

# WATEROUS

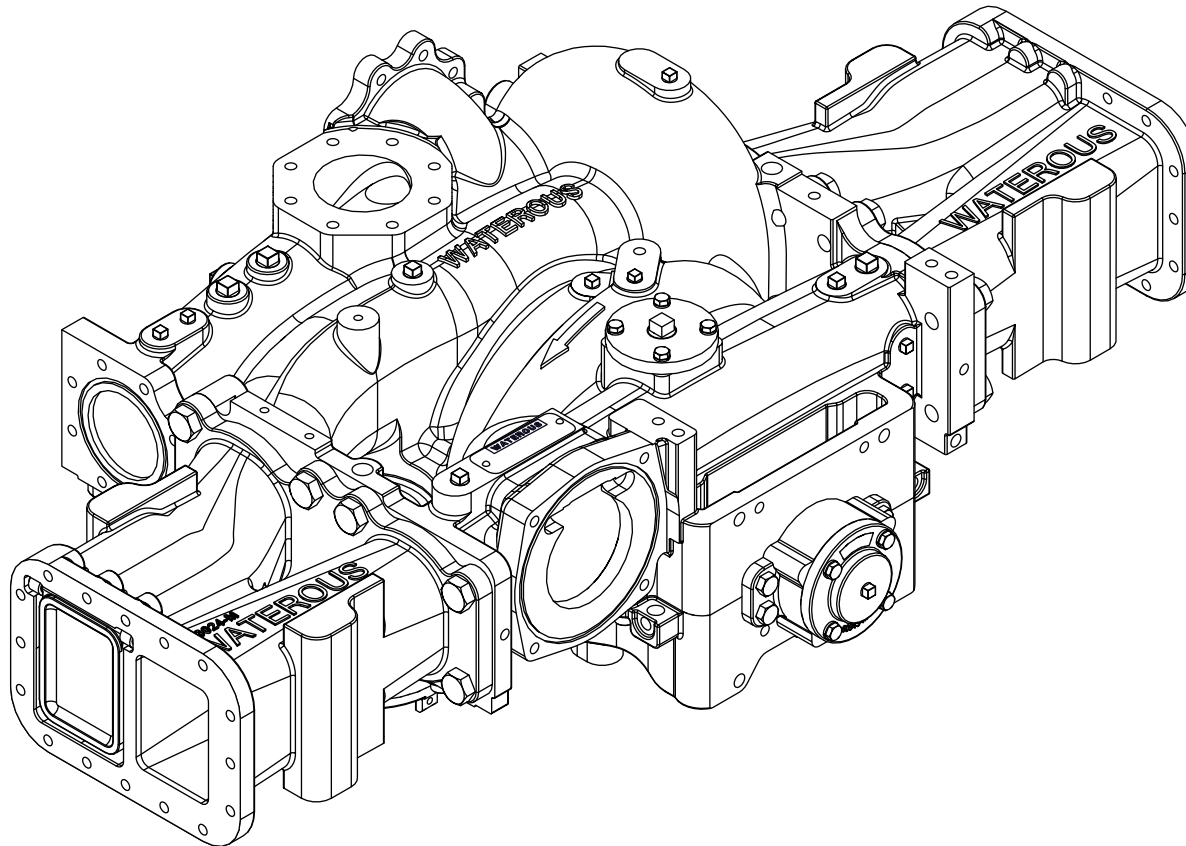
Form Number: F-3003

Issue Date: Jan 5, 2023  
Revision Date: Sept 9, 2024

## CM Series Fire Pumps

### Installation

---



Waterous Company • 125 Hardman Avenue South • South Saint Paul, MN 55075 • (651) 450-5000

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



# Table of Contents

---

<b>Safety</b>	<b>4</b>	<b>Mounting the Angle Brackets</b>	<b>28</b>
Safety Precautions	4	CMC22/CMUC22 (Front-Mounted)	29
<b>Introduction</b>	<b>5</b>	Optional Spring Configuration	30
Using this Document	5	<b>Mounting the Pump</b>	<b>31</b>
Viewing the Document Electronically	5	3-Point Mounting Method	31
Printing the Document	5	3-Point Mounting Method—CMC22/CMUC22 (Front-Mounted)	32
Additional Documentation	5	4-Point Mounting Method—Optional Spring Configuration	33
Symbols	5	<b>Installing the Pump Drain Lines—Pump Body</b>	<b>34</b>
<b>Product Overview</b>	<b>6</b>	<b>Installing the Transmission Drain Lines—CMK</b>	<b>35</b>
CM Series Pumps—Drive Options	6	<b>Installing the Transmission Drain Lines—CMUK</b>	<b>36</b>
CM Series Pumps—Intake and Discharge Flanges	7	<b>Installing the Transmission Drain Lines—CMPA/CMUPA</b>	<b>37</b>
CMD/CMUD	8	<b>Installing the Transmission Drain Lines—CMC22/CMUC22</b>	<b>38</b>
CMK/CMUK	9	<b>Installing the Transfer Valve Actuator—Manual Version</b>	<b>40</b>
CMPA/CMUPA	10	Mounting the Control Panel	40
CMC22/CMUC22	11	Installing the Handle	41
CMC22/CMUC22 (Front-Mounted)	12	Installing the Control Rod	42
Transfer Valve Actuator Control Panel—Manual Version	14	Connecting the Components	43
Manual Transfer Valve Actuator	15	<b>Installing the Transfer Valve Actuator—Electric Version</b>	<b>44</b>
Encoder Extension Cable	16	Mounting the Control Panel	44
Transfer Valve Actuator Control Panel—Electric Version	17	Mounting the Power Relay Module	45
Electric Transfer Valve Actuator	18	Connecting the Components	46
Power Relay Module	19	<b>Installing the Transfer Valve Actuator—Manual Override</b>	<b>47</b>
Motor Extension Cable	20	Mounting the Control Panel	47
Transfer Valve Actuator Manual Override—Optional	21	Installing the Crank Handle	48
<b>Installation</b>	<b>22</b>	Installing the Control Rod	49
Installation Overview	22	<b>CMCGV/CMUCGV—Building the Isolation Valve Controls</b>	<b>50</b>
Preparing for the Installation	22	<b>Installing the Anodes and Intake Screens</b>	<b>51</b>
Modifying the Equipment	22	<b>Tachometer Connection</b>	<b>52</b>
Determining the Pump Location	22	<b>Lubrication</b>	<b>52</b>
Determining Cable and Wire Routing	22	<b>Transmission Temperature Specifications</b>	<b>52</b>
Optional Equipment	22	<b>Testing After Installation</b>	<b>52</b>
CMD/CMUD—Installing the Pump	23		
CMK/CMUK—Installing the Pump	24		
CMPA/CMUPA—Installing the Pump	25		
CMC22/CMUC22—Installing the Pump	26		
CMC22/CMUC22 (Front-Mounted)—Installing the Pump	27		

## Safety Precautions

- Read and understand all the associated documentation before you begin installing the product.
- Contact Waterous when you have questions about installing the equipment.
- Read and understand all the notices and safety precautions.
- Do not operate the equipment when safety guards are removed.
- Do not modify the equipment.


! WARNING	
<p><b>Sudden Unexpected Movement</b></p> <ul style="list-style-type: none"> <li>• Unexpected movement can cause injury or death.</li> <li>• Make sure the shift unit is in the proper mode before operation.</li> </ul>	

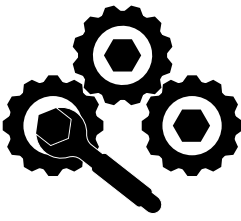
! WARNING	
<p><b>Hot Liquid</b></p> <ul style="list-style-type: none"> <li>• Hot liquid can scald you.</li> <li>• Do not operate if water temperature exceeds 160°F (71°C).</li> </ul>	

! WARNING	
<p><b>High Pressure</b></p> <ul style="list-style-type: none"> <li>• Liquid ejected at high pressure can cause serious injury.</li> <li>• Do not operate beyond recommended pressure.</li> </ul>	

! WARNING	
<p><b>Hot Surface</b></p> <ul style="list-style-type: none"> <li>• Hot surfaces can burn you.</li> <li>• Do not touch the surface during operation—allow it to cool after operating.</li> </ul>	

! WARNING	
<p><b>High Pressure</b></p> <ul style="list-style-type: none"> <li>• Discharge ejected at high pressure can cause serious injury and damage.</li> <li>• Direct discharge away from people and equipment.</li> </ul>	

NOTICE	
<p><b>Before Operation</b></p> <ul style="list-style-type: none"> <li>• Read and understand all the instructions provided.</li> <li>• Check all fluid levels and replenish if necessary.</li> <li>• Remove all shipping plugs and install the operation plugs or caps.</li> </ul>	

NOTICE	
<p><b>Maintenance</b></p> <ul style="list-style-type: none"> <li>• Not following maintenance procedures can damage your equipment.</li> <li>• Perform all maintenance procedures as required.</li> </ul>	



Use this document to install and operate your Waterous equipment. Understand the following conditions before continuing with the document:

- The instructions may refer to options or equipment that you may not have purchased with your system.
- The illustrations in this document are intended to convey concepts. Do not use the illustrations to determine physical attributes, placement, or proportion.
- Understand that your application may require additional steps, that are not described in the illustrations or instructions, to perform the installation.
- The equipment described in this document is intended to be installed by a person or persons with the necessary skills and knowledge to perform the installation.
- The equipment described in this document is intended to be operated by a person or persons with the basic knowledge of operating similar equipment.
- The information in this document is subject to change without notice.

This document is divided into the following sections:

### SAFETY

This section describes general precautions and alert symbols that are in this document.

### INTRODUCTION

This section is an overview of the document.

### PRODUCT OVERVIEW

This section describes the components that make up the system.

### INSTALLATION

This section describes installing the equipment.

## Using this Document

Use the guidelines below when viewing this document.

### Viewing the Document Electronically

- View this document in landscape orientation.
- Use the table of contents to navigate directly to that section.
- Text **with this appearance** is linked to a reference.

### Printing the Document

- The document is best viewed when printed in color.
- The print on both sides and flip on long edge features provide the best results.
- Use a 3-ring binder to store the document.

## Additional Documentation

Additional documentation is available through the MyWaterous login at [waterousco.com](http://waterousco.com). Use your serial number to gain access to the service parts list associated with your system. Dimensional drawings are available through the Waterous Service department.

## Symbols

Symbols are used to illustrate additional tools or operations that are required to complete the instructions.



Discard—This symbol tells you to discard or recycle the part in accordance with local regulations.



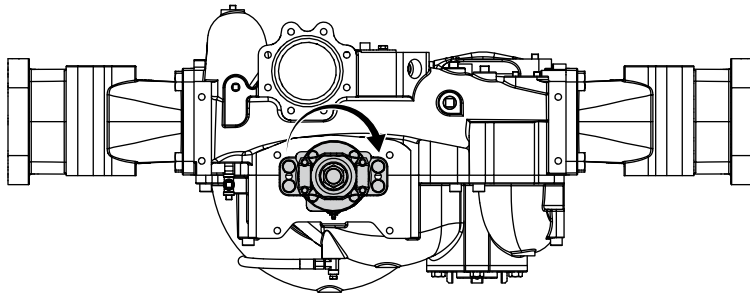
Drill—This symbol tells you to drill holes in the apparatus.



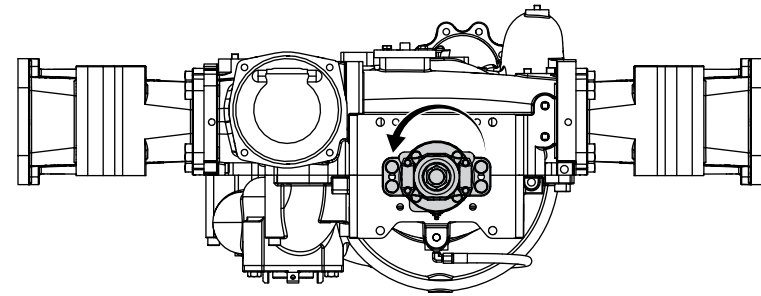
Lubrication—This symbol tells you to apply the appropriate lubricant to the part.

## CM Series Pumps—Drive Options

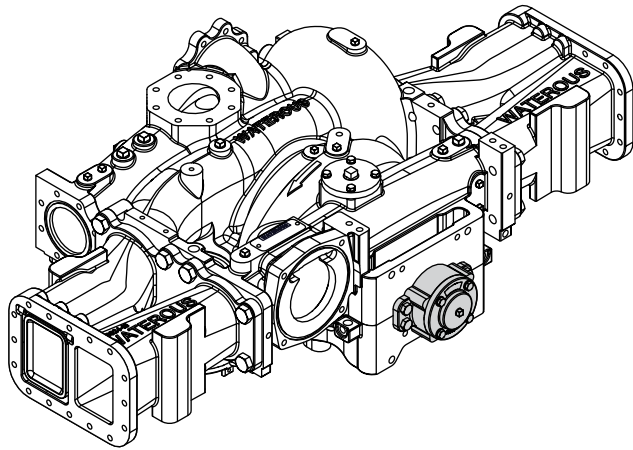
CM Series pumps are midship-mounted centrifugal pumps with multiple impellers. Depending on the model, pump capacity can range from 500 to 2,250 GPM (1,900 to 8,550 LPM). CM and CMU pumps are available with direct drive or one of the following transmissions: C22 (rear- or front-mounted), K, or PA (rear-mounted only). Direct drive applications are available with clockwise or counterclockwise rotation.



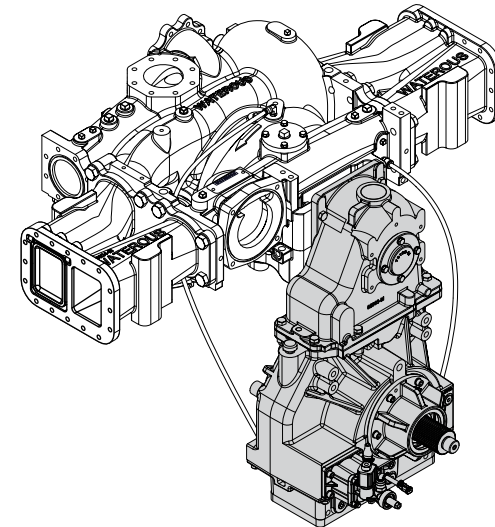
Clockwise Rotation



Counterclockwise Rotation



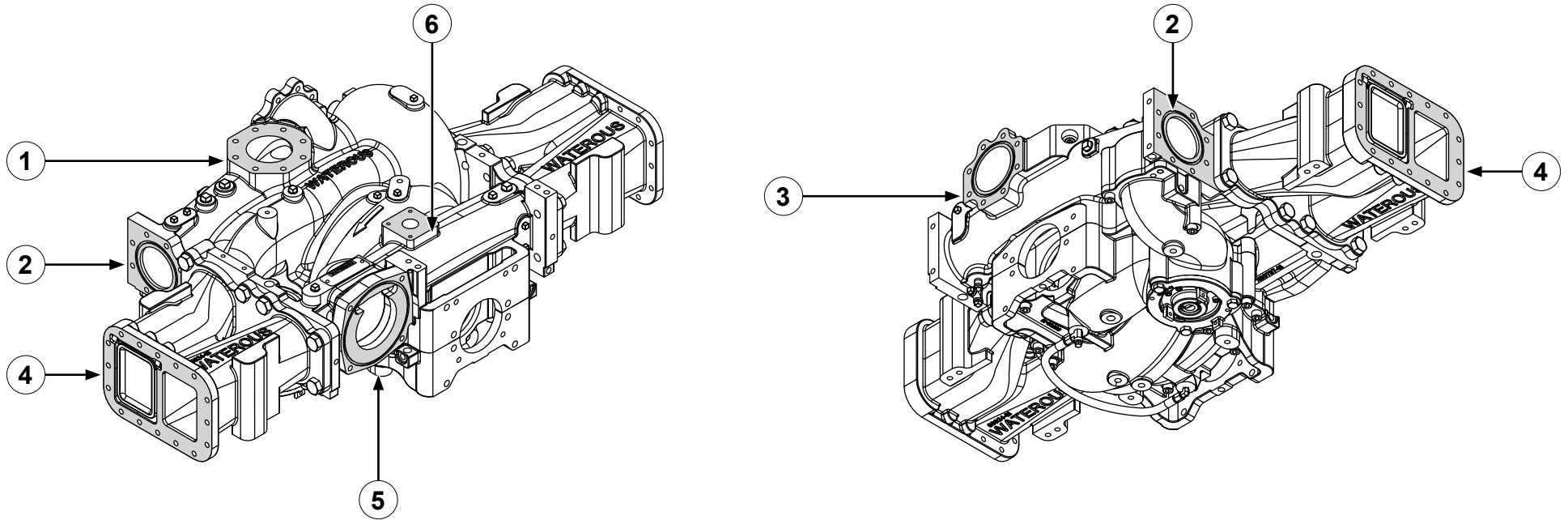
Direct Drive



Transmission (C22)

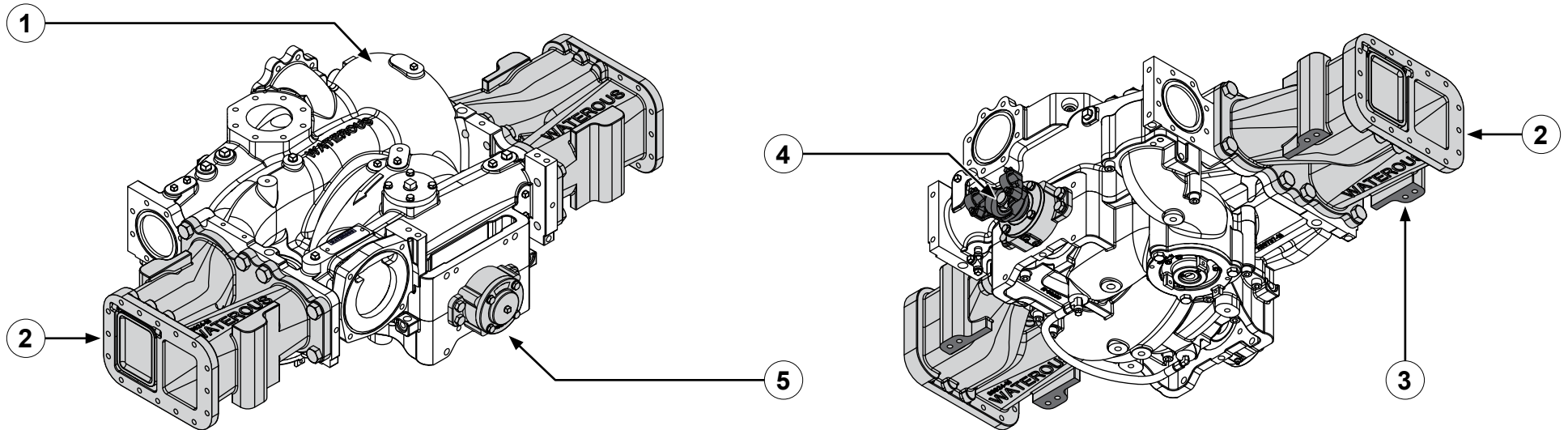
## CM Series Pumps—Intake and Discharge Flanges

CM Series pumps are available with angle-compensated or non-angle-compensated front and side discharge flanges—pump without angle compensation shown below. Pumps with angle compensation feature a front discharge flange angled at 4° and side discharge flanges with holes machined at a 4° rotation. This option ensures that the discharges align with the operator panel after installation.



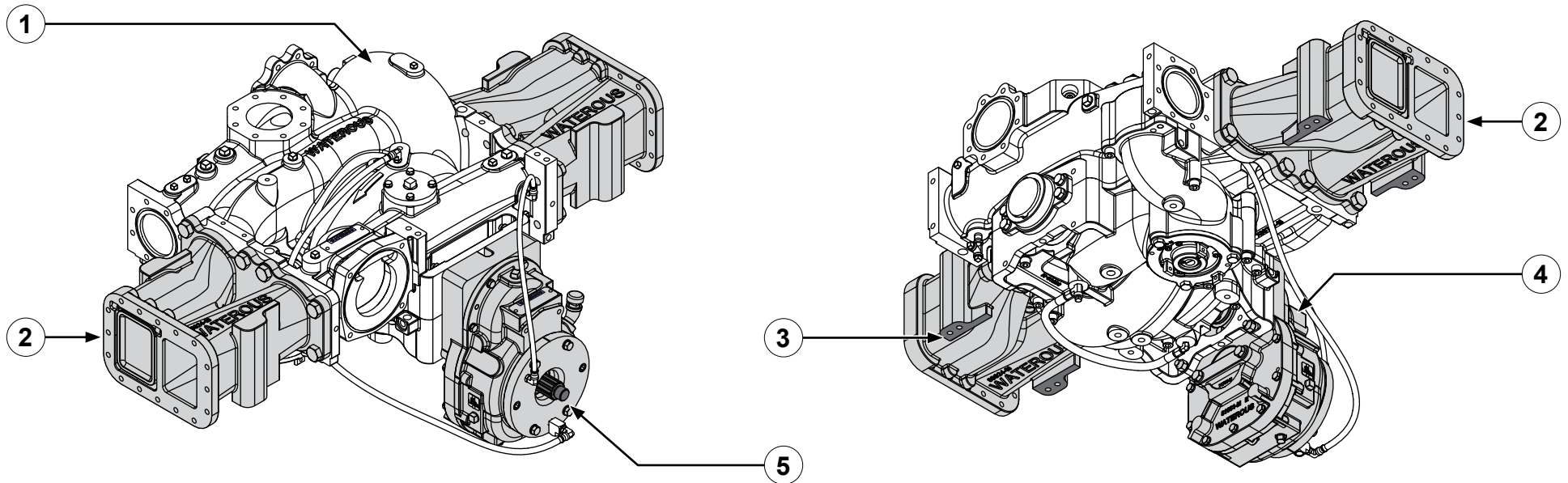
Feature	Description
1 Center discharge flange	Water exits the pump through this discharge. In applications where discharge plumbing is not needed, a cover is available.
2 Side discharge flange	Water exits the pump through the side discharges. Optional discharge fittings and plumbing are available to connect to the discharge flanges.
3 Front discharge flange	Water exits the pump through this discharge. In applications where discharge plumbing is not needed, a cover is available.
4 Intake flange	Water enters the pump through the intakes. Optional intake fittings are available to connect to the intake flanges.
5 Tank-to-pump flange	This is where the tank-to-pump valve or fitting is mounted on the pump.
6 Priming valve mounting pad	This is where the priming valve is mounted on the pump. In applications without a priming valve, a cover is available.

