18 GPM Seal-Less ECDC Water Circulation Pump

Service & Parts Manual
Model Numbers 071041, 071086, 071042, 071043, 071045, 071080, 071104, 071106

Rev. 1/2007
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PRODUCT DESCRIPTION

The 18 GPM Seal-Less ECDC Water Circulation Pump uses a brushless, electronically commutated direct-current motor designed for long product life. The seal-less pump circulates water at a rate of up to 18 gallons per minute by a brushless, direct-current motor operating on 13.8 volts or 27.6 volts DC. The pump’s motor system contains no wearing components except for ball bearings, which are designed for 60,000 hours of operation and are not subject to the life-reducing brush dust inherent in brush-motor pumps. ECDC motors have no brushes and are sealed to prevent contamination from salt, road chemicals, wash-down products and humidity. These advantages, coupled with life-cycle cost savings, result in superior performance from AMETEK ECDC motor products.

Components

The seal-less pump has of two main sections:

• Seal-less pump
• 13.8 VDC motor or 27.6 VDC motor

Configurations

The seal-less pump is available in a variety of configurations, each of which is labeled with a six-digit identifier (see table 1.1, p. 1-2, and 1.2, p. 1-2).

<table>
<thead>
<tr>
<th>Table 1.1. Seal-Less Pump Configurations with a 13.8 VDC Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Identifier</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>071041</td>
</tr>
<tr>
<td>071086</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 1.2. Seal-Less Pump Configurations with a 27.6 VDC Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Identifier</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>071042</td>
</tr>
<tr>
<td>071043</td>
</tr>
<tr>
<td>071045</td>
</tr>
<tr>
<td>071080</td>
</tr>
<tr>
<td>071104</td>
</tr>
<tr>
<td>071106</td>
</tr>
</tbody>
</table>
The motor for a 13.8 VDC or 27.6 VDC seal-less pump also is labeled with a numerical identifier (see table 1.3, p. 1-3).

### Table 1.3. Motor Identifiers with 13.8 VDC and 27.6 VDC Replacement Motors

<table>
<thead>
<tr>
<th>Motor Identifier</th>
<th>VDC</th>
<th>Pump Configuration Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>071070000</td>
<td>13.8</td>
<td>071041 and 071086</td>
</tr>
<tr>
<td>071071000</td>
<td>27.6</td>
<td>071042 and 071104</td>
</tr>
<tr>
<td>071072000</td>
<td>27.6</td>
<td>071043, 071045 and 071106</td>
</tr>
</tbody>
</table>

Note: For pump model number 071080, use motor 071071000, and add a female connector.

### ABOUT THIS MANUAL

This manual provides step-by-step instructions and annotated diagrams for servicing the 18 GPM Seal-Less ECDC Water Circulation Pump. A parts list for the seal-less pump, the 13.8-volt motor and the 27.6-volt motor is provided (see appendixes A-C).

On the parts lists, each part is identified by part number, item number, quantity and description. The item numbers are used to annotate the schematic diagrams included in this manual (see, for example, figure 4.1 (p. 4-3). Circled numbers on the diagrams refer to the item numbers in the applicable parts list. For example:

6 refers to item number 6 (screw, socket head) and part number 121857000 on the Seal-Less Pump Replacement Parts List (see appendix A).

119 refers to item number 119 (shim) and part number 522361000 on the 27.6 VDC Motor Replacement Parts List (see appendix C).

These circled numbers also correspond to numbers in the maintenance and repair procedures chapter (see chapter 4) of this manual. In the text of the steps, the item numbers are enclosed in flat brackets and follow the part name being referenced. For example:

round gasket [3A] refers to item number 3A on the Seal-Less Pump Replacement Parts List (see appendix A).
When a notation such as \((2x)\) appears with a part name on an annotated diagram, the number refers to the quantity of that particular part that is needed where indicated.

