



Reversing Hydraulic Pump For TMQ Autopilots



Installation and Service Instruction Manual

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INTRODUCTION

This manual is intended as a guide when installing drive unit to TMQ autopilots in boats with hydraulic steering. The description is based on the following set of components:

- Hypro Reversing Hydraulic Pump.
- Adapters and fittings to the reversing pump and an existing hydraulic steering system.
- Two flexible hoses for interconnection of the reversible pump to the existing hose lines of the steering system.
- One flexible hose for the reservoir line between the reversing pump and the helm pump, or to a separate reservoir tank.

Read this manual carefully before you start the installation, it helps you to avoid making mistakes. The same procedure is applicable regardless of the brand of hydraulic steering. We have assumed that the existing installation is done with flexible hoses.

This manual describes how to connect a Hypro reversing pump. Brands of hydraulic steering might differ in dimensions of hoses and fittings. This must be known before you start the installation to ensure you have the right adaptors and fittings at hand.

For the choice of pump size it is important to know the internal volume of the hydraulic ram. TMQ autopilots are designed to fit pumps that can steer the boat from full port to full starboard in 8 to 14 seconds (this is referred to as the "Hard Over" - time). The time value is obtained by dividing the internal volume of the ram with the flow rate of the reversing pump.

For the electrical installation of the reversing pump to the autopilot, we refer to the manual of the autopilot.

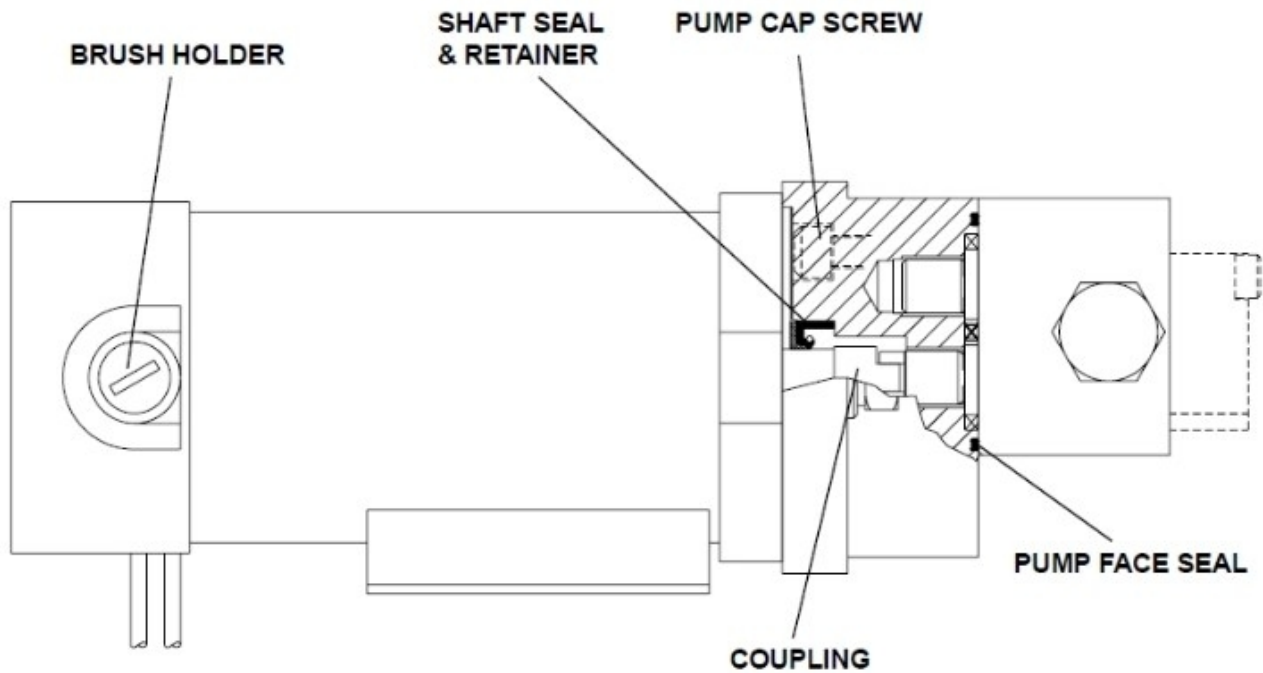
NOTE

All installation of hydraulic systems need careful attention to cleanliness. One small particle that enters the system and mixes with the hydraulic oil can very quickly destroy an otherwise good steering. We recommend that hydraulic systems are refilled with fresh oil since the age and condition of the oil may not be known. If you need to reuse oil then ensure that the oil is filtered through a fine mesh filter before reuse to remove any particles. When emptying and filling the system with oil it is easier if you are two persons. One who is filling the oil reservoir and one who is controlling the bleed nipple on the ram unit.

