

WATEROUS

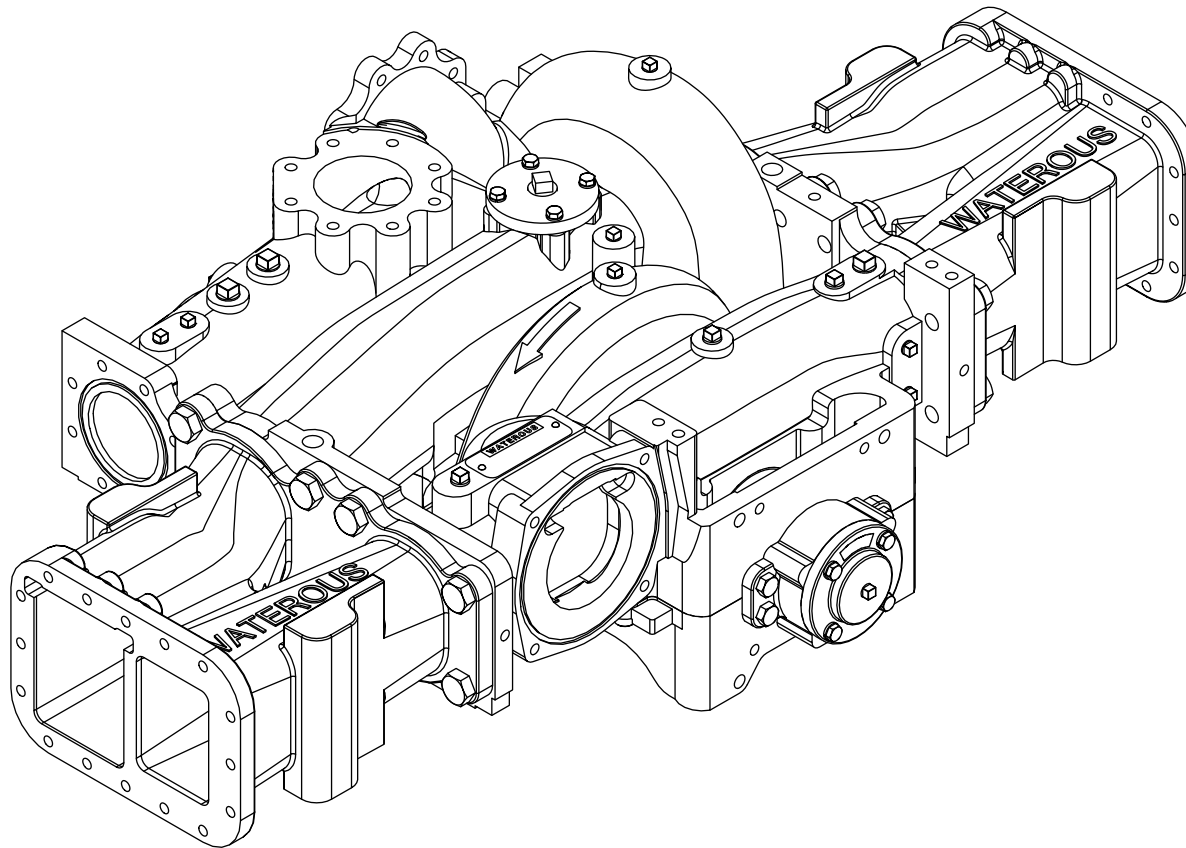
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CS Series Fire Pumps

Installation



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www.waterousco.com

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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.

Understand that each application is unique. Options included or not included with your application determine the operation of your specific system. It is incumbent upon the operators to develop operational protocols that include robust safety considerations and industry best practices before operating the system. Use the information in this instruction to guide you in developing operating protocols for your application.


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

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

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

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

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

 Read and understand all instructions following this symbol.

Safety Precautions

Read and understand all Notices to provide the best performance in your application and to prevent premature service requirements.

NOTICE

Before Operation

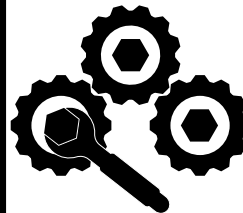
- Read and understand all the instructions provided.
- Check all fluid levels and replenish if necessary.
- Remove all shipping plugs and install the operation plugs or caps.



NOTICE

Maintenance

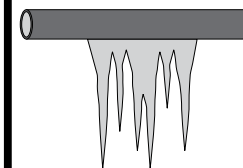
- Not following maintenance procedures can damage your equipment.
- Perform all maintenance procedures as required.



NOTICE

Freeze Damage

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



Read and understand all notices following this symbol.

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.

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 designed to be printed on both sides and in color.
- Use a 3-ring binder to store the document.

Additional Documentation

Additional documentation is available through the MyWaterous login at waterousco.com. Use your serial number to gain access to the service parts list (SPL) 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.



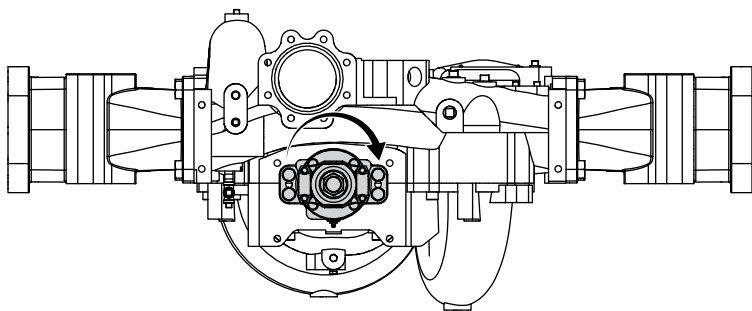
Drill—This symbol tells you to drill holes in the apparatus.



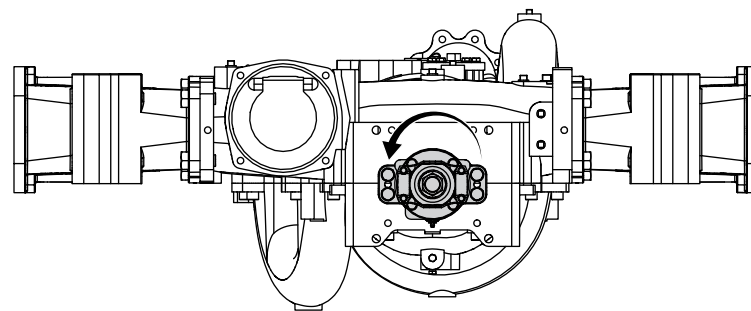
Lubrication—This symbol tells you to apply the appropriate lubricant to the part.

CS Series Pumps—Drive Options

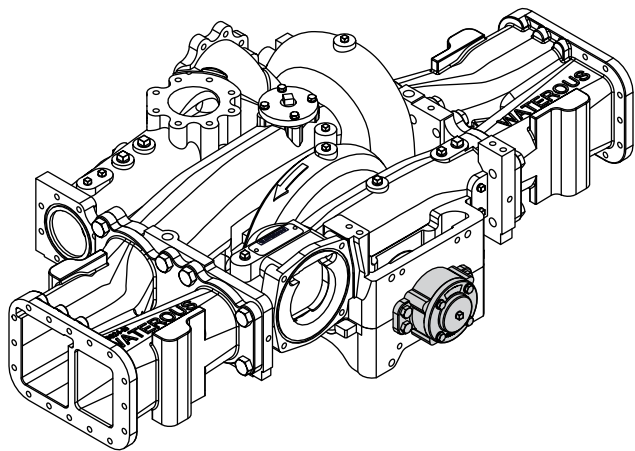
CS Series pumps are midship-mounted centrifugal pumps with a single impeller. Depending on the model, pump capacity can range from 750 to 2,250 GPM (2,850 to 8,550 LPM). CS and CSU pumps are available with direct drive or one of the following transmissions: C22 (rear- or front-mounted), K, or PA (rear-mounted only). Direct drive applications are available with clockwise or counterclockwise rotation.



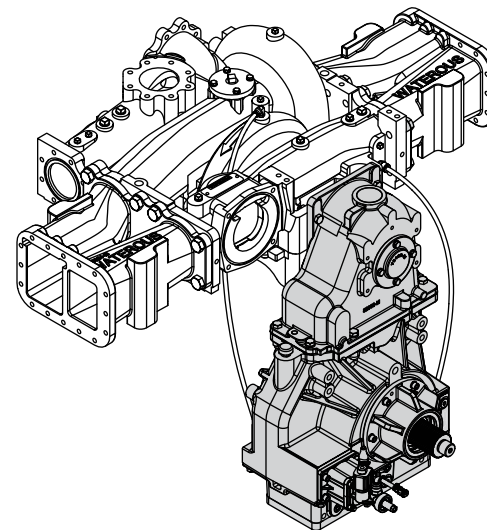
Clockwise Rotation



Counterclockwise Rotation



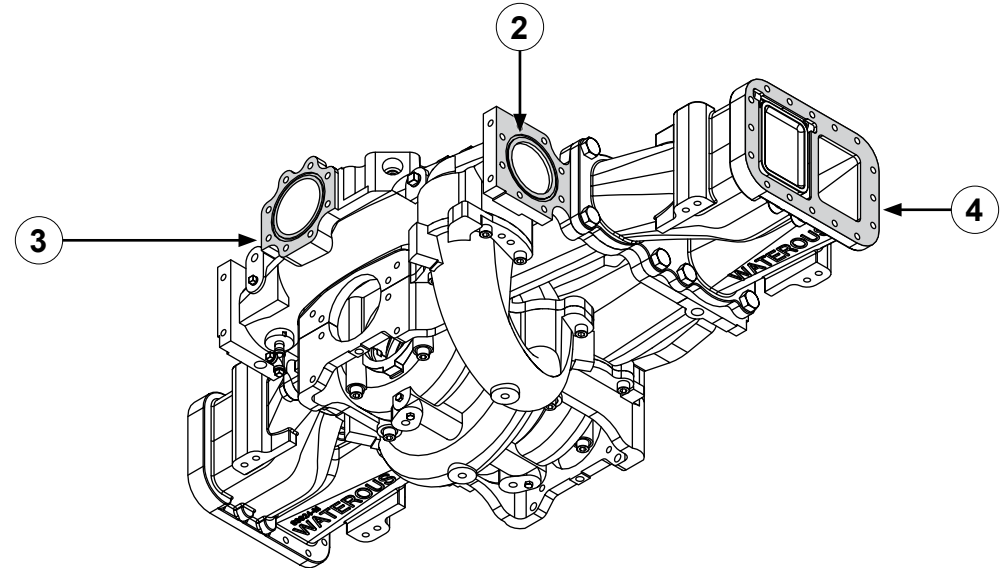
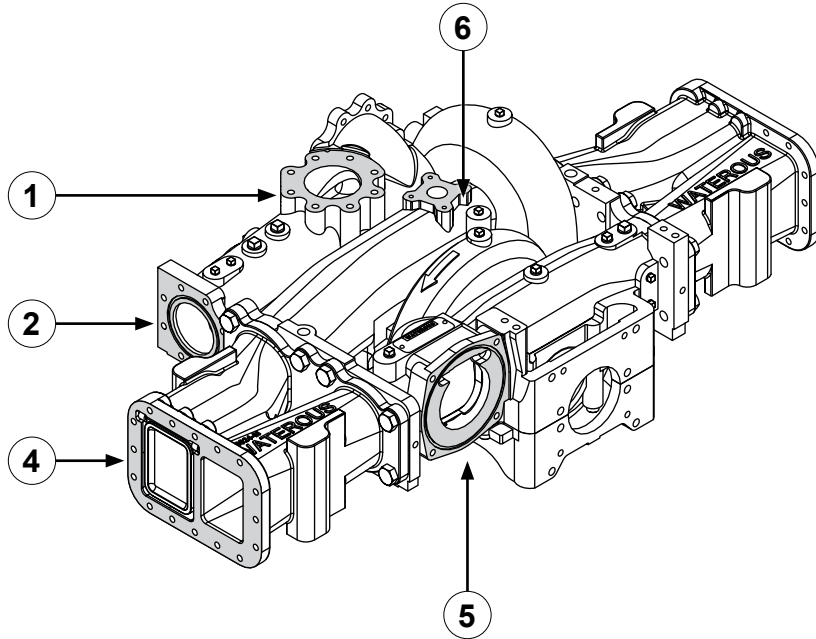
Direct Drive