The remaining sections of this manual are as follows:
• Chapter 2: Recommended Maintenance
• Chapter 3: Troubleshooting
• Chapter 4: Maintenance and Repair Procedures
• Appendix A: Replacement Parts List for Seal-Less Pump
• Appendix B: Replacement Parts List for 13.8 VDC Pump Model Numbers 071041 and 071086
• Appendix C: Replacement Parts List for 27.6 VDC Pump Model Numbers 071042, 071043, 071045, 071080, 071104 and 071106
• Appendix D: Outline Drawings for 13.8 VDC Pump Model Numbers 071041 and 071086
• Appendix E: Outline Drawings for 27.6 VDC Pump Model Numbers 071042, 071043, 071045, 071104 and 071106

Three sets of procedures are included in Chapter 4:
• Removing the Seal-Less Pump
• Replacing the Ball Bearings
• Replacing the Electronics Component
INTRODUCTION

The primary advantage to using ECDC motor products is the life-cycle cost savings with regard to maintenance. The elimination of brushes and commutators (as in brush DC motors) makes ECDC motors more reliable because there are no brushes or commutators to replace or service. ECDC motors also are sealed to protect them from outside contamination.

MOTORS AND BALL BEARINGS

Of the main parts of the 18 GPM Seal-Less ECDC Water Circulation Pump’s components, only the motor requires scheduled maintenance.

The ball bearings in the seal-less pump’s motor assembly are the only wearable parts and are designed for 60,000 hours of service. The ball bearings should be changed after six to eight years of service. This is an estimate of useful ball-bearing life, and the actual life may be longer depending on load and severity of use.
Chapter 3: Troubleshooting
INTRODUCTION

When using the 18 GPM Seal-Less ECDC Water Circulation Pump, you may encounter one or both of the following problems:

• Hot water is not flowing through the seal-less pump.
• Motor will not operate.

The “no heat” problem means that something in the pump system is not operating properly. No heat is generated because water is not flowing through the pump system. Causes for this problem may include an inoperable pump, a failed part or a blockage of some sort. An inoperable motor also can have multiple causes.

The two sections below tell you how to troubleshoot and find the cause of the problem you are experiencing.

NO HOT WATER FLOW

If the pump is not generating a flow of hot water, follow the steps below to determine whether the pump has failed or if some other part of the system is causing the problem:

1. Locate a clamp-on DC ammeter with a range of 500 mA to 10 amps DC.
2. Remove any loom covering from the leads of the pump motor so you can access the red (+) and black (-) leads.
3. Attach the ammeter clamp over the red (+) lead.
4. Energize power to the pump.
5. Use a voltmeter to verify that the proper voltage is being applied to the pump motor.

The proper voltage in a 12 VDC system is approximately 13.8 VDC.

The proper voltage in a 24 VDC system is approximately 27.6 VDC.

6. Check the ammeter reading. The following readings indicate various conditions:
**Normal Operation.** If the ammeter reading is 5.0 amps to 11 amps with a 12 VDC system or 2.5 amps to 5.5 amps with a 24 VDC system, the current range is normal and the pump is functioning properly.

**Pump Damage.** If the ammeter reading is 0.5 amps to 1.0 amps, either the pump has decoupled from the motor because of an obstruction in the pump or the pump is locked because the pump has run dry. The problem is not with the motor; it is operating properly. The pump portion of the motor, however, needs to be repaired or replaced, depending on the extent of the damage. You will need to disassemble the pump to see which parts have been affected and whether they can be repaired or must be replaced.

**Pump or Motor Ball-Bearing Failure.** An ammeter reading of 12 amps or higher with a 12 VDC system or 7.0 amps or higher with a 24 VDC system indicates that the pump either is being obstructed but not to the point of complete failure or the pump has run dry and is in the process of failing. The higher-than-normal current reading may indicate that the motor’s ball bearings are failing. Verify that the motor runs properly **without** the pump attached. If the current reading for the motor alone is greater than 1.5 amps, then the ball bearings should be replaced.

**Improper Supply Voltage.** If the ammeter reading is 100mA or less, check the supply voltage to verify that the proper voltage is being applied to the pump motor.

![NOTE](image)

The proper voltage reading will depend on the type of bus in which the pump was installed.

