



ELECTROHYDRAULIC POWER STEERING SYSTEMS MK. III ESPE 600 ESPE 700

Installation and User manual

SLEIPNER MOTOR AS

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Made in Norway

SIDE-POWER
Steering Systems



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All Side-Power steering products complies with the CE directive 94/25/EC

Please read this installation manual thoroughly, before you start installing your Steering Power hydraulic steering kit. Sleipner Motor AS will not take any responsibility for products that are not installed in accordance with the instructions given in this installation manual.

IMPORTANT USER PRECAUTIONS AND PROCEDURES

- Please take time to acquaint yourself with the Power steering system components, operation characteristics and safety features.
- Should the helm pump warning light illuminate or the alarm sound, immediately reduce engine power to idle and go to the helm position with hydraulic back up (Lower helm on Flybridge boat).

When carrying out any servicing work on the Power Steering System or removal of the systems Oil Tank Filler Cap release the system pressure.

(Invert the air pressure valve dust cover and press it against the top of the pressure valve)

- The power steering system can have two types of helm pumps installed - with or without hydraulic backup.
- The system will shut down immediately in the event of an unexpected major component failure related to the safe operation of the system. Oil or electric motor overheat conditions will activate the helm pump warning light and alarm sounder, the system will monitor the alarm condition for a further two minutes before system shut down. If the alarm condition is resolved within 2 minutes the system will continue to function normally.
- In the event of system shut down, the helm pump with hydraulic back up function will become the only operational helm (the electric only helm unit will not function) the steering system will function as normal but with an increased number of wheel turns accompanied by a heavier wheel feel.
Do not continue to drive the boat at high speeds using the back up system.

Cylinder bypass:

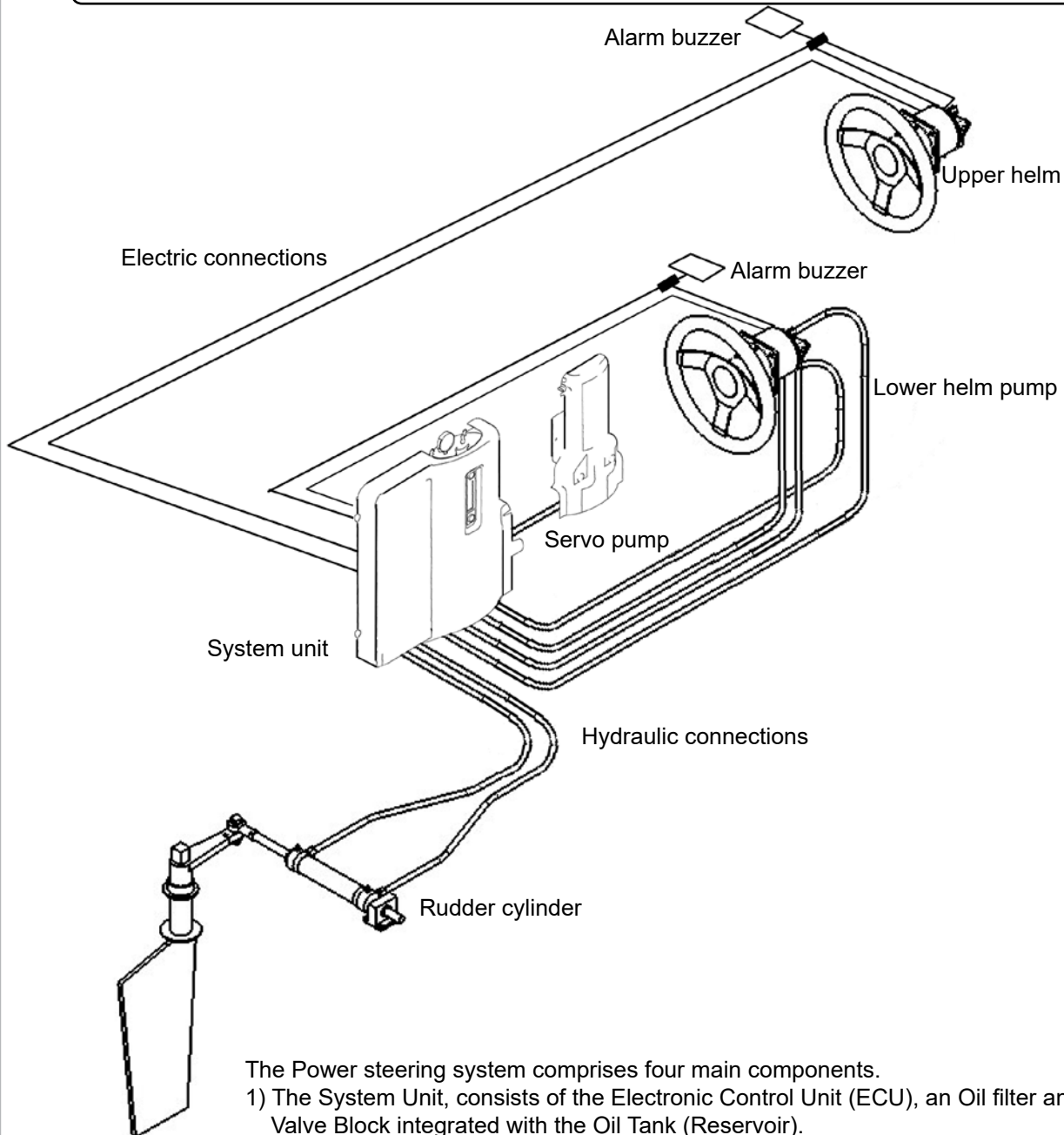
To centralize the rudders, release valve locknut, open valve NV3 & NV4 (turn ccw until stop). The cylinder is now free and the rudders can be centralized. Return NV3 and NV4 to original closed position (cw until stop) and tighten valve locknut

IN THE EVENT OF SHUTDOWN



- immediately reduce engine power to idle, and go to the helm position with hydraulic backup!

System description for Flybridge Yachts (Twin helm)



The Power steering system comprises four main components.

- 1) The System Unit, consists of the Electronic Control Unit (ECU), an Oil filter and a Valve Block integrated with the Oil Tank (Reservoir).
- 2) A Hydraulic Pump Unit, driven by an attached 24volt D.C. electric motor.
- 3) 2 x Helm Pumps
- 4) Hydraulic Cylinder(s)

The lower (primary) steering position helm has two functions:

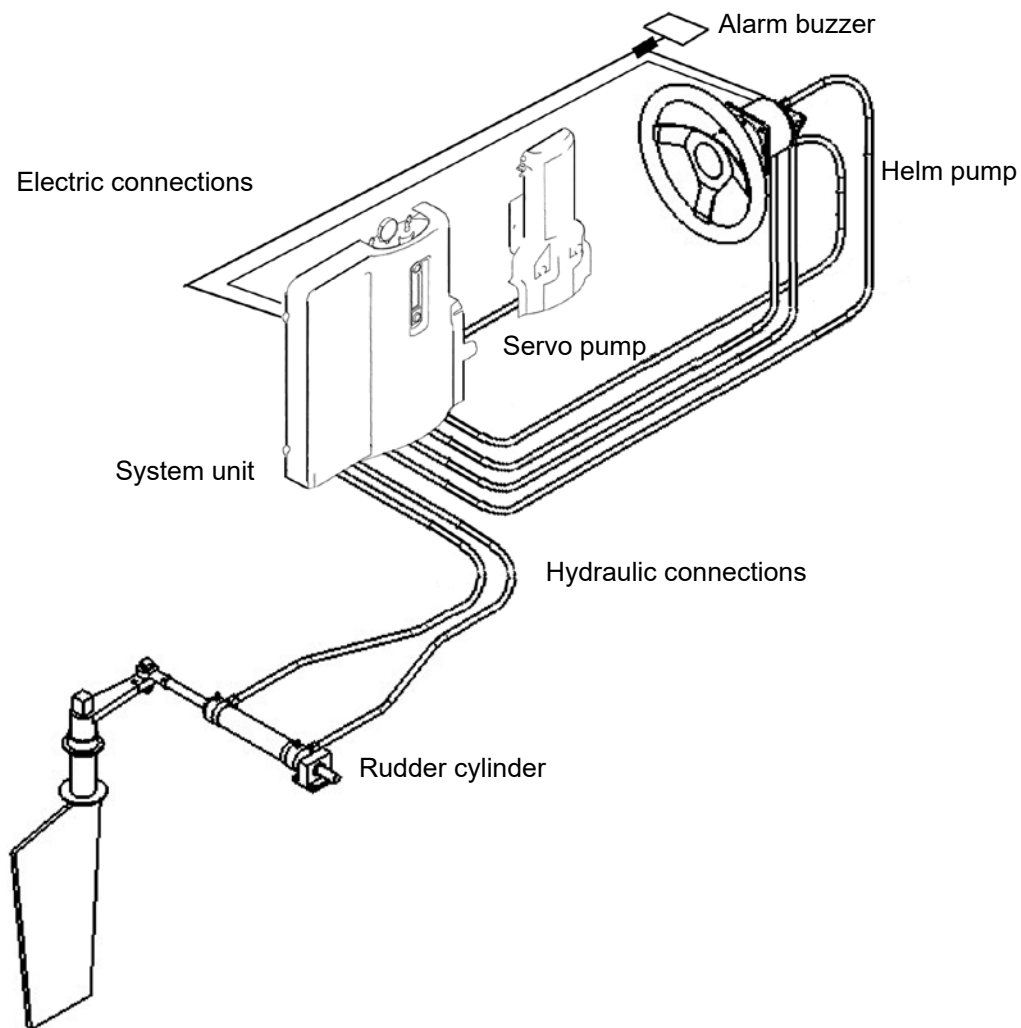
- a) It contains electronic sensors which transmit a signal to the ECU for normal Steering operation.
- b) It acts as a Hydraulic Helm Pump (back-up) in the event of an ECU system shut down (NB, The number of wheel turns will increase from stop to stop during back up mode).