Transmission (C22)

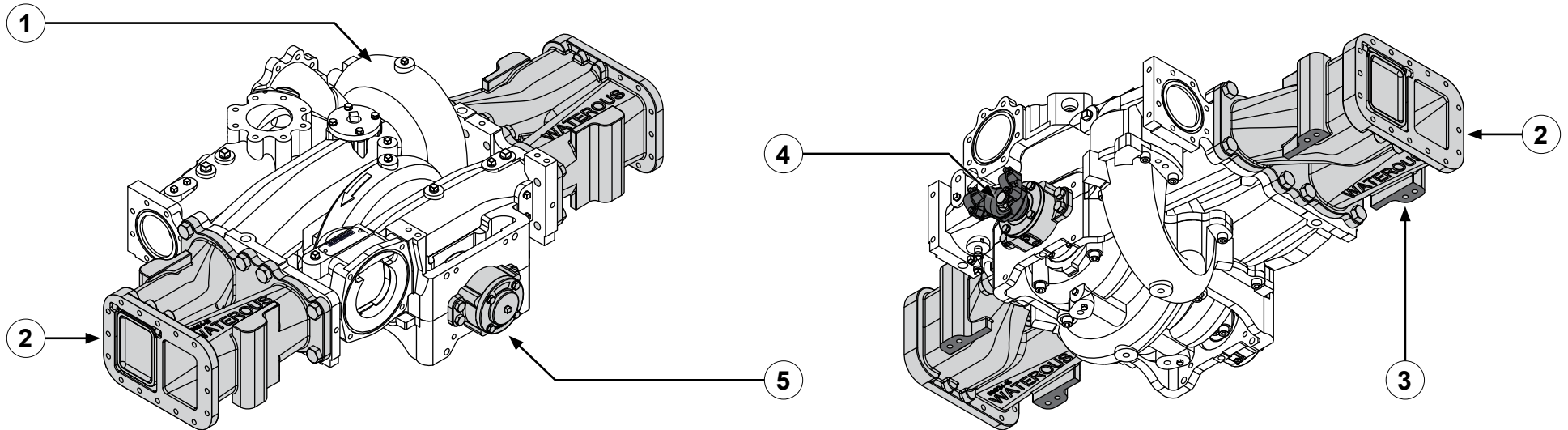
CS Series Pumps—Intake and Discharge Flanges

CS 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.



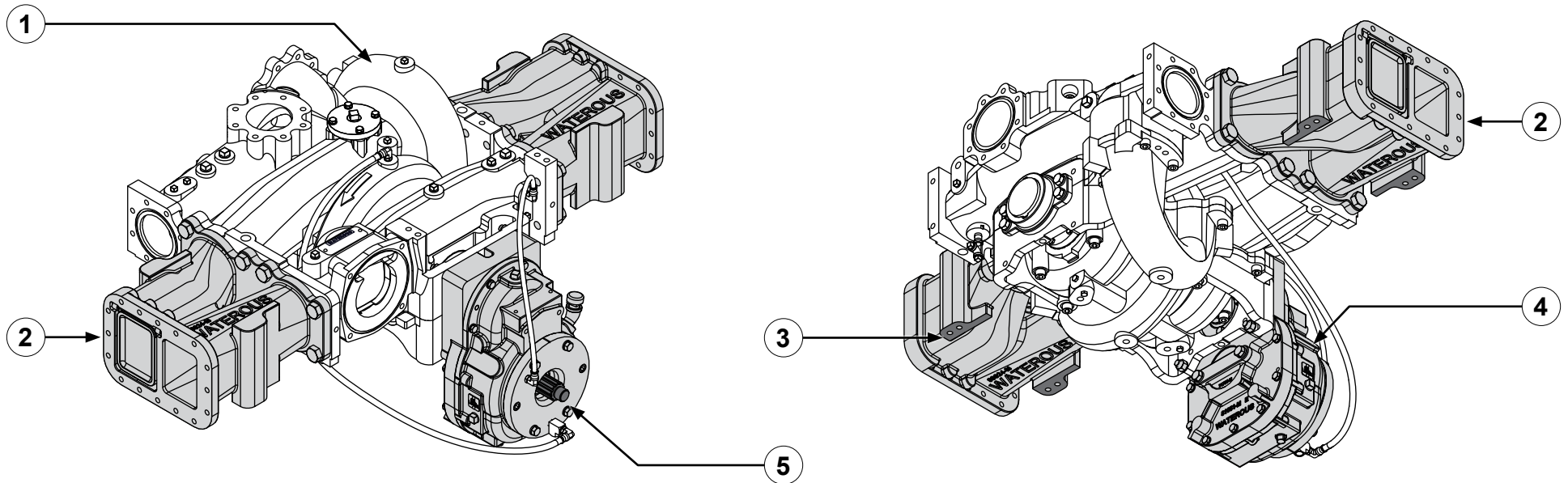
Feature	Description
1 Center discharge flange	Water exits the pump through this discharge. In applications where discharge plumbing is not needed, a cover is available.
2 Side discharge flange	Water exits the pump through the side discharges. Optional discharge fittings and plumbing are available to 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.

CSD/CSUD



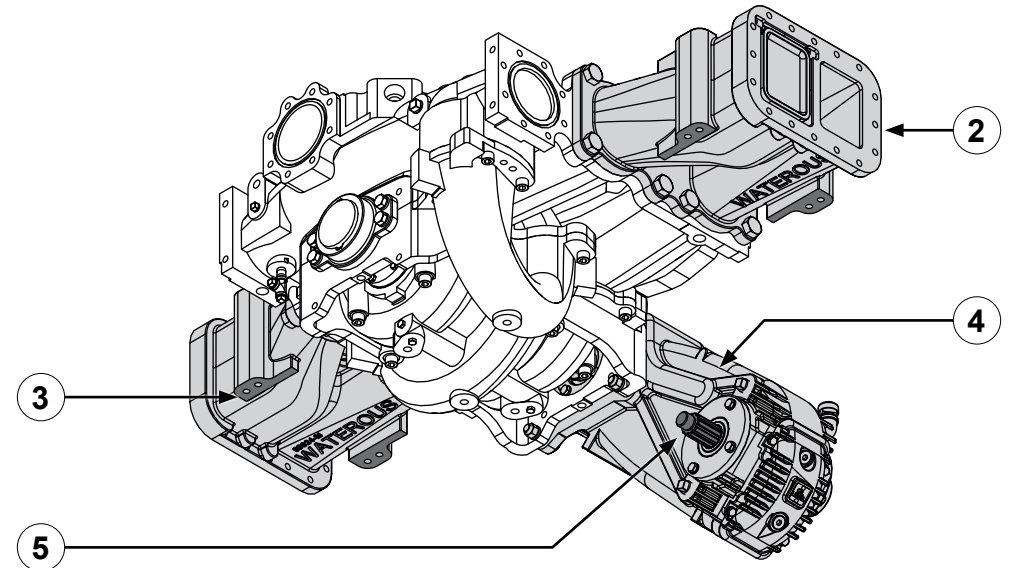
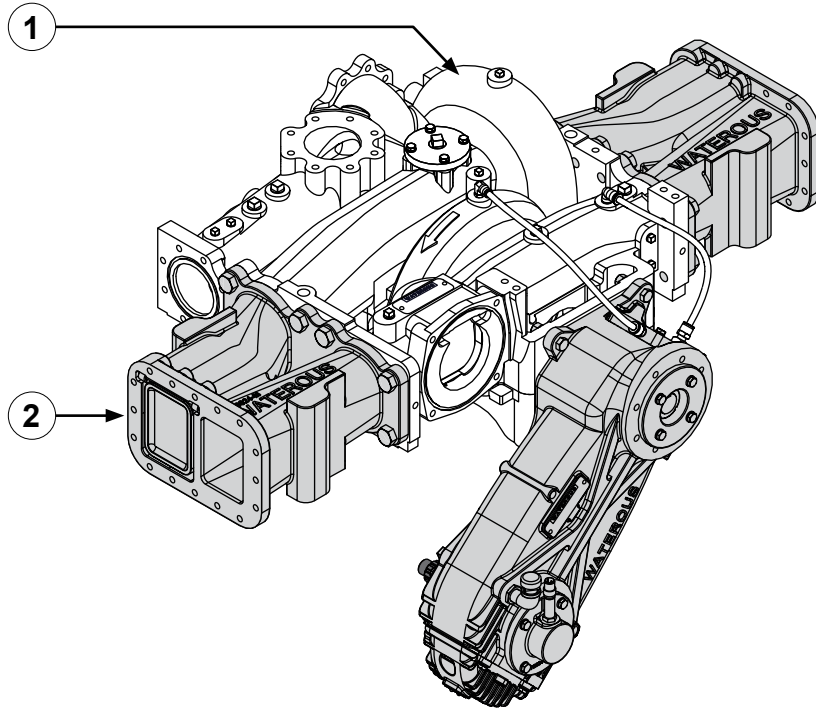
Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Impeller shaft	This connects the pump to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

CSK/CSUK



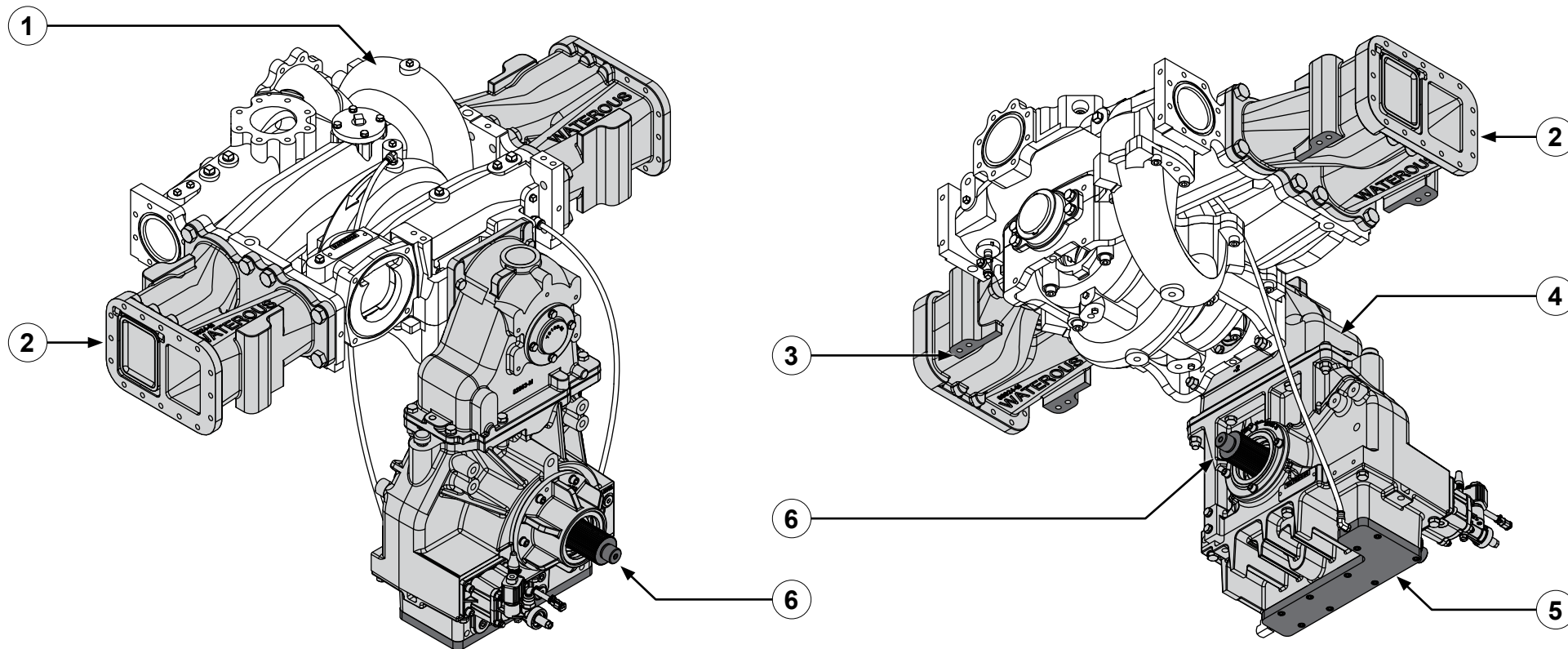
Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Transmission	This increases the speed of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

