CATTAIL BRANCH SEWAGE PUMPING STATION
EQUIPMENT INSTALLATION
IFB NO. 500640-FY17-23
ADDENDUM #3
April 21, 2017

Question 1: Please provide a specification for the tapping sleeve, and tapping valve.

Answer 1: **Specification Section 15006 has been added to the Bid Document to provide bidding Contractors with guidelines for acceptable material/equipment. This Specification has been attached to this Addendum accordingly.**

Question 2: What is the expected delivery date for the Owner supplied equipment (pump, valves, etc)?

Answer 2: **The Town, along with the Design Engineer of Record, has reviewed and approved the Shop Drawings for the Owner supplied equipment. A copy of the approved Shop Drawing has been attached to this Addendum for informational purposes only (see attached Sydnor Hydro Equipment Submittal Package). Delivery of the equipment is anticipated within the next 12 weeks. However, potential Bidders shall coordinate with the equipment supplier, as required by the Contract Documents, to ensure a smooth installation.**

Question 3: The contract duration is 240 days. When will the Contract time officially start, with respect to the delivery of the Owner supplied equipment? Will it start the date that the Equipment is delivered? If it starts before the equipment is delivered, please identify the time span between start of contract time and date of equipment delivery, so we can determine if there is sufficient time left (out of 240 days) to complete the work.

Answer 3: **It is anticipated that a Notice to Proceed (NTP), which is when project time will begin, will be issued to the lowest responsive bidder by June 30th. Given the projected delivery date of the equipment (noted above) and NTP, a modification to the contract duration is not anticipated at this time. The Contractor will be required to provide their own submittals for approval at the beginning of the project, prior to doing any pipeline or pump installation work (i.e. linestop, tapping sleeve, etc.). This effort was accounted for in the contract duration included and would coincide with any time between the NTP and delivery of the Owner supplied equipment.**

Question 4: Drawing C-1 calls for inclusion of a line stop in the event that the plug valve does not work. Line stops are typically used for short time durations, not for the entire temporary bypass time period. In situations like this it is normal procedure to also install a new line valve just upstream of the line stop, so that flow can be isolated with the new valve, and then the line stop removed. Is this your intent? In that case, should the new isolation valve be a 20" plug valve, or gate valve? Should it be installed outside the station, or should the existing 20" flanged valve inside the station, shown on M-2, be replaced?

Answer 4: **It is anticipated the line stop will be necessary for a relatively short period of time to prevent bypass flow from going back towards the discharge of the pumping station (See Response to Question 7 below). The Town intends to investigate and potentially repair, if necessary, the flanged isolation plug valve that is located upstream of the line stop and shown on M-2. No new valve upstream of the line stop is anticipated at this time.**

Question 5: Addm 1 provided the flow that we are to use for the bypass pumps (4070 gpm), but we also need to know the head conditions that the pump must be sized for. Should we use 208', which is the TDH for the new pumps based on 2035 gpm flow capacity?

Answer 5: **The Contractor shall assume a TDH of 250'. Additional parameters are noted below, but shall be field verified by the Contractor and reflected in the bypass pumping plan that is submitted for review and approval during construction.**

Bypass Pump
Elevation: 215' (Contractor to field verify)
Flow: See Addendum No. 1
Head: 250' TDH

Suction
Elevation of suction: 205' (Contractor to field verify)
Total Suction piping length: ~15'(Contractor to field verify)

Discharge
Elevation of discharge connection to force main: ~201' (Contractor to field verify)
Total discharge length: ~140' (Contractor to field verify)

Question 6: Given that only two of the four existing pumps are being replaced…why is bypass pumping even necessary? Can't we just replace pumps 1 and 2 while using existing pumps 3 and 4?

Answer 6: **All pumps are connected along a common discharge header with no valve to isolate Pumps 1 and 2 from Pumps 3 and 4. The Contract includes the removal and replacement of the suction and discharge plug valves. Contractor shall refer Specification Section 01520, 1.05.A – the Contractor shall submit for review and approval their anticipated sequence of construction.**

Question 7: To further clarify question 6 above, rather than require bypass pumping for the full duration of pump replacement as outlined in 01520-4, why can't the bypass duration be limited to just the time necessary to replace the two 12" discharge valves that are connected to the discharge header, for pumps 1 and 2? Once these valves are replaced, the bypass pumps could be removed and the station returned to service using existing pumps 3 and 4.

Answer 7: **The duration of the bypass pumping operation shall be determined by the Contractor and submitted for review as is required by Specification 01520 –**

the sequence included in Specification 01520 is a suggested sequence. The duration of bypass pumping shall be as long as necessary to safely and adequately isolate Pumps 3 and 4 for removal and replacement. The Contractor shall also be mindful of the instrumentation and control (I&C) work included on this Contract and ensure that as the I&C work is being completed the station shall remain in continuous operation.

Question 8: Spec section 11000 calls for gages to be installed on suction and discharge side of each pump, yet this is not shown on the drawings. What is the intent? Will the pump supplier also provide these gages, along with necessary small diameter pipe nipples, valves, etc? Or will the General Contractor need to provide these?

Answer 8: **The General Contractor, or their Subcontractor, shall install pressure gauges on the suction and discharge for Pumps 1 and 2. The Contractor shall coordinate pressure gauge mounting with the pump manufacturer.**

Question 9: The IFB states that, "Work includes installation of Town-procured pumping units, valves, electrical and I&C equipment…" Is this meant to imply that the Town has pre-purchased pumping units, AND valves, AND electrical, AND I&C equipment? If so can a list of all pre-purchased equipment be provided along with suppliers if relevant.

Answer 9: **Pumps and select valves have been pre-purchased. Electrical and I&C equipment has not been purchased and is the requirement of the General Contractor. Please see the response to Question #2 for additional information.**

END OF ADDENDUM #3

SECTION 15006

SEWAGE FLOW DIVERSION AND ISOLATION

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall furnish and install a tapping sleeve on existing ductile iron pipe and a linestop along existing PVC pipe without interrupting sanitary flow. Contractor shall confirm piping material and diameter by exposing pipe, prior to submitting tapping and/or linestop material/equipment for review and approval.

B. The Contractor shall furnish all labor, materials, equipment, appurtenances, tools, and services required for the furnishing, installation and testing of all tapping and linestop equipment and fittings as shown on the Drawings, specified in this Section and required for the Work. The tapping and linestop equipment and fittings shall be furnished and installed of the material, size, pressure, and at the locations shown on the Drawings.

C. Qualifications for tapping and linestop equipment installer:

1. Experience: Actively engaged in tapping and linestop installation for a minimum of 5 years, with at least 5 projects in the last 3 years of similar size and type.

2. Field supervisory personnel: Experienced in the performance of work and tasks stated herein for a minimum of 5 years.

3. Contractor shall submit information on experience in this type of work for Engineer review and approval.

D. The work shall include, but not be limited to, the following:

1. Connections to existing pipelines.

2. Test excavations necessary to locate or verify existing pipe and appurtenances.

3. Installation of all new pipe and materials required for a complete installation.

4. Cleaning and testing as required.

1. 2 SUBMITTALS

A. The Contractor shall measure the existing pipe's outside diameter prior to selecting the tapping sleeves. This information shall be submitted with the shop drawings for the tapping sleeves.

B. Manufacturer's shop drawings for tapping and linestop installation, including but not limited to: pipe taps, drilling apparatus, linestops, tapping valves and all other equipment and materials necessary to complete the work.

C. Contractor shall submit laying schedules and detailed Drawings in plan and profile for all tapping and linestop fittings and equipment piping as specified and shown on the Drawings

D. Installation and testing instructions.

E. Recommended maximum test pressure and length of time for testing assembly using water as test medium.

F. Submit product data and coating procedure for surface preparation, prime coat and finish coat applications for steel coated with shop coat primer.

G. Contractors Experience and Supervisory Field Personnel for tapping and linestop Equipment/Installer.

1. Presentation of similar experience in the last 3 years. Include, but not limited to, owner name, address, telephone number, contact person, date and duration of work, location, pipe information, and contents handled by the pipeline

2. Supervisory field personnel and historical information of tapping and linestop experiences.

3. At least one of the field supervisors listed must be at the site when the tapping and linestop operations are in progress.

1.3 STANDARDS

A. MSS SP 124 Fabricated Tapping Sleeves

1.4 MATERIAL CERTIFICATION AND SHOP DRAWINGS

A. The Contractor shall furnish to the Owner (through the Engineer) a Material Certification stating that the pipe materials furnished under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.

PART 2 - PRODUCT

2.1 GENERAL

A. All specials and every length of pipe shall be marked with the manufacturer's name or trademark, size, class, and the date of manufacture. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. Tapping Assemblies

1. Designed to withstand total pressure (operating plus surge), minimum pressure of 150 psi.

2. Saddle Plates: Manufactured from ASTM A285 Grade C, ASTM A36 or equal.

3. Gasket: Broad, flat sealing surface and material suitable for raw wastewater ranging in temperature from 32 degrees F to 110 degrees F.

4. Valve flange:
   a. Manufactured: AWWA C207, Class E or F (match tapping valve flange).
   b. Suitable for connecting to mating end of tapping valve, which has raised male face to ensure true alignment of valve and tapping machine following MSS SP60.
   a. Bolts, nuts and studs: Type 316 stainless steel conforming to ASTM Al 93,Grade B8M for bolts, and ASTM A194, Grade 2H for nuts.

5. Welds:
   a. Interior lining: Dye-penetrate inspected for watertightness.
   b. Certified welders: AWWA C301, Section 1.9.2.

6. Interior lined with Warren 301 spray on epoxy liner, or equal. Final dry film thickness shall be as recommended by the lining manufacturer given the anticipated service (pressure flow). Alternative manufacturers may be submitted for approval.

7. All other steel coated with shop coat primer.

8. Sleeve.
   a. Provide separate gland, which allows sleeve to be installed and annular space between pipe and sleeve to be grouted.
   b. Use foam grouted gaskets and hard rubber spacers, to provide annular space between pipe and sleeve.
   c. Grout after sleeve is installed.
   d. Sleeves furnished with grout horns to facilitate grouting annular space.

9. Grout
   a. Quick-set cement mortar which does not contain calcium chloride or other material. Approved manufacturer and product shall Sikaset NC by Sika Corporation or equal.

10. Gland:
    a. Equipped with load bearing set screws to transfer thrust from branch to sleeve.
    b. Welding gland to steel cylinder of pipe to provide watertight seal will not be permitted.

11. Encase sleeve in minimum of 1 inch of cement mortar minimum strength 3000 psi, without calcium chlorides, or concrete for corrosion protection after tap.

C. Linestop

1. General.
   a. Line stops shall be used to connect new piping to existing piping without causing an interruption in service where shown on the Drawings.
   a. Rated at minimum working pressure of 150 psi and hydrostatic test pressure of 300 psi.
   b. Lined waterways with fusion-bonded epoxy, minimum thickness of 12 mils, following AWWA C213.
   c. Exterior coating: Fusion bonded epoxy minimum thickness 12 mils, following AWWA C-213.
   d. Bolts, nuts and studs: High strength, low alloy, corrosion resistant following AWWA C-111 and ANSI A21.11
   e. Gaskets shall be molded from elastomer compounds that resist compression setting and are compatible with raw wastewater in the 32 to 70 degree F. temperature range

2. Tapping Saddle Assembly.
   a. Full encirclement, consisting of, at minimum, an upper saddle plate with anchor neck, lower saddle plate, a tapping flange and nozzle with gland or gasket for pressure tight seal suitable for waste water ranging in temperature from 32 degrees F to 70 degrees F. All components properly shaped and of adequate strength to ensure proper mounting and pressure tight seal around existing pipe.
   b. Saddle plates manufactured from ASTM A283 Grade C, ATSM A36 or equal steel, clean and sound without defects that impact their service. No plugging or welding of such defects will be allowed.
   c. Outlet flange manufactured of same material as tapping saddle assemblies: Flat face and drill following ANSI B16.5, Class 150 flange. Provide suitable independently operating locking device in periphery of flange to secure the completion plug.
   d. All waterways: Dye-penetrant inspected for watertightness.

3. Completion Plug:
   a. Manufactured from ASTM A283 Grade C, ASTM A36 or equal steel.
   b. Equipped with two circumferential grooves; one to receive the locking device from flange, and second to contain a compressible "O" ring to seal pressure tight against interior diameter of the nozzle.

4. Blind Flange:
   a. To seal the tapping saddle assembly upon removal of the tapping and linestop equipment.
   b. Manufactured from AWWA C207, Class D steel and drilled to match bolt circle of the nozzle of the tapping saddle assembly.

5. Drain/Equalization Taps:
   a. Linestopping Contractor will provide drain and pressure equalization taps as required between Linestops. These pressure connections will allow quick determination of shutdown adequacy and will also allow pressure equalization prior to removing linestop.

b. The minimum nominal size of the drain taps shall be 2" diameter on 20" pipe and smaller, 4" diameter on 24" through 36" pipe and 6" diameter on 42" through 66" pipe

6. Thrust and Support Blocking:
   a. Prior to mounting linestopping machinery, Contractor shall install concrete thrust and support blocking, as determined necessary by the manufacturer – Contractor shall submit information for review prior to installation. Blocking, as necessary, shall reach a minimum cure strength before any valves or machinery shall be mounted onto the linestop fitting.

7. Cutting Operation:
   a. Drilling equipment shall be in good condition, and equipped with power drive to insure smooth cutting, and to minimize shock and vibration. Carbide or diamond-tipped cutters and pilots shall be used

9. Linestop Machine:
   a. Tapping Equipment Fabricator/Installer: Furnish folding plug head linestop capable of a pressure tight seal against the inside diameter of the existing pipe.
   b. Linestop: Advance into and retract from the pipeline by means of hydraulic or mechanical actuator. When retracted the folding plug head to be housed in pressure tight chamber bolted pressure tight between the actuator and tapping valve.
   c. Folding plug: Capable of displacing accumulated grit deposits in interior of the pipe while advancing to its linestopping position and have molded polyurethane sealing element around its perimeter and supply workable seal with interior diameter when fully advanced.

PART 3 - EXECUTION

3.1 INVESTIGATION

A. Contractor shall determine from coordinating with the pipe manufacturer the following:

1. Manufacturer

2. Year of manufacture

3. Outside diameter of pipe barrel

4. Internal working pressure

5. Support condition

B. Before ordering Tapping Sleeves for piping, excavate, expose, and clean the exterior of the pipe at the location of the wet tap or linestop.

1. Allow for tapping manufacturer or representative access.

2. Measure barrel circumference and check for roundness to verify sleeve will fit.

3.2 TAPPING

A. Taps will be accomplished while the pipe is under pressure, but in operation. Written notification shall be provided by the Contractor to the Town a minimum of two weeks in advance of performing the tapping sleeve installation.

B. Excavate and clean pipe in area where saddle is to be installed. Remove any irregularities extending beyond the normal contour of the pipe surface. Check all measurements to be certain saddle is correct size for the pipe.

C. Air test or test assembly following manufacturer's instructions to ensure watertightness in presence of Engineer before making tap.

D. Check to make certain all grout gaskets are in place around the edge of the saddle. Install the straps. Tighten straps with only sufficient torque to lightly compress and seal the grout gaskets, alternating from one side of the saddle to the other - starting at the outside straps and working in toward the center.

E. Pour portland cement grout into the grout horns in the saddle filling the space between the saddle and the pipe. Strike the saddle with a hammer to vibrate the grout into place. After the grout has set, again tighten the bolts on the straps.

F. Check the gasket in the gland to make certain it is undamaged and is in its retaining groove. Remove any tape used to secure the gasket in place during shipment.

G. Install the threaded studs in the saddle outlet to assist in properly aligning the gland. Install the gland in the saddle outlet so that the contour of the gasket seat exactly matches the contour of the steel cylinder. Install the remainder of the draw bolts. Check the gasket seat and all alignments. Tighten the draw bolts evenly to compress the gland gasket. A feeler gauge can be used to check gland gasket position during tightening. When completely tightened there should be approximately 1/8" between the gasket seat and the pipe cylinder.

H. After installation of the tapping gland, tighten the load bearing set screws located between the draw bolts of the outer circle. This locks the gland in place and transfers any loading from the outlet onto the saddle and away from the cylinder.

I. Install the tapping valve equipped with three flange configuration (two draw flanges and the flange for mating the tap valve). It is strongly recommended that fully threaded studs and nuts be used to connect the valve, as the flange configuration may not allow for the use of bolts. Valve shall be properly braced/blocked prior to releasing tension from lifting equipment.

J. Use water to pressure test the gland gasket seal, flange gaskets, and tapping valve to assure all joints are tight and gaskets properly seated. Test pressure shall be 110% of the pipe's operating pressure.

K. Mount the tapping machine to the tapping valve. Open the valve completely. Advance the

cutter by means of the hand screw through the open valve. Apply power, and the pilot drill will begin to cut the cylinder. Resistance will increase when the shell cutter contacts the pipe cylinder. When the automatic feed screw has advanced to a predetermined distance, the cut is complete. Tap completion is verified by advancing cutter manually to verify there is no resistance to rotating cutter.

L. Withdraw the cutting head past the gate and close the valve. Disconnect the tapping machine.

M. Upon completion of the tap, pour a Portland cement mortar mix (two parts sand, one part Portland cement) into the opening between the gland and the saddle, and into the grouting hole in the saddle neck, completely filling the space around the gland. Encase the saddle in a protective coating of Portland cement mortar or concrete to a minimum thickness of 1" over the entire assembly including the straps.

O. Provide thrust blocking and a permanent support beneath the valve.

3.3 LINESTOP

A. Only approved tapping equipment fabricator and installer shall install the tapping saddle assembly to pipe and to insert linestop into pipe for line isolation.

B. Excavate and clean pipe in area where saddle is to be installed. Remove any irregularities extending beyond the normal contour of the pipe surface. Check all measurements to be certain saddle is correct size for the pipe.

C. Check pipe outside diameter and roundness to verify assembly will fit.

D. Provide all materials and equipment, to perform installation of linestop.

E. Provide blocking/support as determined necessary by the manufacturer.

F. The assembly shall be hydrostatically tested.

G. A second pressure test should be applied through the tapping machine to insure the integrity of the assembled valve and machine. Upon successful test the Contractor shall proceed with the wet tap.

H. After completion of the wet tap and depressurization of the tapping machine and its removal, the coupon is inspected for surface condition and thickness. The linestop sealing element is checked for proper sizing to confirm setup size from prior information and actual pipe thickness.

I. The linestop machine is installed onto the temporary control valve, the control valve is opened, and then the stopple head is placed into the pipe system a pre-measured distance.

J. The Contractor shall inspect the seal by “depressurizing” the isolated pipe section through the wet tap fittings installed for depressurization/equalization. Once it is established that

the seal is holding and that there are no leaks from other valves, the isolated pipe section can be removed.

K. After the reconstruction of the isolated section the pressure is re-established at the same level as the up-stream pressure through the equalization fitting.

1. Once this pressure equalization is in effect, the bulkhead is removed from the pipe system and the temporary control valve is closed.

2. The linestop machine is depressurized and removed from the control valve.

L. The completion plug is installed on the wet tap machine and measurements for placement depth of completion plug are taken.

M. The wet tap machine is installed on the control valve and the valve opened

1. The completion plug is set at the pre-measured distance and secured into position. Thus stopping flow from reaching the valve and tap machine.
2. The technician then double checks the security of the plug prior to detaching the tap machine from the plug.

N. The boring bar or the tap machine is retracted above the gate of the control valve. The valve is then closed half way and the wet tap machine is depressurized.

O. After assuring the completion plug is in the proper position, the control valve is removed from the linestop fitting and a blind flange is installed.

- END OF SECTION -

PROJECT:

Cattail Branch Sewage Pumping Station Equipment
IFB No. 500640-FY17-12
Town of Leesburg, VA

OWNER:

Town of Leesburg, VA
Department of Utilities
25 W. Market Street
Leesburg, VA 20176

EQUIPMENT SUPPLIER

Sydnor Hydro, Inc.
2111 Magnolia Street
Richmond, VA 23223
Phone: (804) 643-2725

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March 17, 2017

Amy Wyks, P.E.
Director of Utilities
Town of Leesburg, VA
25 West Market Street
Leesburg, VA 20176

Re: Town of Leesburg, VA - Cattail Branch Sewage Pumping Station Equipment
Response to Engineer's Comments dated 2/24/17

Dear Ms. Wyks:

Please see our responses below to the comments regarding our submittal package. We hope you find our responses sufficient and we look forward to a successful project with the Town of Leesburg.

1. Understood; new valve will be positioned with access port on top and lever arm on right had side when viewing from pump location. As noted in the field with Mr. Bailey the lever arm is opposite of existing.

2. Warranty language has been included in revised submittal. Pump startup shall be within 6 months of pump shipment to ensure full 18 month operational warranty.

3. To follow under separate cover.

4. Sydnor confirms that pump is a bolt in replacement of existing with identical anchor bolt and suction/discharge flange location. Pump and motor shall be handled separately to stay below existing bridge crane rating of 1.5 Tons. Note that motor weight has been updated to a firm value. Pumps will fit through top floor hatch. Sydnor did not confirm fitment past existing catwalk as we understand that this will be modified in installation contract.

5. See revised submittal for motor winding overtemp details. Note that general arrangement drawing provides some details regarding location of float (to be provided by others) for blower motor shutdown.

6. See revised submittal.

7. Seal water sketch was included by mistake. The proposed Chesterton 442 MS with spiraltrac bushing does not require seal water. However note that if readily available seal water does provide even further protection against MS contamination.

8. This is a type of v-ring lip seal provided to protect bearing housing from water intrusion in case of flooding. See revised submittal for additional details and note that sectional drawing of pump calls out these v-ring seals.

9. See revised submittal.

10. See revised submittal.

11. Confirmed that complete motor testing will be performed and results will be submitted.

Don't hesitate to contact us with any additional questions or comments. We will wait for official approval before releasing any equipment to production.

Best regards,

Jared Wray, P.E.

Jared Wray, P.E.
Sales Engineer
Sydnor Hydro, Inc.
(804) 643-2725 ext. 228
j.wray@sydnorhydro.com

Hazen and Sawyer
One South Broad Street, Suite 1150
Baltimore, MD 21202 • 410.539.7681

February 24, 2017

Amy Wyks, PE
Director of Utilities
Town of Leesburg, VA
25 West Market Street
Leesburg, VA 20176

Re: Cattail Branch Sewage Pumping Station IFB No. 500640-FY 17-12
Pumping Station Equipment Submittal

Dear Ms. Wyks, PE:

Per e-mail request on February 15, 2017, we have reviewed the submittal from Sydnor Hydro, Inc. for the Cattail Branch Sewage Pumping Station IFB No. 5006040-FY 17-12 project. We recommend the Equipment Supplier **Revise and Resubmit** the submittal for the following reasons:

1. Note: Check valve orientation on Figure 11 is incorrect within the Contract Drawings – it is correctly shown on the section cuts.

2. Manufacturers shall provide field services, as required by the Contract Documents, at a later date. Per Specification 11151, Section 1.05 – Warrant shall not begin until the date equipment is placed in use, which will occur at a later date (Phase II – installation contract is to be issued shortly).

3. Per Specifications 11151, Section 1.04 – Contractor shall supply O&M Manuals. These can be supplied under separate cover.

4. Per Specification 11151, 1.03 A. 2, written certification that pumps and motors can fit through existing floor penetrations and into allotted space with existing bridge crane and no piping modifications required shall be submitted. Confirmation that the existing bridge crane will be adequate to lower the pumps and motors is also required.

5. Per Specification 11151, 1.03 A. 15, equipment and motor protective device details shall be provided.

6. Per Specification 11151, 1.03 A. 19, warranty documentation shall be provided.

7. Page 20 of the PDF shows a seal water flush schematic. Per Specification 11151, 2.02, F, no seal flush water shall be required. Page 18 of the submittal includes the correct mechanical seal. Please clarify what page 20 of the PDF is referencing.

8. Page 21 and 22 of the submittal: We are not sure what this is referencing, please clarify.

9. There is no indication that two (2) 12-inch discharge control plug valves are being supplied. Refer to drawings and Specifications 15100 and 15109 for requirements associated with the

discharge control plug valve and electric actuators. Submit this equipment under separate cover.

10. Per Specification 11151, Section 3.01 – shop testing is required, which shall be witnessed by the Owner. Contractor shall submit test procedure to Owner prior to scheduling.

11. Per Specification 15170, 3.03 A.1.b, motor certified test results shall be provided and include full load heat run, percent slip, running load current, locked rotor current, breakdown torque (calculated), starting torque, winding resistance, high potential, secondary current and voltage at collector rings (wound rotor), efficiencies at 100, 75, and 50 percent of full load, power factors at 100, 75 and 50 percent of full load, and bearing inspection.

Regards,

Jeremy Hise, PE
Senior Associate

cc: Micah Blate, PE and Dave Weber, PE/Hazen and Sawyer

1. The supply and installation of the following items are by others unless otherwise identified in this submittal.
   - Anchor bolts, nuts and washers
   - Gauges, valves and miscellaneous fittings and adapters.
   - Connecting piping and/or supports
   - Maintenance lubrication piping and related equipment.
   - System control apparatus
   - Maintenance tools and/or storage boxes.
   - Equipment tags

2. The following information is required by Pentair Flow Technologies prior to or at release of the pumps to production.
   - Verification of rotation and discharge position.
3. The following items are shipped loose for installation in the field:
   - Drivers and couplings.

Fairbanks Nijhuis
Submittal Data
For
Cattail Branch PS
Leesburg, VA

Supplier:

Sydnor Hydro, Inc.
P.O. Box 27186
Richmond, VA 23261

Manufacturer:

Pump

Fairbanks Nijhuis
3601 Fairbanks Ave.
Kansas City, Kansas 66106-0906
(913) 371-5000
Fax: (913) 748-4025

Project Number:	0908965
Sales Order Number:	51232770
Quantity:	2
Pump Size & Model:	5” C5446

Coupling:

Falk Corporation
3001 West Canal St.
Milwaukee, WI 53208-4222
(414) 342-3131
Fax: (414) 937-4359

Motor:

Baldor Electric Co.
8929 Freeway Drive
Macedonia, OH 44056
(330) 468-4777
Fax: (330) 468-7778

- Clockwise Rotation at Discharge Position 7
- Dynamically Balanced Cast Iron Impeller
- Stainless Steel Impeller Fasteners
- Stainless Steel Impeller Wear Ring
- Stainless Steel Casing Wear Ring
- 8 x 8 Suction Elbow
- Chesterton 442 Mechanical Seal with RSC vs. RSC Facers
- Spiral-Trac Bushing
- Modified Packing Box for 442 Seal
- Stainless Steel Shaft Sleeve
- Variable Speed Motor Adaptor
- Bearing Life Calculations
- Certified Witness Performance Test per H-I Standards
- Certified Witness Hydraulic Test
- Curve Approval Prior to Shipment
- Test Logs to be Provided
- 200HP, 1800RPM Baldor Motor
- A Lot of Spare Parts

1. Refer also to clarifications that may be included on the vendor submittal.

PENTAIR FAIRBANKS NIJHUIS

5" D5436WD SUBMITTAL CURVE

CURVE NO.:	0908965 C	REV.:	0

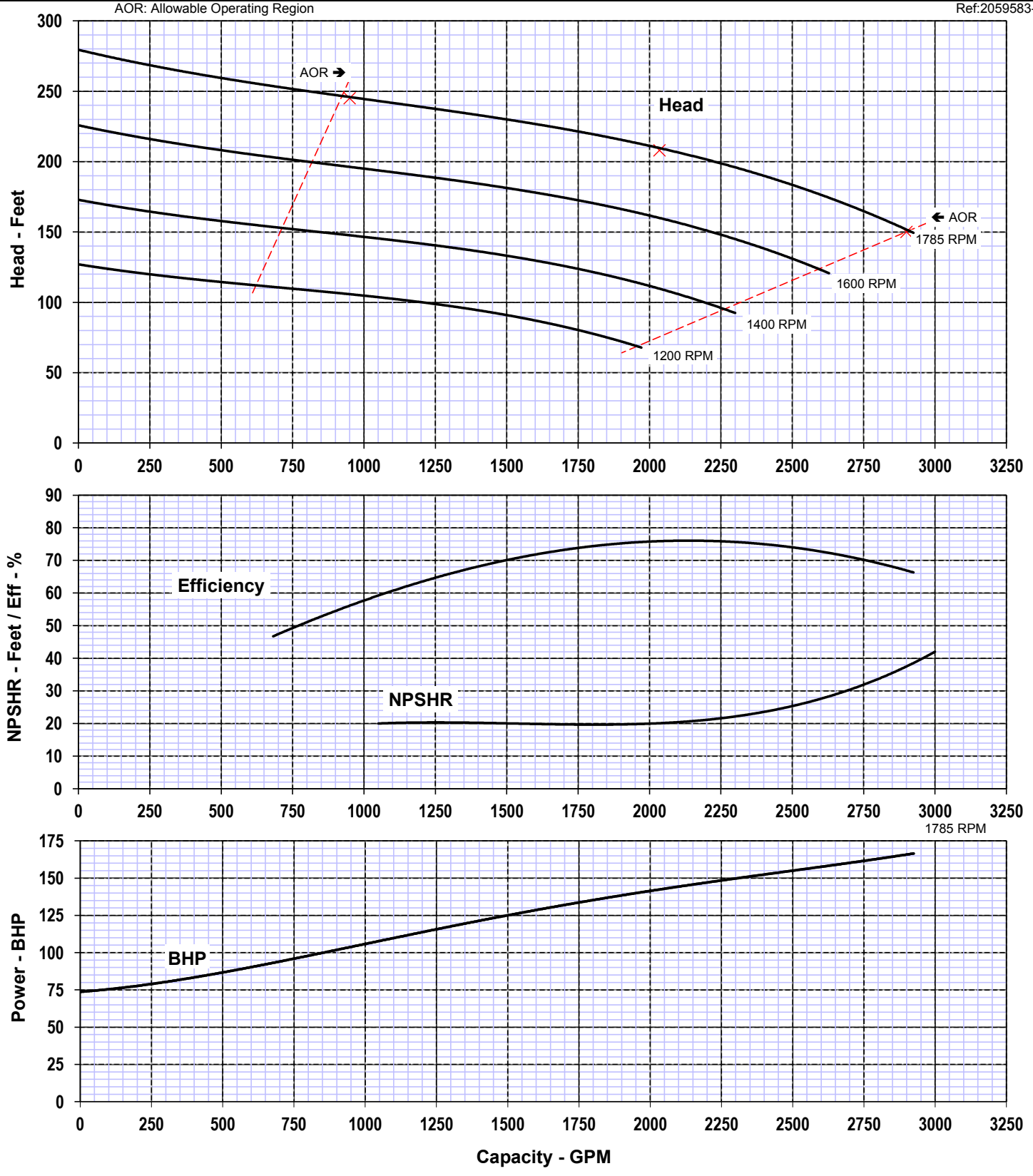
SPEED	IMPELLER	DIAMETER	STAGE
1785	T5D1AS(UF)	OS-15.40"	ONE
SPHERE	DRIVER	DATE	BY
3"	200 HP	11/21/2016	JCM

THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

GUARANTEED VALUES			
FLOW	HEAD	% EFF	BHP
2035	208		
950	245		
2900	150		

AOR: Allowable Operating Region

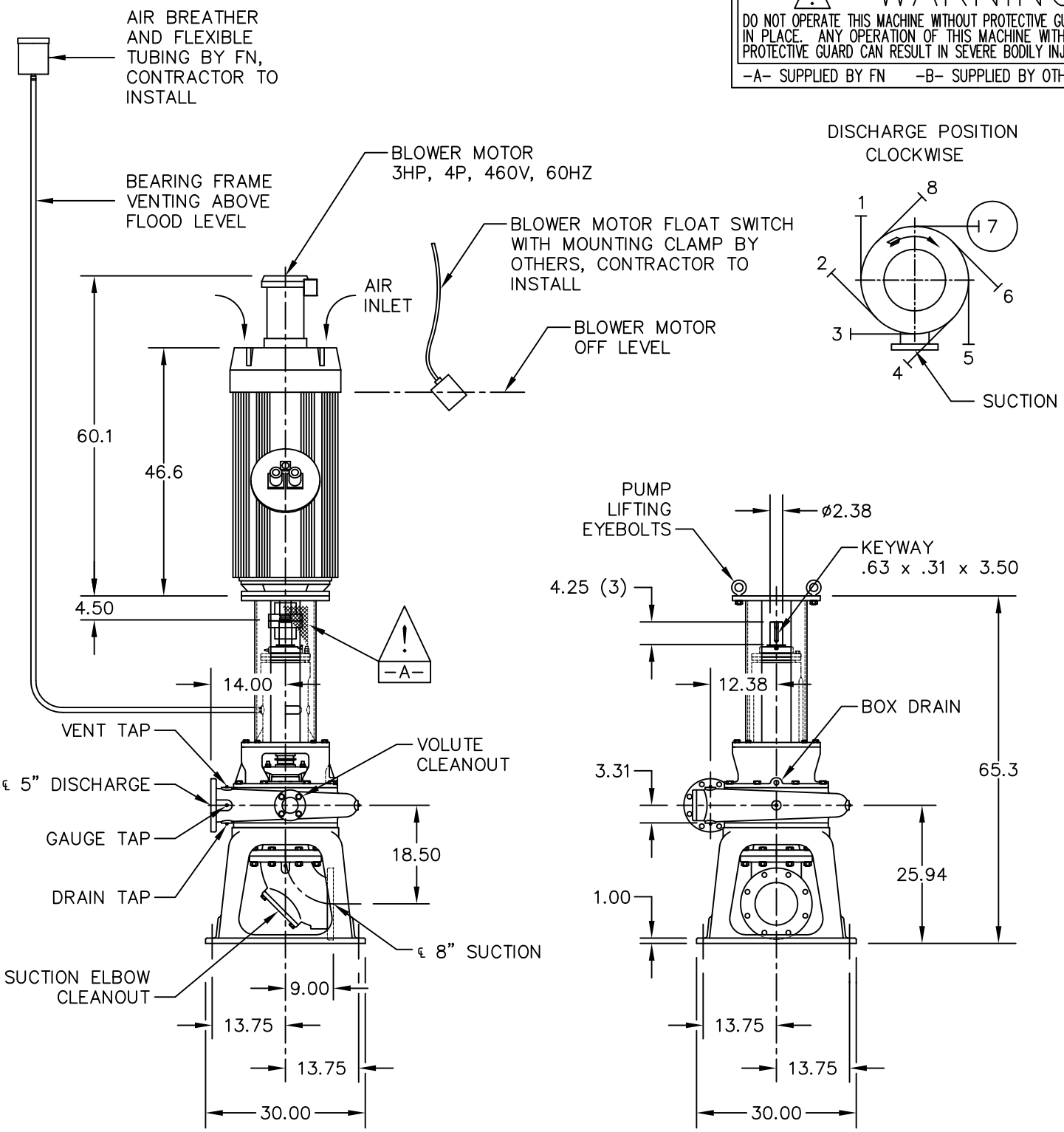
Ref:2059583-0



⚠ WARNING

DO NOT OPERATE THIS MACHINE WITHOUT PROTECTIVE GUARD IN PLACE. ANY OPERATION OF THIS MACHINE WITHOUT PROTECTIVE GUARD CAN RESULT IN SEVERE BODILY INJURY.

-A- SUPPLIED BY FN -B- SUPPLIED BY OTHERS



NOTES:

(1) ALL FLANGES ARE 125# ANSI DRILLING UNLESS NOTED.
(2) ALL DIMENSIONS ARE IN INCHES UNLESS NOTED.
(3) DIMENSIONS REFLECT USABLE SHAFT LENGTH.
(4) BASES ARE DESIGNED TO HAVE FULL CONTACT WITH GROUT OR A SOLE PLATE IN PLACE.
(5) NOT FOR CONSTRUCTION, INSTALLATION, OR APPLICATION PURPOSES UNLESS CERTIFIED. DIMENSIONS SHOWN MAY VARY DUE TO NORMAL MANUFACTURING TOLERANCES.