## CMD/CMUD



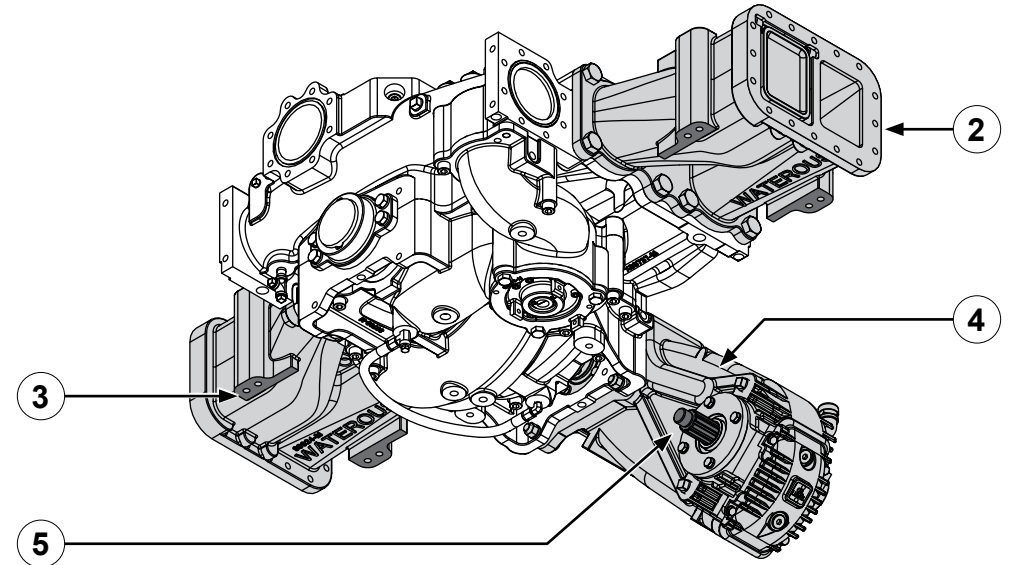
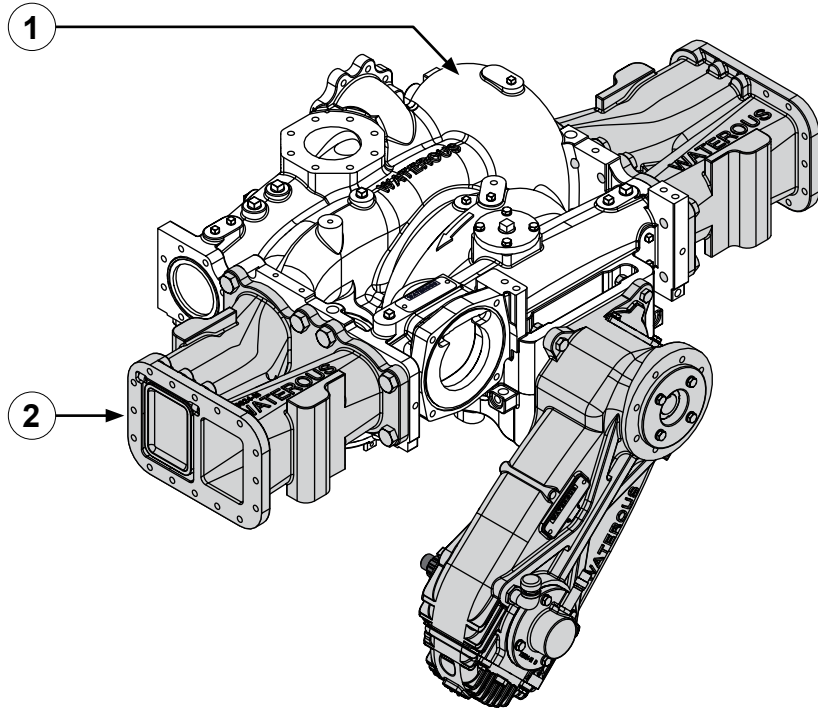
Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Impeller shaft	This connects the pump to the driveline.
5 Outboard bearing housing	This supports the impeller shaft assembly.

## CMK/CMUK



Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Transmission	This increases the speed of the pump.
5 Drive shaft	This connects the pump to the driveline.

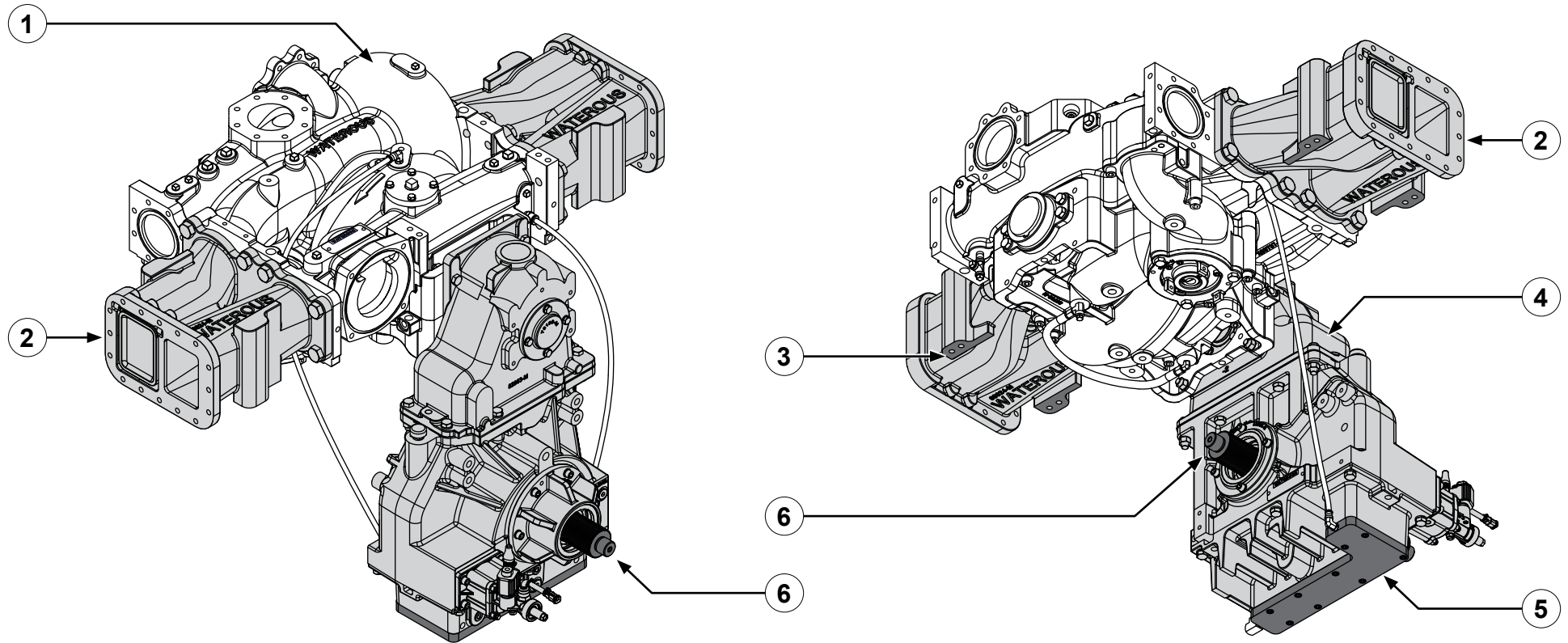
## CMPA/CMUPA



Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Transmission	This increases the speed of the pump.
5 Drive shaft	This connects the pump to the driveline.

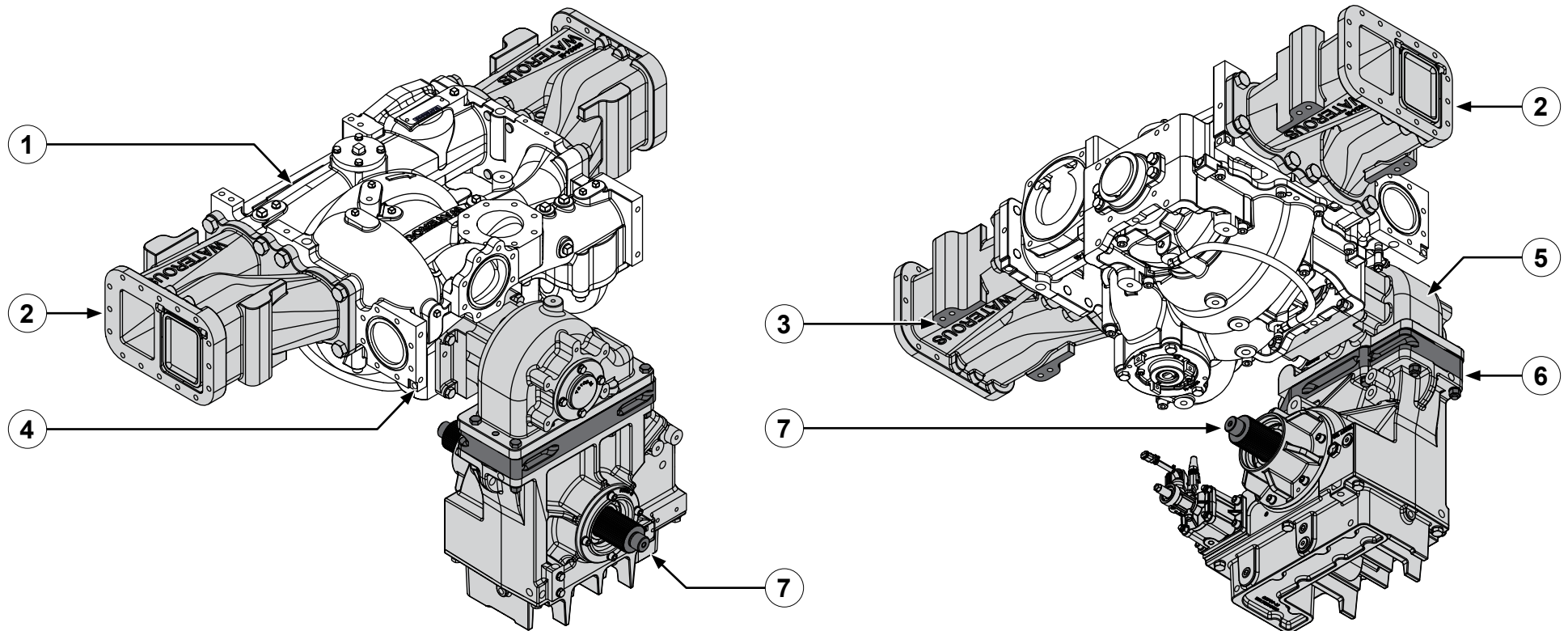


## CMC22/CMUC22



Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Transmission	This increases the speed of the pump and can transfer incoming power to either the pump or driveline. C22 transmissions are available with both an input and output shaft or the input shaft only—input and output option shown.
5 Cooler plate—optional	This is part of the optional internal oil cooler. Water from the pump is circulated through the cooler plate to cool the oil.
6 Drive shaft	This connects the pump to the driveline.

## CMC22/CMUC22 (Front-Mounted)

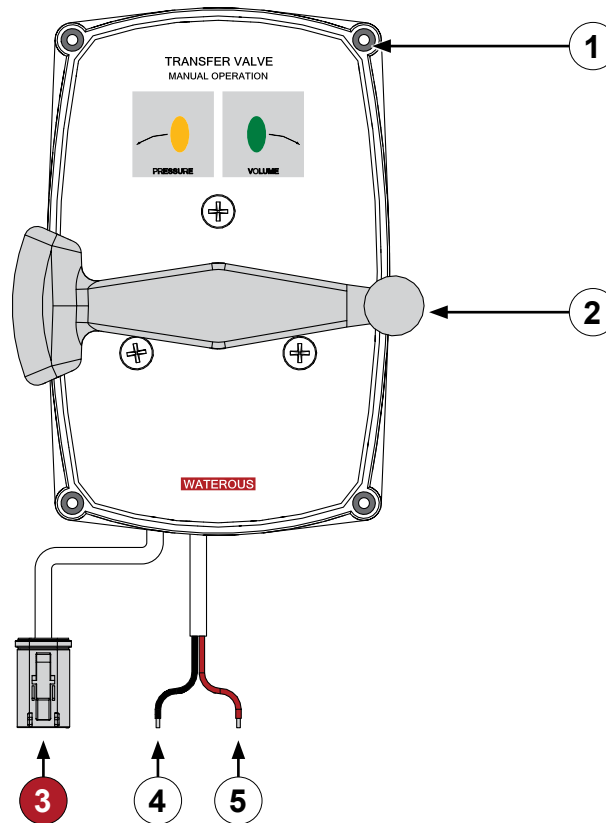


Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Front support mounting hole	This is where the installer-supplied front support bracket is attached to the pump.
5 Transmission	This increases the speed of the pump and can transfer incoming power to either the pump or driveline. C22 transmissions are available with both an input and output shaft or the input shaft only—input and output option shown.
6 Transmission spacer	This is placed between the transmission body and cap to create space for different drops and gear ratios—C drop with 2.27 ratio shown.
7 Drive shaft	This connects the pump to the driveline.



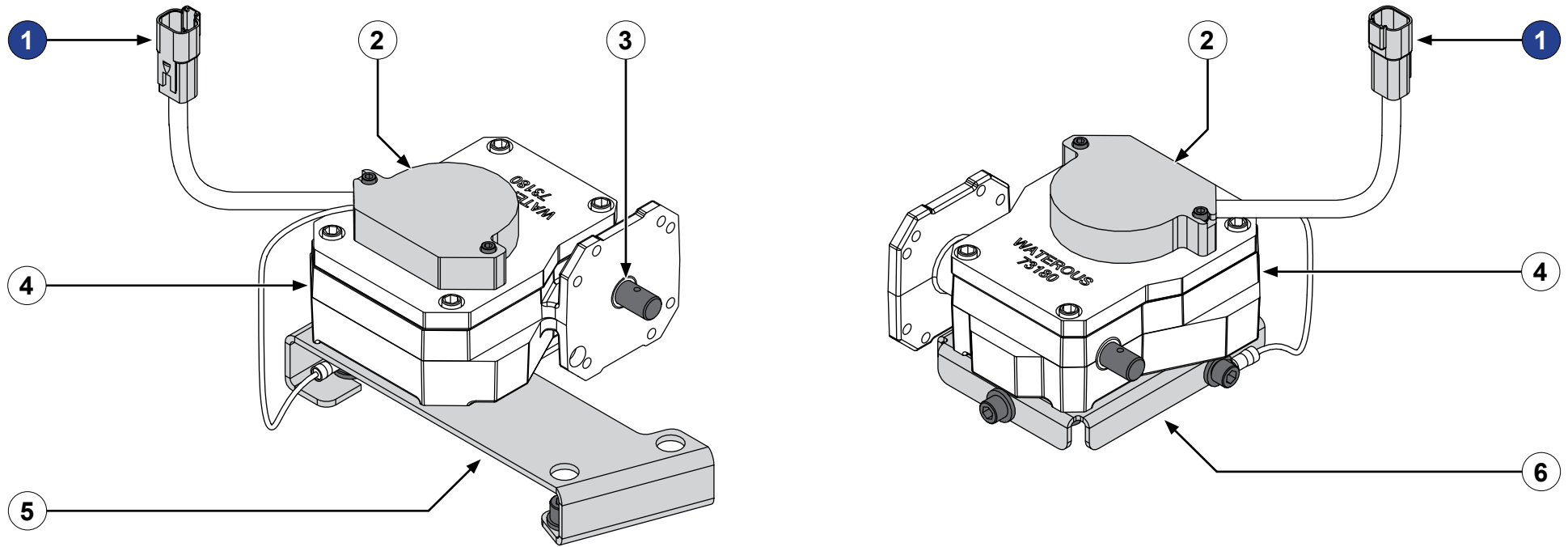


## Transfer Valve Actuator Control Panel—Manual Version



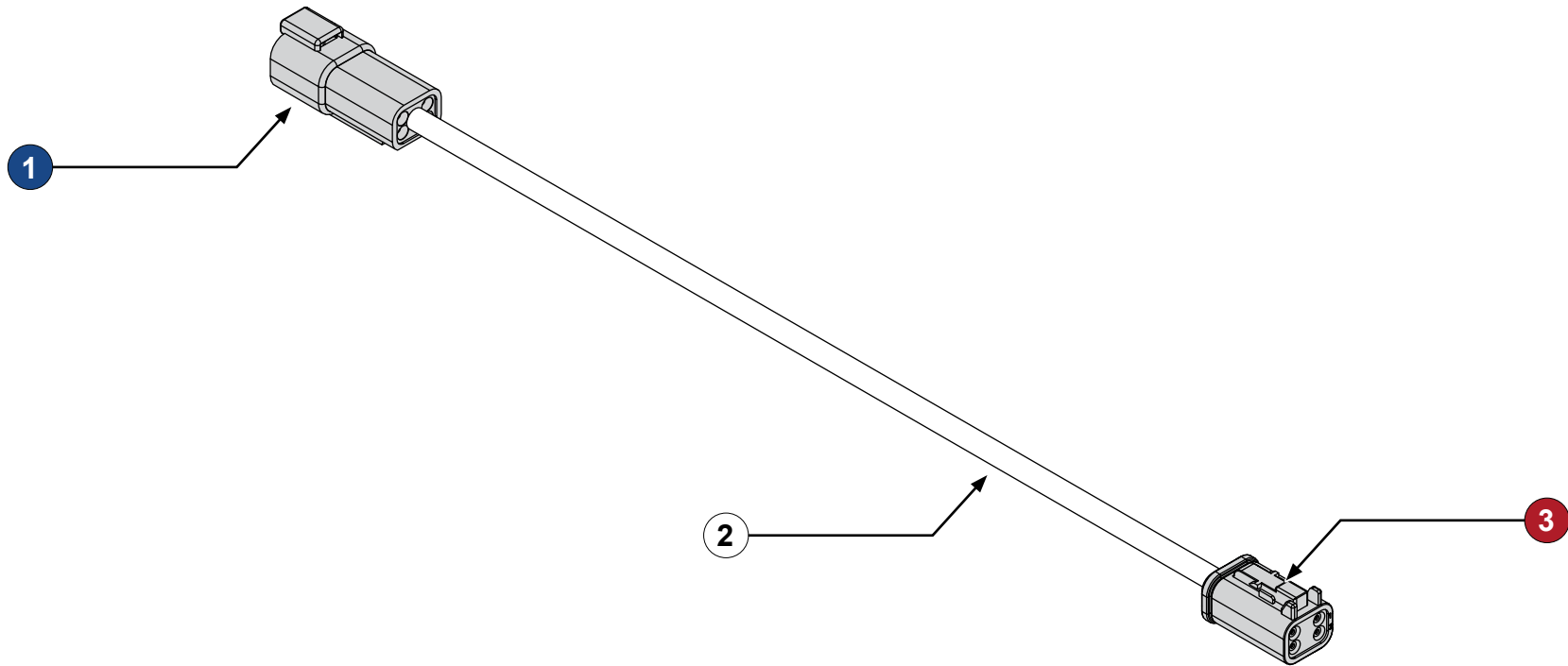
Feature	Description
1 Mounting holes	These are used to mount the actuator control panel to the apparatus.
2 Handle	This handle moves the valve into the pressure or volume position.
3 Connector	This connects to the extension cable that goes between the control panel and encoder—DT06-4S.
4 Bare lead—black	This connects to ground.
5 Bare lead—red	This connects to power.

## Manual Transfer Valve Actuator



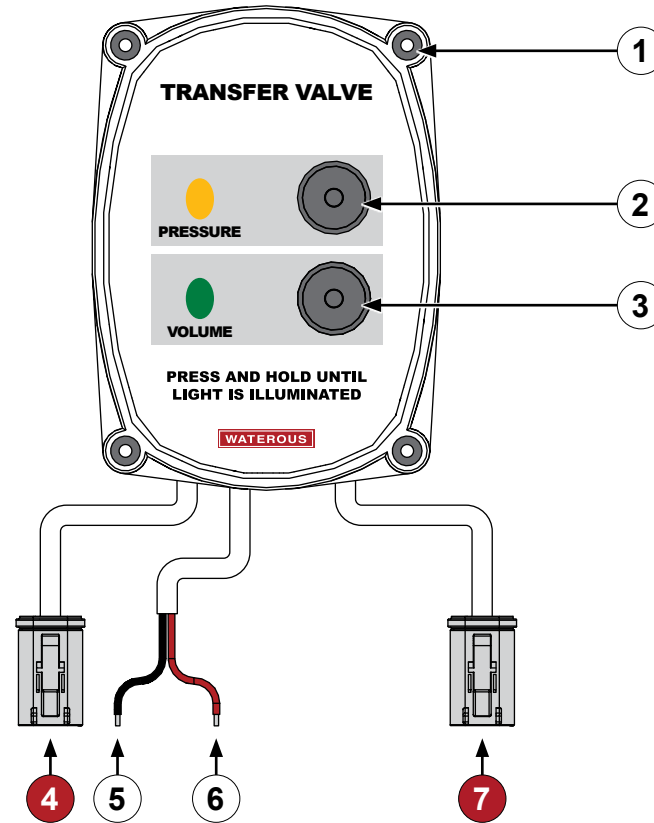
Feature	Description
1 Connector	This connects to the extension cable that goes between the control panel and encoder—DT04-4P.
2 Encoder	This monitors the position of the actuator and sends it to the control panel.
3 Gear case shaft	This connects to the control rod that goes between the control panel and actuator. A U-joint is used to connect the shaft to the control rod.
4 Actuator housing	This houses the actuator's mechanical components.
5 Top mounting bracket	This is used to mount the actuator on the top of the pump.
6 Bottom mounting bracket	This is used to mount the actuator on the bottom of the pump.

