1-2.5
	100 psi	7.0 kg/cm <sup>2</sup>	700 Kpa	1000	3000	10-90	5-7	5-10	1-2.5	2-4	5-7	5-10	1-2.5	2-4
	200 psi	14 kg/cm <sup>2</sup>	1400 Kpa	1000	3000	20-180	10-15	10-18	1-4	5-8	10-20	15-35	3-6	5-8
	400 psi	28 kg/cm <sup>2</sup>	2800 Kpa	2400	3000	45-360	16-30	16-45	4-8	5-15	16-30	16-45	4-8	5-15
	600 psi	42 kg/cm <sup>2</sup>	4200 Kpa	2400	3000	75-540	16-50	20-75	5-15	6-25	16-50	20-75	5-15	6-25
	1000 psi <sup>(5)</sup>	70 kg/cm <sup>2</sup>	7000 Kpa	12000	14000	160-900	75-130	50-160	7-30	10-85	75-130	50-160	7-30	10-85
	2000 psi	140 kg/cm <sup>2</sup>	14000 Kpa	12000	14000	350-1800	150-200	150-350	20-50	25-110	150-200	150-350	20-50	25-110
	3000 psi	210 kg/cm <sup>2</sup>	21000 Kpa	12000	14000	400-2600	180-250	180-400	30-70	50-250	180-250	180-400	30-70	50-250

## DIFFERENTIAL PRESSURE SWITCHES

APPROXIMATE DEADBAND<sup>(2)</sup> (BUNA-N DIAPHRAGM)

NOMINAL RANGE <sup>(1)</sup>			Overpressure Ratings		PDA <sup>(3)</sup>		PDS <sup>(4)</sup>					PDD <sup>(4)</sup>		
			Static Working Pressure	Proof psi	SWITCH ELEMENT									
					J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP	
30" H <sub>2</sub> O Diff.	750mm H <sub>2</sub> O	5.4	21.6	5.5-27	3-5	4-6.5	0.5-1	0.5-2	3-5	4-6.5	0.5-1	0.5-2		
60" H <sub>2</sub> O Diff.	1500mm H <sub>2</sub> O	5.4	21.6	5.5-54	3-5	4.5-6.5	0.5-1.3	1-2	3-5	4-6.5	0.5-1.3	1-2		
100" H <sub>2</sub> O Diff.	2500mm H <sub>2</sub> O	5.4	21.6	8.5-90	4-6	4.5-8.5	1-2	1-3	4-7	4-8.5	1-2	1-3		
150" H <sub>2</sub> O Diff.	3750mm H <sub>2</sub> O	5.4	21.6	18-135	5-11	10-18	1.5-3	2-6	8-12	10-18	1.5-3	2-6		
15 psid	1.0 kg/cm <sup>2</sup>	500	2000	2.5-13	1-2	1-3	0.5-1	0.5-1.2	1-2	1-3	0.5-1	0.5-1.2		
30 psid	2.0 kg/cm <sup>2</sup>	500	2000	3.5-27	1-2.5	2-4.5	1-1.5	1-1.5	1-2.5	2-4.5	0.5-1.5	0.5-1.5		
60 psid	4.0 kg/cm <sup>2</sup>	500	2000	6.5-54	2-4	4-7	1-2	1-2.5	2-4	4-7	1-2	1-2.5		
100 psid	7.0 kg/cm <sup>2</sup>	1000	4000	10-90	5-7	5-10	1-2.5	2-4	5-7	5-10	1-2.5	2-4		
200 psid	14 kg/cm <sup>2</sup>	1000	4000	20-180	10-15	10-18	1-4	5-8	10-20	10-18	3-6	5-8		
400 psid	28 kg/cm <sup>2</sup>	1000	8000	45-360	16-30	16-45	4-8	5-15	16-30	16-45	4-8	5-15		

Values shown are for 0 static working pressure

### NOTES:

- Switches may generally be set between 15% and 100% of nominal range on in-creasing pressure. Consult factory for applications where set points 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

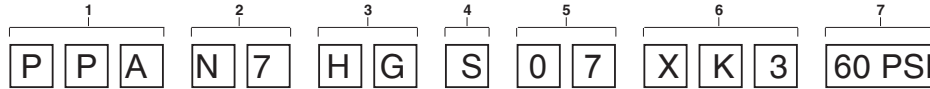
3 Deadbands for PPA and PDA models are adjustable between

- the values shown.
- Deadbands for PPS, PPD, PDS and PDD models are fixed within the range of values shown. Manufacturing and parts variances result in variation from one unit to another as shown.
  - Proof pressure is 4000 psi with SS and Monel welded diaphragms.

# P-Series Differential Pressure, Pressure & Temperature Switches

**P-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 – FUNCTION	
<b>PPA</b>	Pressure control, single setpoint, adjustable deadband
<b>PPD</b>	Pressure control, two independently adjustable setpoints, fixed deadband
<b>PPS</b>	Pressure control, single setpoint, fixed deadband
<b>PDA</b>	Differential pressure control, single setpoint, adjustable deadband
<b>PDD</b>	Differential pressure control, two independently adjustable setpoints, fixed deadband
<b>PDS</b>	Differential Pressure control, single setpoint, fixed deadband

2 – ENCLOSURE	
	N7-NEMA 7&9, IP66 (explosion proof Div. 1 & 2)

3 – SWITCH ELEMENTS FOR PPA & PDA CONTROLS			
CODE		S.P.D.T. Switch Elements UL/CSA Listed	
<b>H</b>	General Purpose	10A, 125/250 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc	
<b>J</b>	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc	
SWITCH ELEMENTS FOR PPD, PPS, PDD AND PDS CONTROLS			
CODE		Switch Elements UL/CSA Listed	
Single (PS)	Dual (PD)		
<b>C</b>	<b>CC</b>	Heavy Duty – AC	22A, 125/250 Vac
<b>E</b>	<b>EE</b>	Manual Reset, Actuates on Decreasing Pressure	15A, 125/250 Vac 5A, 30 Vdc
<b>F<sup>(4)</sup></b>	<b>FF</b>	Sealed Environment Proof	15A, 125/250 Vac
<b>G<sup>(5)</sup></b>	<b>GG</b>	General Purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
<b>H</b>	<b>HH</b>	General Purpose – AC-DC	10A, 125/250 Vac 10A, Vdc
<b>J</b>	<b>JJ</b>	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc
<b>K<sup>(4)</sup></b>	<b>KK</b>	Narrow Deadband	15A, 125/250 Vac
<b>L</b>	<b>LL</b>	Hermetically Sealed, Gold Contacts	1A, 125 Vac
<b>M</b>	<b>MM</b>	Low Level Gold Contacts	1A, 125 Vac
<b>P(3)</b>	<b>PP</b>	Hermetically Sealed – AC	5A, 125/250 Vac
<b>U</b>	<b>UU</b>	Manual Reset, Actuates on Increasing Pressure	15A, 125/250 Vac 6A, 130 Vdc
<b>W</b>	<b>WW</b>	Ammonia Service	5A, 125/250 Vac 6A, 30 Vdc
<b>Y</b>	<b>YY</b>	High Temperature 300°F Ambient	15A, 125/250 Vac
<b>S</b>	<b>SS</b>	Heavy Duty – DC	10A, 125 Vac or Vdc 1/8 HP, 125 Vac or Vdc

**NOTES:**

- 1 These items are wetted by process fluid.
- 2 Ambient operating temperature limits –20 to 150°F, all styles. Set point shift of range per 50°F temperature change is normal.
- 3 Estimated dc rating, 2.5A, 28 Vdc (not UL listed).
- 4 Estimated dc rating, .4A, 120 Vdc (not UL listed).
- 5 Not UL listed at 480 Vac.
- 6 Supply static pressure for D/P switches.
- 7 St. diaphragm only.
- 8 Not available with Buna-N diaphragm.
- 9 Available on psi only.
- 10 Not available on NEMA 7.
- 11 Available with Teflon diaphragm only, to 600 psi only.

4 – ACTUATOR SEAL™					
Code and Material	Process Temp. Limits °F <sup>(2)</sup>	Range			
		VAC ~ H <sub>2</sub> O	0-600 psi	1000 psi	2000-3000 psi
B – Buna-N	0 to 150	•	•	•	•
V – Viton	20 to 300	•	•	•	
T – Teflon	0 to 150	•	•	•	•
<b>S – SS<sup>(9)</sup></b>	0 to 300		•	•	
P – Monel <sup>(9)</sup>	0 to 300		•	•	

5 – PRESSURE PORT	
<b>Code</b>	
<b>25</b>	¼" NPT Female (Std. up to 1000#)
<b>06</b>	¼" NPT Female and ½" NPT Male Combination
<b>07</b>	½" NPT Female

6 – P-SERIES OPTIONS					
CODE	DESCRIPTION	Pressure		Differential Pressure	
		psi	~ H <sub>2</sub> O	psi	~ H <sub>2</sub> O
<b>XCH</b>	Chained Cover	•	•	•	•
<b>XC8<sup>(10)</sup></b>	CSA Approval, N7	•	•	•	•
<b>XD2</b>	Dual Seal Rating	•	N/A	N/A	•
<b>XFP</b>	Fungus Proofing	•	•	•	•
<b>XFS<sup>(6)</sup></b>	Factory Adjusted Setpoints	•	•	•	•
<b>XG9<sup>(7)</sup></b>	Fire Safe Actuator	•	N/A	N/A	N/A
<b>HHX</b>	40 psi Static Press. (D/P Only)				
	160 psi Proof Press. (D/P Only)	N/A	•	N/A	•
	100 psi Proof Press. (Press. Only)				
<b>XJL</b>	¾" to ½" Reducing Bushing	•	•	•	•
<b>XK3</b>	Terminal Blocks	•	•	•	•
<b>XL9<sup>(11)</sup></b>	Low Hardness SS Pressure Conn.	•	N/A	N/A	N/A
<b>XNH</b>	Tagging Stainless Steel	•	•	•	•
<b>XPK<sup>(10)</sup></b>	Pilot Light(s)	•	•	•	•
<b>XPM</b>	¾" Sealed Conduit Conn. with 16" Lead Wires	•	•	•	•
<b>XTA</b>	316 SS Press. Conn. for ~H <sub>2</sub> O Ranges	N/A	•	N/A	•
<b>XUD</b>	316 SS Press. Conn. for psid Ranges	N/A	N/A	•	N/A
<b>X6B<sup>(6)</sup></b>	Cleaned for Oxygen Service	•	N/A	•	N/A

7 – RANGE	
Select from Table on Page 2	

# P-Series Differential Pressure, Pressure & Temperature Switches

## P-SERIES TEMPERATURE SWITCH MODEL NUMBER:

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



1 – FUNCTION	
<b>PTA</b>	Temperature control, single setpoint, adjustable deadband
<b>PTD</b>	Temperature control, two independently adjustable setpoints, fixed deadband
<b>PTS</b>	Temperature control, single setpoint, fixed deadband

2 – ENCLOSURE	
N7-NEMA 7, 9, IP66 (explosion proof Div.1 & 2)	

4 – LINE LENGTH <sup>(2)</sup>		
<b>Direct Mount</b>		
ORDER CODE	Line Length	Style
<b>00</b>	Not Applicable	Rigid
<b>Remote Mount</b>		
<b>05</b>	5'	Capillary with Armor (Std.)
<b>10</b>	10'	
<b>15</b>	15'	
<b>20</b>	20'	
<b>25</b>	25'	

5 – THERMAL SYSTEM SELECTION <sup>(1)</sup>	
<b>LINE MATERIAL</b>	
<b>Direct Mount</b>	
ORDER CODE	DESCRIPTION
	No Entry Required for Direct Mount
<b>Remote Mount</b>	
<b>A7</b>	SS Armor (Std.)

6 – BULB LENGTH SELECTION <sup>(3)</sup>		
<b>Direct Mount</b>		
ORDER CODE	"S" DIM.	MIN. <sup>(8)</sup> THERMOWELL "U" DIM.
<b>027<sup>(10)</sup></b>	2¾"	–
<b>040</b>	4"	2½"
<b>060</b>	6"	4½"
<b>090</b>	9"	7½"
<b>120</b>	12"	10½"
<b>Remote Mount</b>		
<b>030</b>	3"	2½"

3 – SWITCH ELEMENTS FOR PTA CONTROLS			
CODE	S.P.D.T. Switch Elements UL/CSA Listed		
<b>H</b>	General Purpose	10A, 125/250 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc	
<b>J</b>	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc	
SWITCH ELEMENTS FOR PTD AND PTS CONTROLS			
CODE		Switch Elements UL/CSA Listed	
Single (PS)	Dual (PD)		
<b>C</b>	<b>CC</b>	Heavy Duty – AC	22A, 125/250 Vac
<b>E</b>	<b>EE</b>	Manual Reset, Actuates on Decreasing Pressure	15A, 125/250 Vac 5A, 30 Vdc
<b>F<sup>(4)</sup></b>	<b>FF</b>	Sealed Environment Proof	15A, 125/250 Vac
<b>G<sup>(5)</sup></b>	<b>GG</b>	General Purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
<b>H</b>	<b>HH</b>	General Purpose – AC-DC	10A, 125/250 Vac 10A, Vdc
<b>J</b>	<b>JJ</b>	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc
<b>K<sup>(4)</sup></b>	<b>KK</b>	Narrow Deadband	15A, 125/250 Vac
<b>L</b>	<b>LL</b>	Hermetically Sealed, Gold Contacts	1A, 125 Vac
<b>M</b>	<b>MM</b>	Low Level Gold Contacts	1A, 125 Vac
<b>P<sup>(3)</sup></b>	<b>PP</b>	Hermetically Sealed – AC	5A, 125/250 Vac
<b>U</b>	<b>UU</b>	Manual Reset, Actuates on Increasing Pressure	15A, 125/250 Vac 6A, 130 Vdc
<b>W</b>	<b>WW</b>	Ammonia Service	5A, 125/250 Vac 6A, 30 Vdc
<b>Y</b>	<b>YY</b>	High Temperature 300°F Ambient	15A, 125/250 Vac
<b>S</b>	<b>SS</b>	Heavy Duty – DC	10A, 125 Vac or Vdc 1/8 HP, 125 Vac or Vdc

7 – P-SERIES OPTIONS	
CODE	DESCRIPTION
<b>XCH</b>	Chained Cover
<b>XC8<sup>(9)</sup></b>	CSA Approval, N7
<b>XFP</b>	Fungus Proof
<b>XFS</b>	Factory Adjusted Setpoints
<b>XJL</b>	¾" to ½" Reducing Bushing
<b>XK3</b>	Terminal Blocks
<b>XNH</b>	Tagging Stainless Steel
<b>XPk</b>	Pilot Light(s)
<b>XPM</b>	¾" Sealed Conduit Connection with 16" Lead Wires
<b>XBx</b>	69 Series Bushing for Thermowell System. ½ Male NPT

8 – STANDARD TEMPERATURE RANGE SELECTION <sup>(4)</sup>	
Select from Table on Page 2	

### NOTES:

- 1 All thermal systems are 316 St. St.
- 2 Additional line lengths available, consult factory.
- 3 Additional bulb lengths available, consult factory.
- 4 Additional ranges available, consult factory.
- 5 Estimated dc rating, 2.5A, 28Vdc (not UL listed).
- 6 Estimated dc rating, .4A, 120 Vdc (not UL listed).
- 7 Not UL listed at 480 Vac.
- 8 See page 5 for thermowell application information.
- 9 Standard on N4 enclosure.
- 10 Not available in 350/5250F range.

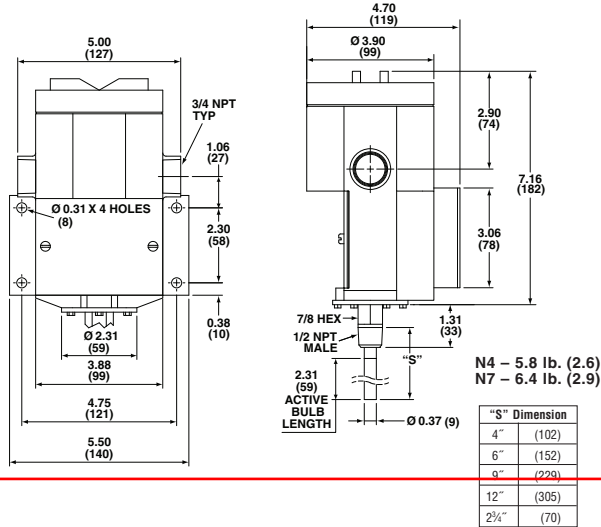
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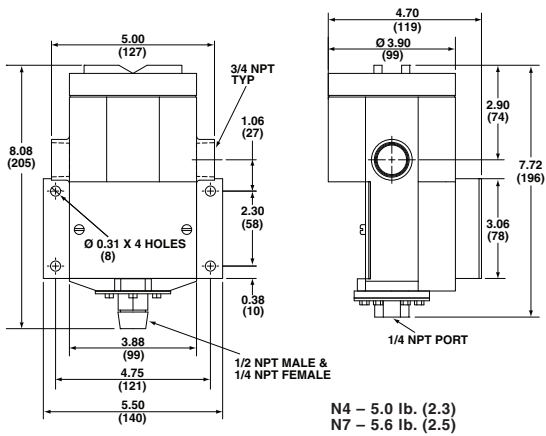
# P-Series Differential Pressure, Pressure & Temperature Switches

## Dimensions – P-Series

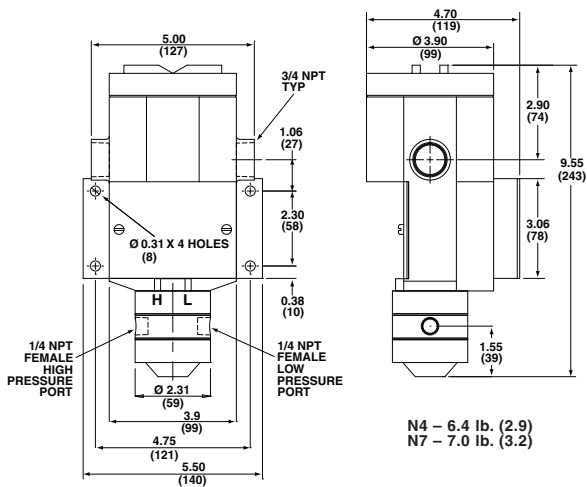
### Temperature Switch – Direct Mount



### Pressure Switch – psi Ranges



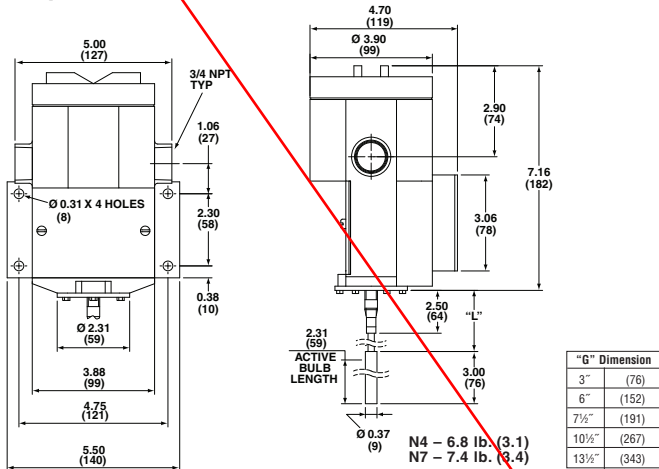
### Differential Pressure Switch – psid Ranges



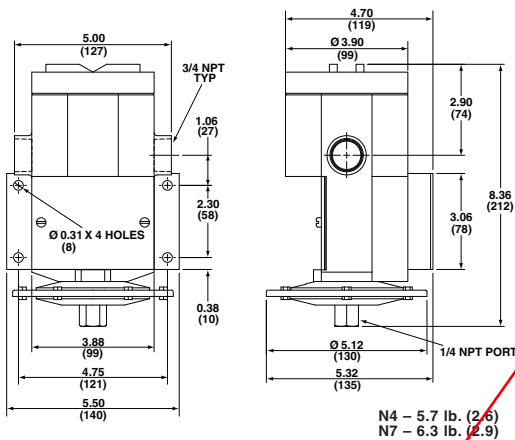
# P-Series Differential Pressure, Pressure & Temperature Switches

## Dimensions – P-Series

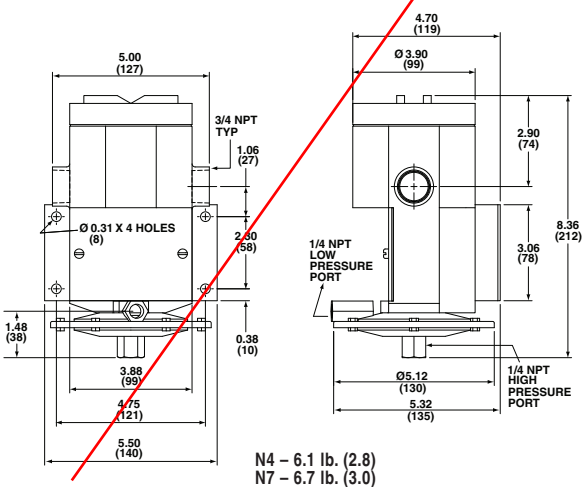
### Temperature Switch – Remote Mount



### Pressure Switch – in. H<sub>2</sub>O Ranges



### Differential Pressure Switch – Diff. in. H<sub>2</sub>O Ranges





# VELAN

## CAST STEEL Gate, Globe and Check Valves



API 600 & 603 • ASME Class 150-1500 • 2-60" (50-1500 mm)



# VELAN COMPANY PROFILE

Velan is one of the world's leading manufacturers of industrial valves, supplying forged and cast steel gate, globe, check, ball, butterfly and knife gate valves for critical applications in the chemical, petrochemical, oil and gas, fossil and nuclear power, cogeneration, pulp and paper and cryogenic industries.

Founded in 1950, Velan earned a reputation for excellence as a major supplier of forged valves for nuclear power plants and the U.S. Navy. Velan Inc., pioneered many designs which became industry standards, including bellows seal valves, all stainless steel knife gate valves and forged valves up to 24".

Velan valves are manufactured in 12 specialized manufacturing plants, including five in Canada, two in Korea, and one each in the U.S., France, U.K., Portugal and Taiwan. We have a total of 1,126 employees in North America and 374 overseas.

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The **Velan Corporate Philosophy** is to bring to the market new and innovative valve designs with special emphasis on quality, safety, ease of operation, simple in-line maintenance and most of all, long service life. All this combined with the use of high quality materials, advanced manufacturing technology and automation in all stages of manufacturing ensures the highest possible quality at a competitive price. Velan is strongly committed to defending its market position and aggressively competing in all countries around the world.



**MONTREAL, CANADA** 115,000 sq. ft. (10,683 m<sup>2</sup>)  
3-24" (80-600 mm) butterfly, 3/8-4" (10-100 mm) metal & resilient seated ball valves

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*Velan has sales offices and distributors located worldwide.*

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Visit the Velan website at [www.velan.com](http://www.velan.com) for an updated contact list.

**NOTE:** The material in this catalog is for general information. For specific performance data and proper material selection, consult your Velan representative. Although every attempt has been made to ensure that the information contained in this catalog is correct, Velan reserves the right to change designs, materials or specifications without notice.



# MANUFACTURING PLANTS AROUND THE WORLD

**PLANT 1**



**MONTREAL, CANADA** 109,000 sq. ft. (10,126 m<sup>2</sup>) ¼-4" (8-100 mm) forged gate, globe & check valves, ASME 'N' stamp, ISO 9001

**PLANT 2 & 7**



**MONTREAL, CANADA** 170,000 sq. ft. (15,800 m<sup>2</sup>) 2-60" (50-1500 mm) forged and cast steel gate, globe, check, ball, knife and butterfly valves 3-36" (80-700 mm) ASME 'N' stamp, ISO 9001

**PLANT 4 & 6**



**GRANBY, CANADA** 186,500 sq. ft. (17,325 m<sup>2</sup>) 2-12" (50-300 mm) cast steel gate and check valves, ¼-12" (8-300 mm) ball valves, ISO 9001



**TORONTO, CANADA** *Velan-Proquip* 41,000 sq. ft. (3,800 m<sup>2</sup>) 2-48" (50-1200 mm) wafer check valves ½-24" (15-600 mm) clamp joint connectors, ISO 9001



**WILLICH, GERMANY** 12,000 sq. ft. (1,115 m<sup>2</sup>) ISO 9002



**LEICESTER, ENGLAND** 14,000 sq. ft. (1,300 m<sup>2</sup>), ISO 9002

**PLANT 3**



**WILLISTON, VERMONT, U.S.A.** 155,000 sq. ft. (14,400 m<sup>2</sup>) 2-24" (50-600 mm) forged and cast steel gate, globe and check valves, ASME 'N' stamp, ISO 9001



**LYON, FRANCE** 160,000 sq. ft. (14,900 m<sup>2</sup>) ¼-40" (8-1,000 mm) forged and cast steel gate, globe and butterfly valves, ISO 9001



**LISBON, PORTUGAL** 60,000 sq. ft. (5,600 m<sup>2</sup>) ISO 9002 2-12" (50-300 mm) cast steel gate, globe and check valves



**ANSAN CITY, SOUTH KOREA** *Plant 1* 30,000 sq. ft. (2,800 m<sup>2</sup>) components and 2-4" (50-100 mm) cast steel valves, ISO 9002



**ANSAN CITY, SOUTH KOREA** *Plant 2* 65,000 sq. ft. (5,800 m<sup>2</sup>) 2-12" (50-300 mm) cast steel gate, globe, check, ball and knife gate valves



**TAICHUNG, TAIWAN** *Velan-Valvac* 20,000 sq. ft. (1,840 m<sup>2</sup>) ¼-2" (8-50 mm) ball valves, ISO 9002



# VELAN API 600 & 603 CAST STEEL VALVES

**FOR THE OIL, GAS, PETROCHEMICAL,  
CHEMICAL AND PULP & PAPER INDUSTRIES**

## LOW FUGITIVE EMISSIONS

Velan's comprehensive line of cast steel gate globe and check valves features leading edge design, engineering and manufacturing technology. Our valves meet the most stringent national and international standards for fugitive emissions.

Our gate globe and check valves are widely used in many industries including:

- **Process Industries** – Oil, Chemical, Petrochemical, Refining, Pulp & Paper, Pharmaceutical and Food Processing.
- **Power Industries** – Nuclear, Fossil Fuel, Combined Cycle, Cogeneration and District Heating.

In addition, our valves are used for Ship-building, LNG Tanker Carriers, Offshore Platforms, Water Treatment, Mining and more.



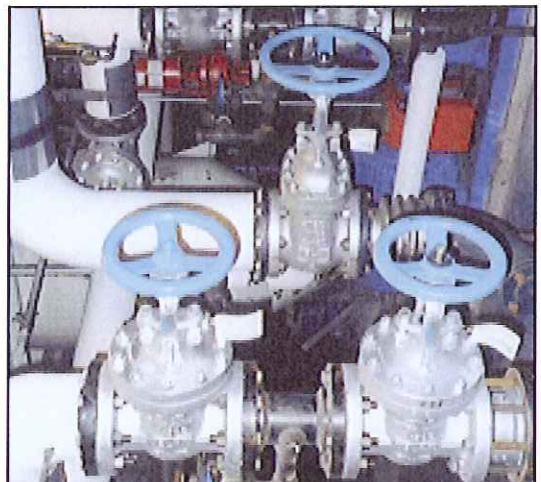
*Carbon steel gate valve (ASME Class 600), used for boiler feed water installation at a Hydrogen Plant in Texas.*



*Cast steel valve installation at an oil refinery.*



*A geothermal power plant valve installation for sour gas service.*



*API 600 gate valves in service for a boiler feed installation.*



# CAST STEEL VALVES MANUFACTURING PROGRAM

## API 600 CAST STEEL GATE, GLOBE & CHECK VALVES

VALVE TYPE & CLASS	SIZE (in, mm)																						
	2 50	2½ 65	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600	28 700	30 750	32 800	36 900	40 1000	42 1100	48 1200	54 1350	60 1500	
GATE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	600	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	900	✓	✓	✓	✓	✓	✓	✓															
	1500	✓	✓	✓	✓	✓	✓	✓															
GLOBE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												
	600	✓	✓	✓	✓	✓	✓	✓															
	900	✓		✓	✓																		
	1500	✓		✓	✓																		
CHECK	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓						
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
	600	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
	900	✓	✓	✓	✓	✓	✓																
	1500	✓	✓	✓	✓	✓	✓																

## API 603 CAST STAINLESS STEEL GATE, GLOBE & CHECK VALVES

VALVE TYPE & CLASS	SIZE (in, mm)																
	½ 15 <sup>(1)</sup>	¾ 20 <sup>(1)</sup>	1 25 <sup>(1)</sup>	1½ 40 <sup>(1)</sup>	2 50	2½ 65	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600
GATE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
GLOBE	150	✓	✓	✓	✓	✓	✓	✓	✓								
	300	✓	✓	✓	✓	✓	✓	✓	✓								
CHECK	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

(1) Refer to API 603 catalog.

### API 600 BONNET GASKET MATERIALS

VALVE TYPE	MATERIAL
GATE	Class 150: corrugated steel/graphite (except 2-2½" (50-65 mm) spiral wound)
	Class 300-1500: spiral wound stainless steel and graphite
GLOBE	Spiral wound stainless steel and graphite
CHECK	Spiral wound stainless steel and graphite

### OPTIONAL BODY MATERIALS

ASTM SPEC. GRADE	NOMINAL DESIGNATION	MIN. TEMP		MAX. TEMP.		VELAN CODE
		°F	°C	°F	°C	
A216-WCB	Carbon steel	-20	-29	800	427	02
A217-WC6	1½ CR-½ Mo	-20	-29	1100*	593	05
A217-WC9	2½ CR-1 Mo	-20	-29	1100*	593	06
A217-C5	5 CR-½ Mo	-20	-29	1200*	649	04
A217-C12	9 CR-1 Mo	-20	-29	1200*	649	09
A352-LCB	Carbon steel	-50	-46	650	343	25
A352-LCC	Carbon steel	-50	-46	700	371	31
A352-LC2	2½ Ni	-100	-73	650	343	26
A351-CF8M	18 CR-9 Ni-2 Mo	-425	-254	1500*	816*	13
A351-CF3M	18 CR-9 Ni-2 Mo	-425	-254	850	454	14

Note: \*Flanged end ratings terminate at 1000°F (538°C) for Class 150.

### API 603 BONNET GASKET MATERIALS

VALVE TYPE	MATERIAL	
GATE, GLOBE and CHECK	Trim SX or SY	Trim GX, GY or GS
	PTFE with stainless wire mesh	graphite with stainless steel foil

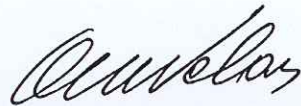
# VELAN

## Mission Statement

*Our aim is to offer products and services which not only meet, but clearly exceed, the expectations of our customers.*

*Through training, teamwork and performance, our employees strive to achieve continuous improvement of all processes.*

*Our goals are:  
Total Quality and On-time Delivery.  
Our method is Total Commitment.*



**A.K. Velan,  
President and C.E.O.**



### **ON-LINE NETWORKED SPC**

Velan has installed on-line networked SPC computers operated by machinists themselves.

Each unit can handle four gageports and provide instant feedback on tool wear and lubrication to a control manager station.



# 6 SYSTEMS ENSURE THE FINAL QUALITY GOALS

## 1. DESIGN

All valves are designed to comply with the requirements of ASME B16.34, the ASME code and special customer requirements, as applicable.

## 2. QUALITY ASSURANCE

Every step from procurement through production, welding, assembly, testing and packaging is in accordance with written quality programs and procedures. (An ASME Section III manual for code valve production and an ISO 9001 QA manual for all other production.) Velan's six North American plants are certified to ISO 9001 and Plants 1 and 2 have ASME "N" type Certificates of Authorization, Plant 3 has a Certificate of Accreditation. Furthermore, Velan has been fully approved to supply CE marked valves in accordance with the PED (European Pressure Equipment Directive). Orders are reviewed by Engineering and QA Departments and all special customer requirements are incorporated into QCI (Quality Control Instructions) issued for each project. The QA Department also maintains calibration and gauge control systems, and trains and qualifies skilled welders and NDT inspectors.

## 3. QUALITY CONTROL

The QC Department is responsible for all aspects of quality, from receiving of material to control of machining processes, welding, nondestructive examination, assembly, pressure testing, cleaning, painting and packaging. When required, a permanent record of all completed quality goals is prepared and sent to customers in the form of a "Valve Data Package".

## 4. PRESSURE TESTING

Each valve is pressure tested in accordance with ASME B16.34, the ASME Code, or special customer requirements as applicable. In all plants test status is integrated into production control/inventory management software.



*TQM innovations at Plant 2 include "snag lists" of any problems encountered in daily engineering and manufacturing processes. The lists are compiled on a weekly basis and automatically become the first items on the agenda for TQM team meetings.*

## 5. IMPROVEMENT TEAMS

Continuous Improvement Teams at point of manufacturing ensure quality at source, process control, higher quality workmanship and operator ownership.

## 6. QUALIFICATION TESTING

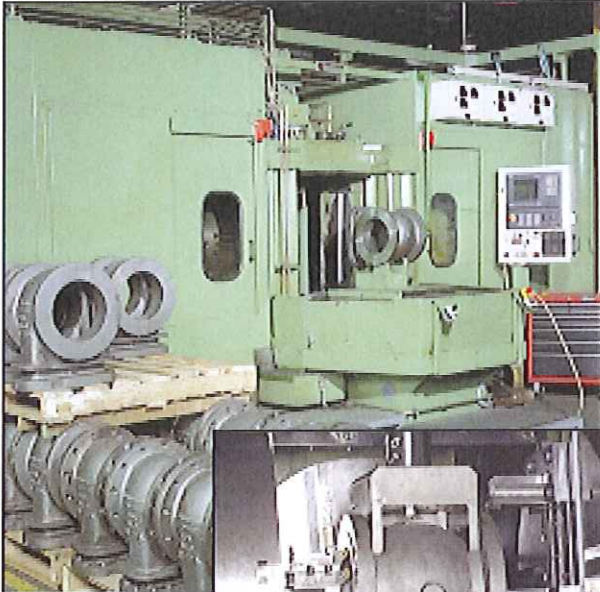
A key to reliability is the performance of functional qualification tests. These tests are performed on all valves to determine reliability and service life. 1000 cold and 1000 thermal cycles with 1000°F superheated steam and five blowdowns with "0" leakage.



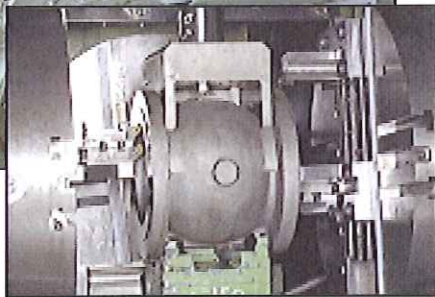
*Operator on CNC horizontal boring mill monitors his own quality.*



# WORLD'S LARGEST MASS PRODUCTION OF API 600 CAST STEEL VALVES



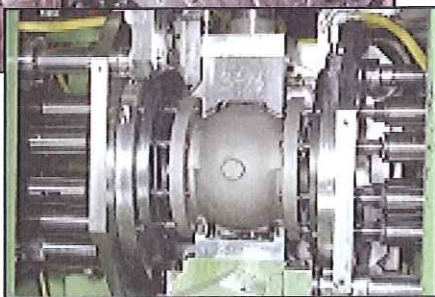
*Automatic 3-way facing machine.*



*For smaller runs, complete automatic machining and drilling in one set-up.*



*Automatic multiple drilling machine.*



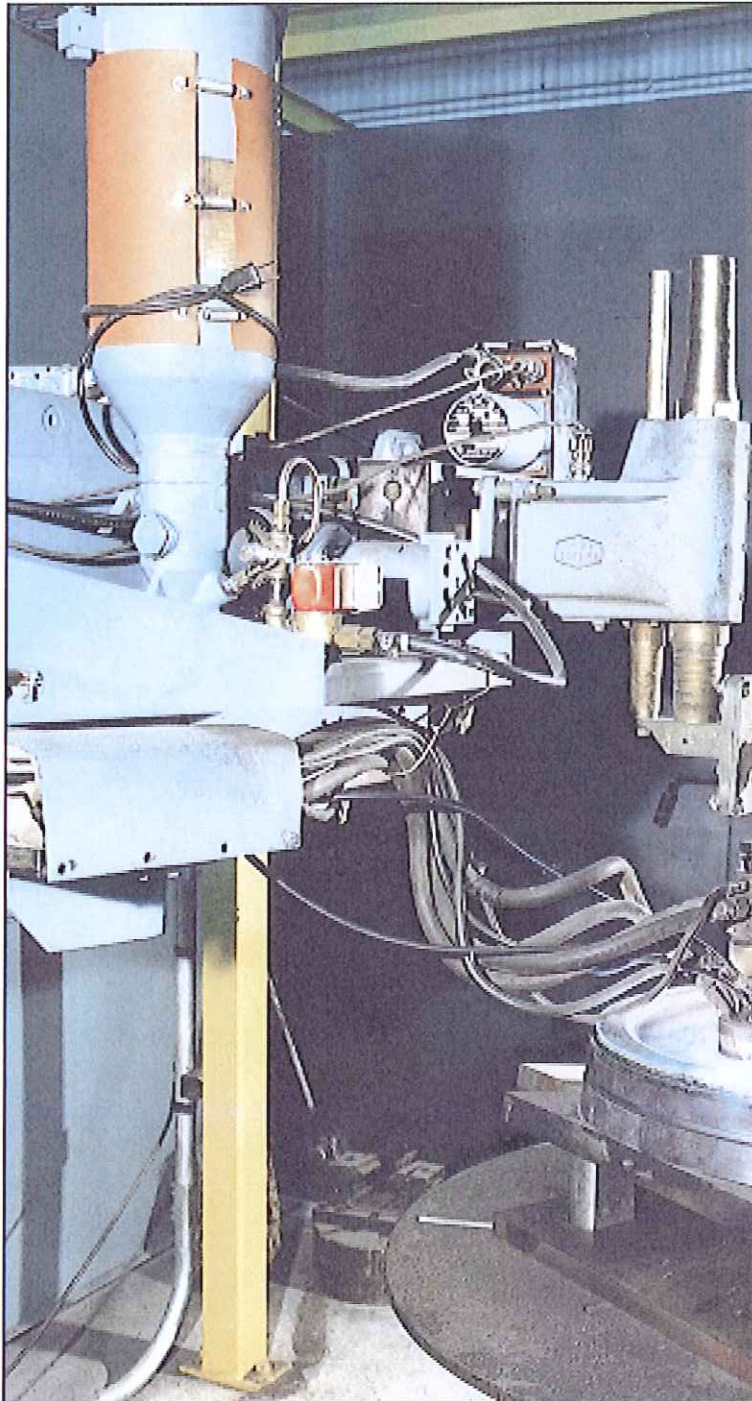
*Automatic bonnet machine.*





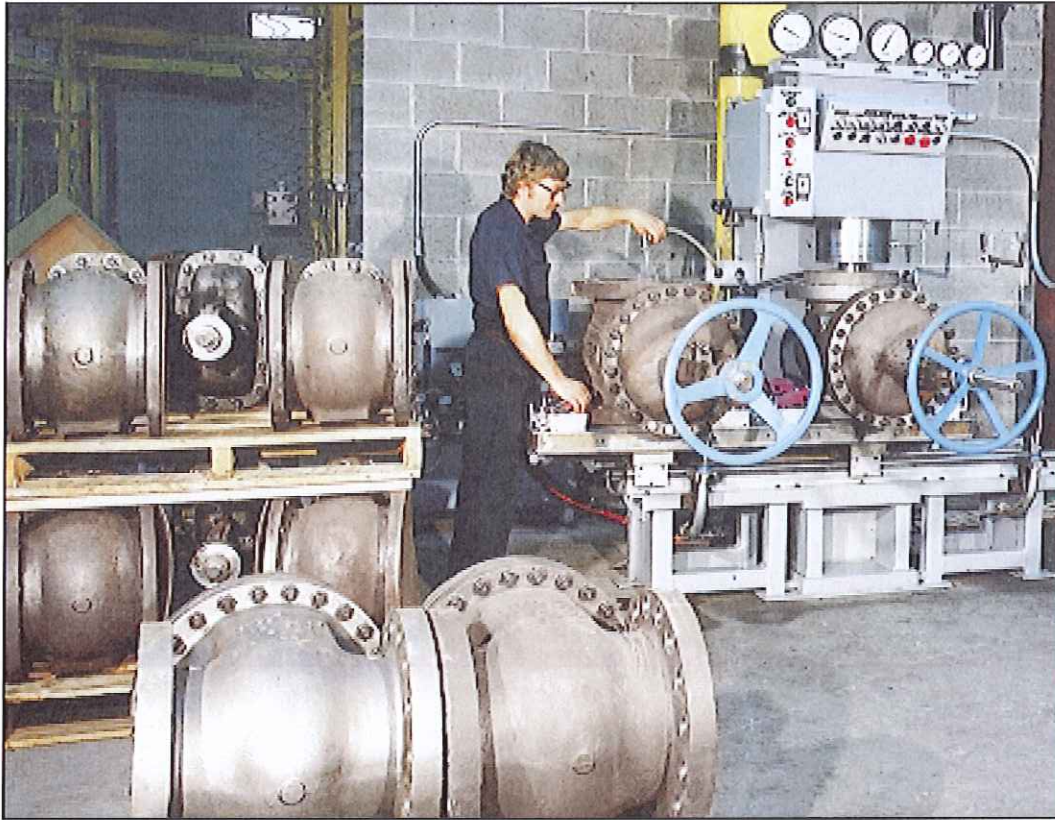
## AUTOMATIC PLASMA ARC HARDFACING FOR SEATS AND DISCS

High quality deposits of Stellite 6 and other hardfacing alloys are assured by the use of the following state of the art technology: controlled preheating, automatic Plasma Arc hardfacing equipment and a controlled cooling process. Shown below is the hardfacing of a gate valve wedge and to the right a cast steel seat.





# RELIABILITY THROUGH TESTING



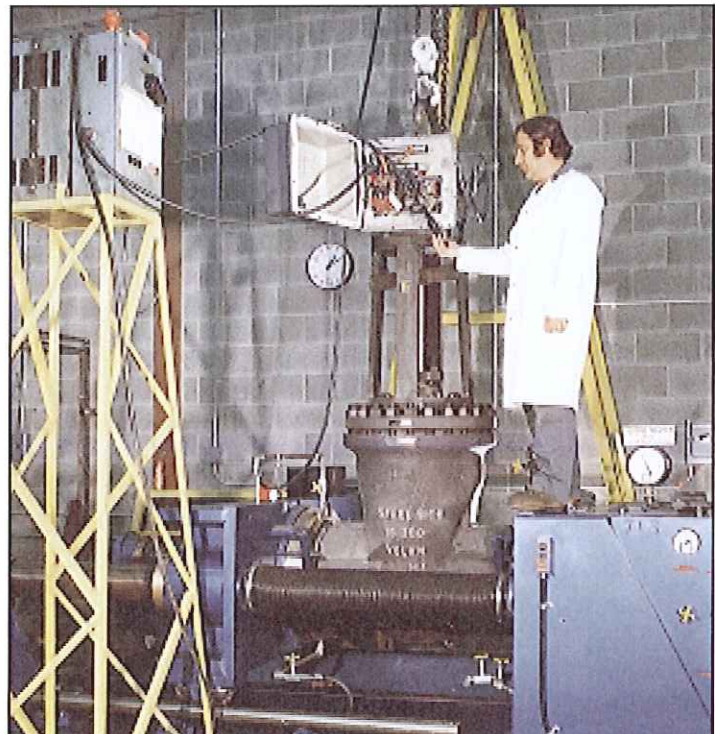
**Top:**  
Semi-automatic  
stations for  
testing 2–12"  
(50–300 mm)  
valves to API 598.

**Bottom Right:**  
Operational test for  
electric actuators.

**Bottom Left:**  
TA-LUFT  
qualification test  
on a 4" Class 600  
gate valve with  
live-loading.  
The test medium  
is helium at  
1500 psi (100 bar).



All valves are tested during production for reliability with pressurized air and hydrotested for bubble-free tightness in accordance with API 598 specifications.





# CONTINUOUS CASTING QUALITY IMPROVEMENT AND COMPUTERIZED CASTING PROCESS SIMULATION

## VELAN'S VEL-QCI-955 PROGRAM (API 600/ISO 10434)

The Velan VEL-QCI-955 Program was implemented to set the quality control standards for pressure boundary castings, and to ensure a consistent supply of quality castings to Velan.

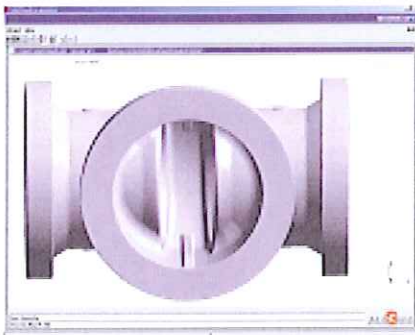
1. X-Ray Sample (pattern) Approval Process;
2. X-Ray Monitoring Program;
3. Casting Monitoring Program.

## SAMPLE CASTINGS

Before castings are released for production, the Velan NDE Inspector Level III, evaluates and approves the submitted x-ray films (100% coverage) as per B16.34 acceptance standard.

## X-RAY MONITORING:

Random x-ray monitoring requires that castings taken every six months from each vendor, randomly by size and quantity sets and x-rayed per B16.34 requirement.

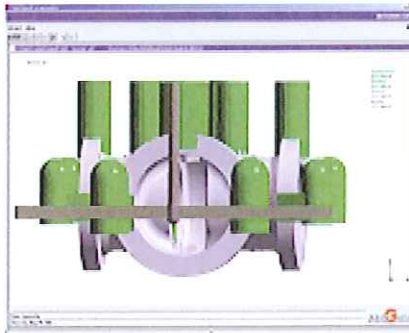


Pro-Engineering model imported into Magmasoft® casting simulation program.

If casting fails to meet the x-ray requirements of B16.34, Velan's Senior Metallurgist will issue a corrective action request to the vendor, including recommendations for detailed methoding change and re-x-ray.

## CASTING MONITORING:

Rejected castings due to defects such as hydro-test leakage, porosity, inclusions, shrinkage indication discovered by x-ray or machining, are entered into the computer, as part of the statistical control of each vendor.

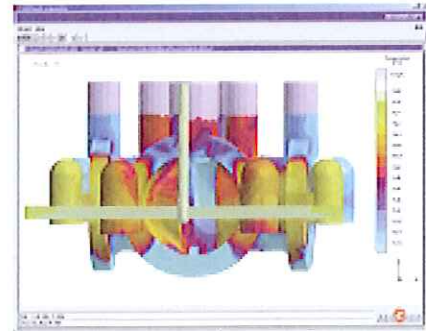


Risering and gating simulation on a 30" Class 600 gate body.

## 3-D SOLIDIFICATION SIMULATION:

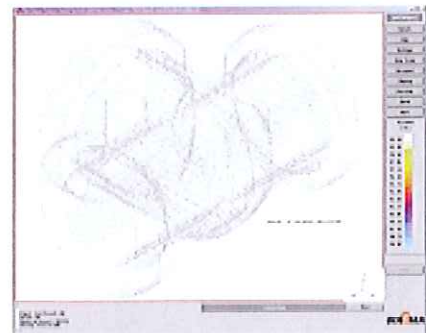
Velan is one of the first valve manufacturers in the world to have the MAGMASOFT® computer casting simulation program at its design facilities.

Working together with foundry engineers and our designers, we continue improving the internal integrity of castings, to X-Ray Level II or better as a general standard.



90% filling simulation on a 30" Class 600 gate body.

One example of the successful cooperation of Engineering, our Metallurgist and the foundry, using the MAGMASOFT® simulation, is shown for 30" Class 600 Gate body on this page.



No shrinkage on a 30" Class 600 gate body simulation.

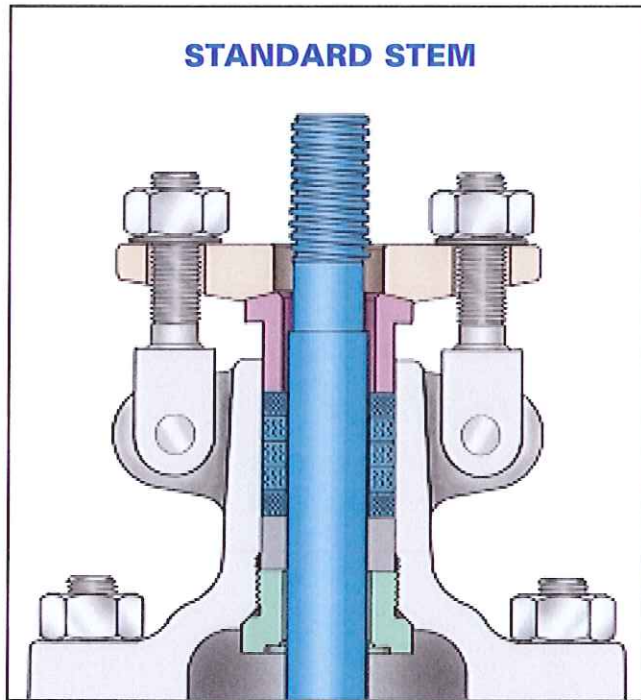
## Benefits to Velan's customers and to the foundries:

- Shorter delivery time,
- Higher quality of commercial castings,
- Optimum methoding system,
- Elimination of trial at sample approval,
- Improves the internal integrity of castings (RT level 2 or better) at pattern approval,
- Optimizes the metal flow and solidification pattern,
- Predicts internal defects,
- Reduces scrap,
- Optimizes the design of the castings,
- Solves problems such as shrinkage and porosity, without test castings,
- Reduces NDE (x-ray) upgrading.



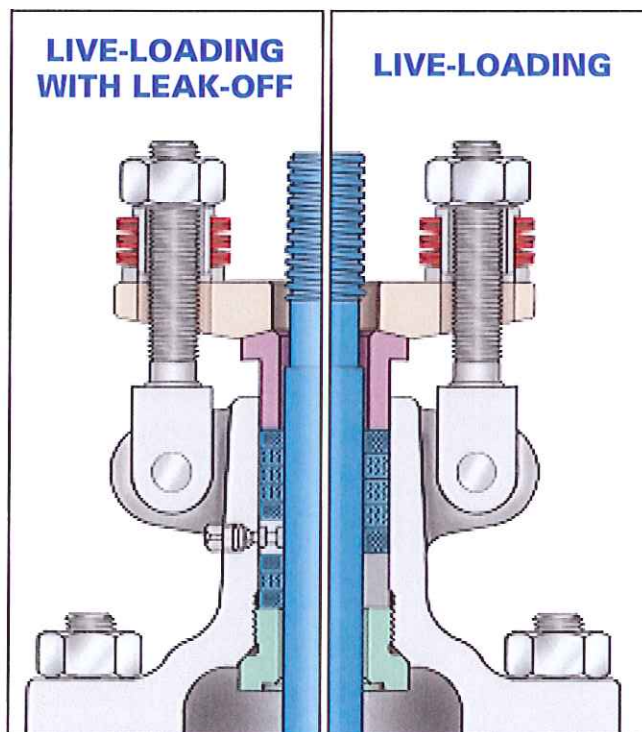
## DESIGN OF STEM SEALS

*Velan now offers standard cast steel bolted bonnet gate and globe valves qualification tested for compliance with EPA fugitive emissions regulations*



The Velan stem seal evolved from these test findings:

- **Ensures leakage of less than 100 ppm** as demonstrated through extensive laboratory testing.
- **Large loads.** Sealing is achieved when compression load is high and packing forms a mass of low porosity and permeability (4,000 psi for graphite).
- **Small clearances between vital parts.**
- **Precision stem and packing chambers.** Straightness, roundness and fine finish of stem and packing chamber wall are essential.
- **Short and narrow packing chambers improve sealing.** Maximum six rings in a single set chamber and wherever possible, only  $\frac{1}{4}$ " wide.
- **Stem and packing chamber walls.** Close roundness, straightness and superior surface finish of 6 RMS or better for the stem and 63 RMS for the packing chamber.

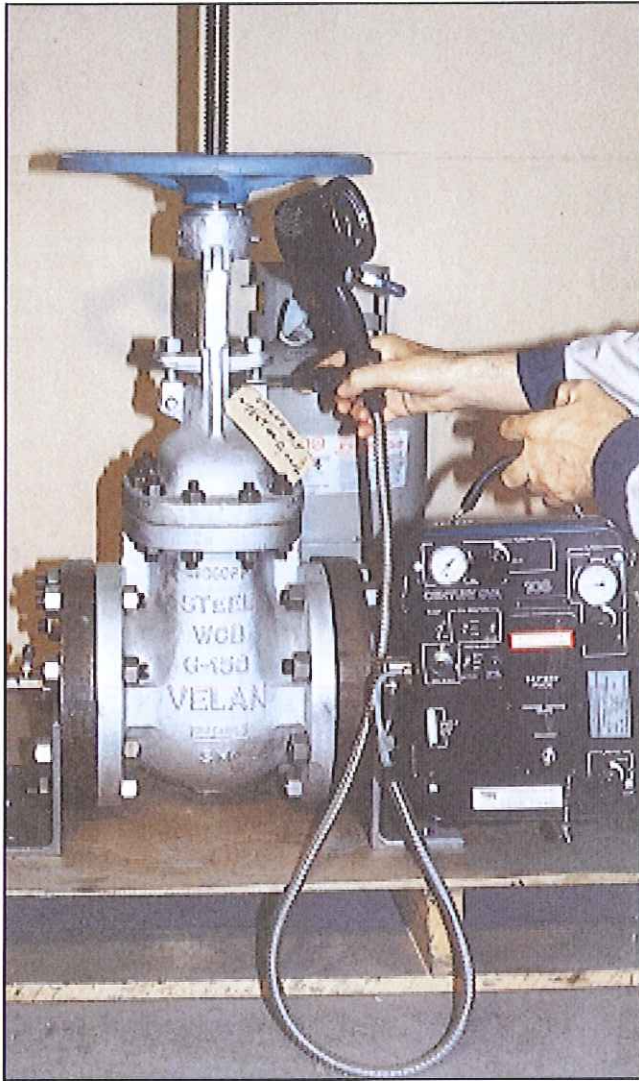


### LIVE-LOADING OPTIONS

- **Live-loading.** Two sets of Belleville springs maintain a permanent packing stress of 3500–4000 psi. Live-loading extends low emission service life especially in service with large pressure/temperature transients or frequent cycling.
- **Leak-off.** For critical service a lantern ring and double packing can be provided with a leak-off connection. The leak-off is provided to allow collection of leakage from the lower packing set.
- **Rings individually compressed in packing chamber** to 3500–4000 psi for graphite and 2,000 psi PTFE to ensure equal stress distribution and effectiveness of all rings.
- **Velan has extensive experience in valve live-loading.** The original live-loading concept was developed by Velan in 1972 in a research project for AECL to eliminate leakage in Nuclear service. Velan has been supplying live loaded valves for Nuclear and non-Nuclear service for more than 30 years.



# API 600 CAST STEEL VALVES TYPICAL TEST REPORT



## TEST CONDITIONS

**Test Medium:** Propane at 115 psi, ambient temperature

**Instrument:** Organic vapor analyzer OVA-108, range 1–10,000 ppm

**Valve Type:** Gate, Class 150, API 600

**Sizes:** 3", 6", 12" (80, 150, 300 mm)

**Packing:** Graphite

**Gasket:** Corrugated steel with graphite filler

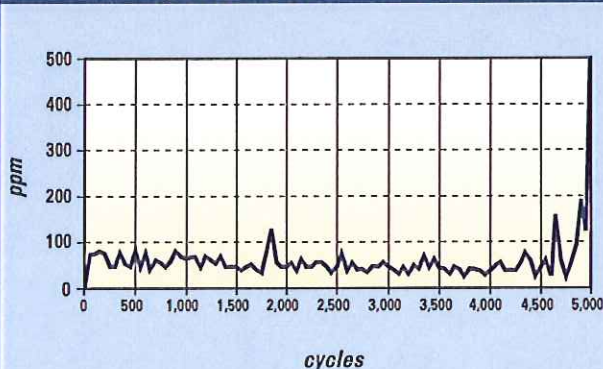
**Trim:** Wedge: 13 CR  
Seat: Stellite

**Quantity:** 3" (80 mm) – one valve  
6" (150 mm) – four valves  
12" (300 mm) – one valve

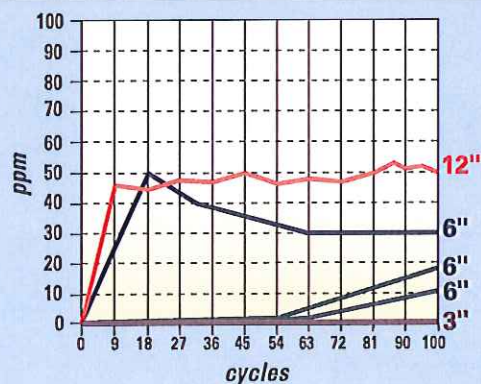
## TEST COMPARISON TO API 598 TEST

- API 598 test standard requires no visible external leakage (gasket, packing chamber and casting). The organic vapor analyzer measures leakage in parts per million (ppm). "Visible leakage" in API 598 is one drop of liquid per minute which we estimate is equivalent to about 2,400 ppm of gas. The API 598 test does not invoke cycling while we have cycled valves between 100 and 5000 cycles in our research testing.
- Critical factors in low emission service life include severity of pressure-temperature transients, number of cycles and cleanliness. During extensive cycling tests it was found that after leak paths developed, leakage could be reduced or eliminated by retightening gland bolts. For example a 150 ppm leak that developed after 350 cycles could be reduced to zero after retightening gland bolts.

**6" GATE VALVE  
5,000 CYCLE TEST**

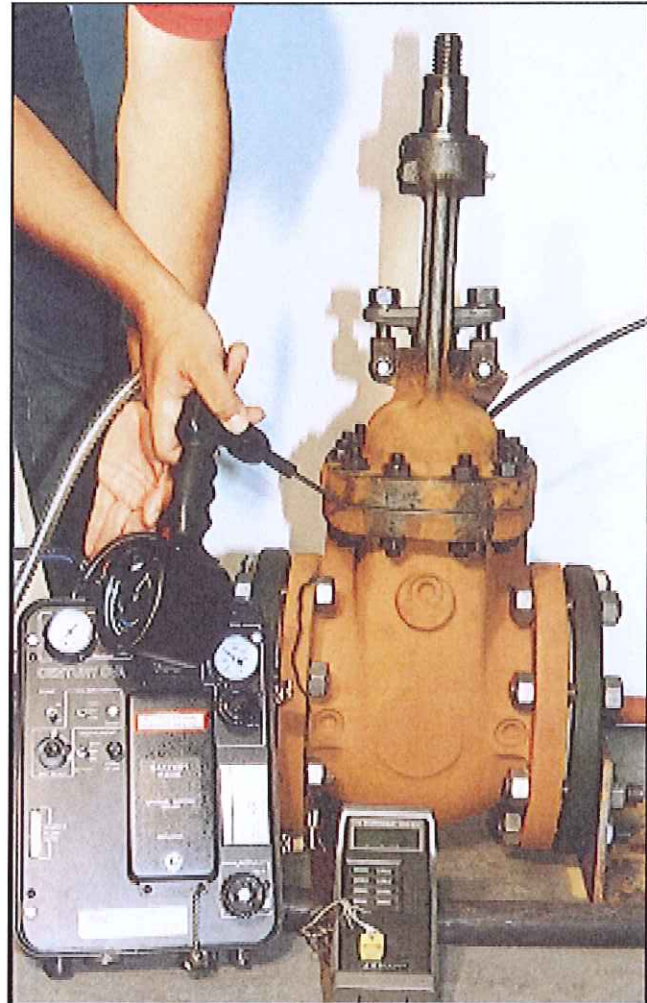
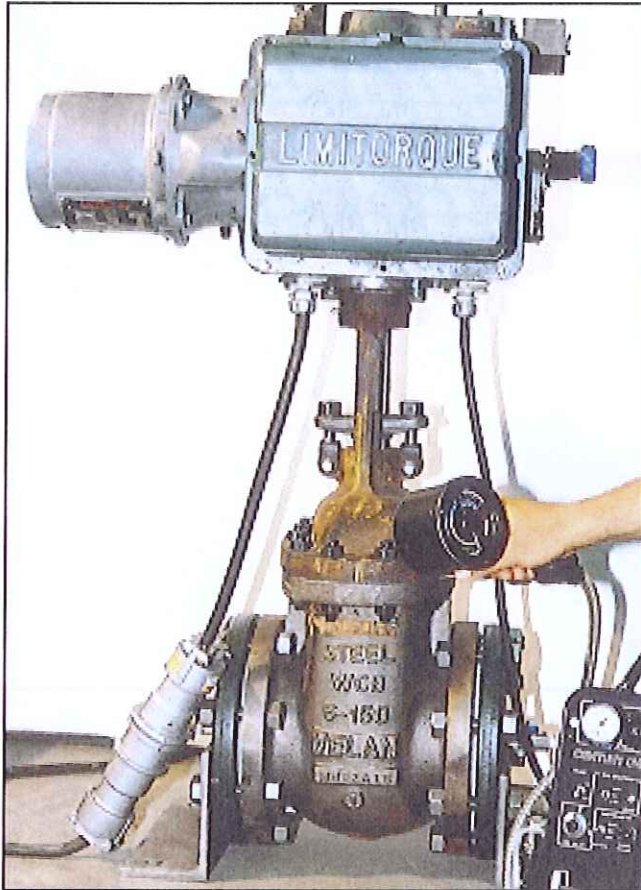


**3", 6" & 12" GATE VALVES  
100 CYCLE TEST**



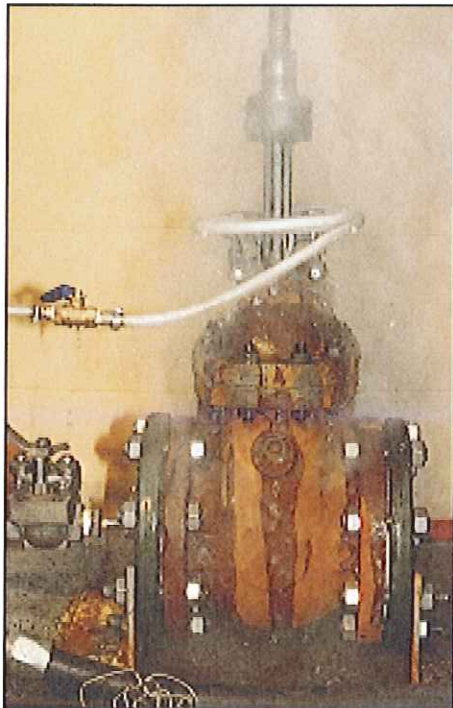


# TESTING GASKET PERFORMANCE



**Upper left:**  
3000 cycles  
with propane  
at 125 psi  
Leakage:  
zero ppm.

**Upper right:** 50 cycles with steam at 400°F (204°C)  
Leakage: zero ppm.

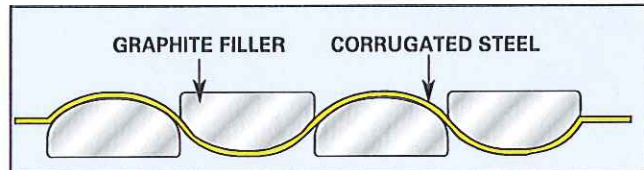


**Left:**  
Thermal shock  
with water at  
60°F (15°C)  
Leakage:  
zero ppm.

<b>Valve type:</b>	<b>Class 150 gate valve</b>
<b>Size:</b>	<b>6" (150 mm)</b>
<b>Gasket:</b>	<b>Corrugated steel with graphite filler</b>
<b>Instrument:</b>	<b>OVA-108 vapor analyzer Range: 1–10,000 ppm</b>



## BODY-BONNET GASKET DESIGN GATE VALVES WITH OVAL FLANGES



Standard corrugated steel gaskets without graphite as specified in API 600 were found to be an unacceptable choice for low emission service, even under ideal laboratory test conditions, and regardless of flange finish and gasket load. After testing several alternative gaskets, we selected the best performing gasket in our tests - a corrugated steel gasket with graphite filled channels.

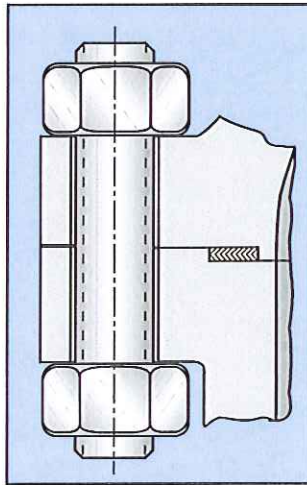
### TYPICAL TEST RESULT:

3700 cycles with zero ppm for 6" Class 150.

### DESIGN FEATURES:

- Ensures leakage of no more than 20 ppm as demonstrated through extensive laboratory testing.
- Requires no retorquing after long cycling.
- Effective under wide fluctuations of temperature and pressure.
- Insensitive to flange finish.
- Steel walls of graphite channels provide additional protection from oxidation, corrosion and blow-out.
- Seal offers the advantage of flexible graphite (0-14pH, -328°F to +2000°F).
- Lower bolt torques.
- Modern torquing methods.

## API 600 CAST STEEL VALVES WITH ROUND BODY-BONNET FLANGES



### FULLY-ENCASED SPIRAL WOUND 316 or 347 SS/GRAPHITE BODY-BONNET GASKET

<b>Gate</b>	Class 150: 2-2½" (50-65 mm) Class 300-1500: 2-36" (50-900 mm)
<b>Globe</b>	Class 150-600: 2-16" (50-400 mm)
<b>Check</b>	Class 150-1500: 2-36" (50-900 mm)

### DESIGN FEATURES:

- Full enclosure to allow gasket to retain positive radial support during loading.
- Ensures leakage of no more than 20 ppm as demonstrated through extensive laboratory testing.
- Accurate control of compression through close tolerance of gasket groove and allowance for radial expansion.
- No radial machine marks.
- Minimum of three inner wraps to prevent buckling.
- Minimum of three tack welds.
- Minimum of three filler wraps.
- Close tolerance ( $\pm 0.005"$  or 0.13 mm) for gasket thickness.
- Regular testing of gasket resiliency and inspection at Receiving due to sensitivity to inconsistent quality.
- Modern torquing methods.

### TYPICAL TEST RESULT:

3100 cycles with zero ppm for 10" Class 300.

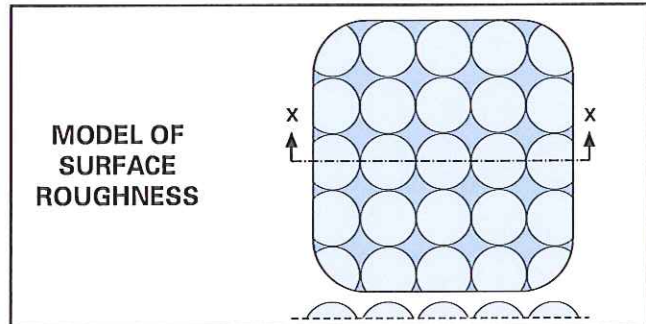


# TECHNOLOGY OF SEAT-DISC TIGHTNESS

The initial seat tightness of valves which can be proven by hydro-testing has little effect on extended long-term tightness.

## SEAT-DISC CONTACT MECHANICS

- When magnified, even a ground, lapped surface appears irregular and rough.
- The rate of leakage is a function of the smoothness and finish of the surfaces.
- The seat-disc (wedge) contacts are between the peaks.
- For absolutely leak-tight joints, the peaks must be deformed with torque until a large portion of mating surfaces is in microscopic contact.
- The compression stress is approximately 3 times the yield (for 70,000 psi–210,000 psi).
- Sufficient contact pressure generated by the torque is essential. A small increase in contact pressure produces a rapid decrease in leakage.
- The valve seat should be either very narrow or very wide, depending on the valve type.



Globe Valves	Conical seat-line contact
Gate Valves and Swing Check Valves	Large, flat-faced seats

# VELAN API 600 GATE VALVE SEAT TIGHTNESS

## GATE VALVE SEAT TIGHTNESS

- Welded-in Stellite 6 faced seats and a flexible wedge in 13 CR, SS 316, Monel or hardfaced with Stellite 6.
- Seating faces ground and lapped to 2 RMS.

## Factory Acceptance Standard for Gate Valve Seat Leakage

Size in	Velan Standard (VEL-NDT-571)	Seat Leakage Rate <sup>(1)</sup> (API 598–October 1996)	
		Low Pressure Test	High Pressure Test
2	0	0	0
2½–6	0	24	12
8–12	0	40	20
14+	28	56	28

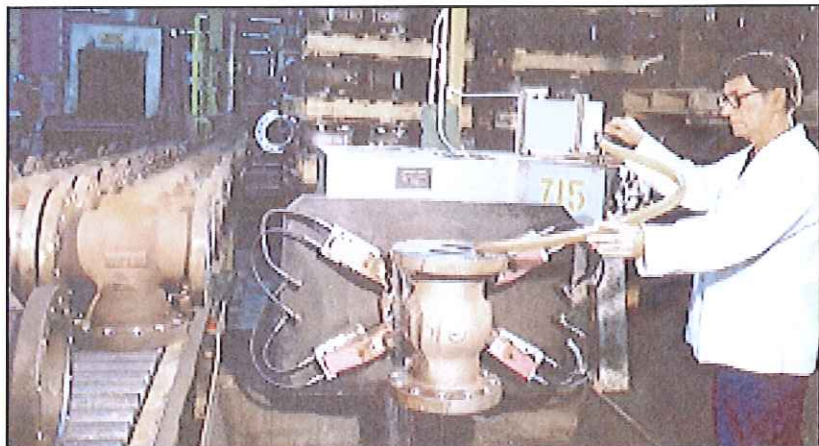
(1) Leakage rates are in bubbles per minute for low pressure test and drops per minute for high pressure test

# EIGHT IMPORTANT STEPS IN ASSEMBLY & TESTING

*Make the Difference in Seat Tightness and Performance*

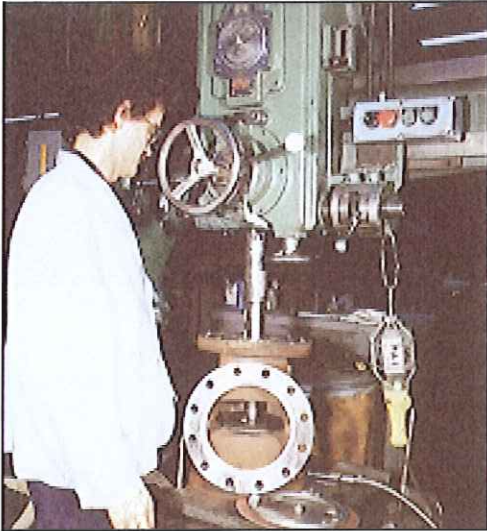


**1** Automatic seal welding of Stellite 6 hardfaced seats.

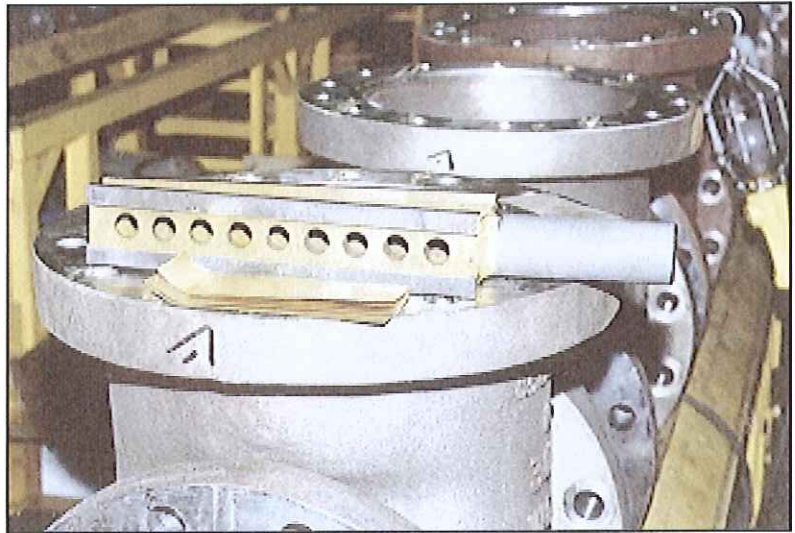


**2** Air-under-water test of the seat's welds.





**3** Relapping of seating faces after seal welding.



**4** Determination of final seat/seat angle with gauge and shims to determine ideal wedge angle (6–60").



**5** Precision grinding of individually fit wedge seating surfaces.



**6** Lapping of wedge seating surfaces.



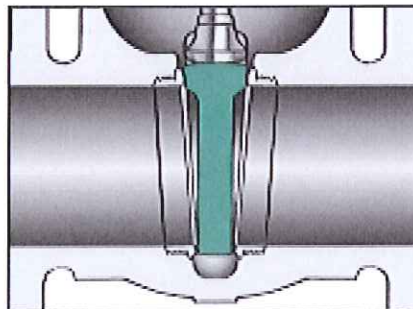
**7** Assigning the ideally fitted wedge, ground and lapped, to proper valve body.



**8** After assembly, pressure testing of shell, seats, packing and backseat to API 598.



## VELAN API 600 GATE VALVES FLEXIBLE WEDGE VERSUS SOLID WEDGE



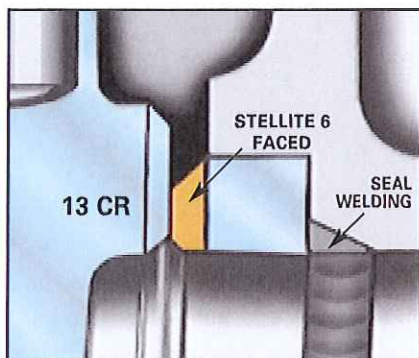
### FLEXIBLE ROUND WEDGE PIONEERED BY VELAN

- Universal use for temperatures up to 1000°F (538°C).
- Flexibility compensates for seat face distortion.
- Compensates for deformation of body due to pipe stresses.
- Long cycle life.
- Ideal for processes with large temperature fluctuations.
- Assures valve tightness on both seats over wide range of pressures.
- Stem to wedge connection is inside the seating faces supporting the wedge ears during opening.
- More robust with less mass.

### CLASSICAL SOLID WEDGE ON COMPETITIVE DESIGNS

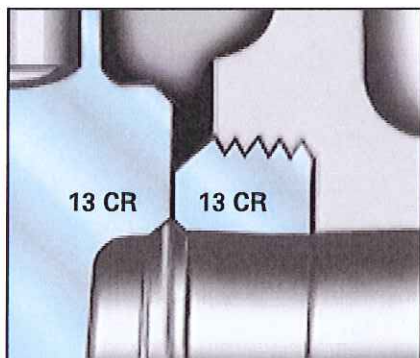
- Wedge may cause severe jamming at temperatures over 200°F (93°C).
- Suitable for small valves (½–2", 15–50 mm).
- Wedge will stick when valve is closed hot and allowed to cool.
- No compensation for deformation of body due to pressure-temperature or pipe stresses.
- Difficult to make valve tight on both seats due to seat face distortion.

## SEAL WELDED SEATS VS SCREWED-IN SEATS



### VELAN STANDARD GROUND AND LAPPED SEAL WELDED SEAT RINGS FACED WITH STELLITE 6

- Pioneered by Velan and considered state-of-the-art technology.
- Welded-in leakproof.
- Weld quality 100% tested.
- Stellite 6 seating faces for long service life.
- Ground and lapped to 2 RMS finish after weld-in.
- Standardized use for steam up to 1000°F (538°C), oil and gas.
- Stellite face will wear less than the 13 CR wedge, which can easily be repaired or replaced.

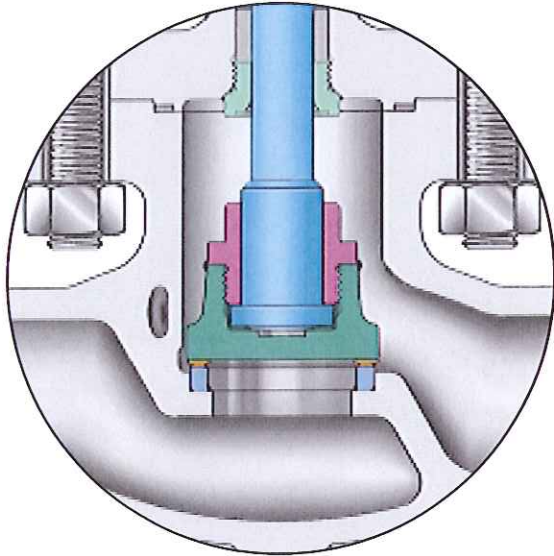


### COMPETING SCREWED-IN SEATS IN 13 CR

- Can loosen up due to corrosion and cause substantial leakage.
- Replacement is difficult if not impossible.
- Threads can corrode and cause leakage.
- Seat is unsecured from unscrewing.
- Seat can become loose due to temperature fluctuations, corrosion or vibration, and can leak.
- Not suitable for steam service. Steam and other fluids will wire draw body threads of loose seats beyond repair.
- 13 CR seat suitable only for certain fluids.

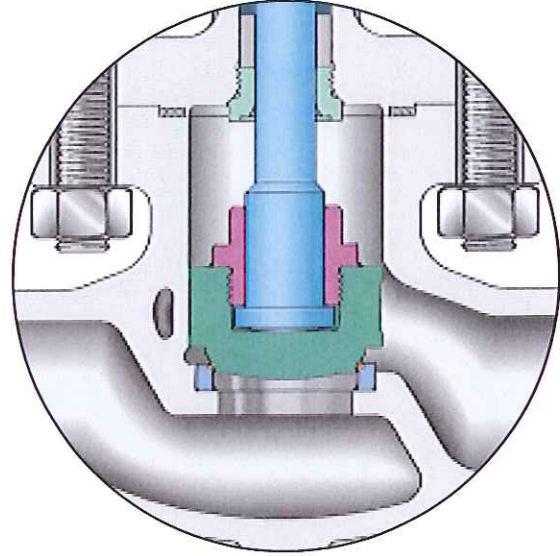
## VELAN API 600 GLOBE VALVES FLAT AND CONICAL SEATS

FLAT SEAT



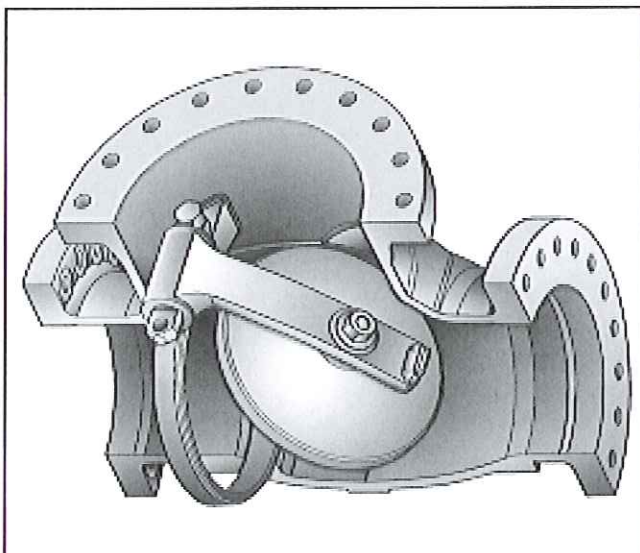
- Machining, lapping to close tolerances is easy.
- Flatness tolerance easy to control.
- Area contact wide seat.
- Disc is guided by the mating surface of the seat.
- Hard thrust pad prevents galling.
- Faster maintenance in-line. Flat seating faces can be lapped and checked for flatness easier.

CONICAL SEAT



- Line contact seal.
- Contact pressure increase by 1.5–5 with same stems and yokes.
- Seat has greater elasticity.
- Lower closing torques.
- Recommended for high pressure-temperature.

## VELAN API 600 SWING CHECK VALVES

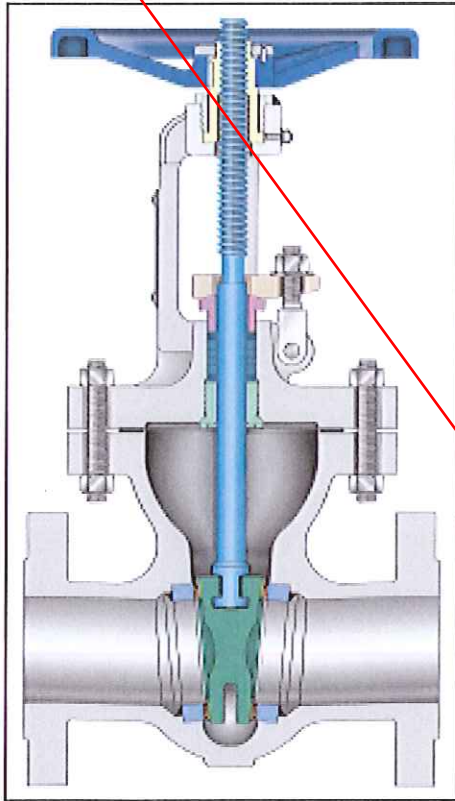


- Cage unit design with no penetration of body prevents:
  - a) Possibility of leakage with gasketed or packed hinge pin.
  - b) Possibility of pin ejection.
- All parts are accessible from the top for easy servicing.
- Welded-in seat is Stellite 6 faced.
- Disc is free to rotate to prevent localized wear.
- Ground and lapped seating surfaces.





# CAST CARBON, STAINLESS OR ALLOY STEEL API 600 BOLTED BONNET GATE VALVES, 2–60" (50–1500 mm) ASME CLASSES 150, 300, 600, 900 AND 1500



## STANDARD MATERIALS

PART	MATERIALS			
	WCB	WC6	WC9	CF8M
Body <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Bonnet <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Stem <sup>(1)(3)</sup>	SS 410			SS 630, 600 or SS 316
Wedge <sup>(1)</sup>	CA 15 or 13 CR faced WCB	CA 15 or 13 CR faced WC6	CA 15 or 13 CR faced WC9	CF8M
Seat <sup>(1)(2)</sup>	Stellite 6 faced carbon steel	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 faced F316
Packing flange	Carbon steel			Stainless steel
Gland bushing	Carbon steel			Stainless steel
Packing ring <sup>(1)</sup>	Graphite			Graphite
Gland stud	Gr. B or B7 <sup>(4)</sup>			F316, B8M or 630 <sup>(5)</sup>
Gland nut	Gr. 2H			Gr. 8M
Body/bonnet nut	Gr. 2H	Gr. 4		Gr. 8M
Body/bonnet stud	B7	B16		B8M or 630
Back seat <sup>(1)(3)</sup>	SS 410			SS 316
Gasket <sup>(1)</sup>	Class 150: corrugated steel/graphite Class 300-1500: spiral wound stainless steel/graphite			
Key	Carbon steel			
Yoke bushing	Carbon steel			Stainless steel
Bearing	Steel			
Handwheel nut	Malleable iron or steel			
Handwheel <sup>(1)</sup>	Malleable iron or steel			
Grease fitting	Steel			
Groove pin	Carbon steel			Stainless steel
Bushing	Carbon steel			Stainless steel
Washer	Carbon steel			Stainless steel
Name plate	Stainless steel			
Identification tag	Stainless steel			
Rivet	Stainless steel			
Stem nut	A 439 Austenitic ductile iron Gr. D-2C			

(1) Other materials available. (2) Stellite. (3) Hardened.  
(4) For eye bolts Gr. B, for studs B7 is used.  
(5) For eye bolts F316, for studs B8M or 630 is used.

CLASS	FIGURE NUMBER
150	0064C
300	1064C
600	2064C
900	7064C
1500	3064C

## DESIGN SPECIFICATIONS

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS1414
Pressure-temperature rating	ASME B16.34
Face to face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM

## DESIGN FEATURES:

- **Universal Trim.** 13 CR stem, wedge in CA 15 or 13 CR faced, and Stellite seat API Trim 8 suitable for applications up to 850°F (454°C).
- **Seat face** Stellite, ground and lapped to a mirror finish.
- **Flexible Wedge** with low center stem-wedge contact, in solid CA15 (13 CR) or hardfaced with 13 CR, SS 316, Monel or Stellite. Wedge is ground and lapped to a mirror finish and tightly guided to prevent dragging and seat damage. A Stellite 6 hardfaced CF8M wedge is also available.
- **Non-rotating stem** with precision Acme threads and burnished finish. Double Acme for faster operation.
- **Body and bonnet joint** accurately machined. Gasket materials on page 3, details on page 13.

- **Body and bonnet** castings are precision machined. One-piece bonnet up to 12" (300 mm) for better alignment and fewer parts.
- **Gland** has two-piece construction for easy alignment.
- **Flanges:**  
Classes 150–300: 1/8" raised face,  
Class 600–1500: 1/4" raised face.  
Finish 125–250 AARH for all valves.
- **Rotating stem nut** is Austenitic ductile iron Gr. D-2C renewable in line (as shown). Thrust bearings are supplied as follows:  
150–300: 10–12" (250–300 mm), 1 bearing (top),  
16" (400 mm), and up, two bearings  
600: 6" (150 mm) and up  
900–1500: 6" (150 mm) and up.

For information on BELLOWS SEAL VALVES see VEL-BS catalog.



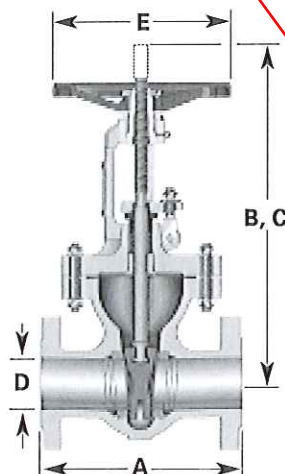
**GATE VALVE DIMENSIONS (CLASSES 150-600)**

SIZE in mm	ASME 150 (PN 20)						ASME 300 (PN 50)					ASME 600 (PN 100)				
	A		B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A <sup>(3)</sup>	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A <sup>(3)</sup>	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E
	BW	FL														
2	8.50	7.00	15.63	20.38	2.00	8	8.50	15.63	20.38	2.00	8	11.50	15.66	20.51	2.00	8
50	216	178	397	518	51	203	216	397	518	51	203	292	398	521	51	203
2½	9.50	7.50	16.88	22.14	2.50	8	9.50	16.94	22.20	2.50	8	13.00	18.59	24.19	2.50	10
65	241	191	429	562	64	203	241	430	564	64	203	330	472	614	64	254
3	11.12	8.00	18.56	24.26	3.00	10	11.12	20.22	26.38	3.00	10	14.00	21.63	27.78	3.00	10
80	282	203	471	616	76	254	283	514	670	76	254	356	549	709	76	254
4	12.00	9.00	22.25	28.32	4.00	10	12.00	23.90	30.95	4.00	10	17.00	25.75	32.76	4.00	14
100	305	229	565	719	102	254	305	607	786	102	254	432	654	832	102	356
6	15.88	10.50	31.19	38.00	6.00	14	15.87	32.31	40.38	6.00	14	22.00	36.28	44.18	6.00	20
150	403	267	792	965	152	356	403	821	1026	152	356	559	922	1122	152	508
8	16.50	11.50	38.19	46.13	8.00	18	16.50	40.94	50.16	8.00	18	26.00	43.72	53.25	7.88	24
200	419	292	970	1172	203	457	419	1040	1274	203	457	660	1110	1353	200	610
10	18.00	13.00	47.16	56.28	10.00	20	18.00	49.19	59.87	10.00	20	31.00	49.06	59.87	9.75	30
250	457	330	1198	1430	254	508	457	1249	1521	254	508	787	1246	1521	248	762
12	19.75	14.00	55.91	66.75	12.00	20	19.75	59.00	70.61	12.00	20	33.00	61.13	72.74	11.75	30
300	502	356	1420	1695	1305	508	502	1499	1763	1305	508	838	1553	1848	298	762
14	22.50	15.00	61.50	75.50	13.25	24	30.00	61.38	77.75	13.25	24	35.00	72.50	83.50	12.88	(2)
350	572	381	1562	1918	337	610	762	1559	1975	337	610	889	1842	2121	327	(2)
16	24.00	16.00	68.75	85.00	15.25	24	33.00	68.75	85.50	15.25	30	39.00	82.25	91.00	14.75	(2)
400	610	406	1746	2159	387	610	838	1746	2172	387	762	991	2089	2311	375	(2)
18	26.00	17.00	73.25	90.00	17.25	24	36.00	77.88	94.00	17.00	(2)	43.00	87.06	116.00	16.50	(2)
450	660	432	1861	2286	438	610	914	1978	2388	432	(2)	1092	2211	2946	419	(2)
20	28.00	18.00	83.00	100.00	19.25	30	39.00	86.50	100.00	19.00	(2)	47.00	103.00	123.00	18.25	(2)
500	711	457	2108	2540	489	762	991	2197	2540	483	(2)	1194	2616	3124	464	(2)
24	32.00	20.00	97.00	115.00	23.25	30	45.00	101.25	125.00	23.00	(2)	55.00	115.00	132.00	22.00	(2)
600	813	508	2464	2921	591	762	1143	2572	3175	584	(2)	1397	2921	3353	559	(2)
26	34.00	22.00	114.50	125.00	25.00	(2)	49.00	114.50	125.00	25.00	(2)	-	-	-	-	-
650	864	559	2908	3175	635	(2)	1245	2908	3175	635	(2)	-	-	-	-	-
28	36.00	24.00	118.63	130.00	27.00	(2)	53.00	118.63	130.00	27.00	(2)	-	-	-	-	-
700	914	610	3013	3302	686	(2)	1346	3013	3302	686	(2)	-	-	-	-	-
30	36.00	24.00	124.12	140.00	29.25	(2)	55.00	124.13	145.00	29.25	(2)	65.00	122.50	150.00	24.75	(2)
750	914	610	3153	3556	743	(2)	1397	3153	3683	743	(2)	1651	3112	3810	629	(2)
32	38.00	26.00	129.63	150.00	30.75	(2)	60.00	129.63	150.00	30.75	(2)	-	-	-	-	-
750	965	660	3293	3810	781	(2)	1524	3293	3810	781	(2)	-	-	-	-	-
36	40.00	28.00	146.68	170.00	35.25	(2)	68.00	147.83	185.00	35.25	(2)	68.00	145.13	170.00	29.00	(2)
900	1016	711	3726	4318	895	(2)	1727	3754	4699	895	(2)	1727	3686	4318	737	(2)
40	42.00	30.00	158.66	188.00	38.50	(2)	-	-	-	-	-	-	-	-	-	-
1000	1067	762	4030	4775	978	(2)	-	-	-	-	-	-	-	-	-	-
42	44.00	31.00	166.50	195.00	40.25	(2)	-	-	-	-	-	-	-	-	-	-
1050	1118	787	4229	4953	1022	(2)	-	-	-	-	-	-	-	-	-	-
48	-	36.00	189.81	225.00	46.00	(2)	-	-	-	-	-	-	-	-	-	-
1200	-	914	4821	5715	1168	(2)	-	-	-	-	-	-	-	-	-	-
54	52.00	40.00	216.56	248.00	51.50	(2)	-	-	-	-	-	-	-	-	-	-
1350	1321	1016	5501	6299	1308	(2)	-	-	-	-	-	-	-	-	-	-
60	-	42.00	238.80	275.00	57.50	(2)	-	-	-	-	-	-	-	-	-	-
1500	-	1067	6066	6985	1461	(2)	-	-	-	-	-	-	-	-	-	-

**CLASSES 900-1500**

SIZE in mm	ASME 900 (PN 150)					ASME 1500 (PN 250)				
	A <sup>(3)</sup>	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A <sup>(3)</sup>	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E
2	14.50	21.25	29.00	1.88	10	14.50	21.25	29.00	1.88	10
50	368	540	737	48	254	368	540	737	48	254
3	15.00	25.75	34.50	2.88	14	15.00	25.75	34.50	2.75	14
80	381	654	876	73	356	470	654	876	70	356
4	18.00	28.75	37.50	3.88	18	21.50	28.75	37.50	3.63	18
100	457	730	953	99	457	546	730	953	92	457
6	24.00	39.00	49.00	5.75	20	27.75	39.00	49.00	5.38	(2)
150	610	991	1245	146	508	705	991	1245	137	(2)
8	29.00	51.75	62.75	7.50	(2)	32.75	45.25	60.00	7.00	(2)
200	737	1315	1594	191	(2)	832	1149	1524	178	(2)
10	33.00	57.75	67.25	9.38	(2)	39.00	57.75	71.00	8.75	(2)
250	838	1467	1708	238	(2)	991	1467	1803	222	(2)
12	38.00	66.57	83.00	11.12	(2)	-	-	-	-	-
300	965	1691	2108	283	(2)	-	-	-	-	-
14	40.50	73.88	90.00	12.25	(2)	-	-	-	-	-
350	1029	1877	2286	311	(2)	-	-	-	-	-
16	44.50	80.44	100.00	14.00	(2)	-	-	-	-	-
400	1130	2043	2540	356	(2)	-	-	-	-	-

(1) Height does not include actuator. (2) Gear actuator. (3) Butt weld & flanged valves have the same end-to-end dimensions for Class 300 and up.



BW = Butt weld  
FL = Flanged

B = Center-to-Top, Open  
C = Dismantling Height

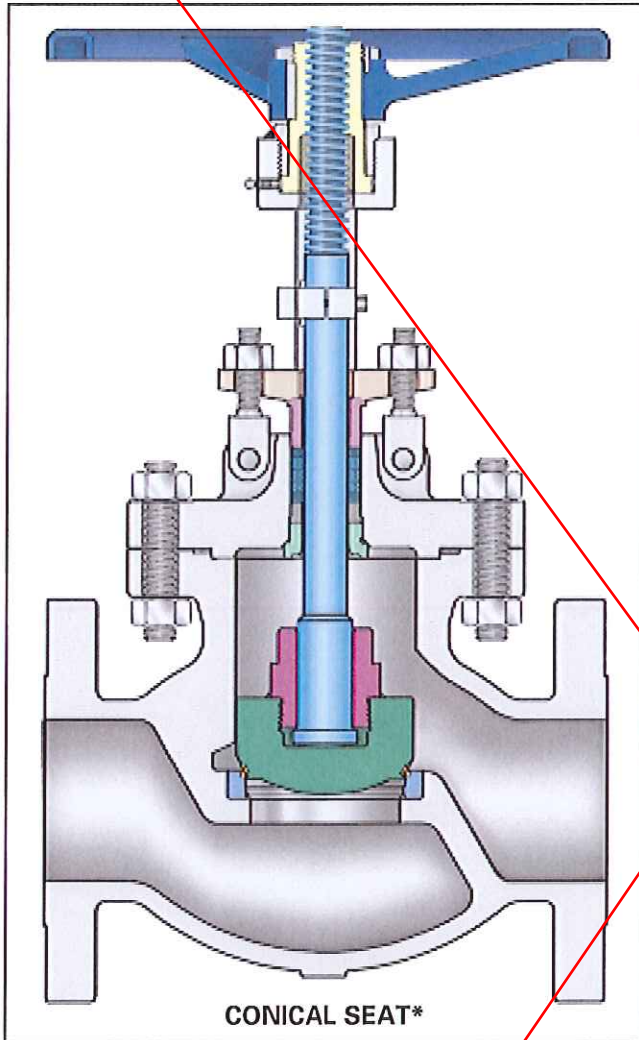
Classes 900-2500  
forged gate valves  
also available.  
See page 32 & 33 for valve  
weights and CVs.



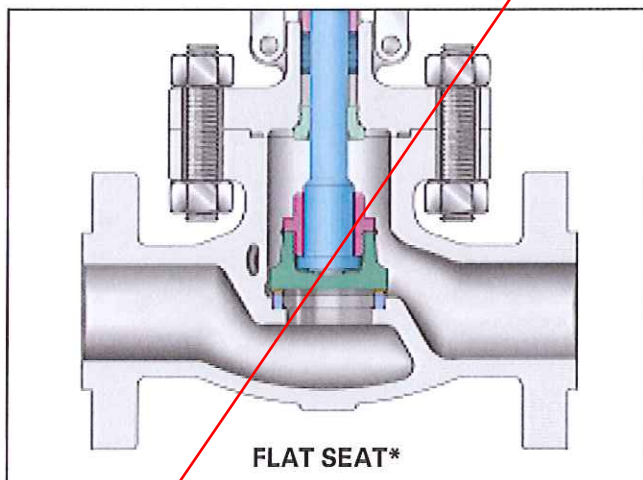
# VELAN

CAST CARBON, STAINLESS OR ALLOY STEEL API 600  
BOLTED BONNET GLOBE AND STOP CHECK VALVES,  
2-16" (50-400 mm) ASME CLASSES 150, 300 AND 600

**NOW THE ONLY API 600 GLOBE VALVE WITH NON-ROTATING STEM**



CONICAL SEAT\*



FLAT SEAT\*

## DESIGN FEATURES:

- **Non-rotating Stem** with precision Acme threads and burnished finish. Valve suitable for horizontal installation.
- **Universal Trim.** 13 CR stem, 13 CR faced disc and Stellite 6 faced seats API Trim 8 suitable for service up to 850°F.
- **Seat face** Stellite, ground and lapped to a mirror finish. Conical seat machined to 8 RMS.
- **Flat disc.** Floating stem-disc engagement, hardfaced with 13 CR, Stellite 6, SS 316 or Monel, ground and lapped with seat. Disc in SS 316 hardfaced with Stellite 6 also available.
- **Tapered disc.** Disc is guided by the mating surface of the seat, hardfaced with 13 CR, Stellite 6, SS 316 or Monel, ground and lapped with seat. Disc in SS 316 hardfaced with Stellite 6 also available. 2-6" (50-150 mm) valves may have solid CA15 (13 CR) discs.
- **Body and bonnet.** Castings are precision machined. One-piece bonnet for better alignment, fewer parts.
- **Stuffing box** finish to 63 RMS or better.
- **Body and bonnet joint** accurately machined. Fully enclosed gasket. Gasket materials on page 3. Details on page 13.
- **Gland** has two-piece construction for easy alignment.
- **Rotating Stem nut.** Austenitic ductile iron Gr. D-2C, renewable in-line.
- **Torque arm.** To reduce wear on packing rings, to enable better sealing and to reduce torque.
- **Impactor handwheels.** Globe and stop check valves require higher closing torques than gate valves with the same seat diameter and pressure class. The most economical mechanism for tight shutoff is the impactor handwheel. Two lugs cast under the wheel strike simultaneous blows and give 3-10 times the closing force of standard handwheels. Impactor handwheels are supplied at manufacturer's option unless specified by customer (see page 21).
- **Flanges.** Class 150-300: 1/16" raised face. Class 600: 1/4" raised face. Finish 125-250 AARH for all valves.

**\*NOTE:** Most sizes and pressure classes have conical seats. Choice of flat or conical seat is manufacturer's option unless specified by customer.

For information on BELLOWS SEAL VALVES see VEL-BS catalog



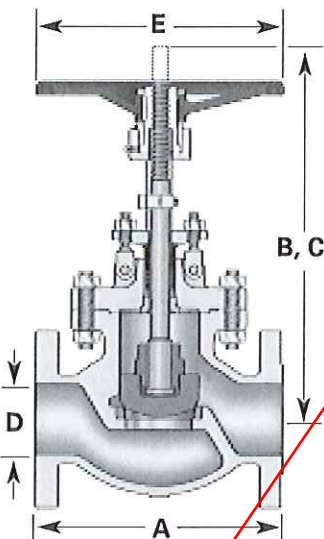
**GLOBE VALVE DIMENSIONS (CLASSES 150-600)**

SIZE	ASME 150 (PN 20)					ASME 300 (PN 50)					ASME 600 (PN 100)				
	in mm	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D
2	8.00	16.85	20.88	2.00	8	10.50	16.85	20.88	2.00	8	11.50	17.10	21.13	2.00	10
50	203	428	530	51	203.2	267	428	530	51	203	292	434	537	51	254
2½	8.50	17.10	21.25	2.50	10	11.50	17.10	21.25	2.50	10	13.00	18.67	22.88	2.50	10
65	216	434	540	64	254	292	434	540	64	254	330	474	581	64	254
3	9.50	18.42	22.75	3.00	10	12.50	18.42	22.75	3.00	10	14.00	20.19	24.13	3.00	14
80	241	468	578	76	254	318	468	578	76	254	356	513	613	76	356
4	11.50	20.88	26.18	4.00	14	14.00	20.88	26.18	4.00	14	17.00	23.88	29.25	4.00	24 <sup>(2)(3)</sup>
100	292	530	665	102	356	356	530	665	102	356	432	607	743	102	610
6	16.00	25.75	32.00	6.00	24	17.50	26.38	32.88	6.00	24 <sup>(2)(3)</sup>	22.00	31.22	37.88	6.00	24 <sup>(2)(3)</sup>
150	406	654	813	152	610	445	670	835	152	610	559	793	962	152	610
8	19.50	30.73	38.38	8.00	24	22.00	32.00	38.88	8.00	24 <sup>(2)(4)</sup>	26.00	41.75	57.88	7.88	(4)
200	495	780	975	203	610	559	813	988	203	610	660	1050	1470	200	(4)
10	24.50	39.25	46.75	10.00	24 <sup>(2)(3)</sup>	24.50	42.34	52.18	10.00	24 <sup>(2)(4)</sup>	31.00	47.16	59.00	9.75	(4)
250	622	997	1187	254	610	622	1075	1325	254	610	787	1198	1499	248	(4)
12	27.50	42.52	53.00	12.00	24 <sup>(2)(4)</sup>	28.00	46.19	62.75	12.00	(4)	-	-	-	-	-
300	699	1080	1346	305	610	711	1173	1594	305	(4)	-	-	-	-	-
14	31.00	54.21	65.44	13.25	(4)	33.00	54.21	72.00	13.25	(4)	-	-	-	-	-
350	787	1377	1662	337	(4)	838	1377	1829	337	(4)	-	-	-	-	-
16	36.00	59.94	72.63	15.25	(4)	34.00	59.94	76.00	15.25	(4)	Inclined cast classes 900-2500 globe valves also available				
400	914	1522	1845	387	(4)	863	1522	1930	387	(4)					
18	38.50	59.62	75.00	17.50	(4)	38.50	59.62	75.00	17.50	(4)					
450	978	1514	1905	444	(4)	978	1514	1905	444	(4)					

**CLASSES 900-1500**

SIZE	ASME 900 (PN 150)					ASME 1500 (PN 250)				
	in mm	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D	E	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D
2	14.50	19.75	25.00	1.88	18	14.50	19.75	25.00	1.88	18
50	368	502	635	48	457	368	502	635	48	457
3	15.00	24.09	30.50	2.88	14 <sup>(2)(3)</sup>	18.50	24.09	30.50	2.75	14 <sup>(2)(3)</sup>
80	381	612	775	73	356	470	612	775	70	356
4	18.00	27.50	35.38	3.88	18 <sup>(2)(3)</sup>	21.50	27.50	35.38	3.63	18 <sup>(2)(3)</sup>
100	457	699	899	99	457	546	699	899	92	457

(1) Height does not include actuators. (2) Impactor handwheel. (3) Gear actuator is optional. (4) Gear actuator.



Forged globe valves classes 900-2500 also available.

See page 32 & 33 for valve weights and CVs.

B = Center-to-Top, Open  
C = Dismantling Height

CLASS	FIGURE NUMBERS		
	GLOBE	STOP CHECK	NEEDLE
150	0074C	0084C	0094C
300	1074C	1084C	1094C
600	2074C	2084C	2094C
900	7074C	7084C	7094C
1500	3074C	3084C	3094C

**STANDARD MATERIALS**

PART	MATERIALS			
	WCB	WC6	WC9	CF8M
Body <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Bonnet <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Seat <sup>(1)(2)</sup>	Stellite 6 faced Carbon steel	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 F316
Disc	CA 15 or 13 CR faced A105	CA 15 or 13 CR faced F11	CA 15 or 13 CR faced F22	CF8M or F316
Disc nut	Carbon steel			SS 304 or 316
Stem <sup>(1)(3)</sup>	SS 410			SS 316 or 630
Backseat <sup>(1)(3)</sup>	SS 410			SS 316
Packing ring <sup>(1)</sup>	Graphite			
Gland stud	Gr. B or B7 <sup>(4)</sup>			F316, B8M or 630 <sup>(5)</sup>
Gland nut	Gr. 2H			Gr. 8M
Packing flange	Carbon steel			SS
Gland bushing	Carbon steel			SS
Bonnet stud	B7	B16		B8M or 630
Bonnet nut	Gr. 2H	Gr. 4		Gr. 8M
Hinge pin	Steel			SS
Gasket <sup>(1)</sup>	Spiral wound stainless steel/graphite			
Torque arm	Carbon steel			
Yoke bushing	Carbon steel			Stainless steel
Stem nut	A 439 Austenitic ductile iron Gr. D-2C			
Handwheel nut	Malleable iron or steel			
Handwheel <sup>(1)</sup>	Malleable iron or steel			

(1) Other materials available. (2) Stellite. (3) Hardened. (4) For eye bolts Gr.B, for studs B7 is used. (5) For eye bolts F316, for studs B8M or 630 is used.

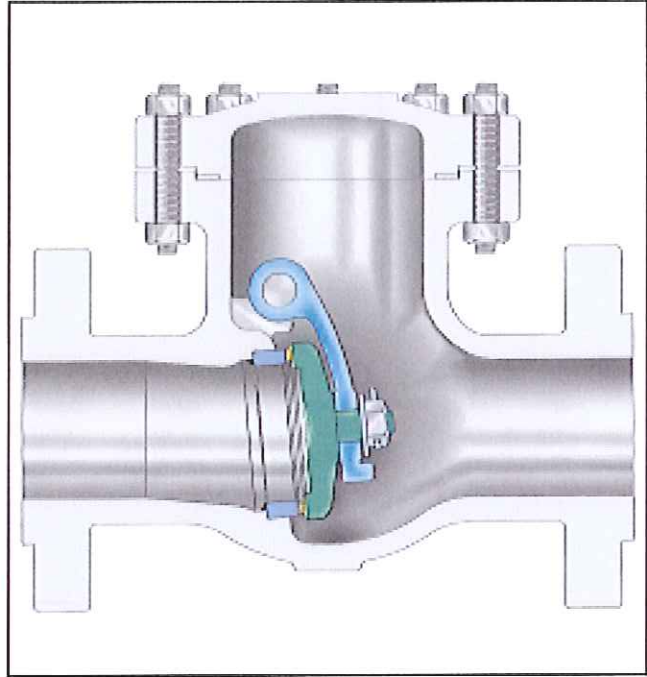
**DESIGN SPECIFICATIONS**

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS 1873
Pressure-temperature rating	ASME B16.34
Face-to-face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM





**CAST CARBON, STAINLESS OR ALLOY STEEL API 600  
SWING CHECK VALVES, 2–36" (50–900 mm)**  
ASME CLASSES 150, 300, 600, 900 AND 1500



CLASS	FIGURE NUMBER	CLASS	FIGURE NUMBER
150	0114C	900	7114C
300	1114C	1500	3114C
600	2114C		

**DESIGN FEATURES:**

- **Body and cover.** Precision machined castings. **Exclusive:** Disc shaft does not penetrate body.
- **Body and cover joint.** Accurately machined, fully-enclosed gasket (gasket materials on page 3).
- **Disc.** Robust one-piece construction to withstand the severe shock of check valve service. Hardfaced with 13 CR, Stellite 6, SS 316, or Monel, ground and lapped to mirror finish. Sizes 2–6" (50–150 mm) may have solid CA15 (13 CR) disc. SS 316 disc with Stellite 6 facing also available.
- **Disc assembly.** Disc is fastened securely to disc hanger with a lock nut and cotter pin. Disc is free to rotate to avoid localized wear. Disc hanger is supported on a sturdy disc carrier hinge pin of excellent bearing qualities. All parts are accessible from top for easy servicing.
- **Flanges.**  
Class 150/300: 1/8" raised face.  
Class 600: 1/4" raised face.  
Finish: 125–250 AARH for all valves.

