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PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF HARDIN COUNTY	**)**	
WATER DISTRICT NO. 1 FOR A	**)**	**CASE NO.**
DEVIATION FROM 807 KAR 5:071,	**)**	**2018-00166**
SECTION 7(4)	**)**	

HARDIN COUNTY WATER DISTRICT NO. 1 RESPONSE TO COMMISSION STAFF'S SECOND REQUEST FOR INFORMATION

Comes Hardin County Water District 1, by counsel, and hereby submits to the Public Service Commission the Hardin County Water District 1 answers to the Requests for Information propounded by the Public Service Commission.

Ashley M. Land
SKEETERS, BENNETT, WILSON & HUMPHREY
550 W. Lincoln Trail Blvd./P. O. Box 610
Radcliff, Kentucky 40160
(270) 351-4404
E-Mail: ashley.land@sbwhlaw.com
HCWD1 Counsel

CERTIFICATE

I hereby certify that ten (10) copies of the foregoing was this 29th day of November, 2018 sent to The Public Service Commission via mail.

Ashley M. Land

Hardin County Water District No. 1

Serving Radcliff and Hardin County for Over 60 Years

1400 Rogersville Road
Radcliff, KY. 40160

November 27, 2018

Gwen R. Pinson
Executive Director
Public Service Commission
211 Sower Blvd.
Frankfort, KY 40602

SUBJECT: PSC Case No. 2018-00166 Second Request for Information Response

Hon. Pinson,

The following information serves to answer the Commission's second request for information for case no. 2018-00166.

1. *State which components of the lift stations are monitored by the supervisory control and data acquisition system.*

The lift stations in the Fort Knox collection system with SCADA monitor the following parameters: Power Failure, Wet Well Level, Pump motor amperage, Pump seal fail, Pump temperature sensor, Pump status – ON/OFF and real-time trend charts of the aforementioned parameters.

The lift stations in the Radcliff collection system with monitoring systems monitor the following parameters: Power Failure, Pump Failure and High Wet Well Level. The Radcliff system has a Board approved and fully funded BRAC grant project to equip 34, or 69%, of the lift stations with a SCADA system similar to the Fort Knox SCADA system mentioned above.

Witness: Justin Metz, County Systems Manager, HCWD1

2. *Describe the current maintenance and inspection schedule for lift stations and provide any differences in the current maintenance and inspection schedule for primary and secondary lift stations.*

When staff members inspect lift stations (mechanical equipment) they check that gates, hatches and electrical panel doors are properly closed and locked, they pull floats and remove any accumulated debris, they pull level transducers and remove any accumulated debris. They operate each pump in "Hand" and evaluate the drop in water level, listen for abnormal sounds and vibrations. They inspect the electrical panel for any alarm lights or fault lights. Run time meter readings are recorded and compared to previous readings to determine if abnormal operation is occurring.

The inspection procedures previously mentioned are the same for all lift stations regardless of inspection schedule. Any lift station with a single pump capacity of greater than or equal to 500 gpm ("primary") is inspected daily. Lift stations with a single pump capacity of less than 500 gpm ("secondary") are checked weekly.

Witness: Justin Metz, County Systems Manager, HCWD1

3. *In Hardin County District's Response to Commission Staff's First Request for Information (Staff's First Request), Hardin County District No. 1 states that 3 of the 38 lift stations at Fort Knox and 6 of the 49 lift stations at Radcliff are inspected on a daily basis. State which of these inspected lift stations are primary lift stations or secondary lift stations.*

The 3 lift stations checked daily at Fort Knox are "primary" and the 6 lift stations inspected daily at Radcliff are "primary". These lift stations have a single pumping capacity of greater than or equal to 500 gpm. The remaining 35 lift stations at Fort Knox and 43 at Radcliff are inspected weekly and could be referred to as "secondary".

Witness: Justin Metz, County Systems Manager, HCWD1

4. *Provide the manufacturer's recommendations for maintenance and inspections of the current lift stations.*

Maintenance schedule information from multiple manufacturers of mechanical components typically found at our lift stations is enclosed with this response letter.

The District utilizes mercury floats and hydrostatic level transducers which are not classified as mechanical devices, but rather as electrical devices.

Witness: Justin Metz, County Systems Manager, HCWD1

This response is true and accurate to the best of my knowledge based on information obtained and available to me at the time of this response.

Sincerely,

Mr. Stephen Hogan
General Manager
Hardin County Water District No. 1

Cf; Mr. David Wilson, Attorney, HCWD1
Mr. Brett Pyles, Fort Knox System Director, HCWD1
Mr. Justin Metz, County Systems Manager, HCWD1

SULZER

SUBMERSIBLE UNITS – XFP SERIES (PE3 – PE6)

MAINTENANCE SUMMARY *

MAINTENANCE OPERATION	FREQUENCY
Wash Down Unit	Every 6 months
Jog Idle Unit (Idle for long period of time)	Every month
Check Seal Water/Glycol Mixture for Contamination	Every 12 months **
Check Mechanical Seals	If water/glycol mixture is contaminated or if the seal failure indicating light on the control panel is activated ***
Inspect Cable for Chafing, Cuts, or Abrasion	Every 3 months
Inspect Impeller/Wear Plate/Wear Rings for Wear	If unit performance has decreased
Inspect Lifting Chains	Every 3 months
Check Motor Performance (Amp Draw)	Every 6 months
Check Bearings for Wear	Regular inspection is not required

* Consult O&M or Workshop Manual for additional information.
** A regular water/glycol mixture change is not necessary. Replace only if water/glycol mixture is contaminated.
*** Any O-Ring or Seal Washer that is removed during inspection should be replaced.