## Encoder Extension Cable



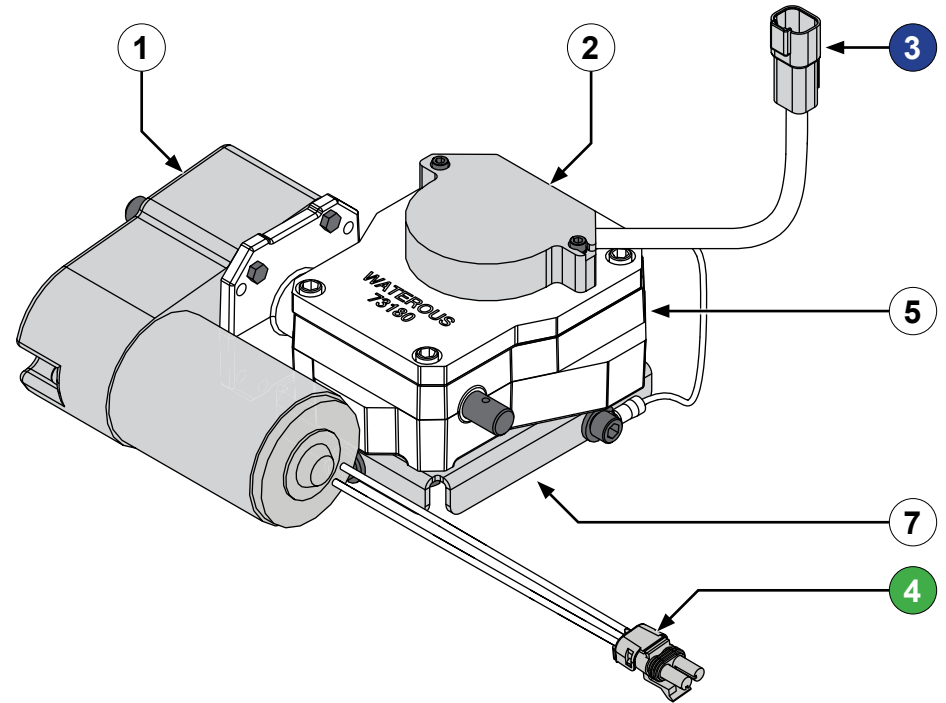
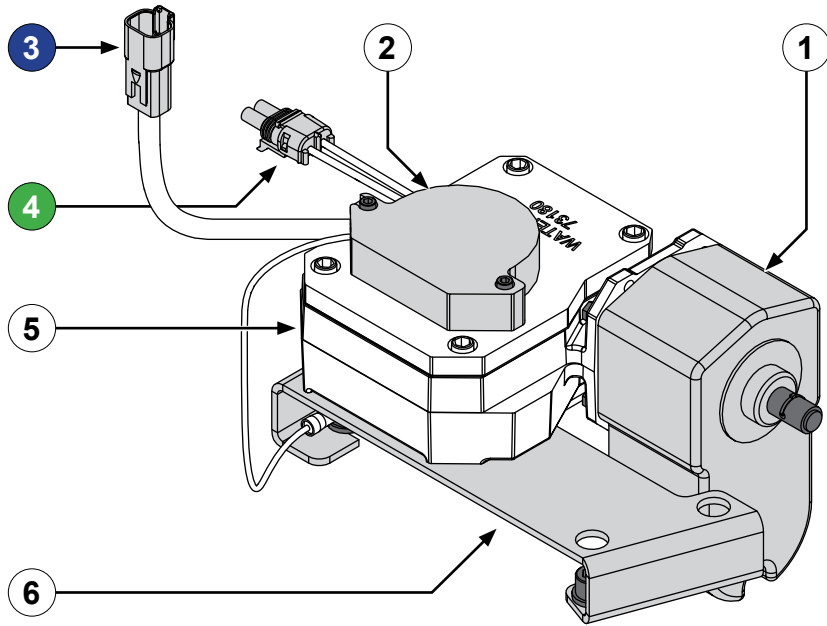
Feature	Description
1 Connector	This connects to the control panel—DT04-4P.
2 Cable	The length of this cable is 120 inches (3,048 mm).
3 Connector	This connects to the encoder—DT06-4S.

## Transfer Valve Actuator Control Panel—Electric Version



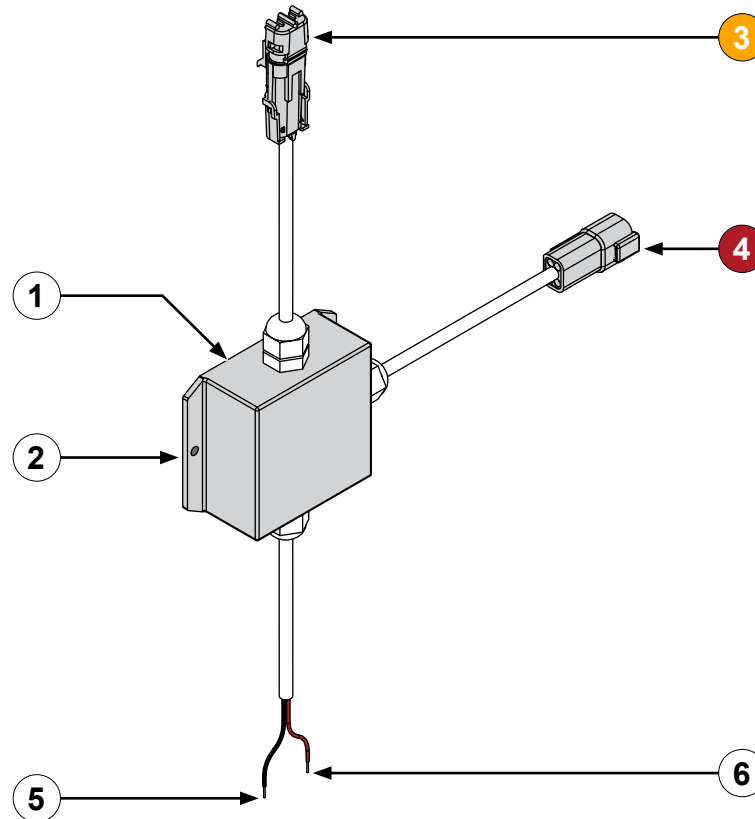
Feature	Description
1 Mounting holes	These are used to mount the actuator control panel to the apparatus.
2 <i>PRESSURE</i> button	This button moves the valve into the pressure position.
3 <i>VOLUME</i> button	This button moves the valve into the volume position.
4 Connector	This connects to the extension cable that goes between the control panel and encoder—DT06-4S.
5 Bare lead—black	This connects to ground.
6 Bare lead—red	This connects to power.
7 Connector	This connects to the power relay module—DT06-4S.

## Electric Transfer Valve Actuator



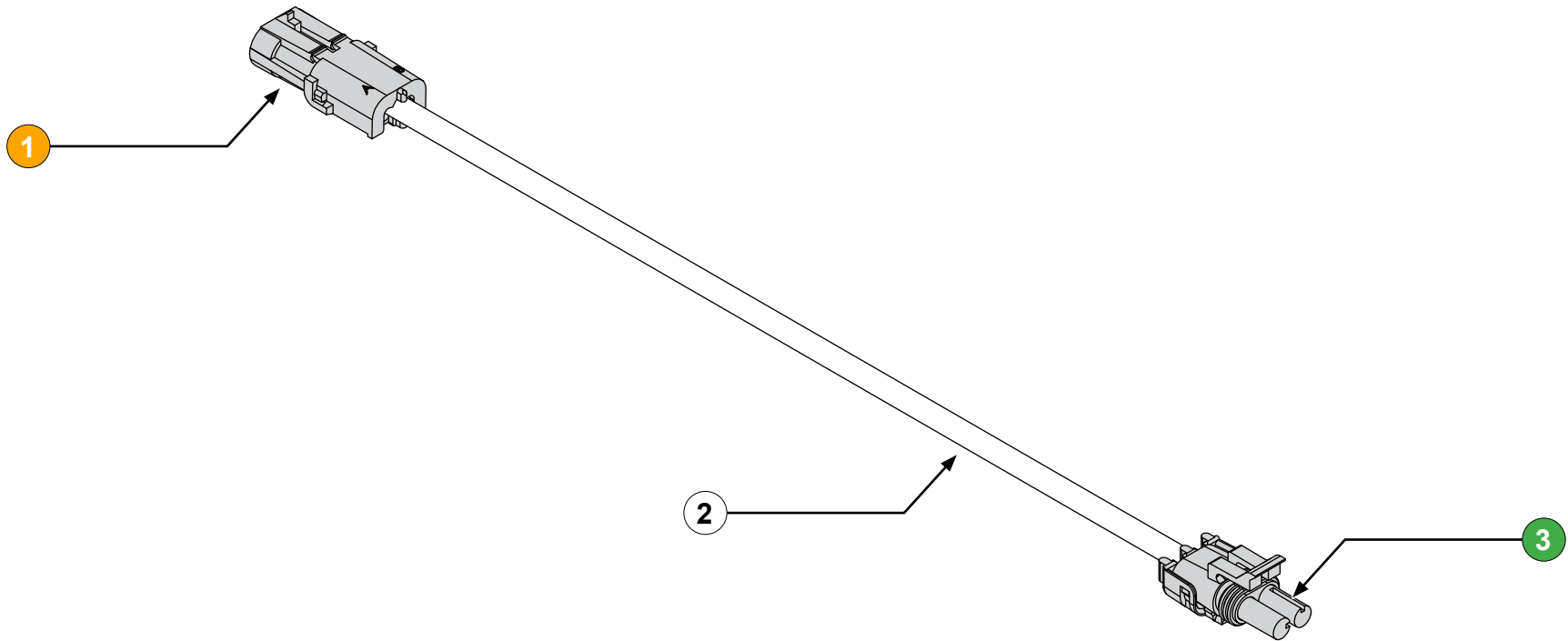
Feature	Description
1 Gear motor	This creates the force to move the valve.
2 Encoder	This monitors the position of the actuator and sends it to the control panel.
3 Connector	This connects to the extension cable that goes between the control panel and encoder—DT04-4P.
4 Connector	This connects to the motor extension cable that goes between the power relay module and gear motor.
5 Actuator housing	This houses the actuator's mechanical components.
6 Top mounting bracket	This is used to mount the actuator on the top of the pump.
7 Bottom mounting bracket	This is used to mount the actuator on the bottom of the pump.

## Power Relay Module



Feature	Description
1 Potting box	This houses the module's electronic components.
2 Mounting holes	These are used to mount the power relay module to the apparatus.
3 Connector	This connects to the motor extension cable that goes between the power relay module and actuator motor.
4 Connector	This connects to the power relay module—DT06-4S.
5 Bare lead—black	This connects to ground.
6 Bare lead—red	This connects to power.

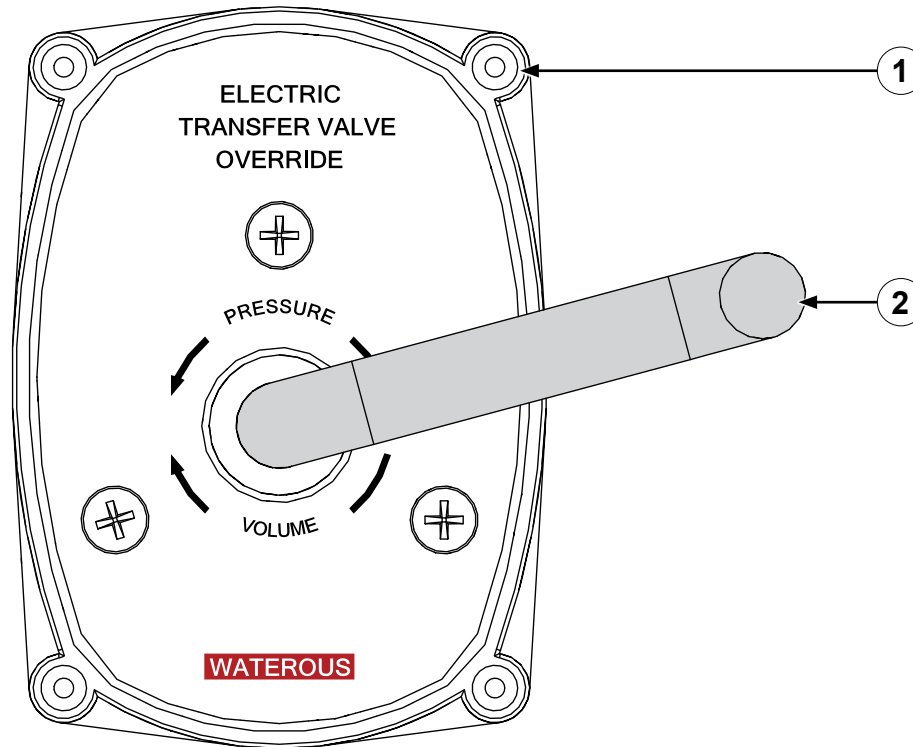
## Motor Extension Cable



Feature	Description
1 Connector	This connects to the actuator motor.
2 Cable	The length of this cable is 120 inches (3,048 mm).
3 Connector	This connects to the power relay module.



## Transfer Valve Actuator Manual Override—Optional



Feature	Description
1 Mounting holes	These are used to mount the manual override control panel to the apparatus.
2 Crank handle	This handle moves the valve into the pressure or volume position if the electric actuator fails.

## Installation Overview

This equipment is intended to be installed by a person or persons with the basic knowledge of installing similar equipment. Contact Waterous with questions about installing the equipment. The installation may require the following tasks and abilities:

- Locating, drilling, and cutting features into the apparatus.
- Welding.
- Installing and securing plumbing.
- Routing and securing the wiring.
- Calibration and final testing.

## Preparing for the Installation

Use the following guidelines before, during, and after the installation.

- Read and understand all the installation instructions before installing the equipment.
- Prepare a suitable, well-lit area and gather all the necessary tools before you begin the installation.
- Make sure that you remove any shipping plugs or caps before installing any components.
- Make sure that you bring all fluids to operating levels before using the equipment.

# NOTICE

## Before Operation

- **Read and understand all the instructions provided.**
- **Check all fluid levels and replenish if necessary.**
- **Remove all shipping plugs and install the operation plugs or caps.**



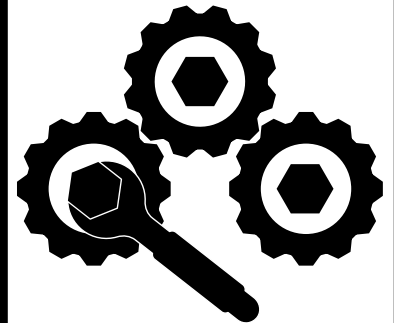
## Modifying the Equipment

This equipment is intended to operate as designed. Do not remove, modify, or change the components in the system. Doing so will void your warranty. Contact Waterous for more information.

# NOTICE

## Modification

- **Modifying the equipment can damage components and void your warranty.**
- **Do not modify the system or any of its components.**



*Do not modify the system or any of its components. Doing so will void your warranty.*

## Determining the Pump Location

Use the following guidelines to determine where to install the pump:

- Consider how the location influences the drive shaft alignment.
- Consider hose and cable routing.
- Consider accessibility for operation and maintenance.
- Consider exposure to excess dirt, road debris, and heat buildup.

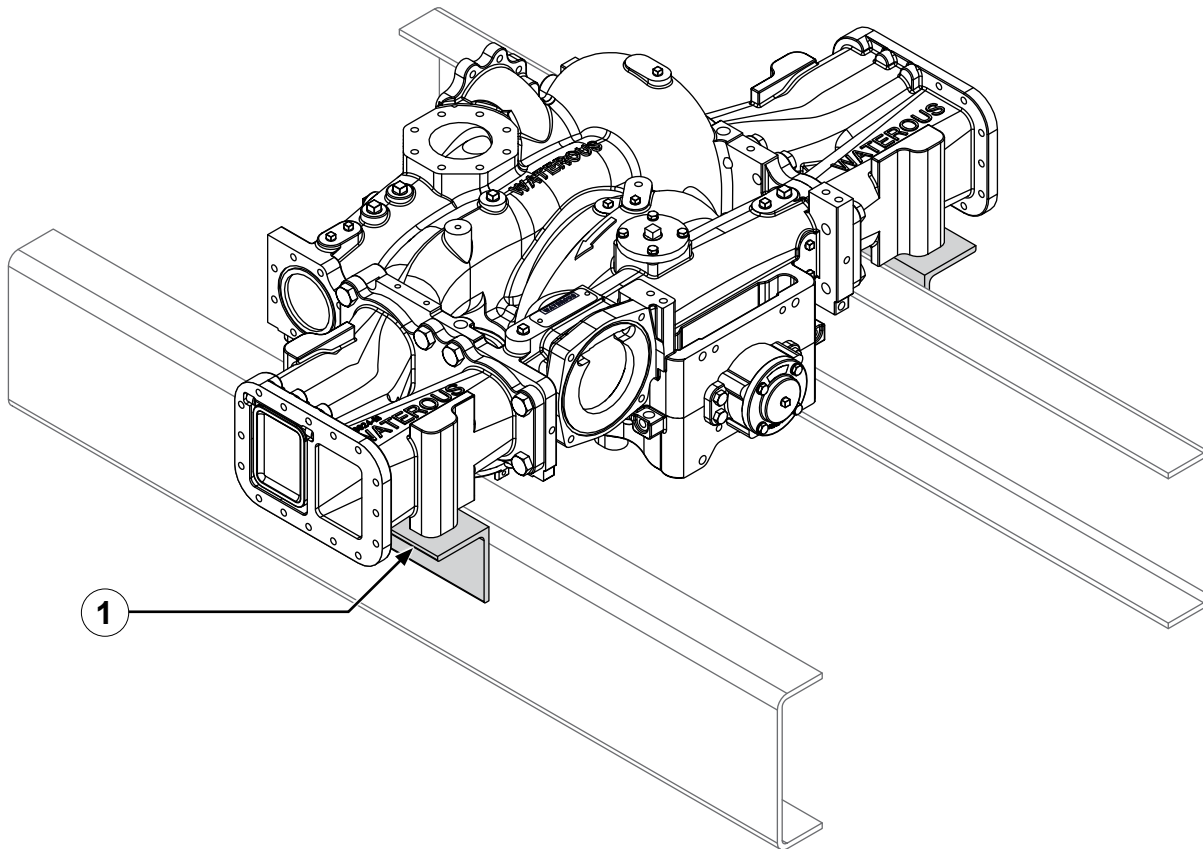
## Determining Cable and Wire Routing

Use the *Wiring Best Practices* document, available at [www.waterousco.com](http://www.waterousco.com), as a guide to select and route wiring for your application.

## Optional Equipment

Be aware that the installation instructions may include optional equipment not included in your application.

## CMD/CMUD—Installing the Pump



Use the illustration and instructions to install the CMD or CMUD pump assembly.

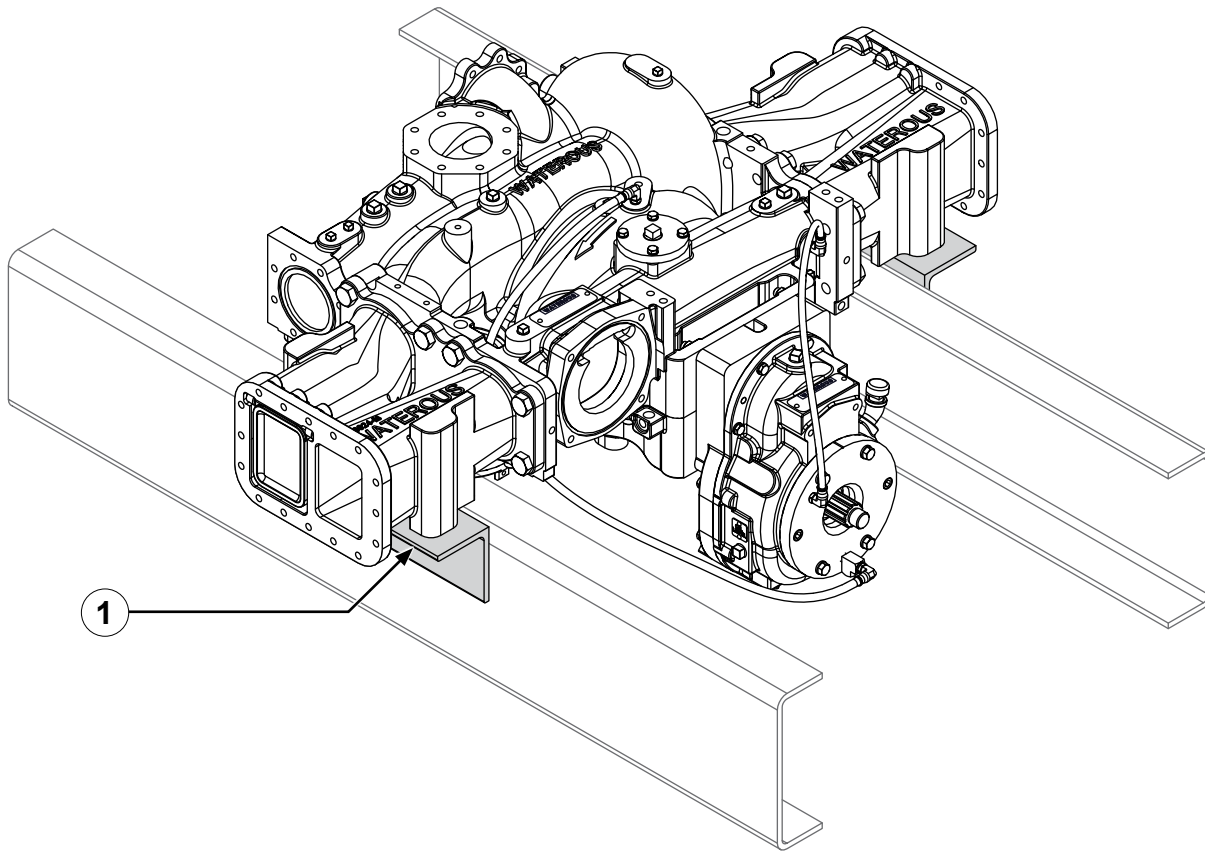
**Note:** *Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.*

- 1 Create angle brackets to attach to the intake mounting pads.