CSPA/CSUPA



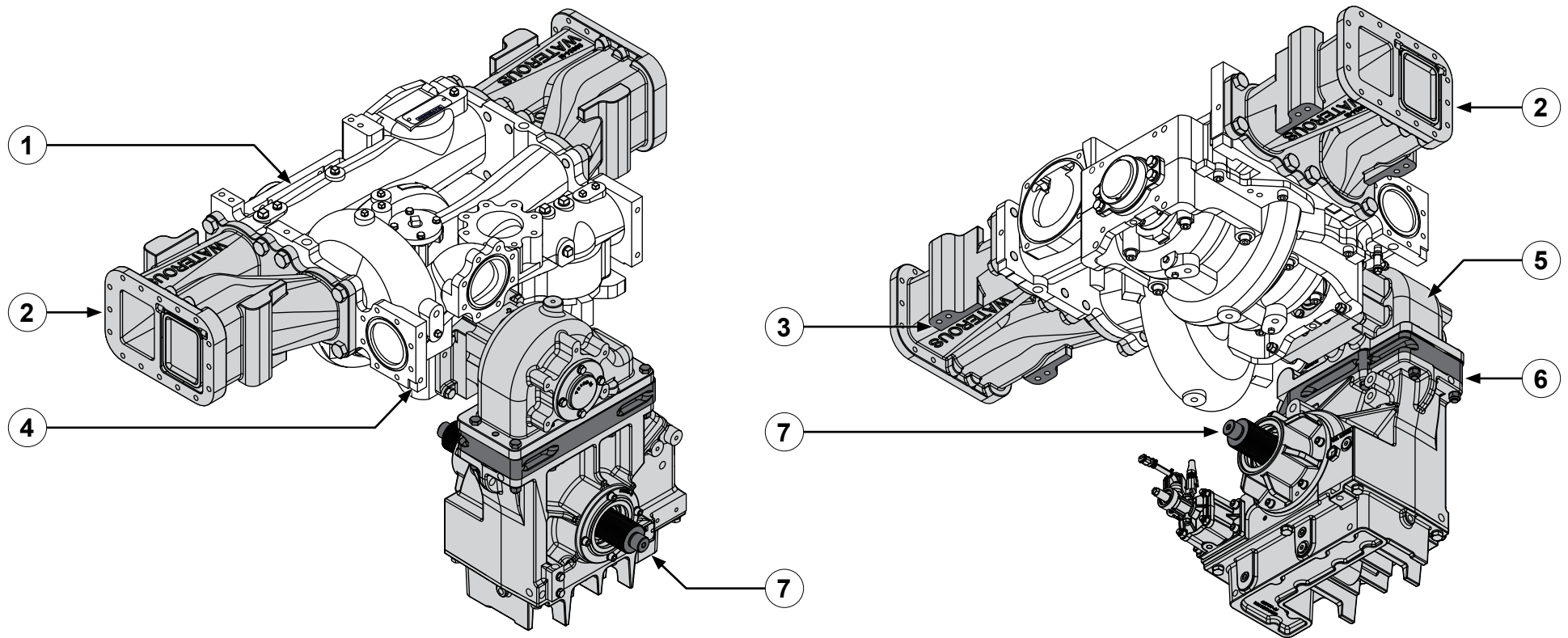
Feature	Description
1 Body assembly	The body assembly consists of the volute body and volute cover.
2 Intake adapter	This connects the pump to the water source.
3 Intake mounting pad	This is where the installer-supplied angle bracket is attached to the pump.
4 Transmission	This increases the speed of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

CSC22/CSUC22



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.

CSC22/CSUC22 (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.

Notes

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.
- Installing and securing plumbing.
- Routing and securing the wiring.
- Welding.
- 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.



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.



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

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.

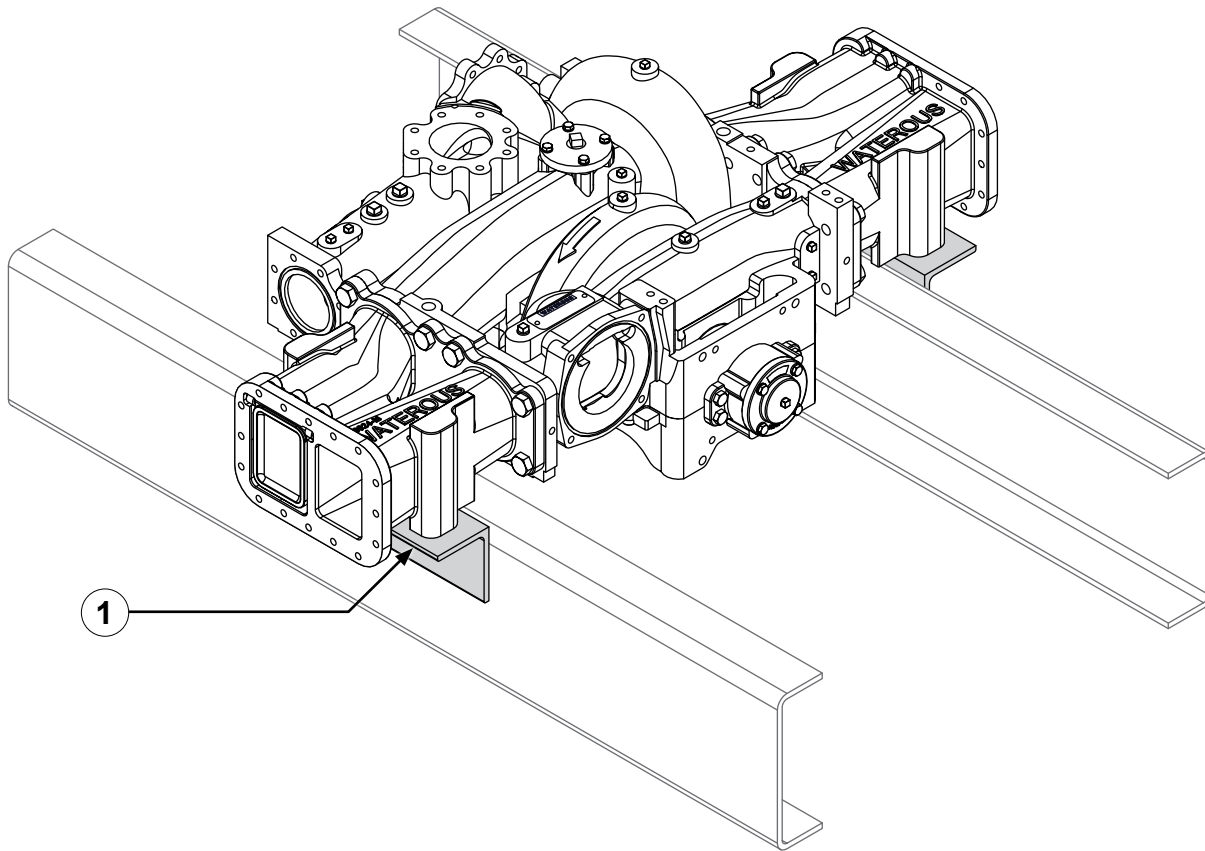
Determining Cable and Wire Routing

Use the *Wiring Best Practices* document, available at 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.

CSD/CSUD—Installing the Pump



Use the illustration and instructions to install the CSD or CSUD pump assembly.

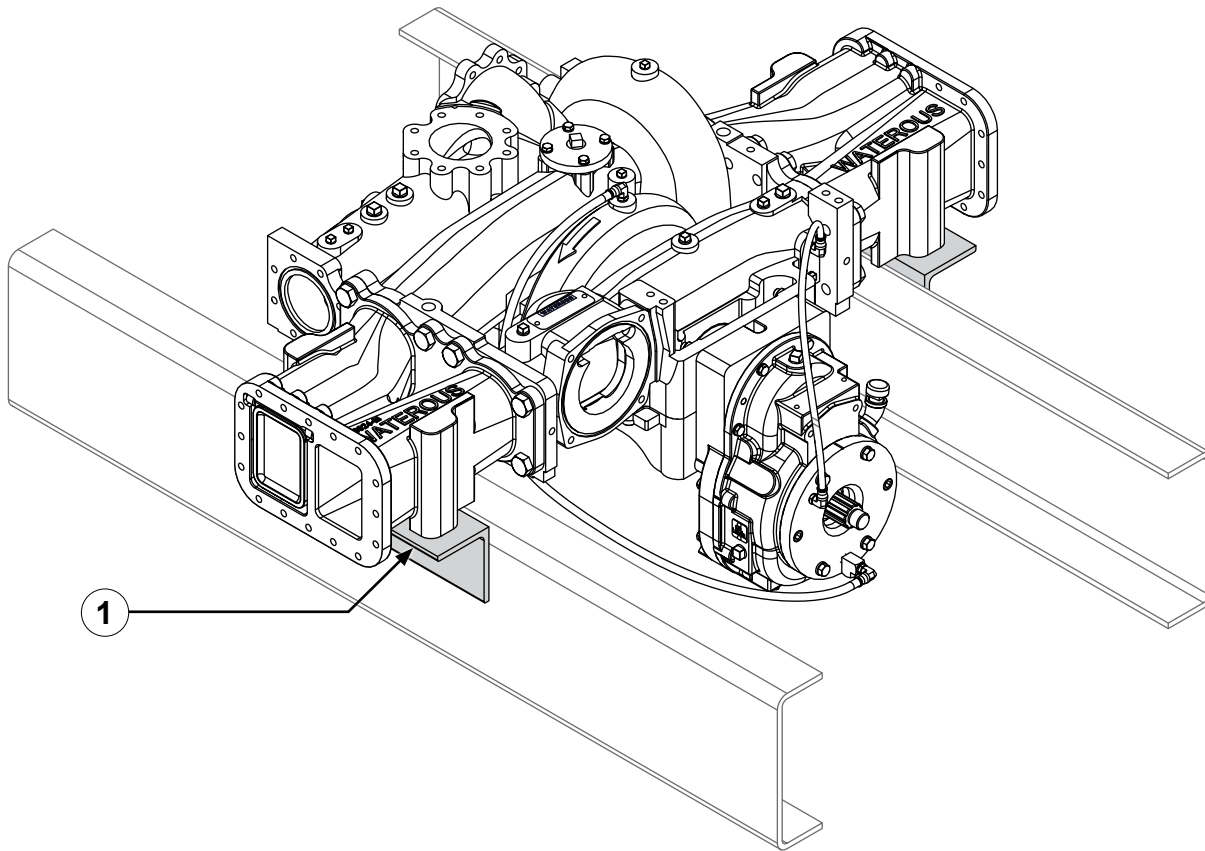
Note: Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.

