SIDE-POWER
Stabilizer Systems

vector FINS

Installation guide

SPS93B series with vector fins™ VF1650

US Patent US9527556
AU Patent AU2013335369
Patent pending: PCT/NO2013/050067

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INDEX

Stabilizer functions

The fin stabilizers function is to reduce the roll of the boat, and how efficiently they can do this will depend on several factors. The main factor is of course the size of the fins compared to the boats "stabilizing requirements", but also the fin positioning on the hull which in turn decides the angle they work and leverage arm length around the boats centre of gravity are important factors to overall efficiency.
In principle, the bigger the stabilizer fins, the more you can reduce your roll, but there are certainly limits also, because there will always be a limit to the size of fin stabilizers you can or wish to fit on a boat. These limitations are typically decided by: space requirements compared to available space in the boat, a limitation in the added drag and potential speed loss you wish to have, budget limitations and so on. Your Side-Power representative will be able to help make an educated decision for what is the best solution (or compromise if you wish) for your boat and your preferences.
The typical or default size suggestion will be that the stabilizers are calculated to the best of our abilities and based on the provided data to reduce the roll at your chosen "minimum stabilizing speed" of approximately 5 degrees. But please note that this is not a guaranteed figure as there are still many factors out of our control. They will reduce the roll less at lower speed, and more at higher speeds. The "AnySpeed" or as also called, "zero speed" or "at anchor" stabilization, if chosen, is by default calculated to reduce the roll by approximately 4 degrees.
If these factors of roll reduction are less than what you are looking for, please double check the stabilizer sizing with your Side-Power representative before starting the installation so that we can be sure that you are not installing parts and products that will not meet your expectations.

Installation planning

Please follow this general guide for steps to prepare and plan your installation process:

- Find the best possible position of the fins based on the information provided in the sections about:
- Safety and General precautions
  Measurements
- Please note the very flexible installation methods possible including off-set angle installation
- Possible with Side-Power stabilizers as this might enable installation in positions more suited and efficient than possible with some other brands or types of fin stabilizers.

- Fin positioning
- Hull forces
- Ensure that it is space to do the reinforcement of the hull if necessary

Plan the installation of the hydraulic parts including hose / pipe runs based on the information provided in the sections:

Basic hydraulic installation
AC power pack
Noise considerations
Relevant hydraulic diagram with hose specifications for your particular system

Plan the installation of the electrical parts including the control panel and wiring runs based on the information in the sections:

Power supply
S-link wiring
Control panel installation

WARNING!
Information given or illustrated as a WARNING may cause personal injury if it is disregarded.

IMPORTANT!
Information given or illustrated as IMPORTANT may cause system and property failure if it is disregarded.

NOTE!
Information given or illustrated as a NOTE will facilitate the installation and work of the Side-Power system.

Important Notice

Sleipner Motor AS is a manufacturing company of marine equipment (Side-Power) and not a Naval Architectural company & therefore will bare no responsibility in regards to the installation of our products onto sea going vessels. This includes any requirement for the vessels hull reinforcement, change in stability, its dynamic performance, its weight and moment, its noise proofing or its watertight integrity after installation during normal operations or in the event of a collision.

It is the responsibility of the installer/boat builder to determine hull reinforcement requirements, ensuring that sufficient strengthening measures are in place & the vessels hull will withstand & maintain watertight integrity in the event of a collision of our product, impacting an object when the vessel is underway.

The recommendations made in this manual are to be used as starting guidelines only, and Sleipner Motor AS (Side-Power) strongly recommend that advise prior to installation should be obtained from a naval architect familiar with the particular vessel brand, prior to installation.

General description

The Side-Power Stabilizer System consists of two under water moveable fins located on shaft and actuator assemblies penetrating through each side of the yachts hull and hydraulically powered with a Side-Power compact Hydraulic System. The system is electronically gyro controlled utilizing the Side-Power S-link (CanBus) network system & stabilizes the yachts rolling motion in the water at various speeds and sea conditions or at anchor (optional).

General Information, Safety Precautions and Warnings.

Prior to installation it is important the installer reads this manual thoroughly to ensure necessary knowledge of the product. The installer must also use the Hydraulic system manual and specific system manual as supplement in order to ensure necessary knowledge to complete the installation.

The Installation Manual is intended to support educated/experienced marine engineering personnel and therefore not sufficient in all details for the correct installation of the product - general engineering standards & practices must be followed.

Personnel are required to use necessary personal safety equipment to prevent injury in accordance with health and safety directives.

The stabilizer product includes heavy parts therefore suitable lifting and support equipment is required during installation & removal to prevent material damage or personnel injury.
Before any servicing work is carried out on the stabilizer system, ensure electrical & hydraulic power is switched off.

WARNING!
Stabilizer systems with 'at anchor' function installed & 'Auto' selected can suddenly operate & move without warning.

During yacht lifting operations, ensure the stabilizer fins are in the locked/neutral position and lifting personnel are informed that stabilizer fins are installed, preventing the danger of snagging the lifting slings & damage to the yacht, its equipment or injury to personnel.

NOTE!
Yacht transportation over land with road vehicles may require for the removal of the stabilizer fins & shafts. Please contact Side-Power representatives for instruction procedures.

Hydraulic operated equipment must be clean and debris free at all times, therefore do not remove the equipment orifice protection blanks or covers until ready for use, preventing ingress of undesired contamination.

WARNING!
Hydraulic equipment (including Nitrogen pressure filled accumulator) operates at high pressure; therefore ensure that all system pressure is released before carrying out any servicing work. Never carry out any welding, soldering or mechanical work on the accumulator unit!

Avoid applying anti-corrosion protection lubricants to the hydraulic actuator cylinder rods as this can attract dirt and debris causing oil leaks due to damaged seals.
On completion of the installation and yacht launch thoroughly check for leakages & the yachts hull watertight integrity is maintained.

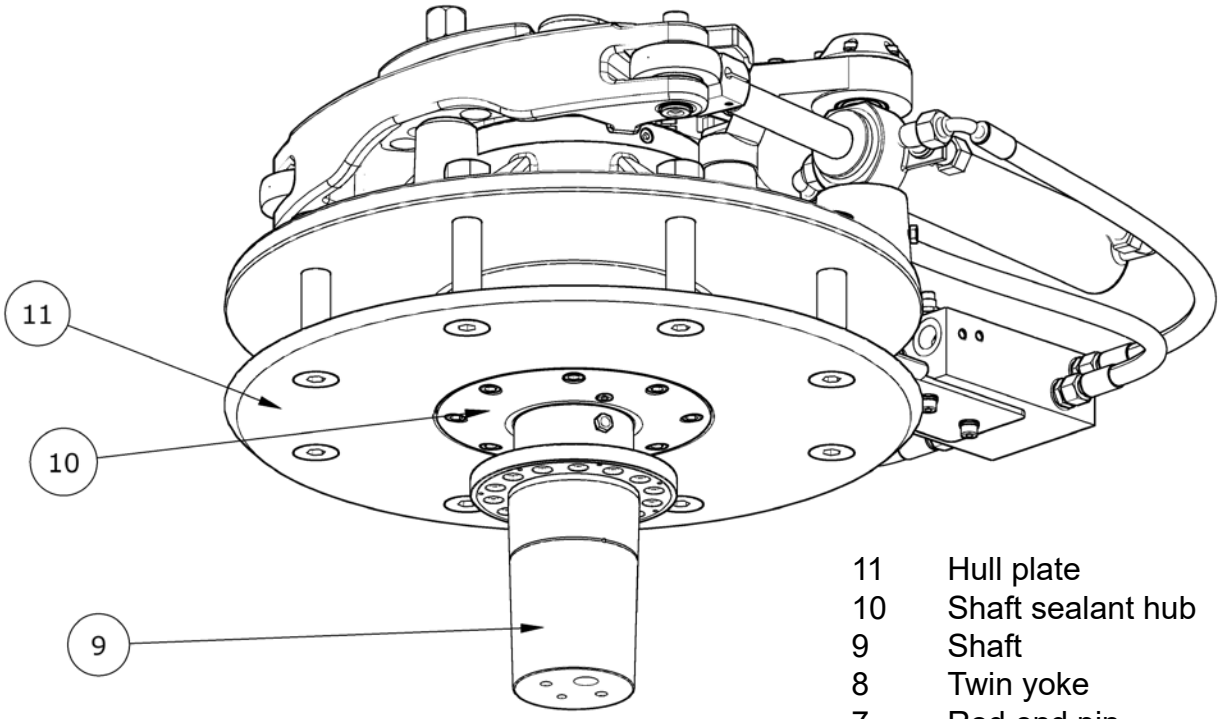
Yacht design considerations

Provide servicing access hatches to stabilizer actuator assemblies for the removal & installation of Stabilizer fin shafts as & when required.

When the Stabilizer System 'At Anchor' function (optional) is installed, position and sound proof the hydraulic power pack (AC generator & pump)& sound proofing of the actuator assembly compartments and hydraulic hose runs, such that the noise the equipment emits doesn't disturb sleeping passengers.

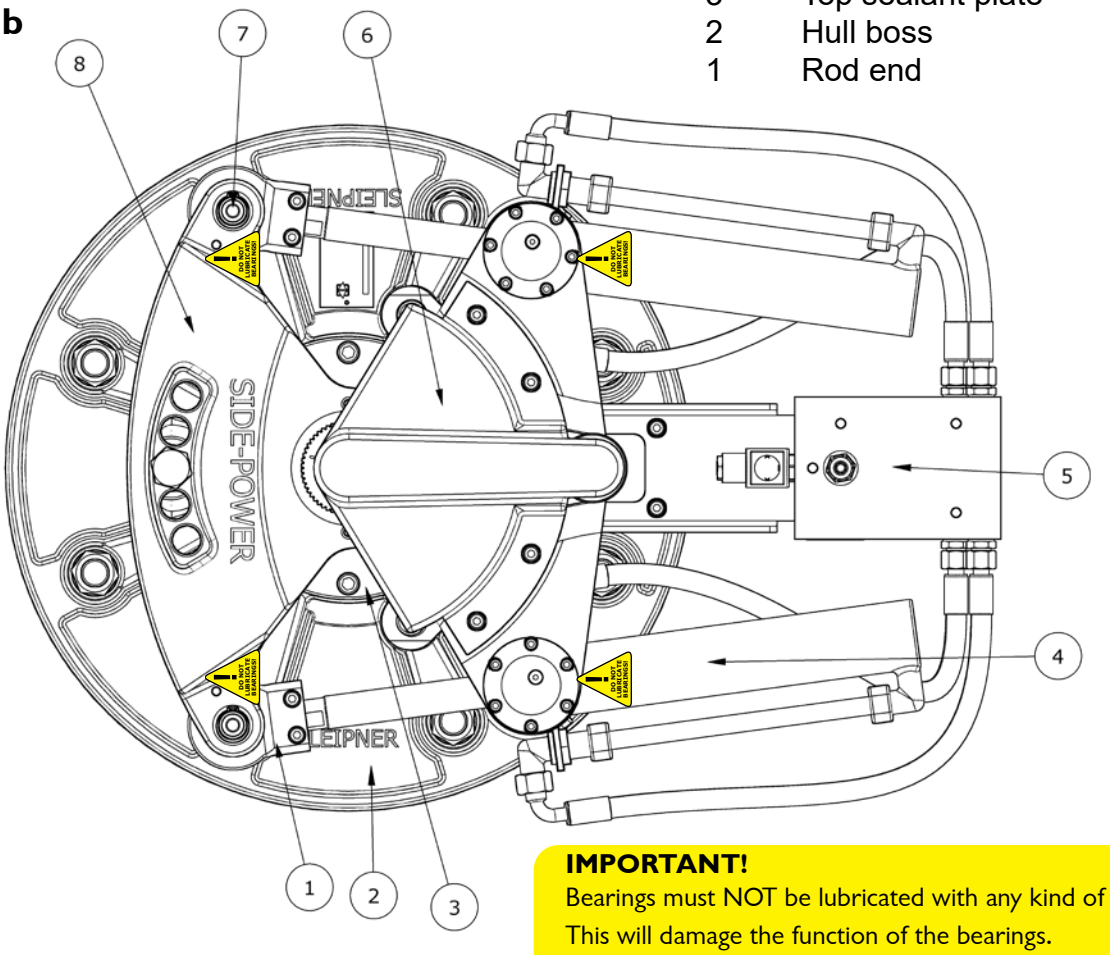
Provision is made to ensure yachts watertight integrity is maintained in the event of a fin collision.

Fig. 1a



11	Hull plate
10	Shaft sealant hub
9	Shaft
8	Twin yoke
7	Rod end pin
6	Cover, encoder
5	Actuator Valve Unit
4	Cylinder
3	Top sealant plate
2	Hull boss
1	Rod end

Fig. 1b



IMPORTANT!
Bearings must NOT be lubricated with any kind of lubrication.
This will damage the function of the bearings.

Fig. 2a

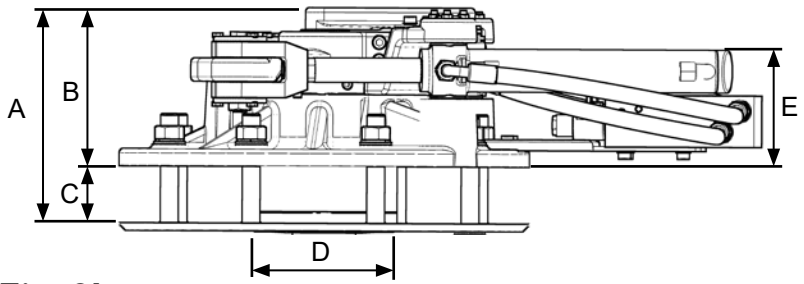
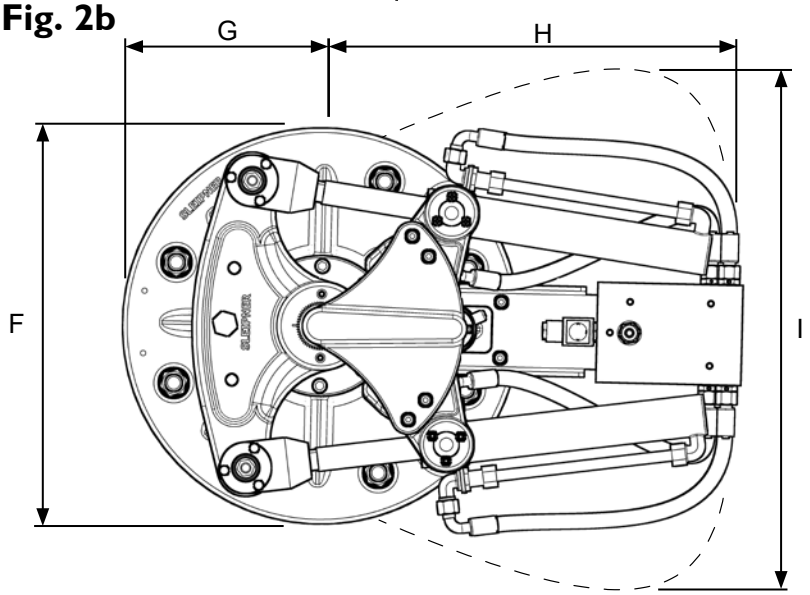


Fig. 2b

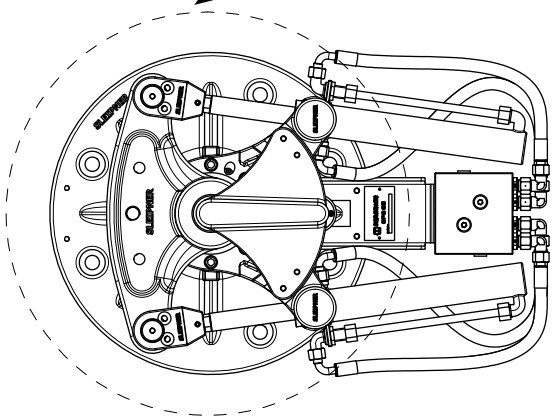


Actuator:	**SPS93B**
A (mm):	346
B (mm):	260
C (mm)*:	86*
D (mm):	235
E (mm):	172
F (mm):	600
G (mm):	300
H (mm):	571
I (mm):	700
Shaft Ø (mm):	90
Weight** (kg)	183

* Strengthened hull must be levelled to 86mm to make an even mounting surface with correct thickness. Tolerances: +0/-5mm (sealant included)

** Complete actuator assembly, per side

Fig. 2c

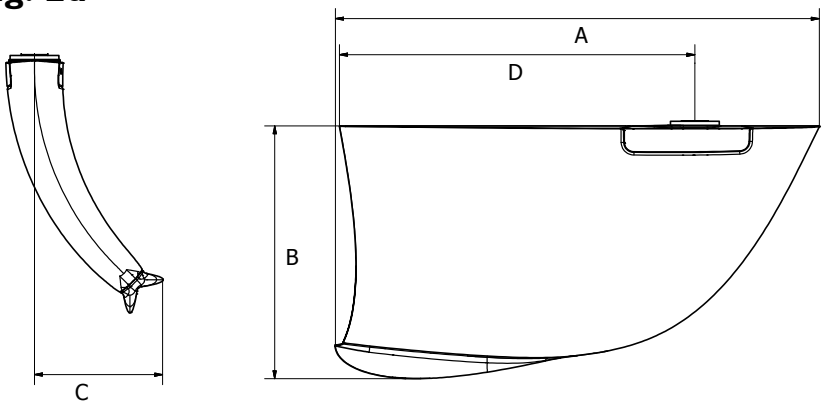


Fin actuator assembly may be installed in any convenient radial 360°

IMPORTANT!

Ensure to consider and plan the positioning/orientation of the actuator to achieve full fin range of movement in both directions. It is also important to achieve correct fin alignment that is parallell to the yachts keel.

Fig. 2d



Vector fin:	**VF1650**
Size (m²):	1.65
A (mm):	2081
B (mm):	1054,1
C (mm):	533
D (mm):	1481

Fins have zero weight in water

Important!
Ensure that all equipment with physical functions (actuators, valves, electrical & hydraulic connection points) are installed so that you allow space in the boat after reasonable dismantling of other parts or interior / furniture (fit service hatch or similar) for service access as per the following illustrations to get ample room for maintenance and any necessary service or repairs.
This is the installer / boatbuilders full responsibility.

Fig. 3a

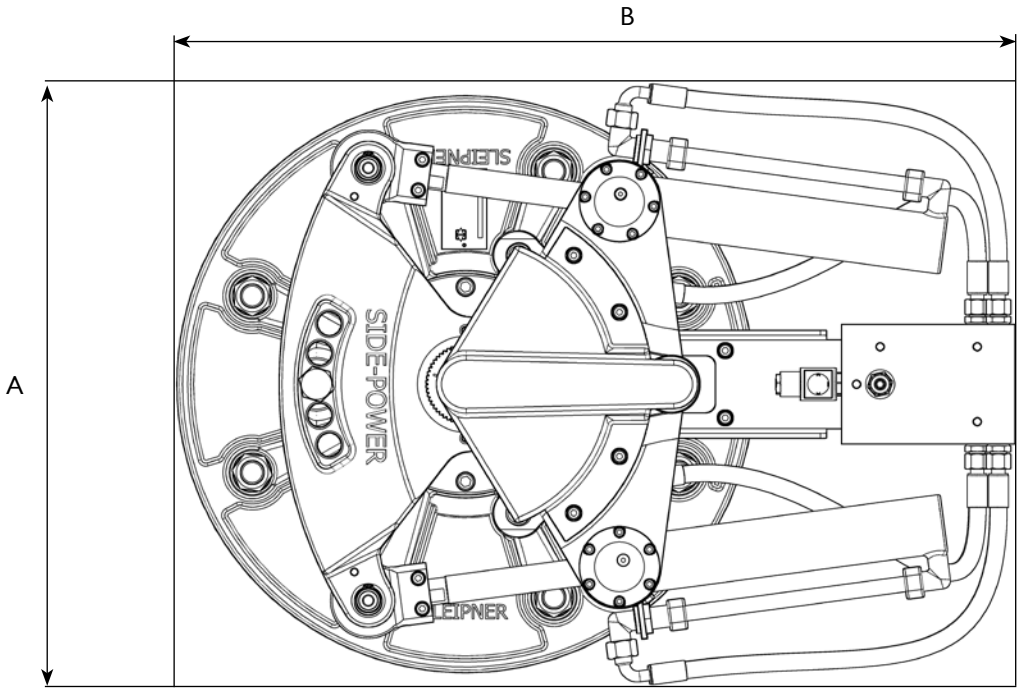
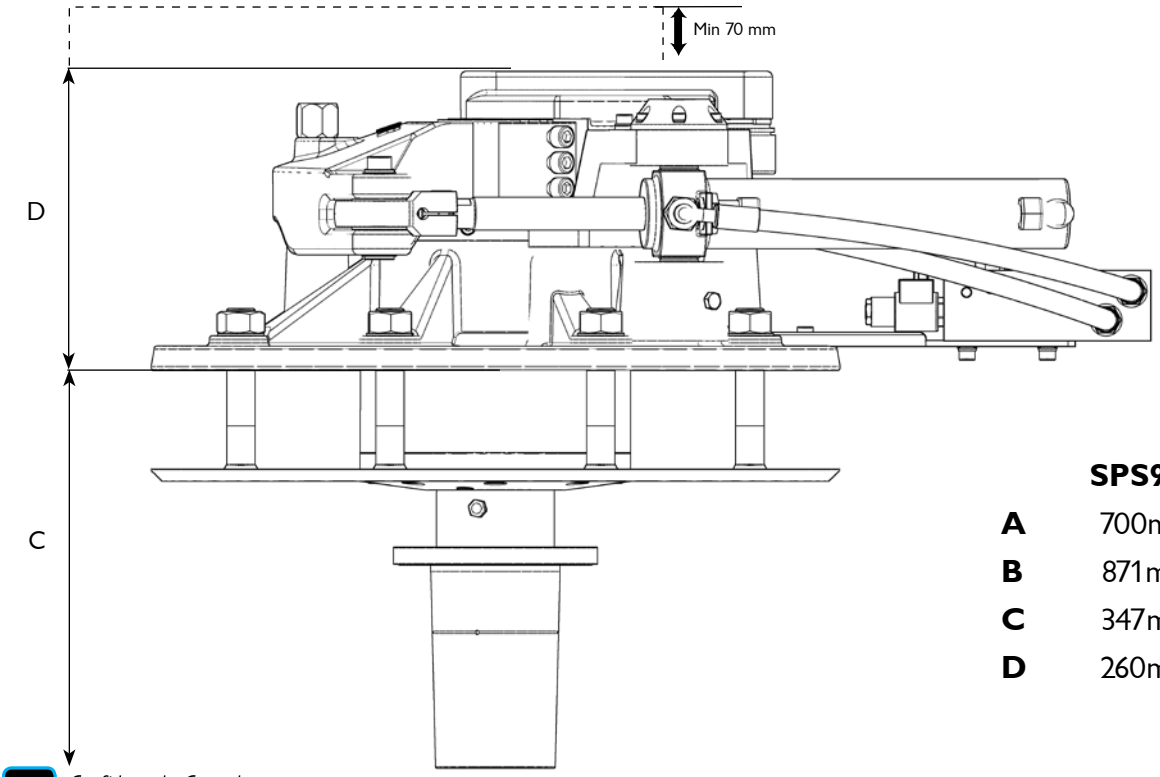


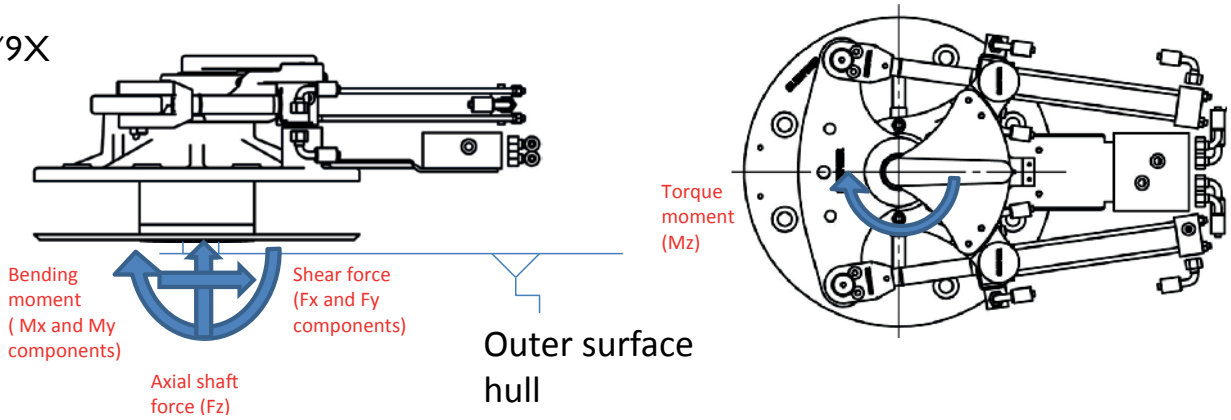
Fig. 3b



SPS93B	
A	700mm
B	871mm
C	347mm
D	260mm

Fig. 4a

SPS6X/9X



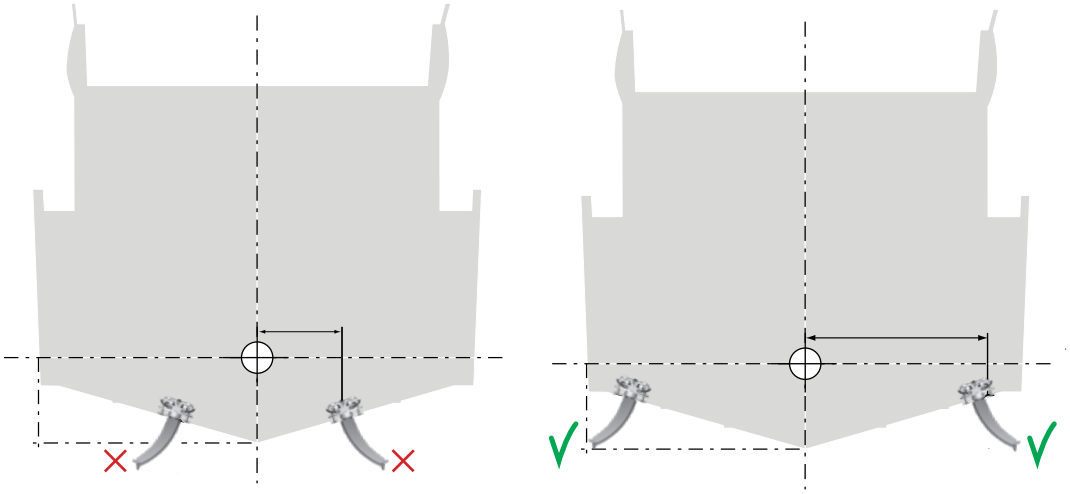
Note that all calculated values are nominal and found by equilibrium considerations and also that various coefficients are inaccurate as hull design etc will affect the actual fin effect. Dynamic effects such as jumps/impacts with waves, backflow closing of valve etc could further increase the hull/shaft loads. Therefore all dimensioning should account for this by using a safety factor.

The aft top face of the fin is deliberately made weaker than the rest of the fin so it will break easier in case of an impact with the hull. If the shaft bends by hitting something in the water or the ground, the fin is still a strong part.
We generally advice that the hull is strengthened, or at least made with materials suitable to sustaing impacts over the total length of the fin within an area of approximately 10 degrees fin rotation in each direction from center as an extra safety measure to be absolutely sure that the fin is prevented from breaking through the hull in a collision situation.

The Vector Fin design also has benefits in hull safety, with the fins being curved, any impact with the ground will not only bend the shaft backwards, but also outward, allowing the fin to break away with less stress on the hull.

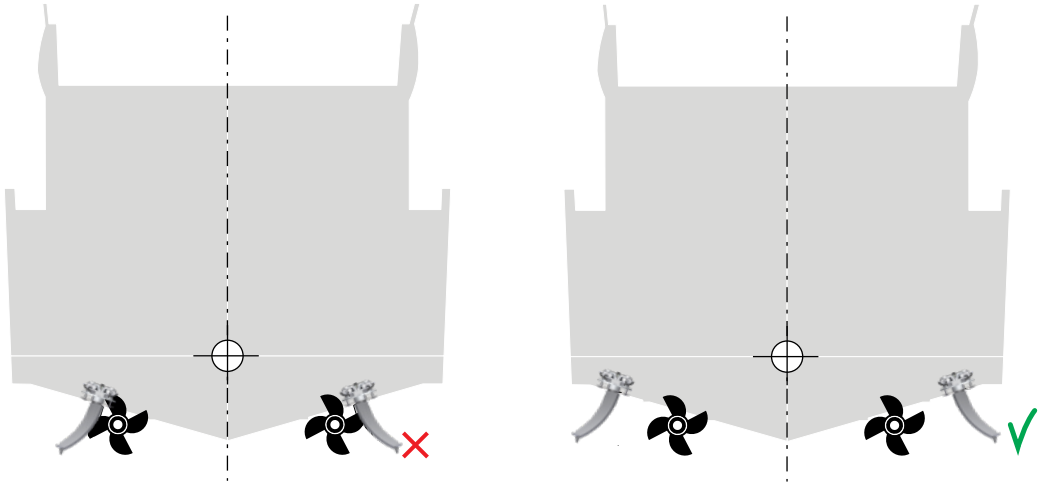
FIN LOADS ON HULL						
Fin size	Speed	Bending moment (Mx+My)	Twisting torque (Mz)	Axial shaft (Fz)	Shear force (Fx+Fy)	Shaft breaka-way
SPS93 VF1650	10 kn / Min	11500 Nm	7000 Nm	8000 N	18000 N	940 kN
	15 kn	13500 Nm	7000 Nm	10500 N	19000 N	940 kN
	20 kn	17500 Nm	7000 Nm	12500 N	21000 N	940 kN
	25 kn	20000 Nm	7000 Nm	14500 N	23000 N	940 kN
	30 kn	20500 Nm	7000 Nm	15000 N	28000 N	940 kN
	35 kn	20500 Nm	7000 Nm	15000 N	38000 N	940 kN
	40 kn	20500 Nm	7000 Nm	15000 N	38000 N	940 kN

Fig. 5a



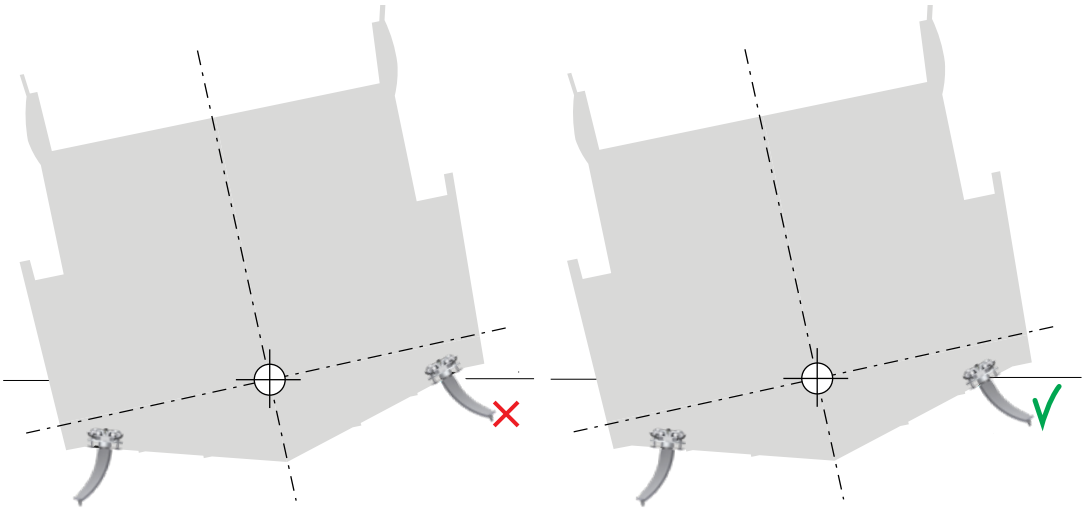
Fins should ideally not extend outside the beam or below the keel when in neutral position.