**Note:** *Mounting brackets are application-specific and supplied by the installer.*

- 2 Attach the angle brackets to the intake adapters. Refer to: "**Mounting the Angle Brackets**" on page 28.
- 3 Use locally sourced hardware to secure the brackets to the frame rails using the 3-point mounting method. Refer to: "**Mounting the Pump**" on page 31.
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

## CMK/CMUK—Installing the Pump



Use the illustration and instructions to install the CMK or CMUK pump assembly.

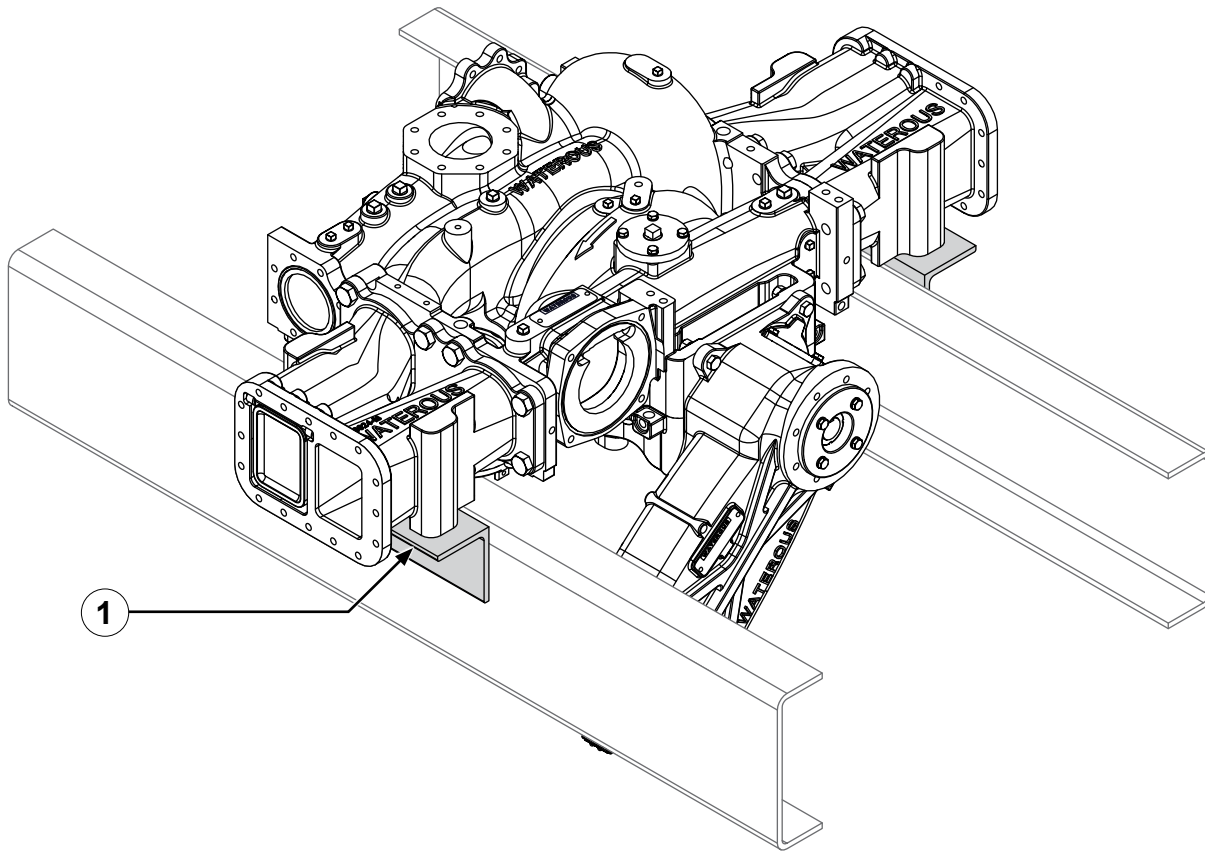
**Note:** Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.

- 1 Create angle brackets to attach to the intake mounting pads.

**Note:** Mounting brackets are application-specific and supplied by the installer.

- 2 Attach the angle brackets to the intake adapters. Refer to: "**Mounting the Angle Brackets**" on page 28.
- 3 Use locally sourced hardware to secure the brackets to the frame rails using the 3-point mounting method. Refer to: "**Mounting the Pump**" on page 31.
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

## CMPA/CMUPA—Installing the Pump



Use the illustration and instructions to install the CMPA or CMUPA pump assembly.

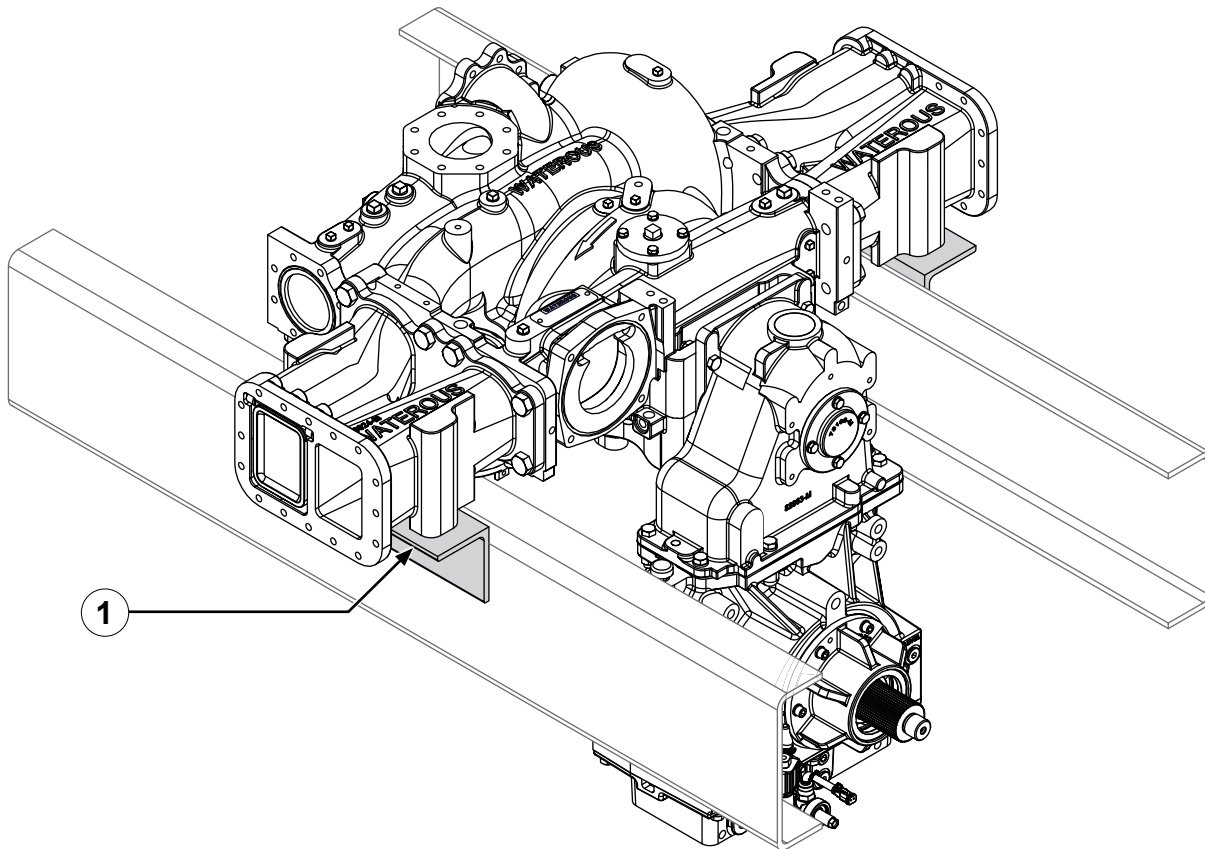
**Note:** *Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.*

- 1 Create angle brackets to attach to the intake mounting pads.

**Note:** *Mounting brackets are application-specific and supplied by the installer.*

- 2 Attach the angle brackets to the intake adapters. Refer to: "**Mounting the Angle Brackets**" on page 28.
- 3 Use locally sourced hardware to secure the brackets to the frame rails using the 3-point mounting method. Refer to: "**Mounting the Pump**" on page 31.
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

## CMC22/CMUC22—Installing the Pump



Use the illustration and instructions to install the CMC22 or CMUC22 pump assembly.

**Note:** Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.

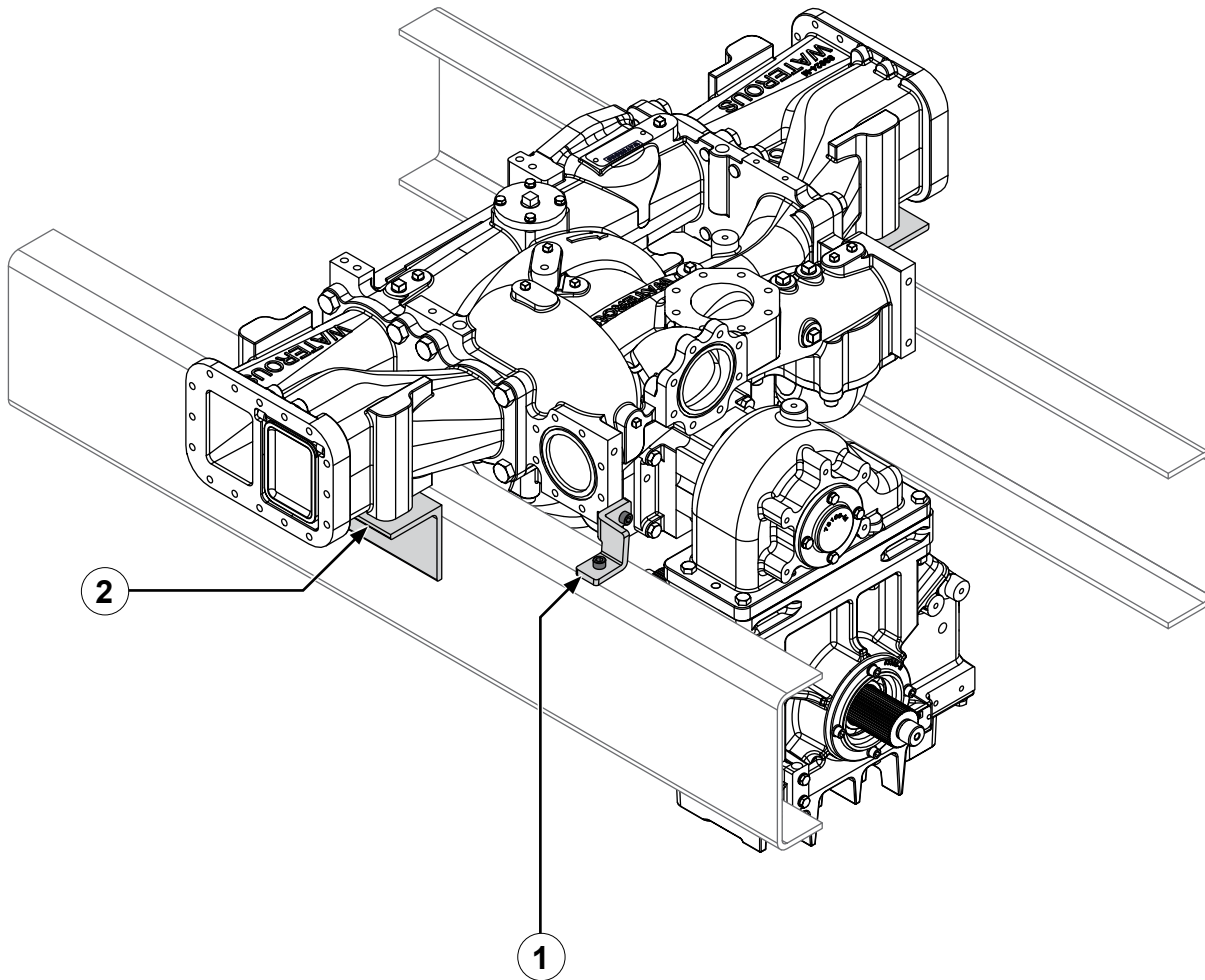
- 1 Create angle brackets to attach to the intake mounting pads.

**Note:** Mounting brackets are application-specific and supplied by the installer.

- 2 Attach the angle brackets to the intake adapters. Refer to: "**Mounting the Angle Brackets**" on page 28.
- 3 Use locally sourced hardware to secure the brackets to the frame rails using the 3-point mounting method. Refer to: "**Mounting the Pump**" on page 31.
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

**Note:** Do not use the mounting holes on the transmission to support the pump.

## CMC22/CMUC22 (Front-Mounted)—Installing the Pump



Use the illustration and instructions to install the front-mounted CMC22 or CMUC22 pump assembly.

**Note:** *Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.*

- 1 Create a front support bracket to attach to the pump's side discharge and the frame rails.

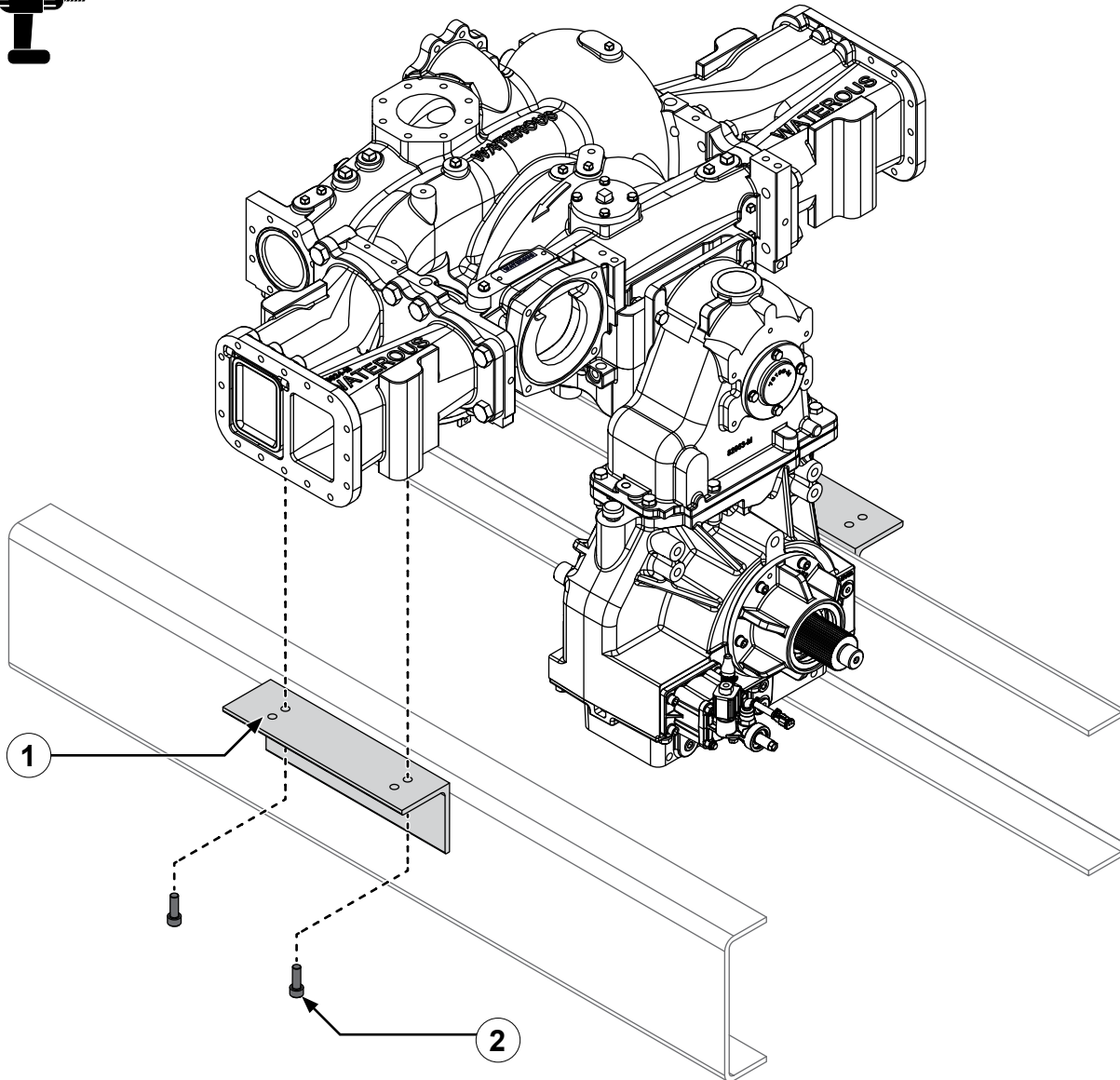
**Note:** *Mounting brackets are application-specific and supplied by the installer.*

- 2 Create angle brackets to attach to the intake mounting pads.
- 3 Attach the front support bracket to the pump's side discharge, then attach the angle brackets to the intake adapters. Refer to: **"Mounting the Angle Brackets"** on page 29.
- 4 Secure the front support bracket and angle brackets to the frame rails. Refer to: **"Mounting the Pump"** on page 32.
- 5 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

**Note:** *Do not use the mounting holes on the transmission to support the pump.*



## Mounting the Angle Brackets

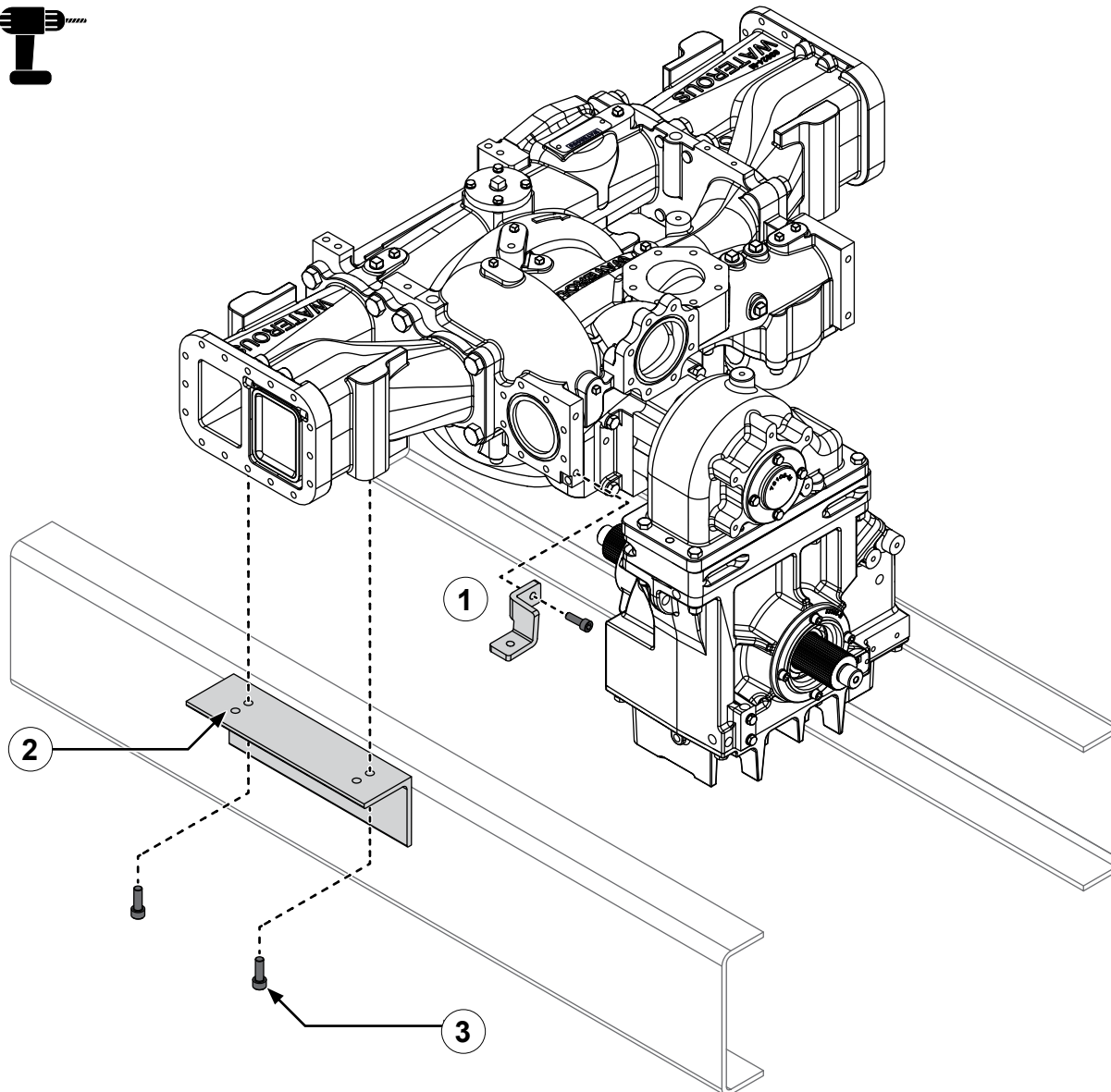


Use the illustration and instructions to secure the angle brackets to the intake mounting pads.