- 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 21.**
- 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 24.**
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

CSK/CSUK—Installing the Pump



Use the illustration and instructions to install the CSK or CSUK pump assembly.

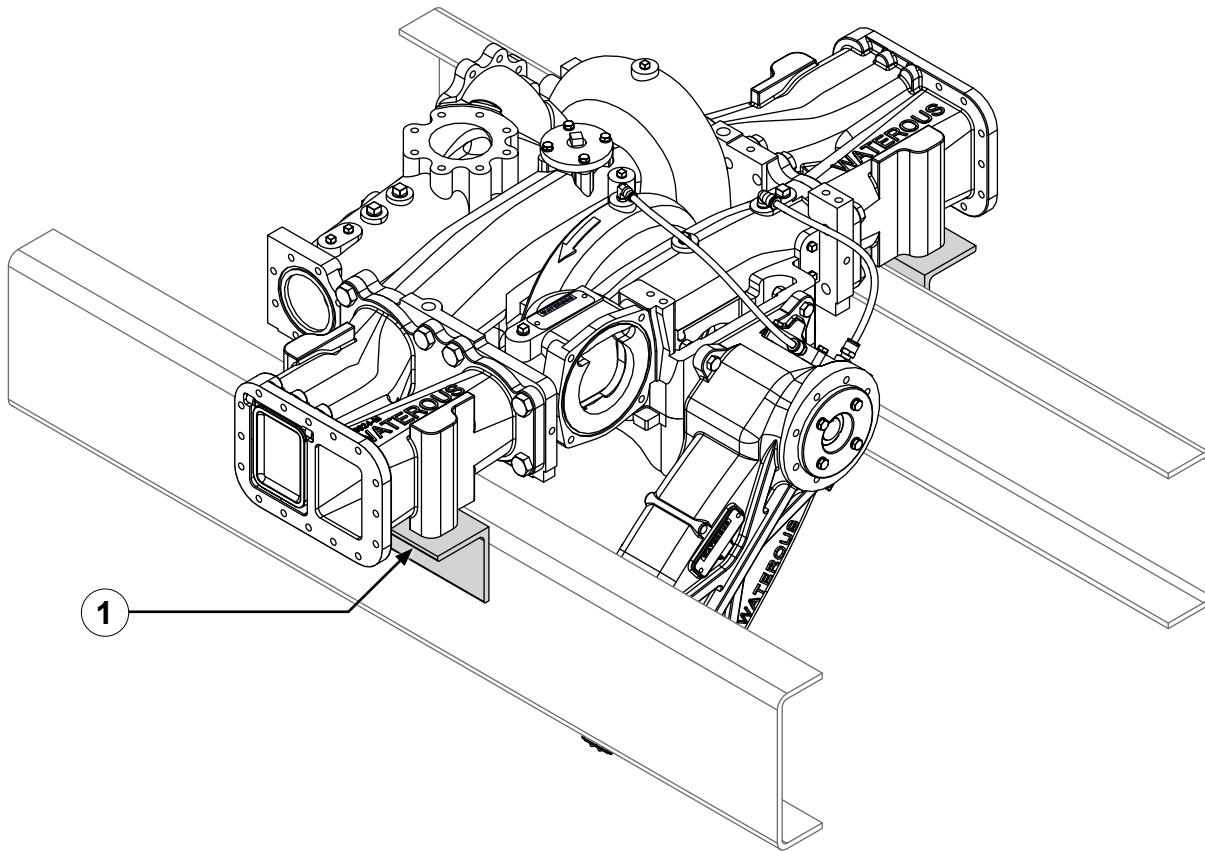
Note: Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.

- 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 21.**
- 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 24.**
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

CSPA/CSUPA—Installing the Pump



Use the illustration and instructions to install the CSPA or CSUPA pump assembly.

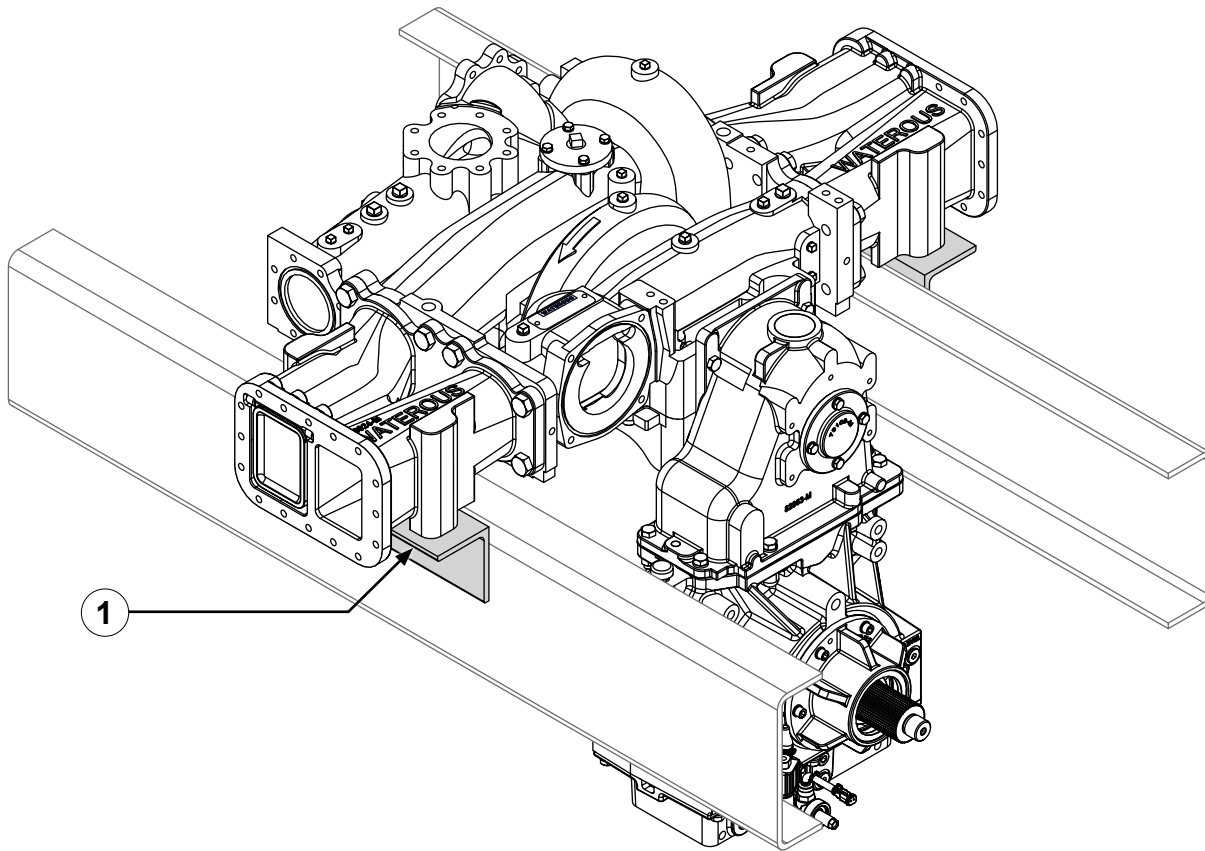
Note: Install the pump where it is accessible for regular maintenance. The pump location must also comply with drive shaft requirements.

- 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 21.**
- 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 24.**
- 4 Provide additional support for the pump assembly and any intake or discharge plumbing as needed.

CSC22/CSUC22—Installing the Pump



Use the illustration and instructions to install the CSC22 or CSUC22 pump assembly.

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

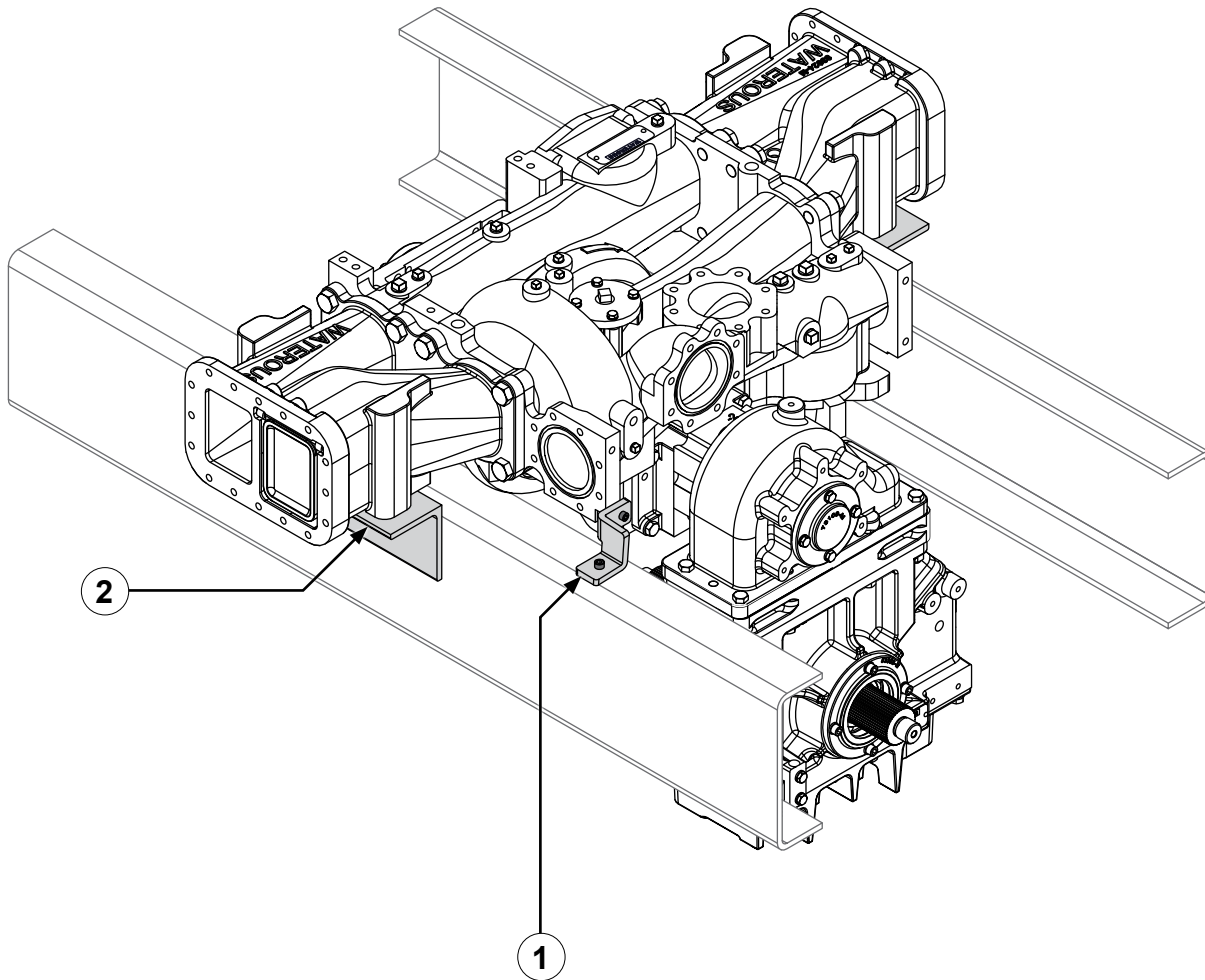
- 1 Create angle brackets to attach to the intake mounting pads.

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 21.**
- 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 24.**
- 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.

CSC22/CSUC22 (Front-Mounted)—Installing the Pump



Use the illustration and instructions to install the front-mounted CSC22 or CSUC22 pump assembly.