Fig. 5b



Fins should be placed as far outboard as possible, and NOT inline with the propellers, to ensure avoiding possible disturbance of the waterflow to the props which in the worst case can cause vibrations / cavitation.

Fig. 5c



No part of the fin should be above water level during normal roll motion/under normal sea conditions.

Fig. 5d

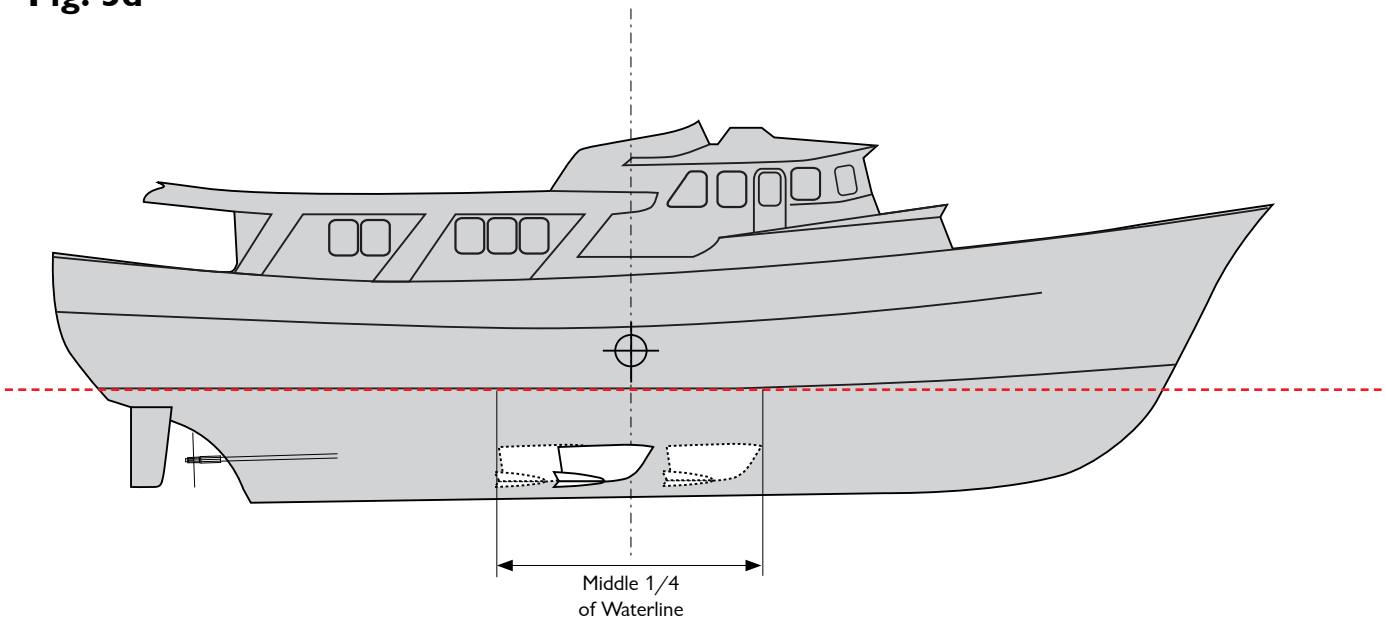
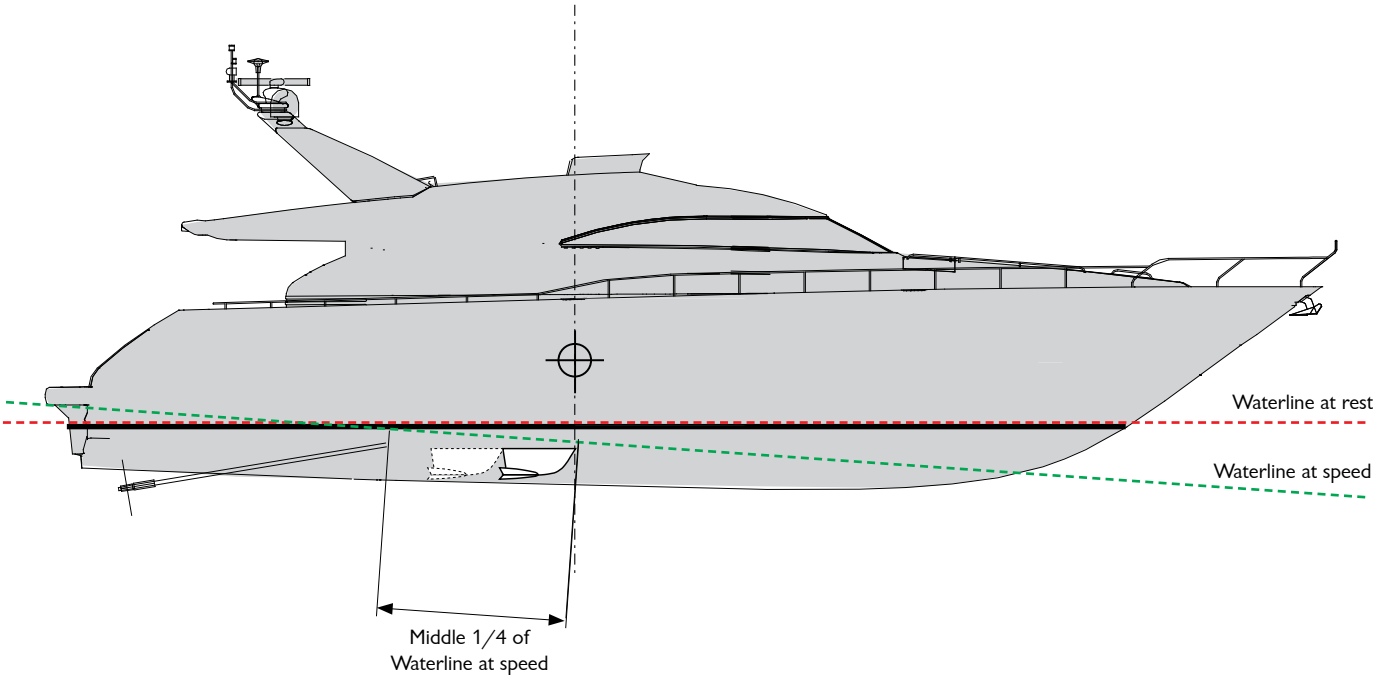


Fig. 5e



To avoid unwanted influences on the steering characteristics, the fins should be placed close to the vessel longitudinal center of gravity (LCG) - If unknown, this is usually a little aft of 50% of the waterline length.

For high speed vessels, the fins should be placed with trailing/leading edge within middle 1/4 of waterline length at speed and not in front of the LCG.

For vessels with top speed under 15 knots, fin may be placed within the middle 1/4 of waterline length.

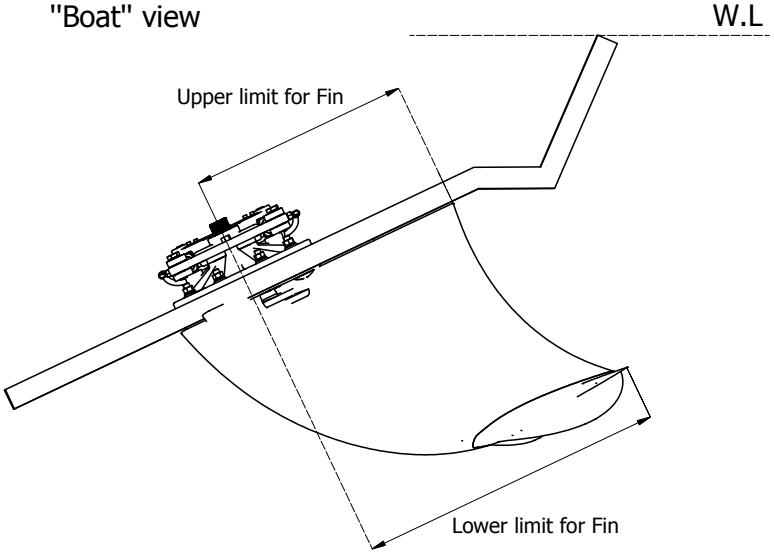
Transversal fin positioning of Vector Fins™

With Vector fins™ it is a priority to push the fins as far outboard as possible to achieve the most possible leverage for the fins forces (unlike standard fins, see illustration on front page).
With Side-Power stabilizers it is possible to install the fins so they have different stroke angles innboard and outboard as the locked center and cruising center is totally flexible because they are locked hydraulically.
Another point that is well worth considering as such is to avoid having to cut off any of the back top of the fin (normal on most fins on hard-chine boats) as this cut-away will cause added resistance/drag by the fin due to the "bigger hole" this area will make in the water in higher speeds, as well as the big distance the aftward part of the fin (the most efficient area in at anchor stabilization) will loose force also as part of the water will pass easier between the hull and the fin.
Also, because of the outward "bend" of the fins, keeping the lower part inside the boats "envelope" will also result in the upper part of the fins being further inboard than they would on straight fins – so you will naturally have less of an outboard stroke in the upper part of the fin (along the hull).
There are many considerations for fin and actuator positioning, and often it is the inside configuration and space that ends up playing a major part of the decision.
In general – push the actuators as far as possible outboard – while keeping at least 22 degrees of outboard stroke as a minimum (if less, and lower part is within boat envelope, a small cut-away of the back upper part can be done as a compromise). If inside configuration / access to inside parts of actuators etc. dictates moving further inboard this is fine, but the performance will be reduced slightly due to less leverage arm for the stabilizing force applied by the fins.

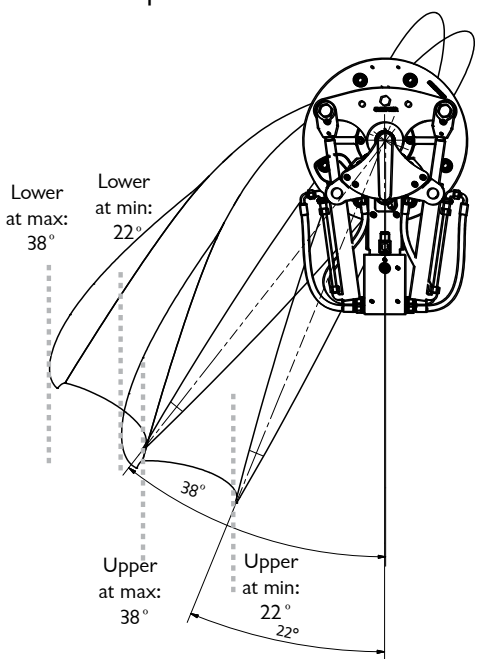
Measurements along hull bottom outwards to chine(upper) and outside boat "envelope" (lower) in mm, center shaft to chine start / outside envelope:

Fin size	At maximum: 38° Upper / lower	At minimum : 22° Upper / Lower
VF650	575 / 810	350 / 625
VF800	642 / 900	390 / 695
VF1050	731 / 1016	444 / 791
VF1350	828 / 1150	504 / 897
VF1650	914 / 1305	557 / 1001

"Boat" view



"Top" view



FIN MODIFICATION

In case of the fin positioning being so that you need to cut down some of the top aft end of the fin to avoid it hitting the hull (very typical on planning boats with hard chines), please do so as per the instructions below.

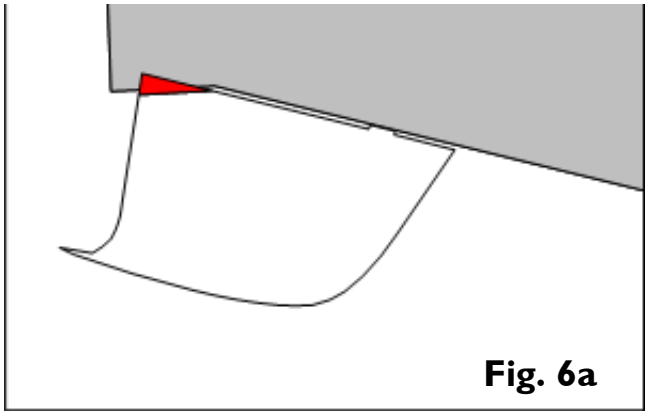
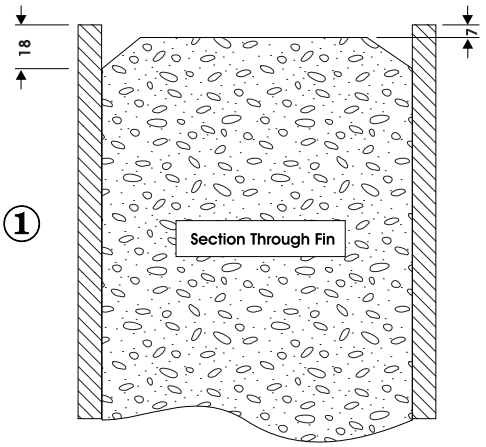


Fig. 6a

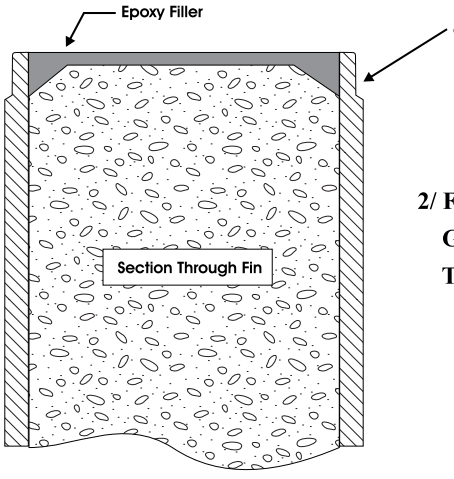
Fig. 6b



①

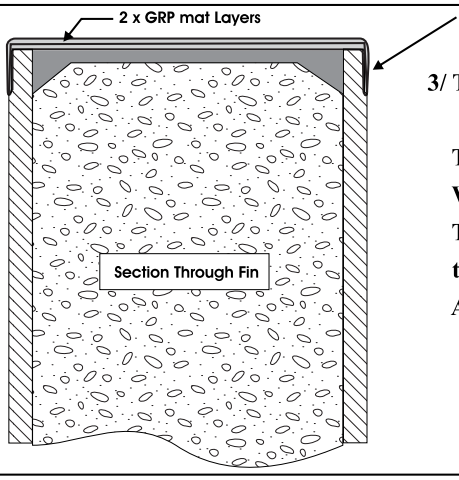
The fins are made with a pre-molded foam core with a vacuum injected Vinylester skin.

1/Cut away the desired area – "dig" / cut out the foam core 7mm all the way along the cut area – but approx. 18mm at the edges.



②

2/ Fill this with epoxy filler, level with the fin outer skin. Grind the GRP back on the fin top edges to allow mat To be applied flush later on.



③

3/ Then apply a couple of layers of GRP mat and epoxy over the top and onto the external skin. The GRP should then be sanded/ground flush With the original surface. The repaired surface should be primed with the customers choice of Anti-foul paint prior to the Application of the final coats of Anti-foul.

IMPORTANT!
Reinforce the yachts hull for stabilizer installation in accordance to Naval ships architects recommendations.

When the optimal position of the stabilizer fins is allocated, drill a 21mm pilot hole at the fin shaft centre line position externally through the yachts hull (Fig 7a)

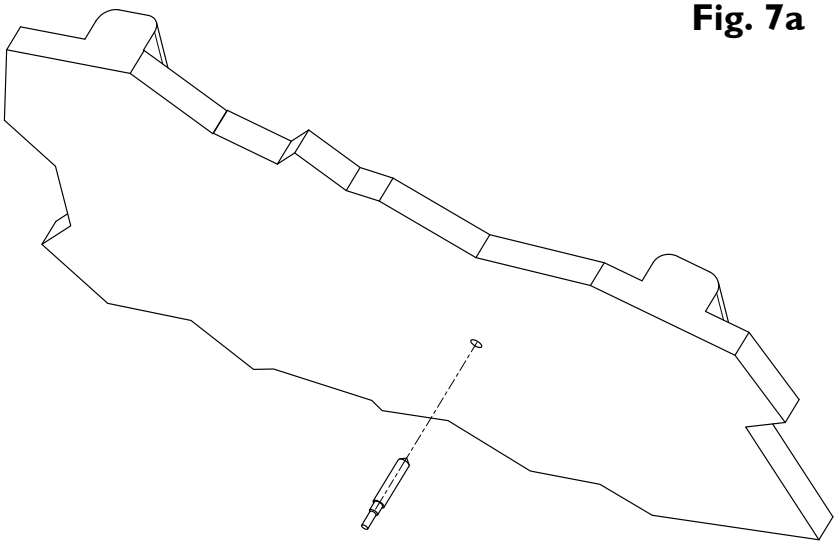


Fig. 7a

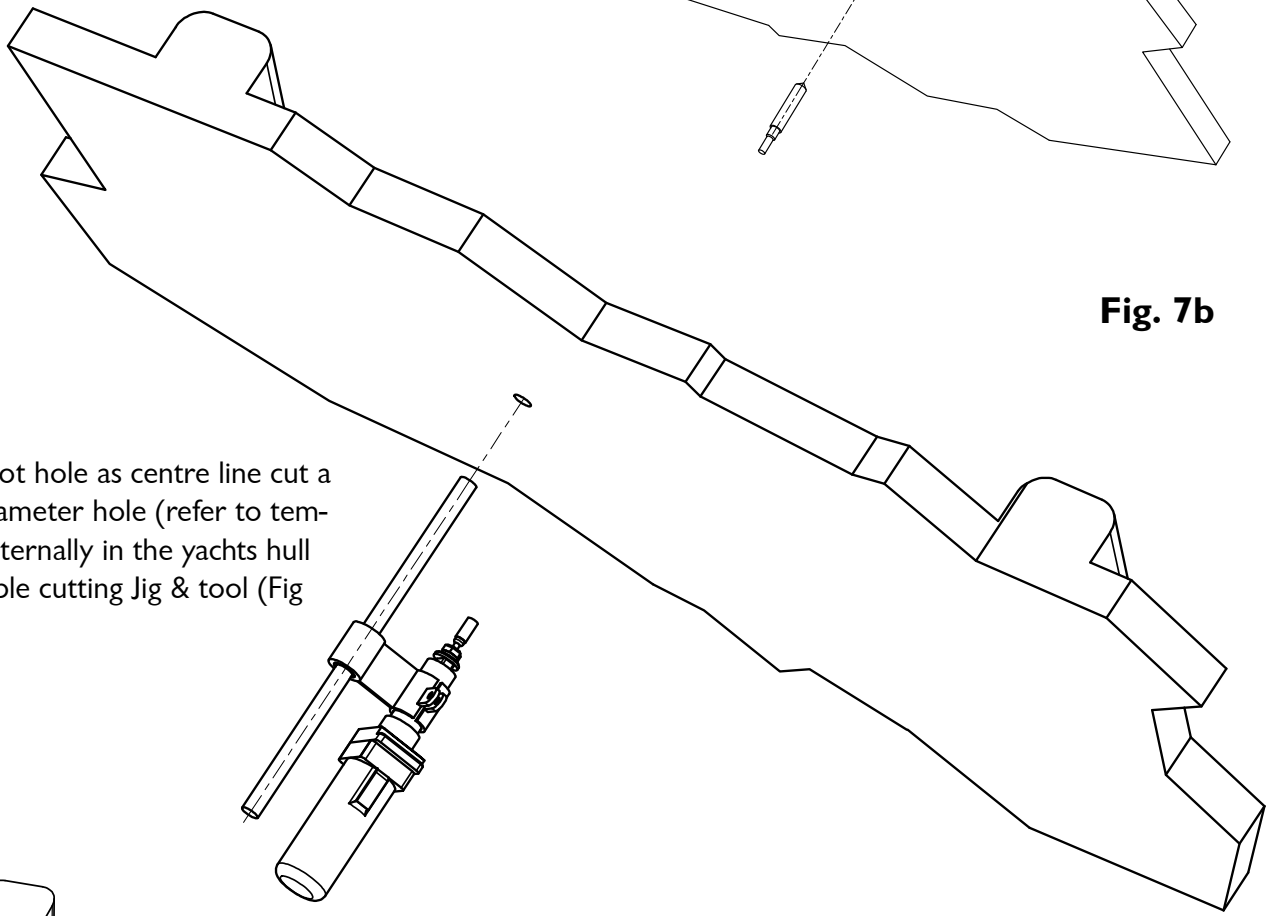


Fig. 7b

Using the pilot hole as centre line cut a **245 mm** diameter hole (refer to template fig 2)internally in the yachts hull using a suitable cutting Jig & tool (Fig 7b/7c).

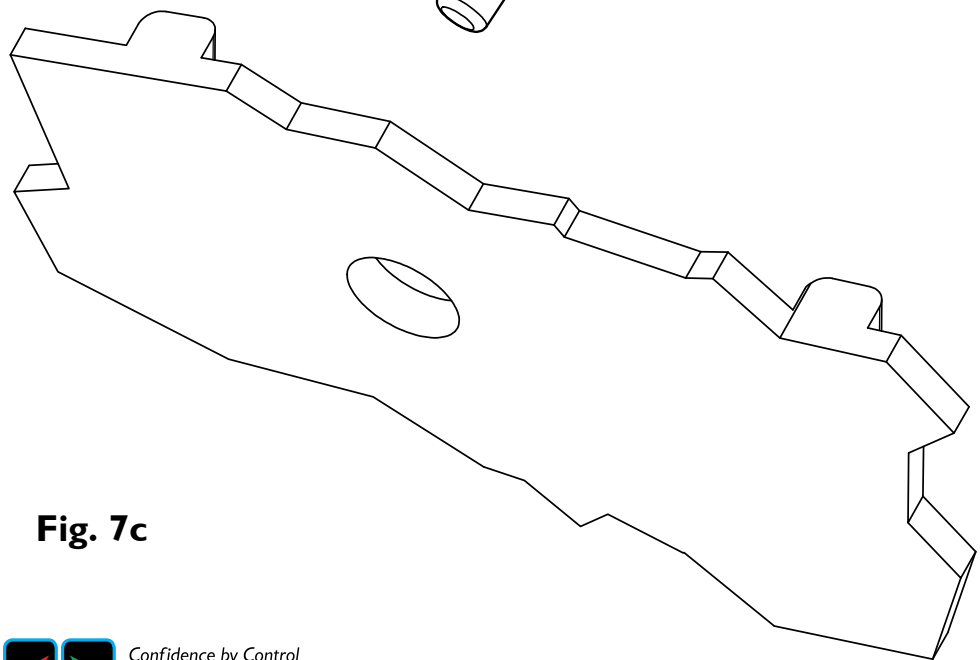
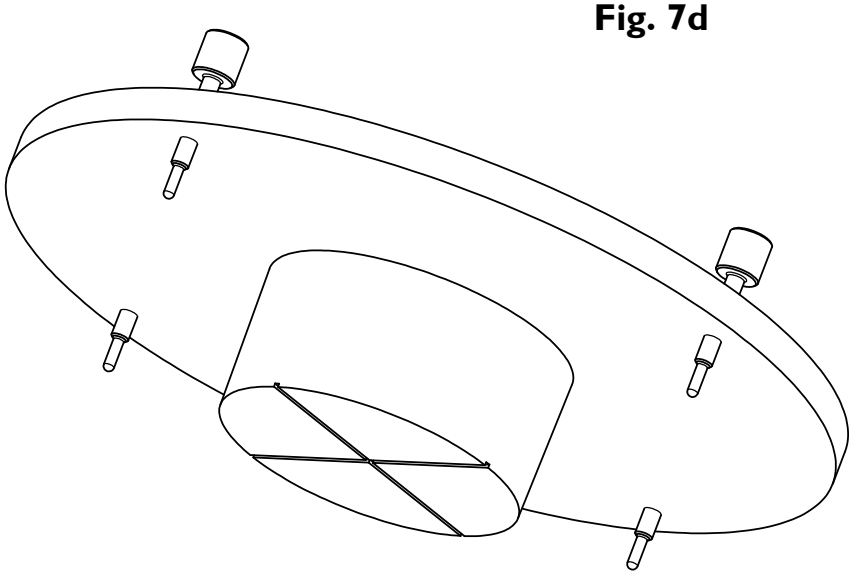


Fig. 7c

Adjust the hull thickness to the required measurement of 86mm(SPS9XB) & ensure that the internal and external surfaces are parallel and flat. (Fig 7d, 7e & 7f)

IMPORTANT!
Tolerances for the hull thickness is +0/-5mm - the thickness of the hull must NOT be larger than 86mm.

Fig. 7d



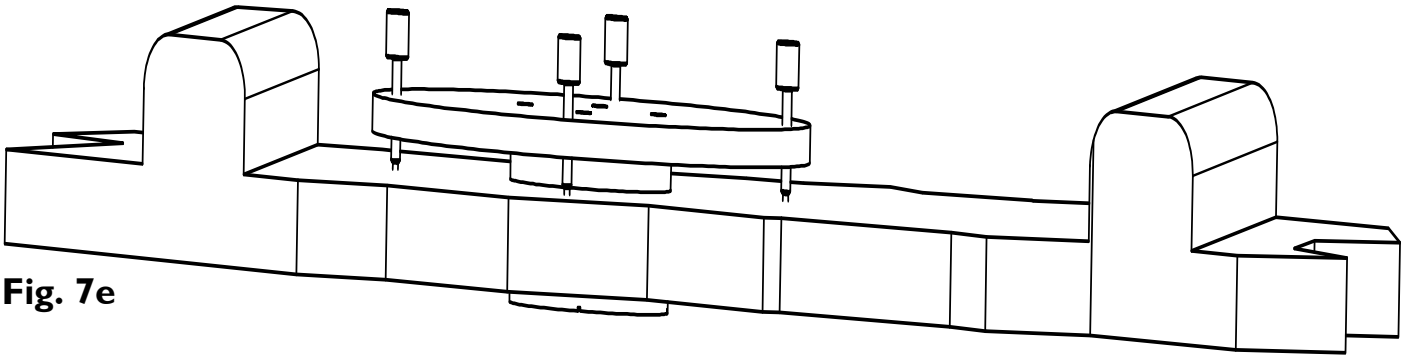


Fig. 7e

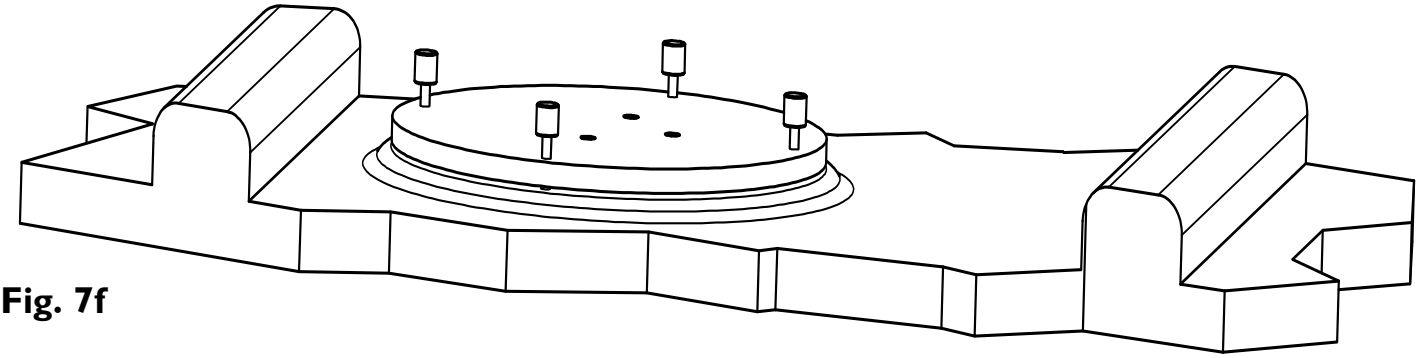
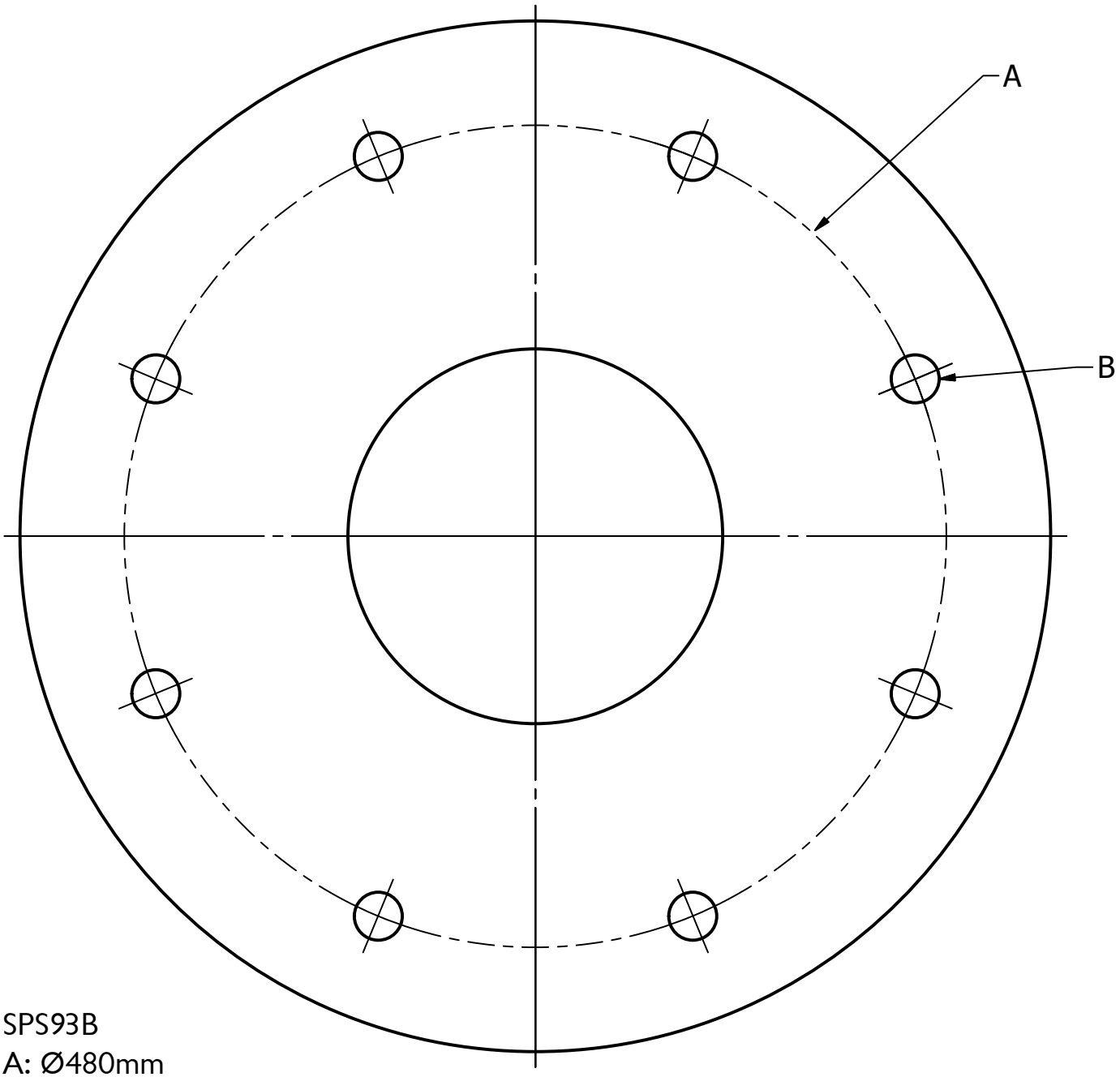


Fig. 7f

Mark the positions of the holes for the securing bolts

Fig. 7g

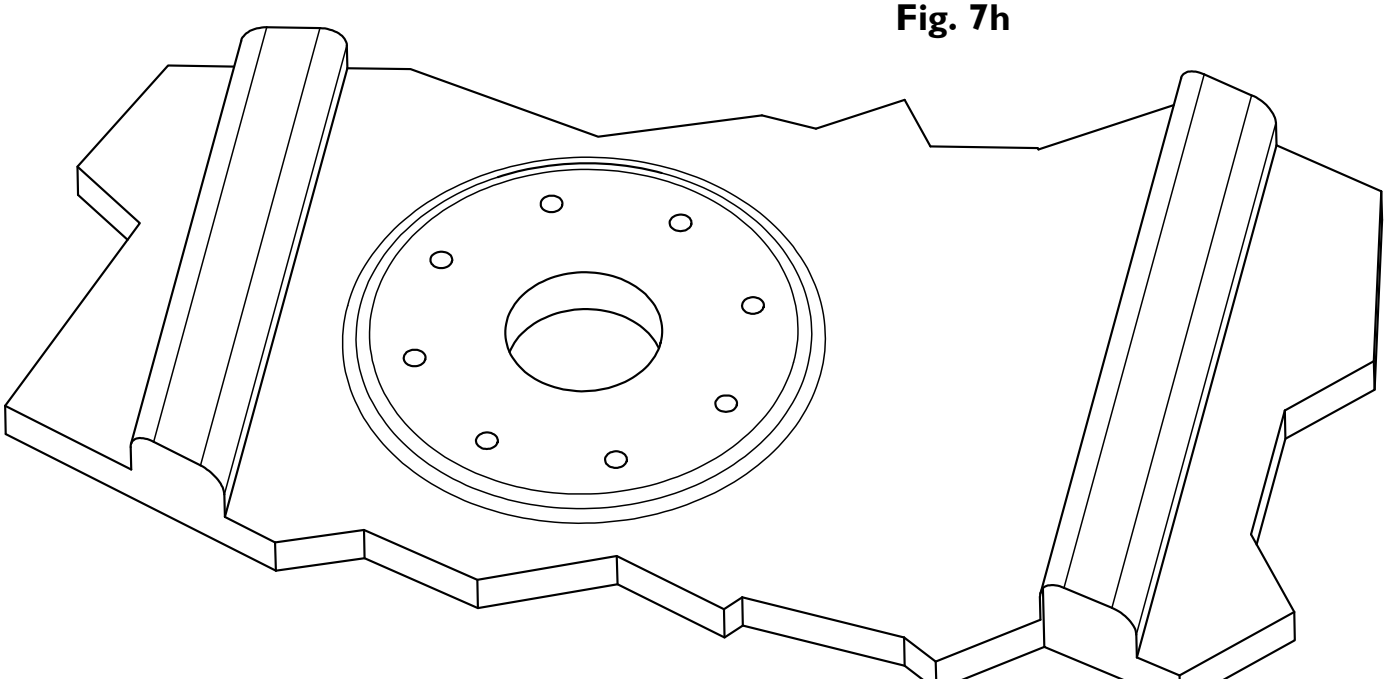


SPS93B
A: Ø480mm
B: Ø25

NOTE!
Use the external securing plate as template.

