

Installation Guide

For Vector Fin Stabiliser Systems

STABILIZER

SPS60E, SPS70E, SPS80E, SPS100E

VECTOR FINS

**V3-14, V4-15, V4-12HS, V3-23, V4-26,
V4-19HS**



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Warnings and Safety

MC_0800

It is essential to follow all instructions within this document to avoid potential personal injury, death, or damage to existing products in the vessel, the vessel's hull integrity, and including this product during installation or operation. Failure to follow instructions within this document will render all warranties given by Sleipner Motor as VOID.

Warnings and situations requiring extra caution are outlined in the documentation. Take extra consideration when warnings are outlined.



WARNING

Indicate a potentially hazardous situation that, if not avoided, could result in death or severe injury.



CAUTION

Indicates a potentially hazardous situation that could result in minor or moderate injury or critical damage to vessel integrity if not avoided.

MC_0020

General:

- The installer must read this document to ensure necessary familiarity with the product before installation.
- Directions outlined in this document cannot be guaranteed to comply with all international and national regulations, including but not limited to health and safety procedures. It is the installers responsibility to adhere to all applicable international and national regulations when installing Sleipner products.
- This document contains general installation guidelines intended to support experienced installers. Contact professional installers familiar with the vessel, Sleipner products and applicable regulations if assistance is required.
- If local regulation requires any electrical work to be performed by a licensed professional, seek a licensed professional.
- When planning the installation of Sleipner products, ensure easy access to the products for future service and inspection requirements.

For stabiliser systems

MC_0203

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

- Find the best possible position of the actuators and fins based on the information provided in the sections about:
- Safety and General precautions Measurements.
- Fin positioning, taken other systems into consideration (water trail not affecting propulsion system, exhaust system not interfering with fins etc.).
- Hull forces
- Ensure that it is space to do the reinforcement of the hull if required
- Service access

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

Your Sleipner representative will be able to help make an educated decision for what is the best solution for your boat and your preferences. Before starting the installation, the Sleipner representative can ensure that you are not installing parts and products that will not meet your expectations. Sleipner Motor AS is a manufacturing company of marine equipment and not a Naval Architectural company & therefore take no responsibility regarding the installation of our products onto seagoing vessels.

This includes any requirement for the vessels:

- Hull reinforcement.
- Change in the vessel's stability.
- Dynamic performance.
- Weight and moment.
- Noise proofing.
- 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 vessel's hull will withstand & maintain watertight integrity in the event of a collision of our product, impacting an object when the vessel is underway.

The stabilizer product includes heavy parts. Ensure suitable lifting and support equipment is available during installation & removal to prevent material damage or personnel injury.

During yacht lifting operations:

- Ensure the stabilizer fins are in the locked/neutral position.
- 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.

Yacht transportation overland with road vehicles may require the removal of the stabilizer fins. Please contact Sleipner representatives for instruction procedures.

For electric eVision stabiliser systems

MC_0656

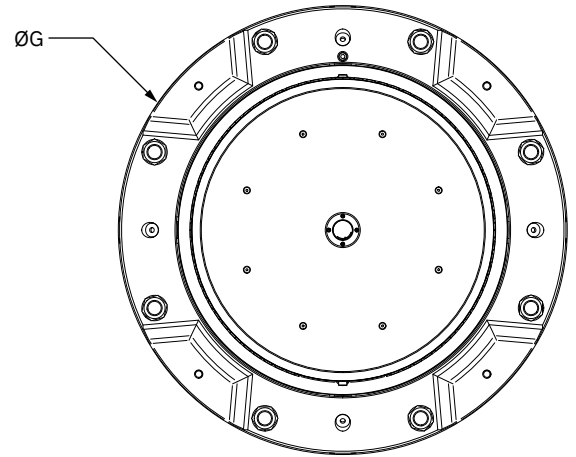
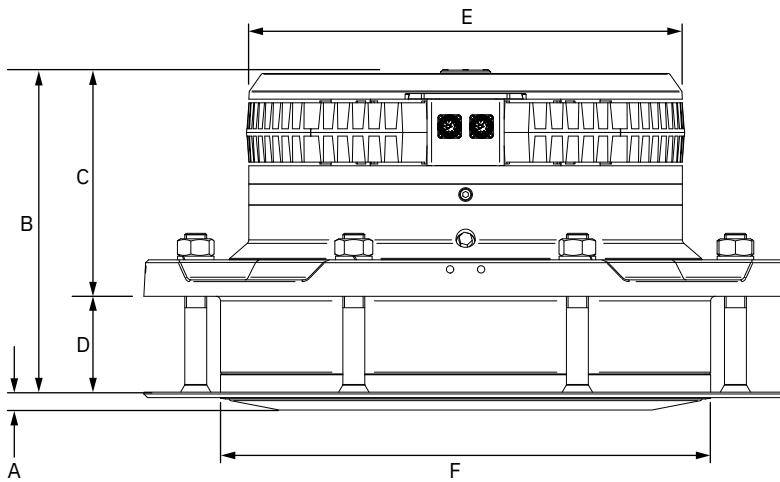


WARNING

Ensure electrical power is switched off before any servicing work is carried out on the stabilizer system.

With power, the Stabilizer systems with 'at anchor' function installed & 'Auto' selected can suddenly operate & move without warning.