The maintenance checks should be performed at the intervals stated.
Severe operating environments will require more frequent checks.

GA Industries Check Valve

VALVE CONSTRUCTION
The standard Figure 250 Swing Check Valve has a cast iron body, bronze or stainless steel (indicated by Figure Number suffixed with "S") body seat, stainless steel hinge shaft and cast iron disc with a rubber disc seat. An "M" suffixed to the Figure Number (e.g., 250-DM, 250-USM) indicates optional metal-to-metal seating was supplied. Refer to the List of Materials submitted for the order if non-standard materials were provided.

Refer to Page 4 for details of construction and parts location.

START-UP
The valve generally does not require any calibration or adjustment prior to start-up. The counterweight(s) should be initially placed at the far end of the arm and secured by tightening the set screw (31A).

The valve should smoothly swing open as flow through the valve increases. The amount of opening depends on the flow velocity through the valve and can be observed by watching the external counterweight arm. The valve is "full ported" at about 25 degrees of swing but can swing open as much as 60 degrees.

Shut down the pump and observe the valve's closure. If the valve was less than 60 degrees open and the closure was smooth and quiet then the weight(s) may be moved incrementally toward the shaft. Repeat these steps to the point where the valve opens to the extent possible but still closes quietly.

The air-cushion chamber cannot retard the valve's closure or prevent the valve from being slammed shut due to the tremendous forces of the reversing water. Non-slam operation is achieved when the counterweight closes the valve prior to flow reversal. In extreme cases, it may be necessary to install additional counterweight(s) to effect non-slam closure.

PREVENTIVE MAINTENANCE
Figure 250 Swing Check Valves require no scheduled lubrication, adjustment or preventive maintenance.

A monthly inspection should be performed for the first 6 months of operation to ensure the valve is functioning properly and there is no external fluid leakage or audible evidence of water leaking backwards through the closed valve.

Thereafter, a quarterly visual inspection should be performed.

TROUBLESHOOTING
- Shaft packing leakage
  Tighten packing gland nuts equally just enough to stop leakage, no more than ½ turn at a time. DO NOT OVER-TIGHTEN! Replace packing if necessary.
- Leakage past seat when closed
  Inspect valve for debris, clean
  Inspect seating surfaces for damage, replace as necessary
- Leakage past cover or flange gaskets
  Tighten cover or flange bolts
- Disc oscillating when open
  Move counterweight(s) toward shaft
- Valve slams upon closing
  Move counterweight(s) toward end of arm
  Ensure shaft packing is not too tight
  Ensure cushion chamber and linkage operates freely
  Install additional counterweight(s)

WARNING
Removing the valve from the line or disassembling the valve while there is pressure in the valve body may result in injury or damage to the valve

WARNING
Follow all applicable safety regulations and codes and read and understand all instructions before undertaking disassembly.

DISASSEMBLY
All Figure 250 valves can be serviced while the body remains connected to the pipeline. A skilled technician should perform all work. No special tools are required.

First ensure there is no pressure within the valve and operating equipment is tagged and locked out. Refer to page 4 for parts identification.

It is not necessary to disassemble the entire valve to replace the shaft packing, follow steps 1 to 3 and 5a.

1. Ensure there is no pressure within the valve and operating equipment is locked out.
2. Mark the position of the counterweight(s) on the arm. Loosen the counterweight set screw (31A) and slide the weight(s) off the arm. Remove the lever cotter pin (29C) and lever pin (29B). Loosen the counterweight arm set screws (30A) and the lever set screw (29A) and slide the arm (30) and lever (29) off the shaft, being careful not to lose the key (30B).
3. Loosen and remove the gland stud nuts (16), slide off the gland (15) and remove the shaft packing (17).
4. Remove the end plate bolts (35), the end plate (34) being careful not to lose or damage the end plate seal (36) unless it is to be replaced
5. Remove the cover bolts (10) and lift off the cover (9). If necessary, carefully pry the cover off using a cold chisel between the body and cover. Be careful not to damage or lose the cover gasket (8) unless it is to be replaced.