Cut & drill the holes using appropriate cutting and drilling equipment (Fig 7h).

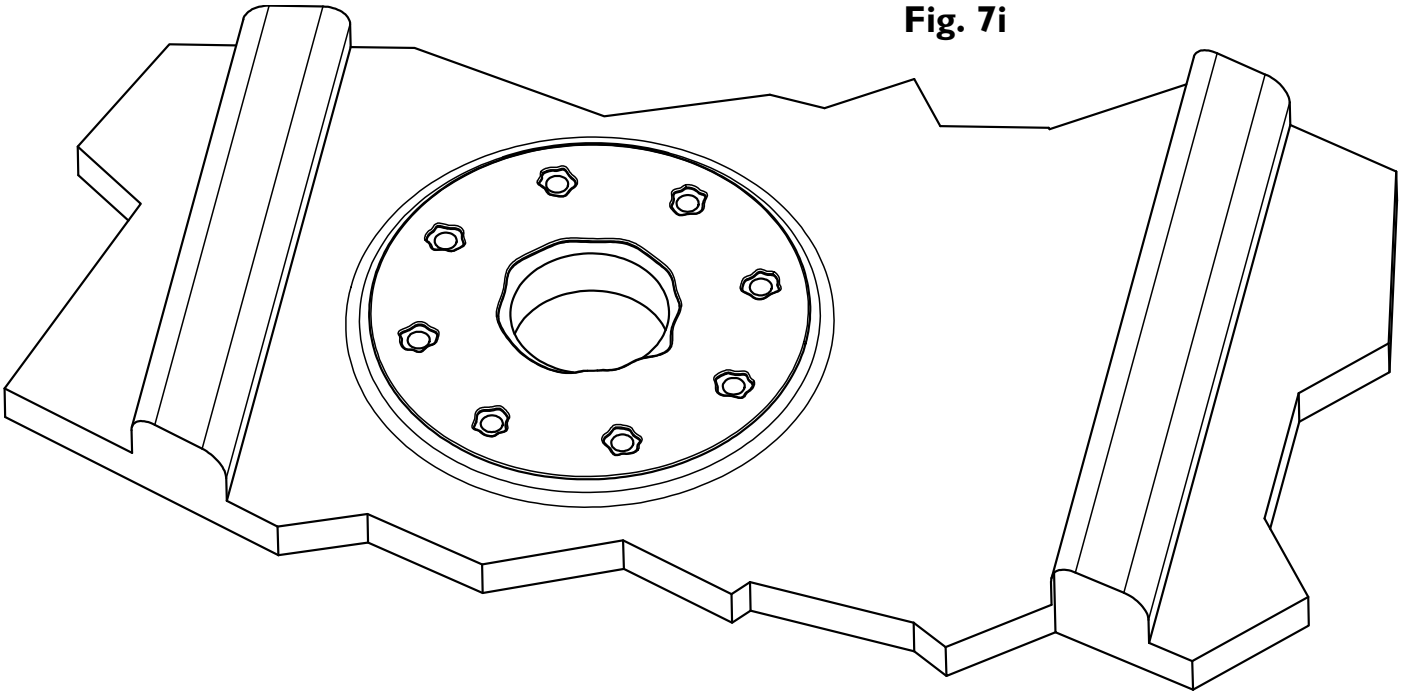
Fig. 7h



Apply a generous coating of water tight sealant to the mating surface (Fig 7i).

IMPORTANT!
Sealant must be compatible with hull material. Naval architect/Boatbuilder must confirm this.

Fig. 7i



MOUNTING OF THE STABILIZER ACTUATOR ASSEMBLY (Actuator details that are illustrated in this document can differ from current actuator version)

Using appropriate lifting equipment (sling) lift the Stabilizer Actuator assembly by the Top Seal Plate Cylinder Mount Arms (Fig 7j).

IMPORTANT
Do not lift or attach lifting equipment to the actuating cylinders or their rams.

Fig. 7j

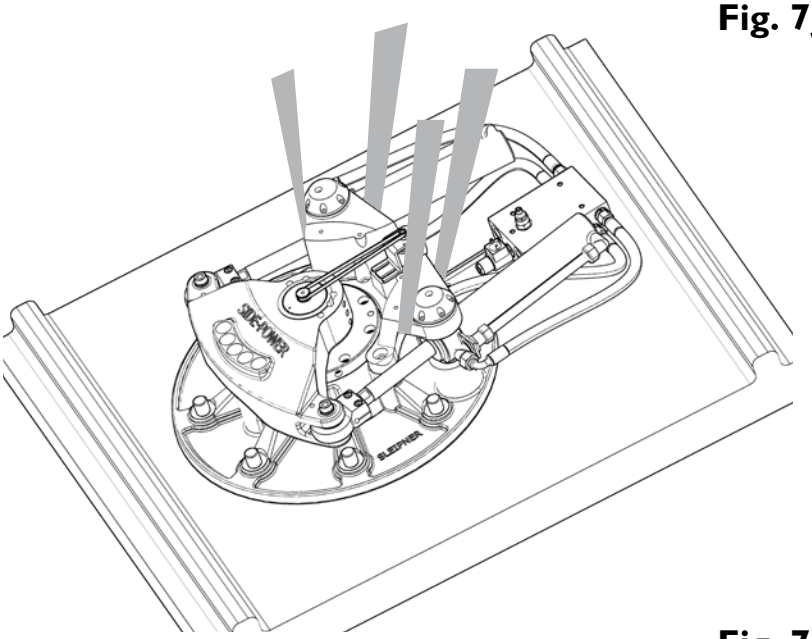


Fig. 7k

Carefully lower the Stabilizer Actuator Assembly into the hulls actuator shaft hole & place in the correct orientation before laying onto the sealant mounting surface. Utilize two of the securing bolts to assist temporally lock the correct Actuator Assembly positioning (Fig 7k).

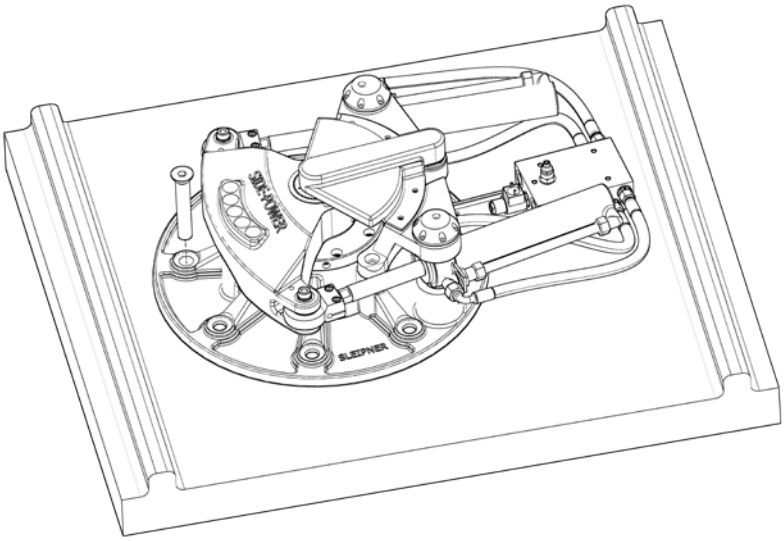
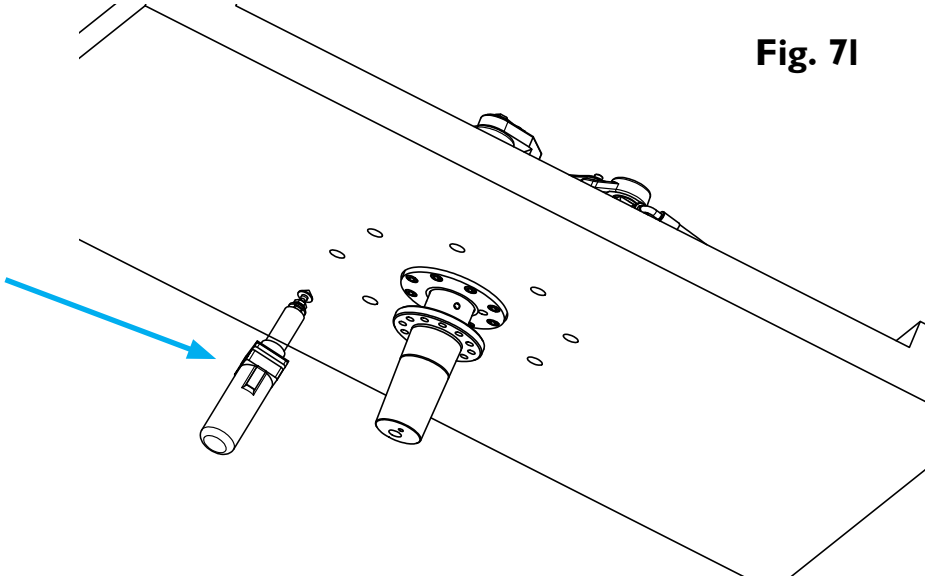


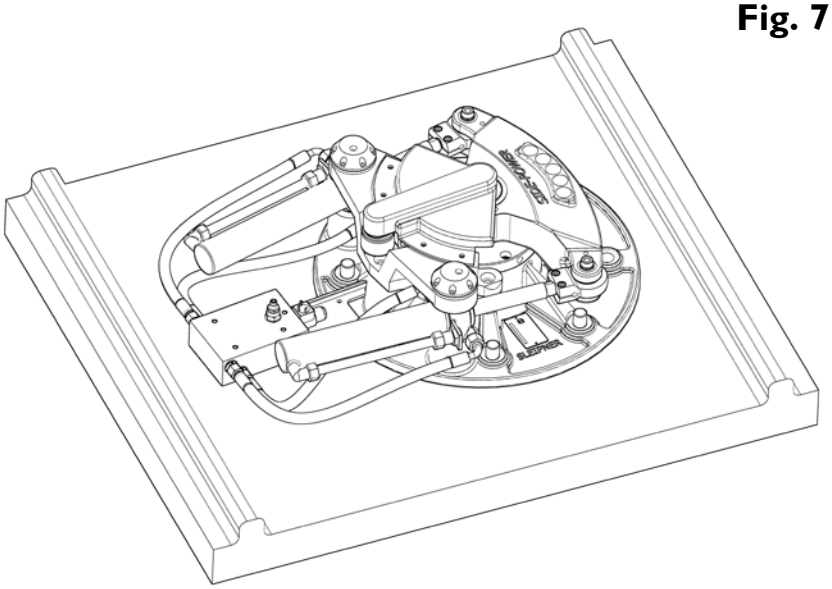
Fig. 7l

IMPORTANT!
Holes must be countersunk to allow room for bolt heads and sealant without damaging the hull.



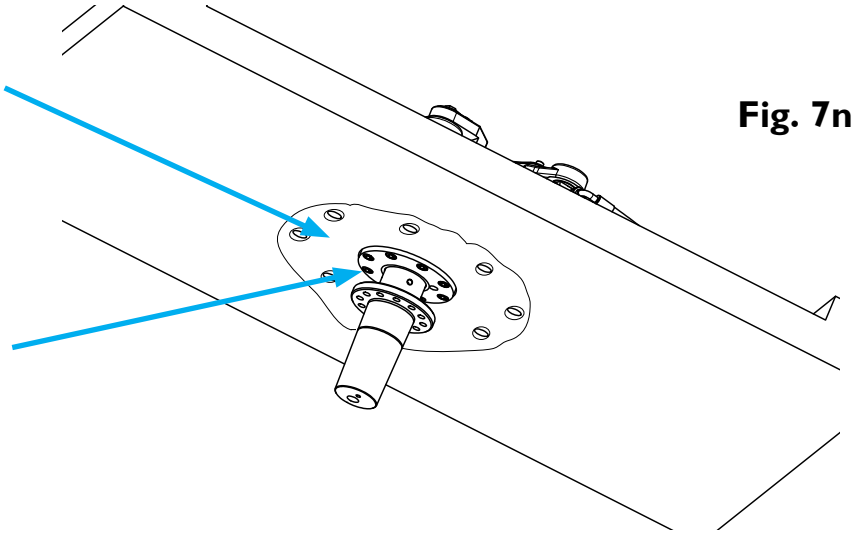
Be aware that the preassembled actuator assembly hoses are not obstructed in the yachts bilge, avoiding any risk of damage from sharp edges or chaffing (Fig 7m)

Fig. 7m



Apply a thin coat of water tight sealant externally to the hull surface (Fig 7n).

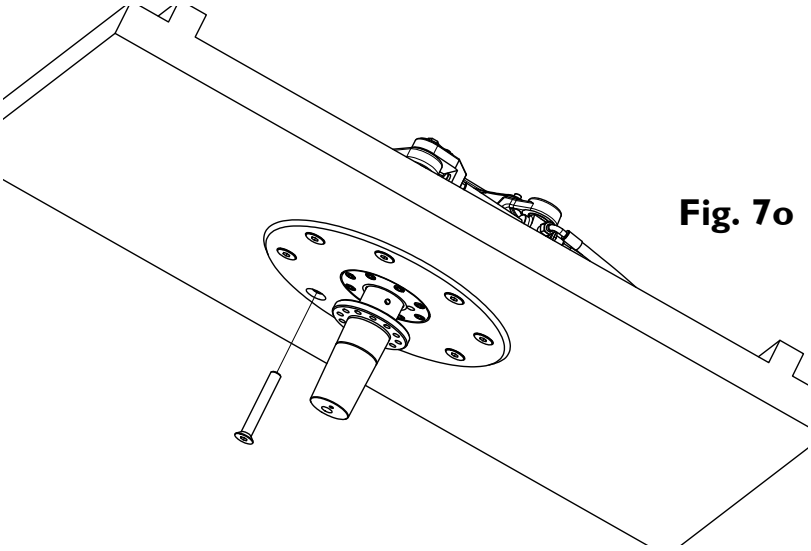
Fig. 7n



IMPORTANT!
Make sure to apply sealant in the gap between center hole in hull and the shaft sealant hub. Sealant must be compatible with hull and hull plate material. Naval architect/Boatbuilder must confirm this.

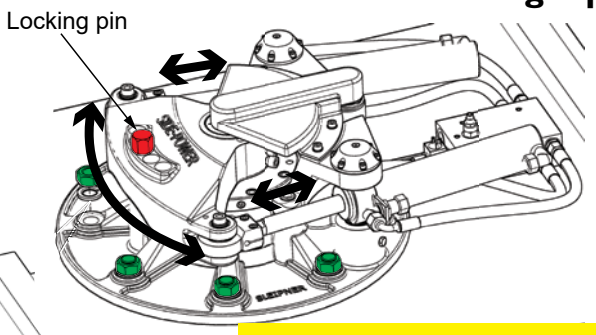
Place the External Securing hull plate over the Stabilizer shaft & onto the external hull mounting surface (Fig 7o).

Fig. 7o

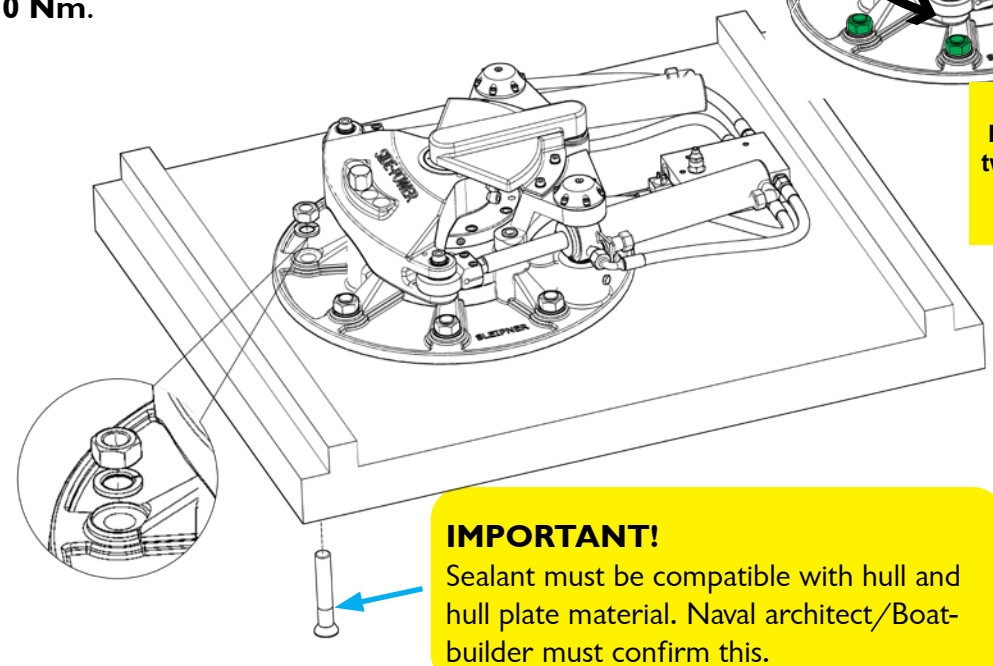


Coat the securing bolts with sealant and insert into the External Securing Plate, the Yachts hull and the Actuator Assembly and secure each with a locking washer and a nut (Fig 7p). Tighten & torque load the securing bolt nuts diagonally to avoid misalignment to **110 Nm**.

Fig. 7p



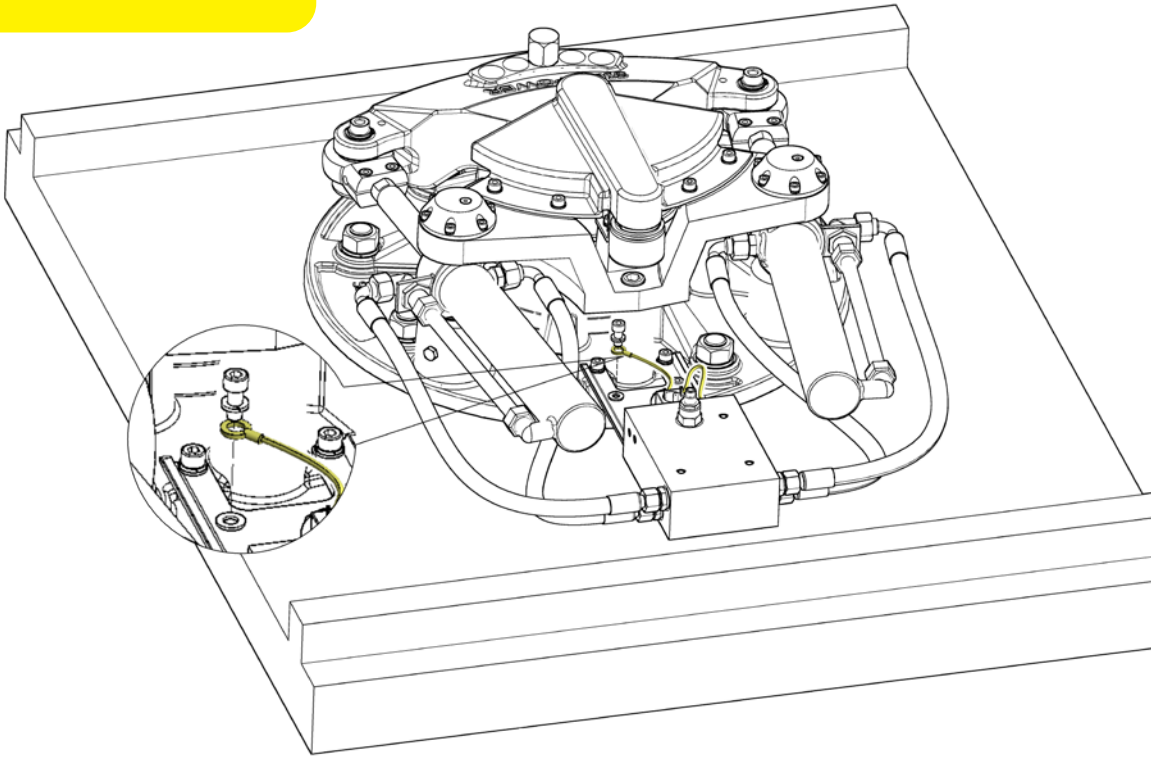
IMPORTANT
Remove locking pin to move the twin yoke for easy access to nuts. Rod ends and cylinders can be damaged when hit



IMPORTANT!
Sealant must be compatible with hull and hull plate material. Naval architect/Boat-builder must confirm this.

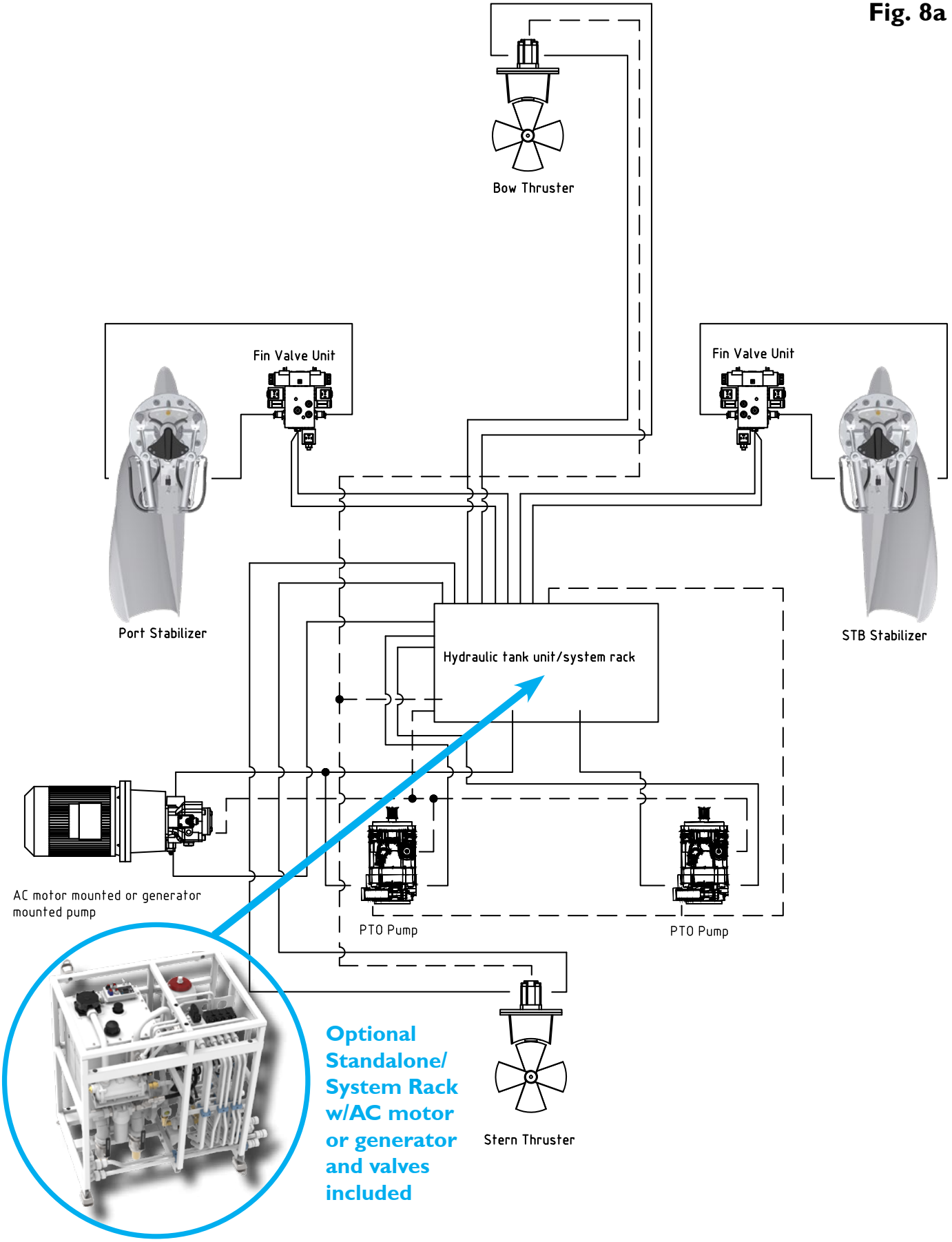
IMPORTANT!
Ensure to connenct a ground wire from the yachts main bonding/anode system to each actuator. (Fig 7q)

Fig. 7q



For specific details see Side-Power 'Hydraulic System Installation, Start-up, User & Service Manual'. Actual system drawings and diagrams will follow product and specific system manual on delivery.

Fig. 8a



IMPORTANT!
For specific and complete details see Side-Power 'Hydraulic System Installation, Start-up, User & Service Manual'. Actual system drawings and diagrams will follow product and specific system manual on delivery.

Tank installation

- Place the tank in a position where you have access to connections and inspection points. Ensure that there is enough space to lift out and replace the filters. Keep in mind to make room for access to the oil filling point.
- Place the tank high enough to get the oil level above the hydraulic pump. The system requires overpressure/gravity feed in the pump feed lines.
- Secure the tank assembly properly.
- Ground the tank electrically to the boat's bonding system.
- Ensure that the tank and other components are thoroughly clean before you start installation of fittings andhoses. Also, make sure that the fittings and hoses are thoroughly clean (avoid ingress of dirt, water and other contamination).
- Ensure to plan and install the cooling system in accordance with Hydraulic system manual.

Pump installation

- Check that the power source drive direction is in accordance with pump rotation !
- Pump direction is decided as described in Hydraulic system manual, facing the pump shaft, i.e the pump direction will be the opposite of engine / PTO / generator. NB ! Please see (PTO) pump nameplate L=CCW and R=CW
- Ensure that the power source and connection point can handle the torque and load from the hydraulic pump.
- As soon as the pump is connected to the power source, it is very important NOT to run the power source before the installation is complete and the pump is prefilled with hydraulic oil.

Hydraulic hoses

Each thruster system is calculated and correctly set up individually by Side-Power. Please see the unique system drawings in the provided system manual for hose/tube/fittings dimensions. Hoses and fittings must be installed by trained proffesionals only. Make sure to clean the hoses internally before assembly, all hoses MUST be cleaned with jet pellets or flushed before they are fitted. To ensure easy and trouble free connection, apply a small amount of oil to threads and mating faces before connecting. Different fittings will require different tightening torque to avoid leakage. If in doubt, please contact a skilled professional to get the best results. It may be required to check and re-tighten all hose connections after startup and sea trial.

Oil filling

Prior to filling the tank, prime the pump(s) through their upper drain port. Use only oil quality as specified. Fill the tank with correct hydraulic oil through the filler/breather unit. It is recommended to use a filler trolley with filter (10 micron). Use only new mineral based hydraulic oil, ISO VG46. Use ISO VG32 oil on systems without stabilizers when the vessel will operate in arctic conditions.

Oil to be according to ISO 11158 Class HV/DIN 51524 Part 3 Class HVLP.
The oil level in the tank should be approximately 3/4 full, or at the middle of the upper indicator of the sight glass. Because vessels heel and the fact that we have an air breathing filter in the oil filler cap, avoid higher oil level than what the sight glass can indicate.
Always check oil level and refill during start-up and air purging.

PTO pump pre- startup

IMPORTANT! Prior to filling the system oil tank, prime the pump(s) through their upper drain port. Stabilizer system must not be activated. Check pump feed line from tank (Dimension/routing) for good gravity feed.

