

# GARMIN®

## SMARTPUMP

### INSTALLATION INSTRUCTIONS

#### Important Safety Information

##### **WARNING**

See the *Important Safety and Product Information* guide in the product box for product warnings and other important information.

You are responsible for the safe and prudent operation of your vessel. The autopilot is a tool that enhances your capability to operate your boat. It does not relieve you of the responsibility of safely operating your boat. Avoid navigational hazards and never leave the helm unattended.

Always be prepared to promptly regain manual control of your boat.

##### **CAUTION**

To avoid possible personal injury, always wear safety goggles, ear protection, and a dust mask when drilling, cutting, or sanding.

##### **NOTICE**

To avoid damage to your boat, the autopilot system should be installed by a qualified marine installer. Specific knowledge of marine steering and electrical systems is required for proper installation.

When drilling or cutting, always check what is on the opposite side of the surface to avoid damaging the vessel.

This pump is only for use with Garmin® autopilot systems. Attempting to use this pump with any other system may damage the system, the pump, or the vessel.

This pump must not be installed with a steering system that has an unvented reservoir, because it will damage the pump. Before installing the pump, you must verify that the vessel steering has a vented reservoir. Typically, the vent hole is in the filler cap of the highest helm. If you are not clear as to whether the steering system is vented, you should check with the manufacturer of the helm or the reservoir to verify.

The pump must be installed in a dry location, protected from water and the weather.

The SmartPump steers your boat by interacting with the hydraulic steering system, based on commands from the autopilot system.

#### Autopilot Software Updates

After completing the autopilot installation, you should update the software before performing the configuration process.

If you connected the autopilot system to a NMEA 2000® network with a Garmin chartplotter, you can update the software using the chartplotter.

If you did not connect the autopilot system to a NMEA 2000 network with a Garmin chartplotter, you must use a NMEA 2000 Network Updater (sold separately). Go to [support.garmin.com](http://support.garmin.com) for update information.



## Tools Needed

- Safety glasses
- Drill and drill bits
- Wrenches
- Torque wrench (if configuring the pump for an unbalanced steering cylinder)
- Wire cutter/stripper
- Screwdrivers: Phillips and flat
- Cable ties
- Marine corrosion inhibitor spray
- Mounting screws: the pump kit includes mounting screws, but if the included screws are not appropriate for the mounting surface, you must provide the correct types of screws
- Hydraulic system hardware (*Hydraulic Considerations, page 3*):
  - Hydraulic hose, -4 [6 mm ( $1/4$  in.) ID] or larger, with machine-cripped or field-replaceable fittings that have a minimum rating of 1000 psi
  - Hydraulic T-connectors
  - Hydraulic shut-off valves
  - Thread sealant, such as Loctite® 567
  - Hydraulic bleeding equipment
  - Hydraulic fluid

## Mounting Considerations

### NOTICE

The pump must be installed in a dry location, protected from water and the weather.

- Before you start the pump installation, you must identify the type of hydraulic steering system in your boat and consult the hydraulic diagrams. Each boat is different, and you must consider the existing hydraulic layout before deciding where to mount the pump (*Hydraulic Considerations, page 3*).
- Before you start the pump installation, you should verify that you have selected the appropriate pump for the needs of your vessel. You can reference the autopilot compatibility guide on [garmin.com](http://garmin.com).
- For installations with larger steering cylinders or those requiring higher fluid pressure, you should install the pump as close to the cylinder as possible, so that preferably no more than 3 m (10 ft.) of hydraulic hose connects the pump to the cylinder.
- You should mount the pump horizontally, if possible.
- If you cannot mount the pump horizontally, you must mount it vertically with the pump head connectors facing up.
- You must mount the pump in a location to which you can extend the hydraulic steering lines of the boat.
- The pump has five hydraulic-connector fittings, although only three are used when installing the pump as recommended. The pump-valve illustration provided in these instructions may be helpful when determining the fitting layout that is best for your installation location (*Pump Ports and Valves, page 4*).

