TRANSMITTAL OF SUBMITTAL

DATE: 8/16/23

TO: Scott Miller

CMG – City of Atlanta
2528 Chattahoochee Circle
Atlanta, GA 30318

New Submittal X Resubmittal

Project: East Area Water Quality Control Facility Improvements

Specification Section No. : 11513

Supplier/Vendor/Subcontractor: Tempelton

Manufacturer: Penn Valley

FROM: LAKESHORE ENGINEERING

1259 Ellsworth Drive

Atlanta, GA 30318

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Submittal number	Submittal Type	Contains Variation to Contract	
				No	Yes
Email	Double disc pumps – O&M Manual	11513-74.01	O&M Manual	X	

Comments/Variation:

CONTRACTOR hereby certifies that (i) CONTRACTOR has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By:_____ _____

Brandon Dow

Penn Valley Pump Co., Inc.
998 Easton Road • Warrington, PA 18976
Ph: 215-343-8750 • Fax: 215-343-8753
www.pennvalleypump.com

PRELIMINARY O&M MANUAL
Atlanta East Area WQCF Improvements

DATE:	**September 21, 2022**
EQUIPMENT MODEL NO.:	**6DDSX107CNU-MK1**
SPECIFICATION NO.:	**11513 Double Disc Pumps**
EQUIPMENT SERIAL NO.:	**210868-1 & 210868-2**
EQUIPMENT TAG NO.:	**82P3602 & 82P3604**
MANUFACTURER:	**Penn Valley Pump Co., Inc. 998 Easton Road Warrington, PA 18976 Ph: 215-343-8750 Fax: 215-343-8753**
REPRESENTATIVE:	**Templeton & Associates 4324 Brogdon Exchange, Suite 100 Suwanee, GA 30024 Ph: 770-614-8550 Fax: 770-614-5992**
CONTRACTOR:	**Lakeshore Engineering, LLC 1259 Ellsworth Drive Atlanta, GA 30318 Ph: 404-355-3976**
ENGINEER:	**Arcadis**

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Equipment Supplied

Quantity	Item/Model Number	Description
2	6DDSX107CNU-MK1	6” MK1 Pump, Cast Iron, Neoprene Elastomers
2	PVD728	6” Piggy Back Mount Frame, Stainless Steel 304
2	0106SDSR41A-P	Toshiba Motor, 10HP, 1200, 230/460, TEFC SD with Thermals
2	PVD701C	Pulsation Dampener, Discharge, 6 150# Fl, CS
2	PVD702C	Pulsation Dampener, Suction, 6” 150# Fl, CS
2	PVP420PS	420 Pressure Switch Assembly, 1” SS316 Sensor, Switch & Gauge
2	PVP420VS	420 Vacuum Switch Assembly, 1” SS316 Sensor, Switch & Gauge
2	ANCHOR BOLTS	HILTI KB3 ¾” x 5 ½” SS 316 Sets of Anchor Bolts
1	G001N63	Spare Parts Kit for 6DDSX107CNU-MK1

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O&M MANUAL

INDEX

Model 6DDSX107-MK1

Index

INTRODUCTION

The Penn Valley Double Disc Pump™ utilizes a unique principle of operation whereby the discs perform the duties of pumping and valving, providing a double acting, non-clogging, pumping action. Through an arrangement of connecting rods and a camshaft, a reciprocating action of the discs is created, forming a large cavity between discs. This cavity is filled and exhausted in a continuous flow. The large, valve-like discs mean that large solids and rags can be handled without loss of the pumping action. The valve-like discs have large seating areas that provide for low internal velocities, extending the pump wear life on abrasive sludges and slurries. The fluid chamber is sealed with flexible trunnions that eliminate packing, mechanical seals, and requires no flushing water or other forms of lubrication. The large diameter discs are proven to handle large solids, rags, plastics, etc. that would cause other pumps to fail.

Here's how it works:

Suction Cycle (fig. 1)
The suction disc (right) is lifted from its seat creating a vacuum. The cavity between the discs is filled during the reciprocating motion of the suction disc. The discharge disc (left) is seated, creating a seal in the flow path during the suction cycle. A clack valve prevents return flow.

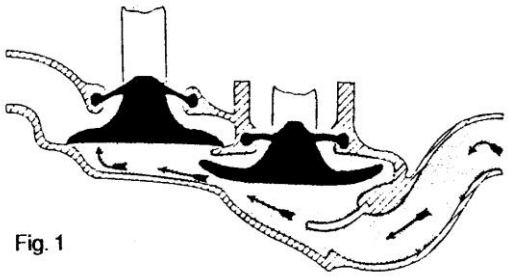
Fig. 1

Discharge Cycle (fig. 2)
The reciprocating action then causes the suction disc (right) to seat and create a seal in the flow path and a downward motion of the discharge disc (left) forces the discharge.

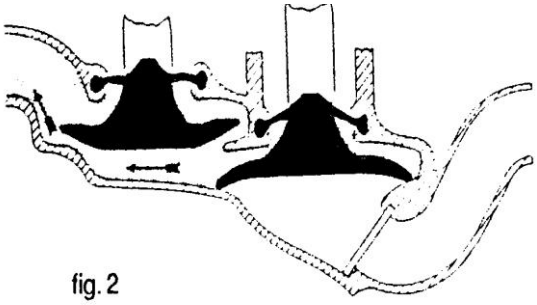
fig. 2

FEATURES

- Double Disc Pumps use a flexing membrane, which achieves the sealing of the fluid chamber. There are no rotating shafts so packing and mechanical seals are eliminated. No seal water required.
- Maintain-in-Place design allows pump to be serviced without disturbing piping.
- All Double Disc Pumps can operate dry without fluid chamber damage.
- There are no close-clearances or rotating parts in the fluid chamber to wear on abrasive applications.
- There are no check valves in the suction or discharge that will plug. Double Disc Pumps will pass hand towel sized rags.
- There are no reciprocating pistons requiring packing or that will wear on abrasive slurries.
- Double Disc Pumps can operate in either direction of shaft rotation without affecting the pump efficiency.

PIPING and SUPPORTS

IMPORTANT: **When connecting piping to the pump, the connection should be made with the pipe in a free supported state and without the need to apply vertical or side pressure to obtain alignment of the piping with the pump flanges.**

All piping should be independently supported near the pump so that pipe strain will not be transmitted to the pump. The use of pipe hangers or pipe saddles that just support, rather than rigidly attach, and brace the piping are not adequate enough to prevent pipe movement.

Sufficient, rigid, piping support and bracing must be supplied to prevent the suction and discharge piping from moving during the suction and discharge cycle. Adequate support and bracing close the pump is the best method to prevent pipe movement. See Figure 3 and Figure 4 illustrations below for recommendations.

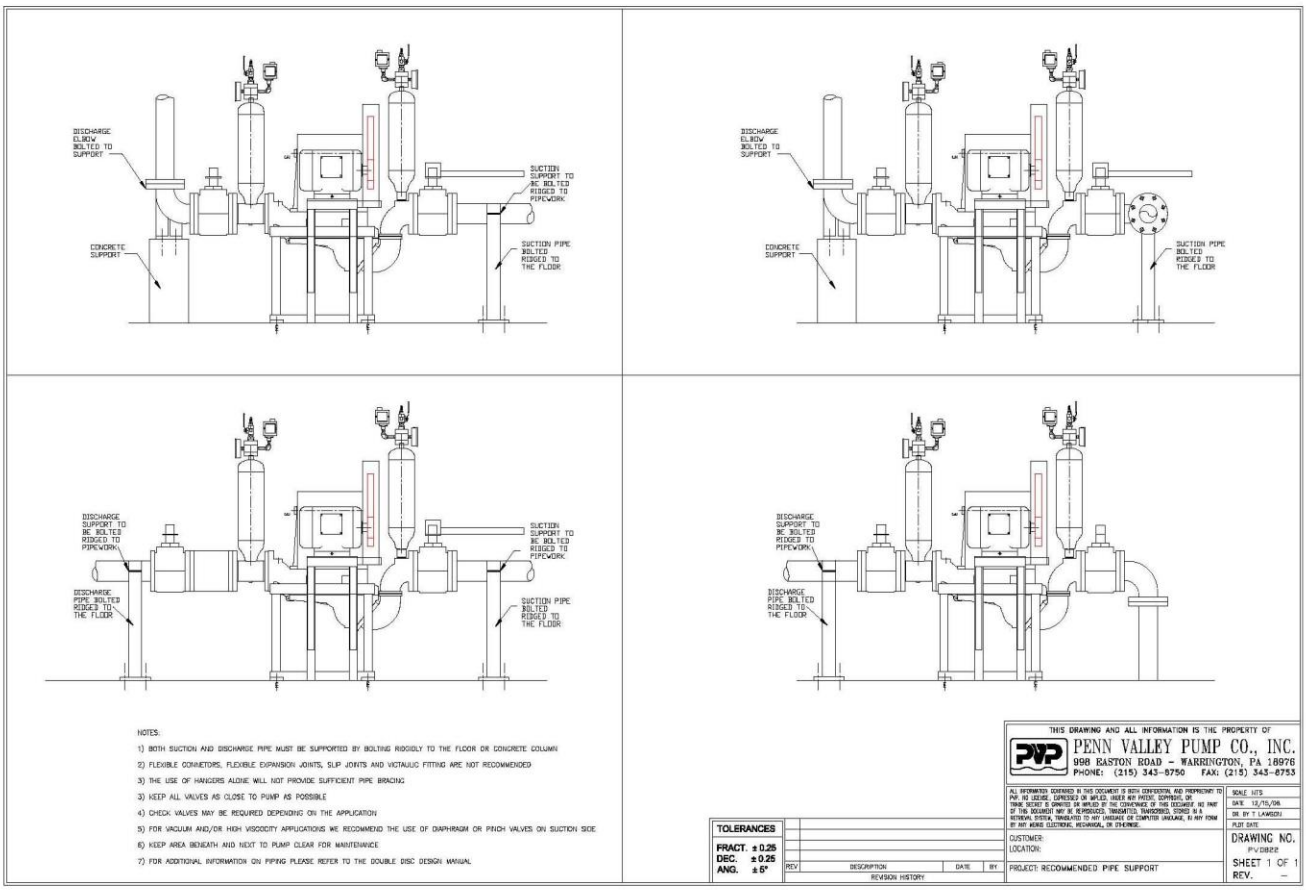

Fig. 3

We do **NOT** recommend the use of flexible connections/expansion joints on the suction and discharge ports of the pump. Our long-term experience has found these items do not reduce vibration, but rather can enhance vibration allowing improperly supported piping to move substantially when used with reciprocating positive displacement pumps. To maximize the pumps "Maintain-in-Place" design the suction swan neck should be attached rigidly to the suction piping.

The use of slip joints and mechanical pipe joining systems (i.e., Victaulic style) is also highly discouraged. These mechanical systems do not provide the same rigid connections as traditional flanged piping systems. These mechanical systems can be difficult to properly brace leading to pipe vibration issues. If mechanical piping joining systems will be used, the engineer, contractor or owner must ensure the manufacturer's installation method for *rigid pipe cutting* and coupling connections is strictly adhered to.

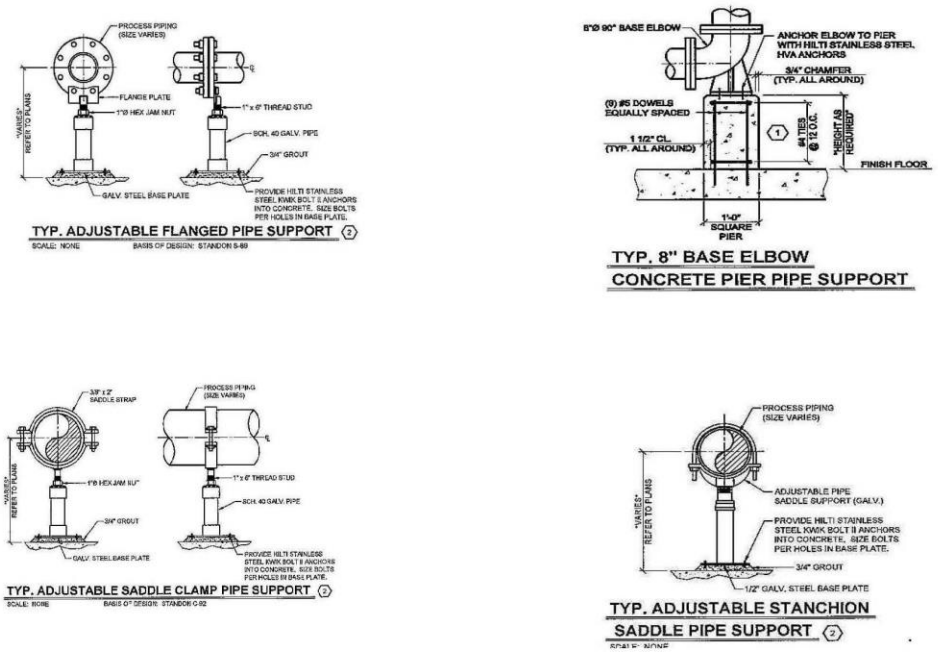

Fig. 4

Pressure gauges should be installed on the suction and discharge piping and located as close to the ports as practical. The operator can only determine any unstable pump operation by observing these gauges. Any change in the system operating characteristics will be indicated in the gauge readings.

Install isolation valves in the suction and discharge piping as close to the pump as practical. The valves will allow for the removal of the pump or permit maintenance on the pump without draining the system.

SUCTION PIPING

CAUTION: **Do not operate Double Disc Pumps against a closed suction line for extended periods of time. Excessive vacuum build-up can cause disc and/or trunnion failure.**

It is imperative that a properly sized suction piping system be used in accordance with the suction conditions. The importance of proper suction system design cannot be over emphasized. The majority of pump operating problems and pump failures are created by improper suction line conditions.

A Net Positive Suction Head Calculation (NPSH) that includes the Acceleration Head (h_a) component must be calculated for applications with long suction lines to determine if there is adequate suction pressure available based on a given line size and length.

A reciprocating pump, by creating a vacuum at the suction port, utilizes atmospheric pressure (14.7 psi at sea level) to draw the liquid into the pump much like a person drinking through a straw. A static suction head will assist this action whereas pipe friction losses, suction pipe length and pressure drop through equipment reduces the overall pressure available. The following design considerations are offered to prevent pump starvation defined as cavitation.

Good system design dictates that the lowest possible suction lift be designed into the piping system. Double Disc Pumps are capable of operating under a 28-foot suction lift when fully primed, will re-prime at 18-feet and will dry prime on systems having a 7-foot lift. When using the standard disc construction, a maximum of 20 -feet suction lift is recommended for continuous operation. If higher suction lifts are necessary, a special disc construction may be required.

The pump should be located as close to the source as possible, with the suction piping as short and as direct as practical. It is imperative that the suction line hydraulics be carefully considered when locating the pump. The suction pipe size is determined by the percent solids, length of run, and flow in gallons per minute, taking into consideration the number of elbows and other obstructions in the suction piping. A rule of thumb is that the suction pipe size should never be smaller than the suction port on the pump being installed. On a horizontal run, the suction piping should have a gradual rise, up to the suction port of the pump. This is to prevent air entrapment, causing improper pump operation.

On high suction lifts, long suction lines, or on applications handling high percent solids, the suction piping may need to be one or two sizes larger to reduce friction losses and allow the pump to fill. These applications may require the pump to operate under a vacuum condition. When operating under a vacuum condition the integrity of the suction line is critical to pump efficiency and performance. The piping must be air-tight to the amount of vacuum that must be generated to allow flow. All valves and fittings must be tight to prevent any air leaks. The use of diaphragm valves or pinch valves is highly recommended when the suction line will be routinely operated under high vacuum conditions. Most plug valves and knife gate valves are not suitable for high vacuum conditions.

DISCHARGE PIPING

CAUTION: **Do not operate Double Disc Pumps against a closed discharge line. Excessive pressure build-up will cause disc and/or trunnion failure.**

Double Disc Pumps must not be operated against a closed valve in the discharge piping or damage can occur. This type of operation will lead to disc inversion and breakage of the discs. To avoid this, it is imperative that a pressure limit be switch installed as close to the discharge port as practical. The switch setting should be set at 10 psi above operating pressure. When the pressure exceeds the pressure setting, the limit switch will turn the pump drive off.

The use of back flow check valves is recommended when there are multiple pumps connected to a common discharge line or the pump will be installed on a common discharge line with other pumps. If a check valve is required for the application, we recommend a lever and spring assisted check valve style be used.

PULSATION DAMPENERS

Pulsation dampeners are designed to control rapid velocity changes that may cause potentially dangerous pressure excursions. This is accomplished by using a vessel charged with inert gas (air) and connected to the pipeline carrying the liquid. This vessel has the capability to convert the kinetic energy of the moving liquid into stored potential energy when a liquid over-pressure occurs. When a pump stops, the vessel air expands, and 'pumps' needed liquid into the line to prevent the formation of vacuum or column separation. With a pulsation dampener installed in the pipeline, flow from the pump is received within the pulsation dampener compressing the stored gas on top of the liquid. Pump energy thus stored is released in a controlled fashion to establish steady state flow.

The use of a pulsation dampener, mounted in the discharge piping system is the most effective solution. The pulsation dampener must be sealed from atmospheric pressure, as even a minute leak will soon deplete the air in the top of the chamber. The liquid being pumped may gradually absorb the air in the chamber, causing the chamber to become ineffective until the chamber is purged of liquid and the air is replenished. This is easily accomplished by introducing compressed air on top of the pulsation dampener through the valve provided. This forces the liquid back into the piping system, thereby re-establishing the air cushion in the chamber.

After making certain that the discharge piping is securely supported and the pump is securely bolted to a rigid foundation, the following solution for reducing this phenomenon is recommended.

Pulsation dampeners installed in the suction piping can improve the NPSH conditions of the application and reduce the acceleration head. The following are examples of conditions where suction side pulsation dampeners would be required:

1. Static lift requirement. (i.e., fluid source below pump suction inlet)
2. Suction line diameter smaller than pump inlet.
3. Suction line longer than 50 ft.

Vibration and/or noise can occur on the discharge side due to the valving action of the discs. Discharge chambers are not required on every installation. The system hydraulics must be reviewed to determine the requirements of the pumping system. The following are examples of conditions where pulsation dampeners would be required.

1. Discharge pipe in excess of 100 feet - Discharge Chamber required.
2. Static discharge head in excess of 10 feet - Discharge Chambers required.
3. Multiple pumps discharging into a common line - Discharge Chamber required.

The discharge pulsation dampener must be purged after the piping system is filled with liquid. The pressure in the pulsation dampener then equalizes to the discharge head conditions. If this is not done, the discharge head will cause the liquid to rise in the chamber, thereby reducing the effectiveness of the pulsation dampener.

DRIVES

Each Double Disc Pump is provided completely assembled on a mounting base with an electric motor and v-belt and pulley drive system. The pumps are relatively slow speed pumps and require a speed reduction from the standard 1200 and 1800-rpm motor speeds. This reduction is achieved by sizing the sheave and pulley ratio to achieve the required pump speed and horsepower per belt rating for the motor requirement. A gear reducer between the motor and pump may also be used. The reducer is then used in conjunction with the belt and pulley arrangement.

INSTALLATION

Foundation & Base

Each Double Disc Pump is provided completely assembled on a tubular SS304 mounting base. Each based is completely seam welded and gusseted to handle the torque and load requirements. The frame must be mounted to a solid foundation for proper pump operation. The foundation must be rigid enough to prevent vibration and misalignment during operation. The pump base must be anchored to the floor with appropriate anchor bolts and leveled by shimming at the anchor bolt locations.

The frames are elevated for each model to allow adequate room beneath the pump for maintenance access. Pump disassembly is commenced from the bottom with the “Maintain-in-Place” hinged housing design allowing the housings to be lowered into the area beneath the frame. This area

should remain clear of any conduit, piping or other obstruction that would limit access to underside of pump for maintenance.

Outdoor Installation
The standard Double Disc Pump configuration can be mounted outdoors. When installing outdoors in cold weather climates the pump and piping must be protected from freezing temperatures. If the liquid in the pump chamber is allowed to freeze, the resultant expansion will crack the pump housings and cause damage to the pump and piping system.

PUMP PROTECTION

The use of a discharge pressure switch is highly recommended to prevent pump damage due to a high-pressure event. A high-pressure event may be due to an inadvertent closed valve or clogged line. Penn Valley Pump provides a PVP420 Discharge pressure switch assembly for the majority of the applications. This assembly consists of an annular sensing ring, NEMA 4X pressure switch and pressure gauge. This assembly is filled with glycerin and calibrated at our factory. This assembly is designed to mount to the top of the discharge pulsation dampener through the 1" NPT connection. Please refer to datasheet SLS-420PS for more information on this assembly.

CONTROLS

The Double Disc Pump can be operated by a motor starter for constant speed applications or a variable frequency drive (VFD) for variable speed applications. If using a motor starter, the use of a soft starter is highly recommended to allow the pump speed to ramp up to maximum operating speed. This minimizes pressure spikes at pump start and is especially important on long suction and/or discharge lines.

If using a VFD (recommended option) the unit must be sized appropriately for a constant torque application. The VFD shall be sized for a heavy-duty overload capability based on the full load amp rating for the motor horsepower being used. VFD manufacturers appear to have different ratings (light, normal and heavy duty) for their drives. Depending on the manufacturer, the horsepower of the VFD may need to be one size larger than the horsepower rating of the motor. A drive that is undersized may experience DC bus issues (regeneration) requiring the addition of dynamic braking resistors. In most cases this regeneration can be remedied through programming in the drive by adjustments to the deceleration rate.

For set-up of the VFD we typically recommend a minimum acceleration rate of 30 seconds for speed ramp up to full speed to minimize start-up pressure spikes. The deceleration rate should be set as close to zero as possible.

Double Disc™ Pumps

The World Leader in Free - Diaphragm Technology

Penn Valley Pump Company Inc.

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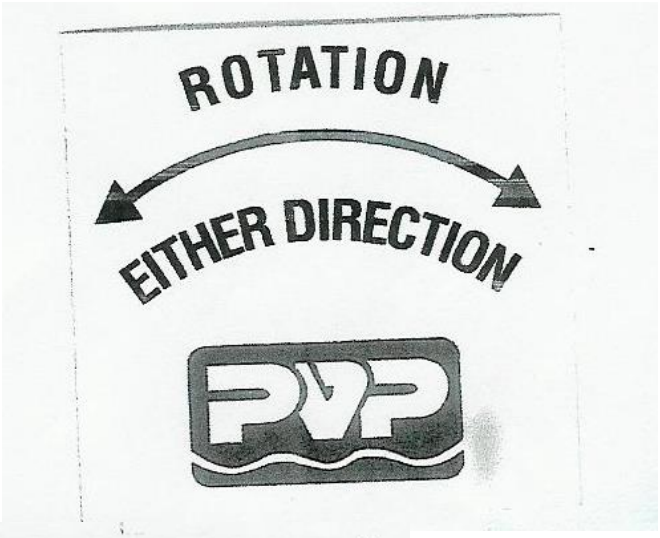
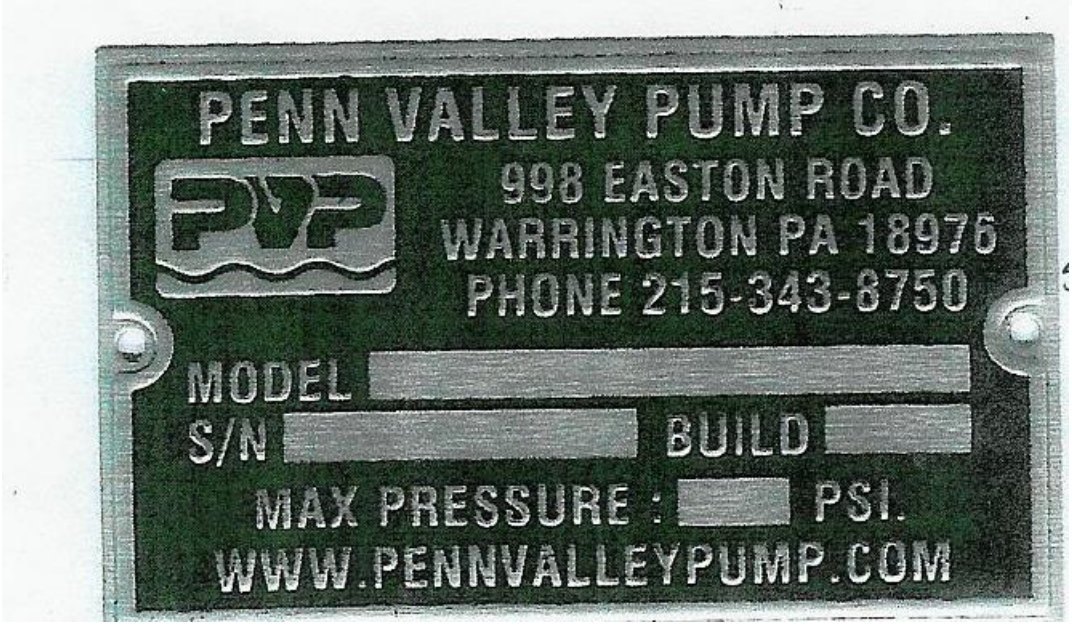




316 Stainless Steel

PENN VALLEY PUMP CO., INC.

PRICE LIST
6" DOUBLE DISC PUMP
MODEL 6DDSX107-MK1

Item No.	Part No.	Description	Qty per Pump	Weight LBS
1	PVD703C	Suction Housing, Cast Iron	1	120
1	PVD703CT	Suction Housing, Tungsten Carbide Coated Cast Iron	1	120
1	PVD703CP	Suction Housing, PVC Lined Cast Iron	1	123
1	PVD703CN	Suction Housing, Neoprene Lined Cast Iron	1	123
1	PVD703CG	Suction Housing, Glass Lined Cast Iron	1	120
1	PVD703CPC	Suction Housing, Powder Coated Cast Iron	1	120
2	PVD692C	Intermediate Housing, Cast Iron	1	98
2	PVD692CT	Intermediate Housing, Tungsten Carbide Coated Cast Iron	1	98
2	PVD692CP	Intermediate Housing, PVC Lined Cast Iron	1	101
2	PVD692CN	Intermediate Housing, Neoprene Lined Cast Iron	1	101
2	PVD692CG	Intermediate Housing, Glass Lined Cast Iron	1	98
2	PVD692CPC	Intermediate Housing, Powder Coated Cast Iron	1	98
3	PVD691C	Discharge Housing, Cast Iron	1	162
3	PVD691CP	Discharge Housing, PVC Lined Cast Iron	1	165
3	PVD691CN	Discharge Housing, Neoprene Lined Cast Iron	1	165
3	PVD691CG	Discharge Housing, Glass Lined Cast Iron	1	162
3	PVD691CPC	Discharge Housing, Powder Coated Cast Iron	1	162
4	PVD718C-90	Swan Neck Upper, Cast Iron	1	47
4	PVD718CP-90	Swan Neck Upper, Cast Iron, PVC Lined	1	49
4	PVD718CN-90	Swan Neck Upper, Neoprene Lined Cast Iron	1	49
4	PVD718CG-90	Swan Neck Upper, Glass Lined Cast Iron	1	49
4	PVD718CPC-90	Swan Neck Upper, Powder Coated Cast Iron	1	49
5	PVD718C-130	Swan Neck Lower, Cast Iron	1	48
5	PVD718CP-130	Swan Neck Lower, PVC Lined Cast Iron	1	50
5	PVD718CN-130	Swan Neck Lower, Neoprene Lined Cast Iron	1	50
5	PVD718CG-130	Swan Neck Lower, Glass Lined Cast Iron	1	50
5	PVD718CPC-130	Swan Neck Lower, Powder Coated Cast Iron	1	50
6	PVD709-8	Pedestal	2	40
8	PVD852	Drive Shaft	1	22
9	PVD806	Cam Lobe	2	4
10	PVD727S-8	Con Rod Suction	1	14
11	PVD727D-8	Con Rod Discharge	1	12
12	PVD708	Drive Rod, Universal	2	2
14*	PVD580N	Trunnion, Neoprene	2	3
14*	PVD580B	Trunnion, Buna N	2	3
14*	PVD580E	Trunnion, EPDM	2	3
14*	PVD580V	Trunnion, Viton	2	3
14*	PVD580R	Trunnion, HNBR	2	3
15	PVD722S	Trunnion Clamp Ring, Suction	1	4
15	PVD722S-AL	Trunnion Clamp Ring, Suction, Aluminum	1	4
16	PVD722D	Trunnion Clamp Ring, Discharge	1	2
16	PVD722D-AL	Trunnion Clamp Ring, Discharge, Aluminum	1	2
21*	PVC696N	Disc Integral, Neoprene - 55 or 63 Durometer	2	11
21*	PVC696B	Disc Integral, Buna N - 55 or 63 Durometer	2	11
21*	PVC696E	Disc Integral, EPDM - 55 or 63 Durometer	2	11
21*	PVC696V	Disc Integral, Viton - 55 or 63 Durometer	2	11
21*	PVC696R	Disc Integral, HNBR - 55 or 63 Durometer	2	11
23*	PVD725	Gasket, Swan Neck	1	1
24*	PVD719	Gasket Suction, CF	1	1
25*	PVD720	Gasket Discharge, CF	1	1

Effective: April 1, 2021

PENN VALLEY PUMP CO., INC.

PRICE LIST
6" DOUBLE DISC PUMP
MODEL 6DDSX107-MK1

Item No.	Part No.	Description	Qty per Pump	Weight LBS
26*	PVD721	Gasket, Clack Valve	1	1
27*	PVD704N	Clack Valve, Neoprene w/ retaining screws	1	3
27*	PVD704B	Clack Valve, Buna N w/ retaining screws	1	3
27*	PVD704E	Clack Valve, EPDM w/ retaining screws	1	3
27*	PVD704V	Clack Valve, Viton w/ retaining screws	1	3
27*	PVD704R	Clack Valve, HNBR w/ retaining screws	1	3
28	PVD738	Bearing ret washer, con rod	2	1
29	PVD841	Drive Pin, 6" pump, 0.500 dia	4	1
30	PVD816	Bearing, Con Rod	2	9
31	PVD815	Bearing, Pedestal	4	8
32	PVD736	Pump Cover, 6" SS304	1	12
33	PVA180	Priming/Drain Plug, 1" NPT	4	1
50	PVD743	Hinge pin, quick release	2	1

* Recommended spare parts.
Notes: Serial number is required to confirm pump build and elastomer type.

Kit Spare Parts Numbers

Each rebuild kit includes the following items which are part of the recommended spare parts: two (2) discs, two (2) trunnions, one (1) clack valve, one (1) suction gasket, one (1) discharge gasket, one (1) swan neck gasket and one (1) clack valve gasket.

Part No.	Description	Qty per Pump	Weight LBS.
SPKG001B55	Kit, Spare parts Buna-N elastomers 55 durometer	1	43
SPKG001B63	Kit, Spare parts Buna-N elastomers 63 durometer	1	43
SPKG001E55	Kit, Spare parts EPDM elastomers 55 durometer	1	43
SPKG001B63	Kit, Spare parts EPDM elastomers 63 durometer	1	43
SPKG001R55	Kit, Spare parts HNBR elastomers 55 durometer	1	43
SPKG001R63	Kit, Spare parts HNBR elastomers 63 durometer	1	43
SPKG001N55	Kit, Spare parts Neoprene elastomers 55 durometer	1	43
SPKG001N63	Kit, Spare parts Neoprene elastomers 63 durometer	1	43
SPKG001V55	Kit Spare parts, Viton elastomers 55 durometer	1	43
SPKG001V63	Kit, Spare parts Viton elastomers 63 durometer	1	43

BALL & ROLLER BEARINGS

POPULAR SIZE

ISO 9001/QS-9000
Certificate No. 927265

Con Rod Bearings

Deep groove ball bearings

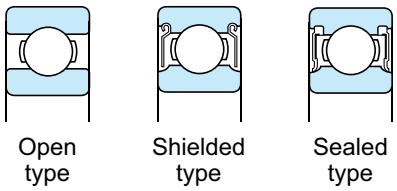
Deep groove ball bearings are available in a variety of sizes, and are the most popular of all rolling bearings. This type of bearing supports radial load and a certain degree of axial load in both directions simultaneously.

- Shielded / sealed type
  - Simplifies sealing structure of applications.
  - Greasing is not necessary because bearings are pre-lubricated.
  - Table 1 on the next page lists major shielded and sealed bearing types and compares their performance.

- With locating snap ring
  - Bearings with a locating snap ring can be fit to the housing easily, as the locating snap ring facilitates axial positioning.

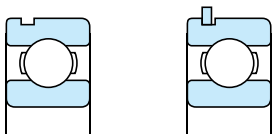
- Extra-small ball bearings and miniature ball bearings
  - The open type is widely used. Also available are the shielded / sealed type and the flanged type; the latter is easily positioned in the axial direction.

Single-row deep groove ball bearings



Open type | Shielded type | Sealed type

Bore diameter **10 – 200 mm**



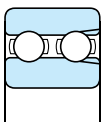
With snap ring groove | With locating snap ring

Bore diameter **10 – 130 mm**

Extra-small ball bearings and miniature ball bearings

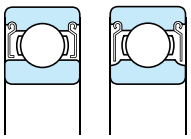
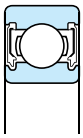
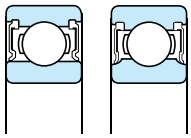
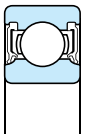
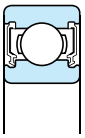
Bore diameter **3 – 9 mm**

Double-row deep groove ball bearings



(with filling slot)

Bore diameter **15 – 75 mm**

Type / Characteristics	Shielded	Sealed			
	Non-contact type	Non-contact type	Contact type		Extremely light contact type
	ZZ	2RU	2RS	2RK	2RD
	 (a) [1] (b)	 (c)	 (d) [2] (e)	 (f)	 (g)
Friction torque	Small	Small	Large	Large	Small
High speed performance	Good	Good	Limited because of contact		Good
Grease sealing property	Good	Better than ZZ type	Better than 2RU type for low-speed applications	Excellent	Excellent
Dirt resistance	Good	Better than ZZ type	Better than 2RU type	Excellent	Excellent
Water resistance	Economical	Better than ZZ type but inferior to 2RS, 2RK and 2RD types	Good	Excellent	Better than ZZ and 2RU types
Operating temperature [3]	–30 to 110˚C		–30 to 100˚C		–30 to 110˚C

Notes)
1) Illustration (a) of the ZZ type shows the relatively small size bearing.
2) Illustration (d) of the 2RS type shows the relatively small size bearing.
3) The operating temperature range listed is for the standard type. It can be widened by using a different type of grease or sealing material. Consult Koyo for details.

Handling instructions

1) The shielded / sealed type deep groove ball bearing and the deep groove ball bearing with a locating snap ring are designed for use with the inner ring rotating.
   Consult koyo on use with the outer ring rotating.
2) When the axial load is large, make the shaft shoulder and housing shoulder larger than usual. (Referring to the specification table, make the mounting dimension d_a larger and make D_a smaller.)

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512. For extra-small and miniature ball bearings, special series (ML) are specified together with those described above.
Tolerances	As specified in JIS B 1514.
Radial internal clearance	■ Deep groove ball bearings (except extra-small ball bearings and miniature ball bearings) ..... as specified in JIS B 1520 (refer to Table 2-1 on p. A11.) ■ Extra-small ball bearings and miniature ball bearings ..... (refer to Table 2-2 on p. A11.) ■ Deep groove ball bearings for motors ..... (refer to Table 2-6 on p. A14.)
Standard cages	• Pressed steel cage (supplementary code : //) • Copper alloy machined cage (supplementary code : FY) Remark : For certain applications, stainless steel sheet pressed cages (YS) and polyamide molded cages (MG) may also be used.

Application of standard cages

Bearing series	Pressed cage	Machined cage
68	683 – 689	–
69	693 – 699	–
60	603 – 609	–
62	623 – 629	–
63	633 – 639	–
68	6800 – 6838	6840 – 68/600
69	6900 – 6918	6920 – 6980
160	16001 – 16028	16030 – 16072
60	6000 – 6034	6036 – 6084
62	6200 – 6230	6232 – 6248
63	6300 – 6328	6330 – 6340
64	6403 – 6418	–
42	4200 – 4215	–
43	4302 – 4315	–

Allowable misalignment	0.002 3 – 0.003 4 rad (8' – 12')

Equivalent radial load (Single / double-row)

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

[refer to the table on the right for values X and Y.]

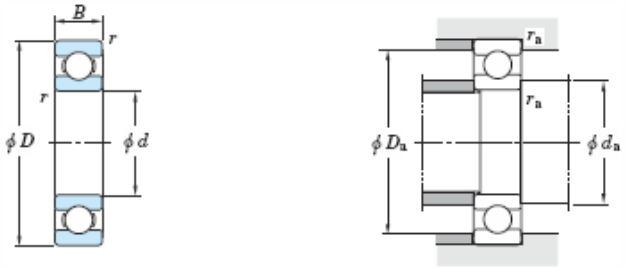
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

[when the value of $P_{0r} < F_r$, $P_{0r} = F_r$]

$\frac{F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.014	0.19				2.30
0.028	0.22				1.99
0.056	0.26				1.71
0.084	0.28				1.55
0.11	0.30	1	0	0.56	1.45
0.17	0.34				1.31
0.28	0.38				1.15
0.42	0.42				1.04
0.56	0.44				1.00

d (65) ~ (85) mm



Boundary dimensions (mm) d	D	B	r min.	Basic load ratings (kN) C_r	C_{0r}	Factor f_0	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No.	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	(Refer.) Mass (kg)
65	120	23	1.5	57.2	40.1	14.4	5 400	6 400	6213	73	112	1.5	0.990
	140	33	2.1	92.7	59.9	13.2	4 800	5 800	6313	76	129	2	2.08
	160	37	2.1	118	79.2	12.4	4 300	5 200	6413	76	149	2	3.30
70	90	10	0.6	12.1	11.9	16.1	6 800	8 100	6814	74	86	0.6	0.134
	100	16	1	23.7	21.2	16.3	6 400	7 600	6914	75	95	1	0.342
	110	13	0.6	30.1	25.6	16.0	6 100	7 200	16014	74	106	0.6	0.433
	110	20	1.1	38.1	30.9	15.6	6 100	7 200	6014	76.5	103.5	1	0.602
	125	24	1.5	62.2	44.1	14.5	5 100	6 100	6214	78	117	1.5	1.07
	150	35	2.1	104	68.2	13.2	4 500	5 400	6314	81	139	2	2.52
	180	42	3	144	104	12.2	3 900	4 600	6414	83	167	2.5	4.83
75	95	10	0.6	12.5	12.9	16.0	6 400	7 600	6815	79	91	0.6	0.142
	105	16	1	24.4	22.6	16.5	6 100	7 200	6915	80	100	1	0.363
	115	13	0.6	27.5	25.3	16.4	5 700	6 700	16015	79	111	0.6	0.457
	115	20	1.1	39.6	33.5	15.8	5 700	6 800	6015	81.5	108.5	1	0.638
	130	25	1.5	67.4	48.3	14.5	4 800	5 800	6215	83	122	1.5	1.18
	160	37	2.1	113	77.2	13.2	4 200	5 000	6315	86	149	2	3.02
	190	45	3	154	115	12.3	3 600	4 400	6415	88	177	2.5	5.87
80	100	10	0.6	12.7	13.6	16.0	6 100	7 200	6816	84	96	0.6	0.150
	110	16	1	25.0	24.0	16.6	5 700	6 800	6916	85	105	1	0.382
	125	14	0.6	31.7	29.7	16.4	5 200	6 100	16016	84	121	0.6	0.597
	125	22	1.1	47.6	39.8	15.6	5 300	6 300	6016	86.5	118.5	1	0.850
	140	26	2	72.7	53.0	14.6	4 500	5 400	6216	89	131	2	1.40
	170	39	3.5	123	86.7	13.3	3 900	4 700	6316	91	159	2	3.59
	200	48	3	164	125	12.3	3 400	4 100	6416	93	187	2.5	6.84
85	110	13	1	18.7	19.0	16.2	5 600	6 600	6817	90	105	1	0.266
	120	18	1.1	31.9	29.6	16.4	5 300	6 300	6917	91.5	113.5	1	0.535
	130	14	0.6	32.6	31.7	16.5	4 900	5 800	16017	89	126	0.6	0.636

[Remark] Standard cage types used for the above bearings are described earlier in this section.

d (85) ~ 105 mm

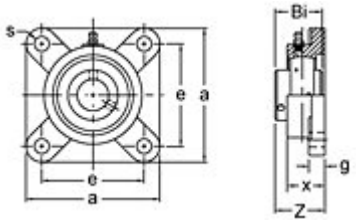
Boundary dimensions (mm) d	D	B	r min.	Basic load ratings (kN) C_r	C_{0r}	Factor f_0	Limiting speeds (min^{-1}) Grease lub.	Oil lub.	Bearing No.	Mounting dimensions (mm) d_a min.	D_a max.	r_a max.	(Refer.) Mass (kg)
85	130	22	1.1	49.5	43.1	15.8	5 000	5 900	6017	91.5	123.5	1	0.890
	150	28	2	84.0	61.9	14.5	4 200	5 000	6217	94	141	2	1.79
	180	41	3	133	96.8	13.3	3 700	4 400	6317	98	167	2.5	4.23
	210	52	4	173	136	12.3	3 300	3 900	6417	101	194	3	8.07
90	115	13	1	20.0	19.7	16.1	5 300	6 300	6818	95	110	1	0.279
	125	18	1.1	32.8	31.6	16.5	5 100	6 000	6918	96.5	118.5	1	0.565
	140	16	1	39.9	37.0	16.3	4 700	5 600	16018	95	135	1	0.848
	140	24	1.5	58.2	49.7	15.6	4 700	5 600	6018	98	132	1.5	1.16
	160	30	2	96.1	71.5	14.5	3 900	4 700	6218	99	151	2	2.15
	190	43	3	143	107	13.3	3 500	4 200	6318	103	177	2.5	4.91
	225	54	4	184	149	12.5	3 100	3 700	6418	106	209	3	9.78
95	130	18	1.1	33.7	33.5	16.0	4 800	5 700	6919	101.5	123.5	1	0.705
	145	16	1	41.2	39.6	16.4	4 500	5 300	16019	100	140	1	0.885
	145	24	1.5	60.4	53.9	15.8	4 400	5 200	6019	103	137	1.5	1.21
	170	32	2.1	100	81.9	14.4	3 700	4 400	6219	105	159	2	2.62
	200	45	3	153	119	13.3	3 300	4 000	6319	108	187	2.5	5.67
100	125	13	1	19.6	21.2	16.0	4 800	5 700	6820	105	120	1	0.309
	140	20	1.1	45.0	41.9	16.2	4 500	5 300	6920	106.5	133.5	1	0.960
	150	16	1	42.4	42.1	16.5	4 300	5 100	16020	105	145	1	0.910
	150	24	1.5	60.2	54.2	15.9	4 300	5 100	6020	108	142	1.5	1.25
	180	34	2.1	122	93.1	14.4	3 500	4 200	6220	111	169	2	3.14
	215	47	3	173	141	13.2	3 000	3 600	6320	113	202	2.5	7.00
105	145	20	1.1	46.5	44.8	16.4	4 300	5 100	6921	111.5	138.5	1	1.30
	160	18	1	41.9	42.2	16.5	4 100	4 800	16021	110	150	1	1.20
	160	26	2	72.3	65.8	15.8	4 000	4 700	6021	114	151	2	1.59
	190	36	2.1	133	122	14.4	3 300	3 900	6221	116	179	2	3.70
	225	49	3	184	153	13.2	2 900	3 500	6321	118	212	2.5	8.05

AMI Bearings, Inc.
570 North Wheeling Road, Mount Prospect, IL 60056
Toll Free: 800.882.8642 • **Phone:** 847.759.0620 • **Fax:** 847.759.0630
Web Address: www.amibearings.com

Pedestal Bearings

Item # UCFX10-31, Set Screw Locking Four-Bolt Flange Unit, UCFX00 Series

- Insert
  - Set Screw Locking
  - Medium Duty
  - Wide Inner Ring
  - AISI 52100 Steel
- Housing
  - Four-Bolt Flange
  - Cast Iron



Specifications · Dimensions

Specifications

Shaft Diameter	1-15/16 in
Bolt Size	5/8 in
Bearing	UCX10-31
Housing	FX10
Lubrication Fitting Tap	1/8-27 NPT
Weight	7.93 lb

Dimensions

a	6-3/8 in
e	5-1/8 in
g	25/32 in
x	1-3/4 in
s	21/32 in
Z	2.339 in
Bi	2.189 in

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Set Screw Locking Four-Bolt Flange Unit, UCFX00 Series

Check up to five results to perform an action.