- Fill hydraulic tank. (ISO VG 46 (by ISO 3448). Or, 32 for arctic climate.) See detailed specifications.
- Remove pump drain blank or hose from pump. (To ensure oil has reached pump)
- Re-fit drain blank or hose in PTO pump port, or at gauge on accumulator block.
- PTO1: Start engine1 and watch pressure gauge for stanby pressure of 10-30 bar. (Monitor oil level)

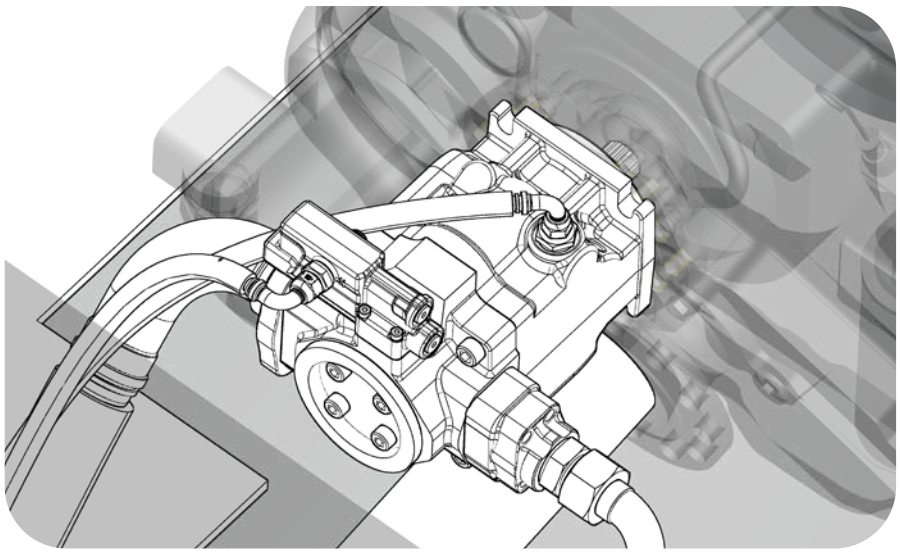
NOTE! Gauge at PVG valves for thruster + stabilizer system. For stabilizer only pressure reading on system status page in stabilizer control panel.

- PTO2: Start engine2 and watch pressure gauge for stanby pressure of 10-30 bar. (Monitor oil level)

Note! If no pressure, confirm pump rotation.

- Check for leaks between tank and pump that is running
- Shut down engine(s) and check oil level in tank. Refill if required. (Refill oil only while accumulator tank is depressurized to avoid flooding the tank later on.)

Fig. 8b



PTO pump pressure adjustment

Most stabilizer system come with preset PTO-pump(s) from Side-Power. The pump has a tag on the drive shaft telling actual pressure setting, if this tag is not present, or other settings are required the pump pressure must be checked and adjusted if necessary.

Note! System pressure will always be directly related to actual system load at the time. Lack of system pressure is more often caused by open bleed/bypass/dump valve or other system related problems than incorrect pump setting.

When above issues are excluded and pump pressure is confirmed incorrect contact Side-Power for pump adjustment instructions. Please have system serial number and pump model data available for correct instructions.

Actuator Valve Unit.

The valve have multiple functions:
1. Combiner for the cylinder hoses
2. Electric operated decouple valve
3. Manual operated decouple valve

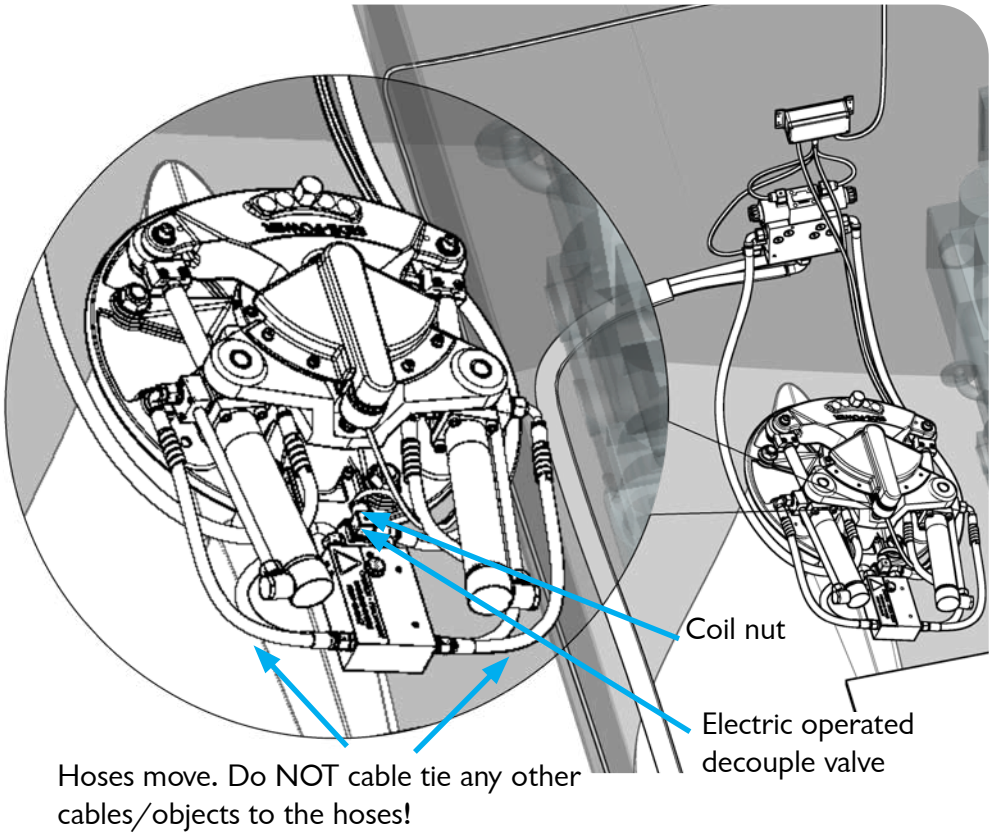
Manual operation:
- Unlock valve by turning the lock nut anti-clockwise (19mm spanner)
- Open the valve by turning the adjustment anti-clockwise (1/4" Allen key)

Fins are now free and can be moved manually to required position.

Hose Connection:
If required, the electrical operated decouple valve coil/solenoid can be removed during hose installation for better access to the hose fittings.

IMPORTANT!
Electric operated decouple valve (coil nut) to be re-torqued to 6.8-9.5 Nm (5-7 Ft-lbs) Over torque of the coil nut will damage the valve function!

Fig. 8c



WARNING!
If valve is unlocked and opened be aware of unexpected movement of fins and cylinders. Especially if boat is afloat!

Fin Valve Unit.

The Fin valve unit should be located as close as possible(Recommended < 2,5m (max 3,5m)), to the Actuator Valve Unit (Fig 8c) with recommended hose dimensions (System drawings). Use minimum 2 layer steel braded hoses.

If installed more than 2,5m from the actuator, very stiff (none expanding) hoses or even better, some of the distance in rigid piping is necessary to not make the fin movement “soft” by the hoses expanding with varying pressure. Always fit hoses to hull on soft mounts.

The unit must be mounted on a rigid flat surface (Fig 8d) - and we recommend to use a vibration dampening material behind them to avoid any high frequency noise/vibration to go into the boats structure.

IMPORTANT!
The unit must be mounted on a rigid flat surface

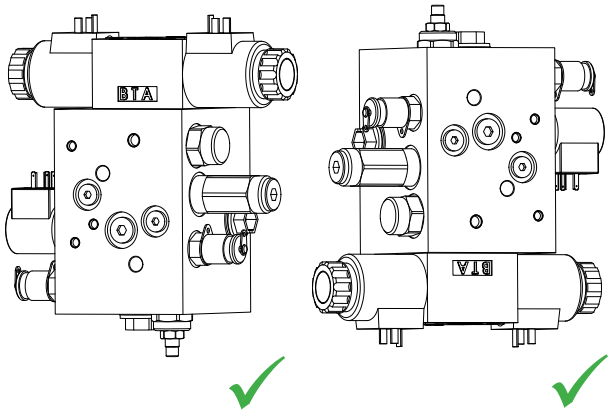
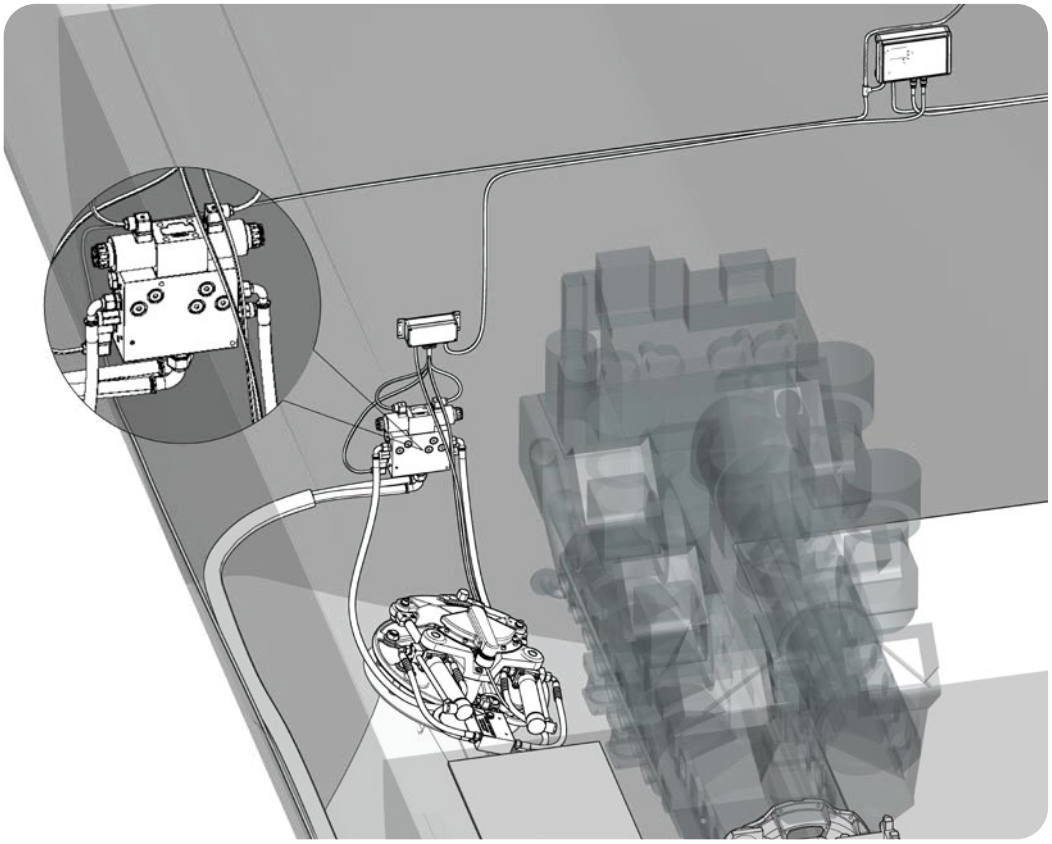


Fig. 8d



Fin Valve Unit manual decouple operation

The manual operated valve (Fig 8e) can be used to allow manual movement of the Stabilizer Actuator Rams/ Stabilizer fins.

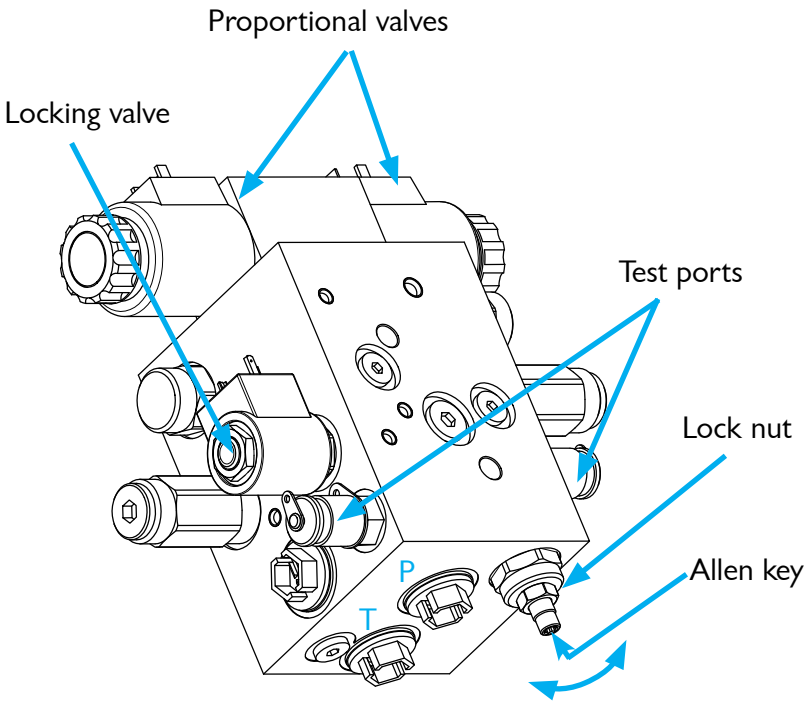
- Unlock valve by turning the 9/16" lock nut anti-clockwise
- Open the valve by turning 3/16" Allen key anti-clockwise.

Fins are now free and can be moved manually to required position.

IMPORTANT!
Manual decouple valves have to be fully closed during normal operation of the stabilizer system

WARNING!
If valve is unlocked and opened be aware of unexpected movement of fins and cylinders. Especially if boat is afloat!

Fig. 8e
Proportional Fin
Valve Unit



P: Pressure from accumulator
T: Tank return

Accumulator tank

All stabilizer systems have accumulator tanks. The main purpose of the accumulator is to create additional capacity and quicker response to the stabilizing system. It also have an pulse dampening effect to the system.

IMPORTANT!
Due to logistic reasons most accumulator tanks are shipped without nitrogen(N_2) (if nothing else is agreed when order was placed) in the pressure bladder in top of the accumulator tank. Therefore, make sure to fill the tank or check the pressure before startup according to accumulator tank manual.

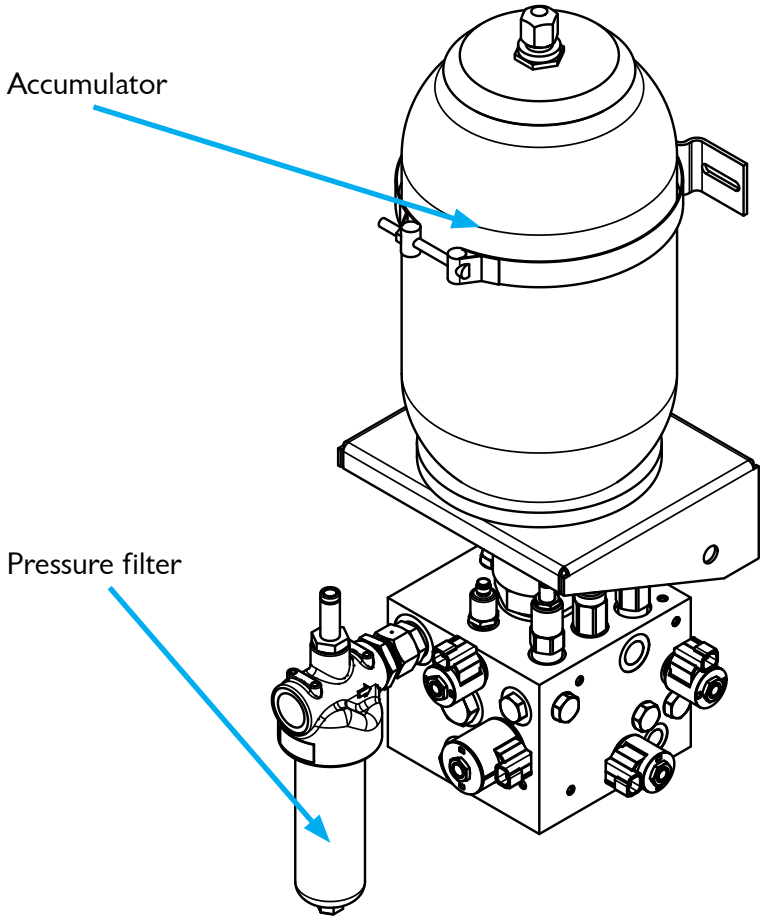
For Nitrogen(N_2) filling and testing procedure - see HYDAC manual. (Accumulator tank supplier)
Bladder charge pressure - 45bar.

Base kit (Filling kit) - 321308 covers these countries: Austria, Belgium, Check Republic, Denmark, Finland, Germany, Netherlands, Norway, Poland, Sweden, Switzerland.

For other countries, additional adapters must be used, see HYDAC manual for correct adapter.

Running the system without any nitrogen/pressure on the tank will damage the stabilizer system.

Fig. 8f



Main Valve Unit

The following functions and ports are integrated into the Main Valve unit (Fig 8g):

- Accumulator Unloading Valve (1)
- LS-V: Load sense from Tank mounted valve unit (2)
- PC: Pressure to Cooling Pump (3)
- Cooling Pump ON/OFF valve (4)
- Feed from Main Pump(s) ON/OFF (5)
- P-AC: Pressure from AC Pump (6)
- P-MAIN: Pressure from Main Pumps (7)
- T: Return to Return Combiner (8)
- LS-P: Load sense to Main Pumps (9)
- Manual Unloading Valve (10)
- P-STAB: Pressure to Fin Valve Units (11)

IMPORTANT!
During normal operation, the manual unloading valve have to be fully closed (tightened clockwise).

Fig. 8g

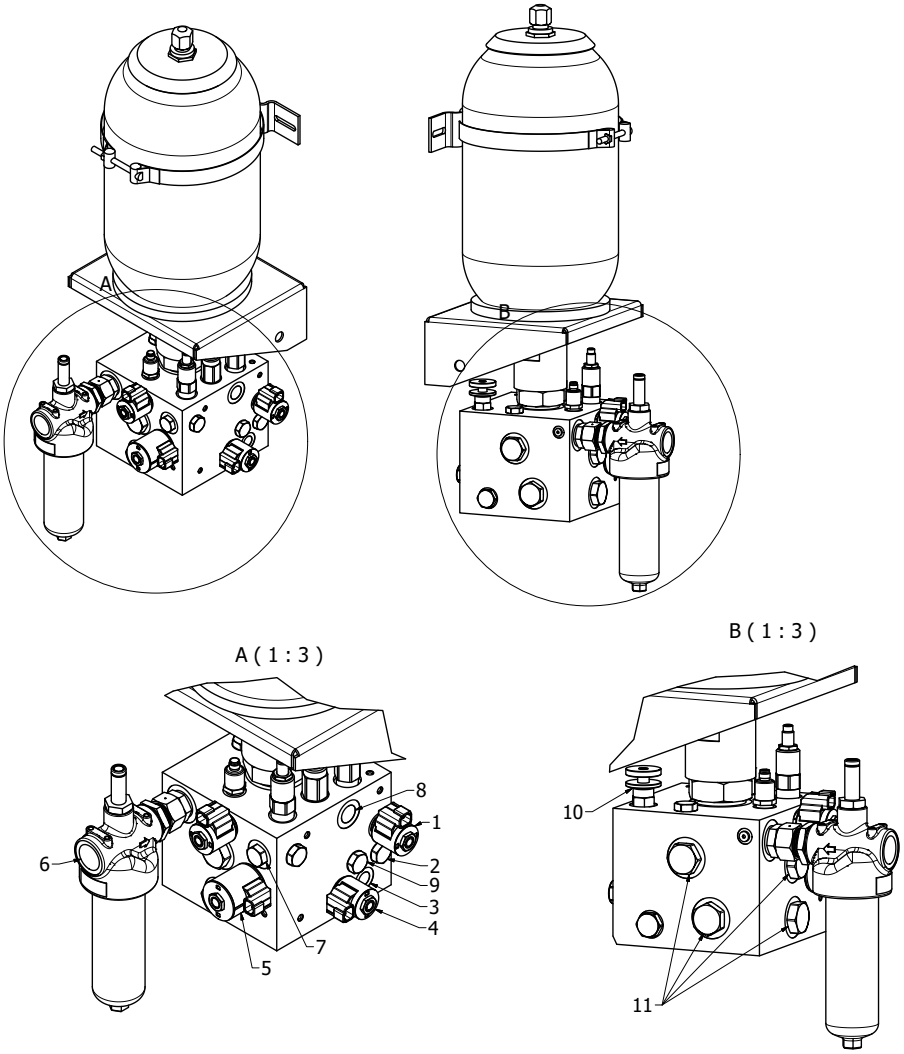
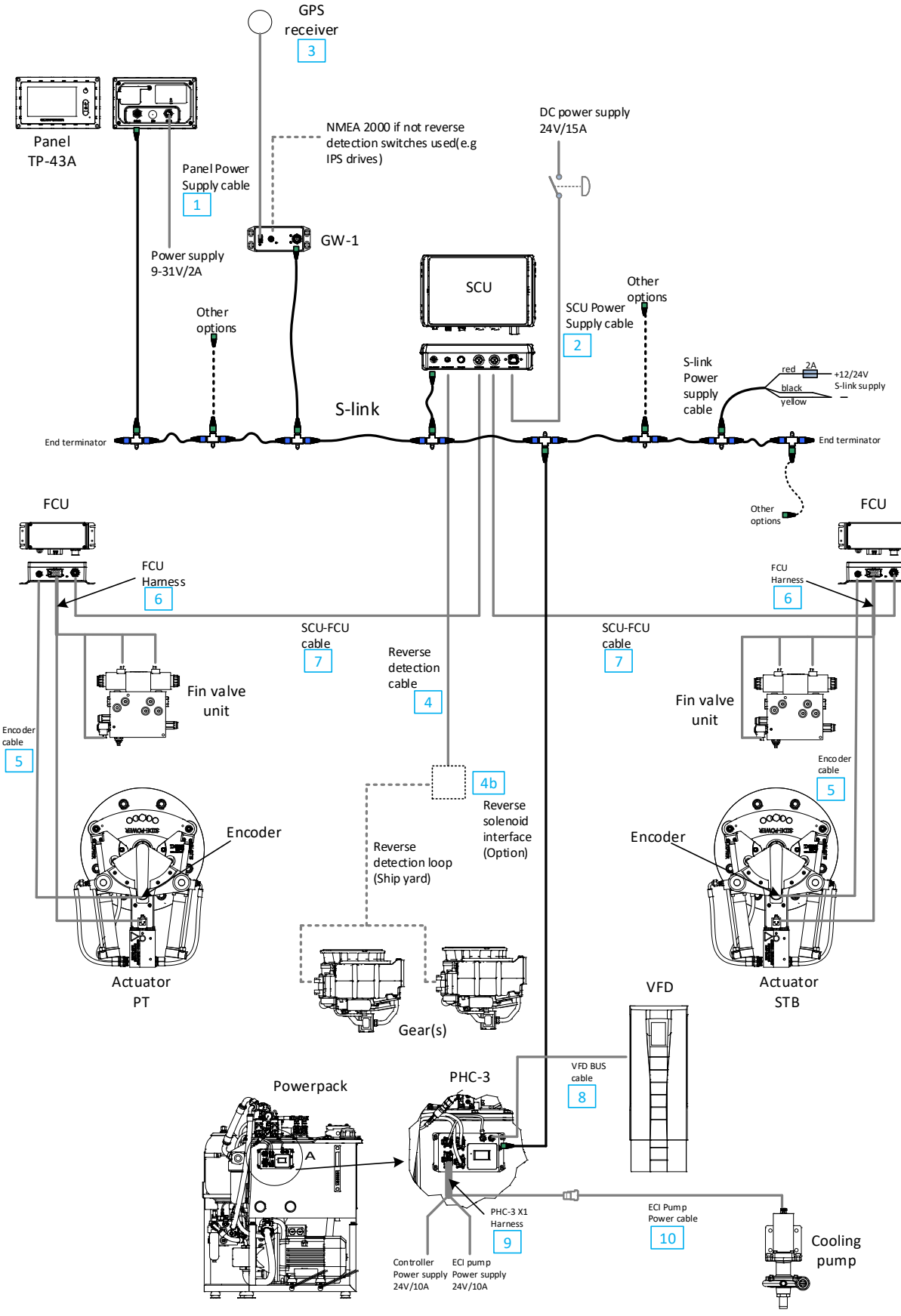


Fig. 9a



Actual system drawings and diagrams will follow product and specific system manual on delivery.

Electrical system cables:

1. Panel Power supply cable Part# 151090-020 - 2m
2. SCU Power supply cable Part# 151371-025 - 2,5m
3. GPS Receiver Part# 321711 - 10m
4. Reverse detection cable Part# 151375-100 - 10m

4b. Reverse Solenoid Interface Part# 151380

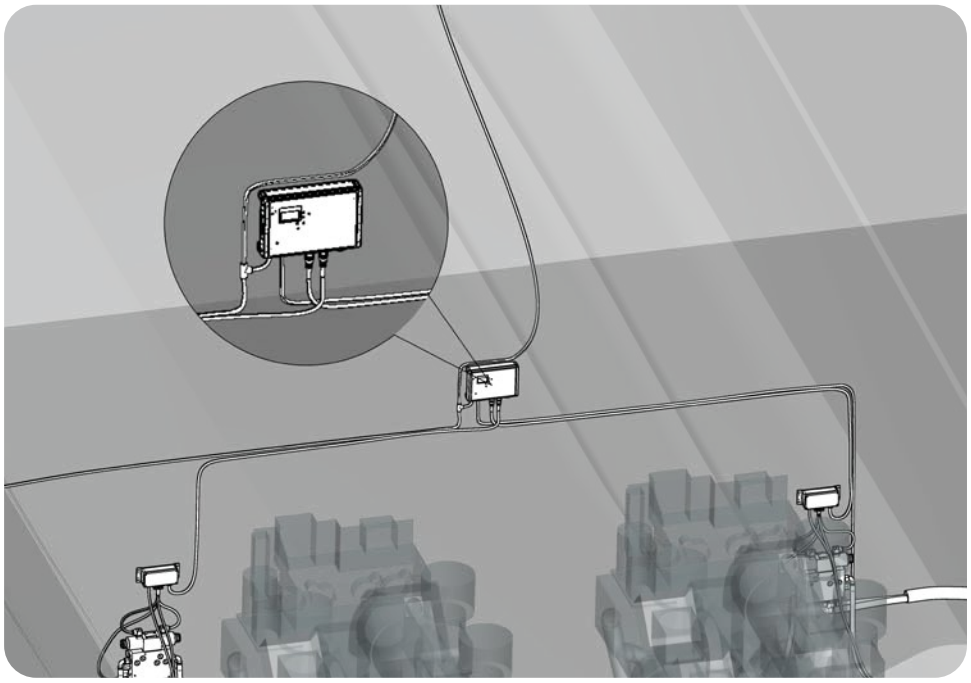
5. Encoder cable Part# 151271-015 - 1,5m
   Encoder cable Part# 151271-030 - 3m
6. FCU harness Part# 151272 - 0,6m+3m
7. SCU-FCU cable Part# 151370-040 - 4m
   SCU-FCU cable Part# 151370-070 - 7m
   SCU-FCU cable Part# 151370-100 - 10m
   SCU-FCU cable Part# 151370-150 - 15m
   SCU-FCU cable Part# 151370-200 - 20m
   SCU-FCU cable Part# 151370-250 - 25m
   SCU-FCU cable Part# 151370-300 - 30m
8. VFD BUS cable Part# 160311-050 - 5m
9. PHC-3 X1 Harness Part# 151470-1
10. ECI pump power cable Part# 151480-050 - 5m
    ECI pump power cable Part# 151480-100 - 10m

DO NOT connect any other control equipment to the S-link controlled products except Side-Power original S-link products or via a Side-Power supplied interface product made for interfacing with other controls. Any attempt to directly control or at all connect into the S-link control system without the designated and approved interface, will render all warranties and responsibilities for the complete line of Side-Power products connected void and null. If you are interfacing by agreement with Sleipner and through a designated and approved interface, you are still required to also install an original Sidepower control panel to enable efficient troubleshooting if necessary

Mounting the SCU:

Mount the SCU on a bulkhead perpendicular to the keel, as central as possible in the boat (so it moves as little as possible). A typical location is the forward or aftward engine room bulkhead, but try to avoid that the SCU is affected by engine vibrations. It must be installed with the cable outlet facing DOWN - the direction, if it is mounted facing forward or aft, a setting stating the direction is done in the control panel during setup.

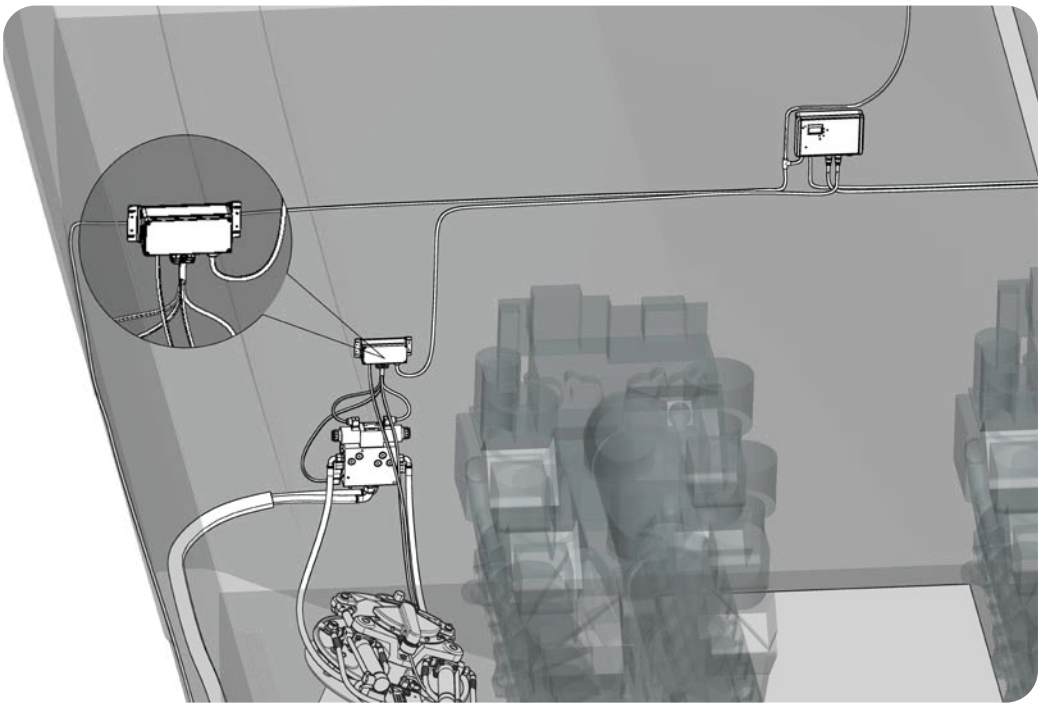
Fig. 9b



Mounting the FCU:

Mount the FCU close to the actuator and fin valve unit.