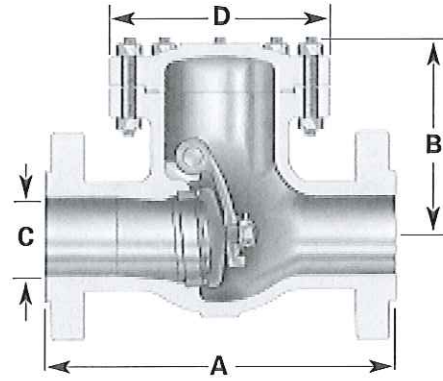
**STANDARD MATERIALS**

PART	MATERIALS			
	WCB	WC6	WC9	CF8M
Body <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Seat <sup>(1)(2)</sup>	Stellite 6 faced CS	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 faced F316
Hinge pin <sup>(1)(3)</sup>	SS 410			SS 630 or 660
Gasket <sup>(1)</sup>	Spiral wound stainless steel/graphite			
Cover stud	Gr. B7	B16		B8M or 630
Cover nut	Gr. 2H	Gr. 4		Gr. 8M
Cover <sup>(1)</sup>	WCB	WC6	WC9	CF8M
Washer	Commercial			
Disc <sup>(1)</sup>	CA 15 or 13 CR faced WCB	CA 15 or 13 CR faced WC6	CA 15 or 13 CR faced WC9	CF8M
Disc hanger	WCB	WC6	WC9	CF8M
Disc nut	Gr. 2H	Gr. 4		Gr. 8M

(1) Other materials available. (2) Stellite. (3) Hardened.

## DESIGN SPECIFICATIONS

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS1868
Pressure-temperature rating	ASME B16.34
Face-to-face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM



See page 32 & 33 for valve weights and CVs.

## CHECK VALVE DIMENSIONS

SIZE in mm	ASME 150 (PN 20)				ASME 300 (PN 50)				ASME 600 (PN 100)				ASME 900 (PN 150)				ASME 1500 (PN 250)				
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	
2 50	8.00 203	5.75 146	2.00 51	6.75 171	10.50 267	6.00 152	2.00 51	6.75 171	11.50 292	6.25 159	2.00 51	6.75 171	14.50 368	9.50 241	1.88 48	8.63 219	14.50 368	9.50 241	1.88 48	8.63 219	
2½ 65	8.50 216	6.25 159	2.50 64	6.75 171	11.50 292	6.25 159	2.50 64	6.75 171	13.00 330	6.50 165	2.50 64	7.50 191	16.50 419	10.00 254	2.25 57	9.25 235	16.50 419	10.00 254	2.25 57	9.25 235	
3 80	9.50 241	7.75 197	3.00 76	8.50 216	12.50 318	7.75 197	3.00 76	8.50 216	14.00 356	8.75 222	3.00 76	9.75 248	15.00 381	10.50 267	2.88 73	10.50 267	18.50 470	11.50 292	2.75 70	10.50 267	
4 100	11.50 292	8.75 222	4.00 102	10.25 260	14.00 356	8.75 222	4.00 102	10.25 260	17.00 432	9.25 235	4.00 102	12.00 305	18.00 457	11.75 299	3.88 99	12.25 311	21.50 546	12.00 305	3.63 92	12.25 311	
6 150	14.00 356	10.75 273	6.00 152	12.50 318	17.50 445	10.75 273	6.00 152	12.50 318	22.00 559	11.50 292	6.00 152	15.75 400	24.00 610	15.00 381	5.75 146	15.25 387	27.75 705	16.50 419	5.38 137	16.00 406	
8 200	19.50 495	12.75 324	8.00 203	15.75 400	21.00 533	12.75 324	8.00 203	15.75 400	26.00 660	13.50 343	7.88 200	15.75 400	29.00 737	19.25 489	7.50 191	18.38 467	32.75 832	21.00 533	7.00 178	20.75 527	
10 250	24.50 622	15.50 394	10.00 254	18.50 470	24.50 622	16.25 413	10.00 254	18.50 470	31.00 787	16.75 425	9.75 248	19.50 495	-	-	-	-	-	-	-	-	
12 300	27.50 699	17.00 432	12.00 305	20.50 521	28.00 711	17.00 432	12.00 305	20.50 521	33.00 838	18.50 470	11.75 298	22.50 572	-	-	-	-	-	-	-	-	
14 350	31.00 787	19.63 499	13.25 337	23.00 584	33.00 838	19.63 499	13.25 337	23.00 584	35.00 889	20.93 532	12.88 327	26.25 667	-	-	-	-	-	-	-	-	
16 400	34.00 864	22.00 559	15.25 387	26.50 673	34.00 864	22.50 572	15.25 387	26.50 673	39.00 991	23.38 594	14.75 375	28.25 718	-	-	-	-	-	-	-	-	
18 450	38.50 978	25.00 635	17.13 435	28.50 724	38.50 978	25.00 635	17.13 435	28.50 724	43.00 1092	28.67 728	16.50 419	31.50 800	-	-	-	-	-	-	-	-	
20 500	38.50 978	26.50 673	19.00 483	31.50 800	40.00 1016	26.50 673	19.00 483	31.50 800	47.00 1194	27.12 689	18.25 464	35.25 895	-	-	-	-	Other sizes on application.				-
24 600	51.00 1295	31.25 794	23.25 591	37.00 940	53.00 1346	31.25 794	23.25 591	37.00 940	55.00 1397	35.69 907	22.00 559	40.25 1022	-	-	-	-					-
26 650	51.00 1295	32.63 829	25.00 635	37.25 946	53.00 1346	32.63 829	25.00 635	37.25 946	-	-	-	-	-	-	-	-	-	-	-	-	
28 700	57.00 1448	36.55 928	27.00 686	42.00 1067	59.00 1499	36.55 928	27.00 686	42.00 1067	-	-	-	-	-	-	-	-	-	-	-	-	
30 750	60.00 1524	36.89 937	29.25 743	44.50 1130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
36 900	77.00 1956	41.78 1061	35.25 895	53.00 1346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

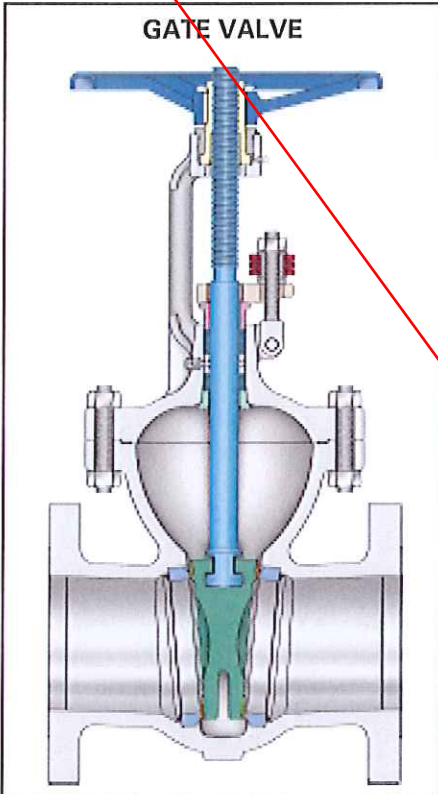
See catalog VEL-PS for Classes 900 and 1500  
FORGED STEEL CHECK VALVES.



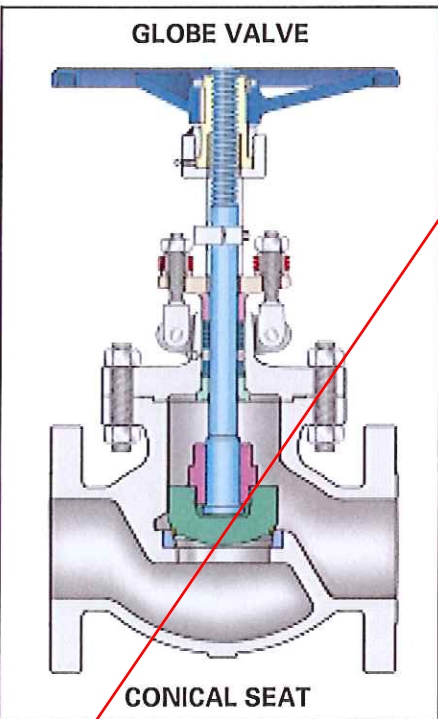


# CAST STEEL API 600 GATE, 2– 60" (50– 1500 mm) & GLOBE VALVES, 2–16" (50– 400 mm)

ASME CLASSES 150, 300, 600, 900 AND 1500 WITH SINGLE OR DOUBLE PACKING, LEAK-OFF AND LIVE-LOADING  
**LIVE-LOADED VALVES**



GATE VALVE



GLOBE VALVE

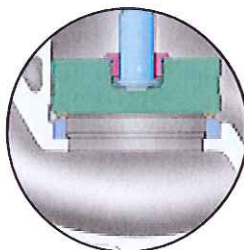
CONICAL SEAT

## DESIGN FEATURES:

- Safer and tighter stem seal.
- Short and narrow packing chamber improves sealing effectiveness.
- Long-life leakproof packing chamber with double packing and leak-off or single set packing.
  - Double packing:** two sets of graphite packing rings compressed to 4000 psi. A lantern ring and leak-off provide option for removal of leakage, if any, from lower packing set.
  - Single set packing:** three or four graphite rings between braided rings, 80-90 lbs./cu. ft. density.
- Live-loading. Two sets of Belleville springs keep stem tight for long periods of time without maintenance.
- Two-piece stem drive is renewable in-line.
- Stronger leakproof body-bonnet joint.
  - Class 150:** Corrugated graphite-filled steel gasket.
  - Class 300-600:** Fully-encased spiral wound graphite-filled stainless steel gasket.
- Classes 300, 600, 900 and 1500 have round bonnet and encased gasket
- Welded-in seats hardfaced with Stellite 6.
- Flexible one-piece wedge, hardfaced with Stellite 6 or 13 CR (solid 13 CR up to 8").
- 13 CR hardened stem with mirror-like, burnished finish for longer packing life.

For dimensions on Gate valves see page 19.  
For dimensions on Globe valves see page 21.  
For other Globe valve design features see page 20.

Most sizes and pressure classes have conical seats.



FLAT SEAT

Choice of flat or conical seat is manufacturer's option unless specified by customer.

For BELLOWS SEAL GATE & GLOBE VALVES ½-12" (15-300 mm) see VEL-BS catalog.





# HF ACID GATE, GLOBE AND CHECK VALVES CARBON STEEL AND MONEL 2–36" (50–900 mm)

PRESSURE CLASSES 150–300

## HYDROFLUORIC ACID PROCESSING VALVES

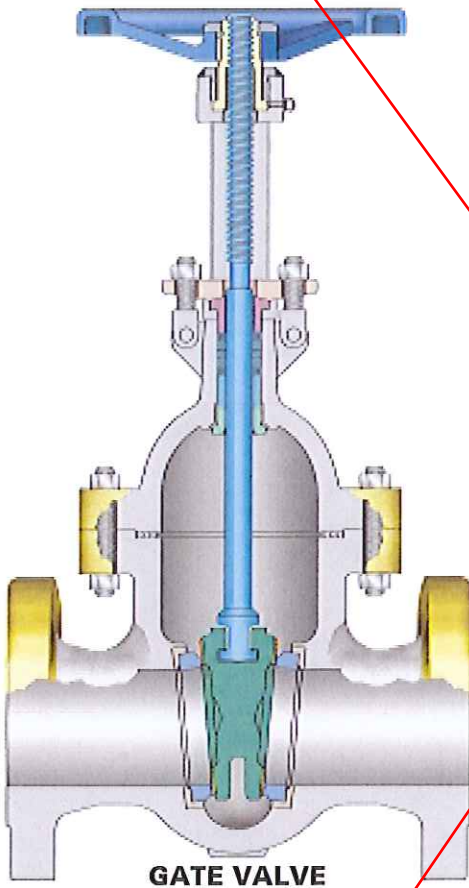


*Hydrofluoric Acid is one of the strongest and most corrosive acids. Industries using HF acid in their manufacturing process have placed an increasing emphasis on safety in using this product.*

Fugitive emissions are a critical factor in the performance of any HF Acid valve and at Velan, we have been committed to reducing emissions beyond the industry standards, and providing the highest quality products to our customers for over 50 years. Velan offers a comprehensive line of Phillips approved and UOP listed API 600 gate, globe and check HF acid valves with several benefits.

### DESIGN FEATURES:

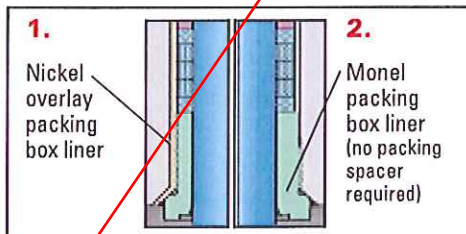
- **Nickel plated overlay on backseat in stem hole** to combat severe alkylation conditions.
- **HF acid detecting paint** to ensure valve integrity.
- **Stem** - made from solid age hardened K-Monel 500 for increased strength and corrosion resistance.
- **Casting design**  
X-ray "RT" quality castings as per B16.34 acceptance standards. Velan is one of the first valve manufacturers to have the MAGMASOFT® computer casting simulation program to ensure high quality levels.
- **Bonnet Joint** - accurately machined for better service life.
- **Seal Welded Seats in Monel**  
Monel seats are welded-in for ensuring zero leakage behind and around the seat and then ground and lapped after welding using state of the art technology to prevent in-service corrosion.
- **Body/Bonnet wall thickness** to API 600.
- **Velan's low-fugitive emissions guarantee**  
Based on extensive laboratory testing and field experience.



**GATE VALVE**

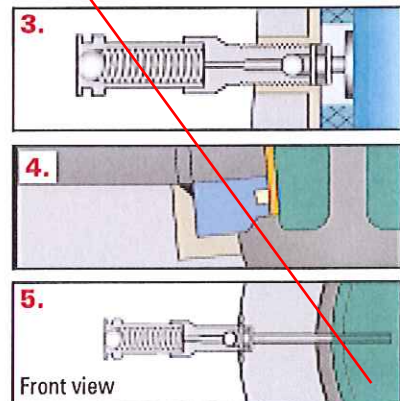
### OPTIONAL DESIGN FEATURES

- 1. Nickel overlay packing box liner**
- 2. Packing box in Monel**  
– to combat severe alkylation conditions in this critical area.



- 3. Grease injector & lantern ring**  
– where grease injection is a requirement (UOP only).
- 4. PTFE seat insert** – resists abrasion and corrosion
- 5. PTFE seat seal grease injection**  
– when required (UOP only)

For more information on  
VELAN HF ACID GATE, GLOBE  
& CHECK VALVES  
see VEL-HFA catalog.

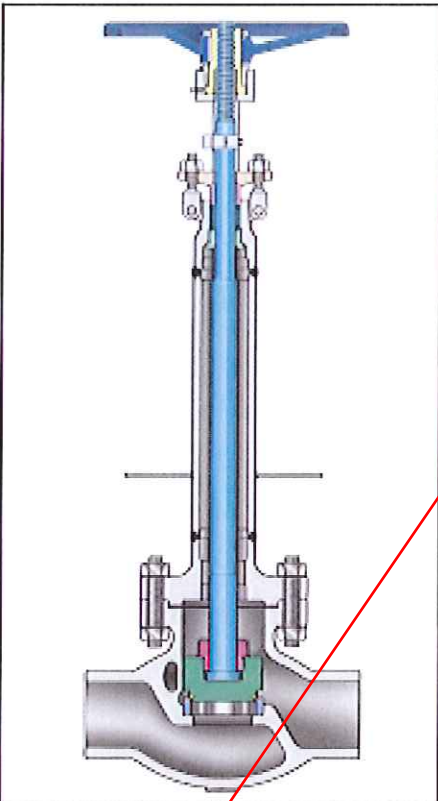
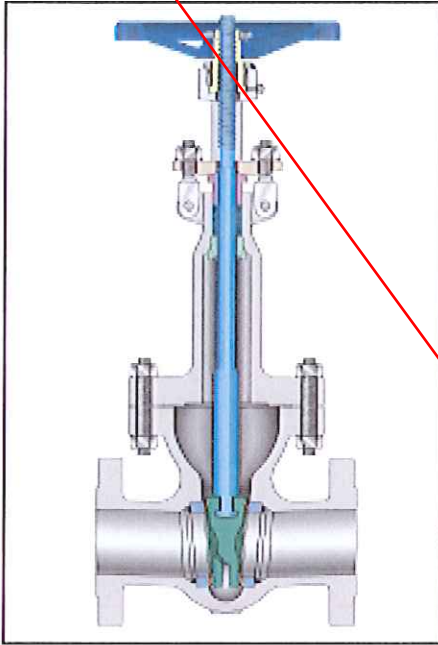






**CAST CRYOGENIC GATE, GLOBE AND CHECK VALVES**  
**AUSTENITIC STAINLESS STEEL 2–30" (50–750 mm)**  
 PRESSURE CLASSES 150–1500

**CAST STEEL CRYOGENIC VALVES**



The production, transport and storage of liquefied gases such as oxygen, nitrogen, argon, natural gas, hydrogen or helium (down to -425°F), presents several technical problems. Velan specially-adapted extended bonnet cast valves offer safe and efficient service.

**MATERIALS:**

- **Body and bonnet:** Austenitic stainless steel castings used for bodies and bonnets offer excellent impact strength, minimal heat loss and protection against corrosion.
- **Stem:** Austenitic stainless steel. To reduce galling, stems are also offered in A479 grade XM-19 with high tensile strength even at extreme low temperatures, excellent low friction and galling-free movement at points of stem contact.
- **Wetted parts:** All Austenitic stainless steel and Stellite 6.
- **Stem nut/yoke bushing:** Austenitic ductile iron Gr. D-2C.
- **Packing:** PTFE or graphite packing protected from freezing by a column of insulating gas.
- **Seating faces:** Stellite 6 is used to prevent seizing and galling. When extremely tight shutoff is required, globe and check valves are supplied with Neoflon, PTFE or other soft inserts.
- **Bolting:** Strain-hardened Austenitic stainless steel.
- **Lubrication of stem nut:** Exxon Nebula Lubriplate No. 930-AA or Shell Darina EPI or equivalent.

**DESIGN FEATURES:**

- **Extended bonnets** with sufficient gas column length, usually specified by customer, are supplied for all valves to keep stem packing at sufficient distance away from the cold fluid to remain functional.
- **Flexible wedges** with Stellite seating faces for cryogenic service.
- **Neoflon inserts** are available for globe, piston, and swing check discs.
- **Cleaning:** All cryogenic valves are thoroughly degreased and cleaned and pipe ends are sealed to prevent contamination.

**TABLE OF LIQUEFIED GASES**

Type	Boiling Point		Liquid Density lb./ft. <sup>3</sup>	Type	Boiling Point		Liquid Density lb./ft. <sup>3</sup>
	°C	°F			°C	°F	
Natural gas (LNG)	-168	-270	26	Air	-194.4	-318	57.87
Methane (CH <sub>4</sub> )	-161.5	-258	26.20	Nitrogen (N <sub>2</sub> )	-195.8	-320	50.45
Oxygen (O <sub>2</sub> )	-182.9	-296	71.20	Hydrogen (H <sub>2</sub> )	-252.7	-423	4.43
Argon (Ar)	-185.9	-303	87.40	Helium (He)	-268.9	-452	7.82
Carbon Dioxide (CO <sub>2</sub> )	-78.5	-109	50.60	Absolute zero	-273.16	-460	-

For more details on Cryogenic Gate, Globe & Check Valves see VEL-CRYO catalog.



# VELAN

## BLOCK & BLEED GATE VALVES FOR CHEMICAL AND PETROCHEMICAL INDUSTRIES



Valve shown has a special "Pipeline" bonnet.

Standard bonnets with regular yoke also available.

### DESIGN FEATURES:

- **Positive shutoff** with visual or remote proof of seat tightness.
- **No product contamination** absolute tightness.
- **Dual seating.** Elastomer-to-metal seat plus metal-to-metal secondary seal.
- **Fire Safe.** The metal-to-metal seat ensures tightness if the secondary elastomer seat is damaged during the fire.
- **PTFE seat insert** resists corrosive media, has high abrasion resistance and operates up to +400°F (204°C).
- **Seat hardfaced with SS 410** and seal welded.

### AVAILABLE RANGE

Velan block and bleed gate valves are available in the following sizes:

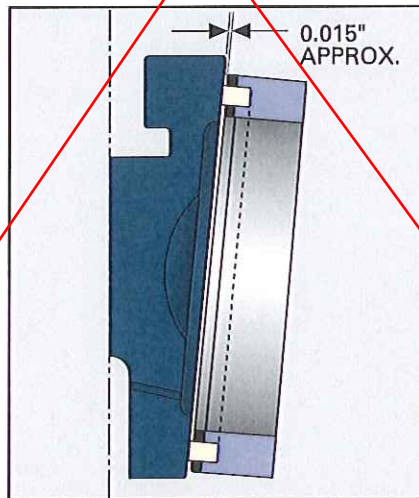
Class 150: carbon steel, flanged or butt weld, 2–60" (50–1500 mm).

Class 300: carbon steel, flanged or butt weld, 2–36" (50–900 mm).

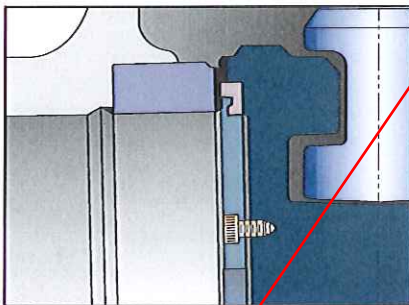
### EASY IN-LINE VALVE RESEATING

Seats are hardfaced with SS 410 and welded-in for lifetime service. A worn soft seat insert can easily be replaced after removal of wedge from the body. Shut off flow and relieve pressure before replacing the seat insert.

### STYLE A 2–12" SEAT - WEDGE DESIGN



### STYLE B 14–60" SEAT - WEDGE DESIGN\*



\*14–24" (350–600 mm) may be STYLE A or B at manufacturer's option

### SPECIFICATIONS FOR SEAT INSERT MATERIALS

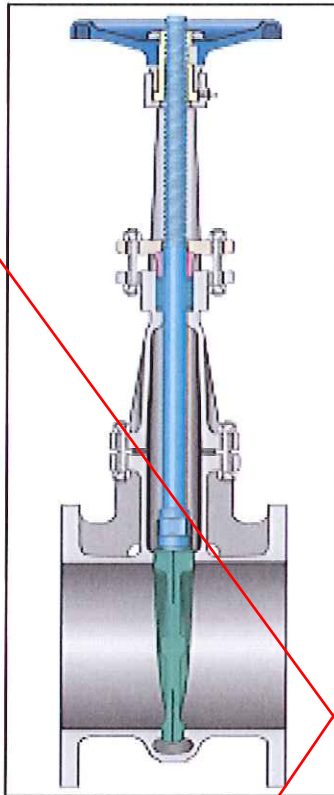
TYPE	MAXIMUM OPERATING TEMPERATURE	NOT RECOMMENDED
PTFE	-100°F to +400°F -73°C to +204°C	Fluorinated hydrocarbons
Buna-N	-20°F to +200°F -29°C to +93°C	Halogenated hydrocarbons, Nitrobenzene, Aniline, Hydraulic fluids, Skydrol, Cellulube, Pydrazil, Acetone
Viton	-20°F to +400°F -29°C to +240°C	Acetone, Anines, Anhydrous ammonia, Hot Hydrofluoric acid, Ester, Ethers





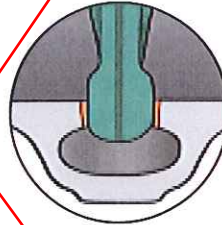
# CAST STAINLESS STEEL GATE VALVES API 603 INTEGRAL SEAT, 2–24", (50–600 mm)

FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34  
WITH FLEXIBLE WEDGE



## STANDARD MATERIALS

PART	MATERIAL
Body	A 351 Gr. CF8M
Bonnet	A 351 Gr. CF8M
Wedge	A 351 Gr. CF8M
Stem	Gr. 316
Gland	Gr. 316
Gland flange	A 351 Gr. CF8M
Yoke bushing	Gr. 316
Handwheel	Malleable iron (painted)
Handwheel nut	Carbon steel
Body/bonnet stud	Gr. B8M
Body/Bonnet nut	Gr. 8M
Gland stud	Gr. 304
Gland nut	Gr. 8M
Spring pin	Stainless steel
Gland packing	SX or SY PTFE GS, GX or GY Graphite
Gasket	SX or SY PTFE with stainless wire mesh GS, GX or GY Graphite with stainless steel foil
Name plate	Stainless steel
Stem nut	A 439 Austenitic ductile iron Gr. D-2C

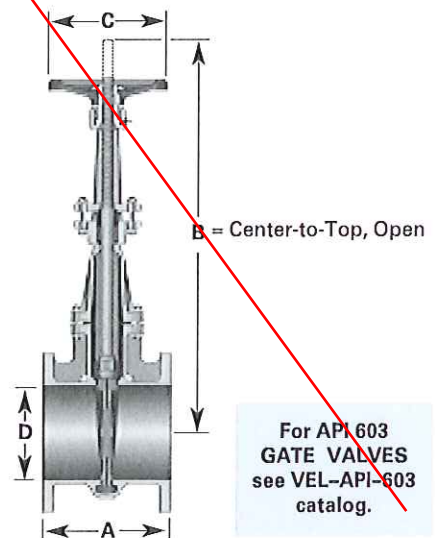


**Optional integral  
Stellited seat face  
available for longer  
service life.**

## DIMENSIONS AND WEIGHTS

SIZE in mm	FLANGED, ASME 150 (PN 20)					FLANGED, ASME 300 (PN 50)				
	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	7.00 178	13.00 330	8.00 203	2.00 51	30 13.6	8.50 216	14.00 356	8.00 203	2.00 51	44 20.0
2½ 65	7.50 191	15.75 400	8.00 203	2.50 64	46 20.9	9.50 241	16.75 425	8.00 203	2.50 64	60 27.2
3 80	8.00 203	17.75 451	8.00 203	3.00 76	52 23.6	11.13 283	18.50 470	8.00 203	3.00 76	86 39.0
4 100	9.00 229	21.50 546	10.00 254	4.00 102	80 36.4	12.00 305	22.63 575	10.00 254	4.00 102	134 60.8
6 150	10.50 267	28.25 718	10.00 254	6.00 152	135 61.2	15.88 403	29.75 756	10.00 254	6.00 152	247 112.07
8 200	11.50 292	36.50 927	14.00 356	8.00 203	222 100.9	16.50 419	39.19 995	14.00 356	8.00 203	390 177.3
10 250	13.00 330	45.00 1143	18.00 457	10.00 254	324 147.3	18.00 457	45.50 1150	18.00 457	10.00 254	630 285.8
12 300	14.00 356	60.25 1530	18.00 457	12.00 305	472 214.1	19.75 502	65.38 1661	18.00 457	12.00 305	880 400.0
14 350	15.00 381	65.00 1651	21.63 549	13.25 337	685 310.7	—	—	—	—	—
16 400	16.00 406	75.00 1905	23.63 600	15.25 387	1000 453.5	—	—	—	—	—
18 450	17.00 432	81.00 2067	29.50 749	17.25 438	1300 589.6	—	—	—	—	—
20 500	18.00 457	93.00 2362	29.50 749	19.25 489	1500 680.3	—	—	—	—	—
24 600	20.00 508	107.00 2718	31.50 800	23.25 591	2000 907.0	—	—	—	—	—

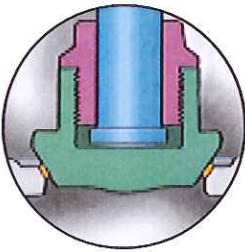
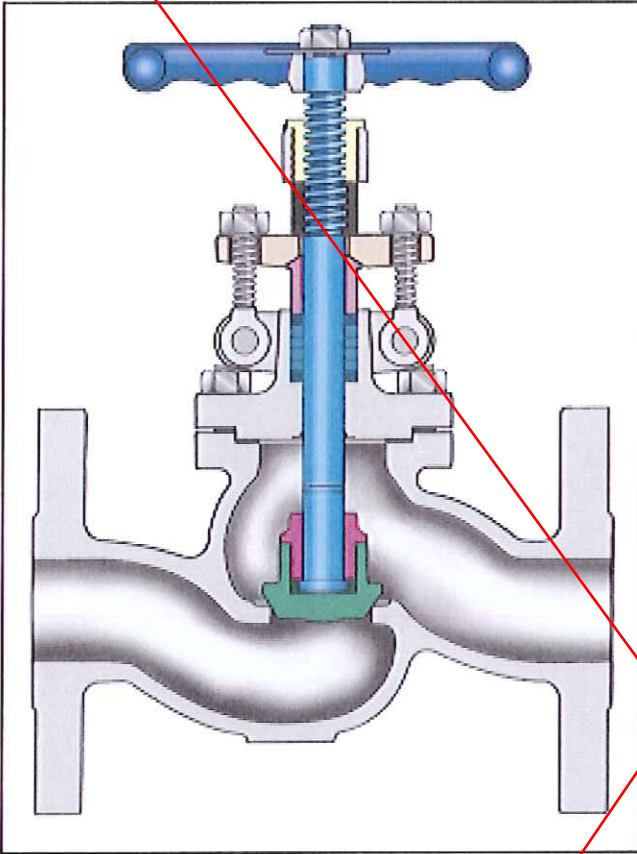
CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0064C-13SX or GX	0064C-13SY, GS or GY
300	1064C-13SX or GX	1064C-13SY, GS or GY



For API 603  
GATE VALVES  
see VEL-API-603  
catalog.



**CAST STAINLESS STEEL GLOBE VALVES API 603  
INTEGRAL SEAT, 2–6" (50–150 mm)  
FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34**



**Optional integral  
Stellited seat face  
available for longer  
service life.**

**STANDARD MATERIALS**

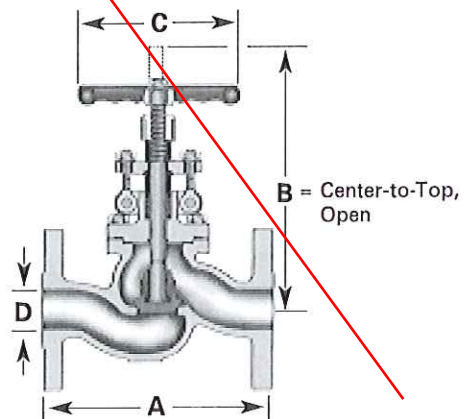
PART	MATERIAL	
Body	A 351 Gr. CF8M	
Bonnet	A 351 Gr. CF8M	
Disc	A 351 Gr. CF8M	
Stem	Gr. 316	
Disc nut	A 351 Gr. CF8M	
Gland pin	Gr. 316	
Gland	Gr. 316	
Gland flange	A 351 Gr. CF8M	
Yoke bushing	Austenitic ductile iron Gr. D-2C	
Handwheel	Malleable iron	
Handwheel nut	Carbon steel	
Name plate	Stainless steel	
Bonnet stud	Gr. B8M	
Bonnet nut	Gr. 8M	
Gland stud	Gr. 304	
Gland nut	Gr. 8M	
Gland packing	SX or SY GS, GX or GY	PTFE Graphite
Gasket	SX or SY GS, GX or GY	PTFE with stainless wire mesh Graphite with stainless steel foil

CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0074C-13SX or GX	0074C-13SY, GS or GY
300	1074C-13SX or GX	1074C-13SY, GS or GY

For API 603  
GLOBE VALVES  
see VEL-API-603  
catalog.

**DIMENSIONS AND WEIGHTS**

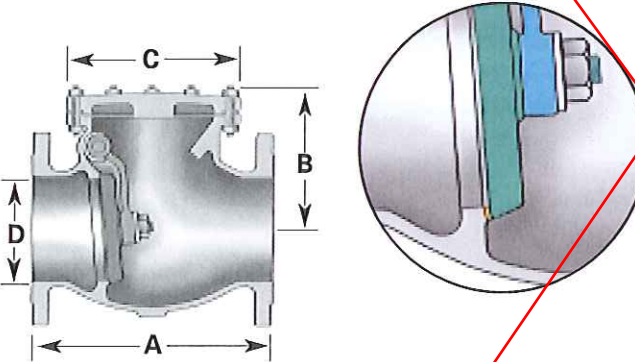
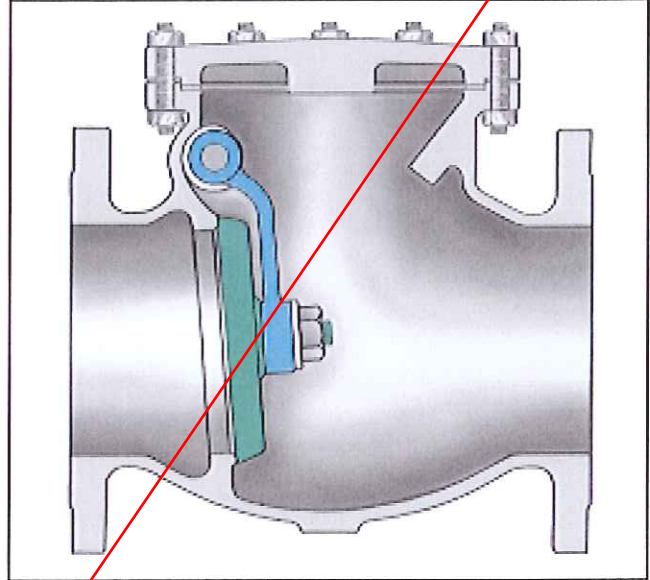
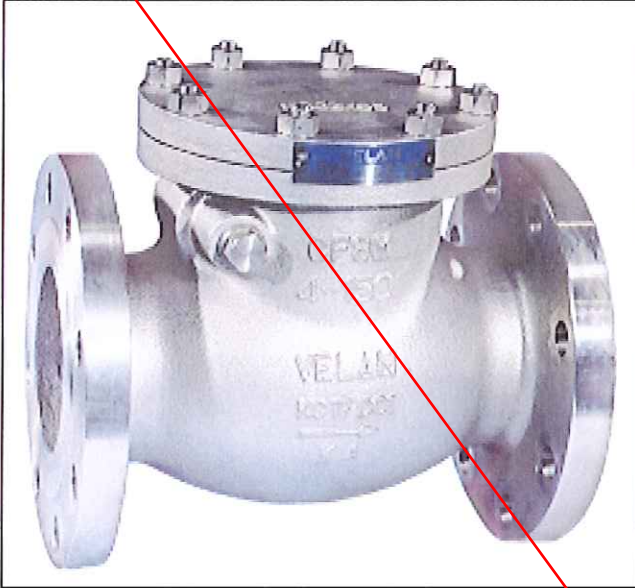
SIZE in mm	FLANGED, ASME 150 (PN 20)					FLANGED, ASME 300 (PN 50)				
	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	8.00 203	9.50 241	8.00 203	2.00 51	27 12.3	10.50 267	11.06 281	8.00 203	2.00 51	45 20.4
2½ 65	8.50 216	10.44 265	10.00 254	2.50 64	40 18.2	11.50 292	12.25 311	10.00 254	2.50 64	70 31.7
3 80	9.50 241	12.19 310	10.00 254	3.00 76	50 22.7	12.50 318	13.75 349	10.00 254	3.00 76	87 39.5
4 100	11.50 292	14.81 376	10.00 254	4.00 102	83 37.6	14.00 356	16.44 418	10.00 254	4.00 102	130 59.0
6 150	16.00 406	19.19 487	10.00 254	6.00 152	154 69.9	17.50 445	21.38 543	14.00 356	6.00 152	252 114.3







**CAST STAINLESS STEEL SWING CHECK VALVES API 603  
INTEGRAL SEAT, 2–12" (50–300 mm)  
FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34**



**Optional integral  
Stellited seat  
face available  
for longer  
service life.**

For API 603 CHECK VALVES  
see VEL-API-603 catalog.

**DIMENSIONS AND WEIGHTS**

SIZE in mm	FLANGED, ASME 150 (PN 20)					FLANGED, ASME 300 (PN 50)				
	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	8.00 203	4.00 102	4.00 <sup>(1)</sup> 102	2.00 51	21 9.5	10.50 267	4.75 121	5.00 <sup>(1)</sup> 127	2.00 51	42 19.1
2½ 65	8.50 216	4.50 114	5.50 140	2.50 64	30 13.6	11.50 292	5.50 140	6.50 165	2.50 64	62 28.2
3 80	9.50 241	5.00 127	6.75 172	3.00 76	43 19.5	12.50 318	6.25 159	8.00 203	3.00 76	80 36.4
4 100	11.50 292	5.75 146	8.00 203	4.00 102	68 30.9	14.00 356	7.00 178	9.00 229	4.00 102	118 53.6
6 150	14.00 356	7.56 192	10.00 254	6.00 152	128 58.2	17.50 445	8.63 219	11.00 279	6.00 152	212 96.4
8 200	19.50 495	9.50 241	13.25 337	8.00 203	226 102.7	21.00 533	10.63 270	13.00 330	8.00 203	330 150.0
10 250	24.50 622	10.75 273	16.00 406	10.00 254	317 143.8	24.50 622	12.00 305	17.00 432	10.00 254	528 240.0
12 300	27.50 699	13.00 330	19.00 482	12.00 305	530 240.9	28.00 711	15.00 381	20.00 508	12.00 305	802 364

(1) Square.

CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0114C-13SX or GX	0114C-13SY, GS or GY
300	1114C-13SX or GX	1114C-13SY, GS or GY

**STANDARD MATERIALS**

PART	MATERIAL
Body	A 351 Gr. CF8M
Cover	A 351 Gr. CF8M
Disc	A 351 Gr. CF8M
Hinge	A 351 Gr. CF8M
Pin	Gr. 316
Plug	Gr. 316
Disc nut	Gr. 8M
Washer	Gr. 316
Cotter pin	Gr. 316
Cover stud	Gr. B8M
Cover nut	Gr. 8M
Gasket	SB, SX or SY
	GB, GS, GX or GY
	PTFE gasket and packing
	Graphite gasket and packing
Nameplate	Stainless steel



# ACCESSORIES



## GEAR ACTUATORS

Gearing is generally applied to valves to make operation easier. The gearing may be of the spur, bevel or worm type—any of which may be applied to Velan valves.

The gears and gear brackets may be either cast iron or cast steel and may have cast or cut teeth, depending on the loads and the application. Gearing is too often neglected when valve operation is considered, resulting in unsatisfactory operation requiring expensive changes.

	CLASS	OPTIONAL	STANDARD
GATE	150	6–24" (150–600 mm)	30–60" (750–1500 mm)
	300	6–16" (150–400 mm)	18–36" (450–900 mm)
	600	4–12" (100–400 mm)	14–36" (350–900 mm)
	900	3–6" (80–150 mm)	8–10" (200–250 mm)
	1500	3–4" (80–100 mm)	6–10" (150–250 mm)
GLOBE	150	6–12" (150–300 mm)	14–16" (350–400 mm)
	300	6–12" (150–300 mm)	14–16" (350–400 mm)
	600	4–10" (100–250 mm)	—
	900	2–4" (50–100 mm)	—
	1500	2–4" (50–100 mm)	—



## ELECTRIC ACTUATORS

Motorized controls may be applied to valves of almost any size for operation in practically any position or location.

All units, whether installed directly on a valve or on a floor stand, can be manually operated in case of power failure. The units are available for either alternating or direct current.

Motor units supplied by Velan are the high torque type with windings impregnated to resist both oil and moisture. They are completely weather-proof, explosion-proof (optional) and dust and steam tight. Various sizes and styles are available for different applications, and systems and can be varied to fit special requirements.

## CHAIN WHEELS

Chain wheels are available for all types of Velan cast steel valves. They may be substituted for a plain handwheel or may be used in addition to the existing handwheel.



## CYLINDER ACTUATORS

The most commonly-used cylinders are actuated by air, but oil and water types are also available if required. In all designs, the valve stem normally serves as a piston rod with disc fastened directly

to them. Tail rods are also supplied as standard equipment to serve as position indicators and for emergency opening. Handwheels and gear heads can be mounted on top of cylinders for operation in an emergency which may arise due to the loss of operating medium in the cylinder.

Velan cylinders can be furnished with mounting pads for one of the commercial cylinders or valve positioners which provide throttling control. High pressure cylinders are also available for specific applications.

## VALVE ACTUATOR SIZING

The Velan philosophy for selecting an actuator is to calculate the required thrust and torque to operate the valve at the required service conditions. A reasonable margin of excess actuator capability over that required is always allowed for in the final actuator selection, but grossly oversized actuators are avoided.

Because of the wide variations in system operating conditions, actuator sizing is based on the following:

ACTUATOR TYPE	LINE PRESSURE	DIFFERENTIAL PRESSURE (CLOSED)	POWER SUPPLY
ELECTRIC	Specified by customer	Specified by customer	Voltage, type, phase and frequency specified by customer
PNEUMATIC	Specified by customer	Specified by customer	Air pressure specified by customer
HYDRAULIC	Specified by customer	Specified by customer	Hydraulic pressure specified by customer
HANDWHEEL/GEAR ACTUATED	70% of CWP <sup>(1)</sup> unless otherwise advised by customer	70% of CWP <sup>(1)</sup> unless otherwise advised by customer	200 lb. rimpull <sup>(2)</sup> unless otherwise advised by customer

(1) CWP = cold working pressure per ASME B16.34 at 100°F (e.g., Class 150, CWP = 285 psig, 70% of CWP = 200 psig).

(2) Rimpull is defined as the total tangential force acting on the handwheel (e.g., 200 lb. rimpull requires 100 lb force per hand). This rimpull figure is given for closing/opening conditions. For running conditions (travel from open to closed or vice versa), the rimpull is considerably less. For details, contact the company.

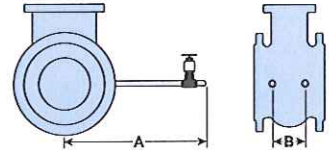
## FLOOR STANDS

Floor stands are available in a number of sizes, and the size to be used depends on the stem size and stem load of the valve.



# BYPASSES

AVAILABLE FOR ALL VELAN CAST STEEL VALVES  
IN ACCORDANCE WITH MSS-SP45 - SERIES A  
API 600 GLOBE (Note: Dimensions are in inches)

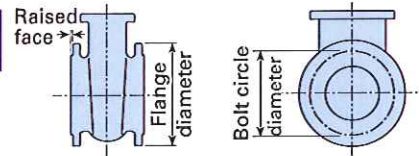


SIZE in	CLASS 150				CLASS 300				CLASS 600			
	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B
3	1/2	13.00	1/2	6.38	1/2	11.50	1/2	6.13	1/2	13.00	1/2	8.25
4	1/2	13.00	1/2	7.50	1/2	16.50	1/2	7.00	1/2	15.00	1/2	9.50
6	3/4	11.13	3/4	11.00	3/4	14.75	3/4	11.00	3/4	13.00	3/4	11.00
8	3/4	11.50	3/4	14.00	3/4	13.00	3/4	14.00	3/4	13.00	3/4	11.25
10	1	18.00	1	14.88	1	18	1	15.00	—	—	—	—
12	1	18.00	1	19.00	1	18	1	18.00	—	—	—	—
14	1	18.00	1	19.50	1	18	1	19.50	—	—	—	—
16	1	18.00	1	24.00	1	18	1	24.00	—	—	—	—

API 600 GATE (Note: Dimensions are in inches)

SIZE in	CLASS 150				CLASS 300				CLASS 600			
	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B
3	1/2	10.50	1/2	4.75	1/2	12.25	1/2	6.25	1/2	12.31	1/2	6.25
4	1/2	13.00	1/2	5.63	1/2	13.00	1/2	6.50	1/2	14.00	1/2	6.50
6	3/4	14.00	3/4	6.13	3/4	14.00	3/4	9.00	3/4	15.00	3/4	9.00
8	3/4	17.00	3/4	6.81	3/4	17.00	3/4	10.00	3/4	17.38	3/4	10.00
10	1	18.00	1	7.69	1	18.00	1	11.00	1	18.50	1	11.00
12	1	18.00	1	8.13	1	18.00	1	12.50	1	18.50	1	12.50
14	1	23.00	1	9.00	1	18.50	1	16.00	1	18.50	1	19.13
16	1	24.00	1	10.00	1	18.50	1	15.50	1	20.50	1	20.00
18	1	26.63	1	12.00	1	19.50	1	14.00	1	20.50	1	24.00
20	1	26.63	1	12.00	1	19.50	1	16.00	1	20.50	1	24.00
24	1	28.75	1	12.25	1	22.50	1	18.25	1	22.50	1	32.00
30	1	33.63	1	14.00	1	26	1	24.00	1	27	1	36.00
36	1	34.00	1	15.25	1	28	1	50.00	1	30	1	35.00
42	1	32.00	1	18.00	—	—	—	—	—	—	—	—
48	1	38.00	1	22.00	—	—	—	—	—	—	—	—
60	1	44.00	1	24.00	—	—	—	—	—	—	—	—

# FLANGES, WEIGHTS & CV FLOW COEFFICIENTS



API 600 CAST STEEL VALVES CLASS 150  
DRILLED AND FACED AS FOLLOWS: 2-24" ASME B16.5<sup>(1)</sup>

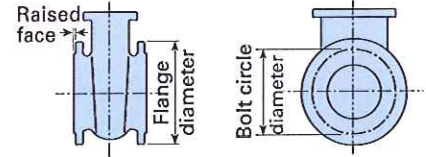
ASME CLASS	DIMENSIONS IN INCHES						WEIGHT IN LBS.						CV FLOW FLOW COEFFICIENTS		
	SIZE in	FLANGE DIAM.	BOLT CIRCLE DIAM.	HOLE DIAM.	QTY. HOLES	DIAM. BOLTS	GATE		GLOBE		SWING		GATE	GLOBE	CHECK
							BW	FL	BW	FL	BW	FL			
150 1/16 RAISED FACE	2	6.00	4.75	0.75	4	3/8	42	48	48	55	31	40	260	35	95
	2 1/2	7.00	5.50	0.75	4	3/8	50	59	54	58	35	44	420	60	150
	3	7.50	6.00	0.75	4	3/8	67	78	82	102	59	78	625	92	220
	4	9.00	7.50	0.75	8	3/8	97	117	120	152	98	121	1150	180	410
	6	11.00	9.50	0.88	8	3/8	180	198	240	280	179	212	2650	430	950
	8	13.50	11.75	0.88	8	3/8	278	319	405	435	314	360	4850	810	1750
	10	16.00	14.25	1.00	12	3/8	456	515	500	550	513	586	7750	1400	2800
	12	19.00	17.00	1.00	12	3/8	646	738	1050	1200	602	823	11,500	1950	4100
	14	21.00	18.75	1.13	12	1	875	954	1700	1850	765	980	14,000	2500	6200
	16	23.50	21.25	1.13	16	1	1120	1200	2300	2500	1120	1300	19,000	3400	8400
	18	25.00	22.75	1.25	16	1 1/4	1485	1570	2640	2850	1450	1660	24,000	4500	11,000
	20	27.50	25.00	1.25	20	1 1/4	1825	1910	—	—	1700	2050	31,000	—	13,500
	24	32.00	29.50	1.38	20	1 1/4	2870	2960	—	—	2900	3300	45,000	—	20,000
	26 <sup>(1)</sup>	34.25	31.75	1.38	24	1 1/2	3600	3700	—	—	3600	4000	53,000	—	23,500
	28 <sup>(1)</sup>	36.50	34.00	1.38	28	1 1/2	4400	4500	—	—	4300	5000	62,000	—	28,000
	30 <sup>(1)</sup>	38.75	36.00	1.37	28	1 1/2	4705	4750	—	—	6300	7000	73,000	—	33,000
	32 <sup>(1)</sup>	41.75	38.50	1.62	28	1 1/2	5800	6000	—	—	—	—	81,000	—	—
	36 <sup>(1)</sup>	46.00	42.75	1.63	32	1 1/2	6500	6850	—	—	8500	9500	108,000	—	48,000
	40 <sup>(1)</sup>	50.75	47.25	1.62	36	1 1/2	8400	9000	—	—	—	—	130,000	—	—
	42 <sup>(1)</sup>	53.00	49.50	1.63	36	1 1/2	10,000	11,000	—	—	—	—	142,000	—	—
48 <sup>(1)</sup>	59.50	56.00	1.63	44	1 1/2	14,000	15,000	—	—	—	—	190,000	—	—	
54 <sup>(1)</sup>	66.25	62.75	1.88	44	1 1/2	21,000	23,000	—	—	—	—	238,000	—	—	
60 <sup>(1)</sup>	73.00	69.25	1.88	52	1 1/2	22,600	26,600	—	—	—	—	300,000	—	—	

(1) 30" and up: ASME B16.47 Series A (MSS-SP-44), for Series B (API 605) contact the factory.



# FLANGES, WEIGHTS & CV FLOW COEFFICIENTS

**API 600 CAST STEEL VALVES CLASS 300, 600, 900 & 1500**  
**DRILLED AND FACED AS FOLLOWS: 2-24" ASME B16.5**



ASME CLASS	DIMENSIONS IN INCHES						WEIGHT IN LBS.						CV FLOW FLOW COEFFICIENTS			
	SIZE in	FLANGE DIAM.	BOLT CIRCLE DIAM.	HOLE DIAM.	QTY. HOLES	DIAM. BOLTS	GATE		GLOBE		SWING		GATE	GLOBE	CHECK	
							BW	FL	BW	FL	BW	FL				
300 1/16 RAISED FACE	2	6.50	5.00	0.75	8	3/8	46	60	45	60	37	45	260	35	95	
	2½	7.50	5.88	0.88	8	3/8	55	76	63	72	49	57	420	60	150	
	3	8.25	6.62	0.88	8	3/8	90	115	88	114	70	96	625	92	220	
	4	10.00	7.88	0.88	8	3/8	136	166	130	171	110	150	1150	180	410	
	6	12.50	10.62	0.88	12	3/8	245	314	261	337	204	265	2650	430	950	
	8	15.00	13.00	1.00	12	3/8	415	506	447	565	360	455	4850	810	1750	
	10	17.50	15.25	1.13	16	1	646	762	1000	1150	582	650	7750	1325	2800	
	12	20.50	17.75	1.25	16	1½	900	1100	1300	1550	825	945	11,500	1950	4100	
	14	23.00	20.25	1.25	20	1½	1392	1720	1800	2100	1200	1350	14,000	2500	6200	
	16	25.50	22.50	1.38	20	1½	1870	2220	2300	2700	1500	1800	19,000	3400	8400	
	18	28.00	24.75	1.38	24	1½	2405	2960	2640	3200	2000	2400	23,500	4500	11,000	
	20	30.50	27.00	1.38	24	1½	3260	3700	—	—	2600	3000	30,000	—	13,500	
	24	36.00	32.00	1.63	24	1½	4250	5100	—	—	3000	4050	44,000	—	20,000	
	26 <sup>(1)</sup>	38.25	34.50	1.75	28	1½	5000	5500	—	—	4000	5000	53,000	—	23,500	
	28 <sup>(1)</sup>	40.75	37.00	1.75	28	1½	7000	7500	—	—	5000	6000	62,000	—	28,000	
	30 <sup>(1)</sup>	43.00	39.25	1.88	28	1½	8550	9000	—	—	—	—	73,000	—	—	
	32 <sup>(1)</sup>	45.25	41.50	2.00	28	1½	8200	8800	—	—	—	—	81,000	—	—	
36 <sup>(1)</sup>	50.00	46.00	2.13	32	2	13,500	15,500	—	—	—	—	108,000	—	—		
600 1/4 RAISED FACE	2	6.50	5.00	0.75	8	3/8	60	72	60	72	48	52	260	35	95	
	2½	7.50	5.88	0.88	8	3/8	89	102	89	100	59	87	420	60	150	
	3	8.25	6.62	0.88	8	3/8	130	157	130	150	96	130	625	92	220	
	4	10.75	8.50	1.00	8	3/8	224	275	213	285	167	225	1150	180	410	
	6	14.00	11.50	1.13	12	1	394	540	415	515	332	476	2650	430	950	
	8	16.50	13.75	1.25	12	1½	726	884	1050	1220	525	715	4850	800	1750	
	10	20.00	17.00	1.38	16	1½	1125	1405	1550	1830	1000	1250	7750	1250	2800	
	12	22.00	19.25	1.38	20	1½	1490	1812	—	—	1500	1750	11,500	—	4100	
	14	23.75	20.75	1.50	20	1½	2200	2500	—	—	1750	2050	13,000	—	5900	
	16	27.00	23.75	1.62	20	1½	3000	3700	—	—	2400	3100	18,000	—	7800	
	18	29.25	25.75	1.75	20	1½	4000	4800	—	—	3200	4000	22,000	—	9900	
	20	32.00	28.50	1.75	24	1½	5600	6800	—	—	4500	6100	27,000	—	12,000	
	24	37.00	33.00	2.00	24	1½	8000	9800	—	—	6400	7600	40,000	—	18,000	
	30 <sup>(1)</sup>	44.50	40.25	2.12	28	2	12,000	14,000	—	—	—	—	52,000	—	—	
	36 <sup>(1)</sup>	51.75	47.00	2.62	28	2½	17,000	19,500	—	—	—	—	72,000	—	—	
	900 1/4 RAISED FACE	2	8.50	6.50	1.00	8	3/8	150	185	—	—	135	165	230	—	80
		2½	9.63	7.50	1.12	8	1	235	270	—	—	175	210	560	—	200
3		9.50	7.50	1.00	8	3/8	235	270	—	—	175	210	560	—	200	
4		11.50	9.25	1.25	8	1½	270	355	—	—	245	330	1050	—	380	
6		15.00	12.50	1.25	12	1½	830	980	—	—	485	635	2400	—	875	
8		18.50	15.50	1.50	12	1½	1220	1500	—	—	700	900	4200	—	1325	
10		21.50	18.50	1.50	16	1½	2000	2400	—	—	—	—	6750	—	1525	
12		24.00	21.00	1.50	20	1½	3170	3670	—	—	—	—	9700	—	—	
14		25.25	22.00	1.62	20	1½	3900	4460	—	—	—	—	12,000	—	—	
16	27.75	24.25	1.75	20	1½	5570	6250	—	—	—	—	16,000	—	—		
1500 1/4 RAISED FACE	2	8.50	6.50	1.00	8	3/8	150	185	—	—	135	165	230	—	80	
	2½	9.63	7.50	1.12	8	1	255	325	—	—	205	275	510	—	185	
	3	10.50	8.00	1.25	8	1½	255	325	—	—	205	275	510	—	185	
	4	12.25	9.50	1.37	8	1½	430	520	—	—	340	430	925	—	330	
	6	15.50	12.50	1.50	12	1½	1045	1205	—	—	805	965	2100	—	750	
	8	19.00	15.50	1.75	12	1½	1850	2550	—	—	1350	2050	3650	—	1325	
	10	23.00	19.00	2.00	12	1½	2600	3300	—	—	—	—	5850	—	—	

(1) 30" and up: ASME B16.47 Series A (MSS-SP-44), for Series B (API 605) contact the factory.



# ENGINEERING DATA

## PRESSURE-TEMPERATURE RATINGS STANDARD CLASS VALVES, FLANGED AND BUTT WELD END

NOTE: FOR SPECIAL CLASS VALVES, WHICH HAVE HIGHER RATINGS CONTACT THE COMPANY.

### CAST

ASTM MATERIAL STANDARD—TO ASME B16.34

ASME Boiler and Pressure Vessel Code Section II materials that also meet the requirements of the listed ASTM specifications.

psig/°F (bar/°C) CLASSES 150–4500

#### A216 Gr. WCB

TEMP. °F	WORKING PRESSURE by classes, psig						
	150	300	600	900	1500	2500	4500
100	285	740	1480	2220	3705	6170	11110
200	260	675	1350	2025	3375	5625	10120
300	230	655	1315	1970	3280	5470	9845
400	200	635	1270	1900	3170	5280	9505
500	170	600	1200	1795	2995	4990	8980
600	140	550	1095	1640	2735	4560	8210
650	125	535	1075	1610	2685	4475	8055
700	110	535	1065	1600	2665	4440	7990
750	95	505	1010	1510	2520	4200	7560
800	80	410	825	1235	2060	3430	6170
850 <sup>(1)</sup>	65	270	535	805	1340	2230	4010
900 <sup>(1)</sup>	50	170	345	515	860	1430	2570
950 <sup>(1)</sup>	35	105	205	310	515	860	1545
1000 <sup>(1)</sup>	20	50	105	155	260	430	770

(1) Permissible, but not recommended for prolonged usage above 800°F (427°C).

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	19.6	51.1	102.1	153.2	255.3	425.5	765.8
50	19.2	50.1	100.2	150.2	250.4	417.3	751.1
100	17.7	46.4	92.8	139.1	231.9	386.5	695.7
150	15.8	45.2	90.5	135.7	228.1	376.9	678.4
200	14.0	43.8	87.6	131.5	219.1	365.2	657.3
250	12.1	41.7	83.4	125.2	208.6	347.7	625.8
300	10.2	38.7	77.5	116.2	193.7	322.8	581.0
350	8.4	37.0	73.9	110.9	184.8	308.0	554.4
375	7.4	36.5	72.9	109.4	182.3	303.9	547.0
400	6.5	34.5	69.0	103.5	172.5	287.5	517.5
425	5.6	28.8	57.5	86.3	143.8	239.6	431.4
450 <sup>(1)</sup>	4.7	20.0	40.1	60.1	100.2	166.9	300.5
475 <sup>(1)</sup>	3.7	13.5	27.1	40.6	67.7	112.9	203.2
500 <sup>(1)</sup>	2.8	8.8	17.6	26.4	44.0	73.3	131.9
525 <sup>(1)</sup>	1.9	5.2	10.4	15.5	25.9	43.2	77.7
540 <sup>(1)</sup>	1.3	3.3	6.5	9.8	16.3	27.2	48.9

#### A217 Gr. WC6

TEMP. °F	WORKING PRESSURE by classes, psig						
	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	720	1445	2155	3610	6015	10830
400	200	695	1385	2080	3465	5775	10400
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	320	640	955	1595	2655	4785
1000	20	215	430	650	1080	1800	3240
1050	20 <sup>(1)</sup>	145	290	430	720	1200	2160
1100	20 <sup>(1)</sup>	95	190	290	460	800	1440

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.4	103.0	154.5	257.4	429.1	772.4
150	15.8	49.6	99.6	149.2	248.8	414.5	746.3
200	13.9	48.1	95.9	143.9	239.8	399.6	719.6
250	12.1	46.2	92.4	138.6	231.0	385.0	692.6
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	25.3	50.6	75.7	126.1	210.1	378.6
525	1.9	18.1	36.3	54.5	90.8	151.2	272.5
550	1.4 <sup>(1)</sup>	12.7	25.4	38.1	63.6	105.9	190.7
575	1.4 <sup>(1)</sup>	8.8	17.7	26.3	44.0	73.4	132.1
600 <sup>(2)</sup>	1.4 <sup>(1)</sup>	6.0	12.0	18.3	30.3	50.5	90.8

(2) Not to be used over 593°C.

#### A217 Gr. WC9

TEMP. °F	WORKING PRESSURE by classes, psig						
	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	375	755	1130	1885	3145	5665
1000	20	260	520	780	1305	2170	3910
1050	20 <sup>(1)</sup>	175	350	525	875	1455	2625
1100	20 <sup>(1)</sup>	110	220	330	550	915	1645

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.6	103.1	154.6	257.7	429.5	773.2
150	15.8	50.3	100.3	150.6	250.9	418.3	753.0
200	13.9	48.8	97.5	146.3	244.1	406.6	731.9
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	27.7	55.7	83.4	139.0	231.8	417.4
525	1.9	21.6	43.3	64.9	108.4	180.6	325.3
550	1.4 <sup>(1)</sup>	15.4	30.7	46.1	77.0	127.9	230.7
575	1.4 <sup>(1)</sup>	10.6	21.1	31.7	52.7	87.7	158.1
600 <sup>(2)</sup>	1.4 <sup>(1)</sup>	6.9	13.8	20.7	34.6	57.4	103.2

(2) Not to be used over 593°C.



# ENGINEERING DATA

## A217 Gr. C5

TEMP. °F	WORKING PRESSURE by classes, psig						
	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	745	1490	2235	3725	6205	11170
300	230	715	1430	2150	3580	5965	10740
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1055	1595	2640	4400	7920
800	80	510	1015	1525	2540	4230	7610
850	65	485	965	1450	2415	4030	7250
900	50	370	740	1110	1850	3085	5555
950	35	275	550	825	1370	2285	4115
1000	20	200	400	595	995	1655	2985
1050	20 <sup>(1)</sup>	145	290	430	720	1200	2160
1100	20 <sup>(1)</sup>	100	200	300	495	830	1490
1150	20 <sup>(1)</sup>	60	125	185	310	515	925
1200	15 <sup>(1)</sup>	35	70	105	170	285	515

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.3	155.0	258.6	430.3	774.6
100	17.7	51.1	102.3	153.4	257.2	425.9	766.8
150	15.8	49.3	98.6	148.2	246.8	411.2	740.5
200	13.9	48.7	97.4	146.1	243.7	406.0	730.8
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.5	116.4	193.9	323.0	581.5
400	6.5	36.5	72.6	109.2	181.8	303.0	545.4
425	5.6	35.2	70.1	105.4	175.6	292.4	526.1
450	4.6	33.7	67.1	100.8	167.9	280.1	504.0
475	3.7	27.6	55.0	82.6	137.7	229.7	413.5
500	2.8	21.3	42.6	64.0	106.4	177.4	319.5
525	1.9	16.1	32.3	48.3	80.5	134.1	241.7
550	1.4 <sup>(1)</sup>	12.1	24.3	35.0	60.3	100.3	180.8
575	1.4 <sup>(1)</sup>	9.0	17.9	26.6	44.3	74.1	133.2
600	1.4 <sup>(1)</sup>	6.2	12.6	18.8	31.1	52.0	93.4
625	1.3 <sup>(1)</sup>	3.9	8.1	12.0	20.0	33.3	59.9
650	1.0 <sup>(1)</sup>	2.4	4.8	7.2	11.7	19.7	35.5

## A217 Gr. C12

TEMP. °F	WORKING PRESSURE by classes, psig						
	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	375	755	1130	1855	3145	5655
1000	20	255	505	760	1270	2115	3805
1050	20 <sup>(1)</sup>	170	345	515	855	1430	2570
1100	20 <sup>(1)</sup>	115	225	340	565	945	1695
1150	20 <sup>(1)</sup>	75	150	225	375	630	1130
1200	20 <sup>(1)</sup>	50	105	155	255	430	770

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.6	103.1	154.6	257.7	425.5	773.2
150	15.8	50.3	100.3	150.6	250.9	418.3	753.0
200	13.9	48.8	97.5	146.3	244.1	406.6	731.9
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	27.7	55.7	83.4	139.0	231.8	417.0
525	1.9	21.4	42.8	64.1	107.1	178.6	321.1
550	1.4 <sup>(1)</sup>	15.0	30.0	45.0	75.0	125.1	225.0
575	1.4 <sup>(1)</sup>	0.4	21.0	31.4	52.1	87.2	156.7
600	1.4 <sup>(1)</sup>	7.2	14.3	21.5	35.8	59.9	107.5
625	1.4 <sup>(1)</sup>	4.9	9.9	14.8	24.7	41.5	74.5
650	1.4 <sup>(1)</sup>	3.4	7.2	10.7	17.6	29.7	53.1

## A351 Gr. CF8M<sup>(3)</sup>, A351 Gr. CF3M<sup>(2)</sup>

TEMP. °F	WORKING PRESSURE BY CLASSES, psig						
	150	300	600	900	1500	2500	4500
100	275	720	1440	2160	3600	6000	10800
200	235	620	1240	1860	3095	5160	9280
300	215	560	1120	1680	2795	4660	8390
400	195	515	1025	1540	2570	4280	7705
500	170	480	955	1435	2390	3980	7165
600	140	450	900	1355	2255	3760	6770
650	125	445	890	1330	2220	3700	6660
700	110	430	870	1305	2170	3620	6515
750	95	425	855	1280	2135	3560	6410
800	80	420	845	1265	2110	3520	6335
850	65	420	835	1255	2090	3480	6265
900	50	415	830	1245	2075	3460	6230
950	35	385	775	1160	1930	3220	5795
1000	20	350	700	1050	1750	2915	5245
1050 <sup>(3)</sup>	20 <sup>(1)</sup>	345	685	1030	1720	2865	5155
1100 <sup>(3)</sup>	20 <sup>(1)</sup>	305	610	915	1525	2545	4575
1150 <sup>(3)</sup>	20 <sup>(1)</sup>	235	475	710	1185	1970	3550
1200 <sup>(3)</sup>	20 <sup>(1)</sup>	185	370	555	925	1545	2775
1250 <sup>(3)</sup>	20 <sup>(1)</sup>	145	295	440	735	1230	2210
1300 <sup>(3)</sup>	20 <sup>(1)</sup>	115	235	350	585	970	1750
1350 <sup>(3)</sup>	20 <sup>(1)</sup>	95	190	290	460	800	1440
1400 <sup>(3)</sup>	20 <sup>(1)</sup>	75	150	225	380	630	1130
1450 <sup>(3)</sup>	20 <sup>(1)</sup>	60	115	175	290	485	875
1500 <sup>(3)</sup>	20 <sup>(1)</sup>	40	85	125	205	345	620

TEMP. °C	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	19.0	49.7	99.3	149.0	248.3	413.8	744.8
50	18.3	48.1	96.3	144.4	240.6	401.0	721.9
100	16.1	42.3	84.6	126.8	211.0	351.7	633.2
150	14.8	38.6	77.1	115.7	192.4	320.8	577.7
200	13.6	35.8	71.2	107.0	178.5	297.2	535.2
250	12.0	33.5	66.8	100.3	167.0	278.2	500.8
300	10.2	31.6	63.1	95.0	158.1	263.6	474.6
350	8.3	30.4	61.0	91.3	152.3	253.9	456.9
375	7.4	29.6	59.9	89.7	149.3	249.1	448.3
400	6.5	29.3	59.0	88.2	147.2	245.4	441.9
425	5.6	29.0	58.3	87.3	145.6	242.9	437.2
450	4.6	29.0	57.7	86.7	144.3	240.4	432.8
475	3.7	28.7	57.3	86.1	143.4	239.0	430.3
500	2.8	27.3	54.8	82.1	136.7	228.0	410.5
525	1.9	25.2	50.6	75.9	126.4	210.7	379.2
550 <sup>(3)</sup>	1.4 <sup>(1)</sup>	24.0	47.8	71.8	119.8	199.5	359.0
575 <sup>(3)</sup>	1.4 <sup>(1)</sup>	22.8	45.4	68.3	114.1	190.1	341.9
600 <sup>(3)</sup>	1.4 <sup>(1)</sup>	19.9	39.9	59.7	99.5	166.0	298.6
625 <sup>(3)</sup>	1.4 <sup>(1)</sup>	15.7	31.7	47.4	79.2	131.7	237.3
650 <sup>(3)</sup>	1.4 <sup>(1)</sup>	12.6	25.3	37.9	63.2	105.7	189.8
675 <sup>(3)</sup>	1.4 <sup>(1)</sup>	10.1	20.6	30.8	51.4	86.1	154.8
700 <sup>(3)</sup>	1.4 <sup>(1)</sup>	8.3	16.9	25.1	42.0	69.8	125.8
725 <sup>(3)</sup>	1.4 <sup>(1)</sup>	6.9	13.9	21.1	35.0	58.2	104.9
750 <sup>(3)</sup>	1.4 <sup>(1)</sup>	5.7	11.3	17.1	28.7	47.7	85.7
775 <sup>(3)</sup>	1.4 <sup>(1)</sup>	4.6	9.0	13.7	22.8	38.1	68.4
800 <sup>(3)</sup>	1.4 <sup>(1)</sup>	3.5	7.0	10.6	17.4	29.2	52.6

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

(2) CF3M: Not to be used over 850°F (454°C).

(3) At temperatures over 1000°F (538°C), use only when the carbon content is 0.04% or higher.



# SPECIFICATION OF CAST VALVE MATERIALS

## BODY AND BONNET, WEDGE-DISC-PACKING FLANGE

DESCRIPTION	CARBON STEEL			ALLOY STEEL				STAINLESS STEEL					
	A216 WCB	A352 LCB	A352 LCC	1¼ CR ½ Mo	2¼ CR-1 Mo	5 CR	9 CR-1Mo	13 CR		316	316L	304	
ASTM DESIGNATION	A216 WCB	A352 LCB	A352 LCC	A217 WC6	A217 WC9	A217 C5	A217 C12	A217 CA15	A296 CA40	A351 CF8M	A351 CF3M	A351 CF8	
COMPOSITION %	Carbon	0.25 <sup>(1)</sup>	0.25 <sup>(1)</sup>	0.25	0.20	0.18	0.20	0.20	0.15	0.10-0.40	0.08	0.03	0.08
	Manganese	1.00	1.00	1.20	0.50-0.80	0.40-0.70	0.40-0.70	0.35-0.65	1.00	1.00	1.50	1.50	1.50
	Phosphorus	0.04	0.04	0.04	0.04	0.40	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Sulphur	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.040
	Silicon	0.60	0.60	0.60	0.60	0.60	0.75	1.00	1.50	1.50	1.50	1.50	2.00
	Nickel	0.50	—	0.50	0.50	0.50	0.50	0.50	1.00	1.00	9.00-12.00	9.00-13.00	8.00-11.00
	Chromium	0.50	—	0.50	1.00-1.50	2.00-2.75	4.00-6.50	8.00-10.00	11.5-14.0	11.5-14.0	18.00-21.00	17.00-21.00	18.00-21.00
	Molybdenum	0.20	—	0.20	0.45-0.65	0.90-1.20	0.45-0.65	0.90-1.20	0.50	0.50	2.0-3.00	2.0-3.00	0.50
	Copper	0.30	0.30	0.30	0.50	—	0.50	0.50	—	—	—	—	—
Heat Treat.	Anneal	Quench and Temper		Temper	Temper	Temper	Temper	Solution anneal					
Tensile psi min.	70,000	65,000-90,000	70,000-95,000	70,000-90,000	70,000-90,000	90,000-115,000	90,000-115,000	90,000-115,000	100,000	70,000	70,000	70,000	
Yield psi min.	36,000	35,000	40,000	40,000	40,000	60,000	60,000	65,000	70,000	30,000	30,000	30,000	
Elong. % Min.	22	24	22	20	20	18	18	18	15	30	30	35	
R. Area % Min.	35	35	35	35	35	35	35	30	25	—	—	—	
Hardness HB	187 max.	197 max.	200 max.	207 max.	207 max.	241 max.	241 max.	327-381	475 min.	—	187 max.	—	
Parts	BODIES-BONNETS-LARGE DISCS							DISC MATERIALS		BODIES-BONNETS-DISCS			

(1) Velan standard: 0.25 or less.

## TRIM SPECIFICATION

ASTM DESIGNATION	BAR STOCK								CAST			
	CR 13		Stainless Steels			Monel		Hastelloy	Monel	Stellite 6	Austenitic Ductile	
	A 479 410*	A 582 416*	A 479 316 St. Hard.	A 479 316	A 564 630	B 164 Monel	AMS 4676A K-Monel	B574 N 10276	A 494 M-25S	AMS 5387 A	A 439 D-2C	
COMPOSITION %	Carbon	0.15	0.15	0.08	0.08	0.07	0.3	0.25	0.010	0.25	0.9-1.4	2.90
	Manganese	1.00	1.25	2.00	2.00	1.00	2.0	1.50	1.0	1.50	1.0	1.80-2.40
	Phosphorus	0.040	0.06	0.045	0.045	0.040	—	0.02	0.04	0.03	0.04	0.08
	Sulphur	0.030	0.15 min.	0.030	0.030	0.030	0.024	0.010	0.03	0.03	0.04	—
	Silicon	1.00	1.00	1.00	1.00	1.00	0.5	1.00	0.08	3.5-4.5	1.5	1.00-3.00
	Nickel	—	—	10.00-14.00	10.00-14.00	3.00-5.00	63.0	63.00-70.00	Balance	Balance	3.0	21.00-24.00
	Chromium	11.50-13.50	12.00-14.00	16.00-18.00	16.00-18.00	15.00-17.50	—	—	14.5-16.5	—	27.0-31.0	0.50
	Molybdenum	—	—	2.00-3.00	2.00-3.00	—	—	—	15.0-17.0	—	1.5	—
	Copper	—	—	—	—	3.00-5.00	28.0-34.0	Balance	—	27.0-33.0	—	—
	Aluminum	—	—	—	—	—	3.00	—	3.00	—	—	—
	Cobalt	—	—	—	—	—	—	—	—	—	Balance	—
	Tungsten	—	—	—	—	—	—	—	—	—	3.5-5.5	—
Iron	—	—	—	—	—	—	—	—	3.50	3.0	—	
Special Condition	Temper	Hard	Level 2	—	—	Hot worked	Hot Fin.	—	Age Hard.	—	—	
Heat Treat.	Class 2	Hard Temper	Sol. Ann.	Sol. Ann.	H 1100	—	—	—	—	—	—	
Tensile psi min.	110,000	—	95,000	75,000	140,000	80,000	140,000	100,000	—	130,000	58,000	
Yield psi min.	85,000	—	75,000	30,000	115,000	40,000	100,000	41,000	—	—	28,000	
Elong. % min.	15	—	25	30	14	30	20	40	—	1	20	
R. Area % min.	45	—	40	40	45	—	—	—	—	—	—	
Hardness HB	269 max.	293-352	—	—	302 min.	—	326 min.	—	300 min.	344 min.	121-171	

\* 13 CR or Monel trim also available in soft form (less than 237 HB). Non-cobalt hardfacing also available.

## SOUR SERVICE VALVES

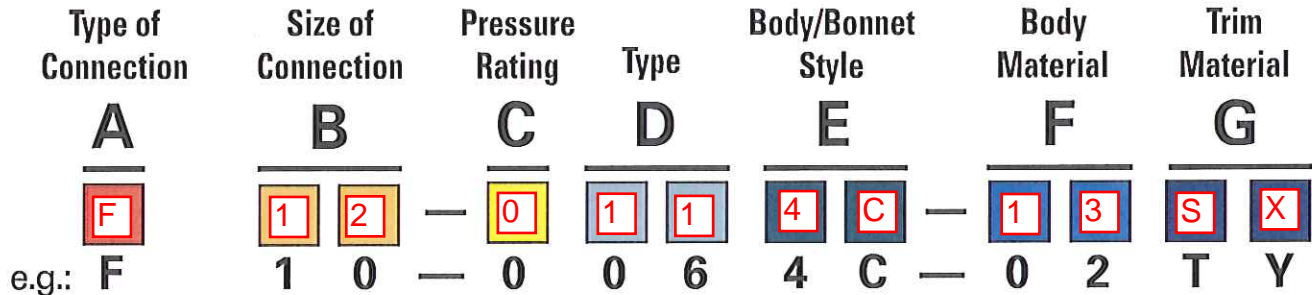
To meet NACE STANDARD MR0175 Valen manufactures the complete range of valves shown in this catalog in compliance with NACE standard MR0175. Trim materials must be selected by customers from table based on experience in corrosion resistance against sulphides (sour gas) found in processing crude oil.

For trim material (wedge/disc surface, seat surface, stem) see page 37.

TRIM	
NA, ND, NE, NF:	B7M / 2HM RC. 22 MAX.
NB, NC, NN:	B7M / 2HM OR B8M / 8



# CAST STEEL GATE, GLOBE & CHECK VALVES



**Example:** Flanged 3" class 150 cast carbon steel full bore gate valve with TY trim.

The figure numbers shown on this key are designed to cover essential features of Velan valves. Please use figure numbers to ensure prompt and accurate processing of your order. A detailed description must accompany any special orders.

A TYPE OF CONNECTION			
A - Special	F - Flanged B16.5 (B16.47 series A)	R - Flanged ring joint	U - Undrilled flanges
B - Butt weld	P - Flanged B16.47 series B (API 605)	X - Butt weld (intermediate class)	
C - Combination			
D - DIN flanged			
E - Welded stubs			
B SIZE OF CONNECTION			
Customers have the choice of specifying valve size as part of the valve figure number (B) using the numbers below, or indicating valve size separately.			
<b>EXAMPLES:</b> F10-0064C-02TY (valve size is part of figure number) 3"F-0064C-02TY (valve size is shown separately)			
08 - 2" (50 mm)	16 - 10" (250 mm)	26 - 26" (650 mm)	44 - 44" (1100mm)
09 - 2½" (65 mm)	18 - 12" (300 mm)	28 - 28" (700 mm)	46 - 46" (1150 mm)
10 - 3" (80 mm)	19 - 14" (350 mm)	30 - 30" (750 mm)	48 - 48" (1200 mm)
11 - 3½" (90 mm)	20 - 16" (400 mm)	32 - 32" (800 mm)	54 - 54" (1350 mm)
12 - 4" (100 mm)	21 - 18" (450 mm)	34 - 34" (850 mm)	60 - 60" (1500 mm)
13 - 5" (125 mm)	22 - 20" (500 mm)	36 - 36" (900 mm)	99 - Special
14 - 6" (150 mm)	23 - 22" (550 mm)	40 - 40" (1000 mm)	
15 - 8" (200 mm)	24 - 24" (600 mm)	42 - 42" (1050 mm)	
C PRESSURE RATING			
0 - 150	1 - 300	2 - 600	3 - 1500 7 - 900
D VALVE TYPE			
01 - Flow control	07 - Stop globe	09 - Needle	99 - Special
06 - Full port gate	08 - Stop check	11 - Swing check	
E BODY / BONNET STYLE			
4 - Vertical	A - Special C - Bolted bonnet (cast) E - Extended bonnet (cryogenic) V - Cast bolted bonnet bellows seal		
F BODY MATERIAL			
01 - Special	09 - C12	19 - Monel M35	31 - LCC
02 - WCB	11 - CF8	23 - Alloy 20	34 - C12A (F91)
03 - WC1	12 - CF3	25 - LCB	38 - LC1
04 - C5	13 - CF8M	27 - LC3	39 - LC2
05 - WC6	14 - CF3M	28 - CG8M	46 - GS-C25N
06 - WC9	15 - CF8C	29 - CG3M	

G TRIM				API Number	If applicable BELLOWS <sup>(2)</sup>
CODE	WEDGE/DISC SURFACE <sup>(1)</sup>	SEAT SURFACE <sup>(1)</sup>	STEM		
MS	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	316		321
MY	CF8M or 316	Stellite 6 <sup>(3)</sup>	316	12	321
TS	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	13 CR (410) <sup>(4)</sup>	5	321
TY	13 CR (410 or CA15)	Stellite 6 <sup>(3)</sup>	13 CR (410)	8	
NA	13 CR (410 or CA15) HRC 22 max	Stellite 6 <sup>(3)</sup>	13 CR (410) HRC 22 max.	8 <sup>(5)</sup>	
NB	CF8M	Stellite 6 <sup>(3)</sup>	316	12 <sup>(6)</sup>	321
NC	Monel	Stellite 6 <sup>(3)</sup>	Monel	11 <sup>(6)</sup>	Hastelloy C
ND	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	630 (H1150M)		
NE	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	13 CR (410) HRC 22 max.	5 <sup>(6)</sup>	
NF	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	Same as Body		
NG	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	316		321
NN	CF8M	Stellite 6 <sup>(3)</sup>	316		IN 625
NX	Monel	Monel	Monel		
AS	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	321		321
AY	CF8C/F321	Stellite 6 <sup>(3)</sup>	321		321
CC	Alloy 20	Alloy 20	Alloy 20	13	
ES	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	347		
EY	CF8C/F347	Stellite 6 <sup>(3)</sup>	347		
HC	Hastelloy C	Stellite 6 <sup>(3)</sup>	Hastelloy C		Hastelloy C
MF	CF8M or 316 w/ Teflon insert <sup>(5)</sup>	Stellite 6 <sup>(3)</sup>	316		
MH	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	316		Hastelloy C
MN	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	316		IN 625
MX	CF8M	316	316	10	
TF	13 CR (410 or CA15) w/ Teflon insert <sup>(5)</sup>	Stellite 6 <sup>(3)</sup>	13 CR (410)		
TH	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	13 CR (410) <sup>(4)</sup>		Hastelloy C
TN	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	13 CR (410) <sup>(4)</sup>		IN 625
XS	Stellite 6 <sup>(3)</sup>	Stellite 6 <sup>(3)</sup>	Monel		
XX	Monel	Monel	Monel	9	
XY	Monel	Stellite 6 <sup>(3)</sup>	Monel	11	
SX <sup>(7)</sup>	Same as body	Integral	Same as body	10	
GX <sup>(7)</sup>	Same as body	Integral	Same as body	10	
SY <sup>(7)</sup>	Same as body	Stellite 6 <sup>(3)</sup>	316	12	
GY <sup>(7)</sup>	Same as body	Stellite 6 <sup>(3)</sup>	316	12	
GS	Stellite 6 <sup>(3)</sup>	Integral	316		
SB <sup>(7)</sup>	Bronze	Integral	316		

(1) Base material is either the same as the body or solid trim at manufacturer's option.  
 (2) Bellows material shown as standard, Inconel can be used in lieu of 321 and Hastelloy C in lieu of Inconel, where design and/or pressure class applicable.  
 (3) Stellite 6 or Stellite 21 based on material or application at manufacturer's option.  
 (4) 616HT Manufacturer's Std. (F91 and C12A only).  
 (5) Inserts may be in seat or wedge at manufacturer's option.  
 (6) NACE service valves are supplied with all materials conforming to NACE MR0175. (Including bolting with max. hardness of RC22).  
 (7) SB, SX, SY PTFE gasket and packing GS, GX, GY Graphite gasket and packing.

**Note:** For a more detailed list of available trims, contact the factory or visit our web site at [www.velan.com](http://www.velan.com)

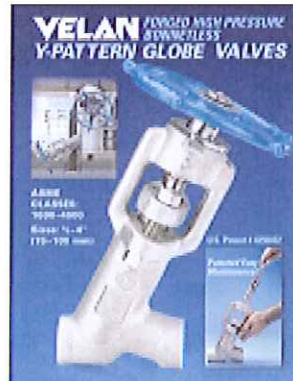


**THE MOST COMPREHENSIVE LINE OF INDUSTRIAL FORGED AND CAST STEEL,  
GATE, GLOBE, CHECK, BALL, KNIFE GATE AND BUTTERFLY VALVES**

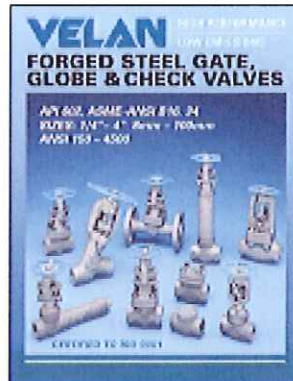
**ASME Pressure Classes 150–4500 in Carbon, Alloy and Stainless Steel**



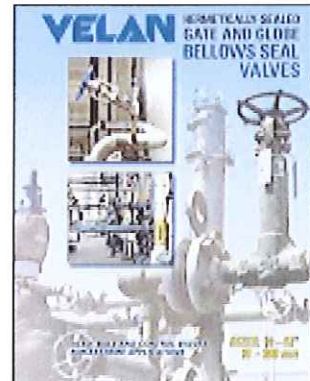
**VEL-PS**



**VEL-BG**



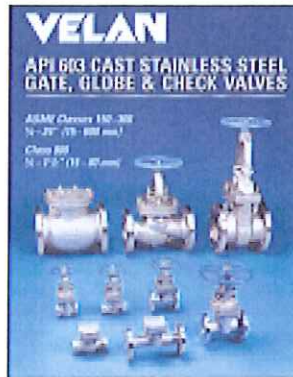
**VEL-SFV**



**VEL-BS**



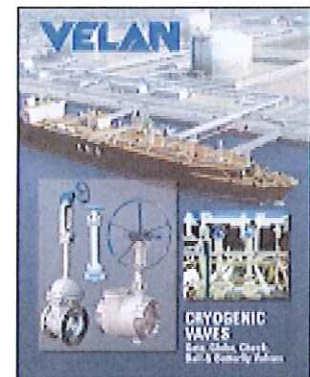
**VEL-PRO-CV**



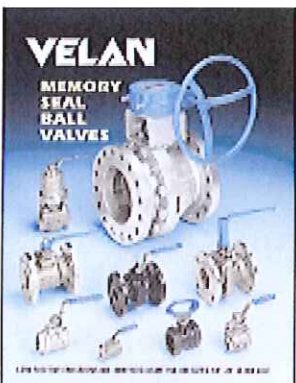
**VEL-API-603**



**VEL-KGV**



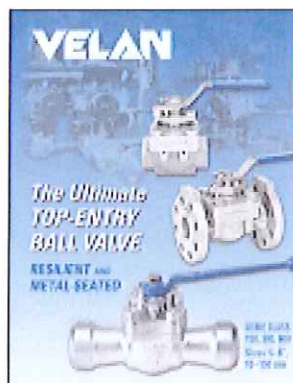
**VEL-CRYO**



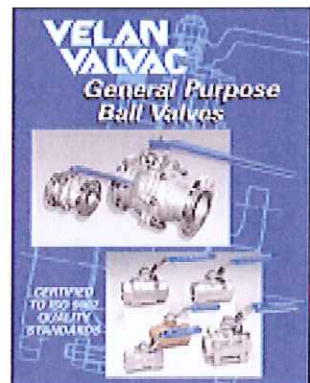
**VEL-BV**



**VEL-UB**



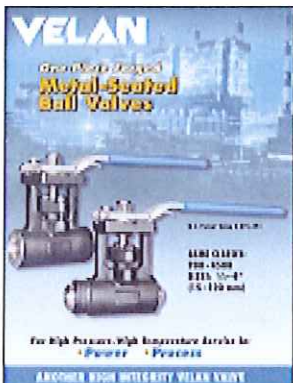
**VEL-TE**



**VEL-GP2BV**



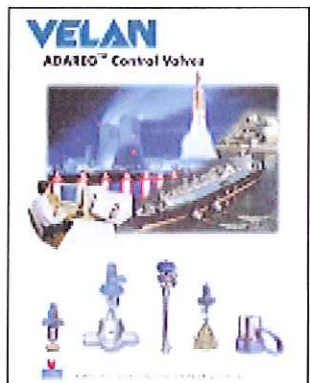
**VEL-MS**



**VEL-PBV**



**VEL-BF**



**VEL-ADCV**

**Swing Check Valve, 3/4 In, NPT, 316 SS**

Swing Check Valve, Check, Material of Construction 316 Stainless Steel, Size 3/4 In., NPT Connection, Length 3-5/32 In., Width (In.) 2.76, Overall Height (In.) 5.00, Top of Handle to Inlet Center (In.) 1.97, Rated For 200 PSI, Cracking Pressure (PSI) 2.85, Max. Temp. (F) 353, Mounting Position Horizontal, Seal PTFE

Grainger Item #	4VMU1
Brand	GRAINGER APPROVED VENDOR
Mfr. Model #	4VMU1
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	0.99
Availability	Typically in Stock
Catalog Page No.	4412

Price shown may not reflect your price. Log In or register.

**Additional Info****316 Stainless Steel Swing Check Valves**

Provide excellent corrosion and chemical resistance. Horizontal mounting. For use in plumbing and heating applications.

- Max. pressure: 200 psi Max. temp.: 353°F

**Tech Specs**

Item: Swing Check Valve

Type: Check

Material of Construction: 316 Stainless Steel

Size: 3/4"

Connection: NPT

Length: 3-5/32"

Width (In.): 2.76

Overall Height (In.): 5.00

Top of Handle to Inlet Center (In.): 1.97

Rated For: 200 PSI

Cracking Pressure (PSI): 2.85

Max. Temp. (F): 353

Mounting Position: Horizontal

Seal: PTFE

Package Quantity: 1

**Notes & Restrictions**

There are currently no notes or restrictions for this item.

**MSDS**

This item does not require a Material Safety Data Sheet (MSDS).

**Required Accessories**

There are currently no required accessories for this item.



# Amercoat® 240

Universal epoxy coating

## Product Data/ Application Instructions

- Formulated for direct-to-metal application with excellent substrate wetting while retaining excellent edge coverage
- Exceptional corrosion protection in salt and fresh water immersion and corrosive chemical environments
- Surface tolerant, lowers the cost of surface preparation
- Excellent adhesion to tight rust
- Compatible with water jetted or hand and power tool cleaned surfaces.
- Low temperature cure down to 0°F (-18°C) without additives or alternate curing agents
- Fast dry-to-recoat and rapid handling properties
- High-build (up to 12 mils) in one coat
- Abrasion resistant

Very low solvent content meets VOC requirements, reduces the risk of pinholing and solvent entrapment at the substrate-coating interface, often a major cause of coating failure with conventional epoxies and lower solids systems.

### Typical Uses

#### Tank Linings and Pipe Coatings

- Ballast and fuel tanks
- Bilges, wet voids and other damp areas
- Crude oil tanks

#### Ships, Offshore and Marine Structures

- Exterior hull above and below waterline
- Decks and superstructures, piping, and equipment
- Interior surfaces

#### Fabrication and New Construction

- Heavy industry, structural steelwork, bridges, tankage
- Speeds up production, even at low temperatures
- A single coat multi-purpose, surface-tolerant coating

### Qualifications

- *Classified by Marintek, as class B1 for use in ballast water tanks*
- *Tested by NOHC as being suitable as a lining for grain storage containers.*
- *Lloyd's Register - Provisionally recognized as acceptable for saltwater ballast tanks and double bottom tanks; Certificate Number MATS/3404/1*
- *NAVSEA - MIL-PRF23236 (D) Classes 5, 7, and 17 Type VII Grade C*
- *NAVSEA - MIL-PRF-24647*
- *Certified by Det Norske Veritas (DNV) to comply with IMO Resolution MSC.215(82) Performance Standard for Protective Coatings (PSPC) for seawater ballast tanks.*
- *Meets performance requirements of Mil-PRF-4556(F)*

### Physical Data

Finish	Semigloss		
Color*	Buff, Haze gray, Pastel green, Oxide red, White		
Components	2		
Curing mechanism	Solvent release and chemical reaction between components		
Specific gravity	1.58 g/cm <sup>3</sup>		
Volume solids (ISO 3233 modified)	87% ± 3%		
Dry film thickness (per coat)	4-12 mils (100-300 microns) depending on system **		
Coats	1 or 2		
Theoretical coverage per mil (25 microns)	ft <sup>2</sup> /gal	m <sup>2</sup> /L	
	1395	33.5	
6 mils (150 microns)	233	5.6	
***VOC (EPA 24) mixed	lb/gal	g/L	
	1.2	145	
VOC (EC SED 1999/13/EC)	lb/gal	g/L	g/kg
	1.28	153	102
Temperature resistance	dry		
	°F	°C	
continuous	250	121	
Flash point (SETA)	°F	°C	
Amercoat 240 resin	122	50	
Amercoat 240 cure	138	59	
T-10 Thinner	80	27	
Amercoat 12	2	-17	

### Suitable for the following Cargoes:

- Crude Oil
- Fuel Oils
- Sour Crude Oil
- Bunker Oil
- Drilling Mud
- Brine
- Aviation Fuel
- Dry Bulk Commodities
- 50% Sodium Hydroxide
- Seawater
- Fresh Water

### Notes:

\* Surface discoloration may occur upon exposure to sunlight, elevated temperatures or chemicals. However, this does not impact performance.

\*\* For IMO-MS.C.215(82) (PSPC) a minimum of 6 mils (160 microns) per coat is recommended to achieve the required 320 microns for the total system.

\*\* VOC figures quoted are according to both EPA Method 24 which is practically determined and EC directive 1999/13/EC which is theoretically determined.

## Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Abrasive blasting is usually the most effective and economical method. When this is impossible or impractical, Amercoat 240 can be applied over mechanically cleaned surfaces. All surfaces must be clean, dry and free of all contaminants, including salt deposits. Contact PPG for maximum allowable salt containment levels.

**Steel**—Remove all loose rust, dirt, grease or other contaminants by one of the following depending on the degree of cleanliness required: SSPC-SP2, 3, 6, 7 or 10 (ISO 8501-1 St-2, St-3, Sa 1, Sa 2.5). These minimum surface preparation standards apply to steel that has been previously abrasive blasted. The choice of surface preparation will depend on the system selected and end-use service conditions.

For more severe service and immersion, clean to SSPC-SP10 (ISO 8501-1 Sa 2.5). Blast to achieve an anchor profile of 2-3 mils (50-75 microns) as indicated by a Keane-Tator Surface profile Comparator or Testex Tape. Previously blasted steel may be ultra-high pressure water jetted to NACE No. 5/SSPC-SP 12 WJ-2L. The wet surface can be dried by blowing with dry compressed air giving special attention to horizontal surfaces and recesses.

**Pre-primed steelwork** —Amercoat 240 can be applied over steelwork shop primed with inorganic zinc silicate. Surfaces must be clean, dry and free of oil, grease, salts and other contamination by detergent washing and high pressure water washing. Specific attention should be paid to removal of white zinc salts. Weld areas, damaged and corroded areas should be blast cleaned to SSPC-SP 6 (ISO 8501-1 Sa 2.5). Overall sweep-blasting may be necessary for widespread breakdown of the zinc silicate shop primer.

**Aluminum**—Remove oil, grease or soap film with neutral detergent or emulsion cleaner, treat with Alodine® 1200, Alumiprep® or equivalent, or blast lightly with fine abrasive.

**Galvanizing**—Remove oil or soap film with detergent or emulsion cleaner, then use zinc treatment such as Galvaprep® or equivalent, or blast lightly with fine abrasive.

**Concrete**—Light abrasive blast per ASTM D4259 to remove all chalk, and surface glaze or laitance. If blasting is not possible, acid etch uncoated concrete per ASTM D4260 to obtain a glaze-free surface with a slightly granular texture. Rinse with clean water and allow to dry thoroughly. After blasting or acid etching, fill all small holes or voids with material such as Amercoat 114A filler compound.

**Aged coatings**—All surfaces must be clean, dry, tightly bonded and free of all loose paint, corrosion products or chalky residue. Abrade surface, or clean with Prep 88. Amercoat 240 is compatible over most types of properly applied and tightly adhering coatings, however, a test patch is recommended to confirm compatibility.

**Repair**—Prepare damaged areas to original surface preparation specifications, feathering edges of intact coating. Thoroughly remove dust or abrasive residue before touch-up.

## Typical Systems

1 <sup>st</sup> coat	2 <sup>nd</sup> Coat	3 <sup>rd</sup> coat
Amercoat 240	None	None
Amercoat 240	Amercoat® 229 Series, 450 Series, Amershield, PSX® 700	None
Amercoat 240	Amercoat 240	None
Amercoat 240 ‡	Amercoat 240	PPG Antifoulings
Dimetcote® 9 Series,		
Amercoat 68 Series or Dimetcote 302H	Amercoat 240	None
Dimetcote 9 Series, Amercoat 68 Series or Dimetcote 302H	Amercoat 240	450 Series, 229 Series, PSX 700

**Tank Coating System**—Two coats of Amercoat 240 at 4 to 12 mils (100 to 300 microns) per coat, to give a total of 12-16 mils (300-400 microns) plus stripe coating over sharp edges, cutouts and welds. Use contrasting colors for each coat and stripe coat.

‡ *Outside the U.S., a tiecoat such as Amercoat 71TC is required. In the U.S. tie coats are typically avoided for VOC compliance.*

## Application Data

Applied over	Steel, concrete, aluminum, galvanizing
Surface preparation	
Steel	Abrasive blasting, manual preparation or UHP waterjetting SSPC-SP 2, SP 3, SP 7, SP6, SP10 (ISO 8501-1 St-2, St-3, Sa 1, Sa 2, Sa 2.5)
Concrete	ASTM D4259 or 4260
Aluminum	Alodine®, Alumiprep® or light abrasive blast
Galvanizing	Galvaprep® or light abrasive blast
Method	Airless or conventional spray. Brush or roller (may require additional coats).
Mixing ratio (by volume)	4 part resin to 1 part cure
Induction time (minutes)	70°F/21°C 15
Environmental conditions	
air and surface temperature	20° to 122°F (-7° to 50°C)
material temperature	50° to 80°F (10° to 27°C)
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation. At freezing temperatures, surface must be free of ice.	
Thinner	T-10
Equipment cleaner	Thinner or Amercoat 12
Pot life	
(including induction time)	°F/°C
	90/32
	40 min.
	80/27
	60 min.
	70/21
	90 min.



Drying time @ 6 mils (150 microns) DFT (hours)

	°F/C				
	90/32	70/21	50/10	32/0	16/-5
dry to touch	3	5	10	24	28
dry hard	6	8	13	30	48

Cure to Immersion\* - Tank Lining Service

°F/C (days)	120/49	90/32	70/21	50/10	32/0	20/-7
	2	3	7	7	7	7

\* These cure-to-immersion times refer to tanks with forced ventilation. On underwater hull systems with PPG Antifoulings, the vessel can be launched after the specified dry-to-launch period indicated in the application instruction for the antifouling.

Recoat/Topcoat time @ 6 mils (150 microns) DFT

	°F/C				
minimum (hours)	90/32	70/21	50/10	32/0	20/-7
Amercoat 240	3	5	10	24	28
Amercoat 229 Series, 450 Series, PSX 700	4	8	16	36	48

	°F/C				
maximum (months)**	90/32	70/21	50/10	32/0	20/-7
Amercoat 240	6	6	6	6	6
Amercoat 229 Series, 450 Series, PSX 700	3	3	3	3	3

*Drying times are dependent on air and surface temperatures as well as film thickness, ventilation and relative humidity. Maximum recoating time is highly dependent upon actual surface temperatures - not simply ambient air temperatures. Surface temperatures should be monitored, especially with sun-exposed or otherwise heated surfaces. Higher surface temperatures shorten the maximum recoat window.*

\*\* Surface must be clean and dry. Any contamination must be identified and adequately removed. A detergent wash with Prep 88 or equivalent is required prior to application of topcoats after 30 days of exposure. However particular attention must be paid to surfaces that have been exposed to sunlight and where chalking may be present. In those situations, a further degree of cleaning may be required. PPG Technical Service can advise on suitable cleaning methods. If the maximum recoat/topcoat time is exceeded, then roughen surface.

**Requirements for Water Ballast Tanks subject to IMO-MSC.215(82) (PSPC):**

- steel; ISO 8501-3:2006 grade P2, with all edges treated to a rounded radius of minimum 2mm or subject to three pass grinding
- steel or steel with not approved zinc silicate shop primer; blast cleaned to ISO-Sa2<sup>1/2</sup>, blast profile 30 - 75µm
- steel with approved zinc silicate shop primer, weld seams and areas of damage shop primer or breakdown should be blast cleaned to ISO-Sa2<sup>1/2</sup>, blasting profile 30 - 75µm
  - for shop primer with IMO type approval; no additional requirements
  - for shop primer without IMO type approval; blast cleaned to ISO-Sa2 removing at least 70% of intact shop primer, blasting profile 30 - 75µm
- dust quantity rating “1” for dust size class “3”, “4” or “5”, lower dust size classes to be removed if visible on the surface to be coated without magnification (ISO 8502-3:1992)

**Application Equipment**

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure, hose and tip size may be needed for proper spray characteristics.

**Airless spray**—Standard equipment with pump ratio of 45:1 or larger, with a 0.021- to 0.025-inch fluid tip, 3/8" (9mm) ID hose with 50 ft. maximum length. Long hose runs or location of work at heights 20-30 feet (6-9m) higher than the pump location may require higher pump ratios, increase hose diameters or other adjustments. A typical arrangement for shipyard use would include a 68:1 (or higher) pump ratio with 1/2" (12mm) to 3/4" (18mm) fluid hose. Nozzle pressure should be approximately 1800-2300 psi.

**Conventional spray**—Standard conventional air spray equipment. A moisture and oil equipment trap in the main air supply line, a pressure material pot, and separate regulators for air and fluid pressure are recommended.

**Power mixer**—Jiffy Mixer powered by an air or explosion-proof electric motor.

**Brush or roller**—Additional coats may be required to attain proper thickness. (Brushing and rolling typically give about 3 mils [75 microns] dft.)

To obtain the maximum performance, adhere to all application instructions, precautions, conditions and limitations. For conditions outside the requirements or limitations described, contact your PPG representative.

**Application Procedure**

1. Flush all equipment with thinner or Amercoat® 12 before use. Stir resin using an explosion-proof power mixer to disperse into a homogeneous mixture.
2. Add cure to resin. Mix thoroughly until uniformly blended to a workable consistency.
 

Induction time (minutes)	70°F/21°C
	15
3. Do not mix more material than can be used within the expected pot life, 1.5 hours at 70°F. Higher material temperatures will shorten the pot life considerably.
4. For optimum application, material should be between 50° to 90°F (10° to 32°C).
5. Use only T-10 thinner at 10% by volume, maximum.
6. Below 50°F additional thinning may be needed and multiple coats required to achieve specified thickness.
7. To minimize orange peel appearance, adjust conventional spray equipment to obtain adequate atomization at lowest air pressure.
8. Apply a wet coat in even, parallel passes with 50 percent overlap to avoid holidays, bare areas and pinholes. If required, cross spray at right angles.
9. When applying directly over inorganic-zincs or zinc-rich primers, a mist coat/full coat technique may be required to minimize bubbling. This will depend on the age of the primer, surface roughness and conditions during curing.
10. Ventilate confined areas with clean air during application, between coats, and while curing the final coat. Prevent moisture condensation on the surface between coats.
11. Repair damaged areas by brush or spray.
12. Clean equipment with thinner or Amercoat 12 immediately after use.

**Note:** Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

For compliance with IMO standard for Ballast Tank Coatings, please refer to the project Ballast Tank Coatings Specification.

## Shipping Data

Packaging unit-US	1 gal	5 gal
Shipping weight (approx.)	lbs/kg	lbs/kg
1-gal unit		
240 resin	11.8/5.4	5.4/2.45
240 cure	2.0/0.9	0.9/0.41
5-gal unit		
240 resin	59.0/26.80	26.8/12.20
240 cure	9.1/4.10	4.1/1.86
Packaging unit-European manufacture		
20 L unit	kg/lbs.	
240 resin (16 L)	28.2/62.0	
240 cure (4 L)	7.2/15.8	

Shelf life when stored indoors at 40° to 100°F (4° to 38°C)  
resin and cure 3 years from date of  
manufacture.

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities.

This mixed product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

## Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of both components. Safety precautions must be strictly followed during storage, handling, and use.

**Caution – Improper use and handling of this product can be hazardous to health and cause fire or explosion.**

**Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep solvent vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.**

**This product is to be used by those knowledgeable about proper application methods. PPG makes no recommendation about the types of safety measures that may need to be adopted because these depend on application and space, of which PPG is unaware and over which it has no control.**

**If you do not fully understand the warnings and instructions or if you cannot strictly comply with them, do not use the product.**

***This product is for industrial use only. Not for residential use in California.***



**PPG Protective &  
Marine Coatings**

[www.ppgpmc.com/northamerica](http://www.ppgpmc.com/northamerica)

One PPG Place, Pittsburgh, PA 15272 • Tel: 888-9PPGPMC





## Typical Properties

### Physical

Impact resistance (ASTM D2794) @ 5 mils		
direct	140 in · lbs	15.8 N · m
reverse	50 in · lbs	5.6 N · m

Taber abrasion	
1 kg load/1000 cycles	weight loss
CS-17 wheel	60.2 mg

Elongation (ASTM D522) >32%

Graffiti cleaning with Amerase with gloss retention 100 cycles

### Chemical Resistance Guide

Environment	Splash and Spillage	Fumes and Weather
Acidic	E	E
Alkaline	E	E
Salt solutions		
Acidic	E	E
Neutral	E	E
Alkaline	E	E
Seawater	E	E
Fresh water	E	E
Solvents	G	E
Petroleum products	E	E
F-Fair    G-Good    E-Excellent    NR-Not Recommended		

*This table is only a guide to show typical resistance of Amershield. Contact your Ameron representative for your particular corrosion protection needs.*

### Typical Systems

Substrate	Primer	Finish Coat
Steel	none, 400*, 68HS	Amershield
Galvanizing	none, 400*, 68HS	Amershield
Aluminum	none, 400*	Amershield
Concrete	400*	Amershield
Masonry	none, 400*	Amershield

\*Other Ameron epoxy primers are also acceptable.

*Refer to specific primer's product data sheets and application instructions for detailed application and surface preparation information.*

*Apply test patch to intact coating to confirm compatibility and adhesion.*

*When Amerlock 400 is used as a primer for Amershield the maximum topcoat time is one month; Amerlock 2 – 7 days, 400 with 861 Accelerator – 14 days. Clean and roughen surface if topcoat time is exceeded.*

*On Amercoat 68HS use a mist coat/full coat application procedure to prevent application bubbling.*

### Environmental Conditions

Temperature air or surface	°F	°C
Amershield	40 to 120	4 to 49
Amershield with 866M	32 to 120	0 to 49

Surface temperature must be at least 5°F (3°C) above dew point to prevent condensation.

### Low Temperature Application

At low temperatures or when a fast cure is required Amercoat 866M accelerator can be added to mixed Amershield resin and cure (see Amercoat 866M literature). **DO NOT** apply Amershield with 866M when surface temperature is over 120°F.

## Application Data

Applied over	Prepared or primed steel, aluminum, galvanizing, masonry and primed concrete
Surface preparation	
steel	SSPC-SP 6 or 10
aluminum	Alodine®, Alumiprep® or light abrasive blast
galvanizing	Galvaprep® or light abrasive blast
concrete	See specific primer
masonry	ASTM D4261
previously coated surface	SSPC-SP1, 3 or 7

*Appearance will vary depending on substrate and application method.*

Mixing ratio (by volume) 1 part cure to 4 parts resin

Pot life (hours)	°F/°C			
	90/32	70/21	50/10	32/0
Amershield	1½	2½	5	-
Amershield with 866M	½	1	2	4

*Using ½ pt Amercoat 866M per mixed 5 gallon Amershield*

### Environmental Conditions

Temperature-Air or surface	°F	°C
Amershield	40 to 120	4 to 49
Amershield with 866M	32 to 120	0 to 49

Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
touch	1	2½	4	-
with 866M	½	¾	1	2½
through	5	10	72	-
with 866M	2	3	6	10

Recoat time (hours)	°F/°C				
	90/32	80/26	70/21	50/10	32/0
minimum	4	5½	8	48	-
with 866M	1½	1¾	2	4	8
maximum	12	24	168	168	-
with 866M	6	8	12	24	48

*Drying times are dependent on air and surface temperatures as well as film thickness, ventilation and relative humidity. Maximum recoating time is highly dependent upon actual surface temperatures - not simply ambient air temperatures. Surface temperatures should be monitored, especially with sun-exposed or otherwise heated surfaces. Higher surface temperatures shorten the maximum recoat window.*

*Roughen surface or use Amerase™ if maximum recoat time is exceeded.*

Thinner	Amercoat 65
Equipment cleaner	Thinner or Amercoat 12

Adhere to all application instructions, precautions, conditions and limitations to obtain the maximum performance. For conditions outside the requirements or limitations described, contact your Ameron representative.

## Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. All surfaces must be clean, dry and free of oil, grease, dirt, salt deposits or other contamination.

1. To provide a smooth appearance to the Amershield coating Amercoat® 851, flow control additive may be used. See Amercoat 851 Product Data Sheet for more information.
2. For faster drying at low temperatures, Amercoat 866M can be used with all Amershield products.

**Steel** – Mill scale and rust must be removed. Abrasive blast hot-rolled steel to SSPC-SP6 and rusted and pitted steel to SSPC-SP10. Clean cold-rolled steel to SSPC-SP1 using vapor degreasing or solvent emulsion to remove all oil, grease and contamination. Solvent wipe is not satisfactory. Contact Ameron for compatible phosphate surface treatments.

**Aluminum** – Remove oil, grease or soap film with neutral detergent or emulsion cleaner; treat with Alodine® 1200 or Alumiprep® or blast lightly with fine abrasive.

**Galvanizing** – Remove oil or soap film with neutral detergent or emulsion cleaner; treat with Galvaprep® Amchem Products or blast lightly with fine abrasive.

**Amercoat 68HS** – Wash off water soluble contaminants; remove oil, grease, etc., with a neutral detergent or emulsion cleaner. Solvent wipe is not satisfactory.