- Insert
  - Set Screw Locking
  - Medium Duty
  - Wide Inner Ring
  - AISI 52100 Steel
- Housing
  - Four-Bolt Flange
  - Cast Iron

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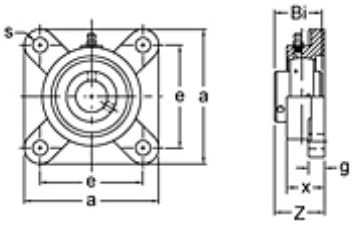

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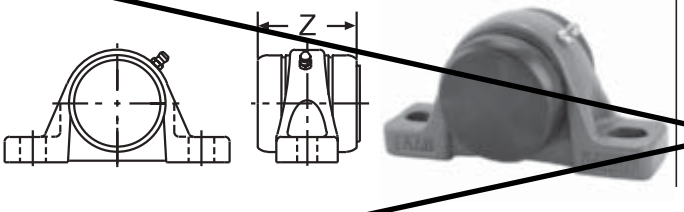
Results 1 - 45 of 45 1

Item #	Shaft Diameter	a	e	g	x	s	Z	Bi
UCFX05-16	1 in	4-1/4 in	3-1/4 in	1/2 in	1-3/16 in	15/32 in	1.583 in	1.500 in
UCFX06-18	1-1/8 in	4-5/8 in	3-5/8 in	9/16 in	1-11/32 in	17/32 in	1.748 in	1.689 in
UCFX06-19	1-3/16 in	4-5/8 in	3-5/8 in	9/16 in	1-11/32 in	17/32 in	1.748 in	1.689 in
UCFX06-20	1-1/4 in	4-5/8 in	3-5/8 in	9/16 in	1-11/32 in	17/32 in	1.748 in	1.689 in
UCFX07-20	1-1/4 in	5-1/8 in	4 in	9/16 in	1-1/2 in	17/32 in	2.016 in	1.937 in
UCFX07-22	1-3/8 in	5-1/8 in	4 in	9/16 in	1-1/2 in	17/32 in	2.016 in	1.937 in
UCFX07-23	1-7/16 in	5-1/8 in	4 in	9/16 in	1-1/2 in	17/32 in	2.016 in	1.937 in
UCFX08-24	1-1/2 in	5-3/8 in	4-1/8 in	9/16 in	1-9/16 in	19/32 in	2.055 in	1.937 in
UCFX09-26	1-5/8 in	5-5/8 in	4-3/8 in	9/16 in	1-9/16 in	19/32 in	2.189 in	2.031 in
UCFX09-27	1-11/16 in	5-5/8 in	4-3/8 in	9/16 in	1-9/16 in	19/32 in	2.189 in	2.031 in
UCFX09-28	1-3/4 in	5-5/8 in	4-3/8 in	9/16 in	1-9/16 in	19/32 in	2.189 in	2.031 in
UCFX10-30	1-7/8 in	6-3/8 in	5-1/8 in	25/32 in	1-3/4 in	21/32 in	2.339 in	2.189 in
UCFX10-31	1-15/16 in	6-3/8 in	5-1/8 in	25/32 in	1-3/4 in	21/32 in	2.339 in	2.189 in
UCFX10-32	2 in	6-3/8 in	5-1/8 in	25/32 in	1-3/4 in	21/32 in	2.339 in	2.189 in
UCFX11-32	2 in	6-7/8 in	5-5/8 in	25/32 in	1-15/16 in	21/32 in	2.705 in	2.563 in
UCFX11-35	2-3/16 in	6-7/8 in	5-5/8 in	25/32 in	1-15/16 in	21/32 in	2.705 in	2.563 in
UCFX11-36	2-1/4 in	6-7/8 in	5-5/8 in	25/32 in	1-15/16 in	21/32 in	2.705 in	2.563 in

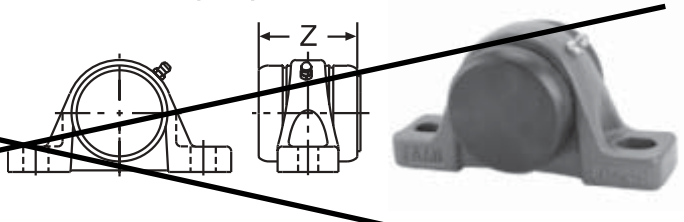
Shaft Diam. (mm)	Bore Size	Pillow Block						2 Bolt			4 Bolt			Flange Cartridge			Take-Up		
		UCP (pg. 13)			UCLP (pg. 18)			UCFL (pg. 31)			UCF (pg. 44)			UCFC (pg. 49)			UCST (pg. 56)		
		Z (in.)	Z (mm)	List Price	Z (in.)	Z (mm)	List Price	Z (in.)	Z (mm)	List Price	Z (in.)	Z (mm)	List Price	Z (in.)	Z (mm)	List Price	Z (in.)	Z (mm)	List Price
12	201																		
15	202	2.205	56	82.20	1.807	45.9	82.20	1.693	43	69.50	1.693	43	69.50	1.496	38	78.00	2.315	56	91.00
17	203																		
20	204	2.205	56	82.20	1.933	49.1	82.20	1.693	43	69.50	1.693	43	69.50	1.496	38	78.00	2.315	56	91.00
25	205	2.480	63	92.90	2.457	62.4	92.90	1.850	47	78.70	1.890	48	78.70	1.654	42	89.30	2.473	63	103.60
30	206	2.559	65	117.50	2.283	58.0	117.50	1.929	49	101.30	2.008	51	101.30	1.693	43	110.40	2.394	65	126.30
35	207	2.756	70	135.60	2.728	69.3	135.60	2.126	54	117.80	2.126	54	117.80	1.811	46	127.50	2.762	70	145.20
40	208	3.228	82	162.80	3.075	78.1	162.80	2.402	61	142.40	2.441	62	142.40	2.047	52	156.60	3.304	82	177.00
45	209	3.228	82	181.90	3.197	81.2	181.90	2.480	63	158.30	2.480	63	158.30	2.008	51	182.20	3.225	82	205.80
50	210	2.425	87	217.50	3.268	83.0	217.50	2.598	66	189.30	2.598	66	189.30	2.126	54	208.00	3.344	87	236.20
55	211	3.465	88	276.00	3.555	90.3	276.00	2.717	69	240.50	2.717	69	240.50	2.244	57	276.00	3.594	88	311.60
60	212	4.016	102	364.70	3.976	101.0	364.70	3.150	80	315.50	3.150	80	315.50	2.677	68	340.30	4.175	102	389.50
65	213	4.016	102	422.90	3.976	101.0	422.90	3.189	81	370.80	3.189	81	370.80	2.638	67	409.60	4.283	102	461.70

Example: UCP205C or UCP205CE; Open Cover (C) with Contact Seal, Closed Cover (CE)
Note: For Take-Up and Pillow Block Units: “C” suffix indicates 2 open pressed steel covers; “CE” suffix indicates 1 open and 1 closed cover.
For more dimensional information, please refer to the page number that follows each unit above.

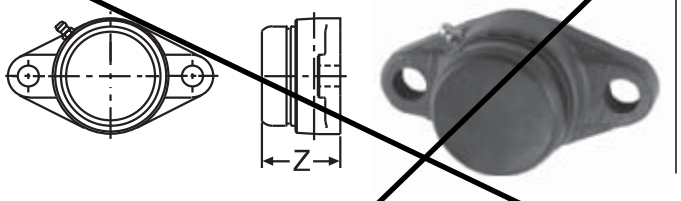
UCP 200 C(CE)



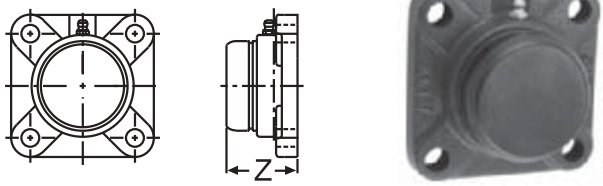
UCLP 200 C(CE)



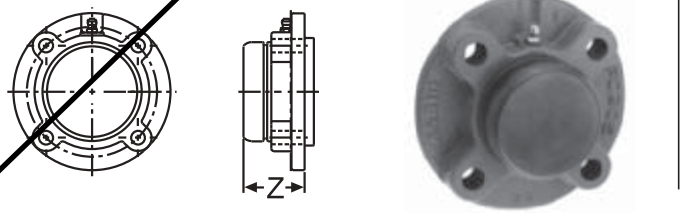
UCFL 200 C(CE)



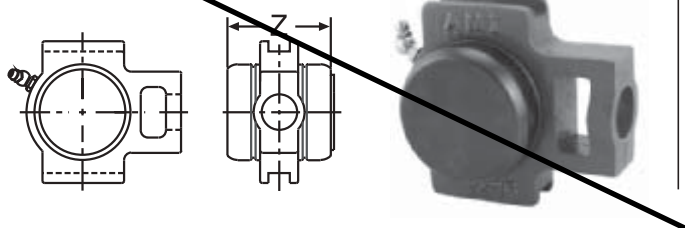
UCF 200 C(CE)



UCFC 200 C(CE)



UCT 200 C(CE)



Aluminum Complex	C	I	I	I	C	I	B	I	I	C	I	I
Barium	I	C	I	I	C	I	B	I	I	I	I	I
Bentonite Clay	I	I	C	C	C	I	B	I	I	I	I	I
Calcium	I	I	C	C	C	B	I	C	B	B	I	I
Calcium 12-Hydroxy	C	C	C	C	C	B	B	C	C	C	I	I
Calcium Complex	I	I	I	B	B	C	C	I	I	C	C	I
Calcium Sulfonate	B	B	B	I	B	C	C	C	C	C	B	I
Lithium	I	I	I	C	C	I	C	C	C	C	I	B
Lithium 12-Hydroxy	I	I	I	B	C	I	C	C	C	C	I	I
Lithium Complex	C	I	I	B	C	C	C	C	C	C	I	B
Polyurea	I	I	I	I	I	C	B	I	I	I	C	I
Sodium	I	I	I	I	I	I	I	B	I	B	I	C

^Back to Top

AMI Bearings, Inc. | 570 North Wheeling Road, Mount Prospect, IL 60056 | Phone: 800.882.8642 or 847.759.0620 | Fax: 847.759.0630 | www.amibearings.com

Penn Valley Pump Co., Inc.
998 Easton Road • Warrington, PA 18976
Ph: 215-343-8750 • Fax: 215-343-8753
www.pennvalleypump.com

Warranty For Double Disc™ Pumps

All Penn Valley Pump Co., Inc. (PVP) Double Disc™ pumps are warranted against defects in materials and workmanship for a period of two (2) years from date of shipment, when properly installed and operated under the conditions recommended by the factory.

Should the pump prove to be defective within this time period, it will be replaced or repaired at no charge to the customer. PVP will have sole discretion as to the determination of repair or replacement. Permission must first be obtained from the factory before any pump is returned so a determination can be made that the pump failure is due to materials or workmanship.

In the event of return of product for repair or replacement, all shipping charges both for the return to the factory and shipment back to sender will be the responsibility of the sender.

No allowance will be made for labor, transportation, or other charges incurred in the replacement of a defective part. PVP will not be responsible for labor charges, losses or damages caused by non-recommended parts, or charges for repairs by unauthorized personnel.

Component parts, equipment, accessories, motor, engines and other ancillary items not manufactured by PVP are warranted only to the extent of the original manufacturers warranty and claim for such failures should be made to such manufacturers.

In no event shall PVP be liable for any special, consequential or other damages of a similar nature, including, but not limited to, lost profits, lost production, or property damage suffered by the buyer or third party. Therefore, consequential damages, if any, are specifically excluded from this warranty.

Contact PVP at the address above it you have any questions, about the coverage of this warranty or service under this warranty.

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PROCEDURE IN THE EVENT OF FAILURE

1) Shut Pump off.
2) Disconnect power to pump motor.
3) Close both Suction and Discharge Valves.

INSTANCES WHICH WILL VOID THE WARRANTY

1) Pumps run against closed valves or blocked lines. This will lead to disc and trunnion failure and will not be a valid warranty claim.
2) Pump failure due to pumps being run at any hydraulic conditions other than that which was specified.
3) Pump failure due to solids in excess of stated solid handling capabilities.
4) Wear caused by chemicals not compatible with components provided.
5) Wear caused by excessive temperature Hot/Cold.
6) The use of Non factory spare parts.

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SAFETY

Safety Instructions for Double Disc Pumps.

1. Pumping equipment must only be operated by personnel who are fully trained in all safety procedures.

2. To prevent personnel injury equipment must not be operated unless all guards and covers are in place and secured.

3. No maintenance or adjustments can be performed until equipment is stopped and electrical power has been locked out.

4. Suitable safety equipment must be worn by any personnel performing maintenance on this equipment including safety glasses, safety shoes and hard hats.

5. Keep hands, clothing, etc. away from moving parts.

6. NEVER permit people who have been drinking alcohol or using drugs to maintain or repair units.

7. Locate "WARNING" signs in areas where moving parts are present. Limit access to authorized personnel only.

8. Inspect and maintain equipment as per equipment operating instructions.

9. Always use factory replacement spare parts for equipment maintenance, always follow equipment maintenance manual for assembly and disassembly instructions.

The World Leader in Free-Disc™ Pumping Technology

Penn Valley Pump

Model: 6DDSX107

Flow Range:	0 - 550 GPM
Displacement:	gal/rev
Operating Speeds:	0 - 400 RPM
Max Discharge Pressure:	60psi operating
Max Suction Lift:	25 ft
Connection:	6" 150# Flanged

Lower Wear = Longer Life

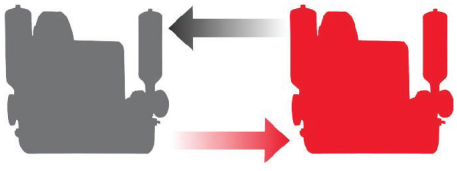
With a non-close tolerance design and no rubbing action to generate flow the Double Disc Pump offers the lowest life cycle cost of any positive displacement pump on the market.

Features and Benefits:

- "Maintain-In-Place" Design
- Self-priming
- Passes up to 2" solids
- Two (2) year warranty
- Made in the USA
- Runs dry without damage
- Low friction design
- No check valves
- No routine maintenance
- Seal-less design

THE ULTIMATE IN SLUDGE PUMPS™

Swap-Your-Pump



A unique trial program that lets you try before you buy.
Contact us today to swap your pump.

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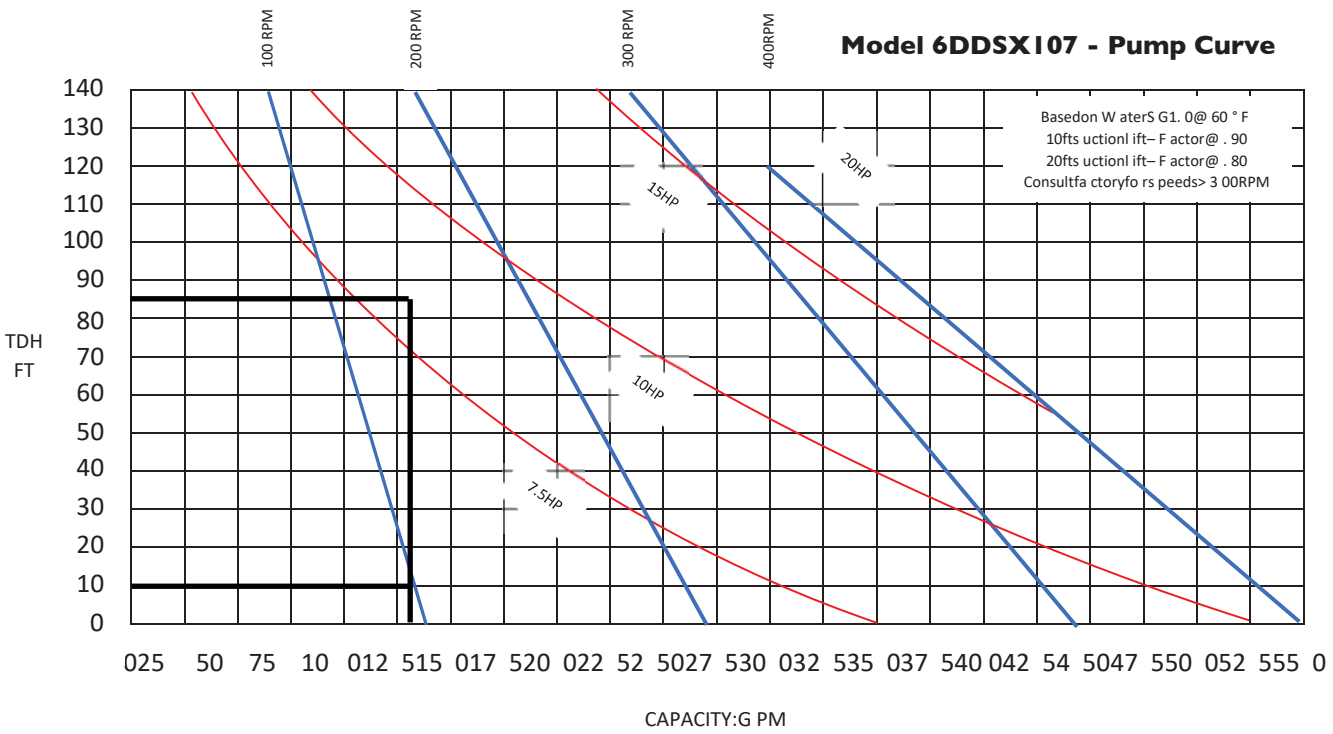
DOUBLE DISC PUMP®

Technical

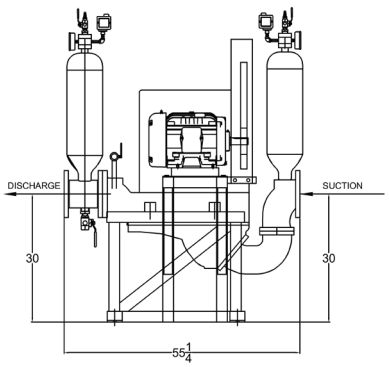


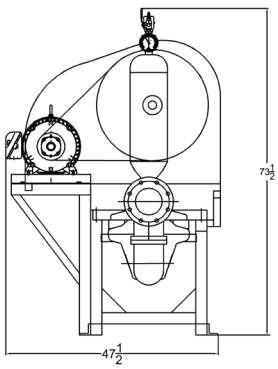
Materials of Construction:

	Standard	Optional:
Housings:	Cast Iron	Linings: Porcelain Glass, Neoprene, Powder Coat, Soft PVC, Tungsten Carbide
Discs & Trunnions:	Neoprene -10° to +200°F	Buna-N +10° to +180° F, EPDM +10° to +200°F, HNBR +10° to +220° F, Viton -40° to +350° F
Connecting Rods:	Aluminum	
Drive Shaft:	High-Tensile 416 Stainless Steel	
Eccentric Cams:	High-Tensile Bronze Alloy	
Bearing Pedestals:	Aluminum	
Frame & Covers:	304 Stainless Steel	316 Stainless Steel

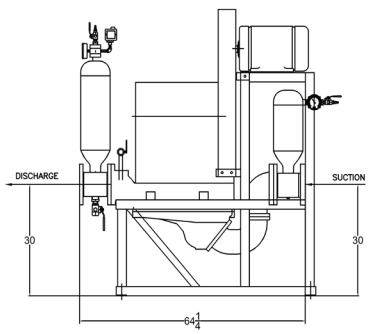
Drive System Options:

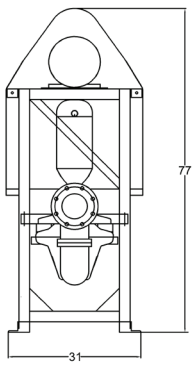
	Standard	Optional:
Static:	Electric motor, belt and pulley	Gearmotor, air or hydraulic motor
Portable:	Electric, Gas or Diesel Engine	





Side Motor Mount





Piggy-Back Motor Mount

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PUMPSET BUILD SHEET

Project: Atlanta East Area WQCF Improvements
Section: 11513 Double Disc Pumps
Location: Solids Processing Pump Station - Atlanta, GA
Application: Belt Filter Press Feed Thickened Sludge
Total Number of units: 2
Serial No: 210868-1 & 210868-2
Tag No: 82P3602 & 82P3604

Pump:

Model 6DDSX107CNU-MK1
Size: 6" ANSI 150lbs Flanges
Casting Material: Cast Iron
Elastomers: Neoprene
Pump Performance: 100-130 GPM @ 10-85ft. TDH
Drawing No: PVD728

Motor:

Manufacturer: Toshiba
Motor No: 0106SDSR41AP
HP: 10
Frame: 256T
Service Factor: 1.15
RPM: 1200
Voltage: 230-460 Volts, 3 Phase, 60 Hertz
Encl: TEFC, Severe Duty, Premium Efficient, Inverter Duty with Thermals

Pump Drive:

Type: Belt and Pulley

Pump:	30.0 2B	Bore:	1-15/16"	No of Grooves:	2
Motor:	3.4 2B	Bore:	1-5/8"	No of Grooves:	2
Belts:	BX100	No. of Belts:	2	HP per Belt:	3.47
Final Pump Speed:	145 RPM				

Pulsation Dampeners:

Suction: YES
Material: Welded carbon steel finished same as pump
Discharge: YES
Material: Welded carbon steel finished same as pump

Vacuum Switch Assy:

Sensor Model:	PVP420	Body Mat'l:	SS316	Sleeve Mat'l:	EPDM	Size:	1" NPT
Switch:	Ashcroft	Model No:	B4-24-B	Range:	0-30" HG	Set at:	10"HG
Gauge:	Trerice	Model No:	D80	Diameter:	4"	Range:	30"HG-30psi

Pressure Switch Assy:

Sensor Model:	PVP420	Body Mat'l:	SS316	Sleeve Mat'l:	EPDM	Size:	1" NPT
Switch:	Ashcroft	Model No:	B4-24-B	Range:	0-100psi	Set at:	45 psi
Gauge:	Trerice	Model No:	D80	Diameter:	4"	Range:	0-100psi

Paint Specs:

1st Coat:	94-H20	Mfg:	Tnemec Hydro Zinc (Gray)	Dry Mils:	2.5-3.5
2nd Coat:	Series 66 Hi-Build Epoxoline	Mfg:	Tnemec Hi Build (PVP Red)	Dry Mils:	4-6
3rd Coat:	Series 66 Hi-Build Epoxoline	Mfg:	Tnemec Hi Build (PVP Red)	Dry Mils:	4-6

Special Items:

1) One (1) pump for duty and one (1) for standby
2) Motors to be provided with Thermals Installed
2) Pumps to include two (2) sets of Anchor Bolts

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Materials of Construction

Pump Model: 6DDSX107CNU

Pump Build: Mark 1

Discs:	Neoprene, high tensile with multiple layers of fabric reinforcement, universal
Trunnions:	Neoprene, high tensile fabric reinforced
Clack Valve:	Neoprene, high tensile with multiple layers of fabric reinforcement encapsulating a rigid core
Gaskets:	Cork fiber
Housings:	Grey cast iron, Class 30
Pedestals:	Aluminum
Connecting Rods:	Aluminum
Drive Rods:	Series 400 stainless steel
Bearings, Pedestal:	Ball bearing, 1-15/16" diameter with no grease fittings
Bearings, Connecting Rod:	Ball bearing, 159mm diameter with no grease fittings
Drive Shaft:	Series 400 stainles steel, 1-15/16" diameter
Eccentric Cams:	High tensile, cast bronze alloy pinned to shaft with drive pins
Drive Pins:	Spirol, heat treated spring steel
Trunnion Clamp Rings:	PVC
Mounting Frame:	Series 304 stainless steel, 2-1/2" square tubing capped with black plastic plugs
Pump Drive Cover:	Series 304 stainless steel
Belt and Pulley Cover:	Series 304 stainless steel
Equipment Weight:	1400 lbs.

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PARTS SUPPLIED WITH EQUIPMENT
Spare Parts Kit Number: SPKG001N63
Pump Model Number: 6DDSX107-MK1

Project: Atlanta Eas Area WQCF Improvements

Location: Atlanta, GA

Section: 11513 Double Disc Pumps

Quantity	Part Number	Description
2	PVC696N63	Universal Disc, Neoprene
2	PVD580N	Trunnions, Neoprene
1	PVD704N	Clack Valve, Neoprene, w/Retaing Screws
1	PVD719	Gasket, Suction
1	PVD720	Gasket, Discharge
1	PVD725	Swan Neck Gasket
1	PVD721	Clack Valve Gasket

November 17, 2021

Project: Atlanta East Area WQCF Improvements

Contractor/Owner: Lakeshore Engineering, LLC, / City of Atlanta, Department of Watershed

Subject: American Iron and Steel Step Certification

I, Leslie Burrage, certify that the below listed equipment is not covered under the AIS requirments. The pump assembly includes: Pump, motor, pump bases, guards and covers. Based on the EPA's requirments for AIS, pumps are not required to certify and thus the appurtenances are exempt as well.

Item, Products and/or Materials:

1. Double Disc Pump Model 6DDSX107CNU-MK1

Such process take place at the following location:

Penn Valley Pump Co., Inc.
998 Easton Rd.
Warrington, PA 18976

If any of the above compliance statements change while providing material to this project we will immediately notify the Project manager.

Kindest Regards,

Leslie J. Burrage
President

Penn Valley Pump Co., Inc.
998 Easton Road • Warrington, PA 18976
Ph: 215-343-8750 • Fax: 215-343-8753
www.pennvalleypump.com

May 23, 2018

Ref: American Iron and Steel Certification Compliance Requirements

Please see below e-mail correspondence from the EPA in regards to Pumps and AIS requirements:

From: Nguyen, Dan-Tam [mailto:Nguyen.Dan-Tam@epa.gov] **On Behalf Of** SRF_AIS
Sent: Wednesday, May 23, 2018 7:43 AM
To: Trevor Lawson <tlawson@pennvalleypump.com>; SRF_AIS <SRF_AIS@epa.gov>
Subject: RE: AIS certification

Good morning Trevor,
Pumps are not a covered item under the AIS requirements. Based on the information you provided below, you are putting together a skid which includes the pump, motor, and appurtenances to the operation of the pump (e.g., guards, cover, pipes). Because pumps are not covered under the AIS requirements, these appurtenances (even though they are iron and steel) are also exempt from these requirements and do not need a certification. You may find our implementation memo helpful in making similar determinations. And don't hesitate to reach out again if you have additional questions.

Dan-Tam

Dan-Tam Nguyen
U.S. Environmental Protection Agency
Office of Wastewater Management
1200 Pennsylvania Avenue, NW
Washington, DC 20460
(202) 564-2784 | nguyen.dan-tam@epa.gov

From: Trevor Lawson [mailto:tlawson@pennvalleypump.com]
Sent: Tuesday, May 22, 2018 8:27 PM
To: SRF_AIS <SRF_AIS@epa.gov>
Subject: AIS certification

Good evening,

My company manufactures pumps which are made of cast iron and steel, we assemble the pumps on Stainless steel bases and the guards and covers are made from Stainless steel. We also buy electric motors to run the pumps. Do manufactures of equipment have to conform the the AIS requirements for projects where the certification is a required?

Double Disc™ Pumps

6” Model 6DDSX107 MK1

Installation, Operating and Maintenance Manual

PENN VALLEY PUMP Co. Inc.
The World Leader in Free-Diaphragm® Technology
998 Easton Road, Warrington, Pa. 18976
(215) 343-8750 Fax (215) 343-8753
www.pennvalleypump.com

Double Disc

TABLE OF CONTENTS

INTRODUCTION

The Penn Valley Double Disc™ Pump utilizes a unique principle of operation whereby the discs perform the duties of both diaphragm and valve, providing a double acting, non-clogging, pumping action. Through an arrangement of connecting rods and a camshaft, a reciprocating action of the discs is created, forming a large cavity between discs. This cavity is filled and exhausted in a continuous flow. The large, valve-like discs mean that large solids and rags can be handled without loss of the pumping action. The valve-like discs have large seating areas that provide for low internal velocities, extending the pump wear life on abrasive sludge's and slurries. The fluid chamber is sealed with flexible trunnions that eliminate packing, mechanical seals, and requires no flushing water or other forms of lubrication. The large diameter discs are proven to handle large solids, rags, plastics, etc. that would cause other pumps to fail.

Here's how it works:

Suction Cycle (fig. 1)
The suction disc (right) is lifted from its seat creating a vacuum. The cavity between the discs is filled during the reciprocating motion of the suction disc. The discharge disc (left) is seated, creating a seal in the flow path during the suction cycle. A clack valve prevents return flow.

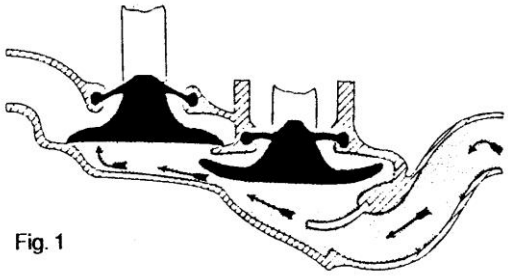


Fig. 1

Discharge Cycle (fig. 2)
The reciprocating action then causes the suction disc (right) to seat and create a seal in the flow path and a downward motion of the discharge disc (left) forces the discharge.

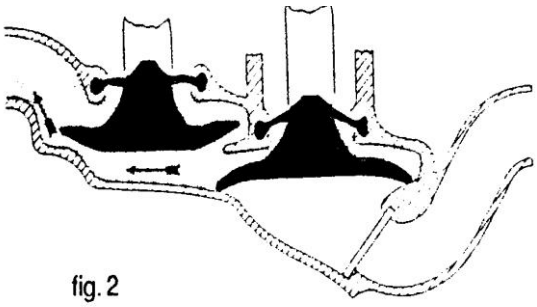


fig. 2

FEATURES

- The Double Disc™ pump is completely serviceable without disturbing the suction or discharge piping.
- The Double Disc™ pump uses a flexing membrane (trunnion), which achieves the sealing of the fluid chamber with no rotating shafts requiring packing or mechanical seals.
- All Double Disc™ pumps can operate dry without fluid chamber damage.
- There are no close tolerances or rotating parts within the fluid chamber to wear on abrasive applications or bind up on stringy material.
- There are no internal check valves to plug allowing the Double Disc™ pump to pass hand towel sized rags.
- Double Disc™ pumps can operate in either direction of shaft rotation without affecting the pump efficiency.
- The Double Disc™ pump requires no routine maintenance. All bearings are sealed for life with no re-greasing required.

SOLIDS HANDLING

The Double Disc™ Pump will pass large rags (hand towel size) and stringy materials that normally cause severe plugging problems with Rotary Positive Displacement Pumps as well as Reciprocating Pumps equipped with check valves. 2" diameter spherical solids will pass through the pump.

Suction Lifts:

All Pumps-	Dry Prime:	6"Hg (7 feet)
	Dry Re-prime:	16"Hg (18 feet)
	Flooded Prime:	25" Hg (28 feet)

Percent Solids:

Municipal Sludge's up to 10% dry weight
Industrial Sludge's up to 70% sand/clay in suspension
Max S.G. 2.2 to 2.4

Air Handling:

2-inch pump – 9 cu. ft./min at max pressure of 15 psi.
All others – 25 cu. ft./min at max pressure of 30 psi.

Stall Pressure:

6DDSX107 – Max working pressure (140 feet) Stall pressure 254 feet

All pumps are capable of withstanding the full stall pressure they are able to produce on an intermittent basis only. This equipment should never be run against closed valves on a continuous basis or damage will occur.

GENERAL

PUMP IDENTIFICATION
Double Disc™ pumps are permanently recorded by serial number at the factory. When ordering repair parts, please supply the serial number of the pump, pump model number, if known, part identification number and part designation.

SHIPPING AND PREPARATION
Penn Valley thoroughly inspects each pump during the manufacturing process and assembly. Each pump is subjected to an operational test prior to shipment to assure trouble free operation in the field.

RECEIVING THE PUMP
Check the pump for damage or shortages immediately upon receiving the pump. *Make all claims with the transportation company promptly.* This will prevent a controversy when the claim is made and will expedite prompt and satisfactory settlement.

Care should be taken when unloading and receiving the pump to prevent dropping the unit or rough handling. The same care should be taken as you would with other pieces of precision-engineered equipment.

PUMP STORAGE

If the pump is not to be placed into service immediately, it should be stored in a clean, dry well ventilated place, free from vibration, moisture, dirt, rapid or wide variation in temperature and potential damage. Care should be taken to protect the Penn Valley Pumps from foreign objects, excessive heat or direct sun light because of the elastomers contained within the pump.

CAUTION: SYNTHETIC RUBBER COVERED EQUIPMENT

This special notice is to advise you of certain precautions to be exercised in handling and storing synthetic rubber covered equipment. All items are carefully inspected and packaged before shipment and should be in excellent condition when received. Improper handling of this equipment will often cause serious damage. Synthetic rubber covered equipment is subject to damage by various causes which may be avoided by following these instructions.

Do Not allow synthetic rubber lined items to contact liquids that are incompatible.
Do Not store in temperatures over 100 degrees Fahrenheit.
Do Not store where temperature changes faster than 10 degrees Fahrenheit per hour.
Do Not allow synthetic rubber to contact other items when temperature is below 40 degrees Fahrenheit.
Do Not store in direct sunlight.
Do Not store near electrical equipment.
Do Not attach slings or any lifting device on synthetic rubber surfaces.
Do Not use anything sharp that may pierce the synthetic rubber covering.
Do Not weld in area of lining as it may destroy the lining or the diaphragm.

INSTALLATION

CAUTION: It is imperative that the coupling hubs or sheaves be a slip fit on the drive shaft. Shock loads from a mallet can have a destructive effect on the bearings, resulting in immediate failure. The use of taper lock bushings is recommended.

PUMP LOCATION

The Double Disc™ pump should be located as close to the source as possible, with the suction piping as short and as direct as practical. It is imperative that the suction pipe hydraulics be carefully considered when locating the pump. Contributing factors are percent solids, losses through elbows, valves, flow in gallons per minute, length of piping run, etc.

The standard Double Disc Pump configuration can be mounted outdoors. When installing outdoors in cold weather climates the pump and piping must be protected from freezing temperatures. If the liquid in the pump chamber is allowed to freeze, the resultant expansion will crack the pump housings and cause damage to the pump and piping system.

FOUNDATION & BASE

It is essential to provide a solid foundation for the proper operation of the pump. The foundation must be rigid enough to prevent vibration and misalignment during operation. The pump sub-base must be anchored to the floor with appropriate anchor bolts and leveled by shimming at the anchor bolt locations.

The frames are elevated for each model to allow adequate room beneath the pump for maintenance access. Pump disassembly is commenced from the bottom with the “Maintain-in-Place” hinged housing design allowing the housings to be lowered into the area beneath the frame. This area should remain clear of any conduit, piping or other obstruction that would limit access to underside of pump for maintenance.

PIPING

CAUTION: When connecting piping to the pump, the connection should be made with the pipe in a free supported state and without the need to apply vertical or side pressure to obtain alignment of the piping with the pump flanges.

All piping should be independently supported near the pump so that pipe strain will not be transmitted to the pump. Sufficient, rigid, piping support and bracing must be supplied to prevent the suction and discharge piping from moving during the pump operation.

We recommend the Double Disc pump be rigidly attached to the suction and discharge connections. We do not recommend the use of flexible connections. We have found the use of these items can accentuate vibration rather than prevent it. If flexible connections are used on the suction and discharge ports of the pump, care must be taken to support the piping on the up-stream and down-stream sides of the flexible connection as close to the connection as practical. It is recommended that tie rods be installed around the flexible connection to provide rigidity.

The suction and discharge piping should be equal to the pump suction and discharge port size. On high suction lifts or on applications handling high percent solids, the suction piping should be one or two sizes larger to reduce friction losses and allow the pump to fill.

ISOLATION VALVES

Install isolation valves in suction and discharge piping as close to the pump as practical. The valves will allow for the removal of the pump or permit maintenance on the pump without draining the system.

SUCTION PIPING

CAUTION: **Do not operate Double Disc™ pumps against a closed suction line. Excessive vacuum build-up can cause disc and/or trunnion failure.**

The majority of pump problems are created by improper suction line hydraulics. It is imperative that the proper sized suction piping system be used in accordance with the suction conditions.

Suction pipe size is determined by the liquid viscosity, length of run, flow in gallons per minute, taking into consideration the number of elbows and other obstructions in the suction piping. A rule of thumb is that the suction pipe size should never be smaller than the suction port on the pump being installed.

On a horizontal run, the suction piping should have a gradual rise, up to the suction port of the pump. This is to prevent air entrapment, causing improper pump operation.

It is recommended that a vacuum sensor & gauge assembly be mounted on the suction pulsation dampener. Process pressure is sensed through the 360° elastomeric tube and glycerin transfers pressure to the gauge, permitting the operator to determine any unstable pump operation. Any change in the system operating characteristics will be indicated in the gauge readings. The unit is capable of being cleaned in place by simply using the process pressure through the SS316 isolation valve mounted to the top of the sensor. The opposite end of the valve is fitted with a universal, quick acting coupling, suitable for compressed air. This valve connection is used to charge the dampener with compressed air.

DISCHARGE PIPING

CAUTION: **Do not operate Penn Valley pumps against a closed discharge line. Excessive pressure build-up will cause disc and/or trunnion failure.**

Double Disc™ pumps must not be operated against a closed valve in the discharge piping or damage can occur. This type of operation will lead to disc inversion and breakage of the discs. To avoid this, it is imperative that a pressure limit switch installed as close to the discharge port as practical. The switch setting should be set at 10 psi above operating pressure. This switch is set to turn the pumping system off when excessive discharge pressure is experienced.

The use of back flow check valves is recommended when there are multiple pumps connected to a common Discharge line or the pump will be installed on a common discharge line with other pumps. If a check valve is required for the application, we recommend a lever and spring assisted check valve style be used.

DRIVES

Penn Valley will accommodate almost any drive to meet the customer's requirement. These pumps operate at relatively slow speed pumps and require a speed reduction from the standard 1150/1750 rpm motor speeds. This reduction is normally accomplished through the use of a v-belt and sheave arrangement to arrive at the desired pump speed. We can also use a gear reducer with a v- belt and sheave arrangement to accomplish even lower pump speeds. A direct coupled gear reducer arrangement can also be used, however this arrangement provides a shorter gear reducer life because of the reciprocating action of the pump. The gear reducer would be directly coupled to the pump shaft through a flexible coupling.

DRIVE ALIGNMENT

Pumps and drives that are mounted at the factory are mounted on a common base and are accurately aligned before shipment. This alignment must be re-checked after the pump unit has been installed. Periodic checking is advisable during the pump service life.

V-BELT DRIVES

The V-belts must be aligned and properly tensioned to obtain the most efficient operation. All V-belt drives are furnished with an OSHA approved guard. This type of drive is the most commonly used on Penn Valley Pumps, providing for ease of speed change in the field.

DIRECT CONNECTED DRIVES

Certain flexible coupling designs are more tolerant of misalignment between pump and drive. Misalignment above the maximum coupling manufactures recommendations will result in premature bearing failure and will cause other problems such as excessive power consumption, etc. For this reason the angular and parallel misalignment must be maintained as close as possible and within the recommended limits of the coupling manufacturer.

The following couplings are recommended based on their greater tolerance for misalignment. Spider type couplings generally have less tolerance for misalignment.

Sure-Flex coupling (Standard on Penn Valley pumps)
Parallel:* .015 - .025 Angular: 1 degree

Grid type coupling
Parallel:* .005 - .012 Angular: 1 degree

Paraflex coupling
Parallel:* .005 - .015 Angular: 1 degree
* Depending on size of the coupling.

PUMP PROTECTION

The use of a discharge pressure switch is highly recommended to prevent pump damage due to a high-pressure event. A high-pressure event may be due to an inadvertent closed valve or clogged line. Penn Valley Pump provides a PVP420 Discharge pressure switch assembly for the majority of the applications. This assembly consists of an annular sensing ring, NEMA 4X pressure switch and pressure gauge. This assembly is filled with glycerin and calibrated at our factory. This assembly is designed to mount to the top of the discharge pulsation dampener through the 1" NPT connection. Please refer to datasheet SLS-420PS for more information on this assembly.

CONTROLS

The Double Disc Pump can be operated by a motor starter for constant speed applications or a variable frequency drive (VFD) for variable speed applications. If using a motor starter, the use of a soft starter is highly recommended to allow the pump speed to ramp up to maximum operating speed. This minimizes pressure spikes at pump start and is especially important on long suction and/or discharge lines.

If using a VFD (recommended option) the unit must be sized appropriately for a constant torque application. The VFD shall be sized for a heavy-duty overload capability based on the full load amp rating for the motor horsepower being used. VFD manufacturers appear to have different ratings (light, normal and heavy duty) for their drives. Depending on the manufacturer, the horsepower of the VFD may need to be one size larger than the horsepower rating of the motor. A drive that is undersized may experience DC bus issues (regeneration) requiring the addition of dynamic braking resistors. In most cases this regeneration can be remedied through programming in the drive by adjustments to the deceleration rate.

For set-up of the VFD we typically recommend a minimum acceleration rate of 30 seconds for speed ramp up to full speed to minimize start-up pressure spikes. The deceleration rate should be set as close to zero as possible.

PUMP OPERATION

NOTE: All Double Disc™ pumps can operate dry without fluid chamber damage.

DIRECTION OF ROTATION

Double Disc™ Penn Valley Pumps can be operated in either direction of rotation without affecting the pump efficiency.

NOISY OPERATION

Noisy operation and/or excessive vibration is generally caused by pump starvation. This is commonly referred to as cavitation. The most common causes of cavitation are as follows:

1. Suction line size is too small to handle the percent solids at the existing flow rate.
2. Suction valve is partially closed.
3. Suction line is obstructed and will not permit sufficient flow to pump.
4. Suction line is too long, creating excessive resistance, which restricts the flow to the pump.