SPECIFICATION

Hypro PR06/PR10

Max pressure	55 Bar
Supply voltage	12V
Recommended oil	ISO VG40 (+10° C to +55° C)
	ISO VG10 (-20° C to +10° C)



PREPARATIONS

This manual is intended primarily for the situation when a boat with hydraulic steering is improved with the installation of an autopilot and a reversing pump, but can also be used when installing the pump at the same time with the hydraulic steering system. The difference is the extra operation to empty the existing steering system of hydraulic oil when the pump is installed at a later stage.

The following steps are described in this manual:

- Draining an existing steering system of hydraulic fluid
- Installation of the reversible pump
- Installation of hoses and fittings
- Refilling with hydraulic fluid
- Bleeding the system

If you install the steering system at the same time as a new hydraulic steering system it is appropriate to first install the hydraulic ram and then the helm pump before you install the autopilot pump. For this follow the manual of the hydraulic steering. The procedure for installing differs between the various hydraulic rams for rudder, stern drive and outboards.

MOUNTING THE PUMP TO AN EXISTING HYDRAULIC STEERING

Draining the Hydraulic Steering System

Before you start installing the new autopilot pump, the existing hydraulic steering must be drained of oil. In order to collect the used oil, an absolute clean receptacle must be used. Alternatively, you can fill with new oil when the assembly is complete. Used oil should be carefully filtered if reused because even very small pollutants can damage the pump or ram. Thereafter, the oil must be stored in its receptacle for a few hours so all air will disappear before it is re-filled in the system.

Remember that the new system with the autopilot pump contains more oil than earlier. You must add new oil of the same specification as before. Waste oil should be disposed of at a recycling centre.

Follow these steps:

Turn the steering wheel so that the ram piston is at one of the end position. Open the bleed and place a collecting tank/receptacle below the nipple furthest from the piston so that the oil can squeeze out when you rotate the steering wheel.

Let oil drain into the collecting tank. Close the nipple after a full turn of the steering wheel when all the oil has run out.

To ensure that all oil is drained from the system, repeat the procedure with the second nipple by rotating the steering wheel in the opposite direction.

If there are no bleed nipples on the ram, you must carefully loosen the thread of the hose fitting without removing it from the ram and allow oil to escape.

NOTE: For bullhorn rams, on outboard engines, the piston moves in the opposite direction in relation to the rudder movement, and the hoses are connected in reverse. Clockwise motion of the steering wheel shall give the starboard rudder effect and vice versa.

Installation of the Autopilot Pump

In general, all electrical motors must be installed sheltered or below deck. The reversing pump should not be exposed to direct water or humidity. For an electric motor the same safety requirements as for gasoline or diesel engine applies. It must be protected from flammable gases in enclosed spaces.

The reversing pump can be mounted either horizontally or vertically, but mounting on a horizontal surface is preferable. The surface must be stable and not subject to vibrations and sound. Use the supplied rubber plates as shock absorbers. Carbon brushes have shorter lifetime when they are affected by vibrations. It is also important that the pump is isolated from any ambient vibrations..