The upper/flybridge helm has electronic sensors that pulses signals to the ECU for normal Steering operation.

Both helms have a built in warning LED (Red). This will illuminate during an alarm condition.

See description of the alarm functions on page 3

System description for Non Flybridge Yachts (Single helm)



The Power steering system comprises four main components.

- 1) The System Unit, consists of the Electronic Control Unit (ECU), an Oil filter and a Valve Block integrated with the Oil Tank (Reservoir).
- 2) A Hydraulic Pump Unit, driven by an attached 24volt D.C. electric motor.
- 3) 2 x Helm Pumps
- 4) Hydraulic Cylinder(s)

The lower (primary) steering position helm has two functions:

- a) It contains electronic sensors which transmit a signal to the ECU for normal Steering operation.
- b) It acts as a Hydraulic Helm Pump (back-up) in the event of an ECU system shut down (NB, The number of wheel turns will increase from stop to stop during back up mode).

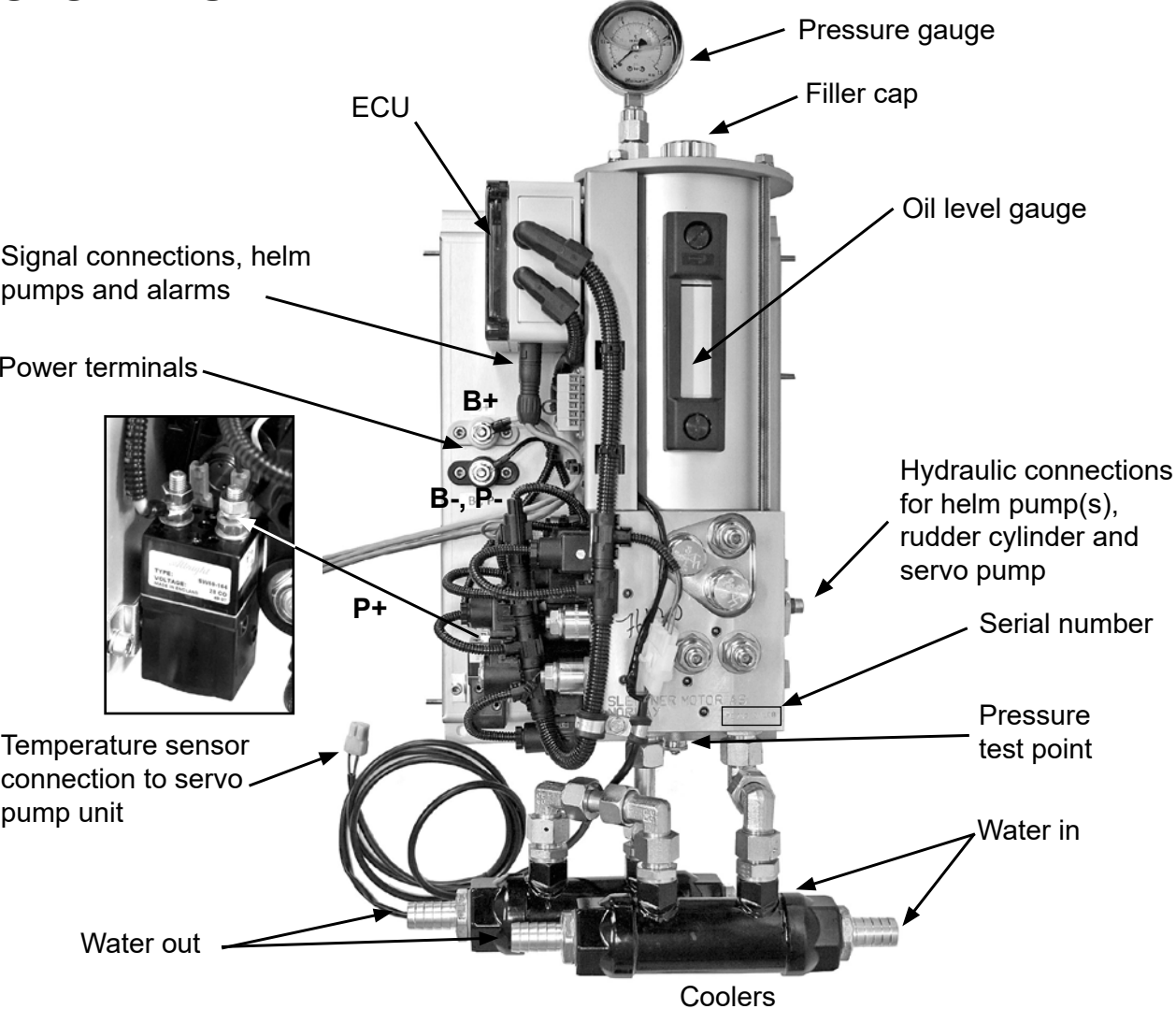
The upper/flybridge helm has electronic sensors that pulses signals to the ECU for normal Steering operation.

Both helms have a built in warning LED (Red). This will illuminate during an alarm condition.

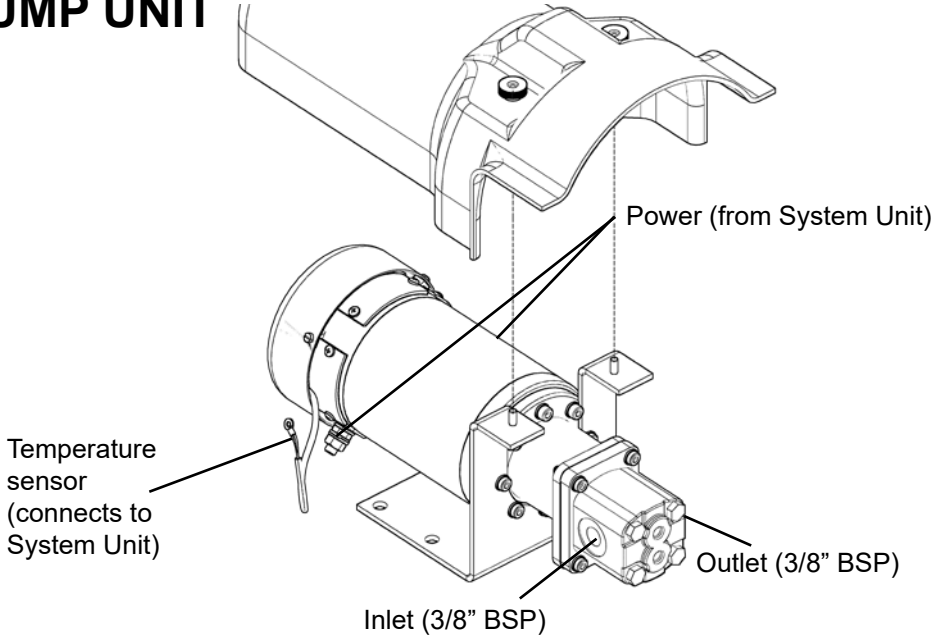
See description of the alarm functions on page 3

System Unit/Servo Pump overview

SYSTEM UNIT



SERVO PUMP UNIT



System Unit/Servo Pump installation

- Locate a suitable position to install the System Unit and Servo Pump Unit. Make sure that the selected mounting position is adequate to support the system unit (approx 25 kg) and servo pump (approx. 10 kg)
- Mount the system unit and servo pump.

Hose installation

- Clean and flush all hoses. Use plastic caps or tape to seal the hose ends before the hoses are installed.
- When routing the hoses, avoid restrictions, hot spots, sharp edges and tight bends (Rmin = 130 mm for 3/8" hose and 180 mm for 1/2" hose). Secure hoses with appropriate fastening devices to avoid chaffing.

Hose connecting

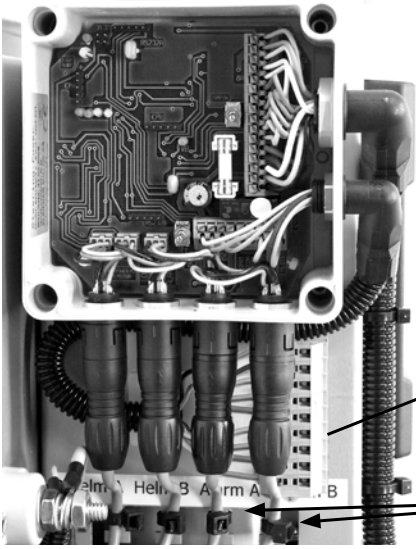
- Connect the servo pump hydraulic inlet/suction hose to hydraulic port S on the system unit. Connect servo pump hydraulic outlet/pressure hose to hydraulic port P (filter) on system unit. Please refer to drawing on page 8 for hydraulic port layout on the system unit.
- The Hoses can be connected either vertically or horizontally into the helm pump (see helm pump description)
- Connect the hoses to the helm pump and the cylinder according to drawing on page 8 and 12.
- Connect the cooling water inlet/outlet hoses to the engine cooling system. Ensure that the hoses are installed in accordance with this manuals paragraph "Hose Installation".

Power supply and signal leads connecting

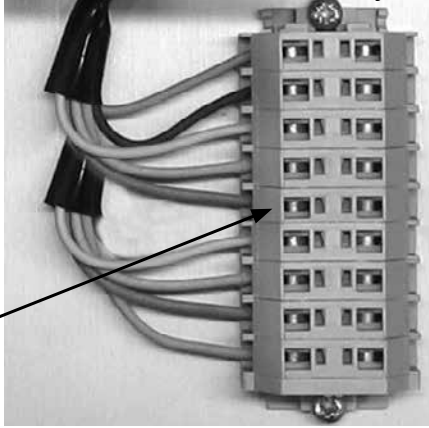
- Connect the temperature sensor leads to the system unit (external contacts). Connect the power leads from (B-,P-) to Servo Pump (-), and (P+) on system unit external relay to (+) on Servo Pump.
- Connect battery power (24V DC) to the System Unit power terminals (positive cable to (B+) terminal and negative to (B-) terminal & torque load to 17Nm)
- A 50Amp fuse must be installed in proximity of the batteries on the positive cable run, to protect the system from damage from possible short circuiting.