## Mounting the Pump

Before you can mount the pump, you must select a location (*Mounting Considerations, page 2*) and determine the correct mounting hardware (*Tools Needed, page 2*).

- 1 Hold the pump in the intended mounting location and mark the locations of the mounting holes on the mounting surface, using the pump as a template.
- 2 Using a drill bit appropriate for the mounting surface and selected mounting hardware, drill the four holes through the mounting surface.
- 3 Secure the pump to the mounting surface using the selected mounting hardware.

## Hydraulic Considerations

### NOTICE

This pump must not be installed with a steering system that has an unvented reservoir, because it will damage the pump. Before installing the pump, you must verify that the vessel steering has a vented reservoir. Typically, the vent hole is in the filler cap of the highest helm. If you are not clear as to whether the steering system is vented, you should check with the manufacturer of the helm or the reservoir to verify.

Do not attempt to use the autopilot to steer the boat until you bleed all air from each part of the hydraulic system.

When adding hydraulic line to the system, use only hose that is -4 [6 mm ( $1/4$  in.) ID] or larger with machine-cripped or field-replaceable fittings that have a minimum rating of 1000 lbf/in<sup>2</sup> (6,895 kPa).

You must not use thread seal tape, such as Teflon<sup>®</sup> tape, or thread putty on any hydraulic fitting in this system. Small debris from thread seal tape or thread putty can enter the hydraulic system, become stuck in valves, and render the autopilot or steering system inoperable. Using thread seal tape or thread putty on any hydraulic fitting in this system voids your warranty.

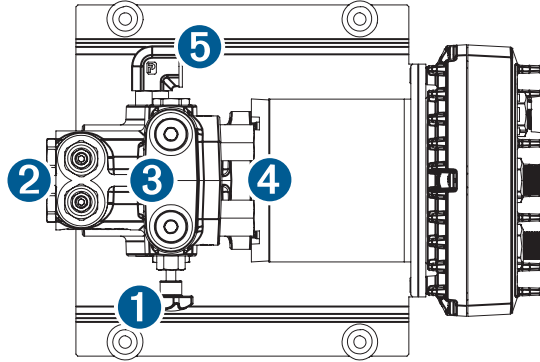
Use caution when applying liquid thread sealant to avoid damage to the hydraulic system or to the autopilot system.

Before you connect the pump to the hydraulic lines, you should consult the hydraulic-layout diagrams to help determine how to best install the pump in the hydraulic system of the boat (*Hydraulic Layouts, page 4*).

When planning the hydraulic layout and making all hydraulic connections, consider the following:

- The pump must be reconfigured if the boat is equipped with an unbalanced steering cylinder (*Configuring the Pump for an Unbalanced Cylinder, page 11*).
- The size and thread types for the hydraulic ports on the pump are listed in the specifications (*Port and Fitting Specifications, page 12*).
- You must use -4 [6 mm ( $1/4$  in.) ID] or larger hoses for all hydraulic connections, including the return line.
- For installations with larger steering cylinders or those requiring higher fluid pressure, you should install the pump as close to the cylinder as possible, so that preferably no more than 3 m (10 ft.) of hydraulic hose connects the pump to the cylinder.
- You should use T-connectors (not included) to connect the hydraulic lines to the pump.
- You should install shut-off valves (not included) in the hydraulic lines between the pump manifold and T-connectors to allow for easy pump isolation and removal.
- For hydraulic fittings with an O-ring, such as ORB and ORFS fittings, you should not use thread sealant.
- For hydraulic fittings without an O-ring, you should use a liquid thread sealant, such as Loctite 567.
- When using liquid thread sealant, you must follow the instructions regarding the cure time, for example, Loctite 567 cures after four hours. If the thread sealant is not properly cured per the manufacturer's instructions, the high pressure in the hydraulic lines may push the sealant out of the threads and create a leak.
- When disconnecting a connector sealed with liquid sealant, you must take care to keep any slivers or other debris from the cured sealant from entering the hydraulic system.