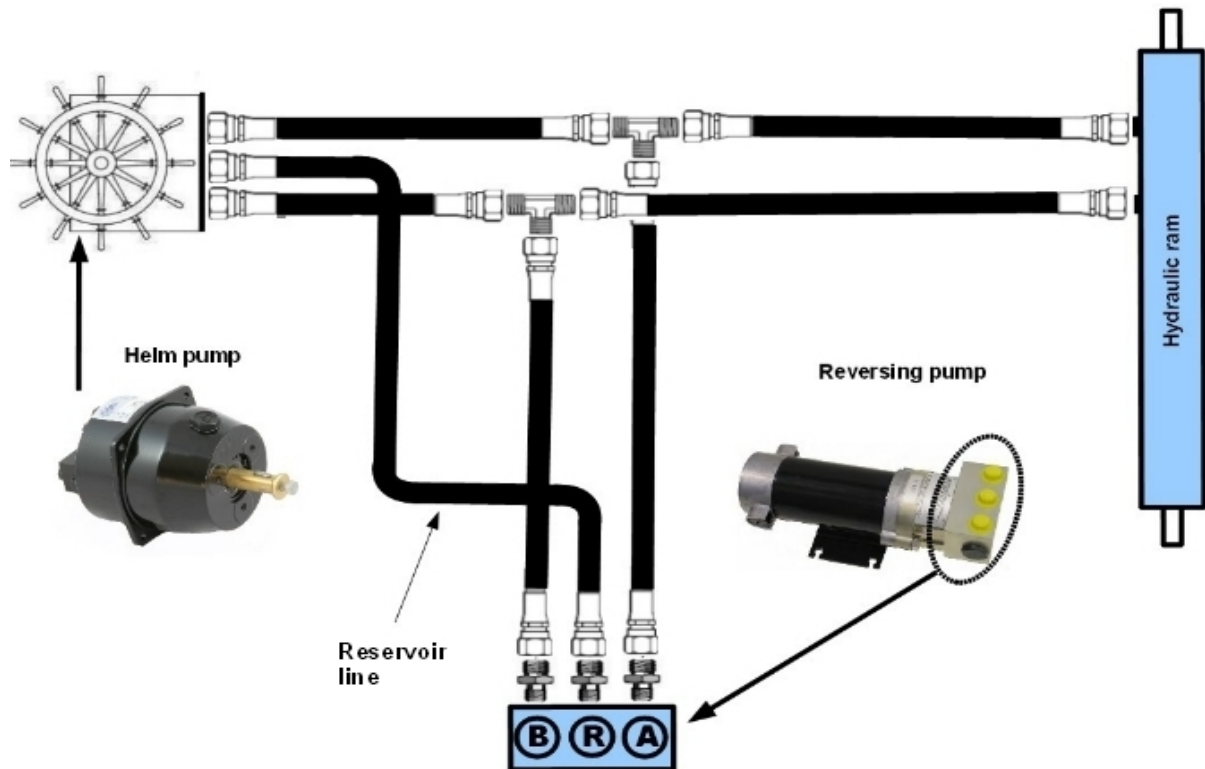
Mount the pump so that the hoses to the existing system lines are as short as possible.

Plan the electrical wiring carefully. Partly to avoid electromagnetic interference to the compass, partly because excessively long electrical cables between power supply, autopilot and pump can cause voltage drops and energy loss that will impair performance.

When the location of the pump is determined it is time to drill the four holes on the surface plate. Use the template supplied with the pump's installation instructions to get the holes in the right place. After the drilling is complete, simply screw the pump and tighten. Use non-corrosive bolts.

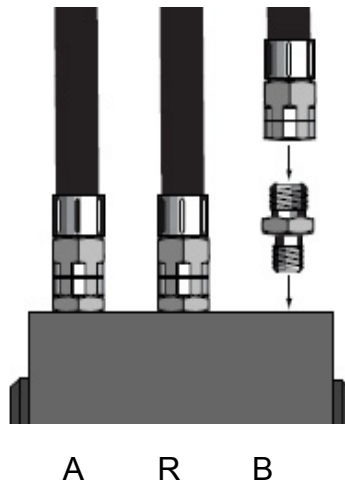
Connect the Hoses to the Existing System:

Hose connections "A" and "B" on the reversible pump in the figure below are used for the hydraulic oil that will drive the ram. The new hoses are connected with T-fittings to the existing lines between the helm pump and the ram. The centre connection, "R" is used for the reservoir hose between the helm pump and the autopilot pump.