For schematic drawings , see page 15 (Twin helm) & page 16 (Single helm).

- Connect the "Motor On" and Pilot Signal electrical looms to the external terminal block mounted on the System Unit.



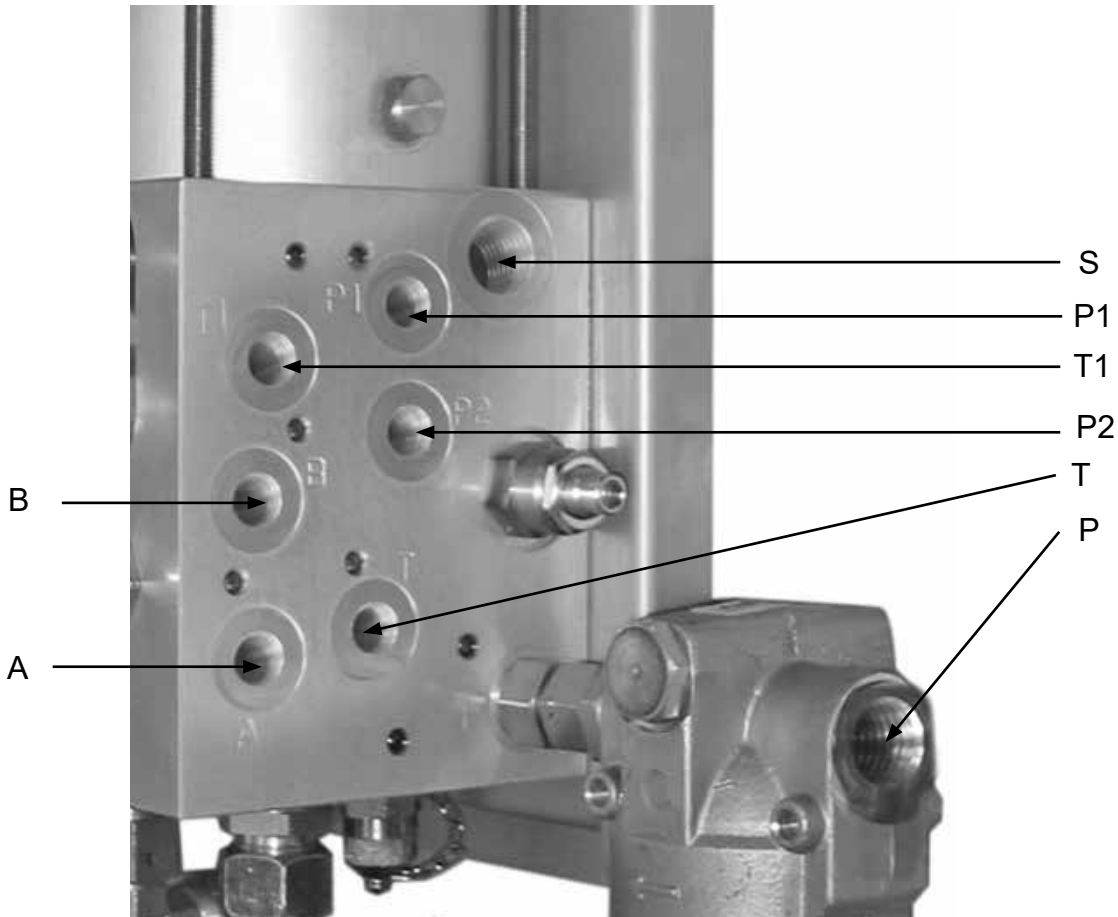
ECU external connector layout



- Pilot STB
- Pilot GND
- Pilot PRT
- Joystick STB
- Joystick GND
- Joystick PRT
- Engine 2
- Engine GND
- Engine 1

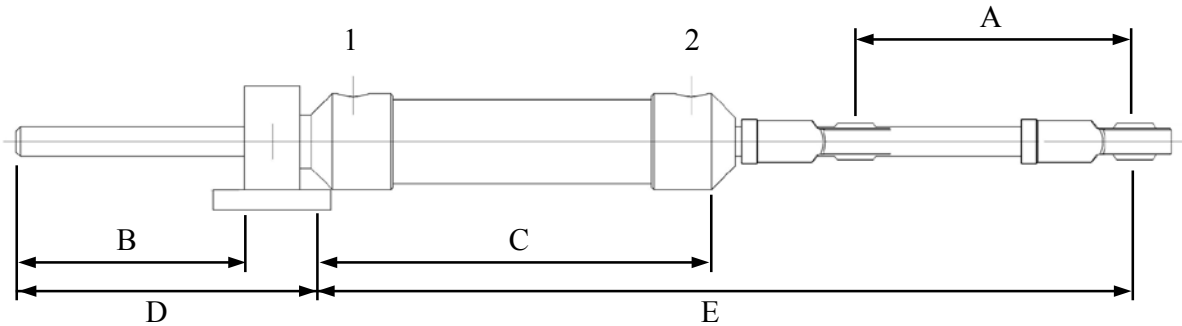
Secure cables properly to attachment points with cable ties

System Unit hydraulic ports



- P1: 1/4" BSP - Helm pump pressure port A
- P2: 1/4" BSP - Helm pump pressure port B
- T: 1/4" BSP - Helm pump upper drain port
- T1: 1/4" BSP - Helm pump lower drain port
- S: 1/2" BSP - Servo pump, hydraulic inlet / suction
- P: 1/2" BSP - Servo pump, hydraulic outlet / pressure
- A: 1/4" BSP - Rudder cylinder stb feed / port return
- B: 1/4" BSP - Rudder cylinder port feed / stb return

Rudder Cylinder installation



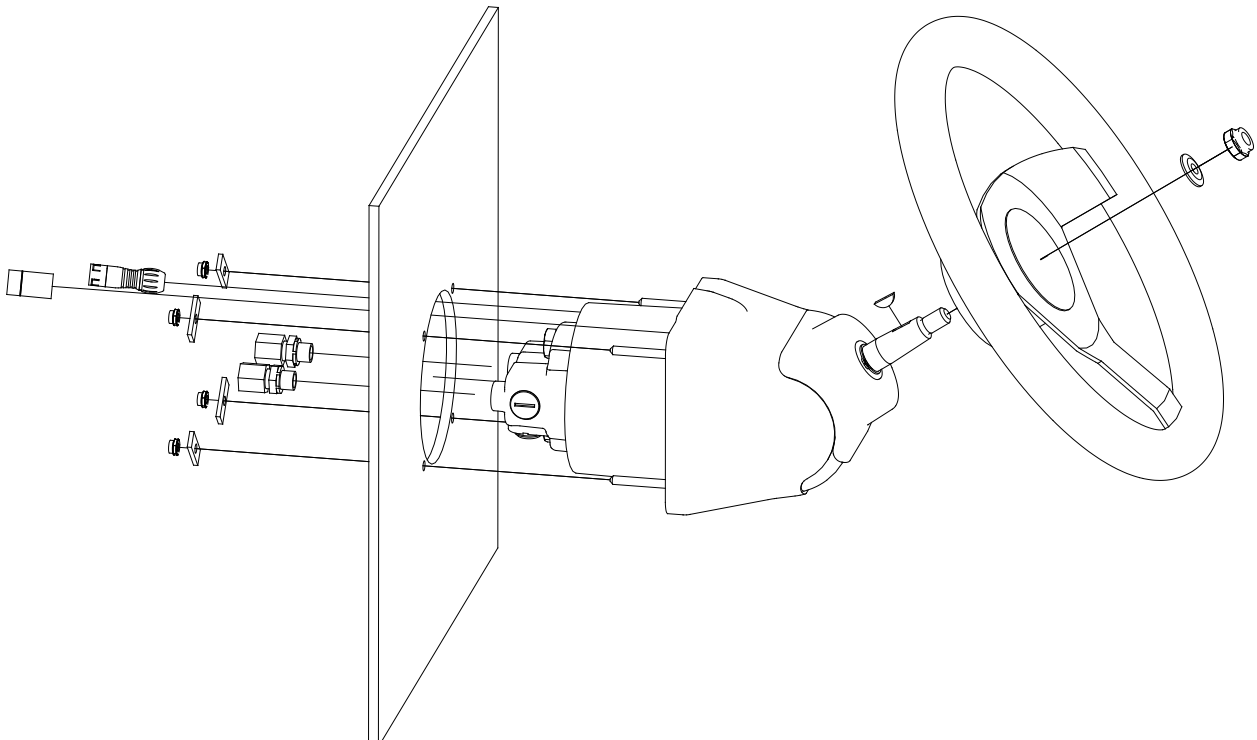
PART	A	B	C	D	E	1	2
71140P190	190	155	269	204	556.5	1/4" BSP	1/4" BSP
71220P190	190	158	302	207	573.5	3/8" BSP	3/8" BSP
71220P220	220	180	332	237	633.5	3/8" BSP	3/8" BSP

- The Cylinder must be mounted on a solid, rigid surface, either directly to the hull, or using an suitable bracket.
- The Cylinder should be angled parallel to the transom (or to the tie bar on dual rudder installations), when the rudder is at one of its end stops.

Ensure the cylinder stroke has been set to half full travel when the rudders are "dead ahead" , this ensures equal stroke in both directions. - The cylinder must be installed in a position where the stroke will be equal in both directions

- Secure the cylinder mounting foot with bolts, washers and Locknuts (i.e. Nyloc).
- It is important that the cylinder mounting foot is installed 90 degrees to the tiller arm, when the rudder is in its centre position.
- Connect the cylinders rod end to the tiller arm using the correct sized bolt.
- Tighten the bolt.
- Connect the hydraulic hoses to the cylinder referring to schematics on page 9 and 14.