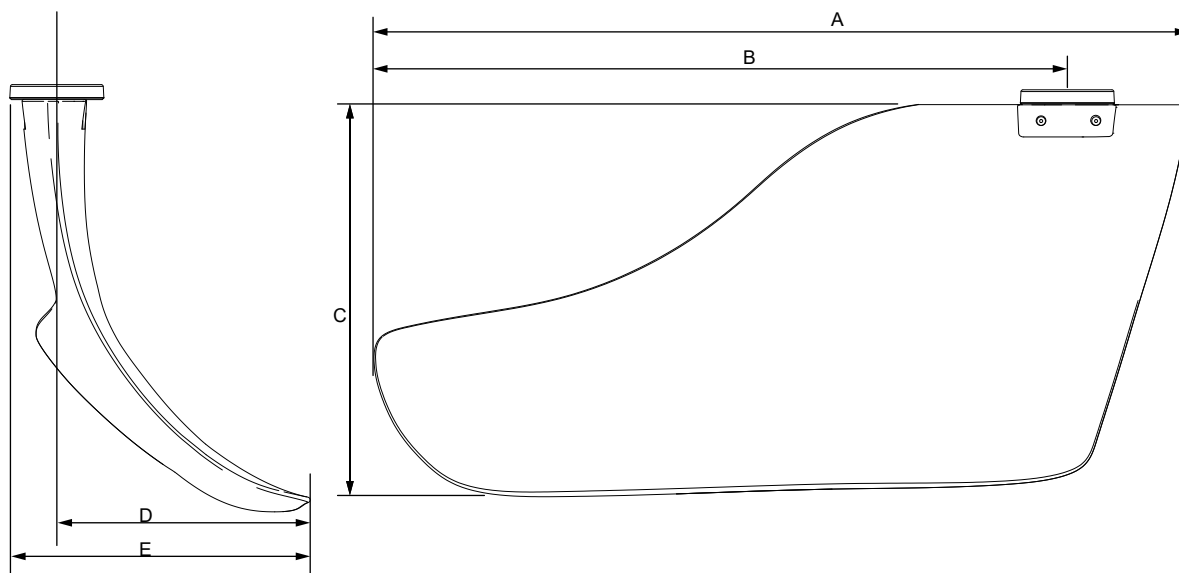
Dimension code	Dimension descriptions	SPS60E		SPS70E		SPS80E		SPS100E	
		mm	inch	mm	inch	mm	inch	mm	inch
A	Actuator height outside the hull	16.8	0.6	16.8	0.6	20	0.8	23.5	0.9
B	Total actuator height	236	9.3	336	13.2	349	13.7	437.4	17.2
C	Actuator height inside the hull	172	6.8	256	10.1	249	10	287.4	11.3
D	Hull thickness (sealant included)	60	2.4	80	3.1	105	4.1	150	5.9
ØE	Diameter of the actuator Motor	350	13.8	405	15.9	475	18.7	559	22.0
ØF	Diameter of the actuator through the hull	408	16	457.5	18.0	537	21	629	24.8
ØG	Diameter of the actuator base plate	564	22.2	620	24.4	705	28	830	32.7
	Weight (kg/lbs)	118/260		194/428		296/653		490/1080	



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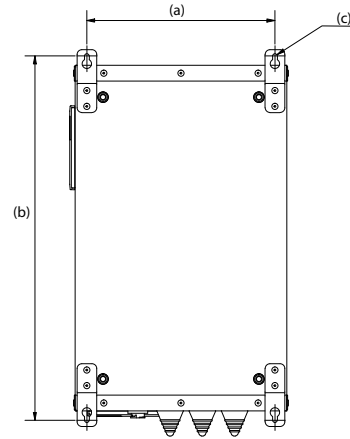
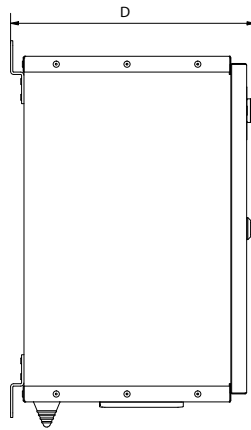
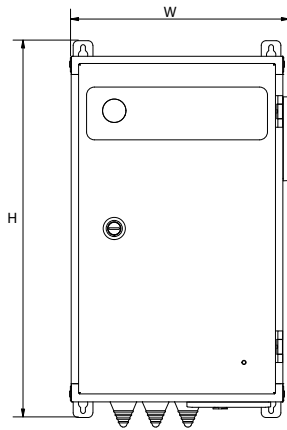
Dimension code	Dimension descriptions	SPS60E						SPS70E					
		V3-14 ≤23 knots		V4-12HS ≤40 knots		V4-15 ≤35 knots		V4-19 ≤35 knots		V4-15HS ≤40 knots		V4-21 ≤23knots	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
A	Total fin length	1751	68,9	1574	62,0	1805	71,1	2000	78,7	1805	71,1	2155	84,8
B	Fin length to centre connection	1490	58,7	1330	52,4	1525	60,0	1690	66,5	1525	60,0	1821	71,7
C	Total fin height	843	33,2	764	30,1	876	34,5	970	38,1	876	34,5	1047	41,2
D	Fin width from centre connection	520	20,5	465	18,3	534	21,0	590	23,2	534	21,0	635	25,0
E	Total fin width	613	24,1	558	22,0	627	24,7	700	27,5	627	24,7	760	29,9

Dimension code	Dimension descriptions	SPS80E						SPS100E			
		V3-23 ≤23 knots		V4-21HS ≤40 knots		V4-26 ≤35 knots		V4-26HS		V5-31 ≤23 knots	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
A	Total fin length	2256	88,8	2155	84,8	2329	91,7	2329	91,7	2520	99,2
B	Fin length to centre connection	1920	75,6	1821	71,7	1966	77,4	1966	77,4	2110	83
C	Total fin height	1086	42,8	1047	41,2	1131	44,5	1131	44,5	1260	49,6
D	Fin width from centre connection	670	26,4	635	25,0	686	27,0	686	27,0	582	22,9
E	Total fin width	795	31,3	760	29,9	811	31,9	811	31,9	725	28,5



MG_0679

Dimension code	Dimension descriptions	eFD	
		mm	inch
H	Height	479	18.85
W	Width	278	10.94
D	Depth	311	12.24
(a)	Mounting hole height	463	18.22
(b)	Mounting hole width	239	9.41
(c)	Mounting hole diameter	6	0.24