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

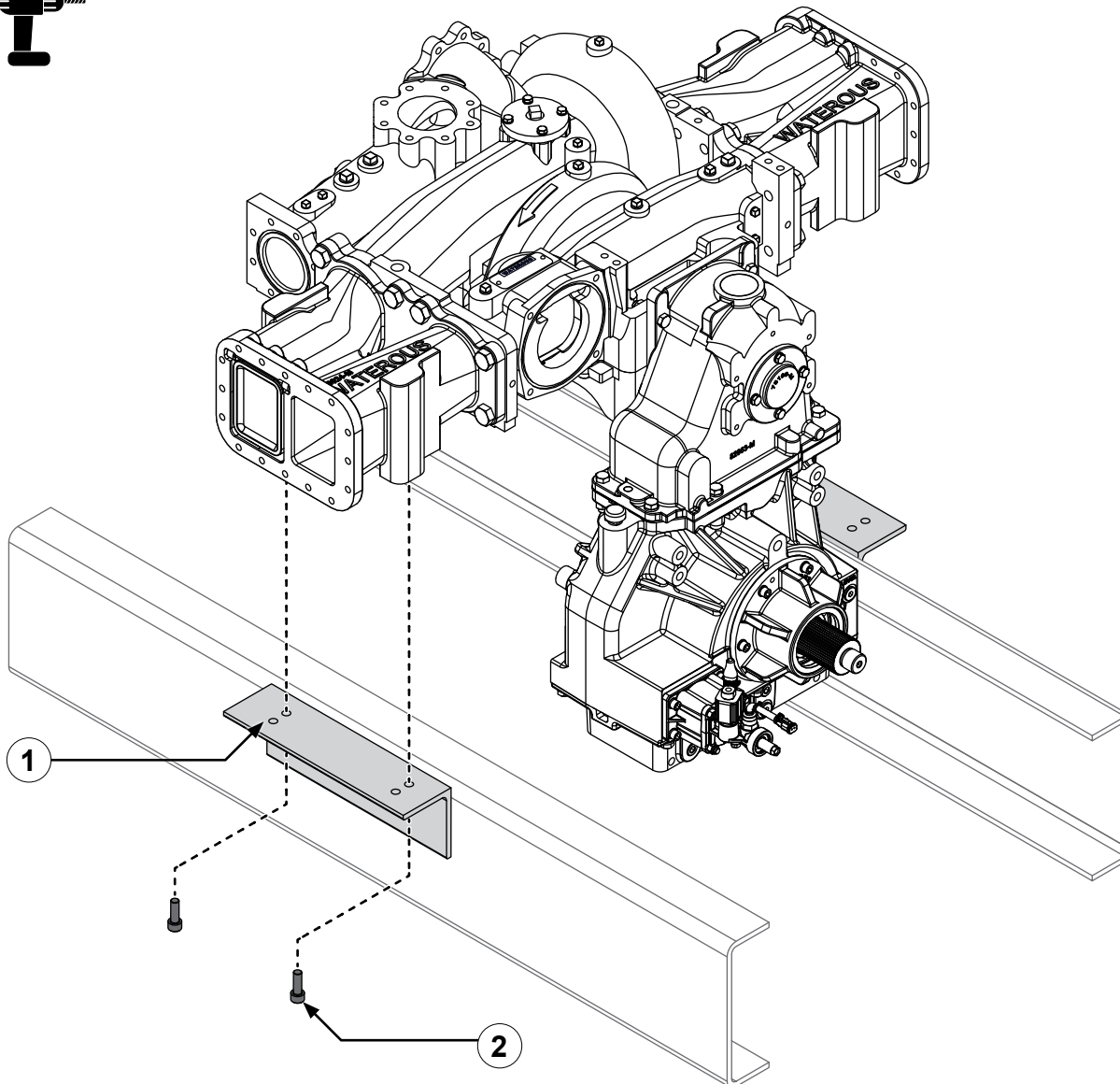
- 1 Create a front support bracket to attach to the pump's side discharge and the frame rails.

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 22.
- 4 Secure the front support bracket and angle brackets to the frame rails. Refer to: "**Mounting the Pump**" on page 25.
- 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.

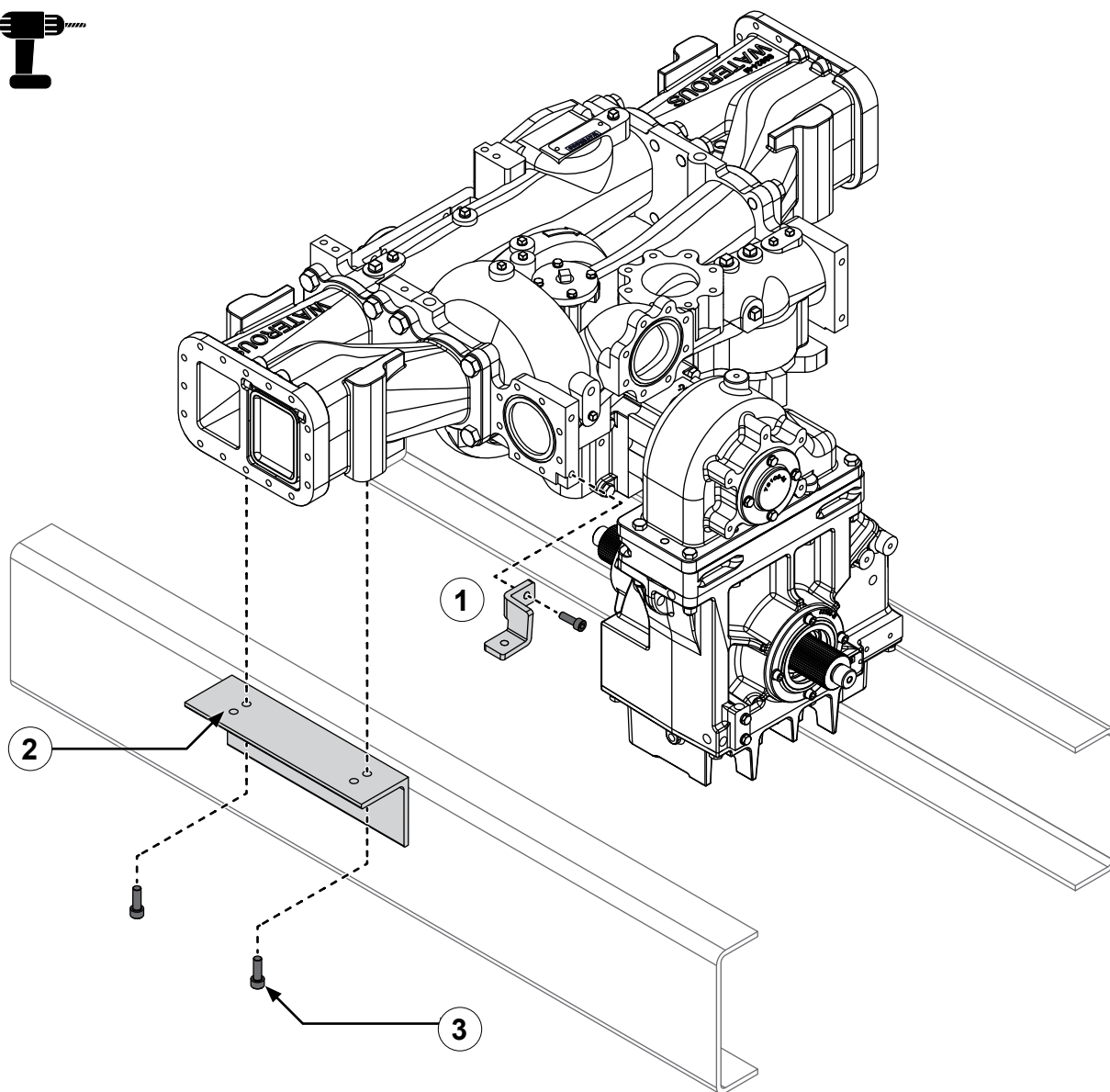
Mounting the Angle Brackets



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

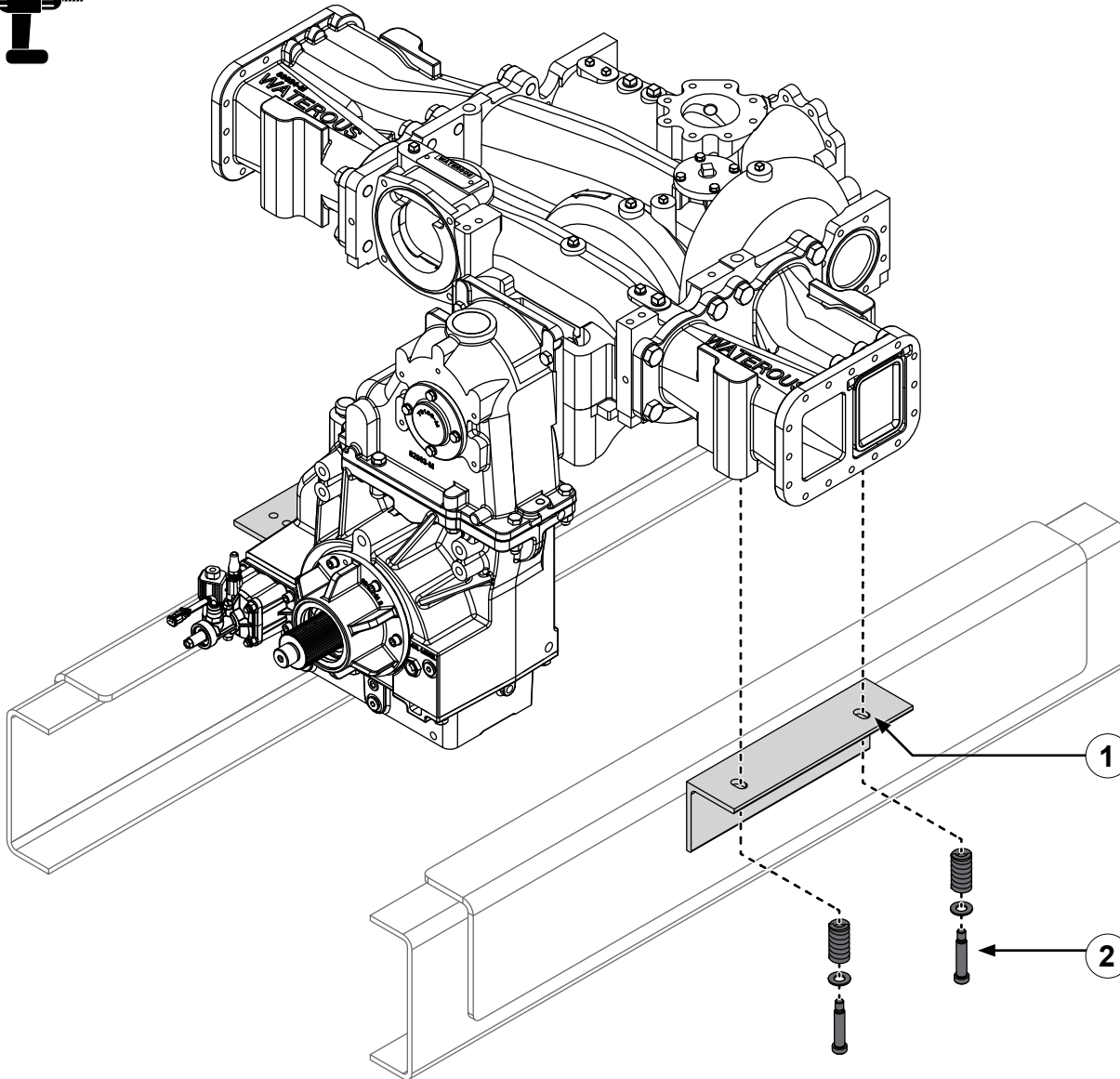


CSC20/CSUC20 (Front-Mounted)

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.