- 1 There are 2 holes in each intake mounting pad. Select the holes that best suit your application, then drill corresponding holes into the angle brackets.
- 2 Use cap screws (1/2-13 inch) to attach the brackets to the intake adapters.



## Mounting the Angle Brackets

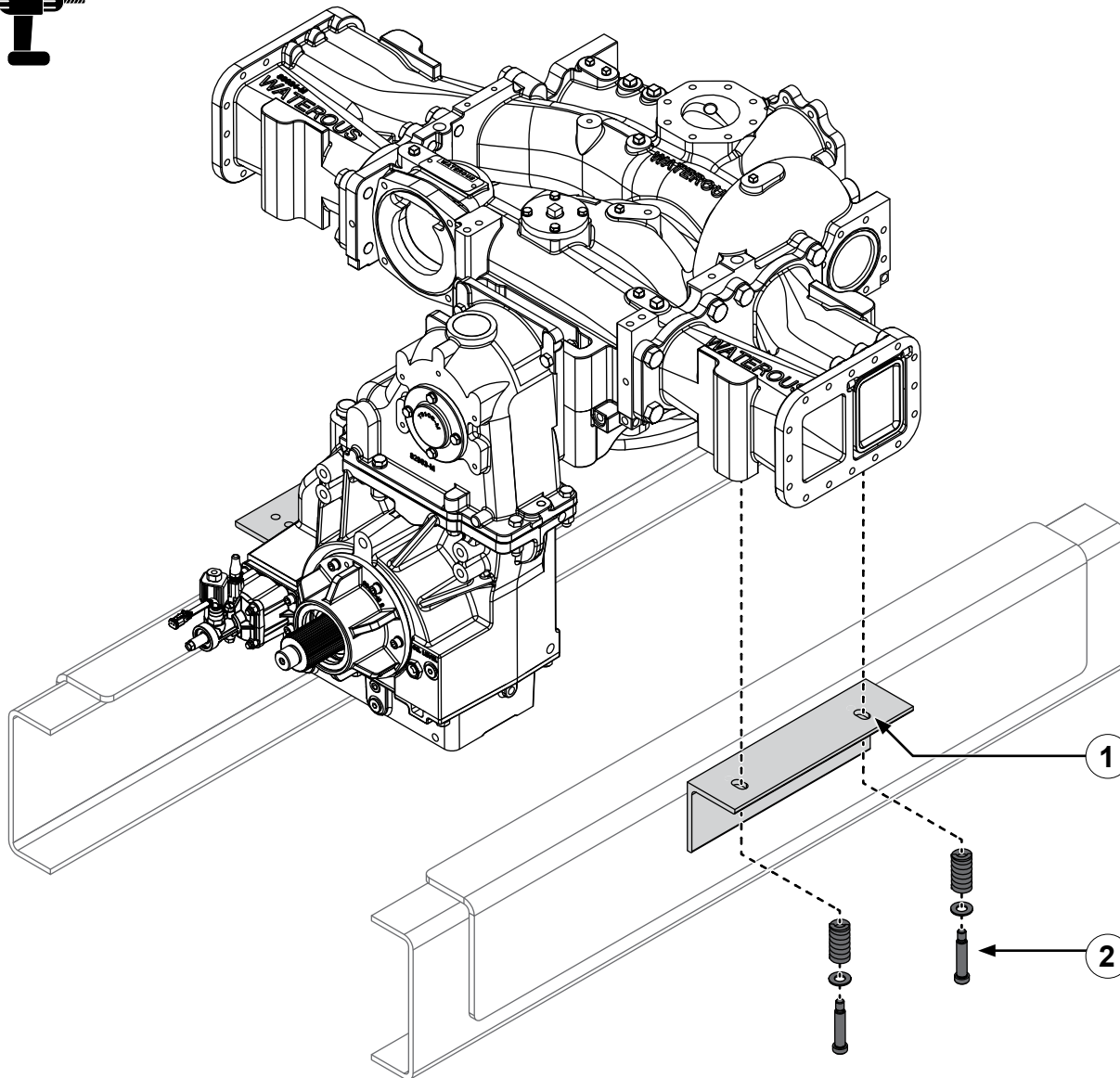


### CMC22/CMUC22 (Front-Mounted)

Use the illustration and instructions to secure the front support bracket and angle brackets to the intake mounting pads.

- 1 Use a cap screw (1/2-13 inch) to secure the front support bracket to the front of the side discharge.
- 2 There are 2 holes in each intake mounting pad. Select the holes that best suit your application, then drill corresponding holes into the angle brackets.
- 3 Use cap screws (1/2-13 inch) to attach the brackets to the intake adapters.

## Mounting the Angle Brackets



### Optional Spring Configuration

Use the illustration and instructions to secure the angle brackets to the intake mounting pads.

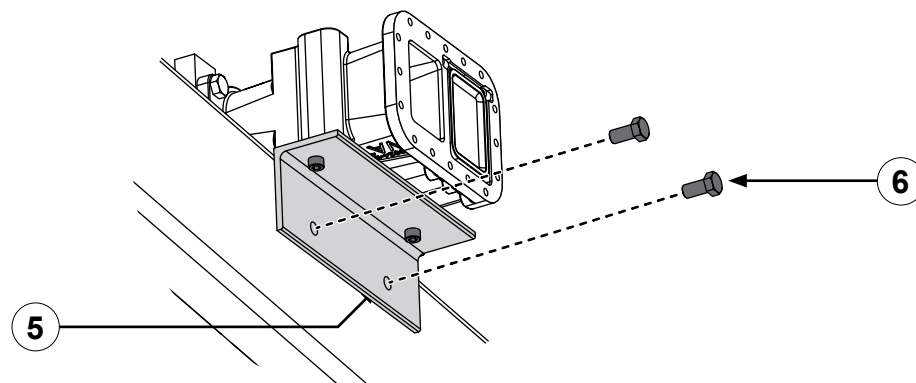
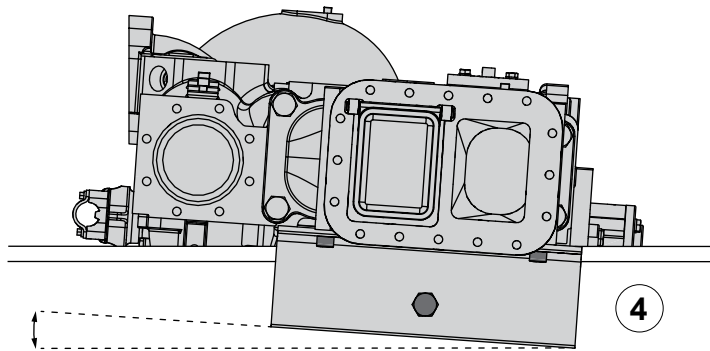
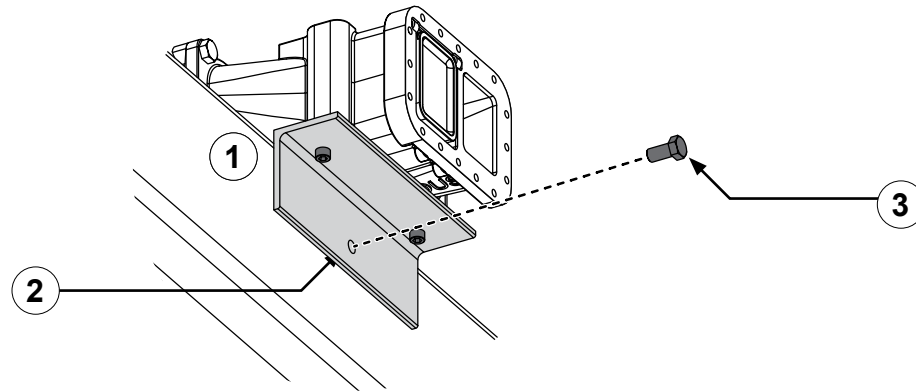
**Note:** Do not use this mounting method if your pump configuration includes a front-mounted C22 transmission.

- 1 There are 2 holes in each intake mounting pad. Select the holes that best suit your application, then drill corresponding holes into the angle brackets. The passenger-side holes should be slotted to accommodate spring movement.
- 2 Use shoulder bolts (5/8 x 3 inches), washers, and die springs (2-1/2 inches) to attach the bracket to the passenger-side intake adapter.

**Note:** The die springs used must have a spring rate of 1,740 lb/inch and a maximum load of 740 lb.

- 3 Use cap screws (1/2-13 inch) to attach the bracket to the driver-side intake adapter.

## Mounting the Pump

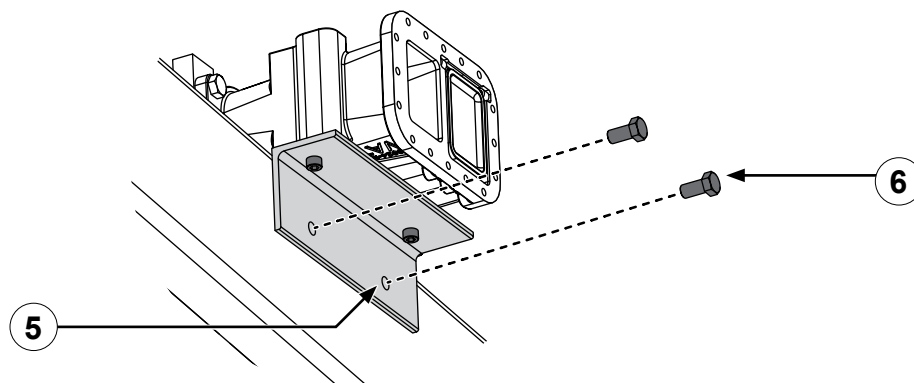
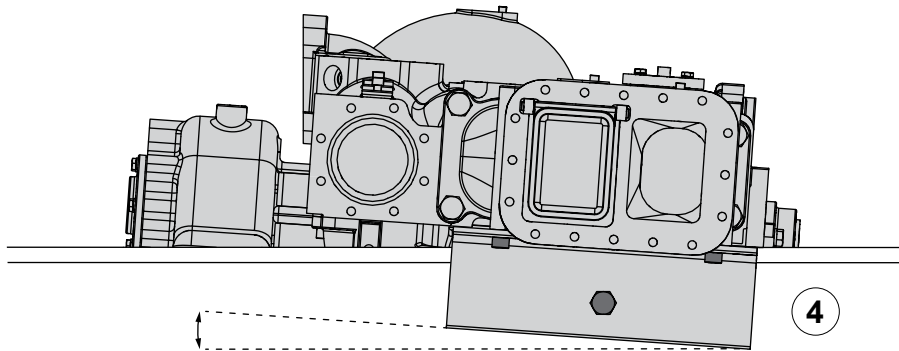
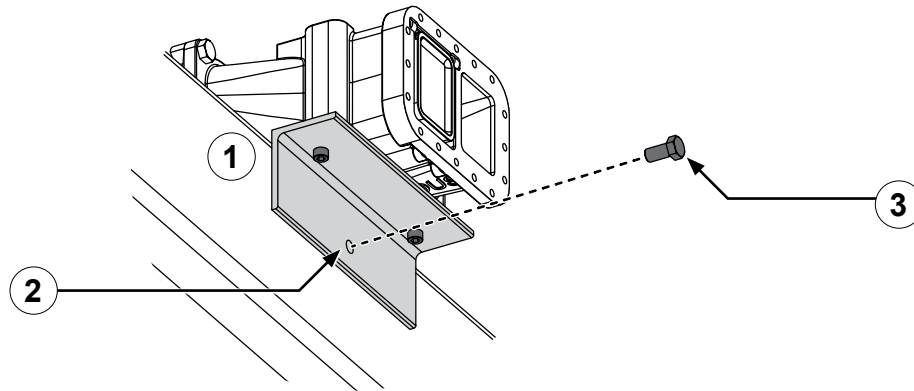


### 3-Point Mounting Method

Use the illustrations and instructions to secure the angle brackets to the frame rails using the 3-point mounting method. This method is recommended to compensate for vehicle frame twist.

- 1 After attaching the angle brackets to the intake adapters, position the pump assembly within the frame rails.
- 2 On the driver side, drill 1 hole into the center of the bracket that goes through the frame rail.
- 3 Use a screw (3/4 inch), washer, and nut to secure the bracket to the frame rail.
- 4 If your pump's discharge flanges are angle-compensated, adjust the tilt of the pump assembly by 4°.
- 5 On the passenger side, drill 2 holes into the bracket that go through the frame rail. Position 1 hole near each edge of the bracket.
- 6 Use screws (3/4 inch), washers, and nuts to secure the bracket to the frame rail.

## Mounting the Pump

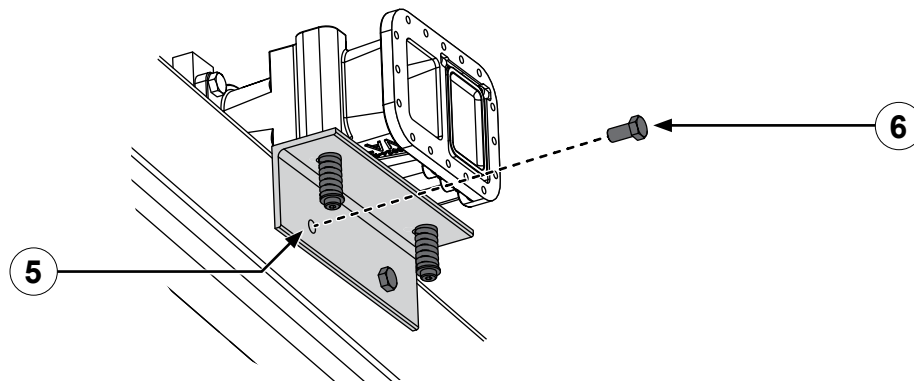
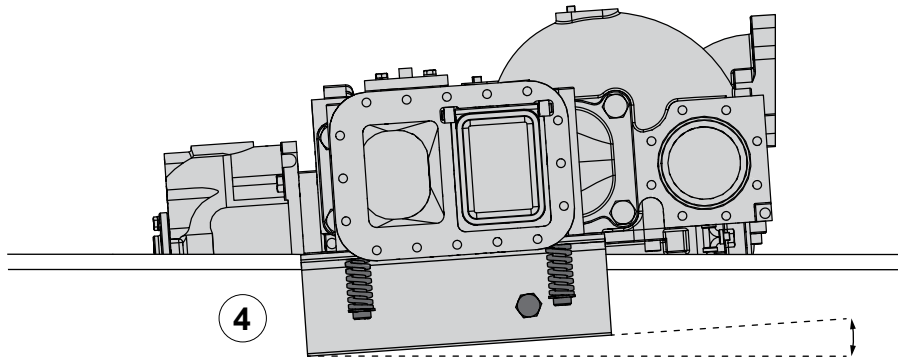
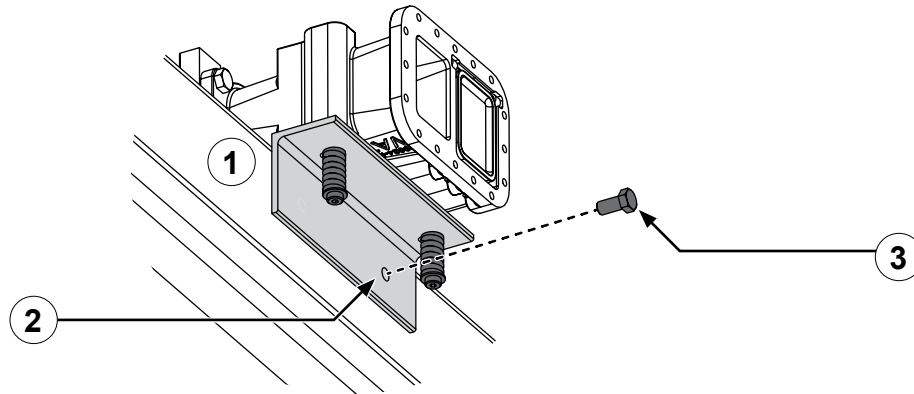


### 3-Point Mounting Method— CMC22/CMUC22 (Front-Mounted)

Use the illustrations and instructions to secure the angle brackets to the frame rails using the 3-point mounting method. This method is recommended to compensate for vehicle frame twist in applications with front-mounted C22 transmissions.

- 1 After attaching the angle brackets to the intake adapters, position the pump assembly within the frame rails.
- 2 On the driver side, drill 1 hole into the center of the bracket that goes through the frame rail.
- 3 Use a screw (3/4 inch), washer, and nut to secure the bracket to the frame rail.
- 4 If your pump's discharge flanges are angle-compensated, adjust the tilt of the pump assembly by 4°.
- 5 On the passenger side, drill 2 holes into the bracket that go through the frame rail. Position 1 hole near each edge of the bracket.
- 6 Use screws (3/4 inch), washers, and nuts to secure the bracket to the frame rail.
- 7 Use a screw (1/2 inch) and lock washer or thread-lock to secure the front support bracket to the frame rail.

## Mounting the Pump



### 4-Point Mounting Method— Optional Spring Configuration

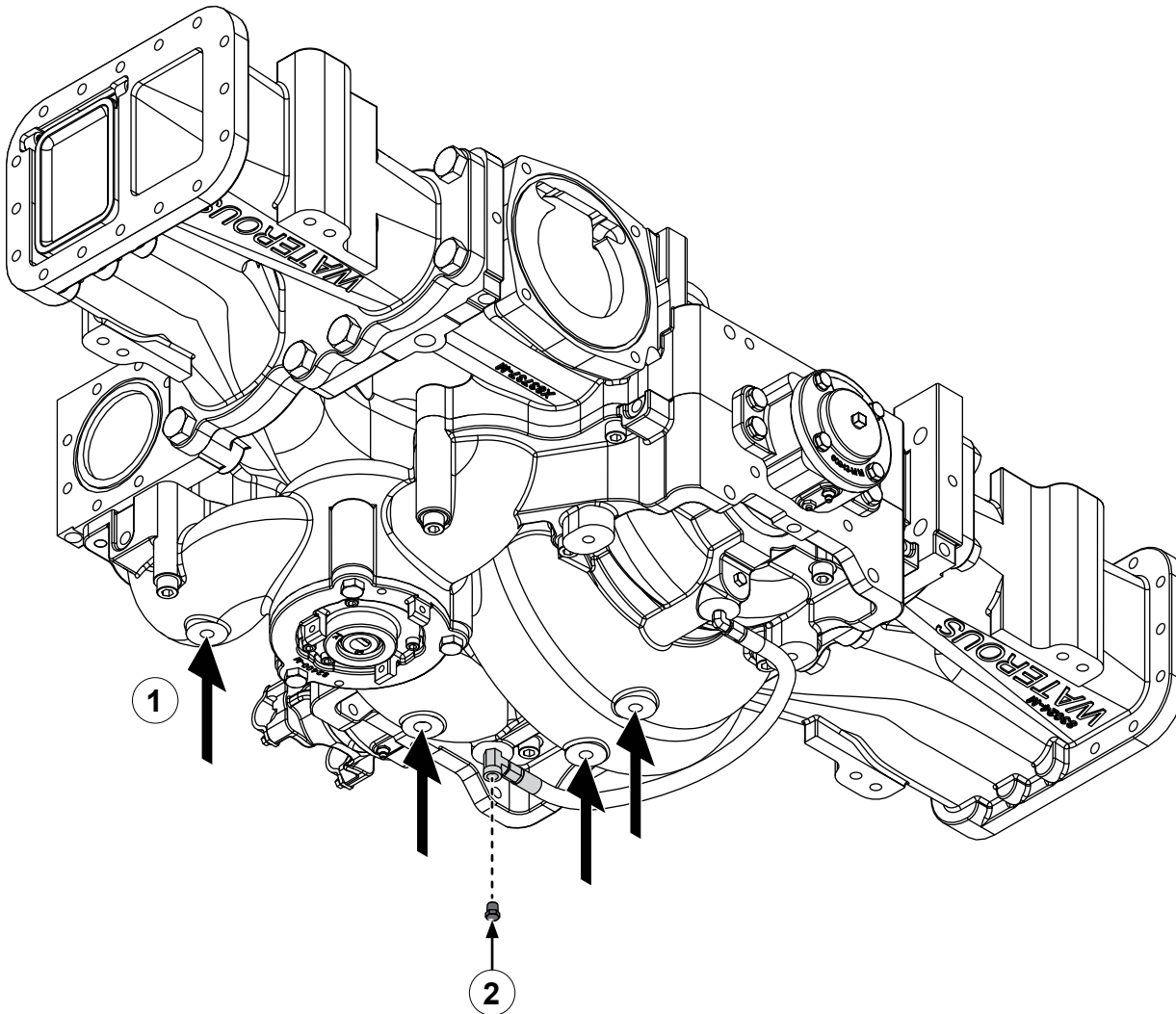
Use the illustrations and instructions to secure the angle brackets to the frame rails using the 4-point spring mounting method. This method allows for approximately 2° of vehicle frame twist.

- 1 After attaching the angle brackets to the intake adapters, position the pump assembly within the frame rails.

**Note:** Using a sub-frame is recommended to lessen frame twist. The maximum frame twist should not exceed the spring travel.