VAG

6. Remove the shaft lock pin (18) by threading a screw into the tapped hole.
7. With the disc and disc arm properly supported, loosen the disc arm set screw (12) and pull the shaft (11) out of the valve. It may be necessary to drive out the shaft from the opposite end.
   NOTE: The outer bushing (14) and disc arm key (19) should come out with the shaft. Be careful not to lose the disc arm key. After the shaft is out, remove the inner bushing (13) from the opposite side.
8. Carefully lift the disc arm assembly out of the body. Remove the disc nut pin (6B), disc nut (6) and disc nut washer (6A).
9. Remove the seat screws (5C), the seat follower (5B) and the renewable seat (5A) or metal seat washer (5D).
10. Remove the link (28) and pull the plunger (22) from the cushion chamber.
11. In the unlikely event it's necessary to remove the body seat (2), the spring pins holding it into the body must be compressed until they no longer "bite" into the body. This is best accomplished by compressing the seat pins (2B) using "vice-grips" and pulling the pins in a radial direction towards the valve centerline.

Inspect all parts for wear and damage. Replace damaged parts.

ASSEMBLY

The valve is reassembled by reversing the disassembly sequence with consideration of the following:

1a. Clean and polish all machined bearing and sealing surfaces. Apply a light coat of lubricant to assist in the assembly.
2a. Ensure the disc arm key slides inside the disc arm before installing the shaft lock pin (18). Ensure the shaft lock pin has dropped into the groove provided for it on the shaft.
3a. Lift the disc assembly several times to ensure free closure with no metal-to-metal contact.
4a. Install the inner and outer bushings then install the shaft packing. Install the end plate (34) with seal (36). Install and tighten the end plate bolts (35) while ensuring the end plate seal (36) remains in the groove provided for it in the end plate
5a. Wrap the packing around the shaft and cut on a 45-degree angle, staggering the cuts with each ring.
6a. Tighten gland bolts evenly until packing is slightly compressed. After pressure has been introduced into the valve, re-tighten evenly until leakage stops.
7a. Ensure cover gasket sealing surfaces are clean and apply a thin coat of Permatex™ #2 to both surfaces. Tighten cover nuts in an alternating pattern. Re-tighten as needed after pressure has been introduced.
8a. Re-install the lever (29) and counterweight arm (30) with key (30B) and tighten counterweight set screws (30A).
9a. Connect lever (29) to the link (28) using pin (29B) and secure with cotter pin (29C). Tighten lever set screw (29A).
10a. Slide counterweight(s) onto shaft and lock in place using set screws (31A). Lift counterweight arm and allow it to fall to ensure free movement.

REPLACEMENT PARTS

Genuine replacement parts are available from your local VAG/GA Industries representative or from the factory:

VAG USA, LLC
9025 Marshall Road
Cranberry Township, PA 16066 USA
Telephone: 724-776-1020
Fax: 724-776-1254
E-mail: info-ga@vag-group.com

Please have the nameplate data available when ordering parts. Identify needed part(s) by Shop Order (SO) Number, Figure Number, valve size and individual part number.

MAINTENANCE

Regular maintenance will help ensure longer pump life and more reliable operation. It is recommended that pumps in intermittent operation be inspected twice a year and pumps in continuous operation be inspected every 1,000 hours. The following is a listing of required inspection and maintenance items.

If any of the problems described in the following list exists stop operating the pump to avoid damage or personal injury.

1. CABLE ENTRY

Make sure that the cable entry flange and strain relief clamp are tight. If the cable entry is showing signs of leakage remove cable from entry, remove grommet, cut a piece of cable off so that the grommet seats on a new portion of the cable, replace grommet, and reinstall cable assembly, into the top of the motor.
Note: Explosion Proof cables are sealed with a Factory Mutual Approved potting compound. Please consult factory for instruction.

2. CABLES

Inspect the cable for cuts, scrapes or sharp bends. If the outer jacket is damaged, replace the cable. Splices of the power or control cable within the wet well area are not acceptable.

3. MOTOR INSULATION RESISTANCE

Megger the insulation between the phases; and between any phase and ground. Resistance values should be greater than 1 M ohm. If abnormal readings are obtained, contact authorized service center immediately.

4. EXTERNAL PARTS ON PUMP

Make sure that all screws, bolts and nuts are tight. Check the condition of pump lifting eyes and replace if damaged or worn, Replace any external part that appears worn or damaged.

5. SEAL CHAMBER OIL

Note: Use extreme care when removing the seal chamber plug, as the chamber may become pressurized if seal failure has occurred. Seal chamber oil should be checked for signs of water intrusion, or other impurities any time the pump is removed from wet well. To check the condition of the oil, remove the oil fill plug. Drain the chamber volume into a transparent container. Visually check sample for impurities or emulsification (oil may appear cream-like if a small amount of water is present). If significant water intrusion has occurred, remove and replace lower mechanical seal. Unless obvious mechanical damage has occurred to the lower seal, it is good practice to replace the upper and lower mechanical seals as a set. Refill seal chamber with fresh oil to the bottom of fill plug port (when pump is in vertical position) and replace oil fill plug.

6. IMPELLER

Periodically inspect impeller by turning pump on its side, remove suction strainer nuts and strainer to expose impeller and relocate position of adjusting plate (suction cover) as needed. Replace the impeller if it is damaged or worn.

SPARE PARTS

In order to obtain spare parts identify the required parts by looking at the enclosed cross sectional drawing and listing, and contact authorized HOMA PUMP TECHNOLOGY representative with your order. Authentic Homa Pump Technology parts shall be used to maintain warranty.
Note: Explosion Proof pumps must be identified as such, and the pump serial number must be referenced for proper parts identification.