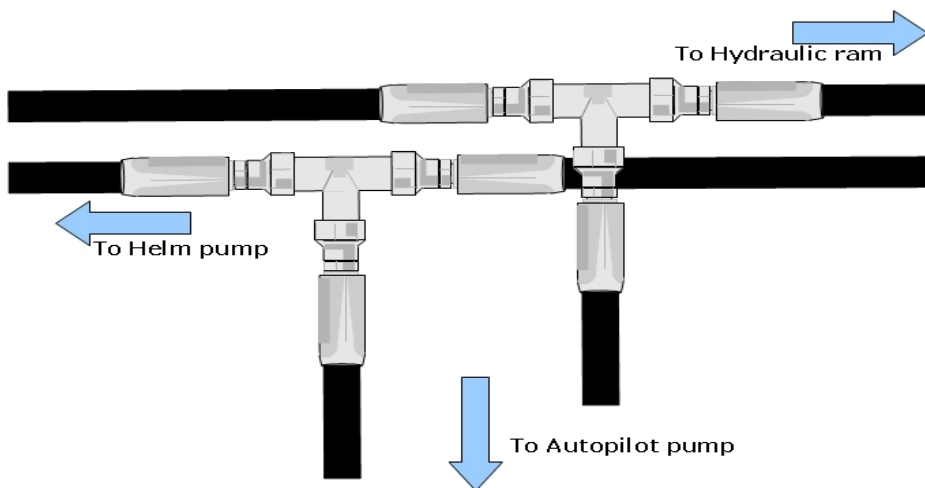
Please consult a reseller of hydraulic steering or a hydraulic shop when purchasing the hoses and fittings that will suite the existing hydraulic steering.

Note that the autopilot pump connections are ¼ BSP female thread. An adapter can be connected between hose fittings and the autopilot pump, as shown below. Also note that the adapter requires a gasket towards the autopilot pump.

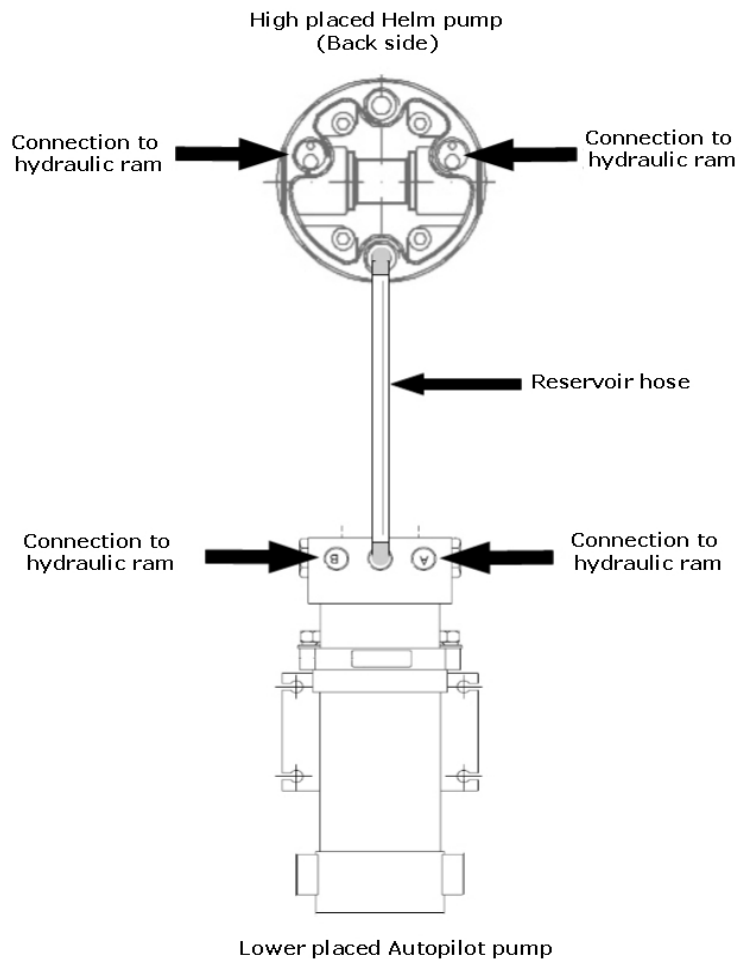


Pump hose connections with adapters

Connect all hoses to the T-fittings as shown in the example below.



Finally connect the reservoir hose between the helm pump and reversing pump. Note that the reversing pump must be at a lower level than the helm pump. If you don't have a helm pump installed you need to install a separate reservoir tank.



The reservoir oil has a much lower pressure than the oil that drives the piston of hydraulic ram.

The bottom bleed point at the back of the helm pump shall be united to the centre connection marked “**R**” of the reversing pump. Cut a hose to the right length and add reusable hose fittings at both ends unless pre assembled hoses are used. Then remove the bolt at the bottom bleed point in helm pump and screw in an adaptor for the hose fitting. Apply another adaptor in the reversing pump. Apply Loctite thread sealant on tapered threads before screwing them into the helm pump and reversing pump. Attach the reservoir hose.