Fig. 9c

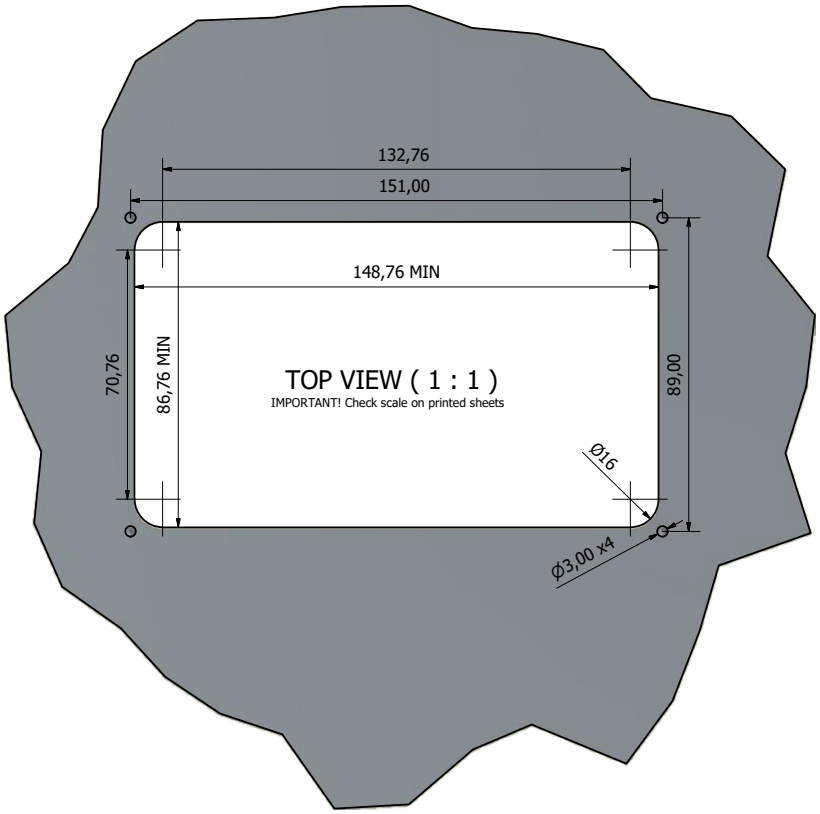


Mounting the Control Panel: Illustrations are not 1:1

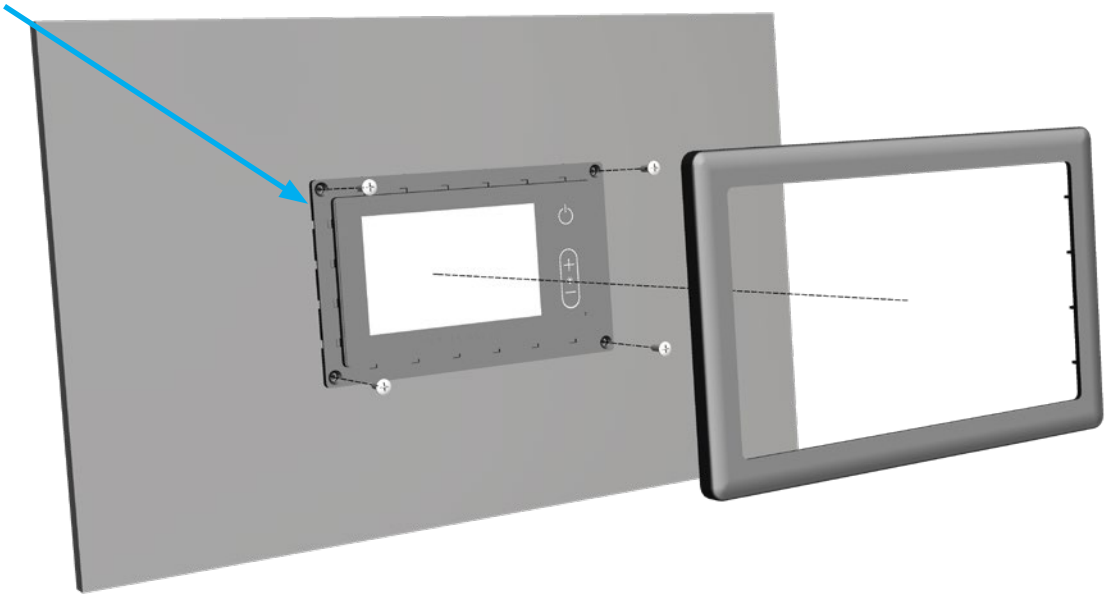
The main operating panel can be fitted on the dashboard(s) from the front using four screws with a smooth plastic cover. Or, it can be "flush-mounted" by rear-fitting using studs or other solutions. The Stabilizer operating panel is a 4,3" sunlight readable touch panel, that is used for setup and operation of the stabilizer system as well as other parts of the S-link system.

Front mounting:

Fig. 9d



Gasket between dashboard and back surface of panel

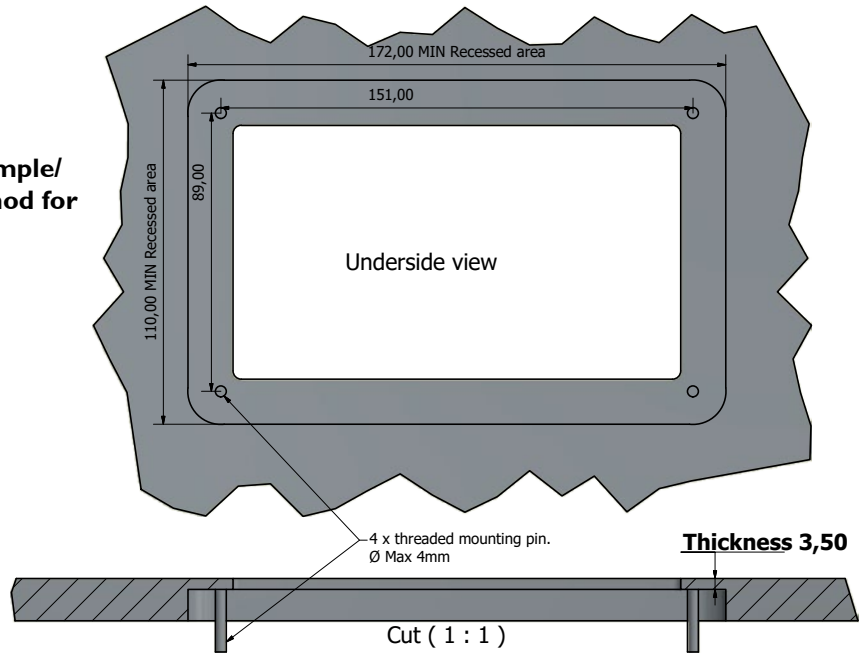


Mounting the Control Panel continues: Illustrations are not 1:1

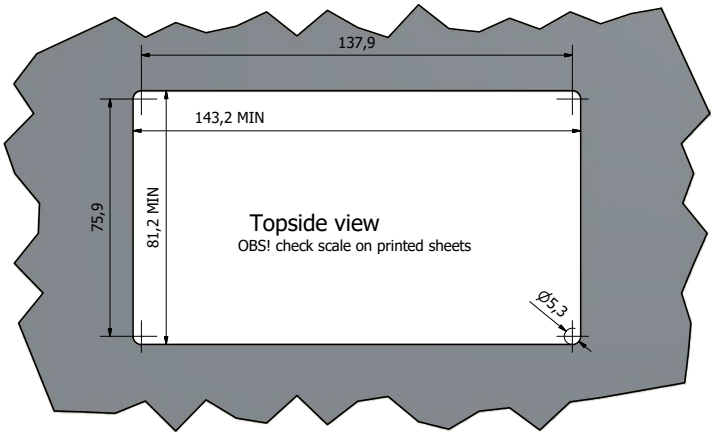
Fig. 9e

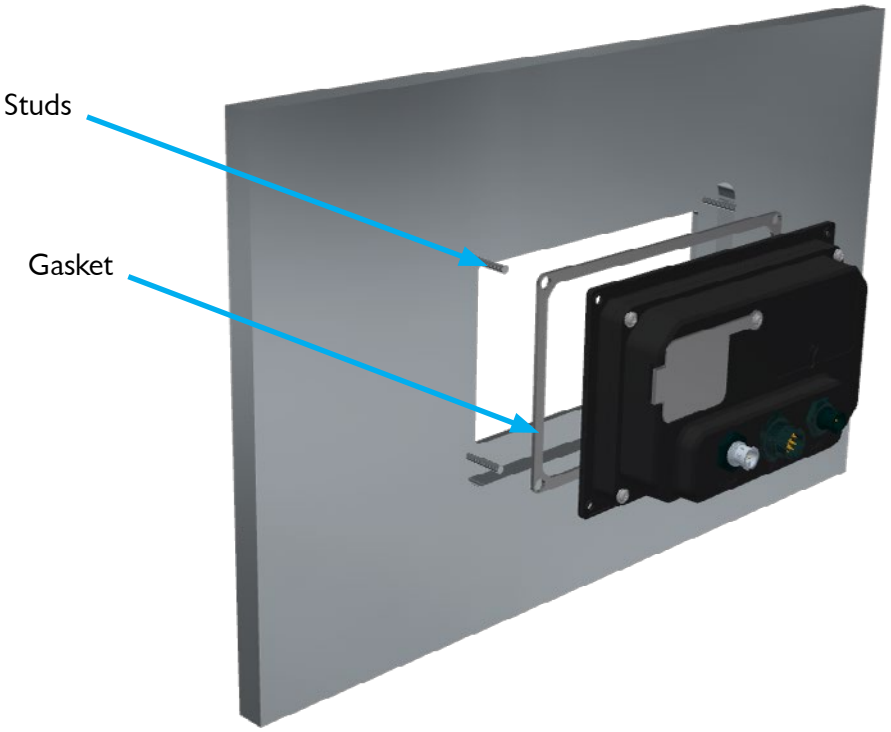
Rear mounting:

NOTE!
This is only an example/ guideline of a method for "flush mounting".



NOTE!
3,5mm is for perfect/ flush fit of panel top surface



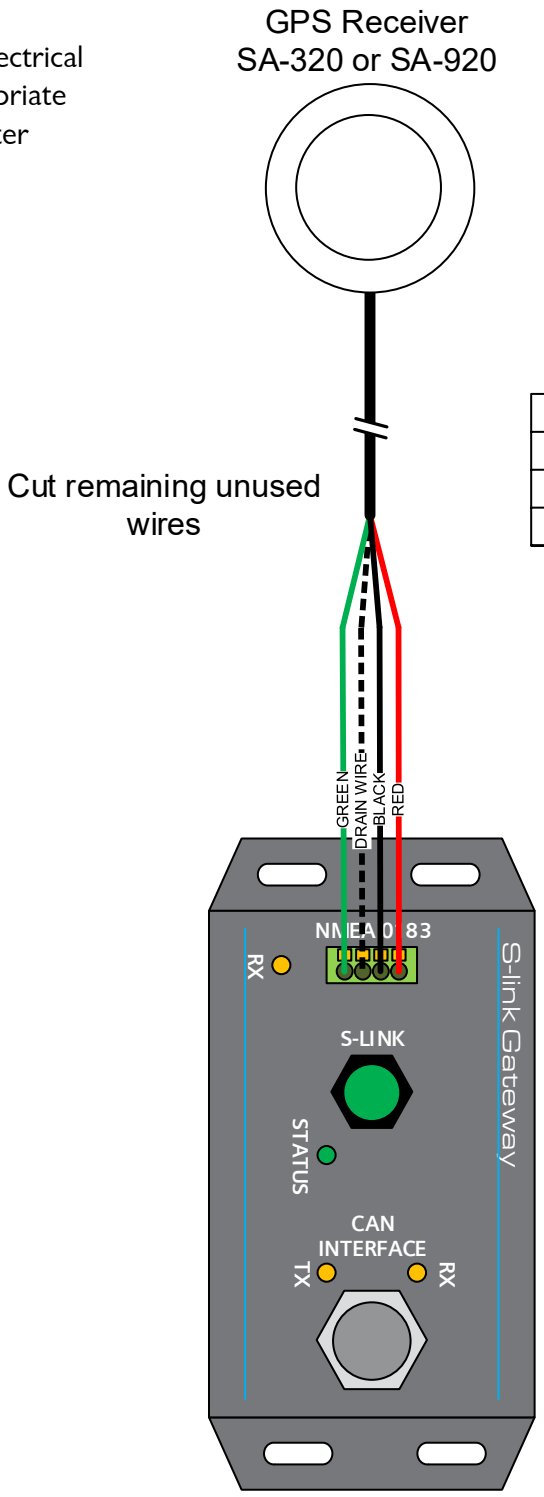


Mounting the GW-1 including GPS receiver:

Mount the GW-1 within 10m from the GPS receiver, for example under the dashboard. See GW-1 manual for detailed information.

NOTE!
Ensure to install all electrical connections in appropriate methods to avoid water ingress.

Fig. 9f



RED	POWER SUPPLY +
BLACK	POWER SUPPLY -
DRAIN WIRE	OUTPUT (DATA) -
GREEN	OUTPUT (DATA) +

Wiring the control system:

See the electrical wiring diagram supplied with the system.

Control panel:

Connect the supplied power cable to a 9-31V, 2A fused circuit.
Connect the panel to the S-link bus with the appropriate S-link cables.

SCU:

Connect the SCU power supply cable 151371 to a 15A fused 24V DC supply. Plug the cable into connector X1.
Connect the 151370-xxx cables for each Fin Control Unit (FCU) to the correct inputs X5-STBD and X6-PORT. Lock the connectors by twisting the locking ring clockwise until a click can be felt.
Connect a S-link spur between input X2, and the S-link bus.
Connect the 151375 Reverse detection cable into X3. Tighten the connector ring clockwise by hand. This connection should not be made in case reverse detection over NMEA2000/S-link is implemented.
All connector inputs are labelled on the SCU.

FCU:

Connect the 151370-xxx cable from the SCU into the appropriate connector. Lock the connector by twisting the locking ring clockwise until a click can be felt.
Connect the wire harness 151272 into the rectangular connector. Connect each of the valve connectors to the correct solenoid valve, and secure the connector screw. Note that Proportional Valve A and Proportional Valve B connectors can be swapped. The actuator tuning performed during commissioning will detect and correct operating direction.
Wiring the actuator position encoder: Remove the yellow protective cap on the encoder connector and connect the 151271 cable between encoder and FCU. Tighten the connector rings clockwise by hand.

S-link:

Basics - The system need a spur drop cable (green) for each s-link unit and a backbone loop through the yacht where you connect all the spur cables included a power feed spur on T-connectors. The stabilizer system will need s-link connection to the control cabinet and the SPSC controller. The stabilizer control panel is ”hard wired” from the SPSC cabinet, so no s-link cable to this panel. If you have upgraded to SEP thrusters you will also have the thrusters and their power switches on the s-link. See S-link overview for cabling references.

GW-1/GPS receiver:

The GPS receiver is wired to the Gateway GW-1 NMEA0183 port, according to the diagram supplied with the GPS receiver. The GW-1 is connected to the S-link bus with the appropriate S-link cables.
GW-1 and GPS is powered from the S-link bus.
GPS data can also be provided from NMEA2000 GPS receivers if GW-1 is connected to a NMEA2000 network. In case GW-1 is connected both to a NMEA2000 network supplying GPS data, and a separate GPS receiver connected to the NMEA0183 port, the GW-1 will automatically switch between the signals.

Wiring the AC Power Pack:

In case of single phase supply systems, a Variable Frequency Drive (VFD) is delivered as part of the Power Pack. The VFD is used as an AC motor starter device, that supply 3 phase voltage for the AC motor.
A separate breaker is required for the VFD supply. Recommended breaker size and the wire gauges can be found in the VFD quick start guide. Cable from VFD to motor should be of screened type, suited for VFD use. For further reference, see Quick Start Guide supplied with the VFD. See Fig 9l for main circuit wiring. Control signal wiring shown in Fig 9g/h/i/j.

FIN valve unit:

Fig. 9g

Harness: #FCU-KIT-15
#FCU-KIT-30

Prop valve connectors A/B (X2/X3)

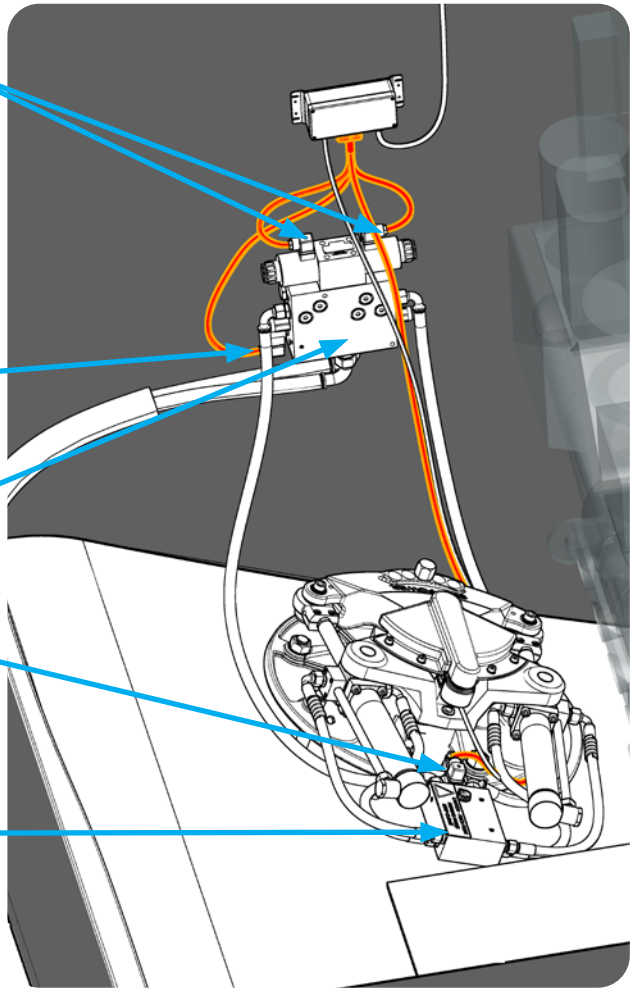
NOTE!
Connectors A/B can be placed either way. The valves direction will automatically be identified at startup.

Lock valve connector (X5)

FIN VALVE UNIT

Float valve connector (X4)

ACTUATOR VALVE UNIT

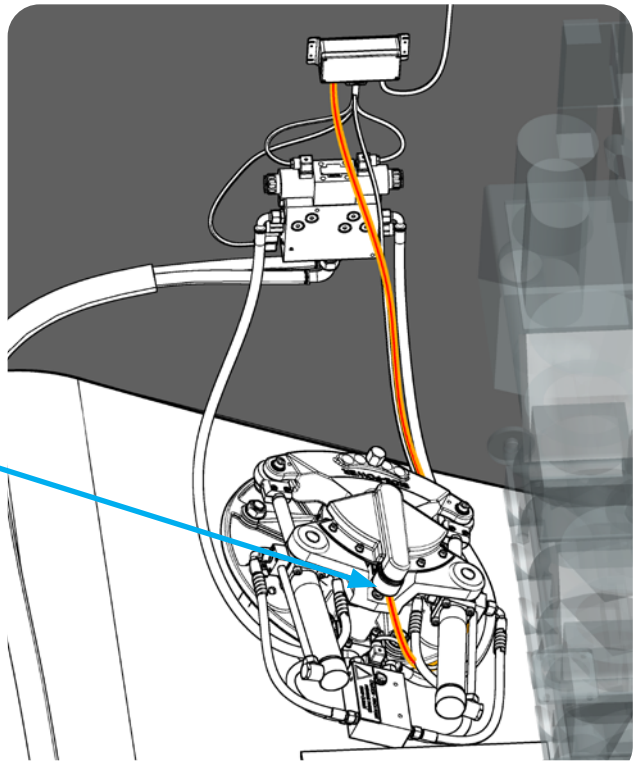


Encoder connection:

Fig. 9h

Cable: #151271-015
#151271-030
(Included in FCU-KITxx)

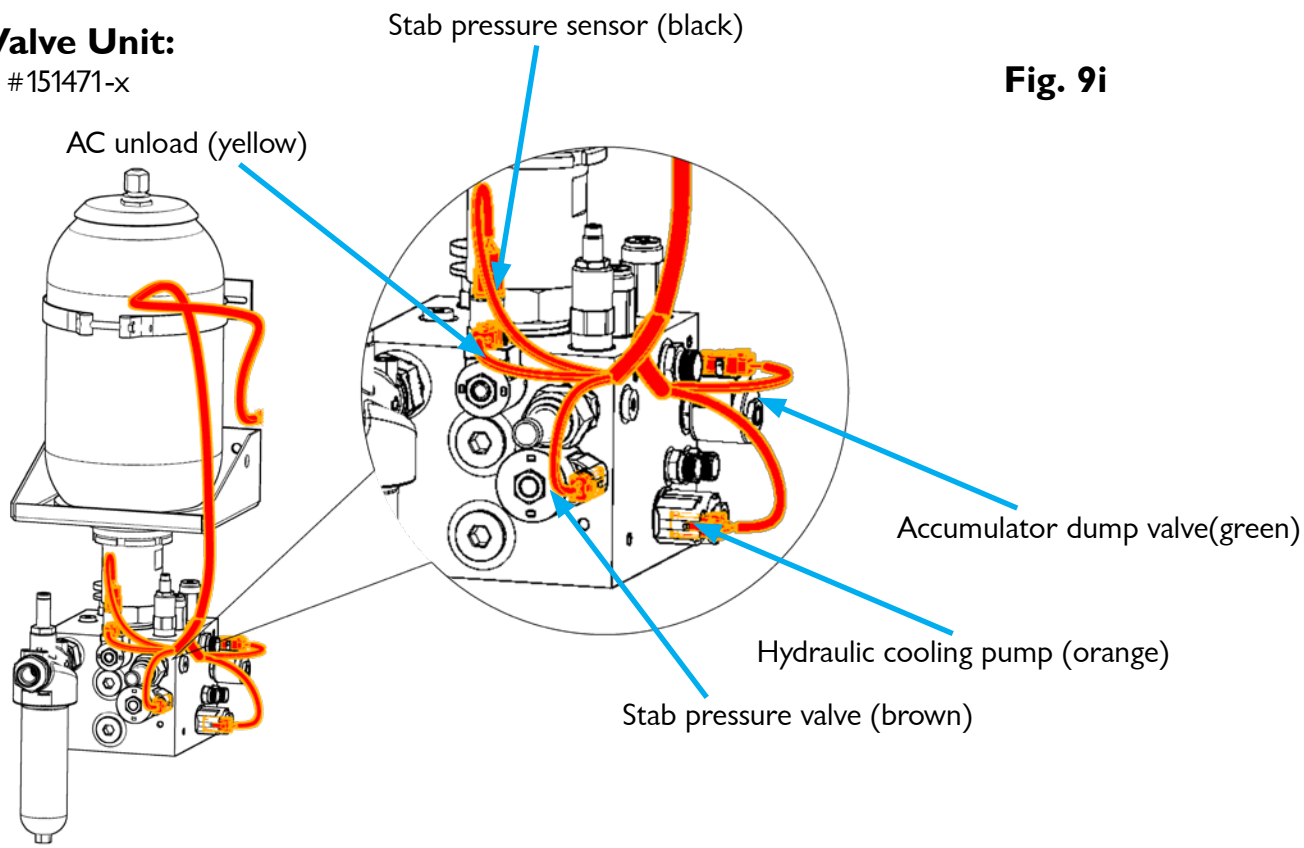
Encoder



IMPORTANT!
All electrical connections and wiring must be secured with cable ties appropriately and not in conflict with actuator cylinder hoses.

Main Valve Unit:
Harness: #151471-x

Fig. 9i



IMPORTANT!
All electrical connections and wiring must be secured with cable ties appropriately and not in conflict with actuator cylinder hoses.

Fig. 9j

Main Valve Unit:
Integrated in a thruster and stabilizer rack. Harness is pre-fitted from factory. Also integrated/prefitted in a standalone stabilizer system.

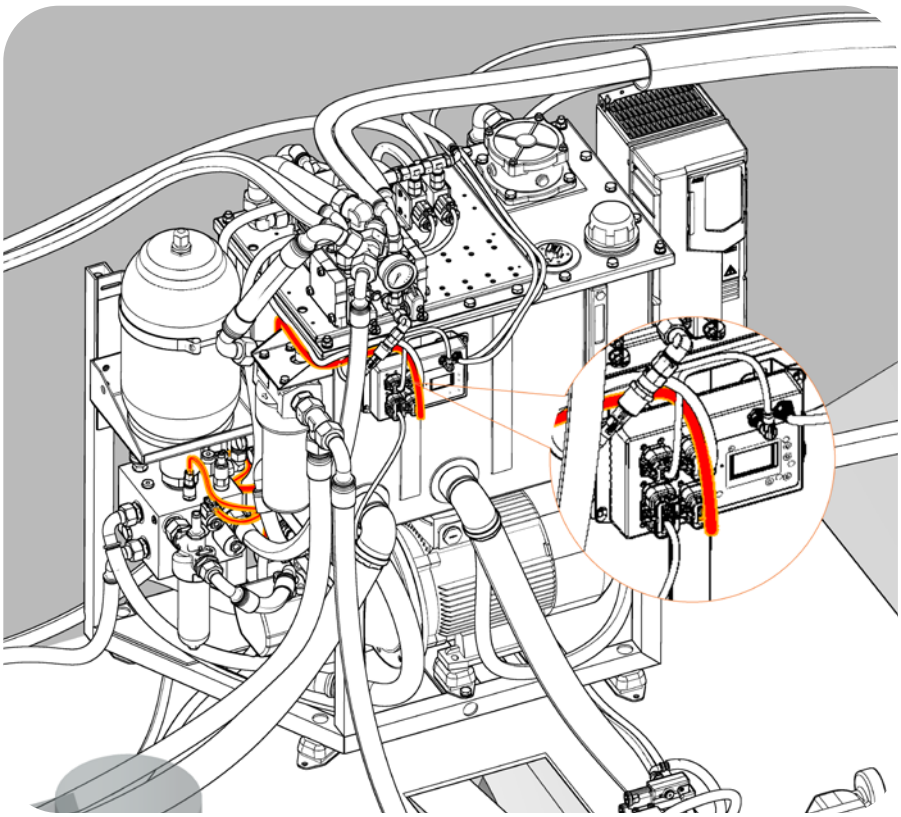
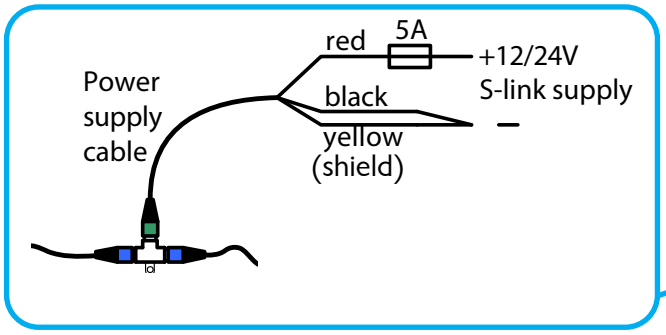


Fig. 9k

Example of S-Link wiring with Stabilizers and DC PRO Thrusters.

You need:
2 x 6 1327 End terminators
11 x 6 1326 T-connectors
1 x 6 1328 Power spur
8 x 6 1320-xxM Backbone cables
10 x 6 1321-xxM Spur cables
Recomended Panel: PJC221/222

NOTE!
Each Panel/S-link unit must have its own T-connector and spur cable.



NOTE!
The yellow wire(shield) in the Power spur must be connected together with the black wire to Battery minus as in the drawing below.

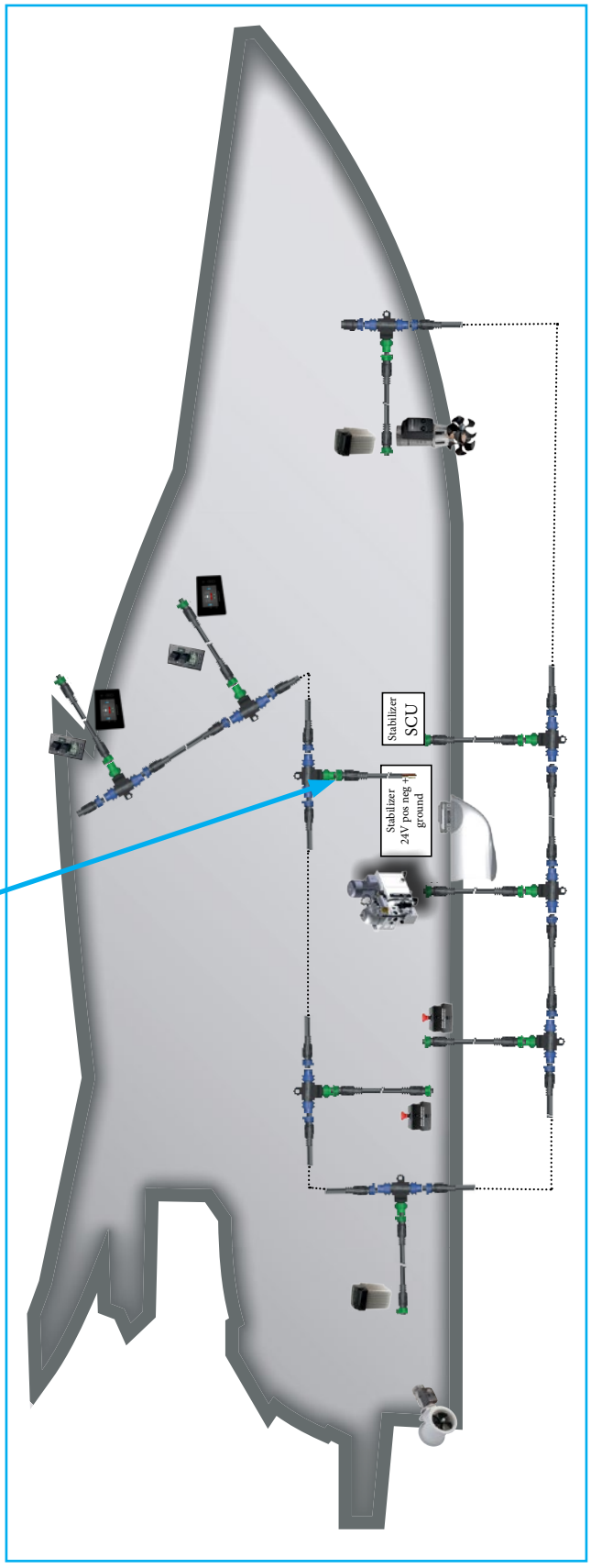
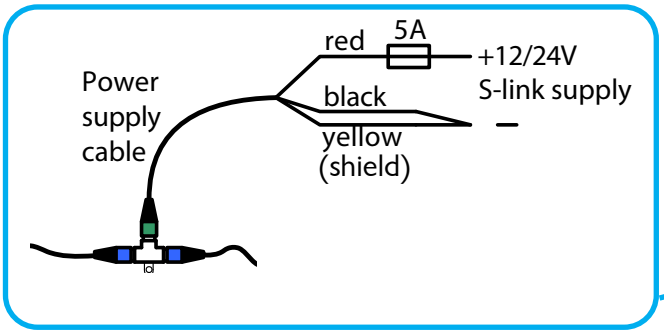


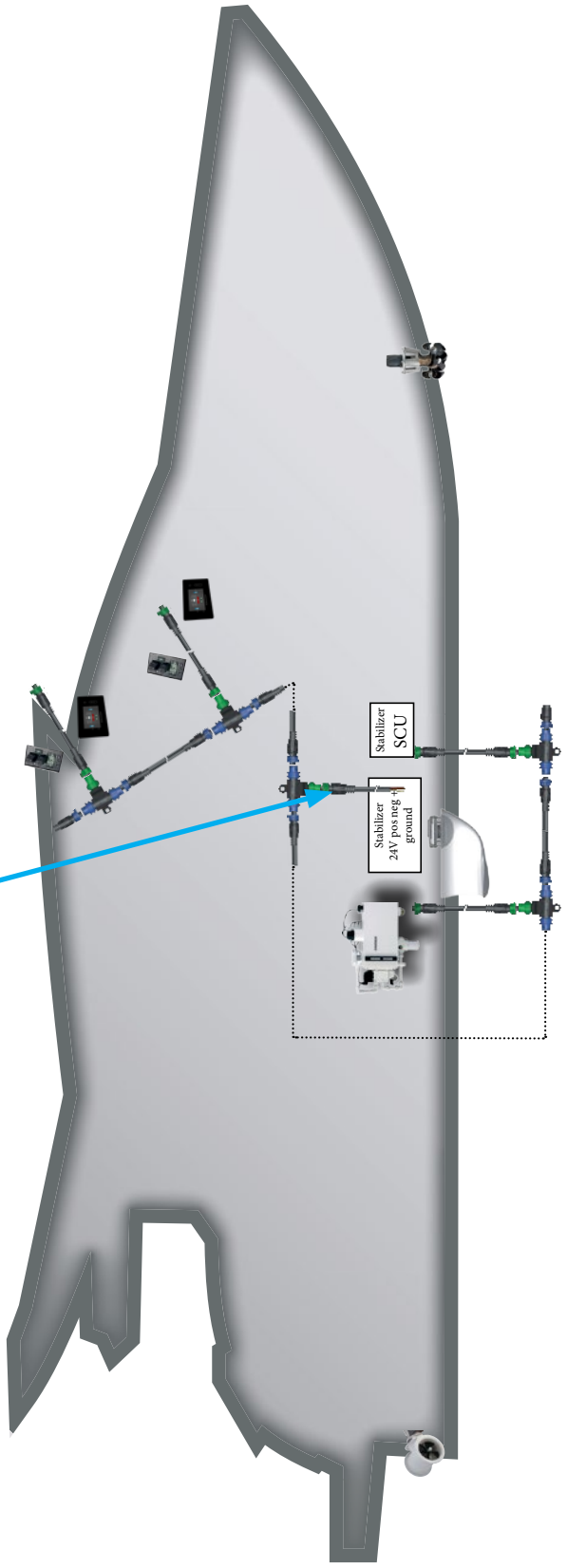
Fig. 9I

Example of S-Link wiring with Stabilizers and HYD Thrusters.