RECOMMENDED TOOLS AND SUPPLIES

In addition to ordinary maintenance and lifting devices, ensure that complete set of metric Allen wrenches, impeller puller, Loctite 242 (Blue), and Anti-seize compound are on hand.

1. Orientation

   a. The hinge pin should be parallel to the plane of the horizon and above the centerline of the pipe.
   b. Wafer check may be installed horizontally or vertically with the flow up.

2. Gaskets

   The wafer check valves bolt between ASME/ANSI B16.1, Class 125 flanges and do not require gaskets (o-rings being provided).

3. Fasteners

   Threaded rods are usually used to fasten up the wafer check.

4. Lifting

   Some sizes may be provided with a threaded hole for inserting an eyebolt for lifting.

III SERVICE LIMITATIONS (Pressure Temperatures)

All valves, all services 32°F minimum working temperature non-shock.

A. UL/FM (Figure 126/1126) valves are for service at 175 psi maximum and 125°F maximum, water only.
B. Figure 106A/1106A (Resilient Seated Checks)

   1. Cold water service (125°F maximum)

      Sizes: 2" to 12" - 200 psi maximum
      Sizes: 14" to 24" - 150 psi maximum

C. Figure 106/1106 (Metallic Seated Checks)

   1. Cold water service (150°F maximum)

      Sizes: 2" to 12" - 200 psi maximum
      Sizes: 14" to 24" - 150 psi maximum

IV MAINTENANCE, CHECKING AND TESTING

A. Swing Checks

Excepting misuse and severe service, maintenance should be limited to the following:

1. Seating surfaces;
2. Bearing surfaces (hinge pins, hinges and side plugs);
3. Replacement of parts subject to corrosion; and
4. Lubrication and repacking of hinge pin stuffing boxes and o-ring stuffing boxes for outside lever valves.

Replacement of resilient disc rings (item #1) and lubrication and repacking of stuffing boxes for outside lever valves (item #4) are the only items subject to regular replacement maintenance or repair.

Replacement of parts subject to corrosion is unpredictable, as corrosion conditions are unknown and subject to many variables. Only the field service representative is qualified to judge when a part is corroded beyond use or safe limits and should be replaced; for replacement procedures see the section on replacing disc rings.

Kennedy Valve is not aware of a case where the bearing surfaces have been worn beyond use, but the possibility remains.

The field service representative must decide what item has worn and replace it.

1. Resilient Discs

    a. When to replace
        1. Replace resilient disc rings whenever leakage is judged excessive or at scheduled intervals.

    b. Replacement parts (order from factory for correct size)

        1. Disc ring
        2. Cover gasket or o-ring (advisable, but not always required, see Schedule Page 8 for sizes).
        3. Anaerobic sealants low strength "Loctite" or equal.
        4. O-ring(s) or gasket for disc bolt (advisable, but not always required).

    c. Special tools

        None

    d. Procedure (see 22 below for lever valves)

        1. Remove cover.

2. Remove side plugs. Use an appropriate size socket or box wrench not an adjustable or pipe wrench.
3. Drive hinge pin out with wooden dowel.
4. Lift hinge/disc assembly from valve ("V" notches in side of valve provide clearance for disc assembly).
5. Remove nut retaining disc plate. At this time, it might be advisable to remove the disc bolt and replace the o-ring(s) or gasket on the disc ball.
6. Lift the disc plate off. If the disc plate sticks, try tapping the back of the disc assembly with a soft faced mallet. Pry it off only as a last resort.
7. Remove the resilient disc ring.
8. Clean the "pocket" where the disc ring seats in the disc holder.
9. Replace the resilient disc ring (seat) with a new one, seating it flat and centered in the "pocket" in the disc holder. Do not use gasket sealant.
10. Clean the back of the disc plate.
11. Polish the seat ring in the valve body with crocus cloth or 600 grit wet/dry sandpaper (see Page 7).
12. If the disc bolt has been removed, lubricate the hole in the disc holder and the disc bolt with clean grease. Then carefully insert the disc bolt through the hinge and disc holder taking care not to twist or cut the o-ring(s).
13. Replace the disc holder by positioning it over the threaded portion of the disc bolt.
14. Replace the disc bolt nut and use a low strength anaerobic sealant. Do not over tighten the disc bolt nut. Tighten the nut only to the point that the disc plate makes a very slight impression into the resilient disc ring.
15. Carefully position the disc/hinge assembly through the cover flange and align with side plug holes and insert the hinge pin.
16. Replace the side plugs, starting by hand, and then tighten with 300 in-lb torque.
17. Inspect the cover sealing surfaces and clean if needed.
18. Inspect the cover gasket or o-ring and replace if needed (order from Kennedy Valve or see Schedule on Page 8).
19. Tighten the cover bolts in an alternating pattern, tightening two bolts at 180° snug, and then tighten two bolts 90° to the first two and 180° to each other, finally tightening all bolts tight. (See Schedule on Page 8 for specific torque.)
20. Pressurize and bleed the valve, checking for any leaks and tighten joints as necessary.
21. Procedure for outside lever valves; same as for valves without outside lever except:

a. Remove spring or weight before removing cover.
b. Loosen setscrew on lever and remove lever and key.
c. Remove side plug packing gland.
d. Remove side plug opposite hinge pin.
e. If setscrews are used on hinge, remove them.
f. Lubricate extended hinge pin.
g. Remove side plug stuffing box from valve.
h. Drive the hinge pin out with a hardwood dowel. (It may be necessary to heat the hinge, but this should be avoided if at all possible).
i. Replace resilient disc ring as above.
j. Lubricate hinge pin and start hinge pin and key into the hinge.
k. Replace the side plug (normally on left-hand side as seen facing valve inlet).
l. Drive hinge pin in with a soft tool (make certain that key and key seats remain lined up).
m. Replace set screws in hinge (if any).
n. Repack or replace rings in the side plug stuffing box.
o. Start packing gland into side plug stuffing box.
p. Replace lever, lever key, and setscrew on extended hinge pin.
q. Tighten side plug stuffing box. Tighten slowly and move lever frequently so as to not over tighten and cause valve to hang open.
r. Replace cover
s. Replace spring or weight.
t. Pressurize and bleed.

2. Seat Rings/Disc Rings

a. When to polish

Leakage is considered excessive.

b. Replacement parts

See Pages 7 & 8.

c. Supplies

Crocus cloth or very fine (600 grit maximum) wet/dry sand paper or valve lapping compound.

d. Procedure

1. See Page 5 – Steps d.1 through d.6.
2. Inspect seat ring and disc ring (on metal to metal valves). Polish away any scale and check for nicks and scratches.
3. For metal to metal valves – lay a piece of wet/dry paper on a very flat surface and polish the disc ring (with a wiping and rotating motion) until the entire brass disc ring is smooth, flat and free of scratches.
4. Wipe the entire surface of the seat ring. It must be smooth, flat and free from radial scratches.
5. For a better than usual seal, use some valve lapping compound on the seat ring. Rub the disc on the seat ring with a rotating and wiping motion. Clean the compound from the seat and disc and replace it several times.
6. See Page 5 & 6 – Steps d.13 through d.21.

V. RECOMMENDED SPARE PARTS FOR C.I. CHECK VALVES (Figure 106, 106A, 1106, 1106A, 126, 126A, 1126 and 1126A.

A. Necessary

1. Cap gasket (1100 series checks use o-rings)
1. Resilient disc (for rubber faced valves only)
2. Packing for lever & spring and lever & weight valves.

B. Useful

2. Hinge pin, hinge, and disc assembly
3. Bolts and nuts (1100 series valves do not require cover nuts)
4. Disc bolt o-ring(s) (106A, 1106A, 126, 1126, 126A and1126A valves)
5. Disc bolt gasket (106/1106 valves)

Valve Size	Bolt Size	Torque (ft-lbs)
2", 2 ½", 3", 4", 6"	5/8 UNC	100
6" & 8"	¾ UNC	150
10" & 12"	7/8 UNC	230

Gaskets (Cap):

2" to 12" valves use a cap gasket identical to the end flange gasket (N/A for 1100 series check valves)

6 Maintenance

Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 3 have been read and understood.

DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.

CAUTION: Crush Hazard

Make sure that the unit cannot roll or fall over and injure people or damage property.

Make sure that you follow these requirements:

- Check the explosion risk before you weld or use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Make sure that the work area is well-ventilated before you open any vent or drain valves, remove any plugs, or disassemble the unit.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

Ground continuity verification

A ground (earth) continuity test must always be performed after service.

Maintenance guidelines

During the maintenance and before reassembly, always remember to perform these tasks:

- Clean all parts thoroughly, particularly O-ring grooves.
- Change all O-rings, gaskets, and seal washers.
- Lubricate all springs, screws, O-rings with grease.

During the reassembly, always make sure that existing index markings are in line.

The reassembled drive unit must always be insulation-tested and the reassembled pump must always be test-run before normal operation.

6.1 Torque values

All screws and nuts must be lubricated to achieve correct tightening torque. Screws that are screwed into stainless steel must have the threads coated with suitable lubricants to prevent seizing.

If there is a question regarding the tightening torques, then contact a sales or authorized service representative.

Screws and nuts

Table 11: Stainless steel, A2 and A4, torque Nm (ft-lbs)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
50	1.0 (0.74)	2.0 (1.5)	3.0 (2.2)	8.0 (5.9)	15 (11)	27 (20)	65 (48)	127 (93.7)	220 (162)	434 (320)
70, 80	2.7 (2)	5.4 (4)	9.0 (6.6)	22 (16)	44 (32)	76 (56)	187 (138)	364 (268)	629 (464)	1240 (915)
100	4.1 (3)	8.1 (6)	14 (10)	34 (25)	66 (49)	115 (84.8)	248 (183)	481 (355)	–	–

Table 12: Steel, torque Nm (ft-lbs)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
8.8	2.9 (2.1)	5.7 (4.2)	9.8 (7.2)	24 (18)	47 (35)	81(60)	194 (143)	385 (285)	665 (490)	1310 (966.2)
10.9	4.0 (2.9)	8.1 (6)	14 (10)	33 (24)	65 (48)	114 (84)	277 (204)	541 (399)	935 (689)	1840 (1357)
12.9	4.9 (3.6)	9.7 (7.2)	17 (13)	40 (30)	79 (58)	136 (100)	333 (245)	649 (480)	1120 (825.1)	2210 (1630)

Hexagon screws with countersunk heads

For hexagon socket head screws with countersunk head, maximum torque for all property classes must be 80% of the values for property class 8.8 above.