**Reversed Polarity.** Check the polarity to ensure that it is correct [i.e., positive (+) red, negative (-) black]. If you are working with a 12-volt pump and the polarity is reversed, the inline fuse (see figure 3.1, p. 3-5) will blow and will have to be replaced. If you are working with a 24-volt pump and the polarity is reversed, the motor will not operate. The 24-volt pump uses a reverse-polarity protection circuit, so there is no fuse to
blow or to replace (see figure 3.2, p. 3-6). Simply hook up the leads correctly, and the motor will operate properly.

NOTE

Different bus systems will operate at different set points. The amp reading for properly operating pumps should remain fairly consistent throughout the same bus model and model year.
Figure 3.1. Fuse on 13.8 VDC Pump.
Figure 3.2. 27.6 VDC Pump (No Fuse).
If the polarity is correct and the ammeter reading remains at 100 mA or less, you will need to remove the motor from the pump for repair or replacement. Which option you choose will depend on the damage you find after disassembling the motor from the pump (see p. 4-2) and inspecting the condition of the various parts that function with the motor.

Instructions for removing the pump from the motor and putting it all back together again are provided in the Removing the Seal-Less Pump section of chapter 4 of this manual (see p. 4-2).

The pump can be removed from the motor without draining the pump first.

If the motor will not operate, follow the steps below to determine the cause of the problem:

1. **Incorrect Voltage Connections.** Check the connections to the motor terminals to verify that the red positive (+) and black negative (-) leads are connected to the proper supply voltage. If the leads are reversed, the unit will not operate. The motor on a 12-volt pump will blow the inline fuse. The motor on a 24-volt pump uses a reverse-polarity protection circuit and will not run until the polarity error has been corrected. Check the circuit breaker to verify that the motor is functioning properly.

2. **Improper Voltage.** Check the motor connections with a voltmeter to verify that the proper voltage is being supplied to the motor.

The proper voltage reading will depend on the type of bus in which the pump motor was installed. In general, though, the motor should draw approximately 1 amp at no-load and rotate in a clockwise direction when viewed from the lead exit end of the motor.
3. **Faulty Motor.** If the motor is receiving the proper voltage and still does not operate, the problem is with the motor. The motor will need to be serviced by the transit operator's shop personnel, at an AMETEK-approved service facility or returned to AMETEK if the motor is still under warranty.

**FIXING THE PROBLEM**

After troubleshooting the problem and determining what needs to be fixed, follow the appropriate maintenance and repair procedures described in chapter 4 of this manual.
Chapter 4: Maintenance and Repair Procedures
This chapter provides step-by-step instructions for the following seal-less pump maintenance and repair procedures:

- Removing and replacing the seal-less pump
- Removing and replacing worn or defective ball bearings
- Replacing the electronics component

**Seal-Less Pump.** Removal and replacement of the seal-less pump involves four main tasks:

- Disassembling the seal-less pump from the motor
- Disassembling the seal-less pump
- Assembling the seal-less pump
- Assembling the pump onto the motor

**Ball Bearings.** Removal and replacement of ball bearings involves two main tasks:

- Disassembling the rear endbell to access the shaft/rotor assembly
- Assembling the rear endbell with new ball bearings attached to the shaft/rotor assembly

**Electronics.** Removal and replacement of the electronic component involves two main tasks:

- Removing the electronics component
- Installing the new electronics component

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**REMOVING THE SEAL-LESS PUMP**

**Disassembling the Seal-Less Pump from the Motor**

To disassemble the seal-less pump from the motor, follow the steps below, and refer to figure 4.1 (p. 4-3) for an exploded view:

1. Remove the four socket-head screws [6] and the four flat washers [7] from the connecting housing [2].
2. Remove the plastic threaded plug [8]. This allows you to remove the drive magnet [3].
Figure 4.1. Water Boost Pump Magnetic Drive Typical Assembly.
3. Loosen the two set screws [9] on the drive magnet [3] as shown in the Detail A diagram on figure 4.1 (p. 4-3).