PUMP SETTING PLAN
5" C5446 IMMERSIBLE

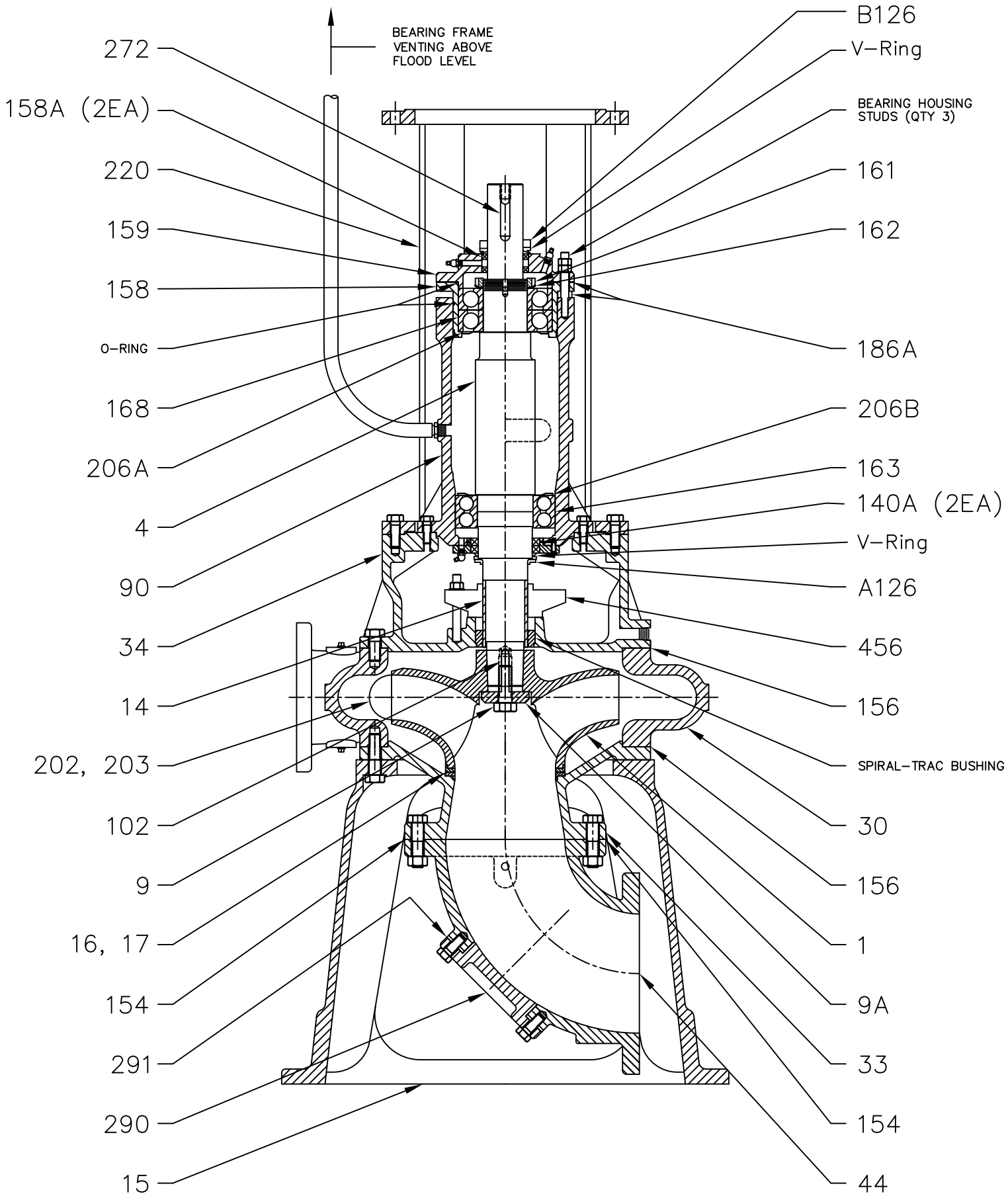
PENTAIR FAIRBANKS NIJHUIS™

DWG NO	0908965SP	REV NO	0

Fairbanks Nijhuis
Material Specifications

Item	Description	Material	Specification[1]
1	Impeller	Cast Iron	A48 Class 30
4	Shaft	Steel	AISI 4140 or AISI 1144[2]
9	Bolt, Impeller	Stainless Steel	A276 S30400
9A	Washer, Impeller	Stainless Steel	A276 S30400
14	Sleeve, Shaft	Stainless Steel	A743 CA40 MOD
15	Base	Cast Iron	A48 Class 30
16	Wear Ring, Fronthead	Stainless Steel	A743 Gr. CA40 MOD
17	Wear Ring, Impeller	Stainless Steel	A743 Gr. CA40 MOD
30	Volute	Cast Iron	A48 Class 30
33	Fronthead	Cast Iron	A48 Class 30
34	Backhead	Cast Iron	A48 Class 30
44	Suction Elbow	Cast Iron	A48 Class 30
90	Frame	Cast Iron	A48 Class 30
A126	Deflector, Inner	Rubber	Commercial
B126	Deflector, Outer	Rubber	Commercial
102	Key, Impeller	Stainless Steel	A276 S30400
140A	Seal, Outer Grease	Steel & Rubber	Commercial
154	Gasket, Elbow	Tag Board	F104
156	Gasket, Volute	Tag Board	D1170-G3111
158	Housing, Thrust Bearing	Cast Iron	A48 Class 30
159	Cover, Thrust Bearing Housing	Cast Iron	A48 Class 30
A206	Retainer, Inner Grease	Steel	Commercial
B206	Retainer, Inner Grease	Steel	Commercial
161	Locknut, Bearing	Steel	SAE Bolt Steel
162	Lockwasher, Bearing	Steel	AISI 1215
163	Bearing, Radial	Steel	Commercial
168	Bearing, Thrust	Steel	Commercial
202	Cover, Volute Cleanout	Cast Iron	A48 Class 30
203	Gasket, Cleanout	Rubber	Commercial
220	High Ring Base	Cast Iron/Steel	A48 Class 30 /A36 & A53
272	Key, Coupling	Steel	A108 Grade 1018
290	Cover, Suction Hand hole	Cast Iron	A48 Class 30
291	Gasket, Handhole	Rubber	Commercial
456	Mechanical Seal	Commercial	Commercial
186A	Shim	Steel	Commercial

[1] All material specifications are ASTM unless otherwise noted and are or description of chemistry only.
[2] Manufacturer's option.



PUMP ASSEMBLY
5" C5446 IMMERSIBLE

PENTAIR FAIRBANKS NIJHUIS™

DWG NO	0908965AP	REV NO	1

PENTAIR FAIRBANKS NIJHUIS™

TEST PROCEDURE
FOR FN Project **0908965**
Revision **0**

Sale Order:	51232770	**Model:**	5”-C5446	**Qty. Test:**	2

The pump unit(s) will be tested in accordance with the Hydraulic Institute's current published test procedures and the job specifications.

Test will be conducted to assure pumps(s) performance meets the requirements of sold conditions, as shown on the Fairbanks Nijhuis submittal curve.

Test conducted at Fairbanks Nijhuis Pump's factory, located in Kansas City, Kansas.

Sufficient test points (at least 8) will be taken to assure the pump(s) performance is established. A certified pump performance curve, based on the actual pump tested will be plotted on an 8-1/2" x 11" sheet of graph paper.

Measurements will be taken using calibrated equipment and the values of each measurement will be determined as follows.

Total Head (H):

The total head will be the summation of the discharge pressure transducer reading, plus or minus the suction pressure transducer (or suction manometer) reading, plus or minus the vertical distance between the gauge zero reference points and any velocity head correction when gauge taps are located on different pipe inside diameters.

Rate of Flow (GPM)

The rate of flow will be measured with a Venturi Meter. The differential head measured with a differential pressure transducer, and the GPM will be derived by using the Venturi Meter calibration data.

RPM:

The RPM will be determined by means of a calibrated Photoelectric Speed Counter.

Horsepower (BHP)

When test with Job motor, the input wattmeter kW reading and Job motor’s guaranteed efficiencies data will be converted to input horsepower, for each test point.

When test with factory calibrated test motor, the input wattmeter kW reading and calibrated data will be converted to input horsepower, for each test point.

Pump Efficiency:

From the values of input horsepower, total head, and rate of flow, the pump efficiency will be calculated for each individual test point.

EQUIPMENT LIST:

Discharge Gauge:	Differential pressure transducer, calibrated once every 4 months using a dead weight tester.
Venturi Gauge:	Differential pressure transducer, calibrated once every 4 months using a dead weight tester.
Venturi Meter:	To be determined.
Watts/Amps/Volts/P.F.:	To be determined.
RPM Counter:	To be determined.

SPECIFIC REMARKS:

1. Witness Certified Performance Test per ANSI/HI.
   - Due to NPSH-Requires at 2900 GPM point will he higher than NPSH-Available, test will be performed with two (2) test motor. One run at 1800 RPM sync. speed and one run at 1200 RPM sync. speed. It is anticipated that at 1800 RPM sync. speed, NPSH-Break would occurs around 2,500 GPM. Test data from 1200 RPM sync. speed will be use (step up per Pump Affinity Law) to show full range performance of 1785 RPM.
   - Reduced speeds (1600 & 1400 RPM) will be plotted per Pump Affinity Law.

2. Allowable test tolerance at the rated point per ANSI/HI 14.6 Grade 1U is:
   - +6% head
   - or +10% on rate of flow
   - +10% on power
   - No negative tolerance will be allowed on efficiency.

PUMP TEST STANDARDS:

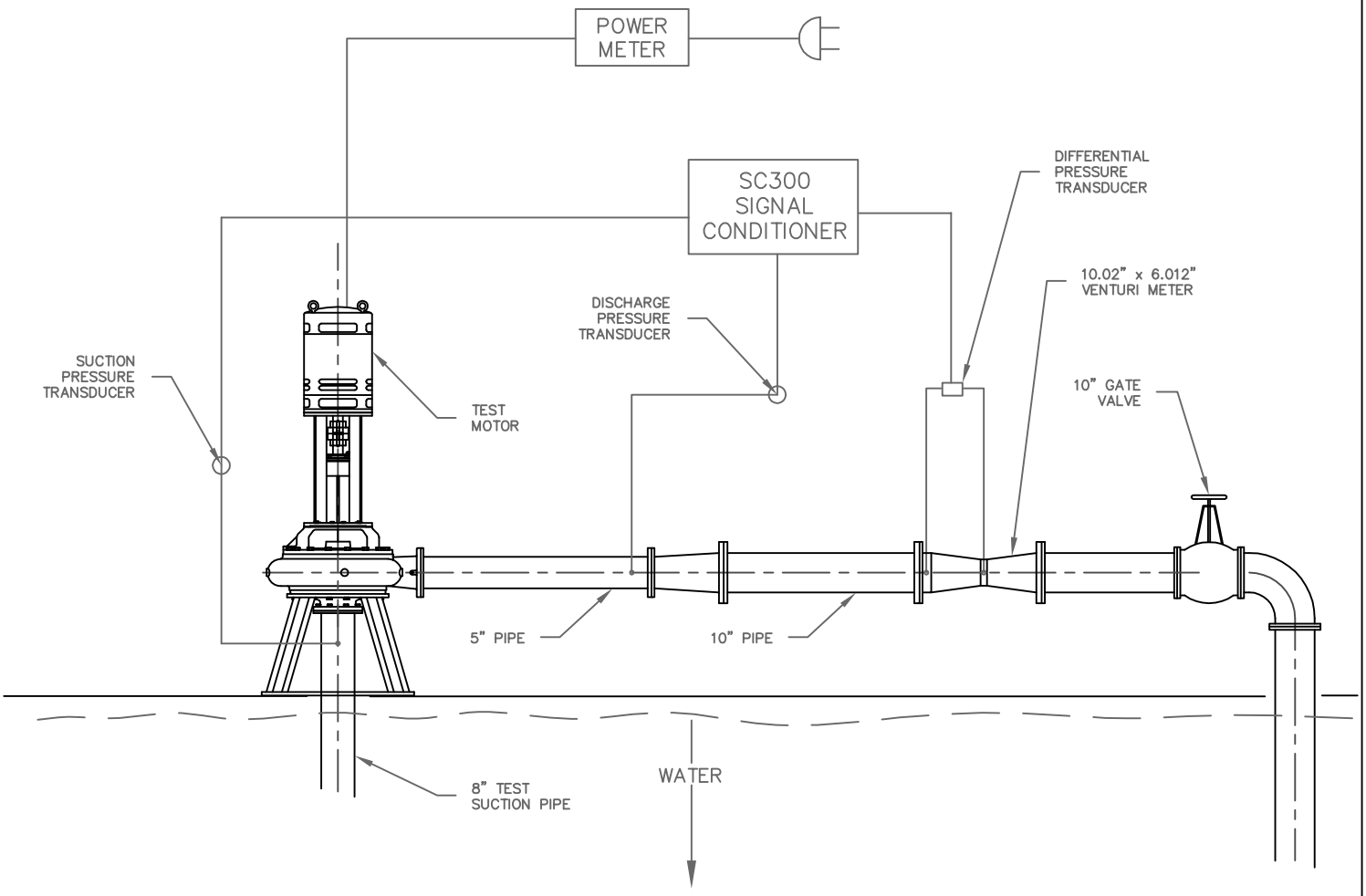
Pump tests conducted by Fairbanks Nijhuis meet the following standards:

Hydraulic Performance Acceptance Tests Standard, ANSI/HI 14.6-2011

Certified By: *Max Du 2017-03-13*

Product Engineer

Pentair Flow Technologies



NOTES:

1. GAUGE LOCATIONS AND PIPE DISTANCES BEFORE THE VENTURI METER ARE PER HYDRAULIC INSTITUDE STANDARDS LATEST EDITION.

REVISION:
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PENTAIR FAIRBANKS NIJHUIS

0908965
TEST SET UP

DWG. NO. 0908965TS | REV. NO. 0

Pump[3]	
Frame Size	T50
Pump Size	5
Suction Size, Standard	8
Nominal Wear Ring Clearance	0.020
Impeller Fastener	
Size	7/8-9
Tightening Torque, lb.-ft.	240
Impeller	
Weight, lb.	89.3
Inlet Area, sq. In	52.05
WK^2 Lb.-Ft.^{2}	18.4
Sphere Size, Maximum	3
Shaft Diameter:	
at Impeller	2 1/2
at Sleeve	2 5/8
at Thrust Bearing	2.953
at Radial Bearing	3.740
Between Bearings	4
at Coupling	2 3/8
Keyway at Coupling	5/8 X 5/16
Torsional Shaft Stiffness, lbs./rad.	$2.9X10^6$
Center to Center of Bearings	14 1/8
Thrust Bearing Number	5315
Radial Bearing Number	6219
Sealing Box:	
Type	442 Split
Recommended Flush Water	
Pressure, PSI (above operating pressure)	1-10
Flow, GPM	1/2-1
Sleeve OD	3
Box ID	4
Box Depth	2 1/8
Box Inlet Tap Size, NPT	1/4
Box Outlet Tap Size, NPT	1/4
Backhead Drain Tap Size, NPT	3/4
Volute Cleanout Diameter	3 7/8
Suction Elbow Cleanout Diameter	6
Vent/Priming Tap Size, NPT	3/4
Gauge Tap Size	
Suction, NPT	1/2
Discharge, NPT	1/2
Hydrostatic Test Pressure, Maximum, PSI	190
Casing Working Pressure, Maximum, PSI	125
Nominal Casing Thickness	11/16
Operating Temperature, °F	150
Anchor Bolt Size Recommended	1 1/8
Minimum Diameter Opening to Install Pump	48
Shipping Weight, Basic Pump, lb.	1360

[3] All dimensions are in inches unless otherwise noted.

PENTAIR FAIRBANKS NIJHUIS™

Bearing Life Statement

Project Number:	0908965
Project Name:	Cattail Branch PS – Leesburg, VA
Pump:	5” C5446
Impeller Design:	T5D1AS
Bearing/Motor Frame:	T-60

Specified Conditions

GPM	2,035
TDH (FT)	208
Speed (RPM)	1785

Bearing Life

Bearing Life meets or exceeds 100,000 hours, ABMA L-10, at the Specified Conditions above.

Certified by: *Max Du* 01/66/2017

PRODUCT ENGINEER.

PENTAIR FAIRBANKS NIJHUIS

CERTIFICATE OF WARRANTY

Sydnor Hydro, Inc.
Purchase Order: 70794

Seller warrants equipment (and its component parts) of its own manufacture against defects in materials and workmanship under normal use and service for eighteen months (18) months from the date of acceptance, installation, or start-up, or twenty-four months (24) months after the date of shipment, whichever occurs first. Seller does not warrant accessories or components that are not manufactured by Seller. However, to the extent possible, Seller agrees to assign to Buyer its rights under the original manufacturer's warranty, without recourse to Seller.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND SELLER HEREBY EXPRESSLY DISCLAIMS AND BUYER WAIVES ALL OTHER WARRANTIES, EXPRESSED, IMPLIED IN LAW, OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller's sole obligation under this warranty shall be, at its option, to repair or replace any equipment (or it's component part) which has a defect covered by this warranty, or to refund the purchase price of such equipment or part. Under the terms of this warranty, Seller shall not be liable for: (a) consequential, collateral, special, incidental or liquidated losses or damages; (b) equipment conditions caused by normal wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment; (c) the expense of, and loss or damage caused by, repairs or alterations made by anyone other than Seller; (d) damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage, mishandling, or other similar conditions; (e) any loss, damage or expense relating to or resulting from installation, removal or reinstallation of equipment; (f) any labor costs or charges incurred in repairing or replacing defective equipment or parts, including the cost of reinstalling parts that are repaired or replaced by Seller; (g) any expense of shipment of equipment or repaired or replacement parts; or (h) any other loss, damage, or expense of any nature.

Brett M. Miller
Director – Customer & Sales Support

03-10-2017
Date

Pentair Project No: 0908965
Sales Order No: 51232770

Cc: Sales File

Fairbanks Nijhuis
Typical Pump Bearing Lubricants

Fairbanks Nijhuis recommends a superior quality, NLGI No. 2, multipurpose, lithium complex grease for all pump rolling element bearing applications that require grease lubrication. The grease characteristics should include good high temperature performance, extreme pressure properties, water resistance, excellent oxidation stability, good rust protection and resistance to chemical breakdown. Fairbanks Nijhuis does not recommend grease with molybdenum disulfide (moly) additives. In addition to the characteristics listed above, the grease should meet the following specification.

Specifications

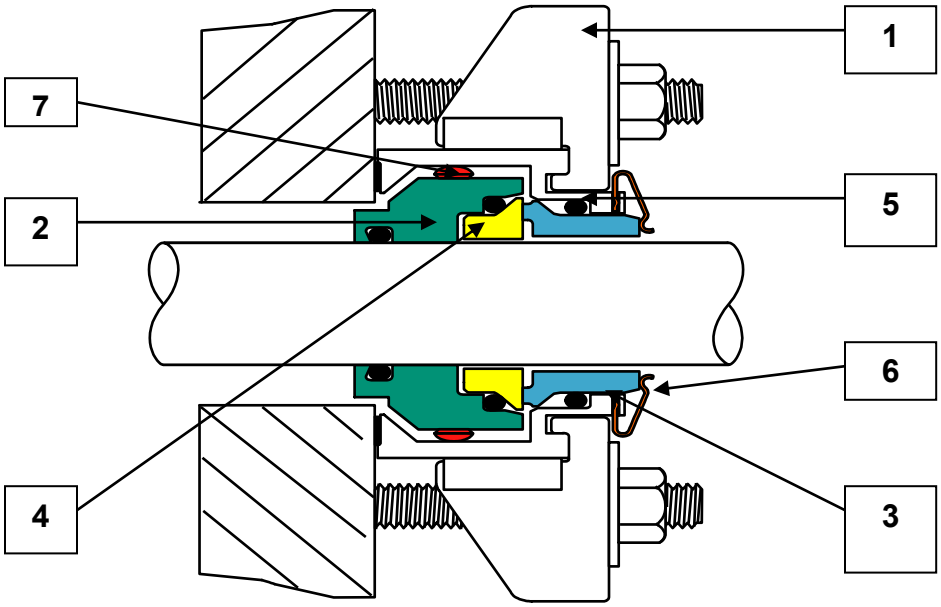
Consistency: NLGI No. 2
Dropping Point ASTM D2265 >450° F
Base fluid viscosity
SUS @ 100° F 700 to 1200
SUS @ 212° F 70 to 100
Rust Prevention ASTM 1743 Pass
Water Washout ASTM 1264 <4% @ 175° F
Four Ball EP Test ASTM D2596 >40kg load wear
>250kg weld point

Fairbanks Nijhuis has compiled a general list of products that meet the grease requirements above. This list is not an endorsement of any particular manufacture and should not be construed as exclusive recommendations. When choosing an alternate manufacture, customers should discuss this typical lubricant recommendation with their vendor to ensure that equivalent grease is supplied.

Typical Products

Manufacturer	Lubricant Brand Name	NLGI No.
BP	BP Energrease® LC EP 2	2
Castrol	Pyroplex Red	2
Chevron	Delo® Greases EP	2
Exxon	Ronex® MP	2
Mobil	Mobiltith® AW2	2
Shell	Retinax® LC	2
Texaco	Starplex® 2	2
76	76 Multiplex EP	2

442 Split Seal Data Sheet

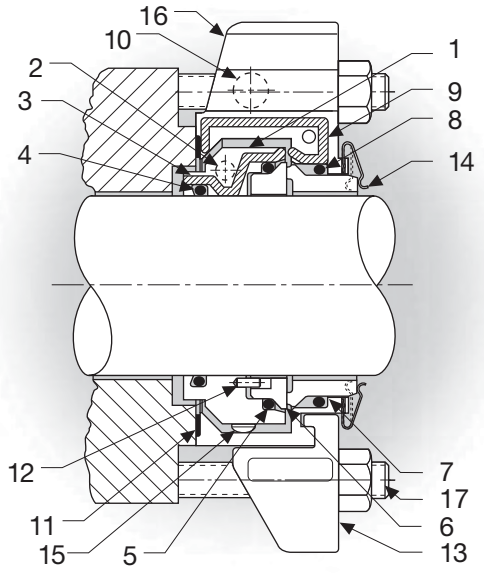


Materials of Construction

1.	**Gland:**	**316 Stainless Steel**
2.	**Rotary Holder:**	**316 Stainless Steel**
3.	**Stationary faces:**	**Reaction Bonded Silicon Carbide**
4.	**Rotary faces:**	**Reaction Bonded Silicon Carbide**
5.	**O-rings:**	**Fluorocarbon* (Viton) ***
6.	**Springs:**	**Elgiloy**
7.	**Centering Button:**	**Ryton**
8.	**Flush Port:**	**3/8” NPT**

* Standard Construction

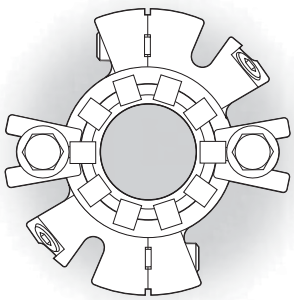
442 Split Mechanical Seal Technical Data



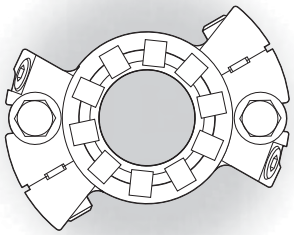
1. Rotary Holder
2. Socket Head Cap Screw
3. Holder Gasket
4. Shaft O-ring
5. Rotary O-ring
6. Rotary Face
7. Stationary Face
8. Stationary O-Ring
9. Gland Gasket
10. Socket Head Cap Screw
11. Stuffing Box Gasket
12. Anti-Rotation Pin
13. Bolt Tab
14. Spring
15. Centering Button
16. Gland
17. Stuffing Box Bolts

EQUIPMENT BOLT PATTERNS

Shaft Sizes: 1.625" to 4.750" (40 mm to 120 mm)



2 BOLTS



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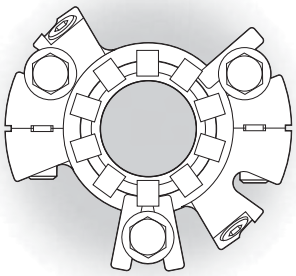
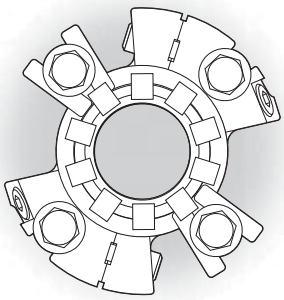
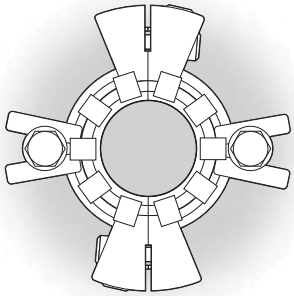


3 BOLTS



4 BOLTS

All Other Shaft Sizes



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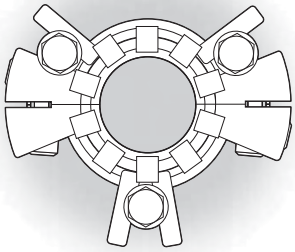

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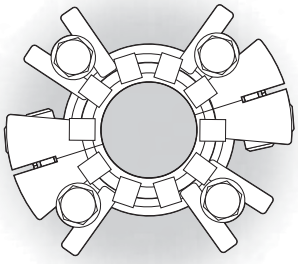
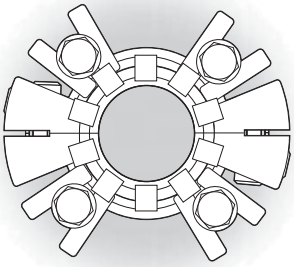


4 BOLTS



4 BOLTS

DIMENSIONAL DATA (INCH & METRIC)

SHAFT SIZE	M HOLDER ID FROM BOX		N INSTALLATION DIM		P NPT SIZE
	INCH	METRIC	INCH	METRIC	
1.250" to 1.500" (32 mm to 38 mm)	0.53	13,5	0.094	2,4	1/4"
1.625" to 4.750" (40 mm to 120 mm)	0.53	13,5	0.094	2,4	3/8"
4.875" to 7.750" (125 mm to 195 mm)	1.03	26,0	0.188	4,8	1/2"

KEY - Figures 1 & 2

- **A** – Shaft Size
- **B** – Max. Gland Dia.
- **C** – Min./Max. Stuffing Box Dia.
- **D** – Gland Length
- **E** – Min. Stuffing Box Depth
- **F** – Outboard Length Required
- **G** – Min. Bolt Circle by Bolt Size
- **H** – Min. Stuffing Box Face OD
- **L** – Gland Hub OD
- **M** – Holder ID from Box
- **N** – Installation Dimension
- **O** – Shaft O-ring Number
- **P** – NPT Size

DIMENSIONAL DATA (INCH)

A SHAFT SIZE	B GLAND OD	C STUFFING BOX BORE		D GLAND LENGTH	E SB DEPTH	F OB LENGTH	G BOLT CIRCLE BY BOLT SIZE					H SB FACE OD	L GLAND HUB OD	O SHAFT O-RING NO.
									MIN					
	MAX	MIN		MAX		MIN	3/8"	1/2"	5/8"	3/4"	7/8"	MIN	MAX	
1.250	4.94	1.86	2.10	1.48	0.17	1.78	3.20	3.33	3.45	-	-	2.35	2.79	-219
1.375	5.02	1.94	2.38	1.48	0.17	1.78	3.28	3.40	3.53	-	-	2.63	2.87	-221
1.500	5.14	2.06	2.50	1.48	0.17	1.78	3.40	3.53	3.65	-	-	2.75	2.99	-223
1.625	5.26	2.19	2.63	1.48	0.17	1.78	3.50	3.63	-	-	-	2.87	3.11	-224
1.750	5.39	2.31	2.75	1.48	0.17	1.78	3.63	3.75	-	-	-	3.00	3.23	-225
1.875	5.51	2.44	2.88	1.48	0.17	1.78	3.75	3.88	-	-	-	3.12	3.35	-226
2.000	5.64	2.56	3.00	1.48	0.17	1.78	3.94	4.06	-	-	-	3.25	3.48	-227
2.125	5.76	2.69	3.12	1.48	0.17	1.78	4.06	4.19	4.31	-	-	3.37	3.60	-228
2.250	5.88	2.81	3.25	1.48	0.17	1.78	4.19	4.31	4.44	-	-	3.50	3.73	-229
2.375	6.01	2.94	3.37	1.48	0.17	1.78	4.31	4.43	4.56	-	-	3.62	3.85	-230
2.500	6.13	3.06	3.75	1.48	0.17	1.78	4.57	4.70	4.82	-	-	4.00	4.23	-231
2.625	7.77	3.35	4.25	1.84	0.26	2.24	5.44	5.56	5.69	-	-	4.75	5.00	-232
2.750	7.77	3.35	4.25	1.84	0.26	2.24	5.44	5.56	5.69	-	-	4.75	5.00	-233
2.875	8.02	3.60	4.50	1.84	0.26	2.24	5.66	5.78	5.91			5.00	5.25	234
3.000	8.02	3.60	4.50	1.84	0.26	2.24	5.66	5.78	5.91	-	-	5.00	5.25	-235
3.125	8.27	3.85	4.75	1.84	0.26	2.24	6.00	6.12	6.25	-	-	5.25	5.49	-236
3.250	8.27	3.85	4.75	1.84	0.26	2.24	6.00	6.12	6.25	-	-	5.25	5.49	-237
3.375	8.51	4.10	5.00	1.84	0.26	2.24	6.16	6.28	6.41	6.53	6.66	5.50	5.75	-238
3.500	8.51	4.10	5.00	1.84	0.26	2.24	6.16	6.28	6.41	6.53	6.66	5.50	5.75	-239
3.625	8.77	4.35	5.25	1.84	0.26	2.24	6.41	6.53	6.66	6.78	6.91	5.75	6.00	-240
3.750	8.77	4.35	5.25	1.84	0.26	2.24	6.41	6.53	6.66	6.78	6.91	5.75	6.00	-241
3.875	9.02	4.60	5.50	1.84	0.26	2.24	6.66	6.78	6.91	7.03	7.16	6.00	6.25	-242
4.000	9.02	4.60	5.50	1.84	0.26	2.24	6.66	6.78	6.91	7.03	7.16	6.00	6.25	-243
4.125	9.27	4.85	5.75	1.84	0.26	2.24	6.91	7.03	7.16	7.28	7.41	6.25	6.50	-244
4.250	9.27	4.85	5.75	1.84	0.26	2.24	6.91	7.03	7.16	7.28	7.41	6.25	6.50	-245
4.375	9.52	5.10	6.00	1.84	0.26	2.24	7.16	7.28	7.41	7.53	7.66	6.50	6.75	-246
4.500	9.52	5.10	6.00	1.84	0.26	2.24	7.16	7.28	7.41	7.53	7.66	6.50	6.75	-247
4.625	9.77	5.35	6.25	1.84	0.26	2.24	7.41	7.53	7.66	7.78	7.91	6.75	7.00	-248
4.750	9.77	5.35	6.25	1.84	0.26	2.24	7.41	7.53	7.66	7.78	7.91	6.75	7.00	-249
4.875	11.28	5.87	7.00	2.91	0.29	3.45	-	-	8.41	8.53	8.66	7.50	7.74	-353
5.000	11.28	5.99	7.00	2.91	0.29	3.45	-	-	8.41	8.53	8.66	7.50	7.74	-354
5.125	11.53	6.12	7.25	2.91	0.29	3.45	-	-	8.66	8.78	8.91	7.75	7.99	-355
5.250	11.53	6.24	7.25	2.91	0.29	3.45	-	-	8.66	8.78	8.91	7.75	7.99	-356
5.375	11.78	6.37	7.50	2.91	0.29	3.45	-	-	8.91	9.03	9.16	8.00	8.24	-357
5.500	11.78	6.49	7.50	2.91	0.29	3.45	-	-	8.91	9.03	9.16	8.00	8.24	-358
5.625	12.03	6.62	7.75	2.91	0.29	3.45	-	-	9.16	9.28	9.41	8.25	8.49	-359
5.750	12.03	6.74	7.75	2.91	0.29	3.45	-	-	9.16	9.28	9.41	8.25	8.49	-360
5.875	12.28	6.87	8.00	2.91	0.29	3.45	-	-	9.41	9.54	9.66	8.50	8.74	-361
6.000	12.28	6.99	8.00	2.91	0.29	3.45	-	-	9.41	9.54	9.66	8.50	8.74	-362
6.125	12.53	7.12	8.25	2.91	0.29	3.45	-	-	9.66	9.79	9.91	8.75	8.99	-362
6.250	12.53	7.24	8.25	2.91	0.29	3.45	-	-	9.66	9.79	9.91	8.75	8.99	-363
6.375	12.78	7.37	8.50	2.91	0.29	3.45	-	-	9.91	10.04	10.16	9.00	9.25	-363
6.500	12.78	7.49	8.50	2.91	0.29	3.45	-	-	9.91	10.04	10.16	9.00	9.25	-364
6.625	13.03	7.62	8.75	2.91	0.29	3.45	-	-	10.17	10.29	10.42	9.25	9.50	-364
6.750	13.03	7.74	8.75	2.91	0.29	3.45	-	-	10.17	10.29	10.42	9.25	9.50	-365
6.875	13.28	7.87	9.00	2.91	0.29	3.45	-	-	10.42	10.54	10.67	9.50	9.75	-365
7.000	13.28	7.99	9.00	2.91	0.29	3.45	-	-	10.42	10.54	10.67	9.50	9.75	-366
7.125	13.53	8.12	9.25	2.91	0.29	3.45	-	-	10.67	10.79	10.92	9.75	10.00	-366
7.250	13.53	8.24	9.25	2.91	0.29	3.45	-	-	10.67	10.79	10.92	9.75	10.00	-367
7.375	13.78	8.37	9.50	2.91	0.29	3.45	-	-	10.92	11.04	11.17	10.00	10.25	-367
7.500	13.78	8.49	9.50	2.91	0.29	3.45	-	-	10.92	11.04	11.17	10.00	10.25	-368
7.625	14.03	8.62	9.75	2.91	0.29	3.45	-	-	11.17	11.29	11.42	10.25	10.50	-368
7.750	14.03	8.74	9.75	2.91	0.29	3.45	-	-	11.17	11.29	11.42	10.25	10.50	-369

442 SPLIT MECHANICAL SEAL OPERATING PARAMETERS†

PRESSURE CAPABILITIES (INCH)

SIZE RANGE	HOLDER TYPE	SHAFT SPEED	FACE MATERIAL COMBINATION		
			CARBON/RSC Psig	RSC/RSC Psig	CARBON/CERAMIC Psig
1.250" to 2.500" (32 mm to 60 mm)	Standard Holder	1750	28" Hg to 300	28" Hg to 300	28" Hg to 300
	Standard Holder	3600	28" Hg to 300	❖ 28" Hg to 175	❖ 28" Hg to 100
	HP Holder	1750	300 to 450	300 to 450	❖ 300 to 350
	HP Holder	3600	300 to 450	*	*
2.625" to 4.750" (65 mm to 120 mm)	Standard Holder	1750	28" Hg to 200	28" Hg to 200	28" Hg to 200
	HP Holder	1750	200 to 250	200 to 250	*
4.875" to 7.750" (125 mm to 195 mm)	Standard Holder	875	28" Hg to 150	28" Hg to 150	28" Hg to 150
	HP Holder	875	150 to 200	150 to 200	150 to 200

PRESSURE CAPABILITIES (METRIC)

SIZE RANGE	HOLDER TYPE	SHAFT SPEED	FACE MATERIAL COMBINATION		
			CARBON/RSC bar g	RSC/RSC bar g	CARBON/CERAMIC bar g
32 mm to 60 mm (1.250" to 2.500")	Standard Holder	1750	710 mm Hg to 20	710 mm Hg to 20	710 mm Hg to 20
	Standard Holder	3600	710 mm Hg to 20	❖ 710 mm Hg to 12	❖ 710 mm Hg to 7
	HP Holder	1750	20 to 30	20 to 30	❖ 710 mm Hg to 24
	HP Holder	3600	20 to 30	*	*
65 mm to 120 mm (2.625" to 4.750")	Standard Holder	1750	710 mm Hg to 14	710 mm Hg to 14	710 mm Hg to 14
	HP Holder	1750	14 to 18	14 to 18	*
125 mm to 195 mm (4.875" to 7.750")	Standard Holder	875	710 mm Hg to 10	710 mm Hg to 10	710 mm Hg to 10
	HP Holder	875	10 to 14	10 to 14	10 to 14

TEMPERATURE

To 250 ºF (120 ºC)

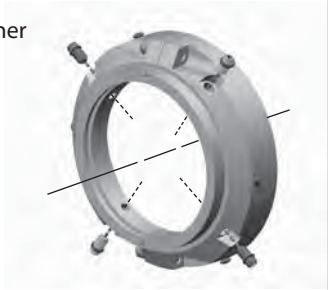
SPEED

To 4000 fpm (20 m/s)

RSC - Reaction bonded silicon carbide
❖ - Metrics limited by PV capabilities.
* - Standard holder handles all PV capabilities of the listed face combinations.
† - Consult Chesterton Engineering for applications exceeding published operating parameters and additional seal sizes.

OPTIONAL 442 HP HOLDER

The 442 HP Holder is required in higher pressure applications as listed in the *442 Split Mechanical Seal Operating Parameters* charts above.



Materials of Construction	
Component	Materials
Rotary Face	Ceramic Silicon Carbide
Stationary Face	Carbon Duplex CarbideTM Silicon Carbide
Elastomers	AflasTM Ethylene Propylene Fluorocarbon
Spring	ElgiloyTM
Metal Parts	316 Stainless Steel

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FORM NO. 073385 PART B

PRINTED IN USA 12/09

SpiralTrac™ Part Number Code

Example: The following part number identifies a *device operating with greatly reduced flush* (**F**), *measured in inches* (I), to fit over a *3.000" shaft* (**3000**) in a pump with *right fluid rotation* (**R**). This is a *split* (**S**) *SpiralTrac*™ for in-place installation with split seals in a pump with a *4.000" seal cavity bore diameter* (**4000**). The device is made of *Carbon Graphite Filled PTFE* (**ESC**).

This part number code applies to typical *SpiralTrac*™ configurations. *For special configurations please forward a drawing to EnviroSeal for review.*

Shaft Size(4)
Actual diameter of rotating component under *SpiralTrac.*™

Outside Diameter(1)
Actual diameter of the seal cavity bore.

Material
316 316 Stainless Steel
416 416 Stainless Steel
GLF Glass Filled PTFE(7)
ESC Carbon Graphite Filled PTFE
BRZ Bronze
Ti Titanium

Measurement Units
I Inches
M Metric

Fluid Rotation(3)
As Viewed From Bearing End
R Right
L Left

F	I	3000	R	S	4000	(ESC)

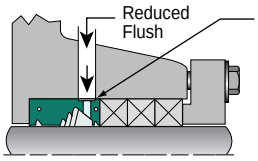
Operating Conditions (SpiralTrac Versions)

F **Greatly reduced flush.**
Installed with split seals while the equipment is still in place (see Type S)

N **Reduced or no flush**(6) **in non-fibrous applications.**
More aggressive single spiral groove, deep air vent and exit groove, available in Types A, B, I and E.(5)

D **Reduced or no flush**(6) **in fibrous applications.**
Double spiral grooves, deeper air vent and exit groove, available in Types A, I and E.(5)

P **For use with packing only.**(2)
A combined lantern ring and centrifugal separator, axially split and manufactured with a single spiral groove.



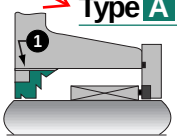
SpiralTrac™ Packing Version Installed in Stuffing Box

Use half or less the normal flush rate.

Greatly extends sleeve and packing life.

Easy Installation Options (SpiralTrac Types)

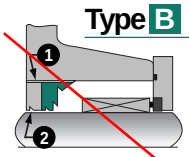
Type A Counterbore Fit



Press into Place using reduced or no Flush(6)***:***
Drives **Circulation** for face cooling.
Forces fluid **Exchange** for heat removal.
Removes **Particulate**.

Recommended Upgrades
❶ ***Drill 5/32" vent hole:***
Releases **Air** when flooding.

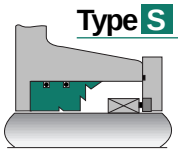
Type B Bore Fit



Press into Place using reduced Flush:
Drives **Circulation** for face cooling.
Enhances fluid **Exchange** for heat removal.
Positions **Particulate** so a small flush (5-7 GPH/*23–32 LPH*) can force it under the throat restriction and out of the cavity.

Recommended Upgrades
❶ ***Drill 5/32" vent hole:***
Releases **Air** when flooding.
❷ ***Extend exit groove:***
Forces fluid **Exchange** and removes particulate without flush(6) while eliminating shaft erosion.

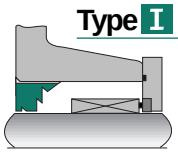
Type S Axially Split Device (Typical for Split Seals)



Press into Place using reduced Flush:
Drives **Circulation** for face cooling.
Enhances fluid **Exchange** for heat removal.
Positions **Particulate** for removal by small flush (5-7 GPH/*23–32 LPH*).

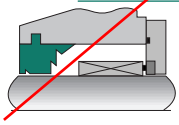
No Upgrades
Not practical due to installation while the pump is assembled.