NOTE:

It does not matter how the hoses to the “**A**” and “**B**” outlets are connected between the reversing pump and the hydraulic hoses since the electrical polarity of the pump can be reversed if needed.

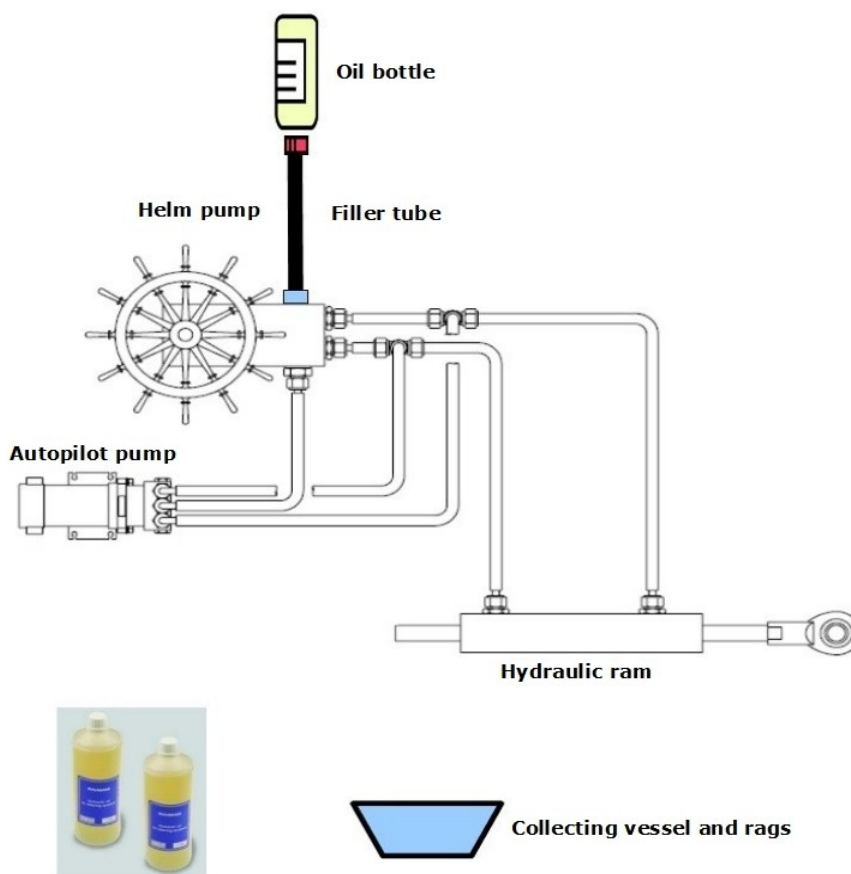
Please note that this is only an example of how to interconnect the reversing pump to an existing hydraulic steering system.

FILLING OIL AND TESTING PUMP

You have now installed the autopilot pump and have a complete hydraulic steering with helm pump and autopilot drive connected in parallel to the hydraulic ram. Before the autopilot can be connected electrically the system must be refilled with oil and bled so that no air remains in the system. During this procedure oil can leak out so it can be helpful to have a container and rags at hand.