WATER HAMMER & PIPE VIBRATION

Inertia is the tendency of matter to remain in its existing state of motion unless acted upon by outside forces. More energy is required to change steady state motion than to maintain it.

Thus more energy is expended to increase or decrease flowing velocity in a pipeline than is necessary to maintain the liquids steady state motion. One measure of the energy used to change liquid motion is pressure. If velocity is changed quickly by the application of much energy in a short period of time, the pressure change will be more significant than when the same amount of energy is expended over a longer time period. Thus, the energy applied to change pressure by 100 PSI in one second is the same amount of energy as that applied for 10 seconds to change pressure by 10 PSI.

Any change from steady state conditions creates a temporary variation in pressure or flow called a hydraulic transient. Hydraulic transients are commonly called surge, shock or water hammer. They are usually caused by opening, closing or regulating valves; or by pumps starting and stopping. Their magnitude is a function of the: (1) change in flowing velocity; (2) liquid density; and (3) sound speed in the liquid and piping system. These hydraulic transients may range in importance from a slight pressure and/or velocity change, to sufficiently high vacuum or pressure to collapse or burst pipes and fittings or damage pumps.

Water Hammer and/or pipe movement may occur in the discharge piping system of the Penn Valley Pump during each revolution. The discs, acting as valves opening and closing create this condition. When the movement of the liquid column ceases, the weight of the column of liquid causes a slight reversal of flow, thus causing noise and/or pipe movement. The kinetic energy of this reversal of flow causes a series of rapid reversals or waves causing vibration and noise in the pipe until the energy is expended in friction.

Pulsation dampeners are designed to control rapid velocity changes that may cause potentially dangerous pressure excursions. This is accomplished by using a vessel charged with inert gas (air) and connected to the pipeline carrying the liquid. This vessel has the capability to convert the kinetic energy of the moving liquid into stored potential energy when a liquid over-pressure occurs. When a pump stops, the vessel air expands and 'pumps' needed liquid into the line to prevent the formation of vacuum or column separation. With a pulsation dampener installed in the pipeline, flow from the pump is received within the pulsation dampener compressing the stored gas on top of the liquid. Pump energy thus stored is released in a controlled fashion to establish steady state flow.

After making certain that the discharge piping is securely supported and the pump is securely bolted to a rigid foundation, the following solution for reducing this phenomenon is recommended.

PULSATION DAMPENER RECOMMENDATIONS

Generally, suction side pulsation dampeners are not required, however certain suction piping conditions may warrant the use of a pulsation dampener on the suction side. Pulsation dampeners installed in the suction piping can improve the NPSH conditions of the application and reduce the acceleration head. The following are examples of conditions where suction side pulsation dampeners would be required:

1. Static lift requirement. (i.e. fluid source below pump suction inlet)
2. Suction line diameter smaller than pump inlet.
3. Suction line longer than 50 ft.

Vibration and/or noise occurs on the discharge side due to the valving action of the discs. Discharge chambers are not required on every installation. The system hydraulics must be reviewed to determine the requirements of the pumping system. The following are examples of conditions where pulsation dampeners would be required.

1. Discharge pipe in excess of 150 feet - Discharge Chamber required.
2. Static discharge head in excess of 10 feet - Discharge Chambers required.
3. Multiple pumps discharging into a common line - Discharge Chamber required.

The discharge pulsation dampener must be purged after the piping system is filled with liquid. The pressure in the pulsation dampener then equalizes to the discharge head conditions. If this is not done, the discharge head will cause the liquid to rise in the chamber, thereby reducing the effectiveness of the pulsation dampener.

For pulsation dampener sizing and system requirements, please review your system with your local Penn Valley Pump representative.

PURGING PULSATION DAMPENERS

The standard style of dampener used by Penn Valley is an open chamber designed to allow air to be trapped at the top of the chamber. This style of dampener is self compensating to adjustments in flow and system pressure thereby reducing the overall operation and maintenance requirements. It is imperative that the pulsation dampener be sealed from the atmosphere, preventing the air charge from escaping. After a period of time the air will be absorbed in the liquid being pumped. At this point in time the pulsation dampener must be purged of the liquid that has replaced the air charge. This is accomplished by introducing compressed air through the supplied an quick release air valve installed to the top of the pulsation dampener. The compressed air forces the liquid out of the pulsation dampener and back into the discharge line.

The amount of air required is a function of the system discharge head pressure. There is NO specific gauge reading to obtain. The system will equalize to the system pressure. Typically all that is required a approximately 5 seconds of air introduced to the dampener. To check the air charge simply tap on the side of the dampener with a metallic object. If the dampener pings like a bell then the air charge is complete. If the sound if more of a muffled thud, introduce more air until dampener is empty.

The discharge chamber must be purged after starting up the system. The air cushion on top of the liquid in the chamber then equalizes to the discharge head conditions. If this is not done, the discharge head will cause the liquid to rise into the chamber thereby reducing the effectiveness of the pulsation dampener.

Note: There are times when the use of a bladder style dampener is required for certain applications. If your application requires a bladder style dampener the maintenance information will provided by the specific dampener manufacturer and contained in the project O&M manual.

RECOMMENDED SPARE PARTS

The proper selection of spare parts is an excellent way to insure a minimum of down time for repairs. The variation in materials being pumped, pumping rates, etc., are too numerous to enable us to specify the exact quantity of spare parts required. For normal operation in wastewater treatment plants it is suggested that one set of the following spare parts be in stock for each pump in service.

Two (2) Discs
Two (2) Trunnions
One (1) Clack valve and gasket
One (1) Swan neck gasket
One (1) Suction gasket
One (1) Discharge gasket

As a service to our customers we have a formal exchange/re-build program in place designed to minimize equipment downtime and ensure your Double Disc™ pump is rebuilt to factory tolerances. For more detailed information please contact our factory or your local representative to receive information on this program and match the spare parts to your particular application.

START-UP PROCEDURES FOR A NEW INSTALLATION

1. Back flush the piping system to be certain the system is free of foreign material left from construction. Isolate the pump prior to back flushing.

2. Pressurize the system with a non-hazardous liquid to check that all piping connections are tight and free from leakage. CAUTION: Do not pressurize over 40 psi.

3. Check that all valves in the discharge piping system are open and the discharge piping is not obstructed.

4. Check that all valves in the suction piping system are open and the suction piping is not obstructed.

5. Check that all guards are in place and secure.

6. Pump rotation can be in either direction without affecting the pump efficiency.

7. Start pump drive. When system is set up at constant speed, jog the drive several times to ensure all valves are open and systems appears function. When using a variable frequency drive, program the drive to have a short ramp up to pump speed and initially start pump a approximately 25% speed.

8. If the system is equipped with a suction vacuum switch and/or a discharge pressure switch, check to be certain that the switch is set at the proper pressure. The vacuum switch is factory set at 10”Hg and the pressure switch is factory set at 45 psi. Please see page 25 for calibration procedure to test switches.

Troubleshooting a Penn Valley Pump Installation

It is common to assume on a pumping installation that the pump is the problem, being the only mechanical device in the system. More often than not the problem is created by pipeline hydraulics. This is particularly true on new installations. The following checkpoints are offered to identify some of the problems that may arise.

Symptom	Cause	Solution
A. Will not prime or slow to prime.	1. Air leak in the suction line.	1. Tighten connections.
	2. Clack valve not seating properly.	2. Replace clack valve.
	3. Discs worn or damaged.	3. Replace discs.
	4. Suction strainer clogged.	4. Clean strainer.
	5. Suction lift to high.	5. Reduce suction lift.
	6. Liquid temp. Too high for lift.	6. Reduce temp. or lift.
	7. Discs not seating property due to solids accumulation.	7. Clean or replace discs.
B. Low Pump capacity or discharge pressure lower than planned	1. Discharge head too high.	1. Reduce pump capacity.
	2. Excessive suction lift.	2. Reduce suction lift.
	3. Pump obstructed.	3. Remove obstruction.
	4. Pump worn.	4. Disassemble and replace worn parts.
	5. Pump speed too low.	5. Increase pump speed.
C. Pump requires excessive horse-power.	1. Liquid viscosity or specific gravity greater than planned.	1. Review liquid and system specifications.
	2. Total head higher than planned.	2. Review liquid and system specifications.
	3. Closed or partially closed discharge valve.	3. Check discharge piping system for closed valve.
	4. Piping obstructed by solids build-up.	4. Clean piping system.
D. Excessive vibration.	1. Discharge head too high.	1. Reduce pump capacity.
	2. Liquid viscosity too high.	2. Reduce pump speed.
	3. Cavitation caused by obstructed suction piping system.	3. Remove suction line obstruction.
	4. Pump damaged.	4. Disassemble and repair pump.
	5. Pipe line obstructed.	5. Remove obstruction.
E. Poor disc wear life.	1. Discharge head too high.	1. Reduce pump capacity.
	2. Liquid attacking disc elastomer.	2. Replace discs with compatible elastomer.
	3. Liquid temperature too high for disc elastomer.	3. Replace disc's with compatible elastomer.
F. Poor drive life	1. Misalignment between pump and drive.	
Obvious but often overlooked		
E. No flow.	1. Suction pipe not immersed in liquid.	1. Lengthen suction pipe.
	2. Drive not operating.	2. Check circuit breaker.
	3. Flow being diverted in discharge piping system.	3. Check valves in discharge piping system.
	4. Obstruction in suction piping system.	4. Open valve or clear obstruction.

PREVENTATIVE MAINTENANCE

1. Be sure that all nuts and cap screws are fully tightened. Gaskets have a tendency to compress over a period of time therefore the cap screws should be checked for tightness.

2. Check coupling wear and alignment periodically. Replace coupling element before excessive backlash develops on direct connected units. The belt tension should be checked and re-adjusted to normal standards if a V-belt drive is used.

3. Be sure the drive cover is always in place to protect personnel from injury and to keep foreign material from entering the area above the sealing trunnions.

4. After extensive usage the upper surface of the trunnions should be visually inspected for any signs of cracking or flex failure. Replace trunnions immediately if any deterioration is noticed.

5. Check suction and discharge pressure gauges occasionally. Higher pressure may indicate a piping obstruction and lower pressure may indicate fluid chamber wear or damage.

6. Pump can be cleaned with a mild household detergent on an as needed basis. Pump contains elastomeric internal components which would be subject to chemical attack if cleaned with chemical solvents.
7. Pumps that are in storage or are not run on a regular basis should have the Pump Drive Shaft and the Motor Shaft rotated on a monthly basis to prevent bearing seizure.

LUBRICATION SCHEDULE

Traditional equipment maintenance normally includes a re-greasing schedule. In many cases we have found that over greasing significantly reduces the life of the pump shaft bearings.

Long-term experience has shown that the best bearing life is achieved when the pump shaft bearings are never re-lubed. The bearings are grease packed for life with a specially formulated lubricant that should not be replenished.

SPECIAL TOOLS

Maintenance and repair of Double Disc™ pumps requires no special tools, standard repair shop tools will be sufficient. Normal tools will include.

- 7/16", 1/2", 9/16", 3/4", AF Wrenches
- Gasket scraper
- 1/4" Punch
- Soft mallet
- Press ring bearing puller (if replacing bearing)
- 17/64" twist drill

Other materials needed.

- Shop rags
- Loctite, Permatex or equal
- Never Seize or equal

PREVENTATIVE MAINTENANCE FOR THE PENN VALLEY DOUBLE DISC PUMP™
PUMP:

Description	**Frequency**	**Reason**	**O&M Reference**
Tighten all nuts and bolts, keep belt and drive guard bolts tight	Every 6 months	Gaskets compress over time	Section 3: Page 13
Check Belts Tension	Every 2 months	Improper tension can cause belt slippage leading to a poor pump operation. (Do not use belt dressings as these products reduce belt life)	Section 6
Inspect trunnion surfaces for any signs of wear and cracking	Every 6 months	If broken pump will leak	Section 3: Page 13
Check all supplied gauges for proper working order	Once a week	High pressure/vacuum is a sign of a line obstruction and will lead to disc failure over time.	Section 3: Page 6, 7, & 13
Lubrication	Never	The bearings are grease packed for life with a specially formulated lubricant that should not be replenished.	Section 3: Page 13
Rotating Pump Shaft & Motor Shaft	Once a Month	For pumps that are in storage or are not used regularly	Section 3: Page 13

MOTOR:

Description	**Frequency**	**Reason**	**O&M Reference**
Inspect motor for dust and cleanliness, keep all ventilation openings clear	Every 3 months	Motor may overheat	Consult Specific Motor O&M Manual
Lubrication	Consult Specific Motor O&M Manual	Over time bearings lose their lubrication	Consult Specific Motor O&M Manual

PUMP DISASSEMBLY INSTRUCTIONS
(items number are contained in the parentheses and shown in the exploded view on page 18)

1. Drain pump by removing pipe plug (33) from bottom of suction housing (1). (Caution: Be sure to relieve pressure from system before plug removal.)

2. Remove four bolts (37) at split swan neck flange.

3. Remove four bolts (35) at lower swan neck (5) and suction housing (1) connection. Lower swan neck can now be removed. Flush pump and surrounding area to obtain a cleaner work environment.

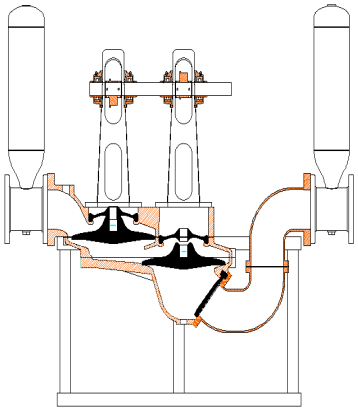
4. To remove suction housing (1), remove seven bolts (37) and five of the six through bolts (36). Leave one through bolt (36) installed at the non-hinge end. Remove the final through bolt (36) and then lower housing. Hinge end will remain in position while housing is being lowered. Once housing is resting on ground, pull quick release pin and lower housing completely to ground.

5. Rotate pump drive to allow disc to be at bottom dead center. Two people may be required to remove disc. Wrap a newspaper over the disc to aid grip and wear gloves to protect hands from cuts or abrasions as the disc releases. Securely grasp exposed suction disc (21) and unscrew from drive rod in counter clockwise direction.

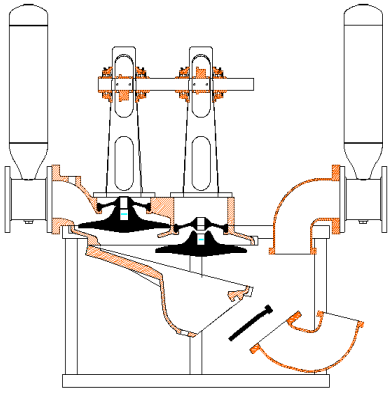
6. To remove intermediate housing remove four screws (47) and lift off bearing pedestal drive cover. Remove three of the four through bolts (34) from suction side pedestal. Then remove the eight bolts (36) that attach the intermediate housing to the discharge housing. Once all eight are removed then remove the last bolt (34) from the suction side pedestal. This will release housing and allow it to be lowered to the ground. Once housing is resting on ground, pull quick release pin and lower completely to the ground. Suction trunnion (14) can now be removed by pulling from housing.

7. Discharge disc can now be removed. Repeat step 5 for removal.

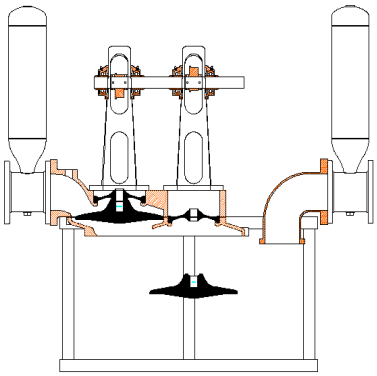
8. To remove discharge trunnion the drive assembly has to be removed. Remove belt and pulley cover (not shown) and drive belts. Drive belts can be removed by slipping of pump pulley with a screw driver. There is normally no need to loosen the motor. Remove four short bolts (46) to release drive assembly. Lift off drive assembly, which releases the discharge trunnion (14) and clamp (16).



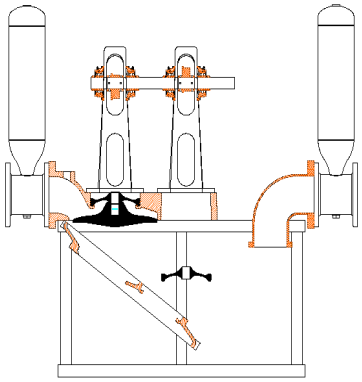
Assembled Unit with Suction & Discharge Pulsation Dampeners



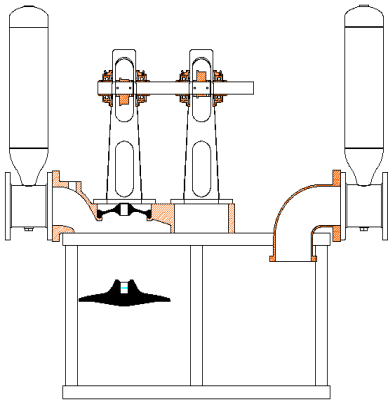
Removal of Lower Swan Neck & Suction Housing. Suction Housing is Hinged to Intermediate Housing for Easy Removal



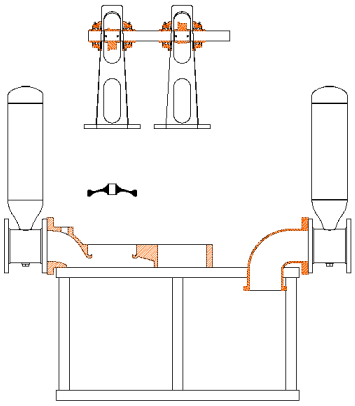
Remove Suction Disc after Removing Suction Housing



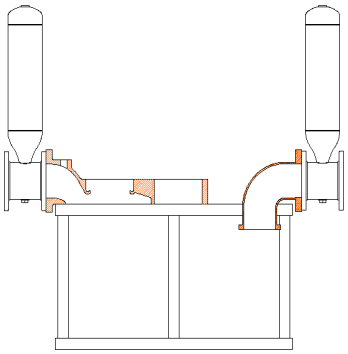
Intermediate Housing is Hinged to Discharge Housing Allowing Removal of Suction Trunnion & Discharge Disc



Remove Discharge Disc after Removal of Intermediate Housing



Remove Drive Assembly to Replace Discharge Trunnion



Removal of Components Leaves Discharge Housing in Frame while Suction & Discharge Piping have not Been Disturbed

Re-Assemble Pump in Reverse Order

- **Make Sure Trunnions are Face Up**
- **MUST Grease Conical Sections of Discs for Proper Shaft & Trunnion Engagement Housing**
- **Use Never Seize on Drive Shaft Threads**
- **Be Sure Not to Pinch Gaskets**

PUMP ASSEMBLY INSTRUCTIONS

1. Fit discharge trunnion (14) into discharge housing (3) and position discharge clamp ring (16). Conical face of trunnion must point upwards as shown.

2. Position complete drive assembly over the discharge housing (3) and lower on to the top face while passing the discharge drive rod (13) through the trunnion center. Secure using four short hex head screws (46) through the discharge pedestal (6).

3. Apply a small amount of grease to the discharge drive rod (13) and *inside the conical form of the discharge* disc (22). (Do NOT use loctite to reassemble disc. This will make it virtually impossible to remove disc on next repair). Screw the disc on to the drive rod. Tighten by hand until it bottoms against the shoulder. The disc cannot be properly seated and tightened without greasing the rubber cone. This allows the disc to slide against the trunnion under side.

4. Fit the suction trunnion (14) into the intermediate housing (2). Fit a new gasket on to the cleaned upper face of the intermediate housing (2). (Hint: Applying a small amount of grease to the gasket surface on the intermediate will help to hold the gasket into place.) Slide housing underneath pump and attach hinge end with quick release pin. Position the suction clamp ring (15) above the trunnion. Raise intermediate housing (2) into position ensuring that the suction drive rod slips through the trunnion. Secure with four long bolts (34) through the suction drive pedestal (6) and discharge housing into the intermediate housing, and four bolts (46) through discharge drive pedestal (6). Firmly tighten all screws.

5. Fit suction Disc (21) as in step 3. *Don't forget the grease.*

6. Inspect the clack valve (27) for cracks or wear. Replace if necessary.

7. Fit a new suction gasket (24) on the cleaned upper face of the suction housing (1) and then slide housing underneath pump and attach hinge end with quick release pin. Raise the housing and secure with the seven bolts (37) and six bolts (36). Tighten all bolts.

8. Reinstall lower swan neck (4) with new clack valve gasket (26) and swan neck gasket (23) if necessary.

9. Double check all screws for tightness.

10. The pump is now ready to placed back in service.

DOUBLE DISC™ PUMP BEARING REPLACEMENT

1. Using 1/4" punch; drive the four spirol pins (29) out of the cam lobes (9) to free the cams from the drive shaft (8). Apply heat to the inner ring locking screws on the four pedestal bearings (31) to soften the "loctite" and remove the screws (total of eight 8). (Be careful not to use excessive heat as this will ruin the bearings.)

2. Utilizing a copper or hide mallet and a soft punch, drive the shaft (8) out of the supports and con rods.

3. Carefully inspect all bearings for roughness of rotation, wear or loose fit between the outer race and housing on the pedestal bearings (31).

4. Replace any bearings found to be worn. The pedestal bearings simply unbolt. All four (4) bearings ***must*** be loosened if any bearings are to be replaced. To replace the con rod bearings (30), remove the two retaining screws from the cam lobe and press the cam out of the bearing. Heat the casting around the bearing to soften the "Loctite" and press the bearing out. The new bearing should be de-greased on the outside diameter and the con rod (10 & 11) cleaned to remove any residual "Loctite" and de-greased. Then apply fresh "Loctite or Permatex" to the bearing bore and press the bearing into position. Check with a 0.005" feeler gauge to ensure that the bearing is fully pressed into the housing. A gap will remain between the rubber seal and the back face, even when the outer race is tight against the housing. Press the cam lobe (9) into the bearing, using a light lubricant, not "Loctite". Replace the cam lobe and bearing retaining screws.

5. With the four pedestal bearings (31) loosely sub-assembled onto the pedestals and the two con rods correctly positioned, lubricate the shaft (8) with "Never-Seize" or equal. Insert the assembly and lightly tap, using a soft mallet, through the bearings. Most pumps are assembled with the keyed end of the shaft adjacent to the suction con rod (10). A reverse drive is assembled with the keyed end of the shaft toward the discharge. Caution: Ensure that your pump is re-assembled to the correct configuration.

6. When the shaft is in position, replace the four spirol drive pins (29). Any broken or damaged pins should be replaced, ensure that they are spirol drive pins and not roll pins, if not purchased from Penn Valley Pump Company. Check that the cams (9) are positioned one up and one down, 180 deg. out of sequence.

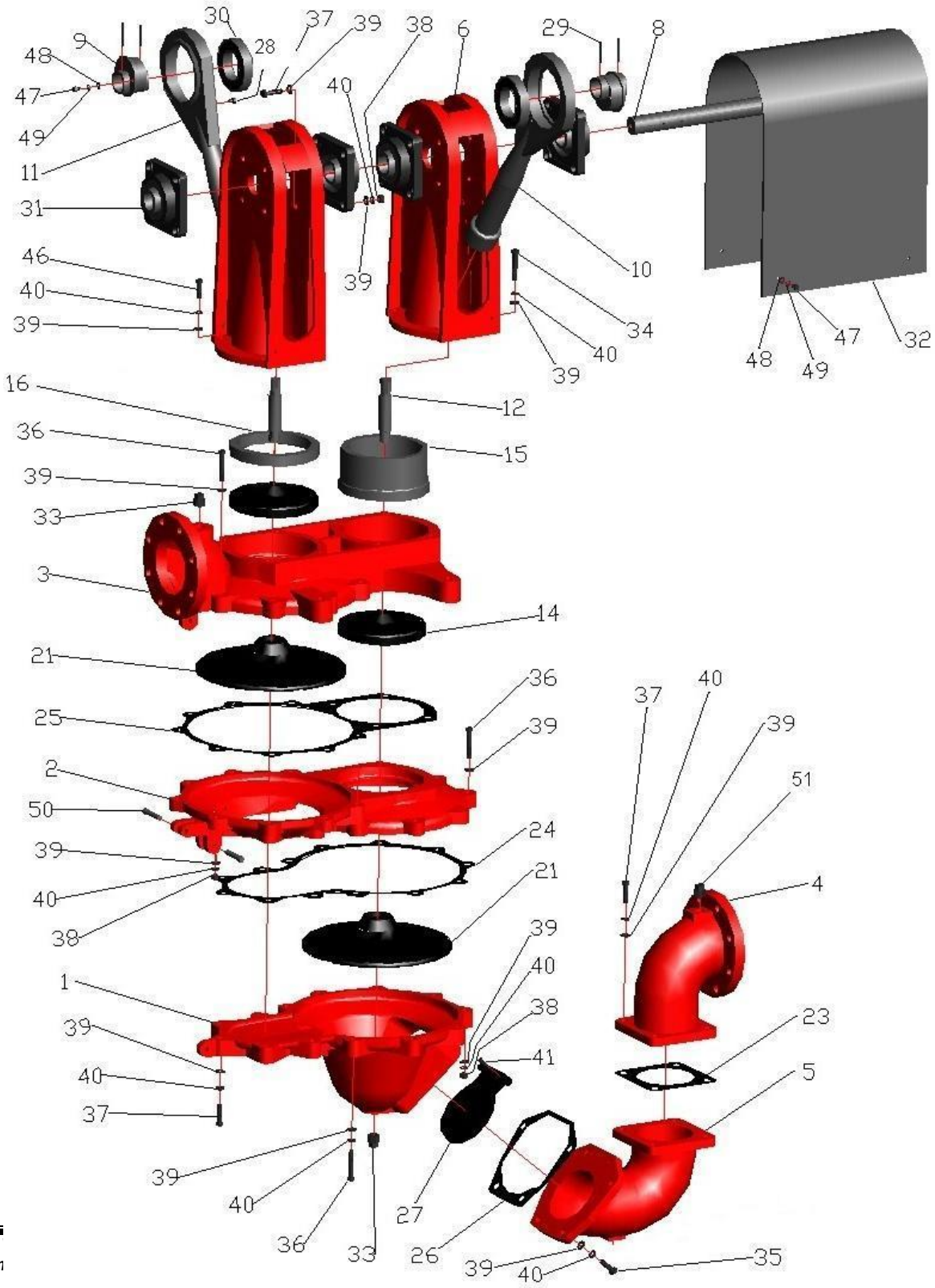
7. It the drive pedestals (6) have been removed from the pump, they should now be positioned and fully tightened back onto the discharge housing (3). The complete shaft (8) and con rod assembly should remain free to slide back and forth through the pedestal bearings (31).

8. Lightly nip the eight bolts (46) securing each of the four bearings (31) to the pump pedestals. Ensure that the inner rings still rotate around the shaft (8) without binding. Then tighten the bearing retaining bolts (46), once again, checking to be sure that the inner rings rotate freely, which ensures the correct alignment.

9. Align the bearing inner rings; nip one of the screws in each. Turn the shaft 90 deg, back out the other screws. Using the largest drill, which will fit into the tapped hole (I 7/64) drill the shaft just deep enough to provide a full drill diameter (0.080"). Apply "Loctite or Permabond" thread lock to the hole and retaining screws, re-fit and tighten. Remove the other lock screws and repeat the procedure (Drill, Loctite, re-fit and tighten). Allow time for the "Loctite" to cure prior to putting the pump back into service.

Assembling the drive in this manner ensures that all the bearings will be aligned and free from any undue side loads without resorting to using precise dial indicators or other such devices.

Model 6DDSX107 MK1 Bareshaft Exploded View



6" Model 6DDSX107 MK1
Bareshaft Double Disc™ Parts List

Item Number	Quantity per Unit	Description	Base Part Number
1	1	Suction Housing	PVD703
2	1	Intermediate Housing	PVD692
3	1	Discharge Housing	PVD691
4	1	Swan Neck Upper, Cast Iron	PVD718-90
5	1	Swan Neck Lower, Cast Iron	PVD718-130
6	2	Pedestal	PVD709-8
8	1	Drive Shaft	PVD853
9	2	Cam Lobe	PVD806
10	1	Con Rod, Suction	PVD727S-8
11	1	Con Rod, Discharge	PVD727D-8
12	1	Drive Rod, Suction	PVD708S
13	1	Drive Rod, Discharge	PVD708D
14*	2	Trunnion	PVD580
15	1	Trunnion Clamp Ring, Suction	PVD722S
16	1	Trunnion Clamp Ring, Discharge	PVD722D
21*	2	Integral Disc	PVC696
23*	1	Gasket, Swan Neck	PVD725
24*	1	Gasket, Suction	PVD719
25*	1	Gasket, Discharge	PVD720
26*	1	Gasket, Clack Valve	PVD721
27*	1	Clack Valve	PVD704
28	2	Bearing retaining washer	PVA738
29	4	Drive Pin	PVD841
30	2	Bearing, Con Rod	PVD816
31	4	Bearing, Pedestal	PVD815
32	1	Drive Cover	PVD736
33	1	Priming/Drain Plug 1½ "	PVA180
34	4	5/8"-11 UNC x 6-1/2" Long Hex Cap Screw	
35	4	5/8"-11 UNC x 1-3/4" Long Hex HD Bolt	
36	12	5/8"-11 UNC x 4 " Long Hex HD Bolt	
37	25	5/8"-11 UNC x 2-1/2" Long Hex HD Bolt	
38	28	5/8" -11 UNC Hex Nut	
39	66	5/8" Flat Washer	
40	56	5/8" Lock Washer	
46	4	5/8"-11 UNC x 2" Long Hex Cap Screw	
47	8	5/16" -18 x ½" Long Hex HD Bolt	
48	8	5/16" Flat Washer	
49	8	5/16" Lock Washer	
50	2	½" Quick Release ball detent pin	PVD743
51	1	Dampener/Sample Connection 2" NPT	PVA767

* Recommended spare parts

Note: In order to guarantee the proper components are supplied when ordering spare parts, the serial number of the unit will be required.

Model 6" 6DDSX107 MK1 Bareshaft

Common Parts

Item Number	Quantity per Unit	Description	Construction
6	2	Pedestal	Aluminum Alloy
8	1	Drive Shaft	High Tensile Stainless Steel
9	2	Cam Lobe	High Tensile Stainless Steel
10	1	Con Rod Suction	Aluminum Alloy
11	1	Con Rod, Discharge	Aluminum Alloy
12	1	Drive Rod, Suction	High Tensile Stainless Steel
13	1	Drive Rod, Discharge	High Tensile Stainless Steel
15	1	Trunnion Clamp Ring, Suction	Aluminum Alloy
16	1	Trunnion Clamp Ring, Discharge	Aluminum Alloy
23	1	Gasket, Swan Neck	CF
24	1	Gasket, Suction	CF
25	1	Gasket, Discharge	CF
26	1	Gasket, Clack Valve	CF
30	2	Con Rod Bearing	Standard Commercial
31	4	Pedestal Bearing	Standard Commercial
32	1	Drive Cover	SS304
33	4	Priming / Drain Plug	Zinc Plated
35-50		Fastener construction available on application	

Cast Iron Construction with Neoprene Elastomers

1	1	Suction Housing	Cast Iron
2	1	Intermediate Housing	Cast Iron
3	1	Discharge Housing	Cast Iron
4	1	Swan Neck, Upper	Cast Iron
5	1	Swan Neck, Lower	Cast Iron
14	2	Trunnion	Neoprene
21	2	Integral Disc	Neoprene
27	1	Clack Valve	Neoprene

Cast Iron Construction with Hypalon Elastomers

1	1	Suction Housing	Cast Iron
2	1	Intermediate Housing	Cast Iron
3	1	Discharge Housing	Cast Iron
4	1	Swan Neck, Upper	Cast Iron
5	1	Swan Neck, Lower	Cast Iron
14	2	Trunnion	Hypalon
21	2	Integral Disc	Hypalon
27	1	Clack Valve	Hypalon

Neoprene Lined, Cast Iron Construction with Neoprene Elastomers

1	1	Suction Housing	Cast Iron, Neoprene Lined
2	1	Intermediate Housing	Cast Iron, Neoprene Lined
3	1	Discharge Housing	Cast Iron, Neoprene Lined
4	1	Swan Neck, Upper	Cast Iron, Neoprene Lined
5	1	Swan Neck, Lower	Cast Iron, Neoprene Lined
14	2	Trunnion	Neoprene
21	2	Integral Disc	Neoprene
27	1	Clack Valve	Neoprene

Model 6" 6DDSX107 MK1 Materials of Construction

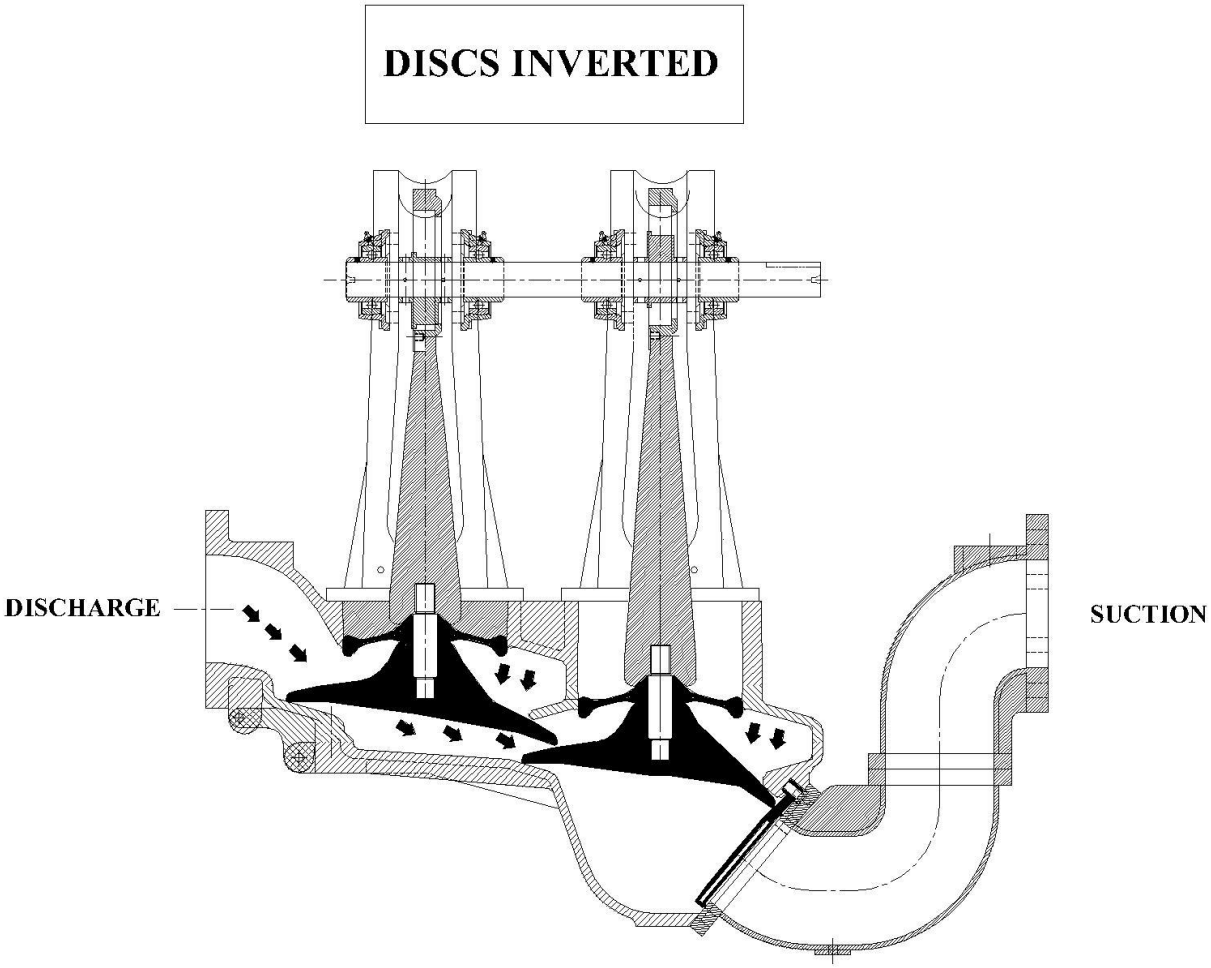
Item Number	Quantity per Unit	Description	Construction
Hypalon Lined, Cast Iron Construction with Hypalon Elastomers			
1	1	Suction Housing	Cast Iron, Hypalon Lined
2	1	Intermediate Housing	Cast Iron, Hypalon Lined
3	1	Discharge Housing	Cast Iron, Hypalon Lined
4	1	Swan Neck, Upper	Cast Iron, Hypalon Lined
5	1	Swan Neck, Lower	Cast Iron, Hypalon Lined
14	2	Trunnion	Hypalon
21	2	Integral Disc	Hypalon
27	1	Clack Valve	Hypalon
Soft Rubber Lined, Cast Iron Construction with Neoprene Discs, trunnions & Clack valves			
1	1	Suction Housing	Cast Iron, Soft Rubber Lined
2	1	Intermediate Housing	Cast Iron, Soft Rubber Lined
3	1	Discharge Housing	Cast Iron, Soft Rubber Lined
4	1	Swan Neck, Upper	Cast Iron, Soft Rubber Lined
5	1	Swan Neck, Lower	Cast Iron, Soft Rubber Lined
14	2	Trunnion	Neoprene
21	2	Integral Disc	Neoprene
27	1	Clack Valve	Neoprene
Tungsten Carbide Hardening Cast Iron Construction with Polyurethane Discs, Neoprene trunnions & Clack valves			
1	1	Suction Housing	Cast Iron, Tungsten Carbide Coated
2	1	Intermediate Housing	Cast Iron, Tungsten Carbide Coated
3	1	Discharge Housing	Cast Iron
4	1	Swan Neck, Upper	Cast Iron
5	1	Swan Neck, Lower	Cast Iron
14	2	Trunnion	Neoprene
21	2	Integral Disc	Polyurethane
27	1	Clack Valve	Neoprene

Other standard elastomer parts are:
Viton suction & discharge disc's, Viton trunnions and Viton clack valves.
EPDM suction & discharge disc's, EPDM trunnions and EPDM clack valves.

Other materials of construction are available on request.

PENN VALLEY DOUBLE DISC™ PUMPS

Failure caused by excessive discharge pressure.



Cause:

Double Disc Pump operated against a closed discharge valve or a plugged discharge line.

Effect:

1. Discharge disc is forced below it's seat.
2. Suction disc is forced downward off of it's seat.

Note: The clack valve will not invert. Continued pressure will cause the gaskets and trunnions to fail.

Solution:

Install a pressure switch in the discharge line set to turn pump off at a predetermined pressure. Typically this pressure would be the maximum recommended operating pressure.

Vacuum/Pressure Sensor and Switch Assembly

PURPOSE

The Penn Valley, Double Disc™ Pump is a positive displacement pump. The pump should never be operated against closed valves or obstructed lines. If this happens the unit will build high vacuum or high pressure and can lead to pump failure. Failure associated with high pressure is described on page 20. A high vacuum condition is not immediately catastrophic, however if the pump is operated at extended period at high vacuum premature elastomer failure is likely. The vacuum/pressure switch assembly is recommended to limit the vacuum/discharge pressure to the maximum recommended operating pressure of the Double Disc™ Pump. The following are the maximum recommended vacuum/discharge pressures:

Pump Model	Vacuum	Discharge
6" Model 6DDSX107	28ft (25"Hg)	140 ft. head (60 psi)

The above head / pressure conversions are based on a specific gravity of one (1). If other than one (1) divide head in feet by the specific gravity and the multiply by 2.31.

Installation

The PVP 420 Vacuum/Pressure switch assembly is designed to be installed to the 1" NPT port at the top of our standard pulsation dampener. If no dampener is supplied the unit is then mounted to the 1" NPT connection at the pump suction and discharge. If a unit other than the PVP 420 is used the unit should be installed as close to the pump suction and discharge ports as possible. Over time solids build-up can occur in the sensing chamber. In most cases the build-up can be cleared by opening the isolation valve and utilizing the system pressure to clear the build-up. If the system pressure is not sufficient to remove the build-up, then the potable or non-potable water system can be used to back flush the sensing chamber. This cleaned in place feature eliminates the need to remove the pressure sensor for cleaning such as is the case with diaphragm seals.

The system consists of a pressure sensor, pressure gauge and a pressure switch. The pressure sensor reads the line pressure in the pump discharge line. The pressure switch is activated when the set pressure is exceeded and that in turn shuts the pumping system down.

The pressure sensor is supplied as standard with an EPDM sensing tube. The sensing system is filled with a 50% ethylene glycol and water solution and is completely protected from the process slurry by the sensing tube. The sensing tube is one-piece construction with integral flanges locked into the pressure sensor with bolted end covers.

The pressure switch is supplied in a watertight alloy enclosure for corrosion resistance that meets 4 requirements. For severe corrosive atmospheres type 3l6 stainless steel and Monel are available. The actuator seal is constructed of Buna-N with process temperature limits of 0 to 150 deg. F. The pressure switch has a plus or minus 1 percent of the range set point repeatability and a minimum of 400 percent of range proof pressures. This unit performs well on applications where shock and vibration could be problem on services such as slurries or abrasive process fluids.

Calibration Procedure
The vacuum switch assemblies are preset to 10”Hg and the pressure switch assemblies are preset at 45 psi. If recalibration is required in the field, the following procedure would be required.

1. Remove the switch cover (environment permitting).

2. Open all system valves and turn the pump on.

3. Check the pressure gauge, the gauge indicator should swing slightly (not more than plus or minus 3 psi) to show line pressure. Adjust the needle valve to achieve the desired gauge indicator fluctuation-open (turn counterclockwise) to increase - close (turn clockwise) to decrease.

4. *The following instructions apply to both vacuum and pressure*. Carefully throttle the pump using the valve until the desired vacuum or pressure is achieved. **Caution: Do not exceed 25”Hg suction or 55 psi discharge.** The pressure switch is factory set at 10”Hg on vacuum and 30 psi so the pump should shut down when that pressure is exceeded.

5. Move the adjusting screw to cut out at the desired pressure. If a lower pressure is being set, the pump will continue to operate until the adjusting nut is turned down (counterclockwise) to the new trip point. It a higher pressure is being set, it will be necessary to adjust the switch (clockwise), then open the valve. Re-start the pumping unit. Then throttle the pump again up to the desired pressure **Caution: Do not exceed 25”Hg suction or 55 psi discharge.** If the pressure switch does not trip, adjust the switch again, repeating the throttling procedure until the correct cut out pressure is achieved.

6. Always re-check the cut out pressure two or three times to be certain that the pressure sensing switch is operating properly. The motor should be wired such that it stays off after the pressure is relieved and requires a manual re-set to be placed back into operation.