Type I Impeller Side Installation (Typical for Open Bore Cavities)



Press into Place using reduced or no Flush(6)***:***
Superior **Air** venting.
Drives **Circulation** for face cooling.
Forces fluid **Exchange** for heat removal.
Removes **Particulate.**

Type E Externally Keyed (Typical for Horizontal Split Case Pumps)



Installed using reduced or no Flush(6)***:***
Superior **Air** release when vent specified.
Drives **Circulation** for face cooling.
Forces fluid **Exchange** for heat removal.
Removes **Particulate.**

Notes:

1. For **Type A** or **Type E** *SpiralTrac,*™ dimensions for the counterbore or external key (**Horizontal Split Case Pumps**) must be provided in addition to the part number. Please contact EnviroSeal for sizing information sheets.
2. For **Packing Version** *SpiralTrac,*™ the width of the lantern ring as well as the size of packing and number of packing rings being replaced by *SpiralTrac*™ must be provided in addition to the part number. Please contact EnviroSeal for sizing information sheets.
3. For **Double Ended Pumps** both right and left rotation devices are required.
4. Depending on the pump, this may be a shaft, sleeve, or impeller hub diameter.
5. When air is a problem from process or dry running, the use of flush, quench or double seals is necessary to provide face cooling.
6. Elimination of flush is dependent on the type of application. Please contact EnviroSeal to determine your application's suitability for total flush elimination.
7. Version P radial cross-section must be greater than .500" when using glass filled PTFE.

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US PATENTS # 5,553,868
5,167,418
Euro.Pat. App.0 912 848

ST01272-280100

A unique sealing concept

The V-ring is an all-rubber seal available from SKF. It is mounted directly on the shaft by hand and seals against a counterface. This unique design has been extensively used on a broad range of applications.

Designed with a long, flexible lip, the V-ring can act as a face seal, a lip seal or slinger. The construction is three part: the body (a), the conical self-adjusting lip (b) and the hinge (c). The elastic body holds itself in place on the rotating shaft while dynamic sealing takes place where the lip is in axial contact with the counterface. The counterface should be metal and can be the end of a gearbox housing, a washer, a suitable steel stamping, even the back of an oil seal. Generally no seal bore is required and no shaft preparation is needed.

In addition to highly effective contaminant exclusion, V-rings can be used to retain grease lubricants. However, with proper countersurface preparation they can run dry with very low torque loss and good service life.

Because the V-ring is very elastic (smaller V-rings can be stretched up to 2 1/2 times their free diameter) it can often be easily fitted to shafts without disassembly of the unit—even over flanges, pillow blocks, or other assemblies.

One size V-ring can be used on a number of shaft sizes either English or metric dimension. Less than 142 sizes covers a wide range of shaft sizes from .110" (2.7mm) to 29' (9000mm). Sizes up to 79.530" (2020mm) and beyond are available in nitrile or fluoroelastomer (Viton®) covering a wide variety of media compatibility in temperature ranges from -40°F to 212°F (nitrile) and -15°F to 392°F fluoroelastomer.

In addition, special constructions and sizes can be made to order including split versions.

There are six styles of V-rings.

VR1 The most common style available in the widest range of sizes from .110" (2.7mm) shaft to 79.530" (2020mm) nitrile and fluoroelastomer. Ideal for protecting gearboxes, electric motors and drives.

VR2 The original V-ring designed with a wide body and tapered heel to firmly hold the ring on the shaft. Available in sizes from .180" (4.5mm) shaft to 8.270" (210mm). Commonly used in agricultural and automotive applications.

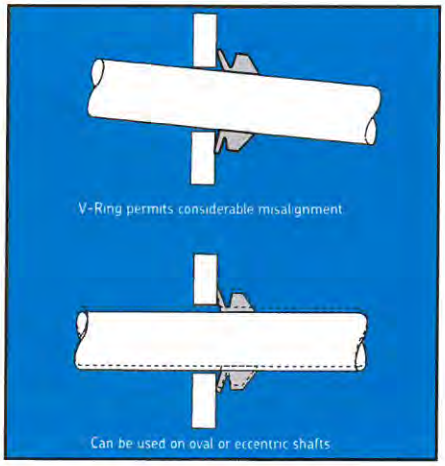
VR3 Very compact axial cross-section commonly used in confined spaces to replace labyrinth seals. Available in nitrile and fluoroelastomer for shaft sizes from 4.134" (105mm) shaft to 78.745" (2000mm) and beyond.

Note: Beyond the six primary V-ring styles and rubber compounds, options are available for special installation dimensions and operating conditions (ie. confined spaces, exposure to caustic fluids). Many V-ring profiles can be ordered for shaft diameters beyond 78.740" (2000mm). Contact SKF Sealing Solutions for details.

VR4 A heavy-duty large diameter style commonly used in rolling mills as a secondary seal for heavy duty applications where the primary seal has to be protected against water and or particulate contamination. VR4 is the preferred heavy duty V-ring in replacement applications. Selected sizes are in stock and others can be made to order. For new designs, the VR6 should be considered and has similar mounting dimensions. Available in both nitrile and fluoroelastomer for shafts from 11.811" (300mm) to over 78" (2000mm).

VR5 A heavy-duty large diameter style designed to operate in the severe conditions found in metals and paper mills. The unique body profile can accommodate radial and axial support in high shaft speeds applications. It has an extension that can be fitted into mechanical components or trimmed to length to meet existing space requirements (contact SKF for details). Available for shaft diameters from 11.811" (300mm) to over 78" (2000mm) in nitrile and fluoroelastomer on a made-to-order basis.

VR6 This heavy-duty profile is also designed primarily for protecting high speed bearing arrangements in rolling mills, papermaking and large machine applications. It should especially be considered for new equipment designs. The shape is similar to the VR5 except it does not have the extension to the rear of the body section, allowing a narrower B_1. It does retain the saddle feature for axial and radial location on the shaft with a specially designed clamping band. The key installation dimensions are the same as the VR4 except for the body height. Available on a made to order basis in both nitrile and fluoroelastomer for shafts from 11.811" (300mm) to over 78" (2000mm). Contact SKF Sealing Solutions for specific size and installation data.



For cross sectional drawings, please see page 4.

Forsheda V-rings
A product of Busak + Shamban
Division of Trelleborg
Sealing Solutions

1

Versatile, cost-effective sealing

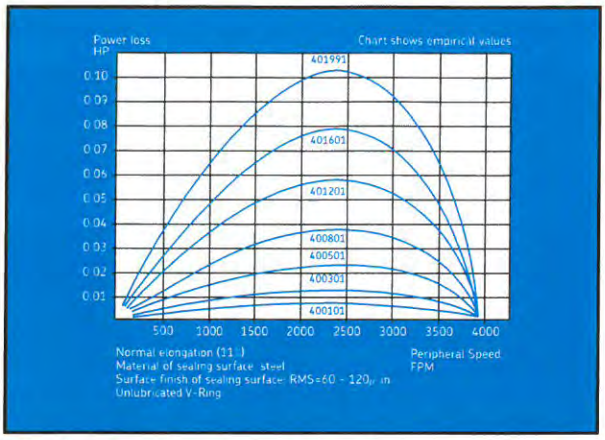
Technical simplicity-Low friction and minimal loss of power. In smaller power units this can be significant. The pressure of the lip against the counterface is very light.

Economical-Wide machining tolerances-little or no shaft finishing. No housing required. No shaft wear. Seals resist damage during installation. One size covers many shaft sizes.

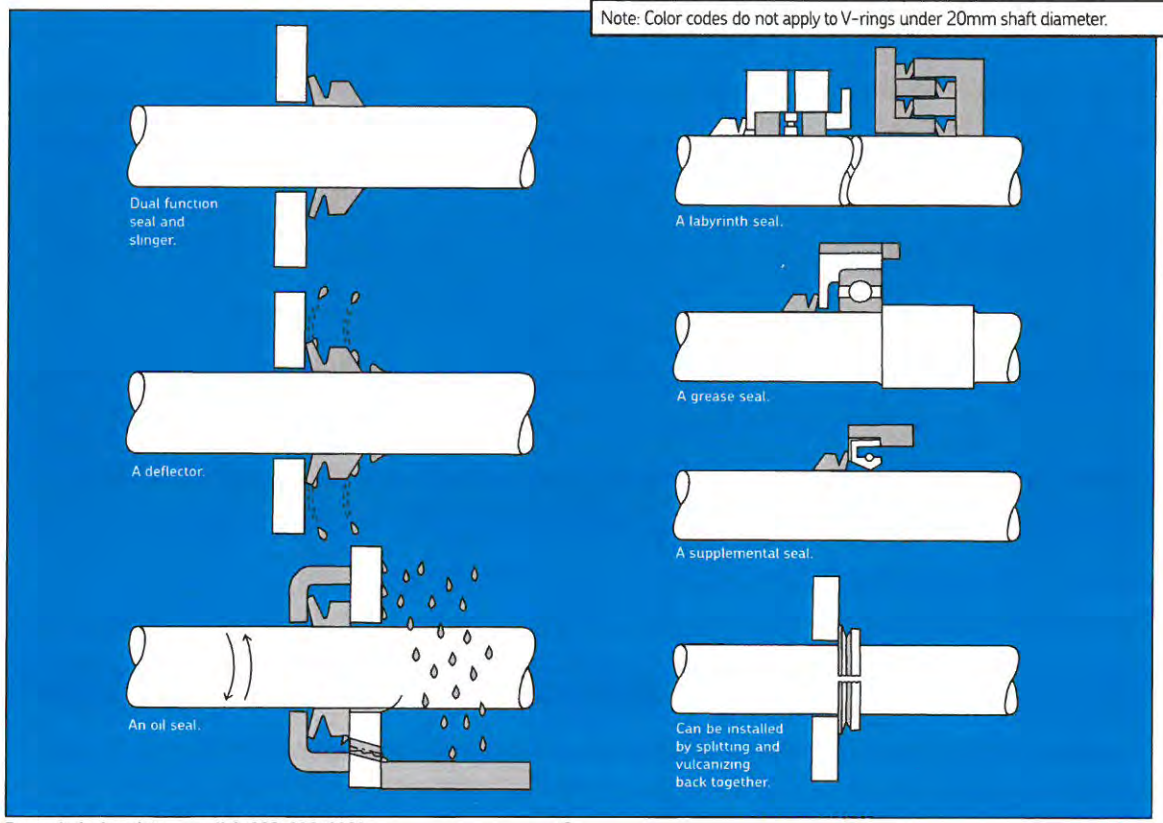
Versatile-Works equally well on rotating or oscillating shafts and at speeds over 3000 FPM. At high speeds the lip lifts away from the counterface and acts as a clearance slinger. Can even be installed split and rejoined.

Compounds-Standard materials include nitrile and fluoroelastomer. Non-standard materials include hydrogenated nitrile, silicone, chloroprene and ethylene propylene. Parts in an FDA approved compound are available.

V-rings with special compounds are marked with a colored dot to indicate the compound used in manufacturing the V-ring. V-18 and smaller in fluoroelastomer are brown with no color dot.



Lip code	Dot color	Material	Purpose
V	Violet	Fluoroelastomer from V-20 & above	Higher temperatures and chemical resistance
V	No mark on brown	Fluoroelastomer from V-13 - V-18	Higher temperatures and chemical resistance
#	Green	Neoprene Chloroprene	Suitable for applications in the presence of ozone
M	Brown	EPDM	Used with special chemicals
R	(None)	(Nitrile) NBR	General purpose
H	White	Hydrogenated Nitrile (HNBR)	Higher temperature and wear resistance than standard Nitrile
D	Blue	Carboxylated Nitrile (XNBR)	Higher wear resistance than standard nitrile
Note: Color codes do not apply to V-rings under 20mm shaft diameter.			



Operating conditions

Surface treatment: In presence of grease, oil, or dry lubricants, no special surface treatment is required. When the counterface is exposed to water or other corrosive elements, mild steel surfaces should be either zinc-plated and passivated; chromium plated or cadmium plated; treated with an anti-corrosive spray such as Molykote 106, or painted. The choice of treatment will depend on the overall running conditions.

Surface finish: The rate of abrasion of the V-ring is influenced by a number of factors, one of which is the surface finish of the counterface. It is recommended that turned surfaces be buffed with emery cloth to remove any sharp peaks arising from the turning operation.

The surface finish should be measured at approximately 90 degrees to the path of the groove to obtain a true reading of the surface.

Guide to Recommended Surface Finish:

Surface finish		Speed FPM/ MPS	Exposure to:	Typical application
Ra Metric (um)	Ra (Inch)			
0.4 To 0.8	16-32	1950/ < 10	Oil, Water, Scale, Fiber	Cold Rolling Mills Paper Machines Wire Mills
0.8 To 1.6	32-63	980-1950/ 5 To 10	Oil Splash Grease, Water Splash	Auto Gear Box Centrifugal Pump Earth Moving Eqpt.
1.6 To 2.3	63-90	195-980/ 1.0 To 5.0	Grease, Dust Water Splash, Scale	Wheel Hub, Mixers, Electric Motors, Hot Rolling Mills
2.3 To 3.0	90-120	195/ 1.0	Grease, Dust	Ball Mills, Suspension Units, Conveyor Rollers

Additional information: Aluminum surfaces should be free of scratch marks. Hardness should be > 100 H_B in abrasive applications. Die cast aluminum can be used in the as-cast condition. Steel and cast iron surfaces should be free from lead and sharp tool marks. Cold roll steel stampings can be used without machining.

Plastic materials are generally not acceptable as counterface materials due to poor heat dissipation. Similarly, stainless steel should not be used in dry running applications unless the speed is < 200 ft/min (1 m/s).

Temperature range:	Nitrile	(Lip Code R)	-40°F-212°F (-40°C-100°C)
	Viton	(Lip Code V)	-15°F-392°F (-26°C-200°C)
Maximum pressure:	10 psi - under certain application conditions 0 psi - standard		

Surface Speeds:	Axial support required above*	Radial support required above	Lip leaves sealing surface at
Compound:			
Nitrile (Lip Code R)	1500 fpm 7.5 MPS	2400 fpm 12.0 MPS	3000 fpm 15.0 MPS
Viton (Lip Code V)	1300 fpm 6.5 MPS	2000 fpm 10.0 MPS	3000 fpm 15.0 MPS
Misalignment tolerance:	1° shaft to counterface misalignment @ 0-2400 FPM	0-12.0 MPS	

*Axial supports are available. Contact your SKF distributor or SKF for complete information.

Installation: Where the V-ring is used as a grease seal/ contaminant excluder, the V-ring is normally mounted on the outside of a bearing housing with axial support when required.

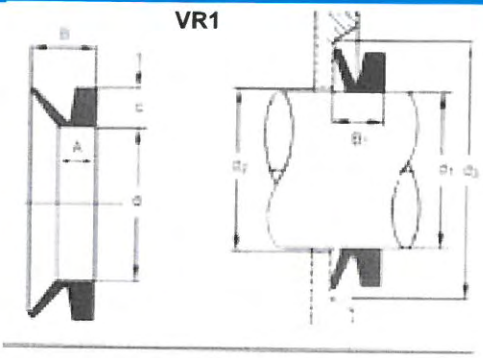
In the case of mass production, it is always advisable to use an assembly tool. Where small quantities are involved, the V-ring may be fitted by using a blunt instrument, such as a screw driver, to manipulate the seal into the correct position.

General rules:

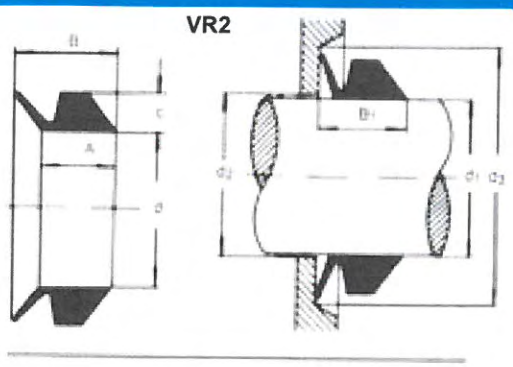
1. The V-ring, the counterface and the shaft should be clean.
2. The shaft should preferably be dry and free from grease or oil, particularly when the V-ring is mounted without axial support.
3. The lip of the V-ring should be lubricated with a thin film of grease or silicone oil.
4. In cases when friction must be reduced to a minimum, coat the counterface with a low friction agent, such as Molykote 7409, and do not apply grease to the lip.
5. Ensure that the V-ring is mounted with a uniform stretch around the shaft.
6. Confirm that the d_2, d_3 and B_1 dimensions are correct.

Complete size listing

VR1



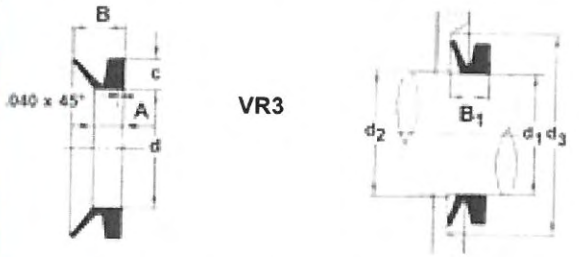
VR2



Profile dimensions

Assembly dimensions

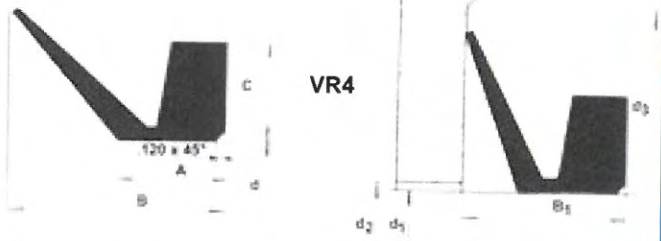
VR3



Profile dimensions

Assembly dimensions

VR4



Profile dimensions

Assembly dimensions

VR5

Profile dimensions

Assembly dimensions

VR6

Complete size listing

SKF stock no.	Shaft diameter d_1 (Range)	Inside diameter d	Height c	Dimension A	Free width B	Maximum d_2 =(d_1+)	Minimum d_3 =(d_1+)	Fitted width B_1	Construction	Lip code	Reference metric shaft size
400250	0.950-1.070	.788	.160	.190	.300	.080	.470	.240±030	VR1	R	25mm
400254	0.950-1.070	.788	.160	.190	.300	.080	.470	.240±030	VR1	V	25mm
400251	0.950-1.070	.788	.160	.310	.410	.080	.470	.354±030	VR2	R	25mm
400255	0.950-1.070	.788	.160	.310	.410	.080	.470	.354±030	VR2	V	25mm
400280	1.070-1.140	.980	.160	.190	.300	.120	.470	.240±030	VR1	R	28mm
400284	1.070-1.140	.980	.160	.190	.300	.120	.470	.240±030	VR1	V	28mm
400281	1.070-1.140	.980	.160	.310	.410	.120	.470	.354±030	VR2	R	28mm
400285	1.070-1.140	.980	.160	.310	.410	.120	.470	.354±030	VR2	V	28mm
400300	1.140-1.220	1.060	.160	.190	.300	.120	.470	.240±030	VR1	R	30mm
400304	1.140-1.220	1.060	.160	.190	.300	.120	.470	.240±030	VR1	V	30mm
400301	1.140-1.220	1.060	.160	.310	.410	.120	.470	.354±030	VR2	R	30mm
400305	1.140-1.220	1.060	.160	.310	.410	.120	.470	.354±030	VR2	V	30mm
400320	1.220-1.300	1.140	.160	.190	.300	.120	.470	.240±030	VR1	R	32mm
400324	1.220-1.300	1.140	.160	.190	.300	.120	.470	.240±030	VR1	V	32mm
400321	1.220-1.300	1.140	.160	.310	.410	.120	.470	.354±030	VR2	R	32mm
400325	1.220-1.300	1.140	.160	.310	.410	.120	.470	.354±030	VR2	V	32mm
400350	1.300-1.420	1.220	.160	.190	.300	.120	.470	.240±030	VR1	R	35mm
400354	1.300-1.420	1.220	.160	.190	.300	.120	.470	.240±030	VR1	V	35mm
400351	1.300-1.420	1.220	.160	.310	.410	.120	.470	.354±030	VR2	R	35mm
400355	1.300-1.420	1.220	.160	.310	.410	.120	.470	.354±030	VR2	V	35mm
400380	1.420-1.500	1.340	.160	.190	.300	.120	.470	.240±030	VR1	R	38mm
400384	1.420-1.500	1.340	.160	.190	.300	.120	.470	.240±030	VR1	V	38mm
400381	1.420-1.500	1.340	.160	.310	.410	.120	.470	.354±030	VR2	R	38mm
400385	1.420-1.500	1.340	.160	.310	.410	.120	.470	.354±030	VR2	V	38mm
400400	1.500-1.700	1.420	.200	.220	.350	.120	.590	.280±039	VR1	R	40mm
400404	1.500-1.700	1.420	.200	.220	.350	.120	.590	.280±039	VR1	V	40mm
400401	1.500-1.700	1.420	.200	.370	.510	.120	.590	.433±039	VR2	R	40mm
400405	1.500-1.700	1.420	.200	.370	.510	.120	.590	.433±039	VR2	V	40mm
400450	1.700-1.889	1.570	.200	.220	.350	.120	.590	.280±039	VR1	R	45mm
400454	1.700-1.889	1.570	.200	.220	.350	.120	.590	.280±039	VR1	V	45mm
400451	1.700-1.889	1.570	.200	.370	.510	.120	.590	.433±039	VR2	R	45mm
400455	1.700-1.889	1.570	.200	.370	.510	.120	.590	.433±039	VR2	V	45mm
400500	1.889-2.090	1.772	.200	.220	.350	.120	.590	.280±039	VR1	R	50mm
400504	1.889-2.090	1.772	.200	.220	.350	.120	.590	.280±039	VR1	V	50mm
400501	1.889-2.090	1.772	.200	.370	.510	.120	.590	.433±039	VR2	R	50mm
400505	1.889-2.090	1.772	.200	.370	.510	.120	.590	.433±039	VR2	V	50mm
400550	2.090-2.290	1.930	.200	.220	.350	.120	.590	.280±039	VR1	R	55mm
400554	2.090-2.290	1.930	.200	.220	.350	.120	.590	.280±039	VR1	V	55mm
400551	2.090-2.290	1.930	.200	.370	.510	.120	.590	.433±039	VR2	R	55mm
400555	2.090-2.290	1.930	.200	.370	.510	.120	.590	.433±039	VR2	V	55mm
400600	2.290-2.480	2.130	.200	.220	.350	.120	.590	.280±039	VR1	R	60mm
~~400604~~	~~2.290-2.480~~	~~2.130~~	~~.200~~	~~.220~~	~~.350~~	~~.120~~	~~.590~~	~~.280±039~~	~~VR1~~	~~V~~	~~60mm~~
400601	2.290-2.480	2.130	.200	.370	.510	.120	.590	.433±039	VR2	R	60mm
~~400605~~	~~2.290-2.480~~	~~2.130~~	~~.200~~	~~.370~~	~~.510~~	~~.120~~	~~.590~~	~~.433±039~~	~~VR2~~	~~V~~	~~60mm~~
400650	2.480-2.680	2.280	.200	.220	.350	.120	.590	.280±039	VR1	R	65mm
400654	2.480-2.680	2.280	.200	.220	.350	.120	.590	.280±039	VR1	V	65mm
400659	2.480-2.680	2.280	.200	.220	.350	.120	.590	.280±039	VR1-SPL	R	65mm
400651	2.480-2.680	2.280	.200	.370	.510	.120	.590	.433±039	VR2	R	65mm
400655	2.480-2.680	2.280	.200	.370	.510	.120	.590	.433±039	VR2	V	65mm
400700	2.680-2.874	2.480	.240	.270	.430	.160	.710	.354±047	VR1	R	70mm

Select the larger V-Ring when the dimension d_1 is on the boundary between two sizes of V-Ring.
Purple dot on V-Ring indicates LongLife material.
Sizes under .787 (20mm) shaft are brown with no dot.
* Check for availability & pricing
# Indicates non-standard compounds for specific applications

Fairbanks Nijhuis
Furnished Spare Parts

Ref. No.	Description	Quantity
14	Shaft Sleeve	1
16	Case Wear Ring	1
17	Impeller Wear Ring	1
456	Mechanical Seal	1
--	Gasket (set)	2
--	O-Ring (set)	2
--	Bearings (set)	1

- **Coating Manufacturer** Davis Industrial Coatings
- **Surface Preparation** Factory Standard.
- **Finish Coat** Modified Alkyd Enamel
  - **Number of Coats** 1
  - **Color** Pentair Blue
  - **Dry Film Thickness** Factory Standard
  - **Surfaces to be coated** Exterior of Pump

Davis Paint Company

1311 IRON STREET • N. KANSAS CITY, MISSOURI 64116
P.O. BOX 7589 • (816) 471-4447
www.davispaint.com

HIGH SOLIDS FAST DRY ENAMEL
PENTAIR BLUE
4-5725

PHYSICAL PROPERTIES:

Weight Gallon:	9.88 ± 0.2 lbs/gal
Weight Solids:	64.7 ± 2%
Volume Solids:	48.4 ± 2%
Coverage: @ 1 Dry Mil:	776 sq. ft./gallon
VOC:	418 g/l; 3.49 lb/gal
Viscosity:	35-45" #4 Ford Cup @ 77°F
Gloss @ 60:	85+
Cure Time (Based on 70° F. & 50% R.H.):	
To Touch:	60 minutes
To Recoat:	0-1 hours, or after 96 hours
Recommended Thinner:	Butyl acetate for cleanup and reduction to spray
Temperature Resistance:	Continuous 150° F., Intermittent 200° F.

WARNING! FLAMMABLE! FOR INDUSTRIAL USE ONLY! Keep away from heat and open flame. Avoid prolonged contact with skin and breathing of vapor or spray mist. Do not take internally. Close container after each use. Use only with adequate ventilation. Use respiratory devices and other personal protective equipment required by OSHA 29CFR 1910. KEEP OUT OF REACH OF CHILDREN. For specific safety requirements, refer to the Material Safety Data Sheet.

02-15

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HIGH SOLIDS FAST DRY ENAMEL

DESCRIPTION:

High Solids Fast Dry Enamel is an alkyd enamel for general industrial finishing of farm machinery, tanks, electrical equipment, heavy duty equipment and a variety of other products that require a high performance coating. Fast Dry Enamel exhibits excellent color and gloss retention, flexibility, hardness and corrosion resistance.

SPECIAL CAUTIONS:

Do not apply Fast Dry Enamel when surface, air or material temperature is below 40°F. Surface must be dry and at least 5°F above the dew point.

SURFACE PREPARATION:

GENERAL - Surfaces to be finished must be clean, dry and free of dirt, oil or any contamination that would adversely affect adhesion, protective properties or appearance of the coating. Abrasive blasting is an effective method of cleaning steel surfaces and removing mill scale, rust and previous coatings.

IRON, STEEL AND FERROUS METAL - For optimum adhesion and corrosion resistance, metal should be cleaned and phosphate treated or primed with Davis Fast Dry Metal Primer.

ALUMINUM & GALVANIZED METAL - For optimum adhesion chemically etch or prime with Vinyl Wash Primer.

PREVIOUSLY FINISHED SURFACES - Scaling and peeling paint must be removed by wirebrushing, sanding or scraping. Rusting metal should be cleaned and spot primed with Fast Dry Primer.

MIXING & THINNING:

Stir each container thoroughly prior to use. Material is packaged at a viscosity requiring little or no reduction for application by airless spray equipment. Conventional air spray, air-assist airless, dip or turbo may require up to a 25% reduction (4 parts paint to 1 part solvent by volume) with aromatic solvent.

Aromatic solvents include toluene, xylene, and SC-100. For cool weather conditions (below 65°F) use toluene or xylene. For normal temperatures (65-80°F) use xylene. For temperatures above 80°F use xylene or SC-100. Never use solvents such as VM&P naphtha, mineral spirits or reclaimed thinner. This product may also be thinned with ketone (MEK) or ester solvents (i.e. n-butyl acetate). Addition of solvent will increase VOC.

To store partially used container, pour a small amount of the recommended thinner over the surface. Do not stir. Replace lid securely. Store away from heat or open flame. Mix thoroughly before reusing.

CLEAN UP:

Use xylene, aromatic solvent or MEK for cleaning guns and equipment.

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APPLICATION:

Material can be applied by conventional air, air-assist airless, airless, dip or more advanced application equipment such as turbo disk or bell. This product may also be applied with electrostatic and/or heated equipment. Not recommended for brush or roller application over large areas. Small touchup areas may be brushed. Use the following recommendations as an application guide:

CONVENTIONAL AIR SPRAY:

Air Cap	66PF
Fluid Nozzle	63
Needle	63
Air Pressure	50-60 psi
Fluid Pressure	10-20 psi

AIR ASSIST-AIRLESS SPRAY:

Tip	0.009-0.013"
Fluid Pressure	300-600 psi
Air Pressure	10-25 psi
Pump/tip Filter	100 Mesh

AIRLESS SPRAY:

Tip	0.011-0.015"
Fan	50° (10-12 inch fan)
Pressure	1200-1800 psi
Pump/tip Filter	100 Mesh

For dip, flowcoat or turbo application, use the viscosity range 25-35" #2 Zahn as a starting point. For hot spray applications it is recommended to stay in the 90-140°F range.

APPLICATION RATE:

Application rate will vary depending on texture, configuration and porosity of surfaces on which coating is applied. Rough or porous surfaces will require more paint. At an application rate of 500 square feet per gallon, 3.2 mils wet, the resulting dry film thickness is approximately 1.5 mils on smooth surface. A dry film thickness of 1.0-2.0 mils is recommended

DRYING:

Optimum drying conditions are 60°F to 90°F (16°C to 32°C) at 50% R.H. Lower temperatures and high humidity will slow dry. Surface must be dry and at least 5°F above the dew point.

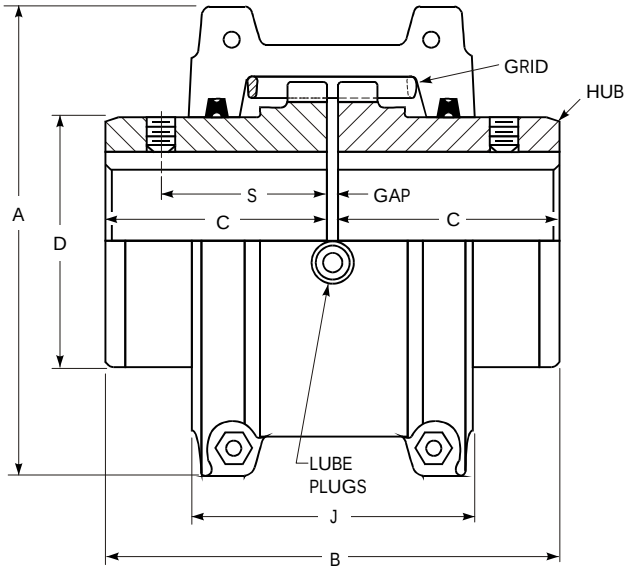
Dry to Touch	60 Minutes
To Recoat	Between 0-1 hours or after 96 hours

This product may also be force cured to enhance dry. Temperatures in the range of 110-180°F may be utilized to accelerate solvent evaporation and speed oxidation.

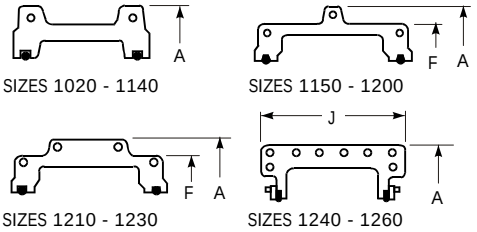
WARNING! FLAMMABLE! FOR INDUSTRIAL USE ONLY! Keep away from heat and open flame. Avoid prolonged contact with skin and breathing of vapor or spray mist. Do not take internally. Close container after each use. Use only with adequate ventilation. Use respiratory devices and other personal protective equipment required by OSHA 29CFR 1910. KEEP OUT OF REACH OF CHILDREN. For specific safety requirements, refer to the Material Safety Data Sheet.

Type T10

Close Coupled/Dimensions — Inches



COVER PROFILES – HORIZONTAL SPLIT



Sizes 1020 thru 1230T10 covers are cast aluminum alloy; Sizes 1240 thru 1260T10 are fabricated steel.

SIZE ★	Torque Rating (lb-in) †	Allow Speed rpm ‡	Max Bore ●	Min Bore ■	Cplg Wt With No Bore-lb	Lube Wt lb	DIMENSIONS — INCHES							
							A	B	C	D	F	J	S	Gap
1020T	460	4500	1.125	.500	4.2	.06	3.82	3.88	1.88	1.56	....	2.62	1.54	.125
1030T	1,320	4500	1.375	.500	5.7	.09	4.16	3.88	1.88	1.94	....	2.69	1.54	.125
1040T	2,200	4500	1.625	.500	7.4	.12	4.50	4.12	2.00	2.25	....	2.75	1.58	.125
1050T	3,850	4500	1.875	.750	12	.15	5.32	4.88	2.38	2.62	....	3.12	1.76	.125
1060T	6,050	4350	2.125	.750	16	.19	5.82	5.12	2.50	3.00	....	3.62	2.06	.125
1070T	8,800	4125	2.500	1.062	23	.25	6.25	6.12	3.00	3.44	....	3.75	2.12	.125
1080T	18,150	3600	3.000	1.062	39	.38	7.50	7.12	3.50	4.12	....	4.56	2.54	.125
1090T	33,000	3600	3.500	1.625	56	.56	8.31	7.88	3.88	4.88	....	4.81	2.82	.125
1100T	55,550	2440	4.000	1.625	93	.94	9.88	9.69	4.75	5.59	....	6.12	....	.188
1110T	82,500	2250	4.500	2.375	120	1.12	10.62	10.19	5.00	6.31	....	6.36	....	.188
1120T	121,000	2025	5.000	2.625	179	1.62	12.12	12.00	5.88	7.06	....	7.54	....	.250
1130T	176,000	1800	6.000	2.625	266	2.0	13.62	13.00	6.38	8.56	....	7.68	....	.250
1140T	253,000	1650	7.250	4.250	392	2.5	15.12	14.75	7.25	10.00	....	7.92	....	.250
1150T	352,000	1500	8.000	4.750	500	4.3	17.84	14.65	7.20	10.60	15.40	10.68	....	.250
1160T	495,000	1350	9.000	5.250	681	6.2	19.76	15.85	7.80	12.00	17.20	10.96	....	.250
1170T	660,000	1225	10.000	6.000	987	7.7	22.32	17.25	8.50	14.00	19.18	12.10	....	.250
1180T	915,000	1100	11.000	6.000	1365	8.3	24.80	19.05	9.40	15.50	21.84	12.64	....	.250
1190T	1,210,000	1050	12.000	7.000	1710	9.7	26.60	20.65	10.20	17.20	23.93	12.80	....	.250
1200T	1,650,000	900	13.000	7.000	2331	12.4	29.80	22.25	11.00	19.60	26.00	14.00	....	.250
1210T	2,200,000	820	14.000	7.000	3140	23.2	33.25	24.50	12.00	21.00	29.56	17.00	....	.500
1220T	2,970,000	730	15.000	8.000	3935	35.4	36.25	26.10	12.80	22.50	32.37	19.30	....	.500
1230T	3,850,000	680	16.000	8.000	4997	53.0	39.50	27.70	13.60	24.00	35.62	21.50	....	.500
1240T	4,950,000	630	17.000	10.000	6504	74.5	42.80	29.50	14.50	25.50	....	25.50	....	.500
1250T	6,600,000	580	18.500	10.000	8450	110.5	46.50	32.10	15.80	28.00	....	27.50	....	.500
1260T	8,250,000	540	20.000	10.000	10322	148.1	49.64	34.50	17.00	30.00	....	30.00	....	.500

★ Refer to Page 3 for General Information and Reference Notes.

How To Use This Manual

This manual provides detailed instructions on maintenance, lubrication, installation, and parts identification. Use the table of contents below to locate required information.

Table of Contents

CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE FREE SERVICE.

INTRODUCTION

This manual applies to Sizes 1020T thru 1140T and 20T thru 140T10 Falk Steelflex Tapered Grid Couplings. Unless otherwise stated, information for Sizes 1020T thru 1140T applies to Sizes 20T thru 140T respectively, e.g. 1020T = 20T, 1100T = 100T, etc. These couplings are designed to operate in either the horizontal or vertical position without modification. Beginning in 1994, these couplings are being supplied with one set of inch series fasteners and one set of metric fasteners. Use either set of fasteners, depending on your preference. Refer to Page 6 for part interchangeability.

The performance and life of the couplings depend largely upon how you install and service them.

CAUTION: *Consult applicable local and national safety codes for proper guarding of rotating members. Observe all safety rules when installing or servicing couplings.*

WARNING: *Lockout starting switch of prime mover and remove all external loads from drive before installing or servicing couplings.*

LUBE FITTINGS

Cover halves have $^{1}/_{8}$ NPT lube holes. Use a standard grease gun and lube fitting as instructed on Page 4.

LIMITED END FLOAT

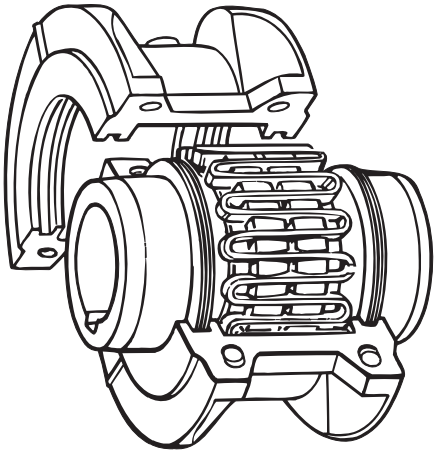
When electric motors, generators, engines, compressors and other machines are fitted with sleeve or straight roller bearings, limited axial end float kits are recommended for protecting the bearings. Falk Steelflex couplings are easily modified to limit end float; refer to Manual 428-820 for instructions.

LUBRICATION

Adequate lubrication is essential for satisfactory operation. Page 2 provides a list of typical lubricants and specifications for general purpose and long term greases. Because of its superior lubricating characteristics and low centrifuge properties, Falk Long Term Grease (LTG) is highly recommended. Sizes 1020T to 1090T10 are furnished with a pre-measured amount of grease for each coupling. The grease can be ordered for larger size couplings.

The use of general purpose grease requires re-lubrication of the coupling at least annually.

TYPE T10 STEELFLEX COUPLING



Long Term Grease (LTG)

The high centrifugal forces encountered in couplings separate the base oil and thickener of general purpose greases. Heavy thickener, which has no lubrication qualities, accumulates in the grid-groove area of Steelflex couplings resulting in premature hub or grid failure unless periodic lubrication cycles are maintained.

Falk Long Term Grease (LTG) was developed specifically for couplings. It resists separation of the oil and thickener. The consistency of Falk LTG changes with operating conditions. As manufactured it is an NLGI #1/2 grade. Working of the lubricant under actual service conditions causes it to become semifluid while the grease near the seals will set to a heavier grade, helping to prevent leakage.

LTG is highly resistant to separation, easily out performing all other lubricants tested. The resistance to separation allows the lubricant to be used for relatively long periods of time.

Steelflex couplings initially lubricated with LTG will not require re-lubrication until the connected equipment is stopped for servicing. If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture, or experiences frequent reversals, more frequent lubrication may be required.