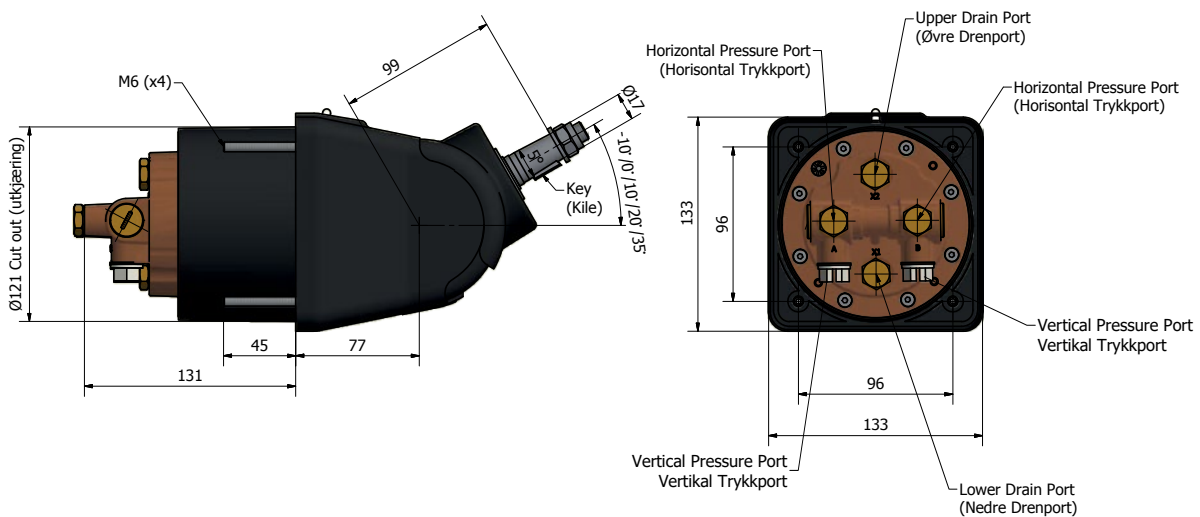
Tilt Helm pump installation – Electric & hydraulic backup



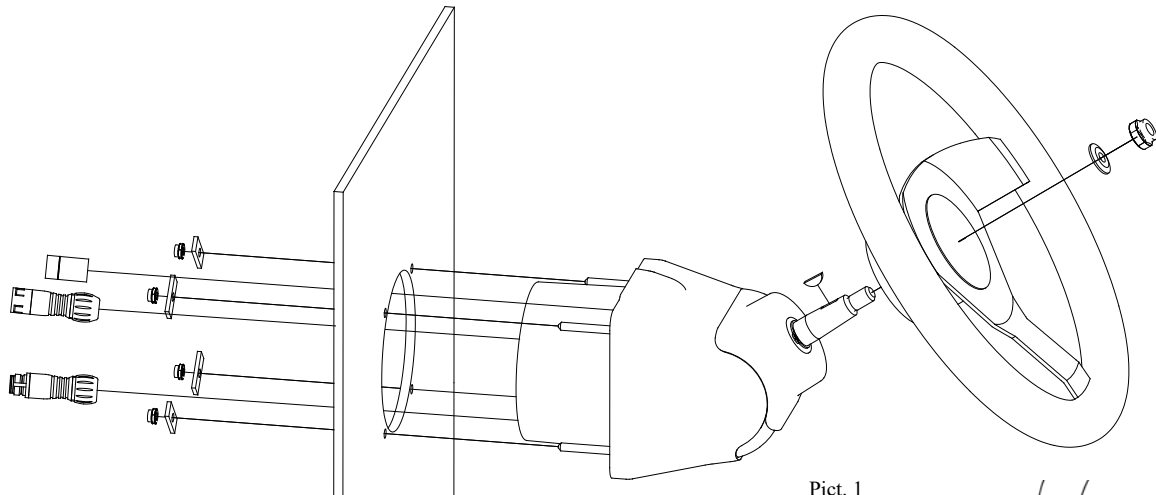
- Ensure there is adequate space to install the Helm Pump, Steering Wheel, associated looms and hoses. Check they do not interfere with cables, wires or other components (See the helm pump dimensions)
- Cut a hole (Ø121 mm), and drill the four 7 mm (5/16") screw holes in accordance with the dimensioned drawing.
- Fit the helm fittings and connect the hydraulic hoses referring to the diagram on page 12.
- Secure the helm pump using the washer and nuts (6mm).
- Apply a thin layer of grease on the helm pump shaft & fit the steering wheel.

Connect signal and alarm cables. Refer to page 15 (Twin helm boats) and page 16 (Single helm boats). Secure and fasten helm unit wiring to avoid wire and connector tension sharp obstacles and chaffing.

NOTE: Ensure “dummy” plug is fitted to the Helm B port on single helm boats.



Tilt Helm installation - Electric only

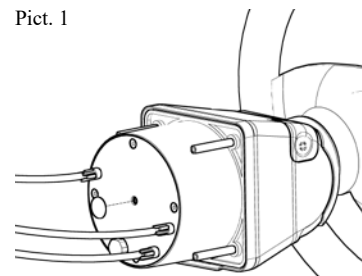


Pict. 1

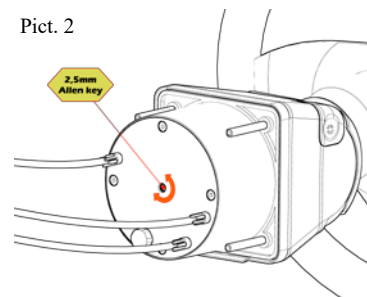
Helm Unit steering friction adjustment

The steering friction setting has a pre-set standard value from manufacture. The friction can be adjusted to a preferred setting as follows:

- Remove the plastic plug in the end cover using a Screwdriver. (Pict.1)
- Using a 2.5 mm Allen Key adjust as follows: (Pict.2)
 - o Turning clockwise increases the friction
 - o Turning counter-clockwise reduces the friction
- Check for desired friction after every ½ turn.
- When satisfied with friction setting, re-fit the plastic plug.



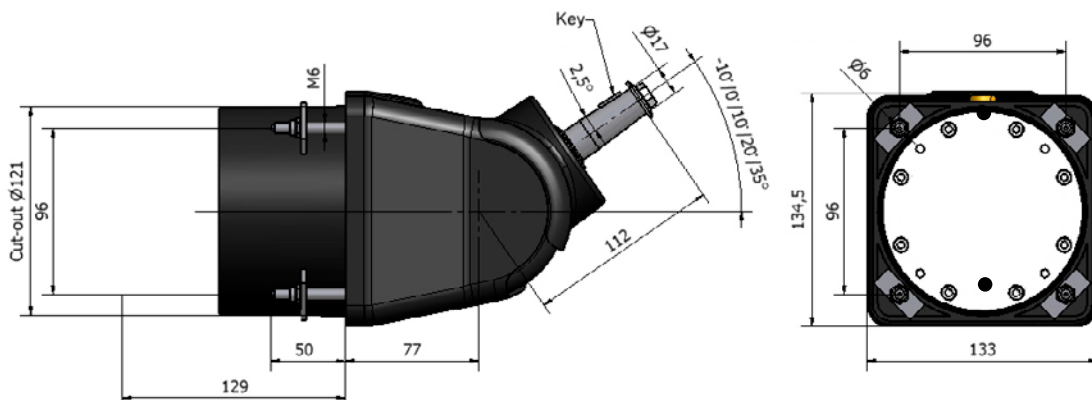
Pict. 2



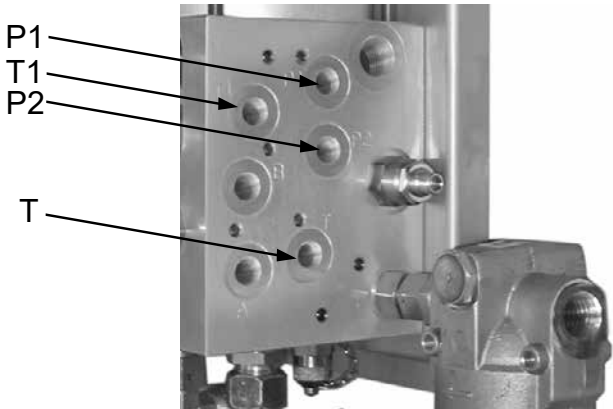
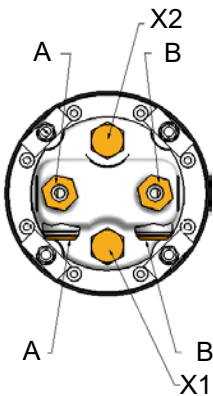
- Ensure there is adequate space to install the Helm Pump, Steering Wheel, associated looms and hoses. Check that they do not interfere with cables, wires or other components (See the helm pump dimensions)
- Cut a hole (Ø121 mm), and drill the four 7 mm (5/16") screw holes in accordance with the dimensioned drawing.
- Secure the helm pump using the washer and nuts (6mm).
- Apply a thin layer of grease on the helm pump shaft & fit the steering wheel.

Connect signal and alarm cables. Refer to page 15 (Twin helm boats) and page 16 (Single helm boats). Secure and fasten helm unit wiring to avoid wire and connector tension sharp obstacles and chaffing.