4. Remove the drive magnet [3].

5. Remove the four flat-head screws [5] on the connecting housing [2].

6. Remove the connecting housing [2].

Disassembling the Seal-Less Pump

To disassemble the seal-less pump, follow the steps below, and refer to figure 4.2 (p. 4-5) for an exploded view:

1. Remove the four flat-head screws [8A] from the pump housing assembly’s housing connector ring [1A].

2. If your pump has a square gasket on the housing connector ring [1A], remove and discard the square gasket. You will not need it for reassembly. This part is no longer being used.

3. Remove the impeller housing [2A].

4. Remove the round gasket [3A] that lies between the impeller housing [2A] and the impeller assembly [4A].

   **STOP**

   This gasket [3A] should be replaced **each time** the pump is disassembled.

5. Remove the impeller assembly [4A] from the impeller shaft [5A].

6. Remove the thrust washer [6A] from the brass pump housing [7A].

7. Inspect the impeller assembly [4A], the thrust washer [6A] and the brass pump housing [7A] for cracks, dents, worn surfaces or other damage.

8. Replace any worn or damaged parts.

9. Clean all parts that will be reused.
Figure 4.2. Pump Housing Assembly Components for Water Boost Pump.

- FLAT-HEAD SCREW (4X)
- HOUSING CONNECTOR RING
- IMPELLER HOUSING
- ROUND GASKET
- IMPELLER ASSEMBLY
- IMPELLER SHAFT
- THRUST WASHER
- BRASS PUMP HOUSING
Assembling the Seal-Less Pump

To assemble the seal-less pump, follow the steps below, and refer to figure 4.2 (p. 4-5) for an exploded view:

1. Attach the thrust washer [6A] to the brass pump housing [7A].
2. Attach the impeller assembly [4A] to the impeller shaft [5A].

STOP

Use caution when replacing the round gasket [3A]. Do not pinch or bend it.

4. Attach the impeller housing [2A].
5. Insert the four flat-head screws [8A] into the holes on the housing connector ring [1A].
6. Apply Loctite #242 to the screw threads.
7. Torque the screws to 120 to 130 inch-pounds.
8. Test the pump for leaks.

Assembling the Seal-Less Pump onto the Motor

To assemble the seal-less pump onto the motor, follow the steps below, and refer to figure 4.1 (p. 4-3) for an exploded view:

2. Apply Loctite #242 to the screw threads.
3. Torque the screws to 23 to 25 inch-pounds.
4. Line up the motor flats (see the Detail B diagram on figure 4.1, p. 4-3) on the motor shaft (see the Detail A diagram on figure 4.1, p. 4-3) with the screw locations on the drive magnet [3] (see the Detail A diagram on figure 4.1, p. 4-3).

STOP

The inside face of the drive magnet [3] must be flush with the end of the shaft.

5. Insert the two set screws [9] as shown in the Detail A diagram on figure 4.1 (p. 4-3).
6. Apply adhesive P-0-2072-H (or an alternate, such as P-1-2052-H) to a minimum of three threads of screws.

7. Torque the two set screws [9] to 50 to 55 inch pounds.

8. Insert the plastic threaded plug [8] into the connecting housing [2].


9. Orient the pump housing assembly [4] with the desired outlet configuration as shown in the Blast Direction Options illustration on figure 4.1 (p. 4-3).

   The orientation options are: position A (12:00 blast), position C (3:00 blast), position E (6:00 blast) and position G (9:00 blast).

10. Attach the pump housing assembly [4] to the connecting housing [2].


12. Apply Loctite #242 to the screw threads.

13. Torque the screws to 55 to 60 inch-pounds.

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**REPLACING THE BALL BEARINGS**

**Disassembling the Rear Endbell**

To access the pump’s ball bearings, the rear endbell in the pump’s motor must be disassembled. To disassemble the rear endbell and gain access to the ball bearings, follow the steps below, and refer to figures 4.3 (p. 4-9) and 4.4 (p. 4-10) for exploded views:

1. Remove the four socket-head screws [6] from the motor [1] as shown in figure 4.1 (p. 4-3).

2. Move the motor to a clean work area.

4. Remove the plastic threaded plug [8]. This allows you to remove the drive magnet [3].

5. Loosen the two set screws [9] on the drive magnet [3] as shown in the Detail A diagram on figure 4.1 (p. 4-3).

6. Remove the drive magnet [3].

7. Remove the four flat-head screws [5] on the connecting housing [2].

8. Remove the connecting housing [2].

9. Remove the four fillister-head screws [108] from the rear endbell [103].
Figure 4.4. 47FR ECDC Pump Motor Showing Endbell and Electronics Component.
10. Remove the rear endbell [103].