6.2 Change the coolant

This image shows the plugs that are used to change the coolant.

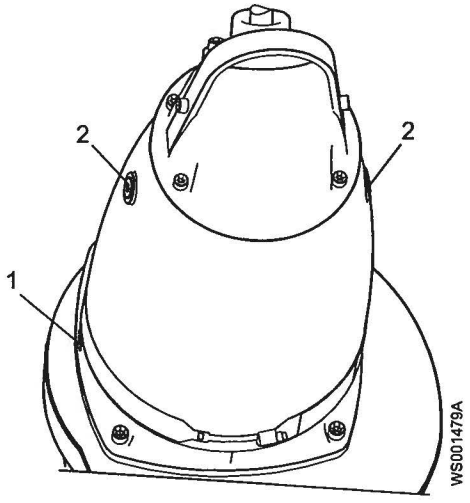


Figure 29: With a cooling jacket

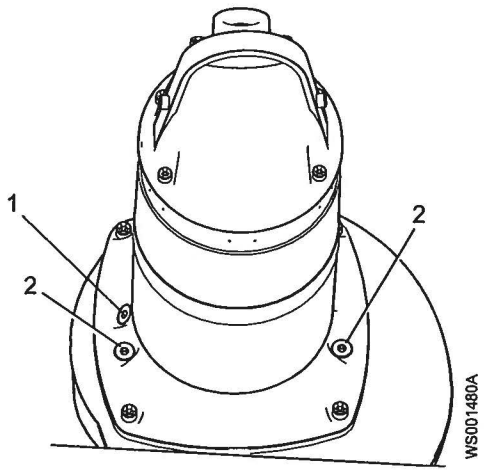


Figure 30: Without a cooling jacket

1. Inspection plug
2. Coolant plugs

6.2.1 Empty the coolant

CAUTION: Compressed Gas Hazard

Air inside the chamber may cause parts or liquid to be propelled with force. Be careful when opening. Allow the chamber to de-pressurize before removal of the plug.

1. Empty the coolant in the inspection chamber:
   a) Remove the inspection plug.

Figure 31: With a cooling jacket

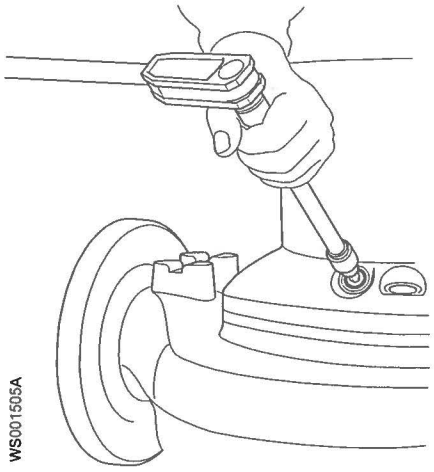


Figure 32: Without a cooling jacket

   b) Pump out any coolant from the inspection chamber, as shown here.

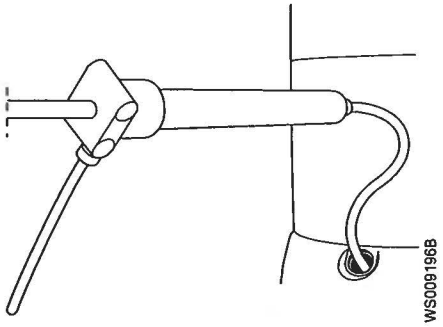


Figure 33: With a cooling jacket

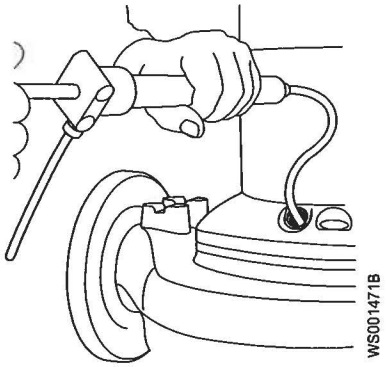


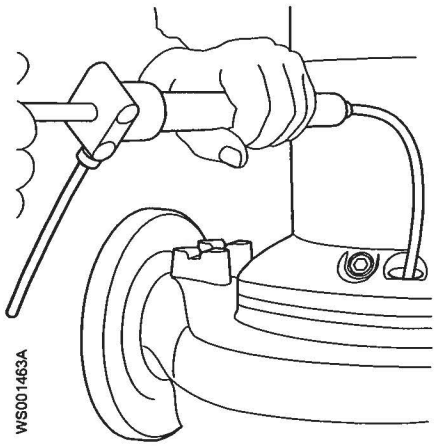
Figure 34: Without a cooling jacket

   c) Fit a new O-ring and re-install the inspection plug. Tighten the plug.
      Tightening torque: 44 Nm (33 ft-lbs)
2. To empty the coolant with the pump upright, do the following:
   This method is applicable only for pumps without cooling jackets.
   a) Remove the coolant plugs.