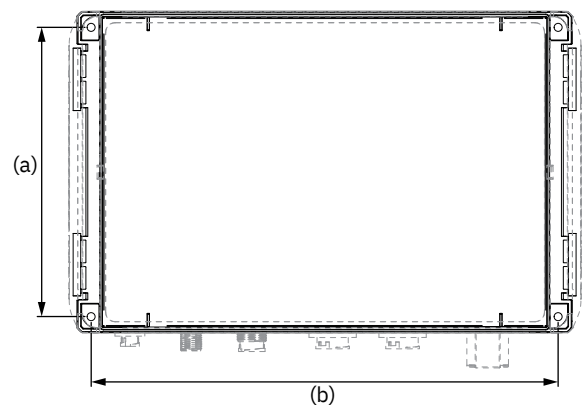
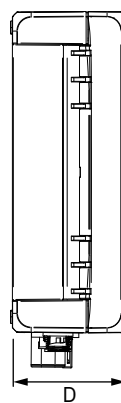
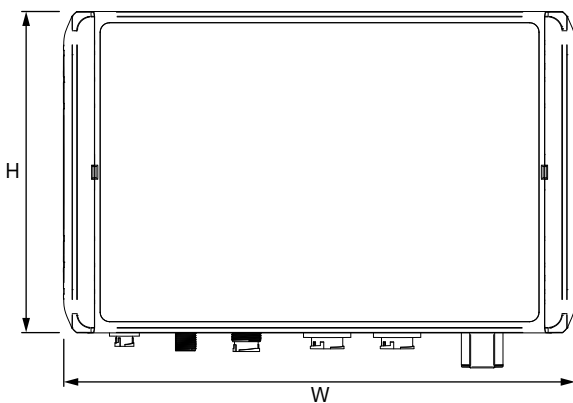


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SCU Dimension

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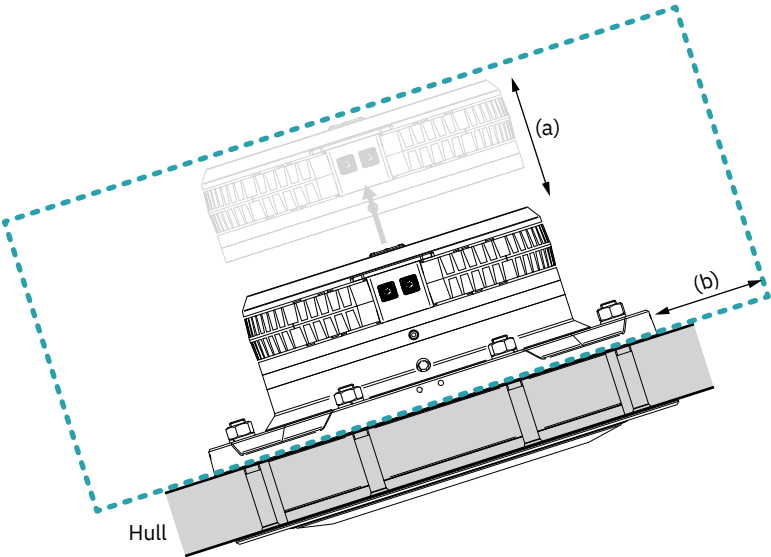
Dimension code	Dimension descriptions	SCU	
		mm	inch
H	Height	170	7
W	Width	271	11
D	Depth	60	2
(a)	Mounting hole height	153	6
(b)	Mounting hole width	247	9.7



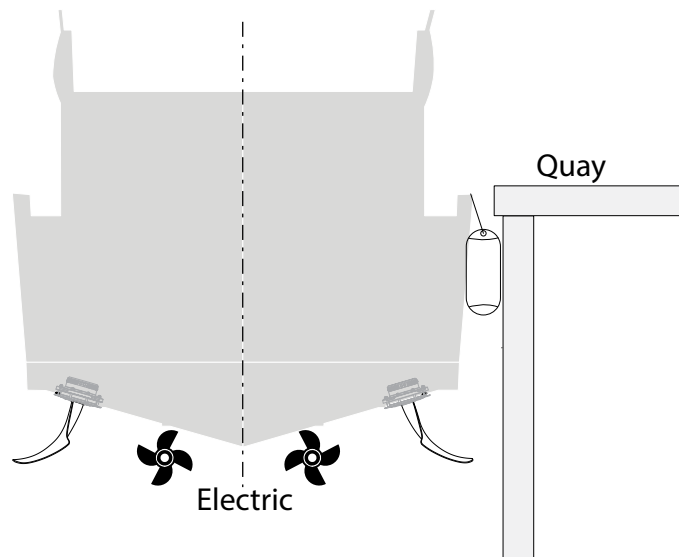
MG_0692

Consider and plan the positioning of the actuator for future service and appropriate area for cooling the electric motor. The ambient temperature is 55°C.
The motor has temperature sensor and system will reduce power to avoid exceeding maximum allowed temperature.

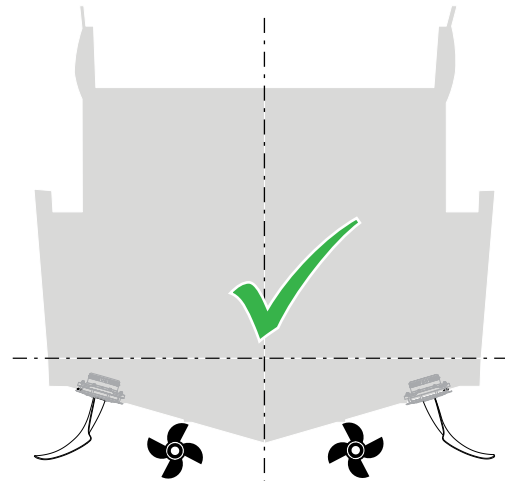
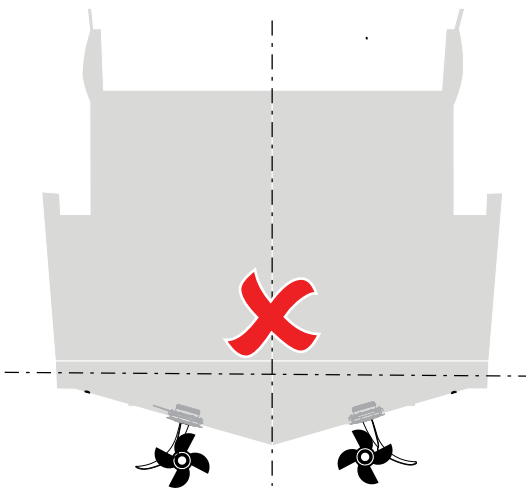
Dimension code	Dimension description	SPS60E		SPS70E		SPS80E		SPS100E	
		mm	inch	mm	inch	mm	inch	mm	inch
(a)	Free space for motor replacement	165	6.5	200	7.9	250	9.9	400	15.7
(b)	Base plate tooling clearance	50	2	50	2	50	2	100	3.9