## Pump Ports and Valves



Item	Description
1	Bypass valve. Used for hydraulic bleeding only, and must remain fully tightened during normal operation.
2	Check valves. Must be reconfigured if the boat is equipped with an unbalanced cylinder ( <a href="#">Configuring the Pump for an Unbalanced Cylinder</a> , page 11).
3	H1 and H2 ports. These are the recommended ports for connecting the pump to the helm and cylinder. The recommended installation method uses a shut-off valve and a T-connector to split each connector on the pump for the helm and cylinder connections ( <a href="#">Hydraulic Layouts</a> , page 4).
4	C1 and C2 ports. These ports may be used instead of the H1 and H2 ports if they are more appropriate for your installation location.
5	Return line port. Connects to the return port on the helm through a shut-off valve (recommended).

**NOTE:** The recommended installation method uses shut-off valves and T-connectors to connect the pump to the helm and cylinder, so the pump can be removed for service while the boat retains normal steering. You can install the pump using all five ports (connecting H1 and H2 to the helm and C1 and C2 to the cylinder), but this type of installation is not recommended because it does not allow you to operate the steering system if you must remove the pump for service.

## Hydraulic Layouts

### NOTICE

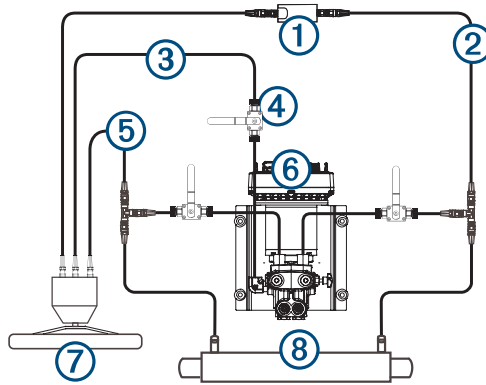
If the steering system in your boat does not match any of the hydraulic layouts in this manual and you are unsure how to install the pump, contact Garmin Product Support.

This pump must not be installed with a steering system that has an unvented reservoir, because it will damage the pump. Before installing the pump, you must verify that the vessel steering has a vented reservoir. Typically, the vent hole is in the filler cap of the highest helm. If you are not clear as to whether the steering system is vented, you should check with the manufacturer of the helm or the reservoir to verify.

Before you start the pump installation, identify the type of hydraulic steering system in your boat. Each boat is different, and you must consider certain aspects of the existing hydraulic layout before deciding where to mount the pump.

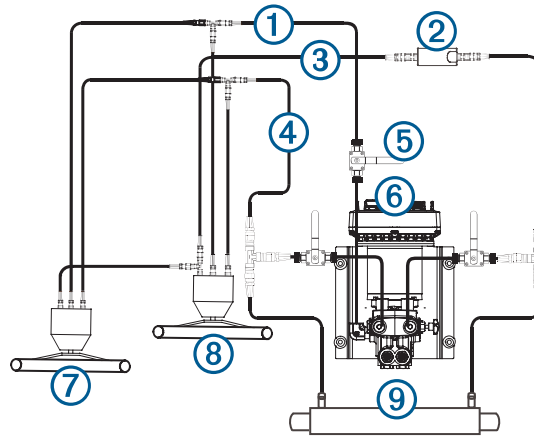
Before you start the pump installation, you should thoroughly review the hydraulic considerations for important information on hydraulic hose and fitting types, installation methods, and thread-sealant information ([Hydraulic Considerations](#), page 3).