NOTE: Ensure "dummy" plug is fitted to the Helm B port on single helm boats



Helm Pump - Hydraulic connections

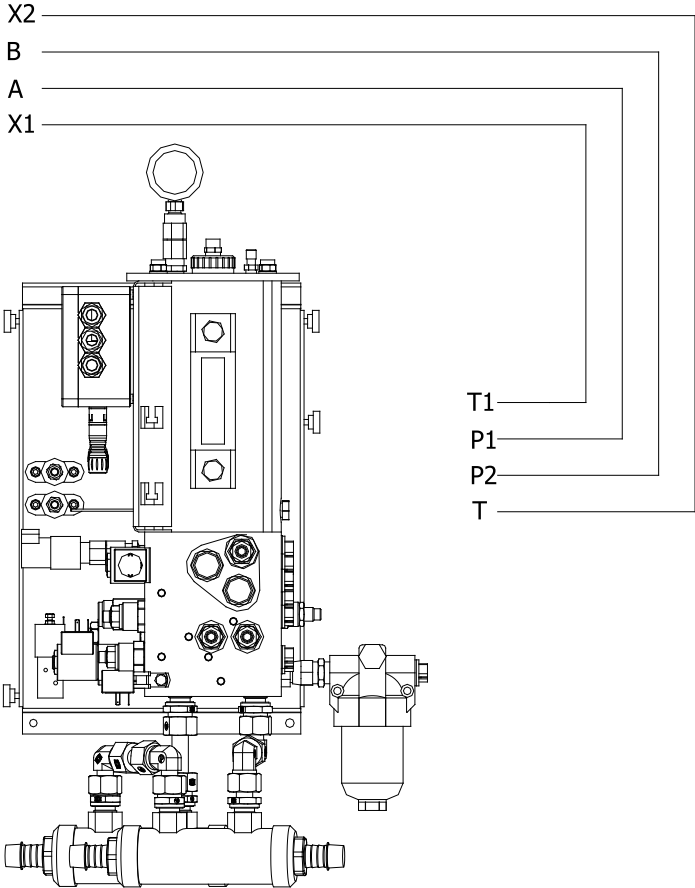
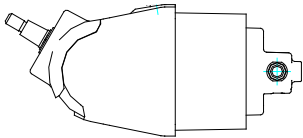


Helm pump

- A: 1/4" BSP - Helm pump pressure port A
- B: 1/4" BSP - Helm pump pressure port B
- X2: 1/4" BSP - Helm pump upper drain port
- X1: 1/4" BSP - Helm pump lower drain port

System unit

- P1: 1/4" BSP - To helm pump pressure port A
- P2: 1/4" BSP - To helm pump pressure port B
- T: 1/4" BSP - To helm pump upper drain port
- T1: 1/4" BSP - To helm pump lower drain port



Filling & Air purging

FILLING AND BLEEDING PROCEDURE

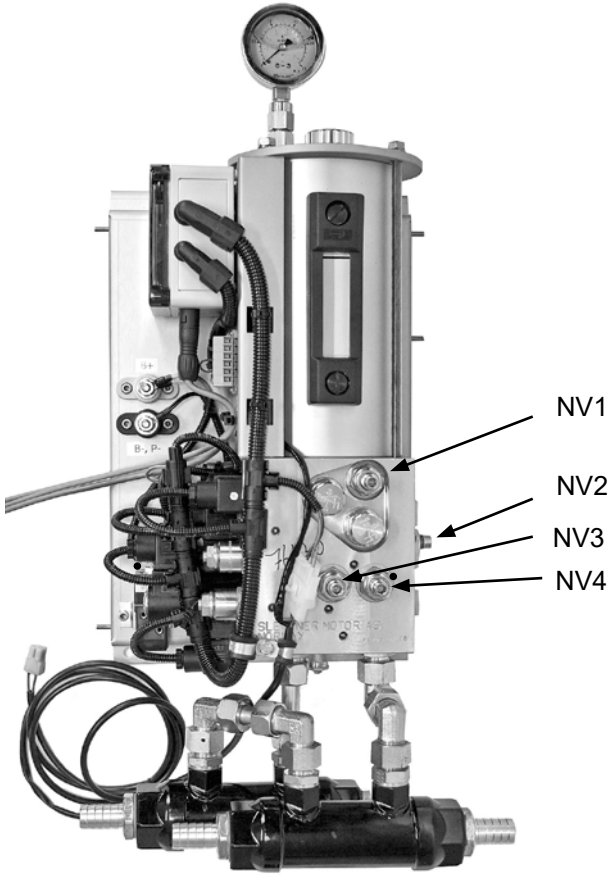
NOTE!

Always ensure that the Servo System (tank) Pressure is released before removing the Tank Filler Cap.
(See IMPORTANT USER PRECAUTIONS AND PROCEDURES)



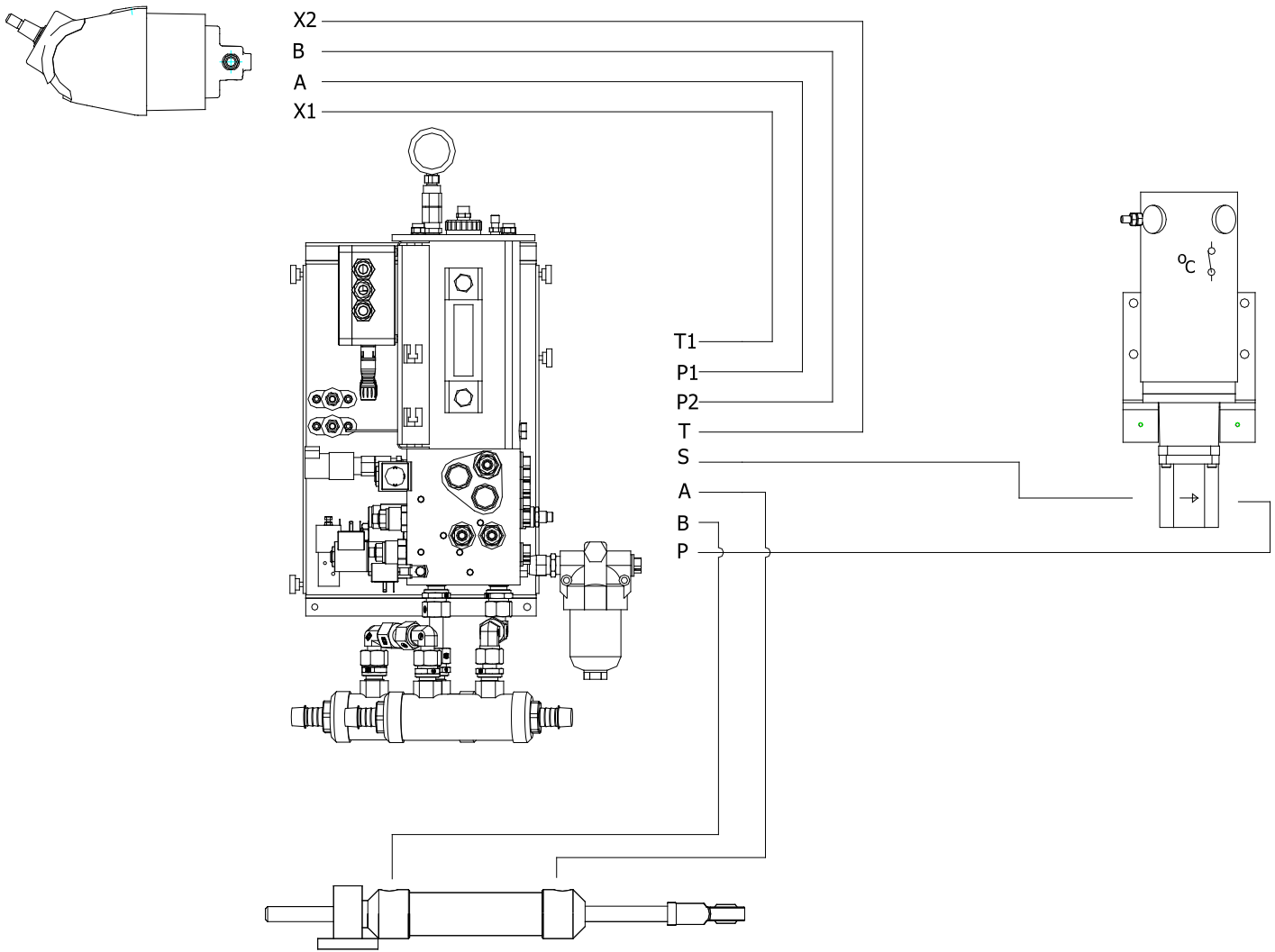
Tank filler cap

- Fill the tank with hydraulic oil ISO-VG-15 (DIN51524-3 HVLP specifications), Ensure that the oil is clean (use a filling filter).
- Set Servo Unit valves to:
 - NV1: Closed (turn CW to stop)
 - NV2: Open (turn CCW to stop)
 - NV3: Open (turn CCW to stop)
 - NV4: Open (turn CCW to stop)
- Switch 'ON' the main power to the Servo Unit.
- Set the Ignition switch to "ON" or activate Engine Override Switch to "UP" (Switch no.2), in the ECU Control Box (page.18)
- Run the pump for 3 minutes by operating the Pump Override Switch (position "UP") (Switch no.1). If the oil level falls below the Level Gauge during bleeding, replenish the oil. NB: Larger yachts require several replenishments of the tank during bleeding.
- Pressurize the tank to 1.5 bar with the supplied air pump (bicycle).
- Wait for 3 minutes
- Turn the steering wheel at the lower steering position (Helm hyd/electric Pump) 20 revolutions to Port, then 20 revolutions to Starboard.
- Reset Servo Unit valves to their initial positions
 - NV1: Open (turn CCW to stop)
 - NV3: Closed (turn CW to stop)
- Deactivate Servo System By switching 'OFF' the Ignition Switch, Engine Override Switch (Switch no.2) and Pump Override Switch (Switch no.1). NB. The steering system now will act as a normal hydraulic steering and will be heavier to operate.
- Finally, rotate the Steering Wheel to one of its end stops and hold with pressure against the stop, for approximately 5 sec. Carry out this procedure in the opposite direction. Repeat this procedure one more time in both directions.
- Check the system for signs of leakage.
- Replenish oil to upper half of the oil level gauge.
- Pressurize the tank to 1.5 bar with the supplied air pump (bicycle).
- Both the Pump Override Switch and the Engine ON switch must be set in the "down" position during normal operations when the Main Engines are running.