You need:
2 x 6 1327 End terminators
7 x 6 1326 T-connectors
1 x 6 1328 Power spur
4 x 6 1320-xxM Backbone cables
6 x 6 1321-xxM Spur cables
Recomended Panel: PJC221/222

NOTE!
Each Panel/S-link unit must have its own T-connector and spur cable.





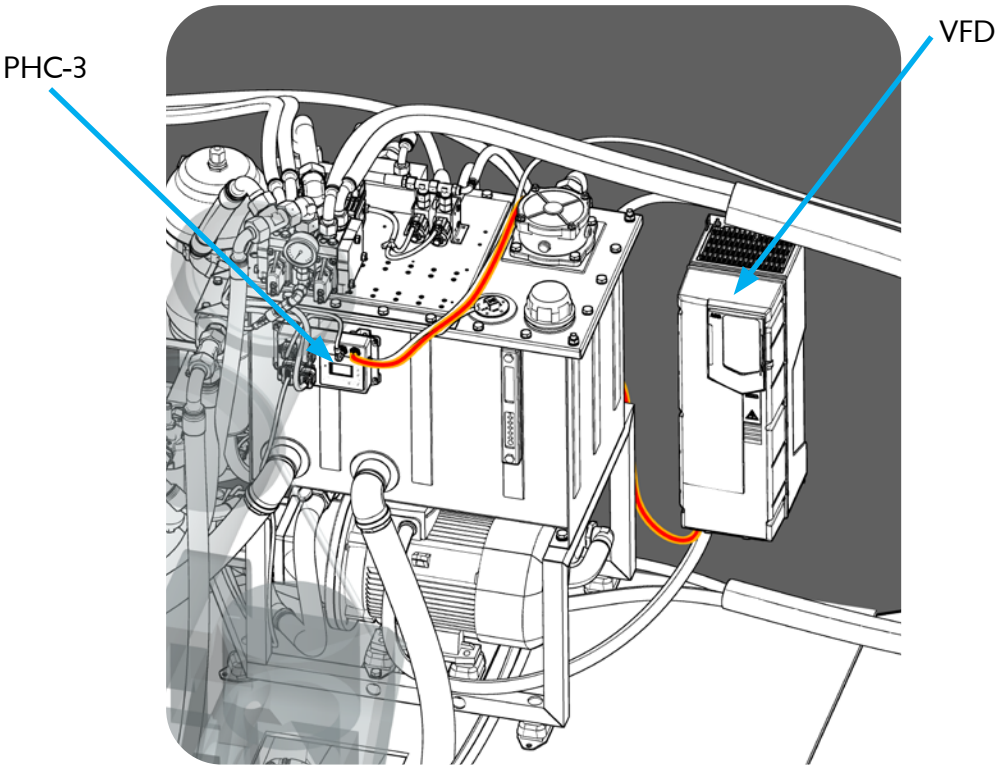
NOTE!
The yellow wire(shield) in the Power spur must be connected together with the black wire to Battery minus as in the drawing below.

VFD:

Mount the VFD relatively close to the PHC-3 controller(Powerpack/Rack/Tank/AC motor), within 4 meters.
Harness: #160311-050

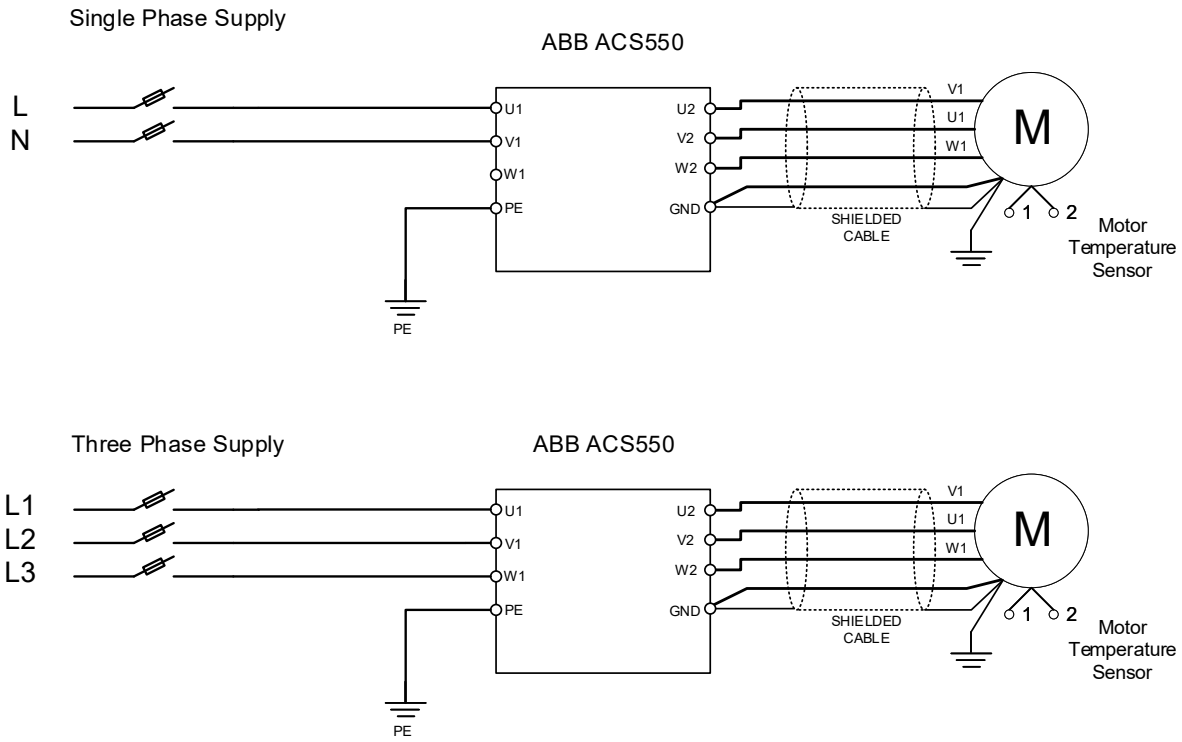
NOTE! VFD must be protected from any water spray.

Fig. 9m



AC Motor - VFD

Fig. 9n



VFD cable dimensions:

*** Based on MAX 20 meters cable lengths.**

Motor power (kW)	Input Phases	Input Voltage (V)	Input Supply Current (A)	Motor Current (A)	Input Wire Size (mm²)*	Motor Wire Size (mm²)*
3,5	1	220	21,8	12,6	4	2,5
4,6	1	220	29,1	16,8	6	4
5,5	1	220	39,0	22,5	10	6
7,5	1	220	46,2	26,7	16	10
7,5	3	220	26,7	26,7	10	10
11	1	220	67,5	39,0	25	16
11	3	220	39,0	39,0	16	16
11	3	400	21,0	21,0	4	4
15	1	220	88,3	51,0	35	16
15	3	220	51,0	51,0	16	16
15	3	400	28,0	28,0	10	10

Changes or misprints might occur in information given.

IMPORTANT!
Responsible electrical technician must consider fitting method, temperature conditions and cable lengths before doing this electrical work. This table is just a general recommendation.

AC Motor driven Pump Unit Pre-Startup

IMPORTANT!
The yachts main engine(s) must be switched off during this procedure. The first start of the AC Motor/Pump Unit must be carried out manually from the PHC-3 control panel. However, before performing pre-startup procedure from the PHC-3 ensure the VFD(variable frequency drive) is in REMOTE mode. The VFD panel is factory programmed, therefore no additional functional programming should be required.

- Leave Stabilizer system off at control panel. (Bypass and dump valves will be open)
- Check oil level in tank and open cock valves (if present) on AC pump feed line.
- Open the Manual Unloading Valve (Fig 8f item 10 in hydraulic section) by turning the wheel fully anti-clock-wise.
- AC motor pre-startup from PHC-3: See MANUAL OPERATION – START VFD procedure in PHC-3 manual.
- **IMPORTANT!** Verify the drive direction in accordance with the direction arrow label on the AC Motor/ Pump Unit (Fig 9o). To better see/feel the drive direction you can insert a plastic cable tie in between the fan blades while pulsing the motor. Re-wire for correct pump rotation if required.
- Monitor oil level and stop the AC pump and refill oil if required.
- When pres-startup is completed, close the Manual Unloading Valve (Fig 8f item 10 in hydraulic section).
- Check for oil leaks and tighten if required.

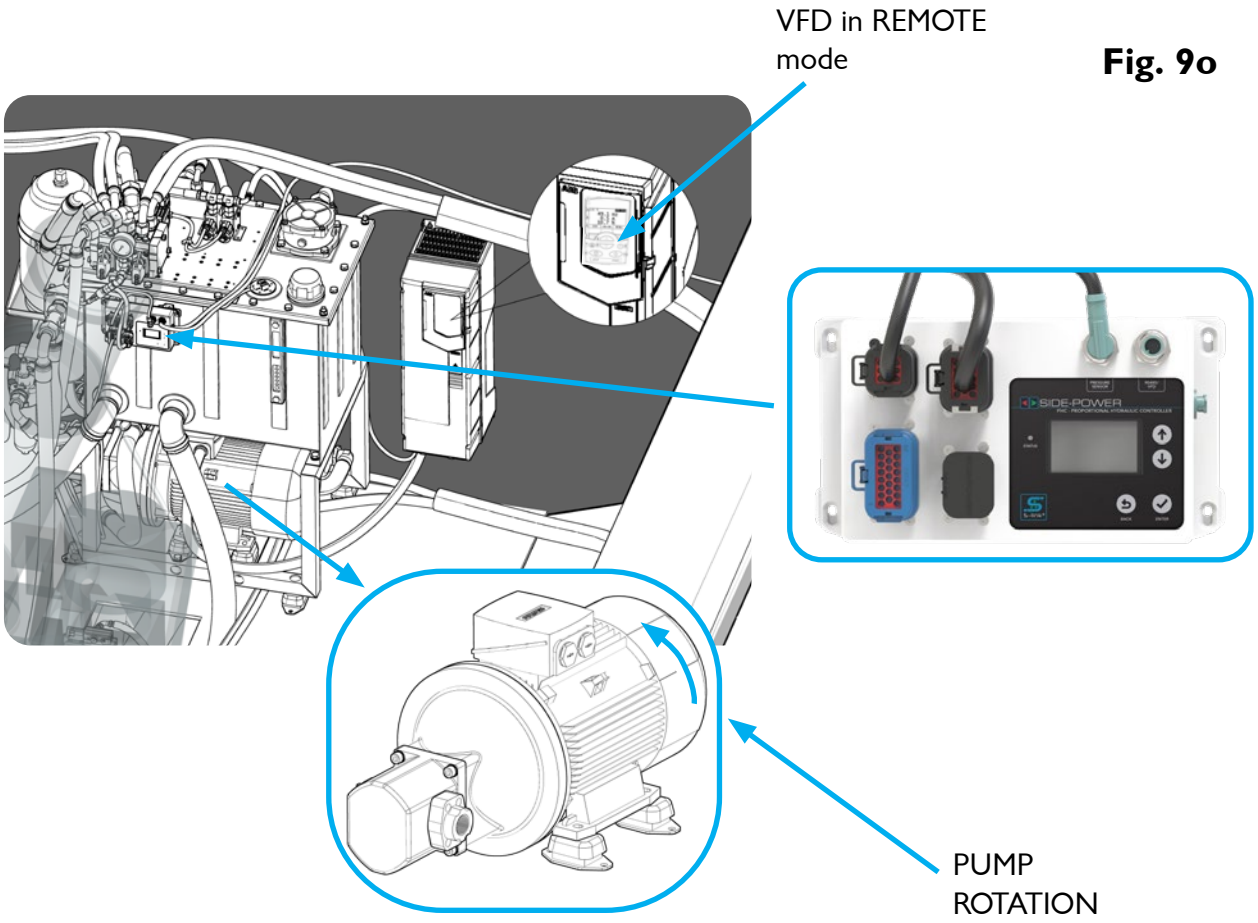
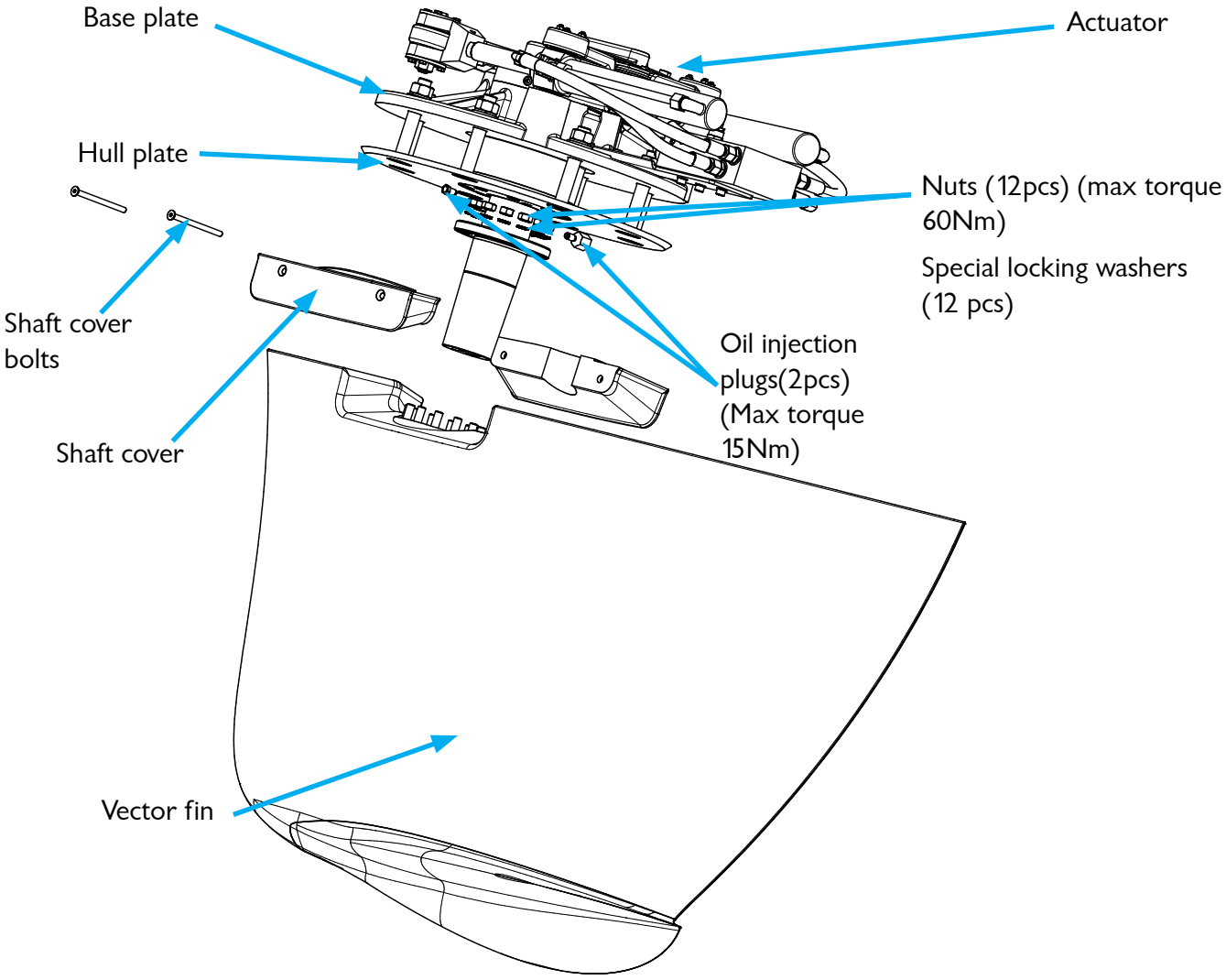


Fig. 9o

FIN ASSEMBLY OVERVIEW

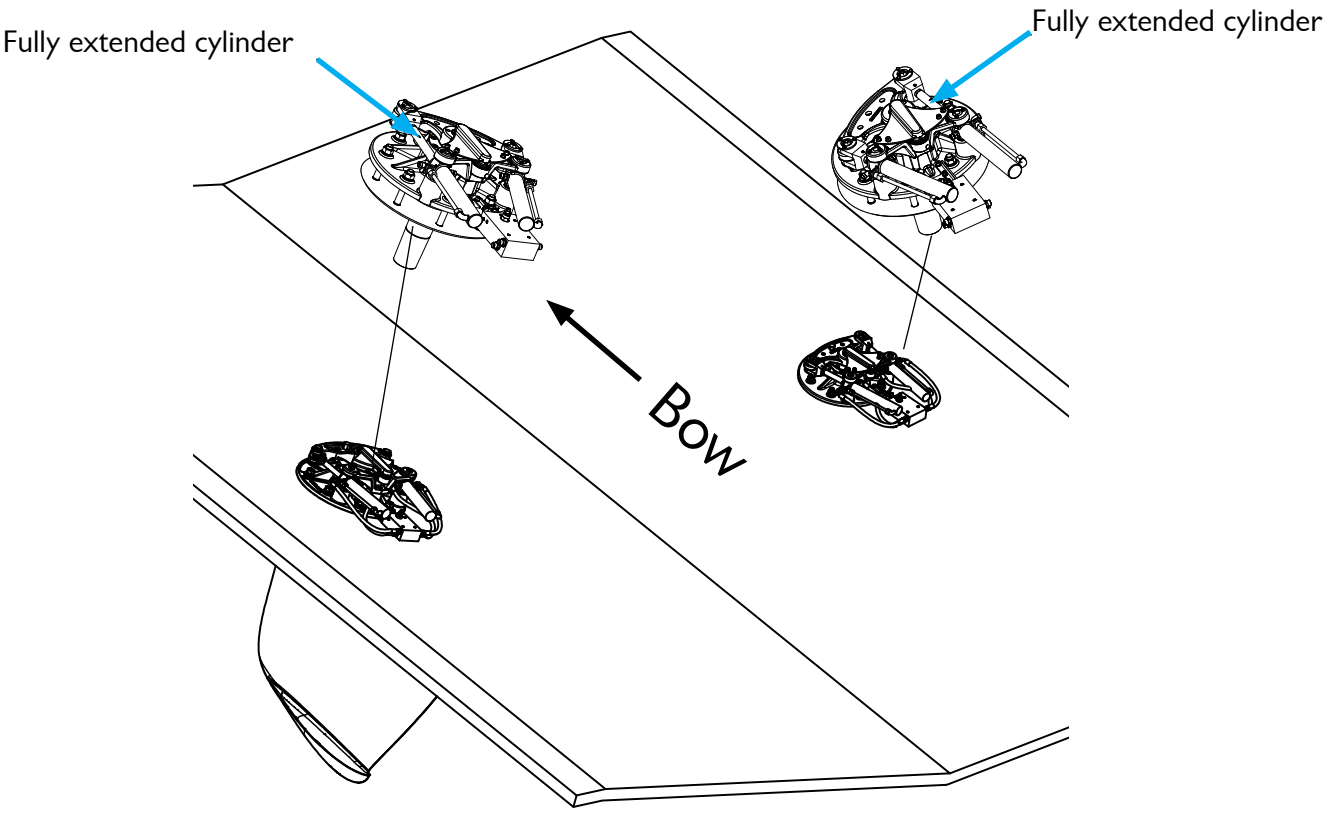
Fig. 10a



CORRECT ACTUATOR POSITION FOR FIN SHAFT INSTALLATION

The following figures illustrate the position the stabilizer actuator assembly cylinders must be positioned in relation to the fully outboard position of the relevant fin.

Fig. 10b PORT ACTUATOR STARBOARD ACTUATOR



When viewed and seen from inside/above the relative Stabilizer Actuator assembly:
- Rotate the Port Actuator fully to clockwise.
- Rotate the Starboard Actuator Fully counter clockwise.
- See Transversal fin positioning section.

WARNING!
During FIN INSTALLATION procedure, fins/actuators can/will move, ensure that health and safety measures will be taken

INSTALLATION OF THE FIN ASSEMBLIES

WARNING!
A hand oil pump (Installation tool kit, Item nr VFT55) must be used to achieve the fin installation. The pump should only be operated by qualified personnel that follow the pump manual operating instruction and health and safety directives.

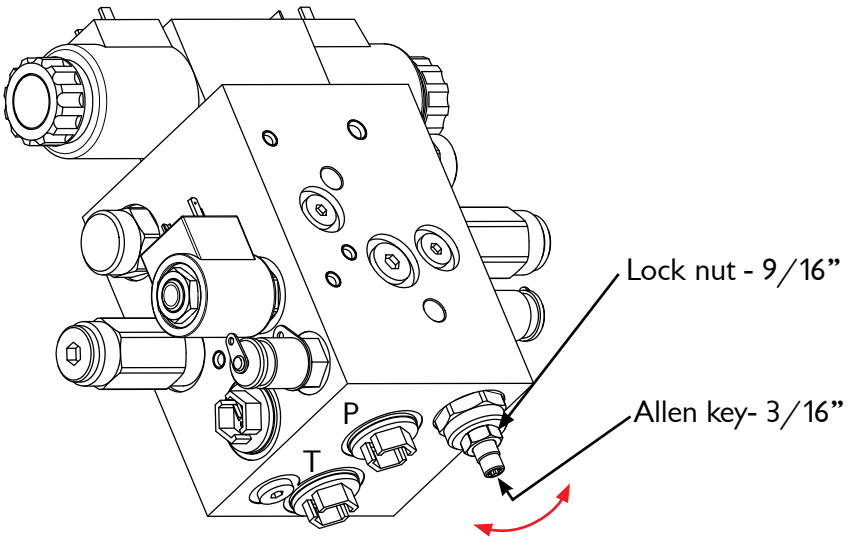
Step 1
Place correct fin on pallet adjacent to relevant actuator under the yacht for mounting.

Step 2
Locate port and starboard fin valve units.

Step 3 **(Relevant only, if you do not have any electrical or hydraulic power installed yet)**
On the fin valve unit it will be a manual decouple valve.

- Unlock the valve by turning the 9/16" lock nut anti-clockwise.
- Open the valve by turning the 3/16" Allen key anti-clockwise.

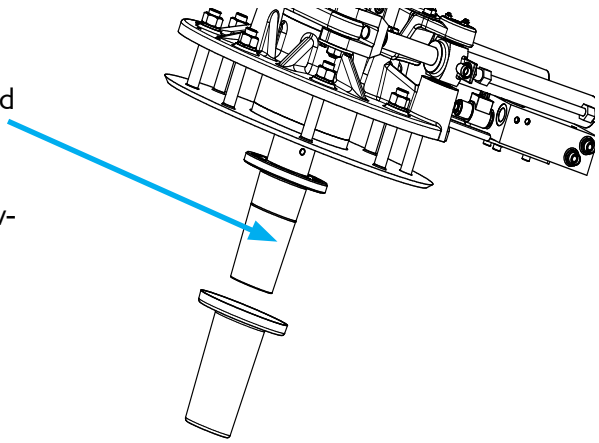
Fig. 10c



Step 4
Remove protective covering (Do NOT cut the protection cover) from the actuator shaft. Clean and degrease the coned surface.

NOTE! The protective cover can easily be removed by blowing air using a air pressure gun into the bottom hole of the cover.

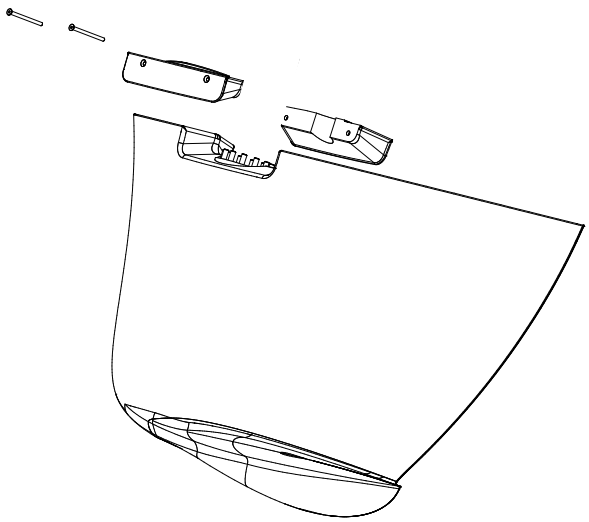
Fig. 10d



Step 5

Remove shaft covers from fin using a 4mm Allen key.

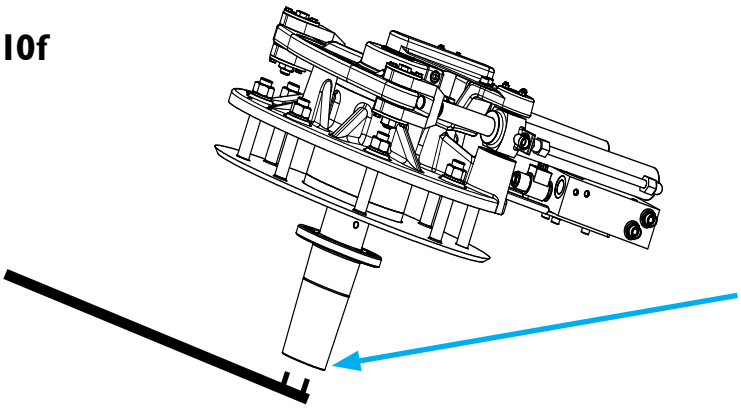
Fig. 10e



Step 6

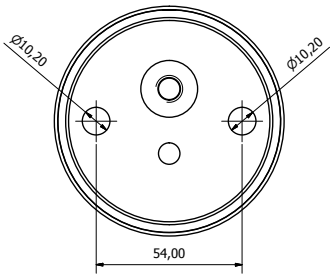
Use a suitable tool to move the actuator to the most outboard position, without damaging the shaft. Checking on the actuator that the cylinders are in the outboard position (inboard will be fully aft, outboard will be fully forward). Ensure that the actuator stays in the outboard position when fin is being installed. **See Step 22-27.**

Fig. 10f



NOTE!

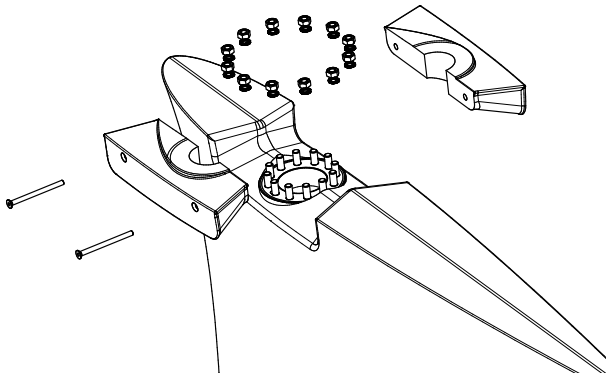
Hole pattern for making assistant tool.



Step 7

- Remove the transportation protection from the Stabilizer fin assembly.
- Unscrew all nuts and washers.
- Inspect and clean the internal hub.

Fig. 10g

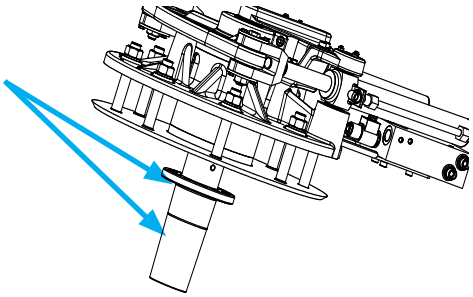


Step 8

Lubricate the shaft and the securing ring with the hydraulic oil (ISO VG 100).

IMPORTANT!
Do NOT use grease, only specified oil.

Fig. 10h

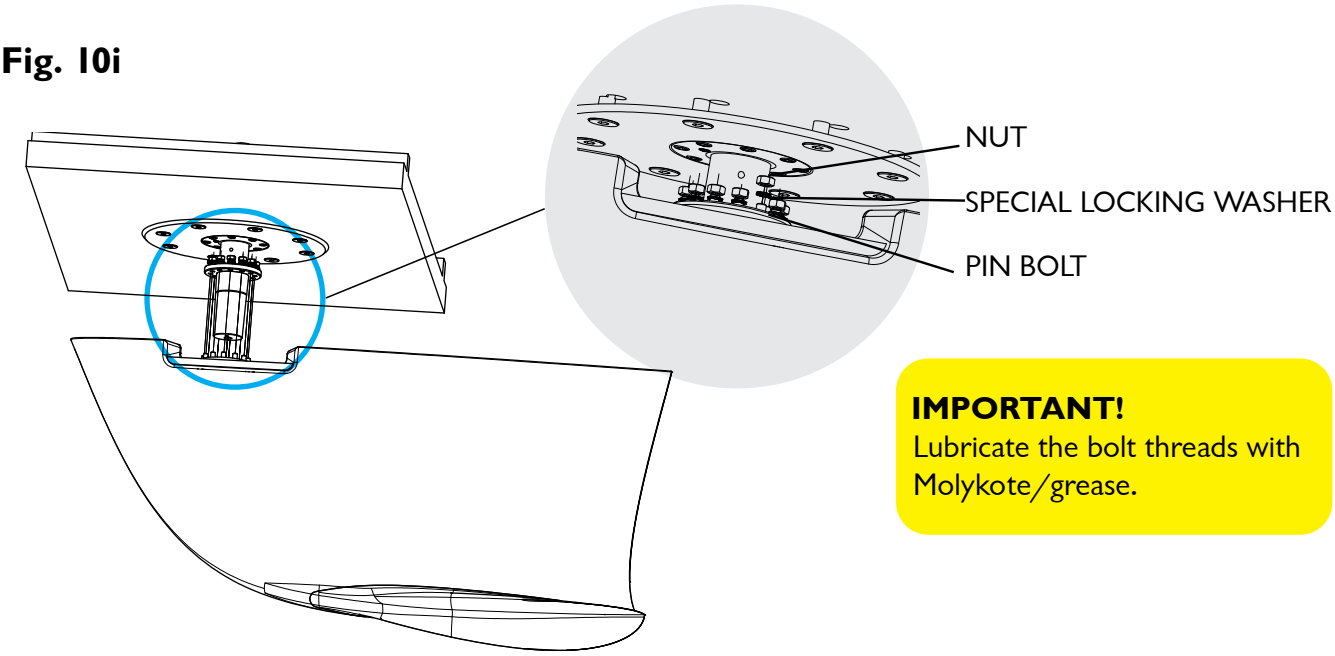


Step 9

When handling the fin assembly, ensure enough manpower is available to assist with careful insertion and alignment positioning and at the same time avoiding any damage to the taper.