Although LTG grease is compatible with most other coupling greases, the mixing of greases may dilute the benefits of LTG.

USDA Approval

LTG has the United States Department of Agriculture Food Safety & Inspection Service approval for applications where there is no possibility of contact with edible products. (H-2 ratings).

CAUTION: *Do not use LTG in bearings.*

MORE>

Specifications — Falk LTG

The values shown are typical and slight variations are permissible.

AMBIENT TEMPERATURE RANGE — -20°F (-29°C) to 250°F (121°C). Min. Pump = 20° F (-7° C).

MINIMUM BASE OIL VISCOSITY — 3300SSU (715cST) @ 100°F (38°C).

THICKENER — Lithium & soap/polymer.

CENTRIFUGE SEPARATION CHARACTERISTICS — ASTM #D4425 (Centrifuge Test) — K36 = 2/24 max., very high resistance to centrifuging.

NLGI GRADE (ASTM D-217) — $^1/_2$

MINIMUM DROPPING POINT — with 60 stroke worked penetration value in the range of 320 to 365 — 350°F (177°C) min.

MINIMUM TIMKEN O.K. LOAD — 40 lbs.

ADDITIVES — Rust and oxidation inhibitors that do not corrode steel or swell or deteriorate synthetic seals.

Packaging

14 oz. (0,4 kg) CARTRIDGES — Individual or case lots of 10 or 60.

35 lb. (16 kg)PAIL, 120 lb. (54 kg) KEG & 400 lb. (181 kg) DRUMS.

General Purpose Grease

Annual Lubrication — The following specifications and lubricants for general purpose grease apply to Falk Steelflex couplings that are lubricated annually and operate within ambient temperatures of 0°F to 150°F (-18°C to 66°C). For temperatures beyond this range (see Table 1), consult the Factory.

If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals, more frequent lubrication may be required.

Specifications — General Purpose Coupling Lubricants

The values shown are typical and slight variations are permissible.

DROPPING POINT — 300°F (149°C) or higher.

CONSISTENCY — NLGI No. 2 with 60 stroke worked penetration value in the range of 250 to 300.

SEPARATION AND RESISTANCE — Low oil separation rate and high resistance to separation from centrifuging.

LIQUID CONSTITUENT — Possess good lubricating properties equivalent to a high quality, well refined petroleum oil.

INACTIVE — Must not corrode steel or cause swelling or deterioration of synthetic seals.

CLEAN — Free from foreign inclusions.

General Purpose Greases Meeting Falk Specifications

Lubricants listed below are typical products only and should not be construed as exclusive recommendations.

TABLE 1 — General Purpose Greases

Ambient Temperature Range	0°F to 150°F (-18°C to 66°C)	-30°F to 100°F (-34°C to 38°C)
Manufacturer	**Lubricant †**	**Lubricant †**
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP1
Chevron U.S.A. Inc.	Dura-Lith EP2	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP2	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #2	EP Conolith Grease #2
Exxon Company, USA	Unirex N2	Unirex N2
E.F. Houghton & Co.	Cosmolube 2	Cosmolube 1
Imperial Oil Ltd.	Unirex N2L	Unirex N2L
Kendall Refining Co.	Lithium Grease L421	Lithium Grease L421
Keystone Div. (Pennwalt)	81 EP-2	81 EP-1
Lyondell Petrochemical (ARCO)	Litholine H EP 2 Grease	Litholine H EP 2 Grease
Mobil Oil Corp.	Mobilux EP111	Mobilith AW1
Petro-Canada Products	Multipurpose EP2	Multipurpose EP1
Phillips 66 Co.	Philube Blue EP	Philube Blue EP
Shell Oil Co.	Alvania Grease 2	Alvania Grease 2
Shell Canada Ltd.	Alvania Grease 2	Alvania Grease 2
Sun Oil Co.	Ultra Prestige 2EP	Ultra Prestige 2EP
Texaco Lubricants	Starplex HD2	Multifak EP2
Unocal 76 (East & West)	Unoba EP2	Unoba EP2
Valvoline Oil Co.	Multilube Lithium EP Grease	. . .

★ Grease application or re-lubrication should be done at temperatures above 20°F (-7°C). If grease must be applied below 20°F (-7°C), consult The Falk Corporation.

† Lubricants listed may not be suitable for use in the food processing industry; check with lube manufacturer for approved lubricants.

INSTALLATION OF TYPE T10 STEELFLEX TAPERED GRID COUPLINGS

Installation

Only standard mechanics tools, wrenches, a straight edge and feeler gauges are required to install Falk Steelflex couplings. Coupling Sizes 1020T thru 1090T are generally furnished for CLEARANCE FIT with setscrew over the keyway. Sizes 1100T and larger are furnished for an INTERFERENCE FIT without a setscrew.

CLEARANCE FIT HUBS — Clean all parts using a non-flammable solvent. Check hubs, shafts and keyways for burrs. Do not heat clearance fit hubs. Install keys, mount hubs with flange face flush with shaft ends or as otherwise specified and tighten setscrews.

INTERFERENCE FIT HUBS — Furnished without setscrews. Heat hubs to a maximum of 275°F (135°C) using an oven, torch, induction heater or an oil bath. To prevent seal damage, DO NOT heat hubs beyond a maximum temperatue of 400°F (205°C).

When an oxy-acetylene or blow torch is used, use an excess acetylene mixture. Mark hubs near the center of their length in several places on hub body with a temperature sensitive crayon, 275°F (135°C) melt temperature. Direct flame towards hub bore using constant motion to avoid overheating an area.

MORE>

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WARNING: If an oil bath is used, the oil must have a flash point of 350°F (177°C) or higher. Do not rest hubs on the bottom of the container. Do not use an open flame in a combustible atmosphere or near combustible materials.

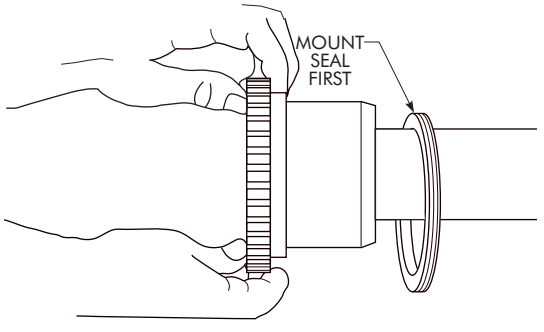
Heat hubs as instructed above. Mount hubs as quickly as possible with hub face flush with shaft end. Allow hubs to cool before proceeding. Insert setscrews (if required) and tighten.

Maximize Performance And Life

The performance and life of couplings depend largely upon how you install and maintain them. Before installing couplings, make certain that foundations of equipment to be connected meet manufacturers' requirements. Check for soft foot. The use of stainless steel shims is recommended. Measuring misalignment and positioning equipment within alignment tolerances is simplified with an alignment computer. These calculations can also be done graphically or mathematically.

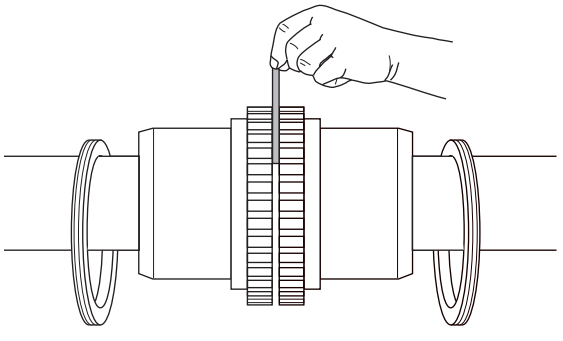
Alignment is shown using spacer bar and straight edge. This practice has proven to be adequate for many industrial applications. However, for superior final alignment, the use of dial indicators (see Manual 458-834 for instructions), lasers, alignment computers or graphical analysis is recommended.

1— Mount Seals And Hubs



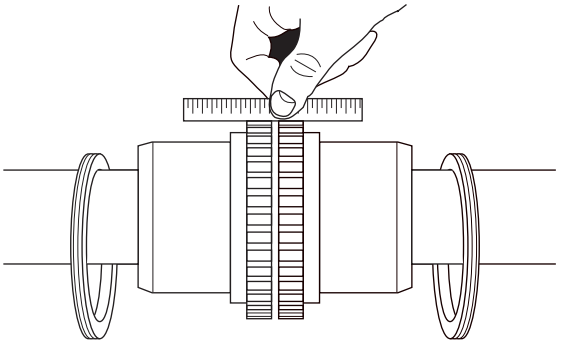
Lock out starting switch of prime mover. Clean all metal parts using a non-flammable solvent. Lightly coat seals with grease and place on shafts BEFORE mounting hubs. Heat interference fit hubs as previously instructed. Seal keyways to prevent leakage. Mount hubs on their respective shafts so the hub face is flush with the end of its shaft unless otherwise indicated. Tighten setscrews when furnished.

2 — Gap and Angular Alignment



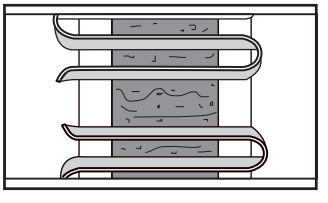
Use a spacer bar equal in thickness to the gap specified in Table 2, Page 5. Insert bar as shown below left, to same depth at 90° intervals and measure clearance between bar and hub face with feelers. The difference in minimum and maximum measurements must not exceed the ANGULAR installation limits specified in Table 2.

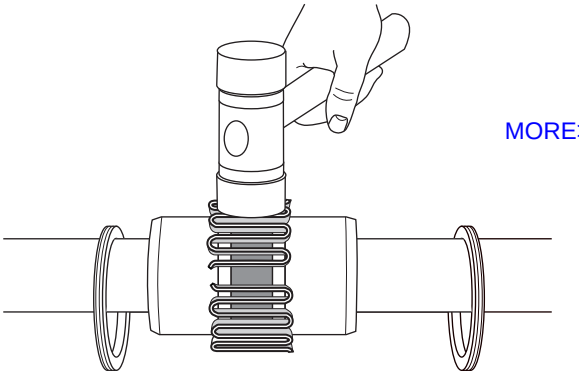
3 — Offset Alignment



Align so that a straight edge rests squarely (or within the limits specified in Table 2) on both hubs as shown above and also at 90° intervals. Check with feelers. The clearance must not exceed the PARALLEL OFFSET installation limits specified in Table 2. Tighten all foundation bolts and repeat Steps 2 and 3. Realign coupling if necessary.

4 — Insert Grid

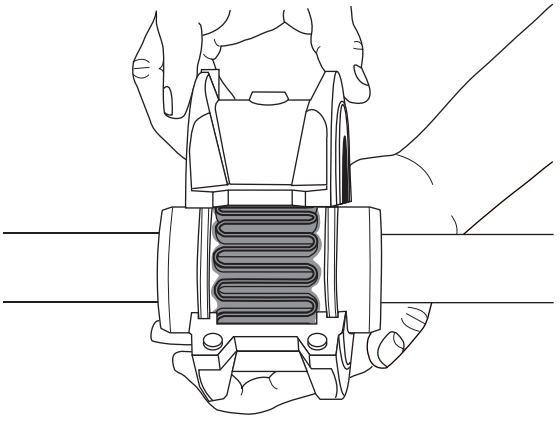


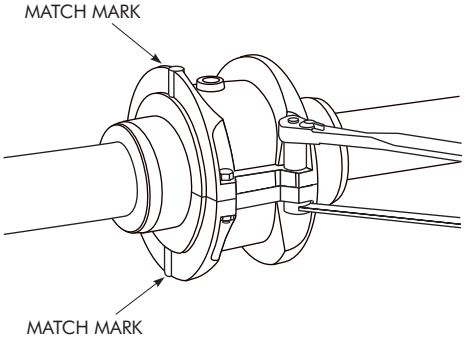


MORE>

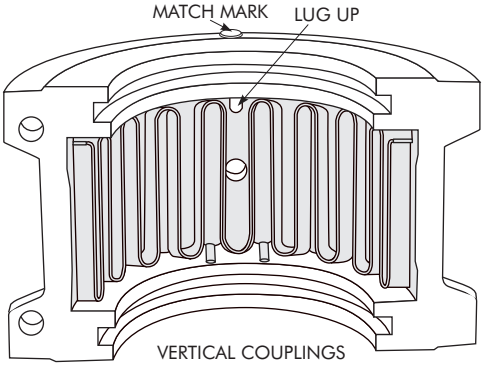
Pack gap and grooves with specified lubricant before inserting grid. When grids are furnished in two or more segments, install them so that all cut ends extend in the same direction (as detailed in the exploded view picture above); this will assure correct grid contact with non-rotating pin in cover halves. Spread the grid slightly to pass over the coupling teeth and seat with a soft mallet.

5 — Pack With Grease And Assemble Covers





Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Position seals on hubs to line up with grooves in cover. Position gaskets on flange of lower cover half and assemble covers so that the match marks are on the same side (see above). If shafts are not level (horizontal) or coupling is to be used vertically, assemble cover halves with the lug and match mark



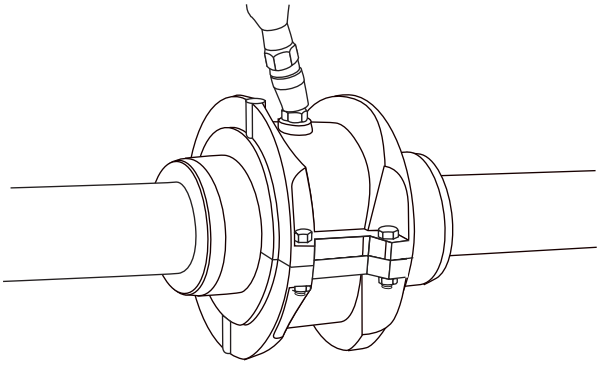
UP or on the high side. Push gaskets in until they stop against the seals and secure cover halves with fasteners, tighten to torque specified in Table 2. Make sure gaskets stay in position during tightening of fasteners. ***CAUTION:*** *Make certain lube plugs are installed before operating.*

ANNUAL MAINTENANCE

For extreme or unusual operating conditions, check coupling more frequently.

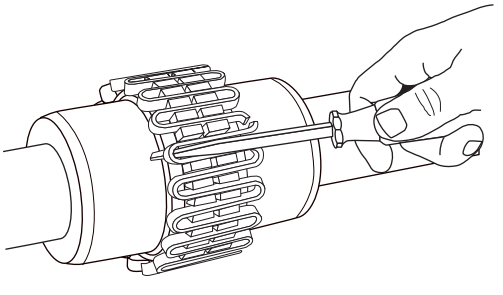
1. Check alignment per steps on Page 3. If the maximum operating misalignment limits are exceeded, realign the coupling to the recommended installation limits. See Table 2 for installation and operating alignment limits.
2. Check tightening torques of all fasteners.
3. Inspect seal ring and gasket to determine if replacement is required. If leaking grease, replace.
4. When connected equipment is serviced, disassemble the coupling and inspect for wear. Replace worn parts. Clean grease from coupling and repack with new grease. Install coupling using new gasket as instructed in this manual.

Periodic Lubrication



The required frequency of lubrication is directly related to the type of lubricant chosen, and the operating conditions. Steelflex couplings lubricated with common industrial lubricants, such as those shown in Table 1, should be relubed annually. The use of Falk Long Term Grease (LTG) will allow relube intervals to be extended to beyond five years. When relubing, remove both lube plugs and insert lube fitting. Fill with recommended lubricant until an excess appears at the opposite hole. ***CAUTION:*** Make certain all plugs have been inserted after lubricating.

Coupling Disassembly And Grid Removal



Whenever it is necessary to disconnect the coupling, remove the cover halves and grid. A round rod or screwdriver that will conveniently fit into the open loop ends of the grid is required. Begin at the open end of the grid section and insert the rod or screwdriver into the loop ends. Use the teeth adjacent to each loop as a fulcrum and pry the grid out radially in even, gradual stages, proceeding alternately from side to side.

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TYPE T COUPLING INSTALLATION & ALIGNMENT DATA

Maximum life and minimum maintenance for the coupling and connected machinery will result if couplings are accurately aligned. Coupling life expectancy between initial alignment and maximum operating limits is a function of load, speed and lubrication. Maximum operating values listed in Table 2 are based on cataloged allowable rpm.

Values listed are based upon the use of the gaps listed, standard coupling components, standard assemblies and cataloged allowable speeds.

Values may be combined for an installation or operating condition.

Example: 1060T max. operating misalignment is .016" parallel plus .018" angular.

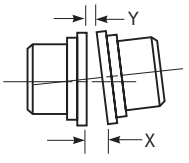
NOTE: For applications requiring greater misalignment, refer application details to Falk.

Angular misalignment is dimension X minus Y as illustrated below.

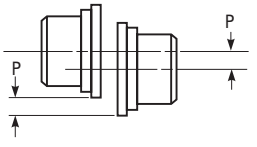
Parallel misalignment is distance P between the hub center lines as illustrated below.

End float (with zero angular and parallel misalignment) is the axial movement of the hubs(s) within the cover(s) measured from "O" gap.

ANGULAR MISALIGNMENT



PARALLEL OFFSET MISALIGNMENT



END FLOAT

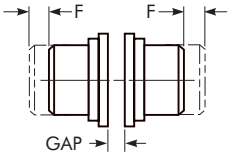


TABLE 2 — Misalignment & End Float

SIZE	Installation Limits						Operating Limits						Cover Fastener Tightening Torque Values		Allow Speed (rpm)	Lube Wt	
	Parallel Offset-P		Angular (x-y)		Hub Gap ± 10%		Parallel Offset-P		Angular (x-y)		End Float Physical Limit (Min) 2 x F						
	Max Inch	Max mm	Max Inch	Max mm	Inch	mm	Max Inch	Max mm	Max Inch	Max mm	Inch	mm	In Series Fasteners (lb-in)	Metric Fasteners (Nm)		lb	kg
1020T	.006	0,15	.003	0,08	.125	3	.012	0,30	.010	0,25	.210	5,33	100	11,3	4500	.06	0,03
1030T	.006	0,15	.003	0,08	.125	3	.012	0,30	.012	0,30	.198	5,03	100	11,3	4500	.09	0,04
1040T	.006	0,15	.003	0,08	.125	3	.012	0,30	.013	0,33	.211	5,36	100	11,3	4500	.12	0,05
1050T	.008	0,20	.004	0,10	.125	3	.016	0,41	.016	0,41	.212	5,38	200	23,6	4500	.15	0,07
~~**1060T**~~	~~.008~~	~~0,20~~	~~.005~~	~~0,13~~	~~.125~~	~~3~~	~~.016~~	~~0,41~~	~~.018~~	~~0,46~~	~~.258~~	~~6,55~~	~~200~~	~~23,6~~	~~4350~~	~~.19~~	~~0,09~~
1070T	.008	0,20	.005	0,13	.125	3	.016	0,41	.020	0,51	.259	6,58	200	23,6	4125	.25	0,11
~~**1080T**~~	~~.008~~	~~0,20~~	~~.006~~	~~0,15~~	~~.125~~	~~3~~	~~.016~~	~~0,41~~	~~.024~~	~~0,61~~	~~.288~~	~~7,32~~	~~200~~	~~23,6~~	~~3600~~	~~.38~~	~~0,17~~
1090T	.008	0,20	.007	0,18	.125	3	.016	0,41	.028	0,71	.286	7,26	200	23,6	3600	.56	0,25
1100T	.010	0,25	.008	0,20	.188	5	.020	0,51	.033	0,84	.429	10,90	312	35	2440	.94	0,43
1110T	.010	0,25	.009	0,23	.188	5	.020	0,51	.036	0,91	.429	10,90	312	35	2250	1.1	0,51
1120T	.011	0,28	.010	0,25	.250	6	.022	0,56	.040	1,02	.556	14,12	650	73	2025	1.6	0,74
1130T	.011	0,28	.012	0,30	.250	6	.022	0,56	.047	1,19	.551	14,00	650	73	1800	2.0	0,91
1140T	.011	0,28	.013	0,33	.250	6	.022	0,56	.053	1,35	.571	14,50	650	73	1650	2.5	1,14

TABLE 3 — Coupling Cover Fastener Identification

SIZE	Inch Series Fasteners				METRIC FASTENERS	
	Old Style		New Style			
1020-1070T10		SAE Grade 8 ★		SAE Grade 8		Property Class 10.9
1080-1090T10		SAE Grade 8		SAE Grade 8		Property Class 10.9
1100-1140T10		SAE Grade 5		SAE Grade 5		Property Class 8.8

★ Older style covers, Sizes 1020T10 thru 1070T10 must utilize socket head cap screws and locknuts held by the cover.

PARTS IDENTIFICATION

All coupling parts have identifying part numbers as shown below. Parts 3 and 4 (Hubs and Grids), are the same for both Type T10 and T20 couplings. All other coupling parts are unique to Type T10. When ordering parts, always SPECIFY SIZE and TYPE shown on the COVER.

PARTS INTERCHANGEABILITY

Parts are interchangeable between Sizes 20T and 1020T, 30T and 1030T, etc. except as noted.

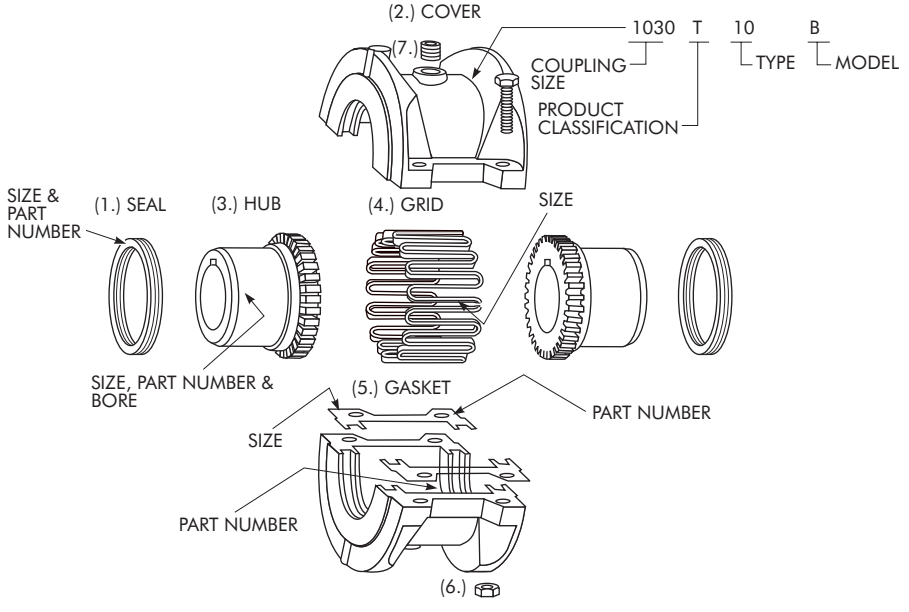
GRIDS — Size 1020T thru 1140T Steelflex couplings use blue grids. Older models, 20T thru 140T, use orange grids.

CAUTION: *Blue grids may be used in all applications, but DO NOT substitute orange grids for blue.*

COVERS — ***CAUTION:*** *DO NOT mix cover halves of different designs. Sizes 1020T thru 1070T10 covers have been manufactured in several different two-rib designs and 80T thru 140T covers have been manufactured with two and three ribs.*

HARDWARE — Older style covers, Sizes 1020T10 thru 1070T10, utilized socket head cap screws with captured locknuts. The new style covers use hex head cap screws (either inch or metric) and unrestrained locknuts. Specify either inch series SOCKET head or metric series HEX head cap screws when ordering replacement parts.

PART NUMBER LOCATION



PART DESCRIPTION

1. Seal (T10)
2. Cover (T10)
3. Hub (Specify bore and keyway)
4. Grid
5. Gasket (T10)
6. Fasteners (T10) — Coupling may be supplied with one set each of inch series fasteners and metric fasteners.
7. Lube Plug

ORDER INFORMATION

1. Identify part(s) required by name above.
2. Furnish the following information.

   EXAMPLE:
   Coupling Size: 1030
   Coupling Type: T10
   Model: B
   Bore: 1.375
   Keyway: .375 x .187
3. Price parts from Price List 422-110 and appropriate discount sheet.

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Introduction

Adequate lubrication is essential for satisfactory operation. This manual provides a list of typical lubricants and specifications for general purpose and long term greases.

The use of general purpose grease requires re-lubrication of the coupling at least annually. By initially using Falk long term grease (LTG), re-lubrication will not be required again until the connected equipment is stopped for servicing.

Long Term Grease (LTG)

The high centrifugal forces encountered in couplings separate the base oil and thickener of general purpose greases. Heavy thickener which has no lubrication qualities, accumulates in the grid-groove area of Steelflex couplings resulting in premature hub or grid failure unless periodic lubrication cycles are maintained.

LONG TERM LTG GREASE

Falk LTG was developed specifically for couplings. It resists separation of the oil and thickener. The consistency of Falk LTG changes with operating conditions. As manufactured it is an NLG1 #1/2 grade. Working of the lubricant under actual service conditions causes it to become semifluid while the grease near the seals will set to a heavier grade, helping to prevent leakage

LTG is highly resistant to separation, easily out performing all other lubricants tested. The resistance to separation allows the lubricant to be used for relatively long periods of time.

Steelflex couplings initially lubricated with Falk Long Term grease (LTG) will not require re-lubrication until the connected equipment is stopped for servicing. If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals, more frequent lubrication may be required.

USDA Approval

LTG has the United States Department of Agriculture Food Safety & Inspection Service approval for applications where there is no possibility of contact with edible products. (H-2 rating).

CAUTION: Do not use LTG in bearings.

Specifications

The values shown are typical and slight variations are permissible.

AMBIENT TEMPERATURE RANGE — –20°F (–29°C) to 250°F (121°C). Min. Pump = 20°F (–7°C)

MINIMUM BASE OIL VISCOSITY — 3300SSU (715cST) @ 100°F (38°C)

THICKENER — Lithium & soap/polymer.

CENTRIFUGE SEPARATION CHARACTERISTICS — ASTM #D4425-84 Centrifuge Test) — K36 = 2/24 maximum, very high resistance to centrifuging.

NLGI GRADE (ASTM D-217) — 1/2

CONSISTENCY (ASTM D-217) — 60 stroke worked penetration value in the range of 315 to 360 measured at 77°F (25°C)

MINIMUM DROPPING POINT — 350°F (177°C) min.

MINIMUM TIMKEN EP O.K. LOAD — 40 lb (18 kg).

ADDITIVES — Rust and oxidation inhibitors that do not corrode steel or swell or deteriorate synthetic seals.

INSPECTION — When connected equipment is serviced, disassemble the coupling and inspect for wear. Replace worn parts. Clean the grease from the coupling and repack with fresh LTG. Install coupling using new gasket as instructed in the appropriate installation manual.

Packaging

14 oz CARTRIDGES — For use in standard industrial lubrication guns.

35 lb PAILS — Ideal for larger size couplings or many smaller sizes.

120 lb KEG — For plants with many small couplings or large size couplings. Best for hand packing.

400 lb DRUMS — For plants with a pressurized lubrication system.

CASE LOTS — 10 pack – 14 oz cartridges, 60 – 14 oz cartridges.

General Purpose Grease

ANNUAL LUBRICATION — The following specifications and lubricants for general purpose grease apply to Falk Steelflex couplings that are lubricated annually and operate within ambient temperatures of 0° to 150°F (–18° to 66°C) For temperatures beyond this range, consult the Factory.

If coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals; more frequent lubrication may be required.

Specifications — General Purpose Coupling Lubricants

The values shown are typical and slight variations are permissible.

DROPPING POINT — 300°F (149°C) or higher.

CONSISTENCY — NLGI No. 2 with 60 stroke worked penetration value in the range of 265 to 295.

SEPARATION AND RESISTANCE — Low oil separation rate and high resistance to separation from centrifuging.

LIQUID CONSTITUENT — Possess good lubricating properties, equivalent to a high quality, well refined petroleum oil.

INACTIVE — Must not corrode steel or cause swelling or deterioration of synthetic seals.

CLEAN — Free from foreign inclusions.

General Purpose Greases Meeting Falk Specifications

Lubricants listed in Table 1 are typical products only and should not be construed as exclusive recommendations.

TABLE 1 — General Purpose Greases

Ambient Temperature Range	0°F to 150°F (–18°C to +66°C)	–30°F to 100° F –34°C to +38°C)
Manufacturer	**Lubricant**	**Lubricant**
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP1
Chevron U.S.A. Inc.	Dura-Lith EP2	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP2	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #2	EP Conolith Grease #2
Exxon Company, USA	Unirex N2	Unirex N2
E.F. Houghton & Co.	Cosmolube 2	Cosmolube 1
Imperial Oil Ltd.	Unirex N2L	Unirex N2L
Kendall Refining Co.	Lithium Grease L421	Lithium Grease L421
Keystone Div. (Pennwalt) Corp.	81 EP-2	81 EP-1
Lyondell Petrochemical (ARCO)	Litholine H EP 2 Grease	Litholine H EP 2 Grease
Mobil Oil Corp.	Mobilux EP111	Mobilith AW1
Petro-Canada Products	Multipurpose EP2	Multipurpose EP1
Phillips 66 Co.	Philube Blue EP	Philube Blue EP
Shell Oil Co.	Alvania Grease 2	Alvania Grease 2
Shell Canada Ltd.	Alvania Grease 2	Alvania Grease 2
Sun Oil Co.	Ultra Prestige 2EP	Ultra Prestige 2EP
Texaco Lubricants	Starplex HD2	Multifak EP2
Unocal 76 (East & West)	Unoba EP2	Unoba EP2
Valvoline Oil Co.	Multilube Lithium EP Grease	. . .

★ Grease application or re-lubrication should be done at temperatures above 20°F (7°C). If grease must be applied below 20°F (7°C), consult The Falk Corporation. Lubricants listed may not be suitable for use in the food processing industry; check with lube manufacturer for approved lubricants.

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Part Detail							
Revision:	-	**Status:**	PRD/I	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod. Type:**		**Elec. Spec:**	W06957C J 002	**CD Diagram:**	416820-036
Enclosure:	TEBC	**Mfg Plant:**		**Mech. Spec:**		**Layout:**	617263-094
Frame:	449HP	**Mounting:**	V1	**Poles:**	04	**Created Date:**	01-04-2017
Base:		**Rotation:**	R	**Insulation:**	F	**Eff. Date:**	12-31-9998
Leads:						**Replaced By:**	
Literature:		**Elec. Diagram:**					

Nameplate 000901002AAA

BLACK PEARL EP
NLGI NO.2

Nameplate 000692000MB

SUITABLE FOR OPERATION ON PWM
INVERTER EQUIPPED WITH IGBT
DEVICES AND CAPABLE OF
CARRIER
FREQUENCY OF 2 KHZ MINIMUM

Nameplate 000613007LF

CAT.NO.			SPEC NO.	M44-A000-0014							
SER.NO.			FRAME SIZE	449HP							
	HP	RPM	VOLTS	AMPS	HZ	S.F.					
	200	1785	460	217.	6-60	1.00					
	200	1785	460	217.	60	1					
CONSTANT HP RPM		@		HZ	CODE	G					
TYPE	P		INSUL.CLASS	F	TORQUE	VARIABLE			DESIGN	B	
D.E. BRG.	65BC03J30X		ENCL	TEBC	DUTY	CONT		PH	3		
O.D.E. BRG.	65BC03JP30X		MOTOR WEIGHT	1		AMB	40				
	OVER TEMP PROT 2										

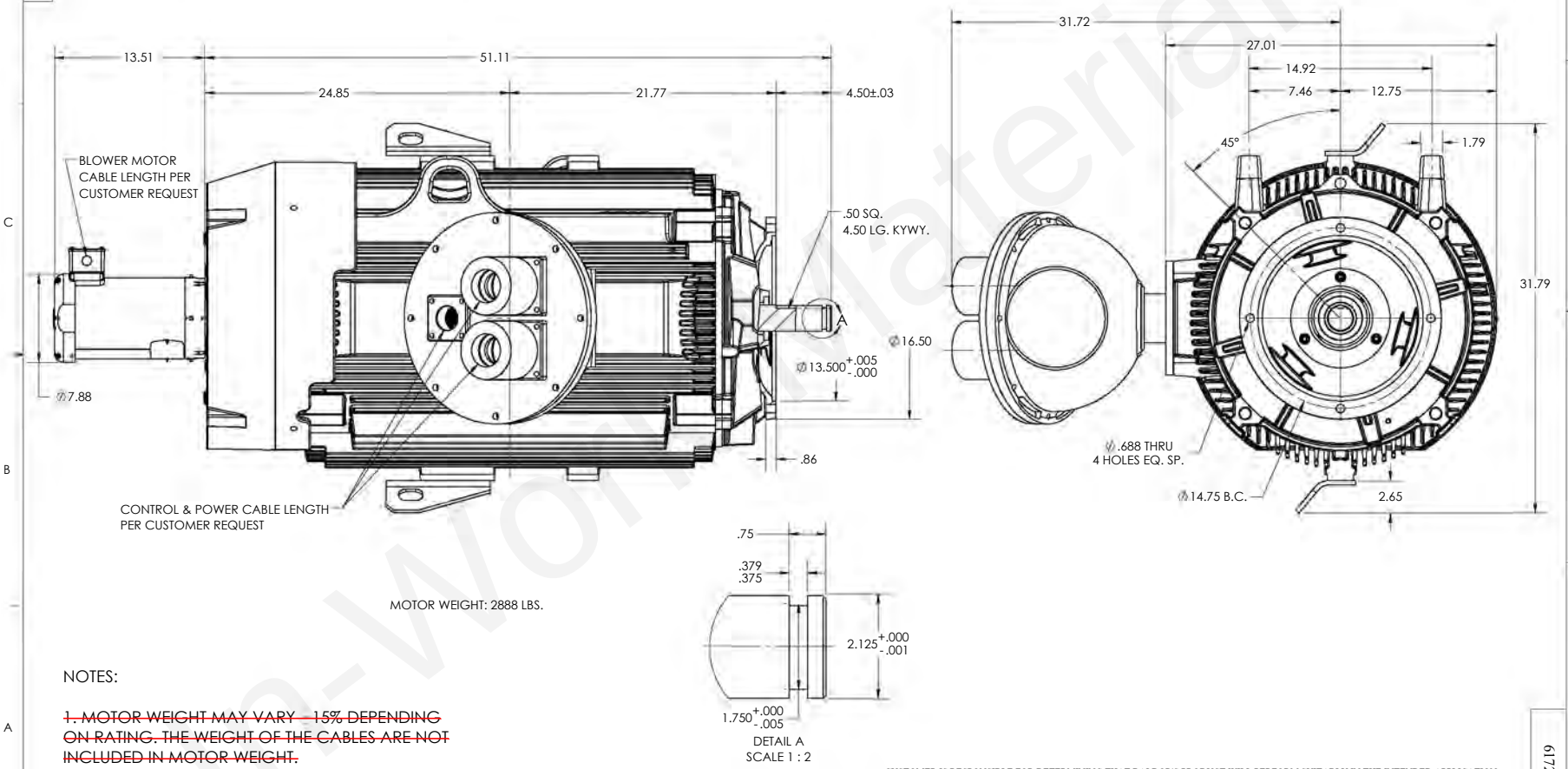
617263-094

DUTY MASTER ALTERNATING CURRENT MOTORS

ENCLOSURE: TOTALLY ENCLOSED
MOUNTING: FOOTLESS

FRAME: G449HP
IMMERSIBLE MOTOR

COOLING: BLOWER COOLED



MOTOR WEIGHT: 2888 LBS.