- 2 On the passenger side, drill 1 hole into the bracket that goes through the frame rail. Position the hole near the edge of the bracket.
- 3 Use a screw (3/4 inch), washer, and nut to secure the bracket to the frame rail.
- 4 If your pump's discharge flanges are angle-compensated, adjust the tilt of the pump assembly by 4°.
- 5 Drill another hole into the passenger-side bracket that goes through the frame rail. Position the hole near the opposite edge of the bracket.
- 6 Use a screw (3/4 inch), washer, and nut to secure the bracket to the frame rail.
- 7 On the driver side, drill 2 holes into the bracket that go through the frame rail. Position 1 hole near each edge of the bracket.
- 8 Use screws (3/4 inch), washers, and nuts to secure the bracket to the frame rail.

## Installing the Pump Drain Lines—Pump Body

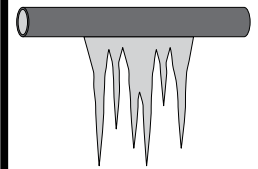


Use the illustration and instructions to install the pump drain lines. Fluid that is susceptible to freezing must be drained from the pump to prevent damage.

### NOTICE

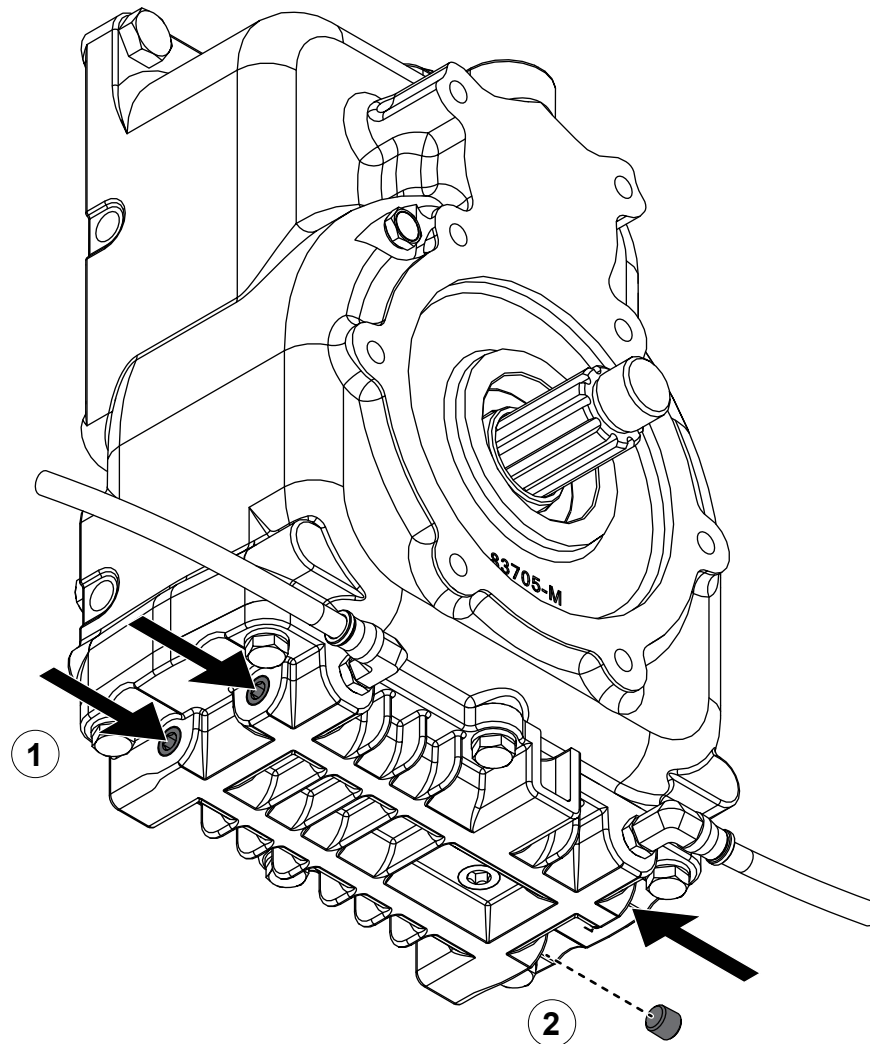
#### Freeze Damage

- Do not allow fluid in the lines to freeze.
- Remove all freezable fluid from the lines before storing the apparatus.



- 1 To drain the pump, do the following:
  - Locate the 4 drain ports at the bottom of the volute cover.
  - Install the appropriate fittings and hoses to drain the pump as required.
- 2 To drain the seal cooling hose, do the following:
  - Locate the drain port on the tee fitting.
  - Remove the drain plug.
  - Install the appropriate fittings and hoses to drain the seal cooling hose as required.

## Installing the Transmission Drain Lines—CMK

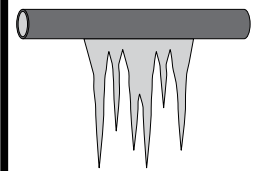


Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

### NOTICE

#### Freeze Damage

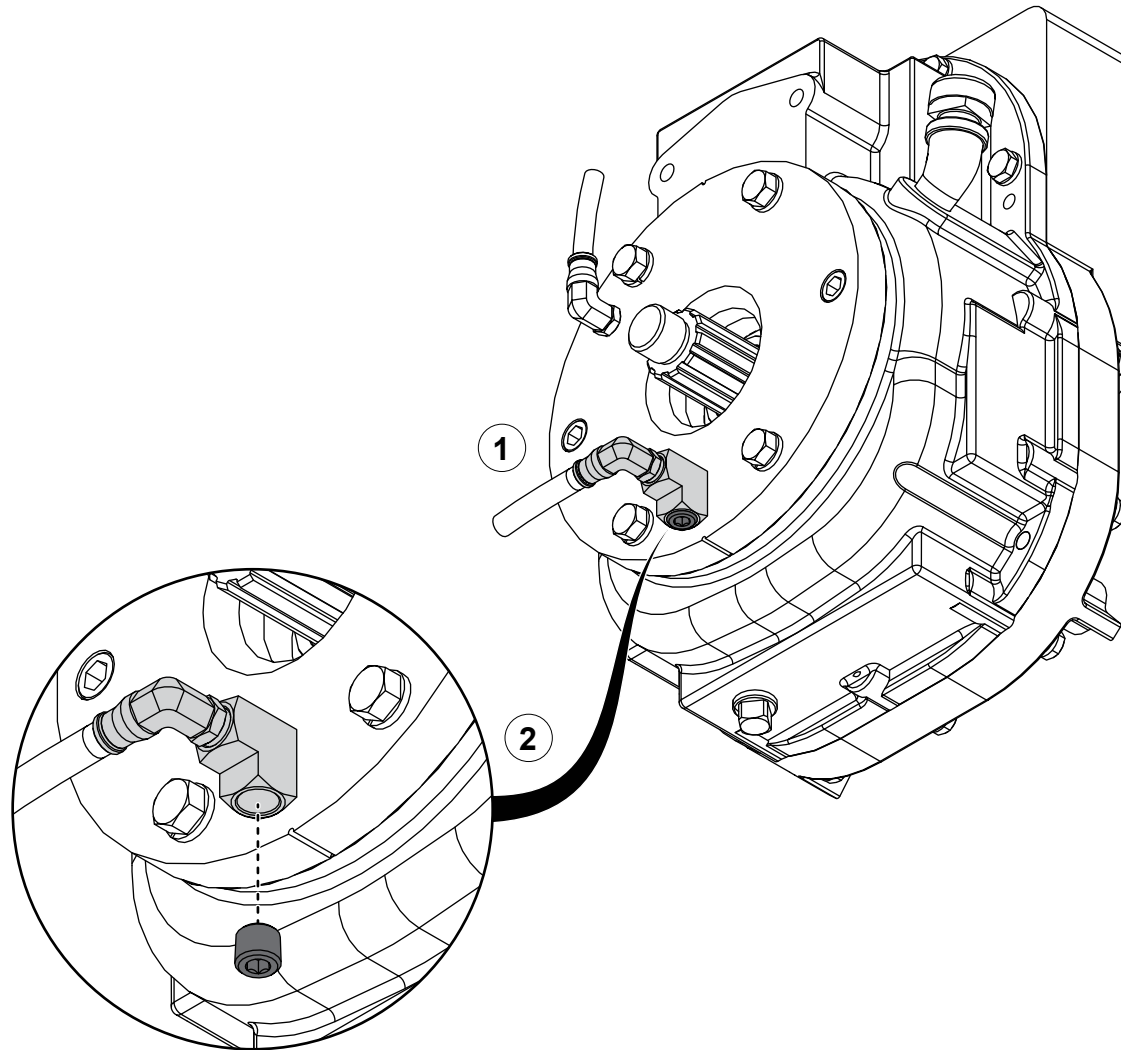
- Do not allow fluid in the lines to freeze.
- Remove all freezable fluid from the lines before storing the apparatus.



- 1 Locate the 4 drain ports at the bottom of the case.
- 2 Select the best port for your application, then remove the drain plug.
- 3 Install the appropriate fittings and hoses to drain the transmission as required.



## Installing the Transmission Drain Lines—CMUK

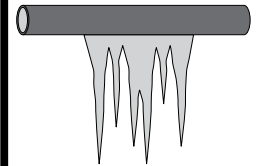


Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

### NOTICE

#### Freeze Damage

- Do not allow fluid in the lines to freeze.
- Remove all freezable fluid from the lines before storing the apparatus.

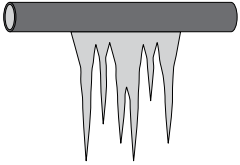


- 1 Locate the drain port on the tee fitting.
- 2 Remove the drain plug.
- 3 Install the appropriate fittings and hoses to drain the transmission as required.

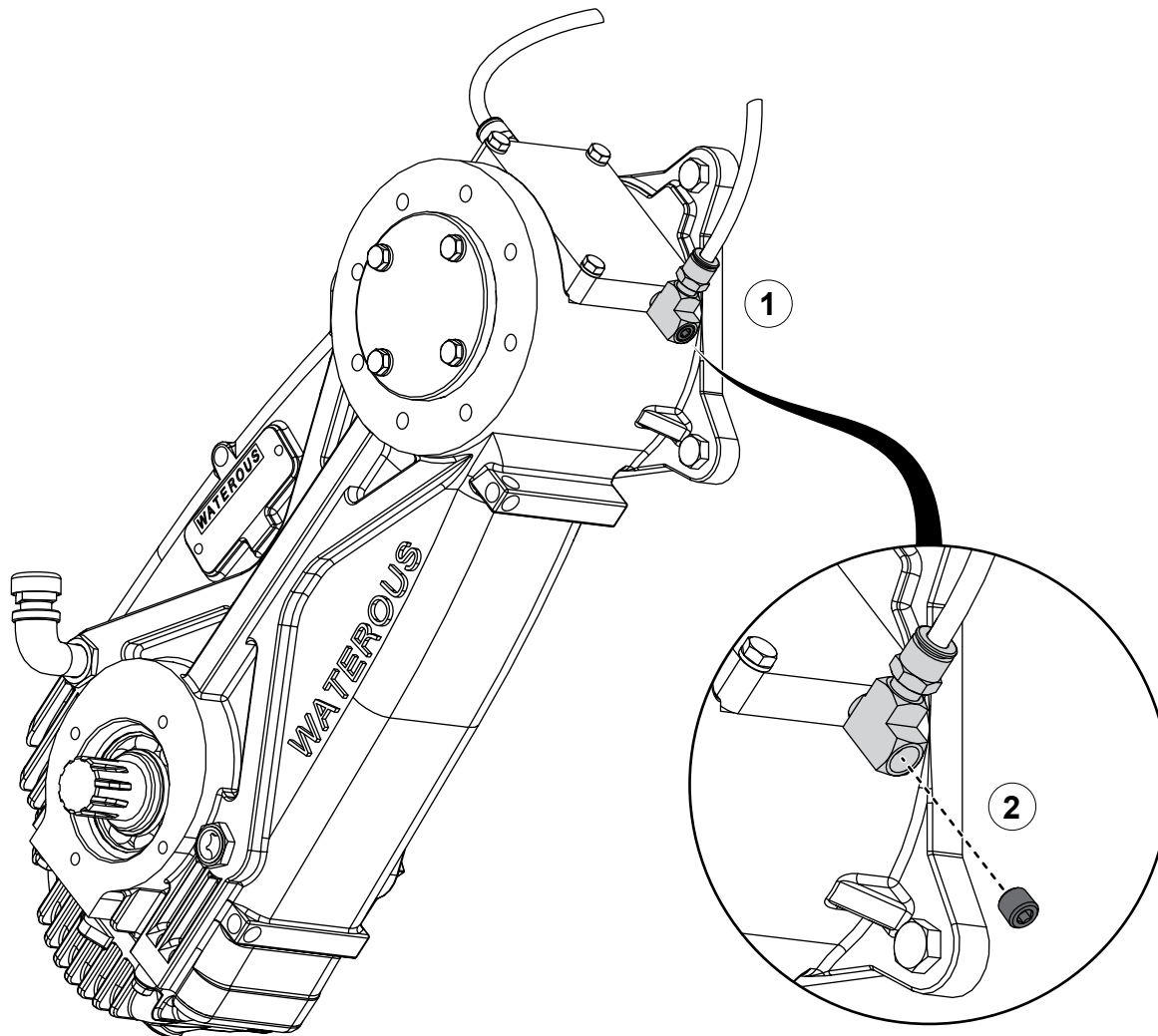


## Installing the Transmission Drain Lines—CMPA/CMUPA

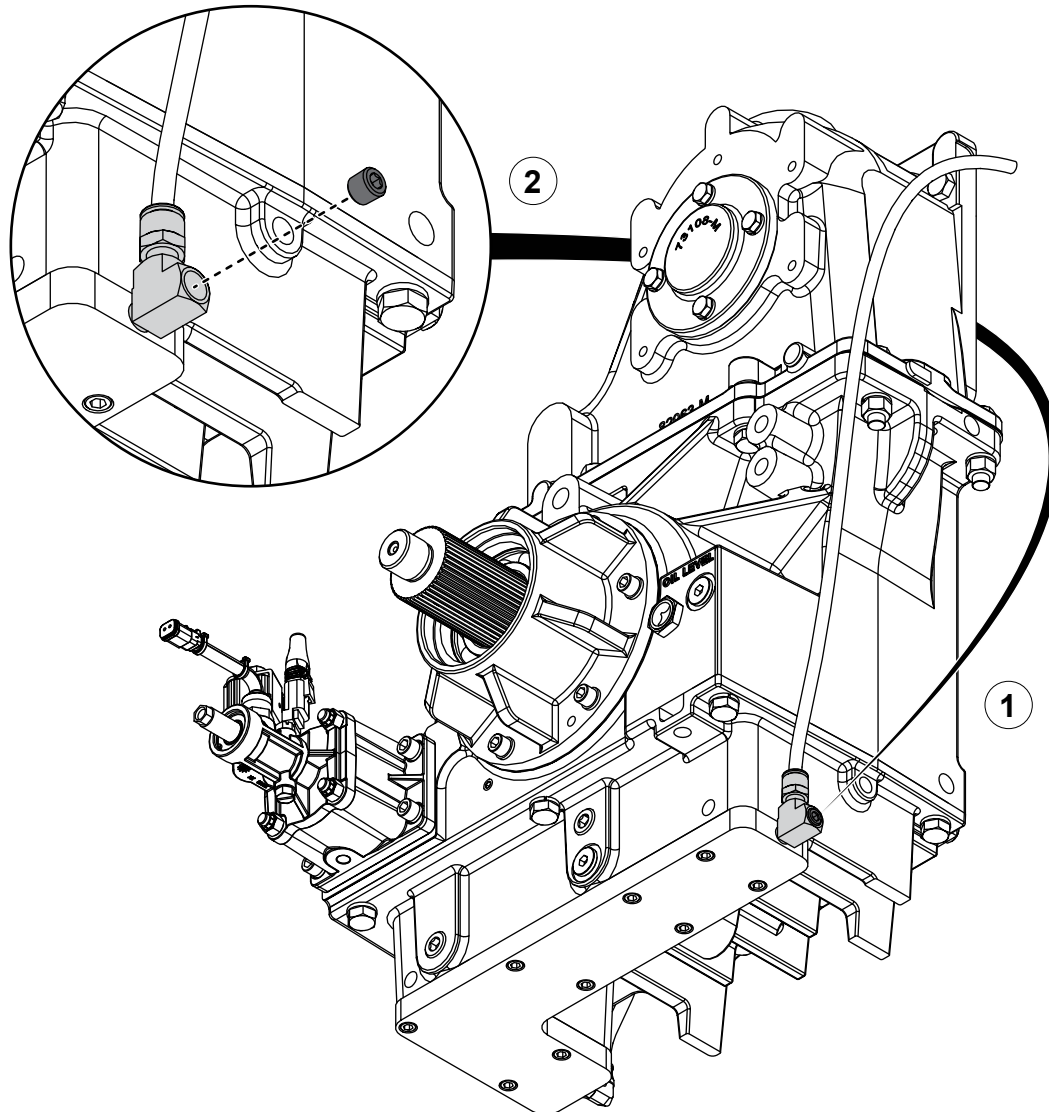
Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

<b>NOTICE</b>	
<b>Freeze Damage</b> <ul style="list-style-type: none"><li>• Do not allow fluid in the lines to freeze.</li><li>• Remove all freezable fluid from the lines before storing the apparatus.</li></ul>	

- 1 Locate the drain port on the tee fitting.
- 2 Remove the drain plug.
- 3 Install the appropriate fittings and hoses to drain the transmission as required.



## Installing the Transmission Drain Lines—CMC22/CMUC22

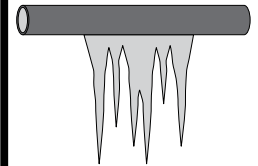


Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

### NOTICE

#### Freeze Damage

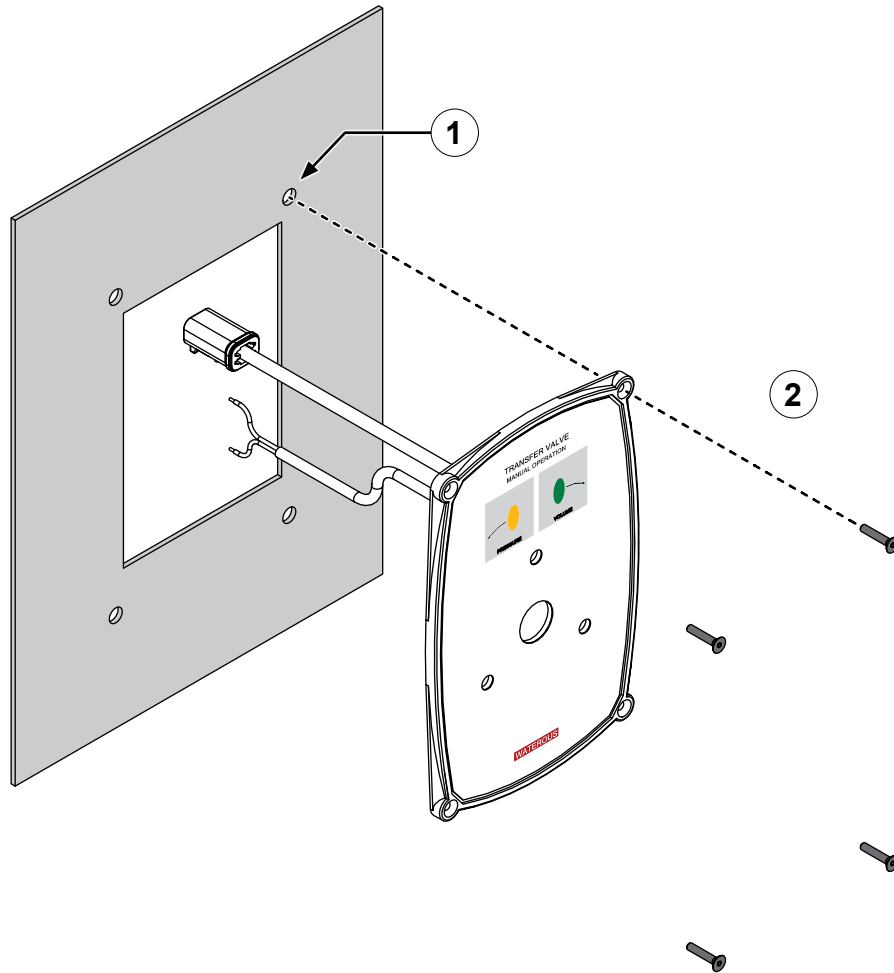
- Do not allow fluid in the lines to freeze.
- Remove all freezable fluid from the lines before storing the apparatus.



- 1 Locate the drain port on the tee fitting.
- 2 Remove the drain plug.
- 3 Install the appropriate fittings and hoses to drain the transmission as required.



## Installing the Transfer Valve Actuator—Manual Version

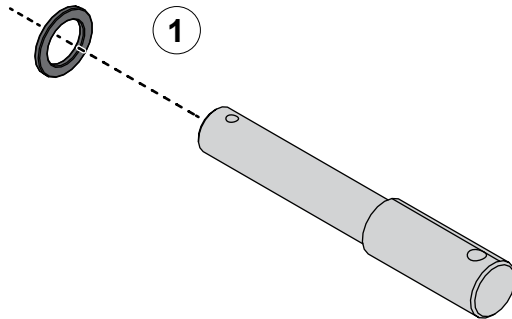


### Mounting the Control Panel

Use the illustration and instructions to mount the actuator control panel on the operator panel.

- 1 Create the cutout and drill the mounting holes for the control panel.
- 2 Insert the control panel wiring through the cutout, then use the mounting hardware to install the control panel.