- Lift the correct handed fin assembly in the appropriate direction and insert the fin on the actuator shaft.
- Fit 2 nuts with washers back onto the securing bolts opposite each other to prevent the fin from falling.

Fig. 10i

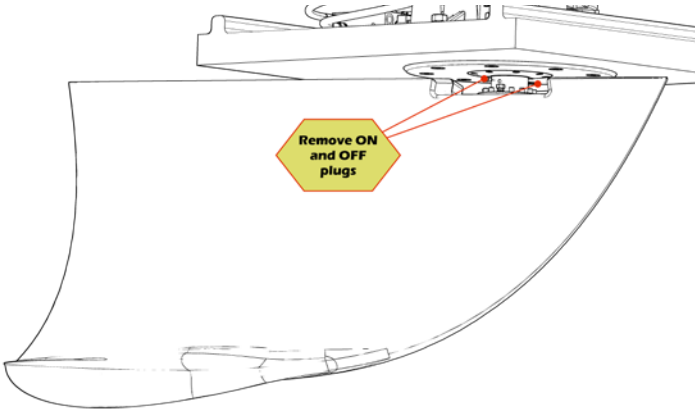


IMPORTANT!
Lubricate the bolt threads with Molykote/grease.

Step 10

Remove both hydraulic pump ports from where the shaft enters the fin.

Fig. 10j



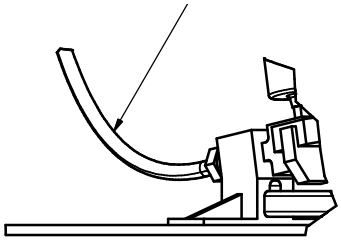
Step 11

Assemble the high pressure pump according to manual included with the pump.

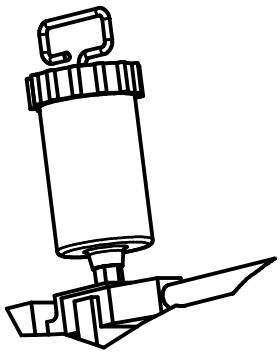
WARNING!
The pump should only be operated by qualified personnel that follow the pump manual operating instruction and health and safety directives.

Fig. 10k

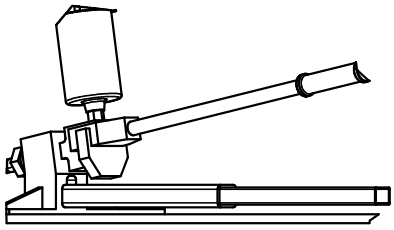
A Connect the high pressure hose.
Part no: 227957A/4000



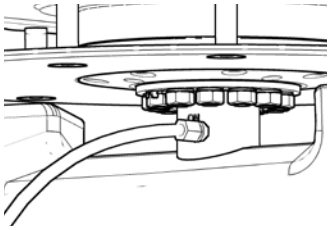
B Fill up the container with oil.
Oil part no: LHMF 300/1 (ISO VG 100)



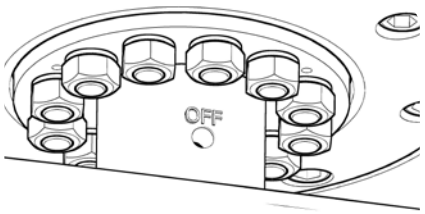
C Use the pump to bleed out the air in the hose.
Part no: 226400 +226402



D When free oil flows connect the hose to the shaft **ON** fitting.



E FITTING TO SHAFT
Part no: 1014357 A

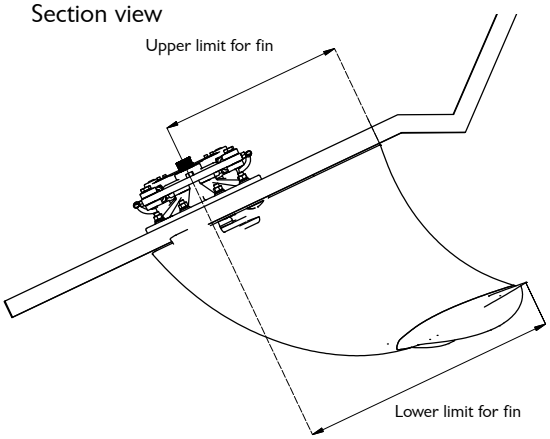


IMPORTANT!
OFF port must be open for drainage.

Step 12

Move the fin as far outboard as possible without hitting outer edge of the hull. **See page 12.**

Section view



Step 13

Fit the rest of the Nord-lock washers and nuts. Lift the fin until the two conical surfaces are fully in contact (shaft and hub), and tighten the nuts to 10 Nm(cross pattern). Measure the distance from the flange to the base through the holes (x7) as illustrated. All measurements should be the same, if not the flange is tilted. Take record of the measurements.

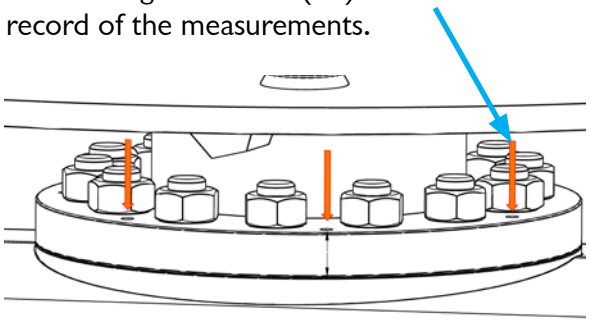
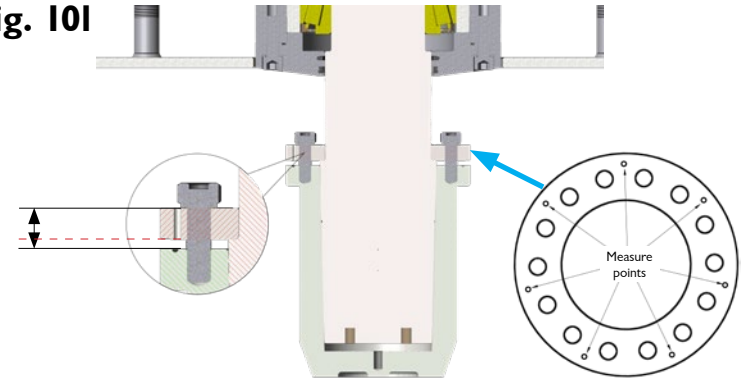


Fig. 10l



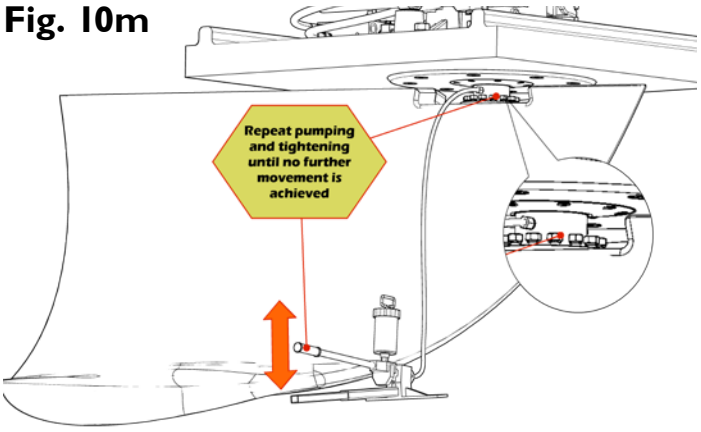
Step 14

Place rags or oil soaking pads underneath the fin or around the shaft and underneath the hydraulic pump.

Step 15

Pump until pump pressure gets stiff or visual oil around the shaft port entrance, then use a 19mm spanner move around in a **circular pattern** tightening the nuts to pull the fin into the shaft/hub.

Fig. 10m



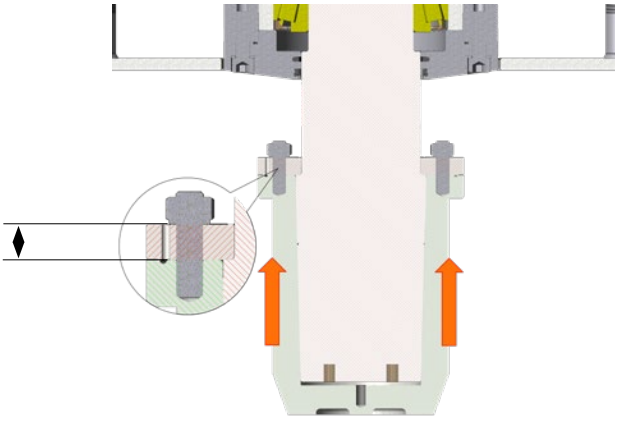
Step 16

Once the nuts are all tight, using a 19mm spanner tighten bolts in a **circular pattern** again while using the hand pump to maintain constant oil pressure.

Step 17 - IMPORTANT!

Repeat step 16 until correct internal drive up distance is achieved. Control the measurements again from the flange to the base through the holes as in step 13.
The measured distance should now be shorter according to following measurements:
SPS6X: 2,8-3,0mm. SPS9X: 4,7-5,0mm.
Control tighten all nuts to torque **60Nm** when correct drive up distance is achieved.

Fig. 10n

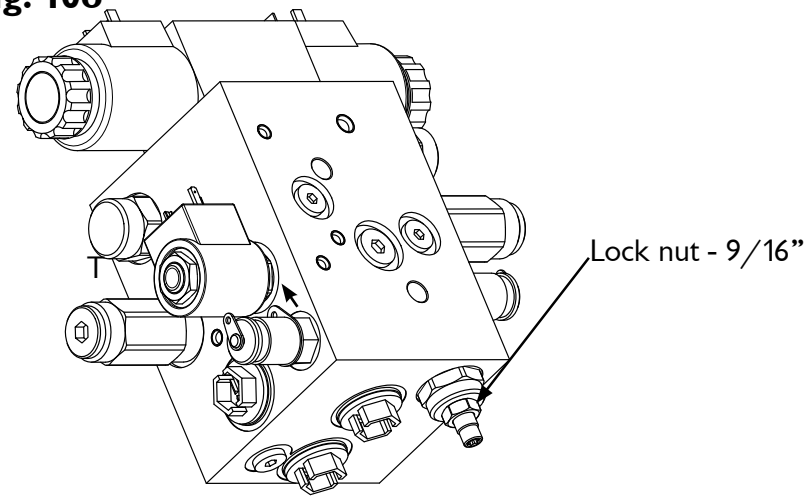


IMPORTANT!
Minimum drive up distance must be achieved to maintain the torque capacity and safety margin.

Step 18 (Relevant only, if you do not have any electrical or hydraulic power installed yet)

If opened in step 3: Re-tighten the manual decouple valve on the fin valve unit.

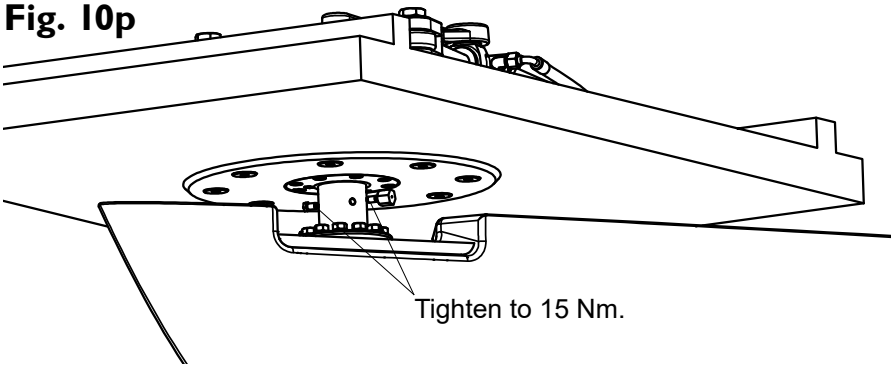
Fig. 10o



Step 19

Refit the ON and OFF plugs into their position 15 min after fin drive up procedure is completed in step 17.

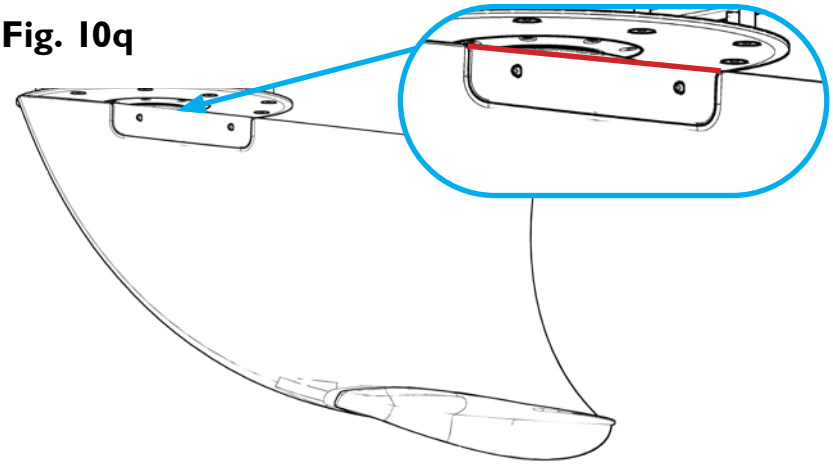
Fig. 10p



Step 20

Loosely place the shaft protectors and inspect the top face to see if it will rub against any section of the actuator face. If rubbing will occur grind off material on the shaft protectors to remove enough material to ensure clearance.

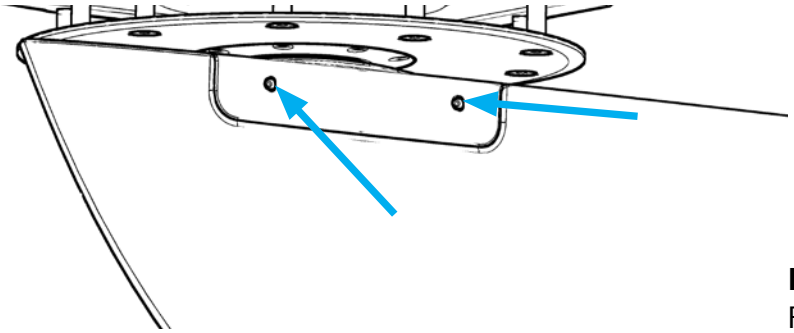
Fig. 10q



Step 21

Secure shaft protectors using a 4mm Allen key.

Fig. 10r



NOTE!

For Fin removal see own section

Step 22
On the stabilizer panel, Touch HOME.

Fig. I0s

Step 23
Touch STARTUP and MAINTENANCE

Fig. I0t

Step 24
Touch STARTUP (Password is 1234 - enter)

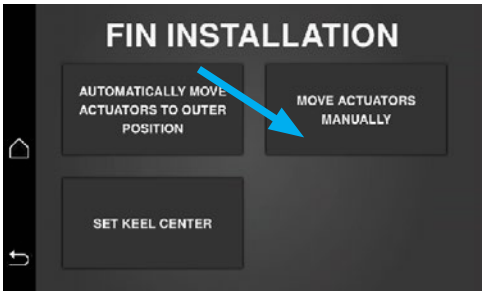
Fig. I0u

Step 25
Touch FIN INSTALLATION

Fig. I0v

Step 26*
Touch MOVE ACTUATORS MANUALLY
(This allows you to open/FLOAT actuators from the panel, without the need to manually open the fin valve unit described in step 3/18. (Step 3 and 18 can be excluded). It requires that Stabilizer control and hydraulic system is wired and connected with 24V power supply.)

Fig. I0w



Step 27

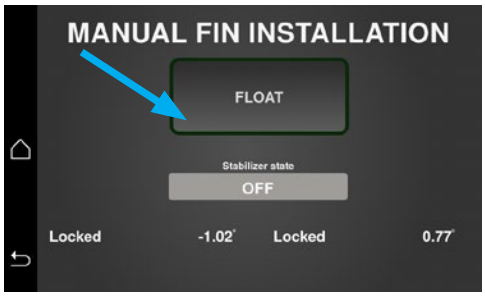
Touch FLOAT - turn actuators to outmost position according to step6

Touch LOCK when desired position is achieved

Install fins according to step 1-21

Touch RETURN when completed

Fig. I0x

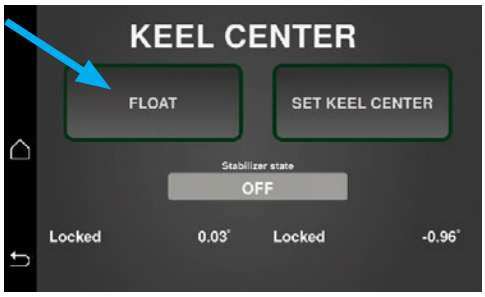


Step 28 **Fig. 10y**

Return to FIN INSTALLATION screen and Touch SET KEEL CENTER.

Step 29 **Fig. 10z**

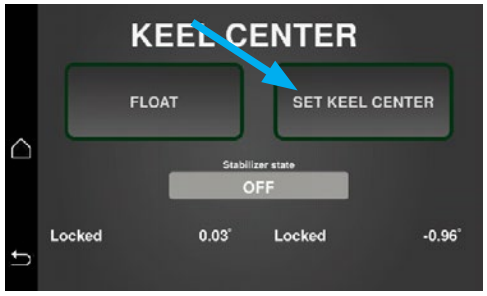
Touch FLOAT - Position the fins manually so the aft. edge and the fore edge are exactly the same distance from the keel. (Parallel to keel)



Step 30 **Fig. 10za**

Touch LOCK and then touch SET KEEL CENTER when fin positioning is completed.

Touch return to proceed to STARTUP.



***Alternative to Step 26**

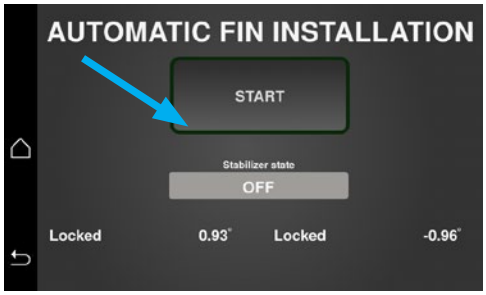
Touch AUTOMATIC FIN INSTALLATION

(This will make the actuators move to outboard position automatically and locked for fin installation. It requires that you have full system power with sufficient shore power supply. It also requires that bleed procedure and endstop detection is completed.)

Step 26b

Touch START

This will make the actuators move to outboard position automatically and locked/held in outer position for fin installation. Actuator position is now being held by hydraulic power. Now proceed to mechanical fin installation step 1-21. (Step 3,6 and 18 can be excluded)



Step 26c

When the mechanical fin installation is completed:

Touch STOP

Actuators/Fins will now move back to centre position.
Proceed to step 28.

After final installation of the fins place the Fin Location Labels to appropriately identify the location of the fins underwater.

Safety labels

To ensure crane operators and swimmers are aware of the fins' location and operation area, please mount the safety labels on the hull.

Height text: 44 mm Height arrows: 63 mm

Length*: 1272 mm

***Length adjustable to all Side-Power fins**
Follow instructions in manual
Items needed: Plastic squeegee (not rubber), Scissors

Start-up checks Actuators

Actuator Manual Decouple Valve Tight. O

Check Electric operated decouple valve (coil nut) is tightened Under 6.8-9.5 Nm. O

Check hose spec from combiner to fin valve(Less than 2.5m)(Recommended). O

Actuator Hose Connections Tight/Clear Port/Stb, and hoses have full range of movement. O

Actuator Electrical Connections Clear. O

Actuator Encoder Belt, Wheels ok and Belt Tight. O

Actuator Bonded to the boats electrical system. O

Actuators clear of Boat Structure. O

Start-up checks Fin valve unit

Fin Valve Manual Decouple Valve Tight. O

Fin Valve Check Hose Connections Port/Stb. O

Fin Valve Electrical Connections Correct. O

Start-up checks Accumulator block

Accumulator Block Manual Decouple Valve Tight. O

Accumulator Block Hose Connections Ok. O

Accumulator Block Electrical Connections Correct. O

Accumulator Pressure Transmitter Reading Correct. O

Start-up checks Electrical components

Check Control Cabinet Connections are correct. O

Check Power Feed is Active. O

SCU and FCU Electrical Connections. O

GW-1 and GPS Connections Correct and Valid Signal. O

Start-up checks Cooling pump

Electric:

PHC-3 settings. See PHC-3 manual. O

Check Cooling pump connections are correct and pump runs in correct direction. O

Hydraulic:

PHC-3 settings. See PHC-3 manual. O

Check connections and drive direction O

Both Electric and Hydraulic:

Check cooling pump is installed below waterline. O

No air traps in the water lines(continuous rise). O

Cooling water discharge should have minimum resistance/back pressure.
(Discharge to engine exhaust will cause problems for the water pump. O

Pre-startup from PHC-3 manual is performed. (MANUAL OPERATION – START COOLING PUMP) O

Cooling pump set to auto when performing Fin Installation from panel. See PHC-3 manual. O

Start-up checks AC pump

AC Pump Clockwise. O

Ac Pump Standby Pressure O
(75 BAR VF650, 90 BAR VF800/VF1350, 100 BAR VF1050, 110 BAR VF1650/VF1950 Vector Fins).

Start-up checks PTO pump

Ensure correct pressure according to specific system drawings O

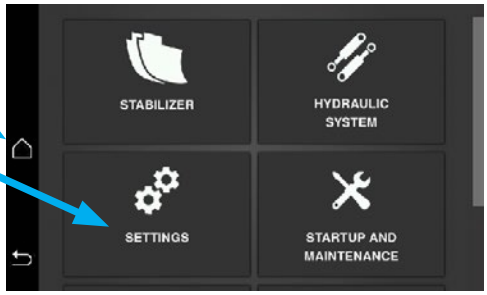
Start-up checks Hydraulics

Check hose connections, all connections may require re-tightening O

Standard start-up parameters are pre-set from factory . These settings are boat dependant and necessary to achieve optimum performance of the system for a given application. Settings are to be changed only when requested by authorized Side-Power personnel.

Pre-STARTUP procedure

Fig. IIa

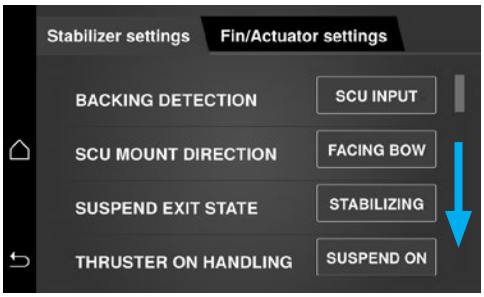


From HOME menu:

Touch SETTINGS, and adjust the parameters to the specific yacht.

Stabilizer settings (Scroll down menu)

Fig. IIb



1. REVERSE/BACKING DETECTION — SCU input / NMEA2000

The reverse signal input is either from reverse detection loop input to SCU or from NMEA2000 transmission signal to the Side-Power gateway GW-1.

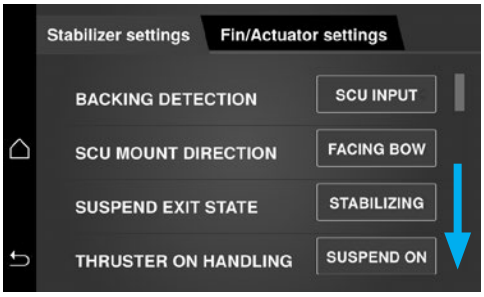
2. SCU MOUNT DIRECTION — FACING BOW / FACING AFT / NO DIRECTION

Set the direction of the stabilizer control unit to match the installation.

3. SUSPEND EXIT STATE — OFF / STABILIZING

Select which state to return to after reversing one or more engines – off or resume stabilization.

Stabilizer settings (Scroll down menu) continues: **Fig. 11c**



4. THRUSTER ON HANDLING — NO HANDLING / SUSPEND ON

Select if thruster(s) and stabilizers should be operating simultaneously (reduced thruster performance), or if the stabilizers should centre and go to suspend mode during thruster operation.

5. CRUISING P — value

6. CRUISING I — value

7. CRUISING D — value

8. AT ANCHOR — value

9. AT ANCHOR P — value

10. AT ANCHOR CENTER — value

11. SPEED THRESHOLD — value

12. SPEED FACTOR — value

13. OPTION 1 — value

14. OPTION 2 — value

15. OPTION 3 — value

16. OPTION 3 — value

17. OPTION 4 — value

18. OPTION 5 — value

19. OPTION 6 — value

20. OPTION 7 — value

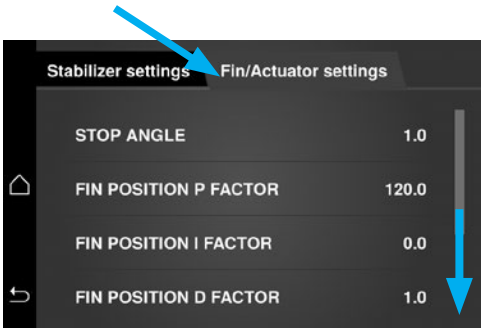
21. OPTION 8 — value

These settings are boat dependant and necessary to achieve optimum performance of the system for a given application. Settings are to be changed only when requested by authorized SP personnel.

Then, proceed to the tab Fin/Actuator settings

Fin/Actuator settings (Scroll down menu)

Fig. 11d



1. STOP ANGLE value

2. FIN POSITION P FACTOR value

3. FIN POSITION I FACTOR value

4. FIN POSITION D FACTOR value

These settings are boat dependant and necessary to achieve optimum performance of the system for a given application. Settings are to be changed only when requested by authorized SP personnel.

5. FIN ACT TYPE select actuator

6. FIN TYPE select fin

Select the actuator and fin size installed in Detect Endstop section.

Pre-STARTUP is now completed. Go to STARTUP.

IMPORTANT!
Before running or making setting adjustments in STARTUP, SEA TRIAL and Parameter SETTINGS ensure that:
- Complete Hydraulic and Electrical system is up and running
- Stabilizer system (also At Anchor) is in OFF status on the panel.
- AC pump is AUTO/ON or PTO is ON.

WARNING!
During STARTUP procedure fins/actuators will move, ensure that health and safety measures will be taken

STARTUP procedure

From HOME menu:

Touch STARTUP and MAINTENANCE

Fig. IIe

Touch STARTUP (1234 - enter)

Fig. IIf

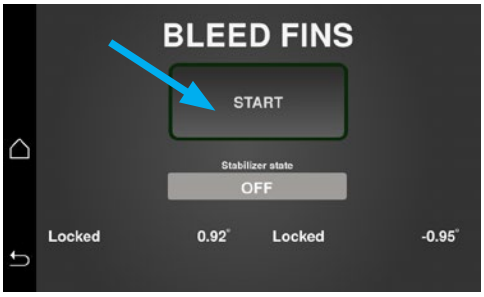
Touch STARTUP BLEED

Check Pressure On Accumulator Gauge (70/90Bar)
Note!
Ac Pump Standby Pressure
(75 BAR VF650, 90 BAR VF800/VF1350, 100 BAR VF1050, 110 BAR VF1650/VF1950 Vector Fins).

Fig. IIg

Touch START (Bleed actuators). Fins/actuators will move

Fig. IIh



Bleeding procedure will take some time.

The bleeding procedure is used to circulate oil through the hoses to flush any gas (air) out of the hydraulic system. Hose/piping routing might require the bleeding to be performed several times.

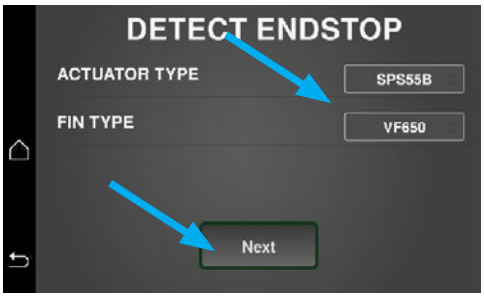
Proceed to the DETECT ENDSTOP menu.

Fig. IIi

Return to STARTUP screen

Touch DETECT ENDSTOP

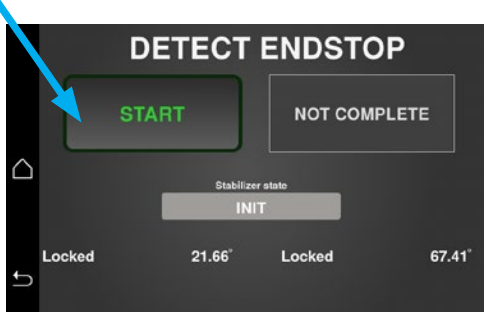
Fig. IIj



Ensure correct Actuator and Fin type selected.

Touch NEXT

Fig. IIk

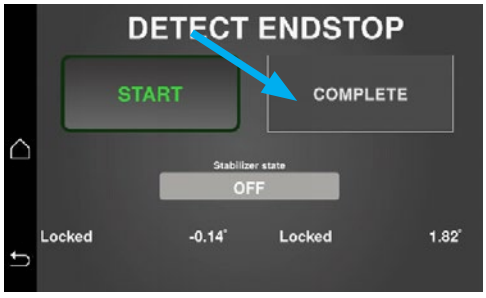


Touch START

Fins/actuators will move

The end stop detection is required as it defines the actuator stroke.

Fig. III



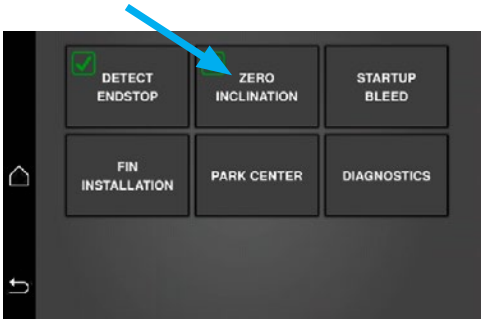
When the procedure is complete, press the RETURN arrow to go back to the STARTUP menu:

Proceed to the ZERO INCLINATION menu.

Return to STARTUP screen

Touch ZERO INCLINATION

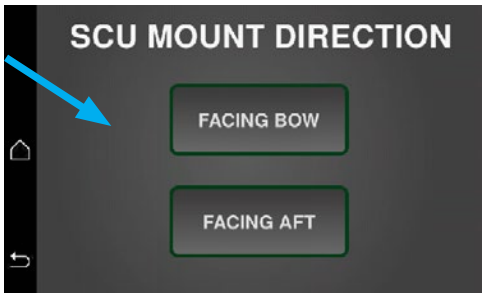
Fig. IIm



Select the SCU MOUNT DIRECTION.

SCU is mounted either facing bow or facing aft of the yacht.

Fig. IIn



Ensure the yacht is level and not rolling before setting the 0° keel:

Touch START

Fig. IIo

When procedure is complete:

Touch RETURN

Fig. IIp

Return to STARTUP screen

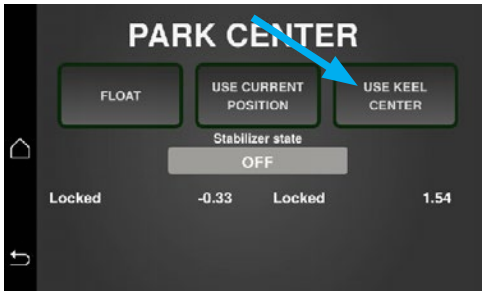
Touch PARK CENTER

Fig. IIq

Touch USE KEEL CENTER (Recommended) (If on shore)

When Stabilizer system is turned off or in backing mode the fins will now be locked in center position that was performed during fin installation.