NOTES:

~~1. MOTOR WEIGHT MAY VARY ~15% DEPENDING ON RATING. THE WEIGHT OF THE CABLES ARE NOT INCLUDED IN MOTOR WEIGHT.~~

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION

REV. DESC: INITIAL RELEASE			
REV: -	VERSION: 00	REVISED: 11:45:32 01/04/2017	TDR: 000001005440
MODEL NO. 617263-094			REF: -
BY: USJAHON			B

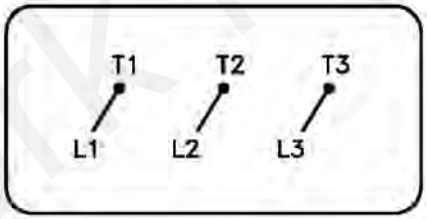
BALDOR

DIM SHT,449HP,IMMERSIBLE,BD=16.5,TEBC

617263-094

416820-036

A-C MOTOR
CONNECTION DIAGRAM
STANDARD 3 LEAD CONNECTED



(N.P. 1575-BA)

416820-036

REV. DESC: LOADED TO BUS, C/R 335225			BALDOR
REV. LTR: –	VERSION: 00	TDR: 000000538207	
FILE: \MGA\00000\682		REVISED: 11:54:06 04/30/2010	CONN DIAG – STANDARD 3 LEAD
MTL: –		BY: RAGRA	SH 1 of 1

CONNECTION DIAGRAM

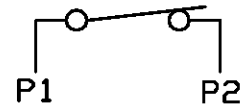
THERMOSTATS

CONTACT RATING		
VOLTS	CONTINUOUS AMPERES	INRUSH AMPERES
110-120	3.0	30
220-240	1.5	15
440-480	0.75	7.5
550-600	0.60	6.0

ALL THERMOSTATS ARE CONNECTED IN SERIES

NORMALLY CLOSED

Thermostat(s)

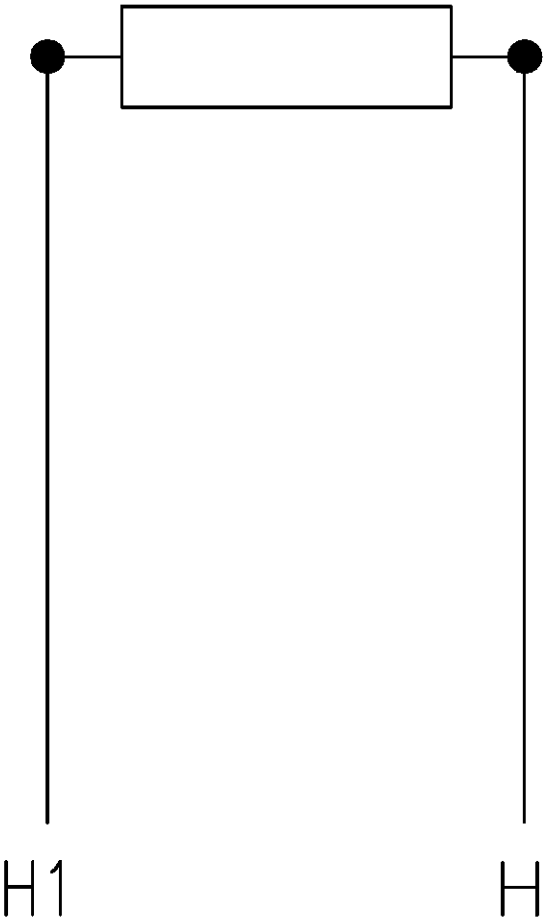


422927-017

REV. DESC: LOAD TO BUS			BALDOR
REV. LTR: –	VERSION: 00	TDR: 000000929947	
FILE: \RGG\00025\380	REVISED: 09:10:41 06/12/2015	BY: RGGWT	THERMOSTAT CONNECTION DIAGRAM
MTL: –			SH 1 of 1

CONNECTION DIAGRAM

SPACE HEATER



416820-071

REV. DESC:			BALDOR
REV. LTR: C	VERSION: 03	TDR: 000000591467	
FILE: \RAG\00014\633		REVISED: 08:54:55 04/19/2011	CONNECTION DIAGRAM – SPACE HEATER
MTL: –		BY: RAGBRP	SH 1 of 2

SPACE HEATER DATA

SPACE HEATER CONNECTION DIAGRAM 416820-071
FREQ(HZ) 25-120

NEMA Frame	Metric Frame	Voltage	Amps	Watts
180* & 210*	112S/M* & 132S/M*	100	0.189	19
		110	0.208	23
		115	0.217	25
		120	0.226	27
		208	0.099	21
		210	0.100	21
		215	0.102	22
		220	0.104	23
		230	0.109	25
		240	0.114	27
		380	0.045	17
		440	0.052	23
		460	0.054	25
		480	0.056	27
		575	0.043	25
250	160L/M	100	0.363	36
		110	0.399	44
		115	0.417	48
		120	0.435	52
		208	0.189	39
		210	0.191	40
		215	0.195	42
		220	0.200	44
		230	0.209	48
		240	0.218	52
		380	0.086	33
		440	0.099	44
		460	0.104	48
		480	0.109	52
		575	0.083	48
280	180L/M	100	0.544	54
		110	0.599	66
		115	0.626	72
		120	0.653	78
		208	0.283	59
		210	0.286	60
		215	0.293	63
		220	0.299	66
		230	0.313	72
		240	0.327	78
		380	0.126	48
		440	0.150	66
		460	0.157	72
		480	0.164	79
		575	0.125	72
320	200L/M	100	0.681	68
		110	0.749	82
		115	0.783	90
		120	0.817	98
		208	0.354	74
		210	0.357	75
		215	0.365	78
		220	0.374	82
		230	0.391	90
		240	0.408	98
		380	0.162	62
		440	0.187	82
		460	0.196	90
		480	0.205	98
		575	0.157	90

NEMA Frame	Metric Frame	Voltage	Amps	Watts
360	225S/M	100	0.900	90
		110	0.990	109
		115	1.030	119
		120	1.070	128
		208	0.468	97
		210	0.472	99
		215	0.483	104
		220	0.495	109
		230	0.517	119
		240	0.539	129
		380	0.214	81
		440	0.248	109
		460	0.259	119
		480	0.270	130
		575	0.207	119
400	250S/M	100	1.210	121
		110	1.330	146
		115	1.391	160
		120	1.451	174
		208	0.629	131
		210	0.635	133
		215	0.650	140
		220	0.666	147
		230	0.696	160
		240	0.726	174
		380	0.287	109
		440	0.333	147
		460	0.348	160
		480	0.363	174
		575	0.278	160
440	280S/M	100	1.700	170
		110	1.870	206
		115	1.960	225
		120	2.050	246
		208	0.886	184
		210	0.895	188
		215	0.916	197
		220	0.937	206
		230	0.980	225
		240	1.023	246
		380	0.405	154
		440	0.469	206
		460	0.490	225
		480	0.511	245
		575	0.390	225

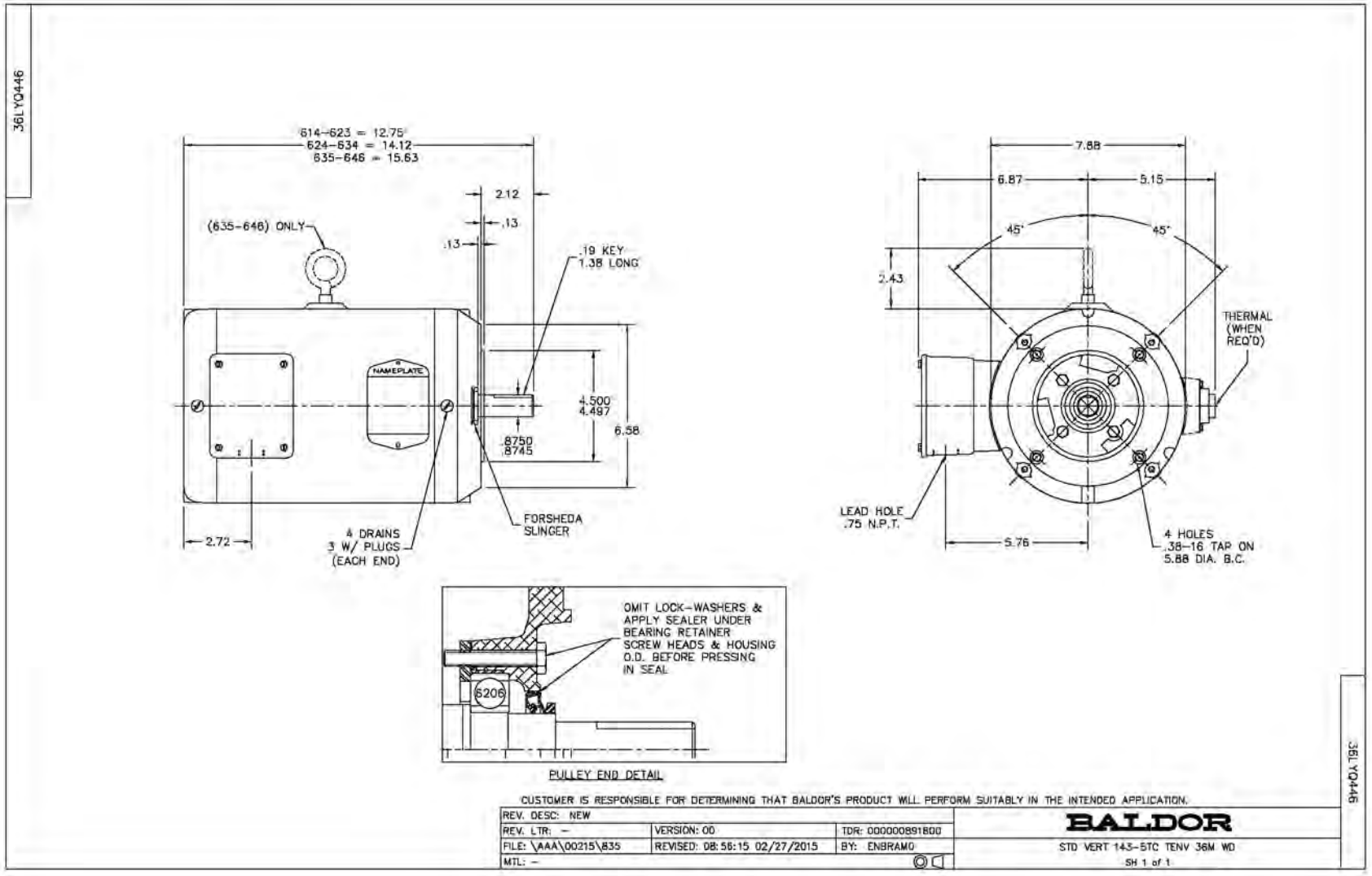
* Low surface temperature

MAKE FROM	MATERIAL	WEIGHT (LB)
BY: RAGBRP	DATE: 04/18/2011	
SPACE HEATER DATA		
VERSION: 01	TDR: 591467	REV: A

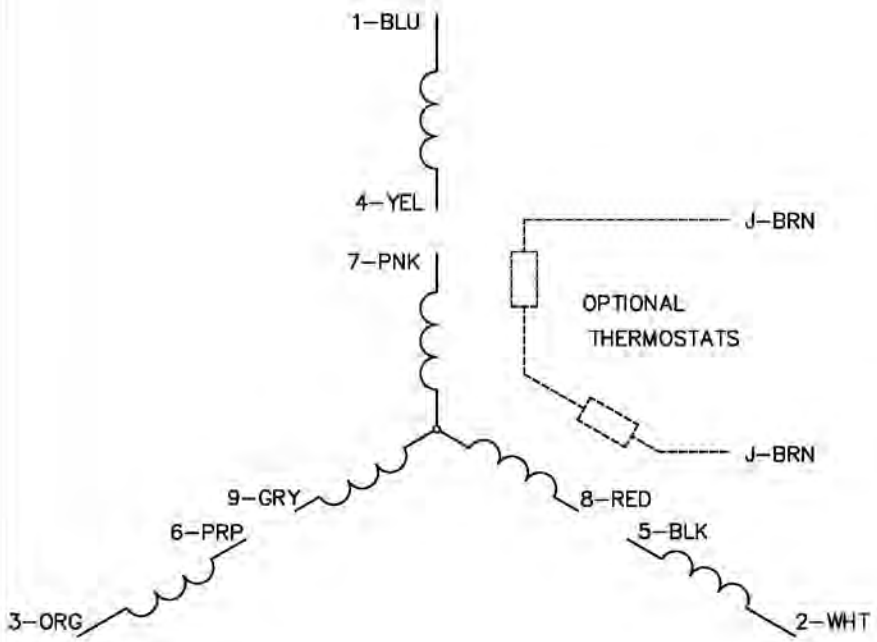
BALDOR ELECTRIC CO.

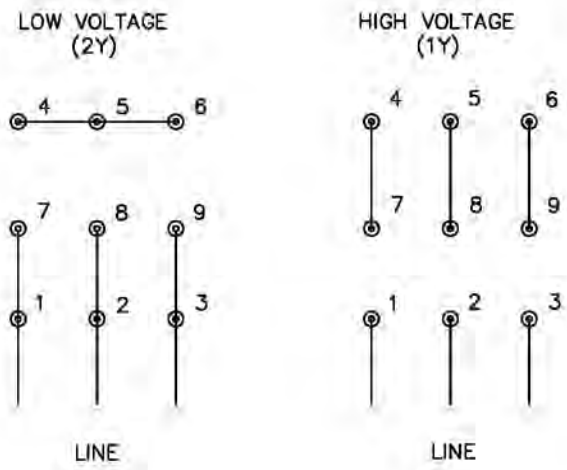
416820-071

SH 2 OF 2


36LYQ446
614-623 = 12.75
624-634 = 14.12
635-646 = 15.63
2.12
.13
.13
(635-646) ONLY
.19 KEY
1.38 LONG
NAMEPLATE
4.500
4.497
6.58
.8750
.8745
2.72
4 DRAINS
3 W/ PLUGS
(EACH END)
FORSHEDA
SLINGER
7.88
6.87
5.15
45°
45°
2.43
THERMAL
(WHEN
REQ'D)
LEAD HOLE
.75 N.P.T.
5.76
4 HOLES
.38-16 TAP ON
5.88 DIA. B.C.
OMIT LOCK-WASHERS &
APPLY SEALER UNDER
BEARING RETAINER
SCREW HEADS & HOUSING
O.D. BEFORE PRESSING
IN SEAL
6206
PULLEY END DETAIL
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000000891800
FILE: \AAA\00215\835
REVISED: 08:56:15 02/27/2015
BY: ENBRAMO
MTL: –
BALDOR
STD VERT 143-5TC TENV 36M WD
SH 1 of 1
36LYQ446

CD0005





NOTES:

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

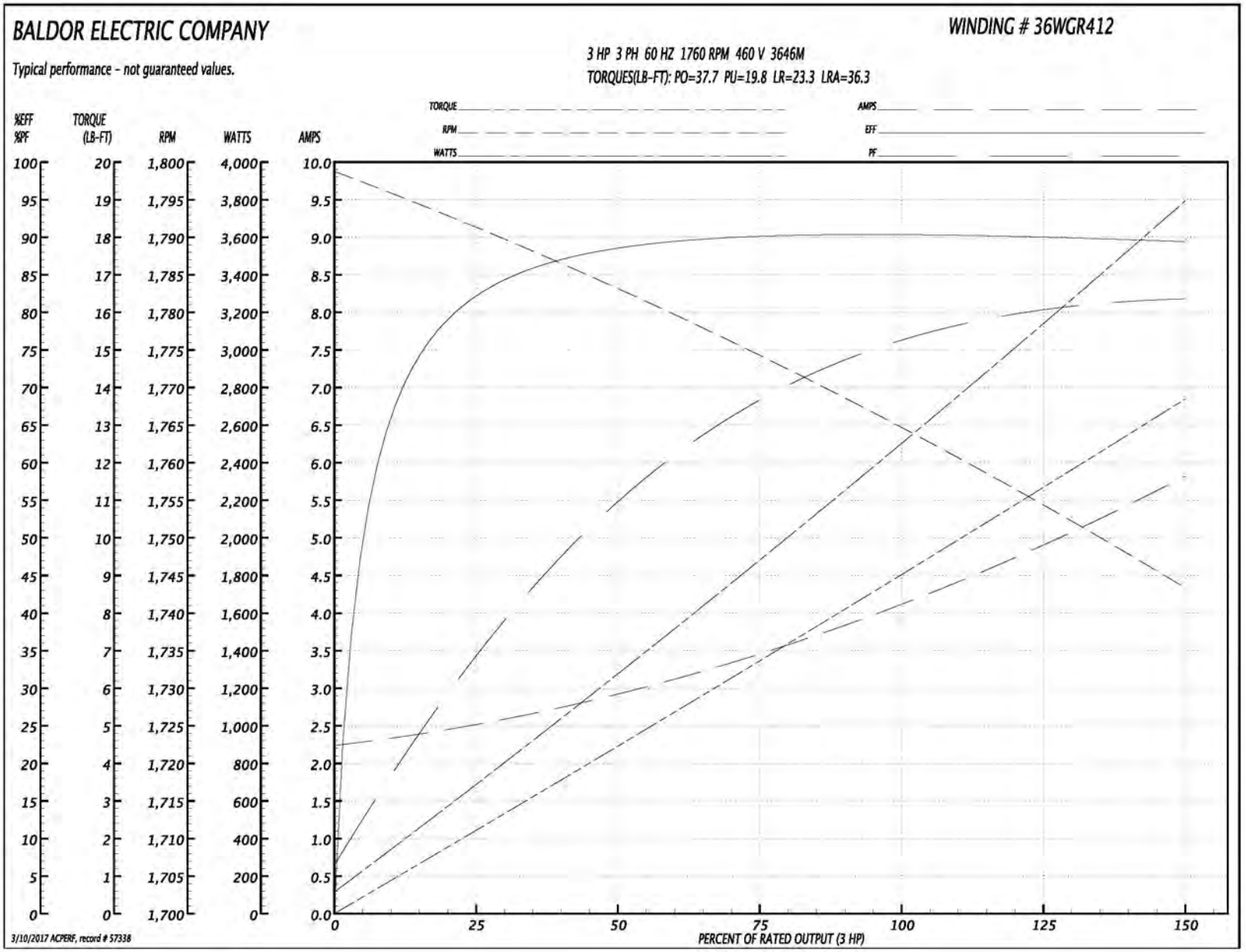
CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

Performance Graph at 460V, 60Hz, 3.0HP Typical performance - Not guaranteed values



Section 3
Maintenance & Troubleshooting

General Inspection Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear.
The following steps should be performed at each inspection:

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

Flood Environment Maintenance

Immersible motors are designed to tolerate operation for 14 days when submerged.
The motor must never be submerged more than 30 feet. When a motor becomes submerged, the external OEM provided float switch (not provided by Baldor) must disconnect power to the external blower motor. Whenever this submerged operation occurs, the motor is then cooled by the liquid.

These maintenance repairs are to be performed by a Baldor approved repair facility.
The costs for this maintenance is the customers responsibility and is necessary to continue the warranty.

Important **If motor has run in a flood environment, it must be disassembled and the following maintenance performed.**

1. Blower motor, see Appendix A.
2. Inspect bearings.
   a. If the bearings are dry, regrease per bearing lubrication procedure.
   b. If the bearings are wet, replace bearings and regrease per bearing lubrication procedure.
3. Replace O-rings on brackets.
4. Replace seals in carrier.
5. Completely fill seal carrier with grease per seal carrier lubrication procedure.

Disassembly If it becomes necessary to disassemble this motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling.

Precautions to keep bearings clean should be exercised.

1. Remove bearing cap screws before removing end shield screws.
   Marking end shields relative to position on frame will make reassembly easier.
2. Bearings should not be removed unless they are to be replaced.
3. If it is necessary to open the conduit box,refer to Figure 2-2 for proper connections.
4. The O-ring should be replaced when reassembled.

Bearing Lubrication Procedure

This motor has been properly lubricated at the time of manufacture and it is not necessary to lubricate at time of installation. If motor has been in storage for a period of six months or more, lubricate before starting. Lubrication of anti friction bearings and seal carrier should be done as a part of a planned maintenance schedule. The recommended lubrication interval should be used as a guide to establish this schedule.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarly, care should be taken to properly clean the grease inlet area of the motor to prevent grease contamination.

Recommended Lubricant For Bearings
Use lubricant stated on motor nameplate. If lubricant is not specified, for motors operating in ambient temperatures from -25″C to +65″C, use the following:
Chevron Black Pearl EP N-2.

Table 3-1 Recommended Lubricant Volume

Frame Size	Lubricant Amount
210–215	0.5 cu. In.
254–286	1.0 cu. In.
324–365	1.5 cu. In.
404–449	2.5 cu. In.

Lubrication Frequency

Baldor anti–friction bearings may be lubricated with the motor running or stationary, however, stationary with the motor warm is preferred.

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting.
2. The motor is equipped with a grease drain plug. Remove the plug and loosen any hardened grease that may block the drain.
3. Add recommended lubricant volume (Table 3-1) using a hand operated grease gun.
4. Run the motor for two hours.
5. Replace the grease drain plug.
6. Replace the pipe plug in grease inlet.

Caution: **Never mix or use incompatible lubricants. Watch for signs of lubricant incompatibility. Failure to use compatible lubricants could result in damage to motor.**

Special Applications:
For high temperature applications, contact your Baldor District Office for recommended lubricants. Mixing lubricants is not recommended due to the possibility of incompatibility. If it is desired to change lubricant without motor disassembly, follow instructions for lubrication and repeat lubrication a second time after 100 hours of service.

Watch for signs of lubricant incompatibility visible from the grease relief area. Incompatible lubricant could result in damage to equipment.

Seal Carrier Lubrication Procedure

Seal Carrier should be greased every 6 months.

1. Remove plugs located on seal carrier.
2. Add Chevron Black Pearl EP N–2 grease until new grease purges out the drain.
3. Replace other plug.

Lubricant for Seal Carrier Chevron Black Pearl EP N–2. **Substitutions are not recommended**.

585 Series

Swing Check Valve

Air Cushion

- **Full Pipe Size Flow Area - Unrestricted flow**
- **Heavy Duty Disc Connections**
- **Non-Clog Design**
- **Fusion Bonded Epoxy Coating NSF-61**
- **Designed, Manufactured and Tested in Accordance with ANSI/AWWA C508 Standard**
- **Resilient Seat - Drip Tight Seating**
- **Three field adjustable closure options:**
  - **Lever and Weight (LW)**
  - **Air Cushion (AC)**
  - **Lever and Spring (LS)**

The Cla-Val 585 Swing Check Valve is designed for long service life and maintenance free operation. It has a full-flow area body and is equipped with a disc arm with dual precision pins for optimum disc connection and protection against damage due to vibration. The body is fitted with a raised 300 Series Stainless Steel seat as well as a resilient seat to help ensure drip tight seating, even in applications with high solids. The seats are replaceable in the field without removing the valve from the pipeline.

The valve is constructed of Ductile Iron to provide greater durability and protection in applications with high stresses and shock loads. The body and cover are fusion bonded NSF-61 epoxy coated in accordance with AWWA C550 for long service life in potable and non-potable systems.

During system flowing conditions the disc swings up to the open position allowing unrestricted flow through the valve. When system reverse flow conditions occur, the disc swings down to the closed position, preventing reverse flow.

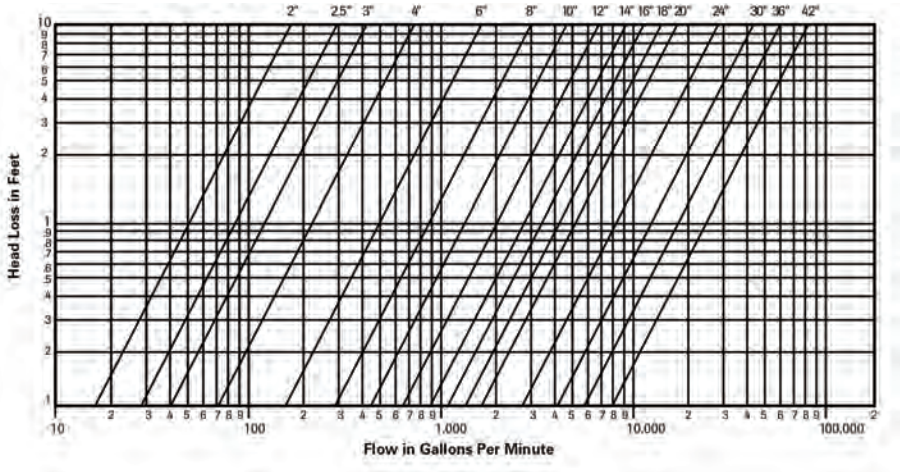
Pressure Ratings (Ambient Temperature)

For Valve Sizes 2 through 42-inches:
250 psi CWP
For Valve Sizes 20 through 1100mm:
1724 kPA CWP

Material Specifications

Component	Standard
Body and Cover 2-24" C508-09 Compliant	Ductile Iron ASTM A536 GR 65-45-12
Body and Cover 30-42"	Ductile Iron ASTM A536 GR 65-45-12
Disc and Disc Arm	Ductile Iron ASTM A536 GR 65-45-12
Shaft	304 Stainless Steel
Seat	316 Stainless Steel
Disc Seat	NBR

Head Loss Characteristics for Swing Check Valves



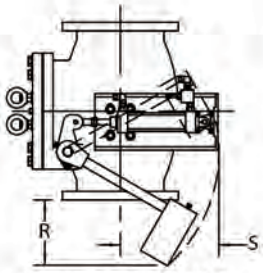
585AC Air Cushioned Check Valve

Valve Size	A	B	C	D	E	F	H	Q	R	S	T
2" 50mm	8.00 203	9.25 235	3.50 89	10.92 277	3.83 97	6.00 152	0.63 16	10.00 254	6.00 152	9.38 238	11.25 286
2.5" 65mm	8.50 216	9.72 247	3.50 89	10.92 277	3.83 97	7.00 178	0.88 22	9.88 251	6.13 156	9.38 238	11.13 283
3" 80mm	9.50 241	10.00 254	4.50 114	11.00 279	4.00 102	7.50 191	0.75 19	10.13 257	5.50 140	9.25 235	12.00 305
4" 100mm	11.50 292	10.75 273	5.00 127	11.75 299	5.00 127	9.00 229	0.94 24	10.75 273	4.88 124	8.75 222	10.88 276
6" 150mm	14.00 356	11.75 299	5.75 146	13.50 343	6.50 165	11.00 279	1.00 25	11.63 295	4.63 118	7.88 200	10.88 276
8" 200mm	19.50 495	13.75 349	7.25 184	17.00 432	7.50 191	13.50 343	1.13 29	15.50 394	5.88 149	10.38 264	13.50 343
10" 250mm	24.50 622	15.00 381	9.38 238	16.25 413	9.00 229	16.00 406	1.19 30	18.38 467	9.00 229	13.63 346	13.50 343
12" 300mm	27.50 699	19.00 483	11.00 279	18.25 464	11.00 279	19.00 483	1.25 32	21.13 537	9.00 229	14.25 362	13.50 343
14" 350mm	31.00 787	22.50 572	13.50 343	26.00 660	14.00 356	21.00 533	1.38 35	25.88 657	11.75 299	18.75 476	13.50 343
16" 400mm	36.00 914	24.50 622	14.25 362	29.50 749	15.00 381	23.50 597	1.44 37	32.00 813	7.25 184	15.88 403	14.50 368
18" 450mm	40.00 1016	26.50 673	17.38 441	31.00 787	18.63 473	25.00 635	1.56 40	36.00 914	9.25 235	21.25 540	13.00 330
20" 500mm	40.00 1016	28.75 730	17.63 448	32.38 822	18.63 473	27.50 699	1.69 43	41.00 1041	—	—	14.50 368
24" 600mm	48.00 1219	32.50 826	20.13 511	34.00 864	21.00 533	32.00 813	1.88 48	38.00 965	8.75 222	19.25 489	11.75 299
30" 750mm	56.00 1422	44.13 1121	29.75 756	39.00 991	24.00 610	38.75 984	2.13 54	53.13 1349	15.50 394	24.00 610	17.25 438
36" 900mm	63.00 1600	50.50 1283	33.50 851	42.00 1067	27.00 686	46.00 1168	2.38 60	57.50 1461	15.00 381	21.00 533	13.00 330
42" 1100mm											

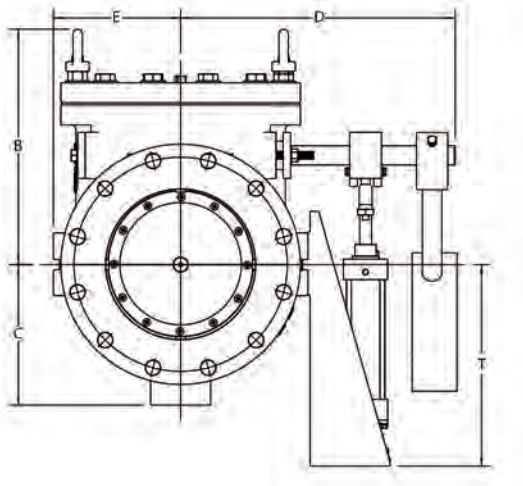
Inches
Millimeters

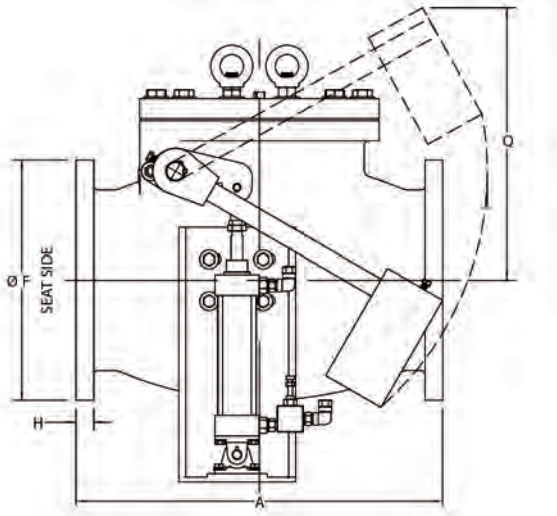
Valve Size	Weight
3" 80mm	110 50
4" 100mm	145 66
6" 150mm	205 93
8" 200mm	330 150
10" 250mm	500 227
12" 300mm	800 363
14" 350mm	1260 672
16" 400mm	1600 726
18" 450mm	2100 963
20" 500mm	2500 1134
24" 600mm	3700 1678
30" 750mm	6000 2722
36" 900mm	9100 4128
42" 1100mm	Contact DeZURIK

Lbs
Kgs



VP, VERTICAL FLOW UP
POSITION INSTALLATION
LEVER ARM SWING





November 14, 2016

APPROVAL DRAWINGS

PROJECT NAME
Cattail Branch Pump Station - Budget Quote

PURCHASE ORDER
70797

VALVE TYPE
ECCENTRIC FULL PORT PLUG VALVE

CONTRACTOR:	SYDNOR HYDRO INC PO BOX 27186 RICHMOND, VA 23261
LOCAL SUPPLIER:	FREEMIRE & ASSOCIATES INC 1215 OLD DORSEY ROAD HARMANS, MD 21077 410-768-8500
MANUFACTURER:	DeZURIK 250 RIVERSIDE AVE NORTH SARTELL, MN 56377 (320) 259-2000
Factory Work Order	461153
Factory Sales Order	619669

TABLE OF CONTENTS

A Data Sheet is included for each line item on the purchase order.
Document numbers are listed at the bottom of the Data Sheet.
Any one drawing may apply to more than one item number.
All documents are assembled in alpha/numeric order within each section.

DeZURIK

Submittal Data Sheet
Date: 11/14/16

SYDNOR HYDRO INC

PO BOX 27186

RICHMOND, VA
23261

P.O. 70797
FACTORY ORDER NO 461153
FACTORY SALES ORDER NO 619669
REV 0

PROJ. NAME Cattail Branch Pump Station - Budget Quote

Fact. ITEM	Cust. ITEM	QTY	DESCRIPTION	PART NO. **9669499**
1		2	PEF,12,F1,CI,NBR,CR,TB7-S30SC0*GS-12A-HD16	

Style	PEF	DeZURIK Eccentric Full Port Plug Valve
Size	12	12 Inch (300mm); SST Bearings; Welded-in Nickel Seat
End Connection	F1	Flanged Drilling; ASME Class 125/150
Body Material	CI	Cast Iron
Packing	NBR	Acrylonitrile-Butadiene; Temperature to 250° F.
Plug & Facing	CR	Chloroprene; -20 to 180°F (-29 to 83°C)
Option	TB7	Certified Seat Leat Test 175 PSI Reverse Pressure per AWWA C517 with actutor stop setting at 175 PSI Reverse. Includes DeZURIK Standard Certified Seat and Shell Hydro Test Reports.
Option	S30SC0	8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Interior with Standard (SP10) surface prep and 8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Exterior with Standard (SP10) surface prep
Act Type	GS-12A-HD16	G-Series Handwheel; 16 In Dia

RELATED DOCUMENTS

A55446	DWG INST PEF F GS-12A-HD 10-20
A55403	DWG VALVE ASSY PEF F1 3-20"
A55615	DWG ACT GS/GB-6A/12A-HD/CW/N
A55418	DWG CONN PARTS GS/GB-6A/12A PE

DeZURIK

Submittal Data Sheet
Date: 11/14/16

SYDNOR HYDRO INC

PO BOX 27186

RICHMOND, VA
23261

P.O. 70797
FACTORY ORDER NO 461153
FACTORY SALES ORDER NO 619669
REV 0

PROJ. NAME Cattail Branch Pump Station - Budget Quote

Fact. ITEM	Cust. ITEM	QTY	DESCRIPTION	PART NO. **9669500**
2		2	PEF,16,F1,CI,NBR,CR,TB6-S30SC0*MG-WR1-HD24	

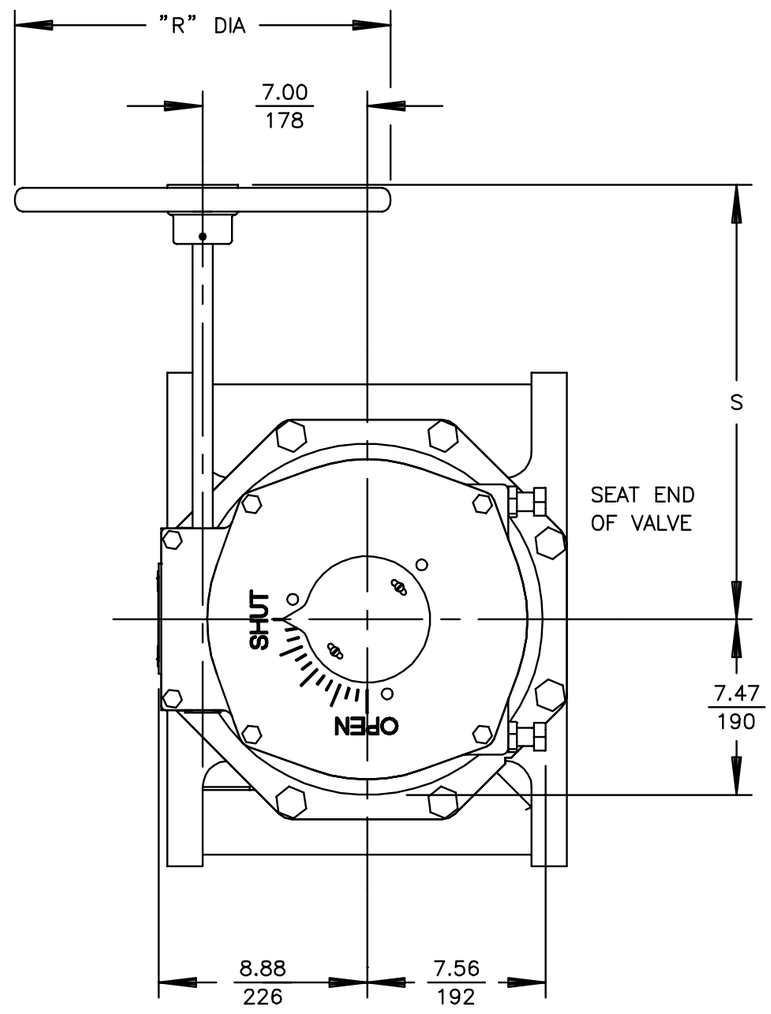
Style	PEF	DeZURIK Eccentric Full Port Plug Valve
Size	16	16 Inch (400mm); SST Bearings; Welded-in Nickel Seat
End Connection	F1	Flanged Drilling; ASME Class 125/150
Body Material	CI	Cast Iron
Packing	NBR	Acrylonitrile-Butadiene; Temperature to 250° F.
Plug & Facing	CR	Chloroprene; -20 to 180°F (-29 to 83°C)
Option	TB6	Certified Seat Leat Test 150 PSI Reverse Pressure per AWWA C517 with actutor stop setting at 150 PSI Reverse. Includes DeZURIK Standard Certified Seat and Shell Hydro Test Reports.
Option	S30SC0	8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Interior with Standard (SP10) surface prep and 8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Exterior with Standard (SP10) surface prep
Act Type	MG-WR1-HD24	Manual Gear Handwheel; 24 In Dia

RELATED DOCUMENTS

J93231	DWG INST PEF F1 MG-WR1-HD 144:
A55403	DWG VALVE ASSY PEF F1 3-20"
J92454	DWG ACT ASSY MG/MGB
J92399	DWG CONN PARTS MG/MGB PEF

VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS										
INCH	MM	A	B	C	D	E	F	G	H	J	K	L
10	250	1.30 / 33	13.00 / 330	9.19 / 233	14.25 / 362	7/8 – 9 UNC	8	.66 / 17	1.00 / 25	4	14.88 / 378	16.88 / 429
12	300	1.36 / 35	14.00 / 356	11.53 / 293	17.00 / 432	7/8 – 9 UNC	8	.75 / 19	1.00 / 25	4	16.94 / 430	18.94 / 481
14	350	1.50 / 38	17.00 / 432	12.06 / 306	18.75 / 476	1 – 8 UNC	8	.88 / 22	1.13 / 29	4	18.25 / 464	20.25 / 514
16	400	1.55 / 39	17.75 / 451	14.13 / 359	21.25 / 540	1 – 8 UNC	8	.88 / 22	1.13 / 29	8	19.69 / 500	21.69 / 551
18	450	1.68 / 43	21.50 / 546	15.44 / 392	22.75 / 578	1 1/8–7 UNC	12	1.13 / 29	1.25 / 32	4	20.94 / 532	22.94 / 583
20	500	1.76 / 45	23.50 / 597	16.81 / 427	25.00 / 635	1 1/8–7 UNC	16	1.13 / 29	1.25 / 32	4	22.75 / 578	24.75 / 629

VALVE SIZE	ACTUATOR NUMBER	DIMENSIONS IN / MM	
		R	S
10&12	GS–12A–HD12	12.00 / 305	15.12 / 384
	GS–12A–HD16	16.00 / 406	15.48 / 393
	GS–12A–HD20	20.00 / 508	15.48 / 393
14–20	GS–12A–HD12	12.00 / 305	18.12 / 460
	GS–12A–HD16	16.00 / 406	18.50 / 470
	GS–12A–HD20	20.00 / 508	18.50 / 470
	GS–12A–HD24	24.00 / 610	22.19 / 564
	GS–12A–HD30	30.00 / 762	23.69 / 602



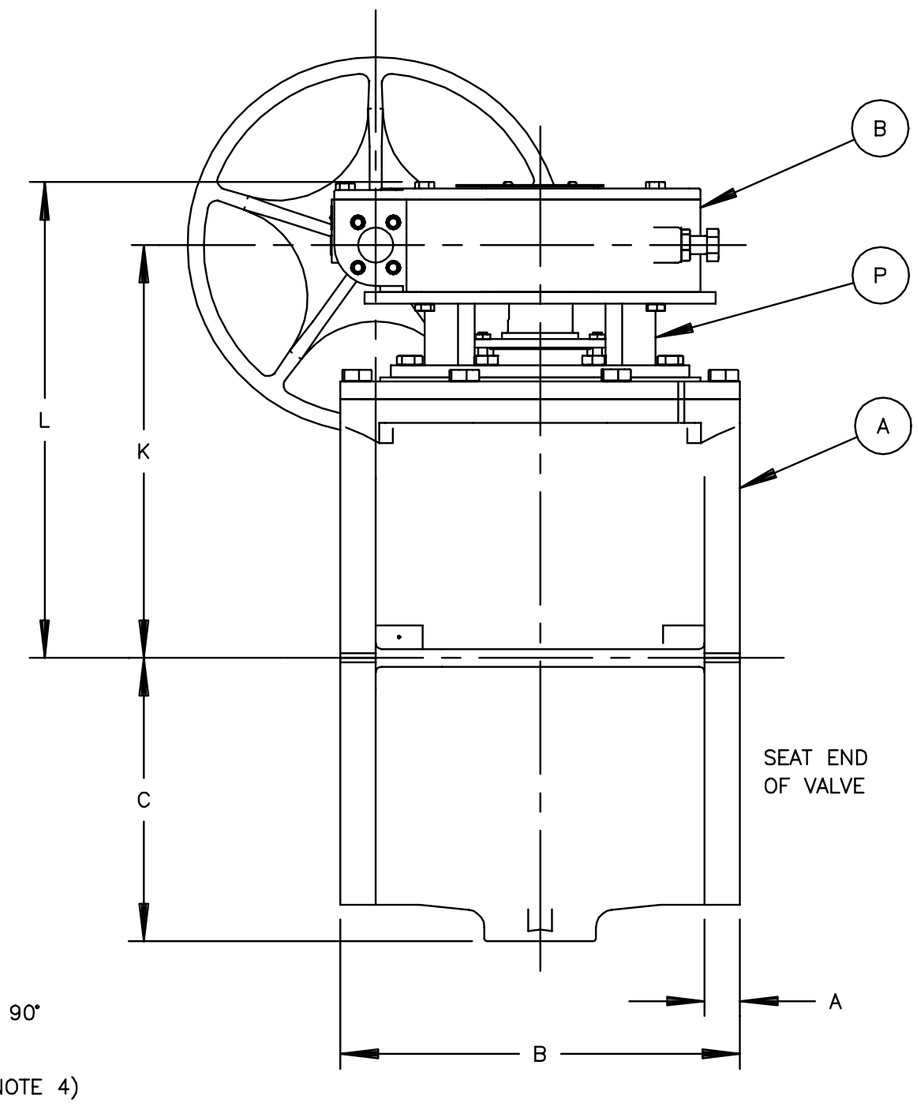
A	VALVE
B	ACTUATOR
P	CONNECTING PARTS

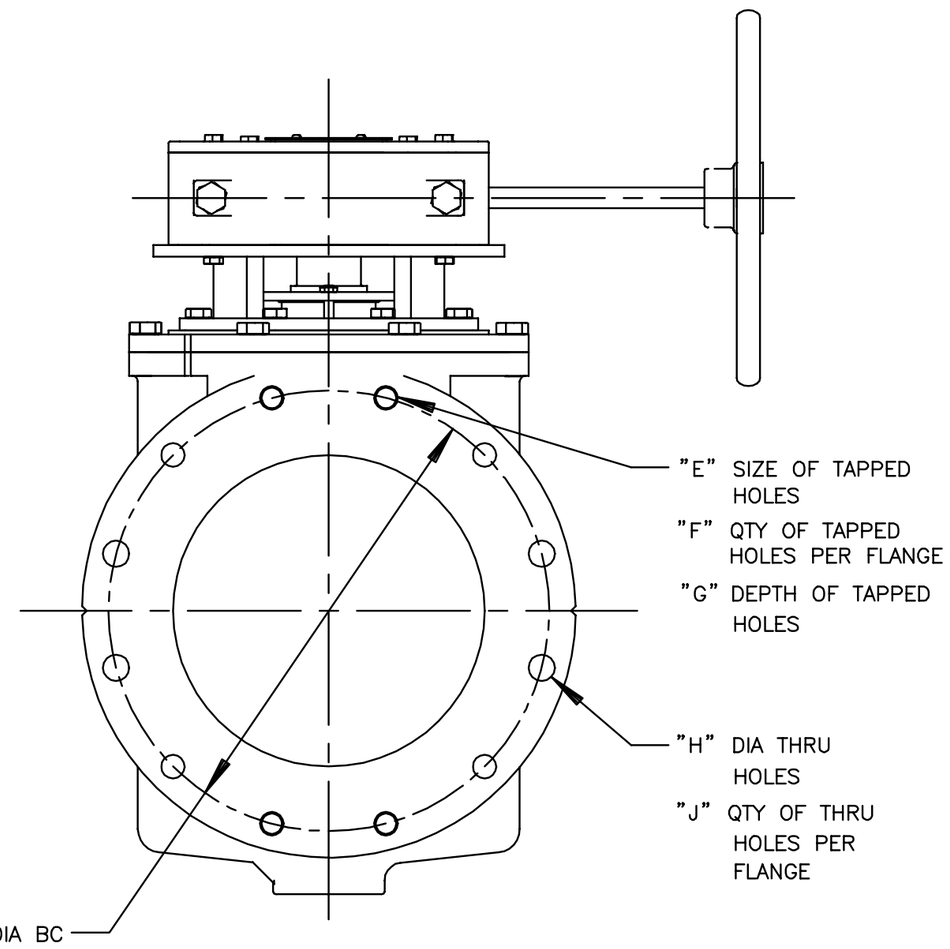
NOTE:

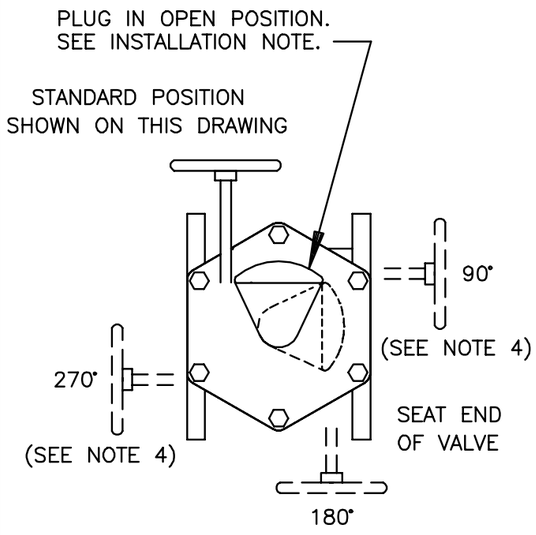
1. FLANGES ARE FLAT FACED WITH THICKNESS, DIAMETER AND DRILLING TO CLASS 125 ANSI STANDARD B16.1, EXCEPT FOR TAPPED HOLES AS INDICATED. SEE A55467 FOR NON–ANSI FLANGE DATA.
2. 19 TURNS OF HANDWHEEL ARE REQUIRED TO OPEN VALVE.
3. INSTALLATION NOTE:
   - FOR LIQUIDS & GASES: INSTALL VALVE WITH HIGHER PRESSURE AGAINST END OPPOSITE SEAT.
   - FOR SUSPENDED SOLIDS, SLURRIES, ETC: INSTALL VALVE WITH HIGHER PRESSURE AGAINST SEAT END. IN HORIZONTAL PIPELINES, VALVE SHOULD BE INSTALLED ON IT'S SIDE SO PLUG ROTATES TO THE TOP OF THE PIPELINE WHEN OPEN. (SEE DIAGRAM BELOW).
4. HD24 AND HD30 HANDWHEELS ARE NOT AVAILABLE IN 90° AND 270° MOUNTING POSITIONS.