**Concrete** – Clean concrete and masonry surfaces, abrasive blast (ASTM D4259) or acid etch (ASTM D4260). Fill concrete voids with Nu-Klad® 114A or 965. Fill masonry block with Amerlock® 400BF block filler.

**Coated surface** – Clean by low pressure water cleaning (1000 psi or greater) water blast, abrasive blast (SSPC-SP7), solvent emulsion cleaning (SSPC-SP1) or power tool cleaning (SSPC-SP3). Surface must be clean, dry and free of oil, grease, dirt or other contamination. Apply test patch to confirm compatibility and adhesion.

## Application Equipment

**Power mixer** – Jiffy mixer powered by an air or explosion-proof electric motor.

**Airless and electrostatic spray** – Standard equipment Graco, DeVilbiss, Nordson-Bede, Speeflo or others having a 28:1 or higher pump ratio and a fluid tip with a 0.015- to 0.021-inch (0.38- to 0.53-mm) orifice.

**Conventional, air-assisted airless and electrostatic spray** – Devilbiss, Binks or Graco production spray equipment with moisture and oil trap in the main air supply line.

**Brush** – Natural bristle. Maintain a wet edge.

**Roller** – Solvent resistant. Level any air bubbles with a bristle brush.

When brush or roller applied, multiple coats may be needed to achieve dry film thickness.

## Application Procedures

1. Flush equipment with thinner or Amercoat 12.
2. Stir resin thoroughly, add cure and mix until uniform. Do not mix more material than will be used within pot life time. Mixing ratio is 4 parts resin to 1 part cure by volume.

Pot life (hours)	°F/°C			
	90/32	70/21	50/10	32/0
Amershield	1½	2½	5	-
Amershield with 866M	½	1	2	4

3. If thinning is necessary, add up to 1 pint Amercoat 65 per gallon of Amershield .

4. When applying by spray, adjust pressures for equipment configuration and environmental conditions to ensure proper atomization.

5. Apply a wet coat in even, parallel passes; overlap each pass 50 percent.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
touch	1	2½	4	-
with 866M	½	¾	1	2½
through	5	10	72	-
with 866M	2	3	6	10

*Using ½ pt Amercoat 866M per 5 gal Amershield*

Recoat time (hours)	°F/°C				
	90/32	80/26	70/21	50/10	32/0
minimum	4	5½	8	48	-
with 866M	1½	1¾	2	4	8
maximum	12	24	168	168	-
with 866M	6	8	12	24	48

*Roughen surface or use Amerase™ if maximum recoat time is exceeded.*

*Note: When applying directly over organic zinc at full thickness, bubbling may occur. A mist coat/full coat technique may be required to prevent application bubbling.*

6. For colors, application of 8-mil wet film thickness (thinned) will normally provide 5-mil dry film thickness, Clear coat at 5-mils WFT will normally provide 3-mil DFT.

7. Clean all equipment with thinner or Amercoat 12 immediately after use.

**Note:** Moisture sensitive – Keep cure container tightly closed. Repeated moisture exposure will cause gellation and gassing; handle bulged containers with caution, lids may eject forcibly.

## Repair

Spot blast or power tool clean bare substrate to the requirements shown under surface preparation. Feather edges of intact coating. Remove dust, dirt and contamination before recoating.

## Shipping Data

Packaging units	1 gal	5 gal
cure	0.20 gal in 1-qt can	1 gal in 1-gal can
resin	0.80 gal in 1-gal can	4 gal in 5-gal can
Shipping weight (approx)	lb	kg
1-gal unit		
cure	2.2	1.0
resin	11.0	5.0
5-gal unit		
cure	10.4	4.7
resin	55.0	25.0
Shelf life when stored indoors at 40 to 100°F (4 to 38°C)		
resin	1 year from shipment date	
cure	1 year from manufacturer date	

Numerical values are subject to normal manufacturing tolerances, colors and testing variances. Appearance will vary depending on substrate and application method. Allow for application losses and surface irregularities. See application instructions for complete information and safety precautions.

This mixed product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

## Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of both components. Safety precautions must be strictly followed during storage, handling and use.

## Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

**Due to Ameron's policy of continuous product improvement, the information contained in this Product Data/Application Instructions sheet is subject to change without notice. It is the Buyer's responsibility to check that this issue is current prior to using the product. For the most up-to-date Product Data/Application Instructions always refer to the Ameron International Performance Coatings & Finishes website at [www.ameroncoatings.com](http://www.ameroncoatings.com).**

## Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

**Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.**

Any recommendation or suggestion relating to the use of products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.



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## AMERSHIELD

General air quality

Area should be sheltered from airborne particulates and pollutants. Ensure good ventilation during application and curing. Provide shelter to prevent wind from affecting spray patterns.

### INSTRUCTIONS FOR USE

Mixing ratio by volume

4 parts base to 1 part hardener

Pre-mix base component with a pneumatic air mixer at moderate speeds to homogenize the container. Add hardener to base and agitate with a power mixer for 1-2 minutes until completely dispersed

Pot life

Temperature	50°F	70°F	90°F
Amershield	5 hours	2.5 hours	1.5 hours
Amershield with 866M accelerator	2 hours	1 hours	30 minutes

Airless spray

28:1 pump or larger, 0.013-0.015 fluid tip  
Can be applied with plural component equipment

Air spray

Thin up to 20%, standard conventional equipment, 0.070" fluid orifice. A moisture and oil trap in the main line is essential. Product is sensitive to moisture contamination.

Brush & roll

Use a high quality natural bristle brush and / or solvent resistant, 1/4" or 3/8" nap roller. Ensure brush / roller is well loaded to avoid air entrainment. Multiple coats may be necessary to achieve adequate film build. *Amercoat 851* flow control additive can be used to for enhanced flow and leveling with brush and roll application. Multiple coats may be required to achieve proper film build and hiding with roller application.

Thinner

*Amercoat 923, Amercoat 65 (xylene), Amercoat 101 (recommended for > 90 °F), Amercoat 911*

Cleaning solvent

*Amercoat 12 Cleaner or Amercoat 65 thinner (xylene)*

Primers

*Amercoat 68HS, Amercoat 68MCZ, Amercoat 370, Amercoat 385, Amercoat 399, Amerlock 2I400, Pittguard Epoxies, Amercoat 435, Amercoat 256*

Safety precautions

For paint and recommended thinners see safety sheet 1430, 1431 and relevant material safety data sheets

This is a solvent borne paint and care should be taken to avoid inhalation of spray mist or vapor as well as contact between the wet paint and exposed skin or eyes.

### DRY/CURE TIMES

Amershield @ 5 mils dft

	40°F	50°F	70°F	90°F
Dry to touch	8 hours	4 hours	2.5 hours	1 hour
Dry through	5 days	72 hours	10 hours	5 hours
Dry to recoat	72 hours	48 hours	8 hours	4 hours
Maximum recoat	168 hours	168 hours	96 hours	12 hours

Amershield with 866M Accelerator @ 5 mils dft

	20°F	32°F	50°F	70°F	90°F
Dry to touch	8 hours	4 hours	75 minutes	25 minutes	10 minutes
Dry through	16 hours	10 hours	6 hours	3 hours	2 hours
Dry to recoat	16 hours	8 hours	4 hours	2 hours	1.5 hours
Maximum recoat	96 hours	48 hours	24 hours	12 hours	6 hours



## AMERSHIELD

- PRODUCT QUALIFICATIONS**
- Compliant with USDA Incidental Food Contact Requirements
  - Nuclear Service Level 2
  - NFPA Class A Flame Spread

**AVAILABILITY**

Packaging Available in 1-gallon and 5-gallon kits  
 1-gallon kits have 0.8 gallons of base and 0.2 gallons of hardener  
 5- gallon kits have 4 gallons of base and 1 gallon of hardener

Product codes	AM -3	White base
	AM -9	Black base
	AM -T1	Deep Tint base
	AM -T2	Light Tint base
	AM -T3	Neutral Tint base
	AM -T4	Red Tint base
	AM -T5	High Hiding Yellow Tint base
	AM -71	Safety Red base
	AM-81	Safety Yellow base
	AM-23	Pearl Gray base
	AM -B	Hardener (Part B)

Worldwide statement While it is always the aim of PPG Protective & Marine Coatings to supply the same product on a worldwide basis, slight modification of the product is sometimes necessary to comply with local or national rules/circumstances. Under these circumstances an alternative product data sheet is used.

**WARRANTY STATEMENT**

PPG warrants (i) its title to the products, (ii) that the quality of the product(s) conform to PPG's specifications for such products in effect at the time of manufacture and (iii) that the products shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the products. THESE ARE THE ONLY WARRANTIES PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG.

The information in this data sheet is based upon laboratory tests PPG believes to be accurate and is intended for guidance only. PPG may modify the information contained herein at any time as a result of practical experience and continuous product development. All recommendations or suggestions relating to the use of PPG products, whether in technical documentation, or in response to a specific inquiry, or otherwise, are based on data, which to the best of PPG's knowledge, are reliable. The products and information are designed for users having the requisite knowledge and industrial skills and it is the end-user's responsibility to determine the suitability of the product for its intended use.

PPG has no control over either the quality or condition of the substrate, or the many factors affecting the use and application of the product. Therefore, PPG does not accept any liability arising from loss, injury or damage resulting from such use or the contents of this data sheet (unless there are written agreements stating otherwise).

This data sheet supersedes all previous versions and it is the user's responsibility to ensure that this data sheet is current prior to using the product. The English text of this document shall prevail over any translation thereof.

**LIMITATION OF LIABILITY**

The information in this data sheet is based upon laboratory tests we believe to be accurate and is intended for guidance only. All recommendations or suggestions relating to the use of the products made by PPG Protective & Marine Coatings, whether in technical documentation, or in response to a specific enquiry, or otherwise, are based on data which to the best of our knowledge are reliable. The products and information are designed for users having the requisite knowledge and industrial skills and it is the end-user's responsibility to determine the suitability of the product for its intended use.

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The English text of this document shall prevail over any translation thereof.



## Competitive Product Equivalents Devoe Coatings vs. Ameron

<u>Code</u>	<u>Devoe Coatings Product</u>	<u>Ameron</u>
5A	Devstar 5A Epoxy High Build Coating	Amercoat 78HB
88	Devprep 88 Water Based Alkaline Cleaner	Prep 88
99	Devclean 99 Graffiti Cleaner	Amerase
108	Devmat 100% Solids Epoxy Tank Lining	Amercoat 133/333, 351
109	Devmat 109 Epoxy Holding Primer	Amercoat 91
110	Devmat 110 100% Solids Epoxy Tank Coating	none at present
111	Devmat 111 100% Solids Epoxy Tank Coating	consider Amercoat 351
112	Devmat 112 100% Solids Epoxy Coating	none at present
122	Devran 122 100% Solids Multi-Purpose Floor Coating	Nu-Klad 120A
124	Devran 124 Chemical Resistant Floor Coating	Nu-Klad 103N
126	Devran 126 100% Solids Clear Epoxy Coating	Nu-Klad 127
133	Devran 133 100% Solids Epoxy Tank Coating	Amercoat 133/333, 351
140	Devran 140 Epoxy Repair Compound	consider Nu-Klad 114A
142C	Devmat 142C 100% Solids Epoxy Amine Caulk	consider Nu-Klad 114A
142HB	Devmat 142HB Epoxy Caulk	consider Nu-Klad 114A
144	Devmat 144 100% Solids Sprayable Epoxy Caulk	none
150	Devran 150 100% Solids Plural Component Epoxy	Amercoat 428PCLO
167	Pre-Prime 167 Rust Penetrating Sealer	Amerlock Sealer
168LTC	Pre-Prime 168 Low Temperature Cure Rust Penetrating Sealer	none
182	Devclad 182 Splash Zone Barrier Coating	Tideguard 182
189	Devgrip 189 Abrasion Resistant Solvent Free Epoxy	Amercoat 351
201	Devran 201 Polyamide Epoxy Exterior Primer	Amercoat 385
205	Devran 205 Universal Epoxy Primer	Amerlock 2/400 or 240
220	Devran 220MX Heavy Duty MIO Epoxy Coating	Amercoat 385PA red
220MX	Devran 220MX Heavy Duty MIO Epoxy Coating	Amercoat 385PA red
224HS	Devran 224HS High Build Epoxy Coating	Amerlock 2/400
229 H	Devran 229 Acrylic Epoxy Gloss Coating	Amercoat 229T
231	Bar-Rust 231 Multi-Purpose Epoxy Mastic	Amercoat 240
232	Devran 232 Heavy Duty Epoxy Coating	
233 H	Bar-Rust 233 H Multi-Purpose Epoxy Coating	Amerlock 2/400 or 240
235	Bar-Rust 235 Multi-Purpose Epoxy Coating	Amercoat 235
236K	Bar-Rust 236K Multi-Purpose Epoxy Coating	Amercoat 240
237C	Devgrip 237C Epoxy Non-Skid Coating	
237M	Devgrip 237M Epoxy Heavy Duty Non-Skid Coating	Amercoat 237M
238	Devgrip 238 Abrasion Resistant Solvent Free Epoxy	Amercoat 238
239	Bar-Rust 239 Epoxy Mastic	
247	Devstar 247 High Build Epoxy Mastic	
250	Devran 250 Direct To Metal Gloss Epoxy	
253	Devchem 253 Chemical Resistant Lining	Amercoat 253
253 KC	Devchem 253KC Chemical Resistant Lining	Amercoat 253
253 KS	Devchem 253 KS Chemical Resistant Lining	Amercoat 253

## Competitive Product Equivalents Devoe Coatings vs. Ameron

Code	Devoe Coatings Product	Ameron
253 S	Devchem 253 S Sulfur Resistant Lining	Amercoat 253
256	Devchem 256 Chemical Resistant Lining	Amercoat 253
257	Devchem 257 Chemical Resistant Lining	Amercoat 253
261QC	Devran 261QC Low Temperature Cure Epoxy	Amercoat 370
265BHF	Devran 265BHF VOC Compliant Epoxy Block Filler	Amerlock 400 BF
302	Catha-Coat 302 Reinforced Inorganic Zinc Primer	Dimetcote 302H
302H	Catha-Coat 302H Reinforced Inorganic Zinc Primer	Dimetcote 302H
302HA	Catha-Coat 302 HA Reinforced Inorganic Zinc Primer	Dimetcote 302H
303H	Catha-Coat 303H Zinc Rich Epoxy Primer	Amercoat 68HS
304	Catha-Coat 304 Alkyl Silicate Inorganic Zinc Coating	Dimetcote 9
304H	Catha-Coat 304 H Alkyl Silicate Inorganic Zinc Coating	Dimetcote 9H
304V	Catha-Coat 304 V Alkyl Silicate Inorganic Zinc Coating	Dimetcote 9H
305	Catha-Coat 305 Water Based Inorganic Zinc Coating	Dimetcote 21-5
313	Catha-Coat 313 Organic Zinc Rich Epoxy Primer	Amercoat 68HS
315	Catha-Coat 315 Organic Zinc Rich Epoxy Primer	Amercoat 68HS
315 HA	Catha-Coat 315 HA Organic Zinc Rich Epoxy Primer	Amercoat 68HS
315 HB	Catha-Coat 315 HB Organic Zinc Rich Epoxy Primer	Amercoat 68HS
359	Devthane 359 High Build Gloss Aliphatic Urethane	Amershield
369	Devthane 369 Aliphatic Urethane Gloss Enamel	Amercoat 450H
378	Devthane 378 Aliphatic Urethane Semi-Gloss Enamel	Amercoat 450HSG
379 UA	Devthane 379 Aliphatic Urethane Gloss Enamel	Amercoat 450H
389	Devthane 389 Aliphatic Urethane Gloss Enamel	Amercoat 450H
430	Devguard 430 LOW VOC DTM Gloss Alkyd Enamel	Amercoat 5450
475	Devshield 475 Silicone Alkyd Gloss Enamel	Amercoat 5410 (GL)
495	Devplate 495 Vinyl Ester Epoxy	none
500	Hydro Strip 500 Paint Stripper	none
502	Hydro Strip 502 Paint Stripper	none
502	Devfloor 502 100% Solids Power Trowel Primer	Nu-Klad 127
503	Hydro Strip 503 Paint Stripper	none
504	Hydro Plus 504 Graffiti Remover	Amerase
505	Devfloor 505 Water-Based Epoxy Primer/Sealer	Nu-Klad 128
510	Devfloor 510 High Solids Epoxy Coating	Nu-Klad 126
514	Devfloor 514 100% Solids Clear Epoxy Coating	Nu-Klad 126 Clear
515	Devfloor 515 Epoxy Mortar Patch Kit	Nu-Klad 114A
516	Devfloor 516 Power Trowel 1/4" Topping	Nu-Klad 110C
517	Devfloor 517 100% Solids Epoxy Grout Coating	Nu-Klad 126
518	Devfloor 518 100% Solids Epoxy Texture Coat	broadcast aggregate
519	Devfloor 519 Epoxy Crack Filler	Nu-Klad 114A
522	Devfloor 522 3-Pack Epoxy Slurry System	consider Nu-Klad 120A
526	Devfloor 526 High Solids Epoxy Primer	Amerlock 2/400
527	Devfloor 100% Solids Epoxy Floor Coating	Nu-Klad 126

## Competitive Product Equivalents Devoe Coatings vs. Ameron

<u>Code</u>	<u>Devoe Coatings Product</u>	<u>Ameron</u>
528	Devfloor 527 Epoxy "Oil-Stop" Primer	Amerlock Sealer
529	Devfloor 529 Urethane Epoxy Flexible Joint Filler	Nu-Klad 750A
550	Devchem 550 Heat-Cured Phenolic Coating	consider PSX-758
561	Devfloor 561 High Wear Urethane Floor Coating	PSX-700 or Amershield
562	Devfloor 562 Polyester Urethane Finish	Amershield
562 Clear	Devfloor 562 Clear Polyester Urethane Finish	Amershield Clear or 700A
563	Clear Waterborne Aliphatic Polyester Urethane Sealer/Finish	none
564	Devfloor 564 High Solids Polyester Urethane Finish	Amershield or PSX-700
565	Devfloor 565 Clear Polyester Urethane Finish	Amershield Clear or 700A
720	Devran 720 Two-Part WB Epoxy Pre-Construction Primer	Amercoat 3207
724	Devran 724 Gloss Epoxy Coating	none
744	Devran 744 Epoxy Tank Lining	240, 90HS or 395FD
755	Devchem 755 FDA Epoxy Lining	Amercoat 395FD
4000	Bloxfil 4000 Interior/Exterior HD Acrylic Block Filler	Amercoat 147
4010	Tru-Glaze 4010 Waterproofing Base Coat & Filler	consider Nu-Klad 114A
4020	Devflex 4020 DTM Flat Interior/Exterior Waterborne Primer	consider Amercoat 335
4030	Tru-Glaze-WB 4030 Waterborne Epoxy Primer	
4100	Devguard 4100 Alkyd Metal Primer	
4110	Speedname 4110 Q.D. Primer (4397)	
4120	All Purpose Metal & Galvanized Metal Primer	
4130	Devshield 4130 Rust Penetrating Metal Primer	Amerlock Sealer
4140	Rustguard 4140 Q.D. Shop Coat Primer	
4150	Rustguard 4150 Low VOC Shop Coat Primer	
4160	Multi-Purpose Tank & Structural Primer	
4165	Universal Metal Primer	
4180	Low VOC Alkyd Metal Primer	
4205	Devflex Interior/Exterior Latex Semi-Gloss Enamel	
4206	Devflex Interior/Exterior Acrylic Semi-Gloss Enamel	
4207	Devflex Waterborne Retarding Additive	none
4208	Devflex Interior/Exterior Waterborne Acrylic Gloss Enamel	
4300	Devguard 4300 Alkyd Industrial Flat Black Coating	
4308	Devguard Alkyd Industrial Gloss Enamel	Amercoat 5450
4318	Speedname 4318 Q. D. Gloss Enamel (4300)	
4328	Devshield Interior/Exterior Urethane Alkyd Gloss Enamel	none
4328-9020	Devshield 4328 Pure Aluminum Finish	
4348	Devguard Low VOC Alkyd Industrial Gloss Enamel	
4380	Uni-Grip 380 Modified Epoxy Flat Dry Fog Primer & Finish	
4382	Uni-Grip 4382 Modified Epoxy Eggshell Dry Fog Primer/Finish	
4406	Tru-Glaze-WB 4406 Waterborne Epoxy Semi-Gloss Coating	
4408	Tru-Glaze-WB 4408 Waterborne Epoxy Gloss Coating	Amercoat 335
4418	Tru-Glaze 4418 Waterborne Acrylic Epoxy Coating	Amercoat 335



## Competitive Product Equivalents Devoe Coatings vs. Ameron

Code	Devoe Coatings Product	Ameron
4508	Tru-Glaze 4508 Chemical Resistant Epoxy Coating	
AS-75	Anti-Slip Floor & Deck Coating	
AS-150	Devran 150 Non-Slip Floor & Deck Coating	
AS-175	Non-Slip Floor & Deck Coating	
AS-250	Non-Slip Floor & Deck Coating	
AS-550	Non-Slip Floor & Deck Coating	
AS-2500	100% Solids Epoxy Non-Slip Floor Coating	Amercoat 136
HMP 771	Underwater Hull Coating	Amercoat 771
HT-10	HT-10 Modified Silicone High Heat Coating	Amercoat 3279
HT-12	HT-12 High Heat Silicone Coating	
HT-4	HT-4 Heat Resistant Silicone Acrylic	Amercoat 874HS
HT-403	HT-403 Heat Resistant Epoxy Coating	
HT-8	HT-8 Heat Resistant Modified Silicone Zinc	Amercoat 872

# Terminator™ DP

## Power Connection Kit

### INSTALLATION PROCEDURES

For Power Connection, In-Line Splice Connection,  
T-Splice Connection, or End Termination Applications



**The Heat Tracing Specialists®**

# Terminator™ DP

The following installation procedures are suggested guidelines for the installation of termination connection systems. They are not intended to preclude the use of other methods and good engineering or field construction practices.

## Receiving, Storing and Handling . . .

1. Inspect materials for damage incurred during shipping.
2. Report damages to the carrier for settlement.
3. Identify parts against the packing list to ensure the proper type and quantity has been received.

## Kit Contents . . .



Item	Quantity	Description
1	1	Expediter Assembly Support Cap with O-Ring Threaded Grommet Compressor Support Base with O-Ring
2	1	Junction Box Lid
3	1	Junction Box Base with O-Ring
4	1	Nut
5	1	Banding
6	1	Banding Guide
7	1	Terminal Blocks with DIN Rail (22-8 AWG, 600 Vac, 50 Amp)
8	1	Junction Box Cord

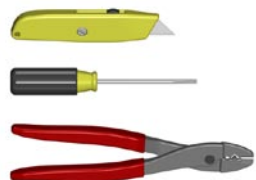
## Certifications/Approvals . . .



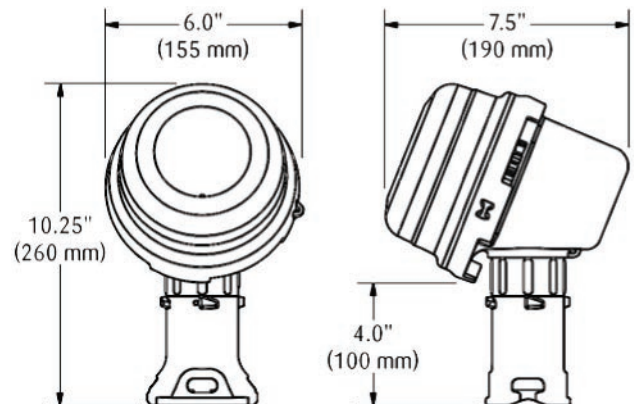
IP66 NEMA/Type 4X  $-60^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$   
 Ordinary & Hazardous Locations  
 Class I, Division 2, Groups A, B, C, & D, Zone 2 IIC  
 Class II, Division 2, Groups F & G, Class III  
 Listed Heat Tracing Cable System 137M



## Tools Required . . .



## Dimensions . . .



## Installation Precautions . . .

- To minimize the potential for arcing and fire caused by product damage or improper installation use ground-fault protection. The National Electrical Code (NEC) and Canadian Electrical Code (CEC) require ground-fault protection of equipment for each branch circuit supplying electric heat tracing.
- Installation must comply with Thermon requirements and be installed in accordance with the NEC, CEC, or any other applicable national and local codes.
- Component approvals and performance ratings are based on the use of Thermon specified parts only. User supplied power connection fittings must be listed or certified for intended use.
- De-energize all power sources before opening enclosure.
- Keep ends of heating cable and kit components dry before and during installation.

## Order Separately . . .

### PETK Power and End Termination Kits (per cable)

PETK-1D for BSX, RSX, TSX, VSX

PETK-2D for KSX, HTSX

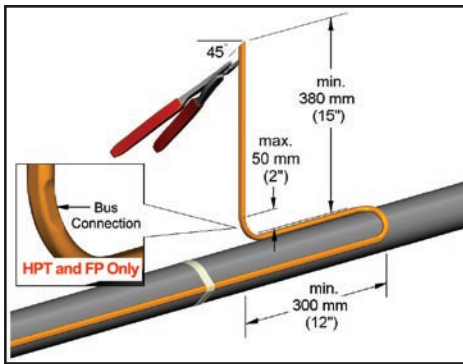
PETK-3D for HPT, FP



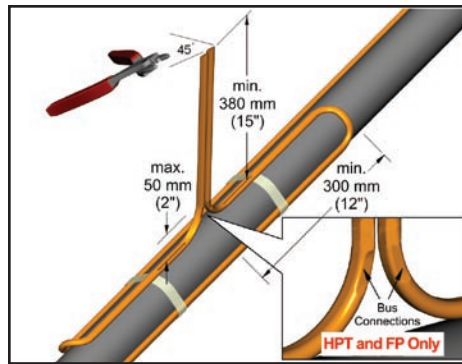
Item	Quantity	Description
1	1	RTV Tube
2	1	Power Connection Boot
3	1	End Cap
4	1	Tape Strip Teflon 6" (PETK-3D only)
5	1	End Termination Caution Label
6	1	GRW-G Grommet (PETK-3D only)



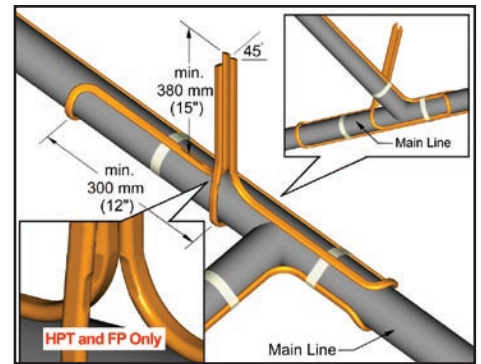
# Terminator™ DP



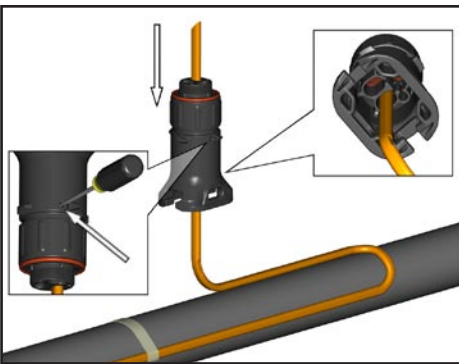
**1a.** For one, two or three cables. Locate bus connection (HPT and FP only) and cable as shown. Cut end of cable at angle to aid in piercing grommet. Leave additional cable for expansion loop.



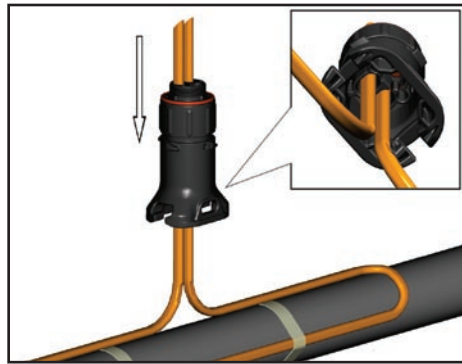
**1b.** Two cables.



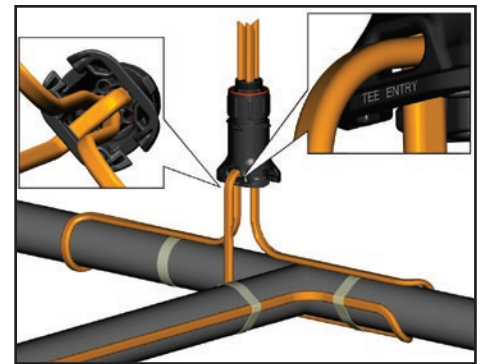
**1c.** Three cables.



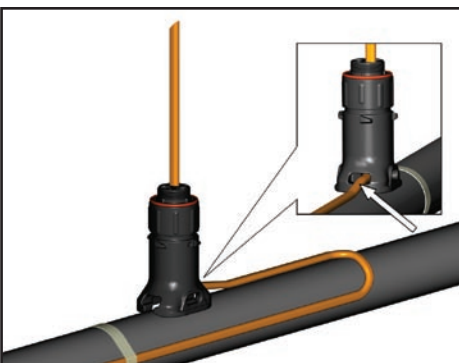
**2a.** For one, two or three cables. Insert cable into expediter. If mounted on bottom of pipe, punch out weep hole.



**2b.** Two cables.



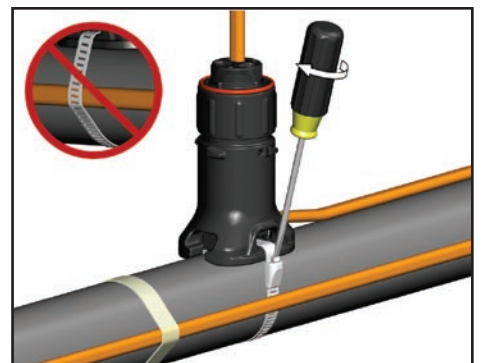
**2c.** Three cables.



**3.** Slide expediter toward pipe and route cable through support base entry.



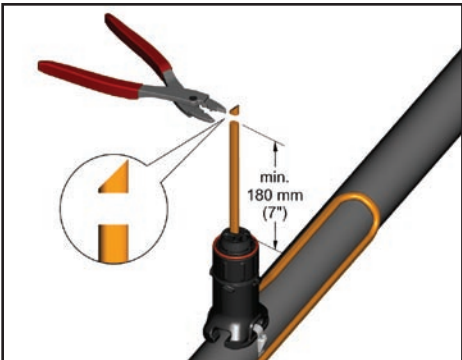
**4.** Insert banding guide into expediter and snap into place.



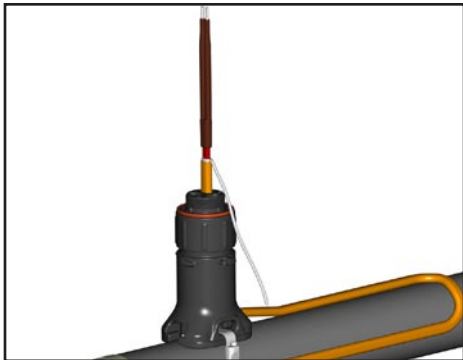
**5.** Mount expediter to pipe using pipe band. Do not band over cable.



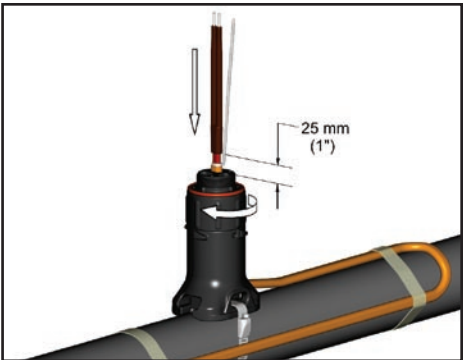
# INSTALLATION PROCEDURES



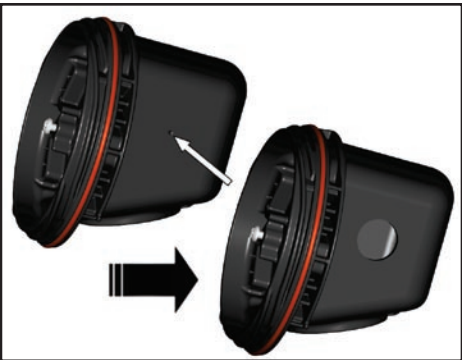
**6.** Cut off end of cable.



**7.** Terminate cable with appropriate PETK termination kit. Refer to PETK installation instructions.



**8.** Push excess cable back through expediter. Tighten cap securely. Tape cable expansion loop to pipe.



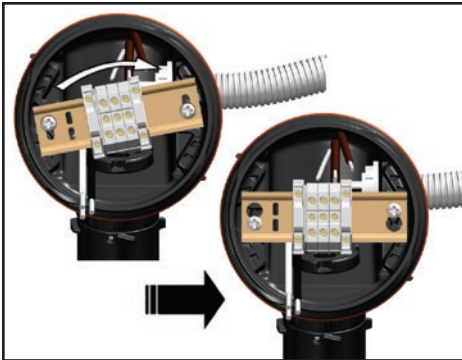
**9.** For power connection applications: Use dimple molded into side of junction box base to locate center of hole, drill for user supplied power connection fittings per manufacturer's recommendations.



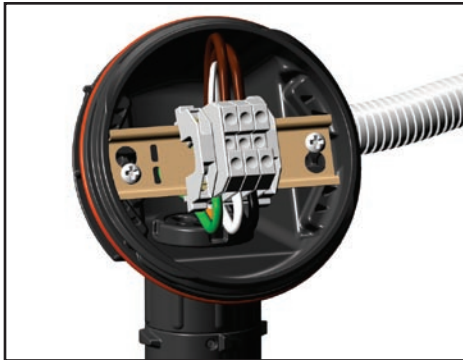
**10.** Mount junction box base on expediter. Make sure to align slots to properly orient junction box base. Tighten nut securely.



**11.** For power connection applications: Install power connection fittings (user supplied) and pull in power and ground wires.



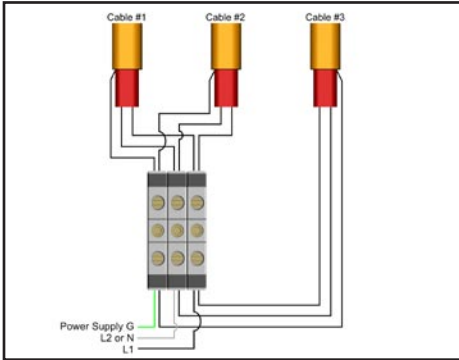
**12.** Install quick mount terminal blocks.



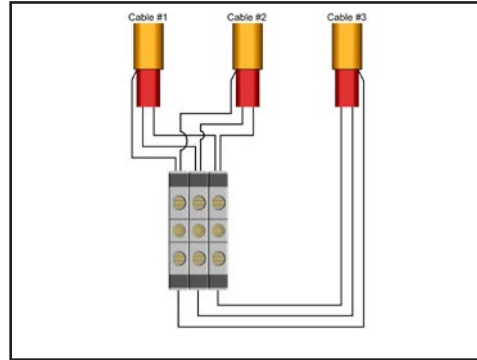
**13.** Complete system wiring. Refer to typical wiring details.

# Terminator™ DP

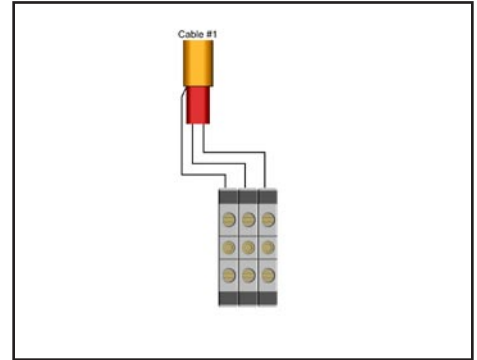
## Typical Wiring Details



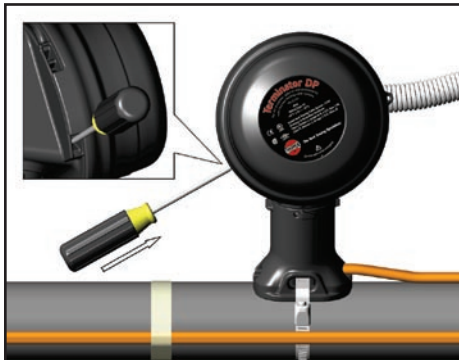
Power Connection (1 to 3 Cables). For 3 cable power connections, additional terminal blocks will be required when using 10mm<sup>2</sup> (#8 AWG) power supply wiring.



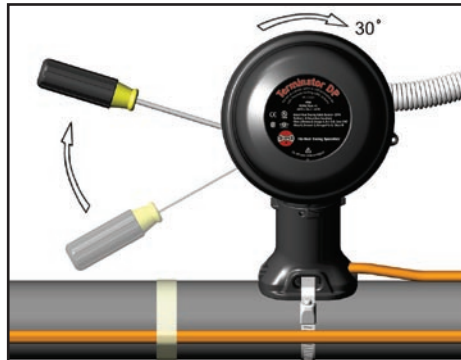
In-Line Splice and T-Splice



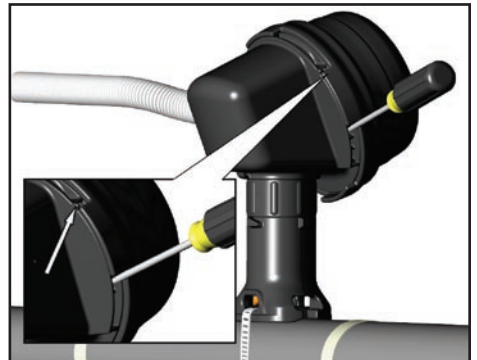
End Termination (1 Cable Only)



**13.** Install junction box lid and twist hand tight. Insert screwdriver into ratchet slots located on side of junction box base.



**14.** Use screwdriver to ratchet on junction box lid. Lid will rotate 30 degrees.



**15.** Lid latch mechanism fully engaged. To remove lid, repeat steps 13 and 14 but in the opposite direction.





# INSTALLATION PROCEDURES



**ISO 9001**  
REGISTERED

**THERMON . . . The Heat Tracing Specialists®**

100 Thermon Dr. • PO Box 609 • San Marcos, TX 78667-0609  
Phone: 512-396-5801 • Facsimile: 512-396-3627 • **1-800-820-HEAT**  
www.thermon.com In Canada call **1-800-563-8461**

Specifications and information are subject to change without notice.

# RTD-100

## Temperature Sensor

### Product Specifications

#### Application . . .

##### Electric Heat Tracing Control

The RTD-100 is designed for use as control input for freeze protection and temperature maintenance applications requiring pipewall or tankwall temperature sensing.

A cast-aluminum NEMA 4/7 enclosure and terminal block allows ease of wiring into a single unit that can be installed directly onto a heat traced pipe. The RTD-100 housing and mounting pad are stainless steel.

The RTD-100 is suitable for use in heat tracing applications where surface temperatures do not exceed 900°F (482°C).

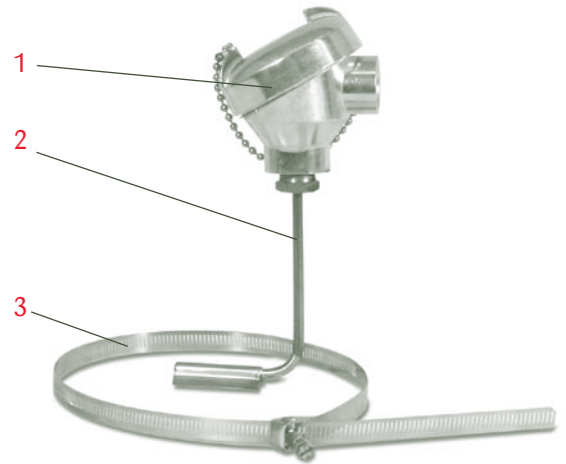
#### Ratings/Specifications . . .

Electrical connection .....ceramic strip w/brass terminals  
 Enclosure rating.....NEMA 4/7  
 Enclosure hub size.....3/4" NPT female hub  
 RTD leads.....22 AWG fiberglass  
 RTD type.....3-wire platinum thin film  
 RTD resistance..... 100 ohms at 32° (0°C)  
 RTD calibration

Per ASTM E1137, DIN standard 43760/BS1904/IEC 751  
 Temperature coefficient.....00385 Ohms/Ohms - °C  
 Maximum sensor temperature..... 900°F (482°C)  
 Sensor housing material .....316 stainless steel

#### Note . . .

1. For additional options or enclosure materials contact Thermon.



#### Construction . . .

- 1 Junction Box With Terminal Strip
- 2 RTD Housing
- 3 Pipe Strap (purchased separately)
  - B4 = pipe dia. up to 4"
  - B10 = pipe dia. up to 10"
  - B21 = pipe dia. up to 21"

#### Certifications/Approvals . . .



##### Canadian Standards Association

The RTD-100 is CSA certified for use in North America.

Ordinary Locations

Hazardous (Classified) Locations

- Class I, Division 2, Groups A, B, C and D
- Class II, Division 2, Groups E, F and G



The RTD-100-D1 (pictured at left) is provided with a cast aluminum enclosure and is CSA certified for use in North America.

Ordinary Locations

Hazardous (Classified) Locations

- Class I, Division 1, Groups B, C and D
- Class II, Division 2, Groups E, F and G



**THERMON . . . The Heat Tracing Specialists®**

100 Thermon Dr. • PO Box 609 • San Marcos, TX 78667-0609  
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 www.thermon.com In Canada call **800-563-8461**

**ISO 9001**  
REGISTERED



# RTD-100

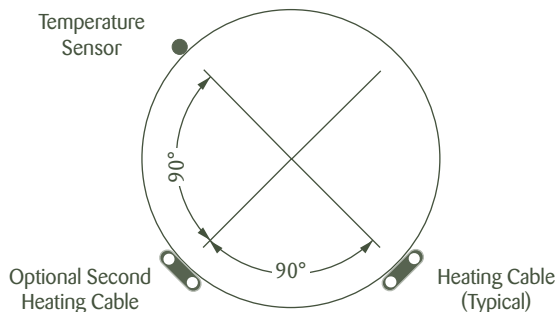
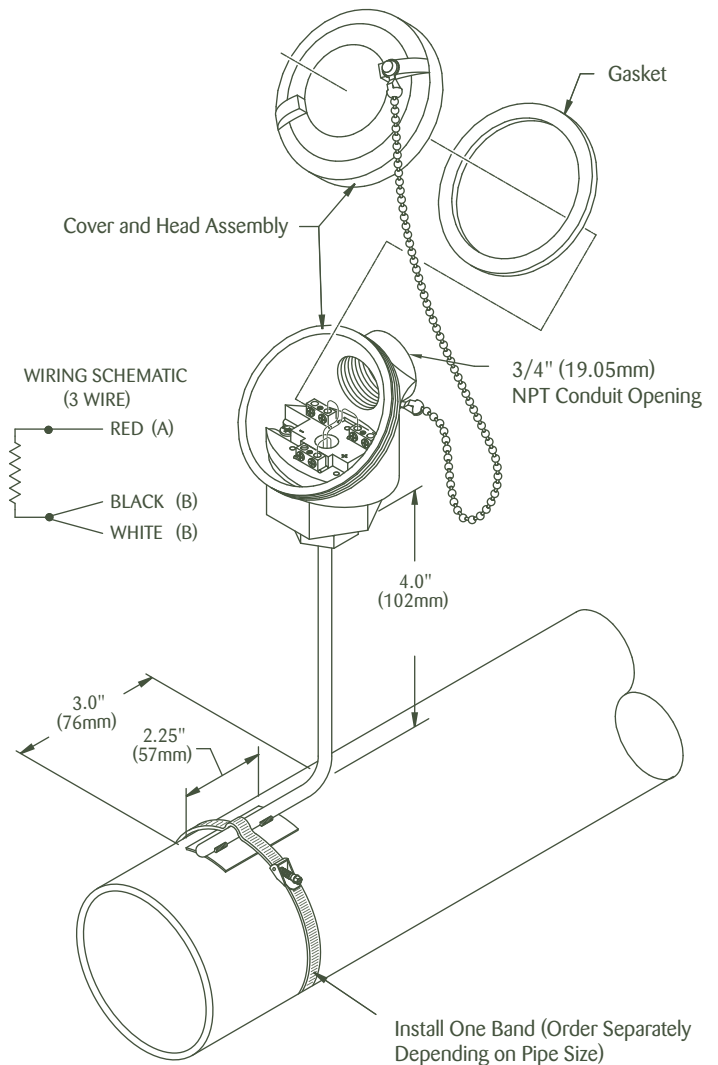
## Temperature Sensor

## Product Specifications

The following installation procedures are suggested guidelines for the installation of a Thermon temperature sensor. They are not intended to preclude the use of other methods utilizing accepted engineering or field construction practices. Temperature sensors are used for freeze protection or temperature maintenance of piping, tanks and instrumentation.

### Temperature Sensor Installation . . .

1. Upon receipt, check to make sure the proper type has been received.
2. Store in a dry place.
3. Ensure that temperature sensor/junction box combination is suitable for the area classification.
4. Mount the temperature sensor/junction box vertically upright and in a position that will prevent condensation from draining into the enclosure from the connected conduit. **Do not bend sensor or lead. Adequately support conduit leading to enclosure.**
5. The sensor should be placed at least 90° around the circumference from the heating cable, or at least 2" (5 cm) from the cable. Mount the sensor in a location that is representative of the overall system temperature away from valves, pipe supports, nozzles, or other heat sinks. Fasten the temperature sensor securely to the pipe/vessel with banding (purchased separately), being sure that the entire length of the sensor is in intimate contact with the pipe surface. The sensor may be covered with a parallel pass of metallic tape to enhance heat transfer (not shown).
6. **Power should always be disconnected and a lockout/tagout procedure performed prior to opening the box enclosure for maintenance.**
7. Any modification to the enclosure or deviation from these procedures may affect unit's rating or approvals. Contact factory if modifications are necessary.



Heating Cable vs. Sensor Location (Line Sensing Control)



# BSX™ Self-Regulating Heating Cable

## Product Specifications

### Application . . .

#### Freeze Protection or Process Temperature Maintenance

BSX self-regulating heating cables are designed to provide freeze protection or process temperature maintenance to metallic and nonmetallic piping, tanks and equipment. The heat output of BSX cable varies in response to the surrounding conditions along the entire length of a circuit. Whenever the heat loss of the insulated pipe, tank or equipment increases (as ambient temperature drops), the heat output of the cable increases. Conversely, when the heat loss decreases (as the ambient temperature rises or product flows), the cable reacts by reducing its heat output. BSX cables are approved for use in ordinary (nonclassified) areas and hazardous (classified) areas.

### Ratings . . .

Available watt densities .....	3, 5, 8, 10 w/ft @ 50°F (10, 16, 26, 33 w/m @ 10°C)
Supply voltages.....	110-120 or 208-277 Vac
Max. maintenance temperature .....	150°F (65°C)
Max. continuous exposure temperature	
Power-off .....	185°F (85°C)
Minimum installation temperature .....	-60°F (-51°C)
Minimum bend radius	
@ 5°F (-15°C) .....	0.38" (10mm)
@ -76°F (-60°C) .....	1.25" (32 mm)
T-rating <sup>1</sup>	
3, 5, 8 w/ft (10, 16, 26 W/m) .....	T6 185°F (85°C)
10 w/ft (33 W/m) .....	T5 212°F (100°C)

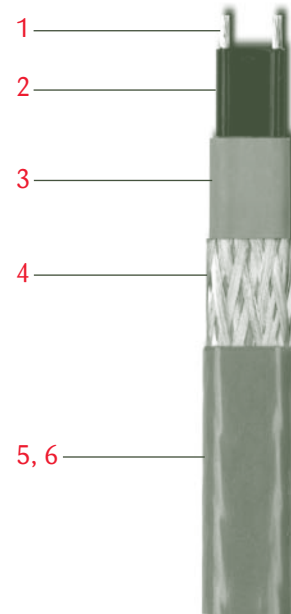
### Basic Accessories<sup>2</sup> . . .

**Power Connection:** All BSX cables require a Terminator, PCA or ECA power connection kit for terminating the circuit before connecting to power.

**End-of-Circuit Termination:** BSX cables require the ET-6 end cap for terminating at the end of the circuit.

### Notes . . .

1. T-rating per the National Electrical Code and Canadian Electrical Code.
2. Information on additional accessories to complete a heater circuit installation and to comply with approval requirements may be found in the "Self-Regulating Cables Systems Accessories" product specification sheet (Form TEP0010).



### Construction . . .

- 1 Nickel-Plated Copper Bus Wires (16 AWG)
- 2 Radiation Cross-Linked Semiconductive Heating Matrix
- 3 Radiation Cross-Linked Dielectric Insulation
- 4 Tinned Copper Braid
- 5 Polyolefin overjacket provides additional protection to cable and braid where exposure to aqueous inorganic chemicals is expected.

### Options . . .

- 6 FOJ Fluoropolymer overjacket over tinned copper braid provides additional protection to cable and braid where exposure to organic chemicals or corrosives is expected.



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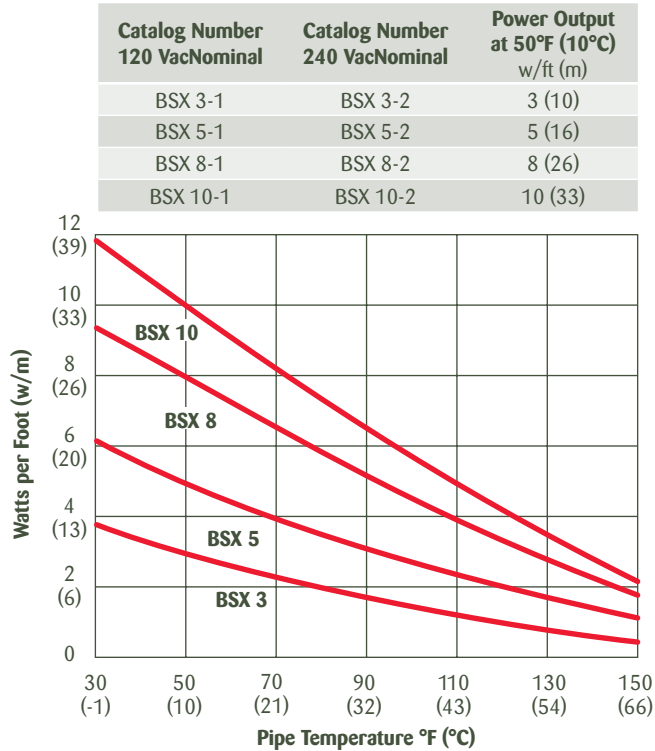
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visit us at . . .  
[www.thermon.com](http://www.thermon.com)

### Power Output Curves<sup>1</sup> . . .

The power outputs shown apply to cable installed on insulated metallic pipe (using the procedures outlined in IEEE Standard 515-2004) at the service voltages stated below. For use on other service voltages, contact Thermon.



### Circuit Breaker Sizing<sup>2</sup> . . .

Maximum circuit lengths for various circuit breaker amperages are shown below. Breaker sizing should be based on the National Electrical Code, Canadian Electrical Code or any other applicable code. The National Electrical Code and Canadian Electrical Code require ground-fault protection of equipment for each branch circuit supplying electric heating equipment. Check local codes for ground-fault protection requirements.

Catalog Number	120 Vac Service Voltage Start-Up Temperature °F (°C)	Max. Circuit Length <sup>3</sup> vs. Breaker Size ft (m)		
		20A	30A	40A
BSX 3-1	50 (10)	360 (110)	360 (110)	360 (110)
	0 (-18)	325 (99)	360 (110)	360 (110)
	-20 (-29)	285 (87)	360 (110)	360 (110)
	-40 (-40)	260 (79)	360 (110)	360 (110)
BSX 5-1	50 (10)	240 (73)	300 (91)	300 (91)
	0 (-18)	205 (62)	300 (91)	300 (91)
	-20 (-29)	185 (56)	275 (84)	295 (90)
	-40 (-40)	165 (50)	250 (76)	265 (81)
BSX 8-1	50 (10)	190 (58)	240 (73)	240 (73)
	0 (-18)	150 (46)	225 (69)	240 (73)
	-20 (-29)	135 (41)	200 (61)	240 (73)
	-40 (-40)	120 (37)	180 (55)	215 (66)
BSX 10-1	50 (10)	160 (49)	200 (61)	200 (61)
	0 (-18)	110 (34)	170 (52)	200 (61)
	-20 (-29)	100 (30)	150 (46)	200 (61)
	-40 (-40)	90 (27)	135 (41)	180 (55)

### Certifications/Approvals . . .



**Factory Mutual Research**  
 Ordinary Locations  
 Hazardous (Classified) Locations  
 Class I, Division 2, Groups B, C and D  
 Class II, Division 2, Groups F and G  
 Class III, Divisions 1 and 2  
 Class I, Zones 1 and 2, AEx e II (requires FOJ)



**Underwriters Laboratories Inc.**  
 Ordinary Locations  
 Hazardous (Classified) Locations  
 Class I, Division 2, Groups B, C and D  
 Class II, Division 2, Groups F and G  
 Class III, Divisions 1 and 2  
 Class I, Zones 1 and 2, AEx e II (requires FOJ)



**Canadian Standards Association**  
 Ordinary Locations  
 Hazardous (Classified) Locations  
 Class I, Divisions 1 & 2, Groups A, B, C and D  
 Class II, Divisions 1 & 2, Groups E, F and G  
 Ex e II

### Notes . . .

- For more precise power output values as a function of pipe temperature, refer to CompuTrace®.
- Based on the trip current characteristic of Type QOB or Type QO equipment protection devices. For devices with other trip current characteristics, contact Thermon.
- The maximum circuit length is for one continuous length of cable, not the sum of segments of cable. Refer to CompuTrace® design software or contact Thermon for current loading of segments.

Catalog Number	240 Vac Service Voltage Start-Up Temperature °F (°C)	Max. Circuit Length <sup>3</sup> vs. Breaker Size ft (m)		
		20A	30A	40A
BSX 3-2	50 (10)	725 (221)	725 (221)	725 (221)
	0 (-18)	650 (198)	725 (221)	725 (221)
	-20 (-29)	575 (175)	725 (221)	725 (221)
	-40 (-40)	515 (157)	725 (221)	725 (221)
BSX 5-2	50 (10)	480 (146)	600 (183)	600 (183)
	0 (-18)	395 (120)	590 (180)	600 (183)
	-20 (-29)	350 (107)	525 (160)	590 (180)
	-40 (-40)	315 (96)	475 (145)	530 (162)
BSX 8-2	50 (10)	385 (117)	480 (146)	480 (146)
	0 (-18)	285 (87)	425 (130)	480 (146)
	-20 (-29)	255 (78)	380 (122)	480 (146)
	-40 (-40)	230 (70)	345 (116)	430 (131)
BSX 10-2	50 (10)	280 (85)	400 (122)	400 (122)
	0 (-18)	225 (69)	340 (104)	400 (122)
	-20 (-29)	200 (61)	300 (91)	400 (122)
	-40 (-40)	180 (55)	275 (84)	365 (111)





# Systems Accessories

## Thermon Heat Tracing Cables

### Product Specifications

#### Terminator™ Nonmetallic Power Connection, Splice and End-of-Circuit Light Kits . . .

Terminator nonmetallic accessories are approved for ordinary and Division 2 hazardous locations. The kits have a maximum pipe exposure temperature rating of 482°F (250°C) with a minimum installation temperature of -76°F (-60°C).



**Terminator DP...** is designed to fabricate power connections, in-line/T-splice connections or for making end terminations. Electrical connections are made in terminal blocks utilizing nickel-plated copper terminals to ensure corrosion-free electrical integrity. The upfront positioning of the terminal block permits easy access during assembly and for future routine maintenance.

The Terminator DP kit includes; Type 4X junction box with integral gasket, three-point DIN mount terminal block with nickel-plated copper terminals (600 V, 50 A), pipe-mounted fitting, stainless steel pipe attachment band for piping 10" or less. (PETK/SCTK termination kit required, order separately)

**Product Reference Legend:**

**DP** .....BSX, RSX, HTSX, KSX, VSX, HPT, FP  
**DP-M** .....TEK, HTEK,



**Terminator DS/DE...** is designed to fabricate in-line splices or end terminations.

**Terminator DE-B...** is designed to provide visual indication of an energized heating circuit.

Electrical connections are made using wire fasteners. Once the kit is assembled, a tool is required to remove the cover to gain access for maintenance or testing. (For applications requiring terminations to be made with terminal block connections, the Terminator DP or DL kit may be used.)

The Terminator DS/DE and DE-B kits include; Type 4X pipe-mounted fitting with locking splice cover, stainless steel pipe attachment band for piping 10" or less. (PETK/SCTK termination kit required, order separately)

**Product Reference Legend:**

**DS/DE** .....BSX, RSX, HTSX, KSX, VSX, HPT, FP  
**DE-B** .....BSX, RSX, HTSX, KSX, VSX, HPT, FP



**Terminator DL...** is designed to provide visual indication of an energized heating circuit. The kit may be utilized as a power connection or an end termination kit. Electrical connections are made in terminal blocks utilizing nickel-plated copper terminals to ensure corrosion-free electrical integrity.

The Terminator DL kit includes; Type 4X junction box, yellow raised light, diode indicating lamp can be energized with up to 254 Vac without change in luminosity, three-point DIN mount terminal block with nickel-plated copper terminals, pipe-mounted fitting, stainless steel pipe attachment band for piping 10" or less. (PETK termination kit required, order separately)

**Product Reference Legend:**

**DL** .....BSX, RSX, HTSX, KSX, VSX, HPT, FP

#### TracePlus™ Nonmetallic Power Connection, Splice and End-of-Circuit Light Kits . . .

TracePlus nonmetallic accessories are approved for ordinary and Division 2 hazardous locations. The kits have a maximum pipe exposure temperature rating of 400°F (204°C) with a minimum installation temperature of -20°F (-29°C).



**PCA...** is designed to fabricate power connections, in-line/T-splice connections or for making end terminations.

The PCA kit includes; Type 4X junction box, pipe-mounted expediter, 2 stainless steel pipe attachment bands for piping 10" or less. (PETK/SCTK termination kit required, order separately)

**Product Reference Legend:**

**PCA-H** .....BSX, HTSX, KSX, HPT, FP  
**PCA-V** .....RSX, VSX



**PCS...** is designed to fabricate accessible outside-the-insulation splices or end terminations.

The PCS kit includes; Type 4X pipe-mounted expediter with splice cover, 2 stainless steel pipe attachment bands for piping 10" or less. (SCTK termination kit required, order separately)

**Product Reference Legend:**

**PCS-H** .....BSX, HTSX, KSX, HPT, FP  
**PCS-V** .....RSX, VSX



**VIL-6...** is designed to provide visual indication of an energized heating circuit. 120 Vac (option 1), 208 Vac (option 4), 240 Vac (option 2) or 277 Vac (option 3).

The VIL-6 kit includes; Type 4X junction box, pipe-mounted expediter, Amber light assembly, 2 stainless steel pipe attachment bands for piping 10" or less. (PETK termination kit required, order separately)

**Product Reference Legend:**

**VIL-6-H** .....BSX, HTSX, KSX, HPT, FP  
**VIL-6-V** .....RSX, VSX



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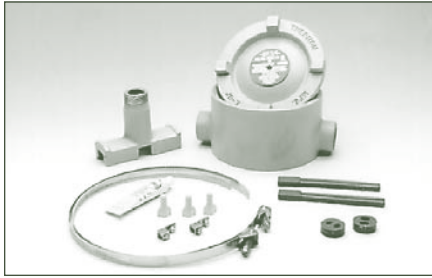
# Systems Accessories

## Thermon Heat Tracing Cables

## Product Specifications

### Metallic Power Connection, Splice and End-of-Circuit Light Kits . . .

Thermon metallic accessories utilize epoxy-coated aluminum junction boxes and expeditors and are approved for ordinary and Division 2 hazardous locations. The kits have a maximum pipe exposure temperature rating of 482°F (250°C) with a minimum installation temperature of -60°F (-51°C).



**ECA-1**...is designed for connecting one or two heating cables to power or for splicing two cables together.

The ECA-1 kit includes; epoxy-coated Type 4X/7 junction box, pipe-mounted expediter, 2 stainless steel pipe attachment bands for piping 4" or less, heater cable grommet, 2 power connection boots, RTV adhesive, wire fasteners and grounding lug.

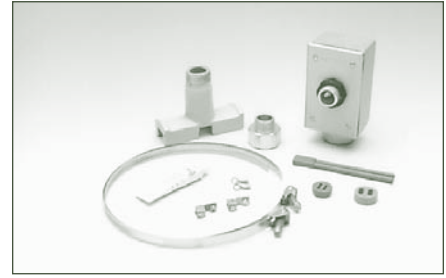
**ECA-1-SR** ..... BSX, RSX, HTSX, KSX, VSX  
**ECA-1-ZN** ..... FP, HPT



**ECT-2**...is designed for connecting three heating cables to power or for splicing three cables together.

The ECT-2 kit includes; epoxy-coated Type 4X/7 junction box, pipe-mounted expediter, third cable entry assembly, 2 stainless steel pipe attachment bands for piping 4" or less, heater cable grommets, 3 power connection boots, RTV adhesive, wire fasteners and grounding lug.

**ECT-2-SR** ..... BSX, RSX, HTSX, KSX, VSX  
**ECT-2-ZN** ..... FP, HPT



**VIL-4C**...is designed to provide visual indication of an energized heating circuit. 120 Vac (option 1), 208 Vac (option 4), 240 Vac (option 2) or 277 Vac (option 3).

The VIL-4C kit includes; pipe-mounted expediter, amber light assembly in Type 4X box, 2 stainless steel pipe attachment bands for piping 4" or less, heater cable grommet, power connection boot, RTV adhesive, 2 ring terminals and grounding splice lug.

**VIL-4C-SR** ..... BSX, RSX, HTSX, KSX, VSX  
**VIL-4C-ZN** ..... FP, HPT

### Cable End Termination Kits, Attachment Tapes and Miscellaneous Items . . .



**PETK**...circuit fabrication kit includes a power boot, end cap, RTV adhesive.

**SCKT**...splice connection/termination kit includes a power boot, wirenuts, RTV adhesive.

**PETK-1D / SCKT-1D** ..... BSX, RSX, VSX  
**PETK-2D / SCKT-2D** ..... KSX, HTSX  
**PETK-3D / SCKT-3D** ..... FP, HPT



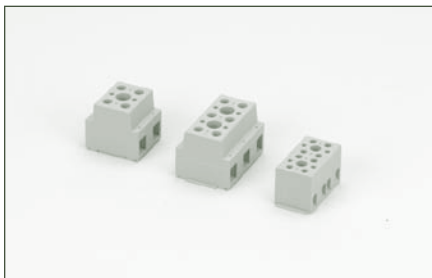
**ET-6C, ET-7C, ET-8C**...end termination kits are designed to properly terminate the end (away from power) of a heat tracing circuit. Each kit includes a rubber end cap, RTV adhesive and caution label.

**ET-6C** ..... BSX, RSX, VSX  
**ET-7C** ..... HPT (BN)  
**ET-8C** ..... HTSX, KSX, FP & HPT (O)



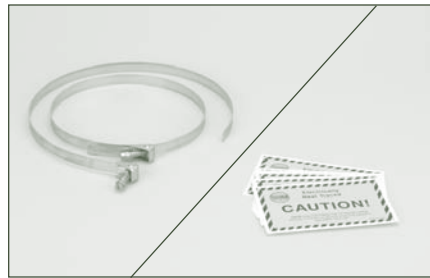
**TBX-3LC, TBX-4LC**...power connection boots are used to prepare heating cable for connection to power. Kit includes rubber boot and RTV adhesive.

**TBX-3LC** ..... BSX, RSX, VSX  
**TBX-4LC** ..... HTSX, KSX, FP & HPT



**TB-2F, TB-3F, TB-4F**...floating terminal blocks for use inside metallic (ECA, ECT) and non-metallic (PCA, PCS) junction boxes.

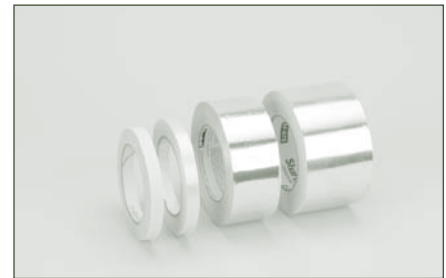
**TB-2F** ..... 2-point-rated 65A @ 600 Vac, 22 - 6 AWG  
**TB-3F** ..... 3-point-rated 65A @ 600 Vac, 22 - 6 AWG  
**TB-4F** ..... 4-point-rated 30A @ 250 Vac, 26 - 10 AWG



**CL**...vinyl-based peel and stick caution labels are intended for direct exposure to industrial environments. Electrically heated pipelines and vessels are to be clearly identified at frequent intervals. Caution labels should be placed at 10'-20' (3-6 m) intervals or as required by code or specification.

**B-4, B-10, B-21**...stainless steel attachment bands for securing Thermon connection kits to pipes. Each connection kit includes two bands.

**B-4**...for pipes up to 4" (100 mm) diameter  
**B-10**...for pipes up to 10" (250 mm) diameter  
**B-21**...for pipes up to 21" (530 mm) diameter



**FT-1L, FT-1H**... fixing tapes for attaching heating cable to piping every 12" (30 cm) or as required by code or specification.

**AL-20L, AL-20H, AL-30L, AL-30H**... aluminum tape for continuous (longitudinal) covering.

Catalog #	Temp. Max.	Min. Install	Dimensions
<b>FT-1L</b>	200°F	40°F	1/2" x 108'
<b>FT-1H</b>	500°F	-40°F	1/2" x 108'
<b>AL-20L</b>	150°F	40°F	2" x 150'
<b>AL-20H</b>	300°F	20°F	2" x 180'
<b>AL-30L</b>	150°F	40°F	3" x 150'
<b>AL-30H</b>	300°F	20°F	3" x 180'





# Electric Heat Tracing INSTALLATION PROCEDURES



**The Heat Tracing Specialists®**



# Electric Heat Tracing

## Complete Electric Heat Tracing System . . .

A complete electric heat tracing system will typically include the following components<sup>1</sup>:

1. Electric heat tracing cable<sup>2</sup> (self-regulating, power-limiting, parallel constant watt or series constant watt).
2. Power connection kit.
3. RTD sensor or control thermostat<sup>3</sup>.
4. In-line/T-splice kit (permits two or three cables to be spliced together).
5. Cable end termination.
6. Attachment tape (use on 12" intervals or as required by code or specification).
7. "Electric Heat Tracing" label (peel-and-stick label attaches to insulation vapor barrier on 10' intervals or as required by code or specification).
8. Thermal insulation<sup>4</sup> and vapor barrier (by others).

The absence of any of these items can cause a system to malfunction or represent a safety hazard.

## Types of Heating Cables . . .

### Self-Regulating Heating Cables:

- BSX™ Self-Regulating Heating Cable (refer to Form TEP0067)
- RSX™ Self-Regulating Heating Cable (refer to Form TEP0004)
- KSX™ Self-Regulating Heating Cable (refer to Form TEP0072)
- TSX® Self-Regulating Heating Cable (refer to Form TEP0006)
- HTSX™ Self-Regulating Heating Cable (refer to Form TEP0074)
- VSX™ Self-Regulating Heating Cable (refer to Form TEP0008)

### Power-Limiting Heating Cable:

- HPT™ Power-Limiting Heating Cable (refer to Form TEP0011)

### Parallel Constant Watt Heating Cable:

- FP Parallel Constant Watt Heating Cable (refer to Form TEP0016)

### Series Constant Watt Heating Cables:

- TEK™ Series Constant Watt Heating Cable (refer to Form TEP0021)
- HTEK™ Series Constant Watt Heating Cable (refer to Form TEP0022)
- MIQ™ Mineral Insulated Heating Cable (refer to Form TEP0020)

### Notes . . .

1. Illustration depicts a typical self-regulating heating circuit.
2. Ground-fault equipment protection is required for all heat tracing circuits.
3. Temperature control is recommended for all freeze protection and temperature maintenance heat tracing applications.
4. All heat-traced lines must be thermally insulated.

Illustration A: Typical Heat Tracing Installation



The Heat Tracing Specialists®



The National Electric Code and Canadian Electrical Code require ground-fault protection be provided for electric heat tracing .

# INSTALLATION PROCEDURES

The following installation procedures are suggested guidelines for the installation of a Thermon electric heat tracing system<sup>1</sup>. They are not intended to preclude the use of other methods utilizing accepted engineering or field construction practices.

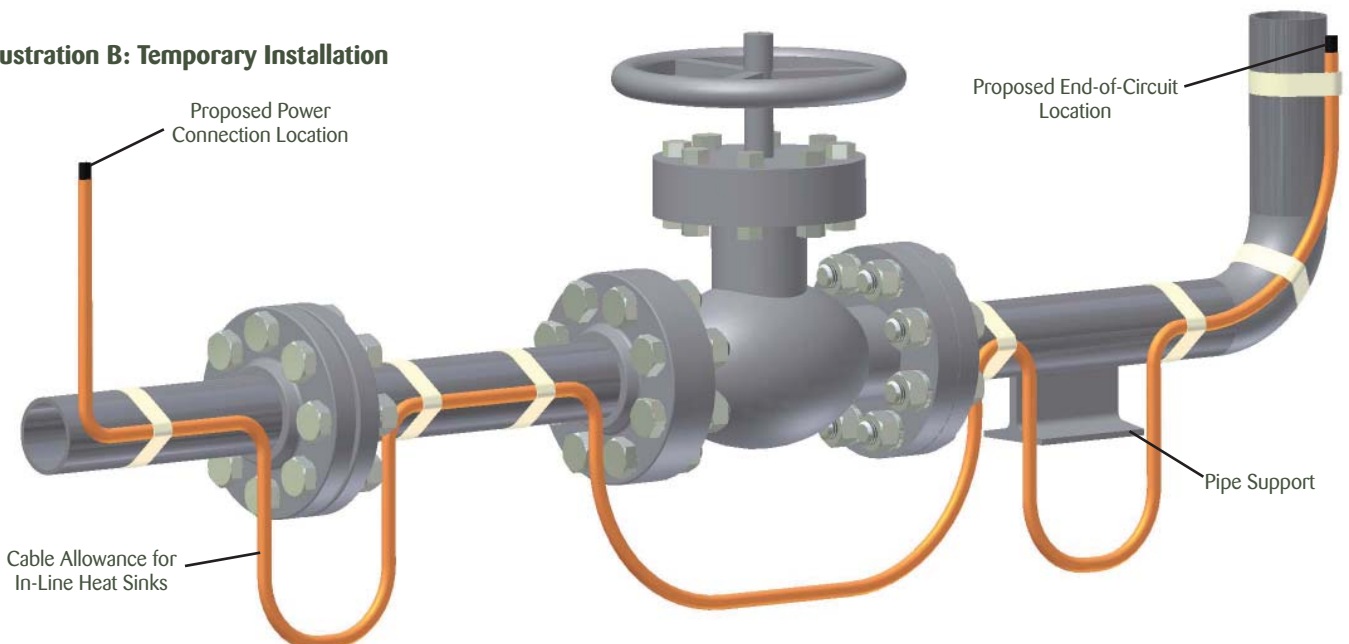
## Upon Receiving, Cable . . .

1. Upon receiving heating cable, check to make sure the proper type and output have been received. All flexible cables have the catalog number, voltage rating and watt output printed on the jacket.
2. Visually inspect cable for any damage incurred during shipment. The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megohmmeter (megger) between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc and 1000 Vdc for MI Cable. Minimum resistance should be 20 megohms. **(Record 1 on Cable Testing Report.)**



Connect the positive lead of the megger to the cable bus wires and the negative lead to the metallic braid.

## Illustration B: Temporary Installation



## Applications . . .

1. Electric heat tracing cables are used for freeze protection or temperature maintenance of piping, tanks and instrumentation.
2. Heat tracing cables may be installed in ordinary (nonclassified) and hazardous (classified) locations depending on the specific cable options and approvals<sup>2</sup>.

## Before Installing Cable . . .

1. Be sure all piping and equipment to be traced is completely installed and pressure tested.
2. Surface areas where heat tracing is to be installed must be reasonably clean. Remove dirt, rust and scale with a wire brush and oil and grease films with a suitable solvent.

## Initial Installation . . .

1. Begin temporary installation at the proposed end-of-circuit location and lay out heating circuit on the pipe, allowing extra cable for the power connection and for any splice locations<sup>3</sup>. Refer to Illustration B for temporary installation.
2. Make heating cable allowances for valves, flanges, elbows and supports as per the applicable drawings and table on pages 3 and 4 of these installation procedures.

## Notes . . .

1. Termination kits to fabricate a heat tracing circuit are not addressed in detail in these installation procedures. Refer to installation instructions included with cable termination kits or contact Thermon for specific instructions to fabricate heating cable.
2. For information on specific cable types and options, refer to Types of Heating Cables on page 1.
3. See product specifications sheet for heating cable minimum bend radius.

# Electric Heat Tracing

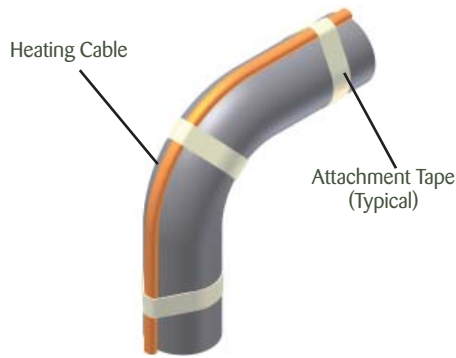
## Installation on Elbows, Supports and Flanges . . .

1. Install heating cable in accordance with Illustrations C, D and E below. Secure heating cable to piping using attachment tape.
2. Elbows: Locate the cable on the outside radius of an elbow to provide sufficient heat to compensate for the added piping material. Secure the cable to the pipe on each side of the elbow with attachment tape.
3. Pipe Supports: Insulated pipe supports require no additional heating cable. For uninsulated supports, allow two times the

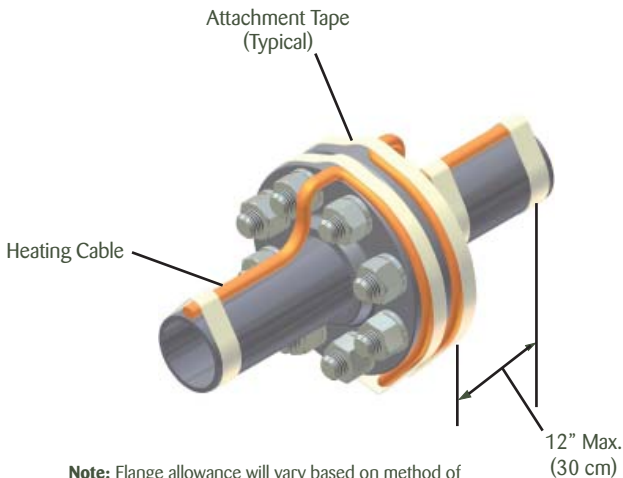
length of the pipe support plus an additional 15" (40 cm) of heating cable.

4. Flanges: Allow cable to be looped around pipe on each side of and adjacent to the flange. Heating cable must maintain contact with flange when bending around pipe flanges to compensate for additional heat loss.
5. Refer to the product specifications sheet for minimum bend radius for the specific cable type. Do not exceed bend radius when completing installation.

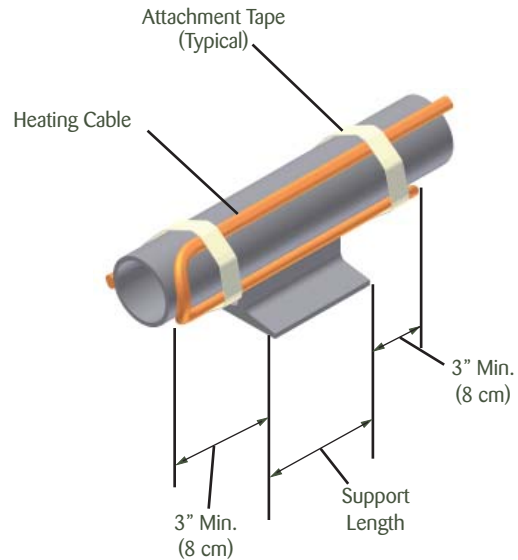
**Illustration C: Pipe Elbow**



**Illustration E: Pipe Flange**



**Illustration D: Pipe Support**



Circuit Layout on Support





# INSTALLATION PROCEDURES

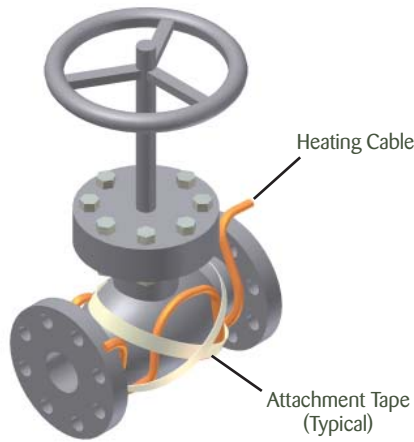
## Installation on Valves and Pumps . . .

1. Install heating cable in accordance with Illustrations F and G below. Secure heating cable to piping using attachment tape.
2. Additional cable is required to provide extra heat at valves, pumps and miscellaneous equipment to offset the increased heat loss associated with these items. Refer to Table 1 for estimated cable requirements for installation on typical valves and pumps.
3. Install heating cable on valves and pumps utilizing a looping technique (this allows the valve or pump to be removed if required). Crossing constant watt heating cable over itself should be avoided.
4. Refer to the product specifications sheet for minimum bend radius for the specific cable type. Do not exceed bend radius when completing installation.

**Table 1: Valve and Pump Allowances**

Pipe Size	Valve Type			Pump Type	
	Screwed	Flanged	Welded	Screwed	Flanged
½"	6"	1'	0	1'	2'
¾"	9"	1' 6"	0	1' 6"	3'
1"	1'	2'	1'	2'	4'
1¼"	1' 6"	2'	1'	3'	4' 6"
1½"	1' 6"	2' 6"	1' 6"	3'	5'
2"	2'	2' 6"	2'	4'	5' 6"
3"	2' 6"	3' 6"	2' 6"	5'	7'
4"	4'	5'	3'	8'	10'
6"	7'	8'	3' 6"	14'	16'
8"	9' 6"	11'	4'	19'	22'
10"	12' 6"	14'	4'	25'	28'
12"	15'	16' 6"	5'	30'	33'
14"	18'	19' 6"	5' 6"	36'	39'
16"	21' 6"	23'	6'	43'	46'
18"	25' 6"	27'	6' 6"	51'	54'
20"	28' 6"	30'	7'	57'	60'
24"	34'	36'	8'	68'	72'
30"	40'	42'	10'	80'	84'

**Illustration F: Typical Valve Detail**

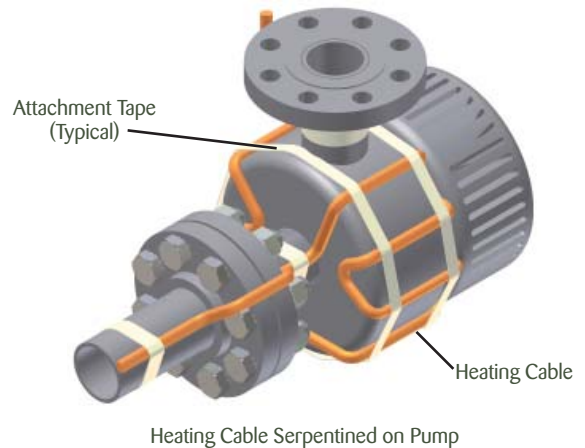


Heating Cable Serpentine on Valve

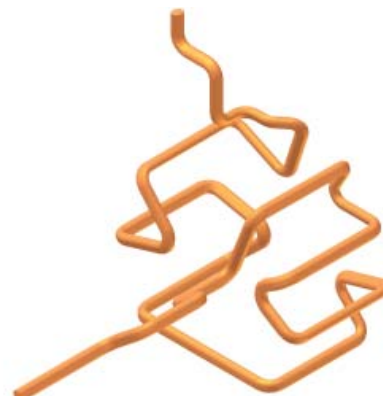


Circuit Layout on Valve

**Illustration G: Typical Pump Detail**



Heating Cable Serpentine on Pump



Circuit Layout on Pump

# Electric Heat Tracing

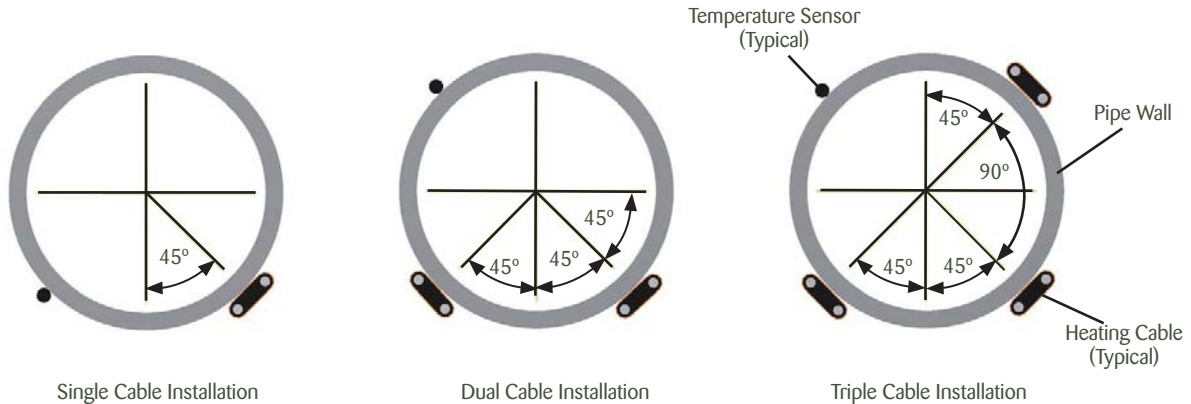
## Completing the Installation . . .

- Begin final cable attachment by securing the end-of-circuit termination kit and working back toward the power supply.
  - Flexible heating cables are to be installed using attachment tape. Circumferential bands of tape should be installed at 12" (30 cm) intervals to keep the cable in proper contact with the pipe. Refer to Table 2 below to calculate the number of rolls of attachment tape required based on the pipe diameter<sup>1</sup>.
  - MIQ mineral insulated heating cables are typically installed with stainless steel banding. These cables may also be installed with heat transfer compound and metal channels.
  - If applicable, refer to installation details provided with the project drawings or contact Thermon for additional information regarding installation.
- In addition to the circumferential tape requirements, a continuous covering of aluminum foil tape may be required when:
  - Spray or foam urethane<sup>2</sup> thermal insulation is applied.
  - Heat tracing nonmetallic piping.
  - Design requirements dictate the use of aluminum tape to improve heat transfer.
- Complete splice connections (if required) in accordance with the installation instructions provided with the splice kit.
- Before making power connections, The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megohmmeter (megger) between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc and 1000 Vdc for MI Cable. Minimum resistance should be 20 megohms. **(Record 2 on Cable Testing Report.)**
- Install power connection kit in accordance to the detailed installation instructions provided with the kit. (MIQ series resistance heating circuits are typically prefabricated at the factory. Pipe-mounted junction boxes to complete a typical MIQ circuit connection to power may not be supplied as part of the system.)
- Secure temperature sensor (if required) to pipe utilizing attachment tape. Locate temperature sensor as shown in Illustration H.

**Notes . . .**

- Table 2 assumes circumferential bands every 12" (30 cm) along the length of the process piping.
- Verify exposure temperature of heating cable versus curing temperature of insulation.

**Illustration H: Heating Cable vs. Sensor Location**



**Table 2: Attachment Tape (Value Represents Approximate Linear Pipe Length Allowance Per Roll)**

Tape Length	Pipe Diameter in Inches															
	½"-1"	1¼"	1½"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"
36 yd	130'	115'	110'	95'	75'	65'	50'	40'	35'	30'	26'	23'	21'	19'	16'	13'
60 yd	215'	195'	180'	160'	125'	105'	80'	65'	55'	50'	43'	38'	35'	31'	27'	22'

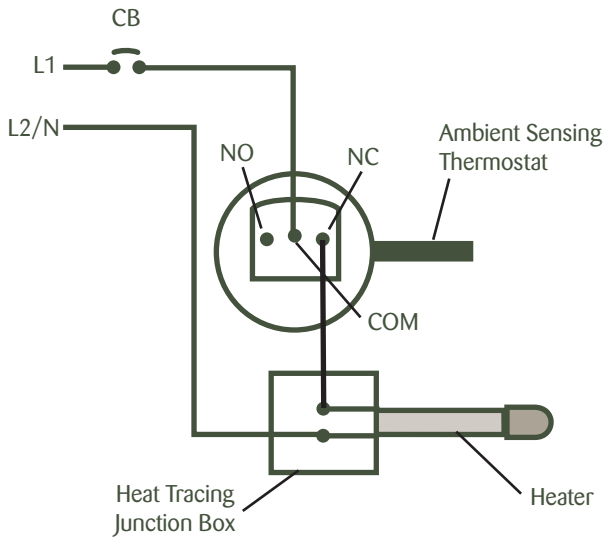


The Heat Tracing Specialists®

# INSTALLATION PROCEDURES

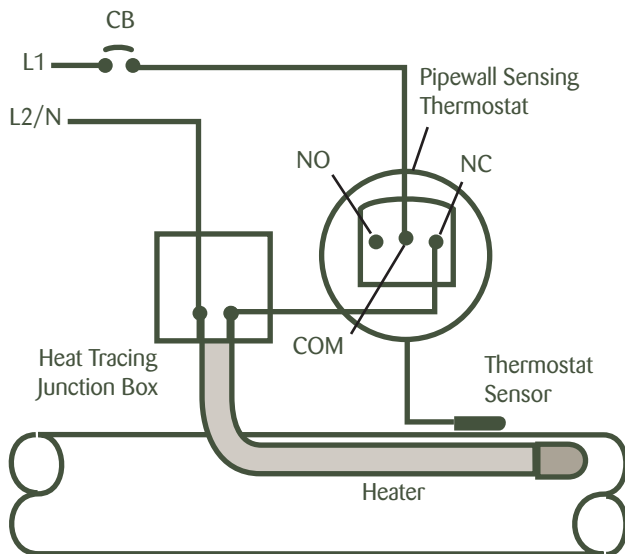
## Final Connections . . .

1. Follow the circuit fabrication instructions for the specific cable type. Power connection and end-of-circuit termination kits are designed for each type of cable; substitutions should not be made.
2. For ambient controlled power, the heating circuit should be connected directly to the switched power feed wiring.



(SPDT Thermostat Shown)

3. For pipewall sensing thermostatic control, the heating circuit is to be connected in series with the control contacts as shown in Illustration I. The pipewall sensing thermostat may require more than one support point.



(SPDT Thermostat Shown)

## Thermal Insulation . . .

1. The need for properly installed and well-maintained thermal insulation cannot be overemphasized. Without insulation, heat losses are generally too high to be offset by a conventional heat tracing system.
2. In addition to piping and in-line equipment such as pumps and valves, all heat sinks must be properly insulated. This includes pipe supports, hangers, flanges and, in most cases, valve bonnets.
3. Regardless of the type or thickness of insulation used, a protective barrier should be installed. This protects the insulation from moisture intrusion, physical damage and helps ensure the proper performance of the heat tracing system. Seal around all penetrations through the thermal insulation.
4. After the installation of the thermal insulation and weather barrier but BEFORE ENERGIZING THE HEATING CIRCUIT, the megohmmeter test should be repeated. This should call attention to any damage to the heating cable that may have occurred during the insulation installation. **(Record 3 on Cable Testing Report)**
5. Apply caution labels to insulation weather barrier at required intervals along pipe

## Final Inspection and Documentation . . .

1. It is recommended that the circuit be temporarily energized so that the volts, amps, pipe temperature and ambient temperature may be recorded. This information may be of value for future reference and should be maintained for the historical operating data log **(Record 4 on Cable Testing Report)**.
2. Stabilized design can be used for self-regulating heating cables to assign a lower T-class through the use of the Thermon CompuTrace software or Thermon Engineering.
3. Stabilized design can be used for power-limiting and constant watt heating cables without a limiting device to determine the T-class through the use of the Thermon CompuTrace software or Thermon Engineering.
4. A sample historical operating data log form is included in the Electric Heat Tracing Maintenance and Troubleshooting Guide, Thermon Form TEP0066).



The National Electric Code and Canadian Electrical Code require ground-fault protection be provided for branch circuits supplying electric heat tracing.

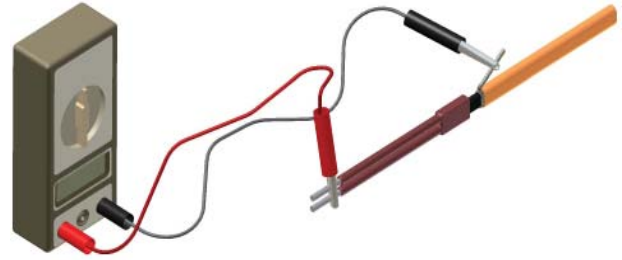


# Cable Testing Report

1. Refer to Thermon Installation Procedures, FORM PN 50207, for general installation procedures, requirements and guidelines.
2. Upon receiving heating cable, check the cable to make sure the proper type and output have been received. All flexible cables have the catalog number, voltage rating and watt output printed on the outer jacket.
3. Visually inspect cable for any damage incurred during shipment. The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megohmmeter (megger) between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc and 1000 Vdc for MI cable. Minimum resistance should be 20 megohms.

**(Record 1 on Cable Testing Report.)**

- A. Connect the positive lead of the megger to the cable bus wires.
  - B. Connect the negative lead of the megger to the metallic braid.
  - C. Energize the megger and record the reading. Readings between 20 megohms and infinity are acceptable. Readings below 20 megohms may mean the electrical insulation has been damaged. Recheck the heating cable for physical damage between the braid and the heating element; small cuts or scuffmarks on the outer jacket will not affect the megger reading unless there was actual penetration through the braid and dielectric insulation jacket.
4. Once the installation is complete, but prior to installation of thermal insulation, recheck the heating cable with at least a 500 Vdc megohmmeter (megger) between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc and 1000 Vdc for MI cable. Minimum resistance should be 20 megohms. **(Record 2 on Cable Testing Report.)**
  5. After the thermal insulation is installed, the megohmmeter test should be repeated. Minimum resistance should be 5 megohms. **(Record 3 on Cable Testing Report.)**
  6. After the thermal insulation is installed and power supply is completed, record the panel and circuit breaker information. Ensure all junction boxes, temperature controllers, cable glands, etc. are properly secured. Set the temperature controller (if applicable) to the manual setting and apply rated voltage to the heat tracing circuit(s) for 5 minutes. Record the ambient temperature, measure and record the circuit(s) voltage and current. **(Record 4 on Cable Testing Report.)**



**NOTE: To ensure the heating cable warranty is maintained through installation, the testing outlined on this sheet must be completed on the installed heating cables, and the test results recorded and mailed/faxed to:**

Thermon Customer Service  
100 Thermon Drive  
San Marcos, Texas 78666  
Fax: 512-754-2420



The Heat Tracing Specialists®

# Cable Testing Report

make additional copies as required for each circuit.

Customer: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
Phone No: \_\_\_\_\_  
Project Reference: \_\_\_\_\_

Contractor: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
Phone No. \_\_\_\_\_

## Record 1: Prior to Installation

Cable Type: \_\_\_\_\_  
Reel Length: \_\_\_\_\_  
Reel Number: \_\_\_\_\_  
Insulation Resistance M Ohms: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 2: After Installation of Heating Cable

Insulation Resistance M Ohms: \_\_\_\_\_  
Heater Length: \_\_\_\_\_  
Heater Number: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 3: After The Thermal Insulation Is Installed

Insulation Resistance M Ohms: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 4: Final Commissioning

Panel Number: \_\_\_\_\_  
Breaker Number: \_\_\_\_\_  
Volts: \_\_\_\_\_  
Ambient Temperature (deg. F): \_\_\_\_\_  
Recorded Amps (After 5 Min.): \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_



The Heat Tracing Specialists®



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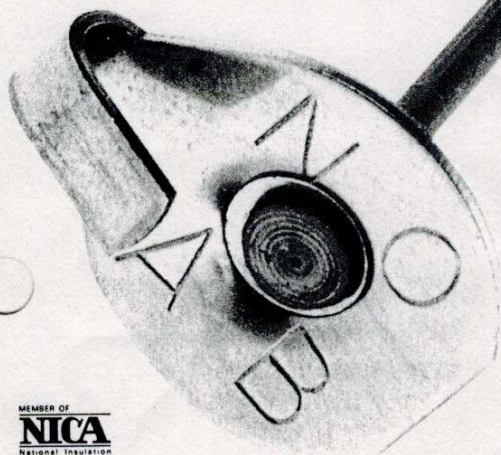
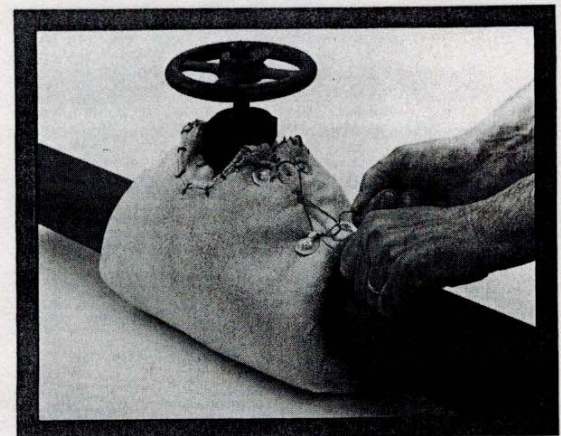
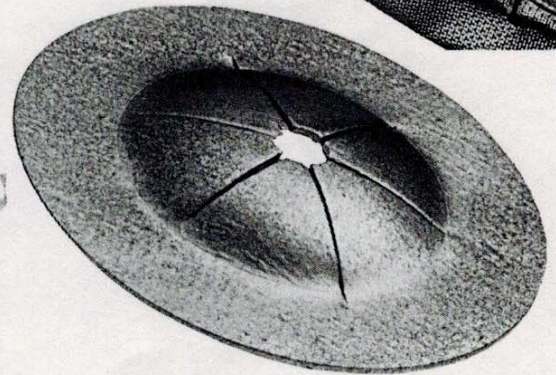
# LACE UP your blankets . . . ANCHOR DOWN your costs!

Wherever you require the use of removable blankets or covers, may we suggest using AGM's Series NLA LACING ANCHORS along with our Self-Locking Washers. This is AGM's answer to the Insulation Industry's need for a low cost, quality fastener.

The Anchors are available with 12 ga. (2.69mm) and 14 ga. (2.03mm) spindles in standard lengths in both Steel and Stainless Steel.

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MEMBER OF  
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National Insulation  
Contractors Association

Litho in USA



**Industries, Inc.**

110 Shawmut Road, Canton, MA 02021 Tel: (617) 828-4705/Telex: 92-4440

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1-89





# TRYMER 3000

## TRYMER 3000 Brand Polyisocyanurate Foam Insulation

TRYMER\* 3000 Brand Polyisocyanurate Foam Insulation is a polyurethane modified polyisocyanurate cellular plastic supplied in the form of bunstock for fabrication into sheets, pipe, tank and vessel covering, and other shapes<sup>1</sup> for a variety of thermal insulation applications. Although similar in physical form to polyurethane foams, TRYMER 3000 has improved dimensional stability over a wider range of temperatures. TRYMER 3000 has been specifically formulated to provide excellent thermal insulation properties without the use of CFC blowing agents.

TRYMER 3000 is available as bunstock 48" (122 cm) wide by 18" (46 cm) high by 36" (91 cm), 96" (244 cm) or 108" (274 cm) lengths for further fabrication into various sizes and shapes to meet various end use needs. Custom lengths are available. Contact your local Dow representative for details.

### Applications

TRYMER 3000 is used extensively in industrial and commercial applications within the service temperature range of -297°F to +300°F (-183°C to +149°C)<sup>2</sup>. Because of the critical technical design aspects of many of these applications, qualified designers or consultants should design the total system. Dow can provide general guidelines and recommendations on many typical applications for TRYMER 3000. Call 1-800-441-4369 or contact your local Dow representative for details. Some typical applications include:

- Core material for architectural and structural panels
- Core material for factory built panelized constructions
- Pipe, tank, and vessel insulation
- Insulation for shipping containers, trucks, or rail cars
- Fabricated pipe fitting insulation
- Flat or tapered boardstock for roof insulation

Like all cellular plastics, this product will degrade upon prolonged exposure to sunlight. A covering to block ultraviolet radiation must be used to prevent this degradation. Other coverings to protect the foam from the elements and to meet applicable fire regulations may also be required. Consultation with local building code officials, design engineers/specifiers, or insurance personnel is recommended before application.

### Safety Considerations

TRYMER 3000 requires some care in handling. All persons who work with these materials must know and follow the proper handling procedures. The current Material Safety Data Sheet contains additional information on the safe handling, storage, and use of this material. A copy of the MSDS can be obtained by calling 1-800-441-4369 or by contacting your local Dow representative.

**NOTICE:** No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

Published December 1998.

\*Trademark of The Dow Chemical Company



**TRYMER\* 3000 Brand Polyisocyanurate Foam Insulation**

PHYSICAL PROPERTIES (1)	ASTM METHOD	ENGLISH UNITS	ENGLISH VALUES (2)	METRIC UNITS	METRIC VALUES (2)
<b>Density (3)</b>	D 1622	lb/ft <sup>3</sup>	3.0	kg/m <sup>3</sup>	48
<b>Compressive Strength (3)</b> Parallel to Rise (Thickness) Perpendicular to Rise (Width) Perpendicular to Rise (Length)	D 1621	lb/in <sup>2</sup>	50 40 45	kPa	350 280 310
<b>Compressive Modulus</b> Parallel to Rise (Thickness) Perpendicular to Rise (Width) Perpendicular to Rise (Length)	D1621	lb/in <sup>2</sup>	1100 900 1200	kPa	7500 6200 8300
<b>Shear Strength</b> Parallel to Rise	C 273	lb/in <sup>2</sup>	40	kPa	270
<b>Shear Modulus</b> Parallel to Rise	C 273	lb/in <sup>2</sup>	375	kPa	2600
<b>Tensile Strength</b> Parallel to Rise (Thickness)	D 1623	lb/in <sup>2</sup>	50	kPa	350
<b>Tensile Modulus</b> Parallel to Rise (Thickness)	D 1623	lb/in <sup>2</sup>	1900	kPa	13100
<b>Flexural Strength</b> Parallel to Rise Perpendicular to Rise (Width)	C 203	lb/in <sup>2</sup>	80 65	kPa	550 450
<b>Flexural Modulus</b> Parallel to Rise Perpendicular to Rise (Width)	C 203	lb/in <sup>2</sup>	2400 1200	kPa	16500 8300
<b>k-Factor (75°F(24°C) mean temp.)</b> Initial Aged 180 days @ 75°F (24°C)	C 518	BTU·in/hr·ft <sup>2</sup> ·°F	0.142 0.190	W/m°C	0.020 0.027
<b>R-Value/in (75°F(24°C) mean temp)</b> Initial Aged 180 days @ 75°F (24°C)	C 518	Hr·ft <sup>2</sup> ·°F/BTU	7.0 5.3	m <sup>2</sup> ·°C/W	1.24 0.93
<b>Closed Cell Content</b>	D 2856	%	97	%	97
<b>Water Absorption</b>	C 272	% by Volume	0.6	% by Volume	0.6
<b>Water Vapor Permeability</b>	E 96	Perm-Inch	2.9	(ng/Pa·s·m)	4.4
<b>Dimensional Stability (4)</b> @ -40°F (-40°C), 7 days Length Volume @ 158°F (70°C)/97% Relative Humidity, 7 days Length Volume @ -10°F (-23°C), 7 days Length Volume @ 300°F (149°C), 7 days Length Volume	D 2126	% Change % Change % Change % Change % Change % Change % Change % Change	-0.2 -0.2 1.0 1.2 0.2 0.2 -0.3 to 1.0 0.8	% Change % Change % Change % Change % Change % Change % Change % Change	-0.2 -0.2 1.0 1.2 0.2 0.2 -0.3 to 1.0 0.8
<b>Service Temperature (5)</b>		°F	-297 to +300	°C	-183 to +149
<b>Surface Burning Characteristics (1" thickness) (6)</b>	E 84	Flame spread/smoke	15 / 295	Flame spread/smoke	15 / 295
<b>Color</b>			Tan		Tan

- (1) All properties are measured at 74°F, unless otherwise indicated.
- (2) Unless otherwise indicated, data shown are typical values obtained from representative production samples. This data may be used as a guide for design purposes, but should not be construed as specifications. For Property ranges and specifications, consult your Dow representative.
- (3) Average value through foam cross section.
- (4) Frequent and severe thermal cycling can produce dimensional changes significantly greater than those stated here. Special design considerations must be made in systems that cycle frequently.
- (5) Above 300°F, discoloration and charring will occur, resulting in an increased k-factor in the discolored area.
- (6) This numerical flame spread data is not intended to reflect hazards presented by this or any other material under actual fire conditions.

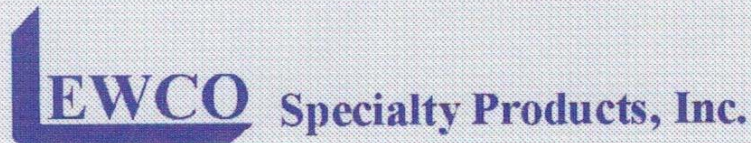
**For Technical Information:**  
1-800-441-4369

Visit us at: [www.styrofoam.com](http://www.styrofoam.com)

**For Sales Information:**  
1-800-232-2436







6859 Renoir Avenue  
Baton Rouge, LA 70806

Tel: (225) 924-3221  
Fax: (225) 927-2918

## **LEWCO 1700 SA-2**

### **Silicone Impregnated Fiberglass Fabric**

---

#### **Product Specifications**

LEWCO Style 1700 SA-2 is an asbestos free woven fiberglass fabric impregnated with a special chemical, water and oil resistant silicone rubber. LEWCO Style 1700 SA-2 is a flexible, light to medium weight fabric for removable insulation blankets.

---

#### **Typical Properties**

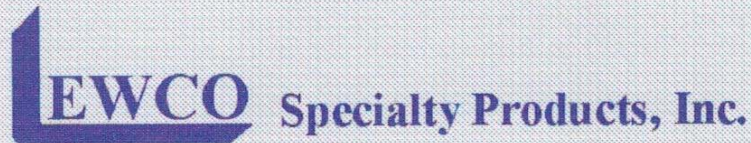
E Glass Melting Point	1523 ° F
Maximum Temperature	500 ° F
Minimum Temperature	-80 ° F
Type Weave	4 Harness Satin
Type Fiberglass	E Glass
Weight	17.0 Oz./Sq. Yd.
Thickness	.017 Inches
Width	60 Inches
Tensile Strength	500 * 400 W F

---

This information is given in good faith and is believed to be accurate. It is intended for use by persons skilled in the art of fabricating and applying removable/reusable insulation or like products. All liabilities are borne by the user. LEWCO does not take any responsibility for misuse of this product. LEWCO recommends testing before use.

S1700SA2-5/2004MED





6859 Renoir Avenue  
Baton Rouge, LA 70806

Tel: (225) 924-3221  
Fax: (225) 927-2918

## LEWCO MAT INSULATION

### Product Specifications

LEWCO Mat Insulation is composed of 100% select grade Type "E" glass fibers needled together into mat form. LEWCO Mat is processed in such a way to maximize thermal efficiency. It is non-respirable, incombustible, asbestos free and contains no resinous or inorganic binders. This material has been tested and conforms to Mil-DTL-24244D(SH), USCG Subpart 164.009, ASTM E84 industry standards and NRC 1.36. Other densities available upon request.

### Typical Properties

Melting Point	1523 ° F
Maximum Temperature	1200 ° F
Continuous Temperature	1000 ° F
Thickness	1/8", 1/4", 1/2", 1" and 1 1/2"
Roll Width	30" and 60"
Roll Length	Various Lengths Available
Density	6 – 7# / Cu. Ft. and 9 – 11# Cu. Ft.

### Thermal Conductivity "K" Factor

	LEWCO	LEWCO	Temp Mat	Ceramic Fiber Blanket	
Temperature	6-7#	9-11#	9-11#	6#	8#
300 ° F	.292	.35	.40	.388	.282
500 ° F	.350	.48	.50	.520	.428
700 ° F	.445	.64	.65	.680	.589

This information is given in good faith and is believed to be accurate. We do not imply or express a license to operate under or infringe on any patents that may apply. This product is intended for use by persons skilled in the use of this product. All liabilities are borne by the user of this product. LEWCO recommends testing before use.  
SLEWCOMAT-08/09/04MED-Rev.01

**END  
OF  
SECTION**



## 4. PUMPS

This section provides the information pertaining to the pumps for this project.