Fig. IIr



If you for some reason want to adjust or use another PARK CENTER position, it can be performed from this section:

Touch related fin value to adjust PARK CENTER position.

NOTE! Values shown are fin position with actuator mechanical center as reference.

Fig. IIs

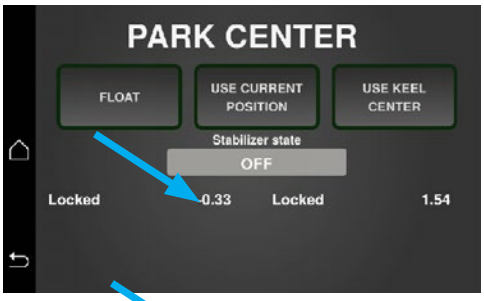
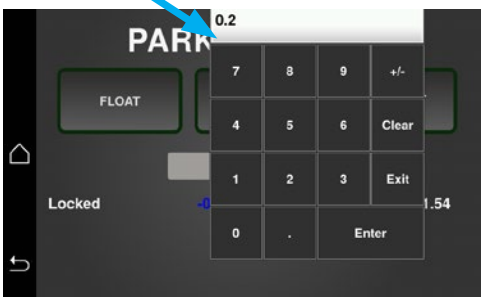


Fig. IIt



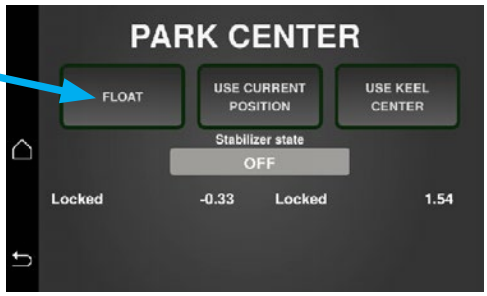
Change value on related fins to desired position.

Touch ENTER when completed.

If you want to adjust PARK CENTER to a given speed:

Touch FLOAT
Proceed to wanted speed

Fig. IIu



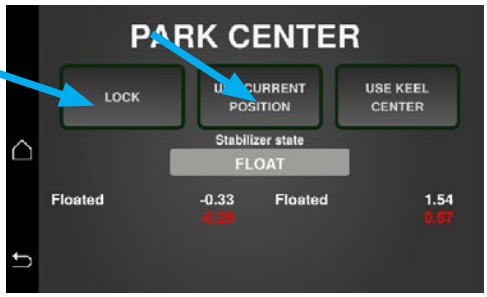
When desired speed is achieved:

Touch USE CURRENT POSITION and then Touch LOCK.

NOTE! Current fin positions are shown i red values. (When in FLOAT state)

Touch RETURN to proceed.

Fig. IIv



STARTUP is now complete

Proceed to SEATRIAL

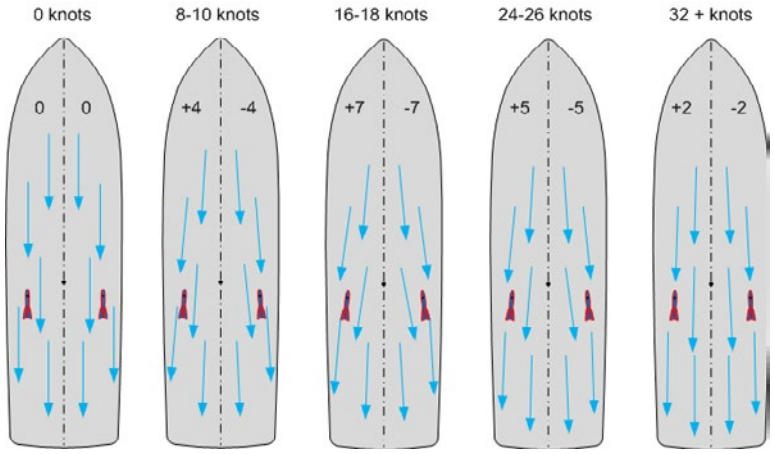
Fig. IIw

DYNAMIC CENTER EXAMPLES

Typical fin center angles as found in dynamic center tests on around 70' planning V- hull boats. The fins are centered by water flow under the boat through test and then fine-tuned manually.

PS! Even if the fins in test at less than 4 knots are found to have an outward angle, the lowest speed should be set to 0 knots (zero) and fins parallel to the keel.

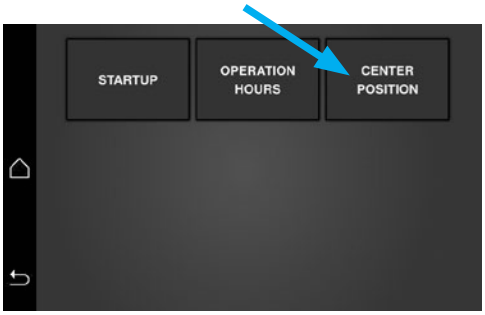
Fig. I2a



From the STARTUP and MAINTENANCE menu:

Touch CENTER POSITION (1234 -enter)

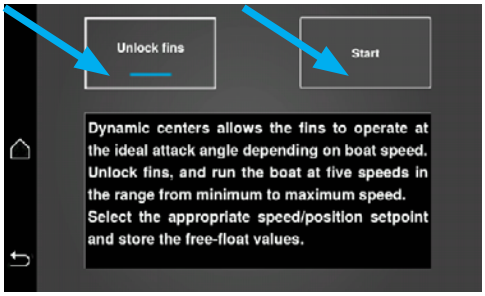
Fig. I2b



Ensure the fins are UNLOCKED and then Touch START

Proceed now to Dynamic fin positioning

Fig. I2c



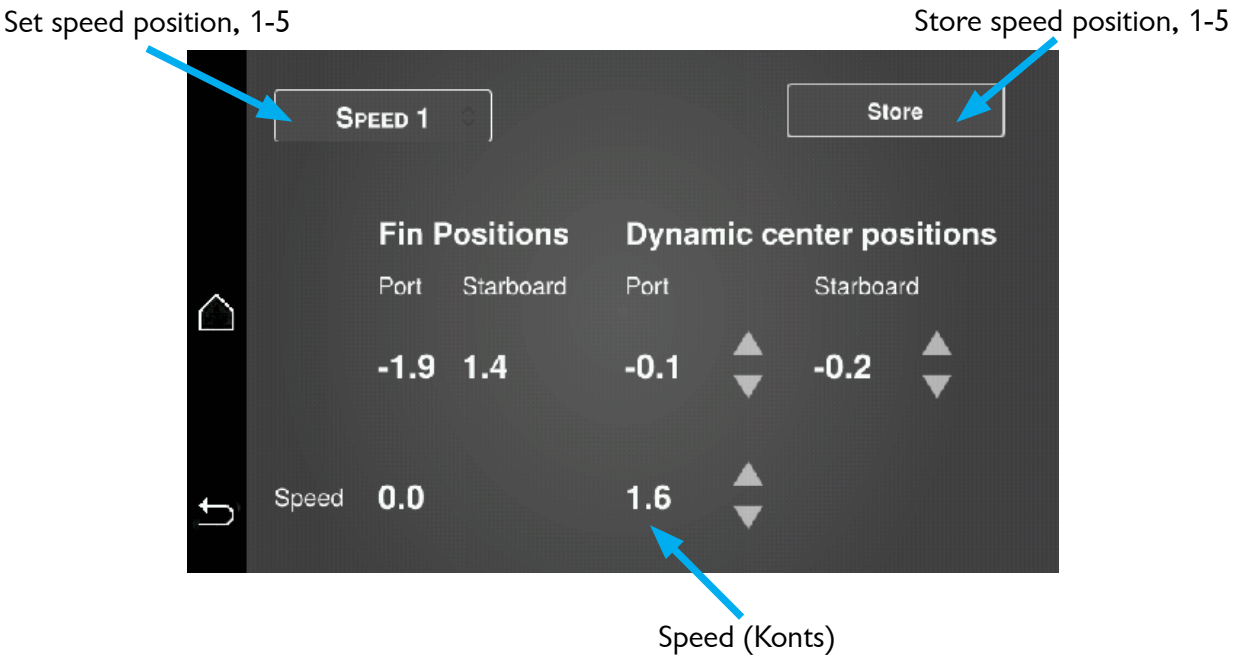
Dynamic fin position setup

The dynamic setup is required to get the best Vector fin performance benefits. A sea trial is required to find the free float positions of the fins at different speeds, and to tune to optimum position for a given speed. It is preferable to have flat sea for the dynamic setup sea trial, to minimize boat roll that will influence fin position.

To find the free float positions, it is necessary to float the fins, start the logger, and take the vessel to maximum speed. Then register the positions at different speeds, starting with the highest and choose speeds steps according to the vessel performance. The position is interpolated between the different speeds, so it is important to have one speed before the planning threshold and one after, as the water flow over the fins often change much during the transition to planning mode.

When all speeds/positions have been set, stop the logger.

Fig. I2d



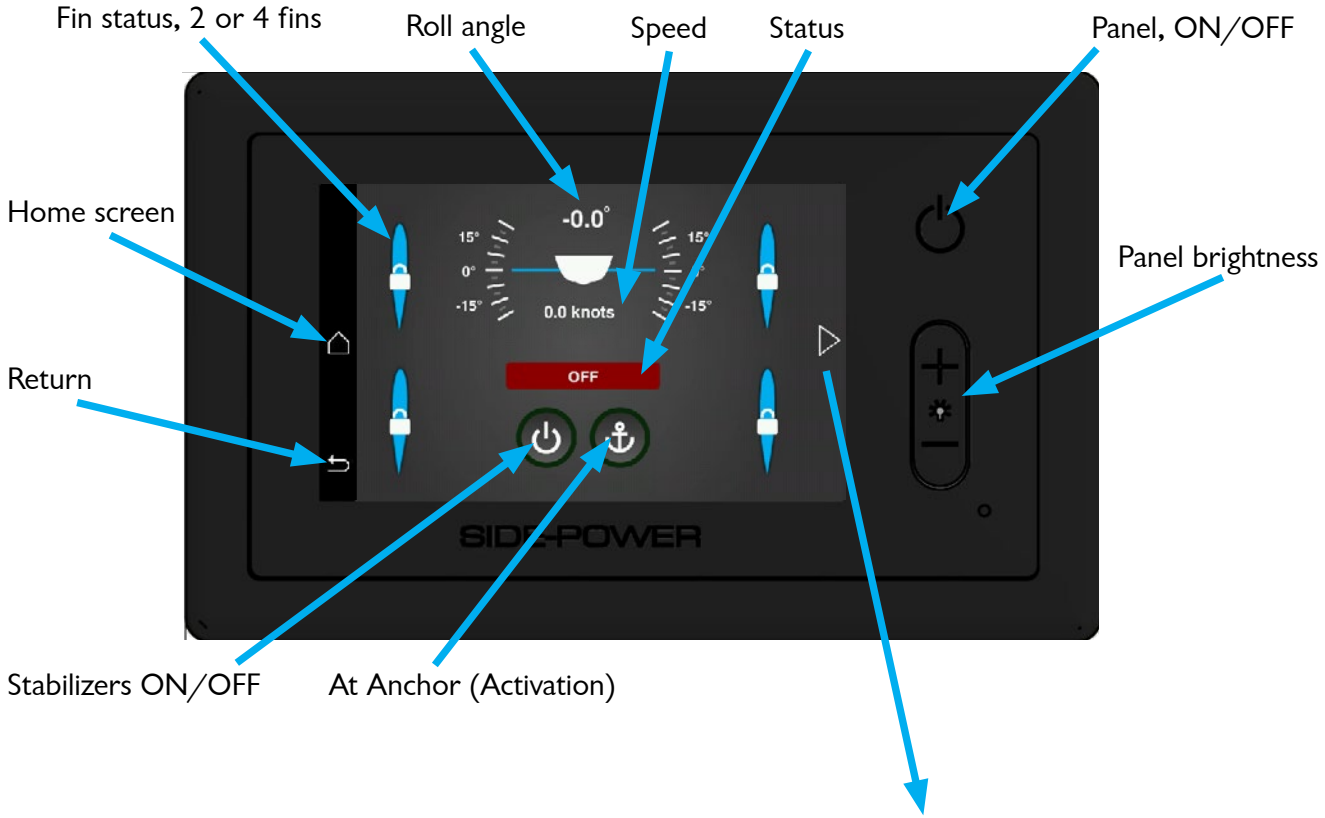
Dynamic fin position setup continues:

When the free float positions have been recorded, the following table can be used as a starting point for fin position adjustment: (Do NOT press STORE after adjusting with these values)

	Speed (knots)	Port fin adjustment	Starboard fin adjustment
1	12	-3°	+3°
2	18	-4°	+4°
3	24	-5°	+5°
4	30	-4°	+4°
5	36	-3°	+3°

Some boats will require more or less adjustment for optimum performance. Too much correction is to be avoided, as the actuator needs some torque reserve to be able to counter roll.

1. Front screen

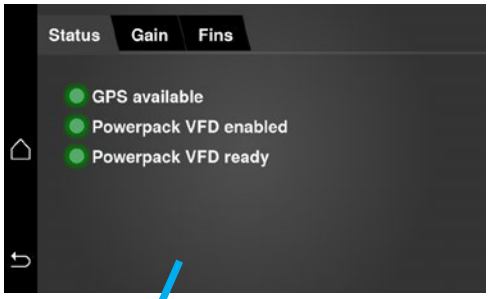


1.1. Status screen (Touch arrow/triangle on the right)

Green light is indicating:

GPS available
Powerpack VFD enabled
Powerpack VFD ready

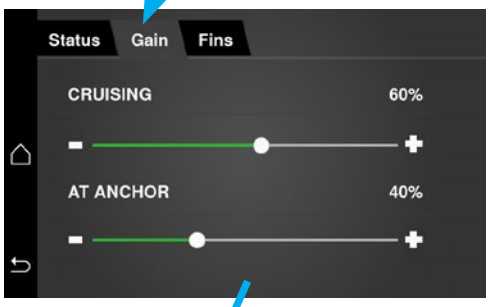
Red light is indicating not ready



1.2. Gain screen

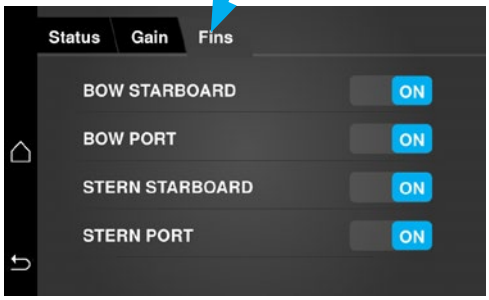
Possible to adjust the system's reaction to roll when cruising

Possible to adjust the system's reaction to roll when at anchor



1.3. Fins screen (2 or 4 fin system)

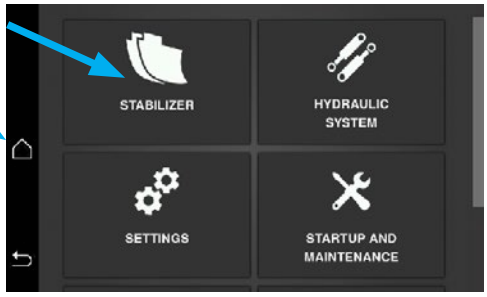
Showing fins status, disabled or enabled.
Fins can be disabled/enabled from this screen



2. ACTIVATE Stabilizers

From HOME menu:

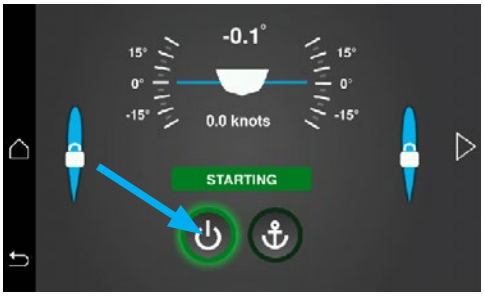
Touch STABILIZER



2.1. Fins are locked and system in OFF status

2.2. Activate Stabilizers to **CRUISING** mode:

Touch ON/OFF button - system is starting



2.3. Stabilizers are active in **CRUISING** mode

Usually in use from 3/4 knots and up.

Note! System change automatically between Cruising/ At Anchor when both is activated.

2.4. Activate Stabilizers to **AT ANCHOR** mode:

Touch ANCHOR button - system is starting and running
Usually in use from 0 to 3/4 knots.
To turn At Anchor OFF, touch Anchor again.

Note! System change automatically between Cruising/ At Anchor when both is activated.

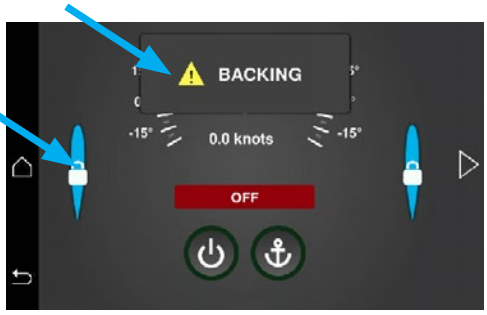
2.5. Turn system **OFF**:

Touch ON/OFF button - fins are centred, locked and not active

3. BACKING the yacht

When the yacht/gearbox is put in reverse the fins will automatically be centred and locked.

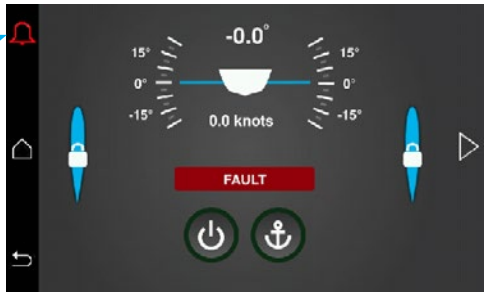
BACKING will be indicated on the screen



4. ALARMS

4.1. Alarms are indicated in upper left corner of the screen

Touch the red alarm bell to view alarm list



4.2. Alarm list shows current alarms, with alarm description

To acknowledge alarm(s) touch ACKNOWLEDGE ALARMS in the bottom of the screen

4.3. Touch the active alarm for more details and Correct the cause of the alarm

Alarm codes and troubleshooting actions are shown in user manual. Alarm actions will also be presented in this screen. Contact Side-Power representative.

Touch close to finish alarm acknowledgement

4.4. All alarms are acknowledged

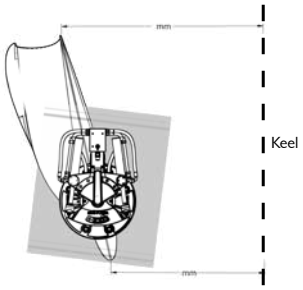
For fault codes, troubleshooting and advanced panel information please contact your Side-Power representative.

REMOVING THE FIN

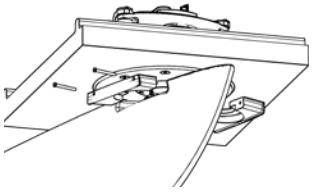
Fig. I4a

WARNING!
A hand oil pump (Installation tool kit, Item nr VFT55) must be used to achieve the fin installation. The pump should only be operated by qualified personnel that follow the pump manual operating instruction and health and safety directives. Turn OFF all electrical and hydraulic power!

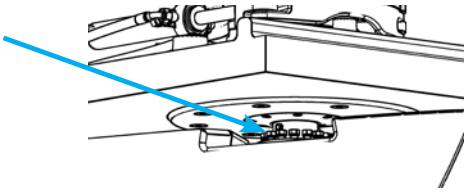
Step 1
Take and record measurements of the distances from the aft end of the fin to the keel and the fore end of the fin to the keel. This to ensure correct fin positiong when service procedure is completed.



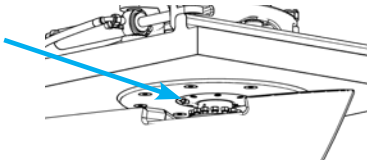
Step 2
Remove the shaft cover using a 4mm Allen key to unscrew the shaft cover bolts.



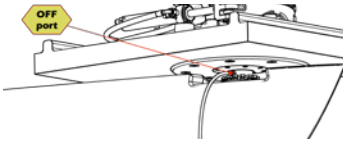
Step 3
Loosen the nuts but do not remove them.



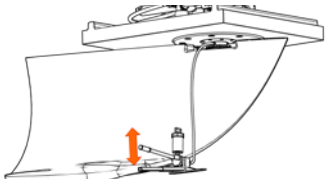
Step 4
Remove the OFF blind for the hydraulic port.



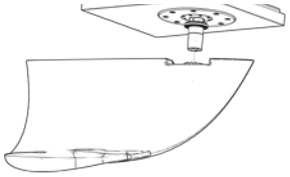
Step 5
Attach the hydraulic pump line into the port marked OFF. The first adaptor is secured with a 22 spanner. The second part is secured with a 15 spanner.



Step 6
Use the hydraulic pump until the fin drops down but is held up by the nuts.



Step 7
Use two people to take the weight of the fin while you remove all the nuts and washers.



Step 8
Lower the fin to the floor and replace the protective cap.

Step 9
Replace the actuator shaft protective covering.

FIN ACTUATOR UNITS

The stabilizer system is in general a low maintenance product, but as all moving parts some degree of preventive maintenance will increase the lifetime and reliability of the system.
A chart for recommended check and service points is thereby offered at the end of this section.

For all new installations, or after a major parts change, a basic check should be done after the first 100 hours of operation or after the first week of proper use:

- Check that all hydraulic fittings are tight.
- Check all hoses for chaffing, and ensure they are not in contact with any moving parts.
- Inspect hydraulic cylinder rods and gland seals for damage, leaking, or scratches.
- Inspect the dirt indicator on the return oil filter.
- "Shake" the fins from the outside to feel if there is any play in any connection.
- Open the fins manual decouple valve (at the acuator point ot allow movement) and manually move the fin fully to both sides to feel that there is not specific tough spot in the bearings.

Every time the boat is out of the water for service or other reason, we recommend that you take this opportunity to more thorougly check some points that is not possible when the boat is in the water. A proper cleaning and check of the fins anodes (if fitted, can also be bonded to boats large anode system) is also appropriate during a haul out.

- Axial and radial play in the shaft can also be checked at this time; see the table below that details play allowances. A dial indicator is recommended for this procedure.

    o Radial play should be checked with the indicator/micrometer positioned just below the seal housing between the top of the fin and the underside of the hull.

    o Axial play should be checked by measuring the relative distance between the top of the axle shaft and hull plate. By using a crow bar on the twin yoke, moving and feeling the tightness of the bearings inside the boat while measur ing from a fixed point with a micrometer.

	Shaft Radial Play (mm) Maximum	Shaft Axial Play (mm) Maximum
SPS 65/66/67	0.10	0.20
SPS 55/90/91/92/93/94/96/97	0.15	0.30

NOTE!

Because of the big variation in different vessels actual use and operation, system specifications and maintenance, it is not possible to accurately predict the anticipated service life of the main shaft bearings. Thereby, Sleipner recommends that the bearing clearances be checked periodically when possible so to avoid extra halout between normal service need.

The service timing indicated in the chart is based calculations and experience, but please note that because of the variations in use and load, both due to different operation and for example different fin sizes allowed on the same actuator size, the life of bearings and seals can be both longer and shorter than indicated by the maintenance chart.

FINS

It is recommended that a thorough inspection of the fins be performed when the vessel is lifted out of water for maintenance. Dam-ages on the fin surface must be repaired with vinylester/epoxy done by professionals

HYDRAULICS

The pressure filters require periodic element changes as per the maintenance schedule. The valves and manifolds are to be inspected regularly for external damage. To avoid corrosion and deterioration, a water inhibitor such as WD-40 or similar should be applied to the valves and fittings immediately after wash-down of the equipment.

***Filter replacement:**
We recommend to replace pressure and return line filter elements after the initial start up and test period, and latest at 50 operating hours. Thereafter every 2000 operating hours or every 2nd year.

Both pressure filter and return filter have pressure drop indicators. Check indicators every 6th month. The check have to be done with oil temperature above 40˚C, and the most flow demanding consumer active. Filter element replacement are required if indicators are in the red area.

Hydraulic oil replacement:
Every 4000 operating hours or every 3rd year. For heavy duty applications and commercial use, we recommend oil sample analyses every year.
***Check oil color every 6th month. White or grey oil indicates water ingress or heavy condensation. This will require filter replacement, oil replacement and flushing of the system. See schedule and Hydraulic system manual.

CONTROL SYSTEM

With the exception of keeping the electrical parts and wiring clean, dry and damage-free, no maintenance is required for these parts. In general, all electrical equipment should be periodically checked to ensure that there are no mechanical damage or water build-up.

POWER UNIT

The power unit and its associated components require maintenance and have a lifetime so will in the future require replacement which can be done preventively as indicated within the charts here, to avoid potential follow damage to other parts.

The hydraulic oil integrity must be checked as per the schedule by extracting a sample from the system for analyzis to ensure it is withing the standards of its spesifications.

The hydraulic power unit motor should not stay unused for longer periods, and either manually rotated every 3 months or started to ensure proper lubrication of the shafts and bearings on its shaft and bearings.

PREVENTATIVE MAINTENANCE SCHEDULE

The maintenance schedules in this section indicate the recommended preventative maintenance intervals for equipment supplied by Side-Power. Components utilized in Side-Power Stabilizer Systems but not supplied by Side-Power are not included in the maintenance schedule or under any Side-Power warranty.

The maintenance intervals are listed in hours of operation and time where relevant. Maintenance is to be performed according to this schedule utilizing time or hour intervals, whichever comes first. . The maintenance schedule incorporates the minimum required maintenance to ensure correct operation of the system. Should these guidelines not be followed, the warranty for those items will be void.

To perform maintenance, replacement parts may need to be purchased. Refer to the recommended spares list and/or drawings for associated part numbers.

☎ Contact a Authorized Side-Power technician.
* If analysis of the scheduled oil sample indicates an elevated level of brass particles in the hydraulic system, the pumps should be replaced or overhauled as soon as possible. Delay in component removal and system flushing will lead to contamination problems throughout the hydraulic system. Erratic component operation may be a symptom of hydraulic fluid contamination.

*** 2000 operating hours or annually, whichever occurs first.

**** Fins should be inspected annually by diver if possible

The data in the table below is provided to assist the vessel in scheduling the appropriate service staff and coordination of vessel docking (haul out) for maintenance procedures.

Level	Description
1	Onboard maintenance possible at sea No shore support required
2	Shore supported maintenance and corrective measures
3	Trained personnel required - Side-Power personnel or equivalent
D	Dry - Vessel must be out of water to perform task
W	Wet - Vessel can be in water to perform task

A. HULL UNIT

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required	Months/ Year
1. Change oil in bearing assembly ☎	**1 D**				✓					36/3rd
2. Inspect spherical bearings, and Main Cylinders for external leakage	**1 W**			✓						
3. Inspect Stabilizer Manifolds	**1 W**			✓						
4. Inspect Stabilizer Manifolds Electrical Connections	**1 W**			✓						
5. Inspect Fin Angle Sensor Belts	**1 W**			✓						
6. Inspect Twin Yoke Area	**1 W**			✓						
7. Inspect Hydraulic Hoses	**1 W**			✓						
8. Check Shaft Clearances ☎	**3 D**							✓		
9. Replace Lower Shaft Seals ☎	**3 D**								✓	
10. Replace Main Shaft Bearings ☎	**3 D**								✓	
11. Inspect and replace Spherical Bearings and Cylinder Pins if necessary. (NOT relevant for SPS55)☎	**2 W**				✓				✓	
12. Rebuild/Replace Cylinders ☎	**3 W**				✓				✓	
13.Replace the Fin Angle Belt	**1 W**				✓				✓	
14. Replace hydraulic actuator hoses	**3 W**				✓				✓	36/3rd

B. FINS

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required
1. Inspect Fin Surfaces	**1 D** ****			✓****				✓	

C. HYDRAULIC POWER UNIT

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required	Months/ Year
1. Inspect the Dirt Indicator of the return filter, replace when required	**1 W**		✓							6/0.5
2. Inspect Flexible Hoses	**1 W**		✓							
3. Inspect Suction Hoses	**1 W**		✓							
4. Inspect Electrical Connections	**1 W**			✓						
5. Inspect Cooling Pump	**1 W**		✓							
6. Inspect Oil Cooler Tubes	**1 W**						✓			
7. Inspect Pump Drive Coupling	**1 W**				✓					
8. Inspect Motor and Frame Mounts	**1 W**			✓						
9. Test Hydraulic Oil Quality by means of taking sample***	**2 W**			✓					✓	12/1st
10. Replace Return Filter Element*	**1 W**			✓					✓	24/2nd
11. Replace Pressure Filter Element*	**1 W**			✓					✓	24/2nd
12. Change Oil. Refill with mineral based hydraulic oil ISO - VG46	**1 W**				✓				✓	36/3rd
13. Replace Drive Coupling Element	**3 W**					✓				
14. Rebuild/Replace Cooling Pump	**3 W**								✓	
15. Replace Hydraulic Hoses	**3 W**								✓	
16. Replace Oil Cooler	**3 W**								✓	
17. Replace Hydraulic Pumps*	**3 W**								✓	

D. CONTROL SYSTEM

Maintenance schedule	Service level	250h	500h	2000h	4000h	8000h	12000h	When out of water	When required
1. Clean the Cooling Fan of the VFD ①	**1/3 W**			✓					
2. Test the Emergency Stop Button	**1/3 W**				✓				

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.

DECLARATION OF CONFORMITY

Sleipner Motor AS
P.O. Box 519, Arne Svendsensgt. 6-8
N-1612 Fredrikstad, Norway

Declare that the following (Stabilizer) products:

SPS55B	Side-Power Stabilizer System	Actuator kit
SPS66B	Side-Power Stabilizer System	Actuator kit
SPS87B	Side-Power Stabilizer System	Actuator kit
SPS93B	Side-Power Stabilizer System	Actuator kit
SPS93B	Side-Power Stabilizer System	Actuator kit
SPS94B	Side-Power Stabilizer System	Actuator kit
SPS97B	Side-Power Stabilizer System	Actuator kit
VF82B	Side-Power Stabilizer System	Vector Fin kit
VF83B	Side-Power Stabilizer System	Vector Fin kit
VF105B	Side-Power Stabilizer System	Vector Fin kit
VF135B	Side-Power Stabilizer System	Vector Fin kit
VF165B	Side-Power Stabilizer System	Vector Fin kit
VF195B	Side-Power Stabilizer System	Vector Fin kit

with the following control systems and optional installation accessories:

SCU	Side-Power Stabilizer Control System	Stabilizer Control Unit
FCU	Side-Power Stabilizer Control System	Fin Control Unit
TP-43 Panel	Side-Power Stabilizer Control System	Stabilizer Main operating panel
PHC-3	Side-Power Stabilizer Control System	Hydraulic system control unit
GW-1	Side-Power Control System	Gateway unit

Has been designed and manufactured in accordance to the following technical regulations:

DIRECTIVE 2013/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 November 2013 on recreational craft and personal watercraft.

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility.

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

Fredrikstad, 19th of January 2018

Signature

Arne K Skauen
Managing Director, Sleipner Motor AS

Worldwide sales and service

www.side-power.com

SLEIPNER MOTOR • AS P.O. Box 519 • N-1612 Fredrikstad • Norway