NOTICE

THIS DRAWING DOES NOT SHOW ACTUATOR ACCESSORIES. IF ACCESSORIES ARE REQUIRED, REFER TO THE APPROPRIATE ACCESSORY INSTALLATION DRAWING FOR DIMENSIONS AND OTHER RELATED INFORMATION.







ACTUATOR MOUNTING POSITIONS AS VIEWED FROM TOP OF VALVE. DOTTED LINES SHOW OPTIONAL MOUNTING POSITIONS.

G	F	E	D	C	B	A	61483 03/16/07

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Sartell, MN USA 56377
www.dezurik.com

PEF 100% PORT ECCENTRIC VALVES SIZE 10 – 20 FLANGED
GS–12A–HD_ HANDWHEEL ACTUATED

DOCT. CODE	DRAWN	APPROVED	A55446
C1	SN	SN	
	CHECKED SN	DATE 10/27/05	

VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS										
INCH	MM	A	B	C	D	E	F	G	H	J	K	L
10	250	1.30 / 33	13.00 / 330	9.19 / 233	14.25 / 362	7/8 – 9 UNC	8	.66 / 17	1.00 / 25	4	17.25 / 438	20.69 / 526
12	300	1.36 / 35	14.00 / 356	11.53 / 293	17.00 / 432	7/8 – 9 UNC	8	.75 / 19	1.00 / 25	4	19.31 / 490	22.75 / 578
14	350	1.50 / 38	17.00 / 432	12.06 / 306	18.75 / 476	1 – 8 UNC	8	.88 / 22	1.13 / 29	4	20.62 / 524	24.06 / 611
16	400	1.55 / 39	17.75 / 451	14.13 / 359	21.25 / 540	1 – 8 UNC	8	.88 / 22	1.13 / 29	8	22.06 / 560	25.50 / 648
18	450	1.68 / 43	21.50 / 546	15.44 / 392	22.75 / 578	1 1/8–7 UNC	12	1.13 / 29	1.25 / 32	4	23.31 / 592	26.75 / 679
20	500	1.76 / 45	23.50 / 597	16.81 / 427	25.00 / 635	1 1/8–7 UNC	16	1.13 / 29	1.25 / 32	4	25.12 / 638	28.56 / 725

HANDWHEEL SIZE	DIMENSIONS IN / MM	
	R	S
WR1–HD16	16.00 / 406	16.34 / 415
WR1–HD24	24.00 / 610	16.34 / 415
WR1–HD32	31.50 / 800	16.34 / 415
WR1–HD36	36.00 / 914	16.34 / 415

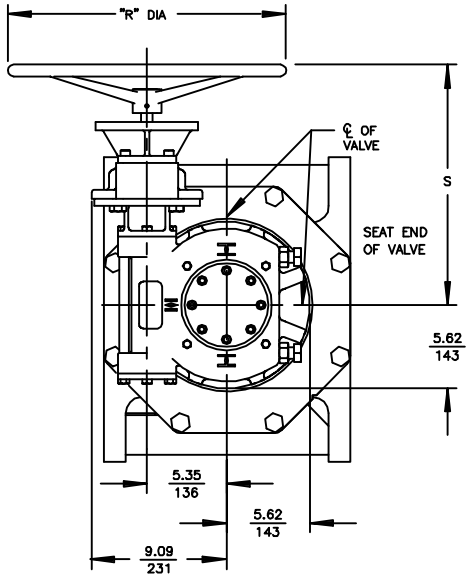
A	VALVE
B	ACTUATOR
P	CONNECTING PARTS

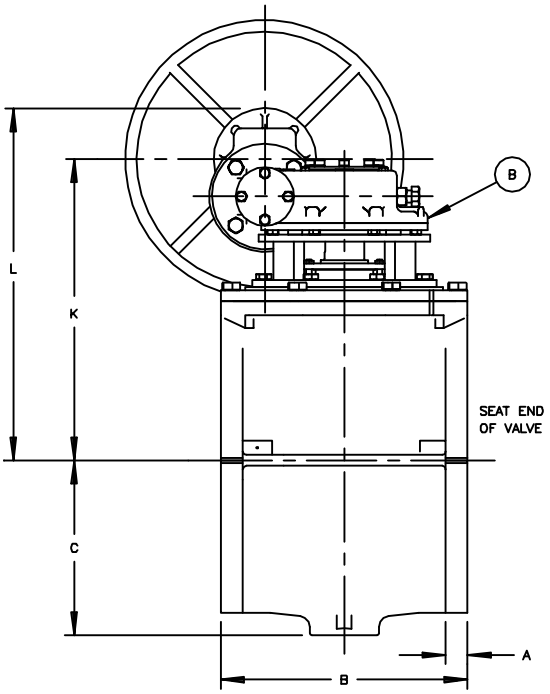
NOTICE

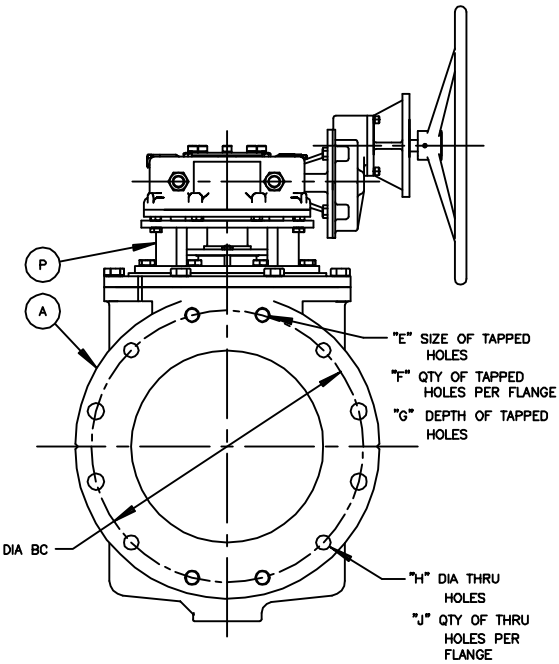
THIS DRAWING DOES NOT SHOW ACTUATOR ACCESSORIES. IF ACCESSORIES ARE REQUIRED, REFER TO THE APPROPRIATE ACCESSORY INSTALLATION DRAWING FOR DIMENSIONS AND OTHER RELATED INFORMATION.

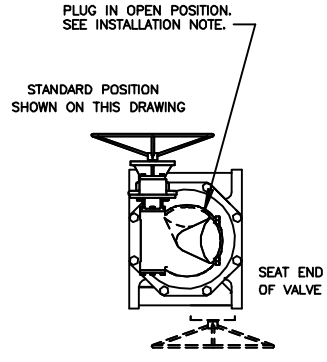
NOTE:

1. FLANGES ARE FLAT FACED WITH THICKNESS, DIAMETER AND DRILLING TO CLASS 125 ANSI STANDARD B16.1, EXCEPT FOR TAPPED HOLES AS INDICATED. SEE A55467 FOR NON–ANSI FLANGE DATA.
2. 36 TURNS OF HANDWHEEL ARE REQUIRED TO OPEN VALVE.
3. INSTALLATION NOTE:
   - FOR LIQUIDS & GASES: INSTALL VALVE WITH HIGHER PRESSURE AGAINST END OPPOSITE SEAT.
   - FOR SUSPENDED SOLIDS, SLURRIES, ETC: INSTALL VALVE WITH HIGHER PRESSURE AGAINST SEAT END. IN HORIZONTAL PIPELINES, VALVE SHOULD BE INSTALLED ON IT'S SIDE SO PLUG ROTATES TO THE TOP OF THE PIPELINE WHEN OPEN. (SEE DIAGRAM BELOW).









ACTUATOR MOUNTING POSITIONS AS VIEWED FROM TOP OF VALVE. DOTTED LINES SHOW OPTIONAL MOUNTING POSITIONS.

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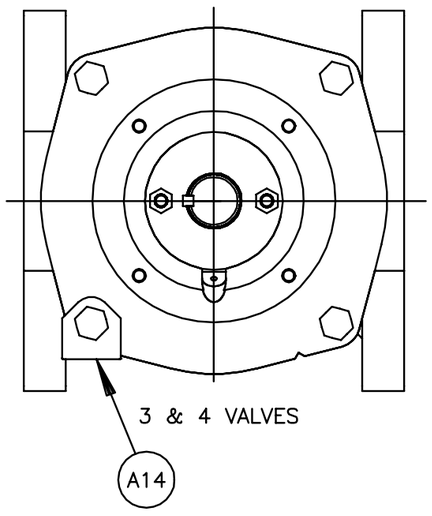
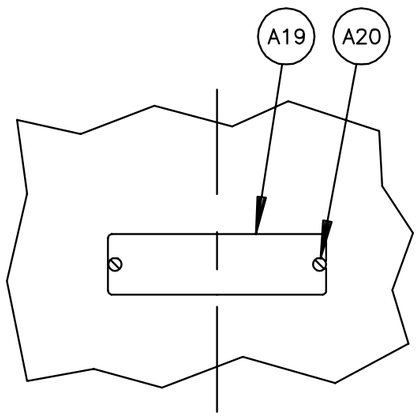
www.dezurik.com

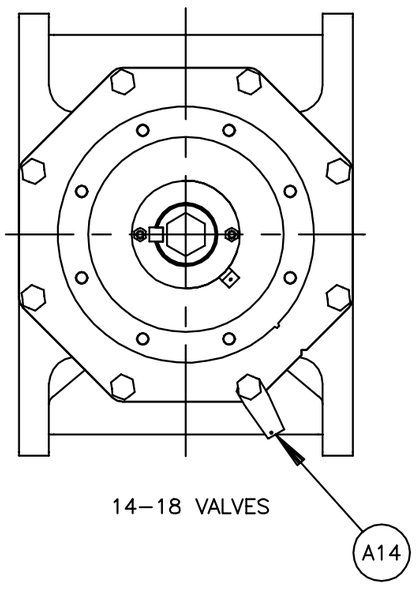
PEF 100% PORT ECCENTRIC VALVES SIZE 10–20 FLANGED
MG–WR1–HD_ (144:1 RATIO) ROTORK HANDWHEEL ACTUATED

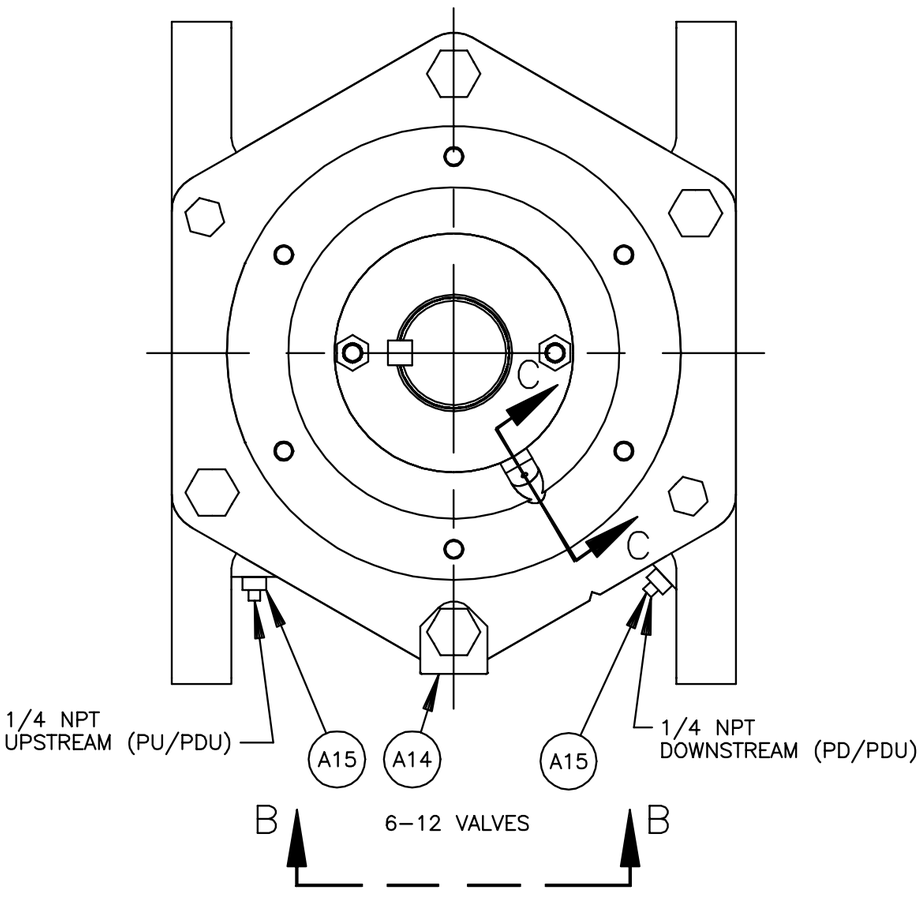
DOCT. CODE	DRAWN	APPROVED	
C1	BMP	TH	J93231
	CHECKED TH	DATE 12/23/15	

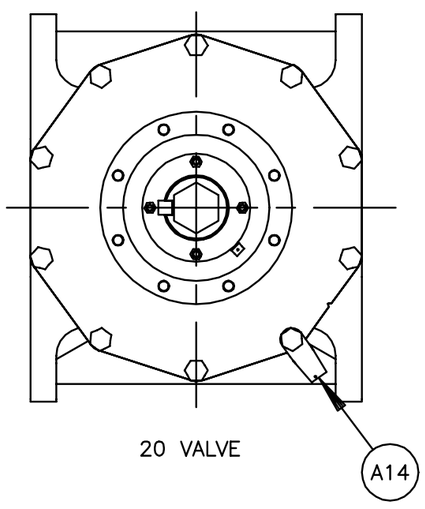


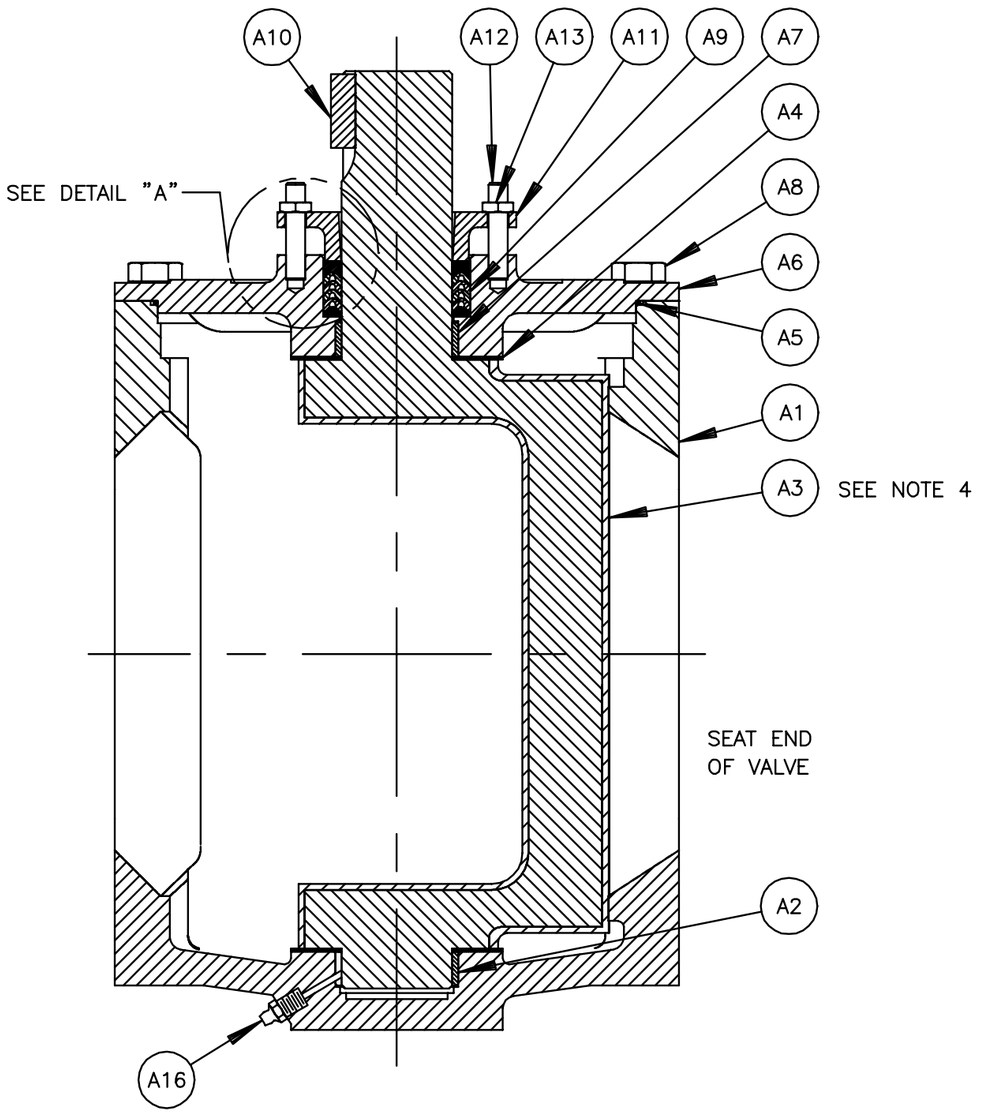


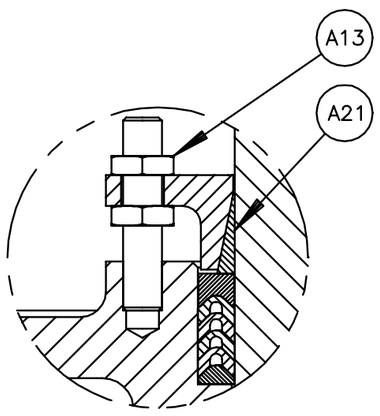
VIEW B – B



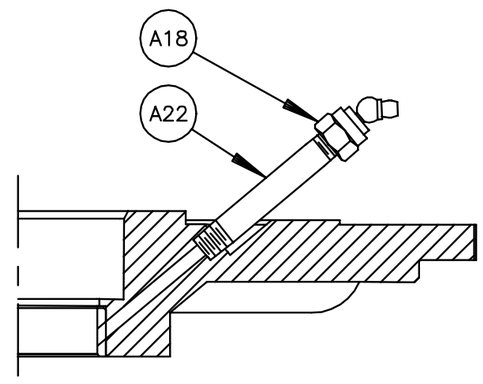








DETAIL "A"
3–8" VALVES
W/NT NUT ACTUATOR



SECTION C–C
GR OPTION–GREASE FITTING IN BONNET,
ALL ACTUATORS

NO	PART NAME	QTY
A1	BODY	1
A2	BEARING (BODY)	1
A3	PLUG	1
A4	GRIT EXCLUDER	2
A5	O–RING	1
A6	BONNET	1
A7	BEARING (BONNET)	1
A8	SCREW (3 & 4 VALVES)	4
A8	SCREW (5 – 12 VALVES)	6
A8	SCREW (14 & 18 VALVES)	8
A8	SCREW (20 VALVE)	10
A9	PACKING	–
A10	KEY (EXCEPT NT)	1
A11	GLAND	1
A12	STUD	2
A13	NUT (EXCEPT NT)	2
A13	NUT (NT)	4
A14	WARNING TAG	1
A15	PIPE PLUG (PU, PD OR PDU)	–
A16	GREASE FITTING (GR)	1
A17		
A18	GREASE FITTING (GR – WHEN REQUIRED)	1
A19	DATA PLATE	1
A20	DRIVE SCREW	2
A21	FRICTION CONE (NT)	1
A22	NIPPLE (GR – WHEN REQUIRED)	1

NOTE:

1. RECOMMENDED SPARE PARTS ARE ITEMS NUMBER A3, PLUG (IF RUBBER FACED), A4, A5 AND A9.
2. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.
3. CLOCKWISE ROTATION OF PLUG STEM CLOSES VALVE.
4. 3" – 8" PLUGS ARE THE ONLY SIZES FULLY RUBBER LINED.

G	F	E 62502 05/23/13	D 62259 04/30/12	C 50312 03/22/10	B 61612 06/10/08	A 61602 05/02/08	

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PEF ECCENTRIC VALVE ASSEMBLY
3–20, FLANGED

DOCT. CODE	DRAWN	APPROVED	
C1	SN	SN	A55403
	CHECKED SN	DATE 12/05/05	

MATERIALS OF CONSTRUCTION

DRAWING(S): A55403

WORK ORDER: 461153 **PART NO:** 9669499

DESCRIPTION: PEF,12,F1,CI,NBR,CR,TB7-S30SC0*GS-12A-HD16

ITEM	MATERIAL
A01	IRON, ASTM A126, CLASS B, HARDNESS TEST
A02	STAINLESS STEEL, TYPE 316L, SINTERED
A03	CHLOROPRENE (CR)
A03	DUCTILE IRON, ASTM A536, GRADE 65-45-12
A04	VIRGIN PTFE
A05	ACRYLONITRILE-BUTADIENE (NBR)
A06	IRON, ASTM A126, CLASS B, HARDNESS TEST
A07	STAINLESS STEEL, TYPE 316L, SINTERED
A08	CARBON STEEL, ZINC PLATED
A09	ACRYLONITRILE-BUTADIENE (NBR)
A10	STEEL, COLD DRAWN, AISI 1018
A11	IRON, ASTM A126, CLASS B
A12	CARBON STEEL, ZINC PLATED
A13	CARBON STEEL, ZINC PLATED
A14	STAINLESS STEEL, SERIES 300
A19	STAINLESS STEEL, TYPE 316
A20	STAINLESS STEEL, TYPE 18-8

MATERIALS OF CONSTRUCTION

DRAWING(S): A55403

WORK ORDER: 461153 **PART NO:** 9669500

DESCRIPTION: PEF,16,F1,CI,NBR,CR,TB6-S30SC0*MG-WR1-HD24

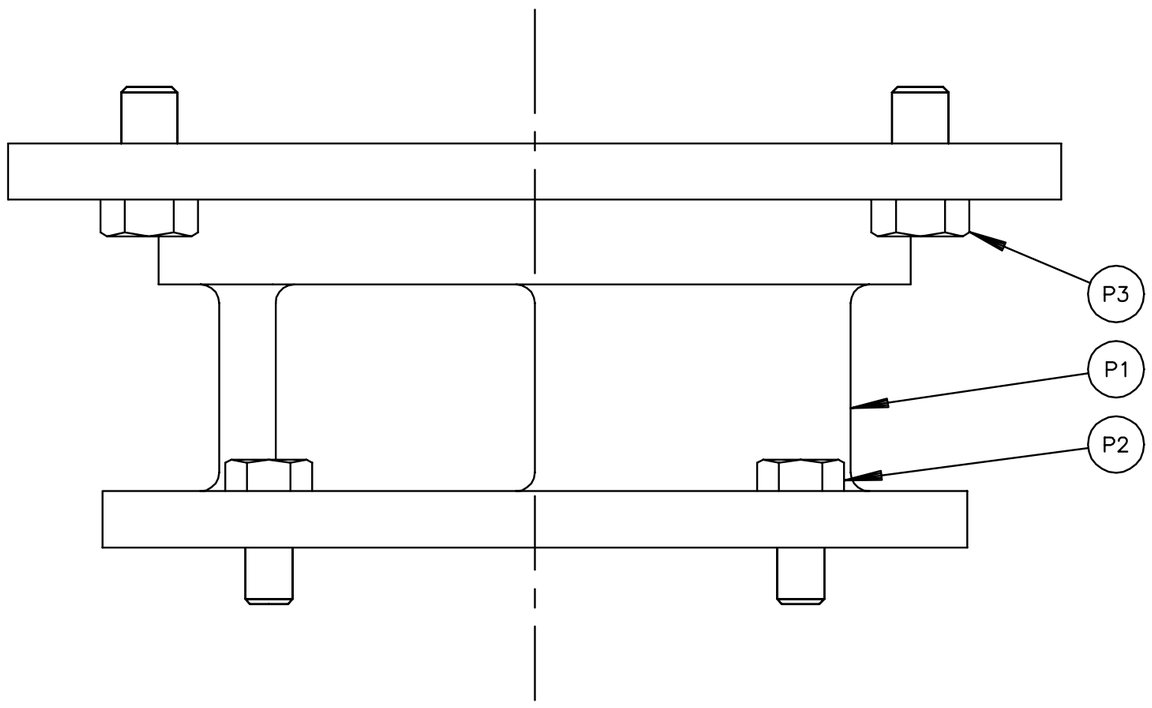
ITEM	MATERIAL
A01	IRON, ASTM A126, CLASS B, HARDNESS TEST
A02	STAINLESS STEEL, TYPE CF-8M, ASTM A743
A03	CHLOROPRENE (CR)
A03	DUCTILE IRON, ASTM A536, GRADE 65-45-12
A04	VIRGIN PTFE
A05	ACRYLONITRILE-BUTADIENE (NBR)
A06	IRON, ASTM A126, CLASS B, HARDNESS TEST
A07	STAINLESS STEEL, TYPE CF-8M, ASTM A743
A08	CARBON STEEL, ZINC PLATED
A09	ACRYLONITRILE-BUTADIENE (NBR)
A10	STEEL, COLD DRAWN, AISI 1018
A11	IRON, ASTM A126, CLASS B
A12	CARBON STEEL, ZINC PLATED
A13	CARBON STEEL, ZINC PLATED
A14	STAINLESS STEEL, SERIES 300
A19	STAINLESS STEEL, TYPE 316
A20	STAINLESS STEEL, TYPE 18-8

NO	PART NAME	QTY
P1	ADAPTOR	1
P2	SCREW (3 & 4 VALVES)	4
P2	SCREW (5 – 12 VALVES)	6
P2	SCREW (14 – 20 VALVES)	8
P3	SCREW	4

NOTE:

1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

ACTUATOR END



VALVE END

G F E D C B A

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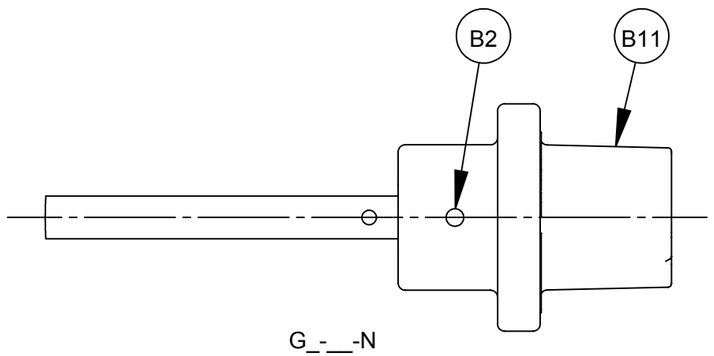
CONNECTING PARTS FOR G_–_A MANUAL ACTUATORS
FOR USE WITH PEF ECCENTRIC PLUG VALVES

DOCT. CODE	DRAWN	APPROVED	
C1	TC	SN	A55418
	CHECKED SN	DATE 11/02/05	



G_-__-N
W/WRENCHING SQUARE ACTUATOR

NOTE:

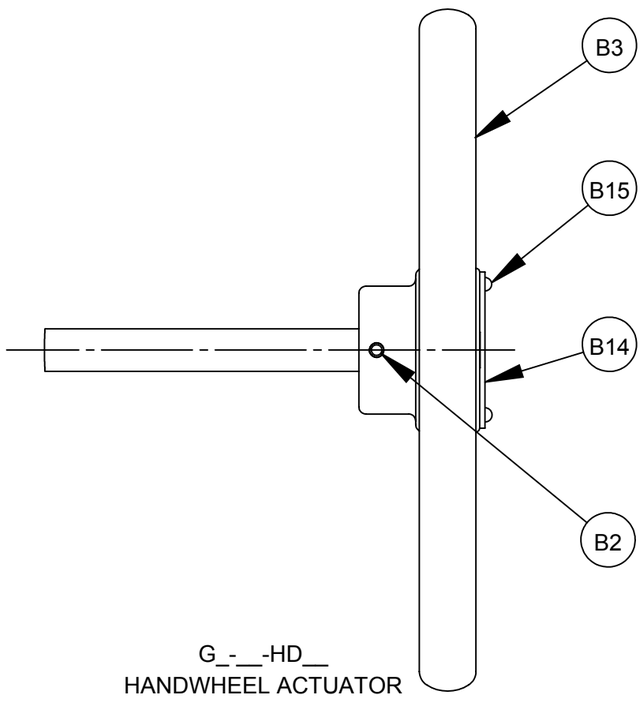
1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

2. TO CONVERT GS-(WEATHER PROOF) ACTUATOR TO GB-(BURIED SERVICE) ACTUATOR:

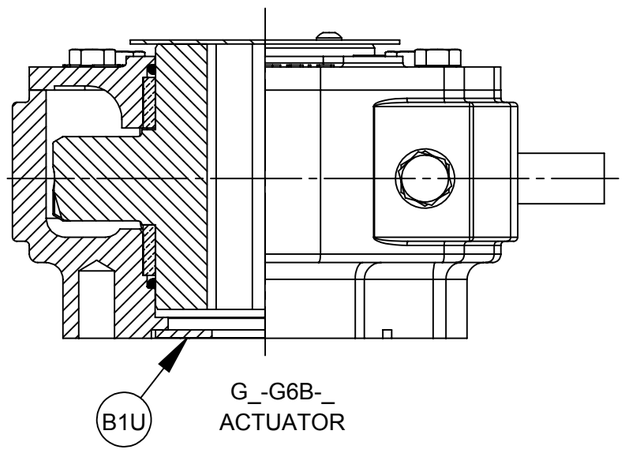
   A. REMOVE POINTER.

   B. APPLY A BEAD OF SILICONE SEALANT DOW RTV-732 (1055515) TO ACTUATOR MATING SURFACE OF COVER (B12), ASSEMBLE TO ACTUATOR AND ATTACH WITH SCREWS (B13).

   C. BEFORE ADJUSTING ACTUATOR STOPS (B1P), LOOSEN JAM NUTS (B1O) AND APPLY 2 WRAPS OF STRING PACKING (1013701) TO THE ACTUATOR STOP THREADS BETWEEN JAM NUTS AND ACTUATOR (B1).