**STOP**

Be sure that you do **not** chip or otherwise damage the **encoder magnet** on the end of the shaft/rotor assembly [104]. The encoder magnet is **not** a replaceable part. If the encoder magnet is damaged, the **entire shaft/rotor assembly** [104] must be replaced.

11. Remove the shaft/rotor assembly [104].

12. Remove the external retaining ring [118] from the shaft/rotor assembly [104].

13. Note the location of any shims [119] and the location of the compression spring [117].

**STOP**

This is an **important step**. You will need to remember these locations in order to ensure proper placement of the shims [119] and the compression spring [117] when you reassemble the rear endbell [103] with new ball bearings (see step 2 in the Assembling the Rear Endbell with New Ball Bearings section, p. 4-11) of this manual.

14. Remove the compression spring [117] and any shims [119].

15. Remove the two ball bearings [116] by sliding one off of each end of the shaft/rotor assembly [104]. One of the ball bearings will be next to the external retaining ring [118]; the other one will be between the O-ring [110] for the rear endbell [103] and the end of the shaft/rotor assembly [104].

16. Discard the ball bearings.

17. Clean the ball bearing seat with No. 800 emery cloth. This will enable the new ball bearings [116] to slip onto the shaft/rotor assembly [104]. No lubrication should be needed.

**Assembling the Rear Endbell with New Ball Bearings**

To replace the old ball bearings and assemble the rear endbell with new ball bearings, follow the steps below, and refer to figure 4.4 (p. 4-10) for an exploded view:

1. Slip one each of the two new ball bearings [116] onto both ends of the shaft/rotor assembly [104].

2. Install the compression spring [117] and any shims [119].
3. Install the external retaining ring [118] with the rounded side facing the ball bearing nearest the compression spring [117].

4. Inspect the O-ring [110] located behind the rear endbell [103] for chips, cracks or other damage.

5. Replace the O-ring [110] if it has been damaged.

6. Place the shaft/rotor assembly [104], with the two new ball bearings installed, into the rear endbell [103].

7. Install the rear endbell [103] onto the motor.

8. Torque the four fillister-head screws [108] on the rear endbell [103] to 18 to 20 inch pounds.

9. Verify that the shaft/rotor assembly [104] has spring in it by pushing on the end of the shaft. The shaft should spring back if properly installed.

10. Hook up the motor leads as shown in the Detail-2 diagram on figure 4.3 (p. 4-9). Be sure to use the proper input voltage.

11. Energize the motor.

12. Verify that the motor is rotating clockwise when viewed from the lead exit-point on the motor (i.e., viewed with the motor shaft going away from you).

13. Use an ammeter to verify that the current draw is approximately 1 amp after one minute of operation.

14. Attach the connecting housing [2].

15. Use the four flat-head screws [5] to secure the connecting housing [2].

16. Attach the drive magnet [3].
17. Use the two set screws [9] to secure the drive magnet [3] as shown in the Detail A diagram on figure 4.1 (p. 4-3).

18. Insert the plastic threaded plug [8] to secure the drive magnet [3].

19. Insert the four socket-head screws [6] and the four flat washers [7] to secure the connecting housing [2].

20. Use the four socket-head screws [6] to reattach the motor [1] to the seal-less pump as shown in figure 4.1 (p. 4-3).

21. Install the pump onto the bus.

22. Connect the pump input connector to the connector.

23. Verify that the pump is operating properly.

24. Energize the pump to the voltage required for the bus.

REPLACING THE ELECTRONICS COMPONENT

**Removing the PCB/Heat-Sink Assembly**

To disassemble the area of the pump that houses the electronics component, follow the steps below, and refer to figures 4.3 (p. 4-9) and 4.4 (p. 4-10) for exploded views:

1. Remove the four socket-head screws [6] from the motor [1] as shown in figure 4.1 (p. 4-3).

2. Move the motor to a clean work area.

3. Mark the location of the lead-wire exit grommet on the PCB/heat-sink assembly [106] (see figure 4.4, p. 4-10; see also, the Detail View D-D diagram on figure 4.3, p. 4-9).