This section is structured as follows:

4.01 PUMP SPECIFICATIONS

4.02 PUMP DIMENSIONAL DRAWINGS

4.03 PUMP PERFORMANCE CURVE

4.04 PUMP OPERATION, INSTALLATION & MAINTENANCE MANUAL

4.05 PUMP RELATED DATA SHEETS

4.05.1 SLIDING SHOE PUMP

4.05.2 SUMP SKIMMER



Conditions: 300 GPM @ 30' TDH, Acetic acid N Propyl Acetate

**PIONEER SELF PRIMING ELECTRIC DRIVEN PUMP PACKAGE:**

**Model: P3O87L3-HO-7.5-4**

- Pioneer Self Priming Heavy Duty Solids Handling Pump
- 316 Stainless Steel Construction with Mechanical Seal
- 7.19 Inch Trimmed Diameter 316 Stainless Steel Impeller
- Oil Lubricated Bearing Frame
- Suction and Discharge Spool Flanges
- 7.5 HP, 1800 RPM, 3 PH, 230/460 V, 60 Hz, TEFC, Premium Efficiency Baldor Motor
- Rigid Steel Base to Support Pump and Motor with Coupling and Guard
- See Attached Specification Sheet for Complete Details
- Entire Package Completely Assembled, Primed & Painted Pioneer Green before Shipment

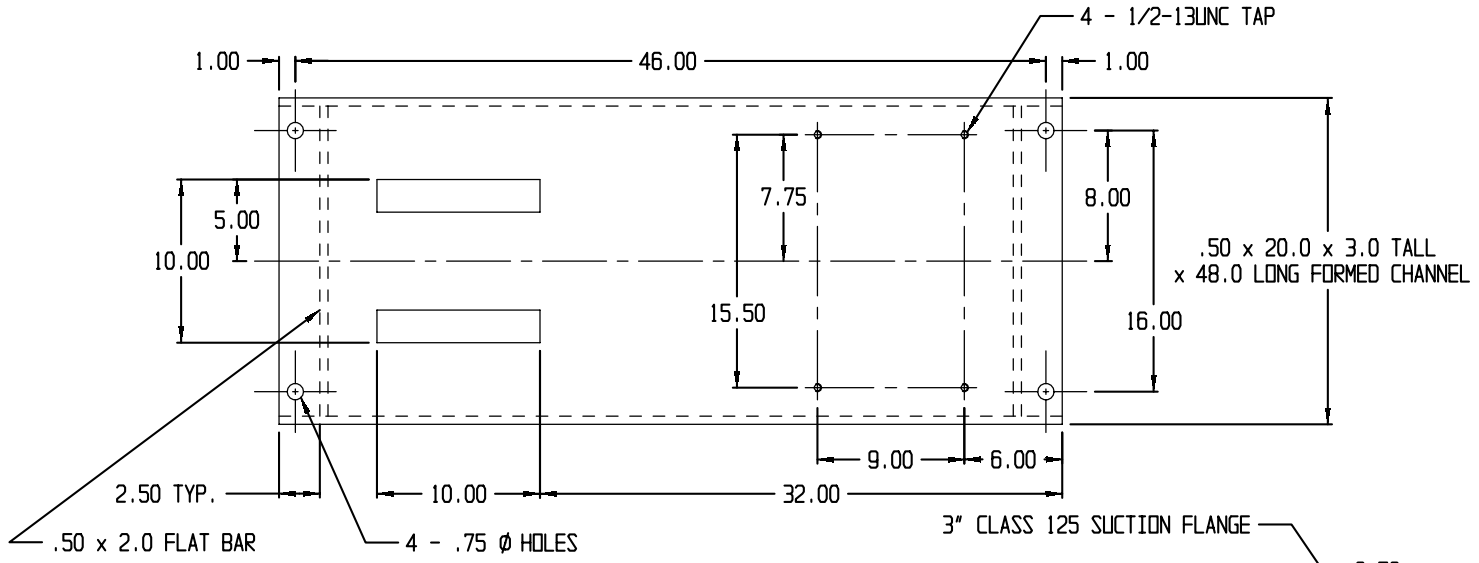
TABLE III -- TYPICAL ACOUSTIC PERFORMANCE  
TEFC/SUPER-E LOW NOISE MOTORS

ALL VALUES LISTED ARE dBA

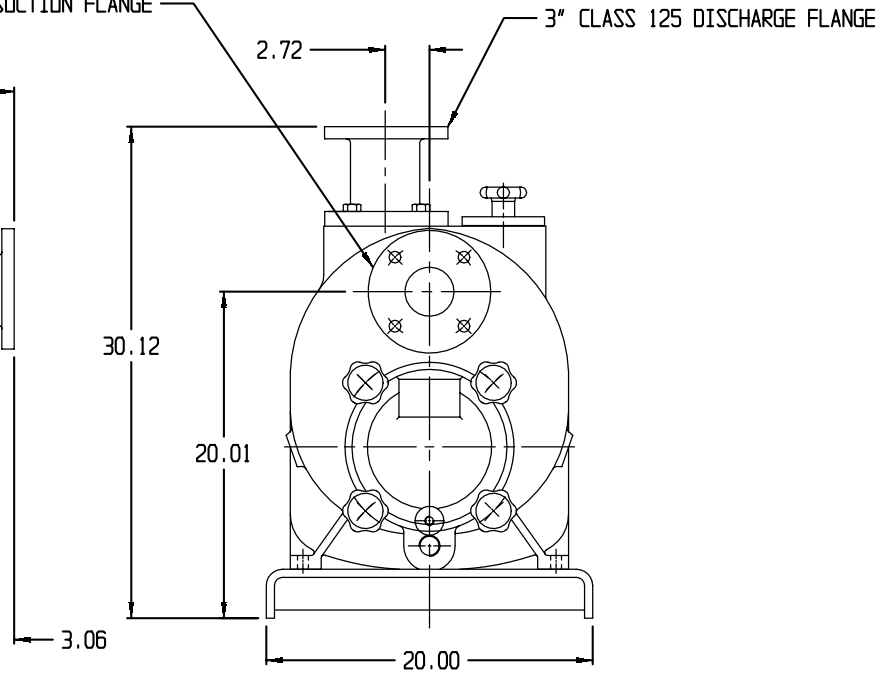
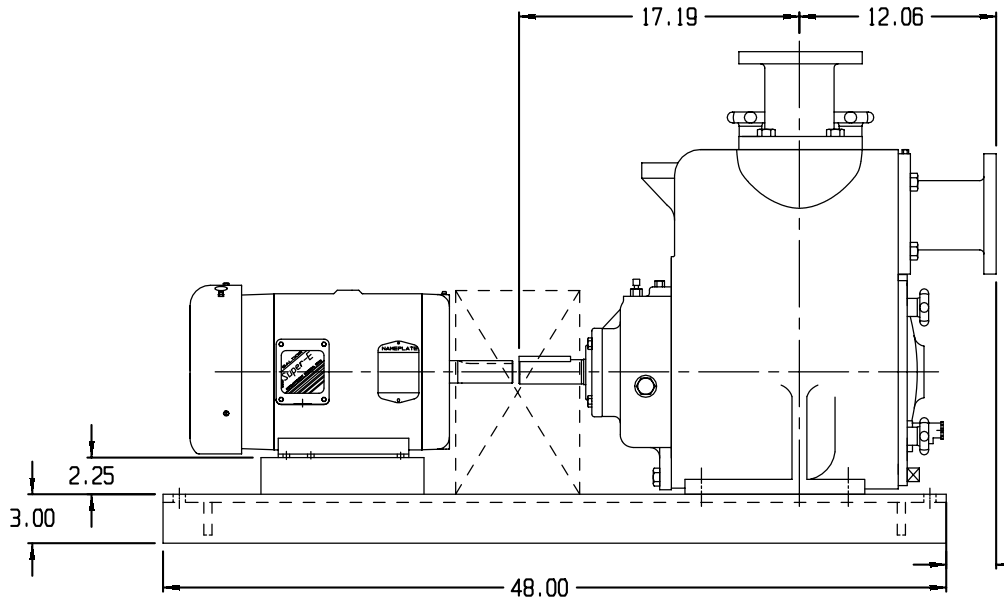
FRAME SIZE		PWL				SPL @ 3'				SPL @ 5'			
BALDOR	NEMA	3600 RPM	1800 RPM	1200 RPM	900 RPM	3600 RPM	1800 RPM	1200 RPM	900 RPM	3600 RPM	1800 RPM	1200 RPM	900 RPM
33	42												
34	48												
35, 305	56	70	67	52		62	59	44		59	56	41	
35, 306	140	70	67	52		62	59	44		59	56	41	
36, 306	180	70	67	54		62	59	46		59	56	43	
37, 307	210	70 (5.25)	70	60		62	62	52		59	59	49	
39, 309	250	76 (6.00)	70	67		67	61	52		64	58	49	
40, 310	280	79 (6.00)	75	64		70	66	55		67	63	52	
42, 312	320	84 (6.00)	75	68		75	66	58		72	63	55	
44, 314	360	87 (7.50)	78	71		77	68	61		74	65	58	
316	400	89 (7.75)	79	76		79	69	66		76	66	63	
318	445	93 (8.50)	84	82		83	73	70		80	70	67	
318	449	97 (12.00)	90	89		87	80	79		84	77	76	
318	449	97 (12.00)	98	97		86	87	86		83	84	83	
500	5000	104	104	97		93	93	86		90	90	85	
580	5800	104	111	112		93	100	101		89	97	97	

NOTES: PWL (SOUND POWER LEVEL) REF.  $10^{-12}$ watts  
 SPL (SOUND PRESSURE LEVEL) REF .0002  $\mu$  bar or  $20 \times 10^{-6}$  Pa or  $20 \times 10^{-6}$  N/m<sup>2</sup>  
 REF DOCUMENTS: MG1-1998, Rev 1, 9.4.1, 9.4.2  
 (Fan Size)

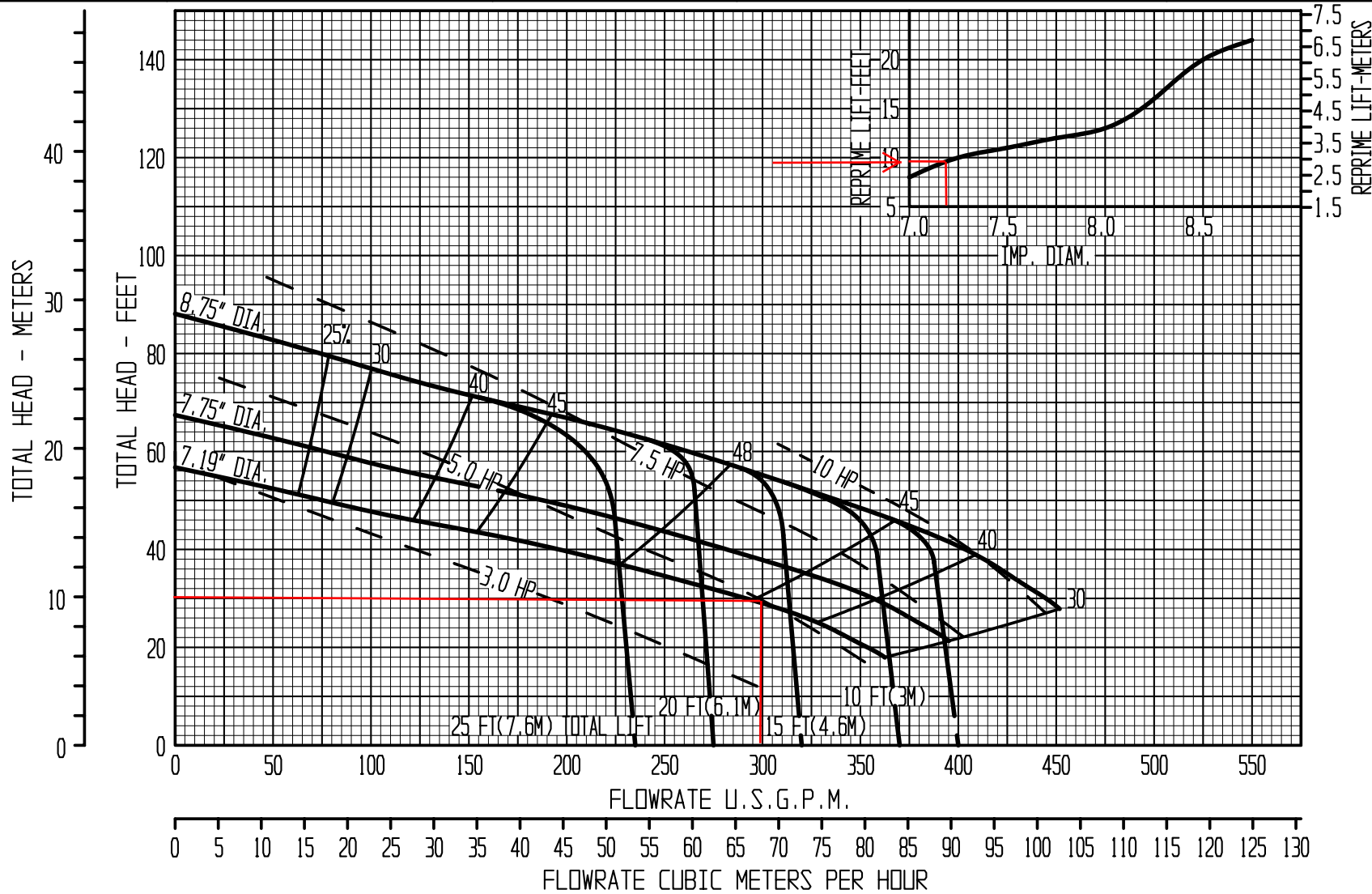




MODEL: P3 FLANGED  
 MOTOR: 7.5 HP, 1800 RPM  
 230/460 VOLT, 60 HZ  
 3 PHASE, 213T TEFC  
 MOUNT: BASE, COUPLING & GUARD



MODEL: P3 | SPEED: 1750 RPM | SIZE: 3" x 3" | IMPELLER DIA. VARIOUS | SOLIDS SIZE: 2.50" | DWG NO.



NOTES:

MODEL: P3

**PIONEER PUMP, INC.**

**SELF PRIMING SERIES**

DWG NO.



**Pioneer Self Priming Series  
P & PE Series  
Operation & Maintenance Manual  
Manual #2001**

**Corporate Office**

**310 South Sequoia Parkway  
Canby, OR 97013  
Phone (503) 266-4115  
Fax (503) 266-4116**



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## **INTRODUCTION**

Thank you for purchasing a Pioneer P Series Self-Priming centrifugal pump, complete with integral suction check valve. The pump is designed for handling non-volatile, non-flammable, mild industrial corrosives, residues and slurries containing large entrained solids.

### **WARNING!!!**

This manual provides installation, operation and maintenance instructions for your Pioneer Self-Prime Pump and is intended to make your personnel aware of any procedure that requires special attention because of potential hazards to personnel or equipment. Read all instructions carefully and remember, pump installations are seldom identical. Therefore, this manual cannot possibly provide detailed instructions and precautions for each specific application. Thus, it is the owner/installer's responsibility to ensure that neither operator safety nor pump integrity are compromised by installations and applications that are not addressed in this manual.

### **WARNING!!!**

Centrifugal Pumps are designed for specific service and may or may not be suited for any other service without loss of performance or potential damage to equipment/personnel. If there is ever any doubt about suitability for a specific purpose; contact your Pioneer Pump, Inc. representative or the factory for assistance.

Remember: Pump performance may be affected by changes in pumpage such as, specific gravity, viscosity, temperature, operating speed and net positive suction head available (NPSHA).

## **INSPECTION**

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage that may have occurred during shipment.

### **PRE-INSTALLATION INSPECTION**

Check as follows: Inspect the pump for cracks, dents, damaged threads, and other obvious damage.

Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

Carefully read all warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated. Note the direction of rotation indicated on the pump and check that the pump shaft rotates counter-clockwise when standing on the suction side of the pump and facing the impeller.

## **CAUTION!!!**

If equipment is stored more than twelve (12) months, some of the components or lubricants may have exceeded their maximum shelf life. These must be inspected and replaced as necessary prior to pump operation to ensure proper pump performance.

### **RECORDING MODEL & SERIAL NUMBERS**

Record the model and serial number for your **Pioneer Pump** in the spaces provided below. The factory will need this information when you require parts or service.

**Pump Model:** \_\_\_\_\_  
**Pump Serial Number:** \_\_\_\_\_  
**Engine/Motor Serial #:** \_\_\_\_\_  
**Engine/Motor Mgf:** \_\_\_\_\_

### **WARRANTY INFORMATION**

Pioneer Pump offers the following limited warranty and method for filing warranty claims.

#### **LIMITED WARRANTY**

Seller warrants for one year from the date of shipment Seller's manufactured products to the extent that Seller will replace those having defects in materials or workmanship when used for the purpose and in the manner which Seller recommends. If Seller's examination shall disclose to its satisfaction that the products are defective, and an adjustment is required, the amount of such adjustment shall not exceed the net sales price of the defective products and no allowance will be made for labor or expense of repairing or replacing defective products or workmanship or damage resulting from the same. Seller warrants the products which it sells of other manufacturers to the extent of the warranties of their respective makers. Where engineering design or fabrication work is supplied, buyer's acceptance of Seller's design or of delivery of work shall relieve Seller of all further obligation, other than as expressed in Seller's product warranty. **THIS IS SELLER'S SOLE WARRANTY. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE PRESIDENT OF THE MANUFACTURER.** Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factory, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instruction or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representative.

#### **WARRANTY CLAIMS**

Contact the factory to file a warranty claim, before shipping parts back. Parts returned to the factory without an RMA number on file will be scrapped upon arrival.



## **SAFETY INFORMATION**

These warnings apply to **P Series** basic pumps. In many cases, **Pioneer Pump, inc.** has no control over or particular knowledge of the power source that will be used. Therefore, refer to the manual accompanying the power source before attempting to begin operation.

### **WARNING!!!**

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or lock out the power source to ensure that the pump will remain inoperative.
3. Check the temperature before opening any covers, plates or plugs.
4. Allow the pump to cool if overheated.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the Pump.

### **WARNING!!!**

This pump is designed to handle mild industrial corrosives, residues and slurries containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials that may damage the pump or endanger personnel as a result of pump failure.

### **WARNING!!!**

After the pump has been positioned, make certain that the pump and all piping connections are tight, properly supported and secure before operation. (Refer to Installation section)

### **DANGER!!!**

Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

### **WARNING!!!**

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

### **WARNING!!!**

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

## **WARNING!!!**

Remove suction and discharge piping from pump prior to moving. Use lifting and moving equipment with adequate capacity and in good repair.

## **INSTALLATION**

Use the following guidelines when installing your new P Series Self Priming Pump.

## **WARNING!!!**

Review safety information in safety information section. This section is intended to outline general recommendations and practices required to position and arrange the pump and piping in static lift situations. If installing the unit in flooded suction applications some of the information will need to be tailored to the specific application. Never exceed the maximum permissible operating pressure of the pump as shown on the pump performance curve.

### **FOUNDATION/BASE PLATE/SKID**

If using a concrete foundation it should be rigid enough to inhibit vibration. Pour the foundation well in advance of installation of pump equipment to allow time for drying and curing.

If the pump is to be mounted on a steel frame, or similar structure, it should be set directly over the supporting beams. These beams and the structure must be rigid enough to prevent distortion and potential misalignment due to movement within the structure or base.

The location of this structure should be as close as possible to the pumpage source. Provide adequate space for operation, maintenance and inspection of the pump and equipment.

The concrete foundation should be provided with anchor bolts for attachment to the base plate. If required, provide adequate drainage to keep pump and motor dry and clean. Also, provide either leveling nuts or leveling wedges for mounting the base plate to the foundation.

### **LEVELING**

When mounting the base plate to the foundation use the leveling nuts or wedges to provide a level, flat base plate. Use a machinist's level on the mounting pads and make adjustments as necessary as the anchor bolts are tightened. This will provide the true alignment between the pump and motor.

### **GROUT**

If this base plate is to be grouted, ensure that you have the mounting surface flat and level for correct alignment of pump and motor. Build a dam around the base plate perimeter that is to be watertight. Use standard grouting practice and be sure to protect (cover) the leveling wedges with caulk or plastic tape if they are to be removed later. After the grout has thoroughly hardened, remove forms. If the wedges are removed, fill holes with grout. Seal grout by covering with a quality paint or sealer.

### **TRAILER MOUNTED UNITS**

See “**OPERATION**” section.

### **INSTALLING PUMP**

Ensure that all foreign material has been removed from the pump before mounting. Be sure to remove all shipping protection prior to operation.

NOTE: Many of the bare pumps are shipped with protective guards and coatings.

### **SUCTION PIPING**

For best performance the suction piping should be at least as large as the pump flange, never smaller. Use an eccentric reducer at the suction flange with the straight side up. The use of flow-retarding fittings is to be avoided and if necessary should never be placed closer to the pump suction than four (4) times the pipe diameter. The pump should be at the highest point of the piping. Slope the piping up to the pump to prevent air pockets and avoid changing pipe size with the exception of the eccentric reducer mentioned above. All suction piping and fittings are to be checked for any foreign material (rocks, bolts, wire, etc.) and also any sharp burrs that could disrupt the flow.

### **CAUTION!!!**

The suction and discharge pipe/hose material should be compatible with the liquid being pumped.

### **CAUTION!!!**

If hose is used on the suction line it should be of the reinforced type to prevent collapse under suction lift.

### **DANGER!!!**

If a manual shut-off valve is installed in the discharge line, it must not be left closed during operation, a closed manual shut off valve will cause overheating and possible explosive rupture of the pump casing. Personnel could be severely injured!

### **DISCHARGE PIPING**

Use a concentric taper on the discharge side to increase discharge pipe diameters. All valving and additional fittings should be the same size as the discharge main-line. The discharge size should be adequate to maintain reasonable velocities and reduce friction losses. It is strongly recommended that a pressure relief valve is installed on the discharge piping.

### **SUCTION & DISCHARGE PIPE FLANGES**

All piping is to be supported, braced and lined up square before connection to the pump flanges. A flexible fitting is recommended on both suction and discharge, to eliminate misalignment loads or stresses being transmitted to the pump.



NOTE: Flexible pipe couplings must be restrained so as not to transmit any strain to the pump flanges when expanding or contracting under pressure. Unrestrained expansion fittings can transmit enormous forces to the pump flanges.

### **SCREENING**

Make provisions for the installation of a suction screen or strainer to prevent any debris from clogging the impeller. The open area of the strainer should be equal to at least four (4) times the area of the pipe. The screen should be rigid enough to prevent collapse when flow is reduced due to clogging.

### **SUMP DESIGN**

The submergence of the suction pipe into the liquid should be at least four (4) to five (5) times the pipe diameter. If this is not possible then provide a baffle or a floating board. This is to prevent any vortex action allowing air into the pipe. For best performance a bell mouth fitting is recommended. Recommended pipe submergences for various flows as well as recommended bell diameters are shown in the table below whose data was taken from ANSI/HI 9.8-1998.

FLOW (GPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
<b>SUBMERGENCE WITH BELL (FT)</b>									
Bell Diameter (in)	6.1	8.6	10.6	12.2	13.6	14.9	16.1	17.2	18.3
Submergence (FT)	2.1	2.6	3.0	3.3	3.5	3.7	3.9	4.1	4.3
<b>SUBMERGENCE WITHOUT BELL (FT)</b>									
PIPE ID (in)- No Bell	SUBMERGENCE WITHOUT BELL (FT)								
3	4.7								
4	3.3	6.3							
6	2.1	3.7	5.3						
8	1.7	2.8	3.8	4.9	6.0				
10	1.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.6

### **LIFTING**

Any lifting equipment is to be rated for at least five (5) times the weight of the item being lifted. Use only established methods when lifting or moving any heavy components.

### **ALIGNMENT OF PUMP AND MOTOR**

Precise alignment is mandatory to achieve correct performance of the system. Every time a component is moved this alignment will have to be checked. The alignment can be checked with a straight edge and an outside caliper, taper thickness gauge, dial indicators, or for best results, use a laser alignment tool. Use the straight edge across the outside diameters of the coupling to ensure that the two halves are concentric and parallel. The outside calipers or the taper thickness gauge is to correct for any angular misalignment and to verify the correct gap between the coupling flanges. Use a laser alignment tool or dial indicators to adjust for concentric and angular displacement. With dial indicators, rotate shafts together and take readings every ninety (90) degrees. Make adjustments by placing shims under the driver, and be sure that the mounting bolts are properly tightened while taking readings and after final adjustment then install coupling guard.

## **ROTATION**

Before the pump is started correct rotation must be confirmed. If the rotation is not correct then follow the direction given by the driver manufacturer.

## **OPERATION**

Review all safety information in the safety information section, before operating the pump.

### **PRE-START CHECK LIST**

- 1) Verify that rotation is correct and that the shaft rotates freely.
- 2) Check all piping connections for tightness.
- 3) Inspect all accessories and make sure they are appropriate for your installation.
- 4) Verify that the driver and coupling are aligned correctly and that all guards are in place.
- 5) Ensure that all bearings and grease seals are lubricated.
- 6) Oil levels should be checked and also, maintained during pump operation.
- 7) Follow the instruction on all tags, labels and decals attached to the equipment.
- 8) Review the operations manual furnished with the power source. (Equipment driver)

## **WARNING!!!**

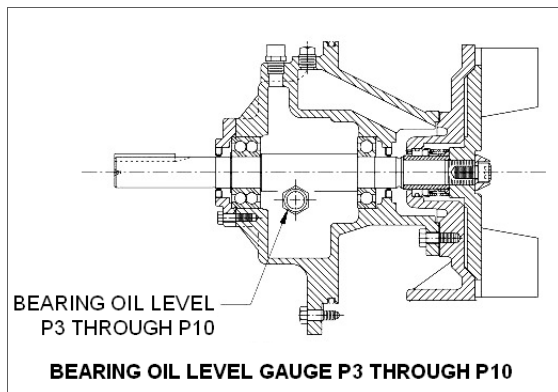
This pump is designed to handle most non-volatile, non-flammable liquids containing specified entrained solids and corrosives. Do not attempt to pump volatile, corrosive, or flammable liquids that may damage the pump or endanger personnel as a result of pump failure.

## **CAUTION!!!**

Pump speed and operating condition points must be within the continuous performance range shown on the Performance Curve in the separate Part List Manual for your specific pump model.

### **LUBRICATION**

This pump is oil lubricated. The bearing housing contains an oil cavity for lubricating the bearings and an oil cavity for lubricating the mechanical seal in case the pump runs dry. The sight gauge on the side of the bearing housing should read half full to indicate the bearings have the correct amount of oil.



### **PRIMING**

This pump is self-priming, but the pump should never be operated without liquid in the pump casing. The pump casing needs to be half filled with liquid in order to prime.

### **CAUTION!!!**

The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly. Make sure pump casing is half filled with liquid when priming.

Add liquid to the pump casing when:

1. The liquid in the pump casing is low.
2. The pump has not been used to an extended period of time.
3. The pump is being put into service for the first time.

Once the pump casing has been filled, the pump will prime and re-prime as necessary.

### **WARNING!!!**

Do not attempt to operate the pump unless all connecting piping, fill plug and other fittings are securely installed, failure to do so, could cause liquid pumped to be forced out under pressure causing injury to personnel.

### **WARNING!!!**

Never run the pump with the discharge valve closed for extended periods of time. Never use the suction valve to throttle the flow. Check all suction and discharge piping for leaks.

If a suction strainer is installed, check the pressure drop across the strainer. If the differential in pressure exceeds five (5) PSI have the strainer cleaned.

### **OPERATION OF ENGINE DRIVEN UNITS**

Review pre-start instructions in the beginning of the Operation section.



## **Before Starting,**

Check the fuel level and oil levels in the engine.

## **CAUTION!!!**

Make sure the pump is level. Lower jack stands and chock the wheels. Use caution when positioning the skid-mounted unit to prevent damage to the fuel tank. Consult the engine operations manual before attempting to start the unit.

## **WARNING!!!**

Do not operate the pump without guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

## **STARTING**

Consult the operations manual furnished with the power source.

### **Rotation**

The correct direction of pump rotation is counter-clockwise when standing on the suction side of the pump and facing the impeller. The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits, verify rotation. If necessary, check the connection to the power source, and interchange two leads (three phase power) in order to change rotation.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while observing the direction of the motor shaft, or cooling fan.

If rotation is incorrect consult the power source operation manual.

### **Operation**

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

### **Liquid Temperature and Overheating**

The maximum liquid temperature for this pump is 160° F (71° C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction and/or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve that will open if vapor pressure within the pump casing reaches a critical point. If overheating does occur, stop the pump immediately and allow it to cool before servicing it.

**Approach any overheated pump cautiously.** It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing overheats and activates the valve.

### **Pump Vacuum Check**

With the pump inoperative, install a vacuum gauge in the system. Make sure the pump is at least half filled with liquid. Block the suction line and start the pump. At operating speed, the pump should pull a vacuum of 20 inches of mercury (508.0 mm) or more. If it does not, check for air leaks at the suction piping gaskets.

### **STOPPING**

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

### **Cold Weather Protection**

If the pump is to remain idle during below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose.

### **Bearing Temperature Check**

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160° F (71° C) are considered normal for bearings, and they can operate safely to at least 180° F (82° C). Measure bearing temperature with a contact-type thermometer.

## **MAINTENANCE**

Under normal conditions this pump is designed to run maintenance free, because of its rugged construction, for extended periods of time. However, all centrifugal pumps contain wear parts that will gradually deteriorate, affecting pump performance. This pump does contain wear parts and these parts should be replaced as required to maintain optimum performance.

General maintenance can be performed without removing the pump from the driver. The following instructions assume a complete disassembly of the pump is required.

The equipment covered in this section is limited to the pump components only. Refer to the applicable vendor's manual for motors, engines and other accessory equipment. This manual also provides a troubleshooting section to diagnose many operational or performance problems. Use the troubleshooting section to help determine the cause of any problems, and only disassemble the pump components required to remedy the problem condition.

Drain volute case of pumpage when pumping unit is idle to avoid freezing and possible thermal cracking of pump case.

## **SPARE PARTS**

Spare parts should be kept on hand to reduce downtime. At a minimum the following parts should be stocked.

Wear Plate  
All O-rings  
Set of bearings  
Mechanical seal  
Set of grease seals

If you have unusual pumping conditions, consult **Pioneer Pump, Inc.** for additional recommended spare parts.

When ordering parts from **Pioneer Pump, Inc.** please provide the following information:

- 1) Pump serial number
- 2) Pump model
- 3) Cross section drawing number
- 4) Part number from cross section drawing
- 5) Description of part
- 6) Quantity required
- 7) Package Vehicle Identification Number (VIN)

## **WARNING!!!**

Before attempting to service this pump, read this manual carefully. Operators and maintenance personnel should have a good understanding of all aspects of this pump and the pumping conditions. Failure of operating personnel to be familiar with all aspects of pump operation outlined in this manual could contribute to equipment damage, bodily injury or possible death.

## **WARNING!!!**

Before any servicing:

- 1) Read this manual carefully.
- 2) Shut down driver and lock out incoming power to ensure that the pump will remain inoperative.
- 3) If the pump or components are hot, allow adequate cooling prior to servicing the unit.
- 4) Close the suction and discharge valves.
- 5) Vent the pump slowly and drain completely.

## **WARNING!!!**

If this pump is used to handle any hazardous materials that can cause illness, either directly or indirectly, take precautions by wearing approved protective clothing and use appropriate safety equipment.



## **WARNING!!!**

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. When lifting the pump with chains or cable wrapped around the pump, make certain that they are positioned so as not to damage the pump, and so that the load will be balanced. The bail on trailer or skid mounted units is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.

## **CAUTION!!!**

When servicing this pump, use only components provided by **Pioneer Pump, Inc.** Any use of non-authorized parts could result in sub-standard performance, damage to equipment and possible injury to personnel. **Non-authorized parts will also void the warranty.**

When using this manual any reference to part numbers or names will be directed to the applicable cross section drawing. These parts will also be called out in the bill of materials for full description.

## **WARNING!!!**

Select a clean suitable location for any required maintenance, and note that all work must be performed by qualified personnel.

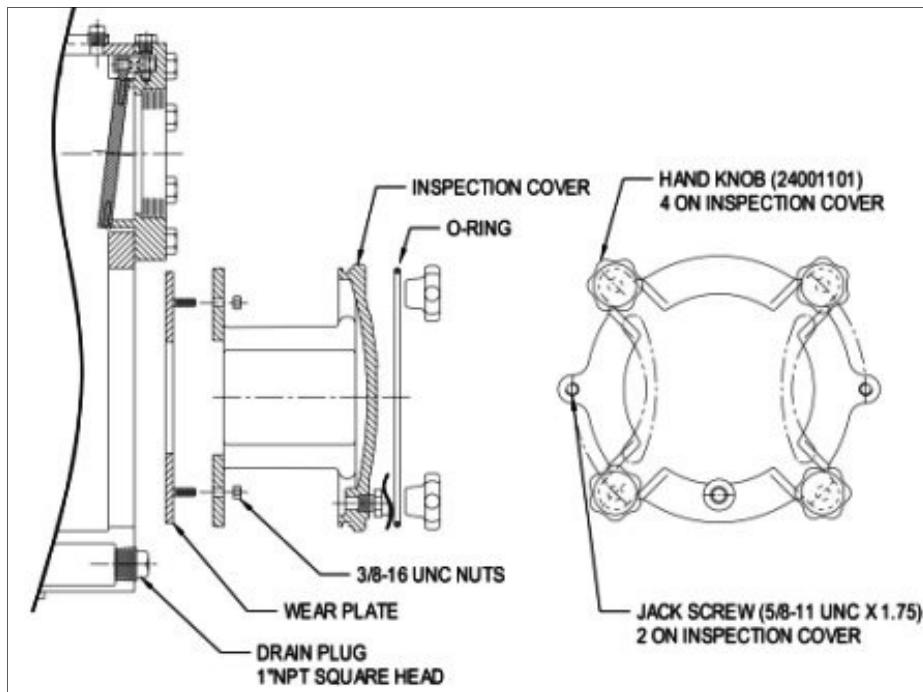
### **DISASSEMBLY**

Before performing maintenance on your pump, verify the following:

1. Driver is shut down and power is **locked out**.
2. If pump components are hot, **allow to adequately cool**.
3. Suction and discharge valves are shut.
4. Drain pump after it has adequately cooled.
5. For power source maintenance refer to power source O & M manual.
6. Review all safety information and follow the instructions in this manual, as well as, all tags, labels and decals attached to the pump or related equipment.

### **INSPECTION COVER AND WEAR PLATE (P3" THROUGH P8" PUMPS)**

Once the pump has been drained, clean the drain plug and reinstall into inspection cover. Remove the four (4) hand lugs and use the two (2) jackscrews (3" through 6" pump) provided to remove the inspection cover and assembled wear plate. Replace the wear plate if it is badly worn or scored. To remove the wear plate, remove the 2 nuts (3", 4" pumps), 4 nuts (6" pumps), or 3 bolts (8" pump). Inspect the inspection cover o-ring and replace if necessary.

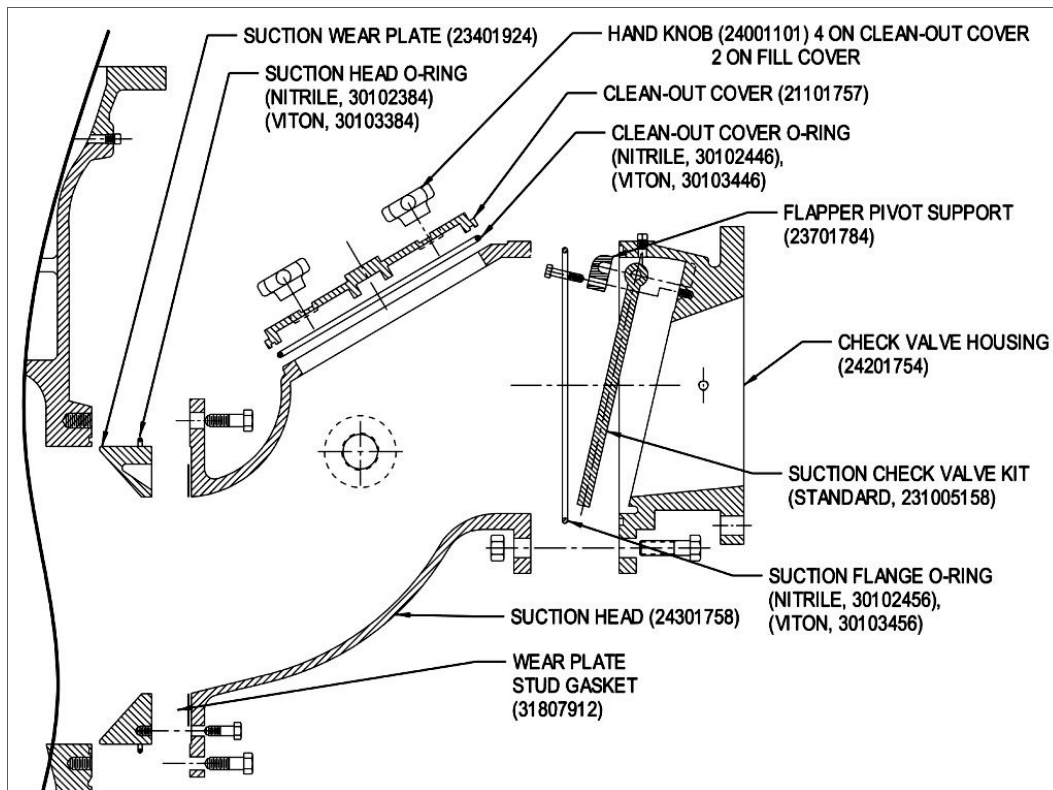


### **SUCTION CHECK VALVE**

To service the check valve assembly, remove the check valve bolt, reach through the inspection cover opening and pull the complete assembly from the suction flange. Service the check valve as required.

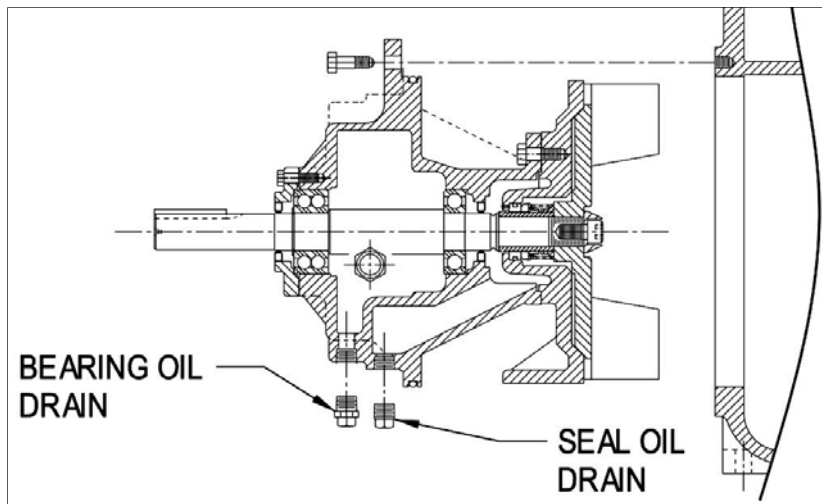
### **SUCTION HEAD, WEAR PLATE, AND CHECK VALVE (P10 PUMP)**

The suction piping must be removed prior to removing the suction head and wear plate. To remove the suction head, support each end securely with lifting straps and remove the 4 bolts from the flange. Use the 2 jackscrews to separate the suction head and wear plate assembly from the volute. Remove the 4 hand knobs to remove the clean-out cover. To service the check valve, unbolt the check valve housing from the suction head and unbolt the flapper pivot support and remove flapper.



### **ROTATING ASSEMBLY**

The power source must be removed prior to removing the rotating assembly. Drain the oil in the seal cavity by removing the seal cavity drain plug. Clean and replace the drain plug after draining seal cavity of oil. Remove the four (4) nuts on studs of the volute, and use the jackscrews to remove the rotating assembly from the volute. Separate the rotating assembly by pulling straight away from the pump casing.

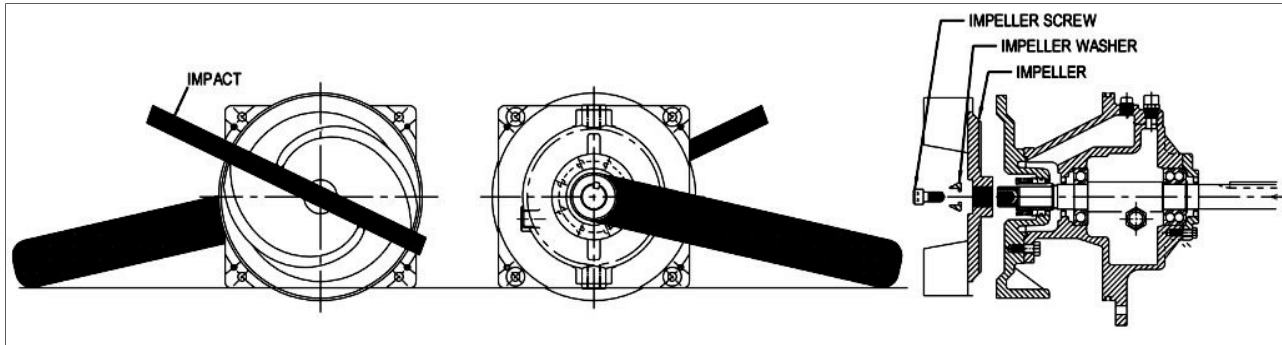


### **IMPELLER**

With the rotating assembly removed from the pump casing, remove the impeller lock screw and unscrew the impeller from the shaft. The impeller was installed at the factory using Loctite® and so may be fairly difficult to unscrew. A propane torch can be used to ease loosening the

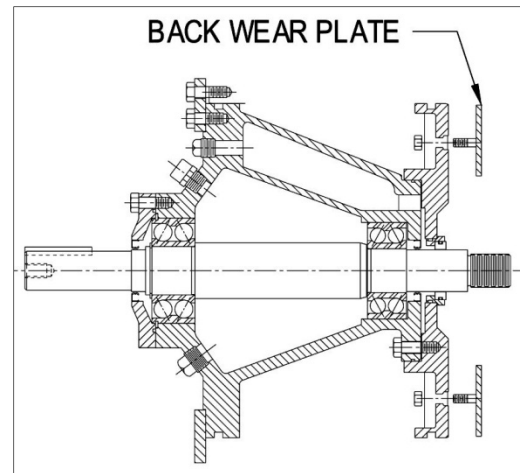


screw if necessary. Use the impeller removal tool to fix the shaft from rotating, and use a metal bar or piece of wood to rotate the impeller counter-clockwise until it is free of the shaft. It may be necessary to pound the bar with a hammer to loosen the impeller. Inspect the impeller and replace as necessary. Use caution when removing the impeller.



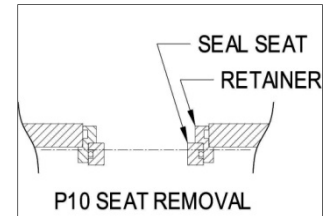
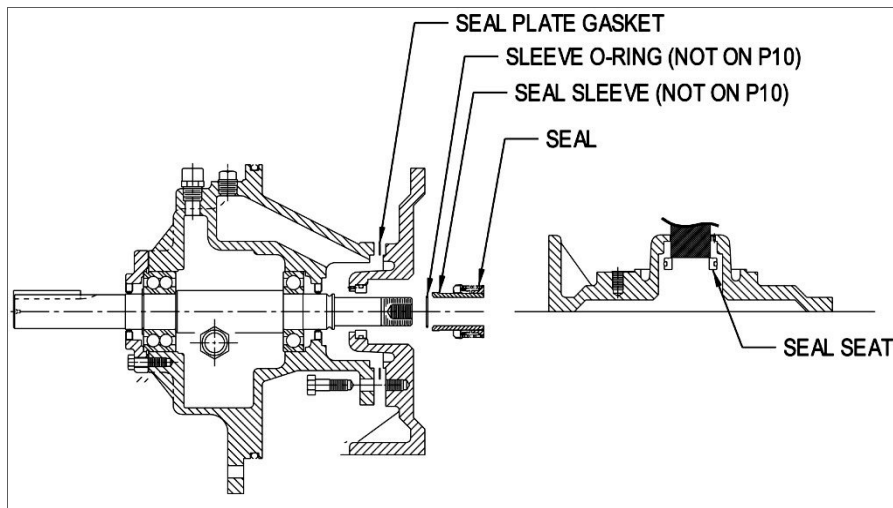
### **BACK WEAR PLATE (P10)**

With the rotating assembly out of the volute and the impeller removed, remove the four (4) nuts to remove the back wear plate. Replace the wear plate if it is badly worn or scored.



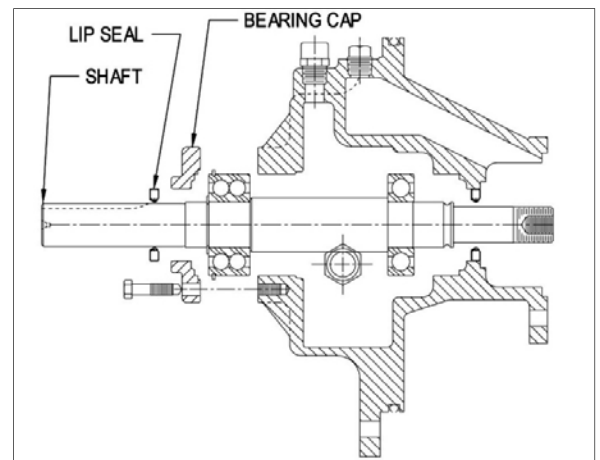
### **MECHANICAL SEAL**

With the rotating assembly out of the volute and the impeller removed, slide the shaft sleeve and rotating portion of the seal off of the shaft as one unit (3" to 8" pumps). On the P10 there is no sleeve or sleeve o-ring. Drain the oil in the seal cavity by removing the seal cavity drain plug, located on the bearing housing's bottom front boss (figure 4). Clean and replace the drain plug after draining seal cavity of oil. Remove the seal housing from the bearing frame, and place it, face down, on a flat surface. With a suitable tool press on the backside of the stationary seat until it is removed from the seal housing. On the P10, the stationary seat is held in a retainer, and the two are pressed out together.



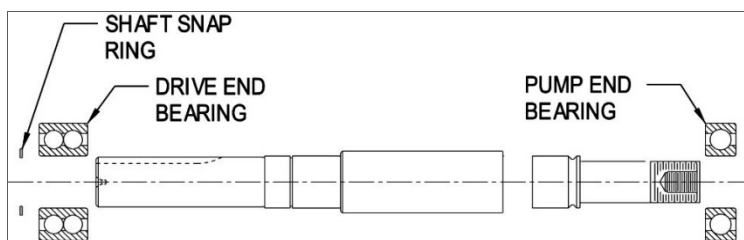
**SHAFT AND BEARING**

With the mechanical seal removed, remove the bearing housing drain plug located on the front bottom left of the bearing frame (figure 4), and drain oil. Clean plug and reinstall in housing. Remove fasteners, and slide the bearing cap/SAE bracket and grease seal off the shaft. Press the grease seal from the bearing cap/SAE bracket. Place a block of wood against the impeller end of the shaft and gently tap the shaft and bearings out of the housing.



**BEARING REMOVAL**

Remove the shaft snap ring. This will require the use of snap ring pliers. It will be necessary to use a puller or hydraulic press to remove the drive-end bearings and pump-end bearing from the shaft. If the bearings are to be reused, be certain that puller jaws bear only against the inside races (shaft-side) of the bearings.



**REASSEMBLY OF COMPONENTS**

**SHAFT AND BEARINGS**

Clean the housing and components with appropriate cleaning solvent and use compressed air to dry components. If bearings need replacement, remove the outboard (drive-end) bearing retaining ring and use appropriate bearing puller to remove bearings from shaft. Inspect shaft and replace if distorted, nicked or scratched beyond repair.

If bearings are to be replaced, then the bearings may be heated to 250° F for ease of installation. An induction heater, electric oven or hot plate may be used to heat the bearings. Never use direct flame to heat bearings.

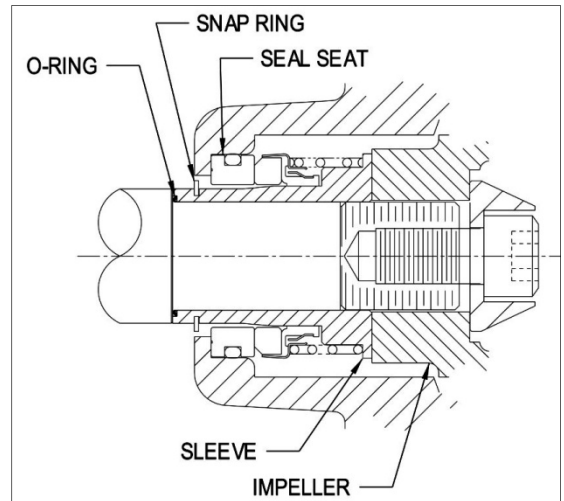
After heating the bearings slide the bearings on the appropriate shaft end. When installing the bearings onto the shaft only press against the inner bearing race. The inboard bearing should be installed with the shielded side toward the impeller. The outboard bearing should have the integral retaining ring on the bearing O.D. toward the drive-end of the shaft.

After installation of bearing, ensure that bearings are tight against shaft shoulders. Secure the outboard bearing on the shaft with the bearing retaining ring. Slide the shaft and assembled bearings into the bearing housing until the retaining ring contacts the bearing housing.

### **SEAL INSTALLATION (P3 to P8)**

A new seal assembly should be installed anytime the old seal is removed. The wear pattern on the old seal can cause premature failure if reused. Refer to figures 1 and 2. Thoroughly clean the shaft where the mechanical seal will be installed, and the seat of the seal housing. Place the sleeve o-ring over the shaft, past the threads and up against the shaft shoulder. Lubricate the stationary seat bore and stationary seat o-ring with P-80, 30 wt. motor oil, or liquid dish detergent and a little water. **DO NOT USE GREASE OR SILICONE LUBRICANTS.**

Carefully slide the cartridge seal assembly over the shaft, with the stationary seat towards the bore. By hand only, carefully press on the flanged end of the cartridge seal sleeve until the stationary seat bottoms in the stationary seat bore. Install impeller according to instructions.



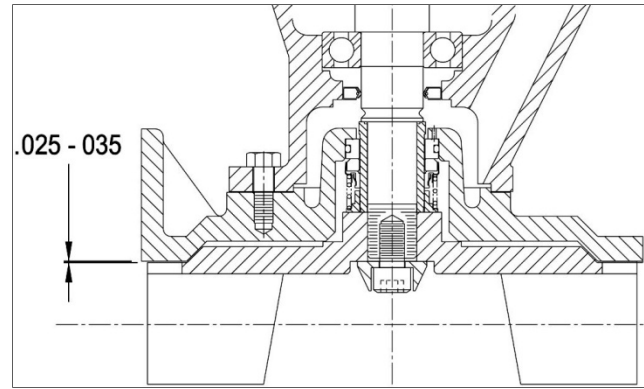
### **SEAL INSTALLATION (P10)** See figure 3

Thoroughly clean the shaft where the mechanical seal will be installed. Place the sleeve o-ring over the shaft, past the threads and up against the shaft shoulder. Lubricate the stationary seat bore and stationary seat retainer o-ring with 30 wt. motor or liquid dish detergent and a little water. **DO NOT USE GREASE OR SILICONE LUBRICANTS.** Press the stationary seat retainer / stationary seat assembly into the seat bore (by hand only). Lubricate the shaft surface and the inside diameter of the seal bellows. With the polished seal face of the rotating element toward the stationary seat, push the rotating element onto the sleeve and up against the stationary seat. Install the spring retainer onto the back of the rotating element (see fig. 3). Install the spring against the spring retainer. Install the impeller and check impeller to sealplate clearance. Follow procedure as outlined in **Seal Installation (P3 to P8)**



## **IMPELLER**

The shaft and impeller threads must be completely clean before re-installing the impeller. Apply anti-seize compound to the external shaft threads. **Do not use anti-seize compounds on the lock screw threads!** Screw the impeller onto the shaft until tight. A clearance of .025 to .035 between the impeller and the seal plate is recommended for optimum pump efficiency. Measure this clearance between the impeller and the rotating assembly with the rotating assembly sitting on the impeller with the shaft oriented vertically. Add or remove impeller adjusting shims as required to achieve the correct clearance. Apply Loctite 2760®, or equivalent thread locking compound, to impeller screw and install impeller washer and screw.



Torque the impeller screw to a minimum of 175 foot pounds, maximum of 235 foot pounds. Tighten the impeller lock screw by hand, and do not use a pneumatic wrench to tighten the. Do not allow the shaft to rotate while tightening the lock screw

## **INSPECTION COVER AND WEAR PLATE**

Re-grease o-ring when installing and use 2760 Loctite® (red), or equivalent, on the wear plate studs. Installation is the reverse of removal.

## **ROTATING ASSEMBLY**

Re-grease o-ring and install rotating assembly into volute. Installation is the reverse of removal. Upon installation, the clearance between the suction cover and impeller needs to be verified. After sliding the rotating assembly back into the volute, evenly tighten rotating element bearing housing fasteners until impeller lightly contacts wear plate. Note: the shaft will not rotate. Tighten bearing housing jack screws until .010" to .020" increase in clearance is achieved. .010" to .020" is the desired clearance between the impeller and wear plate.

This can be determined by taking measurements of the gap between the pump casing and the bearing housing when the impeller is making contact with the wear plate, then re-measure the same gap until the above increase in clearance is achieved at each corner of the bearing housing.

Rotate shaft, making sure there isn't any impeller/wear plate contact or rubbing. Tighten the jack screws at each corner of the bearing housing (not too tight), then tighten the jackscrew lock nuts to maintain setting position. Rotate shaft to verify the shaft is free to rotate without the impeller rubbing on the wear plate after adjustment. If the impeller continues to rub on the wear plate, repeat adjustment procedure above until the shaft rotates freely.

## **PRESSURE RELIEF VALVE**

The suction cover is equipped with a pressure relief valve to provide additional safety for the pump and operator. Make sure the relief valve is set to 80 psi

## **DANGER!!!**

It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump overheats and activates the valve. Periodically, the valve should be removed for inspection and cleaning.

## **LUBRICATION**

Proper lubrication is essential to maintain performance and to help ensure trouble free operation.

### **Seal Assembly**

Prior to starting the pump, remove the seal vent plug and fill the seal cavity with approximately 1 quart of ISO VG 32 viscosity grade 32 Turbine oil, so that the oil level is halfway in the level sight gauge.

### **Bearings**

The bearing housing was lubricated at the factory and should be maintained at the middle of the sight gauge. Use an ISO viscosity grade 32 Turbine oil and fill through the air vent hole at the top right of the bearing frame (figure 4). Under normal use drain and refill bearing housing at least once every 12 months.

## **CAUTION!!!**

Over-filling of oil can result in premature failure of bearings.

## **PUMP STORAGE**

Pumps are adequately prepared for outside storage prior to shipment, but use the following list of additional suggestions for extended storage longer than four (4) weeks.

- 1) Store the unit off the ground so no water will accumulate around the equipment.
- 2) Protect unit from blowing sand and dirt.
- 3) Stack no other items on top of pump/equipment.
- 4) Protect unit from the entry of any animals.
- 5) Periodically rotate shaft to lubricate bearings and protect bearings from brinelling.
- 6) Protect unit with approved drying agents.
- 7) Ensure all bare metal areas are coated with rust preventative.
- 8) Inspect unit every four (4) weeks and replace drying agents (Silica Gel) as required or a minimum of ever six (6) months.
- 9) Keep an inspection record showing dates of inspection with any maintenance preformed and condition of drying agents.
- 10) Before installation ensure that all rust protection has been removed. Also, remove any foreign material that may have accumulated during storage.
- 11) Before installation remove all drying agents (Silica Gel).

## **TROUBLE SHOOTING**

An ongoing record of performance will assist in any troubleshooting and/or analysis of problems. A pressure gauge can be installed on the suction and discharge side of the pump to monitor any changes in differential pressure. Differential pressure is useful in monitoring and diagnosing any possible degradation in pump performance.

Symptom	Possible Causes	Symptom	Possible Causes
No Discharge	1,2,3,4,5,7,8,9,10,17,18,19,20,37,49	Vibration and noise	2,4,9,10,14,15,17,26,27,28,29,30,31,32,33,34,35,36,39,40,41,42,43,44,48,49
Reduced Capacity	2,3,4,5,7,8,9,10,11,17,19,20,21,383,9,40,47,49	Seal: excessive leakage, short life, seal housing overheating	22,23,25,33,34,35,36,41,44,45,46
Reduced Pressure	5,7,8,11,13,18,19,38,39,40,47,49	Bearings: over heating, short life, noise	26,27,28,29,30,31,32,33,34,35,36,41,42,43,44
Loss of Prime	2,3,4,7,10,11,20,21,22,23,49	Pump overheating, seizes	1,8,9,14,33,34,35,36,41,42,43,44
Power consumption excessive, driver runs hot	6,12,13,17,18,19,24,33,34,35,36,37,38,41,42,43,44	Corrosion, erosion, pitting, oxidation or other loss of material	7,8,11,14,15,16
Pump Fails Prime	1,4,5,10,20,21,49,50,51		

1. Pump not primed
2. Suction line not filled
3. Air pocket in suction line
4. Suction inlet or foot valve obstructed, insufficiently submerged, or too small
5. System head higher than pump design head
6. System head lower than pump design head
7. Insufficient NPSH
8. Parallel pump application is incorrect
9. Suction pressure to vapor pressure below minimum
10. Suction lift too high
11. Excess vapor in pumpage
12. Specific gravity of pumpage different than design
13. Viscosity of pumpage different than design
14. Operation at below rated capacity
15. Cavitation
16. Electrolysis
17. Impeller obstructed
18. Wrong rotation direction
19. Low speed
20. Air leak into suction line
21. Air leak through mechanical seal
22. Seal fluid contaminated, hot or insufficient
23. Seal fluid system not vented
24. High speed
25. Mechanical seal insufficient
26. Bearing housing excessively cooled
27. Low oil pressure (oil lube bearings)
28. Improper or poor lubrication
29. Lubrication defective
30. Dirt in lubricant/bearing housing
31. Moisture in lubricant/bearing housing
32. Lubricant excess
33. Pipe strain
34. Temperature growth
35. Misalignment
36. Coupling improperly installed
37. Impeller installed backwards
38. Wear rings worn
39. Impeller damage
40. Improper balance (after repair)
41. Bent shaft
42. Excessive thrust
43. Rotational element dragging
44. Worn or incorrectly installed bearings
45. Mechanical seal not properly set, O-rings damaged or hardened
46. Shaft scored at seal
47. Volute O-ring
48. Foundation not rigid or settle
49. Suction line collapsed
50. Not enough liquid in casing
51. Suction check valve contaminated or damaged



## Conditions and terms of sale

**CONTROLLING PROVISIONS:** These terms and conditions shall control with respect to any purchase order or sale of Seller's products. No waiver, alteration or modification of these terms and conditions whether on Buyer's purchase order or otherwise shall be valid unless the waiver, alteration or modification is specifically accepted in writing and signed by an authorized representative of Seller.

**DELIVERY:** Seller will make every effort to complete delivery of products as indicated on Seller's acceptance of an order, but Seller assumes no responsibility or liability, and will accept no backcharge, for loss or damage due to delay or inability to deliver caused by acts of God, war, labor difficulties, accident, delays of carriers, by contractors or suppliers inability to obtain materials, shortages of fuel and energy, or any other causes of any kind whatever beyond the control of Seller. Seller may terminate any contract of sale of its products without liability of any nature, by written notice to Buyer, in the event that the delay in delivery or performance resulting from any of the aforesaid causes shall continue for a period of sixty (60) days. Under no circumstances shall Seller be liable for any special or consequential damages or for loss, damage, or expense (whether or not based on negligence) directly or indirectly arising from delays or failure to give notice of delay.

**SELLER'S LIABILITY:** Seller will not be liable for any loss, damage, cost of repairs, incidental or consequential damages of any kind, whether based upon warranty (except for the obligation accepted by Seller under "Warranty" above), contract or negligence arising in connection with the design, manufacture, sale, use or repair of the products or of the engineering designs supplied to Buyer.

**RETURNS:** Seller cannot accept return of any products unless its written permission has been first obtained, in which case same will be credited subject to the following: (a) All material returned must, on its arrival at Seller's plant, be found to be in first-class condition; if not, cost of putting in saleable condition will be deducted from credit memoranda. (b) A handling charge deduction of twenty percent (20%) will be made for all credit memoranda issued for material returned. (c) Transportation charges, if not prepaid, will be deducted from credit memoranda.

**CANCELLATION OR ALTERATION:** Cancellation or alteration of an order by Buyer may not be made without advance written consent of Seller and shall be subject to a cancellation charge. The cancellation charge will be a minimum of fifteen percent (15%) or actual cost incurred by Seller at the time of cancellation or alteration, whichever is greater.

**SHIPMENTS:** All products sent out will be carefully examined, counted and packed. The cost of any special packing or special handling caused by Buyer's requirements or requests shall be added to the amount of the order. No claim for shortages will be allowed unless made in writing within (10) days of receipt of a Shipment. Claims for products damaged or lost in transit should be made on the carrier, as Seller's responsibility ceases, and title passes, on delivery to the carrier.

**SPECIAL PRODUCTS:** Orders covering special or non-standard products are not subject to cancellation except on such terms as Seller may specify on application.

**QUOTATIONS:** All quotations are subject to approval, acceptance and correction at the home office. Any errors in quotations resulting in orders will be corrected and re-submitted to the customer for their acceptance or refusal. All quotations are valid for 45 days from the date on the quotation.

**PRICES AND DESIGNS:** Prices and designs are subject to change without notice. All prices are **F.O.B. Point of Shipment**, unless otherwise stated.

**TAXES:** The amount of any sales, excise or other taxes, if any, applicable to the products covered by this order, shall be added to the purchase price and shall be paid by Buyer unless Buyer provides Seller with an exemption certificate acceptable to the taxing authorities.

**TERMS OF SALE:** For value received, Buyer agrees to honor all terms of the sale, as outlined on the reverse hereof, including, but not limited to the following:

- ◆ 3% 10, net 30 days unless otherwise specified in writing.
- ◆ Buyer agrees and understands that payments will be considered past due if payment is not received within thirty (30) days of the invoice date.
- ◆ Buyer agrees that all past due payments shall bear interest at the rate of 1.5% per month (18% per annum) until paid in full.
- ◆ Buyer agrees that it is the intention of Buyer and Seller to conform strictly to all usury laws now in force and effect in the state of purchase.
- ◆ Buyer further agrees not to suffer or permit any charge, lien, security interest, adverse claim or encumbrance of any and every nature whatsoever against the equipment until the indebtedness secured thereby is satisfied in full.
- ◆ Minimum invoice amount will be no less than \$25.00 plus transportation.

**USE OF EQUIPMENT:** Buyer agrees to maintain and use the equipment solely in the conduct of its own business, in a careful and proper manner, and in conformity with all applicable permits, licenses, statutes, ordinances, regulations and laws.

**INSURANCE:** Buyer shall have and maintain at all times with respect to all equipment insuring against risk of fire, theft and other risks as Seller may require, until the indebtedness secured thereby is satisfied in full.

FIGURE 1

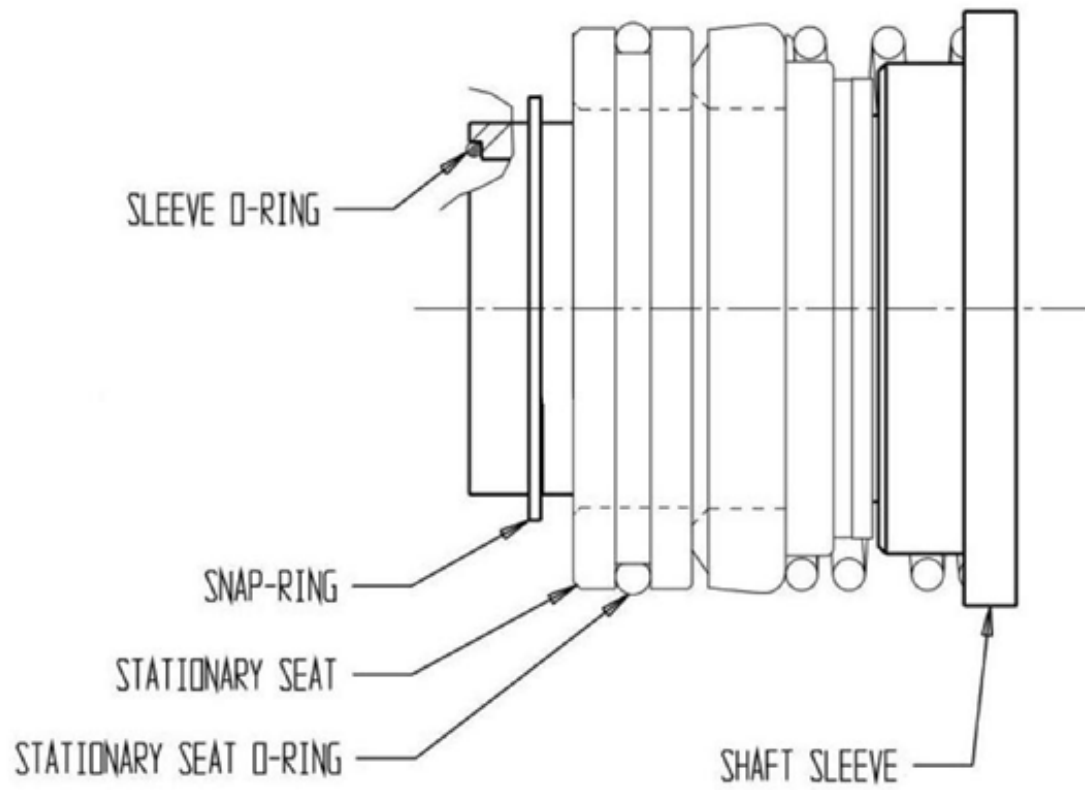


FIGURE 2

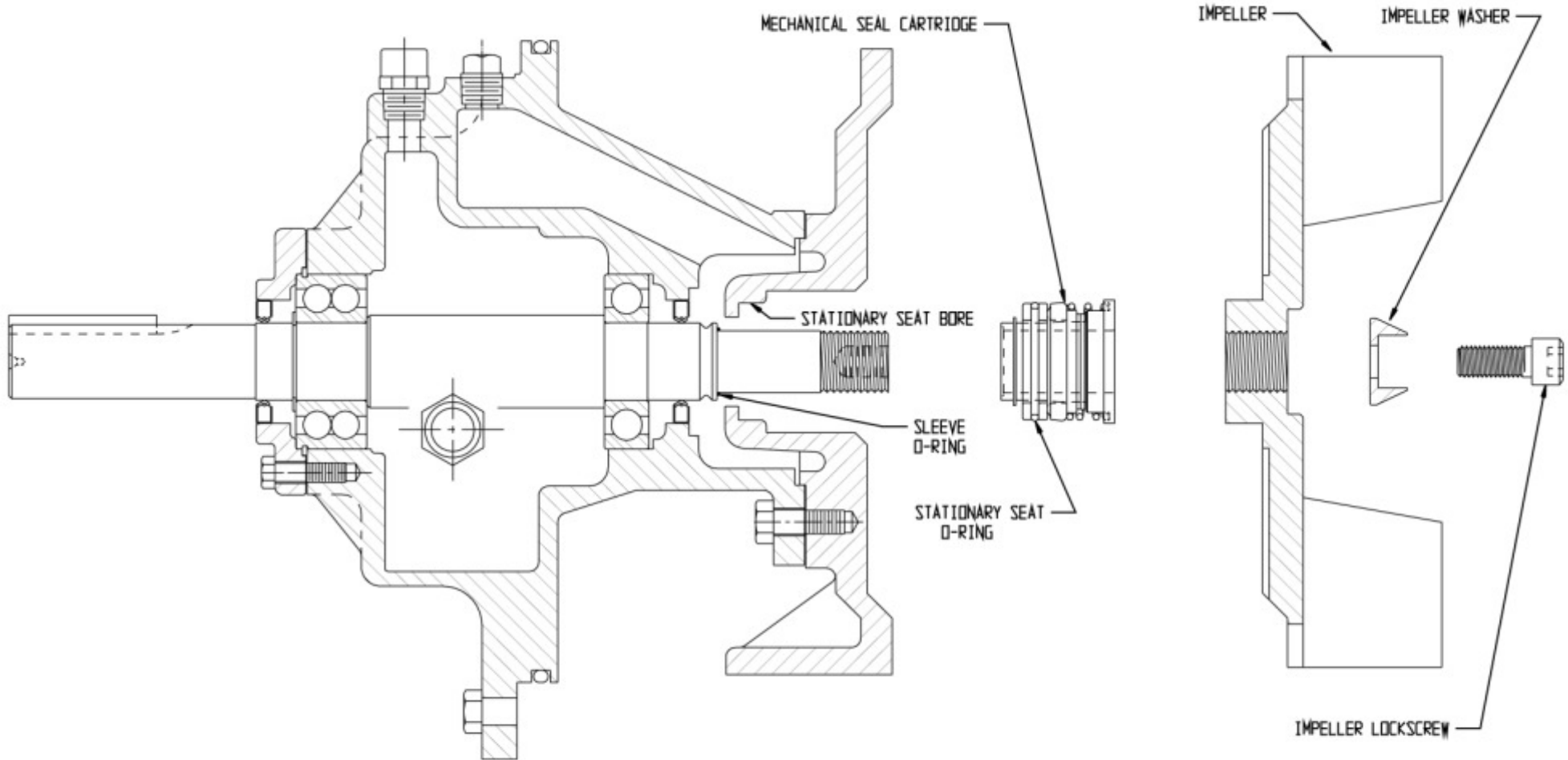
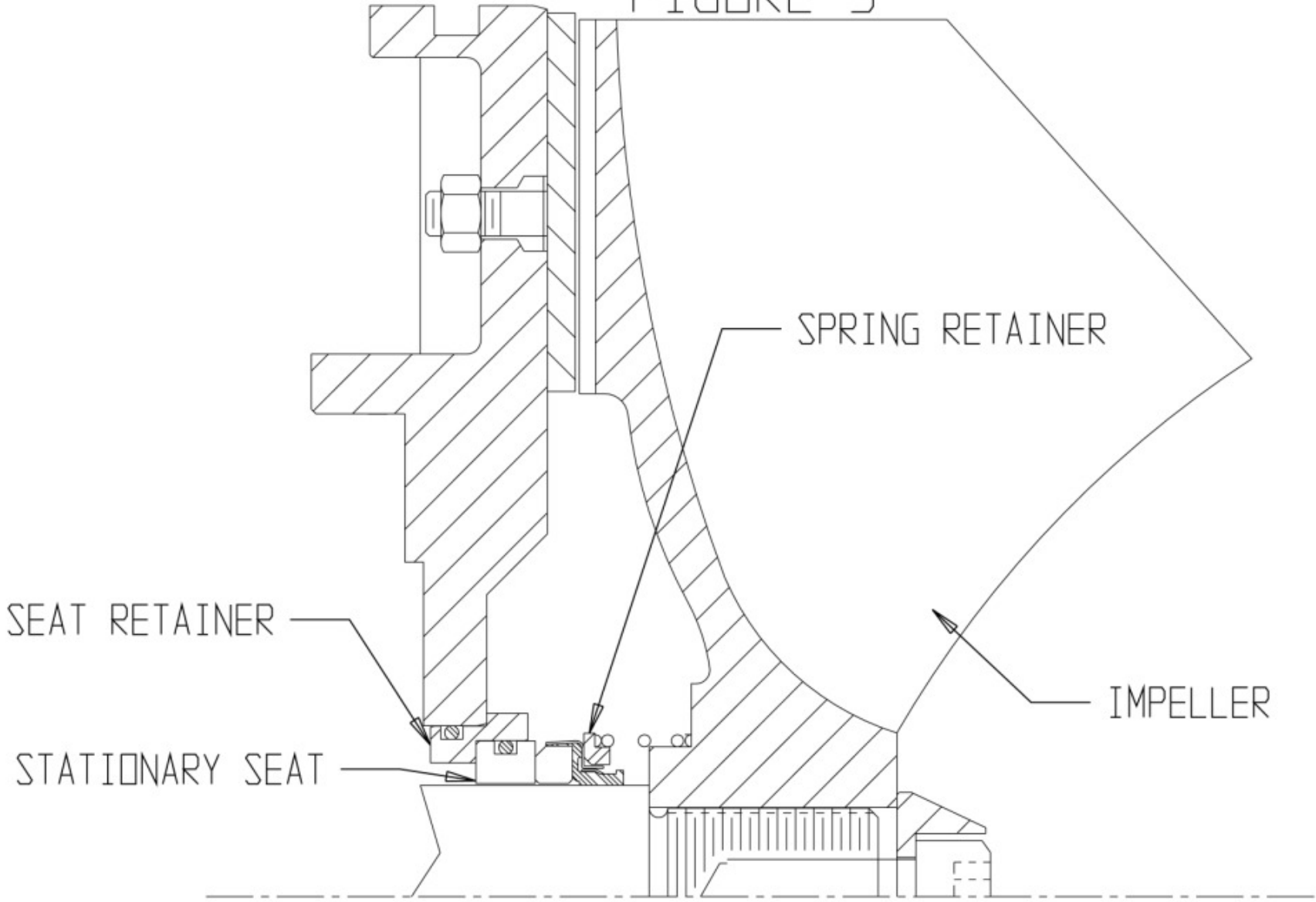




FIGURE 3



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# SLIDING-SHOE PUMP

**BUILT TO LAST.  
NOT TO REPLACE.**



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**MEGATOR**  **R**

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# PUMP COMPARISON

Due to the fact that the Megator Sliding Shoe Pump is a unique design, we are frequently asked by our prospective clients why they should install the Sliding Shoe Pump. Below is a comparison of the Sliding Shoe Pump in contrast to other pump designs.

## PISTON & PLUNGER PUMPS

The absence of valves ensures greater reliability and easier maintenance.

Weight and space occupied are a fraction of that of a piston or plunger pump of equivalent rating.

The elimination of gearing and crank mechanism saves lubrication and maintenance.

Shock and vibration in pipelines are avoided by the smooth laminar flow of the Sliding Shoe Pump.

## GEAR, VANE, SCREW & PROGRESSIVE CAVITY PUMPS

Effective pumping and self-priming in the Sliding Shoe Pump is not dependent on fine fits or clearances.

Positive seating and self-compensation for wear enable the Sliding Shoe Pump to keep going under conditions too severe for ordinary rotary positive pumps.

Sliding Shoe Pumps are not confined to liquids having recognized lubricating or sealing properties, as they work with equal efficiency and length of life on water and similar “non-lubricating” liquids.

Sliding Shoe Pumps will run for long periods with a completely dry suction without overheating or damage.

## CENTRIFUGAL PUMPS

Self-priming of the Sliding Shoe Pump is spontaneous, without the use of any added priming device, and is completely reliable, even when the pump is in an old and worn condition.

Small seepages can be dealt with continuously and any increased flow up to the full capacity of the pump is instantly picked up. The last drop can be removed from containers.

Very high suction lifts and long suction lines can be handled reliably without reduction in capacity. Entrapped air presents no difficulty.

Fluid pumped at a given speed, instead of falling away rapidly with increase in head, is practically constant at all heads and suction lifts within the range of the pump.

The Sliding Shoe Pump cannot overload the motor as a result of reduced head, and for this reason smaller motors can generally be used.

Sliding Shoe Pumps have high efficiency over a wide range of heads and not merely at or near a single “duty point”.

The Sliding Shoe Pump at a given speed will work efficiently and give the same capacity with liquids of very low or very high viscosity.



# THE SLIDING SHOE PUMP

Megator H-300 Cast Iron Pump, used in Mining & Railway applications.



Oily Waste Transfer Pump used in Navy surface ship bilge systems.



Oily Waste Transfer Pump on separator duty.



Megator, helping to guard your investment with rugged, dependable equipment, designed for efficiency and easy maintenance.



# THE MOST SENSIBLE DESIGN ON

## The Megator Sliding-Shoe Pump

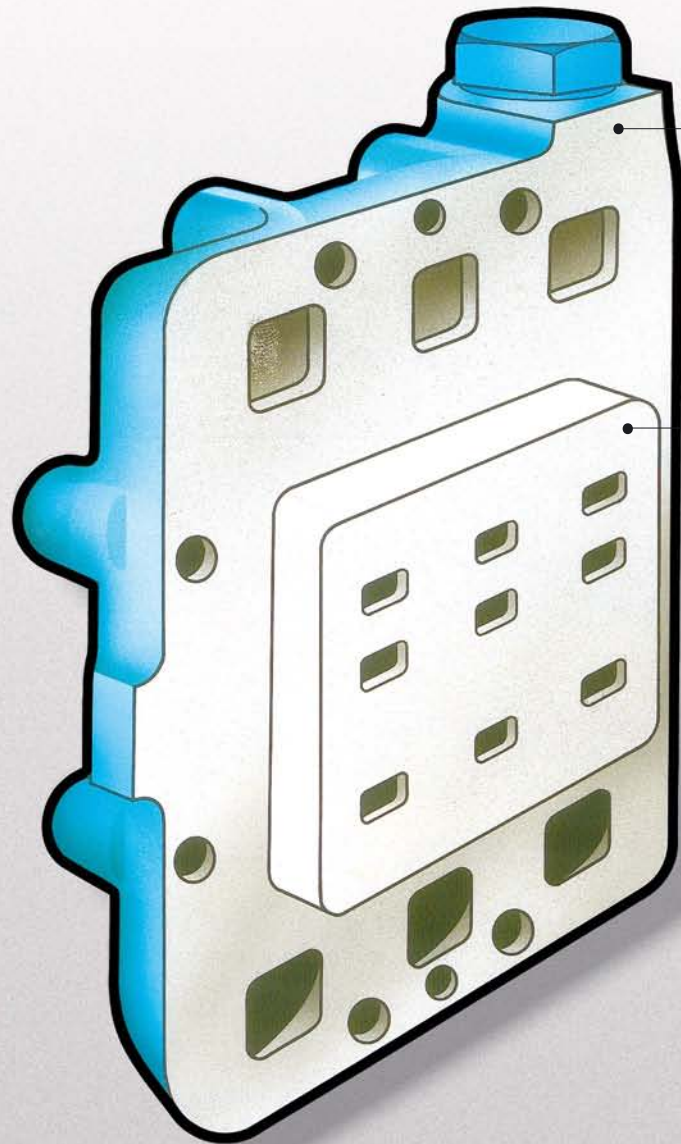
A positive pump with super-suction, self-priming, and dry-running abilities allows easy access to working parts resulting in reduced maintenance costs and down time.

First and foremost, the Sliding Shoe Pump is designed to operate consistently without the need for maintenance. But when maintenance is required, you won't have to spend your valuable time disassembling a complex piece of advanced technology. In fact, to access the heart of the pump, all you do is remove a few fasteners and remove the front cover. You'll reveal the most impressively simple pump design in existence. Few working parts ultimately means fewer problems. And when replacement of shoes or port plate is required, the task is done quickly and easily; without disturbing the drive, bearings, shaft seals or pipe connections.

Sensible design also means sound performance. The Sliding Shoe Pump offers more basic advantages than any other pump. In fact, when the pump was originally created, the most attractive features of various pumps on the market were incorporated into the design of the Sliding Shoe Pump. The problems which plagued other pumps were, of course, excluded from Megator's design.

The Sliding Shoe Pump primes itself instantly and can run without harm during dry suction. Every last drop is removed whether you're dealing with thin or viscous liquids. The pump delivers full capacity at high suction lifts. It's self-compensating for wear. And, as already stated, but worth repeating, it gives single-cover access to working parts.

The Pump provides exceptional suction performance, versatility, and ability to pump constant capacity against heads to 250 feet, and is used in a variety of applications: particularly where simple, rugged construction, inherent self-priming and high suction lift can save time and money.



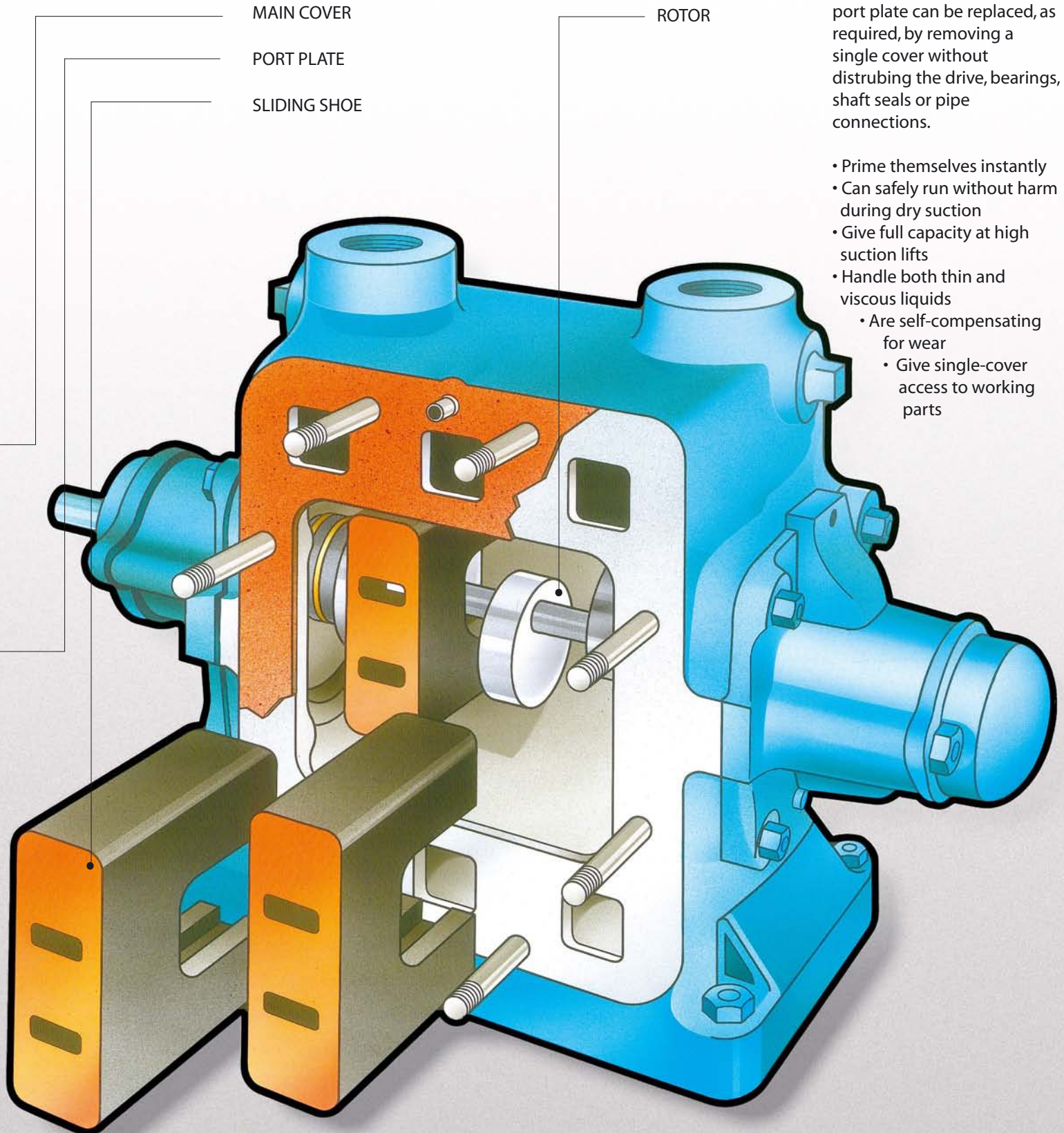


# THE MARKET

SIMPLE AND ACCESSIBLE.

The working parts of the Sliding Shoe Pump can be easily inspected. Shoes and port plate can be replaced, as required, by removing a single cover without disturbing the drive, bearings, shaft seals or pipe connections.

- Prime themselves instantly
- Can safely run without harm during dry suction
- Give full capacity at high suction lifts
- Handle both thin and viscous liquids
- Are self-compensating for wear
- Give single-cover access to working parts







# TAKING ON THE TOUGHEST JOBS

with Versatility and Consistency

ISO 9002 Certified

Sliding Shoe Pumps are available in our L-range designating total heads to 100 feet or H-range designating total heads to 250 feet. They have a maximum total suction lift to 27 feet. Suction and discharge ports 3/4" to 4".

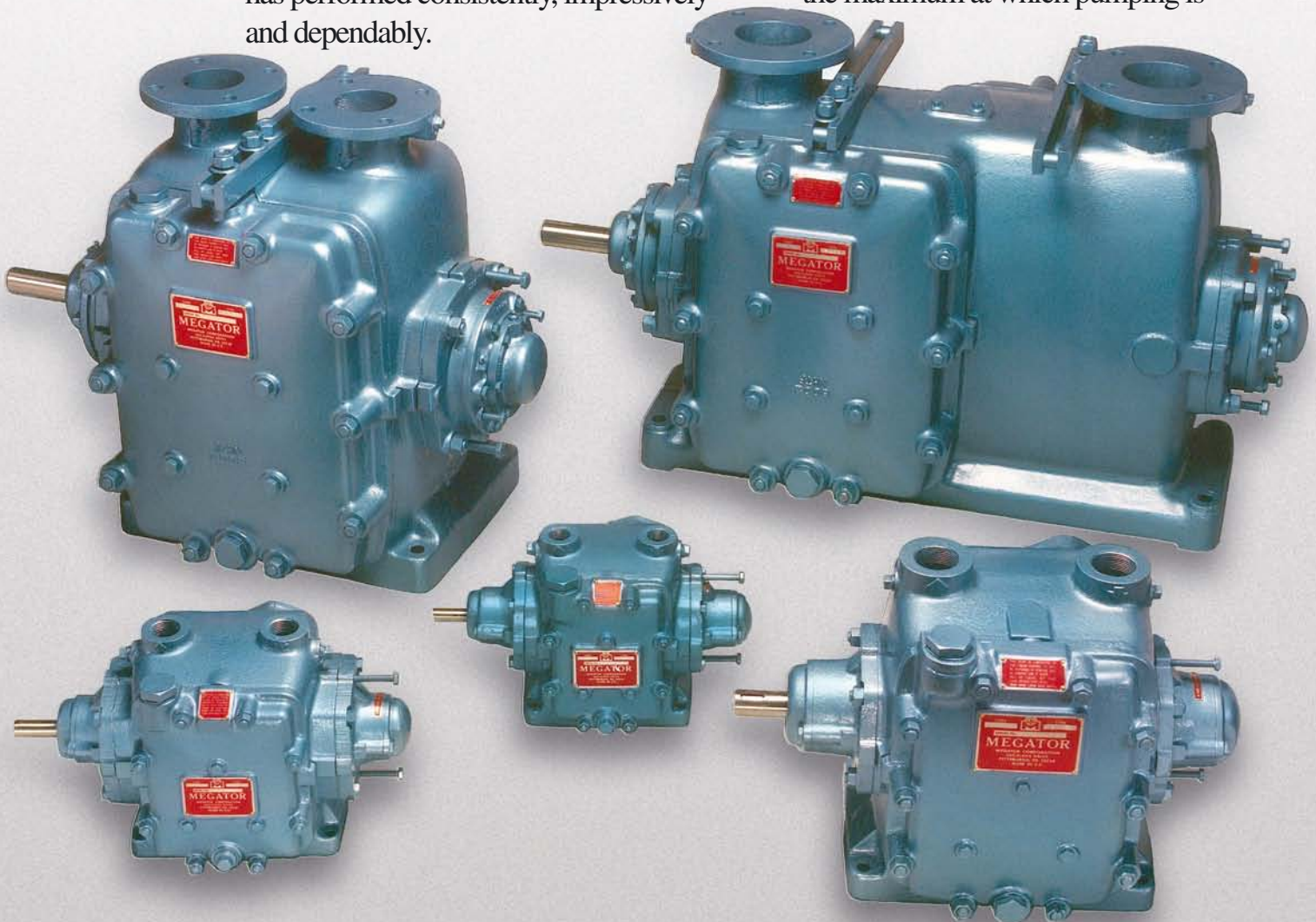
Pump Construction: cast iron, cast iron with Impreglon coating, bronze or aluminum

From the mines to the marines, the Sliding Shoe Pump has seen the worst of it. Specifically, recovering oil from sumps, pits, ponds, oil traps and other such areas. Gathering water in mines. Stripping sludge from tank bottoms. Pumping starch adhesive. Pumping diesel fuels and lubricating oils. And pumping liquids with minimal aeration, emulsification, or shearing.

In each application, the Sliding Shoe Pump has performed consistently, impressively and dependably.

The Sliding Shoe Pump delivers "super-suction" performance which it owes to a unique design feature. The working parts are entirely submerged and liquid sealed; even when pumping nothing but air. Liquid sealing also allows for self-priming and enables the pump to safely run with a completely dry suction without depending on a by-pass or other easily blocked device.

Importantly, the Sliding Shoe Pump will efficiently handle liquids of any viscosity to the maximum at which pumping is



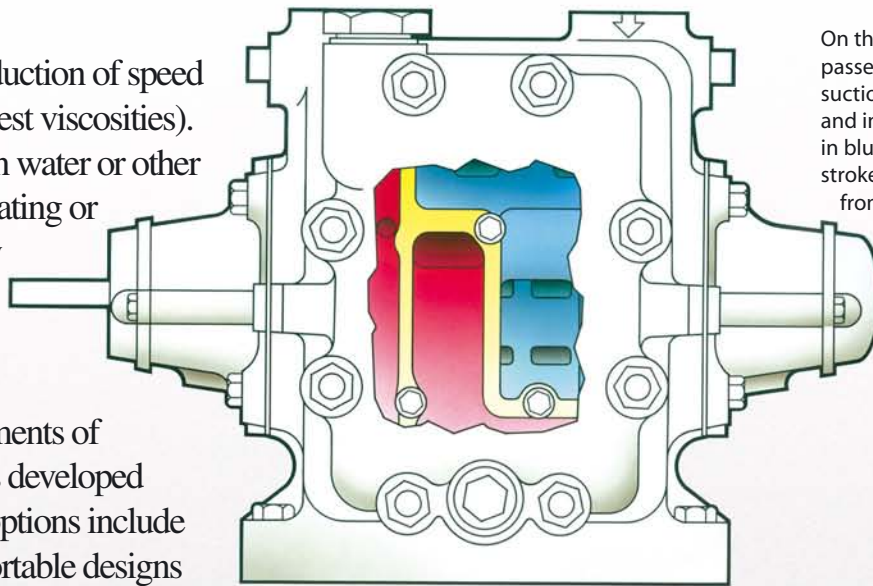


# IN INDUSTRY

economically feasible (some reduction of speed being necessary only at the highest viscosities). The Pump is equally effective on water or other thin liquids that have little lubricating or penetrating properties. It readily handles free-flowing or viscous liquids, or a mixture of both.

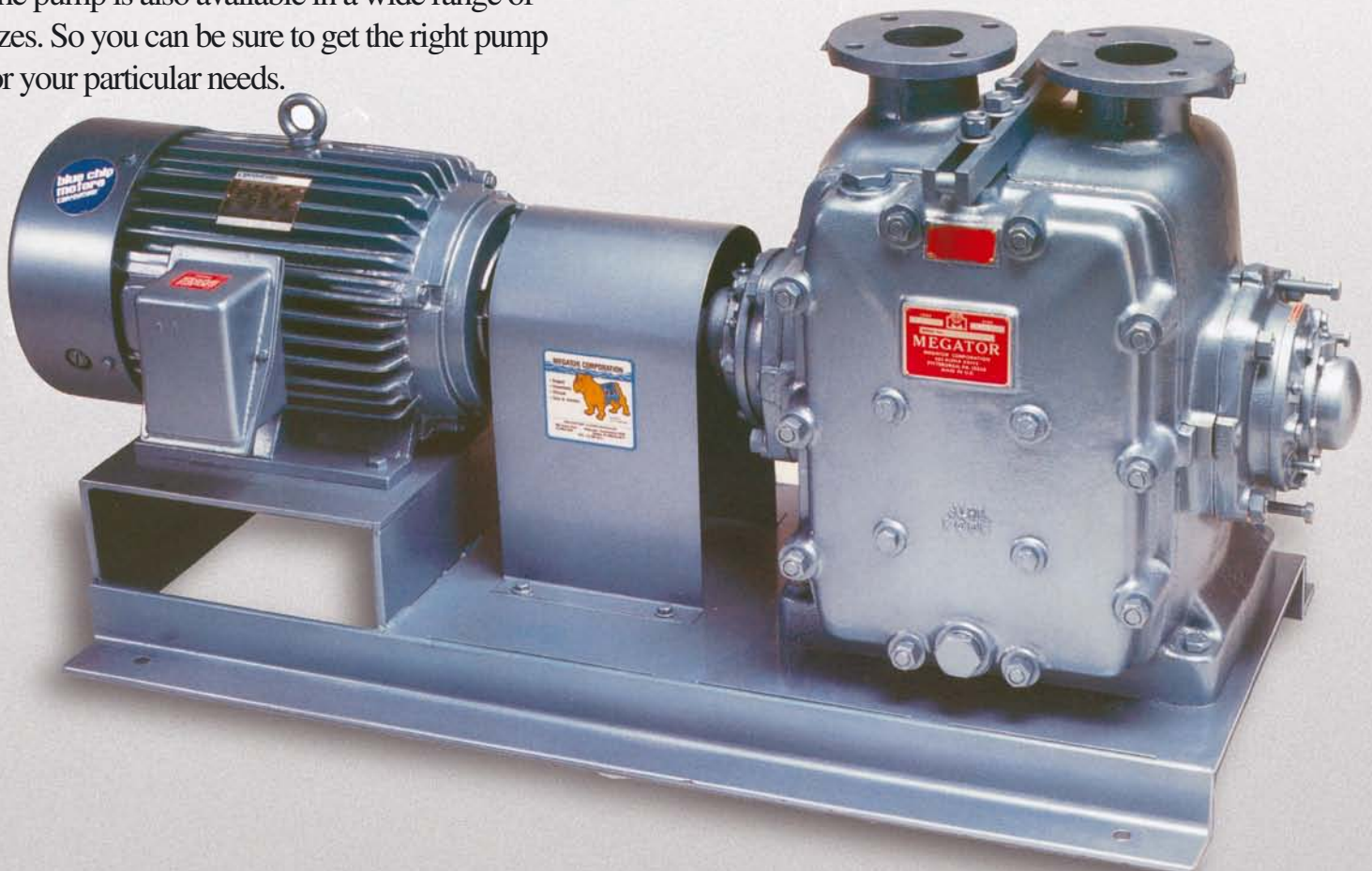
To meet the specialized requirements of different industries, Megator has developed versatile assemblies. Available options include stationary, skid mounted, and portable designs featuring electric, gasoline, diesel, air, or hydraulic drives.

The pump is also available in a wide range of sizes. So you can be sure to get the right pump for your particular needs.



On the suction stroke, liquid passes down through the suction ports in the plate and into the shoes, as shown in blue. On the discharge stroke, liquid is displaced from the shoes through the discharge ports as shown in red.

Model H-300 for direct-drive arrangement.







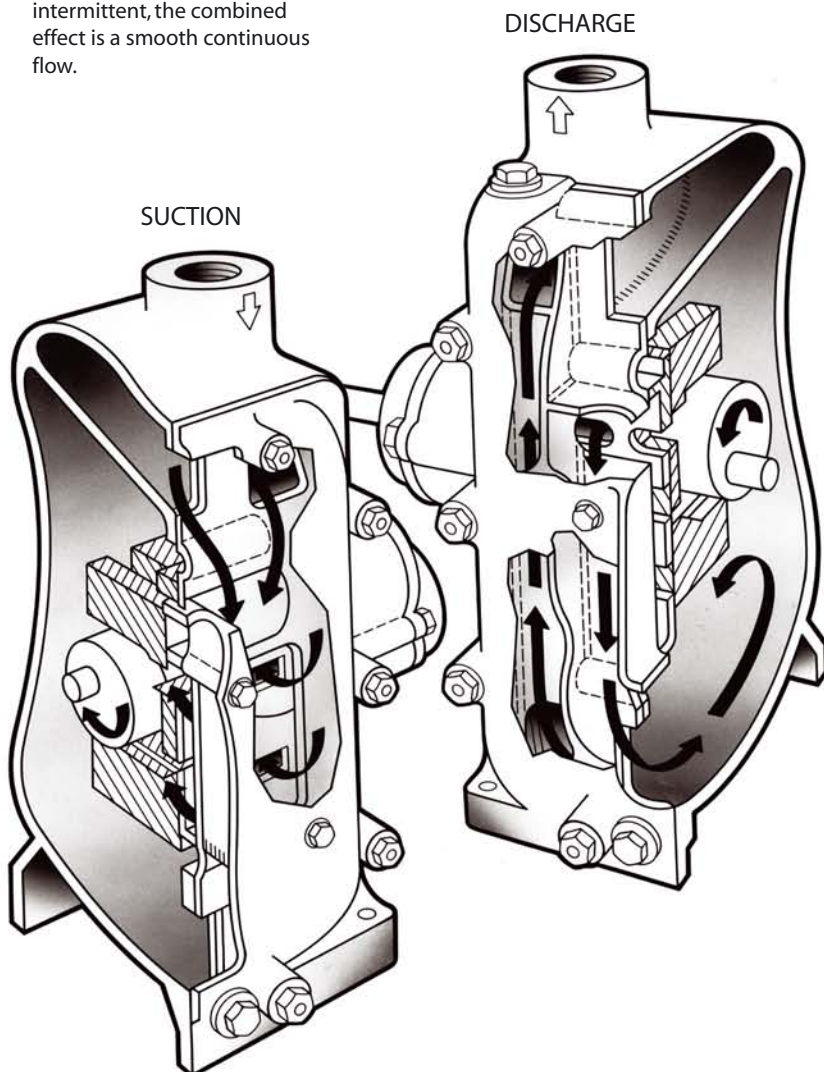
# DEPENDABLE PUMPING ACTION- SMOOTH CONTINUOUS FLOW

"If it ain't broke, don't fix it" This old adage reflects the cautious, sensible approach we've taken when considering design changes on the Sliding Shoe Pump. The modern trend in pump design has been in the direction of greater technical complexity which, experience has shown, usually means a greater probability of downtime. The Sliding Shoe Pump is built to not break down; which is why industries of all kinds have come to rely on our pump.



Model H-300 for waste treatment.

The figure below illustrates the working cycle of a Sliding Shoe Pump. Although the displacement in each shoe is intermittent, the combined effect is a smooth continuous flow.



## HOW THE PUMP WORKS

Pumping action is derived from the rotation of three or more eccentric discs, each of which is closely fitted into a displacement chamber or shoe of plastic material lined with synthetic rubber. The eccentric movement of each disc comprises horizontal and vertical components. The horizontal motion provides displacement; the disc reciprocates in the shoe like a piston in a cylinder. The vertical motion controls the valving, the entry and the discharge of the liquid through the pump.

When the pump is started, a hydraulic pressure differential is created which ensures a tight seal and maintains the shoes in close contact with a flat port plate forming the division between the suction and discharge sides of the pump. The plate has ports opposite each shoe, respectively, leading from the suction branch and into the discharge side of the pump. On the suction stroke, liquid passes down through the main cover and is drawn into the shoes through the suction ports in the plate. On the discharge stroke, liquid is displaced from the shoes through the discharge ports.

The liquid then passes down through the main cover into the bottom of the body before flowing through another passage in the main cover to the discharge branch. This arrangement helps to scavenge the bottom of the body and prevent the accumulation of solids. The outstanding performance of the pump does not depend upon fine clearances.

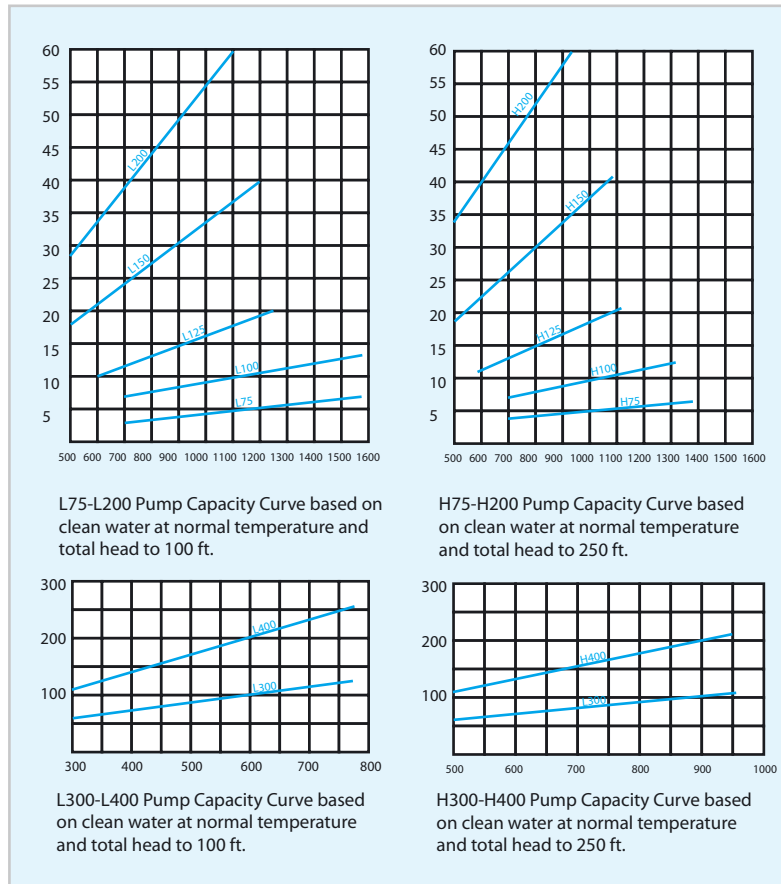
# BUILT TO LAST, NOT TO REPLACE.

Megator developed a heavy-duty, reliable pump that can conceivably outlast any job it is assigned to.



The Sliding Shoe Pump is constructed of cast iron, cast iron with an Impreglon coating, bronze or aluminum. Port plates and rotors are made of precipitation-hardened stainless steel which can be coated for even greater wear resistance. Bearings are eccentric-locking with an inner ring of hardened stainless steel, which guarantees easy removal and quick access to shaft seals. Shaft seals are exposed to the cooling and flushing effect of the liquid flowing through the pump body.

If there is any possibility of excessive head or throttling of the discharge, a relief valve capable of passing the full pump capacity should be installed. The relief valve can be arranged to bypass to suction but an open and visible discharge is generally preferable.



Photo, Top Left Model H-400 pumps on refinery duty.

Photo, Left Sliding Shoe Pumps serving municipal authority.

All these features make the Sliding Shoe Pump the most sensible, reliable pump in operation. Just as reliable as your Megator representative. So if you have any questions, give him a call at 412-963-9200 Outside PA call 800-245-6211.

Web: [www.megator.com](http://www.megator.com)

e-mail: [info@megator.com](mailto:info@megator.com)

# Specifications and Dimensions

## Megator Types L&H Pumps

### Standard Ratings

#### HIGH SUCTION RATINGS

For very high suction lifts, high viscosities and dirty liquids consult factory.

#### CHARACTERISTICS

The Sliding-Shoe Pump delivers its rated capacity at any head and any suction lift within its range. The head developed is the head imposed by the system at the rated flow. A head-capacity curve on the conventional basis would be a straight line.

#### INTERMEDIATE CAPACITIES

For intermediate capacities, pumps can be run at speeds lower than those listed in the tables. The head is independent of the speed. The capacity at a given head is approximately proportional to the speed.

#### MOTOR HOSEPOWERS

The standard motors listed provide for the maximum heads.

Pump	Capacity		Maximum Total Head		Motor HP		Maximum Total Suction Lift				Pump rev/min
	U.S. gal/min	feet water	lbs/in <sup>2</sup>	WATER	4500 SSU	WATER		4500 SSU			
						feet	in Hg	feet	in Hg		

#### TYPE L Belt-Drive: Total Heads To 100 Feet

L75	6	100	45	¾	1	23	20	20	18	1575
L100	12	100	45	1½	2	23	20	20	18	1575
L125	20	100	45	1½	3	23	20	20	18	1290
L150	40	100	45	3	5	23	20	20	18	1225
L200	60	100	45	5	7½	23	20	20	18	1120
L300	120	100	45	7½	15	20	17	18	16	760
L400	240	100	45	15	30	20	17	18	16	760

#### TYPE H Belt-Driven: Total Heads To 250 Feet

H75	6	250	110	1	2	23	20	20	18	1390
H100	12	250	110	2	3	23	20	20	18	1345
H125	20	250	110	3	5	23	20	20	18	1200
H150	40	250	110	5	7½	23	20	20	18	1120
H200	60	250	110	7½	10	22	19	20	18	960
H300	100	250	110	10	20	22	19	20	18	960
H400	200	250	110	20	40	22	19	20	18	960

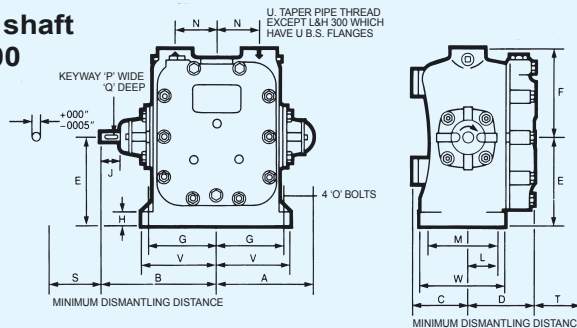
#### TYPE L Direct-Coupled: Total Heads To 100 Feet

L75	6.5	100	45	¾	1	23	20	20	18	1730
L100	13	100	45	1½	2	23	20	20	18	1730
L125	18	100	45	1½	3	23	20	20	18	1150
L150	36	100	45	3	5	23	20	20	18	1150
L200	60	100	45	5	7½	23	20	18	16	1150
L300	130	100	45	7½	15	20	17	18	16	865
L400	260	100	45	15	30	20	17	18	16	865

#### TYPE H Direct-Coupled: Total Heads To 250 Feet

H75	7.5	250	110	1	2	23	20	20	18	1730
H100	15	250	110	2	3	23	20	20	18	1730
H125	18	250	110	3	5	23	20	20	18	1150
H150	40	250	110	5	7½	23	20	20	18	1150
H200	54	250	110	7½	10	21	18	20	18	865
H300	90	250	110	10	20	21	18	20	18	865
H400	180	250	110	20	40	21	18	20	18	865

### Pumps with bare shaft L & H 75 - L&H 300



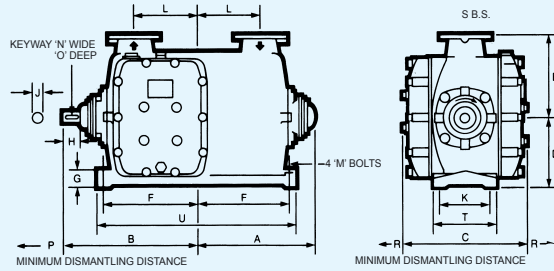
#### Approximate weights

	lbs.		lbs.
L75	38	H75	51
L100	56	H100	71
L125	80	H125	100
L150	122	H150	168
L200	166	H200	221
L300	406	H300	452

Pump type	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
L75	6¼	7¾	3¼	4	4½	4½	3¾	¾	1½	½	1⅝	4	2¾	5/16	¼	1/16	—	9¼	3	¾	3¼	4¾	—
L100	7	8½	4	4⅝	5	5	4	7/8	1½	½	2	5¼	27/16	¾	1/8	1/16	—	10¼	3¾	1	4¾	6	—
L125	7½	9	4½	5⅝	6	6¼	5	7/8	1⅝	5/8	2¾	6¼	3¼	¾	3/16	3/32	—	12¼	4	1¼	57/16	7½	—
L150	8⅝	10	4½	6	7¼	7½	5¾	1¼	1¾	¾	2⅝	6	3½	½	3/16	3/32	—	13¾	5	1½	6¾	7¼	—
L200	9⅝	11⅝	5⅝	6⅝	8½	8¾	6	1¼	1⅞	1	27/8	7	3¾	½	¼	1/8	—	14¾	5½	2	6⅝	8¼	—
L300	13½	16	7⅞	9¾	11	13	8	2	4	1¼	4¼	11	4⅝	5/8	5/16	9/64	—	20	12	3	8⅞	12⅞	—
H75	6½	8	3½	4½	4½	4½	3¾	7/8	1½	5/8	1⅞	4¾	2¾	3/16	3/16	3/32	—	10	3¼	¾	3¼	5½	—
H100	7½	9¼	4⅝	4⅞	5	5	4	7/8	2	¾	2	5¼	27/16	¾	3/16	3/32	—	11½	4¼	1	4¾	6	—
H125	8⅝	10½	4½	5⅝	6	6¼	5	7/8	2	1	2¾	6¼	3¼	¾	¼	1/8	—	13¼	5	1¼	57/16	7½	—
H150	9½	11⅝	4¾	6⅝	7¼	7½	5¾	1¼	2⅝	1⅞	3	7	3½	½	5/16	7/64	—	14½	5½	1½	6¾	8¼	—
H200	10¼	12½	6⅝	6¾	8½	8⅞	6	1¼	2¾	1¼	3¾	8½	3¾	½	5/16	7/64	—	15½	6½	2	6¾	9¾	—
H300	14	17	7⅞	9¾	11	13	8	2	4	1½	4¼	11	4⅝	5/8	3/8	5/32	—	21	12	3	8⅞	12⅞	—



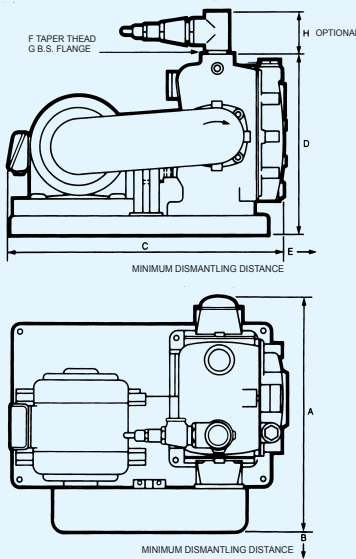
# L & H 400



Pump type	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	Approx. wt. in lbs.
L400	18 1/4	21 5/8	19 1/2	11	13	14 3/4	2 5/16	4	1 1/4	8	10	3/4	5/16	5/64	30	12	4	10	31 1/2	—	710
H400	18 3/4	22 5/8	19 1/2	11	13	14 3/4	2 5/16	4	1 1/2	8	10	3/4	5/8	5/32	31	12	4	10	31 1/2	—	730

**ROTATION** Standard rotation is clockwise facing driving end and the standard assembly is with the suction at the non-drive end. Pump cannot be operated in the reverse direction but can be assembled so that the drive is at the opposite end.

## Belt-driven assemblies



Pump type	A	B	C	D	E	F	G	H	Approx. wt. in lbs.
L75	14 3/4	9 1/4	20 3/4	10 1/2	3	3/4	—	3	105
L100	15 3/4	10 1/4	21 3/4	11 1/2	3 3/4	1	—	3 1/2	135
L125	17	12 1/4	23 1/2	14	4	1 1/4	—	3 3/4	155
L150	19	13 3/4	27 1/4	16 3/4	5	1 1/2	—	4	220
L200	20 3/4	14 3/4	30	20 1/4	5 1/2	2	—	4 1/4	320
L300	30	20	34 1/4	26 3/8	12	—	3	7	560
L400	44	30	54	26 1/2	12	—	4	9	1160
H75	15 1/4	10	21 1/8	10 1/2	3 1/4	3/4	—	3	120
H100	17 1/4	11 1/2	23 3/4	11 1/2	4 1/4	1	—	3 1/2	150
H125	19 5/8	13 1/4	26	14	5	1 1/4	—	3 3/4	205
H150	21 1/2	14 1/2	28 1/4	16 3/4	5 1/2	1 1/2	—	4	260
H200	23 1/2	15 1/2	30 1/4	20 3/8	6 1/2	2	—	4 1/4	355
H300	32	21	34 1/4	26 3/8	12	—	3	7	890
H400	44	31	54	26 1/2	12	—	4	9	1600

### SUCTION LIFT

The suction lifts listed assume normal temperature and elevation. Installations combining suction lift with temperatures or elevations above normal should be referred to Megator.