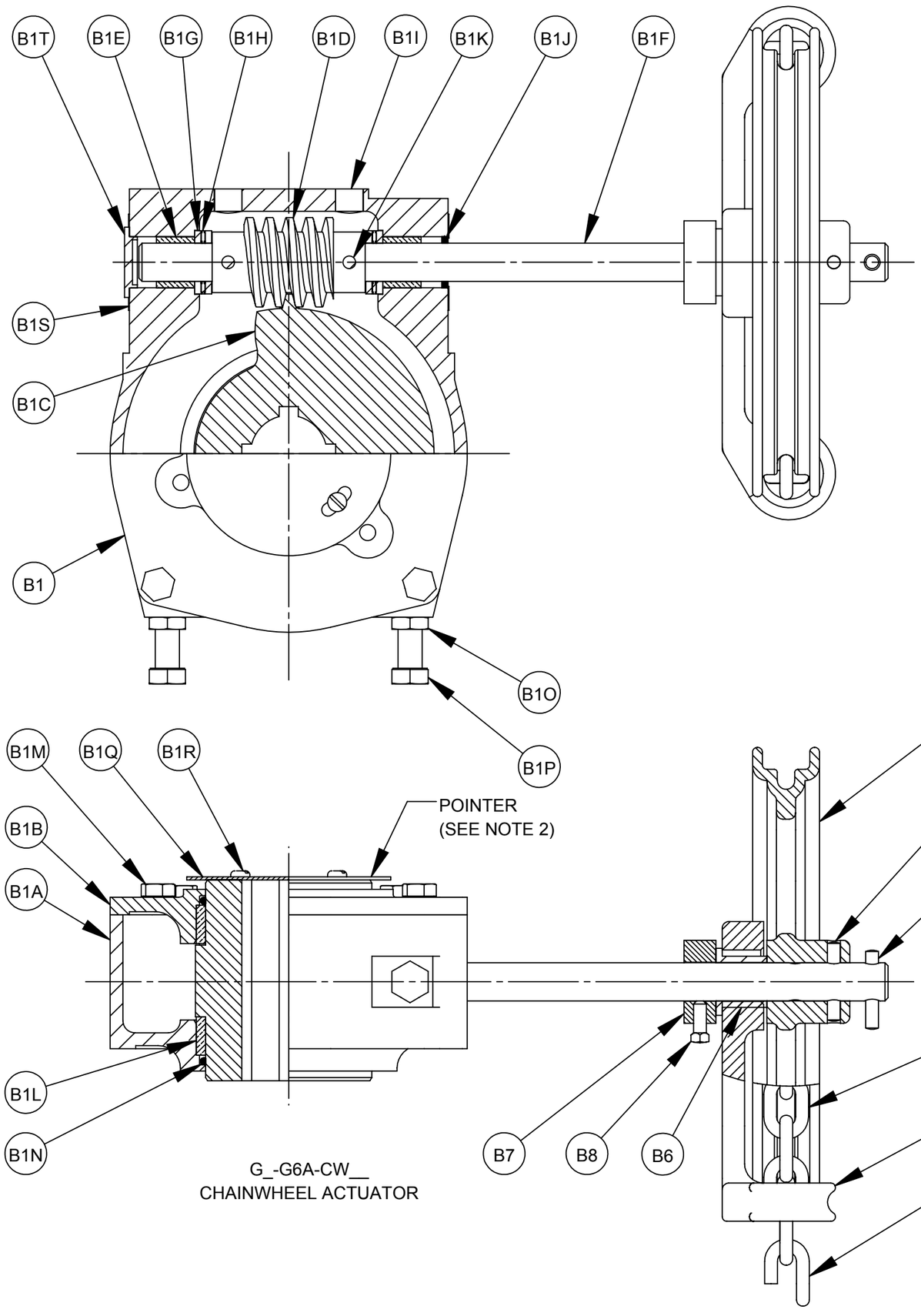


G_-__-HD__
HANDWHEEL ACTUATOR

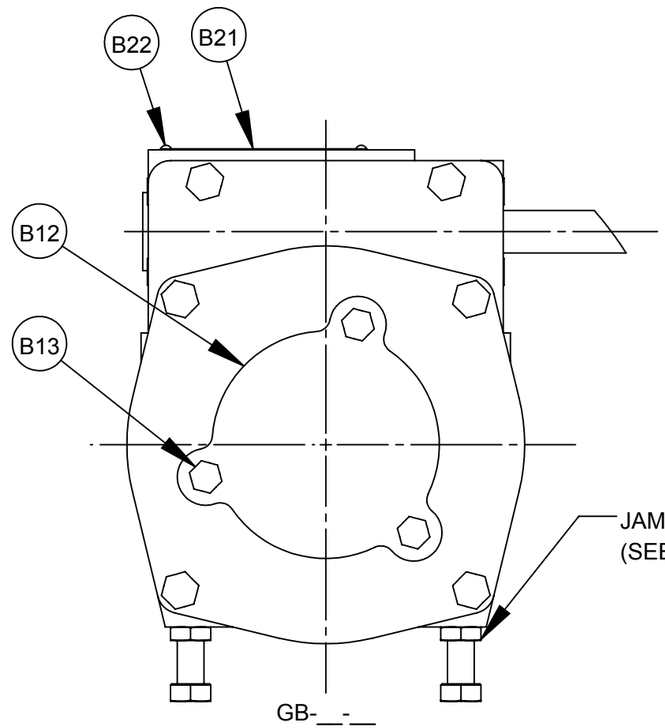


G_-G6B-_
ACTUATOR

NO	DESCRIPTION	QTY
B1	ACTUATOR ASSEMBLY	1
B1A	HOUSING	1
B1B	COVER	1
B1C	GEAR	1
B1D	WORM GEAR	1
B1E	BEARING	2
B1F	DRIVE SHAFT	1
B1G	BEARING RACE	4
B1H	THRUST BEARING	2
B1I	PIPE PLUG	2
B1J	SEAL	1
B1K	PIN	2
B1L	BEARING	2
B1M	SCREW	6
B1N	O-RING	2
B1O	NUT	2
B1P	SCREW	2
B1Q	POINTER	1
B1R	SCREW	2
B1S	PLUG	11
B1T	PLUG	1
B1U	PACKING WASHER (G6B ONLY)	1
B2	PIN (HANDWHEEL & WRENCHING SQUARE)	1
B2	PIN (CHAINWHEEL)	1
B3	HANDWHEEL	1
B4	CHAINWHEEL	1
B5	CHAIN GUIDE	1
B6	BEARING	1
B7	COLLAR	1
B8	SET SCREW	1
B9	CHAIN	-
B10	CLOSING LINK	1
B11	WRENCHING SQUARE	1
B12	COVER (BURIED SERVICE ONLY)	1
B13	SCREW (BURIED SERVICE ONLY)	3
B14	OPEN TAG (24", 30" & 36" HANDWHEEL ONLY)	1
B15	DRIVE SCREW (24", 30" & 36" HANDWHEEL ONLY)	2
B16	ADAPTOR	1
B17	SCREW	4
B18	LOCKWASHER	4
B19	BEARING	1
B20	PIN (CHAINWHEEL)	1
B21	DATA PLATE (BAW ONLY)	1
B22	DRIVE SCREW (BAW ONLY)	2

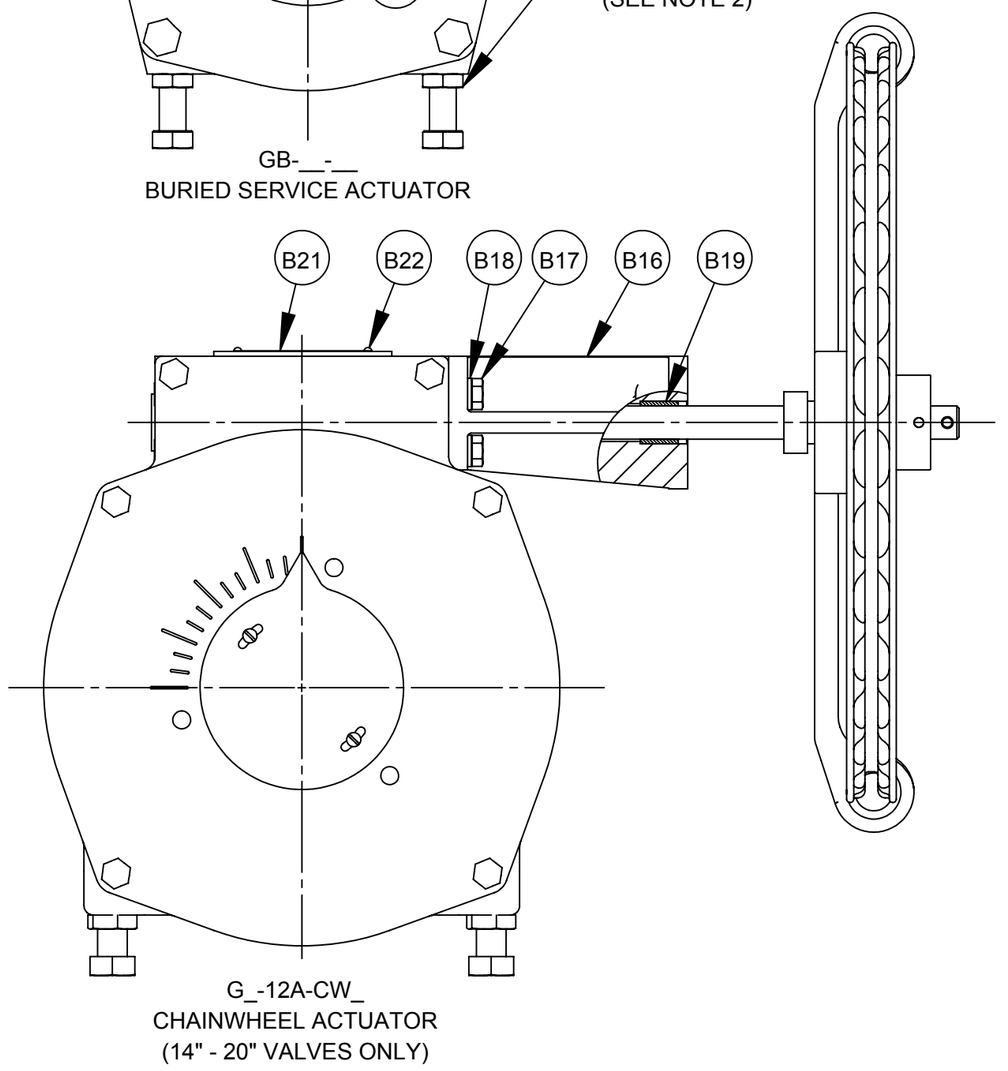


G_-G6A-CW__
CHAINWHEEL ACTUATOR



JAM NUT, G_-6A & G_-12A
(SEE NOTE 2)

GB-__-__
BURIED SERVICE ACTUATOR



G_-12A-CW_
CHAINWHEEL ACTUATOR
(14" - 20" VALVES ONLY)

G	F	E	D	C	B	A	
	08/11/16	03/08/16	06/28/13	07/15/09	01/05/09	05/20/08	
	60312	63180	50312	61790	50312	61613	

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www.dezurik.com

GS-6_, GB-6_ GS-12A & GB-12A MANUAL ACTUATORS WITH CHAINWHEEL, HANDWHEEL AND WRENCHING SQUARE (NUT)

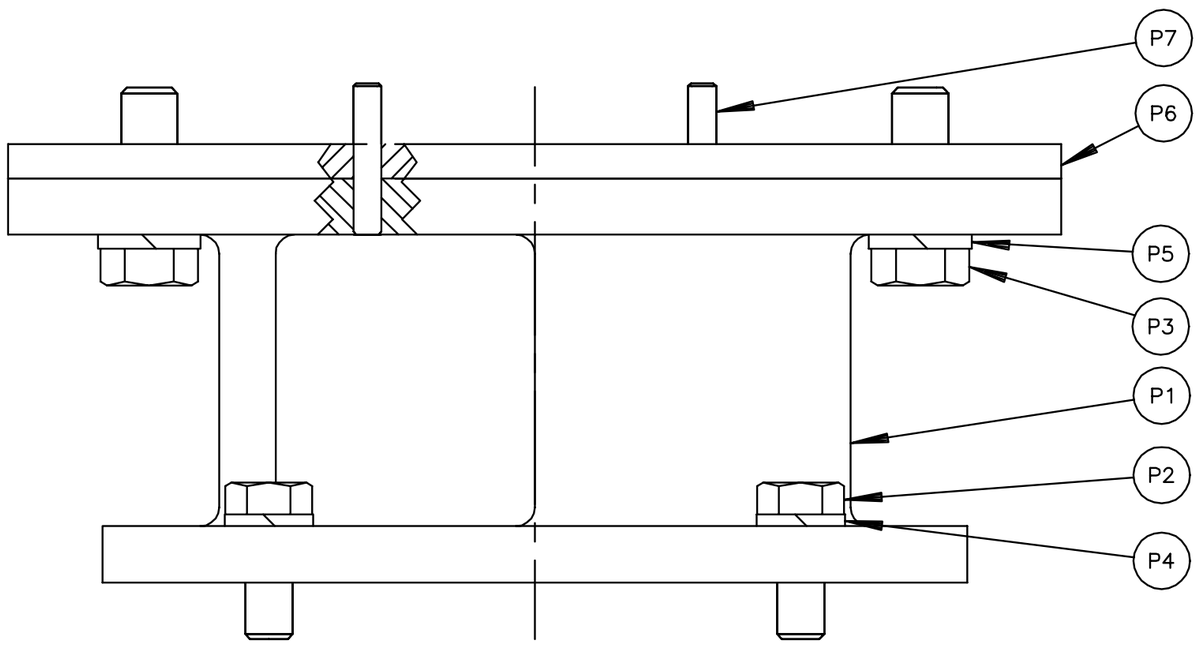
DOCT. CODE	DRAWN	APPROVED	
C1	TC	SN	A55615
	CHECKED: SN	DATE: 12/16/05	

NO	PART NAME	QTY
P1	ADAPTOR	1
P2	SCREW (3 & 4 VALVES)	4
P2	SCREW (5 – 12 VALVES)	6
P2	SCREW (14 – 20 VALVES)	8
P2	SCREW (24 – 36 VALVES)	10
P3	SCREW	–
P4	LOCKWASHER (3 & 4 VALVES)	4
P4	LOCKWASHER (5 – 12 VALVES)	6
P4	LOCKWASHER (14 – 20 VALVES)	8
P4	LOCKWASHER (24 – 36 VALVES)	10
P5	LOCKWASHER	–
P6	SPACER PLATE (WHEN REQUIRED)	1
P7	PIN (WHEN REQUIRED)	2

NOTE:

1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

ACTUATOR END



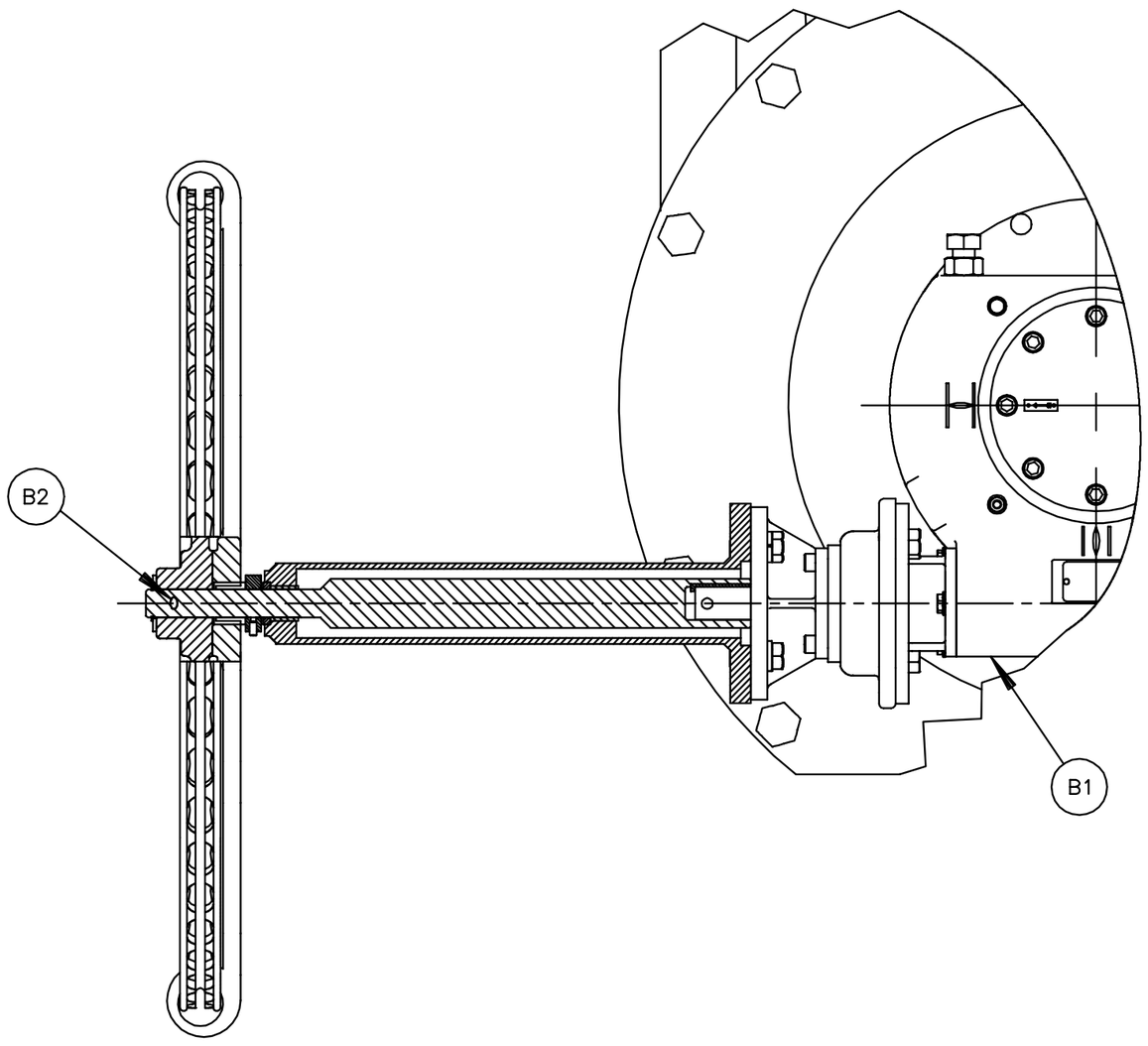
VALVE END

G	F	E	D	C	B	A 62188	11/11/11

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

CONNECTING PARTS FOR PURCHASED ACTUATORS
FOR USE WITH PEF ECCENTRIC PLUG VALVES

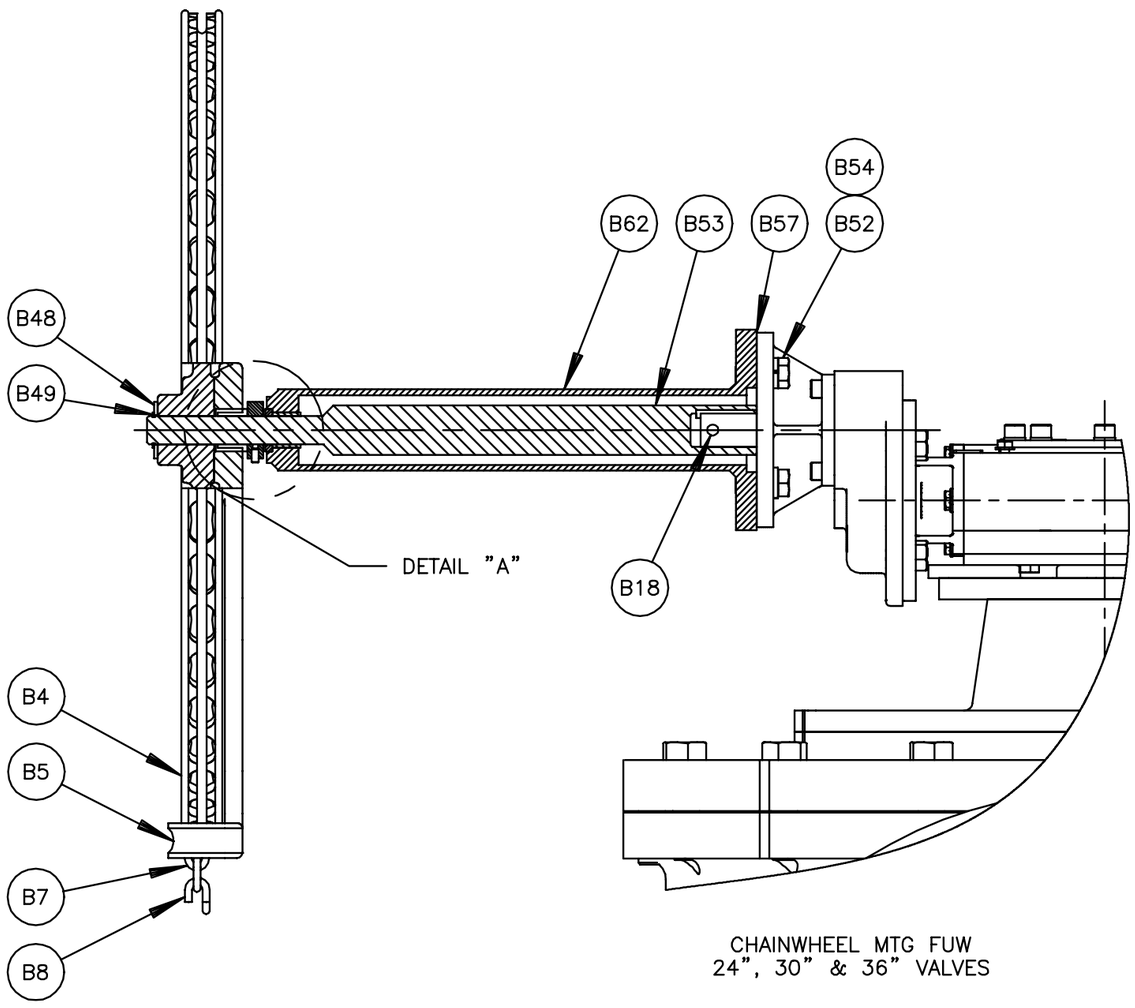
DOCT. CODE	DRAWN	APPROVED	
C1	BMP	GK	J92399
	CHECKED GK	DATE 08/02/10	



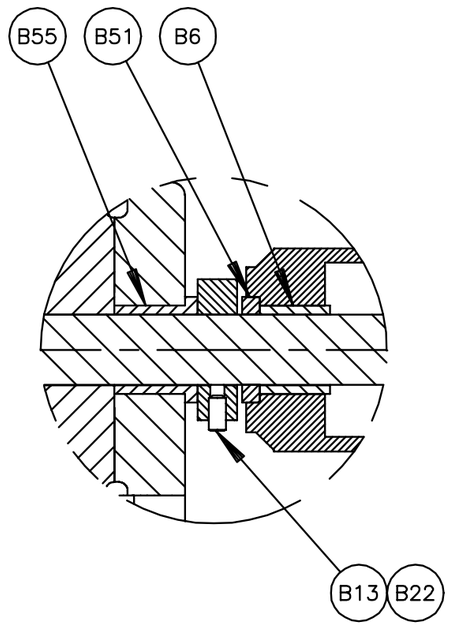
NO	PART NAME	QTY
B1	ACTUATOR	1
B2	PIN (CHAINWHEEL)	1
B3	HANDWHEEL	1
B4	CHAINWHEEL	1
B5	CHAIN GUIDE	1
B6	BEARING	1
B7	CHAIN	1
B8	CLOSING LINK	1
B9	WRENCHING SQUARE	1
B10	OPEN TAG (16,24,30 & 36 HANDWHEEL)	1
B11	DRIVE SCREW (16,24,30 & 36 HANDWHEEL)	2
B12	SET SCREW	1
B13	SCREW (SB16 OPTION ONLY)	1
B17	SHAFT EXTENSION	1
B18	PIN	1
B22	COLLAR AND SET SCREW (CHAINWHEEL)	1
B33	SET SCREW	1
B35	KEY	1
B48	WASHER	1
B49	RETAINING RING	1
B51	SEAL	1
B52	SCREW	4
B53	SHAFT EXTENSION	1
B54	WASHER	1
B55	BEARING	1
B57	GASKET	1
B62	EXTENSION FAB	1

NOTE:

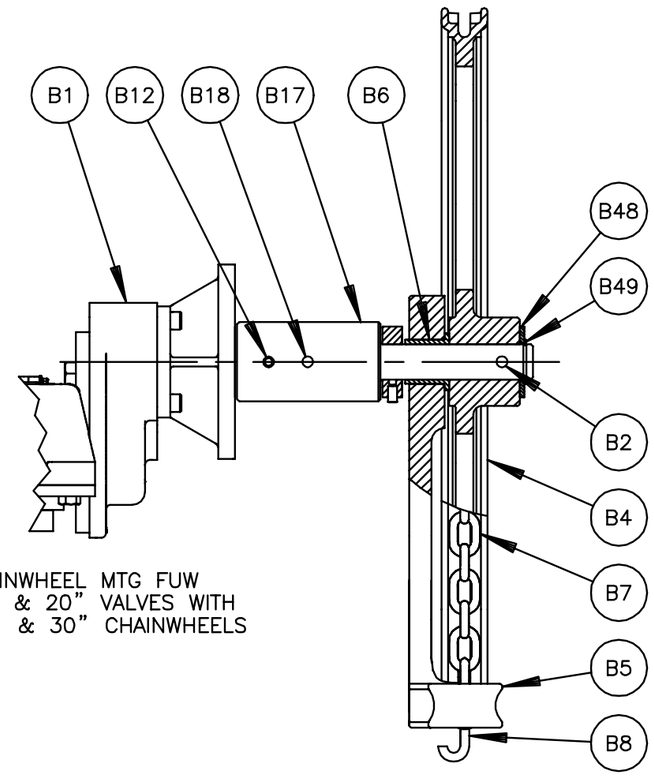
1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.
2. RECOMMENDED SPARE PARTS ARE ITEMS B51,B55, AND B57.



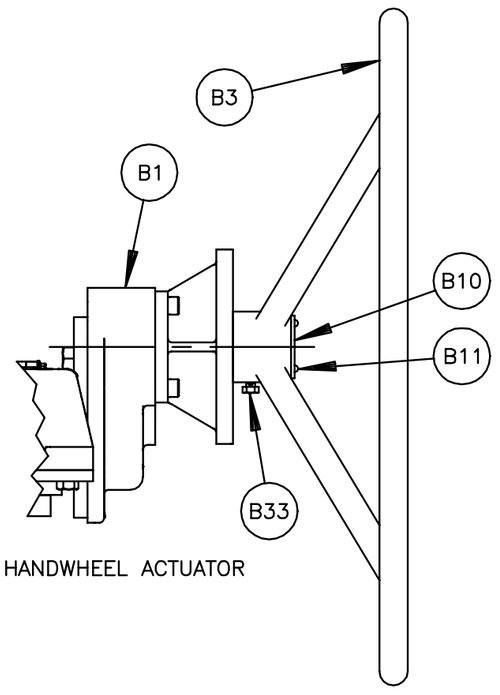
CHAINWHEEL MTG FUW
24", 30" & 36" VALVES



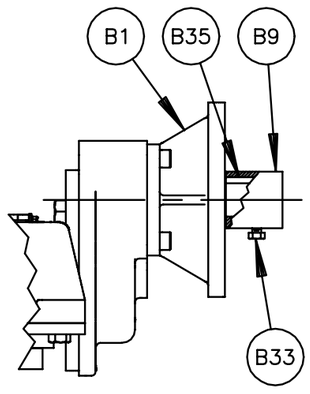
DETAIL "A"
ENLARGED



CHAINWHEEL MTG FUW
16",18" & 20" VALVES WITH
20", 24" & 30" CHAINWHEELS



HANDWHEEL ACTUATOR



NUT ACTUATOR

G	F	E	D	C 50312 02/04/14	B 50312 05/02/13	A 50312 06/18/12

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

MG–_ & MGB–_ MANUAL ACTUATORS WITH CHAINWHEEL, HANDWHEEL AND WRENCHING SQUARE (NUT)

DOCT. CODE	DRAWN	APPROVED	
C1	BMP	GK	J92454
	CHECKED GK	DATE 01/11/11	

DeZURIK
APCO | HILTON

RECOMMENDED LONG AND SHORT TERM STORAGE PROCEDURES

LONG-TERM STORAGE

1. All resilient seated valves shall be stored in the open (unseated) position.

2. All valves with adjustable packing glands should have the packing gland loosened prior to storage.

3. Valves shall be separately packaged in a sealed polyethylene plastic enclosure with a minimum of one package of desiccant inside, dependent upon valve size.

4. Prepared valves shall be warehoused in a clean, dry, indoor facility on concrete or raised racks, with temperature ranging from 35°F to 95°F (2°C to 35°C).

5. Valves shall not be near electric motors or other equipment which may emit Ozone which can cause deterioration of elastomers used for valve and actuator components.

6. The valves shall be inspected periodically to replace the desiccant if required, and to repair any damage to the polyethylene plastic enclosures.

7. Valves with cylinder operators and control valves which are stored for extended periods may be subject to cylinder blow-by caused by permanent distortion of any of the seals. Valves should be operated prior to installation and damaged seals replaced.

8. Valves with electric motor operators shall be stored in accordance with the individual motor manufacturer's recommended long-term storage procedures in addition to Paragraphs 1, 2 and 3 above.

9. All electrical components, if applicable, should be inspected and all electrical contacts cleaned before operation.

10. Valves shall be enclosed in fully sheathed wooden crates or boxes.

SHORT-TERM STORAGE

1. Valve should be protected from the weather, avoid exposure to excessive moisture or dirt. Store at temperatures ranging from 35°F to 95°F (2°C to 35°C).

Form No. 1454-0712

December 5, 2016

APPROVAL DRAWINGS

PROJECT NAME
Cattail Branch Pump Station - Budget Quote

PURCHASE ORDER
70797

VALVE TYPE
ECCENTRIC PLUG VALVE

CONTRACTOR:	SYDNOR HYDRO INC PO BOX 27186 RICHMOND, VA 23261
LOCAL SUPPLIER:	FREEMIRE & ASSOCIATES INC 1215 OLD DORSEY ROAD HARMANS, MD 21077 410-768-8500
MANUFACTURER:	DeZURIK 250 RIVERSIDE AVE NORTH SARTELL, MN 56377 (320) 259-2000
Factory Work Order	461154
Factory Sales Order	619666

TABLE OF CONTENTS

A Data Sheet is included for each line item on the purchase order.
Document numbers are listed at the bottom of the Data Sheet.
Any one drawing may apply to more than one item number.
All documents are assembled in alpha/numeric order within each section.

DeZURIK

Submittal Data Sheet
Date: 12/05/16

SYDNOR HYDRO INC

PO BOX 27186

RICHMOND, VA
23261

P.O. 70797
FACTORY ORDER NO 461154
FACTORY SALES ORDER NO 619666
REV 0

PROJ. NAME Cattail Branch Pump Station - Budget Quote

Fact. ITEM	Cust. ITEM	QTY	DESCRIPTION	PART NO. **9669452**
1		2	PEF,12,F1,CI,NBR,CR,TB7-S30SC0*X*A28267	

Style	PEF	DeZURIK Eccentric Full Port Plug Valve
Size	12	12 Inch (300mm); SST Bearings; Welded-in Nickel Seat
End Connection	F1	Flanged Drilling; ASME Class 125/150
Body Material	CI	Cast Iron
Packing	NBR	Acrylonitrile-Butadiene; Temperature to 250° F.
Plug & Facing	CR	Chloroprene; -20 to 180°F (-29 to 83°C)
Option	TB7	Certified Seat Leat Test 175 PSI Reverse Pressure per AWWA C517 with actutor stop setting at 175 PSI Reverse. Includes DeZURIK Standard Certified Seat and Shell Hydro Test Reports.
Option	S30SC0	8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Interior with Standard (SP10) surface prep and 8 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Exterior with Standard (SP10) surface prep
Act Type	X	Specified in Modifier Below
Modifier	A28267	AUMA SA07.6/GS100.2/AC01.2 - P/N 1431977

RELATED DOCUMENTS

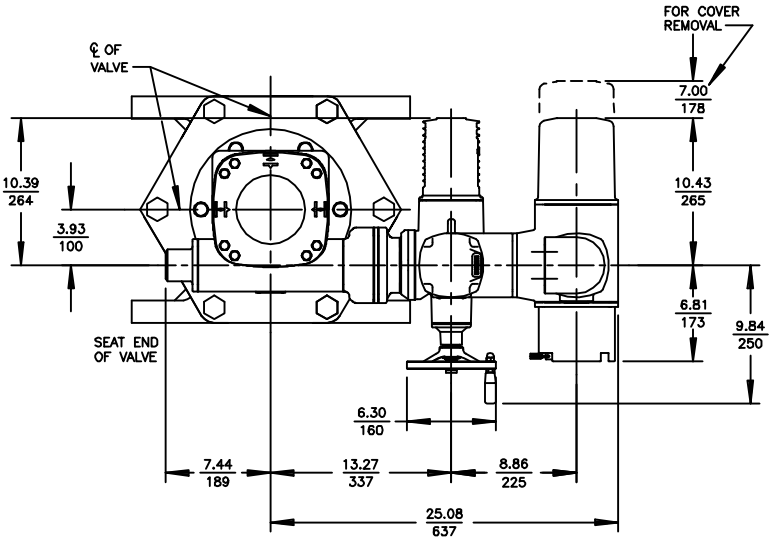
J93405	DWG INST PEF SAR7/GS100.3 AUMA
A55403	DWG VALVE ASSY PEF F1 3-20"
J36658	DWG CONN PARTS PEF PUR/ACT
WIRING DIAGRAM	TPCA-3A2-1D1-D000TPA00R100-0IA-000-S REV-003

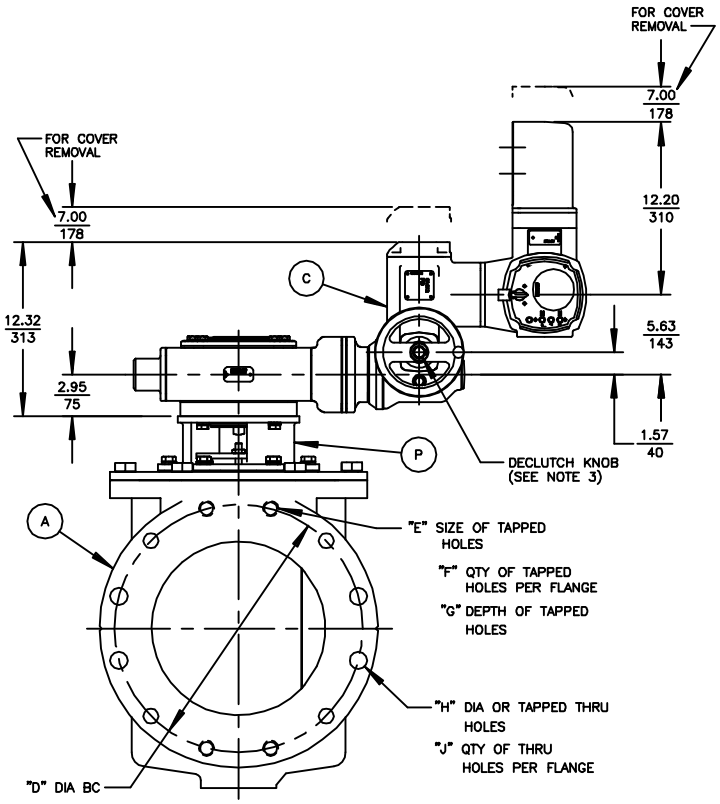
VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS									
INCH	MM	A	B	C	D	E	F	G	H	J	K
3	80	.83 / 21	8.00 / 203	3.56 / 90	6.00 / 152	5/8–11 UNC	4	.81 / 21	N/A	N/A	6.68 / 170
4	100	1.02 / 26	9.00 / 229	4.43 / 113	7.50 / 191	5/8–11 UNC	4	.62 / 16	.75 / 19	4	7.31 / 186
5	125	1.04 / 26	10.50 / 267	5.79 / 147	8.50 / 216	3/4–10 UNC	4	.69 / 18	3/4–10 UNC	4	8.44 / 214
6	150	1.04 / 26	10.50 / 267	5.79 / 147	9.50 / 241	3/4–10 UNC	4	.69 / 18	.88 / 22	4	8.44 / 214
8	200	1.23 / 31	11.50 / 292	7.65 / 194	11.75 / 298	3/4–10UNC	4	.75 / 19	.88 / 22	4	10.78 / 274
10	250	1.30 / 33	13.00 / 330	9.19 / 233	14.25 / 362	7/8 – 9 UNC	8	.66 / 17	1.00 / 25	4	12.19 / 310
12	300	1.36 / 35	14.00 / 356	11.53 / 293	17.00 / 432	7/8 – 9 UNC	8	.75 / 19	1.00 / 25	4	14.25 / 362

A	VALVE
C	MOTOR & GEAR UNIT
P	CONNECTING PARTS

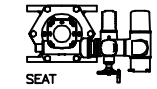
NOTE:

1. FLANGES ARE FLAT FACED WITH THICKNESS, DIAMETER AND DRILLING TO CLASS 125 ANSI STANDARD B16.1, EXCEPT FOR TAPPED HOLES AS INDICATED. SEE A55467 FOR NON–ANSI FLANGE DATA.
2. INSTALLATION NOTE:
   - FOR LIQUIDS & GASES: INSTALL VALVE WITH HIGHER PRESSURE AGAINST END OPPOSITE SEAT.
   - FOR SUSPENDED SOLIDS, SLURRIES, ETC: INSTALL VALVE WITH HIGHER PRESSURE AGAINST SEAT END. IN HORIZONTAL PIPELINES, VALVE SHOULD BE INSTALLED ON IT'S SIDE SO PLUG ROTATES TO THE TOP OF THE PIPELINE WHEN OPEN.
3. PULL OUT KNOB TO ENGAGE FOR MANUAL OPERATION. UNIT REMAINS IN HAND OPERATION UNTIL MOTOR IS ENERGIZED.