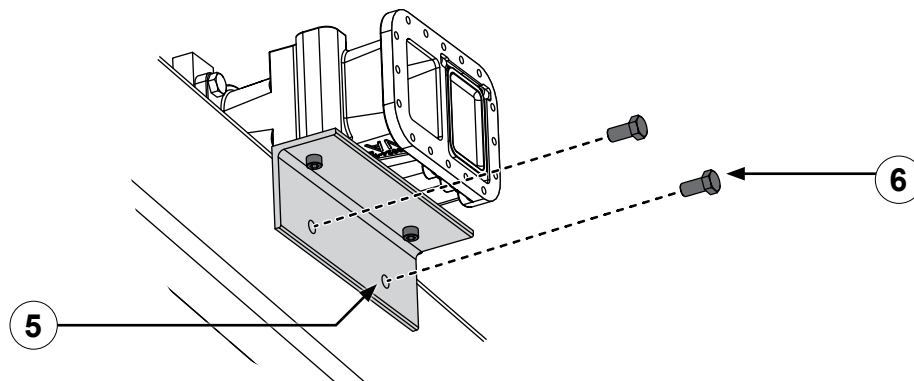
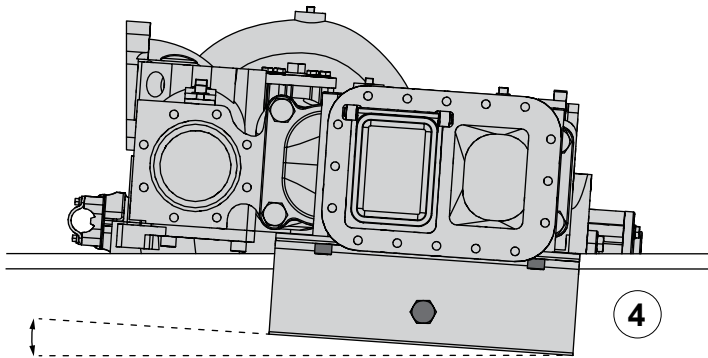
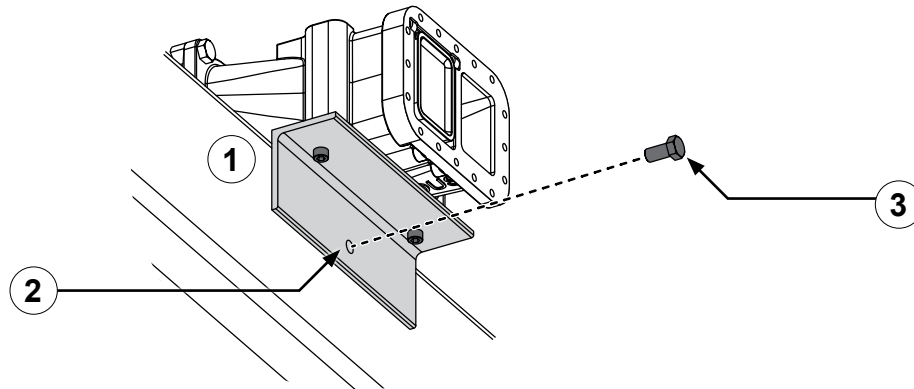
Note: Do not use this mounting method if your pump configuration includes a front-mounted C22 transmission.

- 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

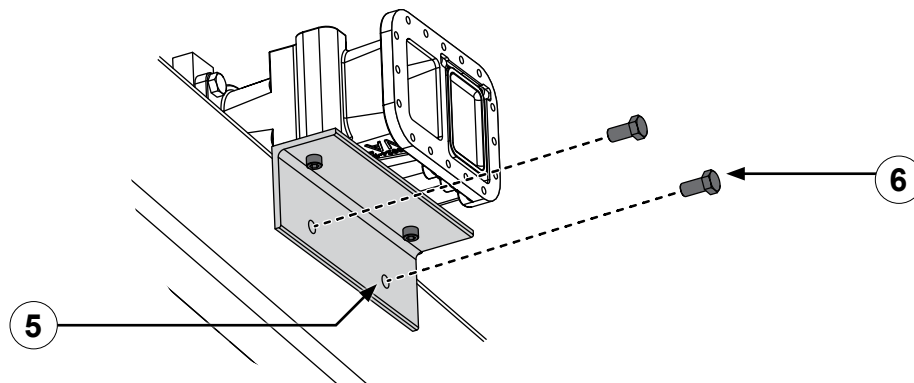
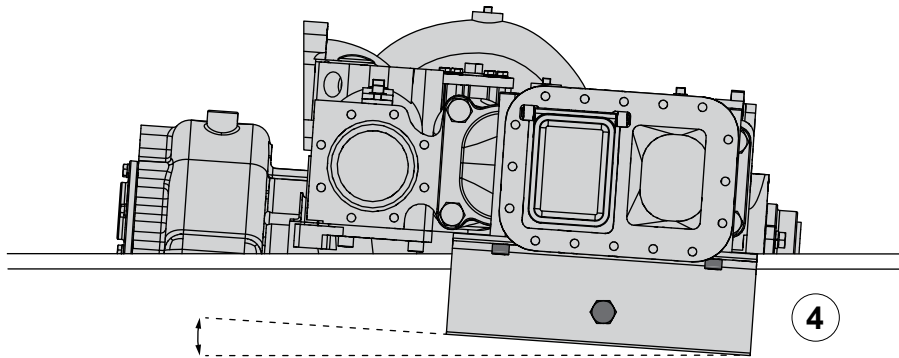
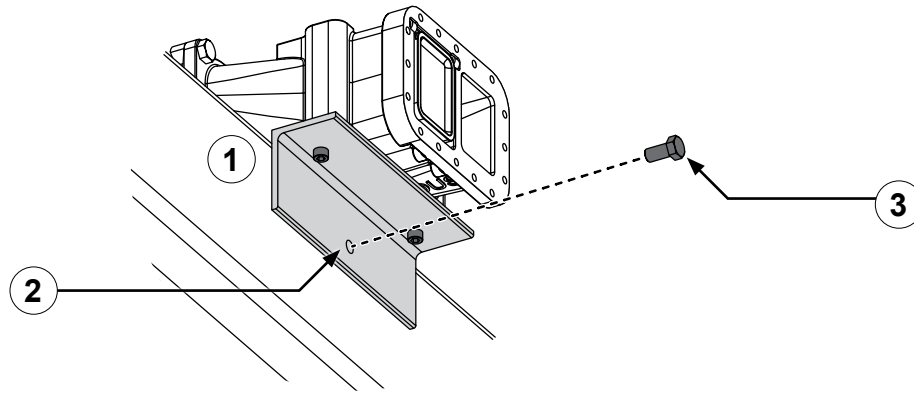


3-Point Mounting Method

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 of the vehicle, 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 of the vehicle, drill 2 holes into the bracket that go through the frame rail. Position 1 hole on each side of the driver-side hole.
- 6 Use screws (3/4 inch), washers, and nuts to secure the bracket to the frame rail.

Mounting the Pump

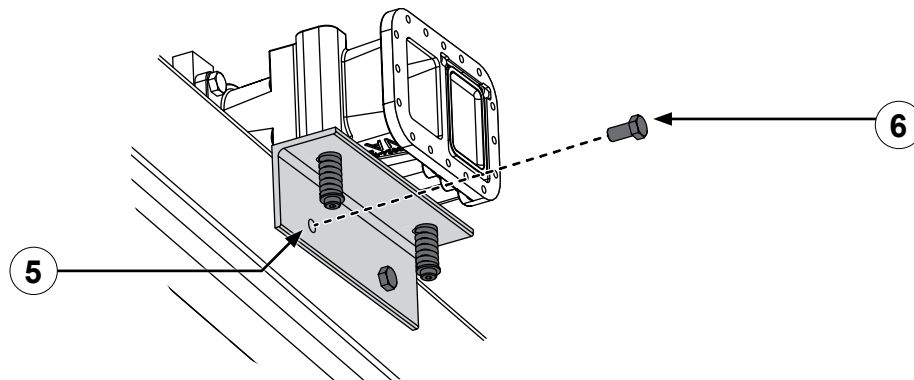
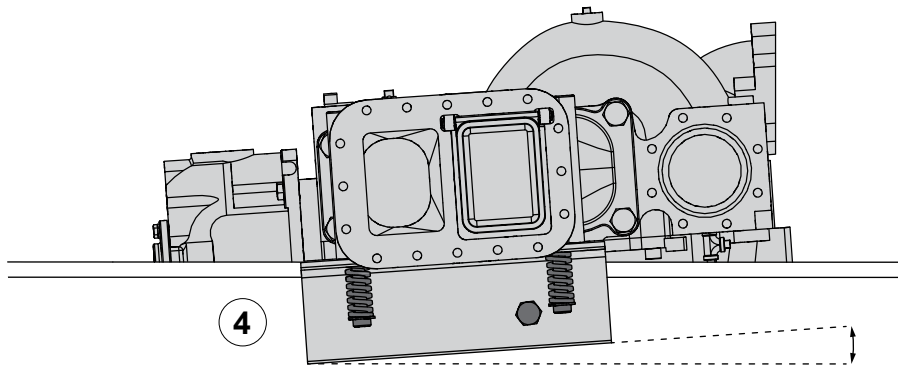
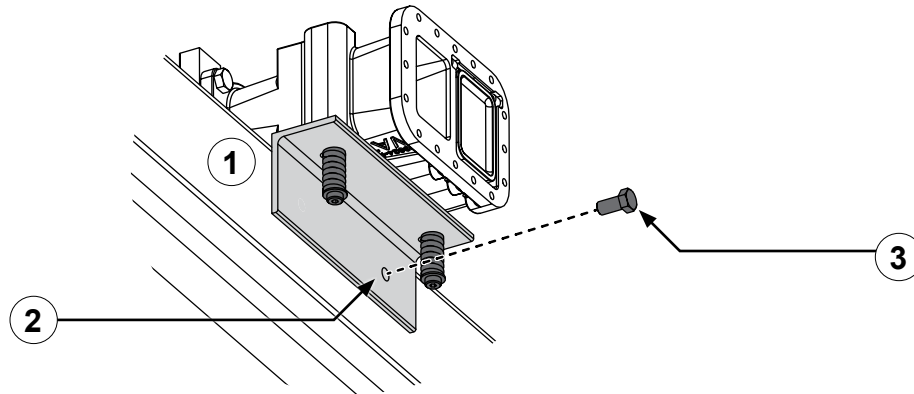


3-Point Mounting Method— CSC22/CSUC22 (Front-Mounted)

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 of the vehicle, 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 of the vehicle, drill 2 holes into the bracket that go through the frame rail. Position 1 hole on each side of the driver-side hole.
- 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

