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# Subsystems



The Publisher's Statements on page i of this Owner's Manual apply to this chapter. Please read before proceeding.

*This chapter gives an overview of the power steering and trim tab subsystems. Basic instruction in the use of trim tabs is provided.*

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## Power Steering System

The Viking Sport Cruiser 61FY has a Hypro Marine integrated hydraulic power-assisted steering system designed for ease of operation and tracking accuracy. The steering wheel is installed on a multi-piston Sea Star helm pump **A** that can produce up to 1000 psi. The steering wheel angle is adjustable, using the lever at the base.

### Hypro assembly

Hypro unit **B**, on the lazarette bulkhead, is a multi-function reservoir / filter / cooler. The tank provides a reserve supply of oil for the system and supplies cooled oil to the helm pump. Sight tube **D** shows oil level inside the reservoir. The level should range between 1/2 and 3/4 and stabilize about halfway up the sight tube.

### Air pre-charge

Before initial use the reservoir must be pre-charged or pressurized to 30 psi using the hand pump provided. This does not need to be done every day – once pressurized, the system is quite stable, apart from variations due to temperature and heavy use. But oil level and steering system pressure should be part of your pre-voyage checklist. Pressure must not go below 20 psi. If it does, pump it up back to 30 psi.

### Interactions and oil flow

Power pump **C** for the steering system is mounted on the power take-off of the port engine. It produces about 1000 psi, with a regulated flow of approx 4 gpm, and requires a peak input of 3 HP.

Oil supplied to power pump is cooled by water, about 3-4 gpm, taken from the engine oil cooler into the heat exchanger. Oil is sucked from the reservoir into power pump **C** then goes aft to the servo, and also to the autopilot. Oil used is Shell Tellus R10 or equivalent.

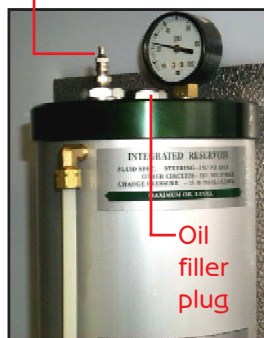
Return oil is filtered by a micro filter cartridge **F**. Replace with the same type after the first year or 50 hours of use. Thereafter the change interval is every two years or 300 hours. Relieve the air pre-charge in the reservoir before changing filter cartridge **F**.

When the steering wheel is turned oil is pumped into servo **S** (opposite page). This acts as a brain, opening valves that allow high pressure oil from the engine-driven power pump to move the ram of the steering cylinder. This then moves the rudders for steering. With the power assist, steering effort for the captain is greatly reduced.

The autopilot pump **P** (opposite) similarly pumps oil into the servo **S** (opposite) to activate steering. This considerably reduces load on the autopilot pump, extending its life and probably the accuracy of its course keeping.