7. Re-install the pressure switch cover. The system is ready to be placed in operation.

SAFETY

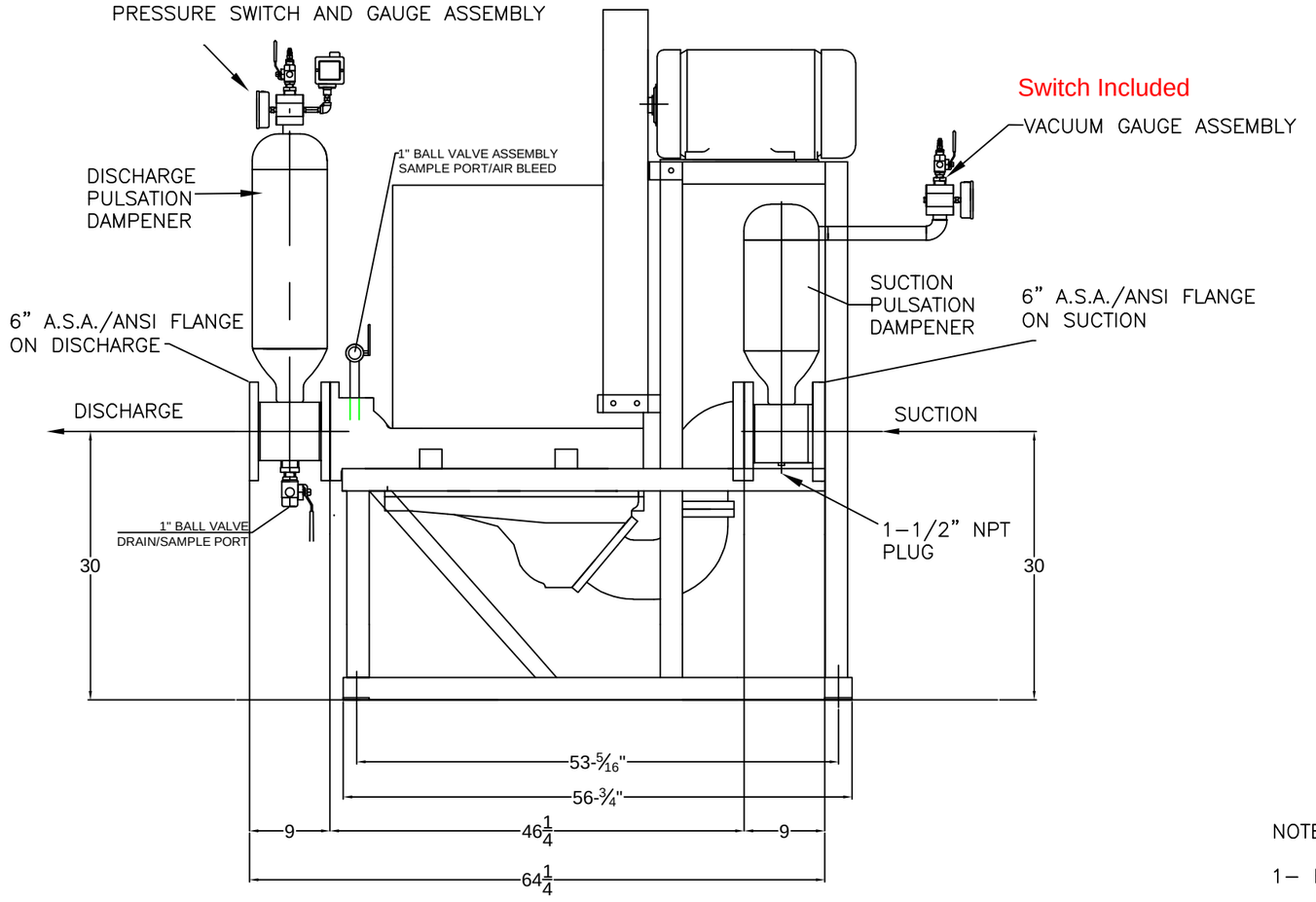
Safety instructions for Double Disc™ Pumps

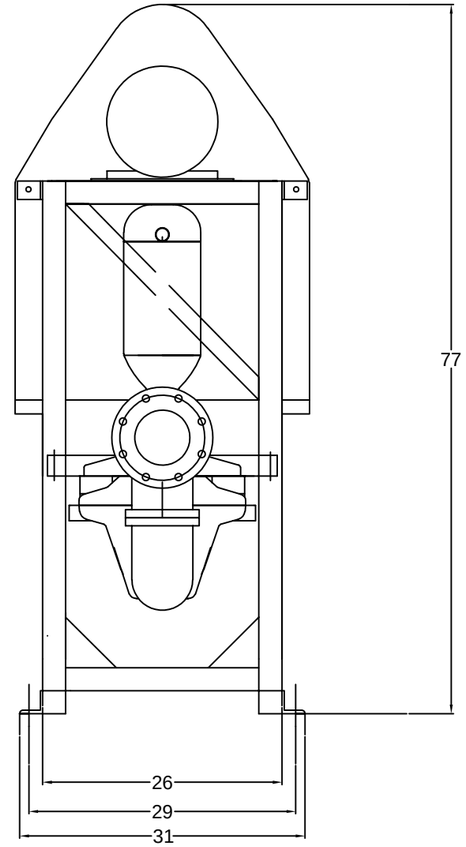
1. Pumping equipment must only be operated by personnel who are fully trained in all safety procedures.
2. To prevent personnel injury, equipment must not be operated unless all guards and covers are in place and secured.
3. No maintenance or adjustments are to be performed until the equipment is stopped and electrical power has been locked out.
4. Suitable safety equipment must be worn by any personnel performing maintenance on this equipment; including safety glasses, safety shoes and hard hats.
5. Keep hands, clothing etc. away from moving parts.
6. Never permit people who have been drinking alcohol or using drugs to maintain or repair this equipment.
7. Locate "WARNING" signs in areas where moving parts are present. Limit access to authorized personnel only.
8. Inspect and maintain equipment as per equipment operating instructions.
9. Always use factory replacement parts for equipment maintenance, always follow equipment maintenance manual for assembly and disassembly instructions.

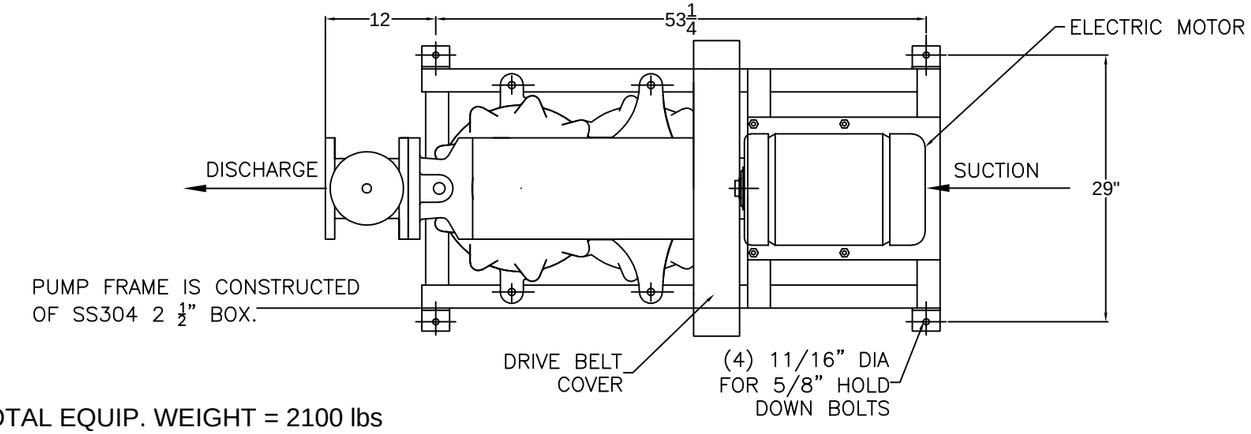
SHUT DOWN INSTRUCTIONS

Shut Down Instructions for Double Disc™ Pump

1. Shut pump off.
2. Disconnect power to pump motor.
3. Close both Suction and Discharge Valves.







NOTES:

1– HEIGHTS SHOWN ARE PVP STANDARDS PUMP CENTERLINE HEIGHTS CAN BE RAISED OR LOWERED.
2– SWITCHES AND DAMPENERS ARE OPTIONAL. CHECK BUILD SHEETS FOR EQUIPMENT SUPPLIED.
3– FLEX JOINTS NOT RECOMMENDED
4– WHEN INSTALLING PUMP KEEP AREA UNDER PUMP CLEAR FOR MAINTENANCE
5– TO REMOVE BELT GUARD, 40–INCHES IS REQUIRED ABOVE THE PUMP. COVERS CAN BE SPLIT TO BE REMOVED HORIZONTALLY

TOTAL EQUIP. WEIGHT = 2100 lbs
WT. W/O DAMPENERS = 1900 LBS

6DDSX107-MK1 Pump Design Information
November 2021

NOTES
MATERIAL: ----

REV	DESCRIPTION	DATE	BY
0	INITIAL RELEASE	9/16/2020	ABB

REVISION HISTORY

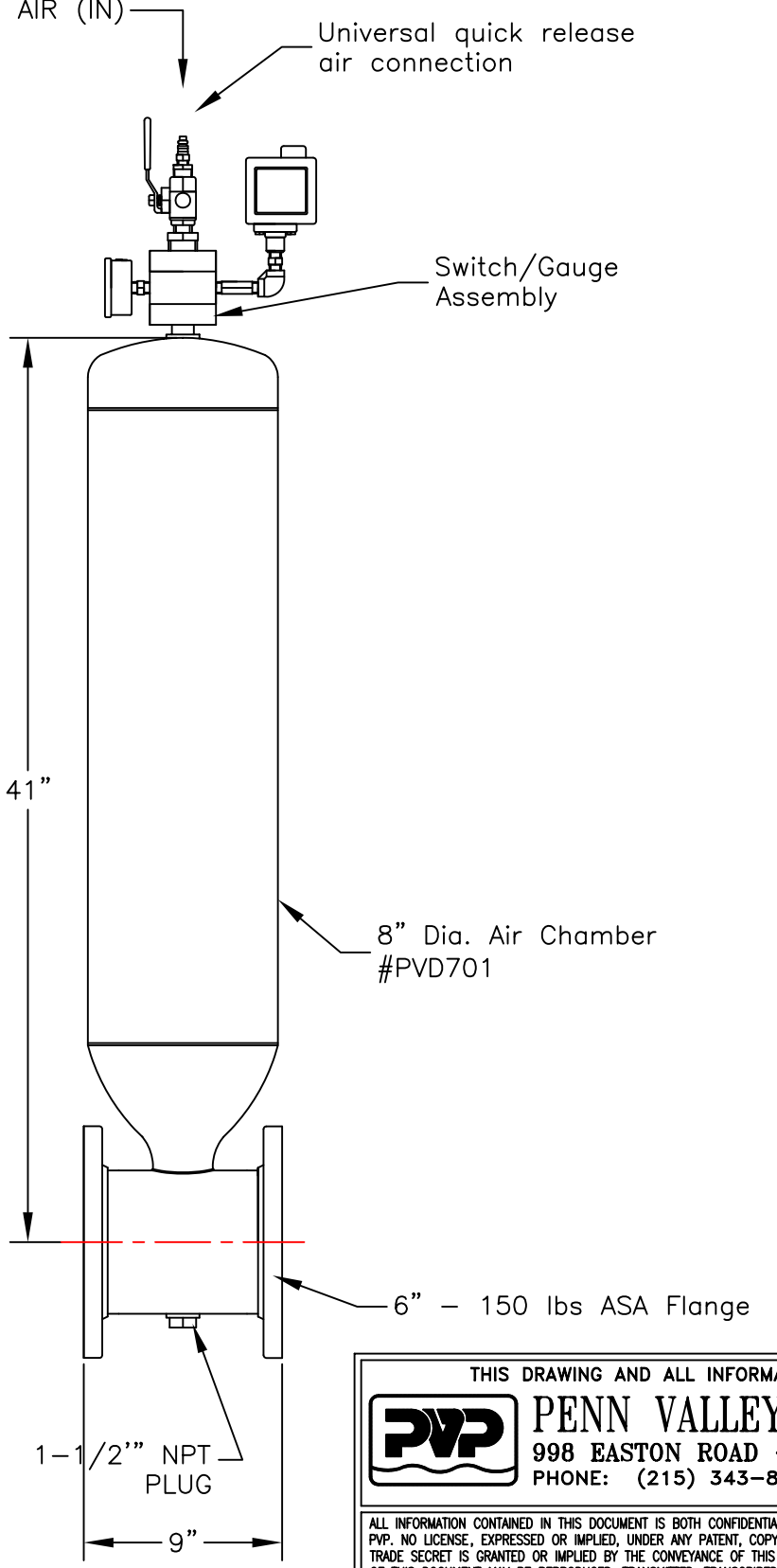
PENN VALLEY PUMP CO., INC.
998 EASTON ROAD - WARRINGTON, PA 18976
PHONE: (215) 343-8750 www.pennvalleypump.com

CUSTOMER: Penn Valley Pump
LOCATION: Internal
TITLE: 6DDSX107 Piggy Back

SCALE N/A
DATE 9/17/2020
DR. BY -
PLOT DATE

DRAWING NO.
PVD728
SHEET
61 1 OF 1

Material of Construction: Carbon Steel



REV	DESCRIPTION	DATE	BY
	REVISION HISTORY		

THIS DRAWING AND ALL INFORMATION IS THE PROPERTY OF

PENN VALLEY PUMP CO., INC.
998 EASTON ROAD – WARRINGTON, PA 18976
PHONE: (215) 343–8750 FAX: (215) 343–8753

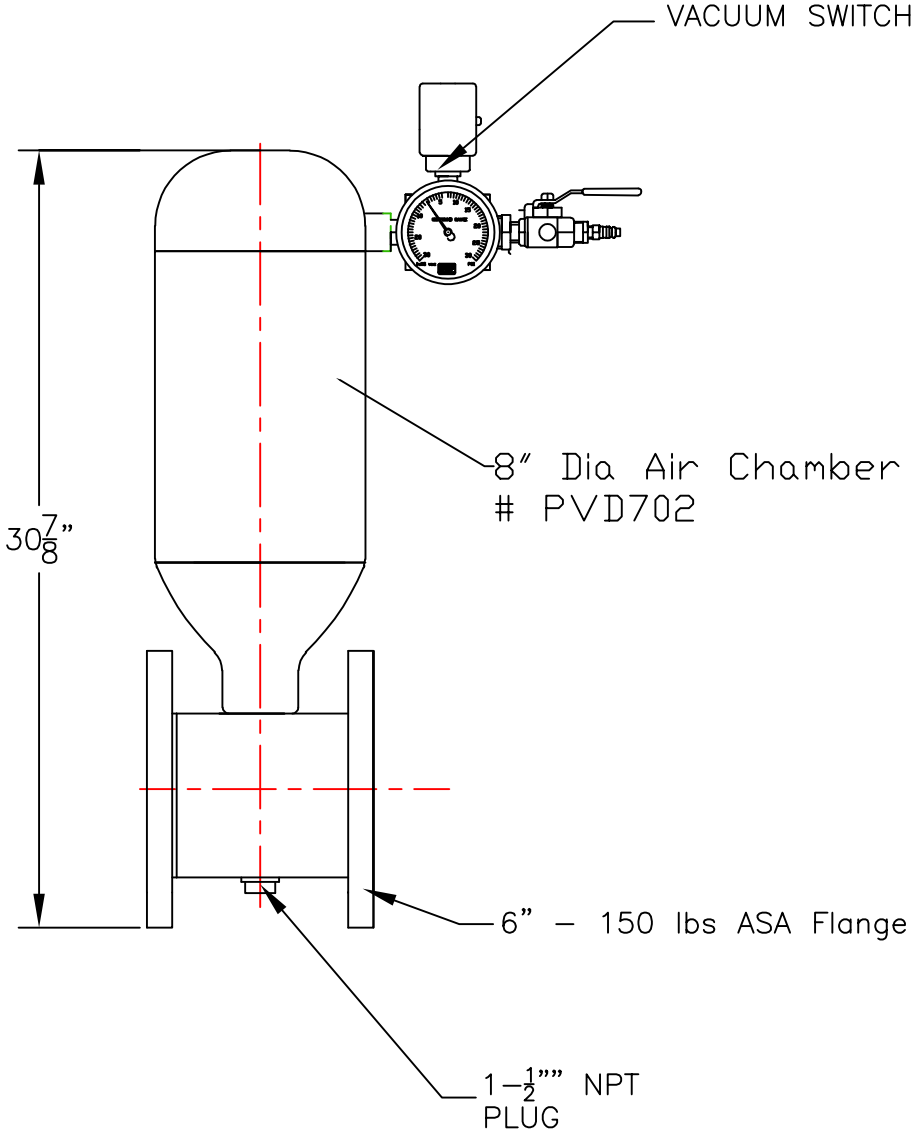
CUSTOMER:
LOCATION:

PROJECT: **6 inch Discharge Dampener for use with Model 6” Penn Valley Pump**

SCALE 1/8”=1”(A)
DATE 01/23/04
DR. BY S LEWANDOWSKI
PLOT DATE

DRAWING NO. PVD701
SHEET 1 of 1
REV. –

Material of Construction: Carbon Steel



THIS DRAWING AND ALL INFORMATION IS THE PROPERTY OF

PENN VALLEY PUMP CO., INC.
998 EASTON ROAD – WARRINGTON, PA 18976
PHONE: (215) 343-8750 FAX: (215) 343-8753

CUSTOMER:
LOCATION:

PROJECT: 6 inch Air Chamber w/ Purge Arrangement for use with Model 6" Penn Valley Pump

SCALE 1/8"=1"(A)
DATE 01/23/04
DR. BY S LEWANDOWSKI
PLOT DATE

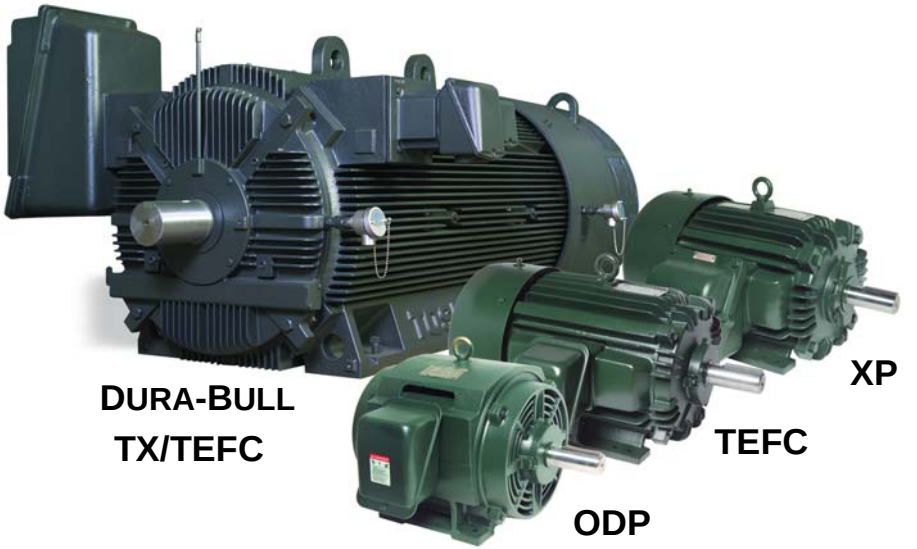
DRAWING NO. PVD702
SHEET 1 of 1
REV. –

REV	DESCRIPTION	DATE	BY

REVISION HISTORY

TOSHIBA
Leading Innovation

August, 2015



Low Voltage 50 and 60 Hz Motor
Installation and Maintenance Manual

DN: 195-0014
Rev. 003

TOSHIBA

Leading Innovation

Low-Voltage Motor Instruction Manual

Installation and Maintenance for Polyphase 50 and 60 Hz AC Motors

Frame Size

- Frames 143 through 5810 Open Drip Proof (ODP)
- Frames 56 through 5811 Totally Enclosed Fan Cooled (TEFC)
- Frames 143 through 449 Expolsion Proof (XP)
- Frames 56 through 5811 Totally Enclosed Air-Over (TEAO)
- Frames 56 through 449 Totally Enclosed Non-Ventilated (TENV)
- Frames 143 through 5811 Totally Enclosed Blower Cooled (TEBC)

⚠ WARNING

- To reduce the risk of fire or explosion, do not install Division 2 motors in areas where the operating temperature code (shown on the motor nameplate or Division 2 label) exceeds the ignition temperature of the hazardous environment.
- Do not attempt to install, operate, maintain or dispose of this equipment until you have read and understood all the product safety information and directions that are contained in this manual.
- Do not disable or bypass any safety guards or protective devices.
- Avoid touching the hot surfaces of the electric motor without wearing proper protection.
- Keep the terminal box cover in place and secured while the motor circuits are powered.
- Two people are required to lift a 140 frame motor.
- Hearing protection is required around noise levels exceeding 80 dBA.
- Protection for overloads, peak starting currents, short circuit current, and ground fault currents, should be in strict accordance with the National Electrical Code (latest release) Article 430, local electrical codes, and building codes.
- Proper circuit protection is required to prevent automatic reset devices from automatically restarting the motor.
- Only qualified personnel are to perform maintenance in an effort to prevent equipment failure or damage.

Notes

- Each Toshiba International Corporation (TIC) electric motor is thoroughly tested at the factory and carefully packaged for standard shipping. Confirm the overall packaging condition upon receipt.
- The equivalent lead wire markings per NEMA(IEC) are: TI(U1), T2(V1), T3(W1), T4(U2), T5(V2), T6(W2), T7(U5), T8(V5), T9(W5), T10(U6) T11(V6), T12(W6).
- All dimensions are in inches. Multiply inch value by 25.4 to convert to millimeters (mm).
- Any motor operated using an Adjustable Speed Drive is subject to potential premature bearing failures due to the increased shaft currents caused by common mode voltages inherent with operation on a sinusoidal power source. TIC recommends insulating both bearings on frame sizes 444 and larger. Smaller motors are at risk as well and should be considered after review of the application and installation. The user is responsible for protecting the couplings and driven

equipment from shaft currents from the motor. Insulated couplings are recommended. Shaft grounding devices provide additional protection, but cannot be used in hazardous areas because of electrical arcing.

- Contact TIC for a complete copy of the TIC **Standard Motor Warranties HBB0001** policy.
- Match the nameplate rating of the motor, connection diagram, and lead numbers with the appropriate category for the applicable connection requirement. TIC special built or special rated motors may follow different connections. If more information is required, contact TIC with the nameplate Model Number and Serial Number of the motor for connection information.
- EQP GLOBAL motors in frames 143T – 184T and all other TIC motors rated 0.5 HP – 5 HP are Wye-connected motors. All other standard size TIC motors are Delta-connected.
- TIC standard motors are built to F-1 assembly specifications. The motor uses the standard connection configuration and, while facing the non-drive end of the motor, the standard rotation is counter-clockwise (CCW).
- For references to the National Electrical Code (NEC) see the latest release of the NEC.
- All products and company names in this document are trademarks or registered trademarks of the respective owners and are used for identification purposes.

Storage

If the equipment is not put into immediate use, it should be stored indoors in an area that is clean and dry. Care should be taken to keep the equipment covered when moving from a cold location to a warm location, otherwise condensation may occur. If condensation does occur, allow the motor to dry thoroughly before applying power. Using a megohmmeter, test the insulation resistance of the windings before applying power. A minimum of 10 megohms is recommended.

For long-term storage or when indoor storage is not available, the motor must be covered with plastic or weather-proof tarp. Cover the motor completely. To ward off the formation of condensation, do not wrap the motor tightly. This will allow for adequate ventilation. Precautions must also be taken to protect the motor from flooding or being exposed to harmful chemical vapors.

Ensure that any unpainted sections are covered. Retouch any scratched or flaked areas.

If condensate plugs or drain plugs are used, ensure that they are functional.

Whether indoors or outdoors, the area should be free from vibration. Excessive vibration can cause bearing damage. Any motor which must be stored in an area that is exposed to vibration must have the shaft locked to prevent any movement.

If the motor is equipped with space heaters, ensure that the space heaters are properly connected and functional. The motor interior temperature should be maintained approximately 5.6° C (10° F) degrees above ambient.

A systematic inspection and maintenance schedule should be established. If the motor is to be stored for 6 months or longer, it should, in addition to the minor precautions above, have the insulation resistance of the windings tested every 3 to 6 months. A minimum of 10 megohms is recommended. A record of insulation values, temperature, time, humidity, and length of voltage application should be recorded to show winding conditions prior to start up.

If windings are designed for outdoor operation, they will not be affected by extreme or sudden temperature changes, or inclement weather in general. However, a weather proof cover with provisions for adequate ventilation should be used to guard against intrusion of salt, dust, or other abrasive or corrosive material.

It is recommended that the rotor be turned every month to redistribute the lubricant in the bearings. Oil or grease should be added every 6 months.

— READ THE FOLLOWING CAREFULLY BEFORE INSTALLING OR STARTING MOTOR —

Receiving

1. Ensure that the nameplate data is consistent with the order specifications.
2. Check whether any damage has occurred during transportation. Typically, motors are shipped FCA TIC factory. Freight Claims must be submitted by the consignee to the carrier.

3. Remove the bearing lock plate before start up (if used). Save the plate for reuse if subsequent shipping is required.

   Note: *If unable to reinstall the bearing lock plate, use wooden wedges to block the shaft to prevent any movement during shipping.*

4. Turn the shaft by hand to ensure that it turns freely.

Location

1. The motor should be installed in an area of unrestricted ventilation. Ensure that there are no limits or obstructions imposed on the operation of the motor.
2. Drip Proof motors are designed for indoor installations in a well ventilated area where the atmosphere is reasonably free of dirt, moisture, and corrosion. Contact TIC for any required modifications.
3. Totally enclosed motors may be installed where dirt, moisture (not running water), and corrosion are present. Outdoor applications are acceptable, subject to the environment. Contact TIC for any required modifications.
4. Explosion Proof motors are designed and built for hazardous locations. Listed by U L for Class 1, Group D; and Class II, Groups E, F and G; temp code T3B (165C); Division 1. Also listed by C.S.A.

Mounting

1. Mount the motor securely on a firm and flat base. All ball and roller bearing normal thrust motors through frame 447 are mechanically capable of being mounted in any position. Consult with TIC for frames larger than 447. Special drains, seals, or support construction may be required on all sizes, subject to the environment.
2. Align the motor accurately, using a flexible coupling if possible. For drive recommendations, consult with the drive manufacturer, equipment manufacturer, or TIC Customer Support Center. See additional information in the section titled Alignment Procedure on pg. 5. Ball bearings are recommended for direct coupled applications. Roller bearings may be used with flexible couplings — ensure proper alignment. Rigid couplings require extra allowance for thermal shaft growth toward the coupling. Skidding noise may result from the combination of internal bearing clearances and alignment tolerances. **DO NOT RUN A ROLLER BEARING WITHOUT A LOAD CONNECTED**.
3. V-belt Sheave Pitch Diameters should not be less than the values listed in Table 1 on page 4 (NEMA recommended values), or calculated from the formula for frames above 445T.
4. Tighten belts enough to prevent slippage **only**. Belt speed should not exceed 6500 ft. per minute, or consult belt/sheave supplier.
5. Motors must not be subjected to vibration exceeding 0.5 G force. Motors are not to be mounted to shaker screens or vibrating equipment that exceeds 0.5 G force on the motor. Complete isolation is required.

Power Supply & Connections

1. Nameplate voltage and frequency should be consistent with the power supply. The motor will operate satisfactorily on line voltages within 10% of the nameplate value. The frequency shall be within 5% of the nameplate value. The combined variation shall not exceed 10%. A motor that is rated for 230 volts can be operated on 208-volt network systems per the nameplated amps, but with slightly modified performance characteristics.
2. Dual voltage and single voltage motors can be connected for the desired voltage by following the connection diagram shown on the nameplate. Alternate starting connections are shown in the conduit box or see the connection diagrams on pg. 8 and pg. 9.
3. Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent an excessive external surface temperature of the motor in accordance with UL standards. The **P1** and **P2** terminals of the thermal protectors should be connected to the motor control equipment. These are bimetal thermostats that are used for the primary thermal protection. Optional auxiliary thermistors embedded in the winding can only be used as secondary devices for thermal protection. The leads will be labeled **TP1** and **TP2** for thermistors. All supplementary device leads will be extended through the main terminal box.
4. Wiring of the motor and control, overload protection, and grounding should be in accordance with the National Electrical Code and local building codes. Explosion Proof motors have the internal terminal grounding connection inside of the main terminal box which must be used for the equipment grounding connection. An optional external grounding terminal on the feet is for a supplemental bonding connection, where local codes permit or require such a connection.
5. Lock out/Tag out and disconnect the motor from the power supply before opening the conduit box or performing any maintenance or repair on the motor.

6. Using a megohmmeter, test the insulation resistance of the motor before energizing. A minimum of 10 megohms is recommended.

Table 1. V-Belt Sheave Pitch Diameters (MG 1-14.42).

Frame Number	Horse Power at Synchronous Speed RPM			V-Belt Sheave (Inches)			
				Conventional A, B, C, D, and E		Narrow 3V, 5V, and 8V	
	3600	1800	1200	Min. Pitch Diameter	*Max. Width	Min. Pitch Diameter	**Max. Width
143T	1.5	1.0	0.75	2.2	4.250	2.2	2.250
145T	2 – 3	1.5 – 2	1.0	2.4	4.250	2.4	2.250
182T	3.0	3.0	1.5	2.4	5.250	2.4	2.750
	5.0	—	—	2.6			2.750
184T	—	—	2.0	2.4	5.250	2.4	2.750
	5.0	—	—	2.6			
	7.5	5.0	—	3.0		3.0	
213T	7.5 – 10	7.5	3.0	3.0	6.500	3.0	3.750
215T	10	—	5.0	3.0	6.500	3.0	3.750
	15	10	—	3.8		3.8	
254T	15	—	7.5	3.8	7.750	3.8	4.000
	20	15	—	4.4		4.4	
256T	20 – 25	—	10	4.4	7.750	4.4	4.000
	—	20	—	4.6			
284T	—	—	15	4.6	9.000	4.4	4.250
	—	25	—	5.0			
286T	—	30	20	5.4	9.000	5.2	4.250
324T	—	40	25	6.0	10.250	6.0	5.250
326T	—	50	30	6.8	10.250	6.8	5.250
364T	—	—	40	6.8	11.500	6.8	5.250
	—	60	—	7.4		7.4	5.250
365T	—	—	50	8.2	11.500	8.2	5.500
	—	75	—	9.0		8.6	
404T	—	—	60	9.0	14.250	8.0	7.250
	—	100	—	10.0		8.6	
405T	—	—	75	10.0	14.250	10.0	7.250
	—	100	—			8.6	
	—	125	—	11.5		10.5	
444T	—	—	100	11.0	16.750	10.0	8.500
	—	125	—			9.5	
	—	150	—	—	—	10.5	
445T	—	—	125	12.5	16.750	12.0	8.500
	—	150	—	—	—	10.5	
	—	200	—	—	—	13.2	

*Maximum sheave width - 2 (N-W)-¼". **Maximum sheave width = N-W.

Sheave ratios greater than 8:1, or with a center-to-center distance less than the diameter of the large sheave, should be referred to TIC. Sheaves must be mounted close to the shaft shoulder.

For motors above 445T frame with narrow V-belts:

Sheave Diameter (inches) = $25\ (H/N_R)^{1/3}$

Where:

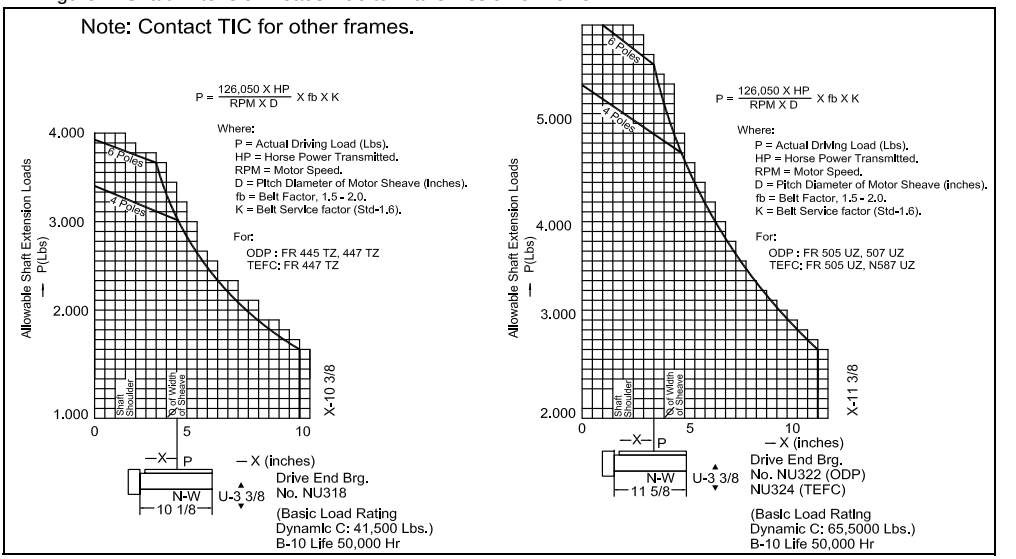
H = Rated motor HP

N_R = Rated motor speed in RPM

Maximum sheave width = N-W of shaft. Contact TIC for other sizes.

Belt Speed (Ft/min) = (Shaft RPM x 3.14 x Sheave Diameter)/12.

Figure 1. Shaft Extension Loads Due to Transmission of Power.



Alignment Procedure

Motor Leveling & Coupling Alignment

When the base has been adjusted, leveled, and grouted, the correct motor leveling and coupling alignment are obtained with the aid of shims between the motor and the base. To give the motor proper support, it is important that the base and shims combine to create a level and stable platform.

Rigid Coupling

Shaft Alignment

Extreme care must be taken to obtain correct shaft alignment when using rigid couplings. Circular concentric peripheral surfaces of the two coupling halves must indicate correct alignment to within 0.0005 inches to 0.001 inches when the two coupling halves are rotated together. The separation between the faces of the two coupling halves must also be maintained within the same tolerance.

The alignment may be checked by utilizing a dial indicator, or with the aid of a straight-edge and thickness gauge or feelers as shown on pg. 7.

The preferred method of checking alignment is with the dial indicator. Bolt the indicator to one of the coupling halves and indicate the position of the dial button on the opposite coupling half with a chalk mark. Set the indicator dial to zero at the first position and then rotate both halves of the coupling to a new position where a reading is to be made. All readings must be made with the dial button located at the chalk mark. At least six readings are to be taken.

A variation in the dial reading at different positions of coupling rotation will indicate whether the machine has to be raised, lowered, or moved to one side or another to obtain alignment of the circular concentric peripheral surfaces of the two coupling halves within the specified tolerance.

Coupling Faces

In addition to the above check, a check of the separation of the coupling faces must be made to establish correct alignment. The separation between the faces of the coupling may be checked with a dial indicator fastened to one coupling half and a

reference surface fastened to the other coupling half. Mark the location of the dial button on the reference surface and make all readings with the indicator in this position.

Set the dial of the indicator to zero for the first reading and use this as the reference. Be sure to rotate both halves of the coupling the same amount, aligning the bottom of the indicator and the mark on the reference surface for each of six readings. A variation of the readings at different positions will indicate how the machine has to be adjusted to obtain correct alignment. After each adjustment of the motor, repeat the above procedure to ensure that the correct alignment and leveling have been obtained.

Flexible Coupling

Units coupled through flexible couplings should be aligned as accurately as possible. The two halves should indicate correct alignment to within 0.002 inches on both the circular concentric peripheral surfaces and the separation between faces. Although most flexible couplings will withstand greater misalignment than rigid couplings, extreme misalignment can cause vibration possibly resulting in failure of motor bearings and/or shaft.

If the method shown in Figure 2 on pg. 7 is used to check alignment of the machines, correct alignment exists when:

- The peripheries of the coupling halves are true circles of the same diameter and if the faces are flat.
- The separation between the faces is held to within the specified tolerance at all points and a straight-edge lies squarely across the rims at any point.

Non-parallel faces will be indicated by a variation in separation of the coupling halves as they are rotated, and a difference in height of the coupling halves will be indicated by the straight-edge and feeler gauge test.

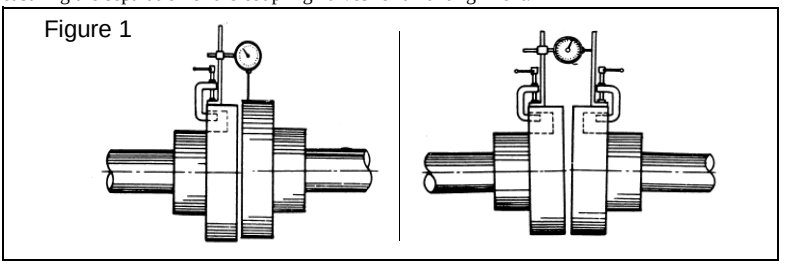
When the coupling halves have been correctly aligned with the motor feet bolted in position, place temporary bolts in two coupling holes for clamping the halves together. Then, ream for a light drive fit through both halves for regular coupling bolts.

The preferred method of measuring coupling alignment is with a dial indicator as shown in Figure 1.

Clamp the dial indicator to the coupling as indicated below to measure the circular concentric peripheral surfaces of the coupling halves for parallel alignment.

Also, as shown in Figure 1, clamping a reference surface to the opposite coupling half allows the dial indicator to be used for measuring the separation of the coupling halves for axial alignment.

Figure 1



Balance (Direct Coupled Units)

TIC motors are balanced at the factory to standard NEMA commercial tolerances. However, if direct coupling units have been disassembled in the field and are not reassembled with the shafts in the same position as they were originally, an unbalanced condition may occur.

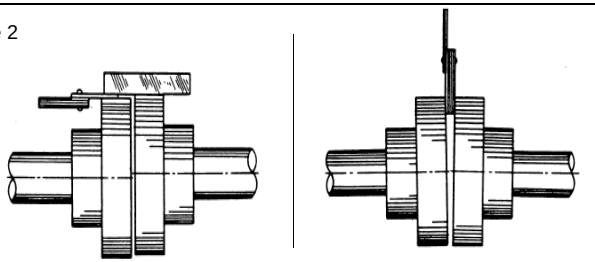
To correct this condition, disconnect the coupling halves and rotate one shaft 90° with respect to the other shaft. Re-connect the coupling and run the motor. If not corrected, repeat the procedure until normal operation resumes.

The straight-edge or thickness gauge or feeler gauge is an alternative method of measuring coupling adjustment as shown in Figure 2 on pg. 7.

Use a straight-edge and thickness gauge of feeler gauge to check the alignment of the circular concentric peripheral surfaces of the coupling halves as shown below. The separation between the faces of the coupling halves can be measured as shown.

Rigid Coupling Tolerances 0.0005 inch to 0.001 inch. Flexible Coupling Tolerance: 0.002 inch.

Figure 2



Warnings

⚠ WARNING

BEFORE STARTING MOTOR, REMOVE ALL UNUSED SHAFT KEYS AND LOOSE ROTATING PARTS TO PREVENT THEM FROM FLYING OFF.

CAUTION: CHECK DIRECTION OF MOTOR ROTATION BEFORE COUPLING MOTOR TO LOAD. TO REVERSE THE MOTOR ROTATION, REVERSE ANY TWO OF THE THREE LEADS TO THE POWER PHASES. IF THE MOTOR IS NOT BI-DIRECTIONAL, CONFIRM THE CONNECTION DIAGRAM AND ROTATION ARROW, OR CONTACT TIC.

⚠ WARNING

ROTATING PARTS, SUCH AS COUPLINGS, PULLEYS, EXTERNAL FANS, AND UNUSED SHAFT EXTENSIONS, SHOULD BE PERMANENTLY GUARDED AGAINST ACCIDENTAL CONTACT WITH HANDS OR CLOTHING. THIS IS PARTICULARLY IMPORTANT WHERE THE PARTS HAVE SURFACE IRREGULARITIES SUCH AS KEYS, KEYWAYS OR SET SCREWS.

⚠ WARNING

WHEN A LIFTING MEANS IS PROVIDED FOR HANDLING THE MOTOR OR GENERATOR, IT SHOULD NOT BE USED TO LIFT THE MOTOR OR GENERATOR PLUS ADDITIONAL EQUIPMENT SUCH AS GEARS, PUMPS, COMPRESSORS, OR OTHER DRIVEN EQUIPMENT.

⚠ WARNING

THE FRAMES AND OTHER METAL EXTERIORS OF MOTORS AND GENERATORS (EXCEPT FOR INSULATED PEDESTAL BEARINGS) USUALLY SHOULD BE GROUNDED TO LIMIT THEIR POTENTIAL TO GROUND IN THE EVENT OF ACCIDENTAL CONNECTION OR CONTACT BETWEEN LIVE ELECTRICAL PARTS AND THE METAL EXTERIORS.

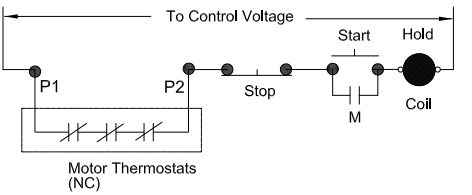
⚠ WARNING

WHEN CAREFUL CONSIDERATION OF THE HAZARDS INVOLVED IN A PARTICULAR APPLICATION INDICATE THE MACHINE FRAMES SHOULD NOT BE GROUNDED OR WHEN UNUSUAL OPERATING CONDITIONS DICTATE THAT A GROUNDED FRAME CANNOT BE USED, THE INSTALLER SHOULD MAKE SURE THAT THE MACHINE IS PERMANENTLY AND EFFECTIVELY INSULATED FROM GROUND. IN THOSE INSTALLATIONS WHERE THE MACHINE FRAME IS INSULATED FROM GROUND, IT IS RECOMMENDED THAT APPROPRIATE WARNING LABELS OR SIGNS BE PLACED ON THE EQUIPMENT OR IN THE AREA OF THE EQUIPMENT BY THE INSTALLER.

⚠ WARNING FOR EXPLOSION-PROOF MOTOR

Disconnect power before working on motor-driven equipment. This motor is equipped with an automatic temperature-limiting device. The National Electrical Code and Underwriter's Laboratories require connection of leads P1 and P2 into the control circuit of a manual reset starter per the following diagram.

Klixon Type	AC Volt	Volt Amp Rating
9700K	120-600 Volt	720 VA



Note: *Frames 256T and smaller have two thermostats.*

Figure 3. Typical Connection Diagrams.