   This is a critical step. You will need the markings later to ensure proper alignment of the new PCB/heat-sink assembly [106] (see step 3 in the Installing the New Electronics Component section, p. 4-14) of this manual.

4. Remove the two fillister-head screws [109] and two flat washers [111] that secure the PCB/heat-sink assembly [106] and the electronics housing [105] in place.

5. Remove the PCB/heat-sink assembly [106] and the electronics housing [105] from the motor [1].
6. Pry off the old PCB/heat-sink assembly [106] from the electronics housing [105]. A press may be used if necessary.

7. Unscrew the PCB/heat-sink assembly [106] leads from the pump connector (see the Detail 2 diagram in figure 4.3, p. 4-9).

8. Remove and discard the old PCB/heat-sink assembly [106].

9. Clean the electronics housing [105].

STOP

Be sure that all of the old RTV sealant has been removed from the electronics housing [105].

10. Inspect the condition of the O-ring [110] for cracks, cuts or other damage.

11. Insert a new O-ring [110] if the old one has been damaged.

12. Place the electronics housing [105] back onto the motor [1].

To install the new PCB/heat-sink assembly, follow the steps below, and refer to figures 4.3 (p. 4-9) and 4.4 (p. 4-10) for exploded views:

1. Attach the PCB/heat-sink assembly [106] leads to the positions shown in the Detail 2 diagram of figure 4.3 (p. 4-9).

2. Run a bead of electronics-compatible RTV sealant (such as Dow Corning 3145) around the PCB/heat-sink assembly [106].

3. Place the PCB/heat-sink assembly [106] as close as possible to the same position as that of the old PCB/heat-sink assembly [106]. Use the markings you made in step 3 of the Removing the Electronics Component section (p. 4-13).

4. Hook up an ammeter to the red (+) and black (-) motor leads.

5. Energize with the proper voltage.

6. Rotate the PCB/heat-sink assembly [106] by 15 degrees clockwise and/or 15 degrees counterclockwise until the current draw of the motor is at its lowest level and the motor is rotating clockwise. The current reading should be approximately 1 amp as viewed from the lead-exit end of the motor.

7. Insert the two fillister-head screws [109] and the two flat washers [111] that hold the PCB/heat-sink assembly [106] and the electronics housing [105] in place.
8. Torque the screws to 18 to 20 inch pounds.

9. Verify that the pump is operating properly. If the ammeter reading is 5.0 amps to 11 amps with a 12 VDC system or 2.5 amps to 5.5 amps with a 24 VDC system, the current range is normal and the pump is functioning properly. Rotation should be in a clockwise direction when viewed from the lead-exit end of the motor.


11. Apply Loctite #242 to the screw threads.

12. Torque the screws to 55 to 60 inch-pounds.
Appendix A:
Replacement Parts List
for Seal-Less Pump
The following is a list of replacement parts for the seal-less pump.