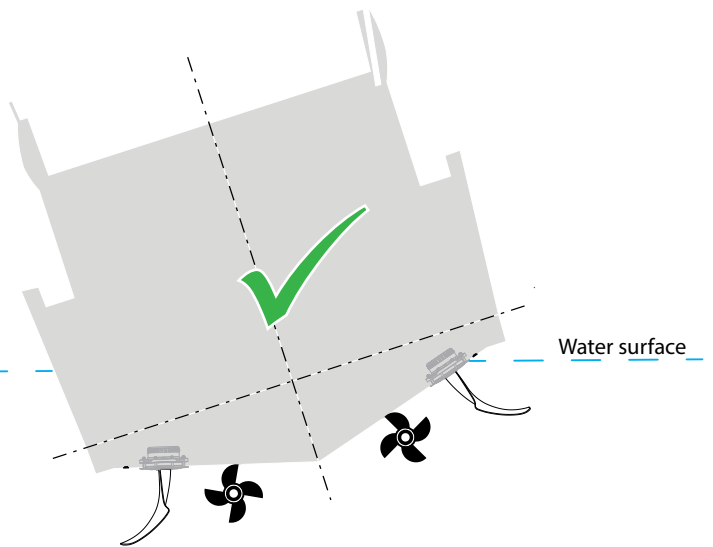
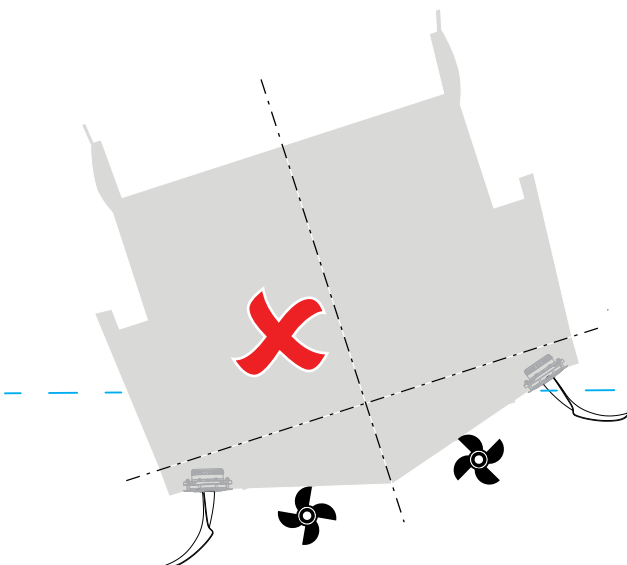
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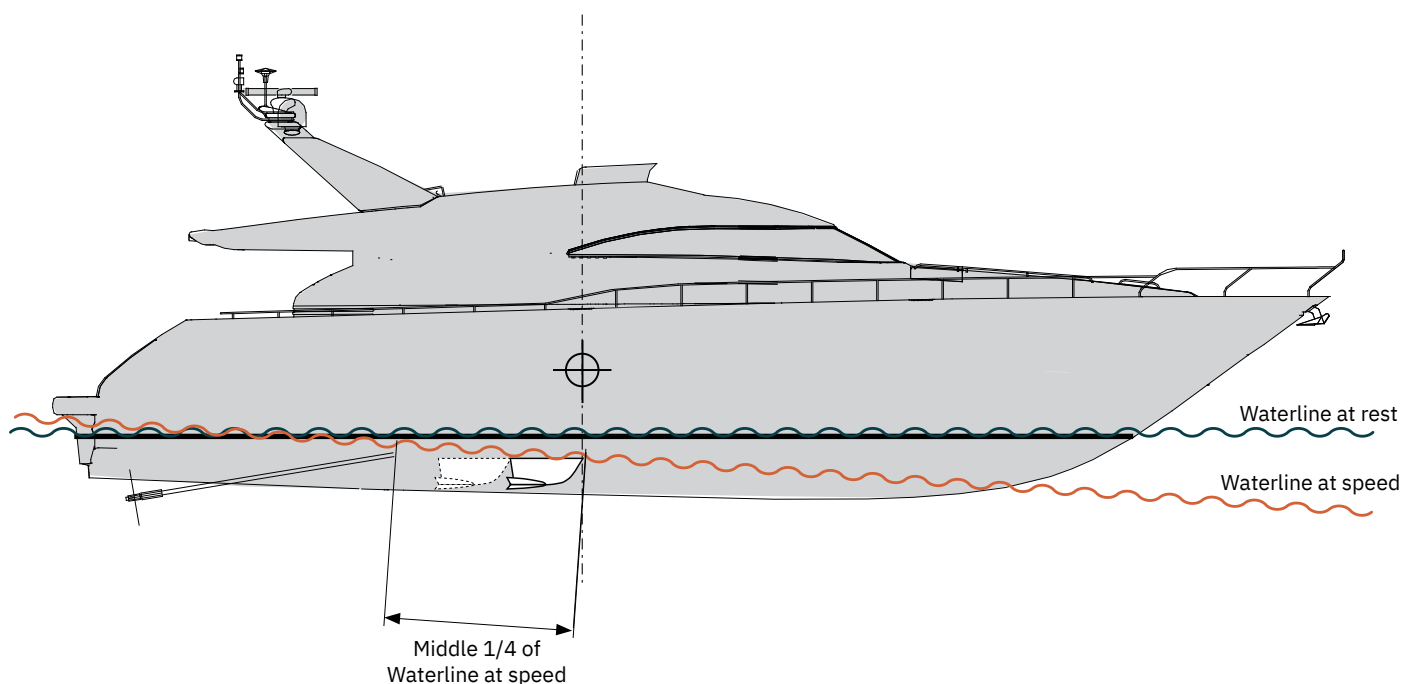
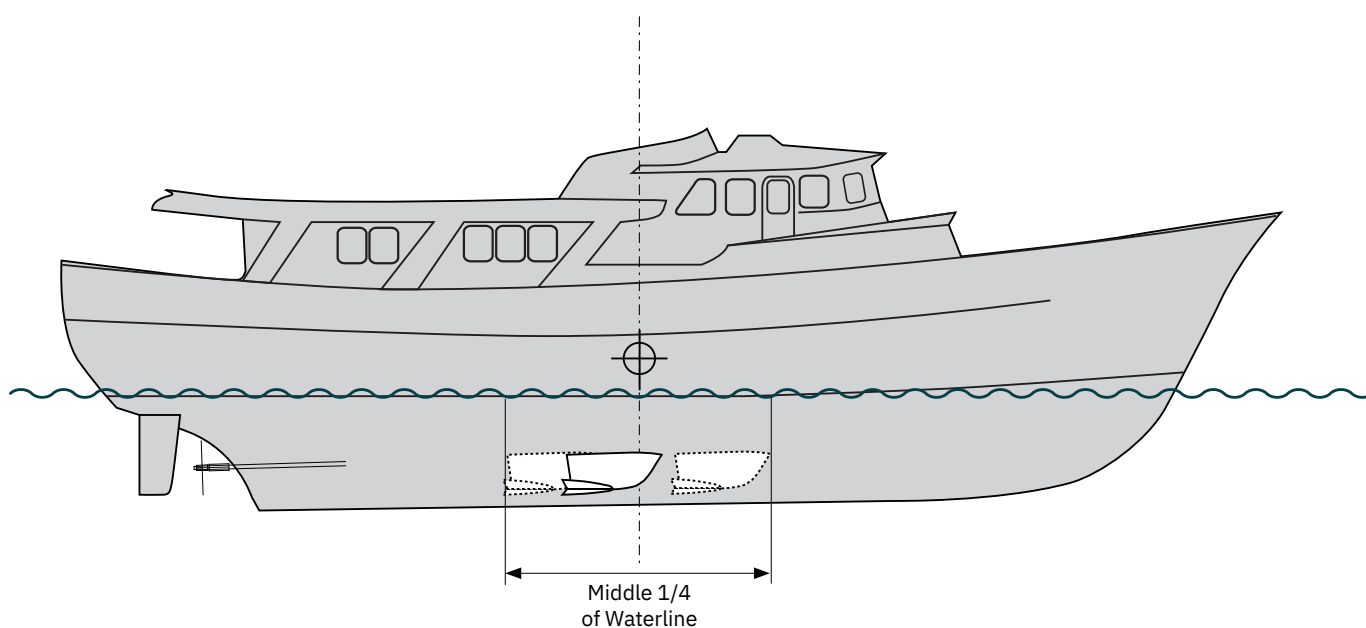
Fins should not extend outside the beam including the fenders, or below the keel/propeller when in neutral position.