Air charging valve



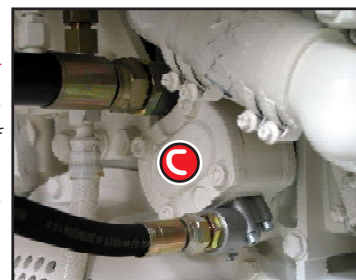
Hypro reservoir

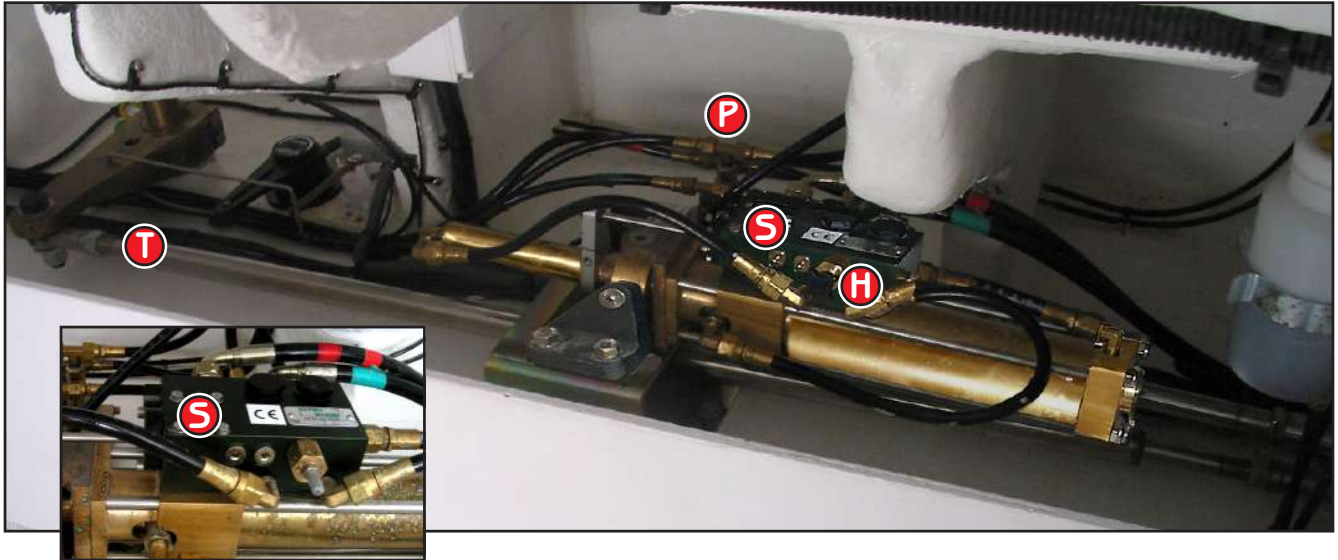
Maintain the system air pressure between 20 and 30 psi. Before changing the micro filter **F** release pressure at the air charging valve (as you would deflate a bicycle tire).



### Power pump

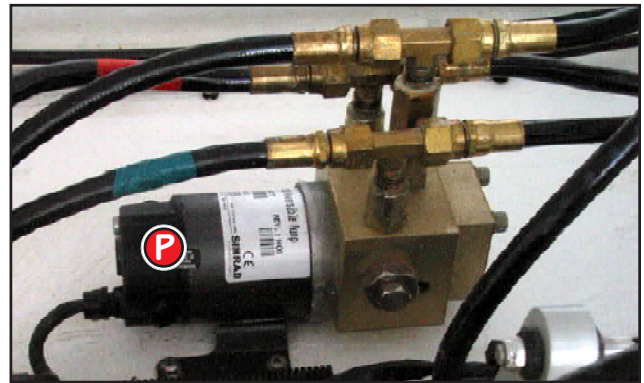
Hydraulic power pump **C** is mounted on the power take-off (P.T.O.) of the port engine. Oil is under intense pressure so check often for sign of leaks.





## Hydro steering gear

- S** - Servo: Helm steering inputs are used as a reference to direct high pressure oil to move the rudders.
- T** - Rudder tie bar connecting port and starboard.
- H** - Bleed/purging valve – for bleeding the system if needed. See Hypro Marine manual before using.
- P** - Autopilot pump.



Simrad Auto Pilot pump

## Troubleshooting

If the engine-driven pump should fail, or the port engine should quit, helm steering effort will significantly increase. However, the helm pump produces enough pressure for the vessel to be operated safely.

### ***Helm unit requires excessive turns for lock to lock. . .***

There is air in the system and it will have to be purged at cap **H**. See Hypro manual for instructions.

### ***Loss of fluid and pressure in reservoir. . .***

There is a leak. Check all connections, including the engine-driven pump, look for a leak on its shaft seal.

### ***Loss of pressure with no loss of reservoir oil. . .***

There is an air leak in upper portion of reservoir. Check free air connections with soapy water, particularly the pressure gauge.

## Hydro preventive maintenance service

Check oil level in the hydro reservoir B. – it should be 1/2 and 3/4 full on the sight tube. If needed, top up with Tellus R10 as recommended by Hypro. You can also use fluids meeting MIL H 5606C specs.

Maintain air pressure between 20-30 psi. Pressure may fluctuate within this range, depending on temperature and usage.

Check for leaking oil over the whole system wherever the hoses are. Check for metal (exposed braiding) that may indicate mechanical wear.

- After first year or 50 hours replace micro filter cartridge. *You must relieve pre-charge pressure first!*
- After two years or 300 hours. Replace micro filter cartridge **F** and carry out complete oil change to the system. Repurge power circuit. See your Hypro manual for complete information.