<table>
<thead>
<tr>
<th>AMETEK Part #</th>
<th>Item #</th>
<th>Quantity</th>
<th>Description</th>
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</thead>
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<td>071070000</td>
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<td>Motor 13.8 VDC; for 071041 &amp; 071086</td>
</tr>
<tr>
<td>071071000</td>
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<td>Motor 27.6 VDC; for 071042</td>
</tr>
<tr>
<td>071072000*</td>
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<td>1</td>
<td>Motor 27.6 VDC; for 071043 &amp; 071045</td>
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<tr>
<td>5-4105-2</td>
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<td>Connecting Housing</td>
</tr>
<tr>
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<td>Drive Magnet (includes set screws)</td>
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<tr>
<td>5-4088</td>
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</tr>
<tr>
<td>251230000</td>
<td>5</td>
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<td>Screw, Flat Head</td>
</tr>
<tr>
<td>121857000</td>
<td>6</td>
<td>4</td>
<td>Screw, Socket Head</td>
</tr>
<tr>
<td>251286000</td>
<td>7</td>
<td>4</td>
<td>Washer, Flat</td>
</tr>
<tr>
<td>5-4137</td>
<td>8</td>
<td>1</td>
<td>Plug, Plastic Threaded</td>
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<tr>
<td>5-7802</td>
<td>9</td>
<td>2</td>
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<td>Housing Connector Ring</td>
</tr>
<tr>
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<td>Impeller Housing</td>
</tr>
<tr>
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<td>Gasket, Round</td>
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<tr>
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<td>4A</td>
<td>1</td>
<td>Impeller Assembly</td>
</tr>
<tr>
<td>5-4088-5</td>
<td>5A</td>
<td>1</td>
<td>Impeller Shaft</td>
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<tr>
<td>5-4088-6</td>
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<td>5-4088-1</td>
<td>7A</td>
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<td>Pump Housing, Brass</td>
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<td>5-4088-8</td>
<td>8A</td>
<td>4</td>
<td>Screw, Flat Head</td>
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</table>

* This motor comes with a male connector on the end of the lead wires.
Appendix B: Replacement Parts List for 13.8 VDC Pump Model Numbers 071041 and 071086
The following is a list of replacement parts for the 13.8 VDC pump configurations 071041 and 071086.

<table>
<thead>
<tr>
<th>AMETEK Part #</th>
<th>Item #</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>071070000</td>
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<td>1</td>
<td>Motor Assembly Complete, 13.8 VDC</td>
</tr>
<tr>
<td>525259000</td>
<td>101</td>
<td>1</td>
<td>Stator/Housing Assembly, 13.8 VDC</td>
</tr>
<tr>
<td>523861000</td>
<td>103</td>
<td>1</td>
<td>Endbell, Rear</td>
</tr>
<tr>
<td>525258000</td>
<td>104</td>
<td>1</td>
<td>Shaft/Rotor Assembly (with Ball Bearings)</td>
</tr>
<tr>
<td>521482000</td>
<td>105</td>
<td>1</td>
<td>Housing, Electronics</td>
</tr>
<tr>
<td>523660000</td>
<td>106</td>
<td>1</td>
<td>PCB/Heat-Sink Assembly</td>
</tr>
<tr>
<td>527156000</td>
<td>107</td>
<td>1</td>
<td>Endbell, Front</td>
</tr>
<tr>
<td>120430000</td>
<td>108</td>
<td>6</td>
<td>Screw, Fillister Head, 8-32 x 0.75&quot; Long</td>
</tr>
<tr>
<td>121300000</td>
<td>109</td>
<td>2</td>
<td>Screw, Fillister Head, 8-32 x 2.25&quot; Long</td>
</tr>
<tr>
<td>121299000</td>
<td>110</td>
<td>3</td>
<td>O-Ring</td>
</tr>
<tr>
<td>251300000</td>
<td>111</td>
<td>2</td>
<td>Washer, Flat # 8</td>
</tr>
<tr>
<td>521458000</td>
<td>116</td>
<td>2</td>
<td>Ball Bearing</td>
</tr>
<tr>
<td>121298000</td>
<td>117</td>
<td>1</td>
<td>Compression Spring</td>
</tr>
<tr>
<td>271092000</td>
<td>118</td>
<td>1</td>
<td>Retaining Ring, External</td>
</tr>
<tr>
<td>522361000</td>
<td>119</td>
<td>1</td>
<td>Shim</td>
</tr>
<tr>
<td>506505000</td>
<td>120</td>
<td>1</td>
<td>Tubing, Heat Sink</td>
</tr>
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</tr>
<tr>
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<td>201</td>
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<td>Connector Housing</td>
</tr>
<tr>
<td>40-5144-2</td>
<td>202</td>
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<td>Cable Seal</td>
</tr>
<tr>
<td>5-4055</td>
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<td>2</td>
<td>Clamp</td>
</tr>
<tr>
<td>40-5144-8</td>
<td>204</td>
<td>2</td>
<td>Terminal, Male</td>
</tr>
<tr>
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<td>205</td>
<td>1</td>
<td>Loom, Nylon</td>
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<tr>
<td>523911000</td>
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<td>1</td>
<td>Baseplate</td>
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<tr>
<td>121617000</td>
<td>207</td>
<td>4</td>
<td>Cable Tie</td>
</tr>
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Appendix C: Replacement Parts List for 27.6 VDC Pump
Model Numbers 071042, 071043, 071045, 071080, 071104 and 071106
The following is a list of replacement parts for the the 27.6 VDC pump model numbers 071042, 071043, 071045, 071080, 071104 and 071106. For motors 071071000 and 071071000, use Parts Groups A and B. Use Parts Groups A and C for pump model number 071080, which requires a female (rather than a male) terminal for the connector housing.