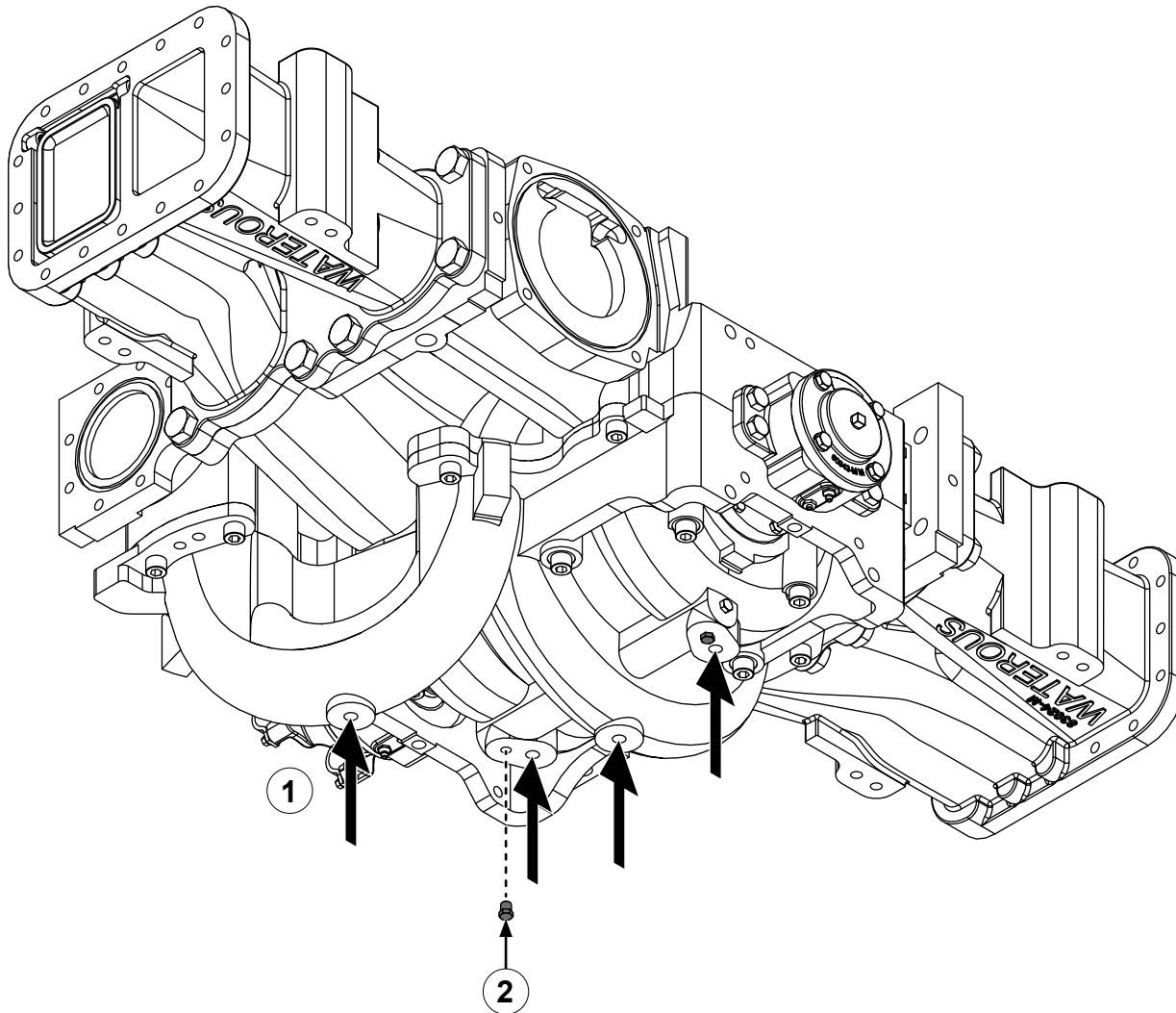
Use the illustrations and instructions to secure the angle brackets to the frame rails using the 4-point spring mounting method. This method allows for approximately 2° of frame twist.

- 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

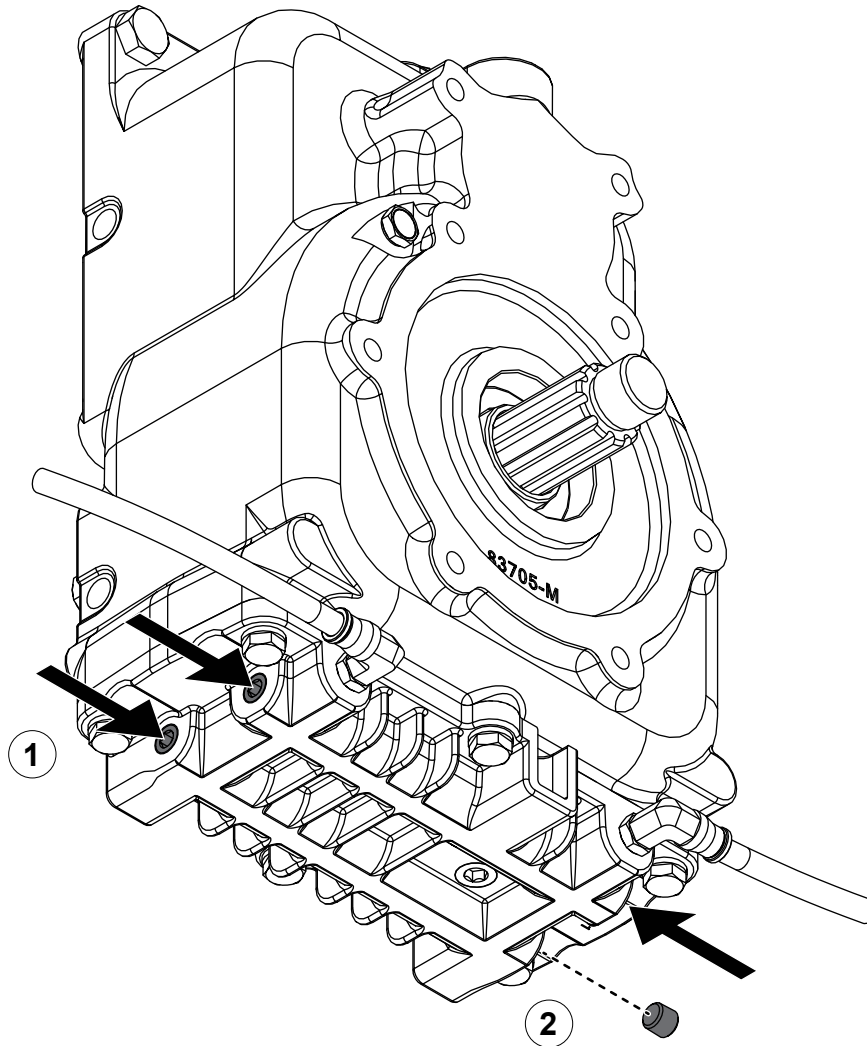


Use the illustration and instructions to install the pump drain lines. Fluid that is susceptible to freezing must be drained from the pump to prevent damage.

! 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 chambers, do the following:
 - Locate the 2 drain ports at the bottom of the volute cover.
 - Remove the drain plugs.
 - Install the appropriate fittings and hoses to drain the seal chambers as required.

Installing the Transmission Drain Lines—CSK



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.

! Freeze Damage: Do not allow fluid in the lines to freeze. Remove all freezable fluid from the lines before storing the apparatus.

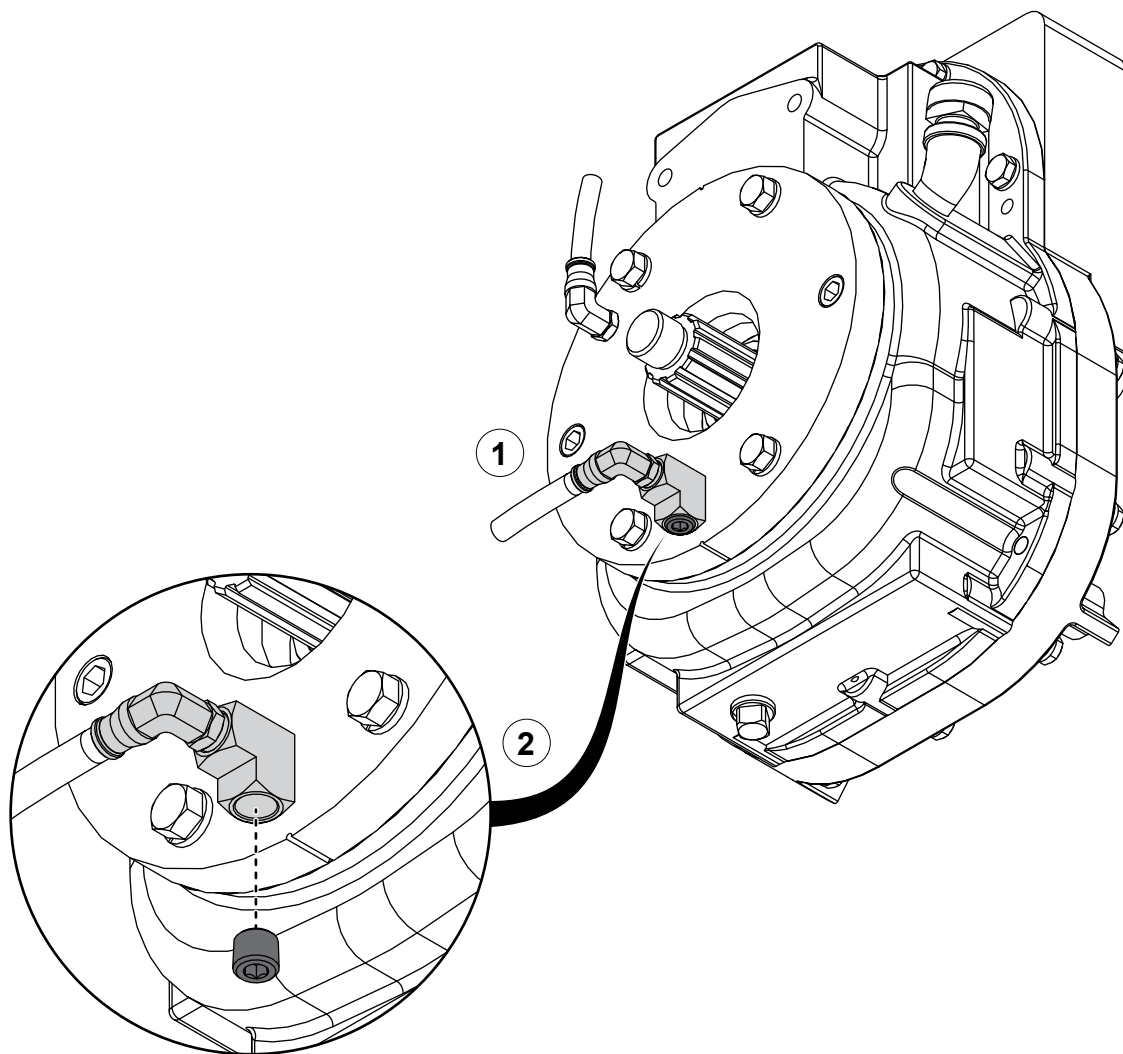
- 1 Locate the 4 drain ports at the bottom of the case.
- 2 Select the best port for your application, then remove the drain plug.
- 3 Install the appropriate fittings and hoses to drain the transmission as required.

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.

! **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.