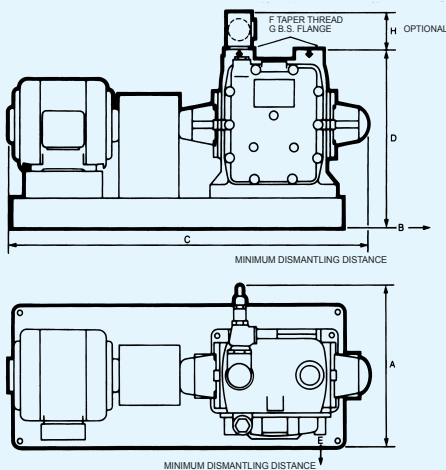
### TEMPERATURE

The Sliding-Shoe Pump allows for temperatures up to 150° F, subject to the note on suction lift. Where higher temperatures are involved, it is advisable to consider them in conjunction with the other working conditions and such cases should be referred to Megator.

### DIRTY LIQUIDS

Reduced pump speeds give a markedly increased resistance to wear and are preferably used for dirty liquids. Under severe conditions still lower speeds may provide the most economical installation.

## Direct-coupled assemblies



Pump type	A	B	C	D	E	F	G	H	Approx. wt. in lbs.
L75	10 3/4	9 1/4	25 3/8	10 1/2	3	3/4	—	3	135
L100	10 3/4	10 1/4	28 3/4	13	3 3/4	1	—	3 1/2	170
L125	12 1/4	12 1/4	30 1/4	15 1/4	4	1 1/4	—	3 3/4	195
L150	12 7/8	13 3/4	34 3/4	17 3/4	5	1 1/2	—	4	310
L200	14 1/4	14 3/4	40 7/8	21 1/4	5 1/2	2	—	4 1/4	460
L300	18 1/2	20	54	28	12	—	3	7	700
L400	21	30	67	28	12	—	4	9	1500
H75	14	10	28 1/4	10 1/2	3 1/4	3/4	—	3	150
H100	14	11 1/2	30 1/2	13	4 1/4	1	—	3 1/2	190
H125	13	13 1/4	35 7/8	15 1/4	5	1 1/4	—	3 3/4	260
H150	14 1/4	14 1/2	41 1/4	18 3/4	5 1/2	1 1/2	—	4	380
H200	15 1/4	15 1/2	43 7/8	21 1/4	6 1/2	2	—	4 1/4	510
H300	18 1/2	21	53	28	12	—	3	7	1100
H400	20	31	69	28	12	—	4	9	2100

As research and development proceed continuously, Megator reserves the right to make detailed modifications of design or dimensions without notice. Certified drawings are available to cover specific orders.

## BENEFITS

- Self-priming
- Operates with dry suction
- Simple to install
- High suction lift
- Constant capacity at varying heads
- Single cover access
- Simple to operate
- Self-compensating for wear
- The same pump for water and oils
- Remove the last drop from containers
- Minimal shear/emulsification

## FEATURES

- Capacities to 264 gpm
- Suction lifts to 27 ft.
- Viscosities to 21,000 SSU
- Heads to 250 ft.
- Available in bronze, cast iron, cast iron with Impreglon coating & aluminum casings
- Air, diesel, electric, hydraulic or gasoline driven
- Variable speed inverter control (VFD)
- Direct coupled or belt drive options
- Available assemblies include stationary, skid-mounted & mobile options



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**DISTRIBUTOR**

# Megator

**Types L and H Pumps**

**Operating  
Instructions  
and Part List**



**MEGATOR CORPORATION**

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Pittsburgh, PA 15238  
Phone: 412/963-9200  
Toll Free: 800-245-6211





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# WARNING!

- The voltage used to operate this equipment is high enough to cause severe injury or death from electrical shock. Fully disconnect and discharge the electric power supply before working on the equipment, by insuring that all switches and circuit breakers have been locked in the open (off) position. In addition, danger of electrical shock may exist when the power control is in the off position. Always disconnect power, and discharge and ground all electrical circuits connected to the equipment, before touching it. Use a voltmeter to insure that all power has been discharged from the electrical circuits before touching any part of the electrical system or equipment. Personnel working with or near high voltage should be familiar with proper methods of resuscitation and other first aid procedures for treatment of electrical shock.
- The internal combustion engine included in this equipment uses flammable materials. Burns and other serious injuries may result from mishandling these materials. Always store flammable materials in containers specifically designed and approved for those materials and do not smoke or use any flames, sparks or other sources of ignition near this equipment or such flammable materials.
- This equipment contains moving parts that can cause amputation and other serious personal injuries if proper precautions are not taken. Coupling and belt guards have been included in the equipment to protect against such injuries, and these guards should not be removed, modified or adjusted under any circumstances. The guards should be inspected regularly to insure that they are in proper working order. Do not operate the equipment unless the guards are in place as originally installed and are in proper working order. Do not wear loose clothing or jewelry when working with or near this equipment, because such clothing and jewelry can get caught in moving parts of this equipment, resulting in serious personal injury.
- Use of this equipment to handle toxic or hazardous chemicals or other substances may create a risk of serious personal injury. User is responsible for handling such chemicals and substances safely. **In addition, this equipment should not be used to handle any chemicals or substances before consulting with Megator Corporation to determine compatibility.** All handling instructions specified by the supplier of any chemicals or substances used in this equipment must be followed. The suppliers of the chemicals and substances should be contacted to obtain specific toxicity and safe use and handling information about all such chemicals and substances.



# Identification

Pump Serial Number \_\_\_\_\_

Pump Model Number \_\_\_\_\_

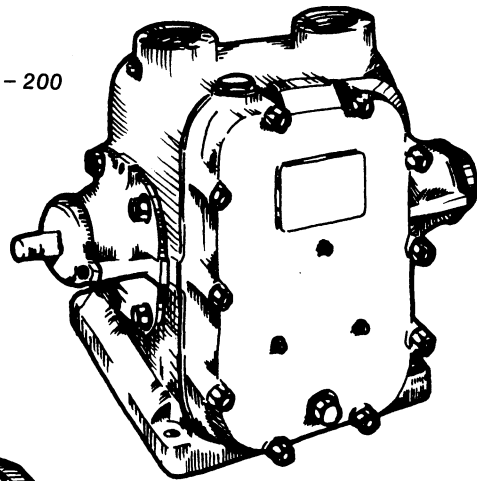
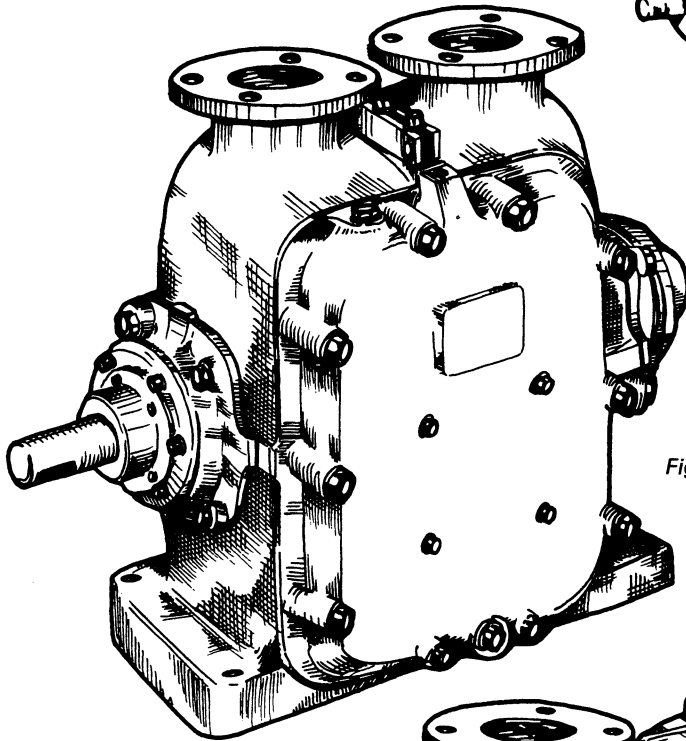
Date of Shipment \_\_\_\_\_

# Ordering Spare Parts

To insure quick supply of spare parts, the following information should be given:

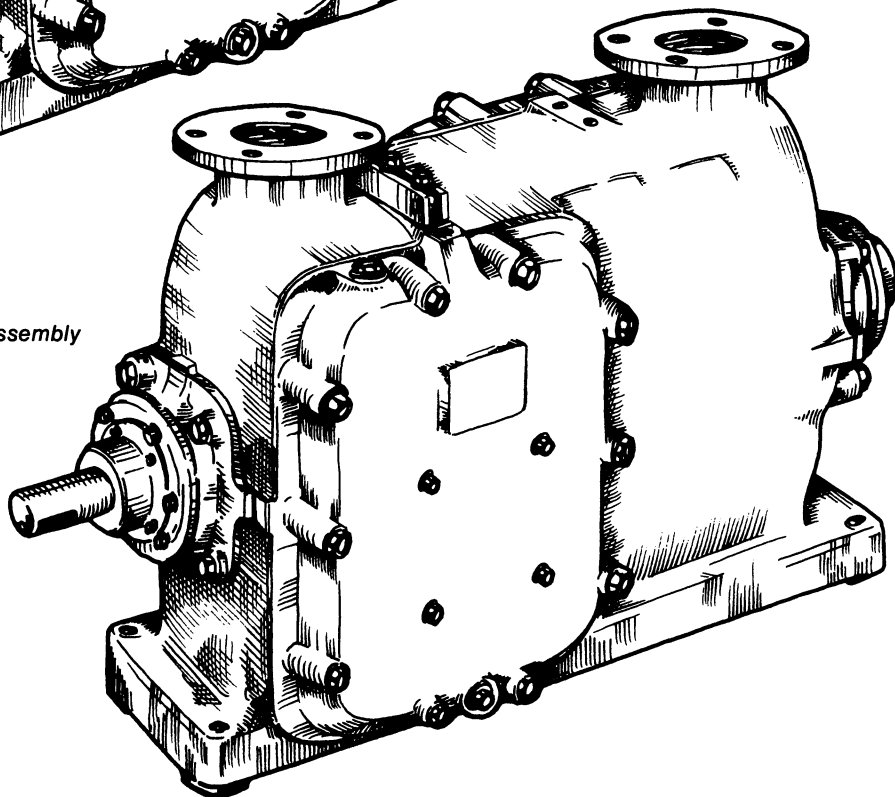
1. Pump serial and model number
2. Part number and name.

*Fig. 1: Standard assembly of L/H75 - 200  
(three-shoe pump).*



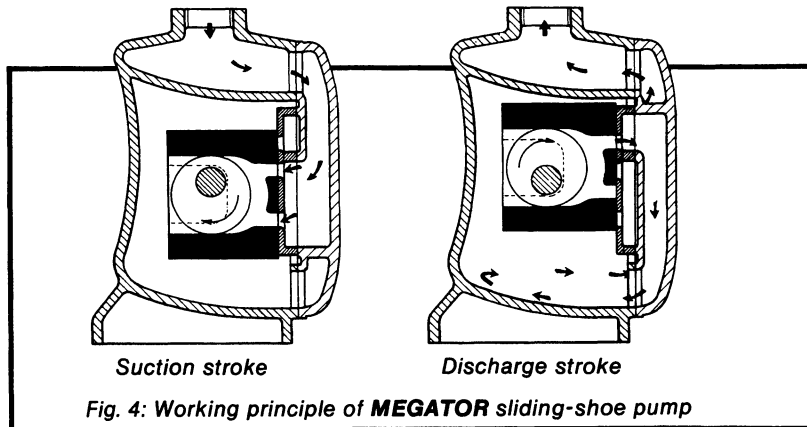
*Fig. 2: Standard assembly of L/H300 pump.*

*Fig. 3: Standard assembly  
of L/H400  
(six-shoe pump).*



# How the Pumps Work

Pumping action is derived from the rotation of three or more eccentric discs, each of which is closely fitted into a displacement chamber, or shoe, of plastic material lined with synthetic rubber. The eccentric movement of each



disc comprises horizontal and vertical components. The horizontal motion provides displacement, the disc reciprocating in the shoe like a piston in a cylinder. The vertical motion controls the valving, the entry and discharge of the liquid through the pump.

When the pump is started, a hydraulic pressure differential is created which maintains the shoes in close contact with a flat port plate forming the division between the suction and discharge sides of the pump. The plate has ports opposite each shoe respectively leading from the suction branch and into the discharge side of the pump. On the suction stroke, liquid passes down through the main cover and is drawn into the shoes through the suction ports in the plate. On the discharge stroke, liquid is displaced from the shoes through the discharge ports. The liquid then passes down through the main cover into the bottom of the body before flowing through another passage in the main cover to the discharge branch. This arrangement helps to scavenge the bottom of the body and prevent the accumulation of solids.

Figure 4 illustrates the working cycle of a single shoe. Although the displacement in each shoe is intermittent, the combined effect is a smooth continuous flow.

## Installation

### ■ Location

Choose an accessible position with ample space for dismantling and maintenance. In particular, you need space for removing the main cover or covers and shoes and inspecting the interior. Make sure that the pump can be conveniently filled and drained.



## ■ Working Heads or Pressures

The maximum continuous total head from all causes and the maximum total suction lift from all causes are given in the table. The suction lifts are applicable to maximum listed speeds and can be exceeded at lower speeds.

	L75 L100 L125	L150 L200	L300 L400	H75 H100 H125 H150	H200	H300 H400
Maximum total head: Feet of water lb/in <sup>2</sup>	100 45	100 45	100 45	250 110	250 110	250 100
Maximum total suction lift at max. rated speed: Feet of water Inches Hg	23 18	22 18	20 16	23 18	22 18	20 18

Damage will be caused by excessive total heads or suction lifts. The most likely causes of excessive head or suction lift are:

- (1) Static head (vertical height from surface of liquid on suction side to surface of liquid on delivery side) too great.
- (2) Excessive losses in piping and fittings, due to too small diameter, sharp elbows, restrictive fittings, etc. See under **Piping** (Page 7).
- (3) Obstruction due to solids, blocked or buried strainer, or flattening of suction hose.

For most efficient operation, the pump should operate against a total head of not less than 10 feet to insure effective seating of the shoes on the port plate.

## ■ Rotation and Branches

As indicated by the arrows on the pump, the suction branch is at the right-hand top end of the pump and the discharge at the left-hand top end when facing the front of the pump. The standard assembly positions the drive at the left-hand discharge end.

The direction of rotation of the pump is with the top of pulley or coupling moving towards the front. **Before testing the rotation of a newly-wired set, make sure that the pump is filled with liquid.** See **Starting and Running** (Page 8).

The rotation of three-phase A.C. motors can be reversed by changing over any two of the three main wires. Single-phase and D.C. motors are reversed by changing the connections on the motor. There is generally an instruction diagram inside the terminal box.

The pump can be assembled, if more convenient, with the drive at the right-hand suction end.

## ■ Ball Bearings

All L and H Pumps (except H300, H400) are provided with sealed ball bearings, which are lubricated for life at the factory and have no provision for further lubrication. The bearings of H300 and H400 pumps are enclosed in housings with shaft seals and nipples for grease-gun lubrication.

The bearing is locked on the shaft by an eccentric locking collar with a socket screw in the collar for additional security. The removal and reassembly of the bearings are described under **Removal and Reassembly of Rotor** (Page 12).

## ■ Piping

Piping should be as short and direct as possible. Use easy bends or round elbows and avoid sharp elbows and tees. Pipe size should not be smaller than the pump branches. Long pipes should generally provide larger diameter. Unless the pipe run is very simple, the actual pipe losses should be estimated to check the total head on the pump (advice and assistance of **Megator Engineers** may be provided if required). It is quite common for the pipe losses to be greater than the static head. Piping must be accurately cut and joined so that it can be connected to the pump branches without putting strain on the pump or the pipe joints. Particular care must be taken to make the joints in the suction line absolutely tight in order to avoid loss of capacity or difficulty in priming due to air leaks.

## ■ Pumps in Parallel

All **Megator Pumps** will operate perfectly in parallel with one another, or with other pumps, but certain points should be observed in regard to the piping.

A common suction pipe for two or more pumps may cause one pump to interfere with the effective priming of another. Each pump should have an individual suction line. If this is impractical, each pump suction should include a non-return valve.

When two or more pumps discharge into the same delivery system, the junction must be made with a twin elbow or pitcher tee so that the streams of liquid easily merge. If an ordinary tee is used, it may cause damaging pulsations.

## ■ Suction Strainer and Hose

The suction hose requires wire reinforcement to prevent collapsing under atmospheric pressure.

The suction pipe should be fitted with a strainer of adequate size. The total area of the holes should be approximately three times the cross sectional area of the suction pipe. The **Megator Pump** primes itself so easily that there is generally no point in fitting a foot-valve which merely adds to the pipe losses.

A Dolphin Floating Strainer is ideally suited and draws from just under the surface, avoiding abrasive matter and saving wear. Even under "snore" conditions and where there is insufficient water to float it, the Dolphin Strainer reduces to a minimum the risk of the suction becoming choked or buried.

## ■ Non-Return Valve

It is generally advisable to install a non-return valve in the discharge pipe to prevent the water from leaking back through the pump when stationary, and to permit the pump to be opened up without draining the discharge pipe.

## ■ Relief Valve

If the pump operates with the discharge throttled or shut off, it will develop very high pressures and suffer serious damage. It is therefore best, where practical, to avoid having stop valves in the discharge line (non-return valves will often serve the same purpose). If a stop valve must be used, or if it is possible for an excessive head to be imposed on the pump by any other cause, a relief valve should be installed. It is essential that the relief valve be capable of passing the full output of the pump without exceeding a safe pressure.

A relief valve is designed to give temporary protection against an abnormal condition and, should the valve operate, the cause must be ascertained and rectified. Every relief valve should be checked at regular intervals to make sure that it is in working order and relieves at the correct pressure.

## ■ Bypass Relief Valve

A bypass relief valve, a relief valve discharging back to the suction side of the pump, is a convenient arrangement for many applications. It has the disadvantage, however, that, if it leaks or is prevented from seating by foreign matter, it forms a connection from the discharge back to the suction and may prevent the pump from priming. It may also cause overheating if operated continuously for any length of time because the same small volume of liquid is continuously recirculated. The ordinary relief valve, discharging to atmosphere or piped back to the source of supply, avoids these disadvantages and is most commonly installed to protect the pump against faulty operation.

# Starting and Running

## ■ V-Belt Drives

The modern 3V and 5V belts, used as standards, are designed to operate at considerably higher tension than earlier types of belt. It is important to maintain correct tension.

The deflection obtainable by hand at the center of each belt should be approximately from 3/16-inch for drives of 12-inch centers, to 5/16-inch for drives of 20-inch centers. Belts are correctly tensioned before shipment but should be checked after the initial twelve hours running and then at regular intervals.

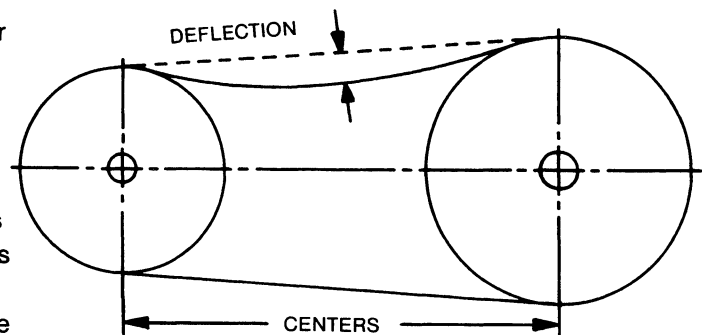


Fig. 5: Adjustment of V-belts



## ■ **Preliminary Filling** (Fill pump to full capacity via Filler Plug!)

***The pump must never be run, even for a few revolutions, in a dry condition.*** It should be filled with water or with the liquid that is to be pumped as soon as it is installed and before the motor is wired. The liquid is essential for lubrication and also acts as a sealing medium. Pump priming may be affected if the pump is only partially filled. Roughening or gouging out of the ends of the shoe cavity in the path of the rotor is evidence of dry running.

This filling is only necessary on first starting or after the pump has been drained or has been standing for weeks. The pump is constructed so that it normally retains sufficient liquid when standing. There is no need to fill the suction piping.

No harm will result if the pump exhausts the supply of liquid and is left for a considerable time with a dry suction and therefore pumping air.

## ■ **Initial Startup**

Before starting after installation or overhaul, the pump should be rotated by hand, after filling, to make sure that everything is clear. In the case of newly-wired motors, the direction of rotation should then be checked. The pump is always somewhat stiff to turn at the start due to the nature of the rubber surfaces of the shoes. When running, the surfaces are lubricated by a film of liquid and the pump becomes quite free.

## ■ **Regulation of Capacity**

Capacity reduction may be obtained by reducing the speed or by bypassing a portion of the output back to the suction. No attempt should be made to reduce the flow by throttling with a valve as this merely increases the pressure on the pump and may result in a broken or damaged pump or an overloaded prime mover. No attempt should be made to increase capacity by increasing pump speed beyond the manufacturer's recommended speed.

## ■ **Freeze Protection**

If the pump must be left standing in cold weather, drain it by means of the drain plug in the main cover. Remove the filler plug at the same time to draw attention to the need for refilling the pump again before starting. As an option, a thermostatically controlled electric heater can be installed on the pump body to prevent freezing.

## ■ Failure to Prime

If the pump does not readily prime itself, the reason will probably be one of the following:

- ***Pump not filled or only partially filled*** (See **Preliminary Filling**, Page 9).
- ***Air leak into suction.*** If the discharge is visible and can be submerged in water, any air passing through the pump will appear as bubbles. Apart from the pipe joints, possible sources of air leaks are in the main cover joint due to the nuts not being properly tightened or to a damaged gasket.
- ***Excessive shoe clearance between shaft and port plate*** (See **Adjustment of Shoe Clearance**, Page 11).
- ***Suction pipe or strainer choked with solid matter.***
- ***Bypass relief valve not seated due to foreign matter.***
- ***Severely worn shoes, port plate or rotor.***

# Maintenance

## ■ Removal and Reassembly of Shoes

First drain the pump by means of the drain plug in the main cover. At the same time, remove the filler plug as a reminder for refilling before starting up again. Remove the main cover or covers. The shoes can then be taken out.

Although the shoes are interchangeable and will work either way up, they should be marked for identification before they are taken out and put back in the same positions, and the same way up, in order to take advantage of the bedding-down that takes place when running.

The shoes, which are lined with synthetic rubber, are initially a push fit on the rotor discs. They will still give good performance when comparatively loose, but should be replaced if there is appreciable clearance on the disc diameter. If a new shoe is loose on the rotor disc, it indicates wear of the rotor.

When reassembling, make sure that the cover gaskets are clean and undamaged. If the shoes are a loose fit and tend to fall off the discs, they can be rested on the bottom edge of the opening in the body, leaning against the discs, and, when the cover is put on, it will push them into position.

## ■ Adjustment of Shoe Clearance

There is only a small clearance between the shaft and the inner edge of the shoes, which are thus kept in tight conjunction to the port plate. As soon as the pump starts working, the shoes are held tightly against the port plate by the pressure created through the pumping action. If wear occurs between the port plate and the faces of the shoes, it is automatically compensated for by the pressure. A condition of wear may eventually be reached, however, when the clearance is so great that the shoes have difficulty in building up the required pressure to begin pumping. The first symptom of this condition is likely to be sluggishness in priming or reduced or irregular flow or pressure due to at least one of the shoes not being properly in action.

Also, where the pump is operating with a suction lift and discharging through a delivery pipe open to atmosphere, there is a tendency for the water to siphon out and partially empty the body when the pump stops. With normal shoe clearance the pump will pick up and prime under these conditions, but if shoe clearance becomes excessive, the pump may fail to prime.

To deal with the above conditions, provision is made for taking up the clearance very simply by removing one of the main cover gaskets. Care must be taken, however, that the clearance is not eliminated altogether, and the shoes are actually gripped between the port plate and the shaft. It is generally possible to feel a clearance by turning the pump backward and forward by hand. There is a small amount of idle motion before the shoes are checked by the port plate with the movement becoming stiffer due to the rotor turning inside them.

## ■ Gaskets

If gaskets are damaged in dismantling, they must be replaced with new ones. It is essential that the material of end cover, front cover and port plate gaskets be 1/32-inch thick to maintain the correct clearances in the pump assembly. It is best to obtain a few sets of spare gaskets and keep them in stock.

## ■ Shaft Seals

The shaft seals are self-adjusting and normally operate without any leakage and require no attention. Although the normal life of the seals is very long, it is advisable to keep a spare set in stock. ***Any sign of leakage at this point should receive immediate attention.***

When handling the seals, the utmost care must be taken to protect the face ring and seat from damage or distortion and to keep the mating surfaces absolutely clean and dry. Under no circumstances should you put oil on them. New parts should be kept in their wrappings until the moment of installation.

The method of access to the seals is described under **Removal and Reassembly of Rotor** (see the following page).



## ■ Removal and Reassembly of Rotor and/or Shaft Seals

**L75, L100, L125, L150, L200**  
**H75, H100, H125, H150, H200**

Remove main cover and shoes as previously described. Remove pulley or coupling and bearing covers. Slacken socket screws in bearing locking collars and, using the socket screw as a bar, undo the locking collars by turning them in same direction as the rotation of the pump. If a collar is too stiff to undo with the screw, it can be freed by a sharp blow with hammer and pin punch in the hole provided. It is important to see that the collar does not suddenly slacken and rotate far enough to lock in the opposite direction. Further hammer blows would then only increase the locking effect. If a small burr has been raised on the shaft by the socket screw, it should be removed before starting to remove the bearing housing. One of the bearing housings should be removed with the bearing in it, using the forcing screws and taking care not to damage or soil the working faces of the shaft seal. The rotor can then be withdrawn from the same end, leaving the other bearing housing and bearing in place.

To reassemble the pump, first mount the seals on the rotor shaft and the seal seats in their mounting rings in the recess in the bearing housings, **taking care not to damage or soil the working surfaces of the face rings and seats or to get oil or other liquid on them**. Before mounting the seals on the shaft, lubricate the shaft with a little grease or heavy oil which will allow the oil-resisting synthetic rubber bellows to slide easily into the correct position when all the parts are bolted in place. The bellows should not be compressed, but left in the normal extended condition. When the assembly is completed, the parts of the seal will take up their correct positions. Next install the bearings into the bearing housings. Install one bearing housing, with bearing, on the body and insert the rotor shaft into that bearing, again taking care to protect the working faces of the seal. Then install the other bearing housing to the body. Position outer end bearing locking collar which locates the shaft axially. Locate outer face of outer end bearing locking collar flush with shoulder on shaft (See Fig. 6) and lock it by turning in the direction opposite of pump rotation and tightening the socket set screw. After locking, make sure that the face of the collar is still flush with the shoulder. Locate outer face of drive-end bearing locking collar flush with end of shaft and lock by turning in opposite direction of pump rotation and tightening socket set screw. Install bearing covers and pulley or coupling.

### **L300, L400, H300, H400**

These larger pumps have sleeves in the end covers, in which the seal collars on the rotor rest before the ball bearings are fitted or after they have been removed. This facilitates both dismantling and assembly of the pump and permits attention to the seals after removing the ball bearings without disturbing the rotor, main cover or shoes.

To remove the ball bearings, take off pulley or coupling and bearing covers. Slacken socket screws in bearing locking collars and, using the socket screw as a bar, undo the locking collars by turning them in the same direction as the rotation of the pump. If a collar is too stiff to undo with the screw, it can be freed by a sharp blow with a hammer and pin punch in the hole provided. It is important to see that the collar does not suddenly slacken and rotate far enough to lock in the opposite direction, as further hammer blows would then only increase the locking effect. If a small burr has been raised on the shaft by the socket screw, it should be removed before starting to remove the bearing housing. The two bearing housings can then be removed with the bearings in them, leaving the rotor resting in the end covers. The seal plates,

with the seal seats in them, can next be removed after which the rest of the seal assemblies can be pulled off the shaft using forcing screws screwed into the backing plates. A little oil or grease on the shaft makes the synthetic bellows slide off more easily.

If the rotor is to be removed, the main cover has to be taken off and the shoes extracted. One end cover should be removed, using the forcing screws. Then slide the rotor out.

To reassemble the pump, enter seal collar of rotor into the end cover already secured to the body. Raise the free end of the rotor and thread the other end cover over it. Then bolt this end cover up to the body. Make sure that the end cover gaskets are undamaged. The seals with stainless steel backing plates should then be fitted on the shaft (a little light grease or heavy oil being used to make the bellows slide more easily along the shaft). Install the seal seats in their mounting rings in the seal plates and fasten them to the end covers. **When handling the seals, the greatest care must be taken not to damage or soil the mating surfaces of the face ring and seat or to get oil or other liquid on them.** Insert the ball bearings into their housings and thread them onto the shaft. In the case of the H300 and H400 pumps, the bearing housing must be filled about two-thirds full of water-repellent lime-based ball bearing grease (some being worked well into the ball cage) and the plates and seal rings fitted. The bearings of the L300 and L400 Pumps are sealed and lubricated for life at the factory. Position outer face of outer end bearing locking collar which locates the shaft axially. Locate outer face of outer end bearing locking collar flush with end of shaft and lock by turning in direction opposite to rotation and tightening socket screw. Fit bearing covers and pulley or coupling.

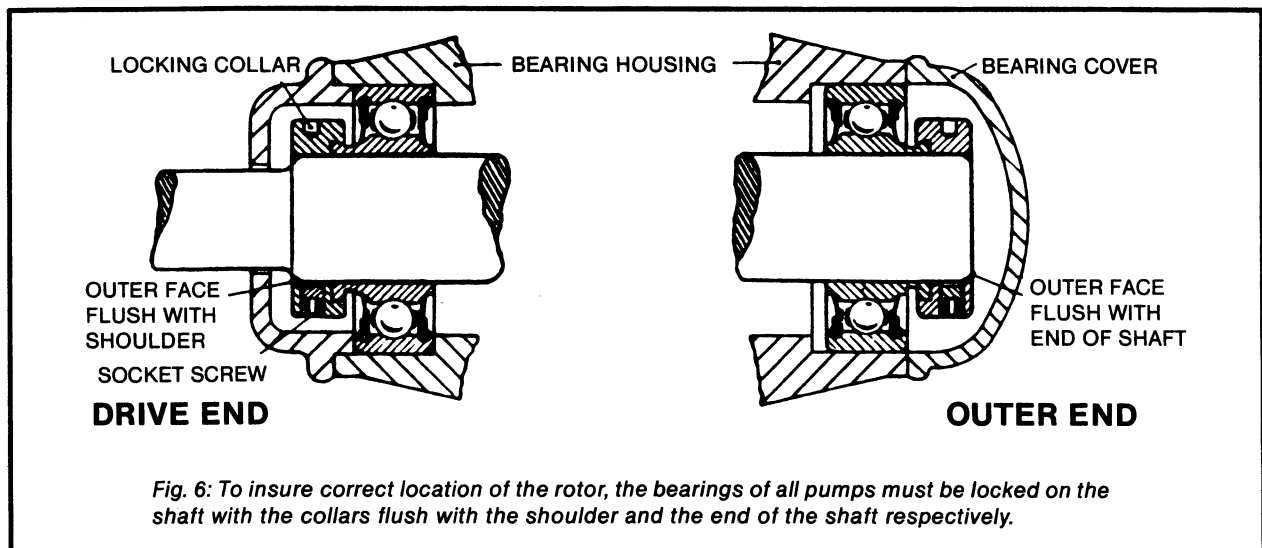
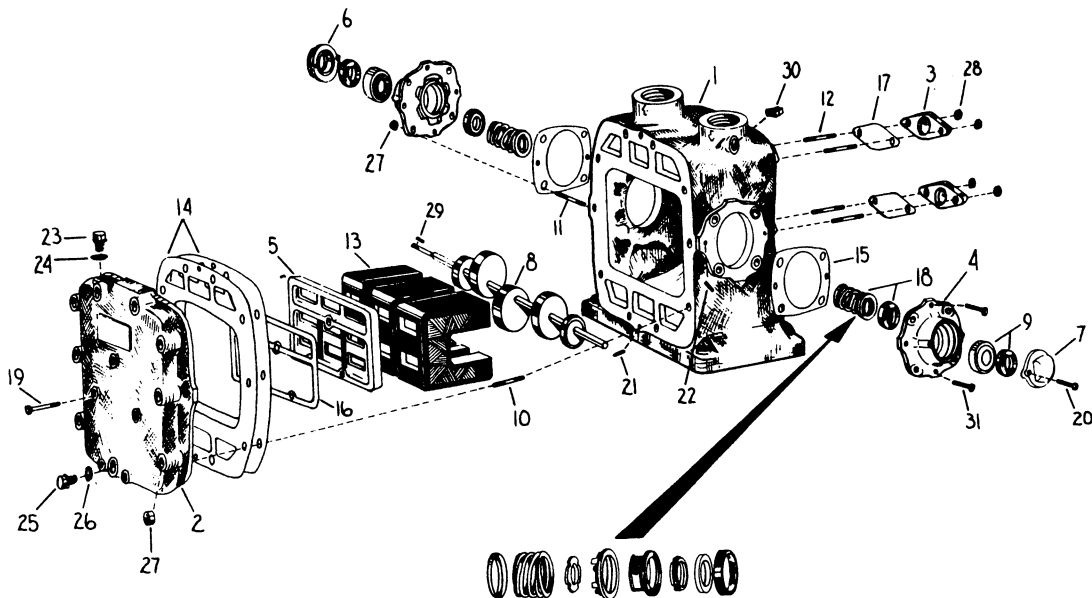


Fig. 6: To insure correct location of the rotor, the bearings of all pumps must be locked on the shaft with the collars flush with the shoulder and the end of the shaft respectively.

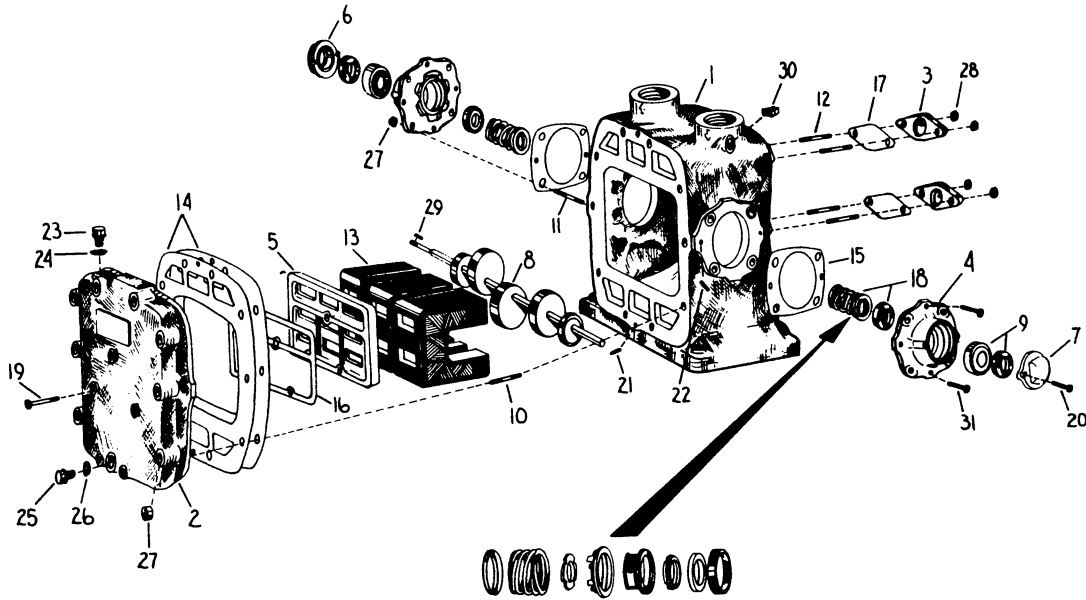
# Parts List: **L75** – L200 Pumps



Dwg. Ref.	Description	L75	L100	L125	No. Per Pump	L150	L200	No. Per Pump	Dwg. Ref.	Description	L75	L100	L125	No. Per Pump	L150	L200	No. Per Pump
1	Body	5001	5201	5401	1	5601	5801	1	17	Blank Flange Gasket	5073	5073	5473	2	5673	5673	2
2	Front Cover	5002	5202	5402	1	5602	5802	1	18	Shaft Seal	5079A	5079A	5479A	2	5679A	5879A	2
3	Body Blank Flange	5003	5003	5403	2	5603	5603	2	19	Port Plate Screw	3403	3403	3405	3	3406	3407	3
4	Bearing Housing	5004	5004	5404	2	5604	5804	2	20	Bearing Cover Screw	3401	3401	3401	4	3401	3401	4
5	Port Plate	5005F	5205	5405F	1	5605F	5805F	1	21	Main Cover Dowel	3411	3411	3412	2	3413	3413	2
6	D/E Bearing Cover	5006	5006	5406	1	5606	5806	1	22	Bearing Housing Dowel	3411	3411	3411	4	3411	3411	4
7	O/E Bearing Cover	5007	5007	5407	1	5607	5807	1	23	Filler Plug	1055B	1055B	1055B	1	1262B	1262B	1
8	Rotor	5031F	5231F	5431F	1	5631F	5831F	1	24	Filler Plug Washer	1056	1056	1056	1	1263	1263	1
9	Bearing	5047	5047	5447	2	5647	5847	2	25	Drain Plug	1260B	1260B	1051B	1	1051B	1055B	1
10	Front Stud	5248	5248	5448	8	5648	5848	10	26	Drain Plug Washer	1261	1261	1078	1	1078	1056	1
11	End Stud	5050	5050	5050	8	5650	5650	8	27	Body Nut	3408	3408	3408	16	3409	3409	18
12	Blank Flange Stud	5050	5050	5050	4	5650	5650	4	28	Blank Flange Nut	3408	3408	3408	4	3409	3409	4
13	Shoe	5061	5261	5461	3	5661	5861	3	29	Shaft Key	3414	3414	1728	1	1728	1089	1
14	Main Cover Gasket	5070	5270	5470	2	5670	5870	2	30	Gauge Plug	1052	1052	1052	2	1052	1052	2
15	Bearing Housing Gasket	5074	5074	5474	2	5674	5874	2	31	Forcing Screw	3707	3707	3708	2	3708	3708	2
16	Port Plate Gasket	5071	5271	5471	1	5671	5871	1									

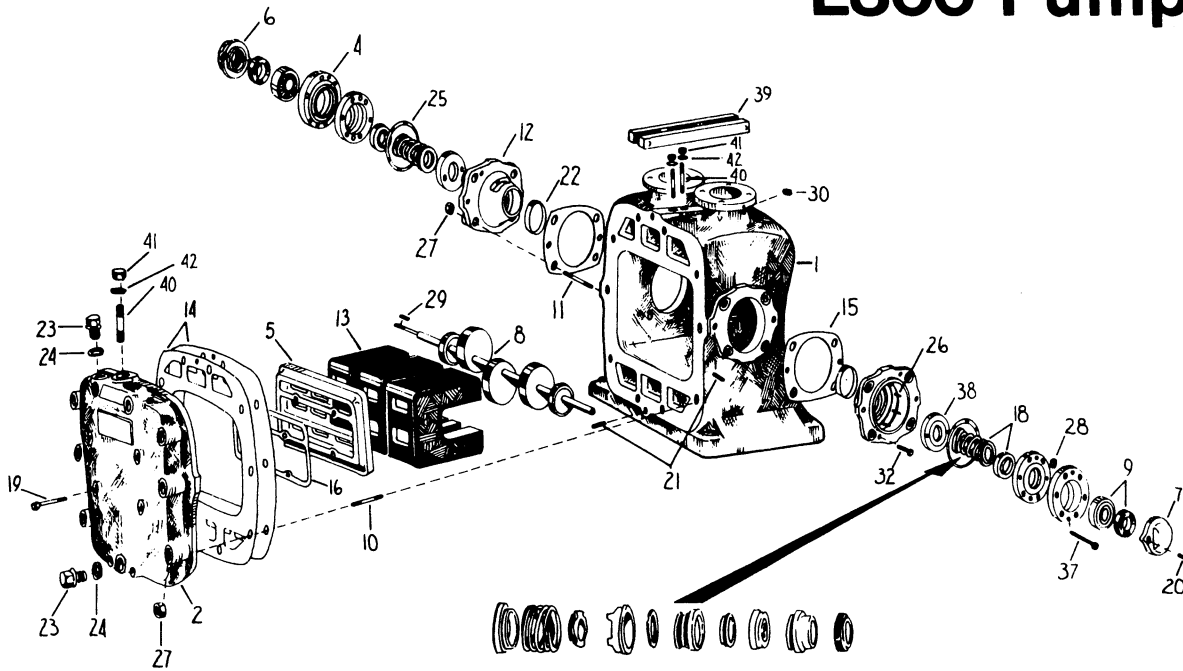


# Parts List: H75 - H200 Pumps



Dwg. Ref.	Description	H75	H100	H125	No. Per Pump	H150	H200	No. Per Pump	Dwg. Ref.	Description	H75	H100	H125	No. Per Pump	H150	H200	No. Per Pump
1	Body	5101	5301	5501	1	5701	5901	1	17	Blank Flange Gasket	5073	5073	5473	2	5673	5673	2
2	Front Cover	5002	5302	5502	1	5702	5902	1	18	Shaft Seal	5479A	5679A	5879A	2	5779A	5979A	2
3	Body Blank Flange	5003	5003	5403	2	5603	5603	2	19	Port Plate Screw	3403	3403	3405	3	3406	3407	3
4	Bearing Housing	5404	5604	5804	2	5704	5904	2	20	Bearing Cover Screw	3401	3401	3401	4	3402	3402	4
5	Port Plate	5005F	5205F	5405F	1	5605F	5805F	1	21	Main Cover Dowel	3411	3411	3412	2	3413	3413	2
6	D/E Bearing Cover	5406	5606	5806	1	5706	5906	1	22	Bearing Housing Dowel	3411	3411	3411	4	3411	3411	4
7	O/E Bearing Cover	5407	5607	5807	1	5707	5907	1	23	Filler Plug	1055B	1055B	1055B	1	1262B	1262B	1
8	Rotor	5131F	5331F	5531F	1	5731F	5931F	1	24	Filler Plug Washer	1056	1056	1056	1	1263	1263	1
9	Bearing	5447	5647	5847	2	5747	5947	2	25	Drain Plug	1260B	1260B	1051B	1	1051B	1055B	1
10	Front Stud	5248	5348	5548	8	5748	5948	10	26	Drain Plug Washer	1261	1261	1078	1	1078	1056	1
11	End Stud	5050	5650	5650	8	5950	5950	8	27	Body Nut	3408	3409	3409	16	3410	3410	18
12	Blank Flange Stud	5050	5050	5050	4	5650	5650	4	28	Blank Flange Nut	3408	3408	3408	4	3409	3409	4
13	Shoe	5161	5361	5561	3	5761	5961	3	29	Shaft Key	1728	1728	1089	1	1729	1729	1
14	Front Cover Gasket	5070	5270	5470	2	5670	5870	2	30	Gauge Plug	1052	1052	1052	2	1052	1052	2
15	Bearing Housing Gasket	5474	5674	5874	2	5774	5974	2	31	Forcing Screw	3708	3708	3708	2	3708	3709	2
16	Port Plate Gasket	5071	5271	5471	1	5671	5871	1									

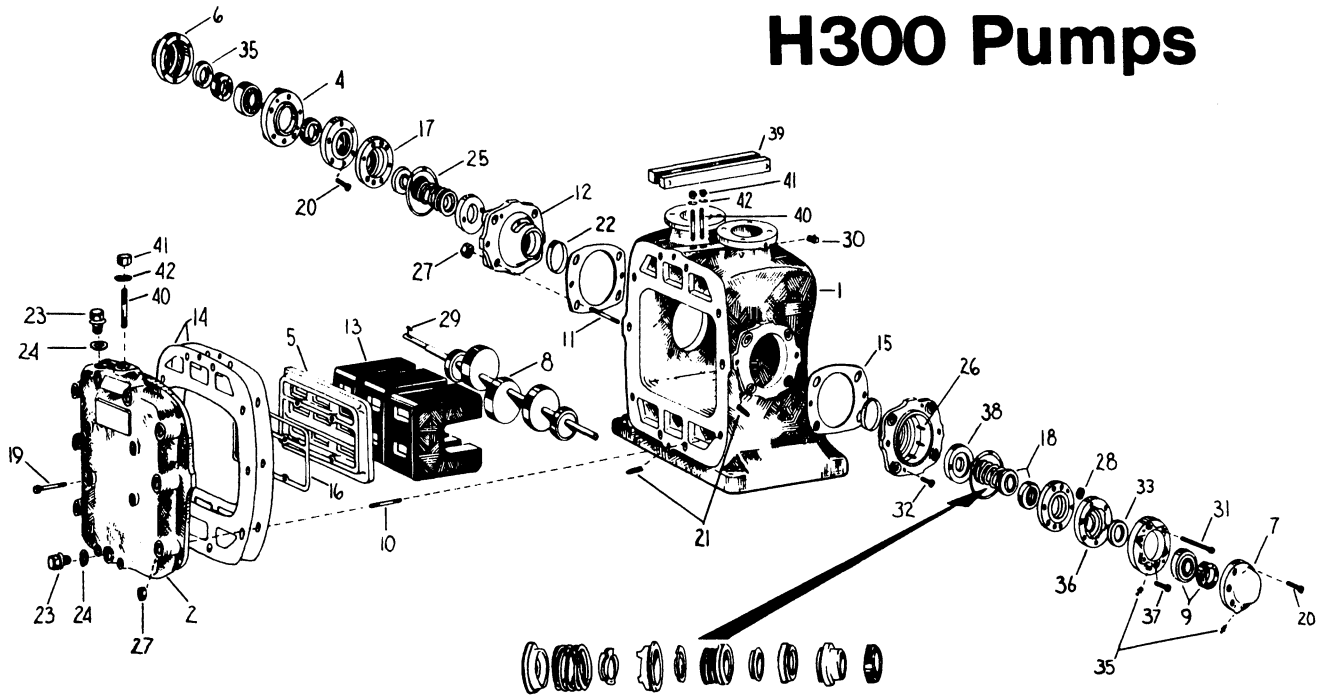
# Parts List: L300 Pumps



Dwg. Ref.	Description	L300	No. Per Pump	Dwg. Ref.	Description	L300	No. Per Pump
1	Body	6001	1	22	Support Sleeve	6010	2
2	Front Cover	6002	1	23	Filler and Drain Plug	1262B	2
3	Back Cover	—	—	24	Filler and Drain Plug Washer	1263	2
4	Bearing Housing	6004	2	25	Seal Plate Gasket	6077	2
5	Port Plate	6005F	1	26	Seal Plate Stud	5050	12
6	D/E Bearing Cover	5906	1	27	Body Nut	3473	20
7	O/E Bearing Cover	5907	1	28	Seal Plate Nut	3408	12
8	Rotor	6031F	1	29	Shaft Key	1729	1
9	Bearing	5947	2	30	Gauge Plug	1052	2
10	Front Stud	6048	10	31	Forcing Screw	3585	2
11	End Stud	6050	10	32	Forcing Screw	3710	2
12	End Cover	6012	2	33	Inner Bearing Seal	—	—
13	Shoe	6061	3	34	Outer Bearing Seal	—	—
14	Front Cover Gasket	6070	2	35	Grease Nipple	—	—
15	End Cover Gasket	6074	2	36	Bearing Housing Back Plate	—	—
16	Port Plate Gasket	6071	1	37	Bearing Housing Screw	3397	12
17	Seal Plate	6009	2	38	Seal Backplate	6078	2
18	Shaft Seal	5979	2	39	Dismantling Arm	596	1
19	Port Plate Screw	3764	4	40	Dismantling Arm Stud	3883	1
20	Bearing Cover Screw	3402	4	41	Dismantling Arm Nut	3790	1
21	Main and End Cover Dowel	3413	6	42	Dismantling Arm Washer	1065	3

**Note:** Any part designated by a dash (—) does not apply to this model pump.

# Parts List: H300 Pumps

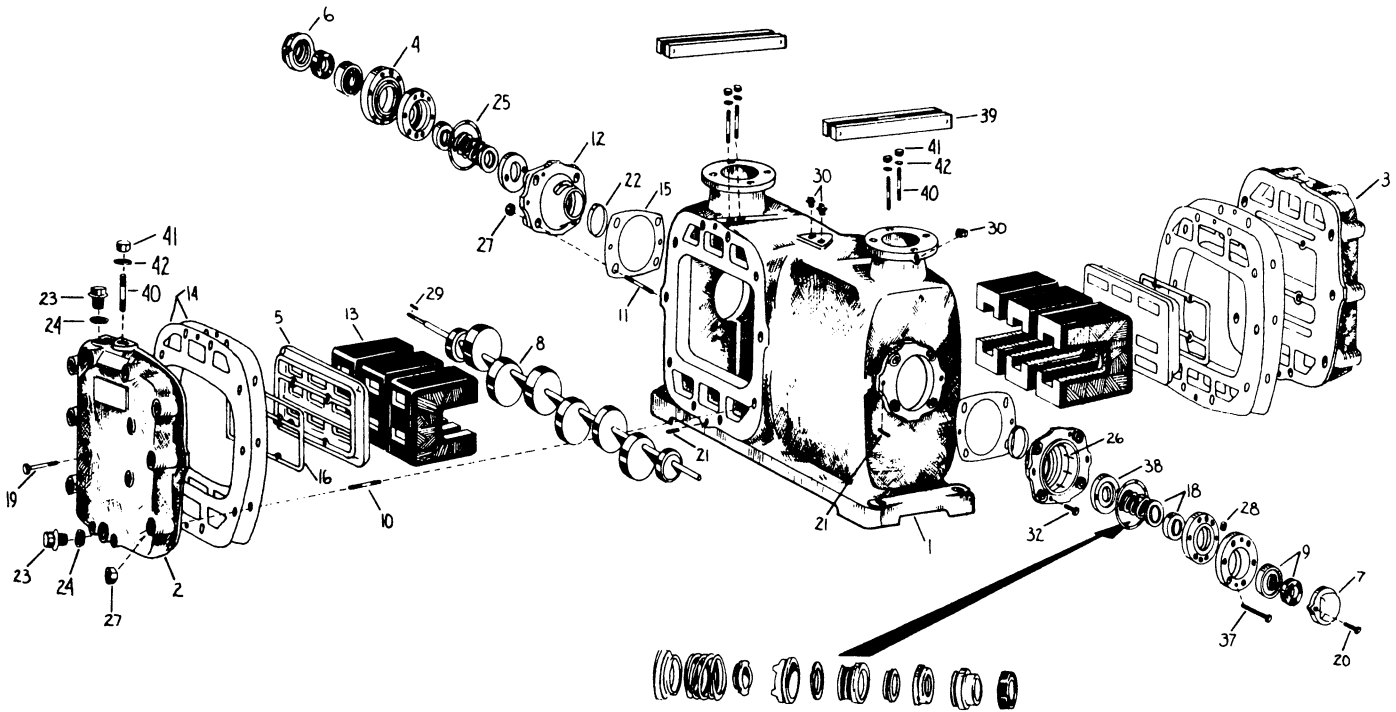


Dwg. Ref.	Description	H300	No. Per Pump	Dwg. Ref.	Description	H300	No. Per Pump
1	Body	6001	1	22	Support Sleeve	6010	2
2	Front Cover	6002	1	23	Filler and Drain Plug	1262B	2
3	Back Cover	—	—	24	Filler and Drain Plug Washer	1263	2
4	Bearing Housing	6104	2	25	Seal Plate Gasket	6077	2
5	Port Plate	6105F	1	26	Seal Plate Stud	5050	12
6	D/E Bearing Cover	6106	1	27	Body Nut	3473	20
7	O/E Bearing Cover	6107	1	28	Seal Plate Nut	3408	12
8	Rotor	6131F	1	29	Shaft Key	646	1
9	Bearing	6147	2	30	Gauge Plug	1052	2
10	Front Stud	6048	10	31	Forcing Screw	3585	2
11	End Stud	6050	10	32	Forcing Screw	3710	2
12	End Cover	6012	2	33	Inner Bearing Seal	6145	2
13	Shoe	558	3	34	Outer Bearing Seal	6146	1
14	Front Cover Gasket	6070	2	35	Grease Nipple	1075	4
15	End Cover Gasket	6074	2	36	Bearing Housing Back Plate	6108	2
16	Port Plate Gasket	6071	1	37	Bearing Housing Screw	3585	12
17	Seal Plate	6109	2	38	Seal Backplate	6178	2
18	Shaft Seal	561B	2	39	Dismantling Arm	596	1
19	Port Plate Screw	3764	4	40	Dismantling Arm Stud	3883	1
20	Bearing Cover/ Backplate Screw	3402	24	41	Dismantling Arm Nut	3790	1
21	Main and End Cover Dowel	3413	6	42	Dismantling Arm Washer	1065	3

**Note:** Any part designated by a dash ( — ) does not apply to this model pump.



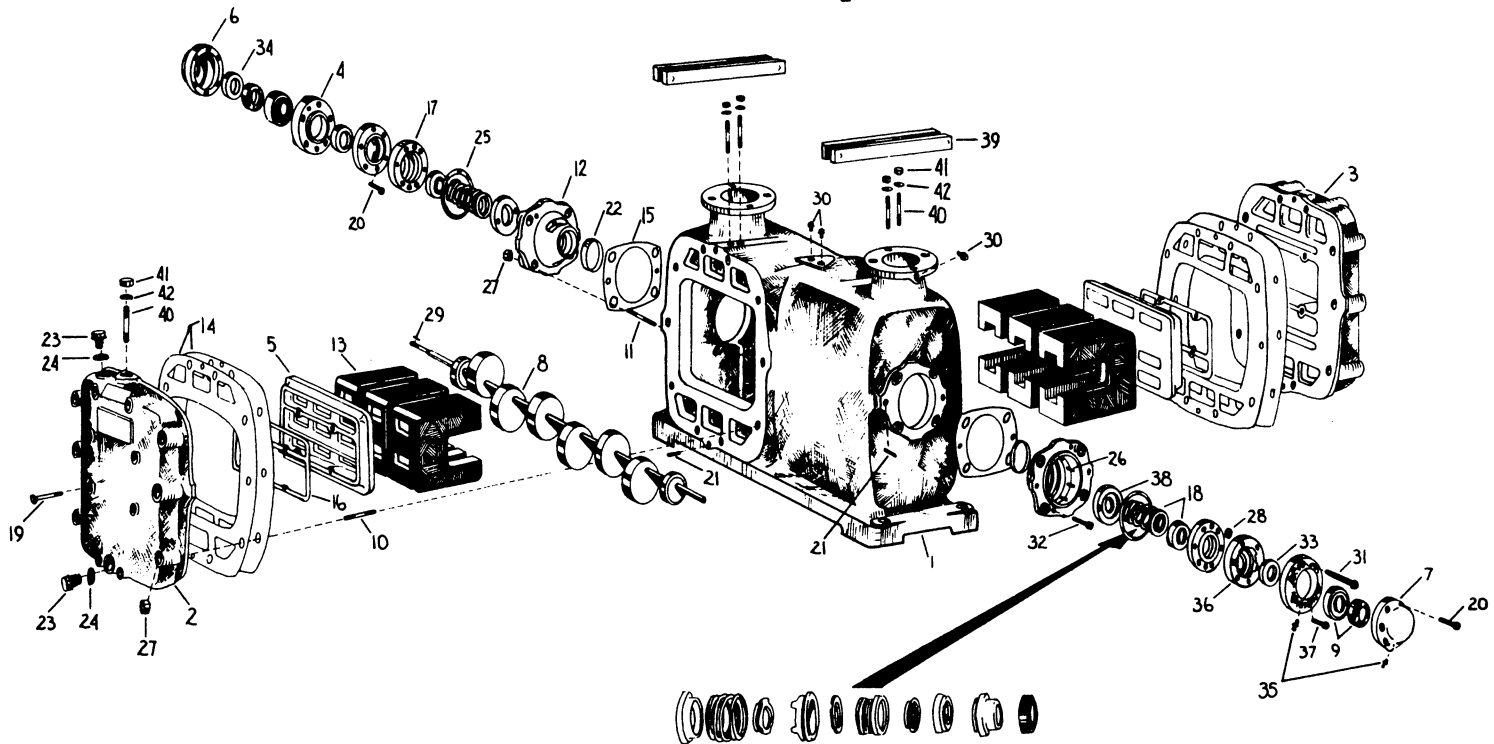
# Parts List: L400 Pumps



Dwg. Ref.	Description	L400	No. Per Pump	Dwg. Ref.	Description	L400	No. Per Pump
1	Body	6201	1	22	Support Sleeve	6010	2
2	Front Cover	6002	1	23	Filler and Drain Plug	1262B	2
3	Back Cover	6202	1	24	Filler and Drain Plug Washer	1263	2
4	Bearing Housing	6004	2	25	Seal Plate Gasket	6077	2
5	Port Plate	6005F	2	26	Seal Plate Stud	5050	12
6	D/E Bearing Cover	5906	1	27	Body Nut	3473	32
7	O/E Bearing Cover	5907	1	28	Seal Plate Nut	3408	12
8	Rotor	6231F	1	29	Shaft Key	1729	1
9	Bearing	5947	2	30	Gauge Plug	1052	2
10	Front Stud	6048	20	31	Forcing Screw	3585	2
11	End Stud	6050	12	32	Forcing Screw	3710	2
12	End Cover	6012	2	33	Inner Bearing Seal	—	—
13	Shoe	6061	6	34	Outer Bearing Seal	—	—
14	Front Cover Gasket	6070	4	35	Grease Nipple	—	—
15	End Cover Gasket	6074	2	36	Bearing Housing Back Plate	—	—
16	Port Plate Gasket	6071	2	37	Bearing Housing Screw	3397	12
17	Seal Plate	6009	2	38	Seal Backplate	6078	2
18	Shaft Seal	5979	2	39	Dismantling Arm	596	2
19	Port Plate Screw	3764	8	40	Dismantling Arm Stud	3883	2
20	Bearing Cover Screw	3402	4	41	Dismantling Arm Nut	3790	2
21	Main and End Cover Dowel	3413	8	42	Dismantling Arm Washer	1065	6

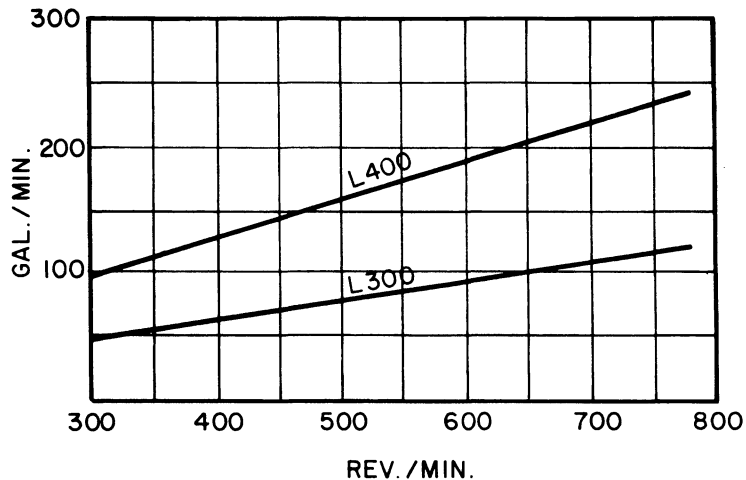
**Note:** Any part designated by a dash ( — ) does not apply to this model pump.

# Parts List: H400 Pumps

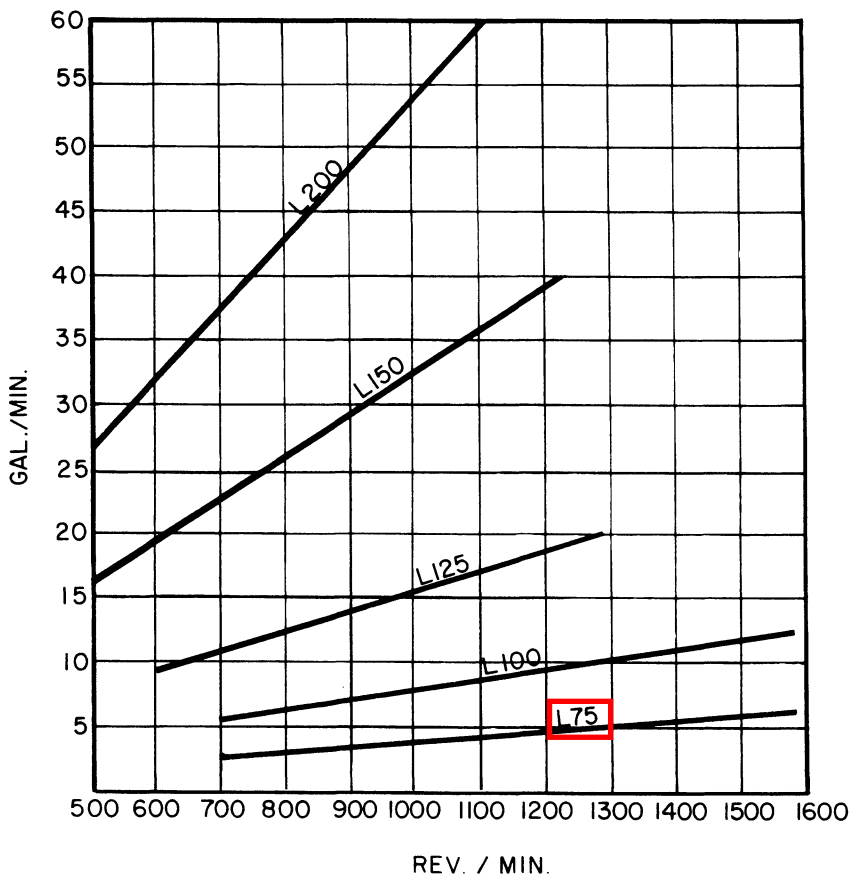


Dwg. Ref.	Description	H400	No. Per Pump	Dwg. Ref.	Description	H400	No. Per Pump
1	Body	6201	1	22	Support Sleeve	6010	2
2	Front Cover	6002	1	23	Filler and Drain Plug	1262B	2
3	Back Cover	6202	1	24	Filler and Drain Plug Washer	1263	2
4	Bearing Housing	6104	2	25	Seal Plate Gasket	6077	2
5	Port Plate	6105F	2	26	Seal Plate Stud	5050	12
6	D/E Bearing Cover	6106	1	27	Body Nut	3473	32
7	O/E Bearing Cover	6107	1	28	Seal Plate Nut	3408	12
8	Rotor	6331F	1	29	Shaft Key	646	1
9	Bearing	6147	2	30	Gauge Plug	1052	2
10	Front Stud	6048	20	31	Forcing Screw	3585	2
11	End Stud	6050	12	32	Forcing Screw	3710	2
12	End Cover	6012	2	33	Inner Bearing Seal	6145	2
13	Shoe	558	6	34	Outer Bearing Seal	6146	1
14	Front Cover Gasket	6070	4	35	Grease Nipple	1075	4
15	End Cover Gasket	6074	2	36	Bearing Housing Back Plate	6108	2
16	Port Plate Gasket	6071	2	37	Bearing Housing Screw	3585	12
17	Seal Plate	6109	2	38	Seal Backplate	6178	2
18	Shaft Seal	561B	2	39	Dismantling Arm	596	2
19	Port Plate Screw	3764	8	40	Dismantling Arm Stud	3883	2
20	Bearing Cover/ Backplate Screw	3402	24	41	Dismantling Arm Nut	3790	2
21	Main and End Cover Dowel	3413	8	42	Dismantling Arm Washer	1065	6

# Pump Capacity Curves: L75 – L400 Pumps

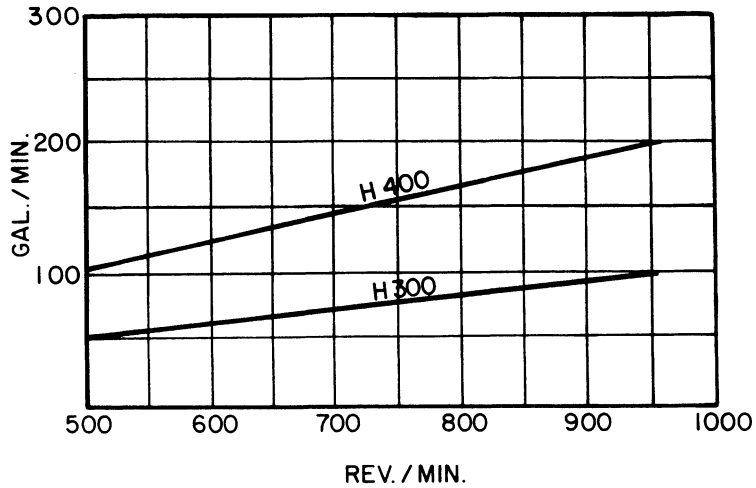


L300 and L400 Pump Capacity Curve based on clean water at normal temperature and total head to 100 feet.

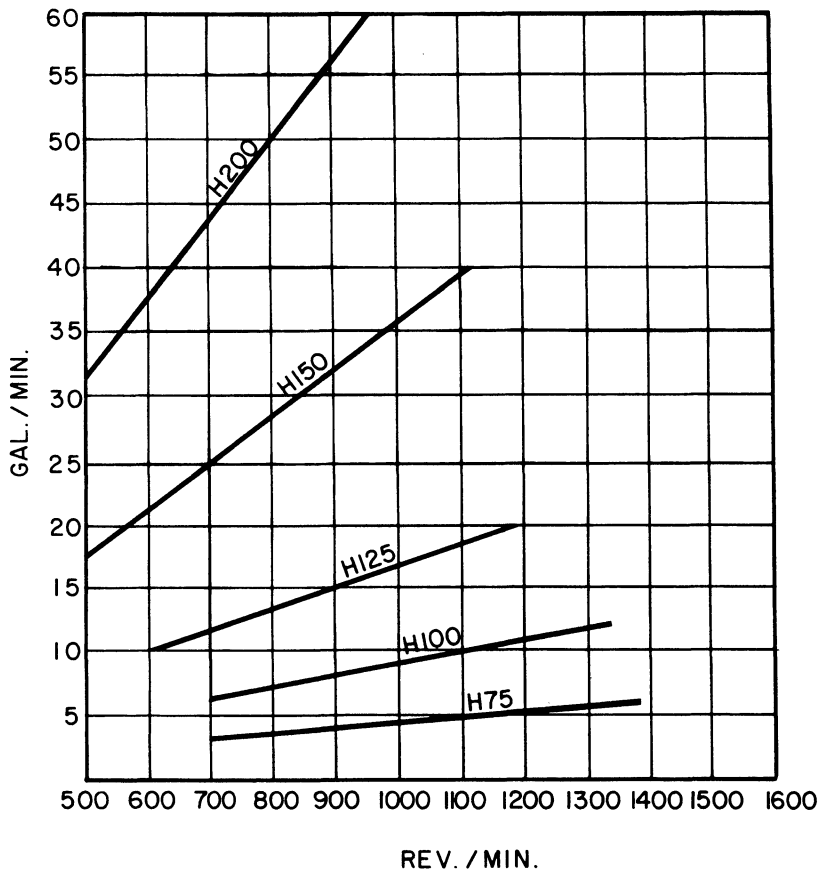


L75 – L200 Pump Capacity Curve based on clean water at normal temperature and total head to 100 feet.

# Pump Capacity Curves: H75 – H400 Pumps



*H300 and H400 Pump Capacity Curve based on clean water at normal temperature and total head to 250 feet.*



*H75 – H200 Pump Capacity Curve based on clean water at normal temperature and total head to 250 feet.*



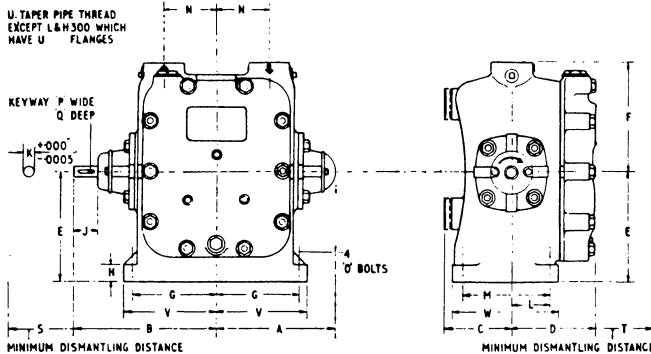
# MEGATOR TYPES L & H PUMPS

## approximate dimensions and weights

inches and millimetres

### Pumps with bare shaft

#### L & H 75—L & H 300

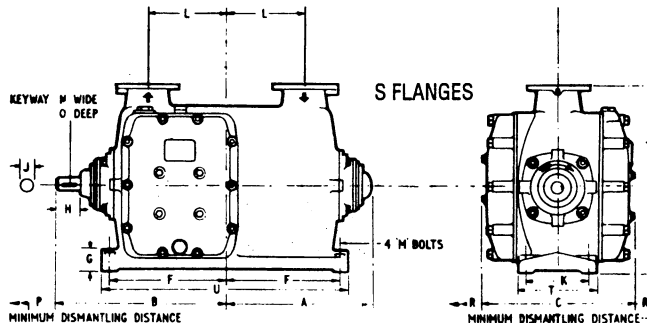


Approximate weights

	lb	kg		lb	kg
L75	40	18	H75	50	23
L100	60	27	H100	70	32
L125	70	32	H125	100	45
L150	110	50	H150	120	55
L200	160	73	H200	180	82
L300	350	160	H300	400	181

Pump type	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
L75	6½ 159	7½ 197	3½ 83	4 102	4½ 114	4½ 114	3¾ 86	¾ 19	1½ 38	½ 13	1¾ 47	4 102	2 ⅜ 56	⅝ 8	½ 13	⅜ 10	—	9½ 235	3 76	¾ 19	3½ 95	4½ 127	—
L100	7 178	8½ 206	4 102	4½ 117	5 127	5 127	4 102	¾ 22	1½ 38	½ 13	2 51	5½ 133	2 ⅜ 62	⅝ 10	½ 13	⅜ 10	—	10½ 260	3½ 95	1 25	4½ 117	6 152	—
L125	7½ 197	9 229	4½ 114	5½ 130	6 152	6½ 159	5 127	¾ 22	1½ 41	¾ 20	2½ 60	6½ 159	3½ 83	⅝ 10	¾ 19	¾ 19	—	12½ 317	4 102	1½ 38	5 ⅞ 138	7½ 187	—
L150	8½ 213	10 254	4½ 114	6 152	7½ 184	7½ 191	5½ 146	1½ 32	1½ 44	¾ 20	2½ 67	6 152	3½ 89	⅝ 12	¾ 19	¾ 19	—	13½ 349	5 127	1½ 38	6½ 162	7½ 184	—
L200	9½ 238	11½ 283	5½ 137	6½ 168	8½ 216	8½ 222	6 152	1½ 32	1½ 48	1 25	2½ 73	7 178	3½ 95	⅝ 12	¾ 19	¾ 19	—	14½ 375	5½ 140	2 51	6½ 168	8½ 210	—
L300	13½ 343	16 406	7½ 195	9½ 248	11 279	13 330	8 203	2 51	4 102	1½ 38	4½ 108	11 279	4½ 105	⅝ 16	¾ 19	¾ 19	—	20 508	12 305	3 76	8½ 227	12½ 327	—
H75	6½ 165	8 203	3½ 89	4½ 114	4½ 114	4½ 114	3¾ 86	¾ 22	1½ 38	½ 13	1¾ 48	4½ 121	2 ⅜ 56	⅝ 8	½ 13	⅜ 10	—	10 254	3½ 83	¾ 19	3½ 95	5½ 140	—
H100	7½ 197	9½ 235	4½ 105	4½ 124	5 127	5 127	4 102	¾ 22	1½ 41	¾ 20	2 51	5½ 133	2 ⅜ 62	⅝ 10	¾ 19	¾ 19	—	11½ 292	4½ 108	1 25	4½ 117	6 152	—
H125	8½ 219	10½ 267	4½ 114	5½ 137	6 152	6½ 159	5 127	¾ 22	1½ 41	1 25	2½ 60	6½ 159	3½ 83	⅝ 10	¾ 19	¾ 19	—	13½ 337	5 127	1½ 38	5 ⅞ 138	7½ 187	—
H150	9½ 247	11½ 289	4½ 121	6½ 156	7½ 184	7½ 191	5½ 146	1½ 32	1½ 44	1 25	3 76	7 178	3½ 89	⅝ 12	¾ 19	¾ 19	—	14½ 368	5½ 140	1½ 38	6½ 162	8½ 210	—
H200	10½ 260	12½ 317	6½ 156	6½ 171	8½ 216	8½ 225	6 152	1½ 32	1½ 48	1½ 38	3 ⅞ 87	8½ 216	3½ 95	⅝ 12	¾ 19	¾ 19	—	15½ 390	6½ 165	2 51	6½ 168	9½ 248	—
H300	14 356	17 432	7½ 195	9½ 248	11 279	13 330	8 203	2 51	4 102	1½ 38	4½ 108	11 279	4½ 105	⅝ 16	¾ 19	¾ 19	—	21 533	12 305	3 76	8½ 227	12½ 327	—

#### L & H 400,



Pump type	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	Approx weight	
																					lb	kg
L400	18½ 463	21½ 549	19½ 496	11 279	13 330	14½ 375	2 ⅞ 65	4 102	1½ 32	8 203	10 254	¾ 19	⅝ 8	⅝ 3	30 762	12 305	4 102	10 254	31½ 800	—	940	426
H400	18½ 476	22½ 575	19½ 496	11 279	13 330	14½ 375	2 ⅞ 65	4 102	1½ 38	8 203	10 254	¾ 19	⅝ 10	⅝ 4	31 787	12 305	4 102	10 254	31½ 800	—	950	431

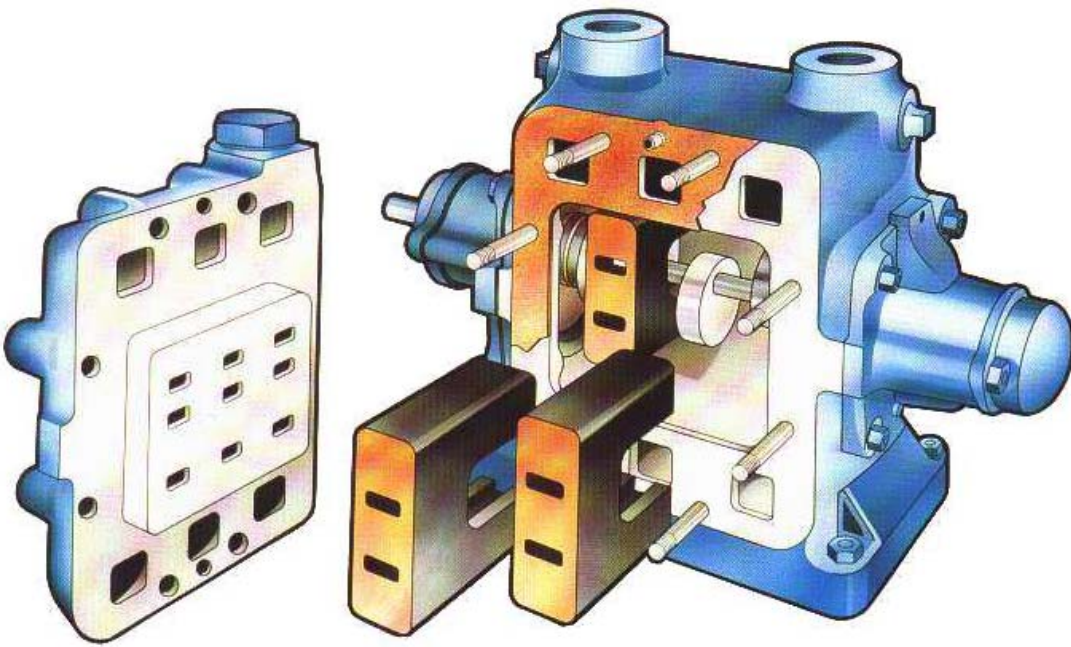
ROTATION Standard rotation is clockwise facing driving end and the standard assembly is with the suction at the non-drive end. Pump cannot be operated in the reverse direction but can be assembled so that the drive is at the opposite end.





# MEGATOR

*Pumping & Pollution Control Solutions*



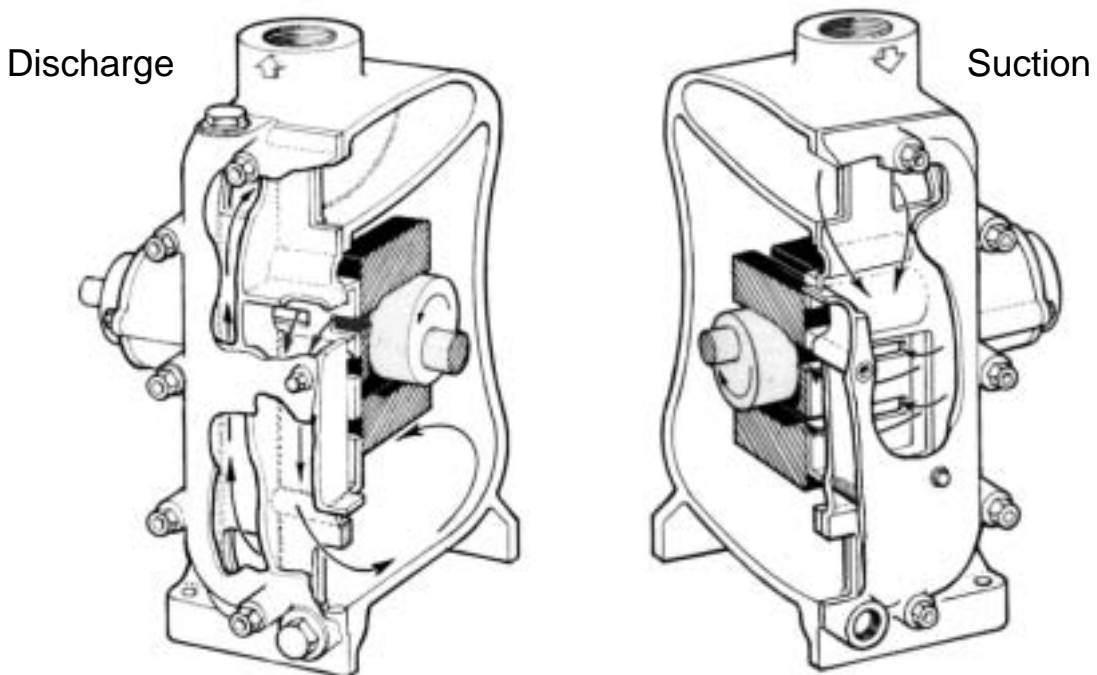
The Megator positive displacement sliding-shoe pump provides exceptional suction performance, versatility, and the ability to pump at constant capacity against heads to 250 feet. It can run without harm during dry suction, is self compensating for wear, has a simple design with few working parts and single cover access. It might be said to resemble a piston/plunger pump, and it has indeed all the well known merits of that type - powerful suction and self priming, constant capacity at varying heads, the ability to cope with rough conditions and to handle a great variety of liquids, viscous or free flowing, clean or dirty. Yet in its simplicity, compactness and even flow it more closely resembles the centrifugal pump. It combines the advantageous features of both these two main pump types without their respective limitations.

**Sliding Shoe Pump**



# How The Pump Works

Pumping action is derived from the rotation of three or more eccentric discs, each of which is closely fitted into a displacement chamber (shoe). The eccentric movement of each disc comprises horizontal and vertical components. The horizontal motion provides displacement, the disc reciprocating in the shoe like a piston in a cylinder. The vertical motion controls the entry and discharge of the liquid through the pump.



When the pump is started, a hydraulic pressure differential is created which ensures a tight seal and maintains the shoes in close contact with a flat portplate forming the division between the suction and discharge sides of the pump. The plate has ports opposite each shoe respectively leading from the suction branch and into the discharge side of the pump. During the suction stroke, liquid passes down through the main cover and is drawn into the shoes through the suction ports in the plate. During the discharge stroke, the liquid then passes down through the main cover into the bottom of the pump body before flowing through another passage in the main cover to the discharge branch. This arrangement helps to scavenge the bottom of the pump body and prevent the accumulation of solids. The outstanding performance of the pump does not depend upon fine clearances.

# Pump Comparison

Due to the fact that the Megator sliding-shoe pump is a unique design, we are frequently asked by our customers as to why they should install the sliding-shoe pump. Below is a comparison of the sliding-shoe pump against three main pump types.

## ↓ Piston & Plunger Pumps

The absence of valves ensures greater reliability and easier maintenance.

Weight and space occupied are a fraction of that of a piston or plunger pump of equivalent rating.

The elimination of gearing and crank mechanism saves lubrication and maintenance.

Shock and vibration in pipelines are avoided by the smooth flow of the sliding-shoe pump.

## ↓ Gear, Vane, Screw & Progressive Cavity Pumps

Effective pumping and self-priming in the sliding-shoe pumps are not dependent on fine fits or clearances.

Positive seating and self compensation for wear enable them to keep going under condition too severe for ordinary rotary positive pumps.

Sliding-shoe pumps are not confined to liquids having recognized lubricating or sealing properties, as they work with equal efficiency and length of life on water and similar “non-lubricating” liquids.

Sliding-shoe pumps will run for long periods with a completely dry suction without overheating or damage.

## ↓ Centrifugal Pumps

Self-priming of the sliding-shoe pump is spontaneous, without the use of any added priming device, and is completely reliable, even when the pump is in an old and worn condition.

Small seepages can be dealt with continuously, and any increased flow up to the full capacity of the pump is instantly picked up. The last drop can be sucked out of a container.

Very high suction lifts and long suction lines can be handled reliably without reduction in capacity. Entrapped air presents no difficulty.

Quantity pumped at a given speed, instead of falling away rapidly with increase in head, is practically constant at all heads and suction lifts within the range of the pump.

A sliding-shoe pump cannot overload the motor as a result of reduced head, and for this reason smaller motors can generally be used.

Sliding-shoe pumps have high efficiency over a wide range of heads and not merely at or near a single “duty point”.

A sliding-shoe pump at a given speed will work efficiently, and give the same capacity, with liquids of very low or very high viscosity.

## Benefits

- ↳ Self-priming
- ↳ Operates with dry suction
- ↳ Simple to install
- ↳ High suction lift
- ↳ Constant capacity at varying heads
- ↳ Single cover access
- ↳ Simple to operate
- ↳ Self compensating for wear
- ↳ The same pump for water and oils
- ↳ Handles clean or dirty liquids, viscous or free flowing
- ↳ Remove the last drop from containers
- ↳ Minimal shear/emulsification

## Features

- ↳ Capacities up to 264 gpm
- ↳ Suction lifts up to 27ft
- ↳ Viscosities up to 21000 SSU
- ↳ Heads up to 250ft
- ↳ Available in bronze, cast iron & Aluminum casings
- ↳ Air, diesel, electric, hydraulic or gasoline driven
- ↳ Variable speed inverter control
- ↳ Direct coupled or belt drive options
- ↳ Available assemblies include stationary, skid-mounted & mobile options.
- ↳ ISO 9001 & ANSI certified. ABS certification available

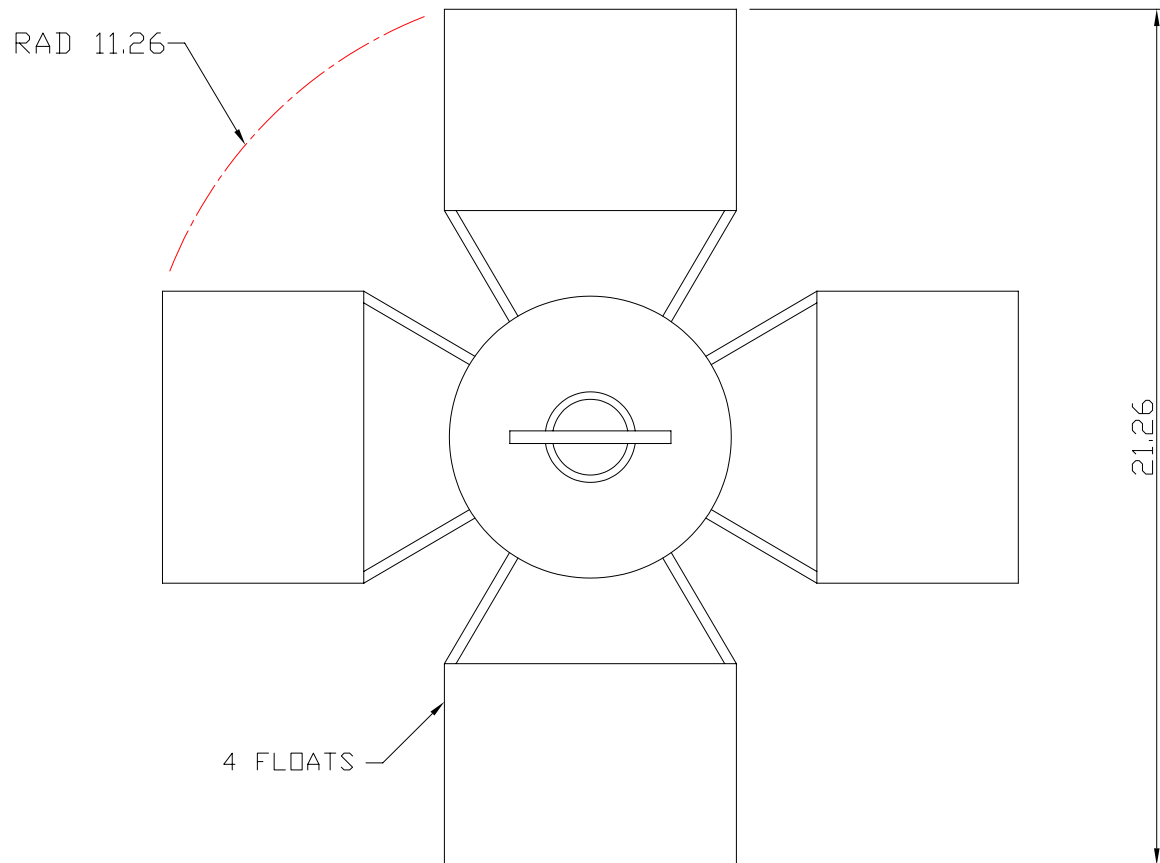
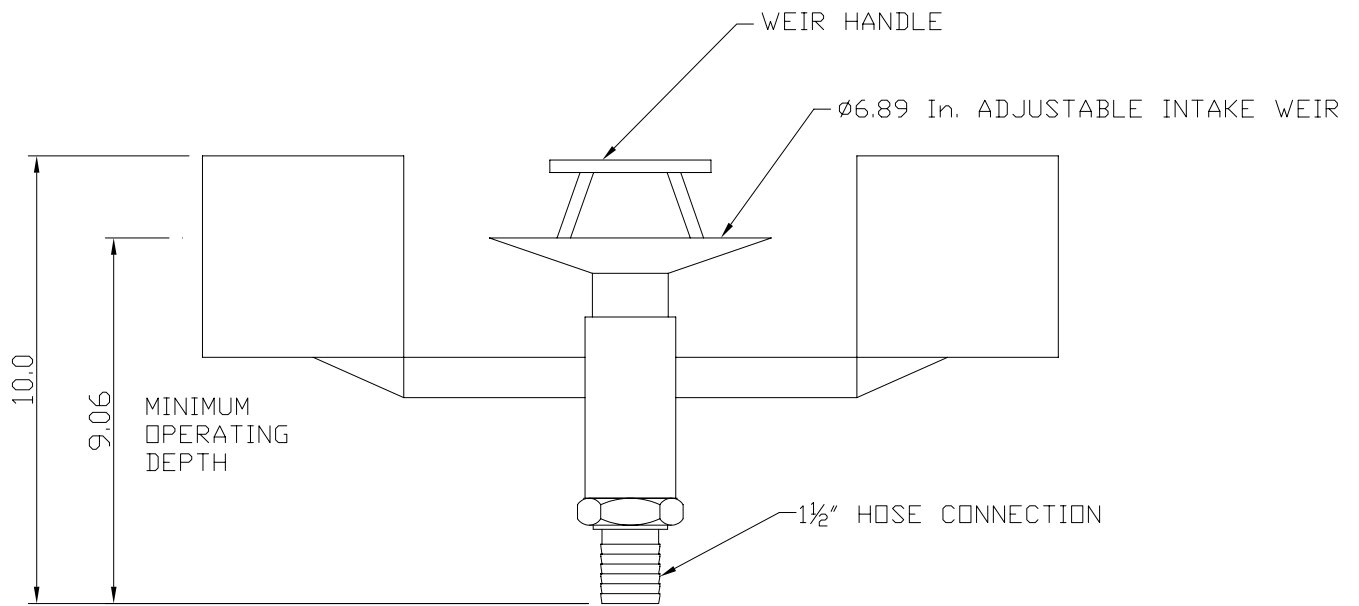


**MEGATOR  
CORPORATION**

562 Alpha Drive, Pittsburgh, PA 15238

Tel: 412.963.9200 1.800.245.6211 Fax: 412.963.9214

www.megator.com Email: info@megator.com



MATERIAL - STAINLESS STEEL 304  
 WEIGHT - 22 Lb.  
 SUPPLIED WITH 10 FT SUCTION HOSE & COUPLINGS  
 ALL DIMENSIONS IN INCHES UNLESS STATED



**END  
OF  
SECTION**

## **5. LIQUID LEVEL SENSORS**

This section provides the information pertaining to the level sensing for this project.

This section is structured as follows:

5.01 PRIMARY LEVEL SENSOR DATA SHEETS

5.02 SECONDARY LEVEL SENSOR DATA SHEETS

# Flush Diaphragm Submersible Liquid Level Sensor



AST4520

ISO9001:2008



The AST4520 Flush Submersible Series is the cost effective solution for level monitoring of turbulent tanks with viscous media. Approved to **UL/cUL913 Class 1 Division 1 IS, Groups C and D with an approved barrier**, the product ensures a safe, reliable source for level measurement.

The AST4520 is offered with pressure ranges from 0-2.5 to 0-15 PSIG. The AST4520 steel cage front end design allows for proper flow of media while keeping the sensor at the bottom of the tank or well. With an engraved stainless steel housing and Kynar PVDF cable, this sensor is built to handle the toughest environments.

## Benefits

- Engraved 316L Housing
- Protective Steel Cage Assembly
- Kynar PVDF Cable
- Compatible with a Wide Range of Chemicals
- Ruggedly Designed for Harsh Waste Water Environments
- Suitable for Waste, Salt, Brackish, or Fresh Water Systems
- EMI/RFI and Reverse Polarity Protection
- Lightning and Surge Protection
- Competitively Priced for OEM Applications
- ABS (American Bureau of Shipping)

Approved

## Applications

- Lift Stations - Wastewater, Storm Water, Industrial Applications
- Food Tanks
- Viscous Media Tanks
- Heavy Oil

## Environmental Data

### Temperature

Operating	-40 to 85°C (-40 to 185°F)
Storage	-40 to 100°C (-40 to 212°F)

### Thermal Limits

Compensated Range	0 to 55°C (30 to 130°F)
TC Zero	<±1.5% of FS
TC Span	<±1.5% of FS

### Other

Shock	100G, 11 msec, 1/2 sine
Vibration	10G peak, 20 to 2000 Hz.
EMI/RFI Protection:	Yes
Rating:	IP-68

## Performance @ 25°C (77°F)

Accuracy*	< ±0.25% BFSL
Stability (1 year)	±0.25% FS, typical
Over Range Protection	2X Rated Pressure
Burst Pressure	5X or 1,250 PSI (whichever is less)
Pressure Cycles	> 50 Million

\* Accuracy includes non-linearity, hysteresis & non-repeatability

## Electrical Data

Output	4-20mA
Excitation	10-28VDC
Output Impedance	>10k Ohms
Current Consumption:	20mA, typical
Bandwidth	(-3dB): DC to 250 Hz
Output Noise:	-
Zero Offset:	<±1% of FS (<±4% 1PSI)
Span Tolerance:	<±2% of FS (<±4% 1PSI)
Output Load:	0-800 Ohms@10-28VDC
Reverse Polarity Protection	Yes

## Ordering Information

**AST4520** **Y** **00010** **P** **4** **X** **1** **355**

**Series Type**

**Process Connection**

Y= G1/2 with steel cage

**Pressure Range**

Insert 5-digit pressure range code

**Pressure Unit**

H= Inches H2O                      P= PSI

**Outputs**

4= 4-20mA (2 wire loop powered)

**Electrical**

(for wiring information visit: <http://www.astensors.com/mediacenter.php>)

X= Optional Length (see options)

**Wetted Material**

1 = 316L / 304 SS / Kynar

**Options Cable Lengths:**

353 = 25 ft. (7.62 m)

354 = 50 ft. (15.24 m)

**355 = 75 ft. (22.86 m)**

	Gage PSIG	Pressure Range Code	Feet of Water Column @ 4°C (approx.)
<b>AST4520</b>	0-15	00015	34.60
	0-10	00010	23.07
	0-7.5*	00208*	17.30
	0-5	00005	11.53
	0-2.5*	00069*	5.77

\*2.5 and 7.5 PSI Sensor must be ordered in inches of H<sub>2</sub>O.

## Barrier Installation

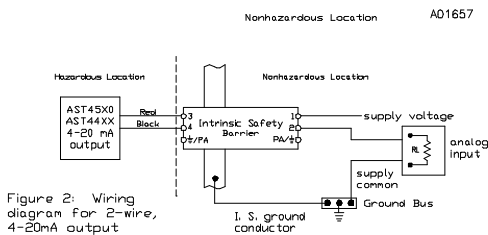


Figure 2: Wiring diagram for 2-wire, 4-20mA output

The transducers listed below are designed for installation in a Class I, Division 1, Groups C and D, Division 1 hazardous location when connected to Associated Apparatus as described in note 1.

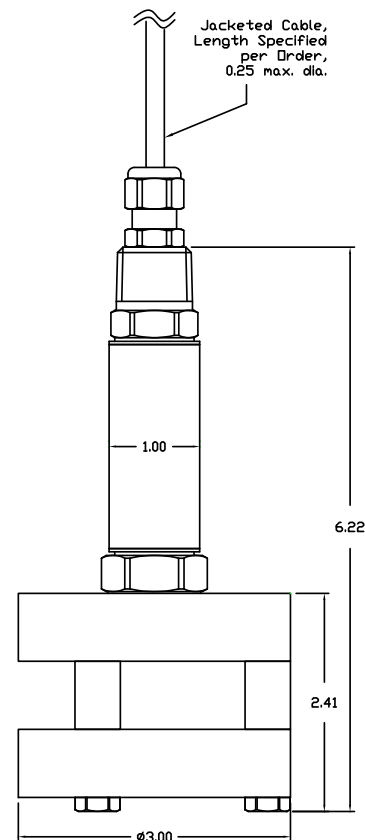
**Entity Parameters**

V<sub>max</sub> = 28Vdc  
 I<sub>max</sub> = 175mA                      I<sub>max</sub> is the total current available from the Associated Apparatus under any condition.  
 C<sub>i</sub> = 0.44µf  
 L<sub>i</sub> = 0

**Notes:**

- Associated Apparatus shall provide intrinsically safe connections which meet the following parameters:  
 $V_{oc} \text{ or } V_t \leq V_{max}$                        $C_a \geq C_i + C_{leads}$   
 $I_{sc} \text{ or } I_t \leq I_{max}$                            $L_a \geq L_i + L_{leads}$
- Control Room apparatus shall not generate in excess of 250V (U<sub>max</sub>).
- Installation should be in accordance with Article 504 in the National Electrical Code, ANSI/NFPA 70.

## Dimensional Data



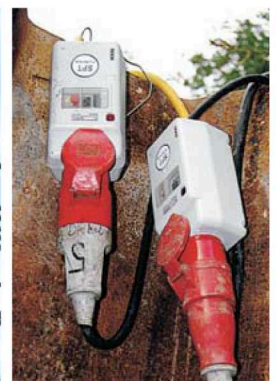
For warranty information, please visit: [www.astensors.com](http://www.astensors.com)





The NIVA level controller MS 1 C is the ideal solution to control liquids with limited switching space. For example in:

- Chemical plants
- Electro plating shops
- Purifying Plants



The NIVA level controller MS1 C was designed for an extremely high resistance to chemical liquids and for use at high temperatures up to 100 °C (212 °F).

### Available versions:

Type	Cable	Lenght (m)	Order-no.
W	Teflon/FEP 4 x 0.5	5	40 000705
W	Teflon/FEP 4 x 0.5	10	40 000710
W	Teflon/FEP 4 x 0.5	20	40 000720

W = Changeover (SPDT)

Other cable types and lengths are available upon request

### Application:

For use in chemically loaded liquids at temperatures up to 100 °C (212 °F).

### Electronic connection

Connection of level controllers	Wire			⏚
	grey	black	brown	
For emptying a tank	insulate	X	X	X
For filling a tank	X	insulate	X	X
Alarm high level	insulate	X	X	X
Alarm low level	X	insulate	X	X

Technical data subject to change

### Technical data:

Specific weight: 0.95–1.05 or according to specification  
 Max. temperature: 100 °C (212 °F)  
 Breaking capacity: 1 mA / 4 V - 5 A / 250 V \*  
 Switch point: 10°  
 Protective system: IP 68 / 2 bar  
 Protection class: II  
 Cable cross section: 4 x 0.5 mm<sup>2</sup>  
 Height / diameter: 180 / 100 mm (7 in / 3.9 in)  
 Housing quality: Polypropylene (PP)  
 Housing Colour: Grey  
 Cable quality: Teflon (FEP)  
 Cable colour: Black  
 Cable seal: Viton

\* Micro-switch with gold-plated contacts especially for low currents in electronic circuits



Potential equalization wire

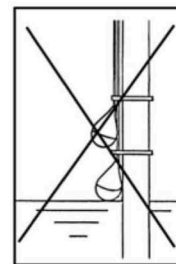
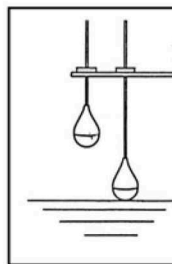
CE  
73/23/EEC



1mA/4V-5A/250V

☐ ⚡ ⚡ ⚡ μ T80  
γ 0,95 - 1,05

# MS 1



<p>           (GB) Connection of Level Regulators            (D) Anschluss der Niveaugler            (F) Branchement des régulateurs de niveau            (I) Collegamento regolatori di livello            (E) Conexión de los reguladores de nivel            (P) Conexão dos reguladores de nível            (NL) Aansluiting van de niveauregelaar            (DK) Tilslutning af niveauregulator            (S) Anslutning av nivåregulatorn            (N) Forbindelse til nivåregulatoren            (FIN) Pinnansäätimen liittäminen            (RUS) подсоединение регулятора уровня            (PL) Przyłącze regulatorów poziomu            (H) A szintszabályozók csatlakoztatása            (CZ) Připoj regulátorů hladiny            (SK) Pripoj regulátorov hladiny            (SL) Priključitev regulatorjev nivoja            (HR) Cijev za regulator razine            (SC) Cev za spravu za regulisanje nivoa            (GR) Σύνδεση ρυθμιστή στάθμης            (TR) Seviye regülatörlerinin bağlanması         </p>	<p>           ①            grey            grau            gris            grigio            gris            cinzento            grijs            grå            grå            grå            harmaa            серый            kolor szary            szürke            šedý            sivý            siv            sivo            sivo            γκριζο            gri         </p>	<p>           ②            black            schwarz            noir            nero            negro            preto            zwart            sort            svart            svart            musta            чёрный            kolor czarny            fekete            černý            černý            črno            crni            crni            μαύρο            siyah         </p>	<p>           ③            brown            braun            brun            marrone            castanho            bruin            brun            brun            brun            ruskea            коричневый            kolor brązowy            barna            hnědý            hnedý            rjavo            smeđi            smeđi            καφέ            kahverengi         </p>
<p>           (GB) For emptying a tank            (D) Zum Entleeren eines Behälters            (F) Pour vider un réservoir            (I) Per lo svuotamento            (E) Para vaciar un recipiente            (P) Para esvaziar um reservatório            (NL) Om een reservoir te legen            (DK) Til tømning af en beholder            (S) För tömning av en behållare            (N) For å tomme en beholder            (FIN) Säiliön tyhjentäminen            (RUS) для опорожнения резервуара            (PL) Opróżnienie pojemnika            (H) Egy tartály ürítéséhez            (CZ) K vyprázdnění nádrže            (SK) K vyprázdneniu nádrže            (SL) Za praznjenje posode            (HR) Za praznjenje nekog spremnika            (SC) Za praznjenje nekog rezervoara            (GR) Για την εκκένωση των περιέκτων            (TR) Bir hazneyi/kabi boşaltmak için         </p> <p>           Alarm high level            Alarm bei hohem Flüssigkeitsstand            Alarme au niveau supérieur            Allarme di massimo livello            Alarma con alto nivel de líquido            Alarme de nível máximo            Alarm bij een hoog vloeistofpeil            Alarm ved høj væskenniveau            Alarm vid hög vätskenivå            Alarm ved høyt væskennivå            Ylärajahälytys            сигнал тревоги при высоком уровне жидкости            Alarm w przypadku wysokiego poziomu cieczy            Riasztás túl magas töltésszint esetén            Poplach při vysokém stavu kapaliny            Poplach pri vysokom stave kvapaliny            Alarm pri visokem nivoju tekočine            Alarm kod visokog stanja tekućine            Alarm kod visokog stanja tečnosti            Αλάρμ σε πολύ υψηλή στάθμη υγρού            Yüksek sıvı seviyesinde alarm         </p>	<p>           insulate            isolieren            isoler            isolare            aislar            isolar            isoleren            isoler            isolera            isolere            eristä            изолировать            zaizolować            szigeteljük            izolovat            izolovat'            izolirati            izolirati            izolovati            μόνωση            izole etmek         </p>	<p>X</p>	<p>X</p>
<p>           (GB) For filling a tank            (D) Zum Füllen eines Behälters            (F) Pour remplir un réservoir            (I) Per il riempimento            (E) Para llenar un recipiente            (P) Para encher um reservatório            (NL) Om een reservoir te vullen            (DK) Til fyldning af en beholder            (S) För fyllning av en behållare            (N) For å fylle en beholder            (FIN) Säiliön täyttäminen            (RUS) для наполнения резервуара            (PL) Napełnienie pojemnika            (H) Egy tartály töltéséhez            (CZ) K naplnění nádrže            (SK) K naplneniu nádrže            (SL) Za polnjenje posode            (HR) Za punjenje nekog spremnika            (SC) Za punjenje nekog rezervoara            (GR) Για την πλήρωση των περιέκτων            (TR) Bir hayneyi/kabi doldurmak için         </p> <p>           Alarm low level            Alarm bei niedrigem Flüssigkeitsstand            Alarme au niveau inférieur            Allarme di minimo livello            Alarma con bajo nivel de líquido            Alarme de nível mínimo            Alarm bij een laag vloeistofpeil            Alarm ved lav væskenniveau            Alarm vid låg vätskenivå            Alarm ved lavt væskennivå            Alarajahälytys            сигнал тревоги при низком уровне жидкости            Alarm w przypadku niskiego poziomu cieczy            Riasztás túl alacsony töltésszint esetén            Poplach při nízkém stavu kapaliny            Poplach pri nizkom stave kvapaliny            Alarm pri nizkem nivoju tekočine            Alarm kod niskog stanja tekućine            Alarm kod niskog stanja tečnosti            Αλάρμ σε πολύ χαμηλή στάθμη υγρού            Düşük sıvı seviyesinde alarm         </p>	<p>X</p>	<p>           insulate            isolieren            isoler            isolare            aislar            isolar            isoleren            isoler            isolera            isolere            eristä            изолировать            zaizolować            szigeteljük            izolovat            izolovat'            izolirati            izolirati            izolovati            μόνωση            izole etmek         </p>	<p>X</p>

**EC Declaration of Conformity**

according to

**EC Directive 2006 /95 / EC  
EC Directiv RoHS 2002 / 95 / EC**

We

**NOLTA GmbH  
35091 Cölbe**

hereby declare, that the products we manufacture conform in conception, design and circulated model to the relevant basic health and safety requirements of EC directives. If any changes are made to the level – controllers without our prior consent, this declaration loses its validity.

Products: **Level – Controllers**Type: **MS 1 C**Applied harmonized standards:

- **DIN EN 60730-1 (VDE 0631-1):2005-12+Ber.1:2007-11  
+/A2:2008-04+/A15:2007-08+/A16:2008-02**
- **DIN EN 60730-2-16 (VDE 0631-2-16):200208+/A11:2005 11**
- **DIN IEC 60730-1 (VDE 0631-1):2008-10+/A3:2005-01**

Cölbe, 14.04.2009

.....  
Dr.-Ing. Jochen Knake / Geschäftsführer.....  
Wolfgang Seip / Quality Manager



**END  
OF  
SECTION**

## **6. ELECTRICAL**

This section includes all schematics and user manuals related to the control panel and electrical components.