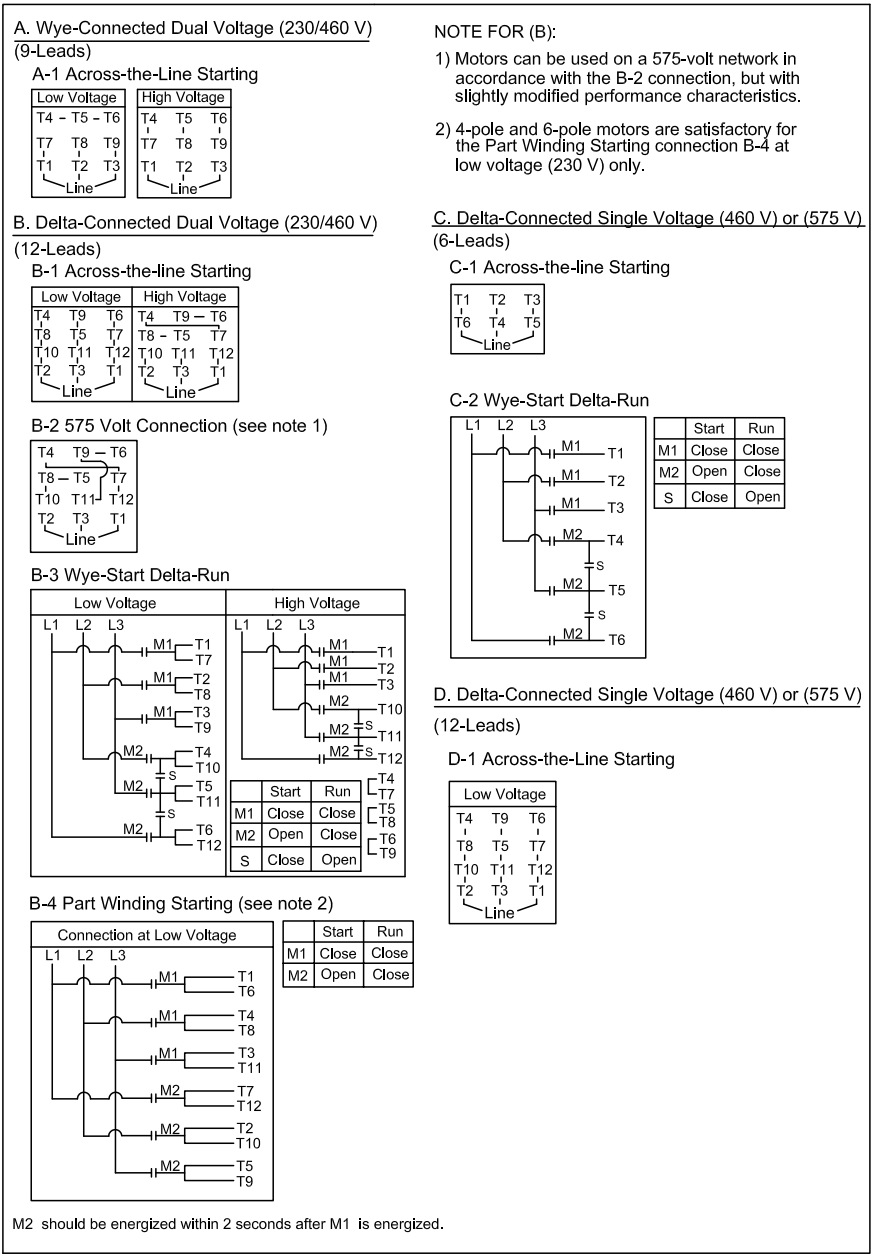
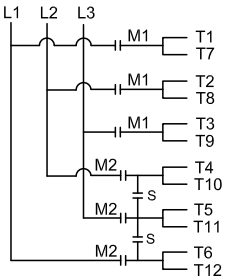


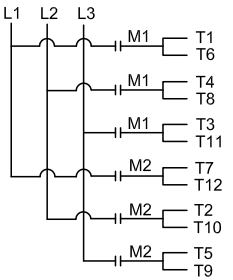
Figure 4. Typical Connection Diagrams (Cont.)

D-2 Wye-Start Delta-Run



	Start	Run
M1	Close	Close
M2	Open	Close
S	Close	Open

D-3 Part Winding Starting (4-Pole and 6-Pole Motors)

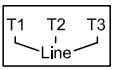


	Start	Run
M1	Close	Close
M2	Open	Close

M2 should be energized within seconds after M1 is energized.

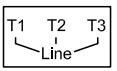
E. Wye-Connected (460 V) or (575 V)
(3-Leads)

E-1 Across-the-Line Starting



F. Delta-Connected (460 V) or (575 V)

F1 Across-the-Line Starting



NOTE

Frames N449T-5811UZ will have 3 leads with multiple cables in each lead numbered the same in each respective lead cable.

Maintenance

Inspection

Inspect motor at regular intervals. Keep the motor clean and the vent openings unobstructed.

Lubrication

Frames 143T – 256T are furnished with double sealed or shielded ball bearings that are lubricated with lithium-based grease prior to installation. Grease fittings are not supplied and bearings are designed for average 100,000 hours operation under standard conditions (see Table 2).

Frames 284T – 5811UZ are furnished with double shielded, open ball, or roller bearings. Depending on HP size and/or the operating speed, it may be necessary to relubricate anti-friction bearings periodically (see Table 2).

These motors are supplied with provisions for greasing and have been lubricated prior to shipping. However, before start up, it is recommended that approximately 30 grams (1 oz.) of grease be applied because of possible settling of grease during storage. Any oil leakage around bearing caps indicate overpacking — excess grease should be purged by operating motor temporarily with relief open.

Table 2. Relubrication Frequency.

Sync. RPM Range	Frame Range	Type Of Service	
		Standard Duty	Severe Duty
3600	143T - 256T	5 Years	3 Years
	284TS - 286TS	12 Mos.	4 Mos.
	324TS - N5811USS	9 Mos.	3 Mos.
1800	143T - 256T	7 Years	3 Years
	284T - 326T	4 Years	1.5 Years
	364T - 365T	2.5 Years	10 Mos.
	404T - 447TZ	2 Years	8 Mos.
	505US - N5811UZ	1.5 Years	6 Mos.
1200 and Slower	143T - 256T	7 Years	3 Years
	284T - 326T	4 Years	1.5 Years
	364T - 447TZ	3 Years	1 Year
	505US - N5811UZ	2 Years	8 Mos.

Note: Typical schedule provided. See nameplate for actual schedule and type of grease, if applicable.

Service Conditions	
Standard Duty	Eight hours per day, light to normal loading, clean condition free of dust.
Severe Duty	Twenty-four hours per day, or light to normal shock loading vibration, exposure to dirt or dusty conditions.
Very Severe Duty	For very severe conditions where the motor is subject to high vibration or heavy shock loading and vibration use 1/3 of the value shown in the severe duty table

Instructions for Lubricating

Toshiba motors (284T – 5811UZ) are furnished with grease fittings. Before greasing, be sure fittings are clean and free of dirt.

Remove the grease relief plug or plate and, using a low pressure grease gun, pump in the required grease amount. Do not over grease. Relubrication intervals are specified in Table 2. After relubricating, allow the motor to run for 10 minutes before replacing relief hardware. All EQP 841 motors have grease fittings. See the **Motor Relubrication** document **#MDS-O-0001** for details on both standard horizontal and vertical motor bearings.

Recommended Greases for Standard Applications

Unless otherwise specified by the grease nameplate of the motor, use the following greases for the listed temperature range. The TIC standard, 840, and 841 motors are greased at the factory with the polyurea base Mobil Polyrex® EM grease.

Operating Ambient Temp. -30° C – 50° C.	
Chevron® SRI	Chevron Corp.
Mobil Unirex® N 2	Exxon Mobil Corp.
Mobil Polyrex® EM	Exxon Mobil Corp.
Shell Dolium® R	Shell Oil Co.
Mobilith SHC® 100	Exxon Mobil Corp.

Recommended Greases for Special Applications

The following greases are recommended for special applications only and should be used only for motors specifically built for such conditions.

Minimum Ambient Temperature -60° C	
Beacon™ 325	Exxon Mobil Corp.
Maximum Ambient Temperature 90° C	
Dow Corning® 44	Dow Corning Corp.
Mobil Unirex® S 2	Exxon Mobil Corp.
Triton® 460	ConocoPhillips Co.
Mobilith SHC® 460	Exxon Mobil Corp.

⚠ **WARNING**: In general it is not recommended to mix greases of different brands. The mixing of different types of thickeners may destroy the composition and physical properties of the grease. In the event that a different grease is required by the end user, the following steps can be taken. Using the instructions for lubrication, open grease outlet and purge the system as much as possible of the old or unwanted grease. Repeat this same operation after 1 week of service. Consult Toshiba Customer Support Center for further recommendations on grease compatibility.

WARRANTY

Toshiba International Corporation (TIC) warrants that the received Goods will be free of defects in materials and workmanship.

This warranty expires eighteen (18) months after the date that the Goods are received by the Purchaser or twelve (12) months after the Goods are placed into operation, whichever occurs first. Neither shall exceed 18 months from the date of receipt of the Goods.

Goods that are received in an unacceptable condition shall, at the sole discretion of TIC, be repaired, replaced, updated, or have the purchase price refunded.

To file a claim, the Purchaser must (1) promptly notify TIC in writing of the nonconformity, (2) furnish TIC satisfactory proof of the nonconformance, and (3) if requested by TIC, return the nonconforming equipment or part to TIC and pay all expenses incurred in connection with such return.

The repaired/replaced item, part, or software, shall be delivered, free of charge, to the Purchaser, FCA TIC designated facility or at TIC's option, FCA TIC-authorized service shop (INCOTERMS 2010). Purchaser shall pay all costs following such delivery, including, without limitation, all handling, transportation, assembly, installation, insurance, testing, and inspection charges.

The warranty excludes (1) normal wear and tear; (2) Goods that have not been properly stored, assembled, installed, serviced, maintained, operated, or used within the limits of rated capacity and normal usage; (3) Goods not used in accordance with current operating and maintenance instructions furnished by TIC, and (4) Goods that have been altered or modified in any manner without the written consent of TIC.

THE FOREGOING OBLIGATION TO REPAIR, REPLACE, OR REFUND THE PURCHASE PRICE PAID FOR THE GOODS SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER, ITS CUSTOMERS AND USERS OF THE GOODS FOR THE NONCONFORMANCE OF THE RECEIVED GOODS.

TIC SHALL HAVE NO OBLIGATION TO DISASSEMBLE ANY NONCONFORMING GOODS OR TO INSTALL ANY REPAIRED OR REPLACEMENT PART, EQUIPMENT OR SOFTWARE OR TO PAY ANY COSTS INCURRD IN CONNECTION WITH SUCH DISASSEMBLY OR INSTALLATION.

THERE ARE NO OTHER WARRANTIES AND TIC HEREBY EXPRESSLY DISCLAIMS ALL OTHER EXPRESS, STATUTORY, AND IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

RENEWAL PARTS

1. Use only genuine Toshiba renewal parts.
2. When ordering, specify complete motor information. Model Number and Serial Number are a minimum requirement. Specify quantity and describe part.
3. For information and service contact the Toshiba Customer Support Center.

⚠ WARNING

Explosion-Proof Motors are constructed to comply with the UL Label Service Procedure Manual. Repair of **Explosion-Proof Motors** must be made by the manufacturer or UL-listed service center to maintain the UL listing.

Customer Support

The TIC Customer Support Center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday.

The toll free number is US (800) 231-1412/(713) 466-0277 — Fax (713) 466-8773.

For after-hours support follow the directions in the outgoing message when calling.

You may also contact Toshiba International Corporation by writing to:

Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041-9990
Attn: Motors.

For further information on Toshiba International Corporation's products and services, please visit our website at www.toshiba.com/TIC.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

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FIRST-CLASS MAIL PERMIT NO. 3142 HOUSTON, TX

POSTAGE WILL BE PAID BY ADDRESSEE

ATTN PRODUCT REGISTRATION
TOSHIBA INTERNATIONAL CORPORATION
13131 W LITTLE YORK ROAD
HOUSTON TX 77041-9988

TOSHIBA PRODUCT WARRANTY REGISTRATION

Thank you for purchasing a Toshiba International Corporation product. This Product Warranty Registration form documents your Toshiba product's current warranty. Your completed registration form can be submitted electronically or by mail. To submit the Product Warranty Registration form electronically, please complete this form online at http://www.toshiba.com/ind/warranty.

All items marked with an asterisk (*) are required.

SECTION I • Company Information

*Company Name: _____

*First Name: _____ *Last Name: _____

*Title: _____

*Address: _____

*City: _____ *State: _____ *ZIP Code: _____

*Country: _____

*Work Phone Number: ( ) _____

*Email Address: _____

Company Website: _____

SECTION II • Product Information

*Product: ☐ Drive ☐ Motor ☐ UPS ☐ Other: _____

*Model Number: _____

*Serial Number: _____

*Date of Installation: _____

*Company Purchased From: _____

City: _____ State: _____ ZIP Code: _____

Country: _____

Authorized Start-Up Agent Certificate Number: _____

Section III • Additional Information

If you would like to receive additional information about your recently purchased Toshiba product and/or information on additional Toshiba Industrial products and services, please complete the following sections.

- Additional Information on Product Offerings:

☐ Product Repair Training
☐ Product Application Training
☐ Extended Warranty Options
☐ Maintenance Agreements

- Additional Information on Toshiba Industrial Products:

☐ Motors
☐ Motor Starters
☐ Drives
☐ Solid State Starters
☐ Instrumentation
☐ Programmable Logic Controllers
☐ Uninterruptible Power Systems
☐ Contactors
☐ Other: _____

P/N 44668-001

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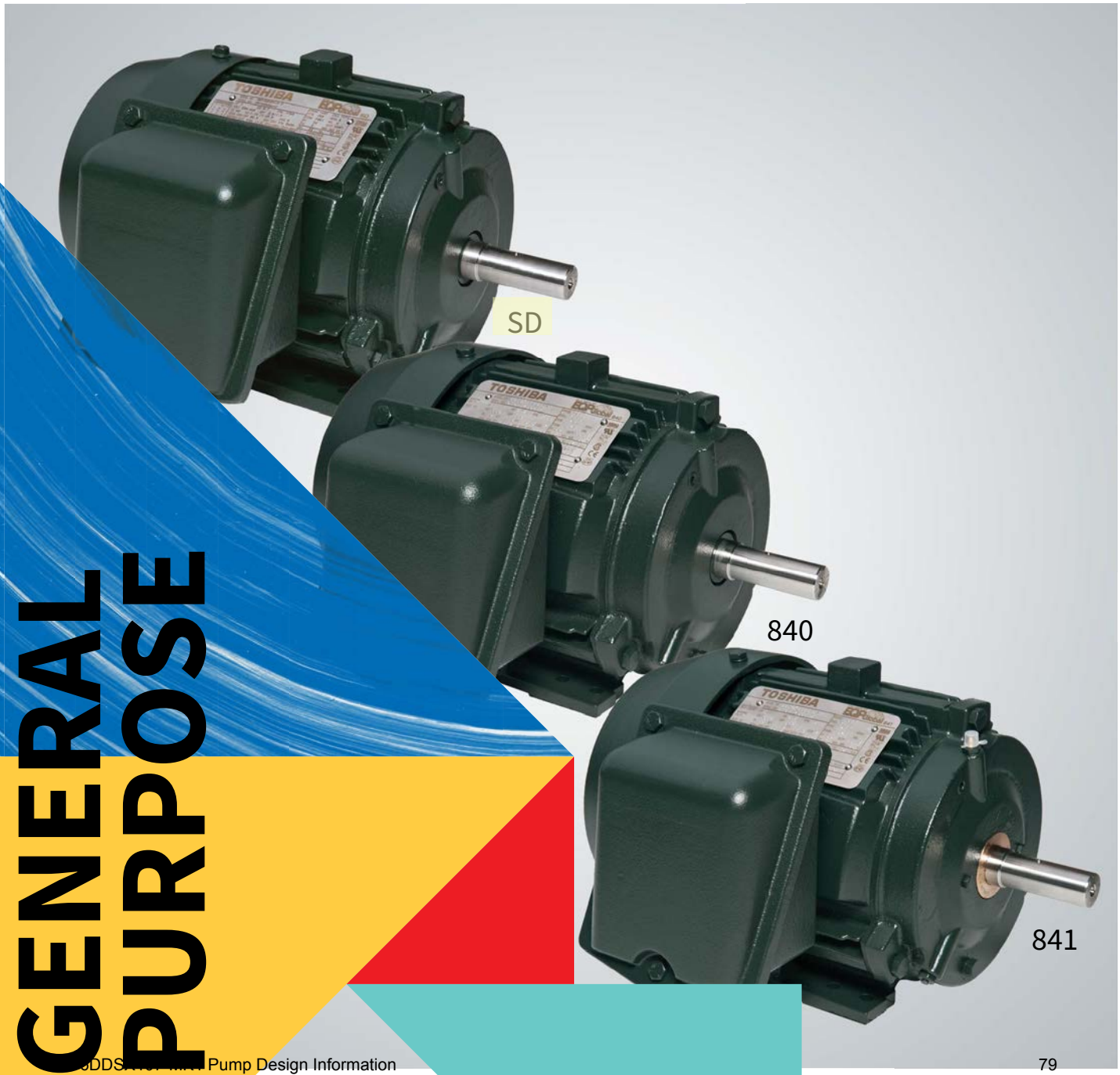
TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

LOW VOLTAGE MOTORS

EQP Global® Motor Series



GENERAL PURPOSE

EFFICIENCY, QUALITY & PERFORMANCE - EQP

The EQP Global® motor series is Toshiba's flagship NEMA Premium® product designed for general purpose industrial applications. The series is engineered with high quality materials, providing superior performance and durability for the most severe conditions.

EQP Global SD

EQP Global 840

EQP Global 841

Oversized Bearings	The majority of motor failures are bearing-related. Toshiba uses over-sized, 300 series bearings on both the drive end and non-drive end. Oversized bearings allow the EQP Global series motors to last up to ten times longer than motors built with smaller bearings.
Low Vibration	The EQP Global series exceeds applicable NEMA® vibration limits, which preserves the mechanical integrity of the motor and bearings, extending the life of the motor.
Heavy Duty Construction	The EQP Global series has a robust cast iron design to increase stability and eliminate common mechanical failures. The durable construction includes increased ribbing in the end bells, maximum surface area at connection points, and deep bearing pockets.
Insulation with Wide Thermal Capability	By incorporating Class H insulation materials in its winding designs, the EQP Global series motors have increased thermal protection. Additionally, these motors operate with very low temperature rise at rated conditions, giving them a wide thermal margin and extended motor life. The life of the insulation doubles for every 10 degrees run below the insulation rating.
C-5 Rated Inter-Lamination Material	The EQP Global series uses C5-rated thermal materials on its stator and rotor laminations, that can withstand burnout temperatures over 1000°F. The C5-rated thermal materials provide increased thermal efficiencies and excellent rewind ability characteristics.
High Torque Output	The EQP Global series motors meet or exceed NEMA® Design B torque levels. High torque designs prevent motors from stalling under heavy loaded applications and help prevent electrical problems such as voltage sags.
Optimized for Adjustable Speed Drive (ASD) Use	When a motor is run on an ASD, its windings need to be able to withstand sharp voltage spikes coming from the ASD. These spikes can cause winding damage to under-protected motors. The EQP Global series motors have capability to withstand 2000 V in 0.1 µs spikes, protecting them against harm from ASDs causing other motors to fail.

GENERAL PURPOSE - EQP GLOBAL MOTOR SERIES COMPARISON

	EQP GLOBAL® SD	EQP GLOBAL® 840	EQP GLOBAL® 841	IEEE 841-2009
GENERAL				
Horsepower	0.5 - 800 HP	0.75 - 500 HP	0.75 - 400 HP	1 - 500 HP
Speed (60 Hz)	3600, 1800, 1200, or 900 RPM			
Speed (50 Hz)	3000, 1500, 1000, or 750 RPM		N/A	3000, 1500, 1000, or 750 RPM
Voltage (60 Hz)	230/460, 460, or 575 V		460 or 575 V	N/A
Voltage (50 Hz)	190/380 or 380 V		N/A	N/A
Frame Size	56 - 5811	143 - 5810	143 - 449	143 & Larger
Enclosure	TEFC	TEFC	TEFC	TEFC or TENV
Application Design	Severe Duty	Mill & Chemical	Petro Chemical	Petro Chemical
ELECTRICAL FEATURES				
Meets or Exceeds NEMA Premium® Efficiency	Yes*	Yes*	Yes*	Yes*
ASD Duty at 1.0 SF (Catalog Appendix C)	Yes	Yes	Yes	Yes
Class F Insulation (Class H Magnet Wire & Varnish)	Yes	Yes	Yes	Class F
Class B Rise at 1.0 SF	Yes	Yes	Yes	Yes
Lead Cable Rating	125°C	125°C: 143 - 365, 150°C: 404 & Larger	150°C	125°C
Red Insulation Spray for Moisture and Dirt Protection	No	Yes	Yes	No
Phase Paper Between All Phases	Yes	Yes	Yes	Yes
Low Loss Electrical Grade Core Steel (1000°F Burnout)	Yes	Yes	Yes	No
Dual Voltage 230/460V	56 - 445	No	No	No
3 Lead Single Voltage (Multiple Strands Leads 449 Frame & Larger)	No	Yes	Yes	Yes
6 or 12 Leads for Wye-Delta Starting	213 - 5010	No	No	No
MECHANICAL FEATURES				
FRAME				
ASTM Grade 25 Gray Cast Iron	Yes	Yes	Yes	Yes
Dual Mount Frame (Industrial Catalog Appendix B)	Yes	Yes	Yes	N/A
F-2 Assembly Modifiable	56 - S/B449, 5010 - 5011	143 - S/B449, 5010 - 5011	143 - S/B449	No
Forged Shouldered Eyebolt With Blind Hole	182 & Larger	182 & Larger	182 & Larger	182 & Larger
External Ground Provision	404 - S/B449	404 - S/B449	Yes	Yes
Drains, Lowest Point Of Frame	Yes	Yes	Yes	Yes
Plugged Drain Holes, Both Bearing Brackets	56 - S447	143 - S447	143 - S447	No
Stainless Steel T-Drain, Both Bearing Brackets	No	143 - S447	143 - S447	No
BEARINGS				
300 Series Bearings, DE & ODE	Yes	Yes	Yes	No
ABMA C3 Clearance	Yes	Yes	Yes	Yes
L-10 Bearing Life Exceeding 150,000 Hours (Direct Coupled)	Yes	Yes	Yes	50,000
L-10 Bearing Life Exceeding 40,000 Hours (Belt Drive)	Yes	Yes	Yes	26,280
L-10 Bearing Life Exceeding 50,000 Hours (Belt Drive)	No	Yes	Yes	26,280
Locked Bearings	No	284 & Up	Yes	Yes
Sealed Bearings (Lithium Grease)	56 - 256	143 - 256	No	No
Regreasable Bearings (Polyurea Grease)	284 & Larger	284 & Larger	Yes	Yes
Cast Iron Inner Bearing Cap, DE & ODE	404 & Larger	284 & Larger	Yes	Yes
Extended Grease Pipes, DE	284 & Larger	284 & Larger	284 & Larger	No
45°C Maximum Bearing Temperature at 1.0 SF (50°C for 2 Pole)	Yes	Yes	Yes	Yes

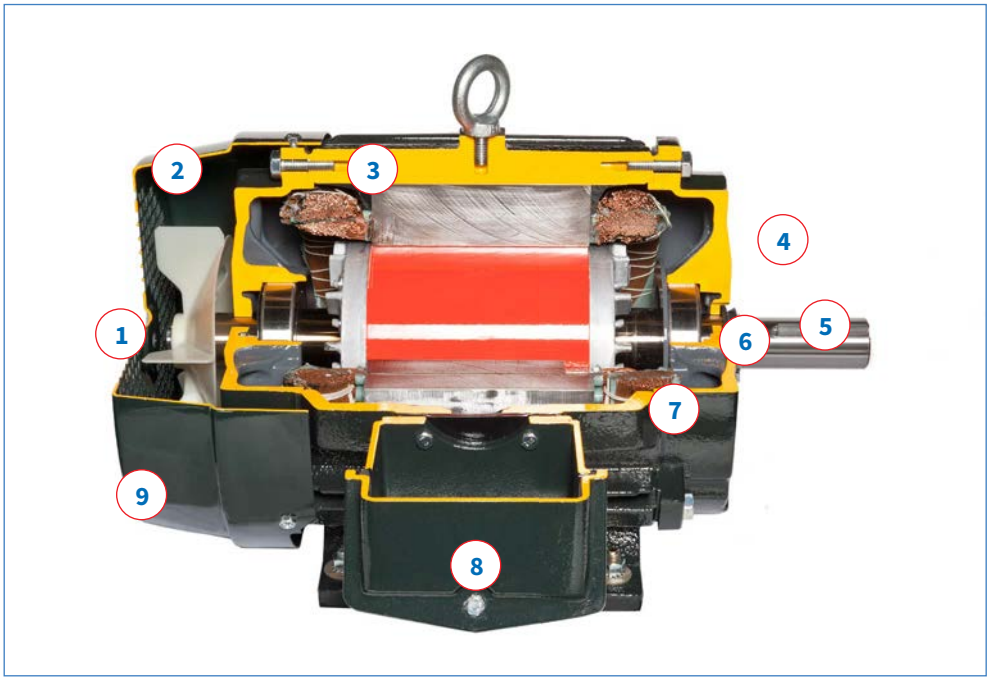
* NEMA Premium® Efficiency is defined 1 - 500 HP.
* Document based on Toshiba's most current design offering, and subject to change without notice.

GENERAL PURPOSE - EQP GLOBAL MOTOR SERIES COMPARISON

	EQP GLOBAL® SD	EQP GLOBAL® 840	EQP GLOBAL® 841	IEEE 841-2009
GENERAL				
Horsepower	0.5 - 800 HP	0.75 - 500 HP	0.75 - 400 HP	1 - 500 HP
Speed (60 Hz)	3600, 1800, 1200, or 900 RPM			
Speed (50 Hz)	3000, 1500, 1000, or 750 RPM		N/A	3000, 1500, 1000, or 750 RPM
Voltage (60 Hz)	230/460, 460, or 575 V		460 or 575 V	N/A
Voltage (50 Hz)	190/380 or 380 V		N/A	N/A
Frame Size	56 - 5811	143 - 5810	143 - 449	143 & Larger
Enclosure	TEFC	TEFC	TEFC	TEFC or TENV
Application Design	Severe Duty	Mill & Chemical	Petro Chemical	Petro Chemical
MECHANICAL FEATURES				
IP RATING				
Degree Of Protection	IP55	IP55: 143 - 286 / IP56: 324 & Larger	IP56	IP55
V-Ring Seal, DE	Yes	143 - 286	No	N/A
V-Ring & Umbrella Seal, DE & ODE	No	324 - 365	No	N/A
Labyrinth Seals, DE & ODE	No	404 & Larger	Yes	Yes
RTV Sealant (Brackets, Caps, T-Box Mounting Joints)	No	No	Yes	Yes
T-BOX				
Gasketed Diagonally Split Cast Iron Terminal Box with NPT Entry	Yes	Yes	Yes	Yes
Rotatable in 90° Increments	Yes	Yes	Yes	Yes
Neoprene Lead Seperator Between Motor Terminal Box and Frame with Permanent Marking for Lead Orientation	No	Yes	Yes	Yes
Grounding Provision	Yes	Yes	Yes	Yes
Terminal Box Volume Per IEEE 841-2009	No	Yes	Yes	Yes
Terminal Box Volume Per NEMA® Part 4	Yes	Yes	Yes	Yes
FAN				
Non-Sparking, Non-Corrosive Fan	Yes	Yes	Yes	Yes
Bi-directional Rotation	4 - 8 Pole & 2 Pole Up to 300 HP B449	4 - 8 Pole & 2 Pole Up to 300 HP B449	4 - 8 Pole & 2 Pole Up to 300 HP B449	No
Cast Iron Fan Cover	No	Yes	Yes	Yes
NAMEPLATE				
304 SS Nameplate	Yes	Yes	Yes	Yes
50 Hz Data	56 - S447	143 - S447	No	No
Class I, Division 2, Groups A, B, C, D	Yes	Yes	Yes	Yes
MISC. FEATURES				
ASTM Grade 5 Hardware with Rust Proof Coating	Yes	Yes	Yes	Yes
ASTM Grade 25 Gray Cast Iron Brackets	Yes	Yes	Yes	Yes
Shaft Runout 1/2 NEMA Standards	Yes	Yes	Yes	Yes
Lead Terminal Lugs	284 & Larger	213 & Larger	Yes	N/A
All Machined Internal Surfaces Protected with Rust Inhibitive Coating	No	Yes	Yes	Yes
Paint System Surpassing 96 Hour Salt Spray Test	Yes	Yes	Yes	Yes
TESTING				
Maximum Sound Power Level dBA, No Load	NEMA® Part 9	NEMA® Part 9	90	90
Motor Vibration Per IEEE 841-2009	No	Yes	Yes	Yes
0.005" Verified Foot Flatness	No	Yes	Yes	Yes
Factory Routine Test Report Supplied with Motor	No	Yes	Yes	Yes
Factory Routine Test Report with No Load Vibration Check	444 & Larger	444 & Larger	Yes	Yes

* NEMA Premium® Efficiency is defined 1 - 500 HP.
* Document based on Toshiba's most current design offering, and subject to change without notice.

EQP GLOBAL MOTOR SERIES



1. Fan Cover

2. Corrosion-Resistant Non-Sparking Conductive Nylon Plastic Fan

3. Class F Insulation System Utilizing Class H Varnish and Magnet Wire

4. Cast Iron Bearing Brackets

5. V-Ring Seals to Prevent Contaminants

6. Heavy Duty Anti-Friction 300 Series Bearings

7. Inner Locking Plate or Bearing Cap

8. Cast Iron Terminal Box

9. Corrosion-Resistant Severe Duty Paint System

100% QUALITY TEST

Toshiba performs a factory routine test per NEMA® MG1 on every single EQP Global motor it manufactures with every such motor going through rigorous quality checks.

PACKAGE DEALS

In addition to manufacturing high quality motors, Toshiba manufactures high quality ASDs and motor starters. If an ASD or starter is purchased as part of a motor/drive or motor/starter package, the warranty period is extended to meet the standard motor warranty of three years.

WARRANTY

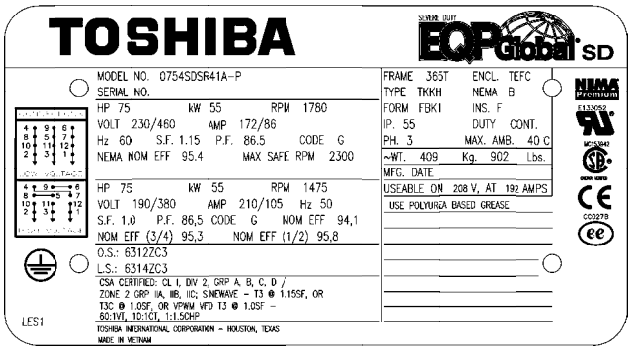
- EQP Global SD & 840 - 36 Months
- EQP Global 841 - 60 Months

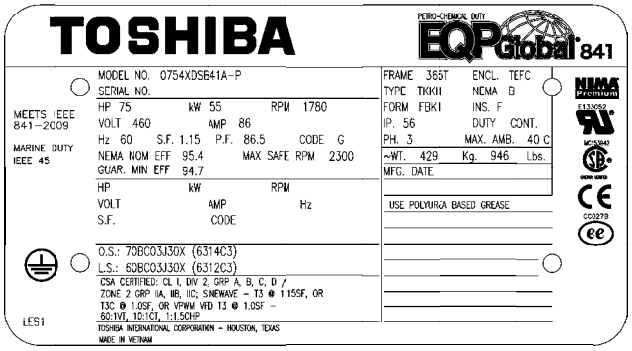
ASD CAPABILITIES

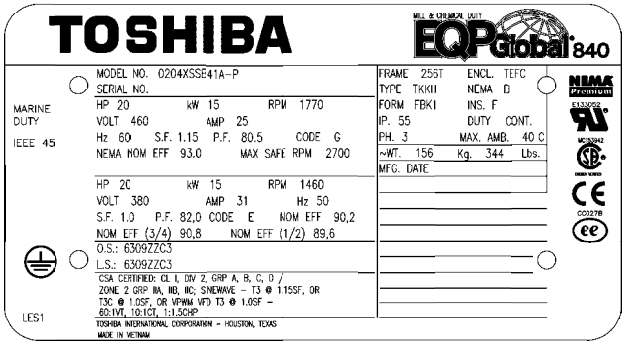
Frame	NONE	T-CODE	60:1 VT					
			2:1 CT	T-Code	3:1 CT	T-Code	10:1 CT	T-Code
140	5 HP Max.	T4	5 HP Max.	T4	5 HP Max.	T4	5 HP Max.	T4
180								
210	100 HP Max.	T3	100 HP Max.	T3	100 HP Max.	T3	100 HP Max.	T3
250								
280								
320								
360								
400								
440	350 HP Max.	T3	350 HP Max.	T3	350 HP Max.	T3	350 HP Max.	T3
500/5000	500 HP Max.	T3	500 HP Max.	T2C	500 HP Max.	T2C	400 HP Max.	T2D
580/5800	800 HP Max.	T3B	800 HP Max.	T3B	800 HP Max.	T3B	600 HP Max.	T2C

- The constant torque coverage dictates the maximum horsepower.
- Above temperature codes are based on Class I, Division 2, and standard ambient and altitude.
- 20:1 CT can be accomodated on motors up to 200 HP, up to 500/5000 frame, 4 & 6 Pole, and non-hazardous area.

NAMEPLATES







MC153942 CC027B E133052 NEMA Premium

TOSHIBA MOTORS & DRIVES
Adjustable Speed Drives • Motors • Motor Controls

www.toshiba.com/tic

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TOSHIBA INTERNATIONAL CORPORATION

Industrial Division
Global Data 10/18/2012
Prepared By: Laura Weisbrod

Model Number: 0106SDSR41A-P
EQP Global Severe Duty TEFC Footed

60 Hz 230/ 460 V Data

HP:	10	**Nominal Efficiency:**	91.0
Hz:	60	**Minimum Efficiency:**	90.2
kW:	7.5	**Power Factor:**	79.5
Volt:	208-230/460		
Amps:	26.8/ 13.4	**Locked Rotor Amps:**	162/ 81
Enclosure:	TEFC	**No Load Amps:**	11.8/ 5.9
Pole:	6		
Speed:	1170 RPM/ 122.5 rad/sec	**Full Load Torque:**	44.9 lb-ft/ 60.9 N.m
Frame:	256T	**Locked Rotor Torque (%):**	260
Insulation Class:	F	**Break Down Torque (%):**	290
NEMA Design:	B		
Code:	H	**Full Load Efficiency:**	91.3
IP:	54	**3/4 Load Efficiency:**	91
Type:	IKKH	**1/2 Load Efficiency:**	89.4
Form:	FBK1		
Weight:	274 lbs/ 124 kg	**Full Load Power Factor:**	79.9
		3/4 Load Power Factor:	75.9
Safe RPM:	2400	**1/2 Load Power Factor:**	66.2
Motor Inertia:	2.7 lb-ft^2/ 0.11 kg-m^2		
Temp Rise (°C) 1.0/1.15:	42/ 57		
Lead Size:	AWG 18		
LS Bearing:	6309ZZC3		
OS Bearing:	6309ZZC3		

ALL CHARACTERISTICS ARE AVERAGE EXPECTED VALUES BASED UPON RATED VOLTAGE, FREQUENCY, AND SINEWAVE POWER INPUT.

TEMPERATURE RISE WILL BE CONSISTENT WITH INSULATION, AMBIENT, AND SERVICE FACTOR AS DEFINED BY NEMA-MG-12.43 OR -20.40.

BEARINGS ARE THE ONLY RECOMMENDED SPARE PART(S).

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Industrial Division
Global Data 10/18/2012
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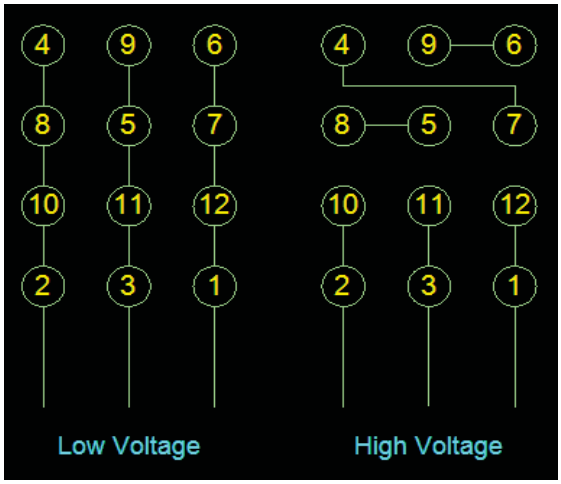
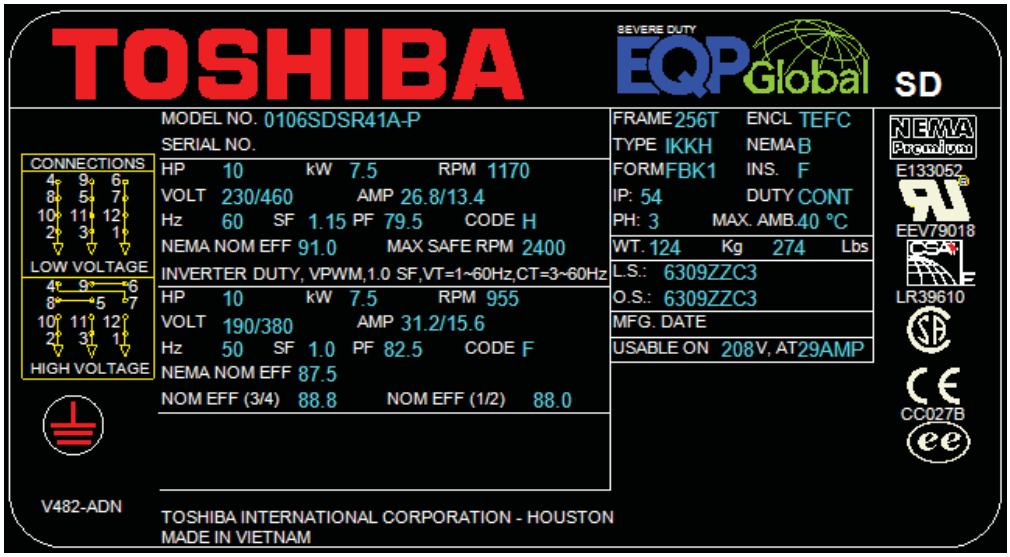
Model Number: 0106SDSR41A-P
EQP Global Severe Duty TEFC Footed

Wiring Diagram For Across-the-Line (Full Voltage) Starting



Nameplate



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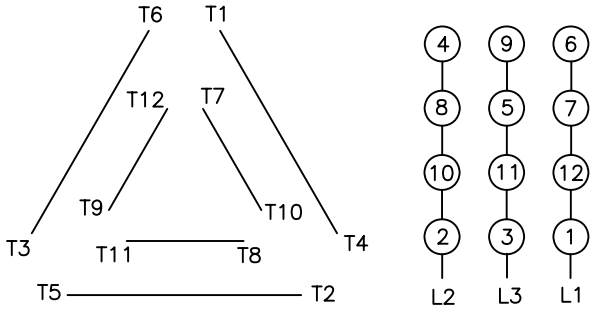
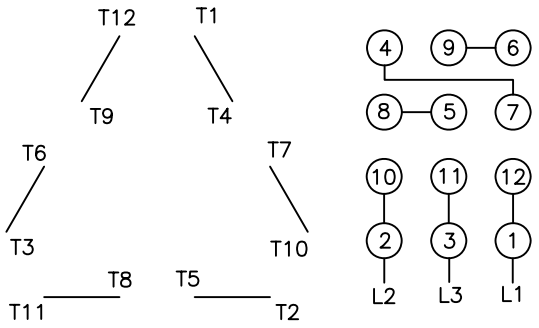
Motor Connection Diagrams
12 Leads
Dual Voltage

Across-the-Line Starting / Running Connections

Low Voltage Delta

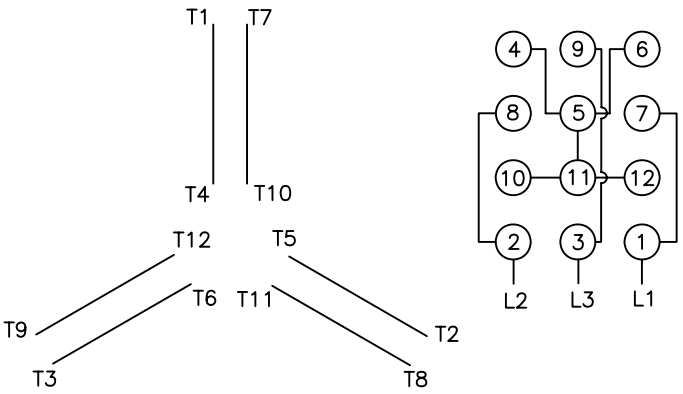


High Voltage Delta

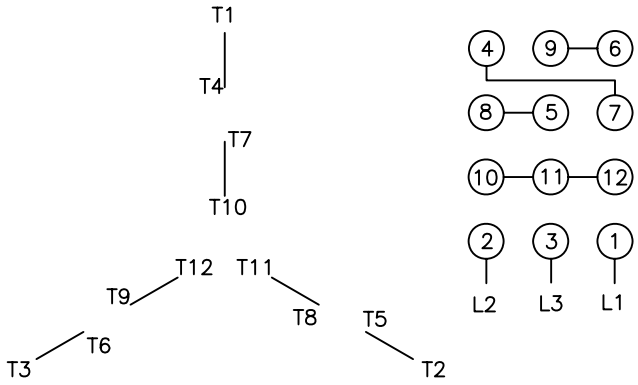


Alternate Connections

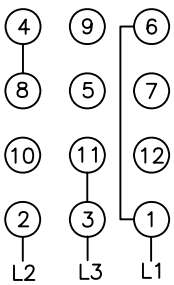
Low Voltage Wye Start



High Voltage Wye Start



Low Voltage Part Winding Start



CAUTION: Part winding should last no longer than 2 seconds to prevent damage.