### Hypro steering gear – Every six months . . .

- Check reservoir for leaks.
- Grease or oil pivot points (if needed).
- Check tightness of bolts mounting steering unit to tiller arm and rear bolts to structure.
- Check lock nuts on the tie bar and grease ball joint.
- Check for wear on ball joints and pivot mounting.
- Check all hoses for chafing, scuffing and cracks in the rubber sheaths. If you can see braiding, replace!

### After one year or 50 hrs . . .

After the first year, or 50 hours, replace the micro filter cartridge. You must relieve pre-charge pressure first!

### After two years or 300 hrs . . .

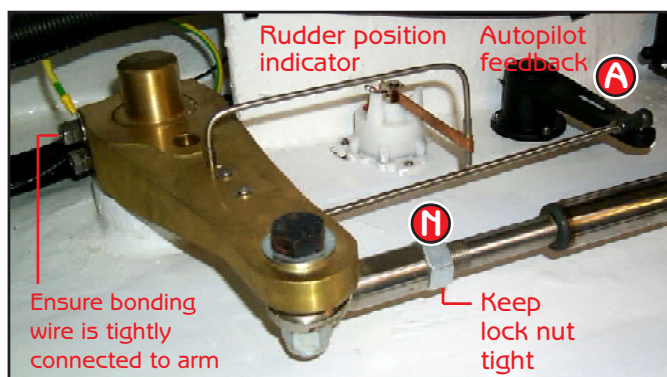
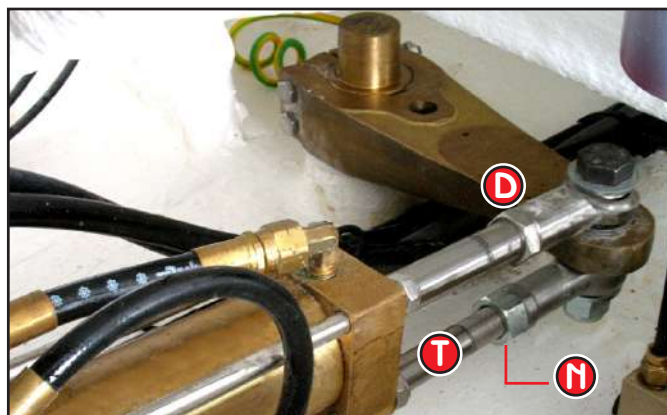
After two years, or 300 hours, replace the micro filter cartridge and carry out a complete oil change to the system. Repurge power circuit (see Hypro manual.)

### Bleeding the system

The steering system is self-bleeding. If it becomes necessary to bleed the system (purge it of air), consult the Hypro Marine owner's manual for the correct procedure. The fill plug on top of the helm pump does not have an air vent because this is a pressure system – however, the fitting on the bridge helm pump may have to be partially opened to allow air to escape during purging (again, consult the Hypro manual).

### Drop window pump, W

The drop window pump **W** is located near the steering gear at portside aft. It uses hydraulic oil from reservoir bottle **R** situated above it.



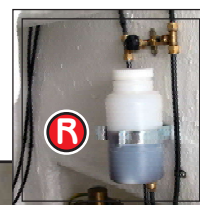
### Autopilot sender, rudder position

*It is critical that the autopilot rudder position sender **A** moves parallel to the rudder tiller arm to maintain the autopilot course selected. Be careful not to disturb these devices and do not stow gear nearby.*

### Rudder positioning

Photo above shows port rudder tiller arm, **D**. It connects by tie rod **T** to the starboard rudder arm.

Tie rod **T** is adjusted to move the port rudder in parallel and in unison with the starboard rudder. Make sure that lock nuts **N** never becomes loose. There are NO mechanical stops for the tiller arms.



## Bennett Trim Tabs

Your Viking Sport Cruiser 61FY is equipped with industry-standard Bennett Marine trim tabs. Trim tabs serve three functions:

1. They help the vessel get on plane faster by pushing the bow down.
2. They adjust vessel attitude (bow up; bow down) for optimum comfort, efficiency, sea-keeping.
3. They correct a port or starboard list, usually caused by windage or clustering of passengers to one side.