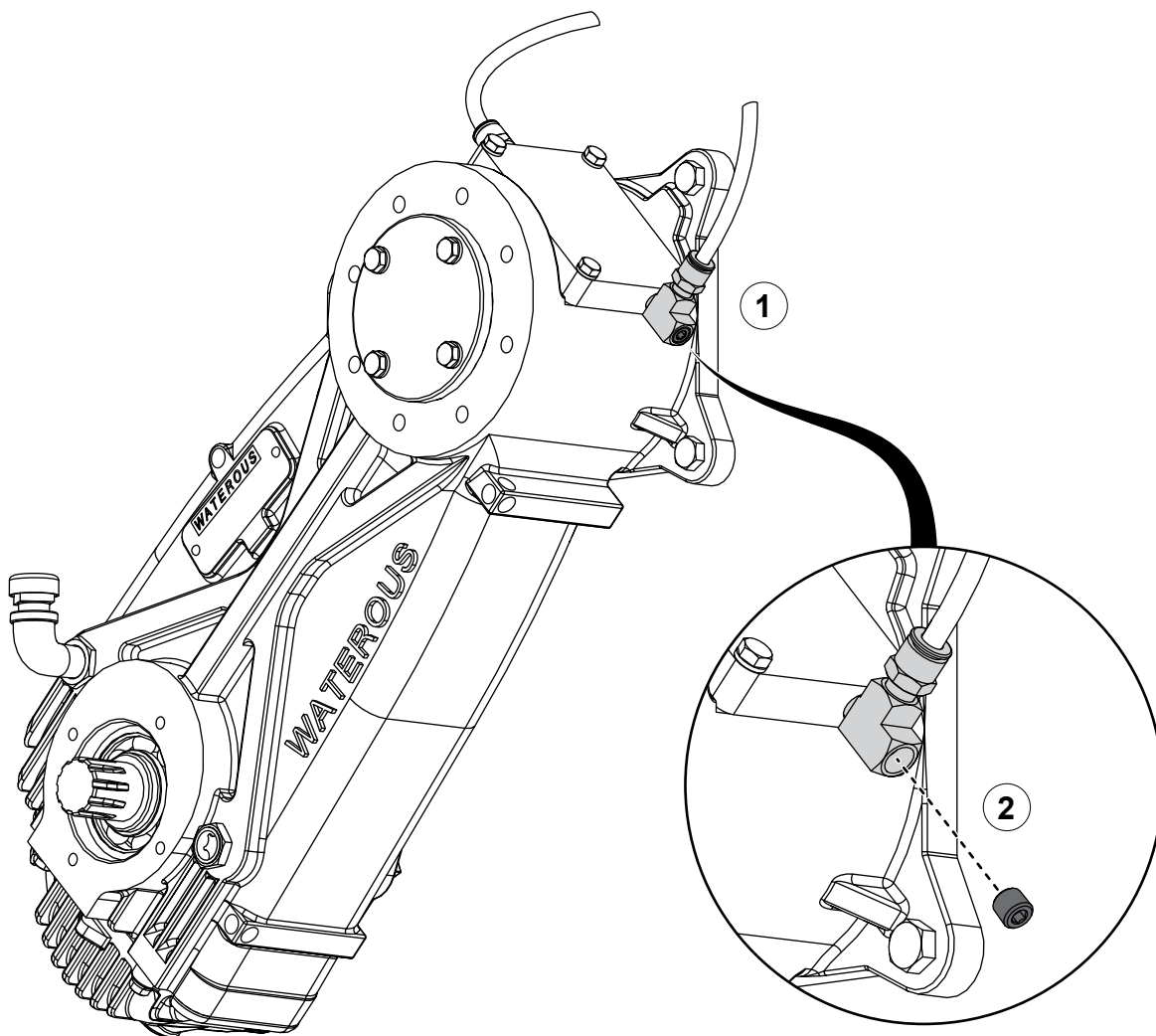


Installing the Transmission Drain Lines—CSPA/CSUPA

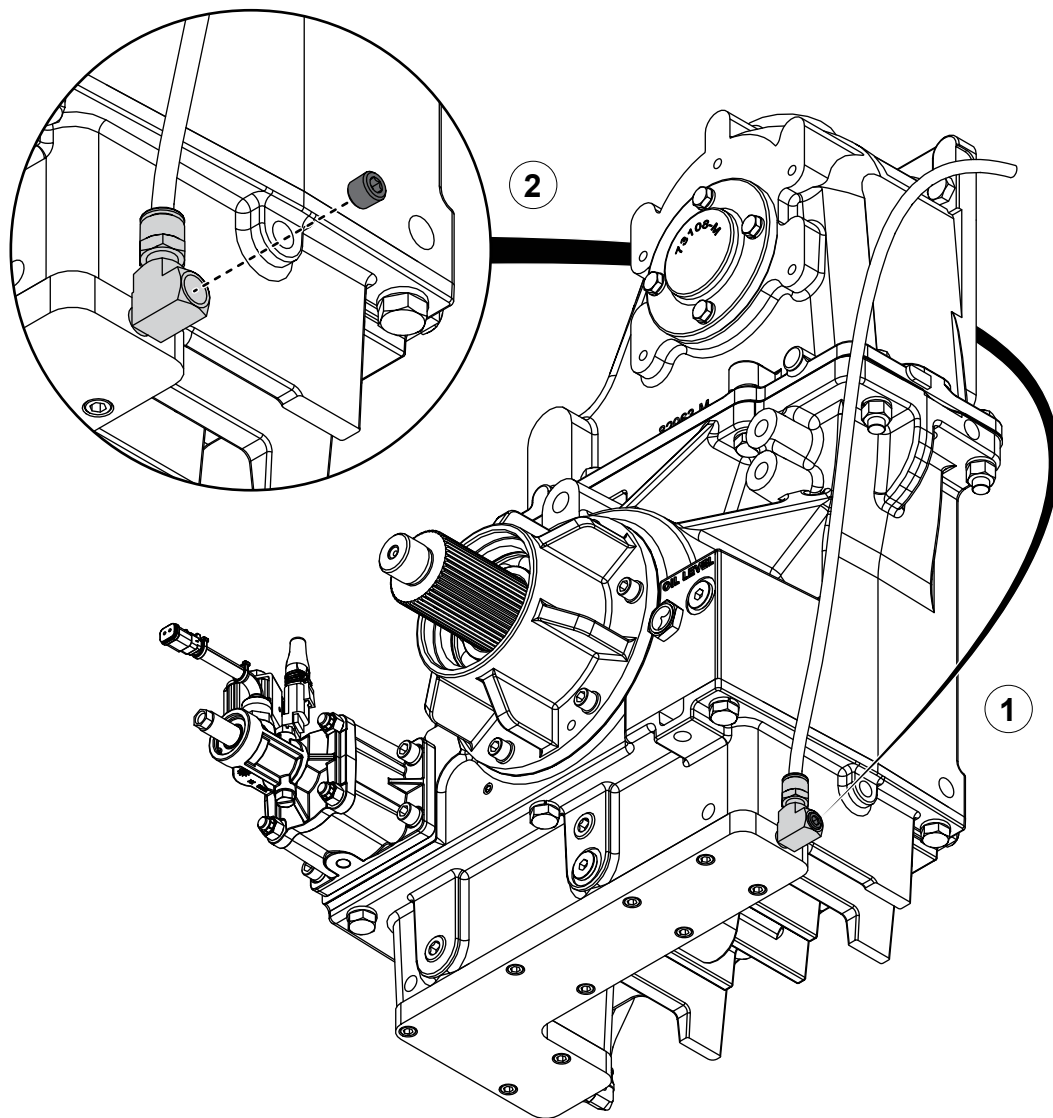
Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

! 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—CSC22/CSUC22

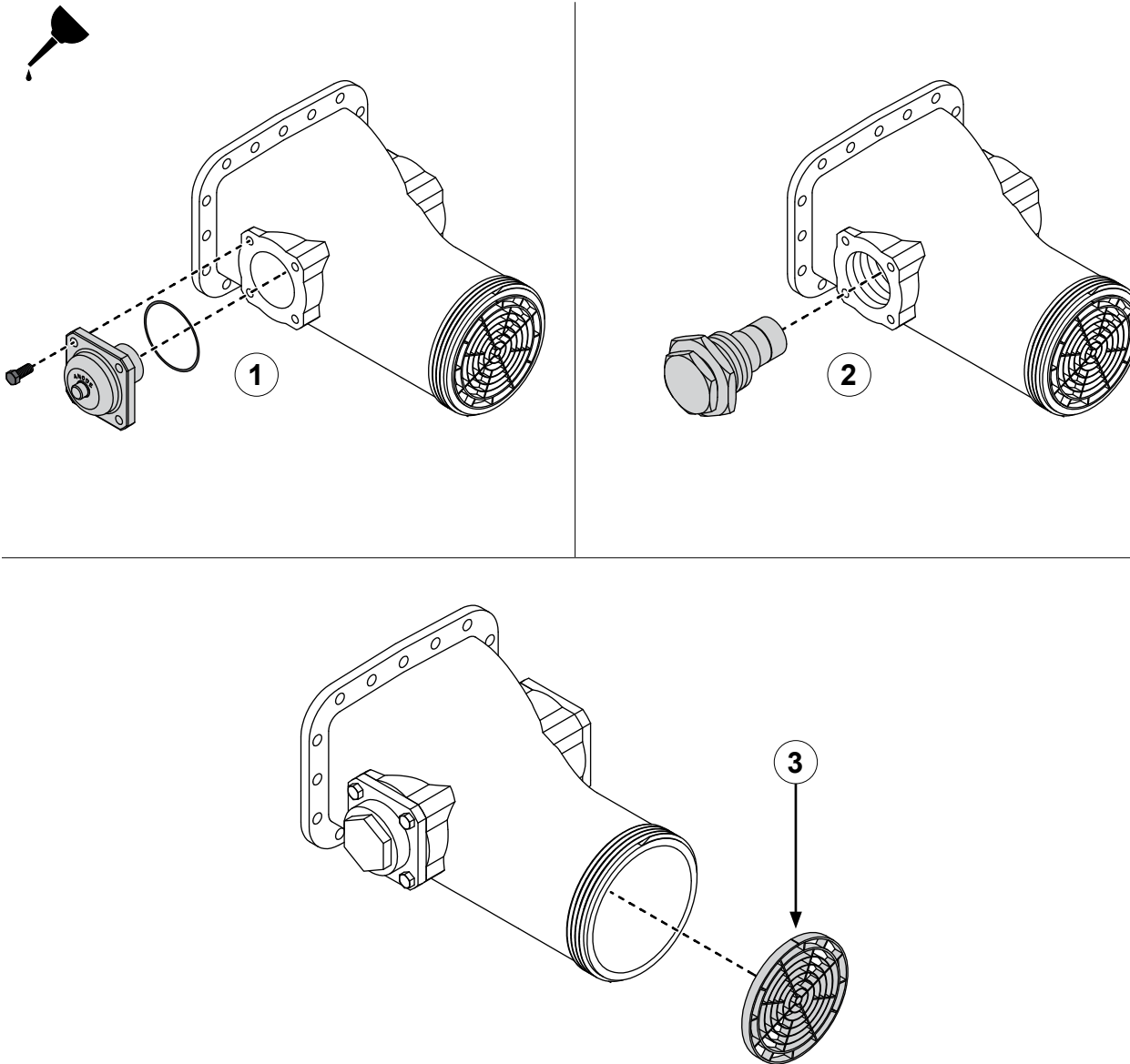


Use the illustration and instructions to install the transmission drain lines. Fluid that is susceptible to freezing must be drained from the transmission to prevent damage.

! 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 Anodes and Intake Screens—Optional



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.

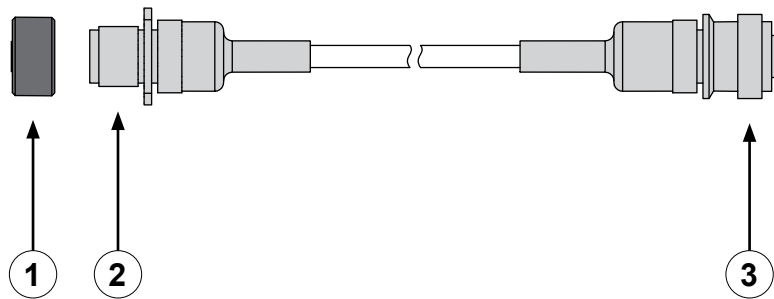
Note: The screen must have strong contact with the fitting to be effective. Remove any corrosion, debris, or paint from the bore that would insulate the fitting.

Tachometer Connection

The electronic tachometer is standard with 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 DEXRON III or MERCON V
PA	1.0	
QC	4.0	
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.

Notes

WATEROUS

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