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



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



To avoid unwanted influences on the steering characteristics, the fins should be placed close to the vessel longitudinal centre 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.

(NB: These are general guidelines and some hull types might allow for an installation position outside of this recommendation.)

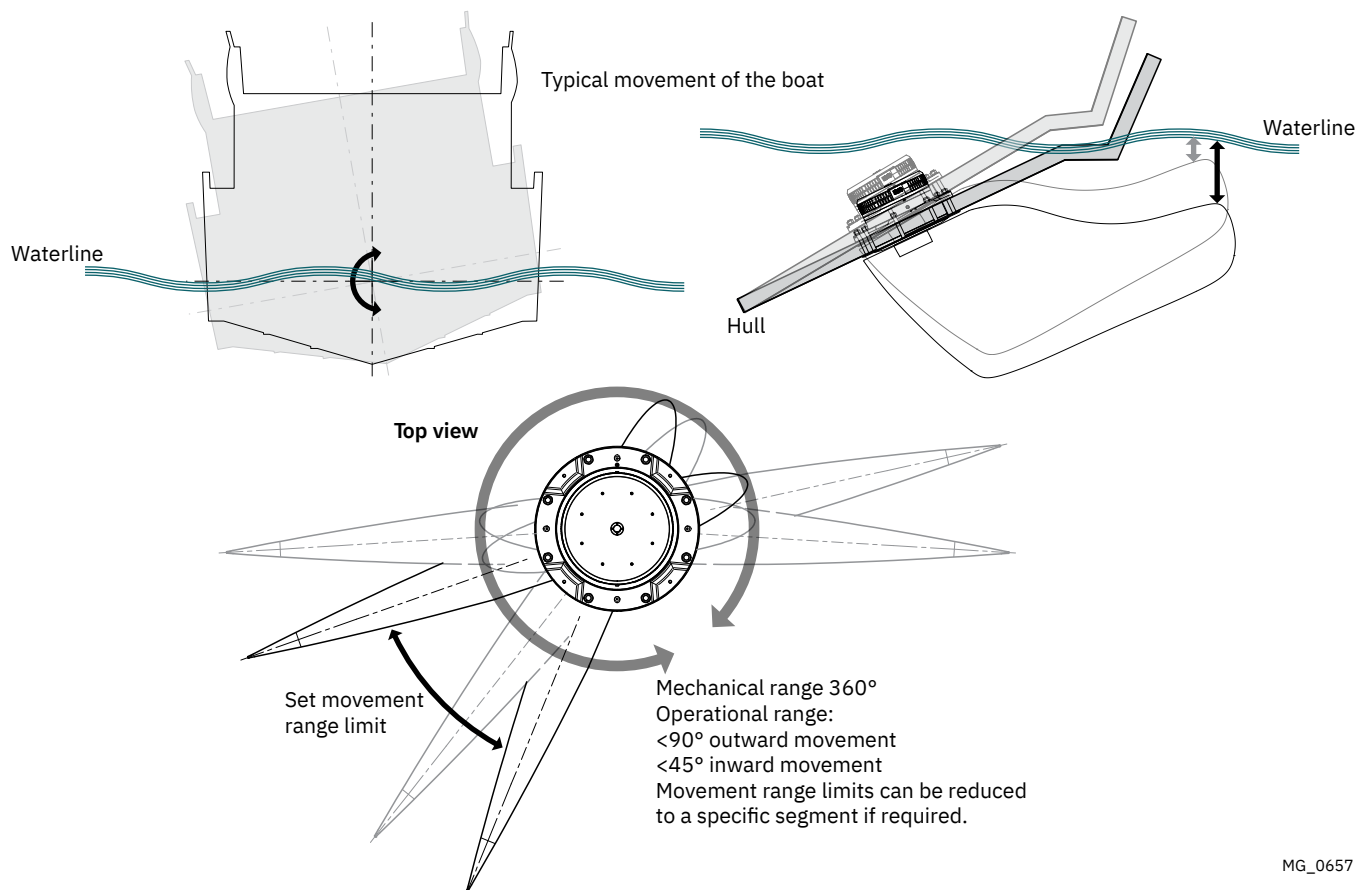
Transversal fin positioning of Vector Fins™