Switch L1 and L2 to reverse rotation

By: R. Murillo Date: 4/9/08 Checked: Date: Revision 0

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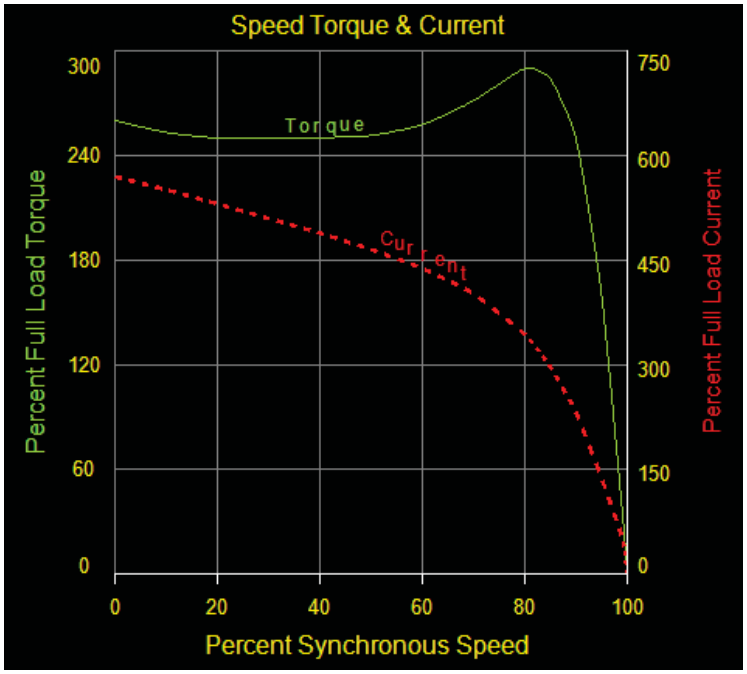
TOSHIBA INTERNATIONAL CORPORATION

Industrial Division
Global Data 10/18/2012
Prepared By: Laura Weisbrod

Model Number: 0106SDSR41A-P
EQP Global Severe Duty TEFC Footed

Speed, Torque, & Current Curve



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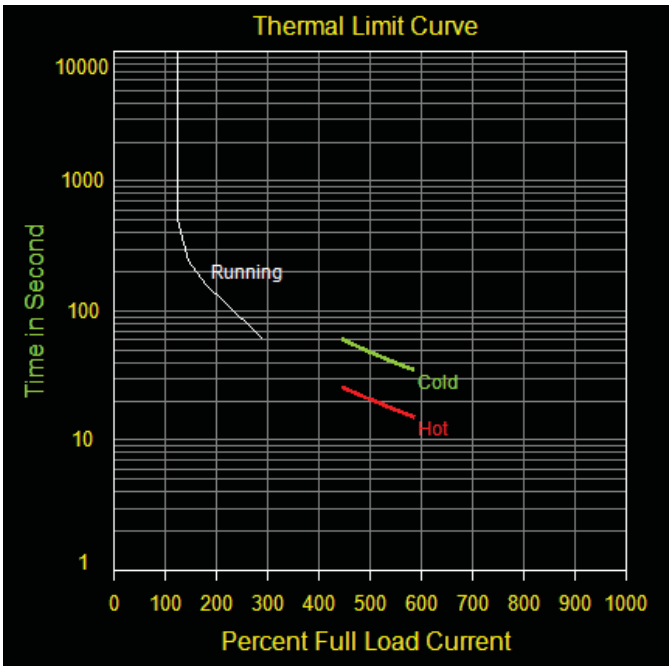
Global Data 10/18/2012
Prepared By: Laura Weisbrod

Model Number: 0106SDSR41A-P
EQP Global Severe Duty TEFC Footed

Thermal Limit Curve



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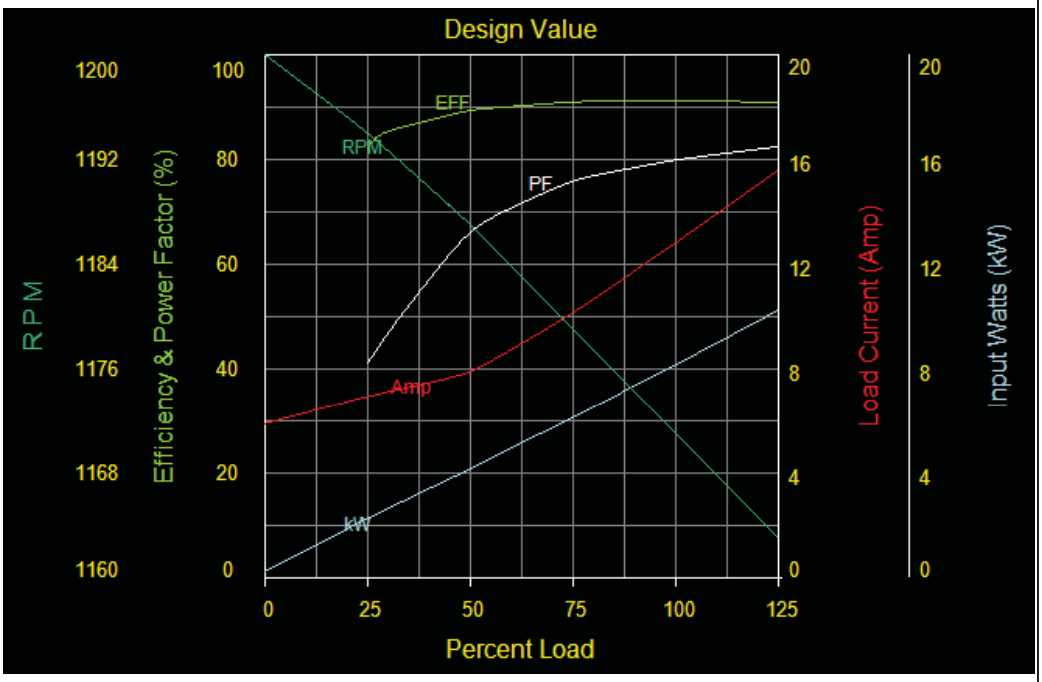
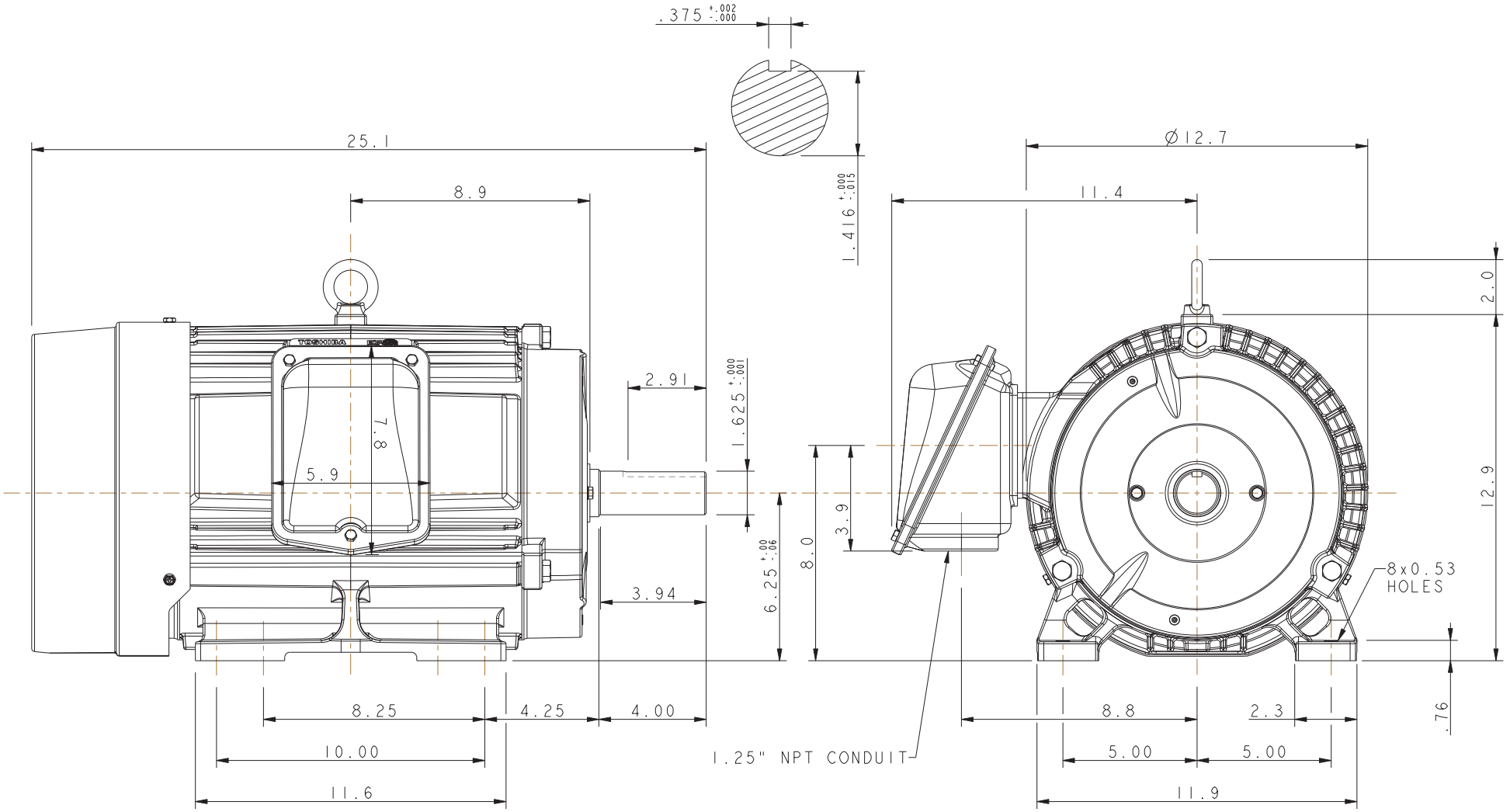
Global Data 10/18/2012
Prepared By: Laura Weisbrod

Model Number: 0106SDSR41A-P
EQP Global Severe Duty TEFC Footed

Design Values Based on Load





NOTES:
1. MAIN CONDUIT BOX MAY BE ROTATED IN 90° INCREMENTS
2. STANDARD PRODUCT USE BI-DIRECTIONAL FAN. OPPOSITE ROTATION AVAILABLE ONLY BY CONNECTION CHANGE.

UNITS: INCHES

250T TEFC FRAME
F1 ASSEMBLY

MDSLV001-04

TOSHIBA
TOSHIBA INTERNATIONAL CORPORATION

TOLERANCES	
.X	.1
.XX	.03
.XXX	.005
.XXXX	.0005

MAXIMUM MOTOR WEIGHT
340 lbs.
154 kgs.

NO	REVISION	DRAWN BY	DATE	CHECK
0	FIRST ISSUE	N. MOMIN	09/02/10	

EQP Global SD
XT SERIES

DRAWN BY: N. MOMIN
CHECK BY:
APPROVED BY:

www.toshiba.com/ind

Laura Weisbrod

TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

Industrial Division

TO: Penn Valley Pumps
CC:
DATE: *12/5/2012*
Subject: *Toshiba EQP Global SD TEFC Severe Duty Motors Operating on a VFD*

All Toshiba EQP Global SD TEFC Severe Duty Motors are inverter duty rated and capable of being applied, as unusual service, to VPWM Adjustable Speed Drives per NEMA MG1 Part 31. Motors 1-200 HP, 4-6 pole, (and 1.5-75 HP, 2 pole, and 7.5 HP, 6 pole), are suitable for 20:1 constant torque (CT=3~60Hz), and 60:1 variable torque (VT=1~60Hz), at 1.0 service factor as shown on the nameplate. Maximum safe RPM is also shown on the nameplate. Operation above 60Hz produces constant horsepower at reduced torque.

TOSHIBA Reliability in Motion

TOSHIBA INTERNATIONAL CORPORATION
INDUSTRIAL DIVISION
PO BOX 40906
HOUSTON TX 77240 (800) 231-1412
(713) 466-0277 FAX (713) 466-8773

SPARE PARTS (RECOMMENDED)

OTHER THAN THE GREASE USED FOR RE-GREASABLE BEARINGS, **TOSHIBA** ADVISES THAT THERE ARE NO "USE" PARTS. THE ONLY INSURANCE SPARES THAT **TOSHIBA** SUGGESTS FOR THESE SQUIRREL CAGE INDUCTION MOTORS ARE INDUSTRY STANDARD, AND COMMERCIALLY AVAILABLE ANTI-FRICTION BEARINGS, AS NOTED BELOW.

MOTOR COMPONENTS (SUCH AS TERMINAL BOXES, FAN COVERS, MACHINED PARTS) ARE AVAILABLE UPON SPECIAL REQUEST. IN THIS CASE, PLEASE ADVISE OUR ORDER ENTRY DEPARTMENT THE MODEL AND SERIAL NUMBERS (FOUND ON THE MOTOR NAMEPLATE) , AND A DESCRIPTION OF THE COMPONENT REQUIRED. THEY WILL THEN FURNISH THE CURRENT PART NUMBER, PRICE AND AVAILABILITY.

(NOTE: OUR INTERNAL PART NUMBERS ARE SUBJECT TO CHANGE WITHOUT NOTICE, AND ARE NOT PUBLISHED).

PLEASE ADVISE IF YOU HAVE ANY QUESTIONS.

CUSTOMER:
PURCHASE ORDER #
Customer Tag:

TOSHIBA FILE #
MODEL # **0106SDSR41A-P**
HP / RPM / ENCL / FRAME: **10** / **1200** / **TEFC** / **256T**
DRIVE END BEARING: **6309ZZC3**
OPPOSITE DRIVE END BEARING: **6309ZZC3**

Prepared By:
Date:

COMPONENT

typical gradients

MOTOR TYPE	THERMOSTAT LOCATION TIED ON END TURNS	THERMOSTAT LOCATION BURIED IN END TURNS
OPEN TYPE	30°C	15°C
TOTALLY ENCLOSED FAN COOLED	25°C	10°C
TOTALLY ENCLOSED NON-VENTILATED	20°C	5°C

epoxy-sealed thermostats for general-purpose motors.

MARS NO.	KLIXON KIT. NO.	KLIXON CAT. NO.	OPERATING TEMPERATURE
37075	SL-11-75	9700K51-146	75°C
37090	SL-11-90	9700K21-146	90°C
37100	SL-11-100	9700K26-146	100°C
37110	SL-11-110	9700K36-146	110°C
37120	SL-11-120	9700K01-146	120°C
37130	SL-11-130	9700K11-146	130°C
37135	SL-11-135	9700K06-146	135°C
37140	SL-11-140	9700K66-146	140°C
37145	SL-11-145	9700K76-146	145°C
37150	SL-11-150	9700K46-146	150°C

Three thermostats per package

KLIXON®

on-winding overheat protection

Klixon SL-11 kits are mounted on the windings of general purpose motors and hermetically sealed compressors. They supplement conventional current overload relays in magnetic starters providing modern total protection for most older motors in use today.

features:

- Allow motors to perform at full-load capacity but will protect against dangerous running overloads
- Protect against blocked ventilation, high ambient temperatures, single-phasing
- Each kit contains three matched motor-winding thermostats
- When starter overloads operate, the SL-11 will protect against re-starting at unsafe winding temperatures if the starter overloads reset when the motor is still too hot
- These motor winding thermostats do not replace overloads in the starter
- UL & CSA listed

installation:

SL-11 thermostats are tied in place on the end turns of appropriate winding bundles, one to each phase or buried in the windings during motor rewind. They are connected in series between the starter coil and its power supply.

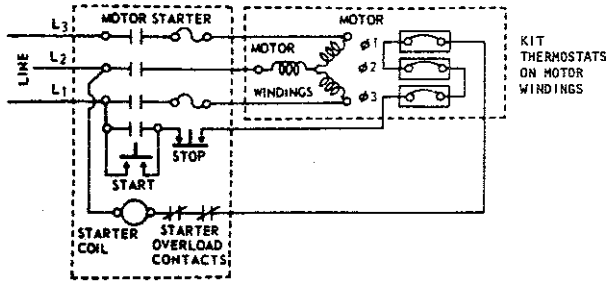
selection:

- Pick thermostat temperature to operate at the mid-point between the “maximum normal running” temperature and the “maximum allowed running temperature.”
- Subtract the gradient temperature (outlined in the chart below) from the mid-point to obtain the operating temperature of the thermostat.

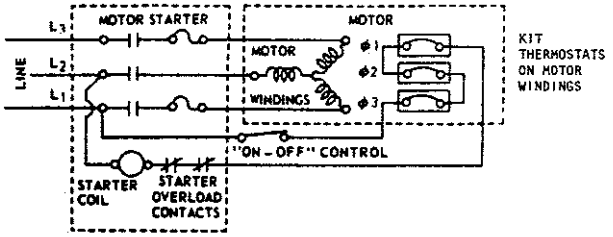
Maximum Contact Rating Amperes			
Klixon #	24V	115V	230V
9700K	18	18	12

To be wired Normally Closed

MANUAL RESET CONNECTIONS



AUTOMATIC RESET CONNECTIONS



THERMOSTAT CONTACT RATINGS FOR CONTROL CIRCUITS

VOLTS	AC AMPERES	
	Break Not Make	Break and Make
110	6.0	3.1
220	3.0	1.6
440	1.5	.8
550	1.2	.6

MAXIMUM ALLOWED RUNNING TEMPERATURES

MOTOR TYPE	CLASS "A" INSULATION	CLASS "B" INSULATION
FRACTIONAL HP	140°C	165°C
INTEGRAL HP	140°C	165°C

SELECTION EXAMPLE

A 5 HP, 3-Phase, Totally-Enclosed Fan-Cooled Motor, Class "B" insulation, 80°C rise. Plan to tie the thermostats on the end turns.

1. 80°C Rise plus 40°C "Standard Ambient" = 120°C.
2. Maximum allowed running temperature, Class B, integral HP - 165°C.
3. Midpoint is approximately 140°C.
4. Approximate gradient is 25°C.
5. 140°C minus 25°C = 115°C, the operating temperature of the thermostats.
6. Use SL-11-110 or SL-11-120.

INSTALLATION NOTES

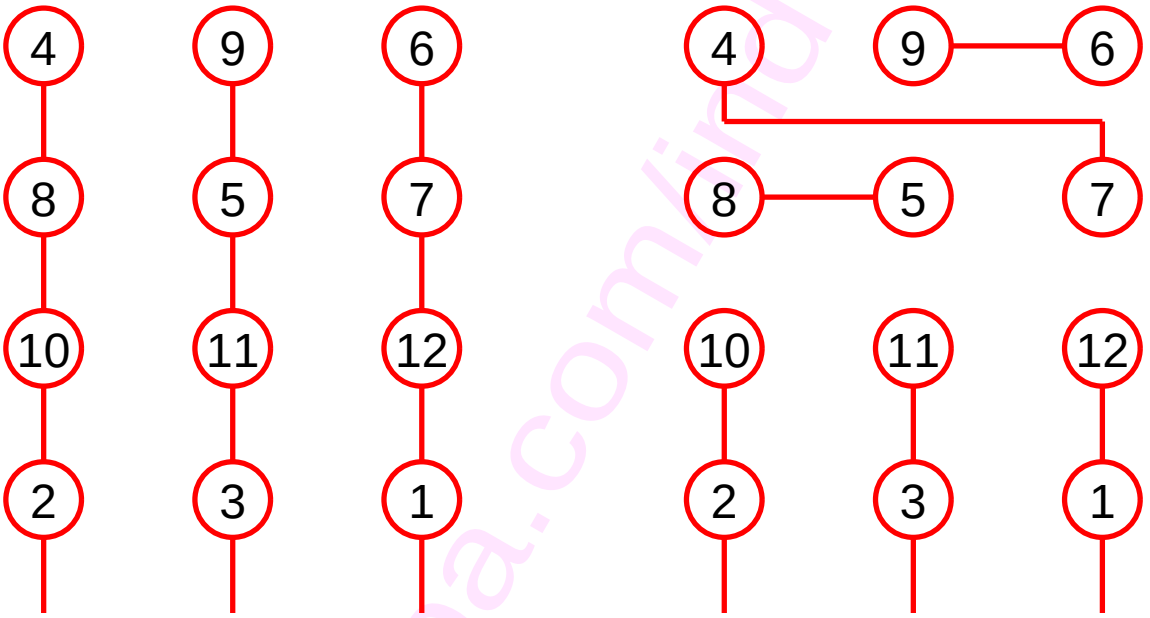
- Install thermostats as far as possible from any air flow.
- Tie thermostats firmly in place to aid heat transfer, reduce temperature gradient.
- Install one thermostat in each phase winding.
- Do not remove Mylar* sleeve. This is needed for insulation.
- If the motor is dipped and baked after thermostats are installed, oven temperature should not exceed 300°F.
- Wire thermostats in series so that any one will open the starter coil circuit. (See wiring diagrams.)
- SL 11 Kits provide overheat protection for running overloads only. Current overloads in the starter are required for locked-rotor protection.
- SL 11 thermostats will handle starter coil currents through NEMA Size 5 and the control relays in most larger-size starters. (See contact ratings.)

TYPICAL GRADIENTS

MOTOR TYPE	THERMOSTAT LOCATION	
	Tied on End Turns	Buried in End Turns
OPEN TYPE	30°C	15°C
TOTALLY ENCLOSED FAN COOLED	25°C	10°C
TOTALLY ENCLOSED NON-VENTILATED	20°C	5°C

*Trademark of E.I. du Pont de Nemours & Co. (Inc.)

Three Phase Motor Wiring Diagram
Across the Line - (Full Voltage) Starting

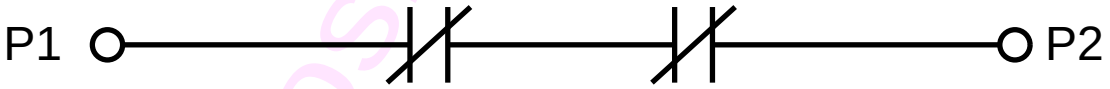


Conn - 12LDV

Low Voltage

High Voltage

Klixons



Temperature Limiting Device Connection

Prepared By: Van Truong
Date: 07 June 2018

TB Wood's

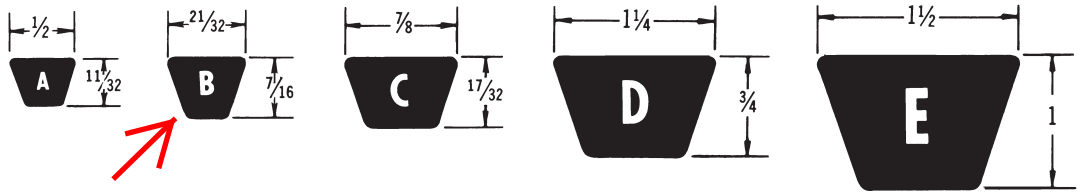
SECTION
B2

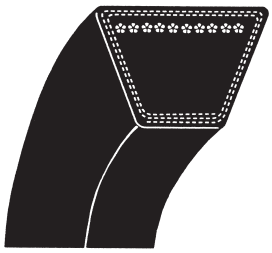
CLASSICAL (CONVENTIONAL) DRIVES

CLASSICAL (CONVENTIONAL) V-BELT FEATURES

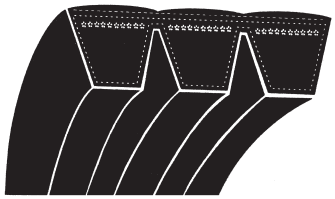
TB Wood's

The Classical (also known as Conventional) V-belts include five cross sections . . . A, B, C, D, and E. These sections are a continuing development of the original V-belts of the 1930's. A, B, C, and D belts are available in wrapped or cog construction and all are static conducting, and oil and heat resistant. **Note: E section V-belts are available for replacement on existing drives, but are not recommended for new drive designs.**

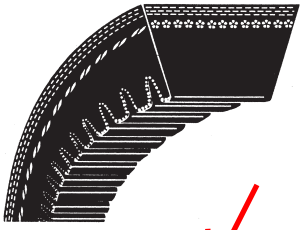




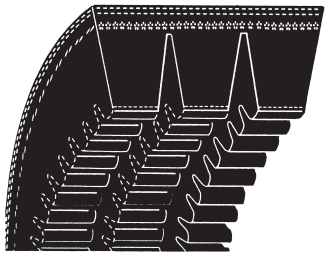
Classical V-belts . . . . are the finest wrapped belts in industry and are designed to provide premium performance at standard prices. The belts have a specially constructed cover fabric for optimum flexibility and abrasion resistant characteristics. Belts perform their best when operating on sheave diameters no smaller than RMA/MPTA recommended: A = 3.0, B = 5.4, C = 9.0, D = 13.0, and E = 21.6.



Classical Banded V-belts . . . . all the same features of the standard wrapped belt, but with the added benefit of multiple belts in a single belt. Should be considered for those problem drives where long center distance, vibration, pulsating or shock loads cause individual belts to whip, turn over, or jump out of sheave grooves. B and C belts available in 2 thru 5 ribs and D belts available in 3 thru 5 ribs.



Classical Cog V-belts . . . . premium raw edge, cog construction. On average, 30% higher horsepower rating than standard wrapped belts. The molded cogs offer greater flexibility and better heat dissipation, especially on those punishing drives where bending stresses created by sub-minimum diameter sheaves dramatically reduce the life of standard belts.



Classical Cog Banded V-belts . . . . same raw edge, cog construction as the individual belt. Can be used on those same problem applications as the standard, wrapped Classical belt. Available in BX, CX, and DX belts in 2 thru 5 ribs.

Warning: Do not mix raw edge cog and wrapped construction belts on the same drive.

CLASSICAL SHEAVE FEATURES

Wood's sheaves are constructed of fine grain, high tensile cast iron, and have been carefully engineered to assure maximum performance over a long life span. Behind each sheave is one of the most extensive engineering design and testing programs in the industry.

With the advent of higher V-belt ratings, Wood's engineers instituted additional careful test programs to ensure that each Wood's sheave would be capable of safely and dependably delivering the increased performance which was required by the new ratings. Wood's engineers, using a special strain gage test stand, subject sheaves to tension and compression stresses far in excess of those encountered in actual operation.

In another standard test procedure, Wood's sheaves are operated at extremely high speeds. Sheaves are selected from warehouse stocks and tested until they are burst by centrifugal force. Such destructive testing allows Wood's engineers to study the effects of construction and balance on sheave performance. The goal is to assure safe operation at normal speeds. Other continuing programs check product quality in the laboratory and on the manufacturing line.

For applications with special requirements, Wood's sheaves are also available on a made-to-order basis in either cast or ductile iron, and in Sure-Grip or bored-to-suit construction.

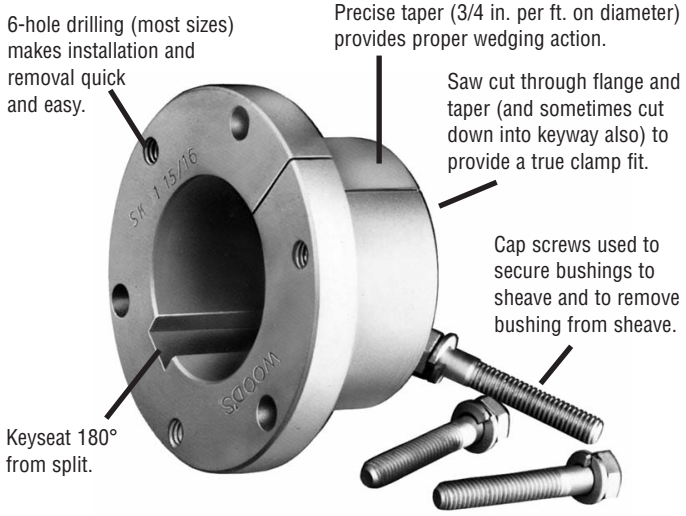
Wood's stock narrow sheaves are available with the convenient Sure-Grip QD type bushing. Easy to install and remove, these split, tapered bushings grip the shaft with the equivalent of a shrink fit. This tight holding power eliminates freezing and fretting corrosion between the shaft and the bore and assures quick removal and interchangeability when necessary.

Stock sheaves are designed to carry the loads of all belts shown in this catalog and other similarly rated V-Belts. For special higher rated V-Belts, consult Wood's Engineering Department for recommendations.

We cast or stamp the maximum safe operating speed, in rpm, on all sheaves we manufacture.

SURE-GRIP BUSHING FEATURES

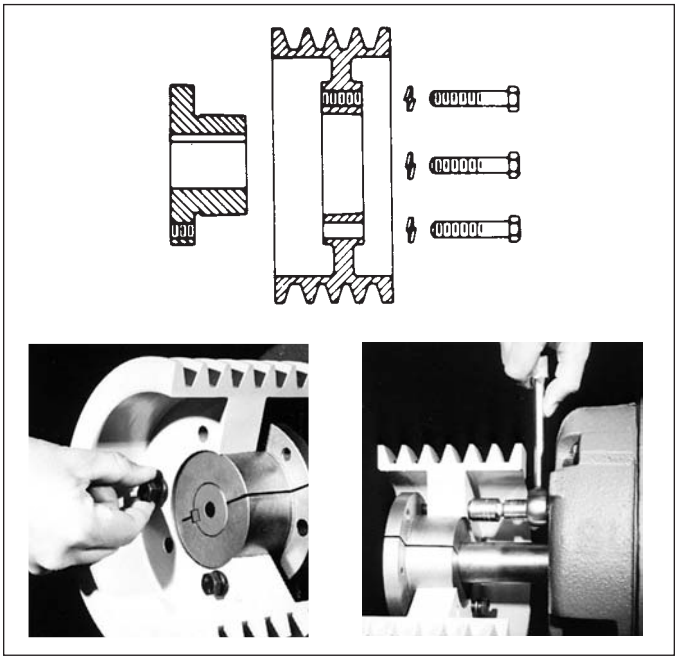
Sure-Grip® "Quick Detachable" bushings are easy to install and remove. They are split through flange and taper to provide a true clamp on the shaft that is the equivalent of a shrink fit. All sizes except JA and QT have a setscrew over the key to help maintain the bushing's position on the shaft until the cap screws are securely tightened. Sure-Grip bushings have a very gradual taper (3/4-inch taper per ft. on the diameter) which is about half the inclined angle of many other bushings. The result is the Sure-Grip securely clamps the shaft, with twice the force of those competitive bushings, to provide extreme holding power.



Versatile Sure-Grip bushings permit the mounting of the same mating part on shafts of different diameters, and the mounting of different sheaves on the same shaft using the same bushing. Their interchangeability extends through sheaves, pulleys, timing pulleys, sprockets, flexible and rigid couplings, made-to-order items by Wood's, and to product lines of several other mechanical power transmission manufacturers.

Sure-Grip bushings are manufactured with the drilled and tapped holes located at a precise distance from the keyseat; thus, a wide mating part having a bushing in each end can be mounted on a common shaft with the two keyways in line. This feature not only facilitates installation but also permits both bushings to carry an equal share of the load.

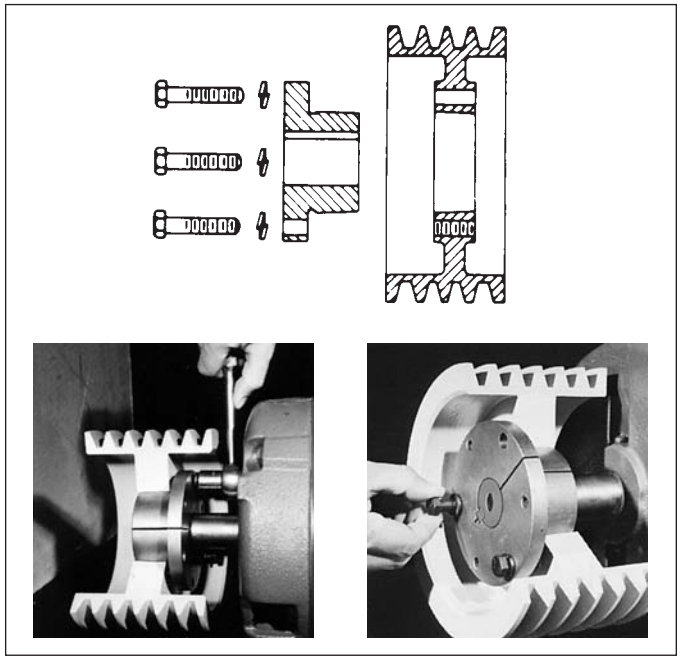
STANDARD MOUNTING



1. Cap screws from outside through drilled holes in the mating part and into threaded holes in the bushing flange located on the inside of the assembly. Or the complete assembly reversed on the shaft and;

2. Cap screws from inside through drilled holes in the mating part and into threaded holes in the bushing flange located on the outside of the assembly.

REVERSE MOUNTING



3. Cap screws from inside through drilled holes in the bushing flange located on the inside of the assembly and into threaded holes in the mating part.

4. Cap screws from outside through drilled holes in the bushing flange located on the outside of the assembly and into threaded holes in the mating part.

TB Wood's

Tensioning V-Belt Drives

Without exception, the most important factor in the successful operation of a V-belt drive is proper belt-tensioning. To achieve the long, trouble-free service associated with V-belt drives, belt tension must be sufficient to overcome slipping under maximum peak load. This could be either at start or during the work cycle. The amount of peak load will vary depending upon the character of the driven machine or drive system. To increase total tension, merely increase the center distance. Before attempting to tension any drive it is imperative that the sheaves be properly installed and aligned. If a V-belt slips it is too loose. Add to the tension by increasing the center distance. Never apply belt dressing as this will damage the belt and cause early failure.

General method

The general method for tensioning V-belts should satisfy most drive requirements.

Step 1: Reduce the center distance so that the belts may be placed over the sheaves and in the grooves without forcing them over the sides of the grooves. Arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug. See figure 1.

Step 2: Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under its highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the drive machine. The drive should be stopped and the belts tightened.

Step 3: Check the tension on a new drive frequently during the first day by observing the slack side span. After a few days' operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight bow in the slack side.

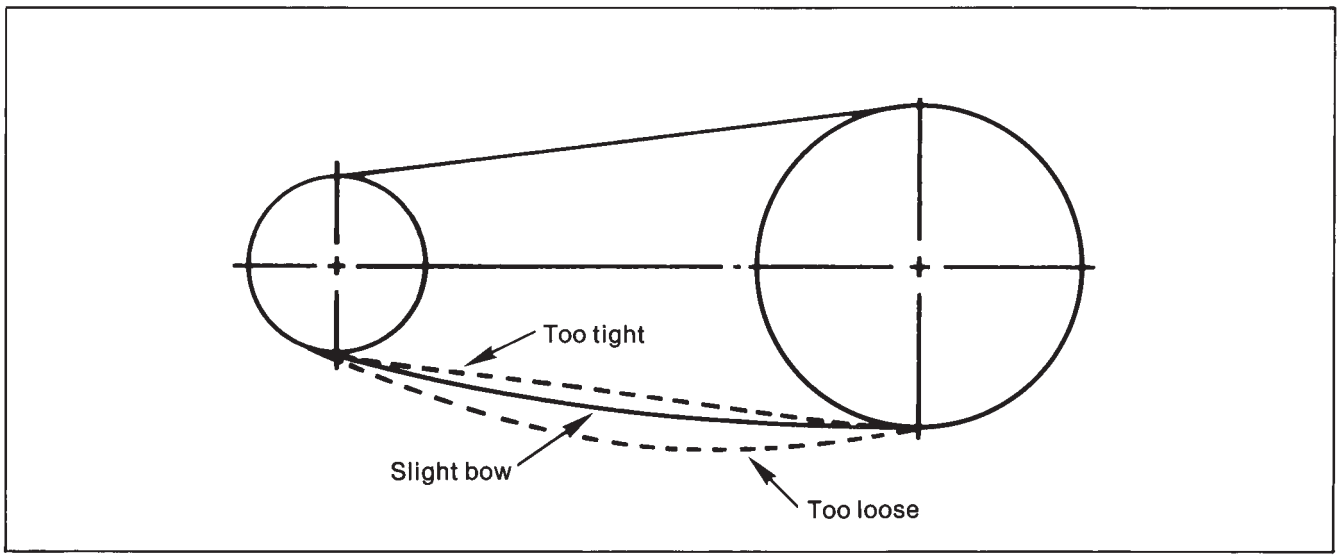


Figure 1

Force deflection method

This method should be used only for tensioning drives on which the grade of belt, rated belt capacity, service factor, design horsepower, etc. are known.

Step 1: Install belts per Step 1 of General Method. Measure span length (t) in inches as shown in figure 2, or calculate using formula.

Step 2: From figure 2 the deflection height (h) is always 1/64" per inch of span length (t). For example, a 32" span length would require a deflection of 32/64" or 1/2".

Step 3: Determine the minimum, maximum, and initial recommended pounds force using table 1 or calculate based on the required Static Strand Tension (T_S). Note: The initial recommended force is used only for installing new belts which have not seated themselves into the sheave grooves and where initial belt stretch has not taken place.

Step 4: Using a spring scale, apply a perpendicular force to any ONE of the belts at the mid point of the span as shown in figure 2. Compare this deflection force with the values found in Step 3.

a. If the deflection force is below the minimum, the belts are too loose and the tension should be increased by increasing the center distance.

b. If the deflection force is higher than the maximum, the belts are too tight and the tension should be decreased.

When new V-belts are installed on a drive the INITIAL tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall between the minimum and maximum force.

To determine the deflection distance from normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple-belt drives an adjacent undeflected belt can be used as a reference.

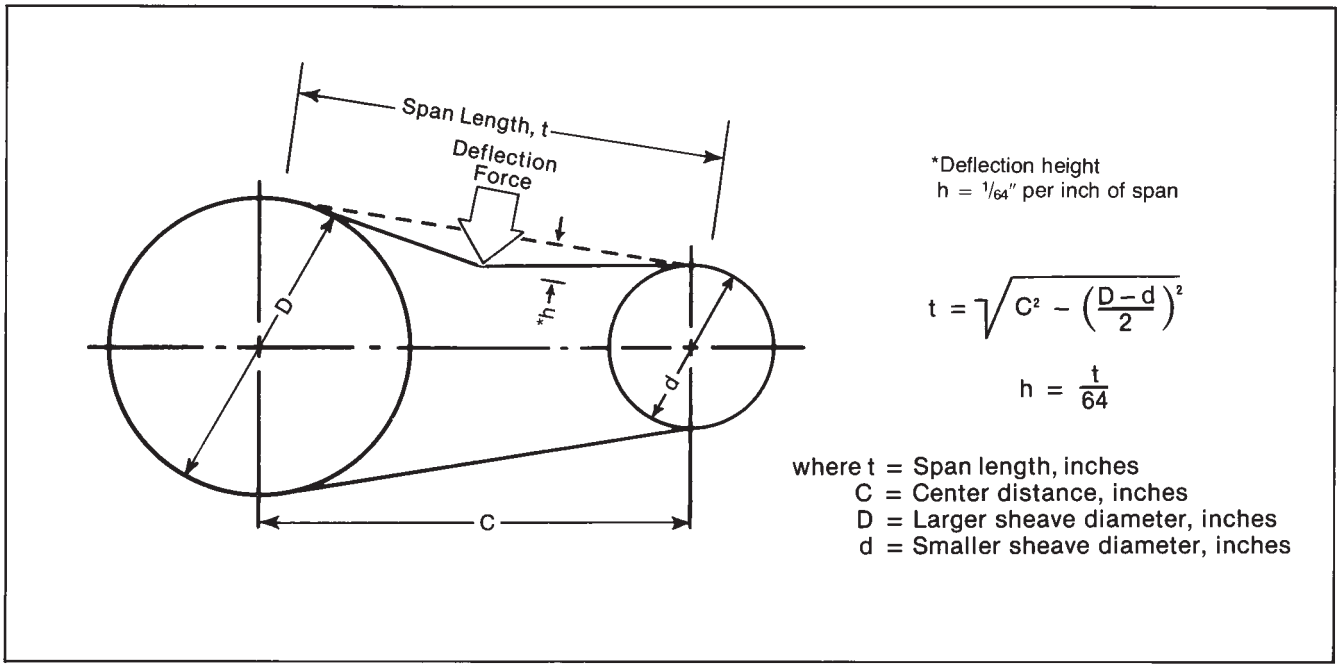


Figure 2

TB Wood's

BP & BX BELTS IN B SHEAVES

LINE #	RATIO	STOCK SHEAVES			DRIVEN SPEEDS AND HORSEPOWER RATINGS PER BELT								
		Datum Diameter		Number Grooves	1160 RPM			1750 RPM			3500 RPM		
					Driven Speed	H.P. Ratings		Driven Speed	H.P. Ratings		Driven Speed	H.P. Ratings	
		DR	DN			BP	BX		BP	BX		BP	BX
451	4.37	5.40	25.00	2-8,10	265	6.27	7.50	400	8.41	10.41	801	11.23	16.16
452	4.43	4.20	20.00	1-6	262	3.97	5.11	395	5.24	7.06	791	6.93	11.11
453	4.46	6.40	30.00	2-8,10	260	8.12	9.43	392	10.90	13.08	784	13.92	19.63
454	4.47	3.80	18.40	1-6	260	3.18	4.29	392	4.14	5.90	784	5.26	9.24
455	4.53	5.20	25.00	2-6	256	5.89	7.10	387	7.90	9.86	773	10.59	15.38
456	4.57	8.00	38.00	2-8,10	254	10.95	12.42	383	14.55	17.08	. . .	. . .	. . .
457	4.60	6.20	30.00	2-8,10	252	7.75	9.05	381	10.41	12.55	761	13.45	19.00
458	4.63	4.00	20.00	1-6	251	3.58	4.70	378	4.69	6.48	757	6.11	10.19
459	4.69	3.60	18.40	1-6	247	2.78	3.88	373	3.58	5.32	747	4.39	8.28
460	4.69	5.00	25.00	2-6	247	5.51	6.71	373	7.38	9.31	746	9.92	14.58
461	4.74	6.00	30.00	2-8,10	245	7.39	8.66	369	9.92	12.03	738	12.95	18.33
462	4.85	3.80	20.00	1-6	239	3.18	4.29	361	4.14	5.90	722	5.27	9.25
463	4.87	4.80	25.00	2-6	238	5.13	6.31	359	6.85	8.76	718	9.22	13.75
464	4.90	5.80	30.00	2-8,10	237	7.02	8.28	358	9.43	11.49	715	12.41	17.63
465	4.92	7.40	38.00	2-8,10	236	9.90	11.31	356	13.23	15.62	. . .	. . .	. . .
466	4.93	3.40	18.40	1-6	235	2.38	3.47	355	3.02	4.73	709	3.49	7.29
467	5.06	5.60	30.00	2-8,10	229	6.64	7.89	346	8.92	10.96	692	11.84	16.91
468	5.07	4.60	25.00	2-6	229	4.75	5.91	345	6.32	8.20	690	8.49	12.90
469	5.09	3.60	20.00	1-6	228	2.78	3.88	344	3.58	5.32	688	4.39	8.28
470	5.18	7.00	38.00	2-8,10	224	9.20	10.57	338	12.32	14.62	. . .	. . .	. . .
471	5.23	5.40	30.00	2-8,10	222	6.27	7.50	334	8.42	10.41	669	11.24	16.16
472	5.28	4.40	25.00	2-6	220	4.36	5.51	331	5.79	7.63	663	7.73	12.02
473	5.33	6.80	38.00	2-8,10	218	8.84	10.19	329	11.85	14.11	. . .	. . .	. . .
474	5.35	3.40	20.00	1-6	217	2.38	3.47	327	3.02	4.73	654	3.49	7.29
475	5.42	5.20	30.00	2-6	214	5.89	7.10	323	7.90	9.87	646	10.60	15.38
476	5.48	6.60	38.00	2-8,10	212	8.48	9.81	319	11.38	13.60	639	14.35	20.24
477	5.51	4.20	25.00	2-6	211	3.97	5.11	318	5.24	7.06	635	6.94	11.12
478	5.62	5.00	30.00	2-6	206	5.51	6.71	311	7.38	9.31	623	9.93	14.58
479	5.64	6.40	38.00	2-8,10	206	8.12	9.43	310	10.90	13.08	621	13.92	19.64
480	5.76	4.00	25.00	2-6	201	3.58	4.70	304	4.70	6.48	608	6.12	10.20
481	5.81	6.20	38.00	2-8,10	200	7.75	9.05	301	10.42	12.56	603	13.46	19.00
482	5.83	4.80	30.00	2-6	199	5.13	6.31	300	6.86	8.76	600	9.23	13.75
483	5.99	6.00	38.00	2-8,10	194	7.39	8.66	292	9.92	12.03	584	12.96	18.33
484	6.03	3.80	25.00	2-6	192	3.18	4.29	290	4.14	5.90	580	5.27	9.25
485	6.07	4.60	30.00	2-6	191	4.75	5.91	288	6.32	8.20	577	8.49	12.90
486	6.18	5.80	38.00	2-8,10	188	7.02	8.28	283	9.43	11.50	566	12.42	17.64
487	6.32	4.40	30.00	2-6	184	4.36	5.51	277	5.79	7.63	554	7.73	12.02
488	6.33	3.60	25.00	2-6	183	2.79	3.88	276	3.58	5.32	553	4.40	8.28
489	6.39	5.60	38.00	2-8,10	182	6.65	7.89	274	8.93	10.96	548	11.85	16.91
490	6.59	4.20	30.00	2-6	176	3.97	5.11	265	5.25	7.06	531	6.94	11.12
491	6.61	5.40	38.00	2-8,10	176	6.27	7.50	265	8.42	10.42	530	11.24	16.16
492	6.66	3.40	25.00	2-6	174	2.39	3.47	263	3.02	4.73	525	3.50	7.29
493	6.84	5.20	38.00	2-6	170	5.89	7.11	256	7.90	9.87	511	10.60	15.39
494	6.89	4.00	30.00	2-6	168	3.58	4.70	254	4.70	6.48	508	6.12	10.20
495	7.10	5.00	38.00	2-6	163	5.52	6.71	247	7.38	9.32	493	9.93	14.58
496	7.22	3.80	30.00	2-6	161	3.18	4.29	242	4.14	5.90	485	5.27	9.25
497	7.37	4.80	38.00	2-6	157	5.13	6.31	237	6.86	8.76	475	9.23	13.75
498	7.58	3.60	30.00	2-6	153	2.79	3.88	231	3.58	5.32	462	4.40	8.28
499	7.66	4.60	38.00	2-6	151	4.75	5.91	228	6.33	8.20	457	8.50	12.90
500	7.98	3.40	30.00	2-6	145	2.39	3.47	219	3.02	4.73	439	3.50	7.29

Shaded area diameters are below industry standard for belt.