This section is structured as follows:

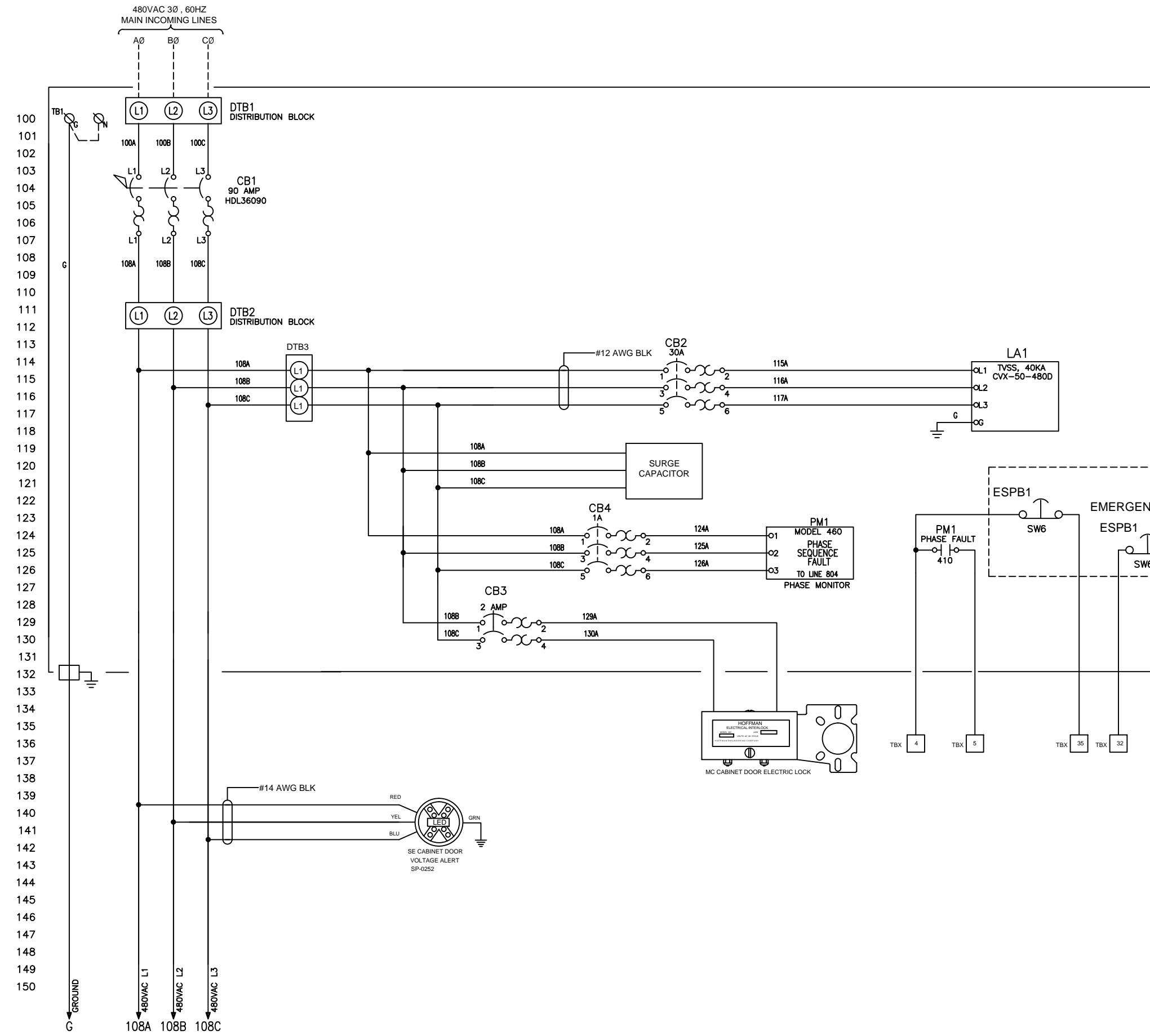
6.01 ELECTRICAL SCHEMATICS

6.02 CONTROL PANEL DATA SHEETS

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SERVICE ENTRANCE COMPARTMENT

<b>ROMTEC UTILITIES</b>	VOLTS <u>480</u> FREQ. <u>60 HZ.</u> PHASE <u>3</u>
	LARGEST HP <u>7.5</u>
	LARGEST FLA <u>11</u>
	TOTAL FLA <u>58</u>
	SHORT CIRCUIT RATING <u>10 KA</u> AT <u>480 VAC</u>
NOTE: HEADER AND PLUGS USE COPPER CONDUCTORS ONLY. TORQUE REQUIREMENT: PLUGS - 1.47 FT. Lbs. UNIT OPERATES AT "POLLUTION DEGREE 2"	
Power Circuit Wiring Temp Rating 75 Degrees C	



SERVICE ENTRANCE COMPARTMENT

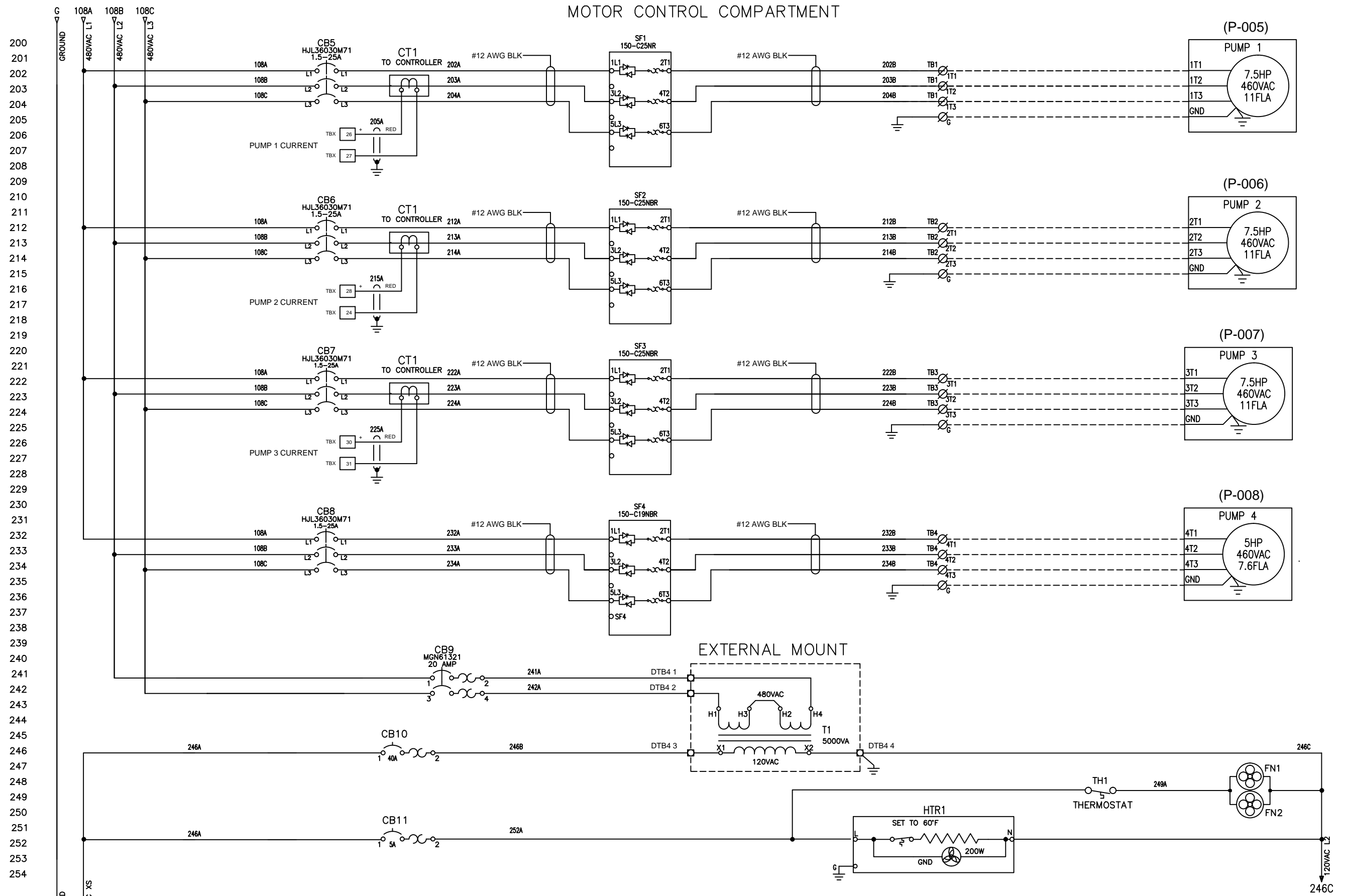
MOTOR CONTROL COMPARTMENT

REV. LET.	REVISIONS	DATE	REV OR APPD BY	REV. LET.	REVISIONS	DATE	REV OR APPD BY

THIS DRAWING IS THE PROPERTY OF ROMTEC UTILITIES, INC. AND CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH MUST NOT BE DUPLICATED, USED OR DISCLOSED OTHER THAN EXPRESSLY AUTHORIZED BY ROMTEC.	SALES REP: ROMTEC UTILITIES, INC. CUSTOMER: PHONE: 541-496-9678 FAX: 541-496-0804	DATE: 5/28/13 DESIGN: KAS DRAWN: KAS CHK'D: HP: 7.5 SIZE: APPR'D: SHEET 1 OF 9	REV. 0	PROJECT NAME: BAE ACETIC ACID PLANT FILE NO: CONFIG NO: ADDR NO: PROJECT NUMBER DRAWING NUMBER CS-104825
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MOTOR CONTROL COMPARTMENT



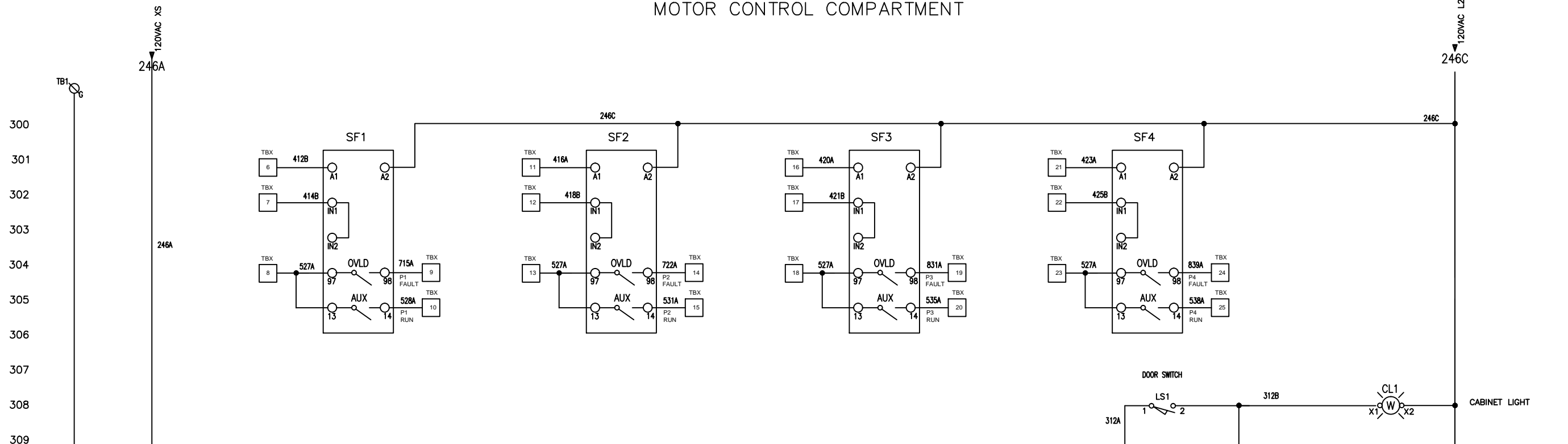
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REV. LET.	REVISIONS	DATE	REV OR APPD BY	REV. LET.	REVISIONS	DATE	REV OR APPD BY

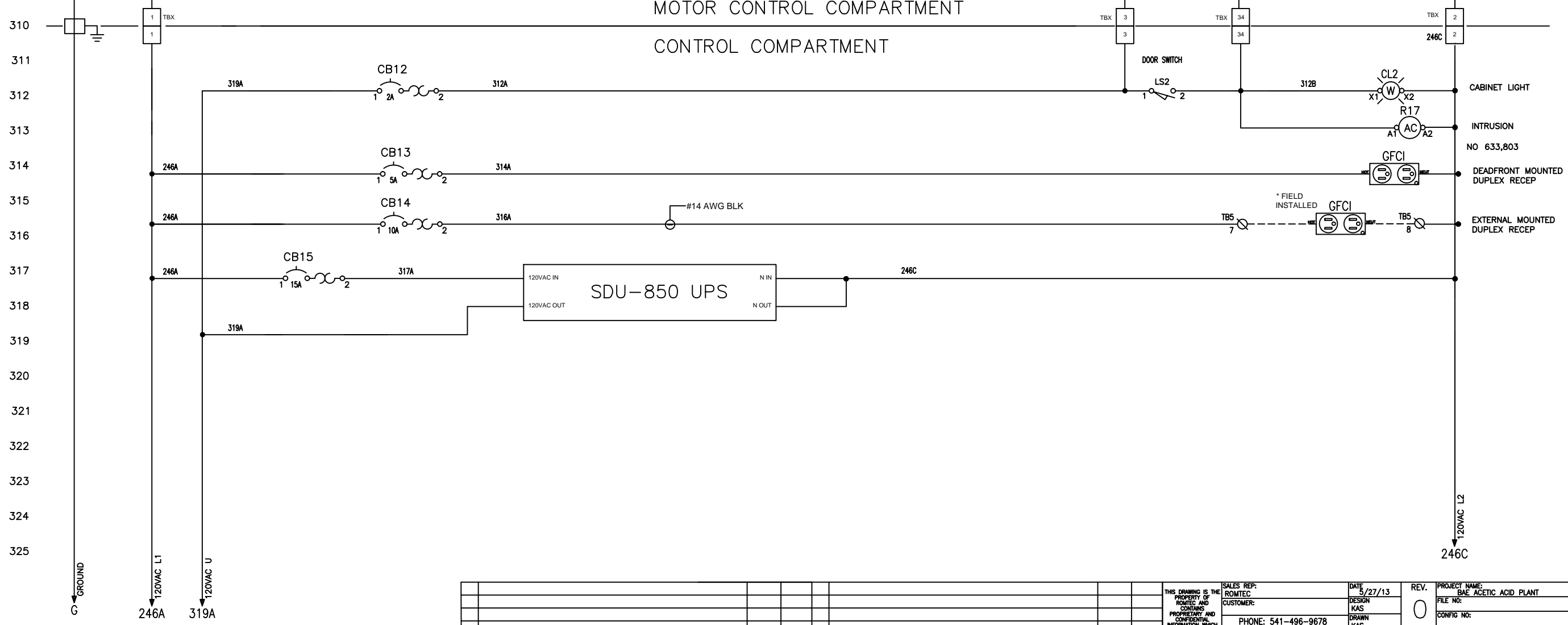
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ROMTEC UTILITIES, INC. ROSEBURG, OREGON SHEET 2 OF 9

MOTOR CONTROL COMPARTMENT



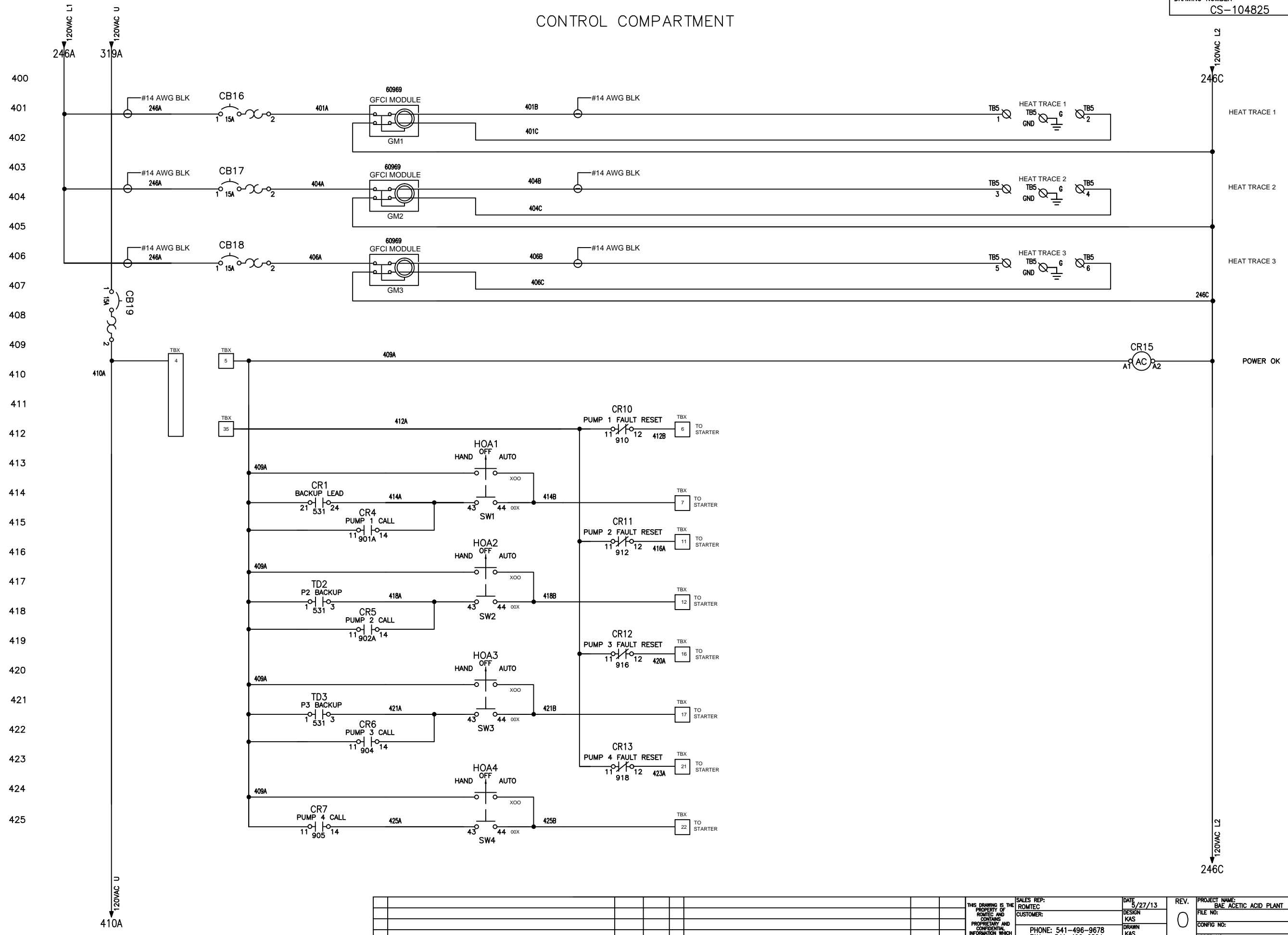
MOTOR CONTROL COMPARTMENT  
CONTROL COMPARTMENT



REV. LET.	REVISIONS	DATE	REV. OR APPD. BY	REV. LET.	REVISIONS	DATE	REV. OR APPD. BY

SALES REP: ROMTEC	DATE 5/27/13	REV. 0	PROJECT NAME: BAE ACETIC ACID PLANT
CUSTOMER:	DESIGN KAS	FILE NO:	
PHONE: 541-496-9678	DRAWN KAS	CONFIG NO:	
FAX: 541-496-0804	CHK'D 	ADDR NO:	
<b>ROMTEC UTILITIES, INC.</b>	APP'R'D 	PROJECT NUMBER	
ROMTEC UTILITIES, INC. ROSEBURG, OREGON	SIZE C	DRAWING NUMBER	CS-104825
	SHEET	3 OF 8	

CONTROL COMPARTMENT

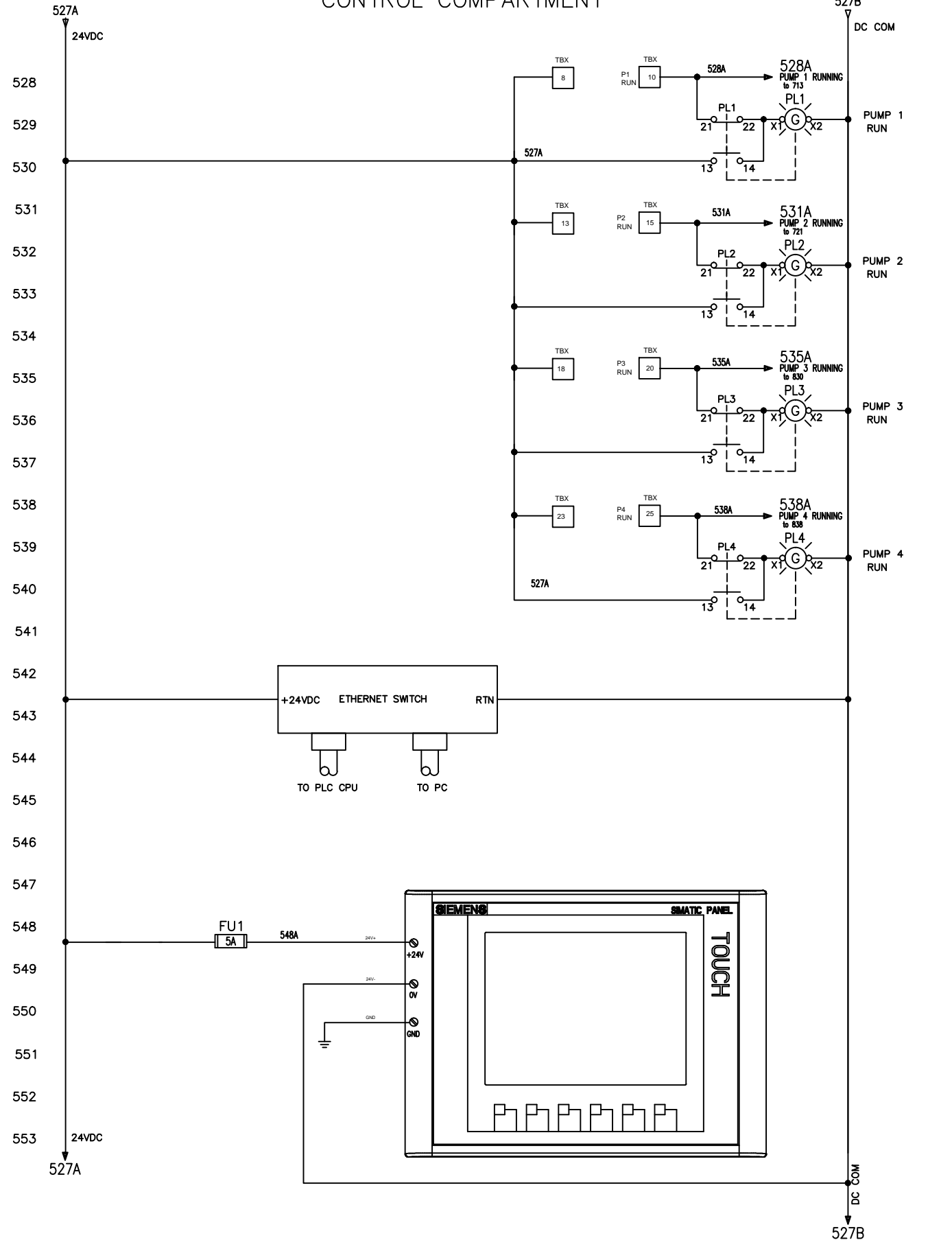
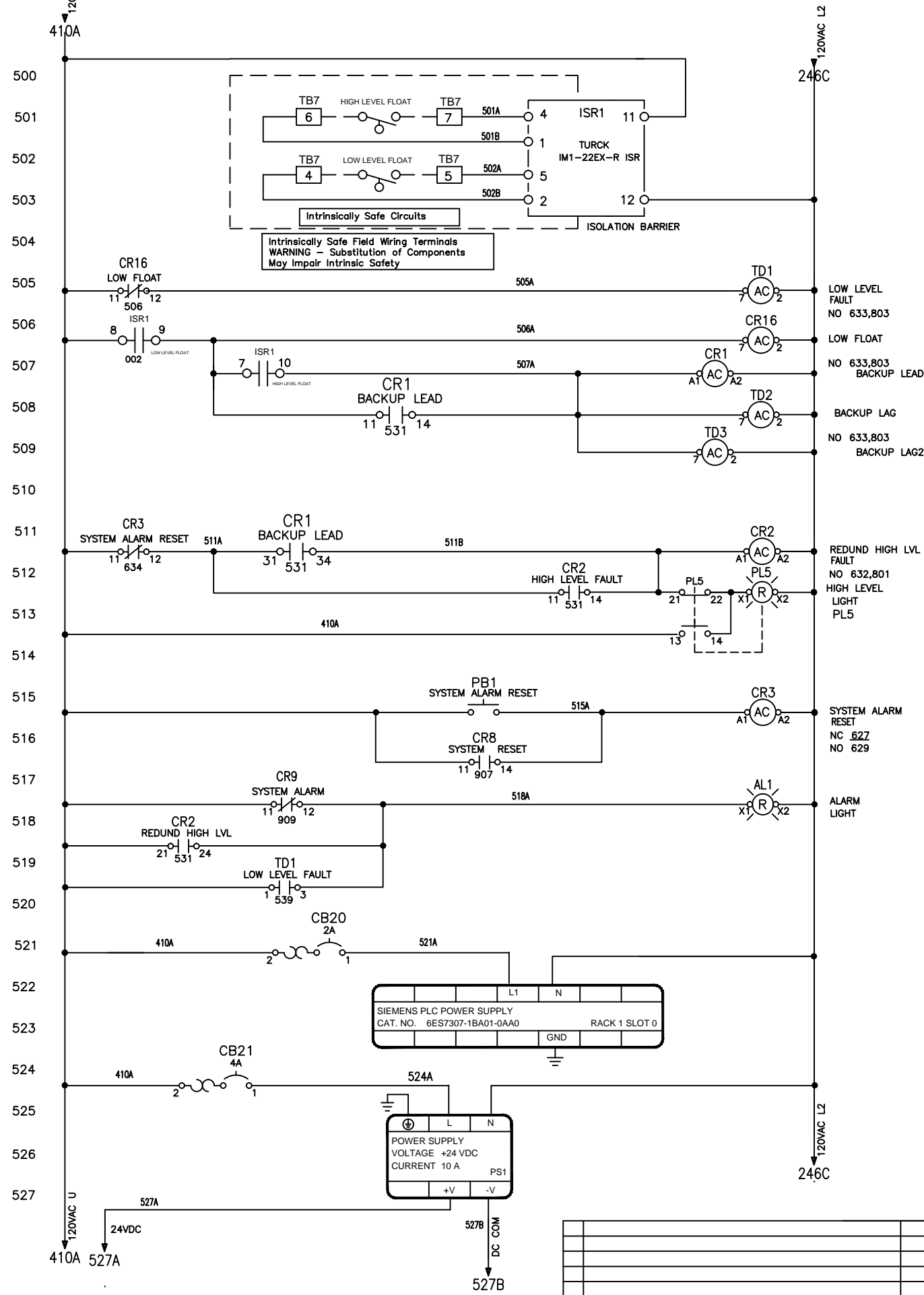


REV. LET.	REVISIONS	DATE	REV OR APPD BY	REV. LET.	REVISIONS	DATE	REV OR APPD BY

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	CUSTOMER: KAS	DESIGN: KAS	0	FILE NO:
	PHONE: 541-496-9678 FAX: 541-496-0804	DRAWN: KAS	HP	CONFIG NO:
	<b>ROMTEC UTILITIES, INC.</b>	CHK'D:	SIZE: C	ADDR NO:
ROMTEC UTILITIES, INC. ROSEBURG, OREGON	APPR'D:	SHEET: 4 OF 9	PROJECT NUMBER:	DRAWING NUMBER: CS-104825

CONTROL COMPARTMENT

CONTROL COMPARTMENT



REV. LET.	REVISIONS	DATE	REV OR APPD BY	REV. LET.	REVISIONS	DATE	REV OR APPD BY

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SALES REP: ROMTEC  
CUSTOMER: BAE ACETIC ACID PLANT

DATE: 5/27/13  
DESIGN: KAS  
DRAWN: KAS  
CHK'D: HP  
APPR'D: C

PHONE: 541-496-9678  
FAX: 541-496-0804

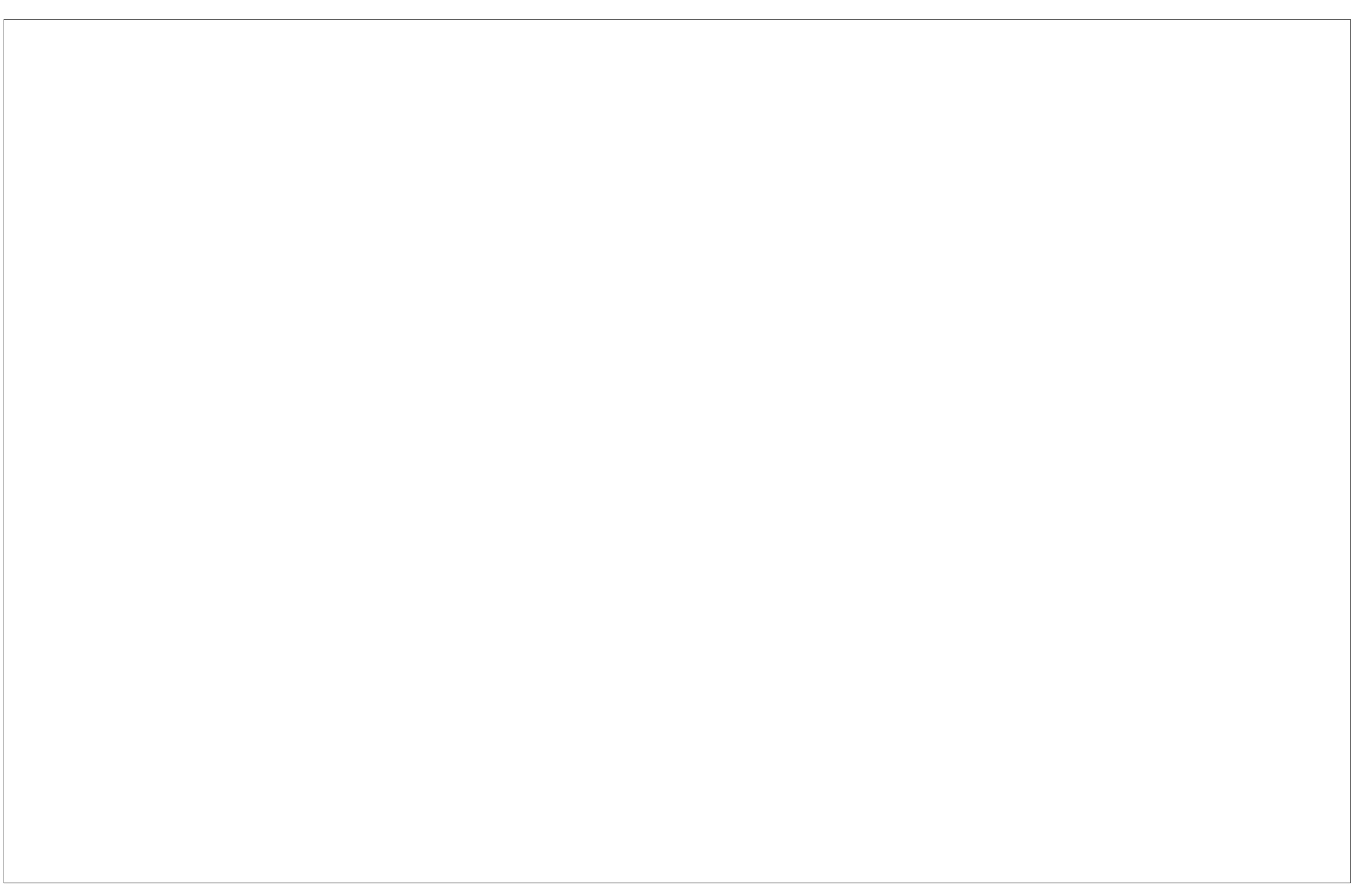
**ROMTEC UTILITIES, INC.**

ROMTEC UTILITIES, INC. ROSEBURG, OREGON

PROJECT NAME: BAE ACETIC ACID PLANT  
FILE NO:  
CONFIG NO:  
ADDR NO:  
PROJECT NUMBER  
DRAWING NUMBER: CS-104825

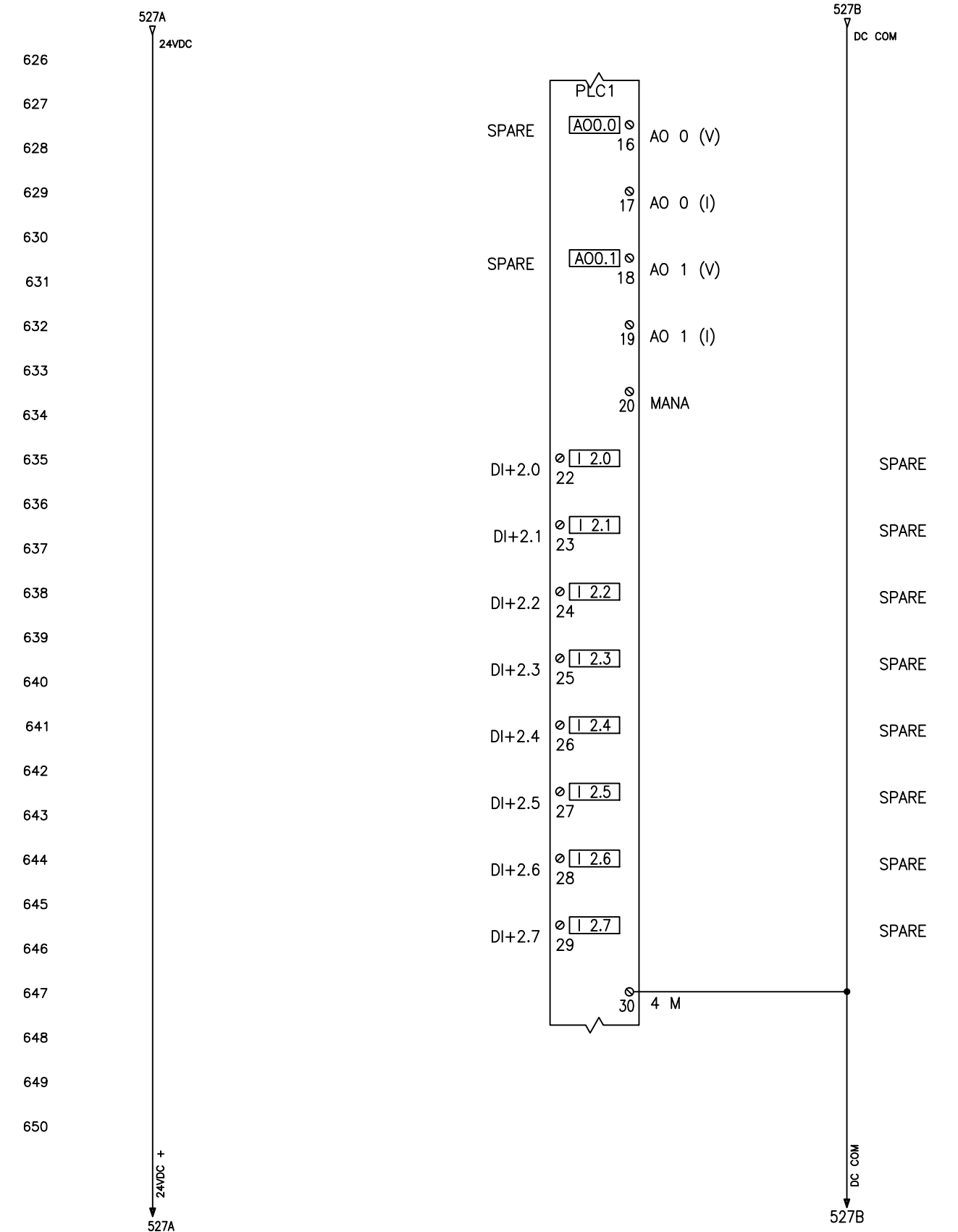
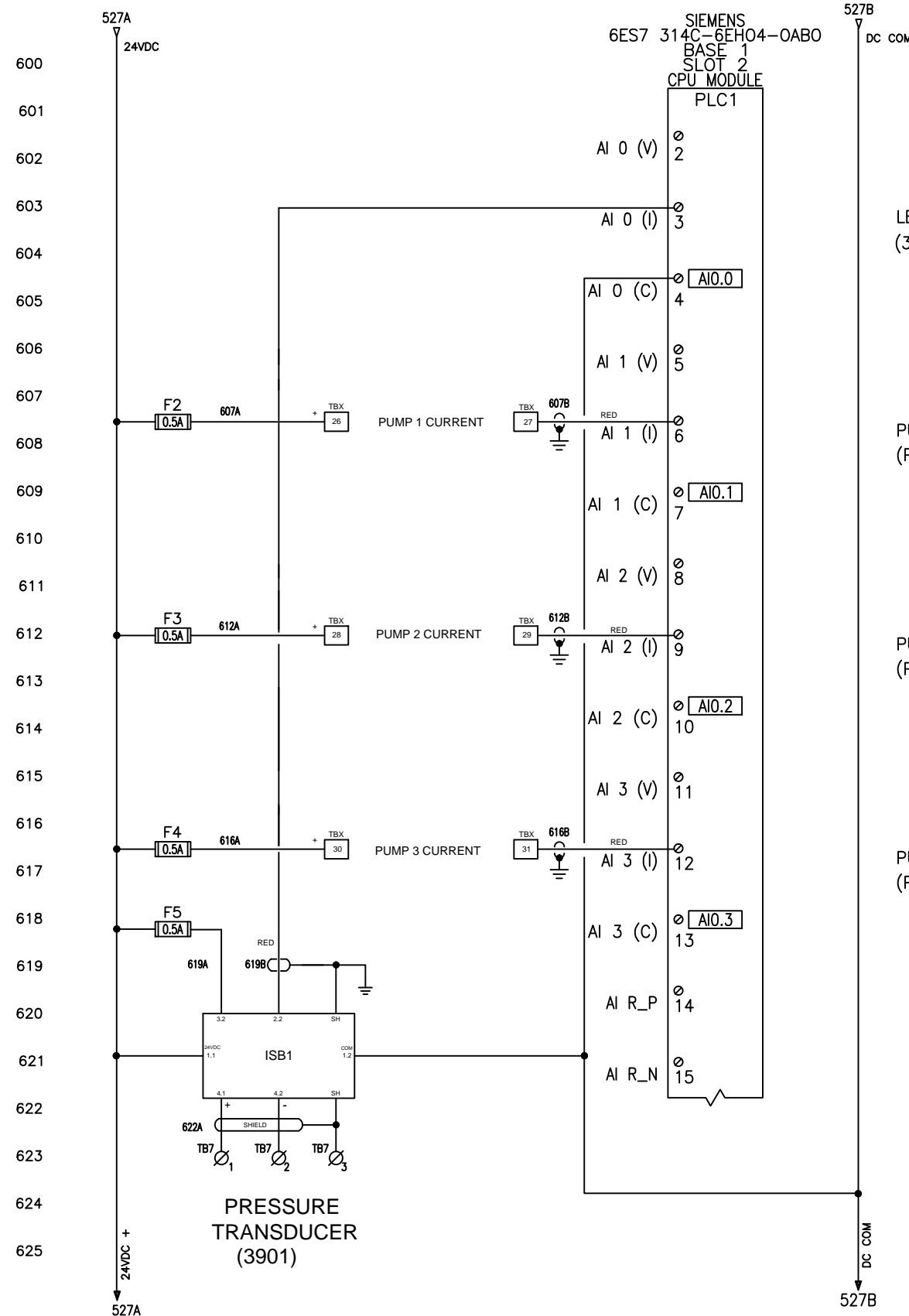
SHEET 5 of 9





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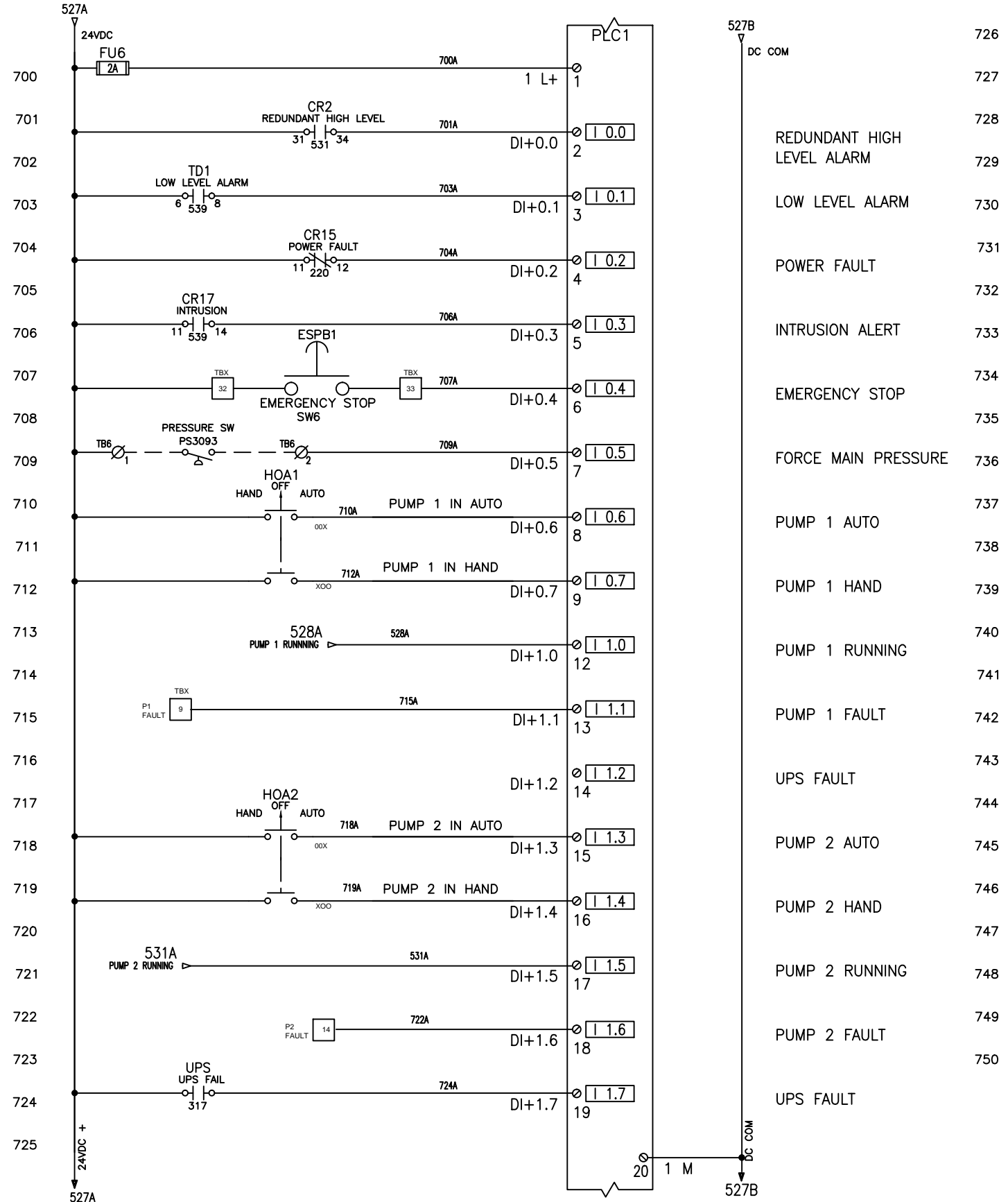
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	CUSTOMER: KAS	DESIGN: KAS	0	FILE NO:
	PHONE: 541-496-9678 FAX: 541-496-0804	DRAWN: KAS	HP: 7.5	ADDR NO:
	ROMTEC UTILITIES, INC.	CHK'D:	SIZE: C	PROJECT NUMBER
ROMTEC UTILITIES, INC. ROSEBURG, OREGON	APPR'D:	SHEET: 6 OF 9	DRAWING NUMBER	CS-104825

CONTROL COMPARTMENT



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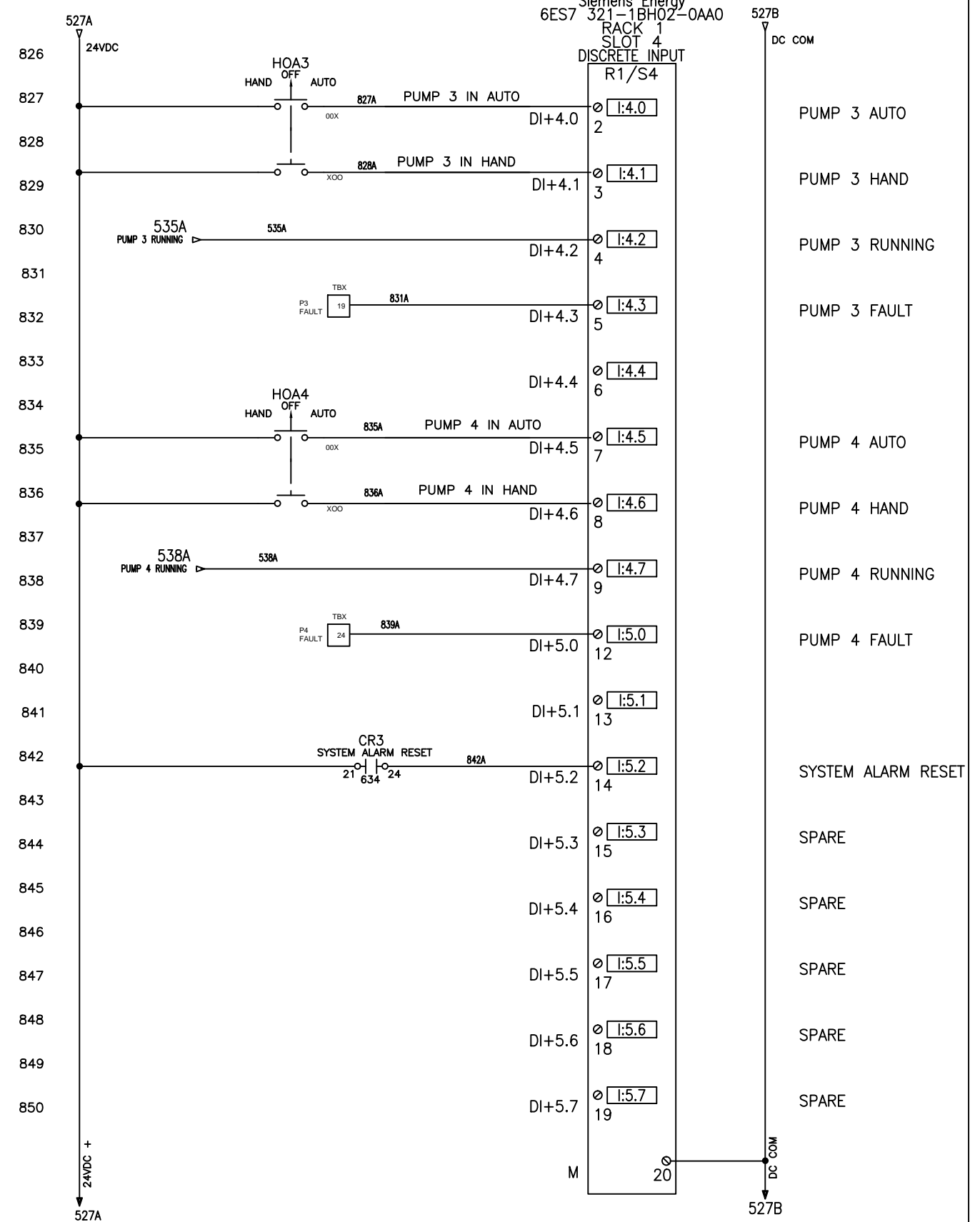
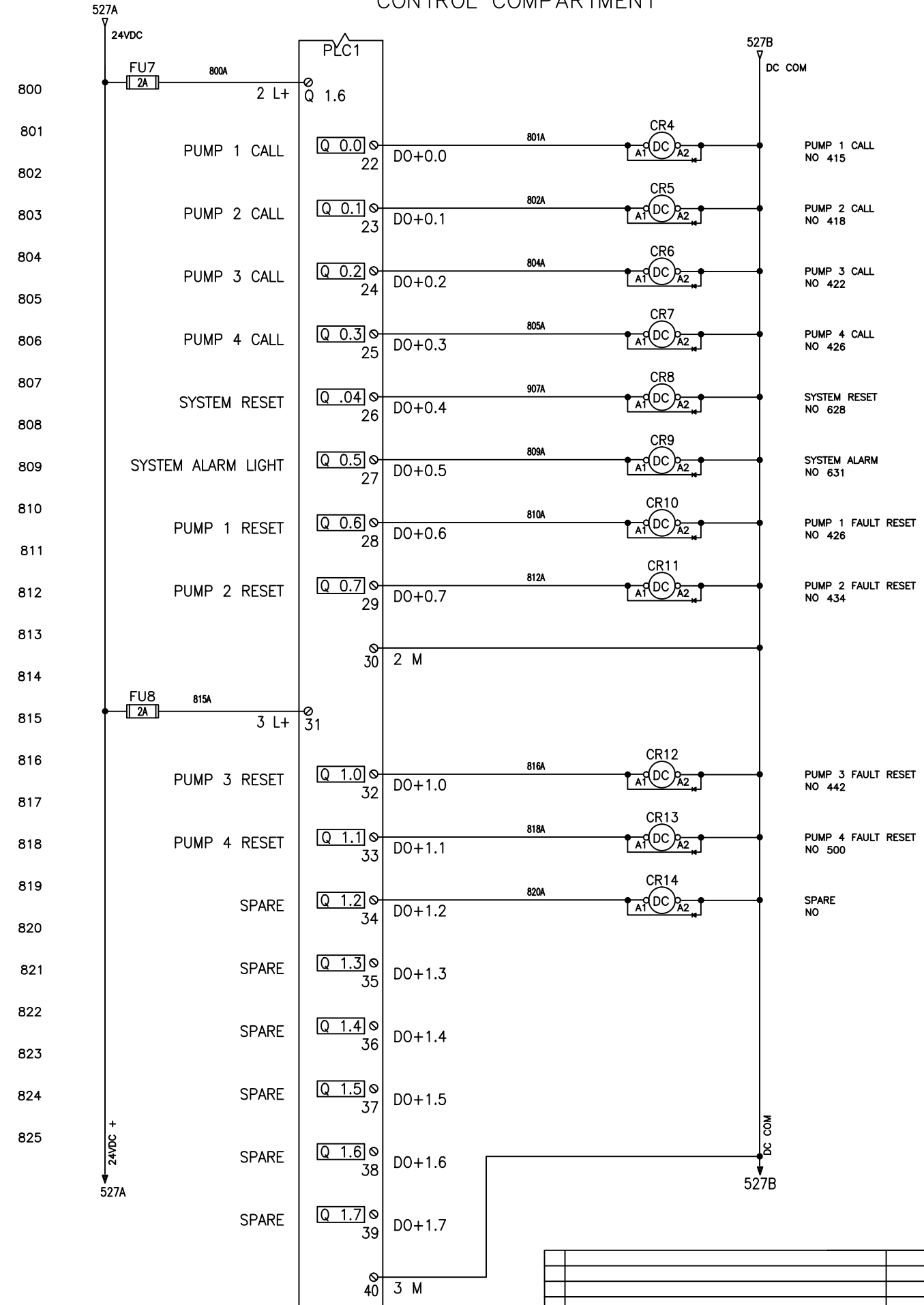
REV. LET.		REVISIONS		DATE	REV. OR APPD. BY	REV. LET.	REVISIONS		DATE	REV. OR APPD. BY	THIS DRAWING IS THE PROPERTY OF ROMTEC AND CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH MUST NOT BE DUPLICATED, USED OR DISCLOSED OTHER THAN EXPRESSLY AUTHORIZED BY ROMTEC.	SALES REP: ROMTEC CUSTOMER:	DATE: 5/27/13 DESIGN: KAS DRAWN: KAS CHK'D: HP APPR'D:	REV. 0 SIZE C SHEET 7 OF 9	PROJECT NAME: BAE ACETIC ACID PLANT FILE NO: CONFIG NO: ADDR NO: PROJECT NUMBER DRAWING NUMBER CS-104825
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ROMTEC UTILITIES, INC. ROSEBURG, OREGON  
 PHONE: 541-496-9678  
 FAX: 541-496-0804

CONTROL COMPARTMENT

CONTROL COMPARTMENT

Siemens Energy  
6ES7 321-1BH02-0AA0  
RACK 1  
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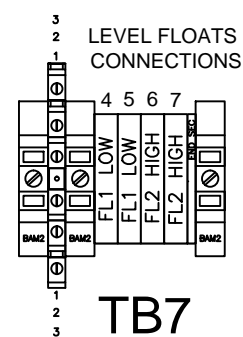
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SALES REP: ROMTEC	DATE 5/27/13	REV. 0	PROJECT NAME: BAE ACETIC ACID PLANT
CUSTOMER: KAS	DESIGN KAS	FILE NO. 	
PHONE: 541-496-9678 FAX: 541-496-0804	DRAWN KAS	CONFIG NO. 	
ROMTEC UTILITIES, INC.	CHK'D 	ADDER NO. 	
ROMTEC UTILITIES, INC. ROSEBURG, OREGON	APPR'D 	PROJECT NUMBER 	
	SHEET 8 OF 9	DRAWING NUMBER CS-104825	



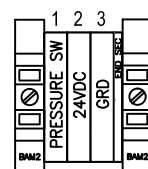
# CONTROL PANEL TERMINAL BLOCK CONNECTIONS

LEVEL  
TRANSDUCER  
CONNECTION

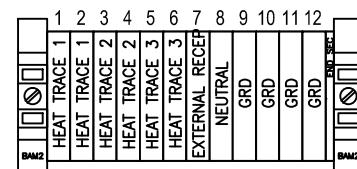


TB7

FIELD DEVICE CONNECTIONS

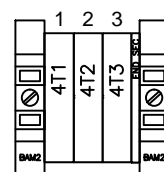


TB6



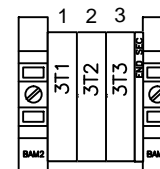
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PUMP 4  
CONNECTIONS

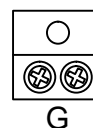


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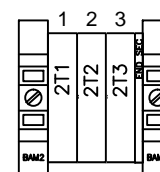
PUMP 3  
CONNECTIONS



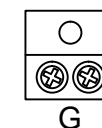
TB3



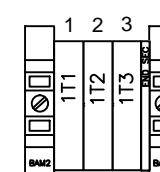
PUMP 2  
CONNECTIONS



TB2

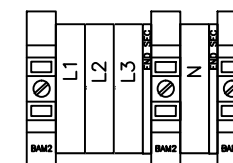


PUMP 1  
CONNECTIONS

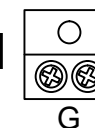


TB1

MAIN POWER CONNECTIONS



DTB1



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	CUSTOMER: KAS	DESIGN: KAS	0	FILE NO:
	PHONE: 541-496-9678	DRAWN: KAS	HP	CONFIG NO:
	FAX: 541-496-0804	CHK'D:	7.5	ADDR NO:
ROMTEC UTILITIES, INC.		APPR'D:	SIZE	PROJECT NUMBER
ROMTEC UTILITIES, INC. ROSEBURG, OREGON		SHEET 9 OF 9	C	DRAWING NUMBER CS-104825

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## Custom Panel "As Built" Product Structure

<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

### Component Description

<u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>ENC,ARC ARMOR,AA603620,SS,BASE MNT</u> ENC	1029477	1	HOFFMAN	819SZ
<u>INNER DR, ARC ARMOR SIZE 1, CONTROL</u> IN DR	1030394	1		
<u>BCK PNL, ARC ARMOR SIZE 1, CONTROL</u> BP	1030395	1		
<u>BCK PNL, ARC ARMOR SIZE 1, MCC</u> BP	1030396	1		
<u>BCK PNL, ARC ARMOR SIZE 1, SERVICE</u> BP	1030397	1		
<u>ALMN, .125x48x96 PVC B/S 3003-H14</u> IS BARRIER	1027169	200	Ryerson	54288958
<u>ENCL, INTERLOCK ELEC, 460V HOFF</u> INTERLOCK	1030200	1	HOFFMAN	AEK460
<u>LGT, LED, VOLTAGE WARNING</u> PWR IND	1030206	1	GRACE ENG. PRO	R-3W
<u>LGT, LED, VOLTAGE WARNING</u> PWR IND	1030206	1	MARSH / BELLOFRAM	UPA100
<u>LBL, VOLTAGE WARNING</u> PWR IND LBL	1030208	1	GRACE ENG. PRO	R-3W-L
<u>LBL, VOLTAGE WARNING</u> PWR IND LBL	1030208	1	MARSH / BELLOFRAM	UPA-WP-100
<u>ENCL, KIT, DOOR STOP LRG ENCL HOFF</u> DR STOP	6002019	2	HOFFMAN	ALGDSTOP2
<u>FAN, 6 INCH SS SHROUD KIT HOFF</u> FAN	1023190	1	HOFFMAN	T6S3RSS
<u>FAN, AXIAL, 120V 120MM 117CFM</u> FAN	1021631	2	SUNON	SP100A-1123XBT.GN
<u>FAN, FINGER GUARD, 120MM</u> FAN	1021632	2	QUALTEK	CR210-ND
<u>FAN, GUARD/FILTER, 120MM</u> FAN	1021633	2	QUALTEK	CR216-ND
<u>FAN, FILTER, REPLACEMENT (5/PKG)</u> FAN	1021635	2	QUALTEK	CR217-ND
<u>CORDGRIP,10SPACE,ROXTEC</u> CORD GRIP	1030386	1	ROXTEC	EZ00000001010
<u>BLOCK,DIST,2POLE,SQD</u>	1030067	2	SQUARE D	9080LBA261104

<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

**Component Description**

<u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>POWER BLOCK,3 POLE,115A/90A,SQD</u> MINI DIST BLOCK	1027469	2	SQUARE D	9080LBA361104
<u>POWER BLOCK,3 POLE,175A/135A,SQD</u> DIST BLOCK	1027472	1	SQUARE D	9080LBA362106
<u>POWER BLOCK,3 POLE,175A/135A,SQD</u> DIST BLOCK	1027470	1	SQUARE D	9080LBA362101
<u>DIST. BLOCK,175A/135A,600VAC,1-POLE</u> NEUT BLOCK	1028518	1	SQUARE D	9080LBA162101
<u>LUG, GND, 2/0 ALUM</u> GND	1030204	5	ILSCO	AU-2/0
<u>GND,BAR,7 CKT</u> GND BAR	1015106	1	SQUARE D	PK7GTA
<u>BKR,3P,HDL 600V 90A SQD</u> CB1	1027982	1	SQUARE D	HDL36090
<u>BKR,600V,30A SQD</u> CB5-8	1025594	4	SQUARE D	HJL36030M71
<u>BKR,1P,QOU 240V 40A SQD</u> CB10	1009580	1	SQUARE D	QOU140
<u>BKR,3P,MINI 480V 15A SQD UL489</u>	1030403	1	SQUARE D	MGN61331
<u>HANDLE, ASSY. 3INCH,SQD</u> CB1	1027484	1	SQUARE D	9421LH3
<u>DISC,SHAFT 8INCH</u> CB1	1027493	1	SQUARE D	9421LS8
<u>DISC,250A,MECH.,SQD</u> CB1	1027486	1	SQUARE D	9421LJ7
<u>BKR,1P,120V,2A,MG</u> CB12, 20	1034112	2	SQUARE D	60103
<u>BKR,1P,120V,4A,MG</u> CB21	1032813	1	SQUARE D	60105
<u>BKR,1P,120V 5A</u> CB11, 13	1032140	2	SQUARE D	60106
<u>BKR,1P,120V 10A MG</u> CB14	1030217	1	SQUARE D	60110
<u>BKR,1P,120V,15A,MG</u> CB15, 16-19	1030942	5	SQUARE D	60112
<u>BKR, 2P, MINI 480V 2A SQD UL489</u> CB3	1024122	1	SQUARE D	MGN61313
<u>BKR,2P,MINI 480V 20A</u> CB9	1032139	1	SQUARE D	MGN61321
<u>BKR,3P,MINI 480V 1A SQD UL489</u> CB4	1024120	1	SQUARE D	MGN61323



<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

**Component Description**

<u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>PADLOCK,HD,FOR C60N,LOCK OFF ONLY</u> CB LOCK	1038290	3	SQUARE D	M9PAF
<u>MULTI9,120/240VAC,GND,FLT,MOD,2P,SQD</u>	1038605	3	SQUARE D	60949
<u>STARTER,SOFT START/STOP,16A,200-460V AB</u> SF1-3	1038292	3	ALLEN BRADLEY	150-C16NBD
<u>SOFTSTART,#150-C9NBD AB</u> SF4	1034843	1	ALLEN BRADLEY	150-C9NBD
<u>CURRENT,SENS,LOOP,4-20mA TRANSMITTER II</u> CT	1038299	3	INGRAM PRODUCTS	FCS521-SP-420E
<u>XFMR,DRY,5kVA,240/480VP,120/240VS</u> T1	1035484	1	SQUARE D	5S1FSS
<u>HLDR, FUSE, 1 POS CLASS CC W/IND</u> FU1-8	1031447	8	SQUARE D	DFCC1V
<u>FUSE,600V,0.5A,TIME DELAY FERRAZ SHAWMUT</u> FU2-5	1038293	4	FERRAZ SHAWMUT	ATMR1/2
<u>2 AMP TIME DELAY FUSE</u> FU6-8	1027722	3	FERRAZ SHAWMUT	ATMR02
<u>FUSE,600V,5A,TIME DELAY SHAWMUT</u> FU1	1034735	1	FERRAZ SHAWMUT	ATMR05
<u>SWITCH 30MM PLASTIC 3POS. SQUARE D</u> HOA1-4	1027417	4	SQUARE D	9001SKS43B
<u>SW,CONTACT BLOCK,30MM NO/NC</u> HOA1-4	6001849	8	SQUARE D	9001KA1
<u>PB,ILLU,RED,MUSH,MAINT,600V,30MM SQD</u> E-STOP	1038294	1	SQUARE D	9001SKR9P1RH13
<u>SW,PUSH,30MM,BLACK SQD</u> PB1	1034833	1	SQUARE D	9001SKR1B
<u>CONTACT BLOCK,N.O.,30MM,10A,600V</u> PB1	1027394	1	SQUARE D	9001KA2
<u>LIGHT, PTT, LED, TRANS, RED, SQD</u> PL5	1035196	1	SQUARE D	9001SKT1LR
<u>LENS RED 30MM SQUIRE D</u> PL5	1027411	1	SQUARE D	9001R31
<u>LGT,30MM,24V,LED,PTT,GRN SQD</u> PL1-4	1037655	4	SQUARE D	9001SKT35LG
<u>LENS GREEN SQUARE D</u> PL1-4	1027392	4	SQUARE D	9001G31
<u>SKT,CIRCULAR,8 PIN</u> TD1-3	1003062	3	IDEC	SR2P-06
<u>IDEC TIMER</u> TD1-3	1027953	3	IDEC	GT3A-3AF20

<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

**Component Description**

<u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>RELAY 120V TESYS</u> CR1-3	1028816	3	TELEMECANIQUE	RXM4AB1F7
<u>RELAY HOLD-DOWN CLIP</u> CR1-3	1028817	3	TELEMECANIQUE	RXZ400
<u>RELAY BASE TESYS</u> CR1-3	1028815	3	TELEMECANIQUE	RXZE2M114M
<u>RELAY W/BASE,1PDT,120V SQD</u> CR15-17	1032613	3	SQUARE D	RSL1PVFU
<u>RELAY W/BASE,PIN,1PDT,24VAC/DC</u> CR4-14	1031573	11	TELEMECANIQUE	RSL1PVBU
<u>RSL RELAY BUSS BAR,SQD</u> RLY JMPR	1032614	2	SQUARE D	RSLZ2
<u>ISR BARRIER,120V,2 CHAN TURCK</u> ISR1	1038070	1	TURCK	IM1-22EX-R
<u>INTRINSIC BARR,1 CHAN,4-20mA MCR-EX-SL-RP</u> 1038295 ISB1	1038295	1	PHOENIX CONTACT	2865340
<u>RELAY,PHASE FAIL/O/U,190-480V 4</u> PM	6002284	1	SYMCOM	460
<u>ARREST,LGTNG,3PH SQD</u> LA	6000368	1	SQUARE D	SDSA3650
<u>ARREST,SURGE CAP,3PH 600V DELTA</u> SC	6000800	1	DELTA	CA603R
<u>PWR,SUPPLY,24VDC,72W,3A WEIDMULLER</u> PWR SUPPLY	1038414	1	WEIDMULLER	8951330000
<u>KTP600,BASIC COLOR DP,6",TFT,4:3 SIEMENS</u> PLC	1038415	1	SIEMENS	6AV66470AC113AX0
<u>CONTROLLER,CPU314C-2PN/PD 192KB,24DI16</u> 1038416 PLC	1038416	1	SIEMENS	6ES73146EH040AB0
<u>SIMATIC,S7-300,RAIL L=480MM SIEMENS</u> PLC	1038418	1	SIEMENS	6ES73901AE800AA0
<u>PWR,SUPPLY,PS307 24V/2A SIEMENS</u> PLC	1038419	1	SIEMENS	6ES73071BA010AA0
<u>S7,MICRO MEMERY CARD,64KB SIEMENS</u> PLC	1038420	1	SIEMENS	6ES79538LF200AA0
<u>MODULE,INPUT,S7300,16DI,24VDC,20PIN SIEME</u> 1038421 PLC	1038421	1	SIEMENS	6ES73211BH020AA0
<u>CONNECTOR,FRNT,SCREW,S7300,40PIN,32PT</u> 1038422 PLC	1038422	1	SIEMENS	6ES73921AM000AA0
<u>CONNECTOR,FRNT,SCREW,S7300,20PN,8/16PT</u> 1038423 PLC	1038423	1	SIEMENS	6ES73921AJ000AA0
<u>ETHERNET SWITCH,5-PORT WEIDMULLER</u> ETH SW	1038413	1	WEIDMULLER	8896940000

<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

**Component Description**

<u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>RECEPT,15A GFCI</u> GFI	1027353	2	LEVITON	7599I
<u>HTR,THRMST,100W 120V HOFF</u> HTR	1004419	1	HOFFMAN	DAH1001A
<u>PHANNENBERG THERMOSTAT</u> TH1	1027914	1	PFANNENBERG	17121000010
<u>HUB, ALUMINUM, 1/2", MYERS</u> ALM LT	1035830	1	MYERS	STA-1
<u>LGT, BEACON, 120VAC STROBE RED PIPE</u> ALM LT	1031934	1	FEDERAL	LP3P-120-R
<u>BLOCK,TERM,SQD</u> TB-WHT	1028802	12	SQUARE D	9080GR6
<u>BLOCK,TERM,END SQD</u> TB END	1028803	4	SQUARE D	9080GM6B
<u>BLOCK,TERM 600V TESYS</u> GND TB	1028822	8	TELEMECANIQUE	AB1TP435U
<u>TERM,BLK,3 TIER,22-12AWG,TELE</u> TB GRY	1031475	1	TELEMECANIQUE	AB1ET3235U
<u>LED,BAR,90-260VAC,13.82" HOFFMAN</u> LED LT BAR	1038297	2	HOFFMAN	LEDA1S35
<u>LEC,LGT,INPUT,CONN/CABLE ASSY HOFFMAN</u> LED LT BAR	1038298	2	HOFFMAN	LEDA20C
<u>PWR SUPPLY,UNINTERPT, 120/120 850VA</u> UPS	1017981	1	SOLA	SDU850
<u>RELAY OPTION CARD SOLA</u> UPS	1034001	1	SOLA	RELAYCARDSDU
<u>STICKER,WARNING YELLOW/BLK CWI APEX</u> WRNG LBL	1033864	3	Apex Packaging Suppli	4-A-3212
<u>STICKER,WHT/BLK COPPER WIRE ONLY CW</u> CPPR LBL	1033865	1	Apex Packaging Suppli	6-A-5278
<u>LBL,ULC,698A</u> UL LBL	1028503	1		
<u>LBL, UL 698 FILE#E189980</u> UL FILE	1028758	1	D-LUX SCREEN PRIN	1-080321
<u>LBL, CSI, ARC ARMOR</u> ARC ARM LBL	1030163	2	METALLICS INC.	1030163
<u>LBL, CSI, ARC FLASH</u> ARC FLSH LBL	1030154	1	PANDUIT	PVS0305W2102Y
<u>LBL, RH, INTERLOCK WRNG, ECOSMART</u> INTLCK LBL	1033548	1		
<u>LIT, SCHEM, MATCHES PANEL #</u> SCHEM	1028516	0	CSI	PRODUCT SCHEMATIC

<u>Shop Order</u>	<u>Part Number</u>	<u>Description</u>	<u>Date Complete</u>
400696	CS-104825	BAE ACETIC ACID PLANT - QUADPLEX PA	10/11/2013

<u>Component Description</u> <u>Where Used</u>	<u>CSI Part Number</u>	<u>Qty</u>	<u>Manufacturer</u>	<u>Manufacturer Part Number</u>
<u>CLOSE NIPPLE,2"WX3"L</u>	1031082	1	NEER	NGA09030
<u>CONDUIT BUSHING 2" PLASTIC</u>	1031083	2	NEER	NERPB600
<u>ANTENA,BRACKET,ARC-ARMOR</u>	1031802	1	SCHOONOVER IND.	CSI-1012
<u>QUART,TURN,LATCH,HOUSING,ASSY.</u>	1030445	2	EMKA Inc.	1000-U675
<u>QUART,TURN,LATCH,CAM</u>	1030446	2	EMKA Inc.	1000-386-18
<u>QUART,TURN,LATCH,ASSY,CHARGE</u>	1030447	2	EMKA Inc.	1000-991
<u>QUART,TURN,LATCH,WING KNOB,INSERT</u>	1030448	2	EMKA Inc.	1000-U711
<u>EXTERNAL PUSH BUTTON NC</u>	1027811	2	EATON	CHZ8411K7
<u>GROUND LUG, ILSCO</u>	1028348	1	ILSCO	TA2
<u>BLOCK, TERM, 1POS AB1 GREY</u>	1027608	87	TELEMECANIQUE	AB1VV435U
<u>BLOCK, TERM, AB1, END BAR GREY</u>	1027603	13	TELEMECANIQUE	AB1AC24
<u>STRIP, TERM, AB1</u>	1027604	9	TELEMECANIQUE	AB1BV6



## Arc Armor® Enclosure – 3 Compartment Enclosures



### Arc Armor® Enclosure

#### Specifications

- 14 gauge Type 304 stainless steel bodies
- 16 gauge Type 304 stainless steel doors
- Individual seams continuously welded and ground smooth
- Compartments sealed via paintable sealant for environmental protection
- Louvered floor stand in 14 gauge Type 304 stainless steel
- Reinforced lifting eyes
- Type 4-rated gasket
- 90-degree external formed flange on top of body opening
- Epoxy Coated Zinc POWERGLIDE Handle and 3-point latching
- Door removed by pulling stainless steel continuous hinge pin
- Data pocket is high-impact thermoplastic
- Collar studs provided for mounting optional panels

#### Finish

Enclosures have white polyester powder paint finish inside and out.

#### Ratings

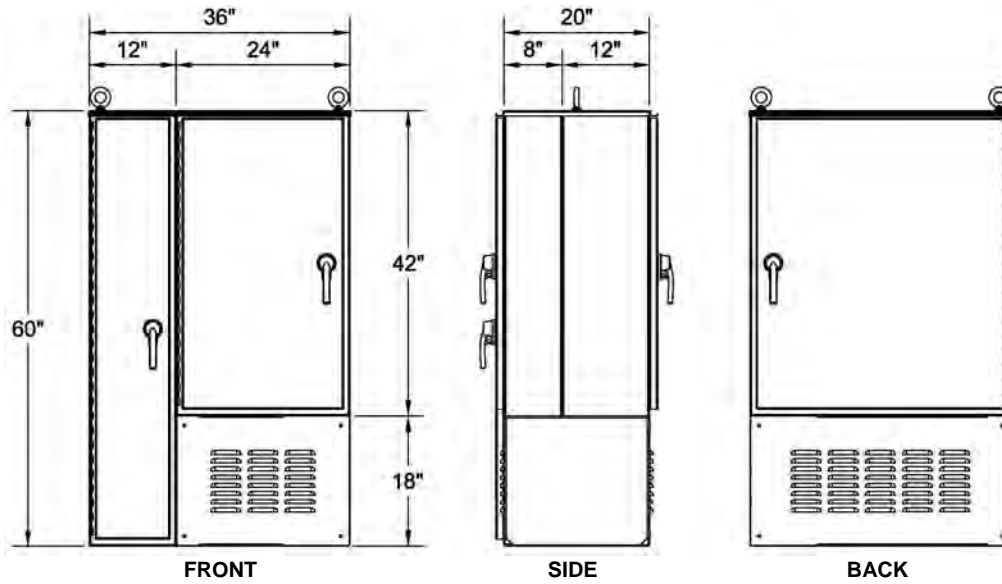
UL 508A Listed; Type 3R, 4, 4X, 12; File No.E61997  
 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12;  
 File No. E61997

Control Cabinet Section meet:  
 NEMA/EEMAC Type 3R, 4, 4X, 12, 13  
 Meets NEMA Type 3RX requirements

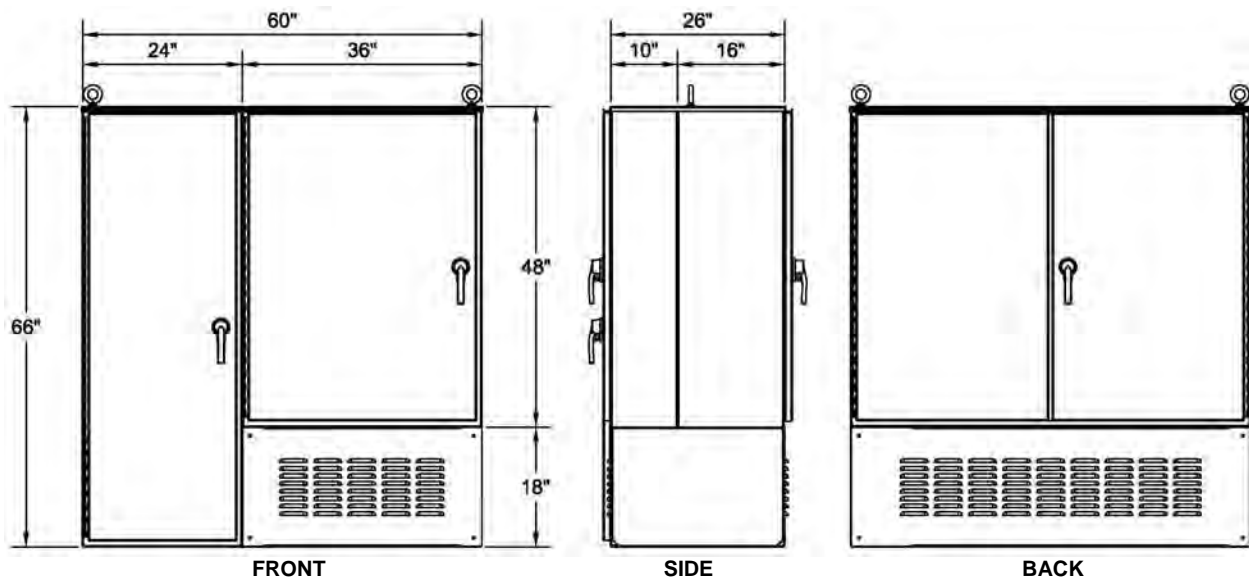
Power and MCC Sections meet:  
 NEMA/EEMAC Type 3R  
 Meets NEMA Type 3RX requirements

Part Number	Size	AxBxC (in.)	AxBxC (mm)	Stainless Steel Type	Latch Type
1029477	Size 1	60 x 36 x 20	1,524 x 914 x 508	304	3-Point Latch
1030423	Size 2	66 x 60 x 26	1,676 x 1,524 x 660	304	3-Point Latch

### Arc Armor® Enclosure – 3 Compartment Enclosures



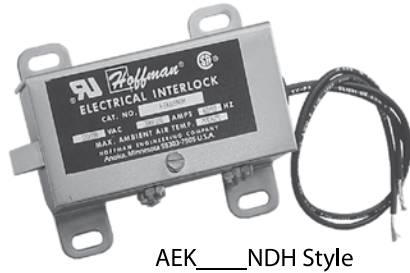
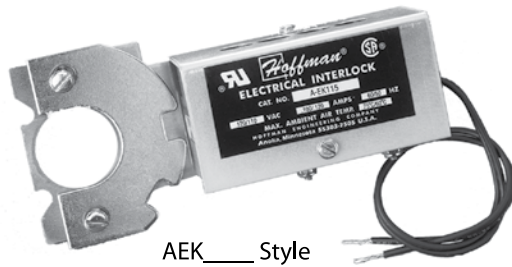
**Size 1 Arc Armor® - #1029477**



**Size 2 Arc Armor® - #1030423**

## Electrical Interlocks

### Electrical Interlocks



The interlocks will fit the following enclosures, but modifications are required. Consult the factory for more information.

1. Two-door Type 12 enclosures for flange-mounted disconnects
2. Heavy duty free-standing Type 12 enclosures for flange-mounted disconnects
3. Modular Type 12 enclosures for flange-mounted disconnects
4. Multi-door Type 12 enclosures

The interlocks will also fit most Hoffman custom enclosures with door latching mechanisms similar to the mechanisms used on the preceding enclosures. Electrical interlocks will not fit CONCEPT® enclosures or Bulletin A25 and A26 enclosures. Interlocks are not designed to be used in place of the standard door or cover latch.

Catalog numbers AEK115NDH, AEK230NDH and AEK460NDH are designed to be used on some Hoffman enclosures and boxes which have exterior latching only. When energized, these interlocks will prevent the enclosure door from being opened. They fit on the door or cover of the following enclosures and maintain UL Type 4, 4X and 12 when properly installed per Hoffman instructions:

1. One-door Type 4 and 4X enclosures
2. Two-door Type 4 and 4X enclosures
3. One-door Type 12 enclosures
4. Larger sizes of CH, CHS, CHNF, CHNFSS and CHAL junction boxes
5. Type 1 and large Type 1 enclosures

The interlocks also fit in most Hoffman custom enclosures and boxes which have doors or covers hinged similar to doors or covers on the preceding enclosures.

### Industry Standards

UL 508A Component Recognized; File No. E61997

CSA Certified; File No. 42186

### Application

Provide positive internal safety lockout on electrical enclosures while the equipment is energized. Catalog numbers AEK115, AEK230 and AEK460 are used with standard Hoffman door latching mechanisms. When energized, these interlocks prevent the door handle from being turned to open the door. Fit either clockwise or counterclockwise handles in the following enclosures:

1. All two-door Type 4 and 12 enclosures
2. All Type 4X with 3-point latch enclosures
3. Free-standing Type 12 enclosures
4. All one-door Type 12 enclosures with latch kits installed

### Installation

AEK115, AEK230 and AEK460 mount on the inside of the enclosure door using the same screws which hold the door handle in place. The strike plate attaches to the existing latch assembly.

### Specifications

- Rugged steel construction and plated finish
- Solenoids are rated for continuous duty and will stand up under heavy industrial use
- Packaged complete with a solenoid assembly, strike plate or bracket and instructions for field installation
- Handles and latch mechanisms are not included.

Bulletin: A80

### Standard Product A-EK\_\_\_ Style

Catalog Number	Volts @ 50/60 Hz	Normal/Inrush Amps @ 60Hz	Normal/Inrush Amps @ 50Hz
AEK115	110/120	.100/.63	.120/.69
AEK230	220/240	.050/.32	.060/.35
AEK460	440/480	.025/.16	.030/.18

### Standard Product AEK\_\_\_NDH Style

Catalog Number	Volts @ 50/60Hz	Normal/Inrush Amps @ 60Hz	Normal/Inrush Amps @ 50Hz
AEK115NDH	110/120	.100/.63	.120/.69
AEK230NDH	220/240	.050/.32	.060/.35
AEK460NDH	440/480	.025/.16	.030/.18



Catalog Numbers  
**R-3W / R-3W-SR**

# Thru-Door Voltage Indicator

## Flashing and Non-Flashing

### Product Data Sheet

VoltageVision® thru-door power warning alerts provide electrical safety information while the panel doors are safely closed. This “one-size-fits-all” solution detects 3-phase AC or DC voltage from 40-750VAC/30-1000VDC. The encapsulated construction and redundant circuit design means rugged reliability. VoltageVision® products are available with flashing LEDs (R-3W) and non-flashing LEDs (R-3W-SR).

#### Safer Lock-Out Tag-Out (LOTO)

Keeping personnel away from live voltage is foundational to electrical safety. Electrical safety demands a precise answer to the question 'Is voltage present?'. Thru-door voltage indicators provide visibility of voltage from outside the enclosure without exposing personnel to voltage.

#### More Productivity in Mechanical LOTO

Workers performing mechanical LOTO must isolate electrical energy. An externally-mounted voltage detector provides a means to check voltage inside an electrical panel. Without a voltage indicator, a mechanic performing mechanical LOTO would be required to work in tandem with an electrician using a voltmeter to physically verify voltage inside an electrical panel. In this case, the electrician is exposed to voltage. With thru-door voltage detectors, the mechanic can verify zero electrical energy without any exposure to voltage.

#### Reduced Voltage Exposure and Arc Flash Risk

Voltage is the common denominator in an electrical accident or an arc flash; no voltage means no accident, no arc flash. While performing electrical LOTO with a thru-door voltage detector installed, the electrician can pre-check the internal voltage state without opening the enclosure. Next, the electrician should replicate a zero voltage reading with his voltmeter as per NFPA 70e 120.1(5). This low-cost, redundant voltage-verification task reduces arc flash risk and increases electrical safety for workers.

Disclaimer: Voltage indicators are a supplement, not a substitute, for establishing electrically safe work conditions when working on potentially live electrical conductors as per NFPA 70E 120.1(1) to (6). Employers must also provide written LOTO procedures and the corresponding training that properly incorporates voltage detectors into their safety programs [NFPA 70E 120.2(C)(2) and 110.6(D)(4)(e)].

## Power Warning Alert

### with Solid-on LEDs or Flashing LEDs

#### FEATURES:

- Redundant Circuitry / Long Life LED's
- 40-750VAC / 30-1000VDC / 35-600VAC 1Ø
- Potted Construction with 6' Leads
- Phase Insensitive
- 30mm Pushbutton or Pilot Hole
- High Surge Immunity
- UL Listed, Type 4X, 12, 13



#### APPLICATIONS:

- Circuit Breaker Disconnects - No Visible Blades
- High Energy Panels (NFPA 70E Category 3 or 4)
- Frequently Accessed Panels
- Mechanical LOTO: Indicating Zero Energy
- Panels with Multiple Power Sources

Three Phase 40-750VAC/30-1000VDC UL-Listed Voltage Indicator for Type 4X/12/13 for 30mm Mounting

<b>R-3W</b>	Flashing
<b>R-3W-KB<sup>1</sup></b>	Flush Mount Assembly with Bezel and R-3W (UL)
<b>R-3W-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W)
<b>R-3W-KB-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W-KB)

<b>R-3W-SR<sup>2</sup></b>	Non-Flashing
<b>R-3W-SR-KB<sup>1</sup></b>	Flush Mount Assembly with Bezel and R-3W-SR (UL)
<b>R-3W-SR-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W-SR)
<b>R-3W-KB-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W-SR-KB)

<b>R-3W2<sup>3</sup></b>	Hazardous Location Flashing Voltage Indicator (Suitable for use in Class 1, Division 2 (Zone 2), Groups A, B, C, D hazardous Location, or Non-Hazardous Locations Only)
<b>R-3W2-KB<sup>1</sup></b>	Flush Mount Assembly with Bezel and R-3W2 (UL)
<b>R-3W-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W2)
<b>R-3W-KB-L</b>	Adhesive-Backed Warning Label (slips over installed R-3W2-KB)

(1) Must be purchased as an assembly for UL Listing

(2) For the R-3W-SR, the LED appearance for differing voltages as follows: 32-159V(FLASH); 160-329V(SHIMMER); 330V+(SOLID)).

(3) See R-3W2 datasheet for specifications and UL information



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5001 Tremont Avenue  
Davenport, IA 52807  
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[www.Graceport.com](http://www.Graceport.com)



The UPA-100 Power Alert **reduces the risk of electrical arc flash** by pre-verifying the electrical isolation from outside of a control panel. Hardwired to the circuit breaker or main disconnect, the UPA flashes whenever voltage is present. Engineered with **redundant circuitry**, the Power Alert is powered by the same voltage that it indicates.

**OPERATION**

The eight detector UPA-100 visually alerts to the presence of dangerous AC or DC (Stored Energy) potentials occurring between any combination of the four monitored input lines (L1, L2, L3, GND). Two LED indicators are assigned to each input line and are designated "+" and "-". For each input line carrying an AC potential (bi-polar), both the "+" and "-" LEDs will be active. A DC or Stored Energy potential will illuminate the "+" LED for the positive line and the "-" LED for the negative line.

OSHA 1910.147 THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe. (d)(5)(ii)

If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists. (d)(6)

"Verification of Isolation." Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.

**SPECIFICATIONS**

OPERATIONAL RANGE	AC Single or 3-Phase	40 to 750 VAC, 50/60/400 Hz, (LINE-TO-LINE or LINE-TO-GND)
	DC or Stored Energy	30 to 1000 VDC, (LINE-TO-LINE or LINE-TO-GND)
MAXIMUM RATED VOLTAGE	750 VAC/1000 VDC (LINE-TO-LINE or LINE-TO-GND)	
DETECTION THRESHOLDS	29 VAC 3-Phase, 40 VAC SINGLE-Phase, 27 VDC (TYP Cutoff)	
POWER CONSUMPTION	1.2 Watts @ 750 VAC (Approximately)	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	NEMA 4X 105°C PVC, Totally Encapsulated for Environment Protection	
TERMINATIONS	(4) 8ft, 18 AWG 1000V, UL-1452	
WEIGHT	9 oz.	

INDICATOR FLASH RATES (L1, L2, L3, GND)

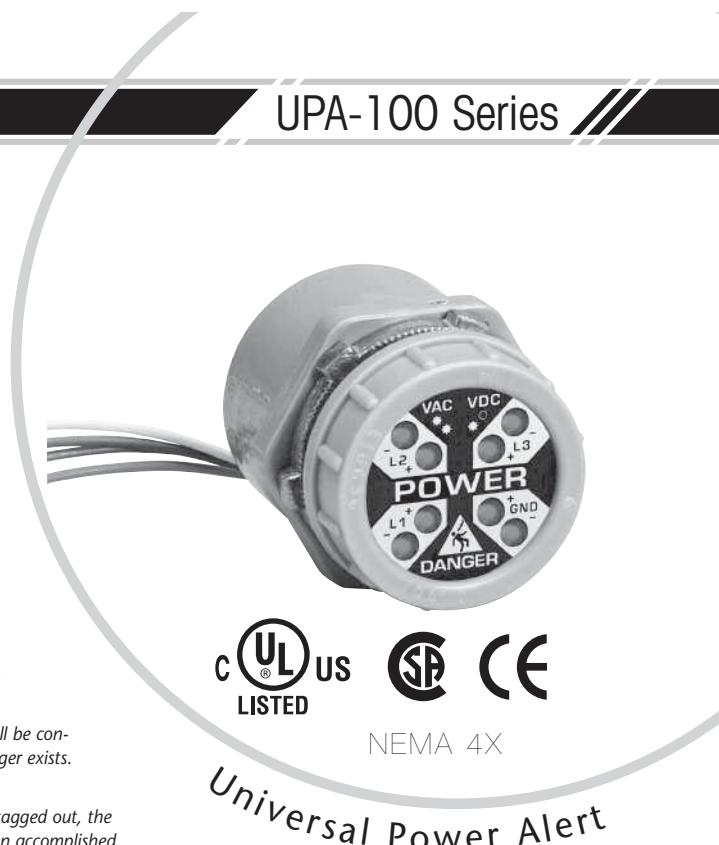
3- Phase Line-To-Line (VAC)	<29	30	120	240	480	600	750
Flashes/Sec (Typical)	0	1.3	4.2	5.8	7.3	8.0	8.8
DC or Stored Energy (VDC)	<27	30	48	110	300	600	1000
Flashes/Sec (Typical)	0	1.6	2.5	4.5	6.9	8.8	9.1

GND DETECTOR THRESHOLDS (LEAKAGE ANY PHASE-TO-GROUND)

3- Phase Line-To-Line (VAC)	30	120	240	480	750
L1, L2, or L3 To Ground Continuity (OHMS)	2M	2M	3M	5M	7M
Detector Included Fault Current (µA)	7	26	38	60	67

DETECTOR INCLUDED FAULT CURRENT (PHASE-TO-GROUND SHORT)

3- Phase Line-To-Line (VAC)	30	120	240	480	750
0 OHM Phase-To-Ground Current (µA)	28	108	219	455	730



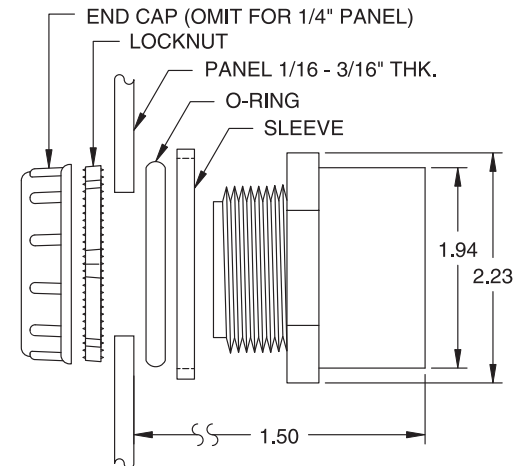
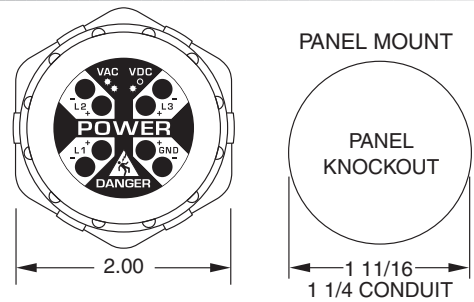
UL LISTED CSA CE NEMA 4X  
Universal Power Alert

- Detects Single or 3-Phase AC & DC Voltage or Stored Energy
- Redundant Circuitry
- Verification of Zero Energy in a Panel
- Fits 1-1/4" Conduit Knock-Out

**ORDERING INFORMATION**

MODEL NUMBER	DESCRIPTION
UPA-100	Universal Power Alert

**DIMENSIONS (INCHES)**



INSTALLATION: INSIDE PANEL SURFACE MUST BE UNIFORM. TIGHTEN LOCKNUT UNTIL SLEEVE BOTTOMS-OUT.

## Door Stop Kit



## Door Stops

Designed for use on most standard Hoffman Type 4 and 12 enclosures to secure the door in the open position. Enclosures must have a "B" dimension of 16.00 in. (406 mm) or more and a door which opens horizontally. Door Stop Kit can be mounted at the top or bottom of the door opening after drilling two small holes in the body of the enclosure and two small holes in the door. The angle of the door is easily adjusted by means of a wingnut, and the stop arm slides neatly out of the way when the door is closed. All parts are plated. Maintains UL/CSA Type 4 and Type 12 if properly installed in a Hoffman enclosure. Door Stop Kit is not intended for use on CONCEPT® window door enclosures, or enclosures configured with a swing-out panel or swing-out rack frame.

Bulletin: A80

Catalog Number	Description
ADSTOPK	Door Stop Kit

## Type 316 Stainless Steel Door Stop Kit



### Application

Type 316 stainless steel door stop kit is available for use in applications that require the kind of corrosion protection that only Type 316 stainless steel can provide. Typical applications include water treatment, pulp, paper, petroleum, chemical, food and pharmaceutical processing, and packaging. Kit includes all mounting hardware. Secures doors in the open position. Can be mounted at either top or bottom of door. Can be installed on either left- or right-hinged doors. Maintains an enclosure's Type 4X rating. Easy to install. Mounting hardware is Type 316 stainless steel.

*This door stop kit can only be mounted in wall-mount enclosures.*

### Features

- Can be mounted at either top or bottom of door
- Can be installed on either left- or right-hinged doors
- Maintains an enclosure's Type 4X rating
- Easy to install

### Specifications

- Kit, including mounting hardware, constructed of Type 316 stainless steel

Bulletin: A45Y

Catalog Number	Description
ADSTOPKSS6	Type 316 stainless steel door stop kit

## Large Enclosure Door Stop Kit

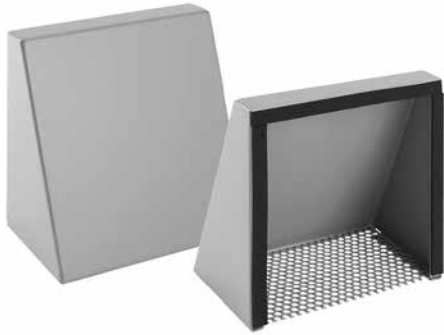


Designed for use with most standard, large mild and stainless steel enclosures to secure the door in the 90 degree open position. Door Stop Kit can be mounted at the top or bottom of the door opening after drilling two small holes in the door and enclosure. All parts are plated. Maintains UL/CSA Type 4 and Type 12 if properly installed in a Hoffman enclosure.

Bulletin: A34Y

Catalog Number	Description
ALGDSTOP2	Large Enclosure Door Stop Kit

## FAN SHROUD KIT, TYPE 3R



### INDUSTRY STANDARDS

Maintains UL/cUL Type 3R rating when properly installed on a UL/cUL Type 3R enclosure.

UL 508A Listed; Type 3R; File No. E61997  
 cUL Listed per CSA C22.2 No. 94; Type 3R; File No. E61997

NEMA/EEMAC Type 3R  
 IEC 60529, IP22

### APPLICATION

Fan Shroud Kits protect outdoor enclosure openings from rain, sleet and snow.

### FEATURES

- Two fan shrouds per package
- Perforated ventilation screen
- Pressure-sensitive adhesive-backed gasket and mounting hardware

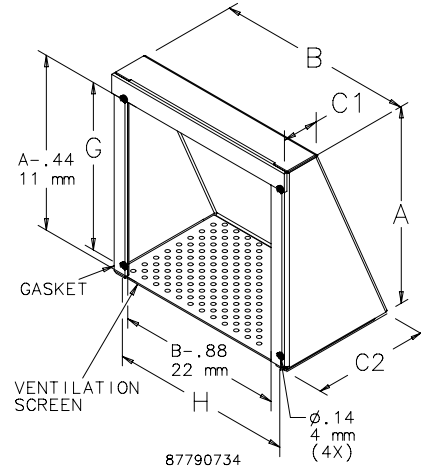
### SPECIFICATIONS

- 16 gauge mild steel or Type 304 stainless steel

### FINISH

ANSI 61 gray polyester powder coating over mild steel; smooth #4 brushed finish on stainless steel

BULLETIN: D85



### Standard Product

Catalog Number	Material	A (in.)	A (mm)	B (in.)	B (mm)	C1 (in.)	C1 (mm)	C2 (in.)	C2 (mm)	G (in.)	G (mm)	H (in.)	H (mm)
T4S3R	Steel	6.00	152	6.00	152	1.44	37	4.69	119	4.69	119	5.25	133
T6S3R	Steel	8.00	203	8.00	203	1.44	37	4.69	119	6.69	170	7.25	184
T10S3R	Steel	12.00	305	12.00	305	1.44	37	4.71	120	10.69	272	11.25	286
T4S3RSS	Stainless Steel	6.00	152	6.00	152	1.44	37	4.69	119	4.69	119	5.25	113
T6S3RSS	Stainless Steel	8.00	203	8.00	203	1.44	37	4.69	119	6.69	170	7.25	184
T10S3RSS	Stainless Steel	12.00	305	12.00	305	1.44	37	4.71	120	10.69	272	11.25	286

### Usage Chart

Catalog Number	Compact Cooling (muffin) Fans (4 in.)	Compact Cooling (muffin) Fans (6 in.)	Compact Cooling (muffin) Fans (10 in.)	Cooling and Exhaust Fan Packages (TFP4-)	Cooling and Exhaust Fan Packages (TFP6-)	Filter Fan Packages (SF05-)	Filter Fan Packages (SF09-)	Filter Fan Packages (SF10-)
T4S3R	•							
T6S3R	•	•				•		
T10S3R	•	•	•	•	•	•	•	•
T4S3RSS	•							
T6S3RSS	•	•				•		
T10S3RSS	•	•	•	•	•	•	•	•

# 120X120X38 mm

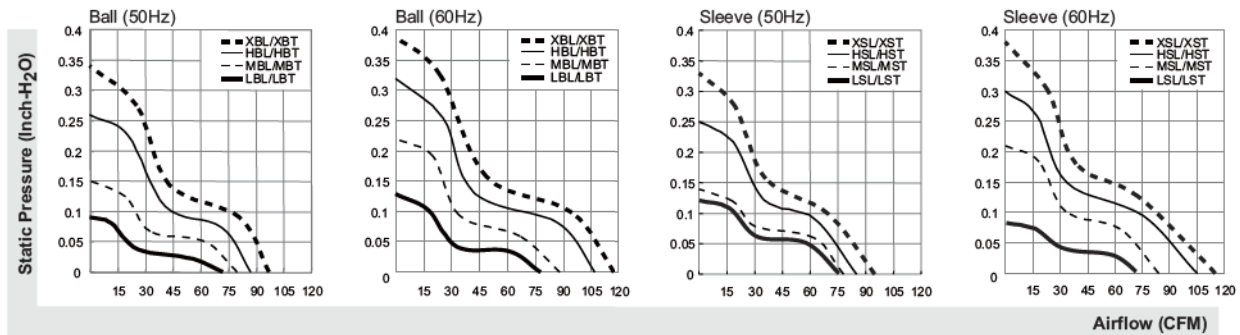
# SUNON

## 70-117 CFM

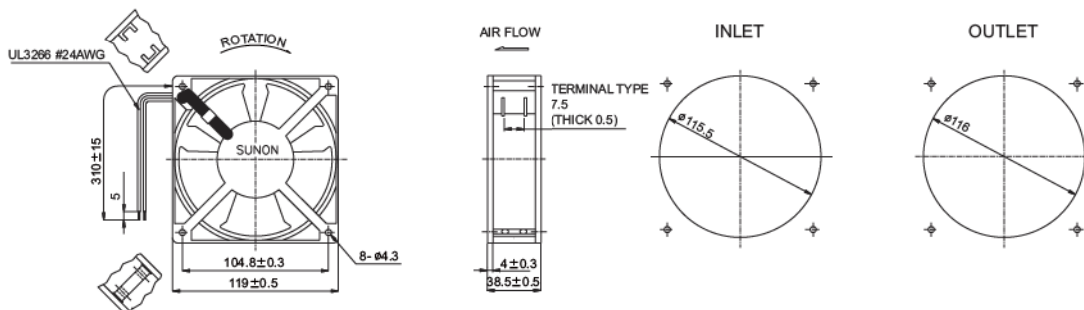


Model	P/N	Bearing	Rating Voltage (VAC)	Freq. (Hz)	Power Current (AMP)	Power Consumption (WATTS)	Speed (RPM)	Air Flow (CFM)	Static Pressure (Inch-H <sub>2</sub> O)	Noise (dBA)	Weight (g)
SP100A	1123XSL.GN	⊙	115	50/60	0.26/0.24	22/20	2700/3100	95/115	0.33/0.38	44/49	550
SP100A	1123XST.GN	⊙	115	50/60	0.26/0.24	22/20	2700/3100	95/115	0.33/0.38	44/49	550
SP101A	1123HSL.GN	⊙	115	50/60	0.21/0.18	20/18	2550/2900	85/105	0.25/0.30	43/48	550
SP101A	1123HST.GN	⊙	115	50/60	0.21/0.18	20/18	2550/2900	85/105	0.25/0.30	43/48	550
SP102A	1123MSL.GN	⊙	115	50/60	0.17/0.16	15/15	2400/2600	78/84	0.14/0.21	33/38	550
SP102A	1123MST.GN	⊙	115	50/60	0.17/0.16	15/15	2400/2600	78/84	0.14/0.21	33/38	550
SP103A	1123LSL.GN	⊙	115	50/60	0.13/0.11	11/11	2200/2000	76/70	0.12/0.08	38/36	550
SP103A	1123LST.GN	⊙	115	50/60	0.13/0.11	11/11	2200/2000	76/70	0.12/0.08	38/36	550
SP100A	1123YBL.GN	○	115	50/60	0.26/0.24	22/20	2850/3150	97/117	0.34/0.39	45/50	550
SP100A	1123XBT.GN	○	115	50/60	0.26/0.24	22/20	2850/3150	97/117	0.34/0.39	45/50	550
SP101A	1123HBL.GN	○	115	50/60	0.21/0.18	20/18	2750/3050	87/107	0.26/0.32	45/50	550
SP101A	1123HBT.GN	○	115	50/60	0.21/0.18	20/18	2750/3050	87/107	0.26/0.32	45/50	550
SP102A	1123MBL.GN	○	115	50/60	0.17/0.16	16/15	2500/2700	80/88	0.15/0.22	35/40	550
SP102A	1123MBT.GN	○	115	50/60	0.17/0.16	16/15	2500/2700	80/88	0.15/0.22	35/40	550
SP103A	1123LBL.GN	○	115	50/60	0.13/0.11	11/11	2150/2300	72/78	0.09/0.13	37/39	550
SP103A	1123LBT.GN	○	115	50/60	0.13/0.11	11/11	2150/2300	72/78	0.09/0.13	37/39	550

Frame : Aluminum alloy



UNITS:mm



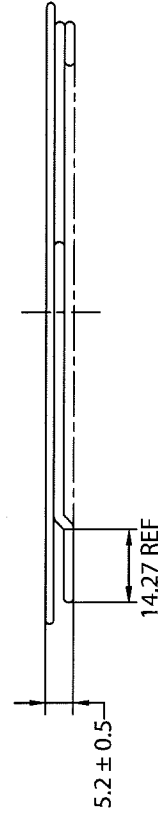
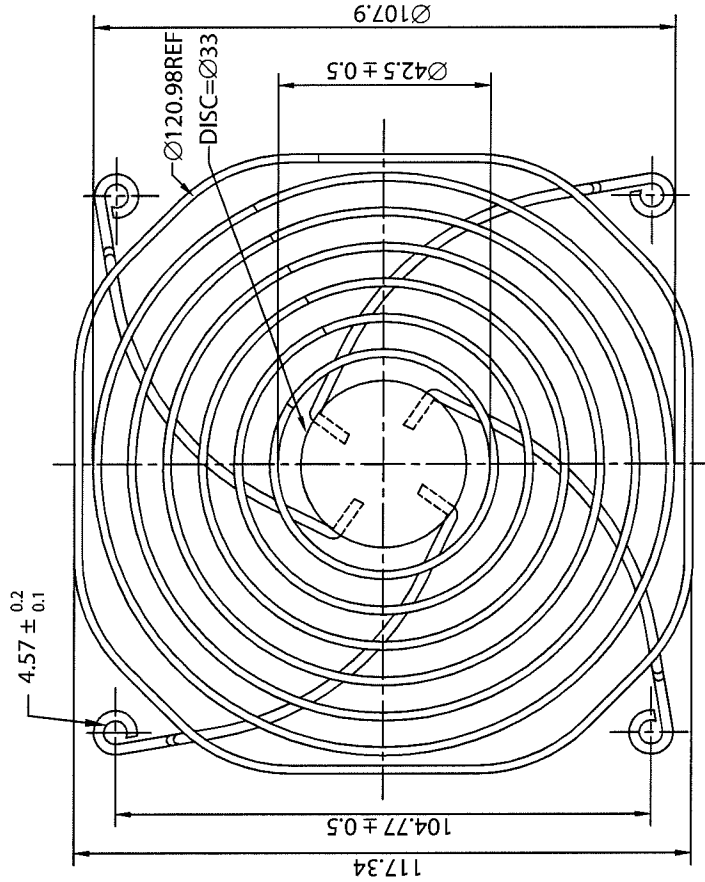
\*All model could be customized on voltage or any other requirements to fit your need.

\*Specifications subject to change without notice. Please Visit SUNON web site at <http://www.sunon.com> for update information.



THESE DRAWINGS ARE THE PROPERTY OF QUALTEK ELECTRONICS AND NOT TO BE REPRODUCED FOR OR COMMUNICATED TO A THIRD PARTY WITHOUT THE EXPRESS WRITTEN PERMISSION OF AN OFFICER OF QUALTEK ELECTRONICS.

REVISION		
REV.	DESCRIPTION	DATE
B	RoHS Compliancy	06-01-06
C	Updated Specifications	06-09-09
		APPROVED
		DP
		LY



NOTES:

1. MATERIAL: C1008 BRIGHT BASIC WIRE
2. FINISH: BRIGHT NICKEL CHROME PLATING
3. 0.35 ± 0.05 DEPTH OF SERRATIONS ON WIRE
4. RING: Ø1.6 ± 0.1mm  
RIB: Ø2.0 ± 0.1mm  
DISC: = Ø33 T=0.8mm
5. GENERAL TOLERANCE UNLESS NOTED IS ± 0.7mm
6. RoHS COMPLIANT

**CONTROLLED**

Qualtek Electronics Corp.  
FAN-S DIVISION

Part Number: 08141



Description: WIRE FORM FAN GUARD (120mm)

REV: C

UNIT: mm

Approved / Date

Checked / Date

JJH / 03-09-05

Drawn / Date

03-09-05

B.ZHANG  
03-09-05

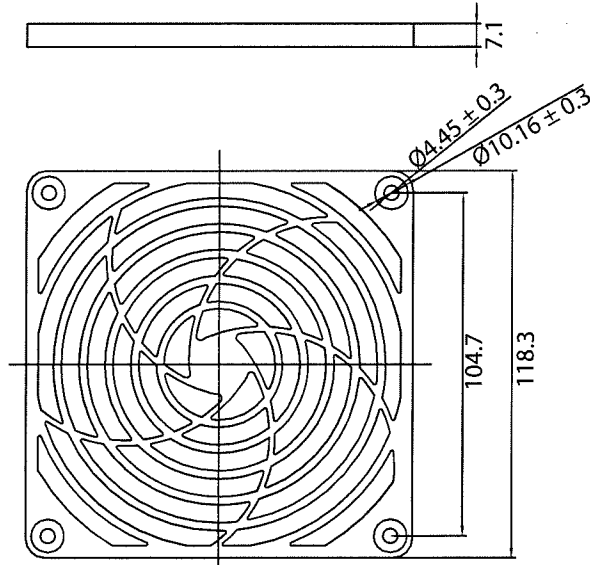
Dim range (mm)	Tolerance +/- (mm)
0-5	0.1
5-16	0.15
16-64	0.2
64-250	0.4
250-1000	0.5
1000-1500	1.0

THESE DRAWINGS ARE THE PROPERTY OF QUALTEK ELECTRONICS AND NOT TO BE REPRODUCED FOR OR COMMUNICATED TO A THIRD PARTY WITHOUT THE EXPRESS WRITTEN PERMISSION OF AN OFFICER OF QUALTEK ELECTRONICS.