### Using the tabs

**In general:**— Under normal sea conditions very little or no tabbing is required to run or bring the vessel onto plane.

**In port:**— Tabs should be fully lifted in port, and at a dock.

**In heavy seas:**— Use tabs to keep bow down in heavy seas. In the case of *following* heavy seas, tabs should be lifted.

**Climbing onto plane:**— Do not deploy tabs until you are about to accelerate onto plane. During acceleration, apply tabs in short bursts, as vessel comes on plane. If tabs are overtrimmed the bow will plow.

**Cruising:**— In normal seas, watch the bow wave as the vessel is trimmed — at proper trim the bow wave and spray will move forward and wake will be reduced. *Do not overtrim — especially at speed!*

**Coming off plane:**— After the vessel has settled off plane, or when operating at displacement speeds, lift the tabs.

**Correcting a list:**— If the port side is too low, you want to push down the starboard bow to balance the vessel. Therefore use the STARBOARD control for BOW DOWN in small bursts to correct the situation. Paradoxically, the “starboard” tab control rocker activates the *portside* tab to lift the port stern. Since the hull must achieve hydraulic equilibrium, the opposite bow (stb) will go down — thus the list will be corrected. Look at the horizon when operating tabs to judge the amount of tab required.

### Maintenance

The Bennett pump (a.k.a. HPU - hydraulic power unit) **A** for the trim tabs is at starboard, above the steering gear. Periodically check fluid level in the HPU. With trim tabs completely retracted fluid level should be about 2 inches from the bottom of the reservoir (it holds about 22 ounces). Fluid level is not critical.

**To refill:**— Remove the Lexan cover, and the filler plug on the left side. Top up with any type of automatic transmission fluid (ATF). Retract and extend the tabs 3 times. Check oil level again. Be very careful, valves are tiny and dirt in the oil can cause failure.

### Troubleshooting

If you hear the pump running, but the tab doesn't move, oil probably needs to be added. If so check for leaks. Also check fuse and voltage. Check zinc anode on each trim tab; they protect against corrosion.

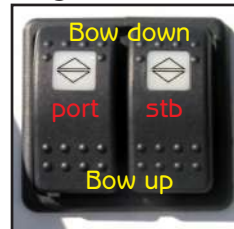


Trim tabs (typical)

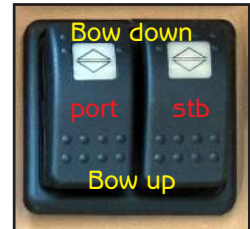
Hydraulic cylinders generate up to 600 psi to push tabs down. Tab retraction (bow UP) opens a valve then the pump removes oil from the cylinders. This permits internal springs to retract the tabs, aided by pressure of moving water.

**Note:**— Do not push one tab **UP**, and the other **DOWN** at the same time. The pump cannot respond to that and will likely stop.

Bridge



Salon



### Trim tab controls

Use tab controls in brief bursts. Push top of button to lower bow; push bottom of button to raise bow.

- When docked have tabs fully retracted.
- In heavy seas keep the bow down.
- Raise tabs in following seas.
- DO NOT OVERTRIM, particularly at high speed.



## Bow Thruster

The Side Power electric bow thruster is made in Fredrikstad, Norway, by Sleipner Motor SS. The design borrows from their very successful commercial vessel thruster designs and installations in Europe. They are now standard world wide on pleasure craft up to 75 feet in place of the hydraulic thrusters used in the past.

One great advantage of electric thrusters is that they work even with the engines shut down; thus the vessel can be moved to one side or another in an emergency.

The SP 95T 95 kg model installed on the 61FY has an 8 hp electric motor. This drives twin 4-blade propellers. They are: 7-inches diameter, symmetrical, glass reinforced polyamide, and same rotation inside a 7.3" fibreglass tunnel. The polyamide propellers provide equal thrust in either direction and are lighter than metal, allowing fast buildup of revs, and quick stops. Polyamide is also less susceptible to barnacle colonisation which can impair efficiency and destroy seals. (*Barnacles are still a hazard, however, so check regularly.*)

EP-90 gear oil **G** lubricates and cools the reduction gears, and keeps out sea water. If this oil turns a **milky tan color**, there is water in the oil – a leaky seal in the lower unit is indicated and it must be replaced as soon as possible.