The World Leader in Free-Disc™ Pumping Technology

Penn Valley Pump

Model: PVP420VS/PS

- Pump protection device
- 1" NPT SS316 Sensor
- EPDM elastomeric sleeve
- 4" SS316 gauge
- SS316 isolation valve
- NEMA 4/4X or 7/9 adjustable switch
- Manual reset options
- Quick release air fittings
- Glycerin filled for smooth operation
- 100% Made in the USA

100% GUARANTEE
Two year warranty

Made in the USA

The Model PVP420VS/PS sensing assembly was designed to provide protection for the Double Disc Pump™ line of positive displacement pumps manufactured by Penn Valley Pump Co., Inc. Our vast experience in pumping and hydraulics has led to a protective device that surpasses those previously available. This device provides protection against the inadvertent pumping against a closed valve or a blocked line thereby preventing damage to the pump.

As process pressure is sensed by the 360° elastomeric sleeve the captive fluid transfers the pressure to the gauge and switch providing for accurate readings and shutdown if the preset pressure has been exceeded. The vacuum assembly is equipped with a 30" HG to 30psi gauge and 30"Hg vacuum switch. The pressure assembly is equipped with 0 -100psi gauge and 90psi switch.

This unit is typically mounted to the top of the pulsation dampener and can be cleaned in place by simply opening the isolation valve and utilizing the system pressure to clear the build-up. The quick release air fitting is used periodically to replenish the air in the dampener that may have been absorbed by the process fluid.

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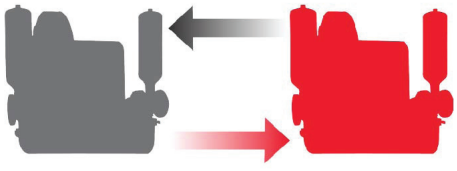

A unique trial program that lets you try before you buy.
Contact us today to swap your pump.

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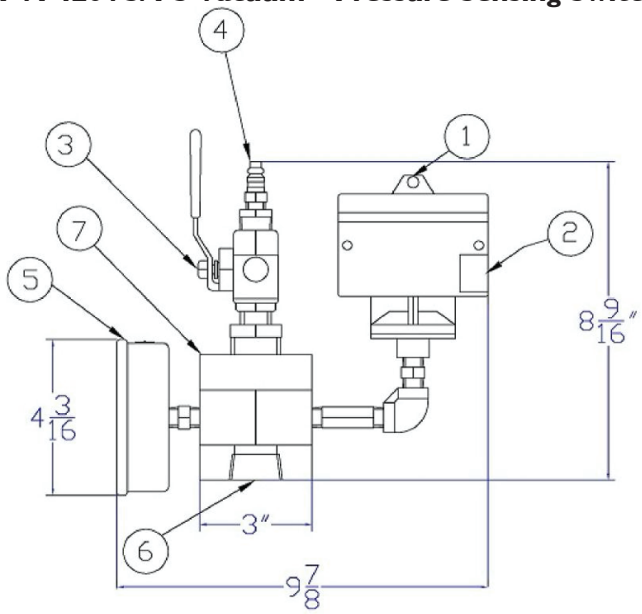
DOUBLE DISC PUMP®

Model PVP420VS/PS Vacuum - Pressure Sensing Switch Assembly



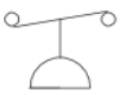
Item	Description
1	Pressure Switch
2	Electrical Connection 1" NPT
3	1/2" SS316 Ball Valve
4	Quick Release Fitting
5	4-inch SS316 Gauge
6	Line Connection 1-inch NPT
7	SS316 Pressure Sensor
	Assembly weighs 12lbs

Electrical

SPDT, 15A, 125/250/480Vac, 1/2A, 125Vdc, 1/4A, 250Vdc; 6A, 30Vdc

Typically wired Normally Closed

NC



Installation

The PVP 420 Vacuum/Pressure switch assembly is designed to be installed to the 1" NPT port at the top of our standard pulsation dampener. If no dampener is supplied the unit is then mounted to the 1" NPT connection at the pump suction and discharge. If a unit other than the PVP 420 is used the unit should be installed as close to the pump suction and discharge ports as possible. Over time solids build-up can occur in the sensing chamber. In most cases the build-up can be cleared by opening the isolation valve and utilizing the system pressure to clear the build-up. If the system pressure is not sufficient to remove the build-up, then the potable or non-potable water system can be used to back flush the sensing chamber. This cleaned in place feature eliminates the need to remove the pressure sensor for cleaning such as is the case with diaphragm seals.

The system consists of a pressure sensor, pressure gauge and a pressure switch. The pressure sensor reads the line pressure in the pump discharge line. The pressure switch is activated when the set pressure is exceeded and that in turn shuts the pumping system down.

The pressure sensor is supplied as standard with an EPDM sensing tube. The sensing system is filled with a 50% ethylene glycol and water solution and is completely protected from the process slurry by the sensing tube. The sensing tube is one-piece construction with integral flanges locked into the pressure sensor with bolted end covers.

The pressure switch is supplied in a watertight alloy enclosure for corrosion resistance that meets 4 requirements. For severe corrosive atmospheres type 3l6 stainless steel and Monel are available. The actuator seal is constructed of Buna-N with process temperature limits of 0 to 150 deg. F. The pressure switch has a plus or minus 1 percent of the range set point repeatability and a minimum of 400 percent of range proof pressures. This unit performs well on applications where shock and vibration could be problem on services such as slurries or abrasive process fluids.

Calibration Procedure

The vacuum switch assemblies are preset to 10"Hg and the pressure switch assemblies are preset at 30 psi. If recalibration is required in the field, the following procedure would be required.

1. Remove the switch cover (environment permitting).

2. Open all system valves and turn the pump on.

3. Check the pressure gauge, the gauge indicator should swing slightly (not more than plus or minus 3 psi) to show line pressure. Adjust the needle valve to achieve the desired gauge indicator fluctuation-open (turn counterclockwise) to increase - close (turn clockwise) to decrease.

4. *The following instructions apply to both vacuum and pressure*. Carefully throttle the pump using the valve until the desired vacuum or pressure is achieved. **Caution: Do not exceed 25"Hg suction or 45 psi discharge.** The pressure switch is factory set at 10"Hg on vacuum and 30 psi so the pump should shut down when that pressure is exceeded.

5. Move the adjusting screw to cut out at the desired pressure. If a lower pressure is being set, the pump will continue to operate until the adjusting nut is turned down (counterclockwise) to the new trip point. It a higher pressure is being set, it will be necessary to adjust the switch (clockwise), then open the valve. Re-start the pumping unit. Then throttle the pump again up to the desired pressure **Caution: Do not exceed 25"Hg suction or 45 psi discharge.** If the pressure switch does not trip, adjust the switch again, repeating the throttling procedure until the correct cut out pressure is achieved.

6. Always re-check the cut out pressure two or three times to be certain that the pressure sensing switch is operating properly. The motor should be wired such that it stays off after the pressure is relieved and requires a manual re-set to be placed back into operation.

7. Re-install the pressure switch cover. The system is ready to be placed in operation.

Penn Valley Pump Co., Inc.
998 Easton Road • Warrington, PA 18976
Ph: 215-343-8750 • Fax: 215-343-8753
www.pennvalleypump.com

Certificate of Calibration for the PVP420PS & PVP420VS

We certify that all PVP420 switch assemblies are fully assembled, tested and calibrated before leaving the factory per the procedures below.

The PVP420PS (pressure switch assembly) is a glycerin filled system:

Assembly:

1) The pressure gauge is attached to the SS316 sensor, the entire sensor is filled and all air is evacuated.
2) There are three (3) fittings attached to the sensor to connect the switch. Two (2) ¼" SS nipples and one (1) ¼" SS elbow.
3) The fittings are attached and filled, all air is evacuated.
4) The switch is attached to the filled system and a 1" ball valve is threaded into the top of the sensor.

Calibration:

The entire sensor is attached to a test rig that is equipped with an air chamber and a separate calibration gauge. An air hose is attached and the chamber is filled with compressed air. The gauge attached to the switch is compared to the calibration gauge for accuracy. The switch is then set at 30psi. All pressure is released. The switch is then tested for continuity on the Normally Open contact. At 30 psi the switch trips and opens the circuit resulting in a continuity reading.*

The PVP420VS (Vacuum switch assembly) is a glycerin filled system:

Assembly:

1) The Vacuum gauge is attached to the SS316 sensor, the entire sensor is filled and all air is evacuated.
2) There are three (3) fittings attached to the sensor two (2) ¼" nipples and one (1) ¼" elbow.
3) The fittings are attached and filled, all air is evacuated.
4) The switch is attached to the filled system and a 1" ball valve is threaded into the top of the sensor.

Calibration:

The entire sensor is attached to a test rig that has an air chamber and a separate calibration gauge. An air hose is attached to a vacuum generator and connected to the rig. The gauge attached to the switch is compared to the calibration gauge for accuracy. The switch is then set at 10"HG. All vacuum pressure is released. The switch is then tested for continuity on the Normally Open contact. At 10"HG the switch trips and opens the circuit resulting in a continuity reading.*

*Both Switches to be wired Normally Closed

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IN A RUSH? ASK FOR ASHCROFT GOLD SERVICE

NEW! 5000 & 7500 PSI RANGES AVAILABLE

ISO 9001 REGISTERED FIRM

DRESSER Instruments

6DDSX107-MK1 Pump Design Information
November 2021

B-SERIES PRODUCT INFORMATION

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

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

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

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

Type 400 Enclosure

UL and CSA listed instrument quality snap-action switch for reliable operation. Ratings up to 10A dc or 20A ac. Hermetically sealed switch also available.

Epoxy-coated aluminum enclosure for corrosion resistance. Meets NEMA 3, 4, 4X, 13 and IP66 requirements.

Accessible adjustment for convenient switch setting, includes vibration-resistant feature.

¾ NPT electrical connection for easy wiring.

Neoprene gasket for sealing enclosure.

High proof pressure.

Deadband limits for each switch.

Standard pressure connection materials:
Pressure psi ranges – 316 SS
Differential psid ranges – Nickel-plated brass
Pressure and differential I.W. ranges –
Epoxy-coated carbon steel

PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for 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_2O, 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 in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

PRESSURE/VACUUM SWITCHES

Nominal Range[1]			Overpressure Ratings		Approximate Deadband[2] Switch Element				
			Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32
Vacuum									
–30˝ Hg	–760mm Hg	-100 kPa	500	1000	0.3-0.7	1.5-3.0	0.5-2.2	0.4-1.5	2.1-4.2
Compound									
–15˝ H_2O/ 15˝ H_2O	–375mm H_2O/ 375mm H_2O	–3.7 kPa/ 3.7 kPa	20	35	0.15-.75/ 0.15-.75	1.5-2.5/ 1.5-2.5	0.45-2.0/ 0.45-2.0	0.5-1.2/ 0.5-1.2	2.1-3.5/ 2.1-3.5
–30˝ H_2O/ 30˝ H_2O	–760mm H_2O/ 760mm H_2O	–7.5 kPa/ 7.5 kPa	20	35	0.30-.60/ 0.30-.60	1.5-2.5/ 1.5-2.5	0.45-2.0/ 0.45-2.0	0.5-1.5/ 0.5-1.5	2.1-3.5/ 2.1-3.5
–30˝ Hg/ 15 psi	–760mm Hg/ 1.0 kg/cm²	–100 kPa/ 100 kPa	500	1000	0.5-1.0/ 0.3-0.7	2.0-3.0/ 0.5-1.5	0.75-2.5/ 0.5-1.0	0.7-1.8/ 0.7-1.4	2.8-4.2/ 0.7-2.1
–30˝ Hg/ 30 psi	–760mm Hg/ 2.0 kg/cm²	–100 kPa/ 200 kPa	500	1000	1.0-1.5/ 0.3-0.8	3.0-6.0/ 1.0-2.0	1.2-4.5/ 0.7-1.5	1.4-2.4 0.4-1.3	4.2-8.4/ 1.4-2.8
–30˝ Hg/ 60 psi	–760mm Hg/ 4.0 kg/cm²	–100 kPa/ 400 kPa	500	1000	2.0-3.0/ 0.7-1.5	5.0-9.0/ 3.0-5.0	2.5-7.0/ 1.1-4.0	2.8-4.5 1.0-2.3	7.0-12.0/ 4.2-7.0
Pressure									
10˝ H_2O	250mm H_2O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30˝ H_2O	750mm H_2O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60˝ H_2O	1500mm H_2O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100˝ H_2O	2500mm H_2O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150˝ H_2O	3750mm H_2O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15 psi	1.0 kg/cm²	100 kPa	2400	3000	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30 psi	2.0 kg/cm²	200 kPa	2400	3000	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60 psi	4.0 kg/cm²	400 kPa	2400	3000	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100 psi	7.0 kg/cm²	700 kPa	2400	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200 psi	14 kg/cm²	1400 kPa	2400	3000	1-3	3-13	2-9	3.0-7.5	7.0-18.2
400 psi	28 kg/cm²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600 psi	42 kg/cm²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	12.6-42
1000 psi	70 kg/cm²	7000 kPa	12000	18000	7-30	30-110	18-70	15-80	42-154
3000 psi	210 kg/cm²	2100 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-329

DIFFERENTIAL PRESSURE SWITCHES

Nominal Range[1]			Pressure Ratings		Approximate Deadband[2] Switch Element				
			Static Working Pressure	Proof psi	20, 26, 27	21, 24, 31	50	22	32
30˝ H_2O	750mm H_2O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60˝ H_2O	1500mm H_2O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100˝ H_2O	2500mm H_2O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150˝ H_2O	3750mm H_2O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0
15 psid	1.0 kg/cm²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0
30 psid	2.0 kg/cm²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0
60 psid	4.0 kg/cm²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5
100 psid	7.0 kg/cm²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0
200 psid	14.0 kg/cm²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0
400 psid	28.0 kg/cm²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0
600 psid	42 0 kg/cm²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	112.0-210.0

Values shown are for zero static working pressure.

NOTES:

1 Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where setpoints must be lower.

2 All deadbands are given in English units as shown in the nominal range column. Deadbands shown are for switches with Buna N diaphragm. Approximate deadbands for optional diaphragms:

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

ORDER INFORMATION

B-SERIES PRESSURE AND DIFFERENTIAL PRESSURE SWITCH MODEL NUMBER:

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

1		2		3	4			5
B	4	2	0	B	X	P	K	600 PSI

D4 psid model shown

1 – ENCLOSURE

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

3 – ACTUATOR SEAL

Code and Material	Process Temperature Limits °F[9]	Range			
		Vac. ″ H_2O	0-600 psi	1000 psi	3000 psi
B – Buna-N	0 to 150	•	•	•	•
V – Viton	20 to 300	•	•	•	
T – Teflon	0 to 150	•	•	•	•
S – 316L[8]	0 to 300		•	•	
P – Monel[8]	0 to 300		•	•	

4 – OPTIONS

Use table from page 10

5 – RANGE

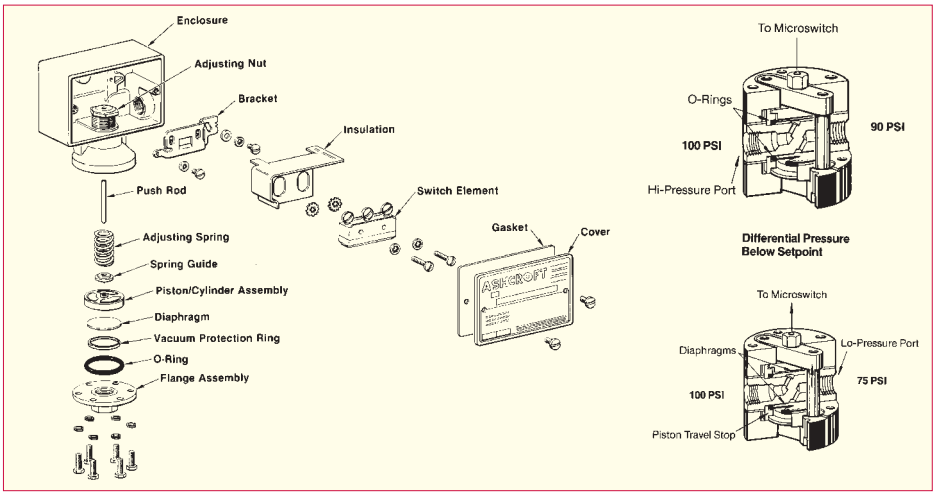
Select from table on page 4

2 – SWITCH ELEMENT SELECTION

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

NOTES:

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



SELECTION

Before making your selection, consider the following:

1. Actuator
The actuator responds to changes in pressure, temperature or differential pressure and operates the switch element in response to these changes.

The actuator is normally exposed to process fluid and must therefore be chemically compatible with it. The following may be used to help select actuator type:

For nominal pressure ranges 0-15 psi through 0-3000 psi, Dresser's standard actuator is a diaphragm-sealed piston. In this actuator, process pressure acting on the piston area causes it to overcome the adjustment spring force and actuate a snap-action switch. A diaphragm and O-ring seal the process media from this mechanism. These are available in various materials, i.e.: Buna N, Teflon and Viton. The standard process connection is stainless steel. Optional Monel pressure connection is available.

For H_2O Pressure and Differential Pressure Ranges, a diaphragm actuator is used. In this design, the standard pressure connections are carbon steel. Diaphragms are available in Viton, Buna N and Teflon. Always review process temperature limits before making seal selections. Optional stainless steel pressure connections are available (option XTA).

For High Differential Pressure Actuator Ranges, 3-15 to 60-600 psid, a Dual Diaphragm-Sealed Piston Actuator is used. This actuator is designed to for high static-pressure applications. The standard pressure connections are nickel-plated brass. Diaphragms are available in Viton, Buna N and Teflon. Always review process temperature limits before making seal selections. Optional stainless steel pressure connections are available (option XUD).

For all temperature ranges the standard Ashcroft® temperature actuator operates on the vapor pressure principle: the vapor pressure in a sealed thermal system is applied to a sensing element, which in turn actuates a switch. This is known as a SAMA Class II system. Various filling materials are used, including Propane, Butane, Methyl Alcohol, N Propyl Alcohol and Xylene. High overtemperature capability is possible with this type of system. The interface between liquid and vapor is the point at which sensing occurs. This is the "sensitive" portion of the bulb. Bulb extensions and capillary are normally filled with vapor, and have little effect on the setpoint, regardless of ambient temperature variations; therefore, no ambient compensation is required. For best results, the bulb should be mounted within 60 degrees of vertical to assure the liquid remains in the bulb.

2. Enclosure
The enclosure protects the switch element and mechanism from the environment and has provisions for mounting and wiring. All Ashcroft switch enclosures are epoxy-coated aluminum or stainless steel for maximum corrosion resistance. Choose between watertight NEMA 4, 4X for most industrial applications and explosion-proof NEMA 7/9 for most process applications.

Ashcroft enclosures include watertight cover gaskets, external mounting holes and one or two ¾ NPT electrical conduit holes for ease of installation. Pressure switches may also be mounted directly to the process by means of the standard ¼ NPTF or optional ½ NPT pressure connection.

Note: When installing Ashcroft switches, refer to instruction sheets included with each switch, the National Electrical Code, and any other local codes or requirements to assure safety.

3. The Switching Function
Next, consider the switching function. Most application is for alarm and shutdown are satisfied by single setpoint, fixed deadband models. For high/low or alarm and shutdown, the dual setpoint models may be selected. For pump, compressor, level and other control applications, an adjustable deadband model is often the best choice. Consult your Ashcroft representative for dual setpoint or adjustable-deadband pressure and temperature switches.

4. The Switch Element
Finally, the electrical switching element must be compatible with the electrical load being switched. For ease of selection, all electrical switching elements are snap acting, SPDT (single pole-double throw), or 2 (SPDT). Refer to catalog pages for switch element choices. Select a switch element with electrical rating that exceeds the electrical rating of the device being controlled by the switch. For better reliability and safety, optional Hermetically Sealed switching elements may be specified.

ADDITIONAL SWITCH TERMINOLOGY

Accuracy – (see repeatability) Accuracy normally refers to conformity of an indicated value to an accepted standard value. There is no indication in switch products; thus, instead, the term repeatability is used as the key performance measure. Ashcroft® pressure and temperature switch accuracy is 1% of nominal range.

Automatic Reset Switch – Switch which returns to normal state when actuating variable (pressure or temperature) is reduced.

Adjustable or Operating Range – That part of the nominal range over which the switch setpoint may be adjusted. Normally about 15% to 100% of the nominal range for pressure and differential pressure switches and the full span for temperature switches.

Burst Pressure – The maximum pressure that may be applied to a pressure switch without causing leakage or rupture. This is normally at least 400% of nominal range for Ashcroft switches. Switches subjected to pressures above the nominal range can be permanently damaged. Consult factory for switches that must operate at pressure above nominal range or reference calibration temperature (70°F).

Deadband – The difference between the setpoint and the reset point, normally expressed in units of the actuating variable. Sometimes referred to as differential.

Division 1 – A National Electrical Code Classification of hazardous locations. In Division 1 locations, hazardous concentrations of flammable gases or vapors exist continuously, intermittently or periodically under normal conditions; frequently because of repair or maintenance operation/leakage or due to breakdown or faulty operation of equipment or processes which might also cause simultaneous failure of electrical equipment. Explosion-proof NEMA 7/9 enclosures are required in Division 1 locations.

Division 2 – A National Electrical Code Classification of Hazardous locations. In Division 2 hazardous locations, flammable or volatile liquid or flammable gases are handled, processed or used, but will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown or in case of abnormal operation of equipment. Either Nema 7/9 explosion-proof enclosures or any enclosure with hermetically sealed switch contacts may be used in Division 2 locations.

Explosion Proof – A term commonly used in industry referring to enclosures capable of withstanding an internal explosion of a specified gas without igniting surrounding gases. Strict installation practices in accordance with the national electrical code are also required for safety.

Fixed Deadband – The difference between the setpoint and the reset point of a pressure or temperature switch. It further signifies that this deadband is a fixed function of the pressure switch and not adjustable.

Hermetically Sealed Switch – A switch element whose contacts are completely sealed from the environment to provide additional safety and reliability. Contact arc cannot cause an explosion, and atmospheric corrosive elements cannot affect the contacts.

Manual Reset Switch – Pressure or Temp-erature switch in which contacts remain actuated even after the actuating variable returns to normal. On Ashcroft manual reset switches, a button must be pushed to reset the contacts.

National Electrical Manufacturers Association (NEMA) – This group has defined several categories of enclosures, usually referred to as "types." Further, they designate certain features and capabilities each type must include. For example, among other features, a NEMA 4 enclosure must include a threaded conduit connector, external mounting provision and cover gaskets. When selecting a NEMA 4 enclosure from any manufacturer, a buyer is assured of receiving these features.

NEMA 4 – Watertight and dusttight enclosures intended for use indoors or outdoors to protect the equipment against splashing, falling or hose-directed water, external condensation and water seepage. They are also sleet-resistant.

NEMA 4X – Watertight, dusttight and corrosion-resistant enclosures with same qualifications as NEMA 4, but with added corrosion resistance.

NEMA 7 – Enclosures for indoor Class I, Division 1 Hazardous locations with gas or vapor atmospheres.

NEMA 9 – Enclosures for indoor Class II, Division 1 Hazardous locations with combustible dust atmospheres.

Normal Switch Position – Contact position before actuating pressure (or variable) is applied. Normally closed contacts open when the switch is actuated. Normally open contacts close when the switch is actuated.

Normally Closed – Refers to switch contacts that are closed in the normal switch state or position (unactuated). A pressure change opens the contacts.

Normally Open Switch – Refers to the contacts that are open in the normal switch state or position (unactuated). A pressure change closes the contacts.

Overpressure Rating(s) – A nonspecific term that could refer to either burst or proof pressure, or both.

Proof Pressure – The maximum pressure which may be applied without causing damage. This is determined under strict laboratory conditions including controlled rate of change and temperature: This value is for reference only. Consult factory for applications where switch must operate at pressures above nominal range, or reference calibration temperature (70°F).

Repeatability (Accuracy) – The closeness of agreement among a number of consecutive measurements of the output setpoint for the same value of the input under the same operating conditions, approaching from the same direction, for full-range traverses. Ashcroft® pressure and temperature switch repeatability is 1% of nominal range.

Note: It is usually measured as nonrepeatability and expressed as repeatability in percent of span or nominal range. It does not include hysteresis or deadband.

Reset Point – The reset point is the Pressure, Temperature or Differential Pressure Value where the electrical switch contacts will return to their original or normal position after the switch has activated.

Setpoint – The setpoint is the Pressure, Temperature or Differential Pressure value at which the electrical circuit of a switch will change state or actuate. It should be specified either on increase or decrease of that variable. (See also reset point.)

Single-Pole Double Throw (SPDT) Switching Element – A SPDT switching element has one normally open, one normally closed, and one common terminal. The switch can be wired with the circuit either normally open (N/O) or normally closed (N/C). SPDT is standard with most Ashcroft pressure and temperature switches.

Snap Action – In switch terminology, snap action generally refers to the action of contacts in the switch element. These contacts open and close quickly and snap closed with sufficient pressure to firmly establish an electrical circuit. The term distinguishes products from mercury bottle types that were subject to vibration problems.

Static Pressure – For differential pressure switches, static pressure refers to the lower of the two pressures applied to the actuator.

B-SERIES SWITCH OPTIONS

		Appicable Switch Series						
		Pressure		Differential Pressure		Temp-erature	H	
Code	Description	(psi)	(in. H_2O)	(psi)	(in. H_2O)	All Ranges		Notes
XBP	Wall Mounting Bracket in. H_2O		•		•			
XBX	½″ Male NPT Bushing					•		
XCH	Chained Cover	•	•	•	•	•	•	
XC8	CSA Approval	•	•	•	•	•		11
XCN	ATEX Directive 94/9/EC EEx d IIC T6	•	•	•	•	•		
XFM	FM Approval – Single Element	•	•	•	•			17
	FM Approval – Dual Element	•	•	•	•			17
XFP	Fungus Proofing	•	•	•	•	•	•	
XFS	Factory Adjusted Setpoint	•	•	•	•	•	•	2
XG3	Belleville Actuator	•						16,17
XG4	Teflon Actuator and Pressure Conn.	•						8
XG5	UL Limit Control to 150″ H_2O				•			1, 17
XG6	UL Limit Control to 600 psi	•						1, 17
XG7	Secondary Chamber with Vent	•						13
XG8	Steam Limit Control to 300 psi	•						7
XG9	Fire Safe Welded Actuator	•						7
XHS	High Static Diflerential Pressure			•				15
XHX	High Pressure, 40 psi, (static) DIP 160 psi (proof) DIP 100 psi proof pressure		•		•			
XJK	Left Conduit Connection	•	•	•	•	•	•	9
XJL	¾″ to ½″ Reducing Bushing	•	•	•	•	•	•	
XK3	Terminal Block (700 Series only)	•	•	•	•	•		6
XLE	Long Leads on the Micro Switch	•	•	•	•	•	•	
XL9	Low Hardness SS Press. Conn.	•						12
XNH	Tagging Stainless Steel	•	•	•	•	•	•	
XNN	Paper Tag	•	•	•	•	•	•	
XPK	Pilot Light(s) Top Mounted	•	•	•	•	•	•	4
XPM	¾″ Sealed Conduit Connection with 16″ Lead Wires	•	•	•	•	•	•	
XTA	316 Stainless Steel Pressure Connection for in. H_2O Range		•		•			
XTM	2″ Pipe Mounting Bracket	•	•	•	•	•		
XUD	316 Stainless Steel Pressure Conn.			•				
X06	Pressure Connection: ½ NPT Male, ¼ NPT Female 316 Stainless Steel (Combination)	•	•	•	•			5
X07	½ NPTF Press. Conn., 316 SS	•	•	•	•			10
X2B	Breather Drain	•	•	•	•	•		
X6B	Cleaned for Oxygen Service	•	•	•				3
	Diaphragm Seal	•	•	•	•			

ATEX Directive 94/9/EC APPROVAL FOR HAZARDOUS LOCATIONS

ATEX is a European designation that deals with standards for equipment and protective systems intended for use in potentially explosive atmospheres. This approval is required for switches intended for use in hazardous locations, especially important to OEMs who export to Europe and contractors specifying or purchasing products for European applications.
XCN option adds special features to Ashcroft 700-Series switch enclosures that meet the requirements for the highest levels of security and danger, such as:

- Special locking device requiring an Allen wrench to remove cover
- Special vents that blow out should the diaphragm rupture, thus preventing pressure build-up in the enclosure
- Special conduit plug requiring an Allen wrench for removal
- Available on pressure, temperature and differential pressure models
- Meets Explosion Class EEx d IIC T6

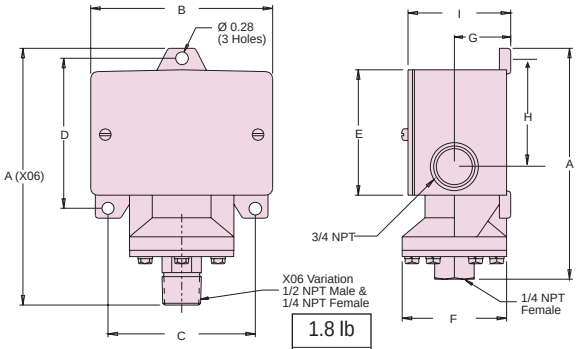
Order option XCN

NOTES:

1 Buna N and Viton diaphragm.
2 Advise static or working pressure for differential pressure switches.
3 Buna N cannot be cleaned for oxygen service.
4 N/A on 700 Series.
5 Standard with 1000 and 3000 psi ranges. Bottom connection only on DP in H_2O ranges.
6 Terminal Blocks standard with 700 dual switches.
7 Stainless steel diaphragm only.
8 Pressure connection ¼ NPTF.
9 Standard on 700 Series. N/A with DPDT element on 400 Series.
10 N/A with Monel diaphragm.
11 Standard on 400 Series.
12 N/A on 3000 psi range. Available with Teflon diaphragm only.
13 SS diaphragm required. Teflon diaphragm is the backup. NEMA 7 only.
14 Available in ranges vacuum to 600 psi. Not available with stainless steel or Monel diaphragm.
15 Buna N and Viton diaphragm – 15#D & 30#D only.
16 24, 32, 64 or 68 element only.
17 N/A on all combinations

TYPE 400 DIMENSIONS

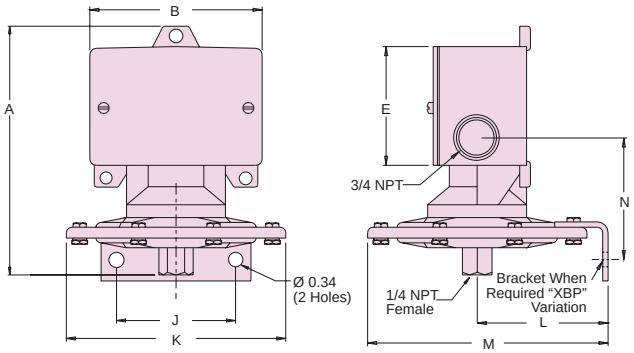
Pressure switch – psi ranges



1.8 lb
(.81 kg)

A (X06)	A	B	C	D	E	F	G	H	I
5 7/8	5 1/8	4	3 1/4	3 5/16	2 3/4	2 5/16	1 1/4	2 13/32	2 5/16
(149)	(130)	(102)	(83)	(84)	(70)	(59)	(32)	(61)	(59)

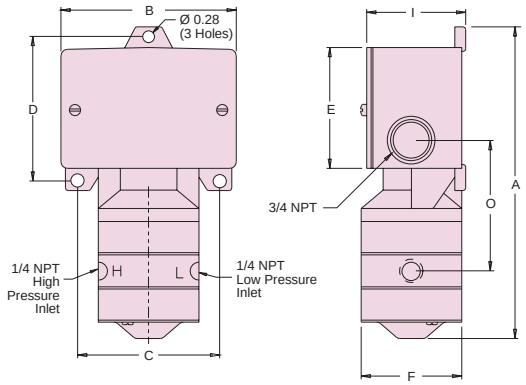
Pressure switch – inches of water ranges



A	B	E	J	K	L	M	N
5 25/32	4	2 3/4	2 25/32	5 1/8	3 1/16	5 11/16	2 27/32
(147)	(102)	(70)	(71)	(130)	(78)	(145)	(72)

2.7 lb
(1.2 kg)

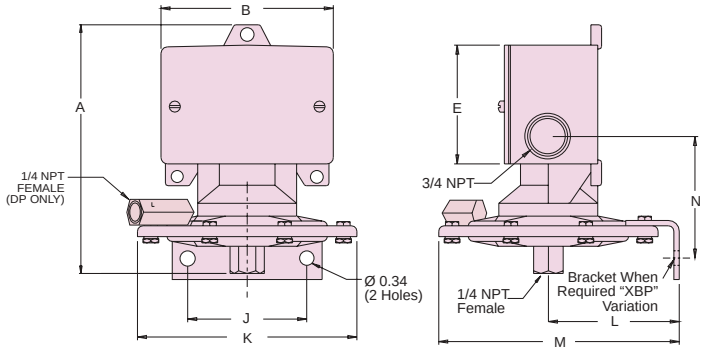
Differential pressure switch – psi differential ranges



A	B	C	D	E	F	I	O
7 5/32	4	3 1/4	3 5/16	2 3/4	2 5/16	2 5/16	3
(182)	(102)	(83)	(84)	(70)	(59)	(59)	(56)

3.6 lb
(1.6 kg)

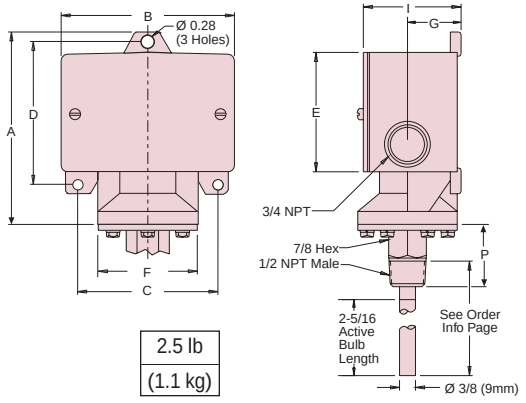
Differential pressure switch – inches of water ranges



A	B	E	J	K	L	M	N
5 25/32	4	2 3/4	2 25/32	5 1/8	3 1/16	5 11/16	2 27/32
(147)	(102)	(70)	(71)	(130)	(78)	(145)	(72)

2.7 lb
(1.2 kg)

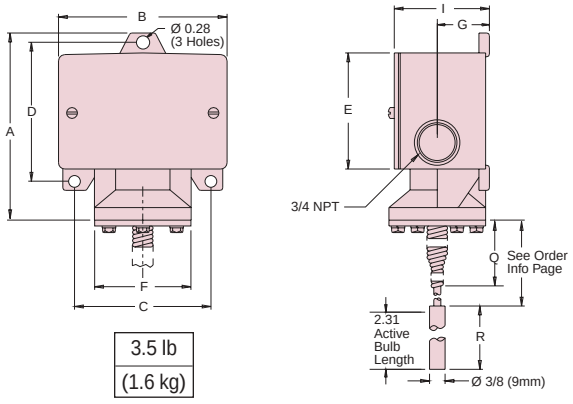
Temperature switch – direct mount



2.5 lb
(1.1 kg)

A	B	C	D	E	F	G	I	P
4 11/16	4	3 1/4	3 5/16	2 3/4	2 5/16	1 1/4	2 5/16	1 5/16
(119)	(102)	(83)	(84)	(70)	(59)	(32)	(59)	(33)

Temperature switch – remote mount



3.5 lb
(1.6 kg)

A	B	C	D	E	F	G	I	Q	R
4 11/16	4	3 1/4	3 5/16	2 3/4	2 5/16	1 1/4	2 5/16	3	3
(119)	(102)	(83)	(84)	(70)	(59)	(32)	(59)	(76)	(76)

ADDITIONAL PRESSURE AND TEMPERATURE SWITCH APPLICATION INFORMATION

DIFFICULT PROCESS MEDIA

When specifying pressure or temperature switches, the material in contact with media must be compatible with it. Otherwise, failure could occur, resulting in leakage, injury, and loss of life, property or production. The user should review prior experience with materials of construction in the process for guidance in material selection. If this is not appropriate, contact Dresser's Control Instrument Operation for assistance. Relevant information such as process media, concentration of each constituent, temperature, pressure, the presence of contaminants, particulate, vibration or pulsation is necessary to make the best recommendation. Refer also to Product Information Page ASH-PI-14B "Corrosion Data Guide."

Some applications are best handled by adding an Ashcroft diaphragm seal to isolate the fluid media from the pressure or differential pressure switch.

Diaphragm seals are recommended where:

- The process media being sensed could clog the pressure element.
- The process media temperature is above or below the ratings of the actuator seal materials.
- The application calls for a sanitary process connection.

Note: The addition of a diaphragm seal may increase the deadband and response time of the pressure switch to process pressure changes. Please consult the Control Instrument Operation for details.

Refer also to Ashcroft Product Bulletin DS-1 and Product Information Page SW/PI-30B, "Switch, Diaphragm Seal Combination."

OXIDIZING MEDIA

When specifying a pressure switch for use in oxidizing media, such as chlorine, oxygen and several other chemical compounds, the wetted materials must be compatible with the media, and the switch should be cleaned for oxygen service. This is necessary to remove any residue that might react violently with the oxidizing media. Specify option X6B (clean for oxygen service). Refer also to Product Information Page SW/PI-6B, "Oxygen Cleaning for Ashcroft Switches."

STEAM SERVICE

In order to prevent live steam from coming into contact with the switch actuator, a siphon filled with water should be installed between the switch and the process line. We recommend the optional stainless steel welded process connection and diaphragm even though viton is rated for use with steam. Experience has shown that in many steam applications, the 300°F high temperature limit of Viton is exceeded by steam under pressure.

In some boiler applications, a special U.L. listing, "MBPR," which requires unique features, is needed. Dresser offers these features with option XG8. Refer also to Product Information Page SW/PI-27A, "Steam Limit Control Switch."

NACE

The National Associations of Corrosion Engineers (NACE) publishes a standard covering the requirements of metallic materials in contact with process media containing Hydrogen Sulfide. We recommend the use of Monel (code P) wetted materials for most applications. Other alternatives include adding applicable diaphragm seals or low hardness stainless steel pressure connection (XL9) and teflon diaphragm. Refer also to Product Information Page SW-22A, "Pressure Switches Meeting NACE Standard MR-01-75."

HIGH TEMPERATURE PROCESS

Refer to the actuator seal table for process temperature limits for pressure switch actuators. Pressure switches mounted directly to the process can withstand up to 300°F when equipped with optional Viton, stainless steel or Monel wetted parts. If process temperature exceeds 300°F, four feet of ½″ tubing between the process and the switch will generally protect the switch from damage.

Alternatively, an Ashcroft diaphragm seal selected from bulletin DS-1 can be used to isolate the switch from the hot process.

VIBRATION

Generally, vibration will not harm Ashcroft pressure switches. However, premature tripping may occur under severe conditions. This tends to be annoying, but repeatable for a given situation and might be in the order of 5% to 10% of switch range from the setpoint, i.e. a 100 psi switch set at 50 psi on increasing pressure might trip somewhere between 40 and 45 psi on increasing pressure. This would not reduce the life of the pressure switch.

The best approach in this type of application is to mount the switch remotely, connecting the switch to the process or equipment with flexible tubing. If this is not possible, consider the use of the Belleville actuator, option XG3. Refer also to Product Information Page SW/PI-58, "Belleville Actuator."

PULSATION

Pressure pulsation below the range of the pressure switch will not harm it. However, because the switch can react to pressure pulses less than one-second duration, it might be desirable to include a dampening device. Several Ashcroft accessories such as snubbers address this situation. Refer to the accessory section of Ashcroft Ordering Handbook (OH-1), or consult your Ashcroft representative for more information.

MOUNTING

All Ashcroft pressure, temperature and differential pressure switches with snap acting contacts may be mounted in any position. This includes the sensing bulbs of temperature switches. This is an important advantage of snap acting switch designs.

ADDITIONAL PRESSURE AND TEMPERATURE SWITCH APPLICATION INFORMATION

SWITCH ELEMENT SELECTION

B-Series switches are available with a wide variety of snap acting switch elements to meet most electrical requirements. The standard contact arrangement is single pole, double throw (S.P.D.T.). This includes both normally open and normally closed contacts. Standard contact material is fine silver which generally is suitable for switching 8 volts or more, up to the rating in the Switch Element Selection Table. When switching less than 8 volts, optional Gold Alloy contacts are recommended.

Optional dual, or 2 S.P.D.T. contacts may be supplied in B-Series enclosures for applications requiring two switch functions at the same setpoint. These contacts are technically not double pole, double throw (D.P.D.T.). They are synchronized at the factory to actuate within 1% of nominal range of each other. For simultaneous actuation of 2 S.P.D.T. contacts, option XG3 should be ordered. Refer also to SW/PI-58 "Belleville Actuator."

HAZARDOUS LOCATIONS

a. Division I.
Ashcroft 700 series or other explosion proof enclosures are required to meet the requirements of Division I Hazardous Locations as defined by the National Electrical Code.

ATEX option shown

b. Division II.
These enclosures also meet the less stringent requirements for Division II Hazardous Locations. Alternatively, Ashcroft 400 series or other watertight enclosures with hermetically sealed switch elements are approved for use in Division II hazardous locations.

c. Intrinsic Safety.
Ashcroft 400 and 700 series pressure and temperature switches may be used with approved barriers in most intrinsically safe systems. These switches do not create or store energy and are therefore designated "simple devices" in these systems.

d. ATEX Approval. (optional)
Ashcroft 700 series pressure and temperature switches are approved for ATEX directive 94/9/EC. This European directive is for equipment intended for use in potentially explosive atmospheres. See option XCN on page 10.