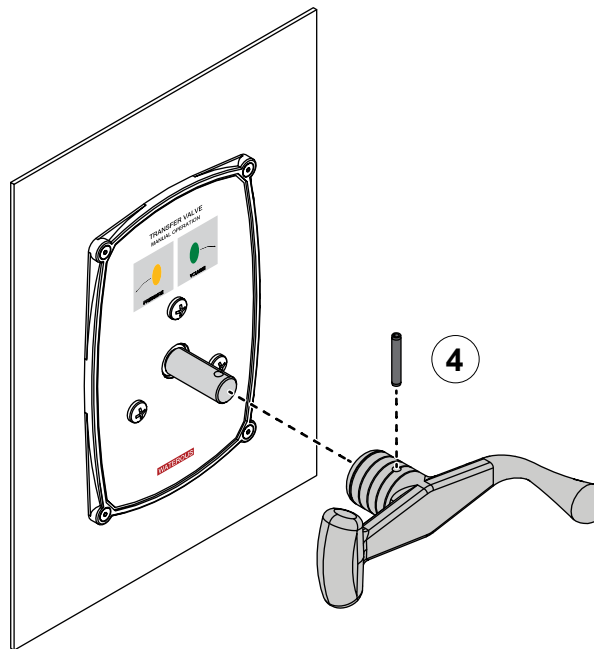
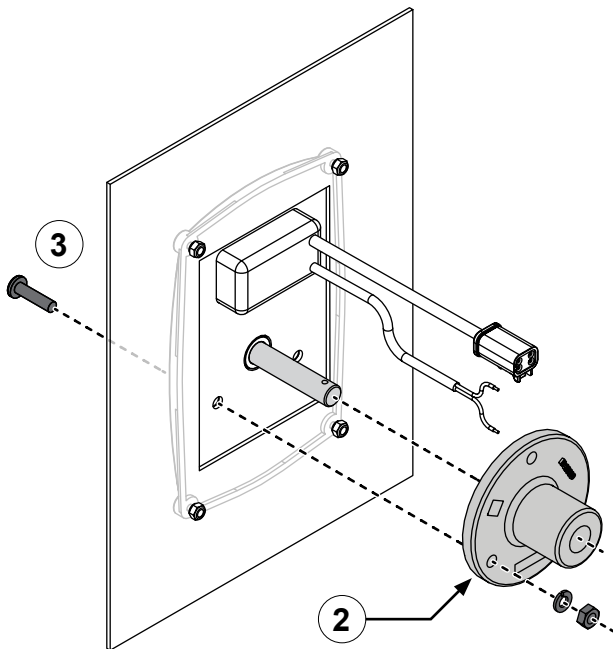
## Installing the Transfer Valve Actuator—Manual Version



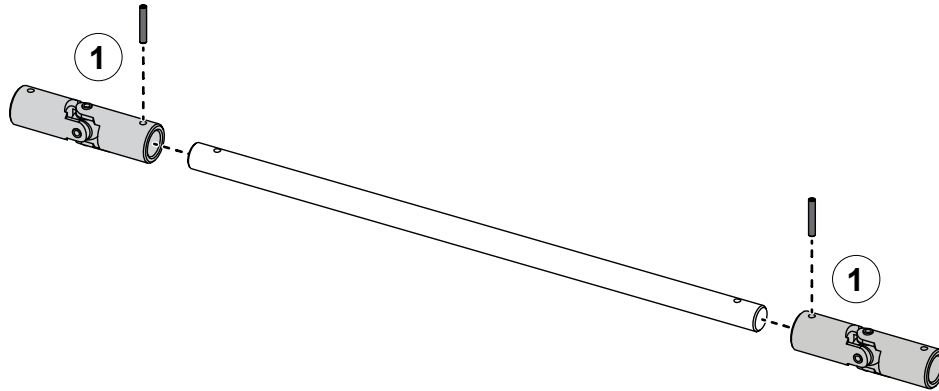
### Installing the Handle

Use the illustrations and instructions to install the handle onto the manual transfer valve actuator.

- 1 Slide the thrust bearing onto the remote shaft.
- 2 Press the remote shaft through the control panel hole, then press the remote body onto the shaft.
- 3 Use the hardware provided to secure the remote body to the back of the control panel.
- 4 Install the handle onto the shaft, then secure it with a spirol pin.



## Installing the Transfer Valve Actuator—Manual Version

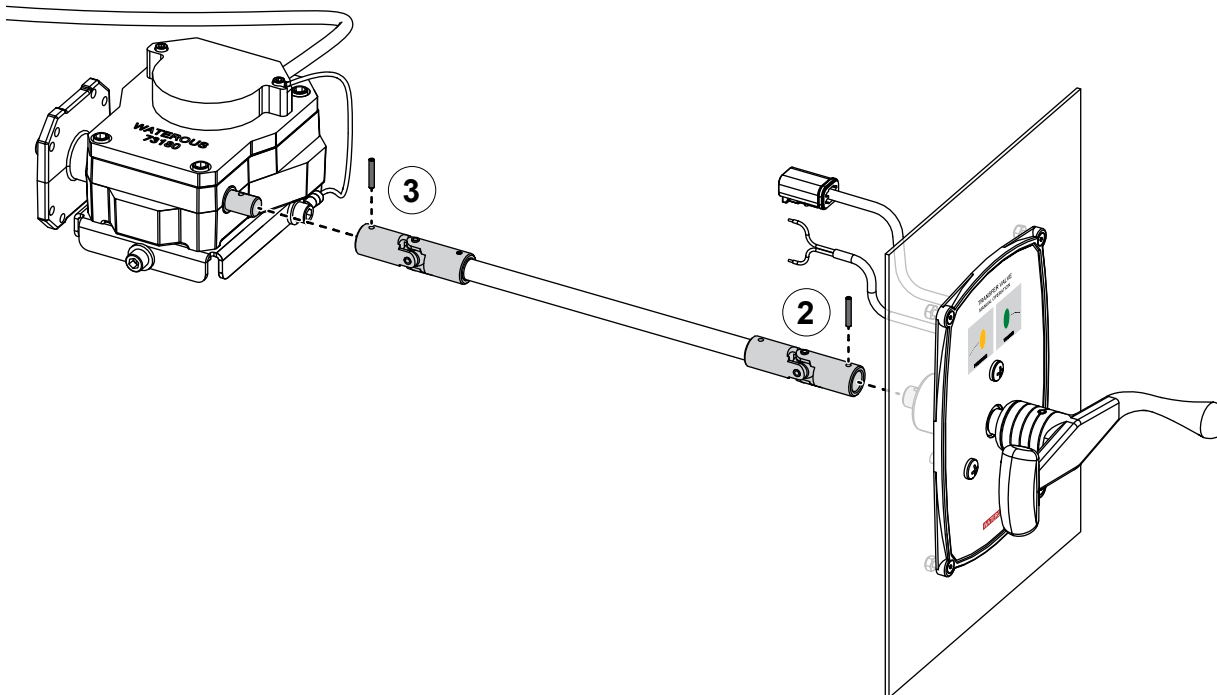


### Installing the Control Rod

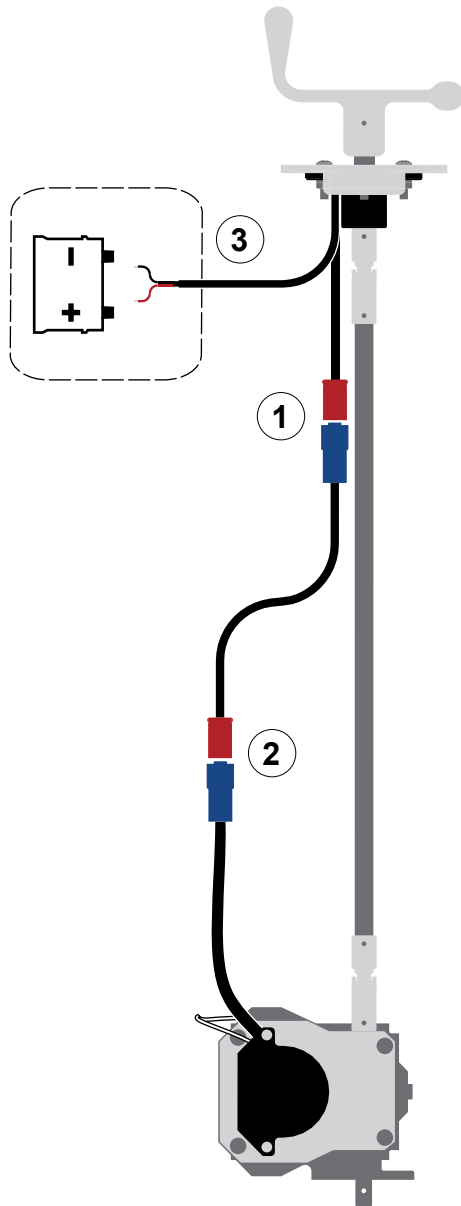
Use the illustrations and instructions to install the control rod between the control panel and actuator.

**Note:** The control rod is usually supplied by the installer and cut to length, but an optional control rod is available from Waterous.

- 1 Install U-joints onto each end of the control rod, then secure the joints with spirol pins.
- 2 Install the U-joint onto the remote shaft, then secure the joint with a spirol pin.
- 3 Install the other U-joint onto the actuator shaft, then secure the joint with a spirol pin.



## Installing the Transfer Valve Actuator—Manual Version

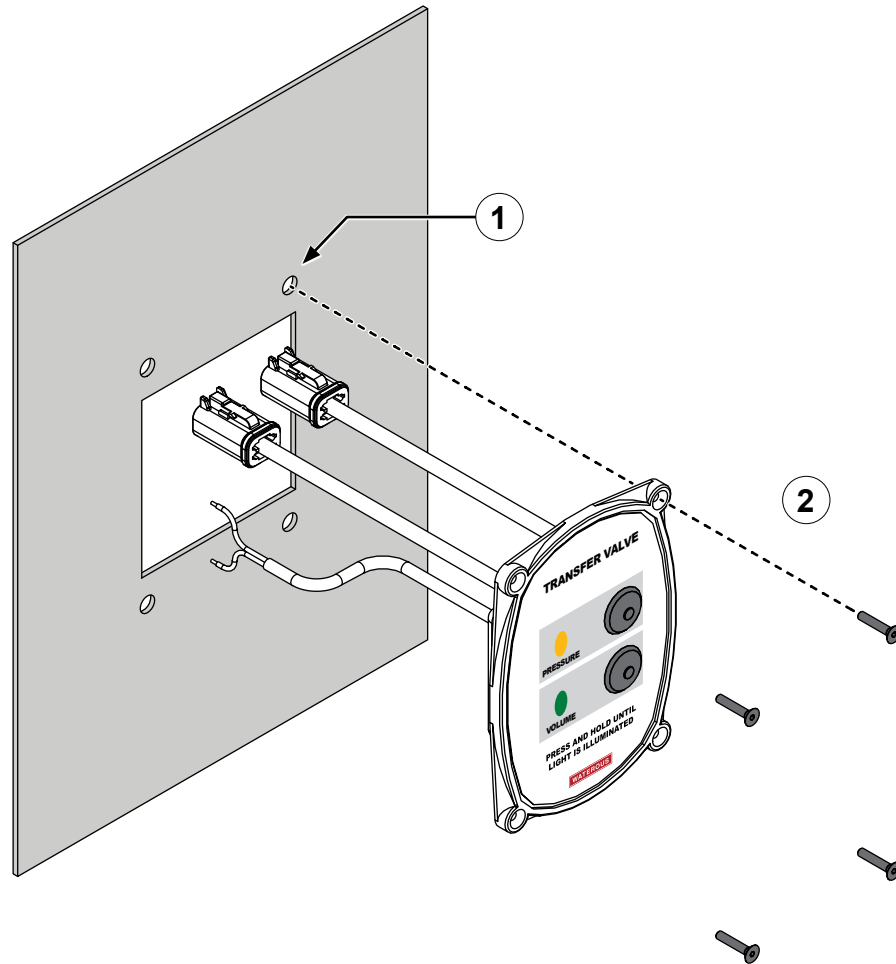


### Connecting the Components

Use the illustration and instructions to connect the manual actuator cables.

- 1 Connect the control panel connector to the extension cable connector.
- 2 Connect the extension cable connector to the encoder connector.
- 3 Connect power (red/white) and ground (black) from the control panel to the appropriate source.

## Installing the Transfer Valve Actuator—Electric Version



### Mounting the Control Panel

Use the illustration and instructions to mount the actuator control panel on the operator panel.

- 1 Create the cutout and drill the mounting holes for the control panel.
- 2 Insert the control panel wiring through the cutout, then use the mounting hardware to install the control panel.

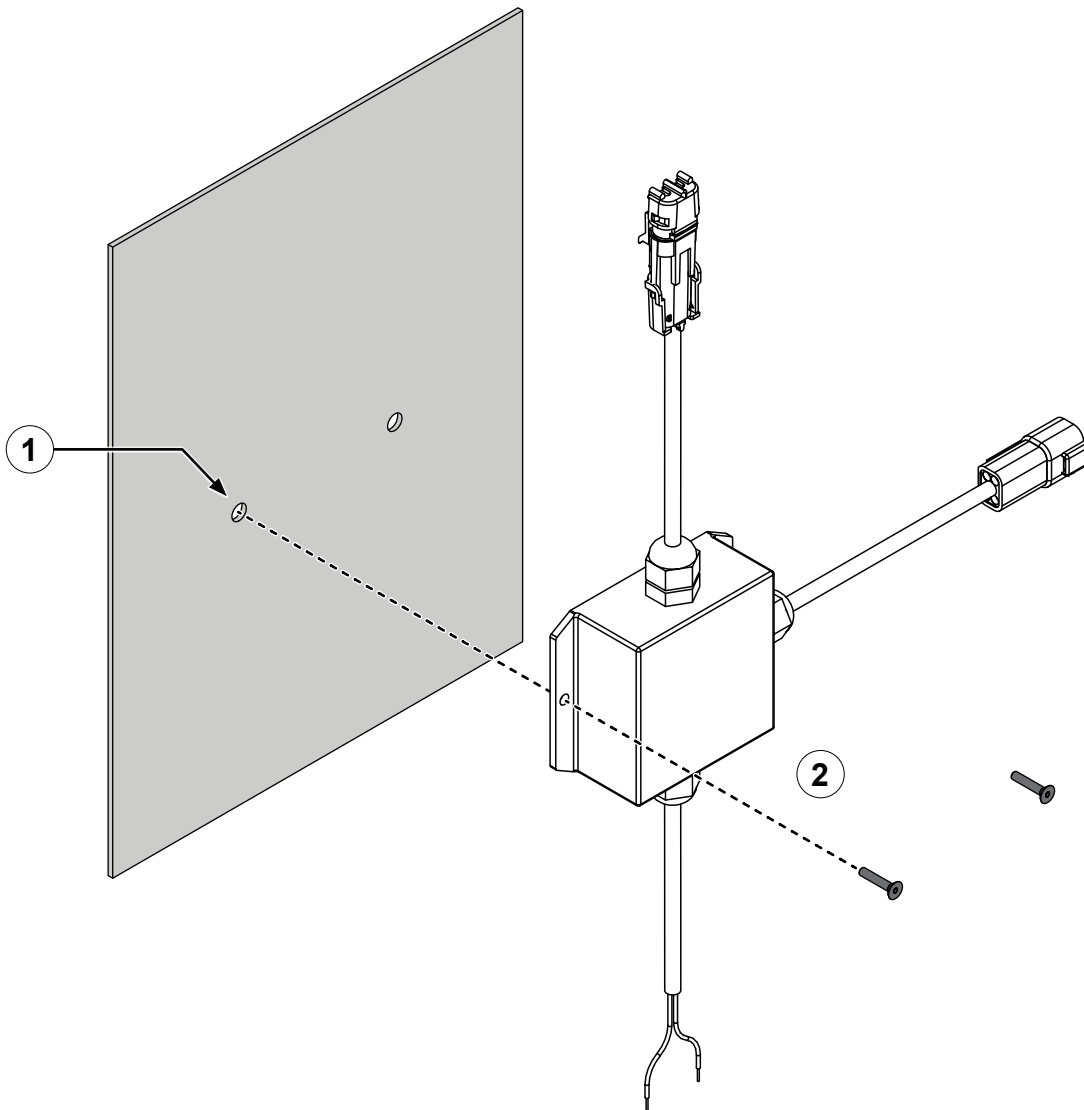


## Installing the Transfer Valve Actuator—Electric Version

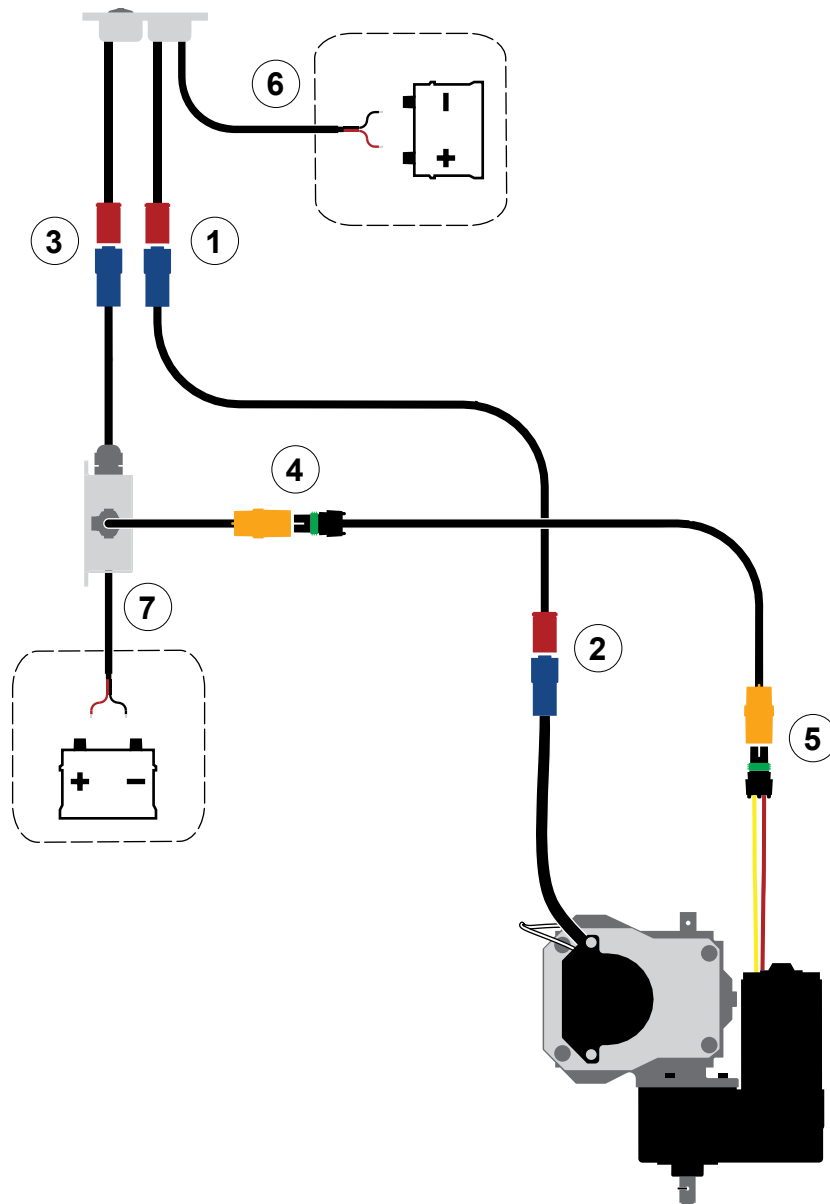
### Mounting the Power Relay Module

Use the illustration and instructions to mount the power relay module on the operator panel.

- 1 Drill the mounting holes for the power relay module.
- 2 Use screws (1/8 inch) to install the power relay module.



## Installing the Transfer Valve Actuator—Electric Version

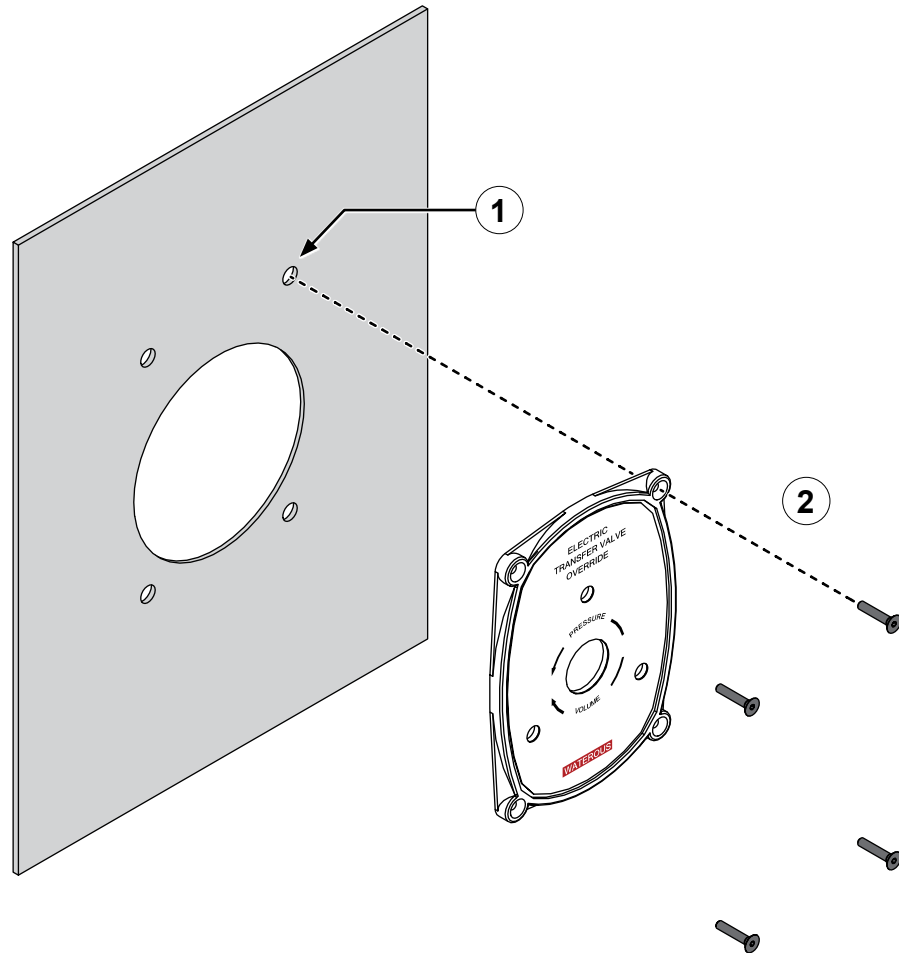


### Connecting the Components

Use the illustration and instructions to connect the cables for the electric actuator assembly.