<table>
<thead>
<tr>
<th>AMETEK Part #</th>
<th>Item #</th>
<th>Quantity</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>071071000</td>
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</tr>
<tr>
<td>071072000</td>
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<td>1</td>
<td>Motor Assembly, 27.6 VDC (with Male Connector)</td>
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</tr>
<tr>
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<td>103</td>
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<td>Endbell, Rear</td>
</tr>
<tr>
<td>525258000</td>
<td>104</td>
<td>1</td>
<td>Shaft/Rotor Assembly (with Ball Bearings)</td>
</tr>
<tr>
<td>521482000</td>
<td>105</td>
<td>1</td>
<td>Housing, Electronics</td>
</tr>
<tr>
<td>523662000</td>
<td>106</td>
<td>1</td>
<td>PCB/Heat-Sink Assembly</td>
</tr>
<tr>
<td>527156000</td>
<td>107</td>
<td>1</td>
<td>Endbell, Front</td>
</tr>
<tr>
<td>120430000</td>
<td>108</td>
<td>6</td>
<td>Screw, Fillister Head, 8-32 x 0.75” Large</td>
</tr>
<tr>
<td>121300000</td>
<td>109</td>
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<td>Screw, Fillister Head, 8-32 x 2.25” Large</td>
</tr>
<tr>
<td>121299000</td>
<td>110</td>
<td>3</td>
<td>O-Ring</td>
</tr>
<tr>
<td>251300000</td>
<td>111</td>
<td>2</td>
<td>Washer, Flat # 8</td>
</tr>
<tr>
<td>521458000</td>
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<td>Ball Bearing</td>
</tr>
<tr>
<td>121298000</td>
<td>117</td>
<td>1</td>
<td>Compression Spring</td>
</tr>
<tr>
<td>271092000</td>
<td>118</td>
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<td>Retaining Ring, External</td>
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<tr>
<td>522361000</td>
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<td>Shim</td>
</tr>
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<td>Tubing, Heat Shink</td>
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<td>40-5144-4</td>
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<td>1</td>
<td>Loom, Nylon</td>
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<tr>
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Appendix D:
Outline Drawings for 13.8 VDC
Pump Model Numbers
071041 and 071086
Figure D.1: Water Circulation Pump Magnetic Drive (13.8 VDC) with Inline Fuse for Pump Model Number 071041.
Figure D.2: Water Circulation Pump Magnetic Drive (13.8 VDC) with Baseplate for Pump Model Number 071086.
Appendix E: Outline Drawings for 27.6 VDC Pump Model Numbers 071042, 071043, 071045, 071080, 071104 and 071106
Figure E.1. Water Circulation Pump Magnetic Drive (27.6 VDC) for Pump Model Number 071042.
Figure E.2. Water Circulation Pump Magnetic Drive (27.6 VDC) with Baseplate and Connector for Pump Model Number 071043.
Figure E.4. Water Circulation Pump Magnetic Drive (27.6 VDC) with Hook-Up Diagram for Pump Model Number 071080.
E-6 Appendix E: Outline Drawings for 27.6 VDC Pump

Figure E.5. Water Circulation Pump with Flange Kit for Pump Model Number 071104.
Figure E.6. Water Circulation Pump with Connector Kit for Pump Model Number 071106.