INFORMATION & GUIDELINES FOR SETTING ASHCROFT PRESSURE, TEMPERATURE AND DIFFERENTIAL PRESSURE SWITCHES

All Ashcroft pressure, temperature and differential pressure switches can be set at any point between about 15% and 100% of the range as designated on the label or the nominal range table.

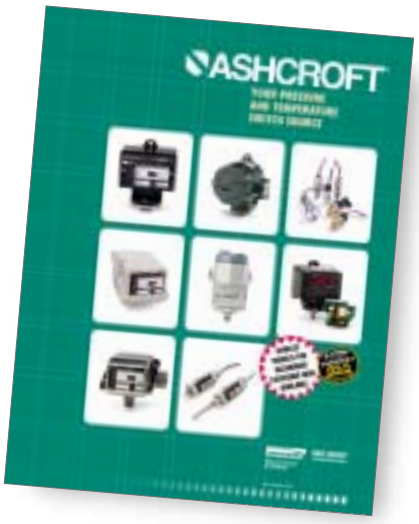
Ashcroft pressure and temperature switches can be either set in the field or ordered from the factory preset to your requirements. When set at the factory, the specification is ±1% of the nominal range.
Factory setting, or XFS, is a very popular option, and as a result, we often receive orders that do not have enough information or have incorrect information.

HOW TO ORDER

When "XFS" is desired:

1. Setpoint must be indicated.
2. Increasing or decreasing pressure must be indicated.

   Ex: B424B XFS 100#
   Set: 60# decreasing
3. For differential pressure switches, static operating pressure must also be specified.



For other Ashcroft switch models request Ashcroft Bulletin, Switch Quick Guide QG-3.
All product information pages mentioned in this bulletin can be downloaded from our web site.

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(52)55-53-10-28-75
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Instruments

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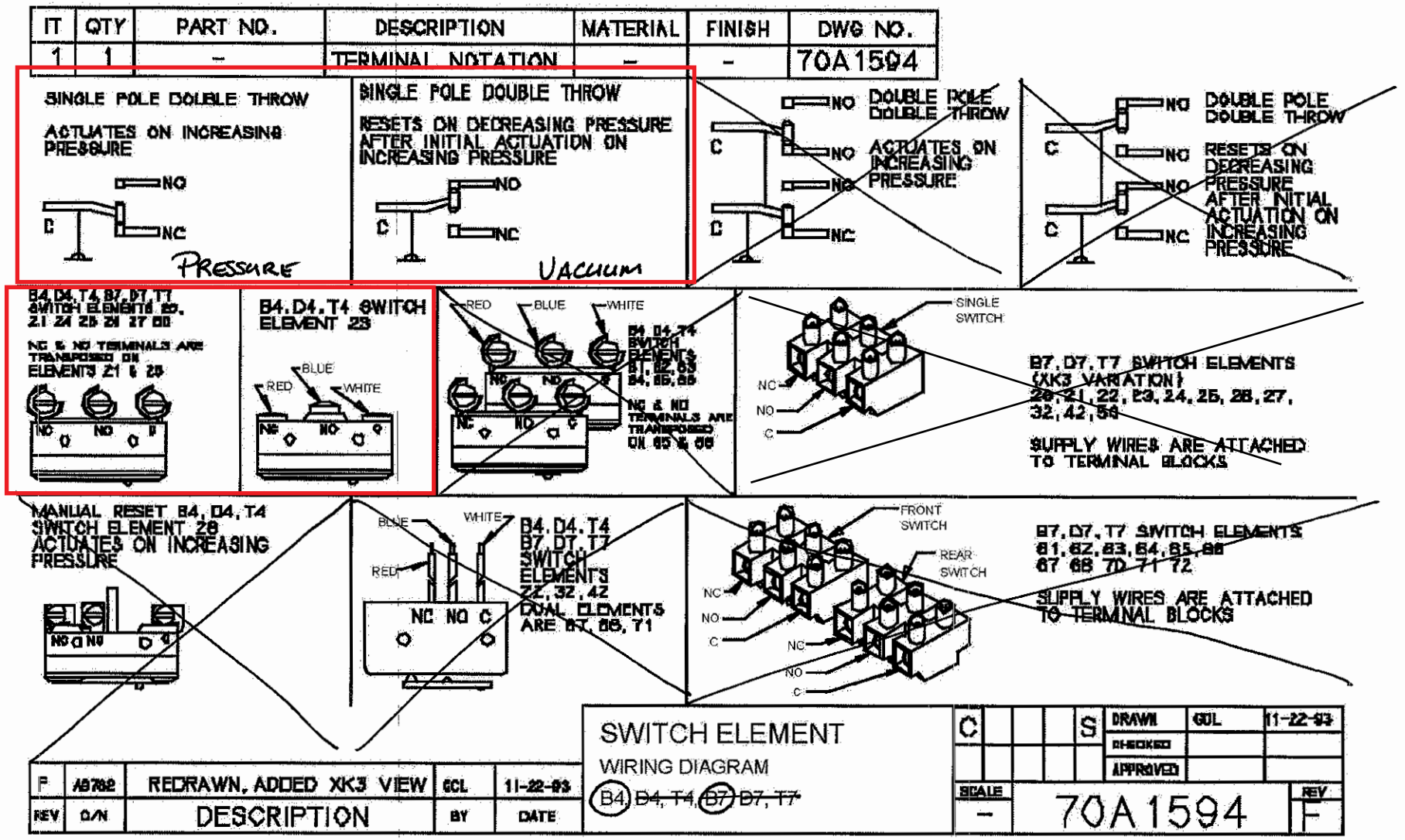
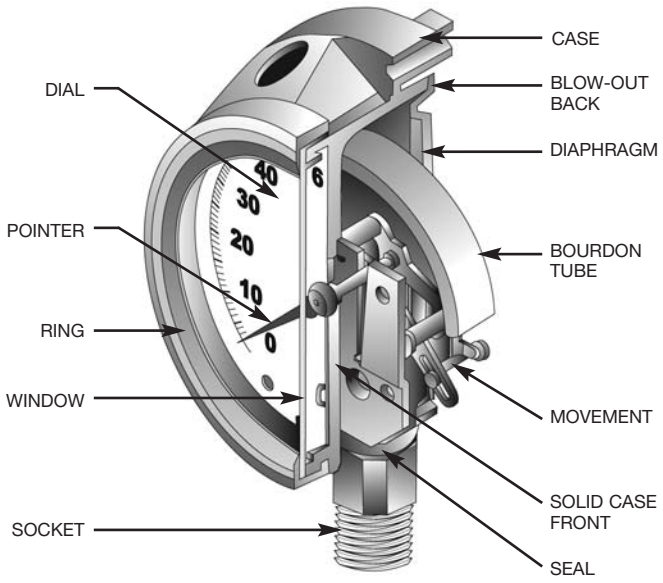

IT | QTY | PART NO. | DESCRIPTION | MATERIAL | FINISH | DWG NO.
1 | 1 | - | TERMINAL NOTATION | - | - | 70A1594
SINGLE POLE DOUBLE THROW
ACTUATES ON INCREASING PRESSURE
NO
C
NC
PRESSURE
SINGLE POLE DOUBLE THROW
RESETS ON DECREASING PRESSURE AFTER INITIAL ACTUATION ON INCREASING PRESSURE
NO
C
NC
VACUUM
NO
DOUBLE POLE DOUBLE THROW
C
NO
ACTUATES ON INCREASING PRESSURE
NO
C
NC
NO
DOUBLE POLE DOUBLE THROW
C
NO
RESETS ON DECREASING PRESSURE AFTER NITIAL ACTUATION ON INCREASING PRESSURE
NO
C
NC
B4, D4, T4, B7, D7, T7 SWITCH ELEMENTS 20, 21 24 25 26 27 60
NC & NO TERMINALS ARE TRANSPOSED ON ELEMENTS 21 & 25
NC NO C
B4, D4, T4 SWITCH ELEMENT 23
BLUE
RED
WHITE
NC NO C
RED
BLUE
WHITE
B4 D4 T4 SWITCH ELEMENTS B1, B2, B3 B4, B5, B6
NC & NO TERMINALS ARE TRANSPOSED ON B5 & B6
NC
NO
C
SINGLE SWITCH
B7, D7, T7 SWITCH ELEMENTS (XK3 VARIATION) 20, 21, 22, 23, 24, 25, 26, 27, 32, 42, 56
SUPPLY WIRES ARE ATTACHED TO TERMINAL BLOCKS
MANUAL RESET B4, D4, T4 SWITCH ELEMENT 26 ACTUATES ON INCREASING PRESSURE
NO C NO C
BLUE
WHITE
RED
NC NO C
B4, D4, T4 B7, D7, T7 SWITCH ELEMENTS 22, 32, 42 DUAL ELEMENTS ARE B7, B6, 71
FRONT SWITCH
REAR SWITCH
NC
NO
C
NC
NO
C
B7, D7, T7 SWITCH ELEMENTS B1, B2, B3, B4, B5, B6 67 68 70 71 72
SUPPLY WIRES ARE ATTACHED TO TERMINAL BLOCKS
F | A8782 | REDRAWN, ADDED XK3 VIEW | GCL | 11-22-93
REV | O/N | DESCRIPTION | BY | DATE
SWITCH ELEMENT
WIRING DIAGRAM
B4, D4, T4, B7, D7, T7
C | S
DRAWN | GCL | 11-22-93
CHECKED
APPROVED
SCALE
-
70A1594
REV
F

Pressure Gauges

DESIGN & OPERATION



Description

A pressure gauge is a mechanical instrument designed to measure the internal pressure and/or vacuum of a vessel or system. Trerice Pressure Gauges are offered in a variety of styles, sizes, and wetted part materials to meet the demands of standard and special applications.

Principles of Operation

Most Trerice Pressure Gauges are constructed with a bourdon tube sensing element. When the sensing element is subjected to pressure, it flexes and the resulting motion is transmitted as a measurement through a mechanical movement to the dial face pointer.

Selecting a Pressure Gauge

Case

Cases are available in a wide variety of materials and configurations. The combination of material and configuration is generally determined by the demands of the application, as well as the preferences of the gauge specifier. The more demanding the environment, the more rugged the case construction (i.e., polypropylene or stainless steel for industrial applications vs. aluminum or steel for construction or commercial applications). Gauge mounting or retrofitting needs may affect case selection (i.e., a gauge to be panel mounted will require either a front flange or u-clamp style case). For safety considerations, a “solid-front” case style may be required. Each application will have a unique set of requirements which will help guide the specifier in selecting the appropriate case style.

All Trerice Pressure Gauges should be carefully selected to meet the demands of the particular application. The information contained in this catalog is only offered as a guide to assist in making the proper selection.

Improper application may cause failure of the gauge, resulting in possible personal injury or property damage. For correct use and application of all pressure gauges, please refer to Pressure Gauge Standard ASME B40.100. This document may be obtained from the American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990.

Wetted Parts and Pressure Medium

Under normal operating conditions, only the tube and socket assembly (Wetted Parts) of a pressure gauge will come into contact with the fluid being measured (Pressure Medium). The selection of the assembly will be determined by the composition of the medium. Air, gas, steam, water and other noncorrosive media are usually satisfied by a bronze or brass bourdon tube and brass socket assembly. Stainless steel or Monel wetted parts are used when the medium contains corrosive elements or when high operating pressures or temperatures will be encountered. A diaphragm seal is recommended for highly corrosive media or that which may solidify or deposit solids within the tube and socket assembly of the gauge. (See the Diaphragm Seal section of this catalog.)

Connection and Mounting

The socket connection provides an entrance port for the process medium as well as a means to mount the gauge to a pipeline or vessel. Male connections can be provided with NPT, BSPT, or other thread styles, in sizes from 1/8" through 1/2". A high-pressure, 9/16" LHT connection is also available. The mounting location indicates where the connection protrudes from the case. Trerice Pressure Gauges are available with three standard mounting locations: lower male (LM), lower back male (LBM), and center back male (CBM). Other connection locations may be available on some models.

Window and Ring

The window provides a means for viewing the measurement, as well as protection of the dial face and pointer of the instrument, and is normally held in place by a ring, which is screwed or snapped to the case of the gauge. Plastic, clear glass and laminated glass are common window materials. Ring styles include threaded, bayonet, friction, crimped and hinged, depending upon the case type.

Pointer

There are essentially three types of pointers available on Trerice Pressure Gauges: a micro-adjustable pointer (providing high quality and accuracy); a friction-type pointer (providing adjustability and durability); and a plain, non-adjustable pointer (providing economic reliability).

Accuracy

The accuracy of a pressure gauge is expressed as a percentage (plus or minus) of the maximum scale range. Please refer to Pressure Gauge Standard ASME B40.100.

Measurement Range and Dial

The maximum operating pressure of the application should not exceed 75% of the measurement range selected. Therefore, the specified range should be twice the normal operating point of the gauge to avoid damage to the gauge internal. A wide variety of measurement ranges is available, from 30" Hg vacuum through 20,000 psi pressure. Ranges are indelibly presented in black figures and markings upon a white dial face.

During system start-up or shut-down, system pressures can greatly exceed intended conditions. Pressure gauges should be protected by appropriate isolation devices such as, but not limited to, needle valves, gauge cocks, etc.

Environmental Conditions

Pressure gauge selection will be influenced by the environmental conditions under which the gauge is expected to perform. Condensation or waterproofing concerns can be addressed through the use of hermetically sealed or weatherproofed gauges. Case construction should be considered when selecting a gauge to be used in conditions of extreme or sustained heat or cold, or where the atmospheric environment may contain corrosive elements.

Pressure gauges provide an excellent and reliable means of measuring and indicating process conditions, however they are passive devices. They are not substitutes for active safety devices. For start-up or test situations on closed loop systems, a safety relief device must be used.

Liquid Filling

Liquid filling (glycerin, silicone or other fills) can prolong the life of a pressure gauge by minimizing wear on the gauge internal resulting from vibration or oscillation. Liquid filling also acts as a permanent lubricant to the moving parts of the instrument.

Utility Gauge D80 Series

D83LFSS, 2 1/2" pictured

2", 2 1/2" & 4"
Dial Sizes

±1.5%
Accuracy

Stainless
Steel Case

Glycerine
Fill Standard

The Trerice Series D80 Utility Gauge is designed for rugged performance requirements at an economical cost. This liquid filled gauge is furnished with a stainless steel case and crimped ring. Wetted parts are either bronze tube with brass socket or stainless steel.

Optional features and case styles are also available. Please consult the Options Section for details.

For correct use and application of all pressure gauges, please refer to Pressure Gauge Standard ASME B40.100.

Specifications

Models
D82LFB (liquid filled)
D83LFSS (liquid filled)

Size
2", 2 1/2", 4"

Wetted Parts
D82LFB: Bronze tube, brass socket
D83LFSS: 316 stainless steel tube and socket

Movement
D82LFB: Brass
D83LFSS: 316 stainless steel

Connection
Lower male or center back male, 1/4 NPT

Case
304 stainless steel, stem mounted flangeless

Ring
Crimped 304 stainless steel

Window
2", 2 1/2" Dial Size: Styrene-acrylonitrile
4" Dial Size: Grilamid

Pointer
Plain, black finish

Dialface
Aluminum, white background with black graduations and markings

Accuracy
±1.5% Full Scale

Maximum Temperature
150°F (65°C)

Approximate Shipping Weight
2" Dial Size: 0.4 lbs [0.18 kg]
2 1/2" Dial Size: 0.5 lbs [0.23 kg]
4" Dial Size: 1.0 lbs [0.45 kg]

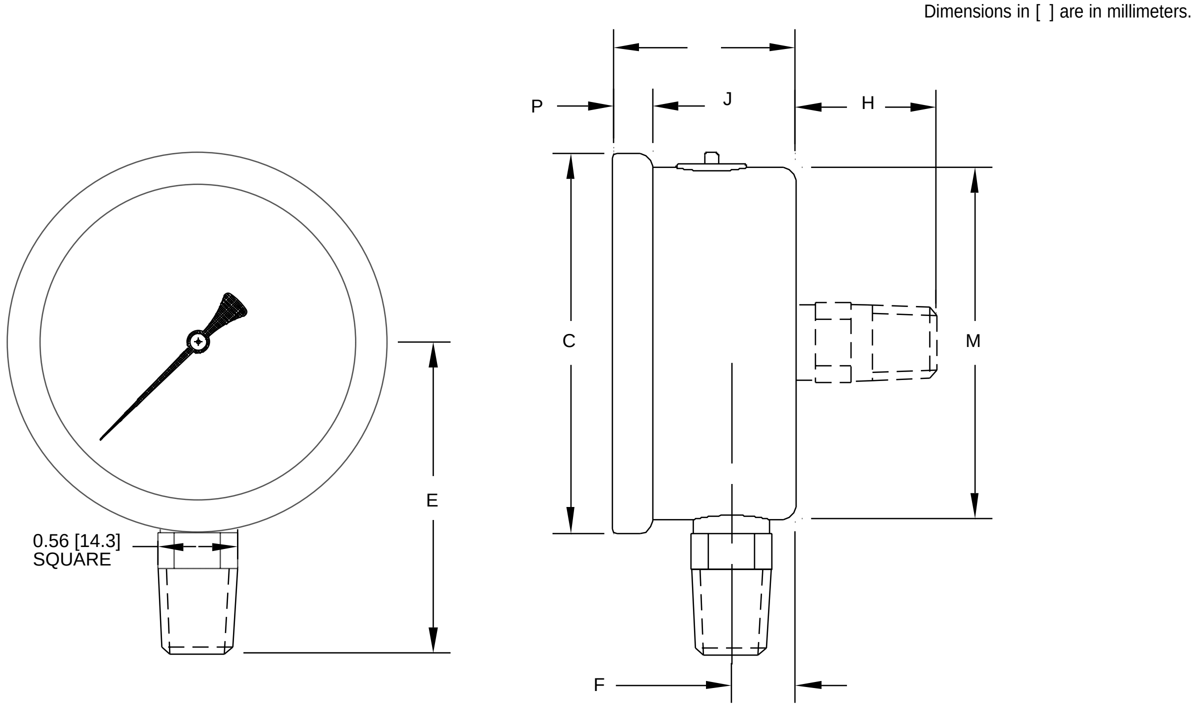
How to Order

Sample Order Number: D82LFBG25FSL250PSI110

D80LFB	*G*	*25*	*FSL*	*250*	*PSI*	*110*
Model	**Liquid Fill Type**	**Dial Size**	**Case Type & Connection Location**	**Connection Size**	**Units of Measure**	**Range Code**
D82LFB **D83LFSS**	**G** Glycerine **S** Silicone	**20** 2" **25** 2 1/2" **40** 4"	**FSL** Flangeless Lower **FSB** Flangeless Back	**250** 1/4 NPT	**PSI** psi **PSI/KPA** psi/kPa	See Standard Available Ranges (over)

Utility Gauge D80 Series

Suction



Dial Size	C	E	F	H	J	M	P
2"	2.09 [53.1]	1.91 [48.5]	0.48 [12.2]	0.98 [24.9]	0.93 [23.5]	1.94 [49.3]	0.18 [4.5]
2 1/2"	2.67 [67.8]	2.19 [55.5]	0.45 [11.4]	0.98 [24.9]	0.93 [23.5]	2.47 [62.7]	0.28 [7.1]
4"	4.18 [106.1]	2.85 [72.3]	0.48 [12..2]	1.08 [27.5]	1.04 [26.4]	3.93 [99.7]	0.28 [7.1]

Utility Gauges

Standard Available Ranges

psi Ranges (PSI)

Range Code	Specific Range	Figure Intervals	Minor Divisions
010	30" Hg to 0	5	0.5
020	30" Hg to 15 psi	10/5	1/0.5
030	30" Hg to 30 psi	10/10	2/1
040	30" Hg to 60 psi	30/20	2/2
050	30" Hg to 100 psi	30/20	5/2
060	30" Hg to 150 psi	30/20	10/5
070	30" Hg to 300 psi	30/30	5/10
080	0 to 15 psi	3	0.2
090	0 to 30 psi	5	0.5
100	0 to 60 psi	10	1
110	0 to 100 psi	20	2

Standard Available Ranges continued

psi Ranges (PSI)

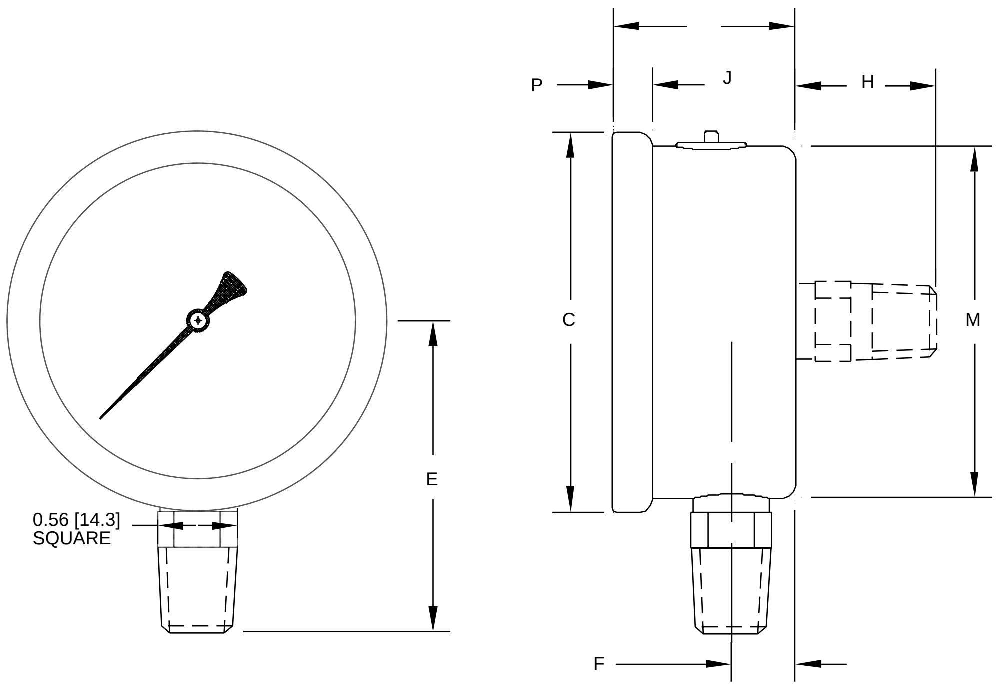
Range Code	Specific Range	Figure Intervals	Minor Divisions
120	0 to 160 psi	20	2
130	0 to 200 psi	50	5
140	0 to 300 psi	50	5
150	0 to 400 psi	100	10
160	0 to 600 psi	100	10
180	0 to 1000 psi	200	20
190	0 to 1500 psi	300	20
200	0 to 2000 psi	500	50
210	0 to 3000 psi	500	50
220	0 to 5000 psi	1000	100
Ranges over 5000 psi are not available in D82LFB.			
230	0 to 10,000 psi	2000	200
240	0 to 15,000 psi	3000	200

*Dual scale (psi/kPa) ranges are available. Specify the range required along with the appropriate Units of Measure code **(PSI/KPA)**.*

Utility Gauge D80 Series

Discharge

All dimensions are nominal.
Dimensions in [ ] are in millimeters.



Dial Size	C	E	F	H	J	M	P
2"	2.09 [53.1]	1.91 [48.5]	0.48 [12.2]	0.98 [24.9]	0.93 [23.5]	1.94 [49.3]	0.18 [4.5]
2 1/2"	2.67 [67.8]	2.19 [55.5]	0.45 [11.4]	0.98 [24.9]	0.93 [23.5]	2.47 [62.7]	0.28 [7.1]
4"	4.18 [106.1]	2.85 [72.3]	0.48 [12..2]	1.08 [27.5]	1.04 [26.4]	3.93 [99.7]	0.28 [7.1]

Standard Available Ranges

psi Ranges (PSI)

Range Code	Specific Range	Figure Intervals	Minor Divisions
010	30" Hg to 0	5	0.5
020	30" Hg to 15 psi	10/5	1/0.5
030	30" Hg to 30 psi	10/10	2/1
040	30" Hg to 60 psi	30/20	2/2
050	30" Hg to 100 psi	30/20	5/2
060	30" Hg to 150 psi	30/20	10/5
070	30" Hg to 300 psi	30/30	5/10
080	0 to 15 psi	3	0.2
090	0 to 30 psi	5	0.5
100	0 to 60 psi	10	1
110	0 to 100 psi	20	2

Standard Available Ranges continued

psi Ranges (PSI)

Range Code	Specific Range	Figure Intervals	Minor Divisions
120	0 to 160 psi	20	2
130	0 to 200 psi	50	5
140	0 to 300 psi	50	5
150	0 to 400 psi	100	10
160	0 to 600 psi	100	10
180	0 to 1000 psi	200	20
190	0 to 1500 psi	300	20
200	0 to 2000 psi	500	50
210	0 to 3000 psi	500	50
220	0 to 5000 psi	1000	100
Ranges over 5000 psi are not available in D82LFB.			
230	0 to 10,000 psi	2000	200
240	0 to 15,000 psi	3000	200

Dual scale (psi/kPa) ranges are available. Specify the range required along with the appropriate Units of Measure code ***(PSI/KPA)****.*

Utility Gauges

TNEMEC

PRODUCT DATA SHEET

HYDRO-ZINC® SERIES 94-H_2O

PRODUCT PROFILE

GENERIC DESCRIPTION Aromatic Urethane, Zinc-Rich

COMMON USAGE A single-component, moisture-cured, zinc-rich primer for steel structures, including the interior and exterior of steel potable water tanks. Provides outstanding long-term corrosion resistance when used as a primer in conjunction with other Tnemec coatings. It cures quickly and offers rapid recoat at surface temperatures down to 35°F. **Note:** When used in conjunction with cathodic protection, anodes or impressed current systems should not provide current demand more negative than –1.05 volts relative to a copper–copper sulfate reference electrode half-cell.

COLORS Greenish-gray

ZINC PIGMENT 83% by weight in dried film

SPECIAL QUALIFICATIONS Certified (with or without 44-710 Urethane Accelerator) in accordance with **ANSI/NSF Std. 61** for use on interior potable water tanks of 500 gallons or greater. Topcoating with Std. 61 certified Tnemec coatings is required. Contact your Tnemec representative for specific recommendations. Reference "Search Listings" section of the NSF website at www.nsf.org for details on the maximum allowable DFT. Meets zinc-rich primer requirements of **AWWA D102-17** Standard for **Inside System No. 3 & 5** and **Outside System No. 3, 4 & 6.** Series 94-H_2O uses a zinc pigment which meets the requirements of **ASTM D 520 Type III** and contains less than .002% lead.

Series 94-H_2O was tested in accordance with, and passed, the California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 emissions testing and meets qualifications of LEED v4, Collaborative for High Performance Schools, and Living Building Challenge.

PERFORMANCE CRITERIA Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

TOPCOATS **Interior:** Series 20, 20HS, FC20, FC20HS, 22, FC22, L140, L140F, N140, N140F, V140, V140F, 141, 215, 406
Exterior: Series 27WB, 66, 66HS, L69, L69F, N69, N69F, 73, 115, 156, 161, 161HS, 215, 1026, 1028, 1029, 1074, 1074U, 1075, 1075U, 1080, 1081. **Note:** Certain topcoat colors may not provide one-coat hiding depending on method of application. Contact your Tnemec representative. **Note:** Series 94-H_2O must be exterior exposed for three days prior to topcoating with Series 1028 or 1029. **Note:** Series 94-H_2O must be exterior exposed for one day prior to topcoating with Series 27WB.

SURFACE PREPARATION

Wet Interior: SSPC-SP10/NACE 2 Near-White Blast Cleaning with a minimum angular anchor profile of 1.5 mils.
Exterior or Dry Interior: SSPC-SP6/NACE 3 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils.

TECHNICAL DATA

VOLUME SOLIDS 62.0 ± 2.0% (mixed)

RECOMMENDED DFT 2.5 to 3.5 mils (65 to 90 microns) per coat.

CURING TIME Without 44-710

Temperature †	To Handle	To Recoat
75°F (24°C)	2 hours	8 hours
55°F (11°C)	4 hours	12 hours
35°F (2°C)	6 hours	16 hours

† 50% relative humidity. **Note:** Refer to product listings on www.nsf.org for specific potable water return to service information. Curing time will vary with surface temperature, humidity and film thickness. **Ventilation:** When used in enclosed areas, provide adequate ventilation during application and cure.
Note: For faster curing, low humidity and low-temperature applications, add No. 44-710 Urethane Accelerator (see separate product data sheet). **Note:** For cure times to immersion service, reference the specified Tnemec interior topcoat product data sheet.

VOLATILE ORGANIC COMPOUNDS
Unthinned: 0.74 lbs/gallon (89 grams/litre)
Thinned 15% (No. 49 Thinner): 0.74 lbs/gallon (89 grams/litre)
Thinned 10% (No. 3 Thinner): 1.57 lbs/gallon (188 grams/litre)
Thinned 10% (No. 2 Thinner): 1.56 lbs/gallon (187 grams/litre)

HAPS
Unthinned: 1.68 lbs/gal solids
Thinned 15% (No. 49 Thinner): 1.68 lbs/gal solids
Thinned 10% (No. 3 Thinner): 1.72 lbs/gal solids
Thinned 10% (No. 2 Thinner): 2.84 lbs/gal solids

THEORETICAL COVERAGE 996 mil sq ft/gal (24.4 m²/L at 25 microns). See APPLICATION for coverage rates.

NUMBER OF COMPONENTS One

PACKAGING 5 gallon (18.9L) pails (yielding 3 gallons) and 1 gallon (3.79L) cans.

NET WEIGHT PER GALLON 24.92 ± 0.60 lbs (11.30 ± .27 kg)

STORAGE TEMPERATURE Minimum 20°F (-7°C) Maximum 110°F (43°C)

TEMPERATURE RESISTANCE Dry (Continuous) 250°F (121°C) Intermittent 300°F (149°C)

SHELF LIFE 9 months at recommended storage temperature.

FLASH POINT - SETA 82°F (28°C)

HYDRO-ZINC® | SERIES 94-H_2O

HEALTH & SAFETY

Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

APPLICATION

COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	3.0 (75)	5.0 (125)	331 (30.8)
Minimum	2.5 (65)	4.0 (100)	398 (37.0)
Maximum	3.5 (90)	5.5 (140)	284 (26.4)

Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. Reference the "Search Listings" section of the NSF website at www.nsf.org for details on the maximum allowable DFT.

MIXING

Stir thoroughly making sure no pigment remains on the bottom of the can. Use an air-driven power mixer and keep material under constant agitation while mixing. Do not use material beyond pot life limits.

THINNING

For air spray, thin up to 15% or 1 1/4 pints (570 mL) per gallon with No. 49 Thinner or thin up to 10% or 3/4 pint (380 mL) per gallon with No. 2 or No. 3 Thinner. (Use No. 2 if ambient temperatures are below 80°F (27°C) and No. 3 if above 80°F (27°C).) For brush or roller, thin up to 5% or 1/4 pint (190 mL) per gallon with No. 49 Thinner or thin up to 10% or 3/4 pint (380 mL) per gallon with No. 2 or No. 3 Thinner. Thinning is normally not required for airless spray. **Note:** No. 49 Thinner may be used where VOC restrictions apply. **Caution: Series 94-H_2O certification is based on thinning with No. 49, No. 2 or No. 3 Thinner. Use of any other thinner voids NSF/ANSI Std. 61 certification.**

POT LIFE

8 hours at 77°F (25°C) and 50% R.H.
Caution: This product cures with moisture acting as a catalyst. Incorporation of moisture or moisture laden air (humidity) during use will shorten pot life. Avoid continual agitation at high RPM. When feasible keep containers of mixed material covered during use.

APPLICATION EQUIPMENT

Note: When intermediate and finish coats are white or light colors, best hiding of this dark color primer can be achieved by spray application; or when roller applied, by using 1/4" nap covers.

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA †	E	704 or 765	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	40-50 psi (2.8-3.4 bar)	10-20 psi (0.7-1.4 bar)

† (with heavy mastic spring) Low temperatures or longer hoses will require additional pressure. Use pressure pot equipped with an agitator and keep pressure pot at same level or higher than the spray gun. Compressed air must be dry.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.015"-0.019" (380-481 microns) Reversible Tip	3000-4000 psi (207-276 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Roller: Use a 1/4" or 3/8" (6.4 mm or 9.5 mm) synthetic woven nap roller cover. Stir material frequently or keep under agitation to prevent settling.
Brush: Use high quality natural or synthetic bristle brushes.

SURFACE TEMPERATURE

Minimum 35°F (2°C) Maximum 140°F (60°C) Maximum for Brush & Roller 120°F (49°C)
The surface should be dry and at least 5°F (3°C) above the dew point. **Note:** Series 44-710 Accelerator must be used if the surface temperature is 35°F to 60°F (2°C to 16°C) and 20% to 40% relative humidity. Please reference Technical Bulletin 98-14 for more information.

AMBIENT HUMIDITY

Minimum 20% Maximum 90%

CLEANUP

Flush and clean all equipment immediately after use with the recommended thinner or xylene or, when required by SCAQMD regulations, No. 49 Thinner.

CAUTION

Series 94-H_2O, with one-component configuration, prevents the product's ability to offer "dry-fall" characteristics.

PRODUCT DATA SHEET

HI-BUILD EPOXOLINE® SERIES 66

PRODUCT PROFILE

GENERIC DESCRIPTION Polyamide Epoxy

COMMON USAGE Industry standard for epoxy coatings for over 40 years. Known for its forgiving application characteristics in adverse and varied conditions, and for benchmark performance.

COLORS Refer to Tnemec Color Guide. **Note:** Epoxies chalk with extended exposure to sunlight and may yellow on aging. Lack of ventilation, incomplete mixing, miscatalyzation or the use of heaters that emit carbon dioxide and carbon monoxide during application and initial stages of curing may accelerate any potential yellowing.

FINISH Satin

COATING SYSTEM

SURFACER/FILLER/PATCHER Series 215, 217, 218

PRIMERS **Steel:** Self-priming or Series 1, 20, FC20, 37H, L69, L69F, N69, N69F, V69, V69F, 90G-1K97, 90E-92, 90-97, H90-97, 90-98, 91-H_2O, 94-H_2O, 161, 394, V530
Galvanized Steel and Non-Ferrous Metal: Self-priming
Concrete: Self-priming, Series 27WB, 201, 1254
CMU: Series 130, 1254
Drywall: 151-1051 for dry interior environments
Note: A maximum recoat time may apply depending on the topcoat specified. Refer to the applicable topcoat product sheet for information on product specific maximum recoat times.

TOPCOATS Series 27WB, 30, 46H-413, 66, L69, L69F, N69, N69F, V69, V69F, 72, 73, 104, 113, 114, 118, 161, 262, 265, 290, 291, 740, 750, 1026, 1028, 1029, 1070, 1070V, 1071, 1071V, 1072, 1072V, 1074, 1074U, 1075, 1075U, 1077, 1078, 1078V, 1094, 1095, 1096, 1224. **Note:** A maximum recoat time may apply depending on the topcoat specified. Refer to the applicable topcoat product sheet for information on product specific maximum recoat times.

SURFACE PREPARATION

STEEL **Immersion Service:** SSPC-SP10/NACE 2 Near-White Blast Cleaning or ISO Sa 2 1/2 Very Thorough Blast Cleaning with a minimum angular anchor profile of 1.5 mils.
Non-Immersion Service: SSPC-SP6/NACE 3 Commercial Blast Cleaning or ISO Sa 2 Thorough Blast Cleaning with a minimum angular anchor profile of 1.5 mils. **Note:** Commercial Blast Cleaning generally produces the best coating performance for this exposure. If conditions will not permit this, in moderate exposures Series 66 may be applied to SSPC-SP2 or SP3 Hand or Power Tool Cleaned surfaces (SSPC Rust Grade Condition C).

GALVANIZED STEEL & NON-FERROUS METAL Surface preparation recommendations will vary depending on substrate and exposure conditions. Consult the latest version of Tnemec Technical Bulletin 10-78 or contact your Tnemec representative or Tnemec Technical Services.

CAST/DUCTILE IRON All external surfaces of ductile iron pipe and fittings shall be delivered to the application facility without asphalt or any other protective lining on the exterior surface. All oils, small deposits of asphalt paint, grease, and soluble deposits should be removed and uniformly abrasive blasted using angular abrasive in accordance with NAPF 500-03-04: External Pipe Surface condition. When viewed without magnification, the exterior surfaces shall be free of all visible dirt, dust, loose annealing oxide, rust, mold coating and other foreign matter. Any area where rust reappears before application shall be reblasted. The surface shall contain a minimum angular anchor profile of 1.5 mils (38.1 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).

CONCRETE Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). Verify concrete dryness in accordance with ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" (moisture vapor transmission should not exceed three pounds per 1,000 square feet in a 24 hour period), F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes" (relative humidity should not exceed 80%), or D 4263 "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method" (no moisture present). Prepare concrete surfaces in accordance with NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide an ICRI-CSP 2-3 surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.

CMU Allow mortar to cure for 28 days. Prepare in accordance with SSPC-SP13/NACE 6 to level protrusions and mortar spatter, and remove other contaminants.

PAINTED SURFACES **Non-Immersion Service:** Ask your Tnemec representative for specific recommendations.

PRIMED SURFACES **Immersion Service:** Scarify the Series 66 prime coat surface by abrasive-blasting with a fine abrasive before topcoating if: (a) the Series 66 prime coat has been in exterior exposure for 60 days or longer and Series 66, 46H-413, L69, L69F, N69, N69F, V69, V69F or 161 is the specified topcoat; (b) the Series 66 prime coat has been in exterior exposure for 14 days or longer and Series 104 is the specified topcoat; (c) the Series 66 prime coat has been in exterior exposure for 7 days or longer and Series 262 or 265 is the specified topcoat.

ALL SURFACES Must be clean, dry and free of oil, grease and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS 56.0 ± 2.0% (mixed) †

RECOMMENDED DFT 2.0 to 6.0 mils (50 to 150 microns) per coat.
Note: Number of coats and thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative.

HI-BUILD EPOXOLINE® | SERIES 66

CURING TIME

Temperature	To Touch	To Handle	To Recoat	Immersion
90°F (32°C)	1 hours	5-7 hours	6-8 hours	4-5 days
80°F (27°C)	1.5 hours	7-9 hours	8-10 hours	6-7 days
70°F (21°C)	2 hours	10-12 hours	12-14 hours	7-10 days
60°F (16°C)	3 hours	16-20 hours	20-24 hours	10-12 days
50°F (10°C)	4 hours	24-30 hours	30-36 hours	14-16 days

Curing time varies with surface temperature, air movement, humidity and film thickness.
Ventilation: When used as a tank lining or in enclosed areas, provide adequate ventilation during application and cure. Reference guidelines contained in the latest edition of AWWA D 102.

VOLATILE ORGANIC COMPOUNDS

Unthinned: 3.02 lbs/gallon (362 grams/litre)
Thinned 5%: 3.20 lbs/gallon (384 grams/litre)
Thinned 10%: 3.37 lbs/gallon (404 grams/litre) †

THEORETICAL COVERAGE

898 mil sq ft/gal (22.0 m²/L at 25 microns). See APPLICATION for coverage rates. †

NUMBER OF COMPONENTS

Two: Part A and Part B

PACKAGING

5 gallon (18.9L) pails and 1 gallon (3.79L) cans — Order in multiples of 2.

NET WEIGHT PER GALLON

12.50 ± 0.25 lbs (5.67 ± .11 kg) (mixed) †

STORAGE TEMPERATURE

Minimum 20°F (-7°C) Maximum 110°F (43°C)

TEMPERATURE RESISTANCE

(Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)

SHELF LIFE

Part A: 24 months; Part B: 12 months at recommended storage temperature.

FLASH POINT - SETA

Part A: 82°F (28°C) Part B: 64°F (18°C)

HEALTH & SAFETY

Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

APPLICATION

COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	4.0 (100)	7.0 (180)	225 (20.9)
Minimum	2.0 (50)	3.5 (90)	450 (41.8)
Maximum	6.0 (150)	10.5 (265)	150 (13.9)

Note: Roller or brush application may require two or more coats to obtain recommended film thickness. Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING

Power mix contents of each container, making sure no pigment remains on the bottom. Pour a measured amount of Part B into a clean container large enough to hold both components. Add an equal volume of Part A to Part B while under agitation. Continue agitation until the two components are thoroughly mixed. Do not use mixed material beyond pot life limits. **Note:** Both components should be above 50°F (10°C) prior to mixing. For application to surfaces between 50°F to 60°F (10°C to 16°C), allow mixed material to stand thirty (30) minutes and restir before using. For optimum application properties, blended components should be above 60°F (16°C). Mixing ratio is one to one by volume.

THINNING

Use No. 4 Thinner. For air spray, thin up to 10% or 3/4 pint (380 mL) per gallon. For airless spray, roller or brush, thin up to 5% or 1/4 pint (190 mL) per gallon.

POT LIFE

20 hours at 50°F (10°C) 10 hours at 77°F (25°C) 4 hours at 100°F (38°C)

APPLICATION EQUIPMENT

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	50-80 psi (3.4-5.5 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.015"-0.019" (380-485 microns)	3000-4000 psi (207-276 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Note: Application over inorganic zinc-rich primers: Apply a wet mist coat and allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply a full wet coat at specified mil thickness.
Roller: Roller application optional when environmental restrictions do not allow spraying. Use 3/8" or 1/2" (9.5 mm to 12.7 mm) synthetic woven nap covers.
Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes.

SURFACE TEMPERATURE

Minimum 50°F (10°C) Maximum 135°F (57°C)
The surface should be dry and at least 5°F (3°C) above the dew point. Coating will not cure below minimum surface temperature.

CLEANUP

Flush and clean all equipment immediately after use with the recommended thinner or MEK.

† Values may vary with color.

EXP ANCHOR KB3 3/4" X 5-1/2" SS316

Everyday standard wedge anchor for uncracked concrete (SS316)

Item number 286034

Packaging unit: 20 pc **Drill bit diameter:** 3/4 in **Anchor length:** 5-1/2 in

Key Technical Data:

Base materials: Concrete (light weight, Concrete (uncracked), Masonry (grout-filled CMU)

Approvals / Test reports: COLA (City of Los Angeles, ICC-ES report (concrete), Nuclear (NQA-1)

IBC compliance: IBC 2003, IBC2006, IBC 2009, IBC 2012

Basic information

FEATURES & APPLICATIONS

Features

- Approved by ICC-ES for concrete
- Rounded end for easy installation
- Dog point impact section to prevent thread damage during installation
- Testing according to AC193 results in smallest edge distance and spacing for all wedge anchors in class
- Also available in carbon steel, hot-dip galvanized and 304 SS

Applications

- Fastening structural steel
- Attaching exterior hand rails and signs
- Fastening curtain wall and masonry facade
- Fastening exterior seating and bleachers
- Glazing

Type of fixing

Pre-fastening , Through-fastening

Environmental conditions

Outdoor

Anchor diameter (Imperial)

3/4 in

Drill bit diameter

3/4 in

Anchor length

5-1/2 in

Length identification mark

I

Baseplate clearance hole

13/16 in

Head configuration

Externally threaded

Installation direction

All

Material composition

Stainless steel, 316

Thread length

1-5/8 in

Wrench/nut size

1-1/8 in

Leadership in Energy and Environmental Design

Yes

Required tightening torque

109.9 ft-lbf

PROFIS Software
Yes