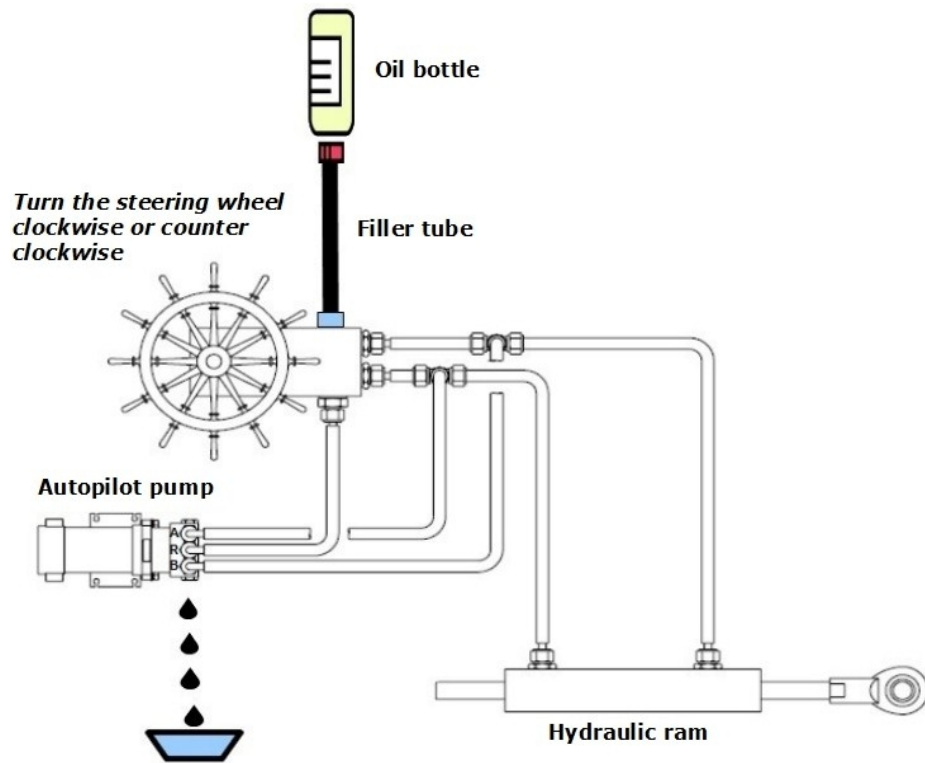
Do the following:

Start by refilling the oil in the helm pump. unscrew the lid of the filling hole on the helm pump and connect the special filler tube that came with the steering. Then remove the lid on a new oil bottle and connect the special filling cap with hose. Turn the bottle upside down and insert the hose in the refilling nipple at the helm pump.



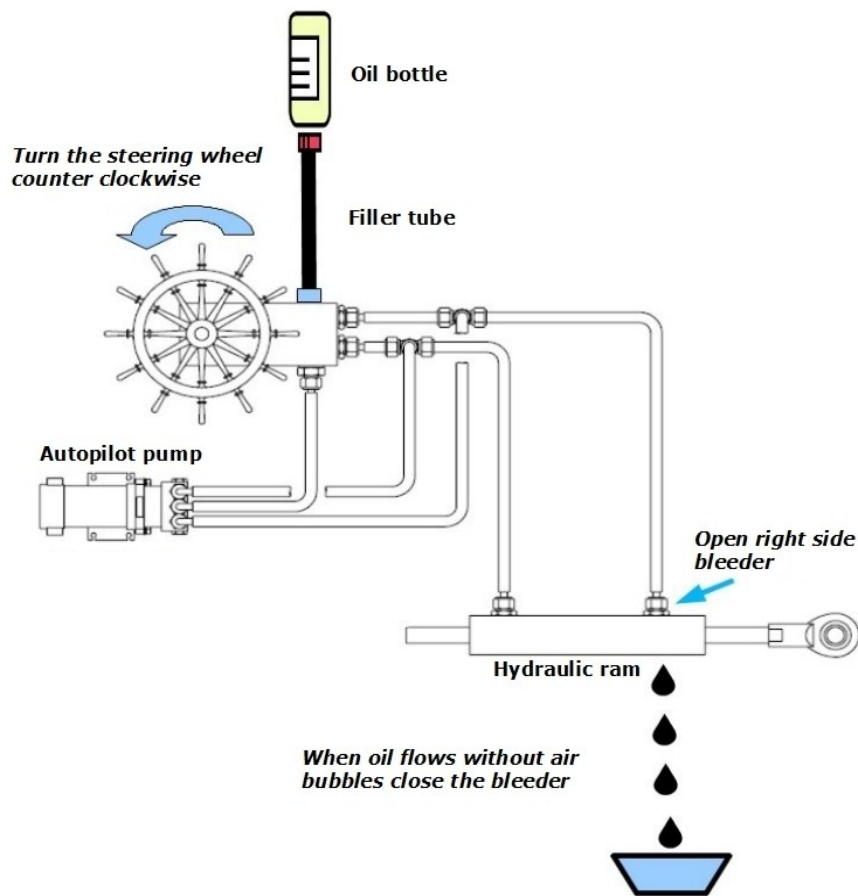
You will quickly notice that the autopilot reversing pump does not have room for so much oil, but it must be filled before continuing.

Now we move to the autopilot pump. Loosen the connection "R" on the pump and ensure that oil is flowing in this direction. Add more oil in the steering pump, if necessary.