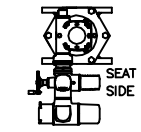




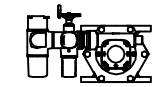
ACTUATOR MOUNTING POSITIONS



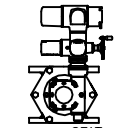
STANDARD POSITION SHOWN ON THIS DRAWING



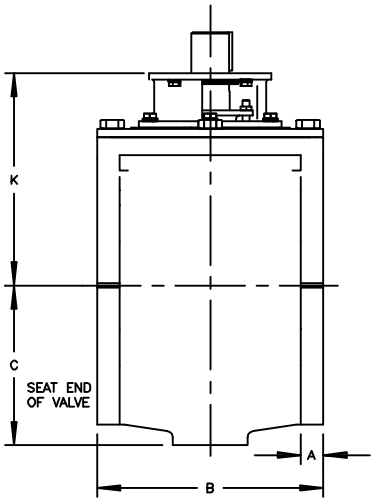
90° POSITION



180° POSITION



270° POSITION

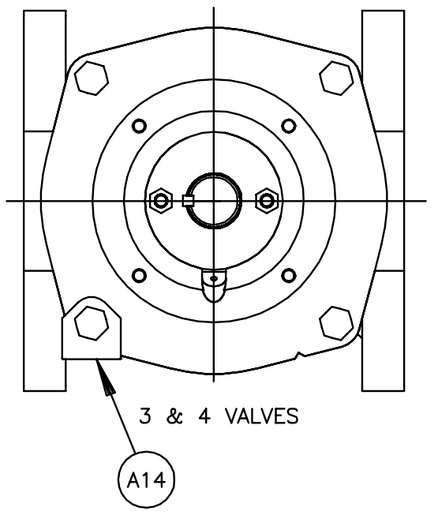


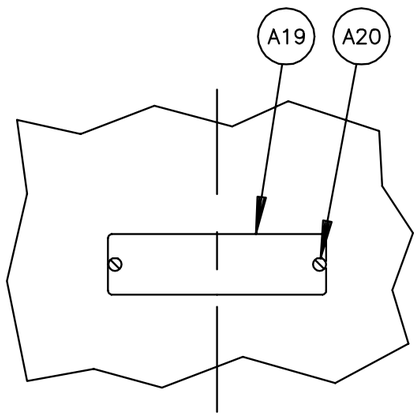
D	E	M	B	U	B	A	REV	11/23/16

DeZURIK APCO | HILTON
www.dezurik.com

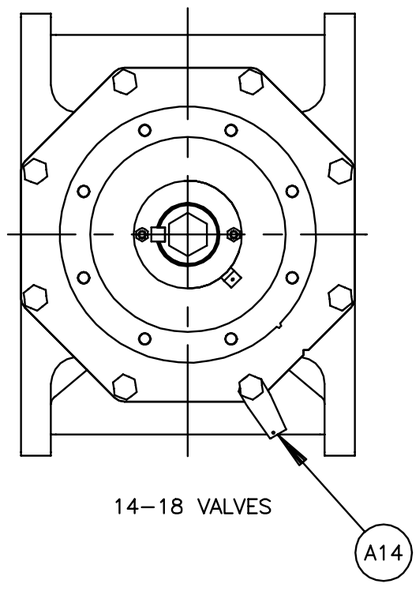
PEF 100% PORT ECCENTRIC VALVES SIZE 3–12 FLANGED
AUMA SA(R)07.2/07.6/GS100.3 AUMA–MATIC (3 PH)
MOTOR ACTUATOR

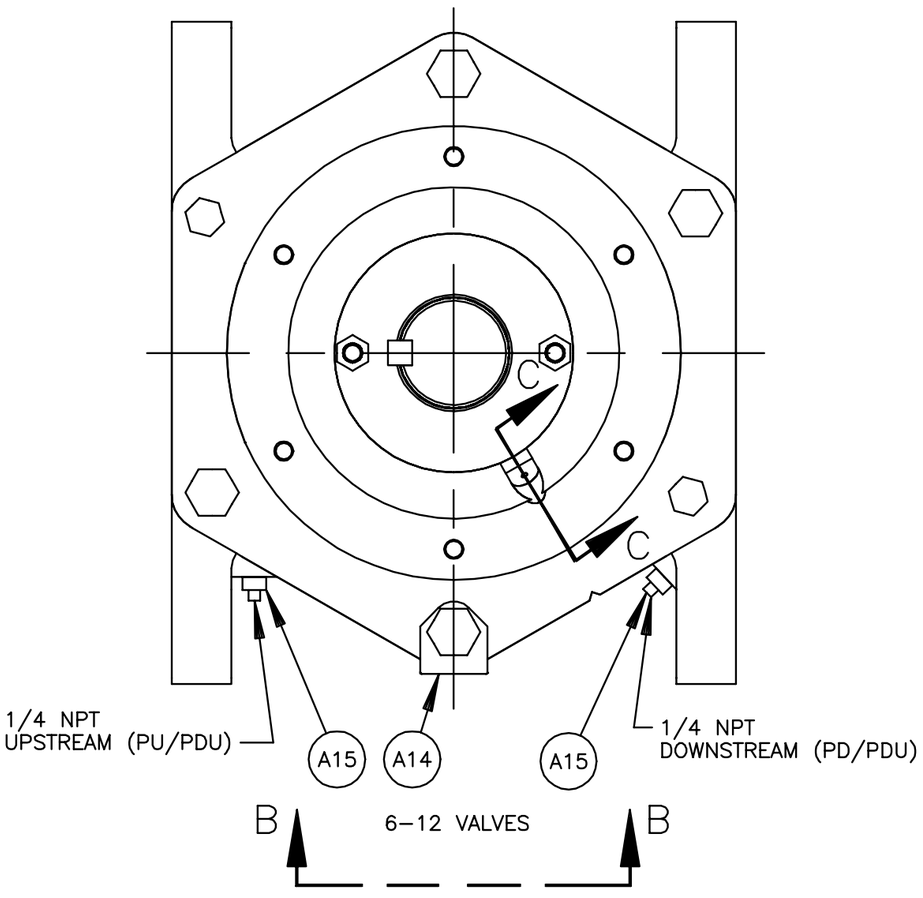
DOCT. CODE	DRAWN	APPROVED	
C1	BMP	JDB	J93405
	CHECKED JDB	DATE 11/23/16	

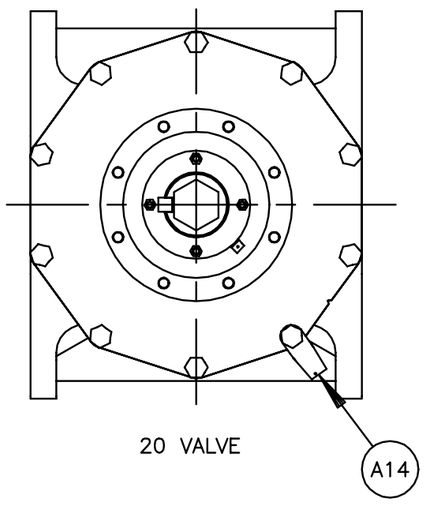


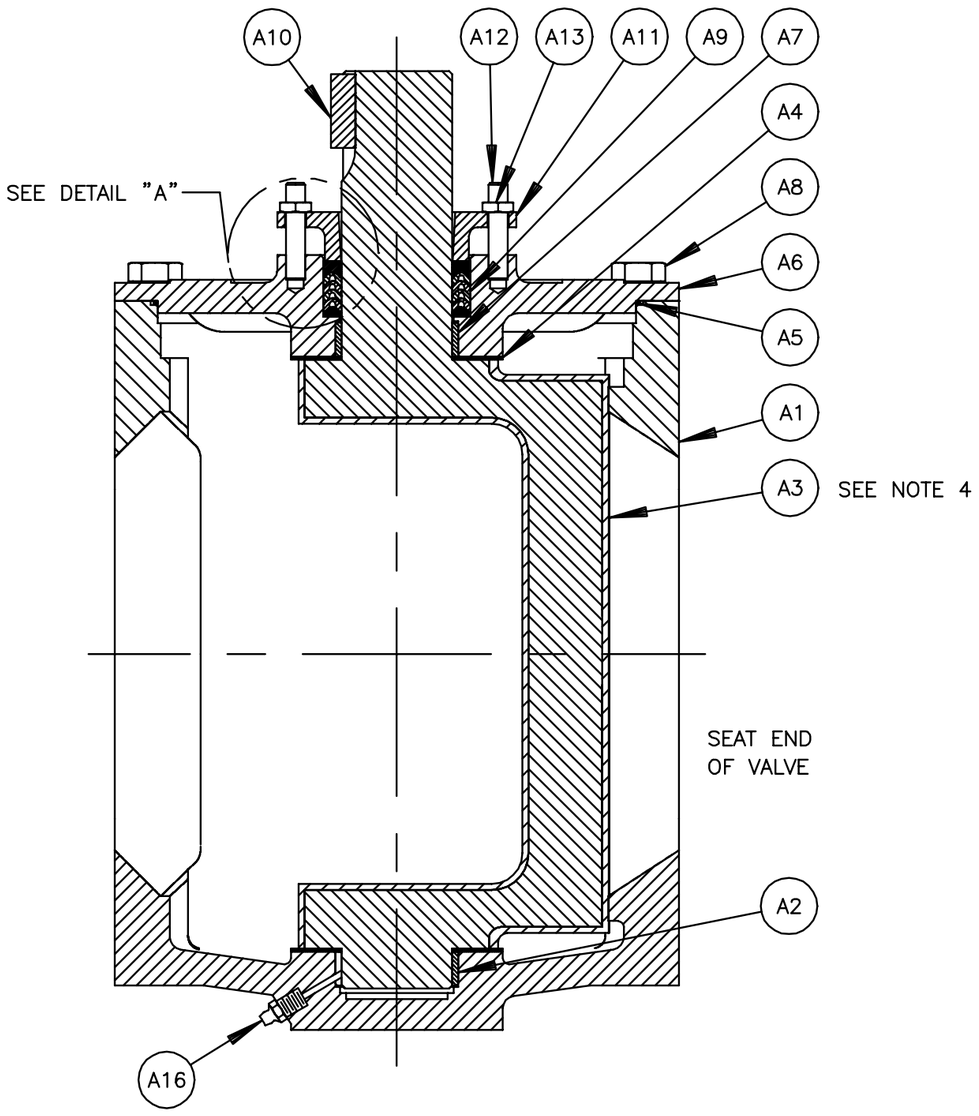


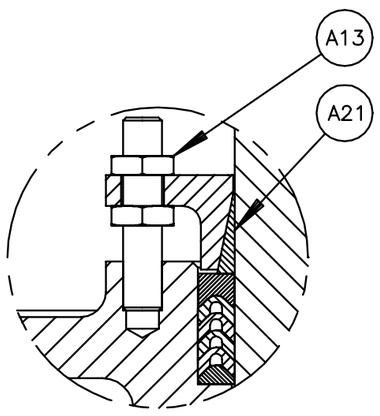
VIEW B – B



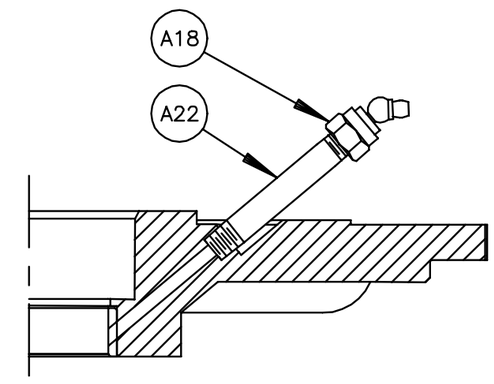








DETAIL "A"
3–8" VALVES
W/NT NUT ACTUATOR



SECTION C–C
GR OPTION–GREASE FITTING IN BONNET,
ALL ACTUATORS

NO	PART NAME	QTY
A1	BODY	1
A2	BEARING (BODY)	1
A3	PLUG	1
A4	GRIT EXCLUDER	2
A5	O–RING	1
A6	BONNET	1
A7	BEARING (BONNET)	1
A8	SCREW (3 & 4 VALVES)	4
A8	SCREW (5 – 12 VALVES)	6
A8	SCREW (14 & 18 VALVES)	8
A8	SCREW (20 VALVE)	10
A9	PACKING	–
A10	KEY (EXCEPT NT)	1
A11	GLAND	1
A12	STUD	2
A13	NUT (EXCEPT NT)	2
A13	NUT (NT)	4
A14	WARNING TAG	1
A15	PIPE PLUG (PU, PD OR PDU)	–
A16	GREASE FITTING (GR)	1
A17		
A18	GREASE FITTING (GR – WHEN REQUIRED)	1
A19	DATA PLATE	1
A20	DRIVE SCREW	2
A21	FRICTION CONE (NT)	1
A22	NIPPLE (GR – WHEN REQUIRED)	1

NOTE:

1. RECOMMENDED SPARE PARTS ARE ITEMS NUMBER A3, PLUG (IF RUBBER FACED), A4, A5 AND A9.
2. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.
3. CLOCKWISE ROTATION OF PLUG STEM CLOSES VALVE.
4. 3" – 8" PLUGS ARE THE ONLY SIZES FULLY RUBBER LINED.

G							
F							
E	62502	05/23/13					
D	62259	04/30/12					
C	50312	03/22/10					
B	61612	06/10/08					
A	61602	05/02/08					

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

PEF ECCENTRIC VALVE ASSEMBLY
3–20, FLANGED

DOCT. CODE	DRAWN	APPROVED	
C1	SN	SN	A55403
	CHECKED SN	DATE 12/05/05	

MATERIALS OF CONSTRUCTION

DRAWING(S): A55403

WORK ORDER: 461154 **PART NO:** 9669452

DESCRIPTION: PEF,12,F1,CI,NBR,CR,TB7-S30SC0*X*A28267

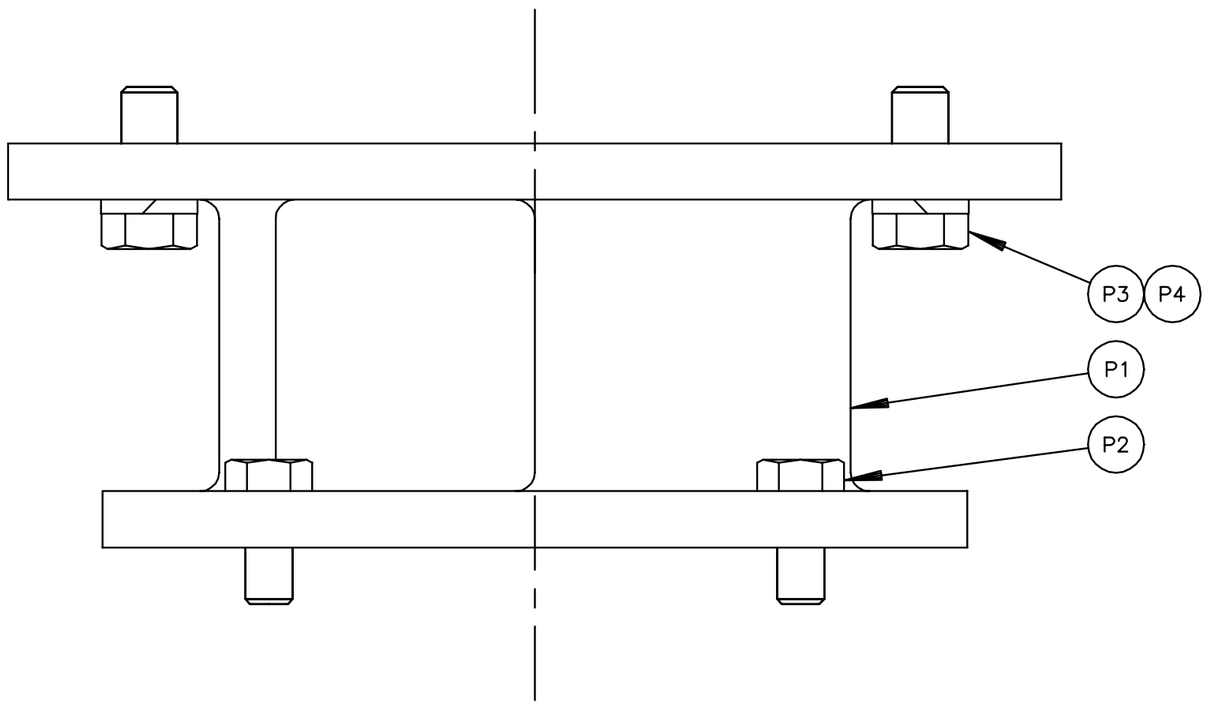
ITEM	MATERIAL
A01	IRON, ASTM A126, CLASS B, HARDNESS TEST
A02	STAINLESS STEEL, TYPE 316L, SINTERED
A03	CHLOROPRENE (CR)
A03	DUCTILE IRON, ASTM A536, GRADE 65-45-12
A04	VIRGIN PTFE
A05	ACRYLONITRILE-BUTADIENE (NBR)
A06	IRON, ASTM A126, CLASS B, HARDNESS TEST
A07	STAINLESS STEEL, TYPE 316L, SINTERED
A08	CARBON STEEL, ZINC PLATED
A09	ACRYLONITRILE-BUTADIENE (NBR)
A10	STEEL, COLD DRAWN, AISI 1018
A11	IRON, ASTM A126, CLASS B
A12	CARBON STEEL, ZINC PLATED
A13	CARBON STEEL, ZINC PLATED
A14	STAINLESS STEEL, SERIES 300
A19	STAINLESS STEEL, TYPE 316
A20	STAINLESS STEEL, TYPE 18-8

NO	PART NAME	QTY
P1	ADAPTOR	1
P2	SCREW (3 & 4 VALVES)	4
P2	SCREW (5 – 12 VALVES)	6
P2	SCREW (14 – 20 VALVES)	8
P3	SCREW	–
P4	LOCKWASHER	–

NOTE:

1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

ACTUATOR END



VALVE END

G	F	E	D	C	B	A 50312 02/13/07

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

CONNECTING PARTS FOR PURCHASED ACTUATORS
FOR USE WITH PEF 100% PORT ECCENTRIC PLUG VALVES

DOCT. CODE	DRAWN	APPROVED	
C1	BMP	TH	J36658
	CHECKED TH	DATE 12/20/05	

AUMA Datasheet

12-02-2016 13:52:08
AUMA Order: A000163132 **Datasheet:** 1
Com-No.: A163132-001

AUMA Actuators, Inc. USA
www.auma-usa.com
Phone: (724) 743-2862 Fax: (724) 743-4711

Customer: **DeZurik**
PO No: **461154**
Customer Item: **1**
Qty: **2**
Valve/Gate Size & Type: **12" PEF**

Certified by: **Dave Bernhardt**
Certified date: **11/23/16**
Revision: **0**
AUMA Line: **2**
Project: **Cattail Branch**

Line Number(s): **2, 3**
Qty: **2**

Tags:

(Qty: 2)	Part No:	**1431977**
(Qty: 2)	Paper Tag:	**1266552**

DEVICE CHARACTERISTICS

AUMA product:	**Quarter-turn electric actuator**
Rated output torque [lbs.ft.]:	**2,849**
Rated output torque [inch.lbs.]:	**34,188**
Rated output torque [Nm]:	**3,863**
Approximate weight (lbs.):	**149**

SERVICE CONDITIONS

Version:	**Weather-proof (non-hazardous location)**
Operating mode:	**OPEN - CLOSE duty**
Enclosure protection:	**NEMA types 4X/ 6P •**
Color:	**AUMA silver-grey (similar to RAL 7037)**
Ambient temperature:	**-30 °C to +70 °C (-22 °F to +158 °F)**
Nameplates:	**English - aluminum (EN-AL)**
Corrosion protection:	**KN**

ELECTRICAL DATA

Mains voltage:	**460 Volts AC**
Phase:	**3-Ph**
Frequency:	**60 Hz**
Type of duty:	**S2 - 15 min.**
Motor protection:	**(D-1T-O140) 3 thermal switches, 1 N.C. contact per phase wired in series 140°C, class F insulation, tropicalized winding**
Motor type:	**3 ph AC motor type AD/VD**

AUMA Actuators, Inc. USA
www.auma-usa.com
Phone: (724) 743-2862 Fax: (724) 743-4711

MOTOR DATA

Motor designation :	**AD00063-2-0.50**
Nominal power (HP) :	**3/4**
Nominal power (kW) :	**0.50**
Nominal speed (RPM) :	**3,360**
Nominal current (FLA) :	**1.8**
Current approx. Imax. (RTA) :	**3.3**
Starting current (LRA) :	**9.4**
NEC code letter :	**G**
COS :	**0.62**

ACTUATOR FEATURES

SA model:	**SA 07.6**
Output speed:	**216 RPM (actuator non-selflocking)**
Valve attachment:	**FA10**
Output drive:	**FA10-B3 Ø=20mm; key width=6mm; key height 6mm**
Mechanical position indicator:	**(11) with symbols OPEN and CLOSED, continuous**
Torque switches:	**(0-M) MWG**
Limit switches:	**(0-M) MWG**
Position transm.:	**(30.2) MWG (for AC 01.2)**
Turns per stroke:	**52 turns per stroke at output drive act.**
Operating time (seconds):	**14**
Stem protection tube:	**Without stem tube, with protective threaded screw plug G 1¼**
Heater:	**(22.5) 24 V in combination with controls: 5 W**
Motor heater:	**(23.11) 100 V - 125 V motor compartment heater: 12.5 W**
Torque switching:	**Setting range 15-37 lbs.ft.**
Set to close lbs.ft.:	**27.3**
Set to open lbs.ft.:	**27.3**
Handwheel:	**6.3" (160mm)**
Close direction:	**RH - clockwise**
Limit switching:	**(200) 1-500 rev/stroke adjustable**
Lubricant:	**F15 - Shell ALVANIA 1029 grease**
Electrical connection:	**(S0-000) actuator plug for mounting AM/SEM/AC**

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GS GEARBOX

GS model:	**GS 100.3**
Reduction ratio i:	**208:1**
Mechanical adv.:	**77.0**
Valve coupling:	**Unbored short spline valve shaft coupling**
Explosion protection:	**(M000) without**
Mounting position:	**Position A**
Swing angle:	**92 degrees, adjusted at factory •**
Version:	**RR: input shaft clockwise, clockwise rotation of the valve shaft to close**
Valve attachment:	**FA16 according to MSS SP-101 without spigot**
Housing material:	**Cast iron housing GJL-250 •**
Worm wheel material:	**Bronze worm wheel**
Gearbox input:	**(FA10-EW20) FA10, input shaft Ø=20mm**
Lubricant:	**F15 - Shell ALVANIA 1029 grease**
Enclosure:	**IP68-8 - continuous submersible duty, max. 26' (8m) head of water, with pointer cover •**
GS cover mounting position:	**Position A**

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ACTUATOR CONTROLS	
AUMATIC version:	**AC 01.2**
Feedback E2:	**MWG magnetic limit/ torque sensor (non-intrusive setting)**
Max. motor power:	**(B00.01) Contactors for power class A1**
Motor protection:	**(C00.01) thermal switch, automatic reset**
Interface:	**(D00.01) Parallel I/O Interface**
Positioner:	**(F00.01) Without, prepared for retrofit •**
Input signals:	**(R00.01) CLOSE, OPEN, STOP, EMERGENCY •**
Control voltage:	**(E00.02) 100 - 120 V AC**
Electronics supply:	**(A10.01) 24 V DC internal •**
Output aux. voltage:	**(A30.02) 115 V AC - 30mA •**
Output contacts:	**(H00.03) 6 output contacts: 6 NO/NC without common 5A •**
Output signals:	**(S00.01) standard configuration: Fault, Close, Open, Remote, Torque Close, Torque Open**
Local controls:	**(L00.01) selector switch LOCAL-OFF-REMOTE with padlock; push buttons OPEN-STOP-CLOSE-RESET; large graphic LCD with 200 x 100 pixels; Bluetooth enabled**
Indication lights:	**(L10.02) CLOSED:green, TRQ-CL:blue, TH:yel., TRQ-OP:violet,OPEN:red, BLUETOOTH:blue (with numbers) •**
Face plate:	**(US) English •**
Tolerance mains voltage:	**(A40.01) +/- 10%**
Electrical connection:	**(SH-080) plug/socket 100mm, 2 x ¾" NPT; 1 x 1 ¼" NPT •**
Heater:	**(Q00.05) heater 24 V internally supplied, motor heater externally supplied**
Analog output 1:	**(P00.02) Position feedback: 4-20mA**
Analog output 2:	**(P10.02) Torque feedback: 4-20mA**
Blinker version:	**(N00.02) USA, lights illuminated in mid travel (electronic)**
Display language:	**English**
Switch off in CLOSE:	**(042.01) Limit**
Switch off in OPEN:	**(043.01) Limit**
Self retaining LOCAL:	**(033.03) In direction OPEN and CLOSE**
Self retaining REMOTE:	**(052.00) OFF**
Mounting position:	**Position A**
Mounting pos. local controls:	**Position A-1, selector switch at 6 o'clock in relation to base of controls (standard for SA/SQ)**

OPTIONAL EXTRAS	
Double sealed at terminal compartment:	**Yes**

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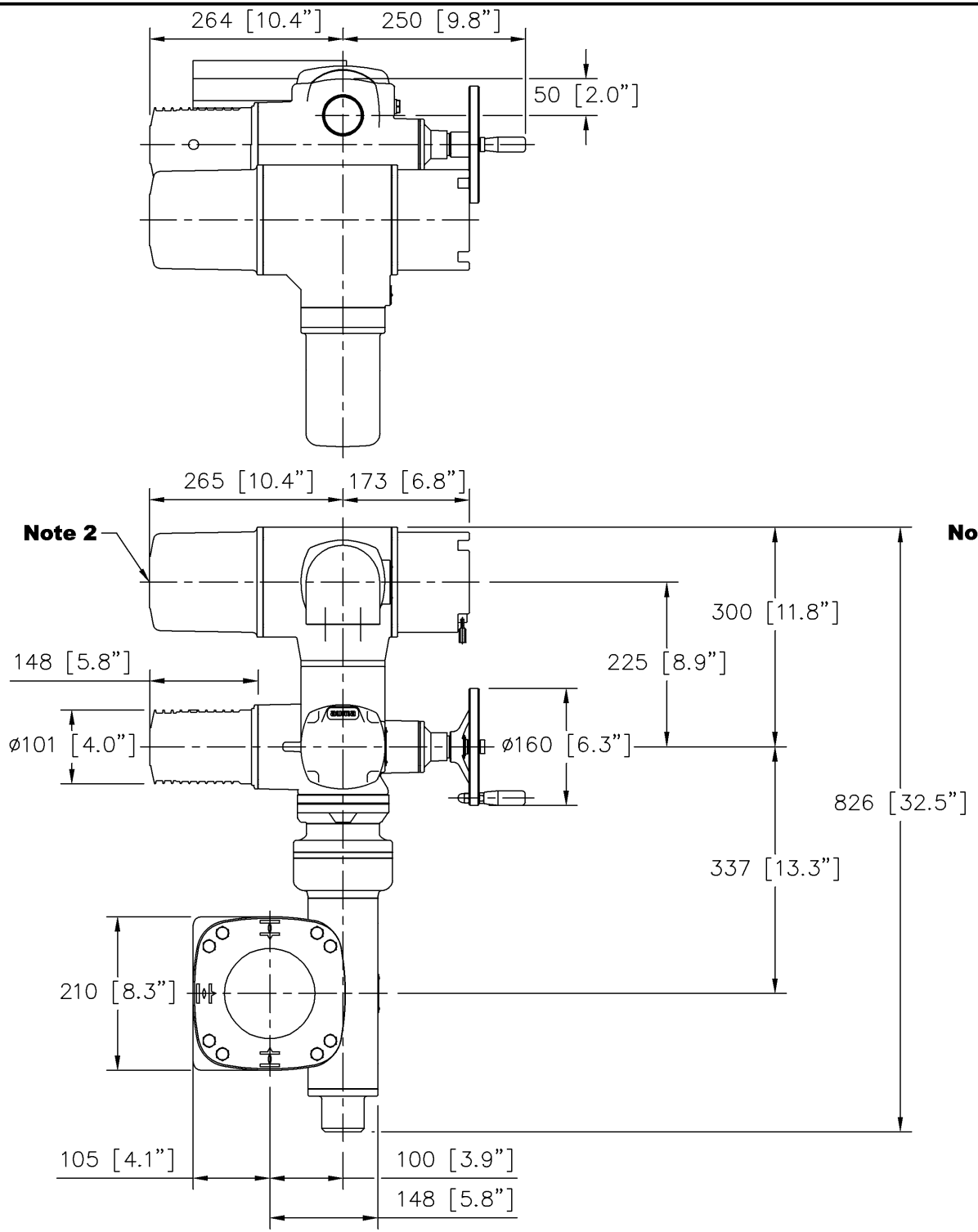
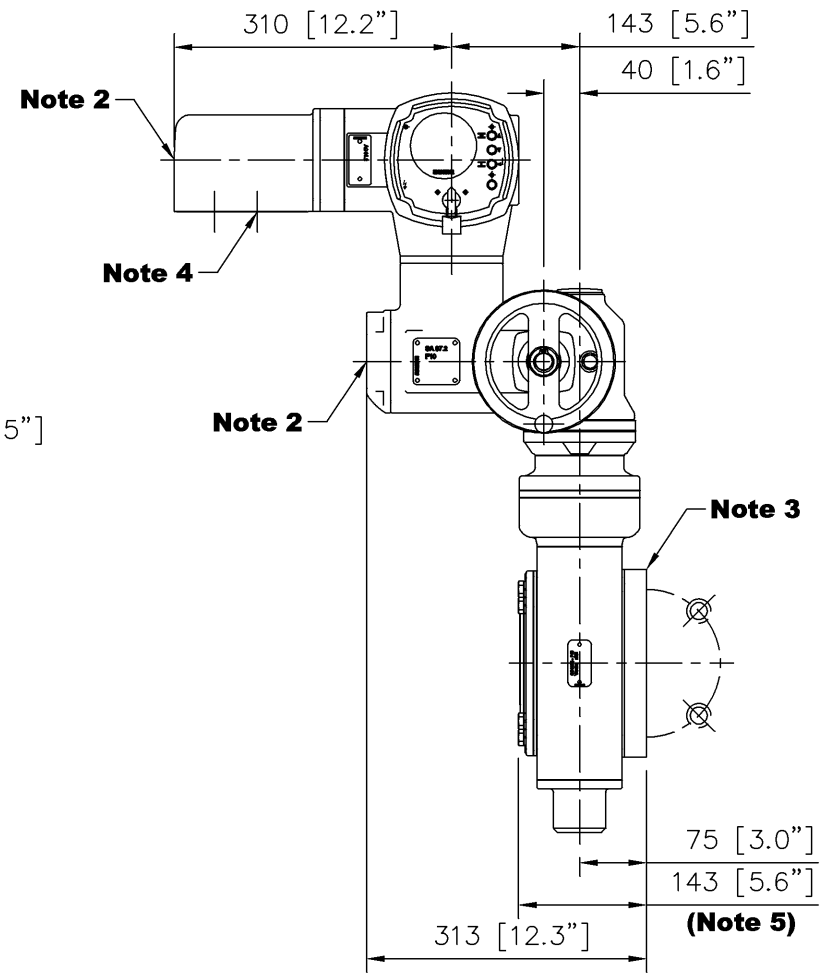
Drawings:

ACTUATOR DIMENSIONAL DWG
DDS00E411AAAAL021 REV-002
OUTPUT DRIVE/MOUNTING FLANGE DWG
SK099241 REV-007
ACTUATOR SCHEMATIC WIRING DWG
TPCA-3A2-1D1-D000TPA00R100-0IA-000 -S REV-003

Operation Manuals:

SA(R) 07.2 - 16.2 with AC 01.2 Parallel Non-intrusive
BA_SAR2_07_16_AC2_NONIN_PARALLEL_EN.PDF
ACTUATOR CONTROLS AUMATIC AC 01.2 Parallel
HB_AC2_PARALLEL_EN.PDF
Worm Gearbox GS50.3 - GS250.3
BA_GS3_50_250_EN.PDF





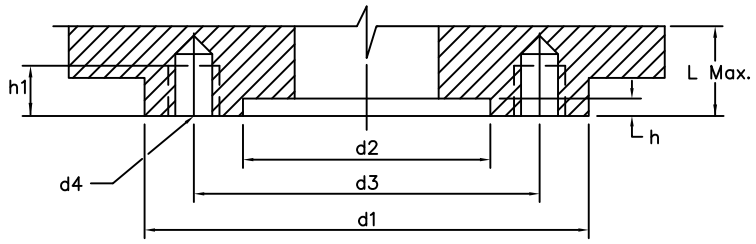
Notes:

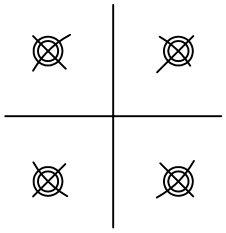
1. **Metric tolerance per ISO 2768-m. Dimensions in brackets [] are in inches and rounded to one decimal place.**
2. **Seven inch minimum clearance recommended for removal of access cover and equipment adjustment.**
3. **See appropriate mounting flange drawing for detail.**
4. **See data sheets for conduit entries.**
5. **Buried service cover - 154mm [6.1"].**

auma® AUMA ACTUATORS, INC.	**Torque only** **GS 100.3 - 126:1,160:1,208:1 - F(A)16** **RR / RL - position A**	**SA(R) 07.2 / 07.6** **Motor 3 phase** **Handwheel - 6.3"**	**AC01.2** **P&S - 100mm - DS** **Matic Pos - A / P&S Pos - A**	REVISED TITLE BLOCK TO ADD RATIOS DESCRIPTION	TK 06/06/2016 BY / DATE	GB 06/06/2016 APP / DATE	2 REV
					DDS00E411AAAAL021		

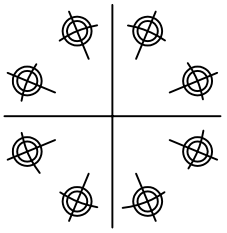
AUMA ACTUATORS, INC.

FA10 – FA40





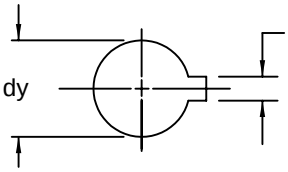
4 HOLE PATTERN (FA10 – FA16)



8 HOLE PATTERN (FA25 – FA40)

GEARBOX MODEL	FLANGE TYPE	d1	d2 (H8)	d3 ± 0.01	(qty.)d4	h	h1	L MAX.	SQ. KEY b	SQ. KEY dy max.	RECT. KEY b	RECT. KEY dy max.
GS50.3	FA10	4.9	3.346	4.00	(4) 3/8–16	0.157	0.63	2.48	3/8	1 7/16	3/8 X 1/4	1 1/2
GS63.3 (5)	FA10	4.9	3.346	4.00	(4) 3/8–16	0.157	0.63	2.95	1/2	1 7/8	1/2 X 3/8	2
GS63.3	FA12	5.9	4.134	4.92	(4) 1/2–13	0.157	0.75	3.07	1/2	1 7/8	1/2 X 3/8	2
GS80.3 (5)	FA12	5.9	4.134	4.92	(4) 1/2–13	0.157	0.75	3.15	5/8	2 3/8	5/8 X 7/16	2 1/2
GS80.3	FA14	6.9	4.527	5.51	(4) 5/8–11	0.197	0.98	3.54	5/8	2 3/8	5/8 X 7/16	2 1/2
GS100.3 (5)	FA14	6.9	4.528	5.51	(4) 5/8–11	0.197	0.98	4.92	3/4	3	3/4 X 1/2	3 1/8
GS100.3	FA16	8.3	5.512	6.50	(4) 3/4–10	0.197	1.26	4.92	3/4	3	3/4 X 1/2	3 1/8
GS125.3 (5)	FA16	8.3	5.512	6.50	(4) 3/4–10	0.197	1.26	5.04	7/8	3 3/8	7/8 X 5/8	3 5/8
GS125.3	FA25	11.8	8.858	10.00	(8) 5/8–11	0.197	0.98	5.04	7/8	3 3/8	7/8 X 5/8	3 5/8
GS160.3	FA25	11.8	7.874	10.00	(8) 5/8–11	0.236	1.00	5.24	1	4	1 X 3/4	4 3/16
GS160.3 (5)	FA30	13.8	9.055	11.75	(8) 3/4–10	0.236	1.26	5.83	1	4	1 X 3/4	4 3/16
GS200.3								6.30	1 1/4	5	1 1/4 X 7/8	5 1/4
GS200.3 (5)	FA35	16.3	10.236	14.00	(8) 1–8	0.236	1.57	7.50	1 1/4	5	1 1/4 X 7/8	5 1/4
GS250.3								9.20	1 1/2	5 3/4	1 1/2 X 1	6
GS250.3 (5)	FA40	18.7	11.811	16.00	(8) 1 1/4–7	0.393	2.00	9.65	1 1/2	5 3/4	1 1/2 X 1	6
GS315	FA40	18.7	11.811	16.00	(8) 1 1/2–6 (4)	0.393	2.00	9.10	1 3/4	7 1/8	1 3/4 X 1 1/2	7 1/4

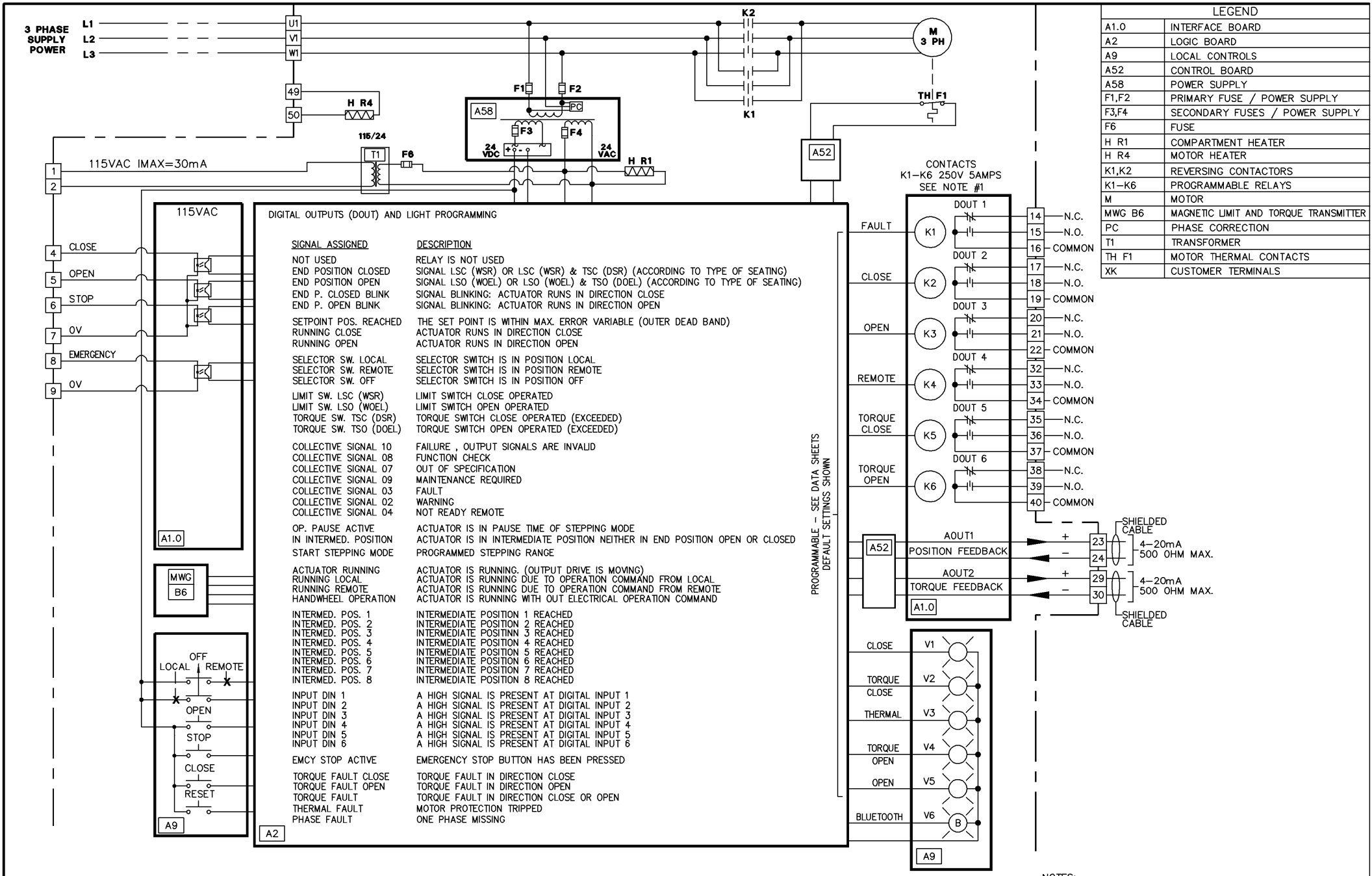
Notes:
1. All dimensions are in inches.
2. Unless specified tolerance per ISO 2768-m.
3. FA Flange per MSS STANDARD SP-101 unless otherwise noted.
4. FA40 Thread size 1 1/2-6 not per MSS STANDARD SP-101.
5. Optional FA Mounting Flange.



DIMENSIONS 'b' BASED ON ANSI B17.1 AT MAX. BORE 'dy'

STANDARD FA MOUNTING FLANGE DIMENSIONS

GS50.3 - GS315	BY/DATE JP 5/12/16	APP/DATE MK 05/12/16	DWG. NO. SK099241	REV 7



auma® ACTUATORS INC. SCHEMATIC WIRING

AUMATIC

2013.03.22	UPDATED CHANGES	TK 11/22/16	PM 11/22/16	3
SCHEMATIC DWG.	DESCRIPTION	BY/DATE	APP/DATE	REV

DWG. No. TPCA–3A2–1D1–D000TPA00R100–0IA–000 –S

DeZURIK
APCO | HILTON

RECOMMENDED LONG AND SHORT TERM STORAGE PROCEDURES

LONG-TERM STORAGE

1. All resilient seated valves shall be stored in the open (unseated) position.

2. All valves with adjustable packing glands should have the packing gland loosened prior to storage.

3. Valves shall be separately packaged in a sealed polyethylene plastic enclosure with a minimum of one package of desiccant inside, dependent upon valve size.

4. Prepared valves shall be warehoused in a clean, dry, indoor facility on concrete or raised racks, with temperature ranging from 35°F to 95°F (2°C to 35°C).

5. Valves shall not be near electric motors or other equipment which may emit Ozone which can cause deterioration of elastomers used for valve and actuator components.

6. The valves shall be inspected periodically to replace the desiccant if required, and to repair any damage to the polyethylene plastic enclosures.

7. Valves with cylinder operators and control valves which are stored for extended periods may be subject to cylinder blow-by caused by permanent distortion of any of the seals. Valves should be operated prior to installation and damaged seals replaced.

8. Valves with electric motor operators shall be stored in accordance with the individual motor manufacturer's recommended long-term storage procedures in addition to Paragraphs 1, 2 and 3 above.

9. All electrical components, if applicable, should be inspected and all electrical contacts cleaned before operation.

10. Valves shall be enclosed in fully sheathed wooden crates or boxes.

SHORT-TERM STORAGE

1. Valve should be protected from the weather, avoid exposure to excessive moisture or dirt. Store at temperatures ranging from 35°F to 95°F (2°C to 35°C).

Form No. 1454-0712