With Vector fins™ it is a priority to push the fins as far outboard as possible to achieve the most leverage for the fins forces unlike standard fins.

Finding the best position for the fin and actuator positioning often is related to the inside configuration and space that is required for proper installation.

General Rules:

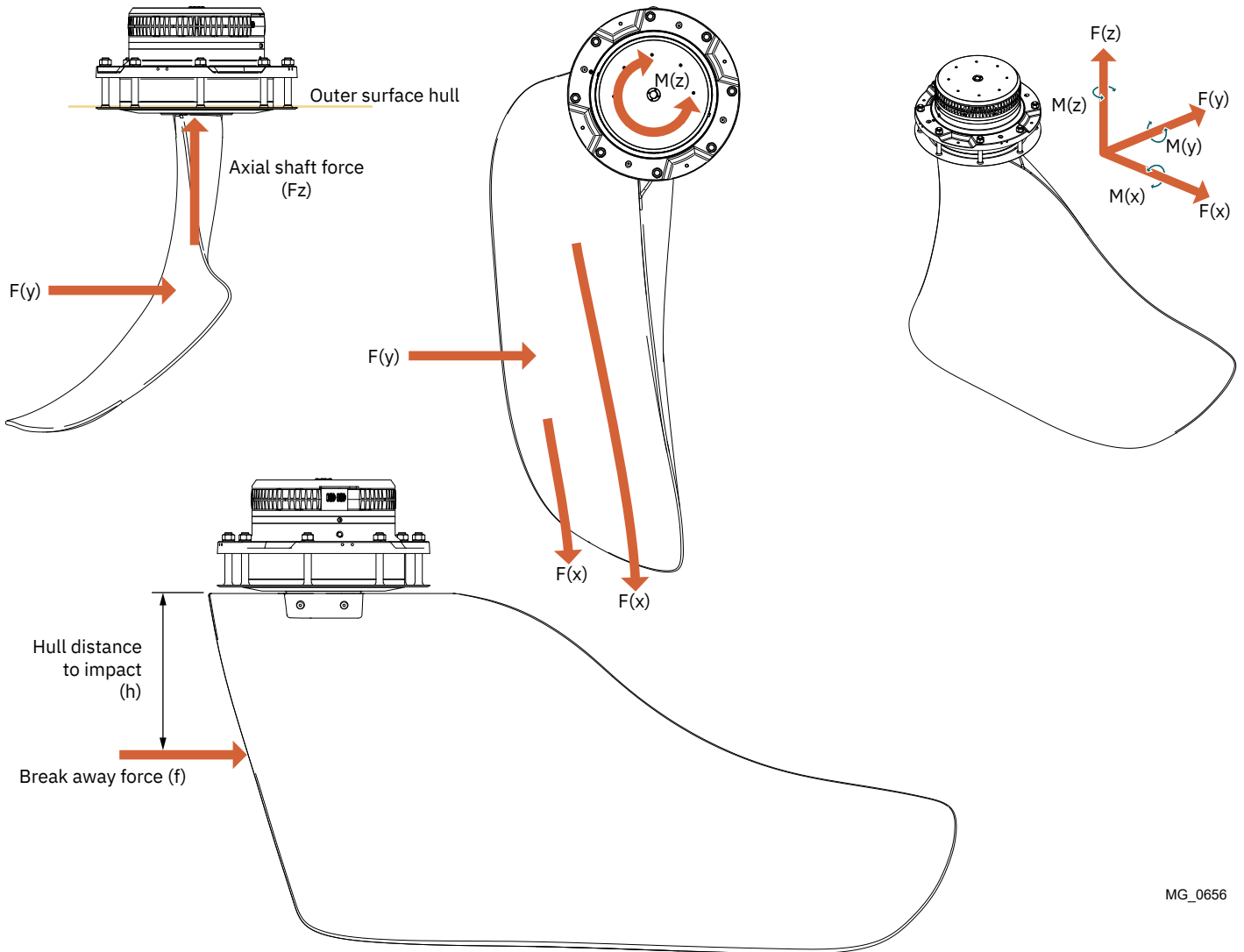
–Push the actuators as far as possible outboard, keeping at least 22 degrees of outboard stroke as a minimum. It is also acceptable installing the fins further inboard If inside configuration/ access to inside parts of actuators is required. **(NB: Performance will be reduced slightly due to less leverage arm for the stabilizing force applied by the fins.)**



MG_0657

All calculated values are normalised, determined 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, back flow closing of valve etc could further increase the hull/shaft loads. Therefore all dimensioning should account for this by using a safety factor.

Sleipner curved Vector Fin design comes with additional benefits in hull safety. Any impact with the ground will not only bend the shaft backwards and outward, allowing the fin to break away with less stress on the hull.