When you see that oil is coming from the hose, screw the reservoir hose tightly back on.

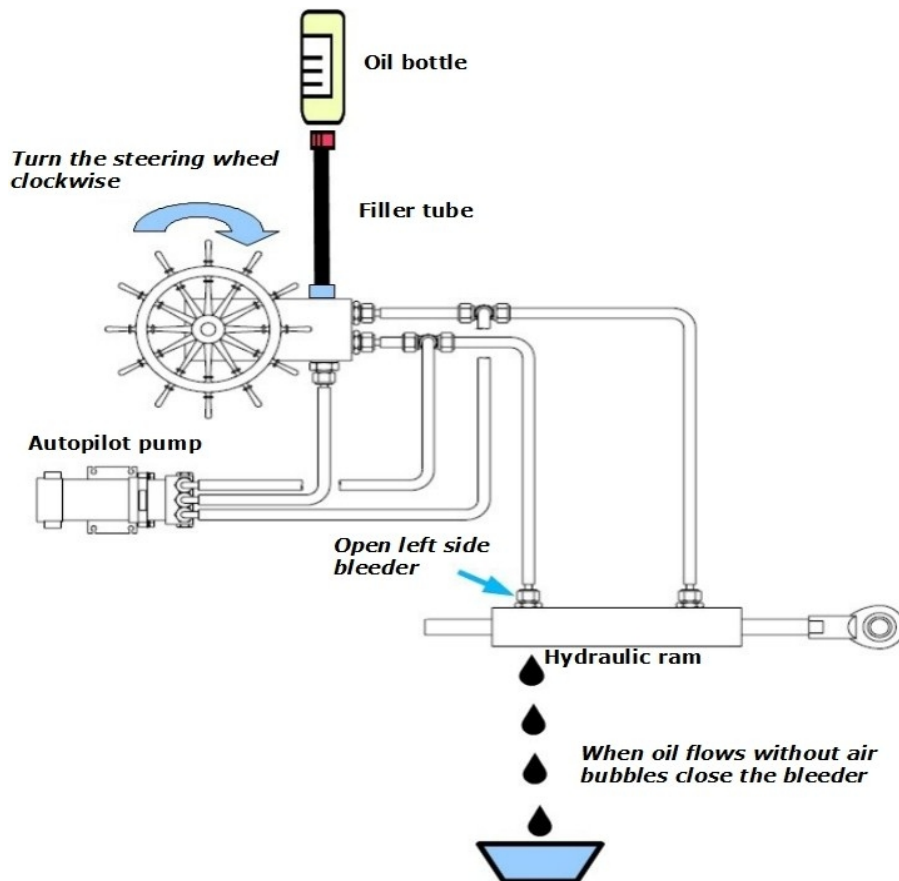
Now fill the hydraulic ram with oil. Loosen the nut to one of the nipple valves on the hydraulic ram about a half turn and connect the transparent hose that came with the steering. Start with the right (starboard) valve. Oil will come out of the tube during the bleeding process so it is advisable to have a container to collect it and rags to wipe with.



While still holding the oil bottle upside down over the helm pump cut out a large hole in the bottom of the bottle so that you can use the bottle as a funnel when adding the oil or adding fresh oil. It's easier for two people when you do this, but you can do it alone.