## Single-Helm Layout



①	Shadow Drive™ valve
②	Starboard line
③	Return line
④	Shut-off valves
⑤	Port line
⑥	Pump
⑦	Helm
⑧	Steering cylinder

## Dual-Helm Layout



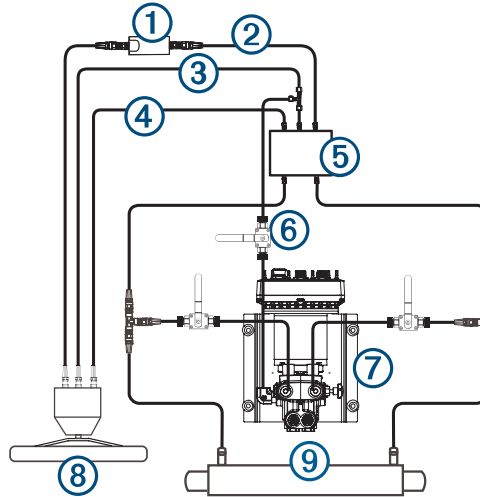
①	Return line
②	Shadow Drive sensor
③	Starboard line
④	Port line
⑤	Shut-off valves
⑥	Pump
⑦	Upper helm
⑧	Lower helm
⑨	Steering cylinder

## Single-Helm with Power Assist Layout

### NOTICE

The pump must be installed between the cylinder and the power-assist module to function correctly.

**NOTE:** Removal of the power assist-module may be necessary to gain access to the fittings, hoses, and bleed-tee fitting.

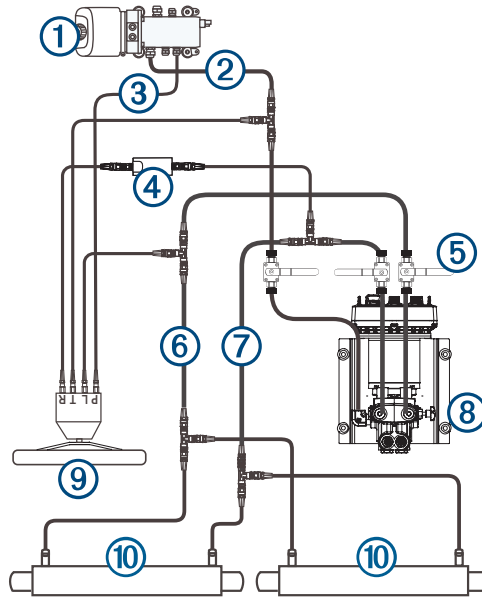


①	Shadow Drive
②	Starboard line
③	Return line
④	Port line
⑤	Power-assist module
⑥	Shut-off valves
⑦	Pump
⑧	Helm
⑨	Steering cylinder

## Single-Helm with Uflex MasterDrive™ Layout

### ⚠ CAUTION

When installing the pump in a system with a Uflex MasterDrive, do not cut the high-pressure line connecting the power unit to the helm to avoid injury or property damage.



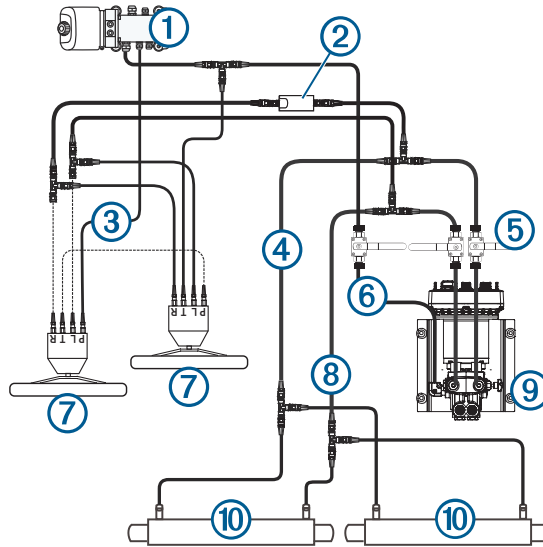
①	Uflex MasterDrive power unit
②	Return line
③	High pressure line - DO NOT CUT
④	Shadow Drive
⑤	Shut-off valves
⑥	Port line
⑦	Starboard line
⑧	Pump
⑨	Helm
⑩	Steering cylinders



## Dual-Helm with Uflex MasterDrive Layout

### ⚠ CAUTION

When installing the pump in a system with a Uflex MasterDrive, do not cut the high-pressure line connecting the power unit to the helm to avoid injury or property damage.