MG_0656

SPS60E							
Structural requirements V3-14		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	22,6	21,2	6,1	3,7	21,0	500	90
25	24,4	23,5	6,1	3,7	21,0		

SPS60E							
Structural requirements V4-15		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	27,0	25,4	8,4	3,7	25,9	500	109
30	28,2	27,7	8,4	3,7	30,6		
35	32,0	32,4	9,6	3,7	36,1		

SPS60E							
Structural requirements V4-12HS		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	19	19	4,5	3	18	450	83
30	29	28	7	3	32		
35	38	36	9	3	44		
40	42	38	9	3	46		

SPS70E							
Structural requirements V4-19		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	36,8	35,0	11,4	5,8	33,6	600	147
30	50,8	46,9	11,4	5,8	49,0		
35	52,9	52,5	11,9	5,8	53,4		

SPS70E							
Structural requirements V4-15HS		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	29,8	27,1	9,1	5,8	31,5	500	109
30	41,1	39,4	9,6	5,8	43,8		
35	45,1	43,8	10,1	5,8	48,1		
40	49,0	48,1	10,5	5,8	52,5		

SPS70E							
Structural requirements V4-21		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	41,5	40,3	12,3	5,8	36,8	700	218
25	44,8	45,1	14,0	5,8	43,8		

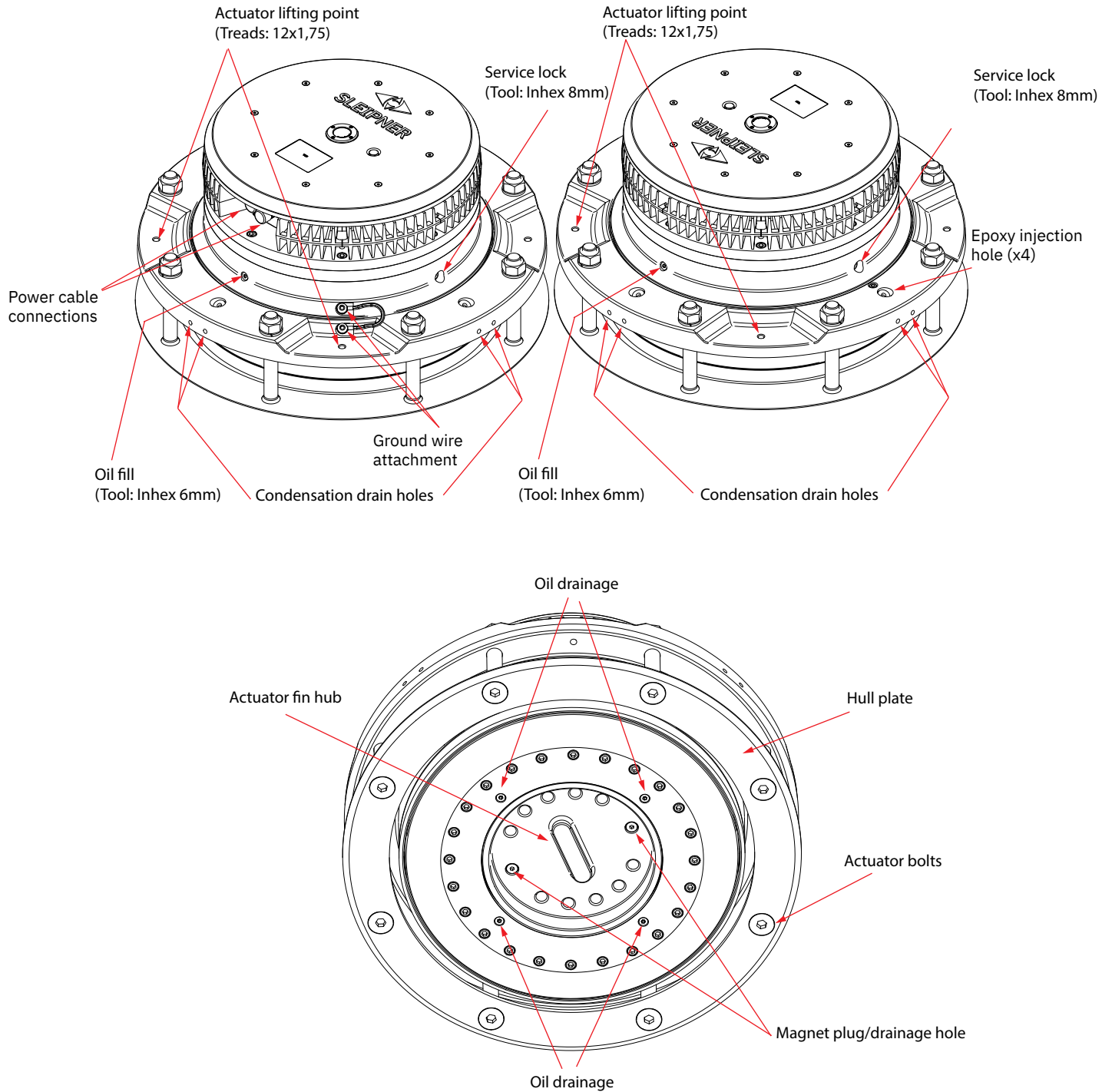
SPS80E							
Structural requirements V3-23		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	43,9	42,35	10,7	7,0	32	700	218
25	47,4	46,6	12,6	7,0	36,0		

SPS80E							
Structural requirements V4-26		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	52,9	50,75	15,8	7,0	40	700	218
30	72,3	70,9	18,0	7,0	60,0		
35	74,8	75,7	18,0	7,0	64,3		

SPS80E							
Structural requirements V4-21HS		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	45,7	43,8	14,4	7,0	39,0	700	218
30	63,4	62,1	16,4	7,0	56,2		
35	67,6	67,4	16,4	7,0	61,5		
40	71,8	72,6	16,1	7,0	66,9		

SPS100E							
Structural requirements 4-26HS		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
20	64,8	63,0	22,8	15,8	52,5	700	218
30	103,3	101,5	24,5	15,8	77,0		
35	110,3	107,6	25,4	15,8	86,6		
40	117,3	113,8	26,3	15,8	96		

SPS100E							
Structural requirements V5-31		Values to be considered individually				Break away impact force	
Speed	Max bending moment (kNm)	Mx (kNm)	My (kNm)	Mz (kNm)	Fz (kNm)	h (mm)	f (kN)
15	61,8	57,8	17,3	15,8	38,2	800	243
20	84,9	81,4	19,3	15,8	45,9		
25	90,1	87,5	16,1	15,8	50,1		
30	105,5	103,4	15,8	15,8	56,9		



! Please refer to the graphic for special considerations relating to your model !