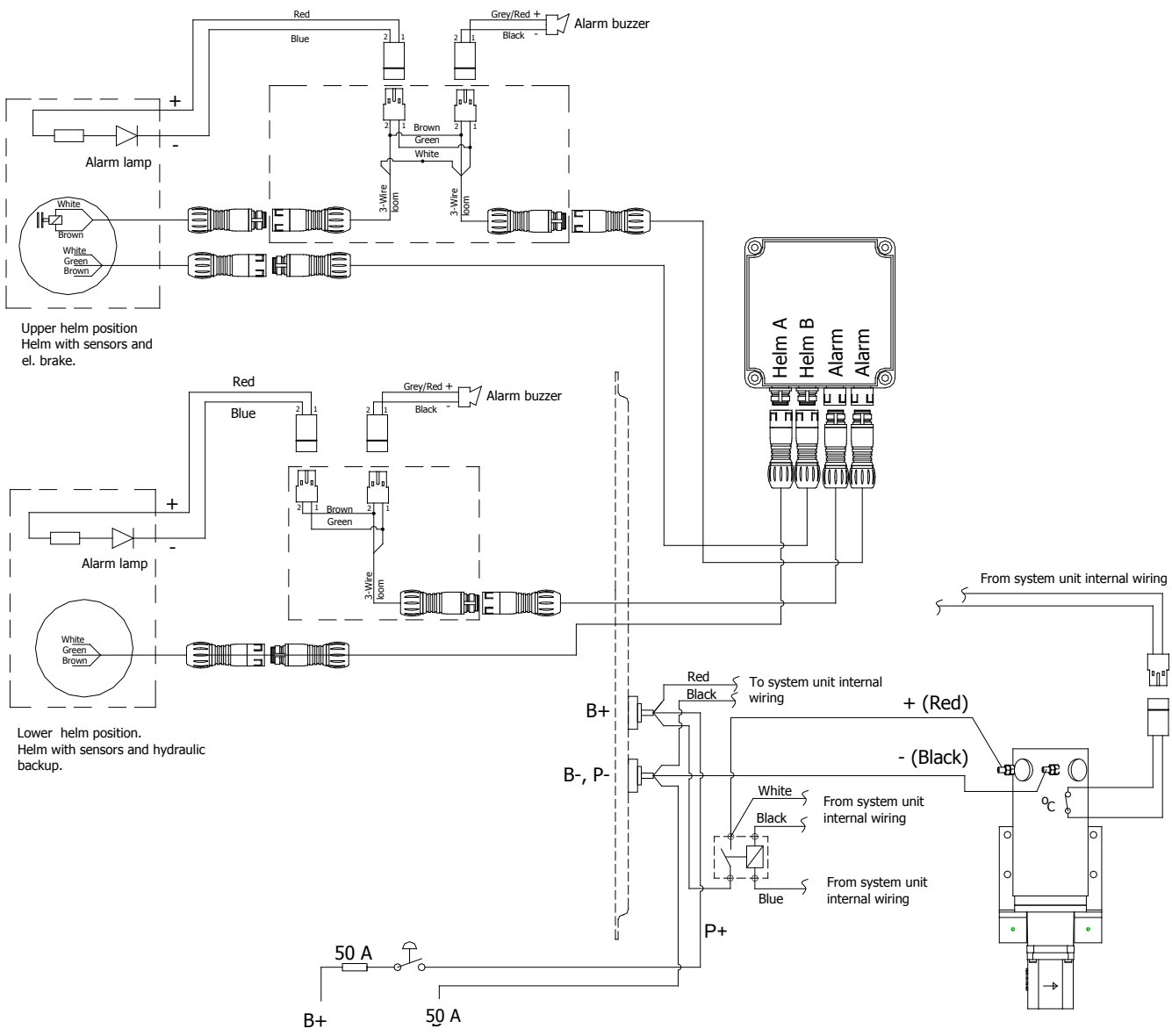


NV2: Closed (turn CW to stop)
NV4: Closed (turn CW to stop)

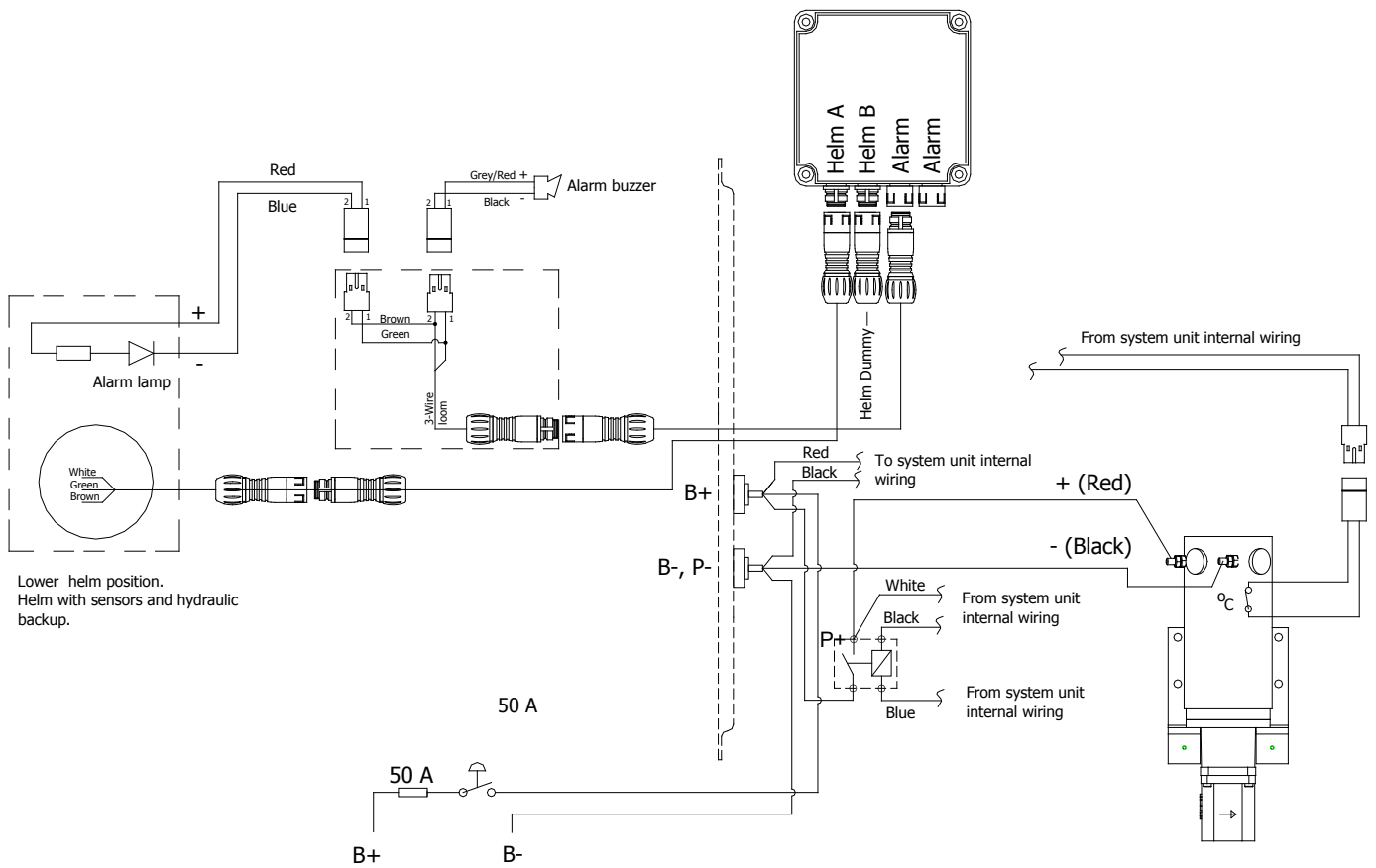
Hydraulic system



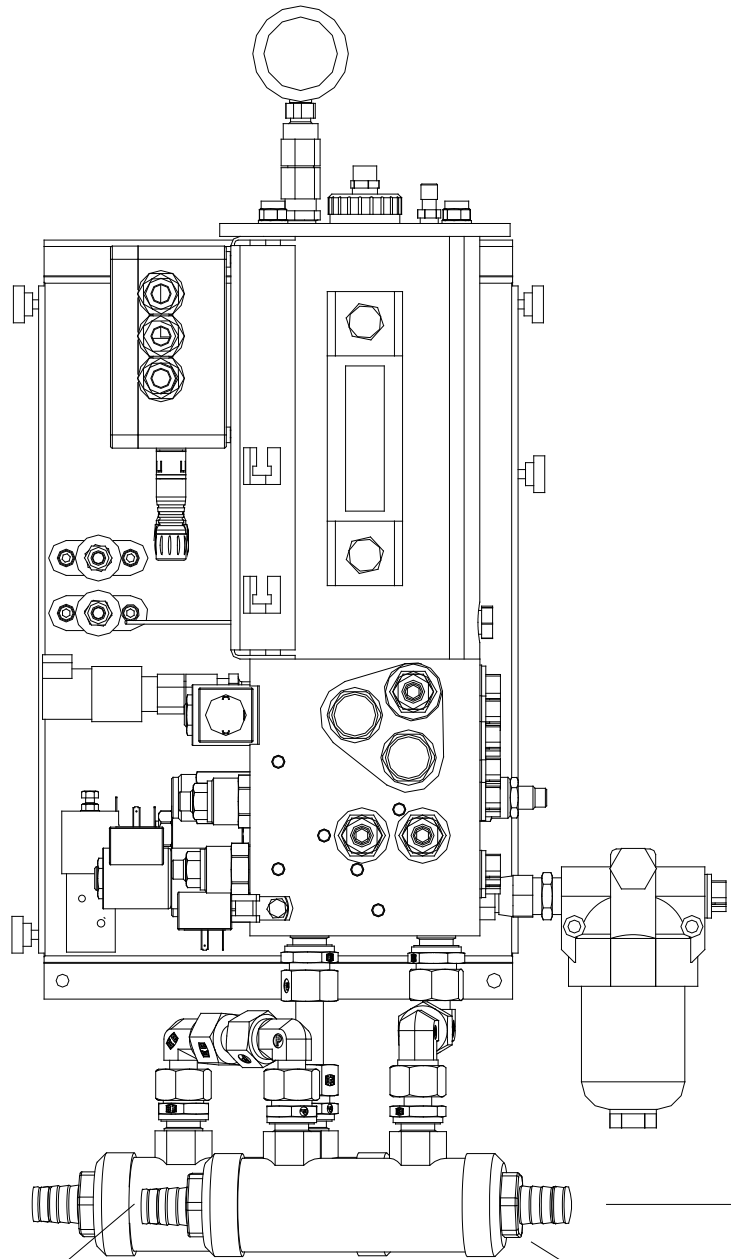
Wiring diagram, Flybridge Yachts (Twin helm)