CAUTION: Compressed Gas Hazard

Air inside the chamber may cause parts or liquid to be propelled with force. Be careful when opening. Allow the chamber to de-pressurize before removal of the plug.

   b) Use a pump to remove the coolant.



3. If it is necessary to separate the drive unit from the hydraulic unit, then do the following:
   a) Carefully open the coolant plugs to relieve any built-up pressure inside the cooling jacket.

   CAUTION: Compressed Gas Hazard

   Air inside the chamber may cause parts or liquid to be propelled with force. Be careful when opening. Allow the chamber to de-pressurize before removal of the plug.

   b) After venting any built-up pressure in the cooling jacket, re-install the coolant plugs.
   c) Remove the pump housing screws.
   d) Remove the drive unit from the pump housing.

   NOTICE:

   Do not allow the weight of the pump to rest on any portion of the impeller. The impeller must not be allowed to make contact with the concrete floor or other hard or rough surfaces.

4. To empty the coolant with the pump in a horizontal position, do the following:
   a) Place the pump horizontally, so that one of the coolant plugs is at the lowest point of the pump, to ensure that the coolant will drain completely.

      It is important to empty all of the coolant.
   b) Place a container under the pump.
   c) Remove the coolant plugs and empty the coolant.

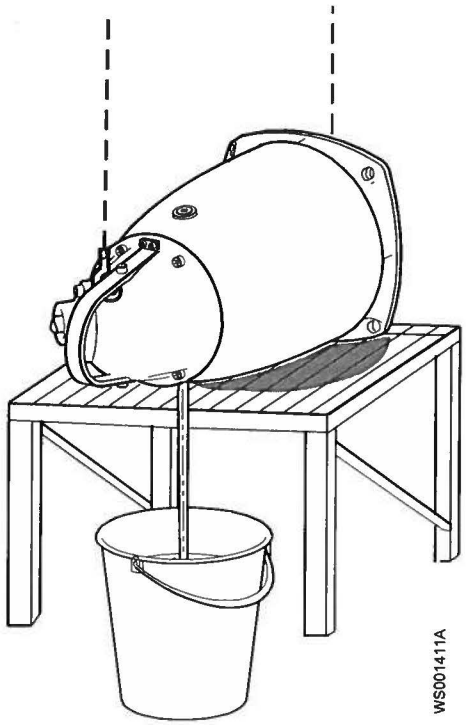


Figure 35: With a cooling jacket

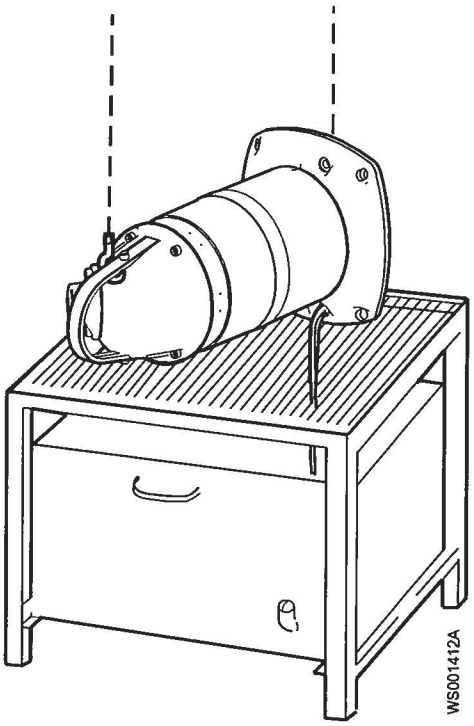


Figure 36: Without a cooling jacket

6.2.2 Fill with coolant

Use a coolant that is a mixture of 70% deionized or distilled water, and 30% DOWCAL 200™ monopropylene glycol. If DOWCAL 200™ from Dow Chemical Company is not available, then contact your local Xylem representative. The monopropylene glycol must fulfill the Xylem material standard M0800.82.0002.

NOTICE:

Deionized or distilled water must be used in the water-glycol mixture.

If the pumped liquid includes potable water or substances to be ingested, then contact a sales or authorized service representative.