①	Uflex MasterDrive power unit
②	Shadow Drive
③	High pressure line - DO NOT CUT
④	Starboard line
⑤	Shut-off valves
⑥	Return line
⑦	Helms
⑧	Port line
⑨	Pump
⑩	Steering cylinders

## Connecting the Hydraulic Hoses to the Pump

For assistance, see the layout diagrams (*Hydraulic Layouts, page 4*).

- 1 Disconnect the necessary hoses from the hydraulic system.
- 2 Add a T-connector to the starboard and port hoses of the hydraulic system between the helm and the steering cylinder.  
**NOTE:** If the boat has a power-assist module, you must add the T-connectors between the power-assist module and the steering cylinder.
- 3 Complete an action:
  - If the boat does not have a return hose connected to the helm, add enough hydraulic hose to connect the return fitting on the helm to the pump.
  - If the boat has a return hose connected to the helm, add a T-connector to the return hose.  
**NOTE:** If the boat has a power-assist module, you must add the T-connector to the return hose between the power-assist module and the helm.
- 4 Add hydraulic hose to the unused fitting on each T-connector, with enough hose to connect the T-connector to the pump fittings.
- 5 Install a shut-off valve (not included) on each hydraulic hose from the T-connector to the pump.
- 6 If you added hydraulic hose to the return fitting on the helm, install a shut-off valve (not included) on the hydraulic hose from the helm to the pump.
- 7 Connect the starboard hose from the T-connector, through a shut-off valve, to a pump fitting labeled with a C1 or C2.
- 8 Connect the port hose from the T-connector, through a shut-off valve, to the other pump fitting labeled with a C1 or C2 that you did not use in the previous step.
- 9 Complete an action:
  - If you added hydraulic hose to the return fitting on the helm, connect the return hose from the helm, through a shut-off valve, to the pump fitting labeled with a T.
  - If you added a T-connector to an existing return hose, connect the return hose from the T-connector, through a shut-off valve, to the pump fitting labeled with a T.
- 10 Install the Shadow Drive valve in the port or starboard hydraulic hose between the helm and the T-connector that connects to the pump.  
See the installation instructions provided in the autopilot corepack when installing the Shadow Drive valve.
- 11 Insert, tighten, and seal the included plugs in the unused pump fittings, if they are not already in place.

## Connection Considerations

- You should mount the SmartPump and connect it to the hydraulic system before connecting the SmartPump to power and to the CCU.
- The ports on the SmartPump labeled POWER and CCU are the only ports used in a typical installation.
- The port on the SmartPump labeled FEEDBACK is used only when installing an optional rudder feedback sensor.

## Completing the Installation

- 1 Follow the instructions included in the autopilot corepack to install the rest of the autopilot components.
- 2 Follow the instructions included in the autopilot corepack to bleed the air from the hydraulic system.
- 3 Apply a marine corrosion inhibitor spray to the SmartPump to ensure corrosion resistance.  
Garmin recommends that you re-apply the marine corrosion inhibitor once each year to extend the life of the SmartPump.

## Configuration and Service

### Configuring the Pump for an Unbalanced Cylinder

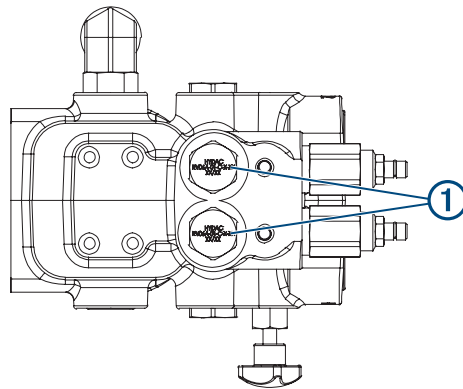
#### NOTICE

To avoid damage to the pump, keep all parts clean and free of dust and debris while configuring the pump for an unbalanced-cylinder steering system.

If you remove the check valves after bleeding the hydraulic system, you must bleed it again. Reconfiguring the check valves may introduce air into the hydraulic system.