- 1 Connect the control panel connector to the extension cable connector.
- 2 Connect the extension cable connector to the encoder connector.
- 3 Connect the control panel connector to the power relay module connector.
- 4 Connect the power relay module connector to the motor extension cable connector.
- 5 Connect the motor extension cable connector to the gear motor connector.
- 6 Connect power (red/white) and ground (black) from the control panel to the appropriate source.
- 7 Connect power (red/white) and ground (black) from the relay module to the appropriate source.

## Installing the Transfer Valve Actuator—Manual Override



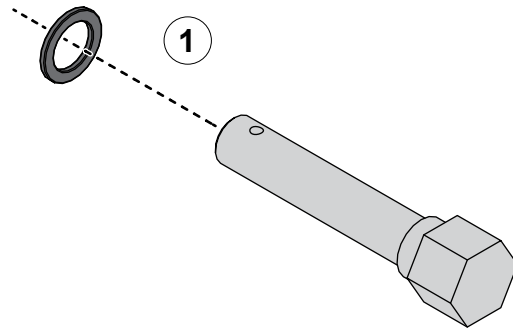
### Mounting the Control Panel

Use the illustration and instructions to mount the manual override control panel on the operator panel.

**Note:** *The manual override is optional with the electric transfer valve actuator.*

- 1 Create the cutout and drill the mounting holes for the control panel.
- 2 Use the mounting hardware to install the control panel.

## Installing the Transfer Valve Actuator—Manual Override

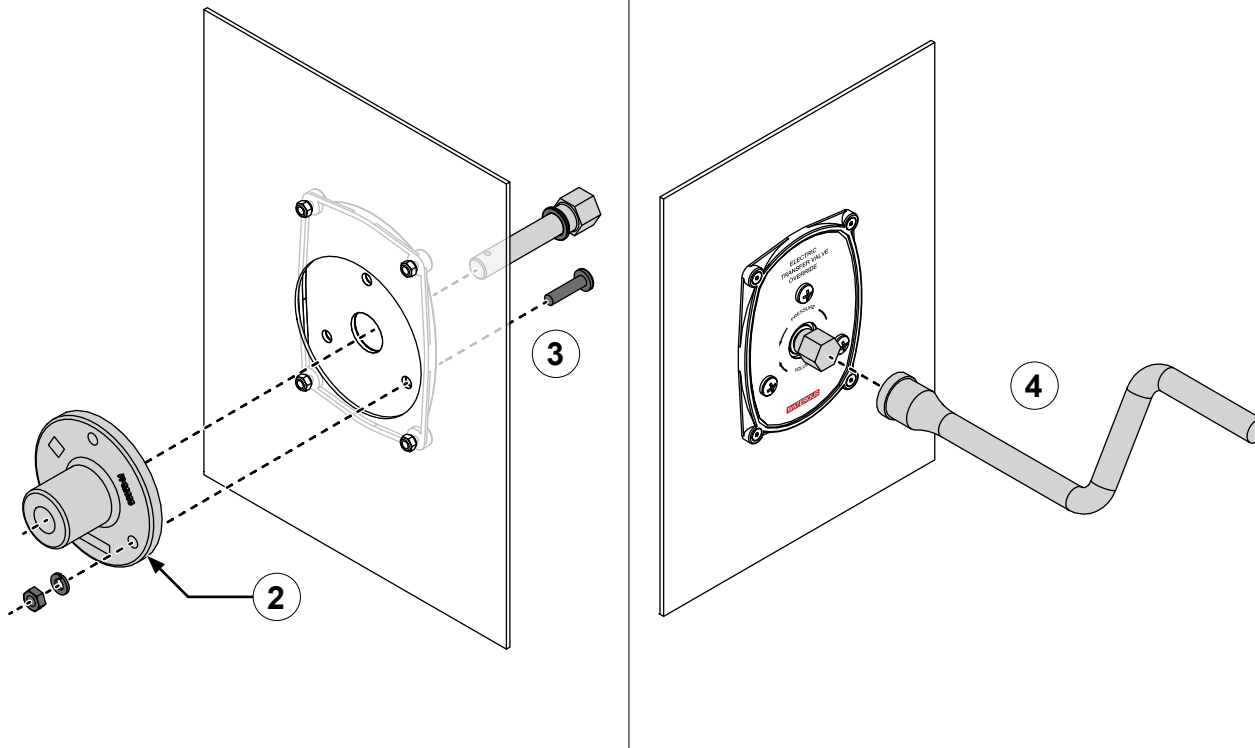


### Installing the Crank Handle

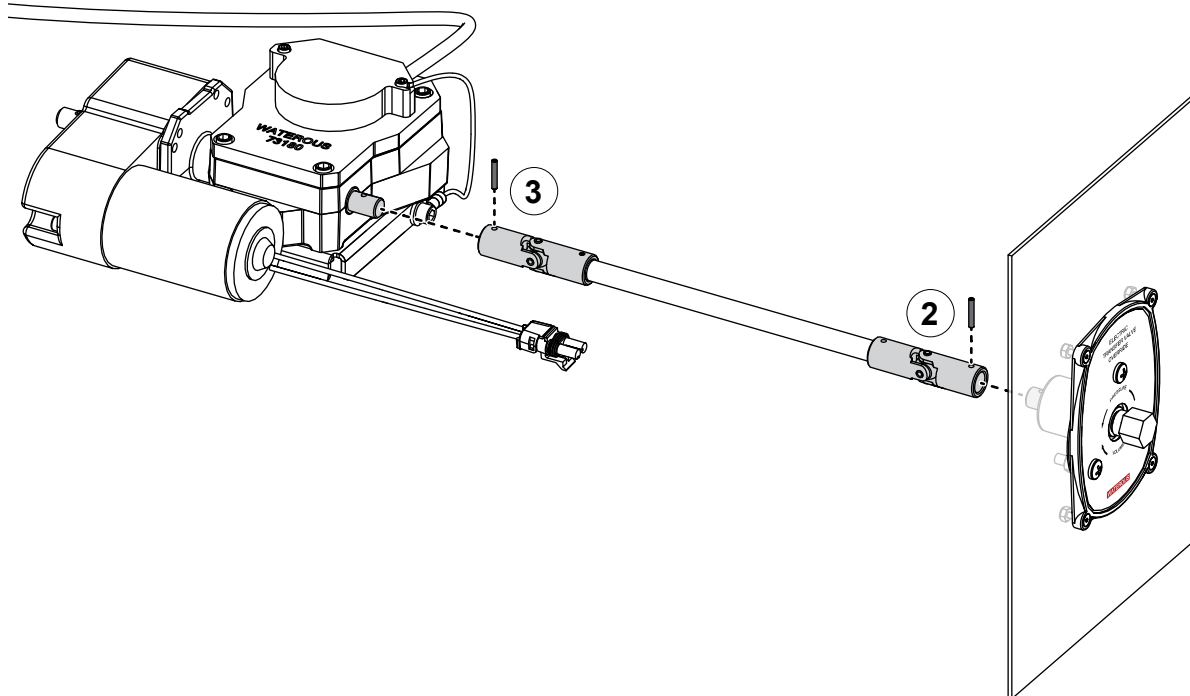
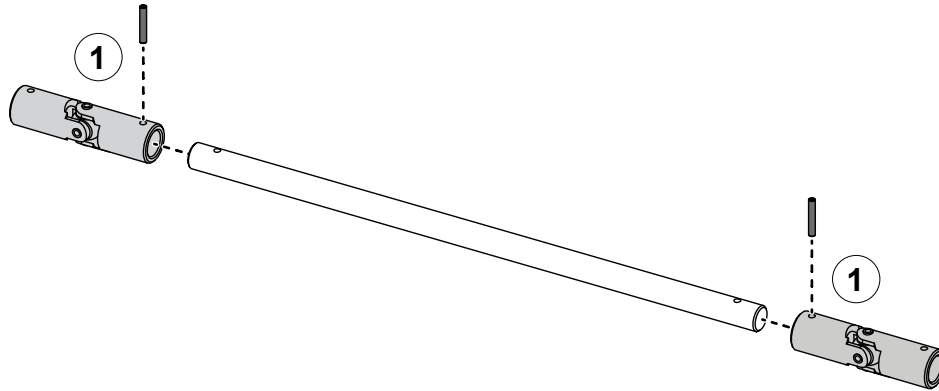
Use the illustrations and instructions to install the handle onto the manual override.

- 1 Slide the thrust bearing onto the remote shaft.
- 2 Press the remote shaft through the control panel hole, then press the remote body onto the shaft.
- 3 Use the hardware provided to secure the remote body to the back of the control panel.
- 4 Install the crank handle onto the shaft.

**Note:** When not in use, remove the handle and store it in a location that is easily accessible.



## Installing the Transfer Valve Actuator—Manual Override



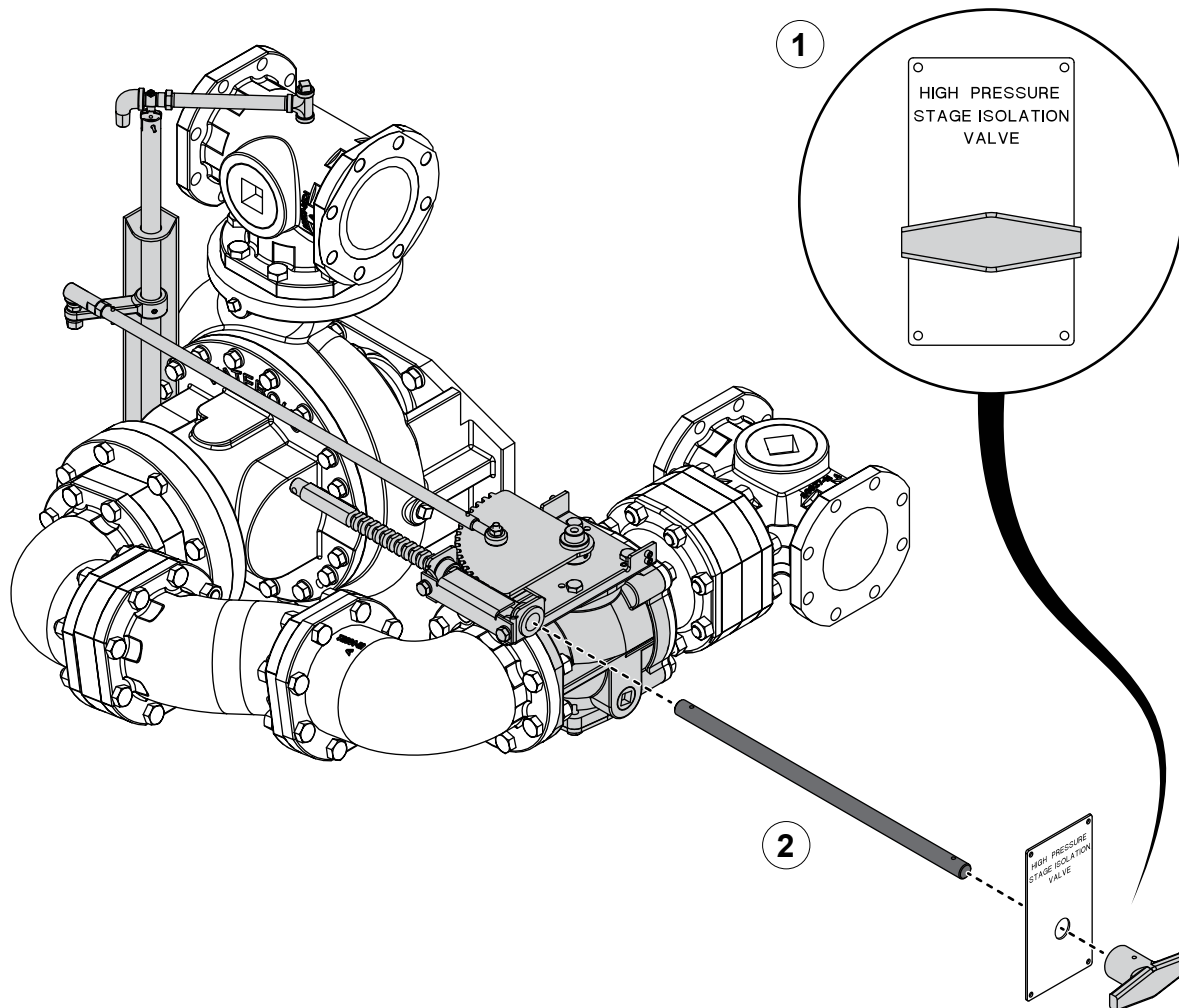
### Installing the Control Rod

Use the illustrations and instructions to install the control rod between the control panel and actuator.

**Note:** The control rod is usually supplied by the installer and cut to length, but an optional control rod is available from Waterous.

- 1 Install U-joints onto each end of the control rod, then secure the joints with spirol pins.
- 2 Install the U-joint onto the remote shaft, then secure the joint with a spirol pin.
- 3 Install the other U-joint onto the actuator shaft, then secure the joint with a spirol pin.

## CMCGV/CMUCGV—Building the Isolation Valve Controls

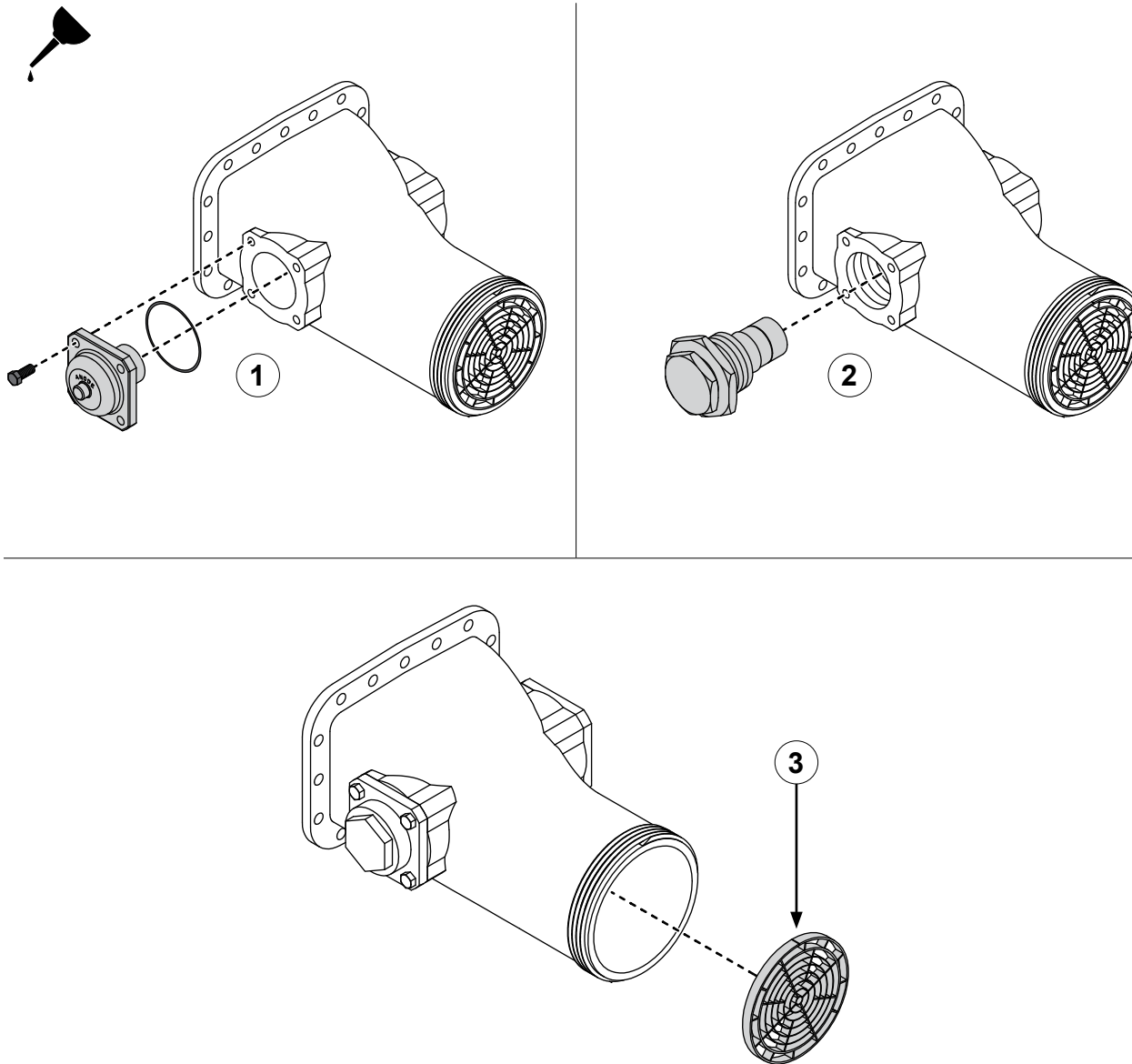


Use the illustration and instructions to build the installer-supplied manual control components for the isolation valve.

**Note:** *Certain parts have been removed from the illustration to provide a clear view of the equipment being discussed.*

- 1 Design and build a control panel for the isolation valve that has the following features:
  - A handle that opens the valve when pulled, closes the valve when pushed, and locks the valve in place when twisted.
  - A label indicating the function of the handle.
  - Optional: an LED that illuminates when the valve is not fully opened or fully closed.
- 2 Create a control rod to install between the control panel and isolation valve rack.
- 3 Use locally sourced hardware and U-joints to install the control components.
- 4 If the control panel has an LED, connect the wiring from the control panel to the appropriate source.

## Installing the Anodes and Intake Screens



Use the illustrations and instructions to install the optional anodes and intake screens for corrosion protection. Anodes should be mounted on the intake plumbing, but can be mounted on the discharge plumbing if no intake mounting pads are available.

- 1 To install the bolt-on anode, do the following:
  - Apply lubricant to the O-ring groove, then install the O-ring into the anode.
  - Secure the anode to the intake pad.

**Note:** The replaceable elements of the anodes must make contact with water to be effective. Do not use paint or any other coating on the anodes.

- 2 To install the threaded anode, screw the anode into the intake mounting pad.

- 3 To install the intake screen, do the following:
  - Press the screen into the counter bore inside the intake fitting.
  - If the screen does not fit tightly, adjust the slot on the outer edge to provide a secure fit.

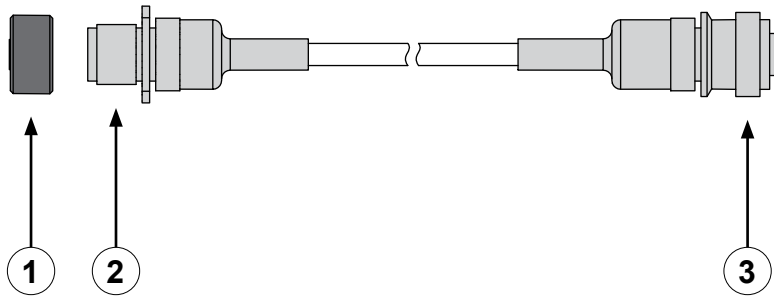
**Note:** The screen must have strong contact with the fitting to be effective. Remove any corrosion, debris, or paint from the bore that would insulate the fitting.

## Tachometer Connection

The electronic tachometer is standard with all PA Series transmissions. The magnetic pickup on the transmission mates with an Amphenol connector (illustrated below). This connector plugs into a wall mount receptacle on the operator panel.

To verify the rotational speed of the drive shaft, multiply the frequency reading from the tachometer sensor by 6 ( $\text{Hz} \times 6 = \text{RPM}$ ).

**Note:** Frequency readings can be measured using a handheld multimeter. A cable assembly for connecting a multimeter to the wall mount receptacle is available from Waterous.



Feature	Description
1 Cap	This covers the plug when the connector is not in use and protects against live circuits.
2 Wall mount plug	This connects to a wall mount receptacle on the operator panel.
3 Tachometer receptacle	This connects to the magnetic pickup on the transmission.

## Lubrication

Pumps and transmissions are shipped without lubricant and must be filled before operation. The table below shows the recommended lubricant for each transmission, including the direct drive option without a transmission. For detailed instructions on adding lubricant to the transmission, refer to the documentation for your specific application.

**Note:** Always fill to the bottom of the oil level plug. Capacities listed vary based on gear ratio, transmission orientation, or both.

Transmission Model	Capacity (qt/L)	Lubricant
C22C, C22D, C22E, C22F	6.0	Automatic transmission fluid that meets the requirements of
PA	1.0	DEXRON III or MERCON V
K	1.0	SAE 80W-90 gear oil
D (Direct Drive)	0.5	Ball bearing grease

## Transmission Temperature Specifications

For all transmissions, including the direct-drive bearing housing, the maximum acceptable temperature at external surfaces is 250°F (121°C).

## Testing After Installation

Perform standard tests associated with the operation of centrifugal pumps, along with any tests outlined in the transmission instructions or required by the National Fire Protection Association (NFPA). During the tests, listen for unusual noises, check for leaks, and monitor the smoothness of operation.





**WATEROUS**

Waterous Company  
125 Hardman Avenue South  
South Saint Paul, MN 55075  
(651) 450-5000  
[www.waterousco.com](http://www.waterousco.com)