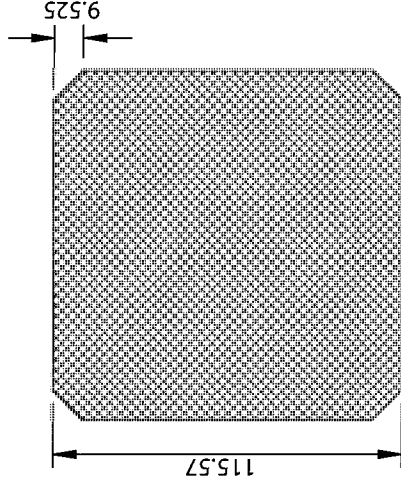
REVISION

REV.	DESCRIPTION	DATE	APPROVED
B	RoHS Compliance	06-01-06	DP
C	Updated Specifications	12-13-07	DP
D	Updated Notes	09-09-09	LY
E	Updated Graphics and Dimensions	05-21-10	LY

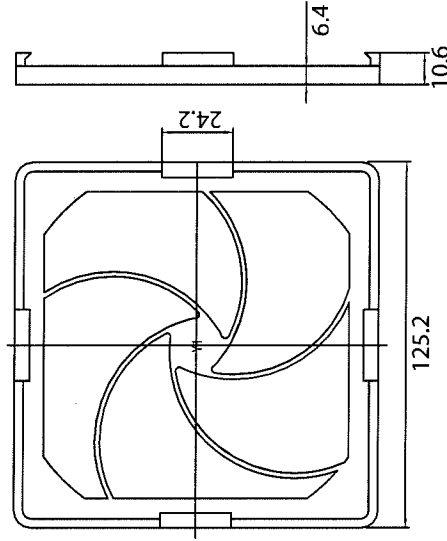
FAN GUARD



MEDIA



RETAINER

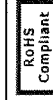


NOTES:

- MEDIA\* AVAILABLE IN:
- XX=30 PPI \*\*
- 45 PPI \*\*
- 60 PPI \*\*
- 100 PPI \*\*
- \* UL 900 CLASS II
- \*\* Pores Per Inch
- RoHS COMPLIANT

**CONTROLLED**

Qualtek Electronics Corp.  
FAN-5 DIVISION



Part Number: 09450-F/XX

Description: PLASTIC FAN FILTER ASSEMBLY

REV: E

UNIT: mm

Approved / Date

Checked / Date

B.ZHANG  
10-10-03

0.1

0.15

0.2

0.4

0.5

1.0

JJH / 10-10-03

10-10-03

10-10-03

10-10-03

10-10-03

10-10-03

10-10-03

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10-10-03

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10-10-03

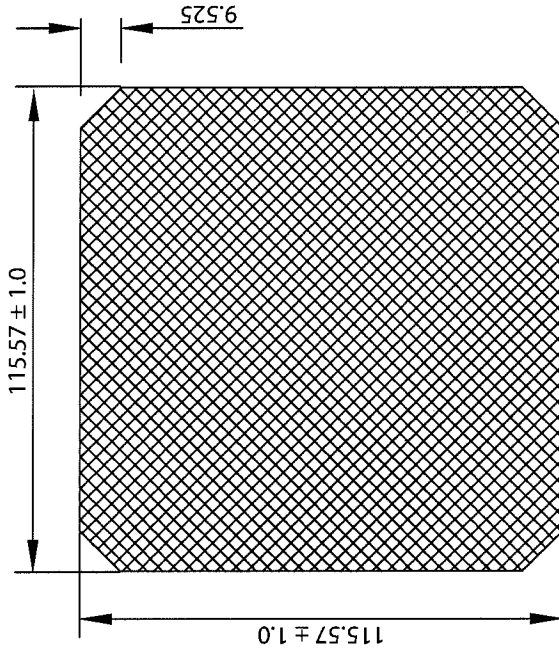
10-10-03

10-10-03

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REVISION

REV.	DESCRIPTION	DATE	APPROVED
B	RoHS Compliancy	06-01-06	DP



NOTES:

- MEDIA \*
- AVAILABLE IN:
- XX = 30 PPI \*\*
- 45 PPI \*\*
- 60 PPI \*\*
- 100 PPI \*\*
- \* UL 900 Class II
- \*\* PORES PER INCH
- RoHS COMPLIANT

**CONTROLLED**

Qualtek Electronics Corp.  
FAN-S DIVISION

Part Number: 09450-M/XX RoHS Compliant

Description: FAN FILTER MEDIA

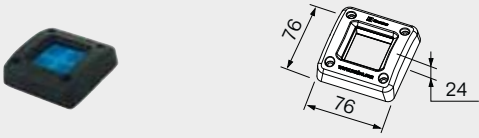
REV: B

UNIT: mm

Drawn / Date	Checked / Date	Approved / Date
B.ZHANG 03-11-03	03-11-03	JJH / 03-11-03

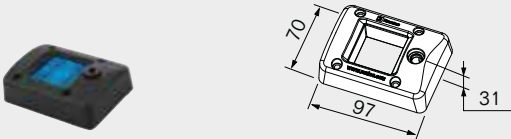
Dim range (mm)	Tolerance +/- (mm)
0-5	0.1
5-16	0.15
16-64	0.2
64-250	0.4
250-1000	0.5
1000-1500	1.0

# Roxtec EzEntry™



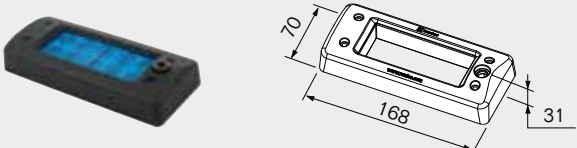
**UL/NEMA 12,13 and IP 55**

EzEntry 4 mini - Kit	Diameter range and number of cables/pipes		Weight		Art No.
	(kg)	(lb)			
	<b>0+3.5-10.5mm</b> <b>0+0.138-0.413"</b> <b>(GM 13.3w40)</b>	<b>0+3.5-16.5mm</b> <b>0+0.138-0.650"</b> <b>(GM 20w40)</b>			
EzEntry 4 mini/4	-	4 cables/pipes	0.100	0.220	EZ00000000440
EzEntry 4 mini/9	9 cables/pipes	-	0.100	0.220	EZ00000000490



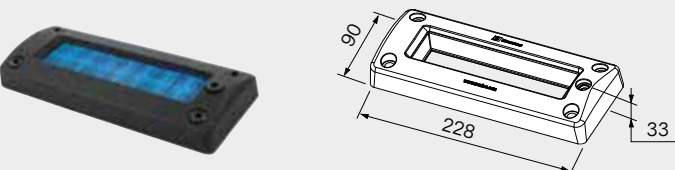
**UL/NEMA 4, 4x, 12, 13 and IP 66/67**

EzEntry 4 - Kit	Diameter range and number of cables/pipes		Weight		Art No.
	(kg)	(lb)			
	<b>0+3.5-16.5mm</b> <b>0+0.138-0.650"</b> <b>(EM 20w40)</b>				
EzEntry 4/4	4 cables/pipes		0.13	0.28	EZ00000000044



**Fits standard multipin connector knock-out.**  
**UL/NEMA 4, 4x, 12, 13 and IP 66/67**

EzEntry 10 - Kit	Diameter range and number of cables/pipes		Weight		Art No.
	(kg)	(lb)			
	<b>0+3.5-16.5mm</b> <b>0+0.138-0.650"</b> <b>(EM 20w40)</b>	<b>0+9.5-32.5mm</b> <b>0+0.374-1.280"</b> <b>(EM 40 10-32)</b>			
EzEntry 10/4	2 cables/pipes	2 cables/pipes	0.30	0.65	EZ00000001004
EzEntry 10/7	6 cables/pipes	1 cables/pipes	0.30	0.65	EZ00000001007
EzEntry 10/10	10 cables/pipes	-	0.30	0.65	EZ00000001010



**Fits FL 21 knock-out.**  
**UL/NEMA 4, 4x, 12, 13 and IP 66/67**

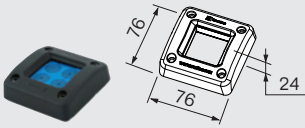
EzEntry 16 - Kit	Diameter range and number of cables/pipes		Weight		Art No.
	(kg)	(lb)			
	<b>0+3.5-16.5mm</b> <b>0+0.138-0.650"</b> <b>(EM 20w40)</b>	<b>0+9.5-32.5mm</b> <b>0+0.374-1.280"</b> <b>(EM 40 10-32)</b>			
EzEntry 16/4	-	4 cables/pipes	0.39	0.86	EZ00000001604
EzEntry 16/10	8 cables/pipes	2 cables/pipes	0.39	0.86	EZ00000001610
EzEntry 16/16	16 cables/pipes	-	0.39	0.86	EZ00000001616

For EzEntry™ 16 please note: When installing the EzEntry™ 16 on a structure thinner than 2 mm or 0.079 inches, you also need a counter frame.



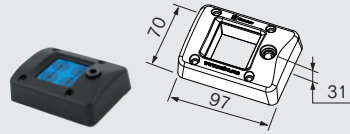
# Roxtec EzEntry™

## Roxtec EzEntry™ 4 mini/4



For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	4
Weight	0.100 kg / 0.220 lb
Article No.	EZ00000000440
Ratings	UL/NEMA and IP 55

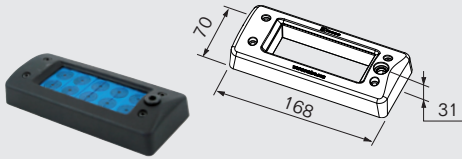
## Roxtec EzEntry™ 4/4



For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	4
Weight	0.130 kg / 0.287 lb
Article No.	EZ00000000044
Ratings	UL/NEMA and IP 66/67

## Roxtec EzEntry™ 10/10

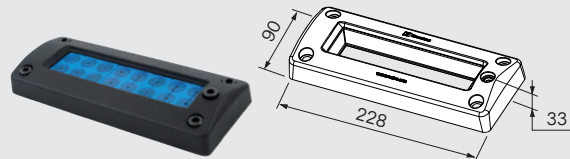
Fits standard multipin connector knock-out.



For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	10
Weight	0.300 kg / 0.650 lb
Article No.	EZ00000001010
Ratings	UL/NEMA and IP 66/67

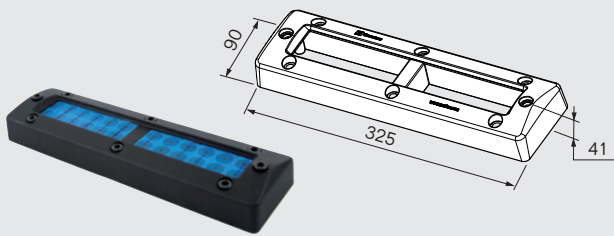
## Roxtec EzEntry™ 16/16

Fits FL 21 knock-out.



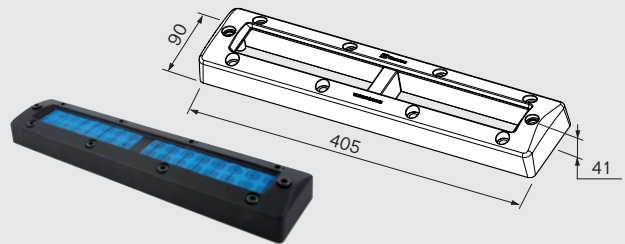
For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	16
Weight	0.387 kg / 0.860 lb
Article No.	EZ00000001616
Ratings	UL/NEMA and IP 66/67

## Roxtec EzEntry™ 24/24



For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	24
Weight	0.805 kg / 1.774 lb
Article No.	EZ00000002424
Ratings	UL/NEMA and IP 66/67

## Roxtec EzEntry™ 32/32



For cable/pipe range	0+3.5-16.5 mm / 0+0.138-0.650 in
Number of cables/pipes	32
Weight	1.030 kg / 2.270 lb
Article No.	EZ00000003232
Ratings	UL/NEMA and IP 66/67

### The kit includes:

- Screws
- Hex key
- Lubricant (Assembly Gel for Roxtec EzEntry™ 4 mini)

### Frame material:

Composite (PA 6.6 25% GF)

For more information, such as holecuts and assembly instruction, please visit:

[www.roxtec.com/ezentry](http://www.roxtec.com/ezentry)



Roxtec International AB  
 Box 540, 371 23 Karlskrona, SWEDEN  
 PHONE +46 455 36 67 00, FAX +46 455 820 12  
 EMAIL [info@roxtec.com](mailto:info@roxtec.com), [www.roxtec.com](http://www.roxtec.com)

### Main

Commercial Status	Commercialised
Range of product	9080LB
Product or component type	Miniature Power Distribution Block
[In] rated current	90 A aluminium 115 A copper
Product certifications	CE CSA RoHS UL listed
Material	Thermoplastic block
[Ue] rated operational voltage	600 V AC
Number of poles	2
Number of terminals	4 branch 1 main
Electrical connection	Lugs tin plated aluminium
Number of cables	4 18...10 AWG copper or aluminium branch 1 14...2 AWG copper or aluminium main
Short-circuit current	65 kA

### Ordering and shipping details

Category	21711 - 9080 LB
Discount Schedule	CP1
GTIN	00785901156956
Nbr. of units in pkg.	1
Package weight(Lbs)	0.16
Returnability	Y
Country of origin	US

### Offer Sustainability

Sustainable offer status	Not Green Premium product
RoHS	Compliant - since 0620 - <a href="#">Schneider Electric declaration of conformity</a>

### Contractual warranty

Period	18 months
--------	-----------

# 9080LBA361104

Miniature Power Distribution Block , 115A/90A  
(Cu/Al), 600VAC, 3-Pole



List Price \$38.70 USD

Availability **Stock Item:** This item is normally stocked in our distribution facility.

## Technical Characteristics

Approvals	UL Recognized File: E60616 CCN XCFR2 - CSA Certified File: LR70361 - CE Marked
Ampere Rating	115A/90A (Cu/Al)
Depth	1.62 Inches
Height	2.29 Inches
Width	2.03 Inches
Block Material	High Impact Thermoplastic
Number of Poles	3-Pole
Lug Material	Tin Plated Aluminum
Maximum Voltage Rating	600VAC
Terminal Type	Lugs
Block Type	Copper or Aluminum Wire
Type	LB
Wire Size	Main: (1)#14 to #2 AWG - Branch: (4)#18 to #10 AWG

## Shipping and Ordering

Category	21711 - Blocks, Distribution, Power, Type LB
Discount Schedule	CP1
Article Number	785901097433
Package Quantity	1
Weight	0.22 lbs.
Availability Code	S
Returnability	Y

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

**Schneider Electric USA**

1415 South Roselle Road

Palatine, IL 60067

Customer Care Center: 1-888-778-2733

Web: www.schneider-electric.us

**Item # 9080LBA362106, Power Distribution Block LBA****Power Distribution Block LBA**

Power Distribution Block

**SPECIFICATIONS**

Ampere Rating	175A/135A (Cu/Al)
UL File	E60616 XCFR2
CSA File	70361 6228-01
RoHS	Yes
CE Marked	Yes
Flammability Rating	UL94V-0
Service Class	C
For Use With	Copper or Aluminum Wire
Maximum Voltage Rating	600VAC
Number of Poles	3
Terminal Type	Lugs
Wire Range - Main	(1)#14 to #2/0 AWG
Wire Range - Branch	(6)#14 to #4 AWG
Cover	9080LB23
Short Circuit Current Ratings with Circuit Breakers	Up to 65 kA



Short Circuit Current Ratings with Fuses	Up to 200kA
35mm Track Adapter	9080FBDIN3



by Schneider Electric

Product availability: Stock - Normally stocked in distribution facility  
Price\*: 25.70 USD

### Main

Commercial Status	Commercialised
Range of product	9080LB
Product or component type	Power Distribution Block
[In] rated current	135 A aluminium 175 A copper
Product certifications	CE CSA RoHS UL listed
Material	Phenolic block
[Ue] rated operational voltage	600 V AC
Number of poles	3
Number of terminals	1 main 1 branch
Electrical connection	Lugs tin plated aluminium
Number of cables	1 14...2/0 AWG copper or aluminium main 2 14...2/0 AWG copper or aluminium branch
Product compatibility	9080LB23

### Ordering and shipping details

Category	21711 - 9080 LB
Discount Schedule	CP1
GTIN	00785901097440
Nbr. of units in pkg.	1
Package weight(Lbs)	0.47
Product availability	Stock - Normally stocked in distribution facility
Returnability	Y
Country of origin	US

### Offer Sustainability

Sustainable offer status	Not Green Premium product
RoHS	Compliant - since 0620 - <a href="#">Schneider Electric declaration of conformity</a>

### Contractual warranty

Period	18 months
--------	-----------

# Product data sheet

## Characteristics

# 9080LBA162101

## POWER DISTRIBUTION BLOCK 600V 175A



by Schneider Electric

Product availability: Stock - Normally stocked in distribution facility  
Price\*: 10.40 USD



### Main

Commercial Status	Commercialised
Range of product	9080LB
Product or component type	Power Distribution Block
[In] rated current	135 A aluminium 175 A copper
Product certifications	CE CSA RoHS UL listed
Material	Phenolic block
[Ue] rated operational voltage	600 V AC
Number of poles	1
Number of terminals	1 main 1 branch
Electrical connection	Lugs tin plated aluminium
Number of cables	1 14...2/0 AWG copper or aluminium main 2 14...2/0 AWG copper or aluminium branch
Short-circuit current	65 kA
Product compatibility	9080LB21

### Ordering and shipping details

Category	21711 - 9080 LB
Discount Schedule	CP1
GTIN	00785901097297
Nbr. of units in pkg.	1
Package weight(Lbs)	0.21
Product availability	Stock - Normally stocked in distribution facility
Returnability	Y
Country of origin	US

### Offer Sustainability

Sustainable offer status	Not Green Premium product
RoHS	Compliant - since 0620 - <a href="#">Schneider Electric declaration of conformity</a>

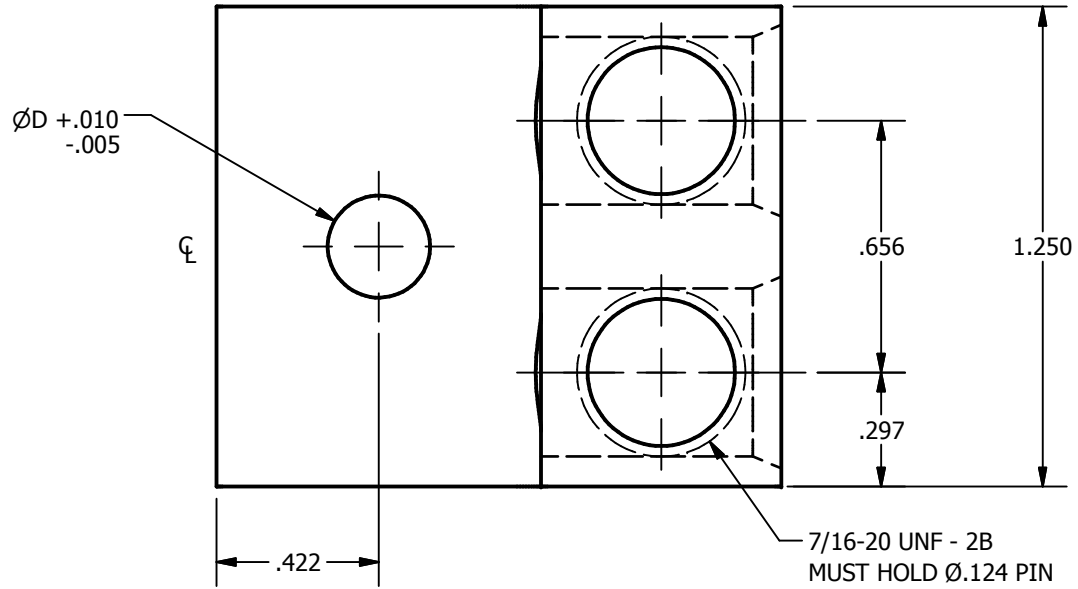
### Contractual warranty

Period	18 months
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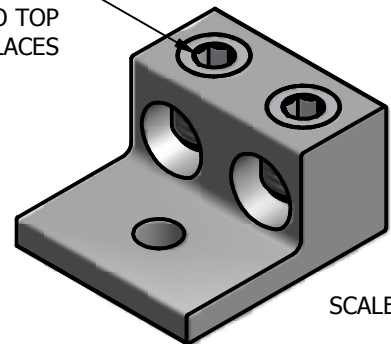
SCREW: E0950	MATERIAL:ALUMINUM, X0031	TOLERANCES-UNLESS OTHERWISE SPECIFIED 2 PL. DEC. ±.015 TRUE C.L. ±.015 3 PL. DEC. ±.015 ANGLES ±1		DWG. NO. <b>D2057</b>	
CAT. NO.:	PLATING: EL-TIN	DRAWN BY:CLH	SCALE: 2:1	SHEET 1 OF 1	
MASS:SEE CHART	MARKING: SEE CHART	DATE:1/16/2008	SIZE: A		
SURFACE AREA: SEE CHART <sup>2</sup>		CELL:AMP			
STUFFER SHT: FORM 1					REV. DESCRIPTION

REV.	DESCRIPTION
E	

Cat #: AU-2/0  
AU-2/0-B2



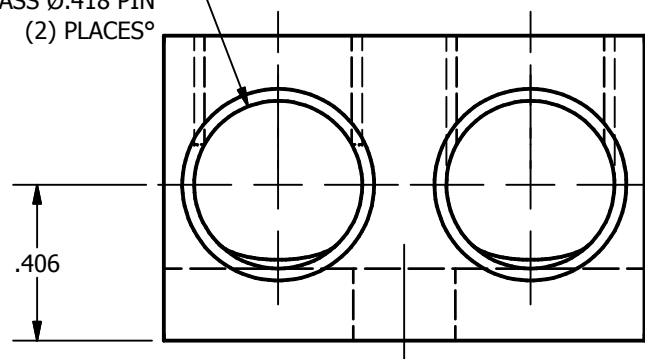
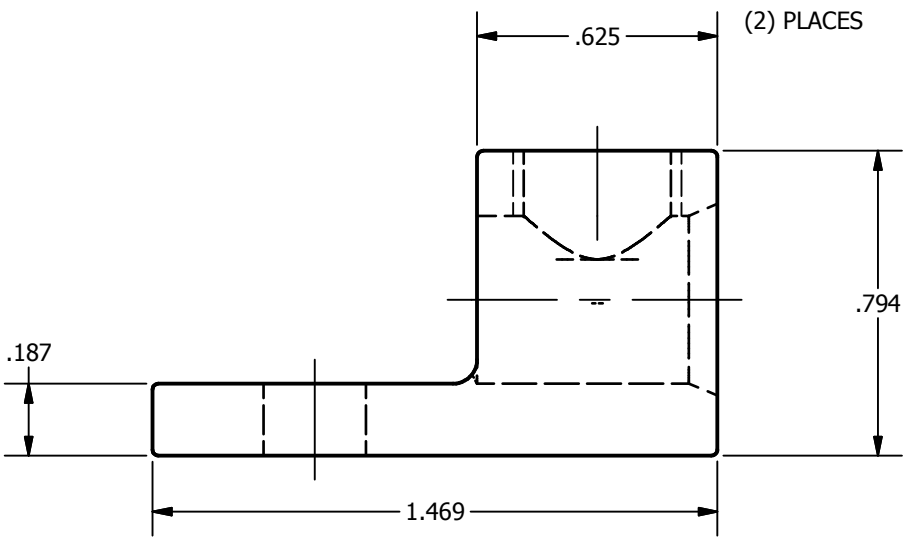
E0950 FLUSH TO TOP (2) PLACES




SCALE 1 : 1

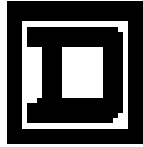
7/16-20 UNF - 2B  
MUST HOLD Ø.124 PIN WITH NO LEAD GAGE (2) PLACES

✓ Ø.437±.005  
✓ Ø.499±.040 X 45°  
MUST PASS Ø.418 PIN (2) PLACES°



DEV	D	MASS LBS.	SURFACE AREA IN <sup>2</sup>	MARKING
-22	.272	.0555	8.0048	ILSCO, D2057, AU-2/0, 2/0-14, AL9CU 



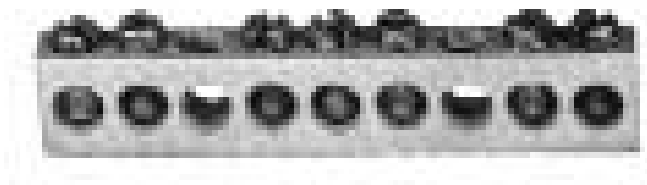


**SQUARE D**  
**GROUPE SCHNEIDER**

## PK7GTA

### Grounding Bar Kit

- Field Installable on all panelboards
- Suitable for copper or aluminum wire
- Wire size of terminals (see technical information)



Terminal	Wire Binding Screw	Wire Range AWG CU-AL	Torque lb-in.
Multi hole bar	Slotted	14-10 CU, 12-10 AL	20
		8	25
		6-4	35
		Two 14 or 12 CU, Two 12 or 10 AL	25

**Technical Characteristics**

For Use With	Industrial Enclosures and Switchboards
Approvals	UL Listed - CSA Certified - IEC Rated
Circuit Breaker Type	Standard
General Application	Provides overload and short circuit protection
Fixed Magnetic Trip	Hold: 800A - Trip: 1450A
Ampere Rating	90A
Frame Type	H-Frame
HACR Rated	Yes
Voltage Rating	600VAC/250VDC
Marketing Trade Name	Powerpact
Mounting Type	Unit Mount
Weight	5 Pounds
Number of Poles	3-Pole
Circuit Breaker Rating	80% Rated
Terminal Type	Line: Lug - Load: Lug
Interrupting Rating	25kA@240VAC - 18kA@480VAC - 14kA@600VAC - 20kA@250VDC
Wire Size	#14 to #3/0 AWG(Al/Cu)
Width	4.12 Inches
Depth	4.36 Inches
Height	6.40 Inches

**Shipping and Ordering**

Category	01110 -
Discount Schedule	DE2
GTIN	00785901955917
Package Quantity	1
Weight	4 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	US

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

# PowerPact® Electronic Motor Circuit Protectors

**Turn It On: motor circuit protection solutions that offer reliability and flexibility**

Delivering more reliable start-ups, better protection for equipment and a wide range of adjustments to meet users' motor starting needs, the Square D® PowerPact® electronic motor circuit protectors (MCP) are available for the PowerPact H- and J-Frame molded case circuit breakers.

To adjust to users' needs, the new PowerPact MCP has a unique design that includes one dial that allows for a wide range of full load amperes (FLA) adjustment and a second dial for motor selection. These adjustments ensure motor circuits are set to the in-rush characteristics of the motor, while achieving National Electrical Code® (NEC®) compliance.



## Where do you use PowerPact electronic motor circuit protectors?

- **Industrial Control Panels**
  - Branch Motor Circuits
- **HVAC Equipment**
  - Branch Motor Circuits

## What can PowerPact electronic motor circuit protectors do for you?

- **Reliable equipment start-ups**
  - Instantaneous trip points align with the motor and NEC requirements to ensure compliant installation
  - Two dials allow quick and precise adjustment of settings to ensure proper protection
- **Simple installation**
  - Wide adjustments range means no need to change devices to cover the starter's horsepower range
  - 30 A MCP has an FLA adjustment range of 1.5 A to 27 A, covering the entire range of a NEMA Size 1 starter
  - Settings align directly with the information published on the motor nameplate for quick and easy installation
- **Improved equipment protection and safety**
  - Improved longevity of equipment from quick and decisive tripping when motor limitations are exceeded
  - Ensures that breaker contacts correspond to the ON, OFF or tripped indication
- **Lower life cycle costs**
  - Due to the PowerPact MCPs flexibility, it eliminates the need to stock a wide variety of unique fuses and non-electronic MCPs

# PowerPact® Electronic Motor Circuit Protectors

## Product Specifications

Product Feature	Benefit
SCCR Ratings for UL 508A	Up to 100 kA at 480 V SCCR rating with Square D® NEMA and Telemecanique® TeSys® contactors and starters
NEC Code Compliance	Adjustment for standard and energy efficient motors make code compliance simple
Motor In-rush	Trip unit setting to allow dampening for in-rush current from an electric motor
Voltage Ratings	Rated for both wye and delta voltage systems Allowing use on 480 Y/277 V, 480 V delta, 600 Y/347 V and 600 V delta voltages
Certifications	UL, IEC, CSA, NOM and CE

## Product Selection

Frame/Current	Full-Load Amperes Range (A)			J Interrupting (see SCCR table)	L Interrupting (see SCCR table)
				Catalog Number	Catalog Number
H-Frame	30A	1.5 – 25	9 – 325	HJL36030M71	HJL36030M71
	50A	14 – 42	84 – 546	HJL36050M72	HJL36050M72
	100A	30 – 80	180 – 1040	HJL36100M73	HJL36100M73
	150A	58 – 130	348 – 1690	HJL36150M74	HJL36150M74
J-Frame	250A	114 – 217	684 – 2500	JJL36250M75	JJL36250M75

## For more information

Visit our Web site at [www.squared.com/powerpact](http://www.squared.com/powerpact) for more information on the PowerPact MCP. The following literature is available from your authorized Square D® distributor or Schneider Electric sales office:

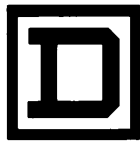
- Brochure, New Motor Circuit Protectors Improve Start-ups, document number 0106HO0601
- Catalog, PowerPact H- and J-Frame Circuit Breakers, document number 0611CT0401
- Brochure, UL 508A tested SCCR Combinations 0101BR0601
- Application Guide, PowerPact H- and J-Frame Circuit Breakers, document number 0611BR0401
- Brochure, PowerPact MCCB, document number 0611BR0402
- Application Guide, MCP Based Starters, document number 0600DB0701

For technical support, please call 888-SQUARED.

## Schneider Electric - North America

2641 Sumner Boulevard  
 Raleigh, NC 27616  
 Tel: 800-468-5342  
[www.us.squared.com](http://www.us.squared.com)





**SQUARE D**  
*GROUPE SCHNEIDER*

## QOU140

### Low Ampere 1 Pole Circuit Breaker

- Terminal lug wire size 1 - #14 - #2 AWG Cu or Al.
- Reversible line and load lugs for convenient flush or surface mount wiring.
- DIN mount (symmetrical rail 35 x 7.5 DIN/EN 50 022).
- UL Listed as HACR type
- Field installable quick connectors.
- Single handle with internal common trip.
- UL Listed 48Vdc (5,000 AIR).
- AIR Rating: 10,000
- Voltage Rating: 120/240 VAC
- Ampere Rating: 40 Amps



**Mounting Type:** Bolt-on

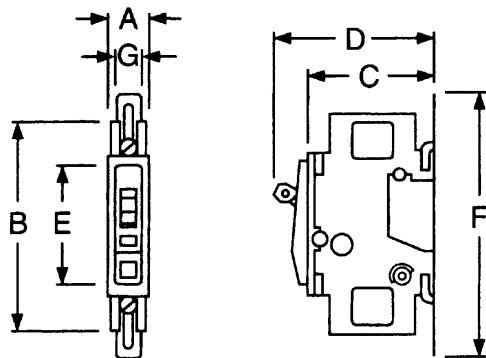
**Interrupting Ratings:** UL/CSA Rating (kA RMS) (50/60 Hz AC)

120 Vac: 10

120/240 Vac: 10

**Special Ratings:** Fed. Specs W-C-375B/GEN; Other Standard: HACR NOM

**Trip System Type:** Thermal-Magnetic



Dimensions - Inches

A	B	C	D	E	F	G
0.75	4.05	2.38	2.98	2.25	5.00	0.62

# Multi 9™ System Catalog

## Section 2—UL and CSA Rated Protection Devices

### UL 489 Listed 480Y/277 Vac C60 Circuit Breakers (AC)

The UL 489 Listed 480Y/277 Vac Multi 9 C60 miniature circuit breakers can be used in 480Y/277 Vac systems. With amperages from 0.5 A to 20 A, they are ideal for fuse replacement, yet carry the UL 489 Listing that is required for branch circuit applications. See specifications on Table 2 for dimensions, weights, and interrupting ratings.



**Table 7: Specifications for UL 489 Listed 480Y/277 Vac C60 Circuit Breakers**

Interruption Rating	2P and 3P 1P	480Y/277 V @ 10kA 277 Vac @ 10kA
Amperage	0.5 A through 20 A	
Construction	1P, 2P and 3P	
Magnetic Trip Curves	C-curve D-curve	7 to 10 Times Ampere Rating 10 to 14 Times Ampere Rating
UL 486E Listed 2-Barrel Lug	18–16 AWG (1–1.5 mm <sup>2</sup> ), Cu Only Stranded Wire: 14–10 AWG (2–5 mm <sup>2</sup> ), Cu Only Solid or Stranded Wire	Torque to 7 lb-in (0.68 N•m) Torque to 14 lb-in (1.6 N•m)
Ring Tongue Screw	5 mm	Torque to 18 lb-in (2 N•m)
Plug-On Auxiliary Modules With Mechanical Linkage:	MN Undervoltage Trip MX + OF Shunt Trip/Auxiliary Switch OF Auxiliary Switch SD Alarm Switch	
Mounting	35 mm DIN Rail	

See selection Table 2 for dimensions, weights, and interrupting ratings.

#### Benefits

- Satisfies customer's preferences to use circuit breakers instead of fuses.
- Eliminates costs of spare fuses, blown fuse indicators, additional wiring, etc.
- Reduces concerns and uncertainty of misapplying a UL 1077 supplementary protector where a UL 489 branch circuit breaker is required.
- Facilitates one common design for UL 489, CSA and IEC applications.
- Simplifies installation with a compact, DIN-mounted circuit breaker that accepts a wide range of accessories.
- Offers alternative terminations for ring terminals or cable.

#### Standard Features

- Fast closing: Allows increased withstand to the high inrush currents of some loads.
- Trip-free mechanism: Contacts cannot be held in the I-ON position when the circuit breaker is tripped automatically.
- Positive indication of contact disconnect. Green mechanical indication on front face of device shows that all poles are open.
- C curve: Overcurrent protection for all application types. Magnetic release operates from 7 to 10 times ampere rating. (7 to 14 for dc)
- D curve: Overcurrent protection for loads with high inrush currents (motors, transformers). Magnetic release operates between 10 and 14 times ampere rating (no dc rating for D curve).
- Suitable for reverse feeding
- Allows locking in O-OFF position using padlock attachment.

**Connections**

Two versions of field wiring connectors are available:

- Two-barrel lug with binding screws for two 18–10 AWG wires.
- Crimp-type ring tongue terminal for up to 8 AWG wire

Both of these terminals provide fingersafe ingress protection per IP20 of IEC EN60529. This feature reduces the potential of incidental contact with live circuit breaker components.

**Standards**

- UL 489 Listed
- CSA C22.2 No. 5.1
- IEC 60947-2
- CE Marked

**Catalog Numbers**

**Table 8: Catalog Numbers for UL 489 Listed 480Y/277 V C60 Miniature Circuit Breakers (AC)**

Rating	2-Barrel Wire Lug			Ring-Tongue Terminal		
	1P	2P	3P	1P	2P	3P
C-curve, 7–10 Times Ampere Rating						
0.5 A	MGN61300	—	—	MGN61366	—	—
1 A	MGN61301	MGN61312	MGN61323	MGN61367	MGN61378	MGN61389
2 A	MGN61302	MGN61313	MGN61324	MGN61368	MGN61379	MGN61390
3 A	MGN61303	MGN61314	MGN61325	MGN61369	MGN61380	MGN61391
4 A	MGN61304	MGN61315	MGN61326	MGN61370	MGN61381	MGN61392
5 A	MGN61305	MGN61316	MGN61327	MGN61371	MGN61382	MGN61393
6 A	MGN61306	MGN61317	MGN61328	MGN61372	MGN61383	MGN61394
8 A	MGN61307	MGN61318	MGN61329	MGN61373	MGN61384	MGN61395
10 A	MGN61308	MGN61319	MGN61330	MGN61374	MGN61385	MGN61396
15 A	MGN61309	MGN61320	MGN61331	MGN61375	MGN61386	MGN61397
20 A	MGN61310	MGN61321	MGN61332	MGN61376	MGN61387	MGN61398
D-curve, 10–14 Times Ampere Rating						
0.5 A	MGN61333	—	—	MGN61399	—	—
1 A	MGN61334	MGN61345	MGN61356	MGN61400	MGN61411	MGN61422
2 A	MGN61335	MGN61346	MGN61357	MGN61401	MGN61412	MGN61423
3 A	MGN61336	MGN61347	MGN61358	MGN61402	MGN61413	MGN61424
4 A	MGN61337	MGN61348	MGN61359	MGN61403	MGN61414	MGN61425
5 A	MGN61338	MGN61349	MGN61360	MGN61404	MGN61415	MGN61426
6 A	MGN61339	MGN61350	MGN61361	MGN61405	MGN61416	MGN61427
8 A	MGN61340	MGN61351	MGN61362	MGN61406	MGN61417	MGN61428
10 A	MGN61341	MGN61352	MGN61363	MGN61407	MGN61418	MGN61429
15 A	MGN61342	MGN61353	MGN61364	MGN61408	MGN61419	MGN61430
20 A	MGN61343	MGN61354	MGN61365	MGN61409	MGN61420	MGN61431

**Type L Circuit Breaker Mechanisms**

Type L door mounted, variable depth operating mechanisms feature heavy duty, all metal construction with trip indication. All can be padlocked in the "OFF" position when the enclosure door is open. Further, the handle assemblies can be locked "OFF" with up to three padlocks, which also locks when the door is closed. (The 3" handle accepts one padlock.) Complete kits are rated for NEMA Type 1, 3R, and 12 enclosures. They include a handle assembly, operating mechanism, and shaft assembly.



Operating Mechanism

**Table 8.47: Complete Kits**

Complete Kit Does Not Include Circuit Breaker			Includes Operating Mechanism Standard 6 in. Handle Standard Shaft Kit			Includes Operating Mechanism Standard 6 in. Handle Long Shaft Kit			Includes Operating Mechanism Short 3 in. Handle Long Shaft Kit		
Use With			Type	\$ Price	Mounting Depth ▲ Min. – Max.	Type	\$ Price	Mounting Depth ▲ Min. – Max.	Type	\$ Price	Mounting Depth ▲ Min. – Max.
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)									
GJL	3	75, 100	LG1	140.00	5-1/2-10-1/4	LG4	158.00	5-1/2-20-7/8	LG3	198.00	5-1/2-20-7/8
FAL, FCL, FHL	2-3	100	LN1	140.00	5-1/2-10-7/16	LN4	158.00	5-1/2-21	LN3	198.00	5-1/2-21
KAL, KCL, KHL	2-3	250	LP1	171.00	6-1/4-11-3/16	LP4	189.00	6-1/4-21-3/4	LP3	230.00	6-1/4-21-3/4
NSF, PowerPact® H and J	2-3	250	LJ1	171.00	5-1/2-10-3/4	LJ4	189.00	5-1/2-21-3/8	—	—	—
LAL♦, LHL♦, Q4L	2-3	400	LR1	242.00	6-5/16-10-7/8	LR4	255.00	6-5/16-21-1/2			
MEL, MXL	2-3	800	LT1	242.00	7-3/16-11-5/8	LT4	255.00	7-3/16-22-1/4			
MAL, MHL	2-3	1200	LT1	242.00	7-3/16-11-5/8	LT4	255.00	7-3/16-22-1/4			
NAL, NCL, NEL, NXL	2-3	1200	LX1	242.00	8-1/4-12-3/4	LX4	255.00	8-1/4-23-3/8			
PowerPact M and P ▼	3	1200	LW1★	242.00	7-3/16-11-5/8	LW4★	255.00	7-3/16-22-1/4			

3 in. handles are not recommended for use with these circuit breakers.

**Table 8.48: Component Parts**

Use With			3 in. Handle Assemblies Type 1, 3R, 12		Standard Handle Assemblies Type 1, 3R, 12		Operating Mechanism Includes Lockout		Standard Shaft (Support Bracket Not Required)			Long Shaft (Support Bracket Included)		
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	Type	\$ Price	Type	\$ Price	Type	\$ Price	Mounting Depth ▲ Min. – Max.	Type	\$ Price	Mounting Depth ▲ Min. – Max.	Type	\$ Price
GJL	3	75, 100	LH3	90.00	LH6	50.00	LG7	68.00	5-1/2-10-7/16	LS8	21.50	5-1/2-21	LS13	35.60
FAL, FCL, FHL	2-3	100	LH3	90.00	LH6	50.00	LF1	71.00	5-1/2-10-7/16	LS8	21.50	5-1/2-21	LS12	35.60
KAL, KCL, KHL	2-3	250	LH3	90.00	LH6	50.00	LK1	105.00	6-1/4-11-3/16	LS8	21.50	6-1/4-21-3/4	LS12	35.60
NSF, PowerPact H and J	2-3	250	LH3	90.00	LH6	50.00	LJ7	105.00	5-1/2-10-1/4	LS8	21.50	5-1/2-21-3/8	LS13	35.60
LAL♦, LHL♦, Q4L	2-3	400			LH6	50.00	LL1	170.00	6-5/16-10-7/8	LS8	21.50	6-5/16-21-1/2	LS10	35.60
MEL, MXL	2-3	800			LH8	50.00	LM1	170.00	7-3/16-11-5/8	LS8	21.50	7-3/16-22-1/4	LS10	35.60
MAL, MHL	2-3	1200			LH8	50.00	LM1	170.00	7-3/16-11-5/8	LS8	21.50	7-3/16-22-1/4	LS10	35.60
NAL, NCL, NEL, NXL	2-3	1200			LH8	50.00	LX7	170.00	8-1/4-12-3/4	LS8	21.50	8-1/4-23-3/8	LS10	35.60
PowerPact M and P ▼	3	1200			LHP8	50.00	LW7	170.00	7-3/16-11-5/8	LS8	21.50	7-3/16-22-1/4	LS10	35.60

- ▲ Mounting depth measured from circuit breaker mounting surface (control panel) to outside of enclosure door in inches.
- Types LT1, LT4, LX1, and LX4 include an 8 in. handle rather than a 6 in. handle.
- ♦ Note: These operating mechanisms cannot be used with any LA/LH circuit breaker with an MB or MT suffix.
- ◆ Type LW1 and LW4 include an 8 in. handle (9421LHP8) rather than a 6 in. handle.
- ▼ These circuit breakers must use the 9421LHP\*\* or LCP\*\* handles only.

**Table 8.49: NEMA Type 4 and 4X Handle Assemblies ▲**

Use With			Standard Handle Assemblies				Special 3 in. Version			
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	NEMA Type 1, 3R, 4, 12 (Painted)		NEMA Type 1, 3R, 4, 4X, 12 (Chrome Plated)		NEMA Type 1, 3R, 4, 12 (Painted)		NEMA Type 1, 3R, 4, 4X, 12 (Chrome Plated)	
			Type	\$ Price	Type	\$ Price	Type	\$ Price	Type	\$ Price
GJL	3	75	LH46	90.00	LC46	149.00	LH43	165.00	LC43	233.00
FAL, FCL, FHL	2-3	100	LH46	90.00	LC46	149.00	LH43	165.00	LC43	233.00
KAL, KCL, KHL	2-3	250	LH46	90.00	LC46	149.00	LH43	165.00	LC43	233.00
NSF, PowerPact H and J	2-3	250	LH46	90.00	LC46	149.00	LH43	165.00	LC43	233.00
LAL, LHL, Q4L	2-3	400	LH46	90.00	LC46	149.00				
MEL, MXL	2-3	800	LH48	90.00	LC48	149.00				
MAL, MHL	2-3	1000	LH48	90.00	LC48	149.00				
NAL, NCL, NEL, NXL	2-3	1200	LH48	90.00	LC48	149.00				
PowerPact M and P	3	1200	LHP48	90.00	LCP48	149.00				

▲ Due to gasketing, NEMA Type 3 & 4 handle assemblies are NOT trip indicating.

**Table 8.50: IEC Style Operating Mechanisms**

Circuit Breaker or Interrupter Type	Type 1, 4, 4X, 12			Operating Mechanism Includes Lockout		Extension Shafts			
	Color	Type	\$ Price	Type	\$ Price	Mounting Depth		Type	\$ Price
						Min.	Max.		
GJL	Red/Yellow	NW3	90.00			6-1/8	10-3/4	NS16	28.70
	Black	NW3B	90.00	LG8	\$71.00	6-1/8	17-7/8	NS336▲	35.60

▲ Contains support bracket.

**Table 8.51: Electrical Interlock Kits—Class 9999 ▲**

Description	Class	Type	\$ Price
Single Pole Double Throw	9999	R47	131.00
Double Pole Double Throw	9999	R48	221.00

▲ Optional accessory for use with 9421L operating mechanisms.

Note: Not used with GJL, NAL, NCL, NEL, NXL, NSF, NSJ, PowerPact® C, D, H, and J circuit breakers; use field-installed circuit breaker interlocks instead.

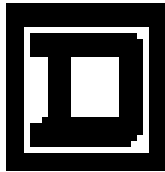


3 in. Handle Assembly



Standard Handle Assembly





**SQUARE D**  
**GRUPPE SCHNEIDER**

# 60103

## Multi 9 C60N UL 489 Listed 1 Pole Miniature Circuit Breaker

**2 Amps, 120/240V AC**

Certified #179014

Listed E215117



- Class 860 - Merlin Gerin
- Box Lug type terminals meeting UL486A
- UL 489 Listed and CSA 22.2 No.5.1 for branch circuit protection
- Magnetic Release: 7-10 x ampere rating
- 10 k AIR (1P @ 120 Vac)
- Suitable for reverse feeding
- Trip-free mechanism
- Positive indication of contact disconnect
- Thermal-magnetic Trip System
- Operating Temperature: -22°F to 158°F
- #18-#4 Awg; Torque 22 lb-in

UL/CSA Rating (kA RMS) (50/60 Hz)

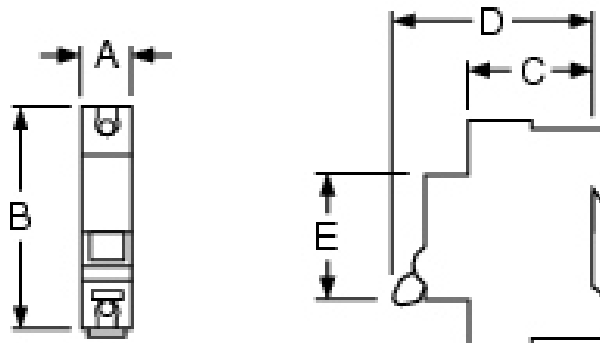
120 Vac: 10

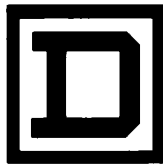
120/240 Vac: 5

240 Vac: 5

Dimensions (Inches):	A	B	C	D	E
	0.71	3.19	1.73	2.76	1.77

**Dimensions**





**SQUARE D**  
**GROUPE SCHNEIDER**

**60105**

**Multi 9 C60N UL 489 Listed  
1 Pole Miniature Circuit Breaker**

**4 Amps, 120/240V AC**

 **Certified** #179014

 **Listed** E215117



- Class 860 - Merlin Gerin
- Box Lug type terminals meeting UL486A
- UL 489 Listed and CSA 22.2 No.5.1 for branch circuit protection
- Magnetic Release: 7-10 x ampere rating
- 10 k AIR (1P @ 120 Vac)
- Suitable for reverse feeding
- Trip-free mechanism
- Positive indication of contact disconnect
- Thermal-magnetic Trip System
- Operating Temperature: -22°F to 158°F
- #18-#4 Awg; Torque 22 lb-in

UL/CSA Rating (kA RMS) (50/60 Hz)

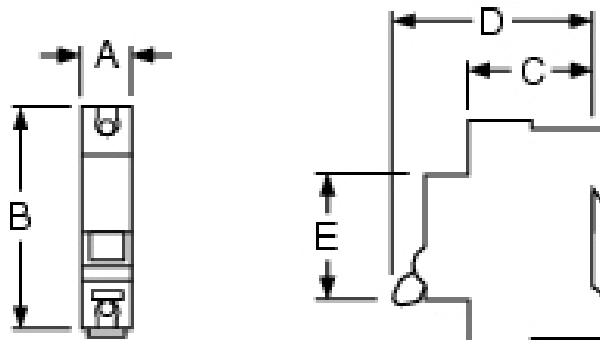
120 Vac: 10

120/240 Vac: 5

240 Vac: 5

Dimensions (Inches):	A	B	C	D	E
	0.71	3.19	1.73	2.76	1.77

**Dimensions**





by Schneider Electric

List Price \$125.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

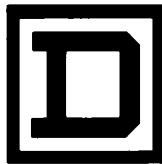
## Technical Characteristics

For Use With	OEM Panels and Enclosures
Enclosure Rating	IP40
Approvals	UL489 Listed - CSA 22.2 #5.1 Certified - IEC Rated 60947-2
Circuit Breaker Type	Standard
Ampere Rating	5A
General Application	Short circuit and overcurrent protection
Marketing Trade Name	Multi 9
HACR Rated	Yes
Voltage Rating	120VAC - 60VDC
Mounting Type	Flush, Surface or DIN Rail (35mm)
Number of Poles	1-Pole
Weight	4.40 Ounces
Short Circuit Current Rating	5kA@240VAC - 10kA@120VAC
Terminal Type	Line: Box Lug - Load: Box Lug
Trip Curve	C Curve - Magnetic operates between 7 to 10 times
Type	C60N
Wire Size	#18 to #4 AWG
Width	0.71 Inches (18mm)
Height	4.21 Inches (107mm)
Depth	3.00 Inches (76mm)

## Shipping and Ordering

Category	00915 -
Discount Schedule	DE2
GTIN	00785901208389
Package Quantity	1
Weight	0.29 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	FR

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



**SQUARE D**  
*GROUPE SCHNEIDER*

**60110**

**Multi 9 C60N UL 489 Listed  
1 Pole Miniature Circuit Breaker**

**10 Amps, 120/240V AC**

 **Certified** #179014

 **Listed** E215117



- Class 860 - Merlin Gerin
- Box Lug type terminals meeting UL486A
- UL 489 Listed and CSA 22.2 No.5.1 for branch circuit protection
- Magnetic Release: 7-10 x ampere rating
- 10 k AIR (1P @ 120 Vac)
- Suitable for reverse feeding
- Trip-free mechanism
- Positive indication of contact disconnect
- Thermal-magnetic Trip System
- Operating Temperature: -22°F to 158°F
- #18-#4 Awg; Torque 22 lb-in

UL/CSA Rating (kA RMS) (50/60 Hz)

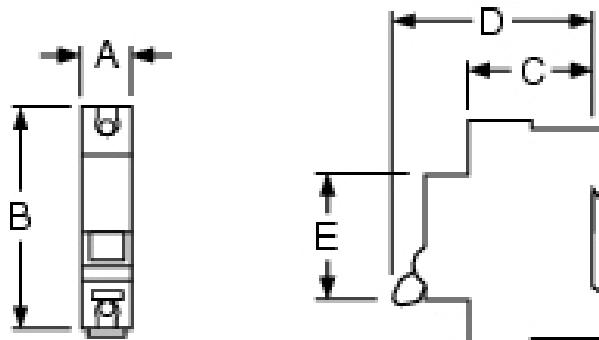
120 Vac: 10

120/240 Vac: 5

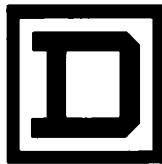
240 Vac: 5

Dimensions (Inches):	A	B	C	D	E
	0.71	3.19	1.73	2.76	1.77

**Dimensions**







**SQUARE D**  
**GROUPE SCHNEIDER**

**60112**

**Multi 9 C60N UL 489 Listed  
1 Pole Miniature Circuit Breaker**

**15 Amps, 120/240V AC**

 **Certified** #179014

 **Listed** E215117



- Class 860 - Merlin Gerin
- Box Lug type terminals meeting UL486A
- UL 489 Listed and CSA 22.2 No.5.1 for branch circuit protection
- Magnetic Release: 7-10 x ampere rating
- 10 k AIR (1P @ 120 Vac)
- Suitable for reverse feeding
- Trip-free mechanism
- Positive indication of contact disconnect
- Thermal-magnetic Trip System
- Operating Temperature: -22°F to 158°F
- #18-#4 Awg; Torque 22 lb-in

UL/CSA Rating (kA RMS) (50/60 Hz)

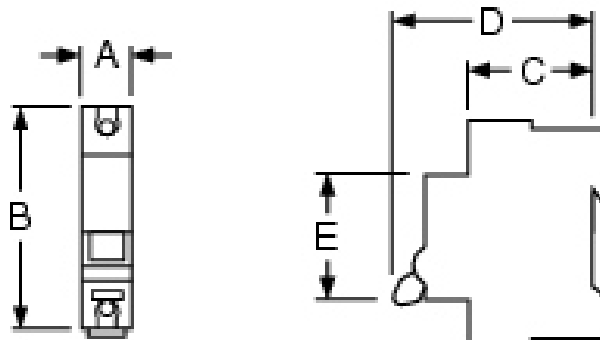
120 Vac: 10

120/240 Vac: 5










240 Vac: 5

Dimensions (Inches):	A	B	C	D	E
	0.71	3.19	1.73	2.76	1.77

**Dimensions**



**Accessories** — *Continued*

Connection Accessories		Catalog No.	List Price
	<b>Ring Tongue Terminal Kit for UL 1077 C60</b>		
	For one pole	17400	\$ 10.50
<b>Plug-in Base for UL1077 C60 — Non UL Recognized — IEC Rated</b>			
	One pole	MG26996	52.00
	<b>Comb Busbar with integral end caps – 63 A – Recognized for use with UL 1077 C60 – See page 30 for IEC Rated type</b>		
	12-Pole Long		
	1 Phase	MG10285	42.00
	2 Phase	MG10286	46.20
	3 Phase	MG10287	53.00
Tooth caps	20 pieces	60488	25.20
<b>Interphase Barrier for UL1077 — Non UL Recognized</b>			
	Bag of 10 pieces	MG27001	33.70
	Not available for C120.		
<b>Terminal Screw Shield for UL1077 C60 — Non UL Recognized</b>			
	Supplied as bag of two 4-Pole shields (May be divided into 1-, 2- or 3-Pole length)	MG26981	33.70
	Not available for C120.		
<b>Terminal Cover for UL1077 C60 — Non UL Recognized</b>			
	1-Pole (Set of two)	MG26975	16.90
	2-Pole (Set of two)	MG26976	33.70
	3-Pole (Requires one 1-Pole and one 2-Pole)	MG26975	16.90
		+MG26976	33.70
	4-Pole (Set of two)	MG26978	68.00
Not available for C120.			
<b>Spacer — Non UL Recognized</b>			
	9mm width	MG27062	6.20
	<b>Padlock Attachment — Non UL Recognized</b>		
	For all C60—bag of two—Accepts 0.315 in/8mm diameter padlock	MG26970	22.10
	For C120—bag of four—Accepts 0.315 in/8mm diameter padlock	MG27145	39.40
<b>Heavy-duty Padlock Attachment — Non UL Recognized</b>			
	For C60—set of two—Accepts 0.315 in/8mm diameter padlock	M9PAF	39.90

# Multi 9™ GFP Ground Fault Protectors

## for Equipment Ground Fault Protection from 30 mA to 300 mA



**2-pole GFP**



**4-pole GFP (used  
for 3 or 4 wires)**

The Multi 9 GFP Ground Fault Protectors provide ground fault protection for electrical equipment, opening a circuit automatically upon detecting a ground fault or earth leakage greater than 30 mA, 100 mA or 300 mA, depending on the model. These GFPs operate without an auxiliary source of power supply.

The GFP Ground Fault Protectors are available in three versions:

- ◆ Two poles for 120 or 240 Vac
- ◆ Two poles for 277 or 480Y/277 Vac
- ◆ Four poles for 240 Vac to 480Y/277 Vac

They can be used in 50 Hz or 60 Hz applications. Listed per UL 1053 Class 1 and certified to IEC 61008, they can be used in OEM equipment built for the U.S. or international markets.

A red mechanical indicator on the front face shows when the GFP has been tripped due to a ground fault. In addition, a test button located on the front of GFP permits recommended periodic testing of the ground fault function.

**NOTE:** *The GFP Ground Fault Protectors have only one protective function – detection of ground faults or earth leakage current. There is no thermal or magnetic protection for overload or short circuit conditions. Therefore, the circuit must be protected by a recommended upstream circuit breaker such as the Multi 9 C60 or C120 miniature circuit breakers.*

### Product Features

- Current ratings from 25 A to 100 A complement the Multi 9 C60 and C120 miniature circuit breaker range
- Protects equipment at most voltages, including 120, 240, 277 and 480Y/277 Vac
- Trips at maximum ground fault levels of 30 mA, 100 mA or 300 mA
- Is designed for noise immunity, even in the industrial environment
- Provides positive break indication via a red flag
- Conforms to international standards, including UL 1053 and IEC 61008, and features the CE mark

### Benefits to the Equipment User

- Protects equipment from damage due to ground faults and reduces downtime needed to repair equipment
- Provides warning that preventive maintenance should be done to the equipment
- Indirectly protects personnel from fires, malfunctioning equipment, etc.

---

## Benefits for OEMs

- Enables selection of appropriate sensitivity and amperage to provide maximum protection with minimal risk of nuisance tripping
- Qualifies equipment for international sales (where ground fault protection is often mandatory)

## Super-Immunized (Si) for Noisy Electrical Environments

The GFP Ground Fault Protectors feature Merlin Gerin's exclusive Si (Super-immunized) design to minimize risk of nuisance tripping due to an electrically noisy environment. Si is ideal for maintaining continuity of service on networks susceptible to high risk of nuisance tripping, including:

- Surges due to lightning strikes
- Variable speed controllers, frequency converters
- Electronic ballasts
- Presence of switchgear that incorporates interference filters; e.g., lighting, microcomputing, etc.

The GFP will also effectively detect ground faults in conditions that might mask ground fault levels, including:

- Presence of harmonics or high frequency rejection
- Presence of DC components: diodes, thyristors and triacs
- Low temperature

## “SiE” Type for Humid and/or Corrosive Environments

In addition to noise immunity, the GFP is also designed for harsh environments. They are particularly suitable for use in humid environments and/or environments polluted by corrosive agents, for example, swimming pools, marinas, the food-processing industry, water treatment plants and industrial sites.

## GFP UL1053 Electrical Specifications

- Voltage rating:
  - ◆ Two poles @ 120 or 240 Vac (-15/+10%)
  - ◆ Two poles @ 277 or 480Y/277 Vac (-15/+10%)
  - ◆ Four poles @ 240 Vac or 480Y/277 Vac (-15/+10%)
- Current rating (40°C):  
25 A, 40 A, 63 A, 80 A or 100 A (depending on catalog number)
- Ground fault sensitivity:
  - ◆ GFP30 – must trip at 29.9 mA; must not trip below 22.1 mA
  - ◆ GFP100 – must trip at 98.9 mA; must not trip below 73.1 mA
  - ◆ GFP300 – must trip at 299 mA; must not trip below 221 mA
- Short-circuit current rating: 10 kA with recommended circuit breaker or fuse upstream (see bulletin GHA1080850AB-12/05)
- Frequency: 50 or 60 Hz



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## GFP IEC 61008 Electrical Specifications

- Impulse withstand level 8/20  $\mu$ s: 3 kA
- Short circuit current withstand ( $I_c = I_{nc}$ ): 10 kA with approved circuit breaker or fuse upstream
- Current rating at 40°C: 25 A to 100 A
- Breaking and making capacity:
  - ◆ rated ( $I_m$ ); 1000 A
  - ◆ rated residual ( $I_{dm}$ ); 1000 A
- Rated impulse withstand voltage ( $U_{imp}$ ): 6 kV
- Utilization category (IEC):
  - ◆ AC 23A rating  $\leq$  63 A
  - ◆ AC 22B ratings 80 A and 100 A

## GFP Mechanical Specifications

- Mounting: 35 mm DIN rail
- Connection, box lug: (75°C copper wire only, stranded or solid)
- Wire: #14 to #2 AWG (2.5 to 35 mm<sup>2</sup>); Torque 31 lb.-in. (3.5 N.m)
- Padlocking in the “tripped” position is possible using a padlocking device (not supplied)
- Ground fault indication on front panel by means of a mechanical red flag indicator

## GFP Environmental Specifications

- Operating temperature: -25 to +60°C
- Storage temperature: -40 to +70°C
- Tropicalisation: treatment 2 (relative humidity 95% at 55°C)
- Weight (oz/g):
  - ◆ 2-pole = 7.70/220
  - ◆ 4-pole = 15.9/450
- Dimensions W x H x D (in./mm):
  - ◆ 2-pole = 1.42 x 3.19 x 3.00 / 36 x 81 x 76
  - ◆ 4-pole = 2.84 x 3.19 x 3.00 / 72 x 81 x 7

## Ordering information

Poles	Voltage	Current (A)	Maximum Sensitivity (mA)	Tripping Range	Family	Cat. No.
2	UL 1053 120/240, 240 60 Hz  IEC 61008 230, 240 50 Hz	25	30	22.1 to 29.9 mA	GFP 30	60949
			100	73.1 to 98.9 mA	GFP 100	60950
			300	221 to 299 mA	GFP 300	60951
		40	30	22.1 to 29.9 mA	GFP 30	60952
			100	73.1 to 98.9 mA	GFP 100	60953
			300	221 to 299 mA	GFP 300	60954
		63	30	22.1 to 29.9 mA	GFP 30	60955
			100	73.1 to 98.9 mA	GFP 100	60956
			300	221 to 299 mA	GFP 300	60957
		80	300	221 to 299 mA	GFP 300	60958
		100	300	221 to 299 mA	GFP 300	60959
		2	UL 1053 277, 480Y/277 60 Hz  IEC 61008 230/240 240/415 50 Hz	25	30	22.1 to 29.9 mA
100	73.1 to 98.9 mA				GFP 100	60970
300	221 to 299 mA				GFP 300	60971
40	30			22.1 to 29.9 mA	GFP 30	60972
	100			73.1 to 98.9 mA	GFP 100	60973
	300			221 to 299 mA	GFP 300	60974
63	30			22.1 to 29.9 mA	GFP 30	60975
	100			73.1 to 98.9 mA	GFP 100	60976
	300			221 to 299 mA	GFP 300	60977
80	300			221 to 299 mA	GFP 300	60978
100	300			221 to 299 mA	GFP 300	60979
4	UL 1053 240, 480Y/277, 60 Hz  IEC 61008 230/240 240/415 50 Hz			25	30	22.1 to 29.9 mA
		100	73.1 to 98.9 mA		GFP 100	60990
		300	221 to 299 mA		GFP 300	60991
		40	30	22.1 to 29.9 mA	GFP 30	60992
			100	73.1 to 98.9 mA	GFP 100	60993
			300	221 to 299 mA	GFP 300	60994
		63	30	22.1 to 29.9 mA	GFP 30	60995
			100	73.1 to 98.9 mA	GFP 100	60996
			300	221 to 299 mA	GFP 300	60997
		80	300	221 to 299 mA	GFP 300	60998
		100	300	221 to 299 mA	GFP 300	60999

### Schneider Electric - North American Operating Division

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# SMC-3 – Smallest Footprint in the Industry

The SMC-3 provides intelligence and unmatched performance in a compact design for controlling your standard squirrel cage induction motor. It features microprocessor-controlled electronic overload with adjustable trip class, motor and system diagnostics, configurable auxiliary contacts, and multiple start and stop modes. All of these combined features provide a highly accurate, reliable, and efficient smart motor controller with the smallest footprint in the industry.



Actual Size 1...37 A

Actual Size 43...85 A

## Current Range

Product Rating	Line Current	Delta Current
3	3	—
9	9	—
16	16	—
19	19	—
25	25	—
30	30	—
37	37	—
43	43	—
60	60	—
85	85	—
108	108	187 <sup>1</sup>
135	135	234 <sup>1</sup>

## Voltage Range

200...600 VAC 50/60Hz

## Control Voltage

100...240 VAC or 24 VAC/DC

## Starting Modes

Soft Start, Kick Start,  
Current Limit Start, or Soft Stop

## Features

### Overload Protection

- Flexibility in trip class (10, 15, 20 or OFF)
- Selectable overload reset (Manual or Automatic)

### FAULT Diagnostics

- Overtemperature in power section
- Phase reversal (selectable)
- Phase loss / Open load
- Phase imbalance
- Shorted SCRs

### Configurable Auxiliary Contacts

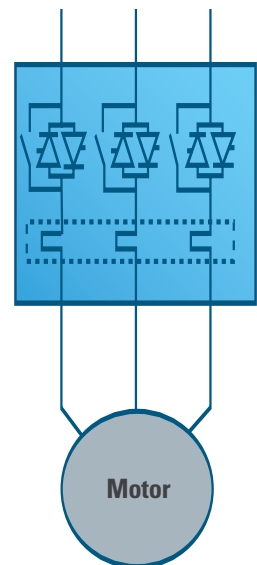
#### Motor Control

- Full 3-phase control
- Standard squirrel cage induction motor
- Star-Delta motors - 108 & 135 A

## Typical Applications

- Compressors
- Fans
- Conveyors
- Lifts
- Chillers
- Pumps

## SMC-3



## Compact Size with true 3-phase control

At a slim 45 mm, 72 mm, or 200 mm, the SMC-3 integrates a bypass to minimize heat generation during run time. The bypass automatically closes when the motor reaches its nominal speed, resulting in a cooler-running component and reduction in enclosure size.



<sup>1</sup> Please reference Delta Connections Diagram on page 4 for connections.

# Unsurpassed Advantages

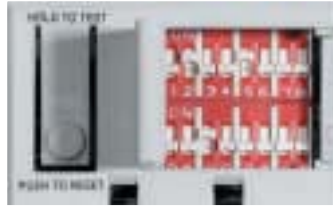
## Features

### Overload

- Built-in Overload
- True 3-Phase Control
- Advanced Diagnostics
- Digital Adjustments
- Add-on Configurable Auxiliary Contacts

### Compact Size

- Configurable Auxiliary Contact (Normal or Up-to-Speed)
- 1...37 A  
45 mm W x 141 mm H x 100 mm D
- 43...85 A  
72 mm W x 206 mm H x 130 mm D
- 108...135 A  
200 mm W x 450 mm H x 216 mm D



## Easy and secure setup

- DIP switches allow for easy, precise, and secure setting of the start/stop profile, overload trip class, and auxiliary contact characteristics.
- The motor FLC setting is easily accomplished using the rotary pot located on the front of the device.

## Configurable Auxiliary Contacts

As standard, the SMC-3 provides a configurable (Normal or Up-to-Speed) normally open (N.O.) auxiliary contact for motor run status indication.



The SMC-3 has a line of side-mount configurable (Normal or Up-to-Speed) auxiliary contacts, allowing you more flexibility than ever before in your smart motor controller application.



## LED Display

An LED display clearly relays device status information including RUN, FAULT diagnostics, and OFF.



Standard Features	
Selectable Start Times	2, 5, 10, 15, 20, 25, or 30 s
Selectable Initial Torque	0%, 25%, 35%, and 65% of locked rotor torque
Selectable Current Limit	150%, 250%, 350%, and 450% of full load current
Selectable Kick Start — 450% FLA	0, 0.5, 1.0, or 1.5 s
Selectable Soft Stop	Off, 100%, 200%, or 300% of the start time setting when wired

Electrical Ratings			
	UL/CSA/NEMA	IEC	
Power Circuit	Rated Operation Voltage	200...480V AC 200...600V AC	200...480V~ — 400V~
	Rated Insulation Voltage	600V AC	500V~ — 500V~
	Dielectric Withstand	2200V AC	500V~
	Repetitive Peak	200...480V AC: 1400V 200...600V AC: 1600V	2500V~
	Operating Frequency	50/60 Hz	200...480V~: 1400V
		1...37 A	—
		43...60 A	—
		85 A	—
	Utilization Category	108 A	—
		135 A	—
	201...251 A	—	
	317...480 A	—	
Number of Poles	Equipment designed for 3-phase only		
Rated Impulse Voltage	6 kV		
DV/DT Protection	1000V/μs		
Overvoltage Category	III		

Type 1							
SCPD Performance	Non-Time Delay		Thermal Magnetic Circuit Breaker		High Capacity Time Delay Class CC/J/L		
	Max. Standard Available Fault	Max. Standard Fuse (A)*	Max. Standard Available Fault	Max. Circuit Breaker (A)	Max. Standard Available Fault	Max. Fuse (A)	
SCPD List‡	3	5 kA	12	5 kA	12	70 kA	6
	9	5 kA	30	5 kA	30	70 kA	15
	16	5 kA	60	5 kA	60	42 kA	30
	19	5 kA	70	5 kA	70	42 kA	40
	25	5 kA	100	5 kA	100	42 kA	50
	30	5 kA	110	5 kA	110	42 kA	60
	37	5 kA	125	5 kA	125	42 kA	60
Line Device Operational Current Rating (A)	43	10 kA	150	10 kA	150	70 kA	90
	60	10 kA	225	10 kA	225	70 kA	125
	85	10 kA	300	10 kA	300	70 kA	175
	108	18 kA	400	18 kA	300	70 kA	200
	135	18 kA	500	18 kA	400	70 kA	225
	201	18 kA	600	18 kA	600	70 kA	350
	251	30 kA	700	30 kA	700	70 kA	400
	317	30 kA	800	30 kA	800	69 kA	500
	361	42 kA	1000	30 kA	1000	69 kA	600
	480	42 kA	1200	30 kA	1200	69 kA	800
Short Circuit Protection	5.1	5 kA	12	5 kA	12	70 kA	6
	16	5 kA	30	5 kA	30	70 kA	15
	27.6	5 kA	60	5 kA	60	42 kA	30
	32.8	5 kA	70	5 kA	70	42 kA	40
	43	5 kA	100	5 kA	100	42 kA	50
	52	5 kA	110	5 kA	110	42 kA	60
	64	5 kA	125	5 kA	125	42 kA	60
	74	10 kA	250	10 kA	250	70 kA	150
	104	10 kA	400	10 kA	300	70 kA	200
	147	10 kA	400	10 kA	400	70 kA	200
	187	18 kA	600	18 kA	500	70 kA	300
	234	18 kA	700	18 kA	700	70 kA	400
	348	18 kA	1000	18 kA	1000	70 kA	600
	435	30 kA	1200	30 kA	1200	69 kA	800
	549	30 kA	1600	30 kA	1600	69 kA	1000
	625	42 kA	1600	30 kA	1600	69 kA	1200
	831	42 kA	1600	30 kA	1600	69 kA	1600

\* Non-time delay fuses (K5).

‡ Consult local codes for proper sizing of short circuit protection.

Bulletin 150  
**Smart Motor Controllers — SMC™-3**  
 Specifications, Continued

Electrical Ratings			
		<b>UL/CSA/NEMA</b>	<b>IEC</b>
Rated Operational Voltage (+10%, -15%)		100...240V AC, 24V AC/DC	100...240V~, 24V AC/DC
Rated Insulation Voltage		250V	250V~
Rated Impulse Voltage		—	4 kV
Dielectric Withstand		1500V AC	2000V~
Overvoltage Category		—	III*
Operating Frequency		50/60 Hz	50/60 Hz
Input onstate voltage minimum, during start (IN1, IN2)		85V AC, 19.2V DC / 19.2V AC	
Input onstate current (IN1, IN2)		9.8 mA @ 120V AC / 19.6 mA @ 240V AC, 7.3 mA @ 24V AC/DC	
Input offstate voltage maximum (IN1, IN2)		40V AC, 17V DC / 12V AC	
Input offstate current @ input offstate voltage (IN1, IN2)		<10 mA, <12 mA	
	3...37 A	215 mA @ 120V AC / 180 mA @ 240V AC, 800 mA @ 24V DC / 660 mA @ 24V AC	
	43...85 A	200 mA @ 120V AC / 100 mA @ 240V AC, 700 mA @ 24V AC/DC	
Control Power with Fan, during start		<b>Fan Power</b>	<b>Control Power</b>
	108...135 A	20 VA	200 mA @ 120V AC / 120 mA @ 240V AC, 600 mA @ 24V AC/DC
	201...251 A	40 VA	
	317...480 A	60 VA	
Control Power without Fan, during start	3...37 A	205 mA @ 120V AC / 145 mA @ 240V AC, 705 mA @ 24V DC / 580 mA @ 24V AC	
	<b>Controller Rating (A)</b>	<b>Steady State Heat Dissipation (W)</b>	<b>Overload Current Range (A)</b>
	3	11	1...3
	9	12	3...9
	16	14	5.3...16
	19	15	6.3...19
	25	17	9.2...27.7
	30	19	10...30
	37	24	12.3...37
Steady State Heat Dissipation and Overload Current Range	43	34	14.3...43
	60	50	20...60
	85	82	28.3...85
	108	62	27...108
	135	75	34...135
	201	129	67...201
	251	147	84...251
	317	174	106...317
	361	194	120...361
	480	239	160...480

Auxiliary Contacts			
		<b>UL/CSA/NEMA</b>	<b>IEC</b>
Rated Operational Voltage		250V AC/30V DC	250V~/30V DC
Rated Insulation Voltage		250V	250V~
Rated Impulse Voltage		—	4 kV
Dielectric Withstand		1500V AC	2000V~
Overvoltage Category		—	III*
Operating Frequency		50/60 Hz	50/60 Hz
Utilization Category		D300/D300	AC-15/DC
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
TB-97, -98 (OVLD/Fault)	Rated Operational Current (max.)	0.6 A @ 120V~ and 0.3 A @ 240V~	
	Conventional Thermal Current $I_{th}$	1 A	
	Make/Break VA	432/72	
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
TB-13, -14 (Normal/Up-to-Speed)	Rated Operational Current (max.)	0.6 A @ 120V~ and 0.3 A @ 240V~	
	Conventional Thermal Current $I_{th}$	1 A	
	Make/Break VA	432/72	

\*Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

Electrical Ratings		
Side-Mount Auxiliary Contacts		
	UL/CSA/NEMA	IEC
Rated Operational Voltage	250V AC/30V DC	250V AC/30V DC
Rated Insulation Voltage	250V	250V AC
Rated Impulse Voltage	—	4 kV
Dielectric Withstand	1500V AC	2000V AC
Overvoltage Category	—	III*
Operating Frequency	50/60 Hz	50/60 Hz
	C300/R150	AC-15/DC-13
TB-23, -24 (Normal/Up-to-Speed) TB-33, -34 (Normal/Up-to-Speed)	Utilization Category	Electromagnetic relay
	Type of Control Circuit	1
	Number of Contacts	Normally Open (N.O.)
	Type of Contacts	AC/DC
	Type of Current	1.5 A @ 120V AC, 0.75A @ 240V AC, 1.17 A @ 24V DC
	Rated Operational Current (max.)	2.5 A
	Conventional Thermal Current $I_{th}$	1800/180V AC, 28V DC (resistive)
	Make/Break VA	B300/R300
TB-11, -12 (Normal/Up-to-Speed)	Type of Control Circuit	Electromagnetic relay
	Type of Control Circuit	1
	Number of Contacts	Normally Open (N.O.)
	Type of Contacts	AC/DC
	Type of Current	3 A @ 120V AC, 1.5A @ 240V AC, 1.17 A @ 24V DC
	Rated Operational Current (max.)	5 A
	Conventional Thermal Current $I_{th}$	3600/360 V AC, 28V DC (resistive)
	Make/Break VA	

\*Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

Environmental	
Operating Temperature Range	-5...50 °C (23...122 °F) (open) -5...40 °C (23...104 °F) (enclosed)
Storage and Transportation Temperature Range	-25...85 °C (-13...185 °F)
Altitude	2000 m (6560 ft)
Humidity	5...95% (non-condensing)
Pollution Degree	2
Type of Protection	IP2X

Mechanical Ratings		
Resistance to Vibration	Operational	1.0 G Peak, 0.15 mm (0.006 in.) displacement
	Non-Operational	2.5 G Peak, 0.38 mm (0.015 in.) displacement
Resistance to Shock	Operational	15 G
	Non-Operational	30 G
Line Power Terminals	Cable Size Tightening Torque	3...37 A 2.5...25 mm <sup>2</sup> (14...4 AWG) 2.3...2.8 N•m (20...25 in-lbs)
		43...85 A 2.5...95 mm <sup>2</sup> (14...3/0 AWG) 11.3...12.4 N•m (100...110 in-lbs)
		108...135 A 23 N•m (200 in-lbs)
		201...251 A Two M10 x 1.5 diameter holes per power pole
		317...480 A Two M12 x 1.75 diameter holes per power pole
Load Power Terminals	Cable Size Tightening Torque	3...37 A 2.5...16 mm <sup>2</sup> (14...6 AWG) 2.3...2.5 N•m (20...22.5 in-lbs)
		43...85 A 2.5...50 mm <sup>2</sup> (14...1 AWG) 11.3...12.4 N•m (100...110 in-lbs)
		108...135 A 23 N•m (200 in-lbs)
		201...251 A Two M10 x 1.5 diameter holes per power pole
		317...480 A Two M12 x 1.75 diameter holes per power pole
Control Terminals	Cable Size Tightening Torque	All 0.2...2.5 mm <sup>2</sup> (24...14 AWG) 0.5...0.9 N•m (4.4...8.0 in-lbs)

Other		
	UL/CSA/NEMA	IEC
EMC Emission Levels	Conducted Radio Frequency Emissions	—
	Radiated Emissions	—
EMC Immunity Levels	Electrostatic Discharge	4 kV Contact and 8 kV Air Discharge
	Radio Frequency Electromagnetic Field	—
	Fast Transient	—
	Surge Transient	—



**Bulletin 150 — Smart Motor Controllers — SMC-3™ Smart Motor Controller**

The SMC-3™ is a compact, simple to use, solid-state motor controller designed to operate 3-phase motors. It features a built-in overload relay and a built-in SCR bypass contactor on all three phases, allowing a smaller footprint than other soft starters on the market. This product is designed for many applications, including compressors, chillers, pumps, conveyors, and crushers.

Modes of operation for the controller are as follows:

- Soft Start
- Current Limit Start
- Kick Start
- Soft Stop
- Coast-to-Rest

The controllers are available in twelve sizes: 3, 9, 16, 19, 25, 30, 37, 43, 60, 85, 108, and 135 A. They offer two voltage ranges: 200...480V AC and 200...600V AC. All voltage ranges will operate at either 50 or 60 Hz.

- 1...135 A Range
- Built-In Electronic Motor Overload Protection
- Built-In SCR/Run Bypass
- Delta Connections for 108 A and 135 A Devices

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 Approximate Dimensions ..... 44  
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 Accessories (SMC-3 and SMC-Delta) ..... 47

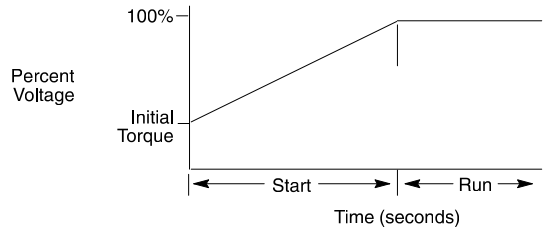
**Standards Compliance/Approvals**

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-4-2
- cULus Listed (Open Type) (File No. E96956)
- CE Marked (Open Type) per EMC Directive and Low Voltage Directive

**Modes of Operation**

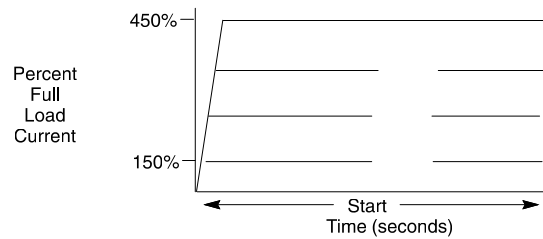
**Soft Start**

This method has the most general application. The motor is raised from an initial torque value to full voltage. This initial torque can be adjusted to 15%, 25%, 35%, or 65% of locked rotor torque. The motor voltage is gradually increased during the acceleration ramp time, which can be adjusted from 2, 5, 10, 15, 20, 25, or 30 s. (3...37 A, 2...15 s only)



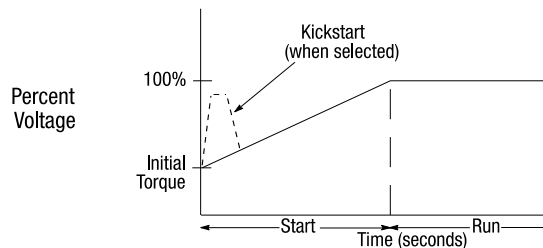
**Current Limit Start**

This starting mode is used when it is necessary to limit the maximum starting current. It can be adjusted to 150%, 250%, 350%, or 450% of full load amps. Start times are selectable from 2, 5, 10, 15, 20, 25, or 30 s. (3...37 A, 2...15 s only)



**Selectable Kick Start**

A kickstart, or boost, at the beginning of the start mode is intended to provide a current pulse of 450% of full load current. The kickstart time is adjustable from 0.5...1.5 seconds. This allows the motor to develop additional torque during starting for loads which may need a boost to get initial shaft rotation.

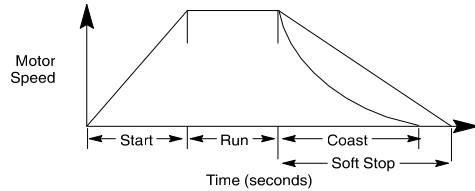




## Modes of Operation, Continued

### Soft Stop

The Soft Stop function can be used with applications that require an extended stop time. When enabled, the voltage ramp down time can be selected to one, two, or three times the starting time. The motor will stop when the motor voltage drops to a point where the load torque is greater than the motor torque.



## Description of Features

### Electronic Motor Overload Protection

The SMC-3 controller incorporates, as standard, electronic motor overload protection. This motor overload protection is accomplished electronically with the use of current transformers on each of the three phases. The controller's overload protection is programmable, providing the user with flexibility. The overload trip class selection consists of either OFF, 10, 15, or 20. The trip current is easily selected by adjusting the rotary potentiometer to the motor full load current rating. Trip reset is selectable to either automatic or manual mode.

**Note:** Trip rating is 120% of dial setting.

### Over-temperature

The SMC-3 monitors the SCR temperature by means of internal thermistors. When the power poles maximum rated temperature is reached, the microcomputer switches off the SMC, a TEMP fault is indicated via LED, and the 97/98 fault contact closes.

### Phase Reversal Protection

When enabled via a DIP switch, 3-phase input power will be verified before starting. If input power phasing is detected to be incorrect, the start will be aborted and a fault indicated.

### Phase Loss/Open Load

The unit will not attempt a start if there is a single-phase condition on the line. This protects from motor burnout during single-phase starting.

### Phase Imbalance

The unit monitors for imbalance between phase currents. To prevent motor damage, the unit will trip if the phase imbalance exceeds 50% current imbalance for 3 seconds, and a fault will be indicated.

### Shorted SCR

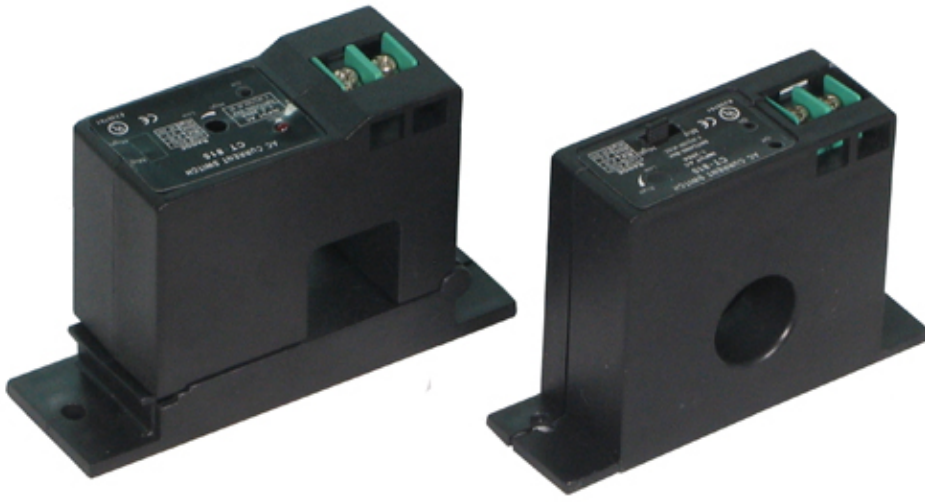
Prior to every start and during starting, the unit will check all SCRs for shorts and unit load connections to the motor. If there is a shorted SCR in the SMC-3 and/or open load, the start will be aborted and a shorted SCR or open load fault will be indicated. This prevents damage from phase imbalance.

### Push to Test

The unit with control wiring can be tested for fault conditions by using the Push to Test function. Hold down the Reset button for 5 seconds to activate the fault Aux (97, 98) and shut down the SMC-3. To clear, either push the Reset button or cycle control power to the device.

### LED Description (Number of Flashes)

1. Overload
2. Overtemperature
3. Phase Reversal
4. Phase Loss/Open Load
5. Phase Imbalance
6. Shorted SCR
7. Test



**Application of Current transducer:**

Current transducer measure power and monitor filling and pumping operations as well as monitoring changing process variables.

**Feature of current transducer:**

- Three ranges per unit reduces inventory by select jumper or none.
- No field adjustment necessary, factory calibrated
- Average measurement is equivalent to True RMS for pure sine waves for the 0-5V,0-10V no need power supply,4-20mA series
- True RMS measurement for sine waves or variable frequency drives for the 420T series
- Input / Output isolation via current transformer
- Solid-state reliability

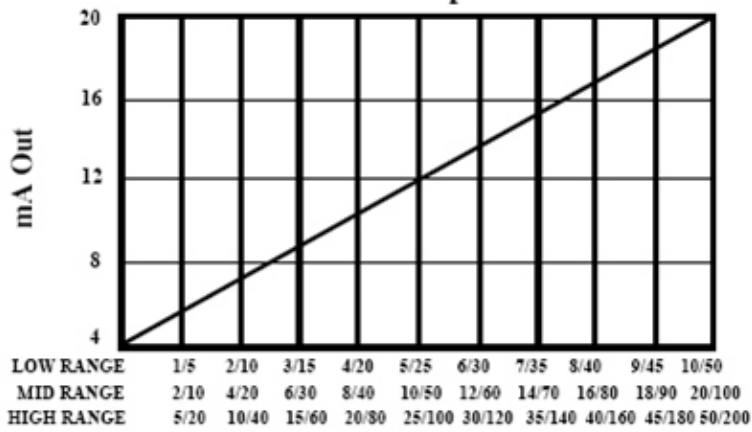
**Specifications:**

**FCS521/FCS2151**

Power Supply 15-42 Vdc at sensor (loop powered) Operating Temperature -30C to +70°C(32 to 104 ° F)  
 Input Current Ranges Three field selectable ranges, 0-10/0-20/0-50 Amps  
 or 0-50/0-100/0-200 Amps  
 Operating Humidity 0 to 95% RH, non-condensing  
 Maximum Input Voltage

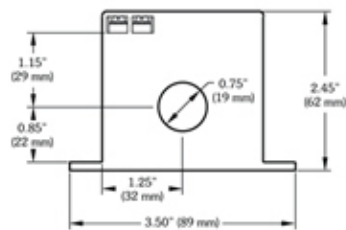
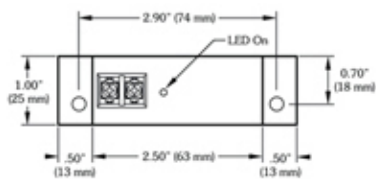
10/20/50 Amp ranges – 80/120/200 Amps continuous  
 50/100/200 Amp ranges – 175/300/400 Amps continuous  
 Protection Circuitry Reverse voltage protected and output limited  
 Response Time < 250mS (0-90%)  
 Wiring Solid Core – Barrier strip  
 AC Conductor Hole Split Core  
 Enclosure Material UL 94 V-0 flammability rated ABS  
 Enclosure Size: below dimension.  
 (H x W x D) 4.67" x 5.07" x 3"  
 Output Signal & Accuracy 4 to 20 mA represents 0 to 100% of current span. Better than ±1% FS on all three ranges

**Model FCS521/FCS215**  
**AC Amps**



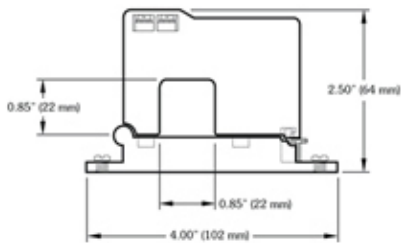
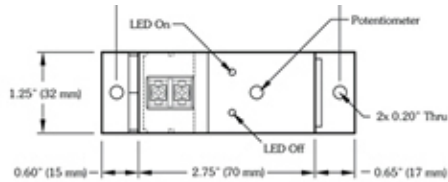
UL E320368, CE compliant, Rohs compliant

**FCS521/FCS2151**



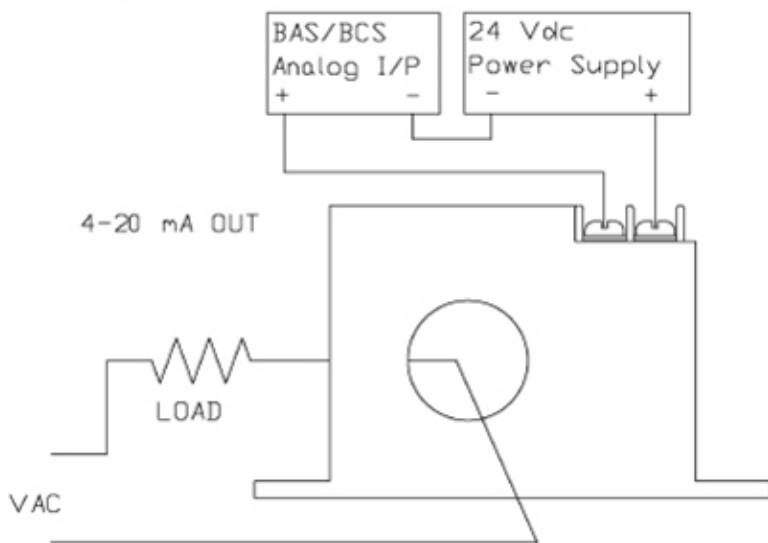
**FCS521/FCS2151**





Installation:

## Wiring



Attention: 0-5V, 0-10V output are do not need power supply.

Disconnect and lock-out all power sources during installation as severe injury or death can result from electrical shock due to contact with high voltage conductors. Ensure all installations are in compliance with applicable electrical codes and that the installation is completed by qualified installers familiar with the standards and proper safety procedures for high-voltage installation. Never rely on status indicating devices only to determine if power is present in a conductor. Insure the range selection jumper is installed in the correct position for the current being monitored. Excessive current can damage the sensor. See below for information on setting the jumpers.

Install the Split-Core over the conductor to be monitored and close the sensor until it latches, ensuring that the two halves are properly aligned. Operation of the sensor will be impaired if any dirt particles prevents good contact between the core pieces when the device is closed, keep the sensor clean when it is opened.

Mount the switch in a suitable location using the two mounting holes in the base of the unit.

The conductor may be looped more than once through the sensor to multiply the sensitivity but this also divides the maximum

currents. For example, on the 0-200 amp scale, if the conductor is looped through twice, the maximum current will now be 100 amps.

Connect the output circuit to the two screw terminals using ring or fork type terminals. Typical connections are shown in the wiring examples. Note polarity as indicated on the device label.

To allow field calibration, all devices have easily accessible calibration pots.



# 5S1FSS

Sealed Transformer , 5kVA, Primary: 240 x 480VAC, Secondary: 120/240VAC



Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

## Technical Characteristics

Insulation Temperature	180 Degrees C
Application	General Purpose - Intended for power, heating and lighting applications
Approvals	cULus Listed
Catalog Reference Number	7400CT9601
Enclosure Code	13B
Enclosure Material	Painted Stainless Steel
Enclosure Rating	NEMA 3R
Enclosure Type	Rainproof and Ice/Sleet proof (Indoor/Outdoor)
Specifications	Sealed and Resin Filled
Width	9.75 Inches
Primary	240 x 480VAC
Type	Dry
Height	14.75 Inches
Temperature Rise	115 Degrees C
Phase	1-Phase
Full Capacity Taps	None
Secondary	120/240VAC
Mounting Type	Wall
Rating	5kVA
Depth	11.75 Inches
Weathershield	Not required for outdoor use

## Shipping and Ordering

Category	16277 -
Discount Schedule	PE2
Article Number	785901338376
Package Quantity	1
Weight	120 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	N

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

Availability **Stock Item: This item is normally stocked in our distribution facility.**

**Technical  
Characteristics**

**Shipping and Ordering**

Category	21714 -
Discount Schedule	CP1
GTIN	00785901879145
Package Quantity	12
Weight	0.13 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	FR

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



**SMALL FUSE - BIG PROTECTION  
FOR GENERAL CIRCUITS**

Amp-trap® ATMR fuses, in the Class CC family, are the smallest dimension 600VAC/DC fuses suitable for branch circuit protection. The ATMR is a popular choice for economical protection of control circuits and control circuit transformers where available short circuit currents exceed 10,000 amperes. ATMR's rejection dimensions prevent substitution by lesser rated fuses. These fast acting fuses give current limiting protection to general circuits.

**B**

**Features/Benefits**

- **Rejection style design** prevents replacement errors when used with recommended fuse blocks
- **Versatile design** for individual component and branch circuit protection

**HIGHLIGHTS:**

- Fast Acting
- Very Current-Limiting



**APPLICATIONS:**

- Control Circuits
- Lighting
- General Loads
- Branch Circuit Protection

**Ratings**

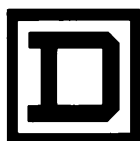
- **AC:** 1/10 to 30A  
600VAC, 200kA I.R.
- **DC:** 1/10 to 30A  
600VDC, 100kA I.R.

**Approvals**

- UL Listed to Standard 248-4 File E2137
- CSA Certified to Standard C22.2 No. 248.4
- DC Listed to ULStandard 248

**Standard Fuse Ampere Ratings,  
Catalog Numbers**

AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER
1/10	ATMR1/10	3-1/2	ATMR3-1/2
1/8	ATMR1/8	4	ATMR4
2/10	ATMR2/10	5	ATMR5
1/4	ATMR1/4	6	ATMR6
3/10	ATMR3/10	7	ATMR7
1/2	ATMR1/2	8	ATMR8
3/4	ATMR3/4	9	ATMR9
1	ATMR1	10	ATMR10
1-1/4	ATMR1-1/4	12	ATMR12
1-1/2	ATMR-1-1/2	15	ATMR15
2	ATMR2	20	ATMR20
2-1/2	ATMR2-1/2	25	ATMR25
3	ATMR3	30	ATMR30



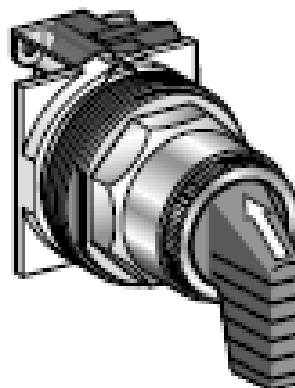
**SQUARE D**  
GROUPE SCHNEIDER

# 9001SKS43B

## Selector Switch

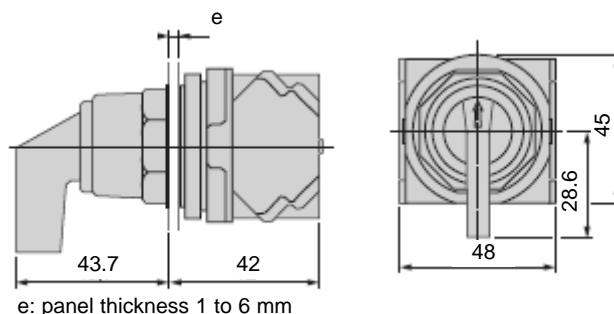
### 3-Position Maintained

### 30mm Black Lever Operator



#### Selector Switch Sequences (using contact block assemblies)

3 Position selector switch			
			Contact block guide
X	O	O	1 N.C. (left or right)
O	O	X	1 N.O. (left or right)
X	O	O	1 N.O. and (left or right)
O	O	X	1 N.C.



#### GENERAL CHARACTERISTICS

##### Environment:

Conformity to standards

Product certifications

Protective treatment

Ambient temperature

Resistance to vibration

Resistance to shock

Protection against electric shock

Degree of protection for chromium metal bezel

Degree of protection for plastic bezel range

Mechanical life

Mounting position

IEC 947-1, IEC 947-5-1, IEC 947-5-4, EN 60947-5-1, JIS C 4520 AND 852, UL 508, CSA C22-22 n° 14

UL508, NEMA A600-Q600

Standard version: "TC"

Operating: -25 °C to +70 °C (-13 °F to +158 °F) Storage: -40 °C to +70 °C (-40 °F to +158 °F)

Conforming to IEC 68-2-6. Frequency 2 to 500 Hz: 7gn Ford Standard EA-1

Conforming to IEC 68-2-27. Half sine wave: 50 gn

Conforming to IEC 536, Class II

Conforming to IEC 529 & NF C 20-010. IP 66;

Conforming to NEMA: Types 1,2,3,3R,4,6,12 and 13

Conforming to IEC 529 & NF C 20-010. IP 66;

Conforming to NEMA: Types 1,2,3,3R,4,4X,12 and 13

Pushbuttons, spring return, 5 million operations

Illuminated pushbuttons, 5 million operations

Selector switches and key switches, 0.5 million operations

All positions

#### PRODUCT CERTIFICATIONS



File LR 25490  
Class 3211 03



File E 78403  
CCN NKCR



File E 78403  
CCN NKCR



Marked

For Declaration of  
Conformity



# 9001KA1

## 30MM CONTACT BLOCK 1N/O 1N/C



List Price \$42.80 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

Ampere Rating	10A
Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Contact Configuration	1 NO - 1 NC
Contact Type	Standard (Fingersafe)
Maximum Voltage Rating	600V
Size	30mm
Terminal Type	Screw Clamp
Type	K

### Shipping and Ordering

Category	21434 - Blocks, Contact, Type KA
Discount Schedule	CS1
GTIN	00785901880004
Package Quantity	1
Weight	0.06 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



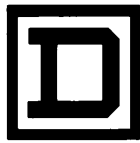
### Technical Characteristics

Ampere Rating	10A
Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Bezel Material	Black Plastic
Button/Cap Color	Red
Button Type	Screw-On Plastic Mushroom (1.63 Inch/41mm)
Guard Type	No Guard
Contact Configuration	1 NO - 1 NC
Contact Block Code	H13
Contact Type	Standard (Fingersafe)
Enclosure Type	Water tight, Dust tight, Oil tight and Corrosion Resistant (Indoor/Outdoor)
Enclosure Rating	NEMA 1/2/3/3R/4/4X/6/12/13
Head Type	Round
Light Module Supply Voltage	110/120VAC@50/60Hz
Light Module Type	Transformer
Maximum Voltage Rating	600V
Markings	None
Mounting Type	Panel
Number of Operators	1
Number of Positions	2
Operator Action	Maintained (Push/Pull)
Operator Type	Illuminated
Size	30mm
Terminal Type	Screw Clamp
Type	K
Utilization Category	AC15 - DC13

### Shipping and Ordering

Category	21429 - Push Buttons, Corrosion Resistant, Type SK & SKY
Discount Schedule	CS1
GTIN	00785901043102
Package Quantity	1
Weight	0.47 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

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**SQUARE D**  
GROUPE SCHNEIDER

**9001SKR1B**  
**Type SK 30.5mm Black**  
**Non-Illuminated Momentary**  
**Push Button Operator**  
**Without Contacts**



**FULL GUARD**

**MAXIMUM CONTACT BLOCK USAGE:**

3 blocks mounted in tandem (total of six blocks)

**OPERATOR SERVICE TEMPERATURE RANGE:**

-22° to +140° Fahrenheit at 50% relative humidity; -30° to +60° Celsius

**ENVIRONMENTAL RATINGS:**

The Type SK operators are UL approved for use in Types 1, 2, 3, 3R, 4, 4X, 6, 12 and 13 flat surface enclosures.

**CONFORMING TO STANDARDS:**

UL508, IEC 947-5-1, VDE 0106, CSA



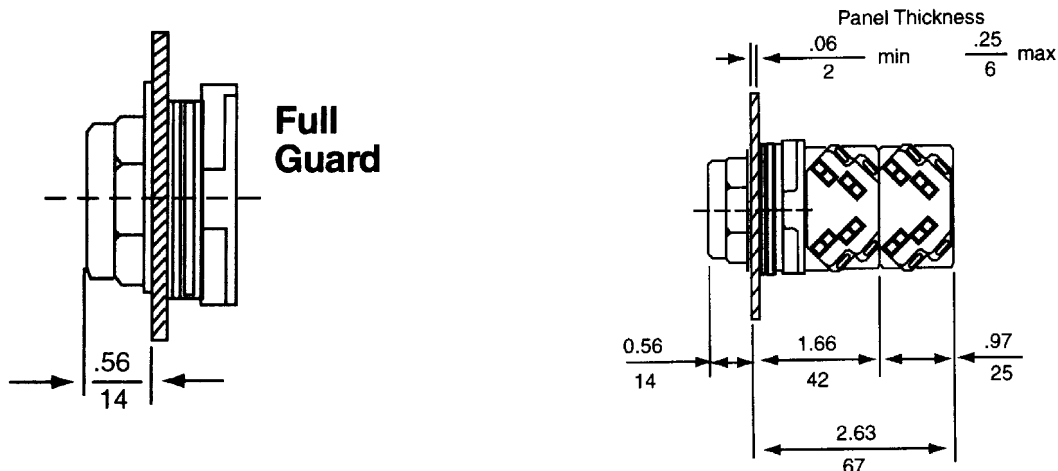
FILE E42259  
CCN NKCR



FILE LR25490  
CLASS 3211 03



**APPROXIMATE DIMENSIONS**



# 9001KA2

## 30MM CONTACT BLOCK 1N/O



List Price \$21.50 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

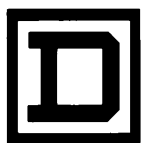
Ampere Rating	10A
Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Contact Configuration	1 NO
Contact Type	Standard (Fingersafe)
Maximum Voltage Rating	600V
Size	30mm
Terminal Type	Screw Clamp
Type	K

### Shipping and Ordering

Category	21434 - Blocks, Contact, Type KA
Discount Schedule	CS1
GTIN	00785901880011
Package Quantity	1
Weight	0.05 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

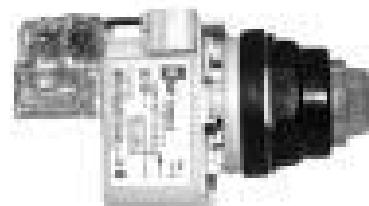




**SQUARE D**  
**GROUPE SCHNEIDER**

## 9001SKT1LR

**Pilot Light, 30 mm, LED, Transformer  
Push to Test, Non-Metallic  
120 VAC/DC, Full Voltage Type  
For use with Red Colored Lens  
(ordered separately)**



### GENERAL CHARACTERISTICS

#### Environment:

Conformity to standards

IEC 947-1, IEC 947-5-1, IEC 947-5-4, EN 60947-5-1, JIS C 4520 AND 852, UL 508, CSA C22-22 n° 14

Product certifications

UL508, NEMA A600-Q600

Protective treatment

Standard version: "TC"

Ambient temperature

Operating: -25 °C to +70 °C (-13 °F to +158 °F) Storage: -40 °C to +70 °C (-40 °F to +158 °F)

Resistance to vibration

Conforming to IEC 68-2-6. Frequency 2 to 500 Hz: 7gn Ford Standard EA-1

Resistance to shock

Conforming to IEC 68-2-27. Half sine wave: 50 gn

Protection against electric shock

Conforming to IEC 536, Class II

Degree of protection for chromium metal bezel

Conforming to IEC 529 & NF C 20-010. IP 66;

Conforming to NEMA: Types 1,2,3,3R,4,6,12 and 13

Degree of protection for plastic bezel range

Conforming to IEC 529 & NF C 20-010. IP 66;

Conforming to NEMA: Types 1,2,3,3R,4,4X,12 and 13

Mechanical life

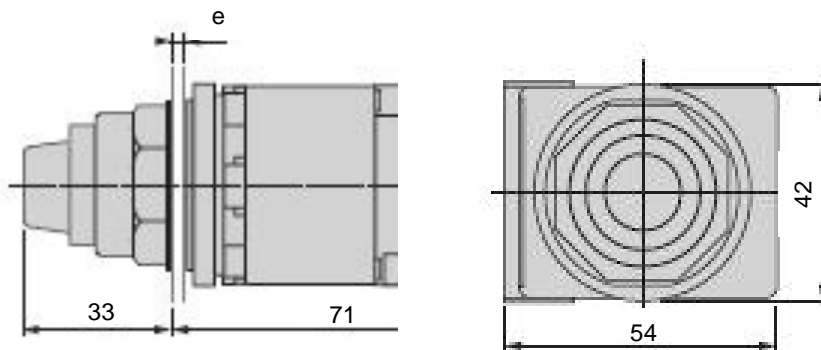
Pushbuttons, spring return, 5 million operations

Illuminated pushbuttons, 5 million operations

Selector switches and key switches, 0.5 million operations

Mounting position

All positions



e: panel thickness 1 to 6 mm

### PRODUCT CERTIFICATIONS



File E 78403  
CCN NKCR



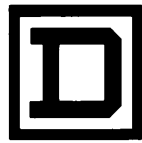
File LR 25490  
Class 3211 03



File E 78403  
CCN NKCR2



Marked



**SQUARE D**  
*GROUPE SCHNEIDER*

## **9001\_31**

**Plastic Fresnel Pilot Light Lens  
for SKP & SKT**

**9001A31 - Amber**

**9001L31 - Blue**

**9001C31 - Clear**

**9001G31 - Green**

**9001R31 - Red**

**9001W31 - White**

**9001Y31 - Yellow**



List Price \$185.00 USD

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.****Technical Characteristics**

Approvals	UL File Number E42259 CCN NKCR - CSA File Number LR24590 Class 3211-03 - CE Marked
Bezel Material	Black Plastic
Enclosure Type	Water tight, Dust tight, Oil tight and Corrosion Resistant (Indoor/Outdoor)
Enclosure Rating	NEMA 1/2/3/3R/4/4X/6/12/13
Head Type	Round
Lens Color	No Lens
Light Module Supply Voltage	24/28V
Lens Type	No Lens
Light Module Type	LED (Green)
Operator Type	Push-To-Test
Size	30mm
Type	K
Terminal Type	Screw Clamp

**Shipping and Ordering**

Category	21429 - Push Buttons, Corrosion Resistant, Type SK & SKY
Discount Schedule	CP1
GTIN	00785901413288
Package Quantity	1
Weight	0.5 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	N
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



## SR2P06

### 8 Pin Din Mount Screw Type Socket



- High reliability and long service life
- SPDT, DPDT, or 3PDT pure silver contacts
- Available with octal (8-pin and 11-pin) or .187" blade plug-in terminals
- Worldwide approvals on octal (8-pin and 11-pin) models: UL, CSA, TUV, CE
- Options include check button for test operation and indicator light
- Mounting options include flange mounting, DIN socket, or panel mount socket



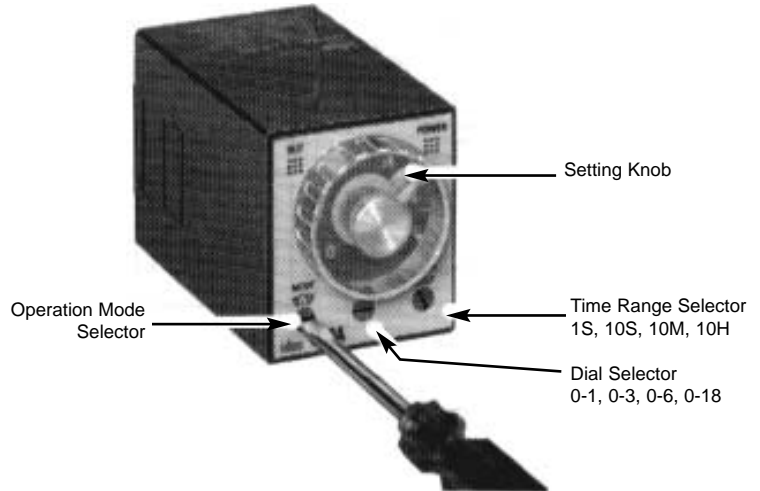




# GT3A3AF20

## Multi-Timer (Multi-Mode Type)

### 8-Pin



**TYPES:**

- Operation Mode:    A: ON Delay  
                               B: Interval ON  
                               C: Flicker  
                               D: Flicker ON

Rated Voltage Code: 100 to 240V AC (50/60Hz)

Time Range: 0.05 sec to 180 hours (See the time range table for details).

Output: 240V AC, 5A; 24V DC, 5A (resistive load)

Contact: Delayed DPDT

**SWITCH SETTING:**

1. The switches should be securely turned using a flat screwdriver, 4 mm wide maximum. Note that incomplete setting may cause malfunction. Type switches, which do not turn infinitely, should not be turned beyond the limits.
2. Since changing the setting during timer operation may cause malfunction, power should be turned off before changing the setting.

TIME RANGE DETERMINED BY TIME RANGE SELECTOR AND DIAL SELECTOR

Range \ Dial	0-1	0-3	0-6	0-18
1S	0.05 sec – 1 sec	0.05 sec – 3 sec	0.05 sec – 6 sec	0.05 sec – 18 sec
10S	0.1 sec – 10 sec	0.3 sec – 30 sec	0.6 sec – 60 sec	1.8 sec – 180 sec
10M	6 sec – 10 sec	18 sec – 30 sec	36 sec – 60 min	108 sec – 180 min
10H	6 min – 10 hours	18 min – 30 hours	36 min – 60 hours	108 min – 180 hours

# Product data sheet

## Characteristics

# RXM4AB1F7

## miniature plug-in relay - Zelio RXM - 4 C/O - 120 V AC - 6 A

Product availability: Stock - Normally stocked in distribution facility  
Price\*: 6.00 USD



### Main

Commercial Status	Commercialised
Range of product	Zelio Relay
Series name	Miniature
Product or component type	Plug-in relay
Device short name	RXM
Contacts type and composition	4 C/O
Contacts operation	Standard
Control circuit voltage	120 V AC
[the] conventional enclosed thermal current	6 A at -40...131 °F (-40...55 °C)
Status LED	Without
Control type	Pushbutton
Coil interference suppression	Without
Utilisation coefficient	20 %
Sale per indivisible quantity	10

### Complementary

Shape of pin	Flat
[Ui] rated insulation voltage	300 V conforming to UL 300 V conforming to CSA 250 V conforming to IEC
[Uimp] rated impulse withstand voltage	2.5 kV 1.2/50 µs IEC 61000-4-5
Contacts material	Silver alloy (Ag/Ni)
[Ie] rated operational current	8 A (AC-1/DC-1) conforming to UL 6 A (AC-1/DC-1) NO conforming to IEC 3 A (AC-1/DC-1) NC conforming to IEC
Minimum switching current	10 mA
Maximum switching voltage	250 V DC 250 V AC conforming to IEC
Minimum switching voltage	17 V
Load current	6 A at 28 V DC 6 A at 250 V AC
Maximum switching capacity	168 W, DC circuit 1500 VA, AC circuit
Minimum switching capacity	170 mW
Operating rate	<= 18000 cycles/hour no-load <= 1200 cycles/hour under load
Mechanical durability	10000000 cycles
Electrical durability	100000 cycles for resistive load
Average consumption in VA	1.2 AC 60 Hz
Drop-out voltage threshold	>= 0.15 U <sub>c</sub> AC
Operating time	20 ms between coil energisation and making of the On-delay contact 20 ms between coil de-energisation and making of the Off-delay contact

Average resistance	4430 Ohm, AC circuit at 20 °C +/- 15 %
Rated operational voltage limits	96...132 V AC
Protection category	RT I
Operating position	Any position
CAD overall width	0.83 in (21 mm)
CAD overall height	1.06 in (27 mm)
CAD overall depth	2.17 in (55 mm)
Product weight	0.08 lb(US) (0.037 kg)

## Environment

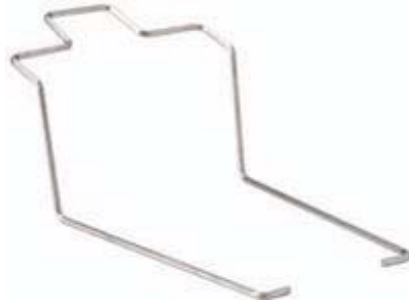
Dielectric strength	2000 V AC (between poles) 2000 V AC (between coil and contact) 1300 V AC (between contacts)
Product certifications	CSA GOST Lloyds UL
Standards	EN/IEC 61810-1 UL 508 CSA C22.2 No 14
Ambient air temperature for storage	-40...185 °F (-40...85 °C)
Ambient air temperature for operation	-40...131 °F (-40...55 °C)
Vibration resistance	5 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 10 cycles not operating) conforming to EN/IEC 60068-2-27 3 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 10 cycles in operation) conforming to EN/IEC 60068-2-27
IP degree of protection	IP40 conforming to EN/IEC 60529
Shock resistance	30 gn for 11 ms not operating conforming to EN/IEC 60068-2-27 10 gn for 11 ms in operation conforming to EN/IEC 60068-2-27

## Ordering and shipping details

Category	21127 - ZELIO ICE CUBE RELAYS
Discount Schedule	CP2
GTIN	00785901646433
Nbr. of units in pkg.	10
Package weight(Lbs)	0.08
Product availability	Stock - Normally stocked in distribution facility
Returnability	Y
Country of origin	CN

## Contractual warranty

Period	18 months
--------	-----------



List Price \$0.50 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

### Shipping and Ordering

Category	21128 -
Discount Schedule	CP2
GTIN	00785901646549
Package Quantity	10
Weight	0.01 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	CN

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



# RXZE2M114M

## RELAY SOCKET 300V 10A RUZ +OPTIONS



List Price \$5.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

### Shipping and Ordering

Category	21128 -
Discount Schedule	CP2
GTIN	00785901758051
Package Quantity	10
Weight	0.12 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	CN

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# Zelio<sup>®</sup> RSL Interface Relays

Save valuable panel space with slim-style relays and sockets.