1. Fill with coolant until it overflows through the opposite hole, as shown here.

Pump	Quantity, L (qt.)	
	With cooling jacket	Without cooling jacket
3202.090/.095/.180./185/.350/.390/.660/.670	25 (26.4)	5.9 (6.2)
3202.800/.810/.820/.830/.840/.850/.860/.870	41 (43.3)	5.9 (6.2)

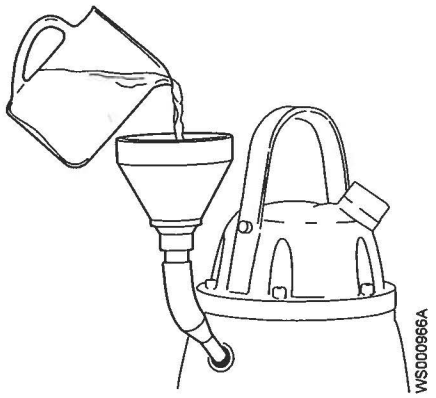


Figure 37: With cooling jacket

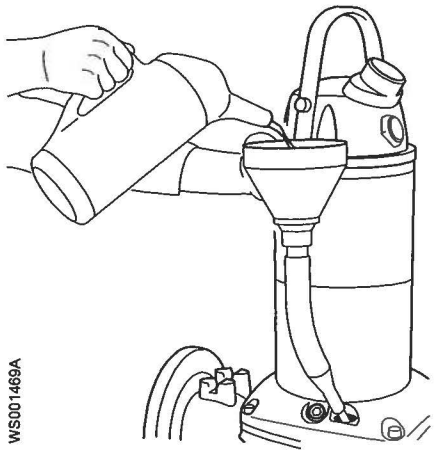


Figure 38: Without cooling jacket

2. Fit new O-rings and re-install the coolant plugs. Tighten the plugs.
   Tightening torque: 44 Nm (33 ft-lb)

6.3 Service the pump

Type of maintenance	Purpose	Inspection interval
Initial inspection	A Xylem-authorized personnel checks the pump condition. From the results, the personnel recommends the intervals for the periodical inspection and overhaul for the installation.	Within the first year of operation.
Periodical inspection	The inspection prevents operational interruptions and machine breakdowns. The measures to increase performance and pump efficiency are decided for each application. They can include such things as impeller trimming, wear part control and replacement, control of zinc-anodes and control of the stator.	Up to 12,000 hours or three years, whichever comes first. Applies to normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).
Overhaul	The overhaul lengthens the operating lifetime of the product. It includes the replacement of key components and the measures that are taken during an inspection.	Up to 24,000 hours or six years, whichever comes first. Applies to normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).

NOTICE:

Shorter intervals may be required when the operating conditions are extreme, for example with very abrasive or corrosive applications or when the liquid temperatures exceed 40°C (104°F).

6.3.1 Inspection

Service item	Action
Cable	1. If the outer jacket is damaged, then replace the cable. 2. Check that the cables do not have any sharp bends and are not pinched.
Connection to power	Check that the connections are properly secured.
Electrical cabinets	Check that they are clean and dry.
Impeller	1. Check the impeller clearance. 2. Adjust the impeller, if necessary.

Service item	Action
Inspection chamber	1. Drain all liquid, if any. 2. Check the resistance of the leakage sensor. If the pump is connected to the MAS 801 or MAS 711, then it is recommended that the sensors be checked in the MAS unit. Otherwise, use a multimeter. For values, see *Sensor connection*. Make sure to select values for the appropriate monitoring equipment and sensor combination.
Insulation	Use a megger maximum 1000 V. 1. Check that the resistance between the ground (earth) and phase lead is more than 5 megohms. 2. Conduct a phase-to-phase resistance check.
Junction box	1. Check that it is clean and dry. 2. Check the resistance of the leakage sensor. If the pump is connected to the MAS 801 or MAS 711, then it is recommended that the sensors be checked in the MAS unit. Otherwise, use a multimeter. Normal value approximately 1530 ohms, alarm approximately 330 ohms.
Level regulators	Check the condition and functionality.
Lifting device	Check that the local safety regulations are followed.
Lifting handle	1. Check the screws. 2. Check the condition of the lifting handle and the chain. 3. If necessary, replace.
O-rings	1. Replace the oil plug O-rings. 2. Replace the O-rings at the entrance or junction cover. 3. Grease the new O-rings.
Overload protection and other protections	Check the correct settings.
Personnel safety devices	Check the guard rails, covers, and other protections.
Rotation direction	Check the impeller rotation.
Seal housing	1. Fill with new coolant, if necessary. 2. Check that the freezing point is lower than -13°C (9°F).
Terminal board	Check that the connections are properly secured.
Temperature sensors: - Thermal contact - Thermistor - Pt100	If the pump is connected to the MAS 801 or MAS 711, then it is recommended that the sensors be checked in the MAS unit. Otherwise, use a multimeter. Do not use a device applying a higher voltage than 2.5 V. 1. Disconnect the sensor leads. 2. Measure the resistance to check the status of the sensor and leads according to values in *Make the electrical connections* on page 26. Make sure to select values for the appropriate sensor, monitoring equipment, and sensor combination. 3. Measure between each sensor lead to ground (earth) to establish that the resistance is infinite (or at least several Megaohm).
Voltage and amperage	Check the running values.

6.3.2 Overhaul

The basic repair kit includes O-rings, seals, and bearings.

For an overhaul, do the following in addition to the tasks listed under Inspection.

Service item	Action
Support and main bearing	Replace the bearings with new bearings.