Wiring diagram, Non Flybridge Yachts (Single helm)



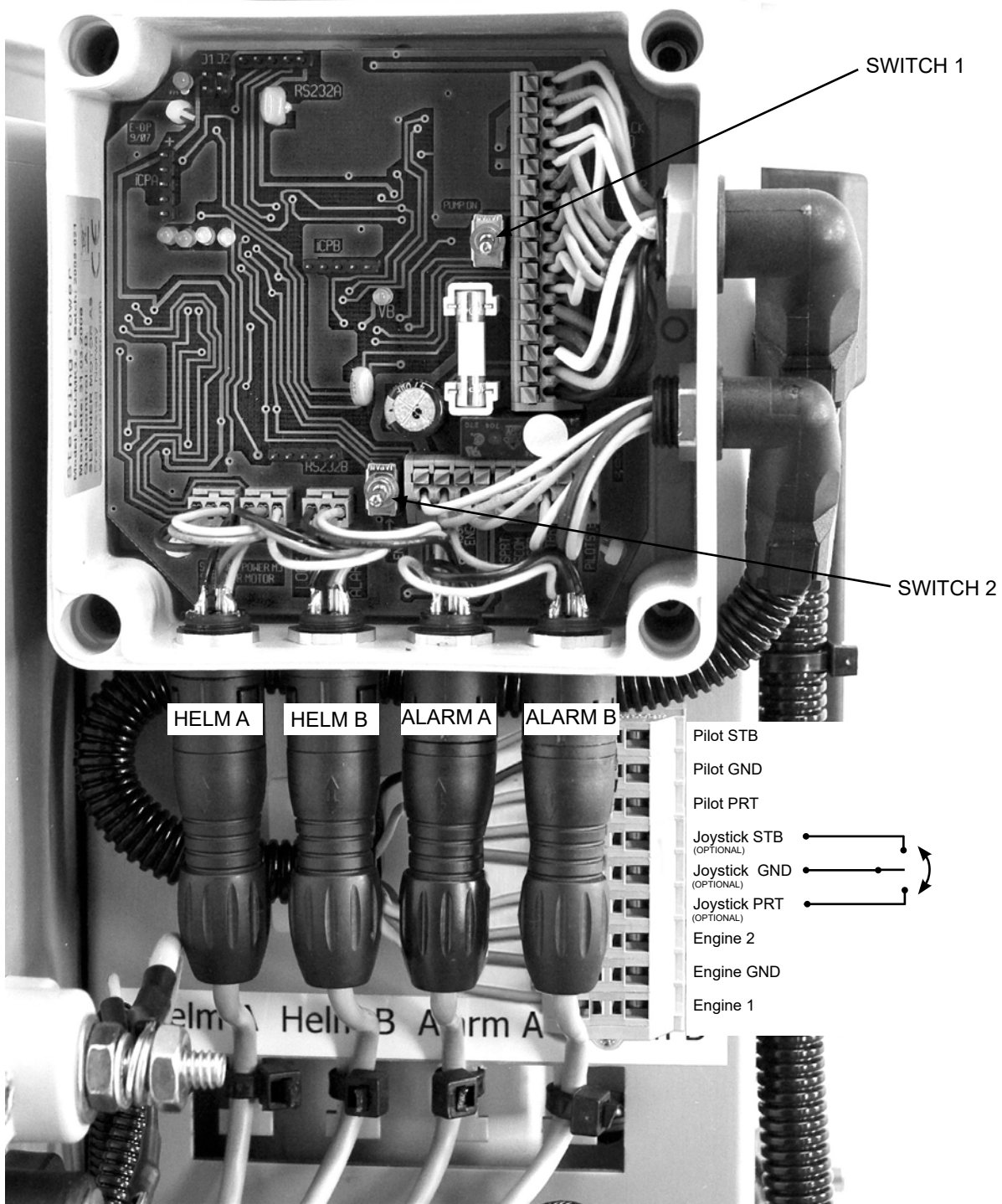
Cooling system



W out

W in

ECU (Electronic Control Unit)



Switches on ECU

1. **PUMP OVERRIDE SWITCH**
 Switch position Down - Normal operation.
 Switch position UP - Override Mode used for system air purging.

2. **ENGINE ON OVERRIDE SWITCH**
 Switch position Down - Normal operation.
 Switch position UP - Override Mode used for system air purging.

Important installation precautions

- All hydraulic components must be installed in a clean environment to avoid contamination
- All hose-ends and connection points should be sealed during the installation.
- Clean oil is of ultimate importance for reliable and trouble free operation in regards to all hydraulic systems.
- Ensure that all bolts and connections are tightened and secure.
- Use Hydraulic Oil ISO-VG-15 (DIN51524-3 HVLP specifications) ONLY.
- Keep all hoses and looms clear of sharp edges and hot surfaces.
- Hoses and looms must be secured adequately to prevent chaffing.
- Thoroughly purge system of air.
- Check for leaks.
- Operate the cylinder from end stop to end stop. Force the steering wheel 1/4 to 1/2 turn further to build up the pressure in the system. Check for leaks.

On completion of installation perform a full functional test of all components including alarm I.e.d. and sounders.

Sealing of Servo Steering System components

Only use the sealing components provided for the Servo Steering System by Steering-power. The use of any unauthorised loctites, sealing compounds or components not provided by Steering-power will disqualify warranty reclamation.

Maintenance

NOTE!

Always ensure that the system (tank) pressure is released before removing the tank filler cap.

Monthly:

- Check tank pressure (Min: 1.25 Bar/18 PSI - Max. 2.0 Bar/29 PSI)
- Check the oil level - visible in the upper half of the level gauge.

NB - If the system oil level is low, carry out the following:

- Check thoroughly for system leakage & replenish as necessary.

6th Monthly:

- Check hoses and connections/fittings for leakages.
- Check hoses for damage (caused by sharp edges, hot surfaces etc).
- Check that all bolts are tightened and secure.
- Ensure that bearings and joints are lubricated and free to rotate

Yearly/every third year:

- The Hydraulic Oil and Filter require replacing after the first years service, and then consequently every third year there after.
- Check DC motor brush wear yearly

For further support, contact you dealer or other authorized service personnel.