Available 4Q 2009!

Schneider Electric's slim interface relays provide compact solutions for general-purpose relay requirements. At only 6mm wide, the Zelio RSL frees valuable panel space. The modular, space-saving design is ideal for panel builders, industrial automation, energy management, conveyors, and assembly machine applications.

Installation time is greatly reduced with pre-assembled relays and sockets. Relays can also be obtained individually to seamlessly replace worn-out, competitive products. Optional accessories include bus-jumpers and print tags to facilitate parallel wiring and provide quick identification.

The Zelio product line ranges from basic to full-featured relays designed for industrial and general purpose product designs.

## Key Features:

- Space-saving 6mm width
- 6-amp load rating
- Single pole, double throw
- Coil voltage range: 12 to 230V
- Reinforced PCB pins (relay)
- Pre-assembled option
- Universal AC/DC socket with built-in surge protection and LED indicator
- DIN rail mounting
- Lever for easy locking and removal of the relay
- Screw terminal and spring clamp socket models
- Can be used in an ambient environment of -40°C to +55°C

Make the most of your energy<sup>SM</sup>

**Schneider**  
Electric

# Zelio® RSL Interface Relays

## Slim Interface Relays, Pre-assembled

Relays mounted on socket equipped with LED and protection circuit – sold in lots of 10

1 C/O contact – Thermal current (Ith) 6A		Socket Type	
Operating Voltage (VDC/VAC)	Control Circuit Voltage (VDC)	Screw Connector	Spring Terminal
		12	12
24	24	RSL 1PVBU	RSL 1PRBU
48	48	RSL 1PVFU	RSL 1PRFU
115	60	RSL 1PVFU	RSL 1PRFU
230	60	RSL 1PVFU	RSL 1PRFU

## Slim Interface Relays for Customer Assembly: Relay + Socket

Relays with flat, reinforced pins (PCB type) – sold in lots of 10

1 C/O contact – Thermal current (Ith) 6A	
Control Circuit Voltage (VDC)	Standard
12	RSL 1AB4JD
24	RSL 1AB4BD
48	RSL 1AB4ED
60	RSL 1AB4ND

Sockets equipped with LED and protection circuit – sold in lots of 10

Operating Voltage VDC/VAC	For Use with Relays	Socket Type	
		Screw Connector	Spring Terminal
12 and 24	RSL 1•B4JD	RSL ZVA1	RSL ZRA1
	RSL 1•B4BD		
40 and 60	RSL 1•B4ED	RSL ZVA2	RSL ZRA2
	RSL 1•B4ND		
110	RSL 1•B4ND	RSL ZVA3	RSL ZRA3
230	RSL 1•B4ND	RSL ZVA4	RSL ZRA4

Accessories for sockets sold in lots of 10


Description	Compatibility	Catalog Number
ID tags (sheet of 64 tags)	With all sockets	RSL Z5
Bus jumper (20-pole jumper)		RSL Z2
Butterfly isolator		RSL Z3

## > Put our expertise to work for you.

For more information on Schneider Electric interface relay solutions, visit us online at [www.Schneider-Electric.us](http://www.Schneider-Electric.us) or talk to one of our experts at 1-888-778-2733.

### Schneider Electric - North American Operating Division

1415 S. Roselle Road  
 Palatine, IL 60067  
 Tel: 847-397-2600  
 Fax: 847-925-7500

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Availability **Stock Item: This item is normally stocked in our distribution facility.**

**Technical  
Characteristics**

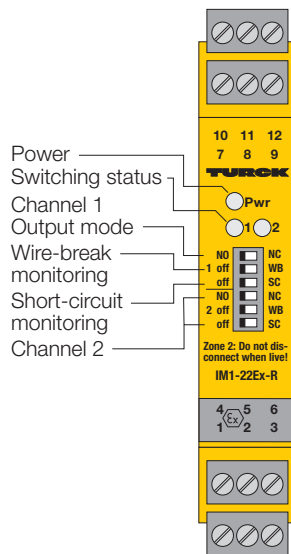
**Shipping and Ordering**

Category	21127 -
Discount Schedule	CP2
GTIN	00785901821878
Package Quantity	10
Weight	0.02 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	IT

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



# Isolating Switching Amplifier IM1-22Ex-R 2-channel



- **2-channel isolating switching amplifier with removable terminal blocks**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD, II 3 G**
- **Approved for installation in zone 2, however the device must be installed in a housing which complies with the requirements of EN 60079-15 with a minimum protection degree of IP54**
- **Functional safety up to SIL 2 (acc. to EN 61508)**
- **Galvanic isolation between input circuits, output circuits and supply voltage**
- **Input circuit monitoring for wire-break and short-circuit (can be disabled)**
- **2 relay outputs, each with one NO contact**
- **Selectable NO/NC output function**
- **Universal supply voltage (20...250 VAC/20...125 VDC)**

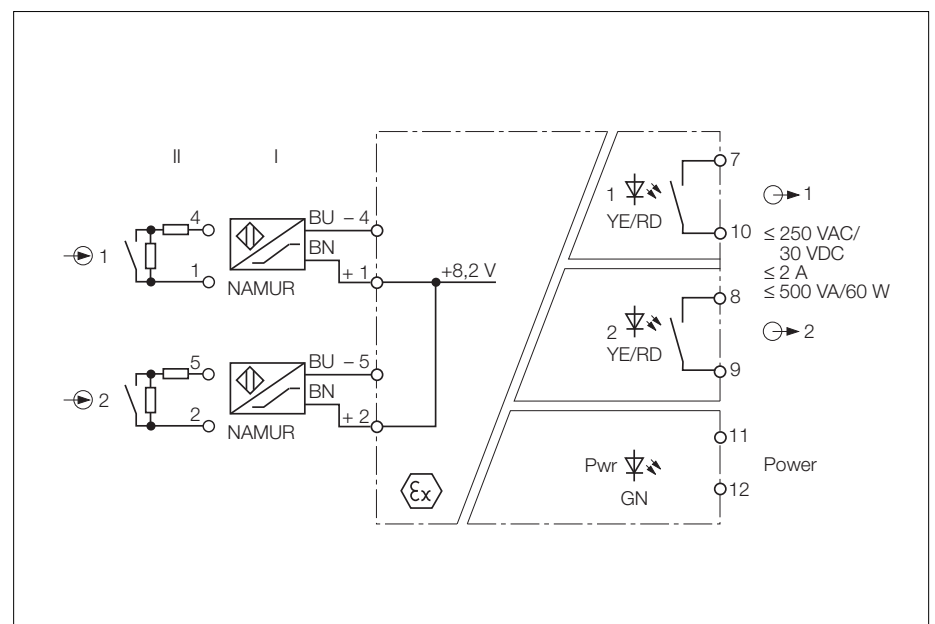
The isolating switching amplifier type IM1-22Ex-R is a dual channel device featuring intrinsically safe input circuits. It can be connected to sensors according to EN 60947-5-6 (NAMUR), variable resistors or potential-free contacts.

The output circuits feature one relay with one NO contact each.

Six front panel programming switches select the output function of each channel (normally open mode = NO/or normally closed mode = NC) and enable separate activation and de-activation of wire-break (WB) and short-circuit (SC) monitoring of each channel.

When using mechanical contacts as the input device, wire-break and short-circuit monitoring must be disabled or shunt resistors must be connected to the contacts (II). (See next page for contact configuration).

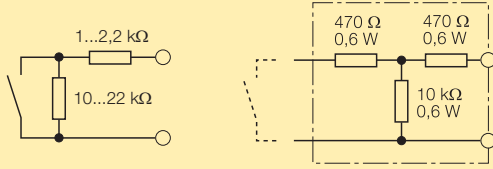
The green LED on the front cover indicates that the device is powered. The two dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.



## Isolating switching amplifier IM1-22Ex-R

<b>Type</b>	IM1-22Ex-R
Ident-no.	7541231
<b>Supply voltage</b> $U_B$	20...250 VAC/20...125 VDC
Line frequency (AC)	40...70 Hz
Power/current consumption	≤ 3 W
Galvanic isolation	between input circuit, output circuits and supply voltage for 250 V <sub>rms</sub> test voltage 2.5 kV <sub>rms</sub>

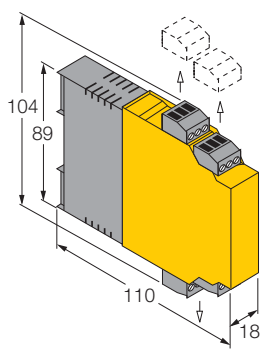
<b>Input circuits</b>	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8,2 V
– Current	8,2 mA
Switching threshold	1.55 mA
Hysteresis	typ. 0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA

<b>Contact configuration</b>	
Of mechanical switches with active input circuit monitoring function	 <p>resistor module WM1, ident-no. 0912101</p>

<b>Output circuits</b>	2 relay outputs with 1 NO contact each
Switching voltage	≤ 250 VAC/120 VDC
Switching current per output	≤ 2 A
Switching capacity per output	≤ 500 VA/60 W
Switching frequency	≤ 10 Hz
Contact material	silver-alloy + 3 μm Au

<b>Ex-Approval acc. to certificate of conformity</b>	TÜV 04 ATEX 2553 / TÜV 06 ATEX 552968 X
Maximum nominal values	
– No load voltage $U_0$	≤ 9.6 V
– Short-circuit current $I_0$	≤ 11 mA
– Power $P_0$	≤ 26 mW
Maximum external inductances/capacitances	
– [EEx ia] IIC	1 mH/1.1 μF / 5 mH/0.83 μF / 10 mH/0.74 μF
– [EEx ia] IIB	2 mH/5,2 μF / 10 mH/3,8 μF / 20 mH/3,4 μF
– Ex nL IIC	1 mH/1,9 μF / 5 mH/1,4 μF / 10 mH/1,2 μF
– Ex nL IIB	1 mH/11 μF / 5 mH/7,5 μF / 10 mH/6,6 μF
Marking of devices	Ⓔ II (1) GD [EEx ia] IIC II 3 G Ex nA nC [nL] IIC/IIB T4

<b>LED indications</b>	
– Power	green
– Switching status/Fault indication	2 x yellow/red (dual colour LED)

<b>Terminal housing</b>	12-pole, 18 mm wide, Polycarbonate/ABS, flammability class V-0 per UL 94	
Mounting	snap-on clamps for top-hat rail (DIN 50022) or screw terminals for panel mounting	
Connection	removeable terminal blocks, reverse-polarity protected, screw connection, self-lifting	
Connection profile	≤ 1 x 2.5 mm <sup>2</sup> , 2 x 1.5 mm <sup>2</sup> or 2 x 1.0 mm <sup>2</sup> with wire sleeves	
Degree of protection (IEC 60529/EN 60529)	IP20	
Operating temperature	-25...+70 °C	

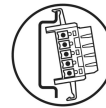
# MACX MCR-EX-SL-RPSSI-I

Order No.: 2865340




<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2865340>

Ex-i repeater power supply and input isolation amplifier, HART. Sends fed or active 0/4-20 mA signals from the Ex area to a load (active or passive) to the safe area. Electrical 3-way isolation, SIL 2 in accordance with IEC 61508.



## Commercial data

GTIN (EAN)	 4 046356 160353
sales group	H720
Pack	1 pcs.
Customs tariff	85437090
Catalog page information	Page 432 (IF-2009)

## Product notes

WEEE/RoHS-compliant since: 08/02/2006



<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

### Measuring input

Current input signal	0 mA ... 20 mA
	4 mA ... 20 mA
Transmitter supply voltage	> 16 V (at 20 mA)

### Measurement output

Signal output	Current output
Current output signal	0 mA ... 20 mA (active)
	4 mA ... 20 mA (active)
	0 mA ... 20 mA (14 ... 26 V ext. source voltage)
	4 mA ... 20 mA (14 ... 26 V ext. source voltage)
Load/output load current output	< 600 Ω

### Power supply

Nominal supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC
Max. current consumption	< 60 mA (at 24 V DC)
Power consumption	< 1.1 W (at 24 V DC / 20 mA)

### Connection data

Conductor cross section solid min.	0.2 mm <sup>2</sup>
Conductor cross section solid max.	2.5 mm <sup>2</sup>
Conductor cross section stranded min.	0.2 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	14
Stripping length	7 mm
Screw thread	M3
Connection method	Screw connection
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

### General data

No. of channels	1
Maximum transmission error	< 0.1 % (of final value)
Transmission error, typical	< 0.05 % (of final value)
Maximum temperature coefficient	< 0.01 %/K
Ambient temperature (operation)	-20 °C ... 60 °C (Any mounting position)
Ambient temperature (storage/transport)	-40 °C ... 80 °C
Permissible humidity (operation)	10 % ... 95 % (no condensation)
Step response (10-90%)	< 600 μs (for 4 mA ... 20 mA step)
Status display	Green LED (supply voltage)

Width	12.5 mm
Height	99 mm
Depth	114.5 mm
Inflammability class acc. to UL 94	V0
Housing material	PA 66-FR
Color	green
Conformance	CE-compliant, additionally EN 61326
ATEX	Ex II (1)G [Ex ia] IIC/IIB Ex II (1) D [Ex iaD] Ex II 3 (1)G Ex nA [ia] IIC/IIB T4
IECEX	[Ex ia] IIC/IIB; [Ex iaD]; Ex nA [ia] IIC/IIB T4
UL, USA / Canada	Class I Div 2; IS for Class I, II, III Div 1
Functional safety (SIL)	SIL 2 according to EN 61508

**Data communication (bypass)**

HART function	Yes
Protocols supported	HART

**Safety characteristic data**

Integrity requirement	for IEC 61508 - Low demand
Equipment type	Type A
Safety Integrity Level (SIL)	Up to 2
Safe Failure Fraction (SFF)	90.7 %
$\lambda_{SU}$	$4.867 \times 10^{-7}$ (486.7 FIT)
$\lambda_{SD}$	0
$\lambda_{DU}$	$5 \times 10^{-8}$ (50 FIT)
$\lambda_{DD}$	0
Probability of a hazardous failure on demand (PFD <sub>AVG</sub> )	$2.19 \times 10^{-4}$ (1 year) $8.76 \times 10^{-4}$ ( years) $1.1 \times 10^{-3}$ (5 years)
Diagnostic coverage (DC)	(DC <sub>S</sub> = 0%, DC <sub>D</sub> = 0%)
Integrity requirement	for IEC 61508 - High demand
Equipment type	Type A
Safety Integrity Level (SIL)	Up to 2
Safe Failure Fraction (SFF)	90.7 %



$\lambda_{SU}$	$4.867 \times 10^{-7}$ (486.7 FIT)
$\lambda_{SD}$	0
$\lambda_{DU}$	$5 \times 10^{-8}$ (50 FIT)
$\lambda_{DD}$	0
Probability of a hazardous failure per hour (PFH <sub>D</sub> )	$4.99 \times 10^{-8}$
Diagnostic coverage (DC)	(DC <sub>S</sub> = 0%, DC <sub>D</sub> = 0%)

**Safety data**

Max. voltage U <sub>o</sub>	25.2 V
Max. current I <sub>o</sub>	93 mA
Max. power P <sub>o</sub>	587 mW
Gas group	II C
Max. external inductivity L <sub>o</sub>	2 mH
Max. external capacity C <sub>o</sub>	107 nF

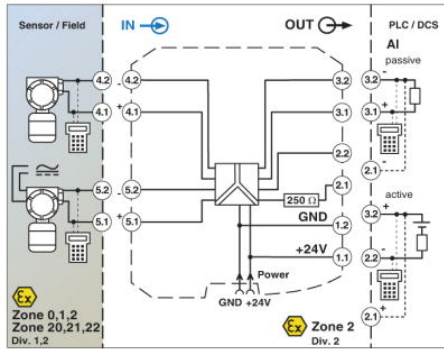
**Certificates / Approvals**



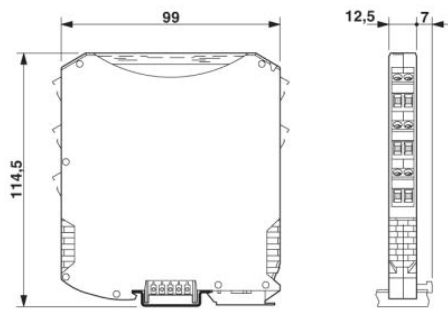
Certification CUL Listed, UL Listed  
 Certification Ex: CUL-EX LIS, IECEX, UL-EX LIS  
 Certifications applied for: GL

## Diagrams/Drawings

### Block diagram



### Dimensioned drawing



## Features

The 460's universal range from 190-480VAC, 50/60 Hz provides the versatility needed to handle global applications.

Four adjustment pots provide versatility for a variety of applications.

Diagnostic LEDs indicate trip status and provide simple troubleshooting.

Microcontroller-based circuitry provides better accuracy and higher reliability than analog designs.

Single-phase conditions are detected regardless of regenerated voltages.

Transient protection meets IEEE and IEC standards and permits operation under tough conditions.



**MotorSaver**  
THREE-PHASE ELECTRIC  
MOTOR PROTECTOR

## Model 460

**Three-Phase  
Voltage Monitor**

**Engineered  
Protection**

**Microcontroller  
Based**

### *Protects 3-Phase Motors from:*

- Loss of any phase
- Low voltage
- High voltage
- Voltage unbalance
- Phase reversal
- Rapid cycling

### *Additional Features:*

- Compact design
- UL and cUL listed
- CE compliant
- Finger-safe terminals
- 5-year warranty
- Made in USA
- Standard surface or DIN rail mountable
- Standard 1-500 sec. variable restart delay
- Standard 2-8% variable voltage unbalance
- Standard 1-30 sec. variable trip delay
- One 10 amp general purpose Form C relay
- Optional manual reset

The **Model 460** is designed to protect 3-phase motors from damaging power conditions. The 460's wide operating range combined with UL and CE compliance enables quick access to domestic and global markets.

A unique microcontroller-based voltage and phase-sensing circuit constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for a specified amount of time (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

The Model 460 automatically senses whether it is connected to a 190-240V, 60Hz system, a 440-480V, 60Hz system, or a 380-416V, 50Hz system. An adjustment is provided to set the nominal line voltage from 190-240 or 380-480VAC. Other adjustments include a 1-30 second trip delay, 1-500 second restart delay, and 2-8% voltage unbalance trip point.



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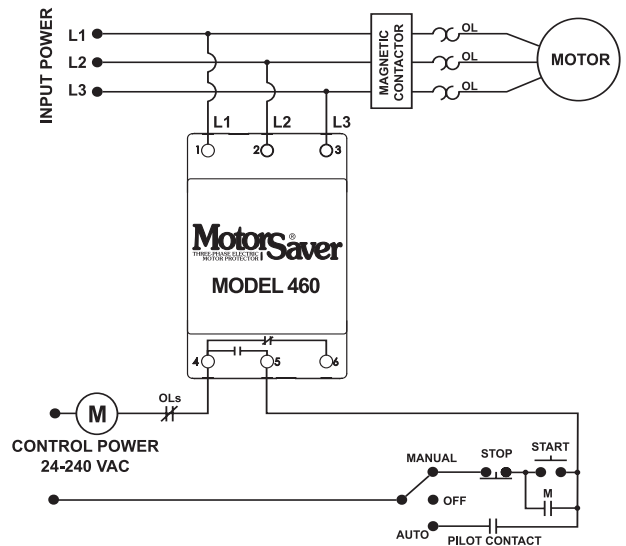
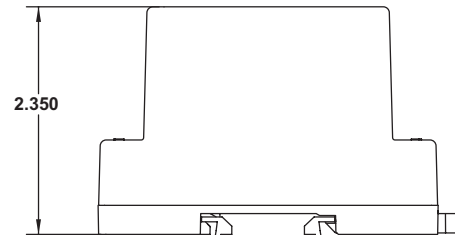
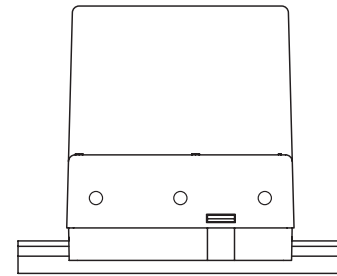
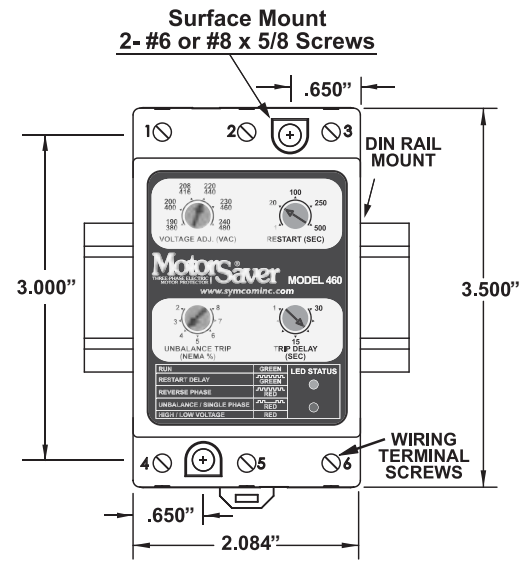
## Model 460 Three-Phase Voltage Monitor

### Specifications

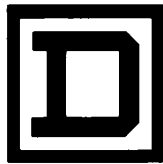
<b>3-Phase Line Voltage</b> .....	190-480VAC (475-600VAC optional) (95-120VAC optional)
<b>Frequency</b> .....	.50*/60Hz
<b>Low Voltage (% of setpoint)</b>	
• Trip .....	.90% ±1%
• Reset .....	.93% ±1%
<b>High Voltage (% of setpoint)</b>	
• Trip .....	.110% ±1%
• Reset .....	.107% ±1%
<b>Voltage Unbalance (NEMA)</b>	
• Trip .....	.2-8% adjustable
• Reset .....	Trip setting minus 1% (5 - 8%) Trip setting minus .5% (2 - 4%)
<b>Trip Delay Time</b>	
• Low, High and Unbalanced Voltage .....	1-30 seconds adjustable
• Single-Phasing Faults .....	1 second fixed
<b>Restart Delay Time</b>	
• After a Fault .....	1-500 seconds adjustable
• After a Complete Power Loss .....	1-500 seconds adjustable
<b>Output Contact Rating</b>	
• 1-Form C .....	10A General Purpose @ 240VAC Pilot Duty 480VA @ 240VAC, B300
<b>Power Consumption</b> .....	6 Watts (max.)
<b>Weight</b> .....	14 oz.
<b>Enclosure</b> .....	Polycarbonate
<b>Terminal Torque</b> .....	.6 in.-lbs.
<b>Wire Type</b> .....	Stranded or solid 12-20 AWG, one per terminal
<b>Safety Marks</b>	
• UL .....	UL508
• CE .....	IEC 60947-6-2
<b>Standards Passed</b>	
• Electrostatic Discharge (ESD) .....	IEC 1000-4-2, Level 3, 6kV contact, 8kV air
• Radio Frequency Immunity, Radiated .....	150 MHz, 10V/m
• Fast Transient Burst .....	IEC 1000-4-4, Level 3, 3.5kV input power & controls
<b>Surge</b>	
• IEC .....	IEC 1000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
• ANSI/IEEE .....	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
• Hi-potential Test .....	Meets UL508 (2 x rated V +1000V for 1 minute)
<b>Environmental</b>	
Temperature Range .....	Ambient Operating: -20° to 70° C (-4° to 158°F) Ambient Storage: -40° to 80° C (-40° to 176°F)
Class of Protection .....	IP20, NEMA 1 (FINGER SAFE)
Relative Humidity .....	10-95%, non-condensing per IEC 68-2-3
<b>Special Options</b>	
Manual Reset .....	External momentary pushbutton required.

\*Note: 50 Hz will increase all delay timers by 20%

SymCom warrants its microcontroller based products against defects in material or workmanship for a period of five (5) years from the date of manufacture. All other products manufactured by SymCom shall be warranted against defects in material and workmanship for a period of two (2) years from the date of manufacture. For complete information on warranty, liability, terms, returns, and cancellations, please refer to the SymCom Terms and Conditions of Sale document.



TYPICAL WIRING DIAGRAM



**SQUARE D**  
*GROUPE SCHNEIDER*

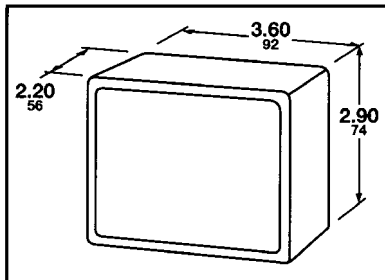
## SDSA3650

### Secondary Surge Arrester

The SDSA3650 is a UL Listed and CSA Certified Secondary Surge Arrester designed for use on secondary services where maximum phase-to-ground system voltage does not exceed 650Vac. The device may also be used for surge protection of irrigation pumps, and motors operating below 650V.



- **Meets ANSI/IEEE C62.11-1987**



SDSA3650 secondary surge arrester will protect most secondary distribution wiring against surge-related damage but **may not protect solid state or electronic equipment from all lightning-induced or other large power surges**. Secondary surge arresters help transient voltage surge suppressors (TVSS) installed in Category A or B locations to protect sensitive electronic equipment. It may be necessary to install a plug-in surge suppressor at the point of use of electronic equipment for additional protection.

#### FEATURES:

**Housing:** The housing of the arrester is made of high temperature thermoplastic. The cover is permanently bonded to the housing by an ultrasonic welding process. Because the arrester is completely sealed, it may be used for both indoor and outdoor applications.

**MOV Technology:** Metal Oxide Varistors (MOV) provide voltage surges with a low resistance path line-to-line or line-to-neutral or line-to-ground while providing a high resistance to the 60Hz power. The MOV responds vaster and has a lower clamping voltage because it does not have a gap structure.

**Fuse Link:** A non-replaceable internal fuse link opens in the event of a damaging varistor overload.

#### APPLICATIONS:

This secondary surge arrester is suitable for use in Category C locations. The threat at these locations is characterized by ANSI/IEEE C62.41-1991 as a 20,000V potential and a 10,000A current. The device clamps the voltage during surges while diverting transient current. Electronic equipment may need to be additionally protected at the point of use with transient voltage surge suppressors.

#### ELECTRICAL CHARACTERISTICS

**Voltage Rating:** 650Vac Maximum phase-to-ground 50/60 Hz

**Typical Clamping Voltages:** For 8/20 microsecond combination wave surge current each phase to ground with specified lead length:

	1" lead	3" lead	6" lead	12" lead	18" lead
<b>1,500A surge current</b>	1525V	1750V	1775V	1800V	1825V
<b>5,000A surge current</b>	1700V	2100V	2125V	2325V	2425V
<b>10,000A surge current</b>	1925V	2375V	2400V	2700V	3000V

**Minimum Life:** 2,500 operations for 1.5kA 8/20 microsecond Wave each line-to-ground

**Rated Peak Single Pulse Transient Current:** 36,000A peak (8/20 microsecond wave)

**Power Consumption per line:** Less than 120 milliwatts. **Response Time:** Less than 1 ns.

**Operating Temperature Range:** -40° to 65°C (-40° to 140°F)

**Surge Energy Capability Per Line:** 2,100 Joules (8/20 microsecond wave)



Listed 75YO FILE NO. E151562



Certified FILE NO. LR78887





# DELTA SURGE CAPACITORS™

Delta Surge Capacitors™ Help Prevent Surge Damage to Electrical and Electronic Equipment. Surge Capacitors control surges which are too light or fast for a Lightning Arrestor, Surge Arrestor, or Surge Suppressor to function.

## 4F34 UL LISTED CA 302R



Leads:  
18" #12  
2 black  
1 white

Weatherproof Enclosure  
DIMENSIONS:  
4-1/2" High 2-1/4" Diameter

Rated voltage - 250V single phase, three wire. Voltage to neutral - 125V. An internal automatic discharge circuit is provided.

This unit is designed for light duty service such as single phase commercial and residential service entrance panels.

Installation: Connect the black wires below the fuses or breaker. Connect the white wire to the ground and/or neutral bus.

## 4F34 UL LISTED CA 603R



Leads:  
18" #12  
3 black  
1 white

Weatherproof Enclosure  
DIMENSIONS:  
4-1/2" High 2-1/4" Diameter

Rated voltage - 600V, three phase, four wire. An internal automatic discharge circuit is provided.

This unit is designed for regular duty service such as commercial three phase service entrance panels.

Installation: Connect the black wires below the fuses or breaker. Connect the white wire to the ground and/or neutral bus.

## 4F34 UL LISTED CA 603



Leads:  
36" #12  
3 black  
1 white

Weatherproof Enclosure  
DIMENSIONS:  
5-3/4" High 3-1/2" Diameter

Rated voltage - 650V, three phase, four wire. An internal automatic discharge circuit is provided.

This unit is designed for heavy duty service such as motor installations.

Installation: Connect the black wires below the fuses or breaker. Connect the white wire to the ground and/or neutral bus.

**Available with separate ground add part No. "G".**

Surge capacitors function differently from surge arrestors. They begin to conduct at a voltage above normal line voltage after a specific time delay. Capacitors conduct current at normal line voltage continually, therefore there is no time delay or voltage change before capacitors begin to conduct. A surge arrestor or suppressor might act in as little as five nanoseconds. A surge capacitor reacts continually, therefore the response time is zero. An arrestor or suppressor might react to as little as a ten percent increase in voltage. A capacitor will react to **any** increase in voltage. Surge capacitors can handle fast low energy surges that can get by an MOV, a surge arrestor, or a surge suppressor. Delta surge arrestors/suppressors can handle high current surges that are too large for an MOV, a surge arrestor, or a surge suppressor. Use of both the Delta surge arrestor/suppressor and the Delta surge capacitor will provide more complete protection. While it is not possible to achieve 100% protection, Delta units will greatly reduce problems due to lightning, power surges, and voltage spikes.

**DELTA LIGHTNING ARRESTORS™, INC.**

P. O. BOX 750  
BIG SPRING, TEXAS 79721

## CP M SNT 70W 24V 3A

**Weidmüller Interface GmbH & Co. KG**

Klingenbergstraße 16

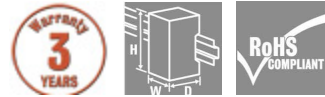
D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-292083

www.weidmueller.com



### PRO-M = Power-Reliable-Optimized

The perfectly reliable power supply for automation technology.

The ten different versions for the 24V-DC power supply all feature a solid but thin metal housing which enables them to be installed without any side gaps. This results in less space required on the mounting rail. Wide range of AC/DC inputs and a wide temperature range enable them to be used anywhere. Because of its high efficiency, resistance to overloads and high power reserves, the PRO-M is a trusted power supply for use in any application. The three-phase PRO-M power supply modules continue to function reliably when one phase fails (i.e., in two-phase mode).

### General ordering data

Type	CP M SNT 70W 24V 3A
Order No.	<a href="#">8951330000</a>
Version	Power supply, switch-mode power supply unit
GTIN (EAN)	4032248742547
Qty.	1 pc(s).

## CP M SNT 70W 24V 3A

Weidmüller Interface GmbH &amp; Co. KG

Klingenbergstraße 16

D-32758 Detmold

Germany

Fon: +49 5231 14-0

Fax: +49 5231 14-292083

www.weidmueller.com

## Technical data

## Dimensions and weights

Width	33 mm	Height	130 mm
Depth	125 mm	Weight	0.57 kg
Net weight	588 g		

## Temperatures

Operating temperature	-25 °C...+70 °C	Storage temperature	-40 °C...+85 °C
-----------------------	-----------------	---------------------	-----------------

## Input

AC current consumption	0.6 A @ 230 V AC / 1.1 A @ 115 V AC	AC input voltage range	85...264 V AC (Derating @ 100 V AC)
DC current consumption	0.25 A @ 370 V DC / 0.7 A @ 120 V DC	DC input voltage range	80...370 V DC (Derating @ 120 V DC)
Frequency range AC	47...63 Hz	Input fuse	Yes
Input fuse (internal)	Yes	Inrush current	max. 40 A
Recommended back-up fuse	2 A / DI, safety fuse 6 A, Char. B, circuit breaker 2...4 A, Char. C, circuit breaker	Wire connection method	Screw connection
rated input voltage	100...240 V AC (wide-range input)		

## output

Output current	3 A	Output power	70 W
Output voltage type	DC	Output voltage, max.	29.5 V
Output voltage, min.	22.5 V	Output voltage, note	(adjustable via potentiometer on front)
Overload protection	Yes	Parallel connection option	yes, max. 5
Powerboost @ 24 V DC, 60 °C	3.6 A for 1 min, ED = 5 %	Rated (nominal) output current @ U <sub>Nom</sub>	3 A @ 60 °C
Wire connection method	Screw connection	continuous output current @ 24 V DC	3.6 A @ 45 °C, 3.2 A @ 55 °C, 2.3 A @ 70 °C
rated output voltage	24 V DC ± 1 %	residual ripple, breaking spikes	< 50 mV <sub>SS</sub> @ 24 V DC, I <sub>N</sub>

## General data

AC failure bridging time @ I <sub>Nom</sub>	> 20 ms @ 230 V AC / > 20 ms @ 115 V AC	Current limiting	> 120 % I <sub>N</sub>
Degree of efficiency	90 % @ 230 V AC / 88 % @ 115 V AC	Housing version	Metal, corrosion resistant
Indication	Operation, green LED	MTBF	> 500,000 h acc. to IEC 1709 (SN29500)
Mounting position, installation notice	Horizontal on TS35 mounting rail, with 50 mm of clearance at top and bottom for air circulation. Can be mounted side by side with no space in between.	Operating temperature	-25 °C...+70 °C
Power factor (approx.)	> 0.6 @ 230 V AC / > 0,65 @ 115 V AC	Protection against over-heating	Yes
Protection against reverse voltages from the load	30...35 V DC	Shock wall acc. to IEC 68227	30 g
Short-circuit protection	Yes	Weight	0.57 kg

## CP M SNT 70W 24V 3A

**Weidmüller Interface GmbH & Co. KG**  
 Klingenbergstraße 16  
 D-32758 Detmold  
 Germany  
 Fon: +49 5231 14-0  
 Fax: +49 5231 14-292083  
 www.weidmueller.com

## Technical data

### EMC / shock / vibration

Limiting of mains voltage harmonic currents	in accordance with EN 61000-3-2	Noise emission acc. to EN55022	Class B
Vibration resistance IEC 60068-2-6		Interference immunity test acc. to	EN 61000-4-2 (ESD)  EN 61000-4-3 and EN 61000-4-8 (fields) EN 61000-4-4 (burst) EN 61000-4-5 (surge) EN 61000-4-6 (conducted)  EN 61000-4-11 (dips)
	Acc. to EN50178, shock: 5g in all directions		
Shock resistance IEC 60068-2-27	30 g in all directions		

### Insulation coordination

Class of protection	I, with PE connection	Insulation voltage	3 kV input/output; 2 kV input/earth; 0.5 kV output/earth
Pollution severity	2	electrical isolation, input-earth	2 kV
electrical isolation, input-output	3 kV	electrical isolation, output-earth	0.5 kV

### Electrical safety (applied standards)

Electrical machine equipment	Acc. to EN60204	For use with electronic equipment	Acc. to EN50178 / VDE0160
Protection against dangerous shock currents	Acc. to VDE0106-101	Protective separation protection against electrical shock	VDE0100-410 / acc. to DIN57100-410
Safety extra-low voltage	SELV acc. to EN60950, PELV acc. to EN60204	Safety transformers for switch-mode power supplies	Acc. to EN 61558-2-17

### Connection data (input)

Conductor cross-section, AWGcmil , max.	12	Conductor cross-section, AWGcmil , min.	26
Conductor cross-section, flexible , min.	0.5 mm <sup>2</sup>	Conductor cross-section, rigid , max.	6 mm <sup>2</sup>
Conductor cross-section, rigid , min.	0.5 mm <sup>2</sup>	Number of terminals [Input]	3 for L/N/PE
Tightening torque, max.	0.6 Nm	Tightening torque, min.	0.5 Nm
Wire connection cross section, flexible (input), max.	2.5 mm <sup>2</sup>		

### Connection data (output)

Conductor cross-section, AWGcmil , max.	12	Conductor cross-section, AWGcmil , min.	26
Conductor cross-section, flexible , max.	2.5 mm <sup>2</sup>	Conductor cross-section, flexible , min.	0.5 mm <sup>2</sup>
Conductor cross-section, rigid , max.	6 mm <sup>2</sup>	Conductor cross-section, rigid , min.	0.5 mm <sup>2</sup>
Number of terminals [Output]	4 (++ / -)	Tightening torque, max.	0.6 Nm
Tightening torque, min.	0.5 Nm		

**Data sheet**

**CP M SNT 70W 24V 3A**

**Weidmüller Interface GmbH & Co. KG**  
 Klingenbergstraße 16  
 D-32758 Detmold  
 Germany  
 Fon: +49 5231 14-0  
 Fax: +49 5231 14-292083  
 www.weidmueller.com

**Technical data**

**Approvals**

Institute (GERMLLOYD)		Certificate No. (GERMLLOYD)	94767-10
Institute (cULus)		Certificate no. (cULus)	E258476VOL1SEC21
Institute (cURus)		Certificate No. (cURus)	E255651VOLX3A14

**Classifications**

ETIM 3.0	EC001039	eClass 5.1	27-04-90-02
eClass 6.2	27-04-90-04	eClass 7.1	27-04-90-04

**Product information**

Descriptive text ordering data	The internal varistor found in a switch-mode power supply does not replace the necessary surge protection in a system.
Descriptive text technical data	*) Recommendation applies only to AC operation; the max. permissible operating voltage is to be observed in all cases!

**Approvals**

Approvals






ROHS	Conform
------	---------

**Downloads**

Package insert	<a href="#">Operating instructions</a>
Declaration of Conformity	<a href="#">K469_12_11.pdf</a>
PDF	<a href="#">Warranty information</a>
EPLAN	<a href="#">8951330000.ema</a>
<a href="#">3-D model</a>	



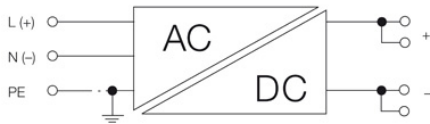
**Data sheet**

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**Drawings**

**Electric symbol**



With DC connection, note polarity

## Basic Panels

Low-cost operator control and monitoring of simple applications

							
<b>KP300 Basic mono PN</b>	<b>KTP400 Basic mono PN</b>	<b>KTP400 Basic color PN</b>	<b>KP400 Basic color PN</b>	<b>KTP600 Basic mono PN</b>	<b>KTP600 Basic color DP / PN</b>	<b>KTP1000 Basic color DP / PN</b>	<b>TP1500 Basic color PN</b>
<b>3.6" Key</b>	<b>4" Touch + key</b>	<b>4" Touch + Key</b>	<b>4" Key</b>	<b>6" Touch + Key</b>	<b>6" Touch + Key</b>	<b>10" Touch + Key</b>	<b>15" Touch</b>
FSTN LCD monochrome	STN liquid crystal display (LCD), 4 gray levels	TFT liquid crystal display (LCD), 256 colors	TFT liquid crystal display (LCD), 256 colors	TFT liquid crystal display (LCD), 256 colors	TFT liquid crystal display (LCD), 256 colors	TFT liquid crystal display (LCD), 256 colors	TFT liquid crystal display (LCD), 256 colors
3.6"	3.8"	4.3"	4.3"	5.7"	5.7"	10.4"	15.1"
240 x 80	320 x 240	480 x 272	480 x 272	320 x 240	320 x 240	640 x 480	1024 x 768
50,000	30,000	50,000	50,000	50,000	50,000	50,000	50,000
165 x 97	140 x 116	140 x 116	150 x 186	214 x 158	214 x 158	335 x 275	400 x 310
Membrane keypad	Touch screen and 4 tactile keys	Touch screen and 4 tactile keys	Membrane keypad and 8 tactile keys	Touch screen and 6 tactile keys	Touch screen and 6 tactile keys	Touch screen and 8 tactile keys	Touch screen
10 / 10	4 / -	4 / -	8 / 26	6 / -	6 / -	8 / -	- / -
Function keys (programmable) / System keyboard							
<b>Usable memory</b>							
User memory	512 KB	512 KB	512 KB	512 KB	512 KB	1024 KB	1024 KB
Memory for options / recipes <sup>7)</sup>	- / 40 KB	- / 40 KB	- / 40 KB	- / 40 KB	- / 40 KB	- / 40 KB	- / 40 KB
Message buffer							
<b>Interfaces</b>							
Serial / MPI / PROFIBUS DP / PROFINET (Ethernet)	- / - / - / -	- / - / - / -	- / - / - / -	- / - / - / -	- / - / - or - / - / - / -	- / - / - or - / - / - / -	- / - / - / -
USB host / USB device	-	-	-	-	-	-	-
Slot for CF / Multi Media / SD	- / - / -	- / - / -	- / - / -	- / - / -	- / - / -	- / - / -	- / - / -
<b>Functionality (if configured with WinCC V12)</b>							
Signaling system (number of messages/message classes)	200 / 32	200 / 32	200 / 32	200 / 32	200 / 32	200 / 32	200 / 32
Process pictures	50	50	50	50	50	50	50
Variables	250	250	500	500	500	500	500
Vector graphics	/	/	/	/	/	/	/
Bar graphs / curve diagrams	-	-	-	-	-	-	-
Faceplates	5	5	5	5	5	5	5
Recipes	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Archiving / Visual Basic Scripts	-	-	-	-	-	-	-
Programming device functions							
<b>Connection to controller</b>							
SIMATIC S7 / SIMATIC WinAC	/	/	/	/	/	/	/
SIMATIC S5 / SIMATIC 505	- / -	- / -	- / -	- / -	- / -	- / -	- / -
SINUMERIK / SIMOTION	- / -	- / -	- / -	- / -	- / -	- / -	- / -
Allen Bradley / Mitsubishi	/	/	/	/	/	/	/

# SIEMENS



# SIMATIC Controllers

The innovative solution for all automation tasks

SIMATIC

Overview

Edition  
April 2013

Answers for industry.

# SIMATIC Controllers

## System-wide engineering, communications and diagnostics

### SIMATIC Modular Controllers



#### Your benefits

- Ready to use
- Long-term compatibility and availability
- For use in harsh environments
- Modular expansion and scalability
- Vibration-resistant
- Maintenance-free

#### Fields of application

- Controlling with centralized and distributed I/O
- Technological tasks
- Fault-tolerant control
- Fail-safe control

**You need optimal solutions for every application area to enable you to automate your machines and plants economically and flexibly.**

**Whether you want open-loop control, or you also want to cover other additional automation applications such as visualization, technology or data archiving – we always have the right solution for you! And with a unique level of integration in engineering, communications and diagnostics.**

Our SIMATIC Controllers are based on different hardware and software architectures:

#### **SIMATIC Modular Controllers**

The Modular Controllers have been optimized for control tasks and specially designed for ruggedness and long-term availability. They can be flexibly expanded at any time using plug-in I/O modules, function modules, and communication modules. Depending on the size of the application, the right controller can be selected from a wide range according to performance, quantity frameworks, and communication interfaces. The modular controllers can also be used as fault-tolerant or fail-safe systems.

## SIMATIC PC-based Controllers



### Your benefits

- Flexible in use
- Openness in hardware and software configuration
- Use of existing PC resources
- Participation in the continuous PC innovation process
- Multifunctional
- Customized PC variants
- Embedded bundles:
  - Ready to use
  - Rugged
  - Maintenance-free

### Fields of application

- Control, operator control and monitoring
- Technological tasks
- Data acquisition and archiving
- Link to PC hardware and software
- Integration of C/C++/C# programs
- Data exchange via OPC
- Fail-safe control

## SIMATIC PC-based Controllers

SIMATIC PC-based Controllers use the realtime-capable software controller WinAC RTX or its fail-safe variant WinAC RTX F on the basis of Windows operating systems. Any PC applications, operator control and monitoring tasks, as well as technological functions can simply be combined here to form an overall automation solution. The SIMATIC embedded bundles, with their highly rugged design and pre-installed, ready-to-use automation software, allow the advantages of PC-based Automation to be implemented at the machine.



SIMATIC Modulare Controllers					
Control	S7-1200	ET 200 with CPU	S7-300	S7-400	S7-1500
	 <a href="http://www.siemens.com/s7-1200">www.siemens.com/s7-1200</a>	 <a href="http://www.siemens.com/et200">www.siemens.com/et200</a>	 <a href="http://www.siemens.com/s7-300">www.siemens.com/s7-300</a>	 <a href="http://www.siemens.com/s7-400">www.siemens.com/s7-400</a>	 <a href="http://www.siemens.com/s7-1500">www.siemens.com/s7-1500</a>
Controlling with technology functions	S7-1200	ET 200	S7-300 with Easy Motion Control or technology CPU (optionally with Safety)	S7-400 with FM 458	S7-1500
	 <a href="http://www.siemens.com/s7-1200">www.siemens.com/s7-1200</a>	 <a href="http://www.siemens.com/et200">www.siemens.com/et200</a>	 <a href="http://www.siemens.com/s7-300">www.siemens.com/s7-300</a>	 <a href="http://www.siemens.com/s7-400">www.siemens.com/s7-400</a>	 <a href="http://www.siemens.com/s7-1500">www.siemens.com/s7-1500</a>
Fail-safe control		ET 200 with F-CPU	S7-300 with F-CPU	S7-400 with F-CPU	S7-1500 with F-CPU
		 <a href="http://www.siemens.com/et200">www.siemens.com/et200</a>	 <a href="http://www.siemens.com/s7-300">www.siemens.com/s7-300</a>	 <a href="http://www.siemens.com/s7-400">www.siemens.com/s7-400</a>	 <a href="http://www.siemens.com/s7-1500">www.siemens.com/s7-1500</a>
Fault-tolerant control				S7-400 H-System optionally with Safety	
				 <a href="http://www.siemens.com/s7-400h">www.siemens.com/s7-400h</a>	
Control, operator control and monitoring					

## Totally Integrated Automation

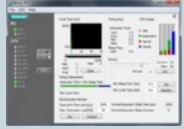
Totally Integrated Automation stands for Industrial Automation from Siemens and encompasses the entire production process. The open system structure incorporates hardware and software sharing the same properties: Consistent data management, world-wide standards, and uniform interfaces. The resulting responsiveness increases

efficiency and productivity. SIMATIC Controllers are an essential component of Totally Integrated Automation. The extensive range of products makes it possible to find the right solutions for the most diverse application areas – in cost-sensitive standard production as well as in plant building and special mechanical equipment manufacture, where reduction of the engineering and startup costs plays a crucial role.

### SIMATIC PC-based Controllers

### Software Controllers for Multi Panels

#### WinAC RTX



[www.siemens.com/winac](http://www.siemens.com/winac)

#### WinAC RTX with Easy Motion Control



[www.siemens.com/winac](http://www.siemens.com/winac)

#### Customized functions with WinAC ODK



[www.siemens.com/winac-odk](http://www.siemens.com/winac-odk)

#### WinAC RTX F



[www.siemens.com/winac-rtx-f](http://www.siemens.com/winac-rtx-f)

#### S7-mEC-RTX F



[www.siemens.com/s7-mec](http://www.siemens.com/s7-mec)

#### Embedded bundles with WinAC RTX F



[www.siemens.com/embedded-automation](http://www.siemens.com/embedded-automation)

#### S7 Modular Embedded Controller



[www.siemens.com/s7-mec](http://www.siemens.com/s7-mec)

#### IPC227D/IPC427C bundles with WinAC RTX (F) and HMI-Software



[www.siemens.com/ipc227d](http://www.siemens.com/ipc227d)

#### HMI IPC277D/IPC477C bundles with WinAC RTX (F) and HMI-Software



[www.siemens.com/ipc277d](http://www.siemens.com/ipc277d)

#### WinAC MP 177/277



#### WinAC MP 377



# Selection guide

## SIMATIC Modulare Controllers

### S7-1200



### ET 200 with CPU



### S7-300



SIMATIC product/family	S7-1200	ET 200	ET 200pro	S7-300
<b>Product Brief</b>	Modular, compact controller for discrete and stand-alone automation solutions	Distributed, discretely-modular I/O system with local intelligence	Distributed, discretely-modular I/O system with local intelligence	Modular controllers for system solutions in production automation in the low to mid-performance ranges
<b>Product range</b>	<ul style="list-style-type: none"> <li>5 compact CPUs</li> </ul>	<ul style="list-style-type: none"> <li>With degree of protection IP20</li> <li>3 standard CPUs</li> <li>2 fail-safe CPUs</li> </ul>	<ul style="list-style-type: none"> <li>With degree of protection IP65/67</li> <li>1 standard CPU</li> <li>2 fail-safe CPUs</li> </ul>	<ul style="list-style-type: none"> <li>7 standard CPUs</li> <li>7 compact CPUs</li> <li>5 fail-safe CPUs</li> <li>2 technology CPUs</li> <li>1 fail-safe technology CPU</li> </ul>
<b>Spare parts guaranteed for</b>	10 years	10 years	10 years	10 years
<b>Temperature range</b>	-20 ... 60 °C 1)	0 ... 60 °C 2)	0 ... 55 °C	0 ... 60 °C 2)
<b>Performance</b>				
<b>Execution time for bit operation, min.</b>	0.085 µs	0.06 µs	0.025 µs (IM154-8FX)	0.004 µs (CPU 319)
<b>Memory</b>				
<b>Main memory, max.</b>	125 KB (CPU 1217C)	192 KB 5)	512 KB 6)	2 MB (CPU 319), 2.5 MB (CPU 319F)
<b>Load memory/mass storage, max.</b>	4 MB (CPU 1217C)	Micro Memory Card		Micro Memory Card
<b>Backup, max.</b>	Program and data due to SIMATIC Memory Card (maintenance-free)	8 MB	Program and data due to Micro Memory Card (maintenance-free)	8 MB
<b>I/O devices</b>				
<b>I/O address area, max.</b>	1024 / 1024 bytes	2048 / 2048 bytes	2048 / 2048 bytes	8192 / 8192 bytes
<b>Centralized</b>				
· I/O integrated in CPU	■			■ (compact CPU)
· I/O modules on CPU	■	■	■	■
<b>Distributed</b>				
· I/O modules on PROFIBUS	■	■	■	■
· I/O modules on PROFINET	■	■	■	■
<b>Technology functions</b>				
<b>Loadable function blocks</b>	■	■	■	■
<b>Basic functions integrated in CPU</b>	■			■ (compact CPU)
<b>Special modules, plugged in centrally</b>	■			■ (technology CPUs) 7)
<b>Special technology controllers</b>				■
<b>Isochronous mode</b>		■ (PN-CPU)	■	■
<b>Safety / availability</b>				
<b>Fail-safety</b>	available soon	■ (F-CPU)	■ (F-CPU)	■ (F-CPU) 8)
<b>Fault tolerance</b>				
<b>Configuration changes during operation (CIR)</b>				
<b>Connection / disconnection of centralized I/O during operation (hot swapping)</b>		■		
<b>HMI functions</b>				
<b>Integrated</b>				
<b>PC functions</b>				
<b>C/C++/C#/Visual Basic link</b>				
<b>Data acquisition and archiving</b>	■			
<b>Expandable with PC standard hardware</b>				
<b>Integration of PC standard HW/SW</b>				
<b>Engineering</b>				
<b>Configuration / programming software</b>	STEP 7 Basic V12 in the TIA Portal, STEP 7 Professional V12 in the TIA Portal		STEP 7 / STEP 7 Professional from V5.x, STEP 7 from V11 in the TIA Portal	
<b>Programming languages</b>	KOP, FUP, SCL		KOP (LD), FUP (FBD), AWL (IL), S7-Graph (SFC), S7-SCL (ST), S7-HIG	
<b>Configuration of integral HMI functions</b>				
<b>Communications</b>				
<b>MPI</b>		■	■	■
<b>PTP</b>	■ (character-based serial comm.)			■ (also via CP)
<b>AS-Interface</b>	■ (via CP with STEP 7 V11 SP2)			■ (via CP)
<b>PROFIBUS</b>	■	■	■	■ (also via CP) 4)
<b>PROFINET IO</b>	■	■ (PN CPU)	■	■ (also via CP)
<b>Others integrated</b>				
<b>Web server</b>	■ (Smart Device Access, SIMATIC S7-1200 App)	■ (PN CPU)	■	■ (PN CPU)

**Industrial Ethernet  
IE-SW5-WAVE**

**Weidmüller Interface GmbH & Co. KG**  
Klingenbergstraße 16  
D-32758 Detmold  
Germany  
Fon: +49 5231 14-0  
Fax: +49 5231 14-292083  
www.weidmueller.com



The range of Wave Line switches fits between 3 and 8 ports into the smallest of spaces with a compact plastic housing. With features such as auto-negotiation and auto-crossing and their operating temperature range of 0°C to +60°C, the WaveLine products are ideal for gaining a foothold in Industrial Ethernet wherever terminals have to be connected to your Ethernet in the simplest way.

**General ordering data**

Type	IE-SW5-WAVE
Order No.	<a href="#">8896940000</a>
Version	Network switch, IP 20, Number of ports: 5x RJ45, unmanaged
GTIN (EAN)	4032248646357
Qty.	1 pc(s).

## Industrial Ethernet IE-SW5-WAVE

**Weidmüller Interface GmbH & Co. KG**  
 Klingenbergstraße 16  
 D-32758 Detmold  
 Germany  
 Fon: +49 5231 14-0  
 Fax: +49 5231 14-292083  
 www.weidmueller.com

## Technical data

### Dimensions and weights

Length	108 mm	Width	22.5 mm
Height	127.8 mm	Net weight	340 g

### Industrial Ethernet

AC input power	4 VA AC	DC input power	4 Watt DC
Standard	IEEE 802.3; 802.3u; 802.3x; Class I, Division 2	Segment length	Copper, 100 m; fibre multimode, 2 km; fibre singlemode 20 km
Type of mounting	TS 35	Storage temperature, min.	-40 °C
Storage temperature, max.	85 °C	Status indication	Data rate, Power, Connection/Activity
Number of ports	5x RJ45	Data rate	10 Base-T/100 Base-TX (copper) 100 Base-FX (fibre), 10 Base-T/100 Base-TX (copper) 100 Base-FX (fibre)@@@
Aging	300 s	Flow control	HD (backpressure) / FD (pause)
Input voltage AC, min.	12 V	Input voltage AC, max.	24 V
Input voltage DC, min.	10 V	Input voltage DC, max.	35 V
Input frequency	47 - 63 Hz	Version	Autonegotiation, Autocrossing (RJ45), Redundant power supply
Protection degree	IP 20		

### Technical data

Version	Autonegotiation, Autocrossing (RJ45), Redundant power supply	Operating temperature, min.	0 °C
Operating temperature, max.	60 °C	Optical budget	8 dB for 62.5/125 µm multimode cable 4 dB for 50/125 µm multimode cable
Protection degree	IP 20		

### Classifications

ETIM 3.0	EC000734	UNSPSC	43-17-27-01
eClass 5.1	19-03-01-17	eClass 6.2	19-17-01-06
eClass 7.1	19-17-01-06		

### Approvals

Approvals

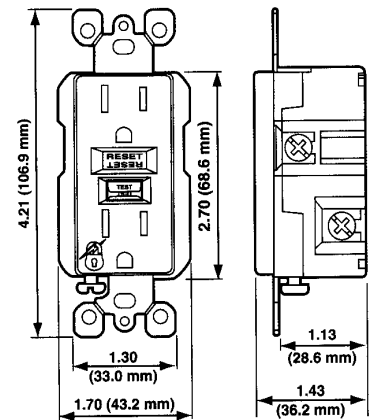


ROHS Conform





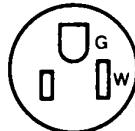
**7599-I (Ivory)**  
**Commercial Grade**  
**Smart Lock™**  
**GFCI Receptacle**  
**with Lockout Action**  
**15A 125V at Receptacle;**  
**20A 125V Feed-Through**



**GROUND FAULT CIRCUIT INTERRUPTER**

All Leviton GFCI receptacles have these features:

- Conforms to UL Standard 943 Class A (GFCI) and 498 (receptacles)
- #14-#12 AWG solid or stranded wire
- Tough impact-resistant construction
- Temperature tolerance range -30°F to 151°F
- Shallow 1-1/8 inch bodies for extra wall-box room
- Trip at 5Ma ( $\pm 1$ Ma) threshold
- Feed-through ready
- Trip in 0.025 seconds for 240 mA fault
- Silver alloy contacts
- Dual slot terminal and installation crews accept both Phillips and standard driver heads
- Fully tested before shipping
- Supplied with Decora® wallplate
- TEST and RESET functions work together so that a tripped GFCI cannot be reset if GFCI circuit no longer provides ground fault protection
- RESET button is blocked if GFCI protection has been compromised, eliminating the possibility of end-users incorrectly assuming that a reset GFCI is providing ground fault protection when it actually is not
- Cannot be reset if neutral is not present. GFCI can still be tripped with TEST button under this condition
- Line-load diagnostic feature prevents GFCI from being reset and stops power from being fed through to downstream devices. This alerts installer to a line-load reversal.
- Advanced electronics design provides superior resistance to electrical surges and over-voltages
- LED indicator for line-load reversals
- Backed by a Limited Two-Year Warranty



NEMA 5-15R



Listed  
File # 48380

MEETS 2003 UL REQUIREMENTS



# DAH1001A

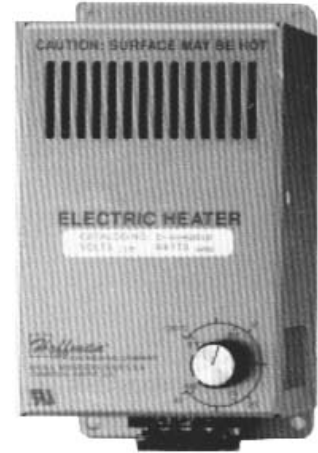
## Electric Heater

### APPLICATION

Designed to protect sensitive mechanical, electrical, and electronic equipment from the harmful effects of condensation, corrosion, and low temperatures. Thermostatically controlled fan-driven heater units maintain a stable temperature within enclosures so critical components can perform more reliably over a longer period of time.

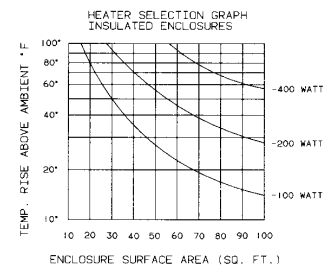
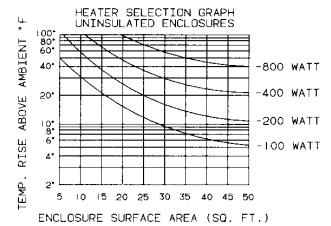
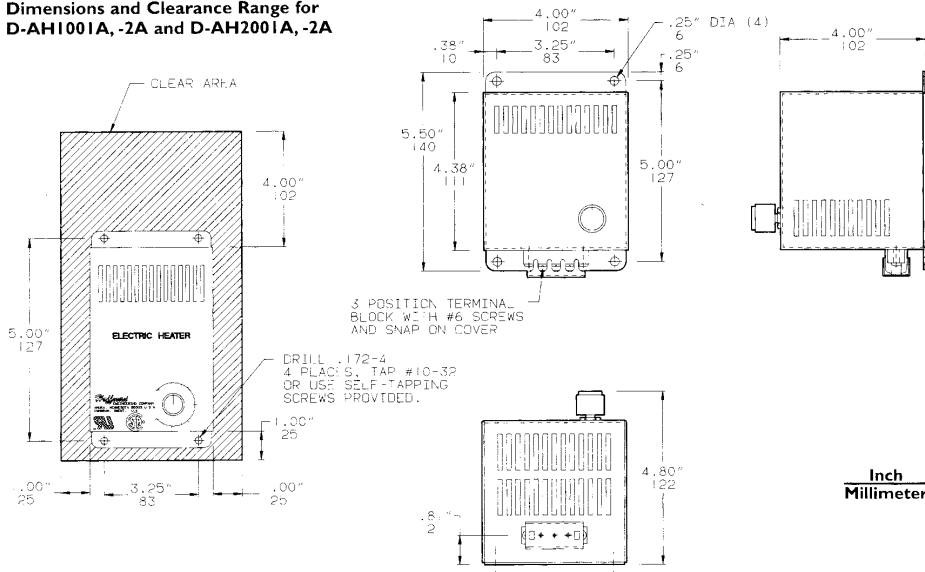
### CONSTRUCTION

- Attractive and durable housing is anodized aluminum
- Thermostat, standard on all units, is adjustable from 0°F to 100°F (-18°C to 38°C)
- Fan draws cool air from the bottom of the enclosure and passes this air across the thermostat and heating elements before being released into enclosure cavity
- Heated air discharged through the top of the heater unit
- Four 10-32 x self-tapping screws are included with each heater
- Ball bearing fan runs continuously for even temperature distribution
- Terminal block has three 6-32 screw terminals with barriers labeled for power and ground connections
- Finish is Anodized aluminum
- UL Component Recognized, CSA Listed



**WATTS: 100 VOLTAGE: 115**  
**Hz: 50/60 AMPS: 0.9**  
**WEIGHT: 4.00 lb.**

#### ■ Dimensions and Clearance Range for D-AH1001A, -2A and D-AH2001A, -2A



# FLZ 510 – FLZ 530

## Thermostats



- The FLZ series are available with N.C. / N.O.<sup>1</sup> and changeover contacts. In combination with control cabinet heaters, they serve for temperature control inside the control cabinet.
- In combination with filterfans, they provide for additional savings on energy, materials and time. All in all, this results in greater reliability of the production process, reduced energy consumption due to need-based use and an improvement in the efficiency of the controlled heaters and filterfans.

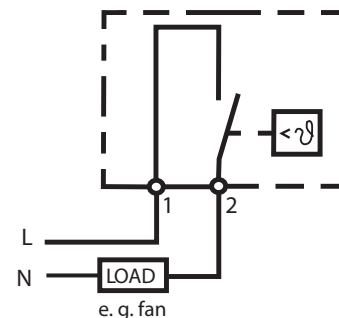
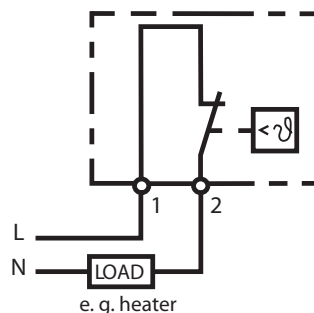
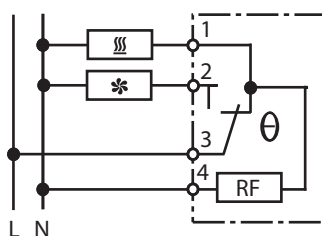
Data		FLZ 510	FLZ 520	FLZ 530	Unit
Part number	0° - 60 °C	17103000000	17111000000	17121000000	
	32 -140 °F	17103000010	17111000010	17121000010	
Type of contact		changeover with spring contact	N.C. with spring contact	N.O. with spring contact	
Switching temperature difference		1 <sup>2</sup> /3		<7	K
Switching point tolerance		± 3		± 4	
Max. switching power - resistive value in brackets (!): inductive load at cos φ = 0.6	N.C.	100 - 250 V AC / 10 (2)		240 V AC / 10 (2)	W
	N.O.	100 - 250 V AC / 5 (2)		120 V AC / 15 (2)	
	DC		max. 30		
Operating temperature range			-4 ... +179 (-20 ... +80)		°F (°C)
Storage temperature range			-4 ... +179 (-20 ... +80)		
Probe type			bimetal		
System of protection			IP 20		
Weight		75		50	g
Connection		screw terminal for cable cross-section 0.5 to 2.5 mm <sup>2</sup>			
Approvals		UL, cUL, CE		UL, cUL, CSA, CE	
Special feature		thermal return <sup>2</sup>		-	
Suitable for the operation of		fan and heater	heater	fan	
Type of mounting		snap fastening for 35mm profile bars according to EN 60715			
Color		RAL 7035			

Accessories	Piece	Part number	Info on page
Hygrostat	1	17207000000	170
Internal enclosure fan	1	18103000002	59

<sup>1</sup> N.C. = normally closed / N.O. = normally open  
<sup>2</sup> for 230 V AC operation only  
 Approvals see page 168

Dimension	Dimensions		
	FLZ 510	FLZ 520	FLZ 530
	inches (mm)		
X	1.46 (37)	1.57 (40)	1.57 (40)
Y	2.52 (64)	2.83 (72)	2.83 (72)
Z	1.81 (46)	1.42 (36)	1.42 (36)

### Schematics



## Applications:

- Myers™ Scru-tite® and Ground hub are used in the termination of electrical circuits through wall of the enclosure
- Ideal for pharmaceutical, chemical and food processing, pulp/paper and nuclear industries.
- Resistant to a variety of chemicals, including acetic, citric and salt water.
- The O-ring is a special "Viton (75)" and has excellent chemical resistance.
- Hub is provided with a stainless steel ground nut.

## Features:

- Vibration proof
- Grounding screw for added safety
- Captive o-ring gasket
- No welding
- Posi-Lok insulated throat (insuliner)
- Fit standard knockouts
- Easy installation
- Controlled thread lengths
- NPSL on male thread
- No sharp edges (along parting line)
- Male thread (NPT)



## Certifications and Compliances:

- NEC/CEC:
  - Class I, Division 2
  - Class II, Division 1 & 2
  - Class III, Division 1 & 2
- UL Listed – UL Standard 514B
- CSA Certified – Certified by UL to CSA standard C22.2 No. 18
- NEMA Type 2, 3, 3R, 4, 4X, 12 (std hub)
- NEMA Type 2, 3, 3R, 4, 4X, 12 (ground hub)

## Standard Materials:

- Nut: Zamek-2, Zamek-3, Aluminum (Al 360), Stainless (316)
- Body: Zamek-2, Zamek-3, Aluminum (Al 360), Stainless (316)
- Insuliner: Lexan
- O-Ring: Gasket Vi Ton
- Ground Screw: Steel

## Standard Finishes:

- Aluminum: Natural
- Zinc: Natural

## Optional Materials and Finishes:

- Stainless: Natural
- Zinc: Chrome-plate

## Hub Basic Scru-Tite® – NEMA 2, 3, 3R, 4, 4X and 12

Zinc

UL File No. E-27258



Cat. #	Size	Unit Qty.	Wt. Lbs. Per 100
ST 03†	3/8"	25	12
ST 1†	1/2"	25	20
ST 2†	3/4"	25	32
ST 3†	1"	25	40
ST 4†	1 1/4"	10	60
ST 5†	1 1/2"	10	70
ST 6†	2"	10	90
ST 7†	2 1/2"	5	200
ST 8	3"	2	250
ST 9	3 1/2"	2	300
ST 10	4"	2	350
ST 11*	5"	1	600
ST 12*	6"	1	800

†Optional Nickel-Chrome Plate Finish. Add suffix -CP. See price list.

\*Not supplied with insulator.

## Hub Basic Scru-Tite® – NEMA 2, 3, 3R, 4, 4X and 12

Aluminum

UL File No. E-27258



Cat. #	Size	Unit Qty.	Wt. Lbs. Per 100
STA 1	1/2"	25	8
STA 2	3/4"	25	16
STA 3	1"	25	16
STA 4	1 1/4"	10	30
STA 5	1 1/2"	10	30
STA 6	2"	10	50
STA 7	2 1/2"	5	80
STA 8	3"	2	100
STA 9	3 1/2"	2	150
STA 10	4"	2	150
STA 11*	5"	1	300
STA 12*	6"	1	300

\*Not supplied with insulator.

## Stainless Steel Ground Hub – NEMA 2, 3, 3R, 4, 4X and 12

Stainless Steel – Type 316

UL File No. E-59509



Cat. #	Size	Unit Qty.	Wt. Lbs. Per 100
SSTG 1	1/2"	10	20
SSTG 2	3/4"	10	30
SSTG 3	1"	10	43
SSTG 4	1 1/4"	5	55
SSTG 5	1 1/2"	5	73
SSTG 6	2"	5	95
SSTG 7	2 1/2"	2	—
SSTG 8	3"	2	—
SSTG 9	3 1/2"	2	—
SSTG 10	4"	2	—

# StreamLine® Low Profile Strobe Light



Models LP3P, LP3S, LP3T

## PERFECT SIZE MEETS SUPERIOR PERFORMANCE

- Available in 12-48VDC, 120VAC and 240VAC
- Surface mount, T-mount, or integrated 1/2 - inch pipe mount
- Five dome colors
- Screw-on lens
- Low profile — Model LP3S is only 5" high
- Type 4X, IP66 enclosure
- PLC and triac compatible
- Optional dome guard
- UL and cUL Listed, CSA Certified and CE Approved\*

\* CE Approval for P, S models only.

Federal Signal introduces the Model LP3 low profile strobe light. This Type 4X strobe is available in five colors: amber, blue, clear, green and red. An optional dome wire guard is available for the LP3S and LP3T.

The LP3 is offered in three mounting configurations. LP3P features an integrated 1/2-inch NPT pipe mount. LP3S features a three-hole surface mount — ideal for control panels and other flat or flush surfaces. The “T-mount” LP3T has a popular 2-hole design for wall or flush mounting.

Both the LP3S and LP3T include a surface gasket to complete the Type 4X installation. An optional dome guard is available for use with the LP3S and LP3T. All LP3 units feature a threaded screw-on lens that provides tool-free wiring and strobe tube replacement. The strobe tube is rated for 7,000 hours.

The LP3 comes in three voltage variations: 12-48VDC, 120VAC and 240VAC. The state-of-the-art strobe mechanism produces 2.2 joules of energy, while drawing relatively low level amperage.

StreamLine® strobes feature high-quality, long-life strobe lamps which are designed to reduce tungsten build-up for longer lamp maintenance cycles. Careful consideration is given to the relationship between lamp shape and lens design for maximum light output. StreamLine products make use of surface mount technology, which provides a more powerful light in a much smaller package. The dry-electrolyte capacitor used in StreamLine products runs cooler than those used in many competitive strobes, resulting in a more reliable product that won't fail due to overheating.

Model	Voltage	Operating Current	Flash Rate/Minute	Joule Output	Candela Peak <sup>1</sup>	ECP <sup>2</sup>
LP3	12-48VDC	0.44-0.10 amps	65-95	2.2	175,000	51.5
LP3	120VAC	0.10 amps	65-95	2.2	175,000	51.5
LP3	240VAC	0.07 amps	65-95	2.2	175,000	51.5

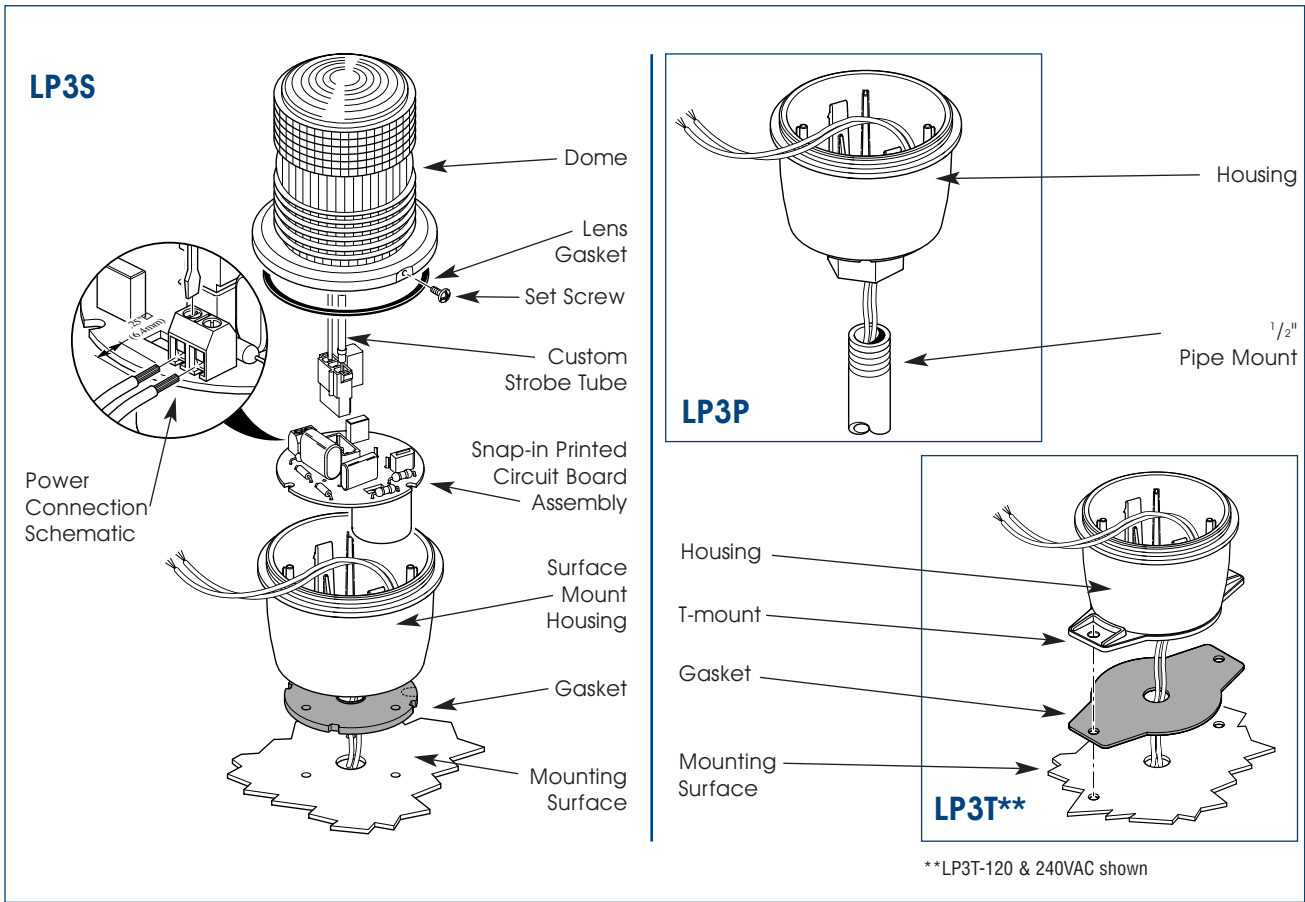
<sup>1</sup> Peak candela is the maximum light intensity generated by a flashing light during its light pulse

<sup>2</sup> ECP (Effective Candela) is the intensity that would appear to an observer if the light were burning steadily





# STREAMLINE® LOW PROFILE STROBE LIGHT (LP3S/LP3P/LP3T)



## SPECIFICATIONS

Lamp Life:*	7,000 hours	7,000 hours
Lamp Style:	Strobe	Strobe
Operating Temperature:	-31°F to 150°F	-35°C to 66°C
Net Weight:	7.3 oz.	206.96 g
Shipping Weight:	8.5 oz.	240.98 g
Diameter:	3.125"	7.94 cm
Height (from bottom):		
LP3P	5.7"	14.48 cm
LP3S	5.0"	12.7 cm
LP3T	5.1"	12.95 cm

\*Optimal hours under ideal conditions.

## HOW TO ORDER

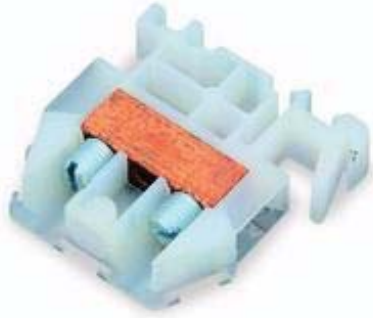
- Specify model, voltage and color
- Specify options  
Wire/Dome guard for LP3S, LP3T (LP3G)
- Please refer to Model Number Index LP3 (P,S,T) beginning on page 374

## REPLACEMENT PARTS

<b>Description</b>	<b>Part Number</b>	<b>Description</b>	<b>Part Number</b>
Dome, Amber	K8589063A	PC Assembly, 12-48VDC	K2001316B
Dome, Blue	K8589063A-01	PC Assembly, 120VAC	K2001317A
Dome, Clear	K8589063A-02	PC Assembly, 240VAC	K2001317A-01
Dome, Green	K8589063A-03	Gasket, Lens	K8589013A
Dome, Red	K8589063A-04	Gasket, LP3S	K8589011A
Strobe Tube	K149130A	Gasket, LP3T	K8589012A

# 9080GR6

## TERMINAL BLOCK 600V 60AMP NEMA +OPTIONS



List Price \$2.40 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

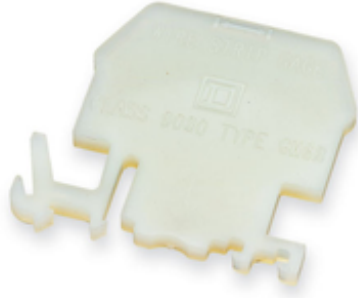
### Technical Characteristics

Ampere Rating	60A
Approvals	UL Listed File: E60616 CCN XCFR2 - CSA Certified File: LR62144 Class 6228 01 - CE Marked
Fingersafe	Yes
Block Material	Nylon
Color	Natural
Width	0.35 Inches
Standard Package Size	50
Lug Material	Copper
Maximum Voltage Rating	600VAC
Mounting Type	Track (9080GH/35mm DIN 3)
Recommended End Barrier	GM6B
Terminal Type	Box Lug
Block Type	Standard
Type	GR6
Wire Size	#22 to #8 AWG (Cu)
Density	34 Sections
Depth	1.72 Inches
Height	1.82 Inches

### Shipping and Ordering

Category	21702 - Blocks, Terminal, NEMA, Channel Mount, Type G
Discount Schedule	CP5
GTIN	00785901000716
Package Quantity	50
Weight	0.03 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



List Price \$0.78 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.****Technical Characteristics**

Type	GM6
Mounting Type	Track (9080GH/35mm DIN 3)
Color	Natural
Standard Package Size	10

**Shipping and Ordering**

Category	21702 - Blocks, Terminal, NEMA, Channel Mount, Type G
Discount Schedule	CP5
GTIN	00785901744023
Package Quantity	10
Weight	0.01 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

# AB1TP435U

## TERMINAL BLOCK 600V IEC +OPTIONS



List Price \$6.20 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

Net Weight	0.88 oz
Color	Green/Yellow
Standard Package Size	100
Maximum Voltage Rating	600V
Mounting Type	Rail (35mm DIN 3)
Number of Points	2
Terminal Type	Screw Clamp
Block Type	Grounding
Type	AB1
Wire Size	#22 to #10 AWG (Cu)
Depth	1.91 Inches
Height	2.01 Inches
Approvals	UL Recognized File: E164359 CCN XCFR2 - CSA Certified File: 702070 Class 6228 01 - CE Marked
Width	0.24 Inches

### Shipping and Ordering

Category	21715 - Blocks, Terminal, IEC, Channel Mount, Type AB1
Discount Schedule	CP5
GTIN	00785901369868
Package Quantity	100
Weight	0.06 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	DE

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



### Main

Range of product	Terminal blocks
Product or component type	Terminal block
Technology type	Screw technology
Product specific application	For 3-wire proximity sensors
Fixing mode	Clip-on mounting on 35 mm asymmetrical rail Clip-on mounting on 35 mm notched symmetrical rail Clip-on mounting on 35 mm symmetrical DIN rail
Nominal cross section	2.5 mm <sup>2</sup>
Local signalling	Without
Length	79.4 mm
Colour	Grey
Number of points	1
Sale per indivisible quantity	100

### Complementary

Width	6 mm
Height	68.6 mm on 35 mm symmetrical DIN rail 73.1 mm on 35 mm asymmetrical rail 76.1 mm on 35 mm notched symmetrical rail
Cable cross section	0.5...1.5 mm <sup>2</sup> , flexible with cable end 0.5...2.5 mm <sup>2</sup> , flexible without cable end 0.5...4 mm <sup>2</sup> , solid
Tightening torque	0.4...0.6 N.m, M2.5 conforming to EN 60999 0.4...0.6 N.m, M2.5 conforming to IEC 60974-1
[Ue] rated operational voltage	250 V AC conforming to VDE group C 300 V DC conforming to VDE group C 300 V, 22...12 AWG CSA 300 V, 22...12 AWG UL 400 V conforming to EN/IEC 60947-7-1
[Ie] rated operational current	25 A, 22...12 AWG CSA 25 A, 22...12 AWG UL 26 A conforming to VDE group C 3...24 A conforming to EN/IEC 60947-7-1
Product weight	11 g

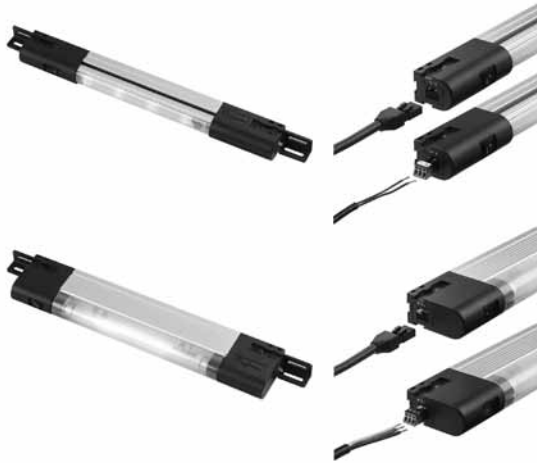
### Environment

Dielectric test voltage	6 kV conforming to EN/IEC 60947-7-1
Product certifications	ASEV CSA UL

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.



## PANELITE™ ENCLOSURE LIGHTS OVERVIEW



### INDUSTRY STANDARDS

#### PANELITE LED and Fluorescent Enclosure Lights

UL 508A Component Recognized; File No. E61997  
 cUL Component Recognized per CSA C22.2 No 14; File No. E61997

CSA File No. 42186  
 Maintains UL/CSA Type 4, 4X and 12 enclosure rating when properly installed in a Hoffman enclosure.

#### 230 VAC Fluorescent Enclosure Light

UL 508A Component Recognized; File No. E234324  
 cUL Component Recognized per CSA C22.2 No 14; File No. E61997

CE

#### LED Light

UL 508A Component Recognized; File No. E234324  
 cUL Component Recognized per CSA C22.2 No 14; File No. E234324

CE

Ingress protection : IP 20

Maintains enclosure type rating up to 4X when installed per instructions

### APPLICATION

Versatile, slim-profile LED and fluorescent lights provide mounting flexibility and are easy to install in any enclosure. Terminal blocks allow for easy wiring. Accessories include ganging cables, power cords and door switches, all provided with plug-and-play connectors for easy connection to the terminal blocks with an innovative terminal connection system. LED version provides superior lighting performance with minimal power consumption.

### FEATURES

- Slim profile allows light to be tucked up out of the way for easy panel installation
- Versatile mounting allows the light to be positioned horizontally or vertically; two-way mounting provides for ideal orientation
- Includes mounting hardware for the following enclosure installations: PROLINE™ Frame, Enclosure Top, Panel Mount and Unistrut
- On/off switch incorporated in light; optional remote door switch accessory available to activate light when enclosure door is opened (230 VAC Fluorescent Enclosure Light has switch or door-activated sensor)

#### PANELITE Only:

- Mounting tabs provide easy access point for attachment hardware; light does not need to be disassembled for installation
- Up to five lights can be daisy-chained together
- Plug-and-play terminal connection system:
  - Pre-wired connection sockets on both ends of light allow use of Hoffman cable accessories
  - Optional terminal blocks snap into the connection sockets allowing customers to use own wiring methods; two terminal blocks provided with each light kit
  - Power supply can be wired manually with Hoffman PANELITE Power Cable with Leads or with Hoffman optional PANELITE Power Cord
  - Ganging cables are available in 2-, 4- and 6-ft. lengths to easily join up to five lights together using one power supply
  - Remote door switch for easy door activation eliminates need to mount light in the exact location required to activate the light

#### LED Light Only:

- Mechanical screw- or magnetic mount (non-slip rubberized)
- Protection Class II (double insulated)
- Operating temperature -22 F to 140 F (-30 C to 60 C)
- On / Off or motion-sensor activation
- LED lights with 900 LM illumination; 120° angle of illumination
- Low, 5-watt power requirement
- Light-weight, all-composite construction
- Input and output connectors included with light (16 AWG)

### SPECIFICATIONS

#### PANELITE:

- Extruded aluminum center support
- Black composite end caps
- Black composite mounting tabs
- Each light fixture includes two mounting tabs, two pre-wired connection sockets, two optional terminal blocks that snap into the connection sockets and enclosure attachment hardware (bulb not included with fluorescent light)

#### 230 VAC Fluorescent Enclosure Light:

- Light gray composite construction – UL 94V-0 material
- Hardware kit provides fasteners to mount to PROLINE, NEMA (4, 4X, 12, and 13), CONCEPT™, FUSION™ and other cabinets
- Easy-access terminal block that accommodates up to 16 AWG wires
- Fluorescent light bulb included (2G7 Base)

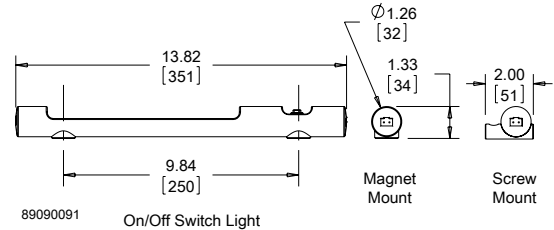
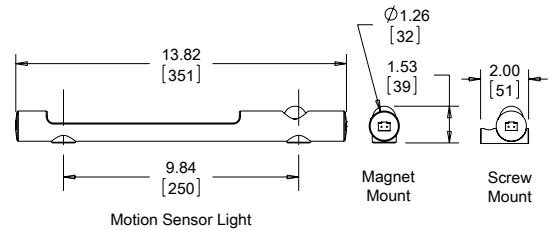
#### LED Light:

- LED (Light Emitting Diode) low-power light kit
- Screw mounting using included hardware kit (maintains enclosure rating up to UL Type 4X)
- No user-serviceable parts
- Life expectancy of 60,000 hours at 68 F (20 C) under specifications
- Operating temperature: -22 to +140 F (-30 to +60 C) under specifications
- 5-watt power consumption
- Transparent, composite construction

### LED LIGHT KIT



LED light kits provide interior enclosure lighting. These light kits are ideal for remote and darkened enclosure applications. The light can be mechanically fastened with included hardware to maintain enclosure UL listing (up to Type 4X), or can be magnetically attached to flat steel surfaces. The lights have auto-sensing circuitry (AC voltage 90 VAC to 260 VAC and DC voltage 20 VDC to 60 VDC). LED lights are light-weight and in a small form factor while providing 900 LM of 6500K light. Power consumption for all models is 5 watts.



#### BULLETIN: A80LT

Catalog Number	AxBxC in./mm	Weight (oz)	Weight (gm)	Mounting Style	Power Source	Activation	Voltage
LEDA1M35	1.34 x 1.26 x 13.82 34 x 32 x 351	4.8	135	Magnetic	AC	On/off switch	90 VAC-260 VAC
LEDA2M35	1.54 x 1.26 x 13.82 39 x 32 x 351	5.0	140	Magnetic	AC	IR Motion Sensor	90 VAC-260 VAC
LEDA1S35	1.42 x 2.05 x 13.82 36 x 52 x 351	4.8	135	Screw	AC	On/off switch	90 VAC-260 VAC
LEDA2S35	1.63 x 2.05 x 13.82 41 x 52 x 351	5.0	140	Screw	AC	IR Motion Sensor	90 VAC-260 VAC
LEDD1M35	1.34 x 1.26 x 13.82 34 x 32 x 351	4.8	135	Magnetic	DC	On/off switch	20 VDC-60 VDC
LEDD2M35	1.54 x 1.26 x 13.82 39 x 32 x 351	5.0	140	Magnetic	DC	IR Motion Sensor	20 VDC-60 VDC
LEDD1S35	1.42 x 2.05 x 13.82 36 x 52 x 351	4.8	135	Screw	DC	On/off switch	20 VDC-60 VDC
LEDD2S35	1.63 x 2.05 x 13.82 41 x 52 x 351	5.0	140	Screw	DC	IR Motion Sensor	20 VDC-60 VDC

### LED LIGHT INPUT CONNECTOR/CABLE ASSEMBLY



The input connector/cable assembly is used to provide supply power to the LED light. Pre-assembled connector/cable assembly with

78.7-in. (2000 mm) long cable whip. Cables are constructed of 16 AWG copper wire.

#### BULLETIN: A80LT

Catalog Number	A in./mm	Power Source	Use with
LEDA20C	78.74 2000	AC	AC LED Lights
LEDD20C	78.74 2000	DC	DC LED Lights

### LED LIGHT EXTENSION CONNECTOR/CABLE ASSEMBLY



The extension connector/cable assembly is used to connect adjacent LED lights (daisy chain). Up to 10 LED lights can be ganged or connected in series. Pre-assembled connector/cable assembly with 39.4-in. (1000 mm) long cable between input and output connectors. Cables are constructed of 16 AWG copper wire.

#### BULLETIN: A80LT

Catalog Number	A in./mm	Power Source	Use with
LEDA10E	39.37 1000	AC	AC LED Lights
LEDD10E	39.37 1000	DC	DC LED Lights

## SDU Series, DIN Rail AC UPS

The SDU DIN Rail UPS combines an industry leading compact design with a wide operation temperature range and unique installation options. The SDU series provides economical protection from damaging impulses and power interruptions. These units include easy to wire screw terminations for critical devices needing battery back up such as computer based control systems.

### Applications

- Programmable Logic Controllers
- Factory Automation
- Robotics
- Conveying Equipment
- Computer-based Control Systems

### Features

- Lightweight, compact industrial design
- Wide operation temperature range (0°C to 50°C)
- Cold start capability
- Phone/dataline surge protection
- Software and cable included for easy installation
- Simulated sinewave output
- RS232 communication port
- USB communication port (optional)
- Form C dry contact relay (optional)
- Panel/wall mounting brackets (optional)
- Remote turn-on and shut-off capabilities
- Two year limited warranty

### Selection Table

Capacity (VA/W)	Catalog Number	Volts, Frequency In/Out	Typical Back-up Time (minutes) *	Input/Output Connections	Approx. Ship Weight – lbs (kg)
500/300	<b>SDU 500</b>	120 Vac, 50/60 Hz	4	IP20 touch proof, screw terminals. Wire range: 10 ~ 24 AWG.	10.7 (4.70)
850/510	<b>SDU 850</b>		2		11.4 (5.00)
500/300	<b>SDU 500-5</b>	230 Vac, 50/60 Hz	4		11.5 (5.20)
850/510	<b>SDU 850-5</b>		2		11.9 (5.40)

\* At full load.

### SDU Accessories

Catalog Number	Description	Approx. Ship Weight – lbs (kg)
<b>RELAYCARD-SDU</b>	Dry contact I/O relay box, IP20 touch proof screw terminals, wire size range 12~22 AWG (IEC 2.5mm); N.O./N.C. form "C" contact. Relay contact signal for "On Battery", "Low Battery" and "UPS Shutdown".	1.0 (0.45)
<b>UPSMON-USB</b>	RS232 to USB adapter cable	1.0 (0.45)
<b>SDU-PMBRK</b>	Mounting brackets to secure UPS to wall, back of panel or enclosure.	1.0 (0.45)



### Certifications and Compliances

#### 120V Models

- **UL** UL Recognized Component, UPS Equipment
  - UL 60950-1/CSA C22.2 No. 60950-1
  - Suitable for UL 508, CSA C22.2 No. 107.1 Ind. Control Equipment Applications with no derating
  - Overvoltage Cat III, Pollution Degree III

#### 230V Models

- **CE**
  - EN62040-1-1

### Related Products

- Portable MCR Power Conditioners
- STV Surge Protective Devices
- SDN DIN Rail Power Supplies
- STFV Plus Active Tracking® Filters

## Specifications

Catalog Number	SDU 500	SDU 850	SDU 500-5	SDU 850-5
Capacity (VA/Watts)	500/300	850/510	500/300	850/510
Load Power Factor	0.6			
<b>Dimensions – inches (mm)</b>				
Unit (H x W x D) – in. (mm)	4.88 x 11.1 x 4.55 (124.0 x 281.0 x 116.0)			
Weight – lbs (kg)	10.7 (4.70)	11.4 (5.00)	11.5 (5.20)	11.9 (5.40)
<b>Input Parameters</b>				
Voltage	120 V (+10%, -20%)		230 V (+/- 20%)	
Frequency	50 +/- 5 Hz or 60 Hz +/- 6 Hz (auto sensing)			
<b>Output AC Parameters</b>				
Voltage (Battery Mode)	Step sinewave +/- 5%			
Frequency (On Battery)	50 or 60 Hz +/- 0.3 Hz			
Overload Protection	UPS automatic shutdown if overload exceeds 105% of nominal at 20 seconds, 120% at 10 seconds, 130% at 3 seconds			
Short Circuit	UPS output cut off immediately			
<b>Battery Parameters</b>				
Battery Type	Sealed, non-spillable, maintenance-free lead acid batteries			
Transfer Time	4 - 6 ms typical			
Back-up Time * (minutes)	4.5/18	2.5/10	4.5/18	2.5/10
Recharge Time	8 hours to 90% capacity after full discharge			
<b>Environmental</b>				
Operating Temperature	0°C to 50°C			
Storage Temperature	-15°C to 60°C			
Relative Humidity	1% to 95%, non-condensing			
Ambient Operation	1-95% humidity non-condensing, 0-50°C up to 5,000 ft. (1500m)			
Audible Noise	< 40dBA (1 meter from surface)			
<b>Standards</b>				
EMC	FCC Part 15, Subpart B, Class A; EMC: EN50091-2, EN61000-3-2, EN61000-3-3, IEC60801-2, IEC60801-3, IEC60801-4, IEC61000-2-2			
Elevation	5000 ft. without derating			
Shock & Vibration	According to the International Safe Transit Association standard ISTA 2A.			
Mounting	To be mounted on DIN TS35/7.5 or TS35/15 rail system. Chassis mounting permissible via optional brackets. Unit handles normal shock and vibration of industrial use and transportation without coming off rail.			

\* At full load/half load.

# 3 PUSHBUTTON SWITCHES

## General Purpose Pushbutton Switches — AC Rated

These general purpose ac rated pushbutton switches offer a wide variety of configurations, button styles and termination types. The 7835 and 7836 light duty series are ac only pushbutton switches. They feature Slow-make/Slow-break butt type contacts with a light operating pressure that is particularly suited to instrumentation applications.

### SPECIFICATIONS

#### Ratings:

See selection table.

#### Circuits:

1PST, 1PDT, 2PDT.  
Momentary action.

#### Contact Material:

**3-6A Rated**  
Movable — Silver plated copper.  
Stationary — Silver plated copper.  
**10-15A Rated**  
Movable — Silver plated copper with fine or coin silver contact face button.  
Stationary — Copper with fine or coin silver contact face button.

#### Terminal Types:

Screw Terminals — Brass.  
Furnished unassembled.  
**8448 Series**  
#6-32 x 3/16" binding head screws (Cat. No. 811-2).  
**8410/8411 Series**  
#5-40 x 3/16" (Cat. No. 811-7206).  
**8406/8440 Series**  
#5-40 x 5/32" screws (Cat. No. 11-26).  
Solder Lug — Brass silver plated.

AC RATED PUSHBUTTON SWITCHES SELECTION TABLE (BOLD FACE TYPE INDICATES ITEMS NORMALLY IN DISTRIBUTOR STOCK)

Type	Rating	Poles and Throw	Contacts	CIRCUIT NUMBER SEE PAGE 4.28	BUTTON				Typical Maximum Operating Force	Mounting or Bushing Length Dimension "A"		CATALOG NUMBER			
					Construction	Color	Button Extension Dimension "B"			mm	inches	Solder Lugs	Screw Terminals	Spade Terminals (.250")	Wire Leads ⑤
					NON-ILLUMINATED					NON-ILLUMINATED					
Flush Mounted Light Duty Momentary Contact	3/4A, 125V ac/dc 1/4A, 250V ac/dc	1 P.S.T. 1 P.S.T.	NC NC	A A	Nylon Nylon	Black Black	11.50	.453"	0.7 lbs. ② 0.7 lbs. ②	— —	Flush Flush	— —	8410K1 8406K1	— —	— —
							11.89	.468"							
Snap-In Mounted Light Duty Momentary Contact	3/4A, 125V ac/dc 1/4A, 250V ac/dc	1 P.S.T. 1 P.S.T.	NC NO	A A	Nylon Nylon	White White	9.53	.375"	— —	— —	Snap-In Snap-In	— —	— —	8423K1 ① 8424K1 ①	— —
							9.53	.375"							
One Hole Mounted Light Duty Momentary Contact	3/4A, 125V ac/dc 1/4A, 250V ac/dc	1 P.S.T. 1 P.S.T.	NC NO	A	Nylon Nylon	Black Red	6.35	.250"	1.5 lbs. ② 1.5 lbs. ③	6.35	.250" .250"	8411K5 —	— —	— —	8411K13 ①
							6.35	.250"							
		1 P.S.T. 1 P.S.T.	NC NO	A	Nylon Nylon	Black Black	10.31	.406"	1.5 lbs. ② 1.5 lbs. ③	11.89	.468" .468"	8411K8 —	8411K7 8411KT2	8411K10 8411K11 ①	— —
							9.53	.375"							
	3A, 125V ac	1 P.S.T. 1 P.S.T.	NC NO	A	Nylon Nylon	Black Black	6.35	.250"	1.5 lbs. 1.5 lbs.	6.35	.250" .468"	— —	— —	8418K1 ① 8418K12 ①	— —
							10.31	.406"							
	5A, 12V dc ④④ 3A, 125V ac	1 P.S.T.	NO	A	Metal	—	7.52	.296"	2.5 lbs.	11.89	.468"	8440K2	8440K3	—	—
	3A, 125V ac 1A, 250V ac 1/10 Hp, 125V ac	1 P.S.T.	NC	A	Metal Nylon (Snap-On) Nylon (Snap-On)	Black	7.92	.312"	—	14.27	.562"	7835K11A 7835K11C	—	—	7835K12A —
						Red	—	—	—	14.27	.562"	7835K11D	—	—	
						Black	7.92	.312"	—	14.27	.562"	7836K11A 7836K11C	7836K13A	—	7836K12A —
Red						—	—	—	14.27	.562"	7836K11D	—	—		
15A, 125V ac 10A, 250V ac 1/3 Hp, 125-250V ac	1 P.S.T.	NO	A	Metal	—	13.49	.531"	0.9 lbs.	17.45	.687" .343"	— —	8444K3 8444K4	8444K2 —	— —	
					—	6.35	.250"								
					15A, 125V ac, NO 10A, 125V ac, NC 10A, 250V ac, NO 5A, 250V ac, NC 1/2 Hp, 250V ac 1/4 Hp, 125V ac	1 P.D.T.	NO,NC	B	Metal Bakelite	—	13.49	.531"	2.0 lbs.	17.45	.687" .687"
Black	13.49	.531"													
15A, 125V ac 10A, 250V ac	2 P.S.T.	NO	C	Metal	—	6.35	.250"	—	8.71	.343"	—	8448K2 ④	8448K1 ④	—	

① Combination spade and solder lug terminal.  
② To change operating pressure, refer to your local Eaton Sales Representative.  
③ Operating pressure cannot be changed.  
④ UL and CSA listings not applicable.  
⑤ Standard length is 152.40mm (6"), stripped 15.88mm (.625").





Availability **Stock Item: This item is normally stocked in our distribution facility.**

**Technical Characteristics**

Width	0.24 Inches
Approvals	UL Recognized File: E164359 CCN XCFR2 - CSA Certified File: 702070 Class 6228 01 - CE Marked
Net Weight	0.28 oz
Color	Gray
Standard Package Size	100
Maximum Voltage Rating	600V
Mounting Type	Rail (35mm DIN 3)
Number of Points	2
Recommended End Barrier	AB1AC24
Terminal Type	Screw Clamp
Block Type	Passthrough
Type	AB1
Wire Size	#22 to #10 AWG (Cu)
Ampere Rating	30A
Depth	1.91 Inches
Height	1.57 Inches

**Shipping and Ordering**

Category	21715 - Blocks, Terminal, IEC, Channel Mount, Type AB1
Discount Schedule	CP5
GTIN	00785901221494
Package Quantity	100
Weight	0.02 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	DE

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

**Technical Characteristics**

Color	Black Marking on White Background
For Use With	IEC Type Terminal Block
Type	AB1

**Shipping and Ordering**

Category	21715 - Blocks, Terminal, IEC, Channel Mount, Type AB1
Discount Schedule	CP5
GTIN	00785901581451
Package Quantity	25
Weight	0.01 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	DE

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



List Price \$0.62 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**




### Technical Characteristics

Color	Grey
For Use With	IEC Type Terminal Block
Mounting Type	Rail
Type	AB1

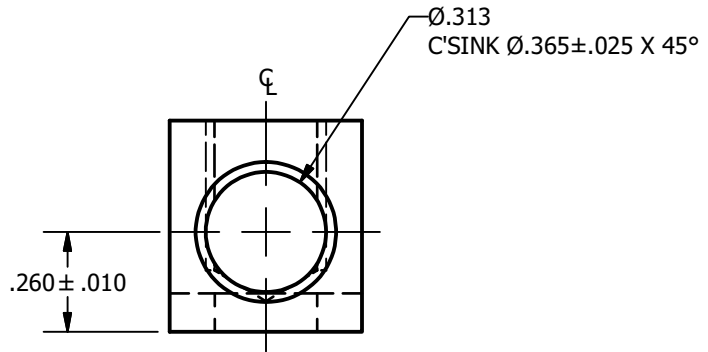
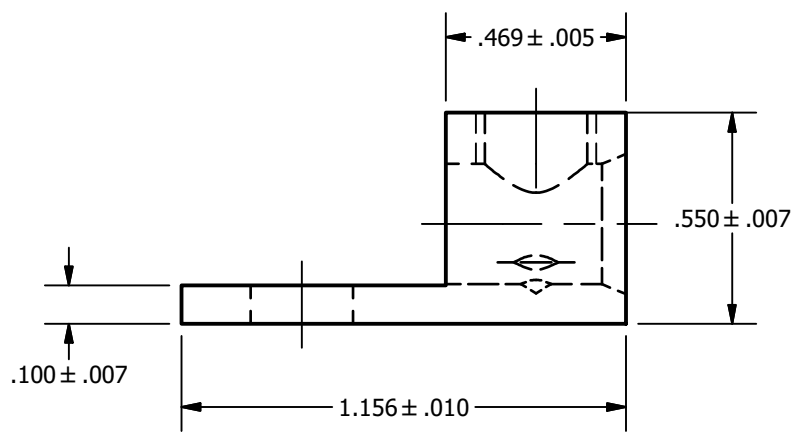
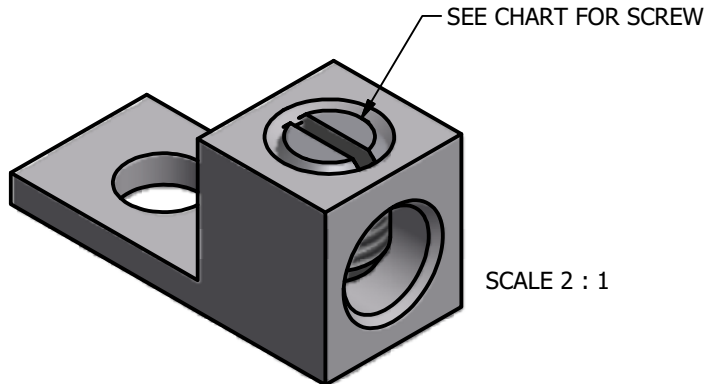
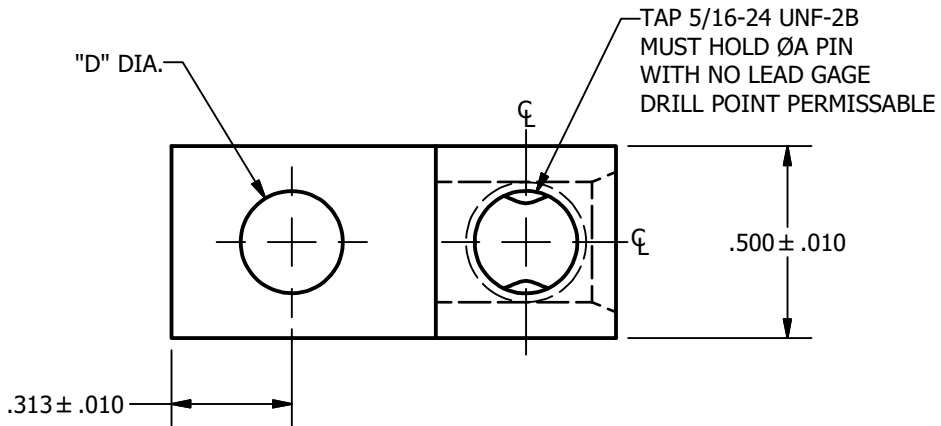
### Shipping and Ordering

Category	21715 - Blocks, Terminal, IEC, Channel Mount, Type AB1
Discount Schedule	CP5
GTIN	00785901580157
Package Quantity	50
Weight	0.01 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	DE

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

SCREW: SEE CHART	MATERIAL:ALUMINUM, X0947	TOLERANCES-UNLESS OTHERWISE SPECIFIED 2 PL. DEC. ±.010 TRUE C.L. ±.015 3 PL. DEC. ±.005 ANGLES ±1		DWG. NO. <b>D0980</b>	
CAT. NO.:TA-2, TA-2-B2	PLATING: EL-TIN	DRAWN BY: NN	SCALE: 2:1	SHEET 1 OF 1	
MASS:.011 LBS	MARKING: ILSCO, TA-2, 2-14, AL9CU,  , 	DATE: 12/7/2007	SIZE: A		
SURFACE AREA: 2.645 IN <sup>2</sup>		CELL:ABM			
STUFFER SHT: FORM 1			REV.	DESCRIPTION	

Cat #: TA-2  
TA-2-B2



DEV.	"A"	ASSEMBLE	SCREW	"D"
-22	.120	FLUSH TO TOP	E0309C92Z	.266

**END  
OF  
SECTION**