The thruster is bonded and has a sacrificial zinc anode **Z** built into the prop hub. Inspect it often and replace at least yearly, otherwise the thruster will quickly corrode.

Power supply is from the Engine Start battery, and with engines running full voltage is available. Current draw is nominal 340 A. The 400 amp fuse **F** (check I.D. on your reference card) is in the lazarette, inside the main 24 volt hi-amp distribution box.



### Bow thruster

*The thruster tunnel is integrated with the hull to ensure the best waterflow and to avoid turbulence and cavitation.*



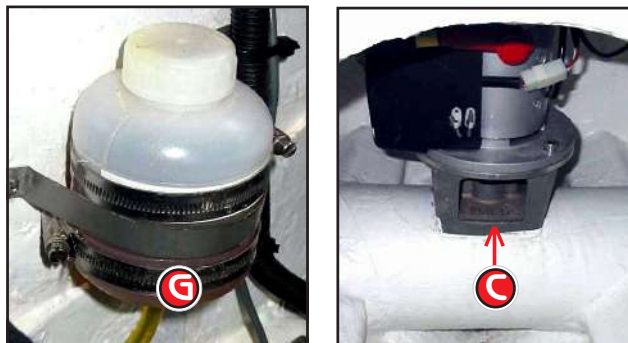
### Sleipner Side-Power SP 95T

*The thruster is nominally rated at 8 hp and 209 lbs thrust. It is the most powerful thruster available for a 185 mm tunnel. Unit is mounted under Hatch #2 just inside fwd cabin.*



### Annunciator lights

*This main panel display has pilot lights to show your nav lights are on – and one to show the thruster is enabled **E**.*



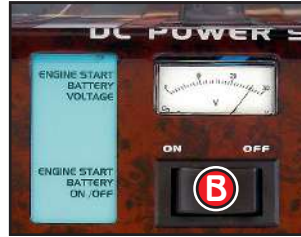
### Reservoir & thruster coupling

*The flexible coupling **C** below the motor can be changed if necessary – usually if solid debris has been hit. Gear oil **G** is EP-90, as used in outboard lower units.*



### To enable the bow thruster

1. ENGINE START BATTERY switch **B** must be on.
2. HIGH LOAD ISOLATION switch **L** must be on (green light).
3. Thruster joy stick **T** must be enabled (amber light).



### Recommended usage

The main function of a thruster is to assist leaving and coming up to a dock. Although you can use the twin engines to move the stern in an arc, the thruster enables you to move the bow in an arc as well and makes docking much easier if the wind is off the dock.

The Side Power electric bow thruster is designed for intermittent use – rating is nominally 3 minutes continuous. However, Viking Sport Cruisers strongly recommend no more than 20 seconds. This is more than sufficient to carry out a maneuver and it avoids rapid heating of the motor and possibly a blown fuse.

Avoid abrupt changes of direction. The electronic controls have some protection against this, and overheating, causing unit failure.

When preparing to leave the dock, ensure first that the HIGH LOAD ISOLATION switch **L** is on. Then, when you are ready, enable the joystick by firmly pushing BOTH ON buttons **J** on the joystick panel. The amber indicator light between the ON buttons will glow brightly to show it is enabled and ready for immediate use.

Make sure you are still securely tied to the dock, then test the thruster by just nudging it for a second (away from the dock). This confirms it is operational. If the vessel does not move, stop at once and find out why.

Look where the vessel bow has to go. Stop before you reach that point, as the bow will continue moving. Use thruster sparingly or you may hit the dock with a bang.

Once underway, push the joystick OFF button **K** to return to the passive state. If you forget to do this, the joystick panel will shut itself down after a few minutes of non use.

For safety, when the vessel is docked and the engines are shut down, switch off the Engine Start Battery. Never leave systems enabled unless they are in use.



### Bow thruster control

Use bow thruster **T** in small bursts only. Long bursts quickly build up momentum that can slam the vessel into a dock. Watch out for swimmers before using. Enable **ON** only when in use.



Thruster propeller can cause serious injury. Before using the thruster check for swimmers or debris in the water around the vessel.