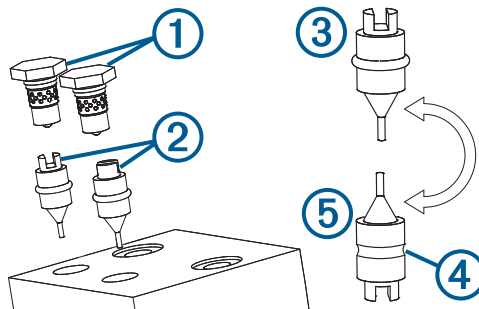
If the boat has an unbalanced cylinder steering system, you must configure the pump to work properly with the steering system.

- 1 Locate the check valves ① on the pump manifold.



Depending on the model of pump, the check valves are located on either the side or top of the manifold.


- 2 Remove the check valves and pull the pistons ② out of the pump manifold.



The pump is configured from the factory with the pistons in the balanced configuration ③, where the tip of the piston is pointing into the pump manifold.

- 3 Remove the O-rings ④ from the pistons and discard them.  
If you cannot easily pull the o-rings from the pistons, you may need to cut them.
- 4 Re-insert the pistons into the pump manifold in the unbalanced configuration ⑤, where the tip of the piston is pointing out of the manifold.
- 5 Insert the check valves into the pump manifold, and tighten them to 25 lbf-ft (34 N-m).

## Specifications

Specification	Measurement
Dimensions (H x W x D)	186 x 190 x 264 mm (7.61 x 7.48 x 10.39 in.)
Weight	5.6 kg (12.25 lb.)
Temperature range	From -15° to 55°C (from 5° to 131°F)
Material	<ul style="list-style-type: none"> <li>• Electronics control unit (ECU): Fully gasketed aluminum alloy</li> <li>• Bracket: Carbon steel</li> <li>• Manifold: Aluminum alloy</li> <li>• Motor: Aluminum alloy</li> </ul>
Power cable length	2.7 m (9 ft.)
Input voltage 	From 10 to 30 Vdc
Fuse	40 A, blade-type
Main power usage	<ul style="list-style-type: none"> <li>• Standby: Less than 1 A</li> <li>• Engaged: From 5 to 10 A</li> <li>• Peak threshold: 30 A</li> </ul>

## Port and Fitting Specifications

Port, Fitting, or Plug	Specification
H1 and H2 ports (top of manifold)	SAE ORB-5 (2)
C1 and C2 ports (side of manifold)	SAE ORB-5 (2)
T ports (side of manifold)	SAE ORB-5 (2)
Included fittings for H and C ports	SAE ORB-5 to 1/4 in. NPT straight (2)
Included fittings for T ports	SAE ORB-5 to 1/4 in. NPT elbow (1)
Included plugs for unused ports	SAE ORB-5 (3)

**NOTE:** Hose fittings must be purchased separately, if needed, to adapt from NPT to the hose type for each installation. For example, most SeaStar™ installations require SeaStar HF5528 or Parker<sup>SM</sup> 68C-6-4 fittings. Most Uflex and Verado® installs require Parker 4-4 FLO. Also, the included adapters can be removed to adapt directly to SeaStar HF6009 or Verado 4-5 F5OLO hose fittings.

© 2017 Garmin Ltd. or its subsidiaries

Garmin® and the Garmin logo are trademarks of Garmin Ltd. or its subsidiaries, registered in the USA and other countries. Shadow Drive™ is a trademark of Garmin Ltd. or its subsidiaries. These trademarks may not be used without the express permission of Garmin.

Loctite® is a trademark of Henkel Corporation in the U.S. and elsewhere. NMEA 2000® is a trademark of the National Marine Electronics Association. Parker<sup>SM</sup> Parker is a service mark of Parker Intangibles, LLC. SeaStar™ SeaStar is a trademark of the Marine Acquisition Corp. Teflon® is a trademark of DuPont™. Uflex® and MasterDrive™ are trademarks of the UltraFlex Group. Verado® is a trademark of Brunswick Corporation.