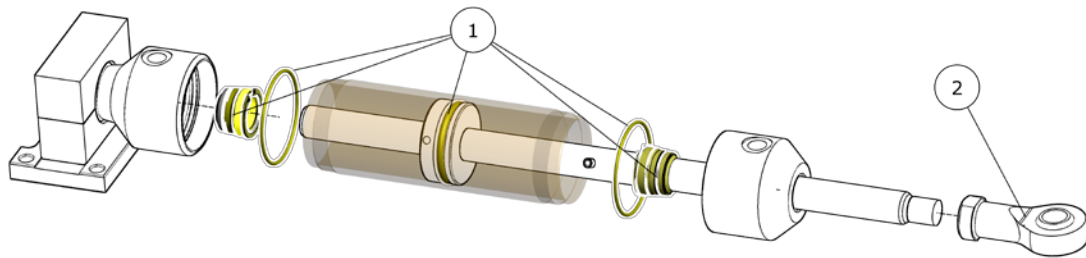


Warranty Statement

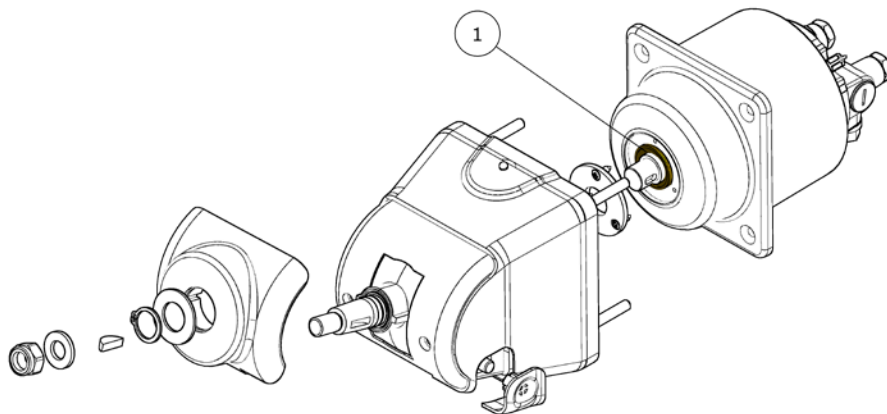
1. The equipment manufactured by Sleipner Motor AS (The "Warrantor") is warranted to be free from defects in workmanship and materials under normal use and service.
2. This Warranty is in effect for of two years (Leisure Use) or one year (Commercial use) from the date of purchase by the user. Proof of purchase must be included, to establish that it is inside the warranty period.
3. This Warranty is transferable and covers the product for the specified time period.
4. In case any part of the equipment proves to be defective, other than those parts excluded in paragraph 5 below, the owner should do the following:
 - (a) Prepare a detailed written statement of the nature and circumstances of the defect, to the best of the Owner's knowledge, including the date of purchase, the place of purchase, the name and address of the installer, and the Purchaser's name, address and telephone number;
 - (b) The Owner should return the defective part or unit along with the statement referenced in the preceding paragraph to the warrantor, Sleipner Motor AS or an authorized Service Centre, postage/shipping prepaid and at the expense of the Purchaser;
 - (c) If upon the Warrantor's or Authorized Service Centre's examination, the defect is determined to result from defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense;
 - (d) no refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. Prior to refund of the purchase price, Purchaser must submit a statement in writing from a professional boating equipment supplier that the installation instructions of the Installation and Operation Manual have been complied with and that the defect remains;
 - (e) warranty service shall be performed only by the Warrantor, or an authorized Service Centre, and any attempt to remedy the defect by anyone else shall render this warranty void.
5. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically designed as waterproof.
6. No other express warranty is hereby given and there are no warranties which extend beyond those described in section 4 above. This Warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, and any other obligations on the part of the Warrantor or its employees and representatives.
7. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, loss of income or profit, or any other consequential or resulting damage or cost which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure or malfunction of the equipment, or part thereof.
8. The Warrantor assumes no liability for incidental or consequential damages of any kind including damages arising from collision with other vessels or objects.
9. This warranty gives you specific legal rights, and you may also have other rights which vary from country to country.

Spare parts

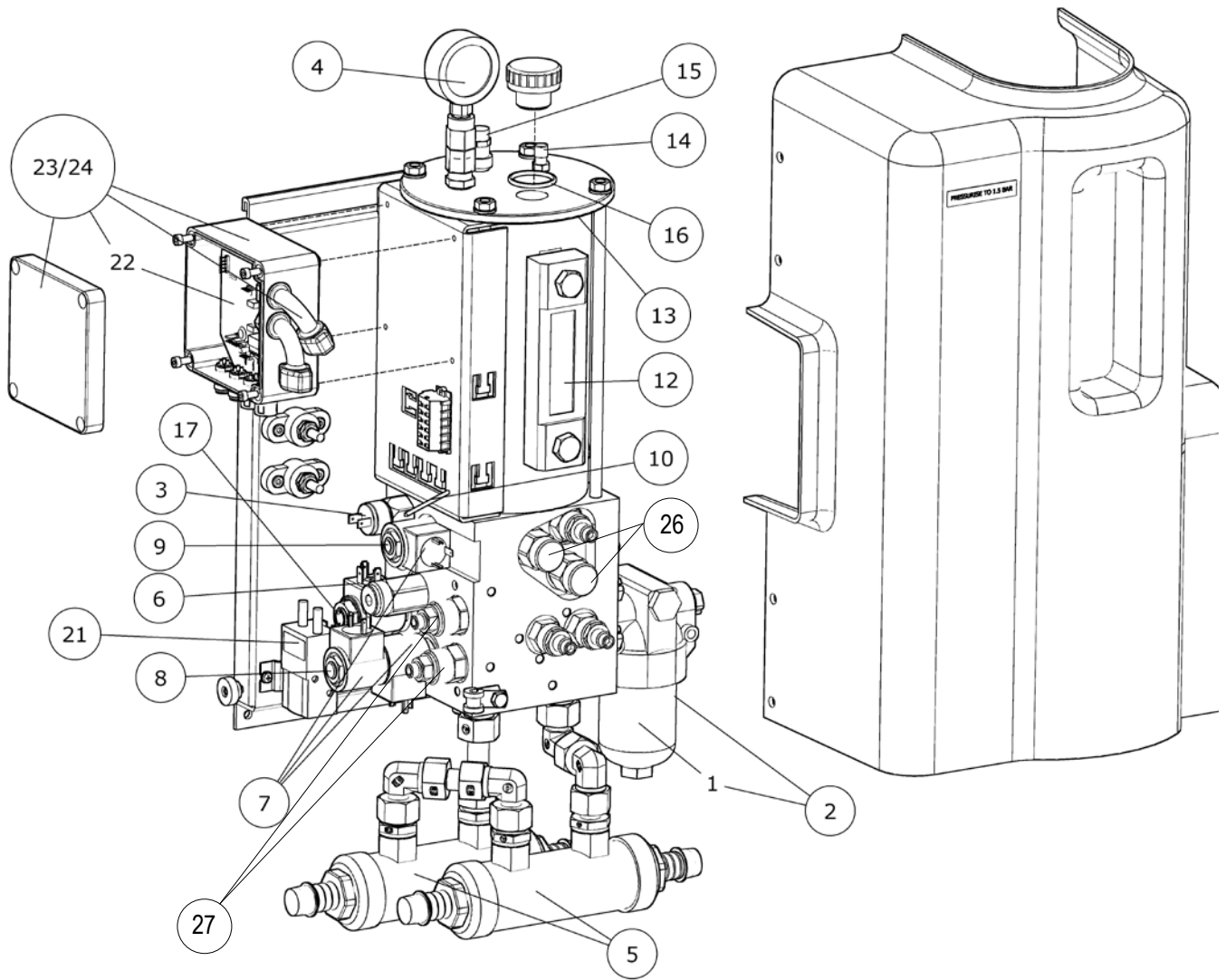
Steering Cylinders	71140P190	71220P190	71220P220
1 Seal kit	75140	75220	75220
2 Rod-end	73051	73051	73051



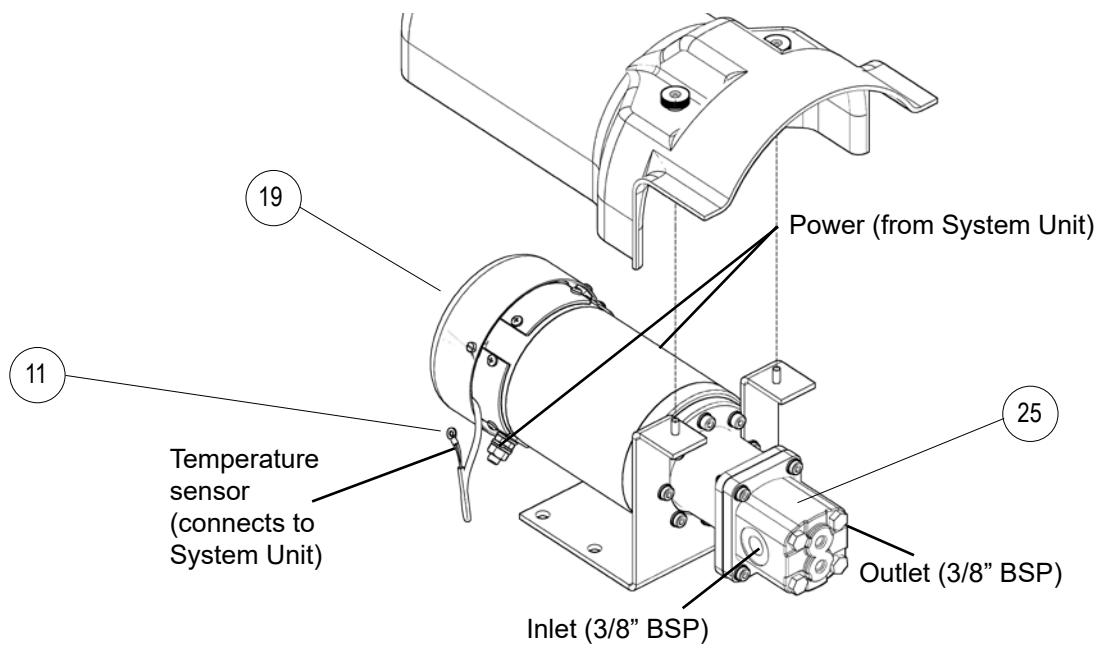
Helms	74085	74087B
1 Shaft seal helm	74008	NA



Spare parts



Servo pump unit





Spare parts

		ESPE600	ESPE700
1	Filter element	74283	74283
2	Complete filter	74091	74091
3	Pressure switch	74310-KIT	74310-KIT
4	Pressure gauge	74227	74227
5	Cooler kit	74065-2	74065-2
6	Coil servo/prop. Valve	74265	74265
7	Coil dir. control valves and lock/bypass valve	74266	74266
8	Valve cartridge, directional control valve	74263	74263
9	Valve cartridge, lock/bypass valve	74262	74262
10	Temp sensor tank	74231	74231
11	Temp switch motor	74274	74274
12	Sight Glass/Level Gauge	74320	74320
13	O-rings tank cover	74219	74219
14	Air filler valve	74076	74076
15	Tank pressure relief valve	74223	74223
16	O-ring oil filler plug	74216	74216
17	Valve cartridge, servo valve	74260	74261
18	Pump/motor unit	74000	74000
19	DC motor*	74217-R	74217-R
19.1	Brush kit**	74369	74369
20	Cover for pump/motor unit	74220A	74220A
21	Motor starter relay	6 8877	6 8877
22	ECU Circuit board MK3	74294-600	74294-700
23	ECU complete with harness MK2-MK3***	74291-MK2-3-600	74291-MK2-3-700
24	ECU complete with harness MK1-MK3****	74291-MK1-3-600	
25	Gear pump	74089	74089
26	Helm insulation valves	74303	74303
27	Load holding valves	74302	74302

* New cover 74220A required

** For motor type with fan

*** Upgrade kit for systems delivered up to Spring 2008. S/N and picture required.

**** Upgrade kit for systems delivered 2006/early 2007. S/N and picture required.

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