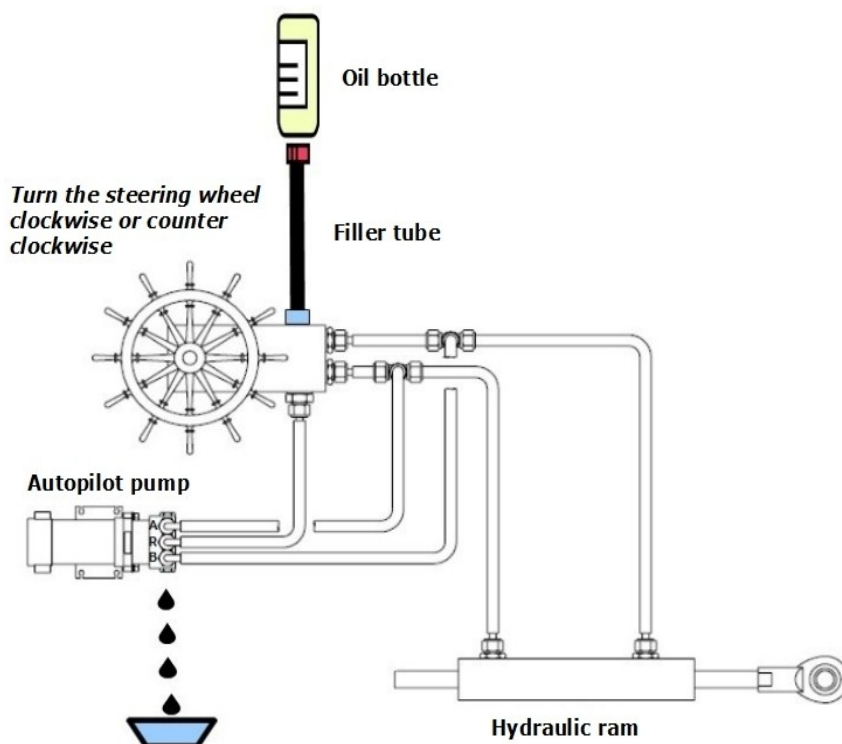
Rotate the steering wheel slowly clockwise, so oil is pumped from the pump into the hydraulic ram and out of plastic pipe you just put on. At first, many air bubbles will come, but they will soon end. Throughout this procedure, you must ensure that the oil in the oil bottle does not run empty. Fill it all the time. When the air bubbles cease, tighten the bleed valve on the hydraulic ram.

Then repeat this but on the other side of the hydraulic ram. Rotate the knob the other way while bleeding the system. Then also tighten this valve.



Now return to the autopilot reversing pump. Loosen the connection at the end of "A" without removing the hose and turn the steering wheel until the oil flows without air bubbles out of the link.

Note that the direction of the steering wheel movement, port or starboard, must correspond to which line connection "A" is attached. Then tighten back the connection "A". Repeat the process by opening the connection "B" on the autopilot reversing pump and rotate the wheel to port until oil flows out of the pipeline. Then tighten back the connection "B".



All air should now have been removed from the hydraulic steering. You can check this by turning the steering wheel full starboard then to port, until the ram reaches its outer limits. The steering wheel should stay stationary in these positions and not feel springy or spongy. If it feels springy or spongy there is air left in the system.

The autopilot reversing pump is now full of oil. You can check the pump by connecting it directly to 12 volts from the battery if you like.

Warning!

It is important that the pump does not run dry during this testing! One person should at all time ensure that the oil level is maintained in the helm pump while another person is running the pump motor gently as follows:

- Ensure that all the fittings are tight
- Run the pump by connecting it directly to a 12V power source. The rudder must now move. Stop before the rudder reaches the end stop.
- Be prepared to top up with oil so that the level of the helm pump oil is maintained.
- Repeat by reversing the polarity of the cables and run the rudder in the other direction.

If everything works as it should, you can loosen the filler tube from the helm pump and replace the cover back. You can now connect the autopilot. Follow the autopilot installation manual to connect the autopilot pump to the autopilot controls.

MAINTENANCE

With a minimum of moving parts, this pump should function smoothly for many years. If it is necessary to replace parts, your dealer can provide spare parts. When dismantling the pump be extremely careful to keep all pump parts clean and free of dirt. When reassembling lubricate all seals and gaskets with hydraulic fluid. A smear of grease on the gaskets will aid assembly without damage. Tighten evenly the four M6 bolts that the pump is attached to the surface with.

Brushes

Inspect the motor brushes every 500 hours, or annually whichever comes first. Replacement motor brushes are available from your dealer. State the serial number of your unit when ordering. Be sure to clean out all loose carbon before fitting new brushes. If fluid has entered the motor, degrease the brush gear and commutator before running the unit, otherwise arcing will reduce brush life.

EXAMPLE OF HOSE FITTINGS AND QUANTITIES

Hoses and fittings bundles are not included. Below is an example of the necessary hoses and fittings to connect a reversing pump to an hydraulic steering system. For all brands of steering, you need to know the helm pump thread for connecting the reservoir hose and the dimensions of the existing hoses.

Below is an example of the components of a typical hose assembly.

7X



Reusable fittings

2X



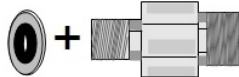
T-fittings

1X



Adapter (helm pump)

3X



Adapter with washer, BSP 1/4"
(autopilot pump)

2x



Hose (high pressure)

1x



Hose (low pressure)