WARNING

When modifying the hull it is important to seek recommendations from a naval architect. Details for Reinforcing/ strengthening the hull for the stabilizer installation must be in accordance with a naval ships architects recommendations.

IMPORTANT

Take necessary measures to isolate noise from the actuator according to current standards if the installation is close to living areas.

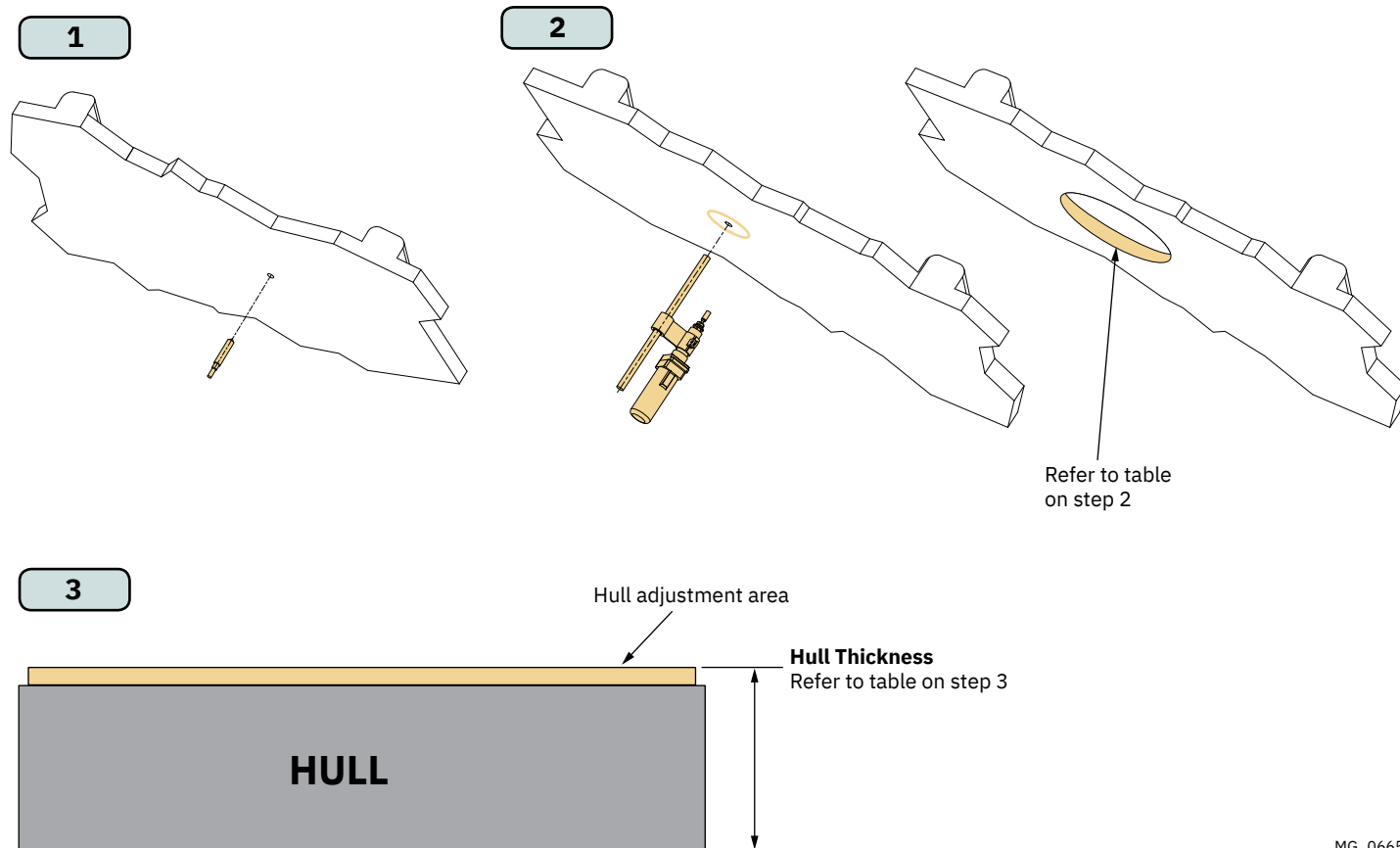
Define the optimal position of the stabilizer fins.

1. Drill a pilot hole at the fin shaft centre line position externally through the yachts hull.
2. Using the pilot hole as centre line mark and cut hole from inside the boat using a suitable cutting Jig & tool.

Through Hole Dimensions	SPS60E		SPS70E		SPS80E		SPS100E	
	mm	inch	mm	inch	mm	inch	mm	inch
Minimum	417.5	16.5	446.5	17.6	550	21.7	642	25.3
Recommended	422	16.6	473.5	18.6	555	21.9	647	25.5
Maximum	431	17	567	22.3				

3. Adjust the surrounding hull to the above thickness (Sealant included) and ensure that the internal and external surfaces are parallel and flat.

Hull Thickness	SPS60E		SPS70E		SPS80E		SPS100E	
	mm	inch	mm	inch	mm	inch	mm	inch
Minimum (Ensures secure sealing between the hull and actuator)	55	2.2	74	2.9	97	3.8	140	5.5
Recommended/ Target	60	2.4	80	3.1	105	4.1	150	5.9
Maximum (Avoids the risk of applying sealant between the fin hub and actuator)	62	2.4	82	3.2	107	4.2	152	6



MG_0665

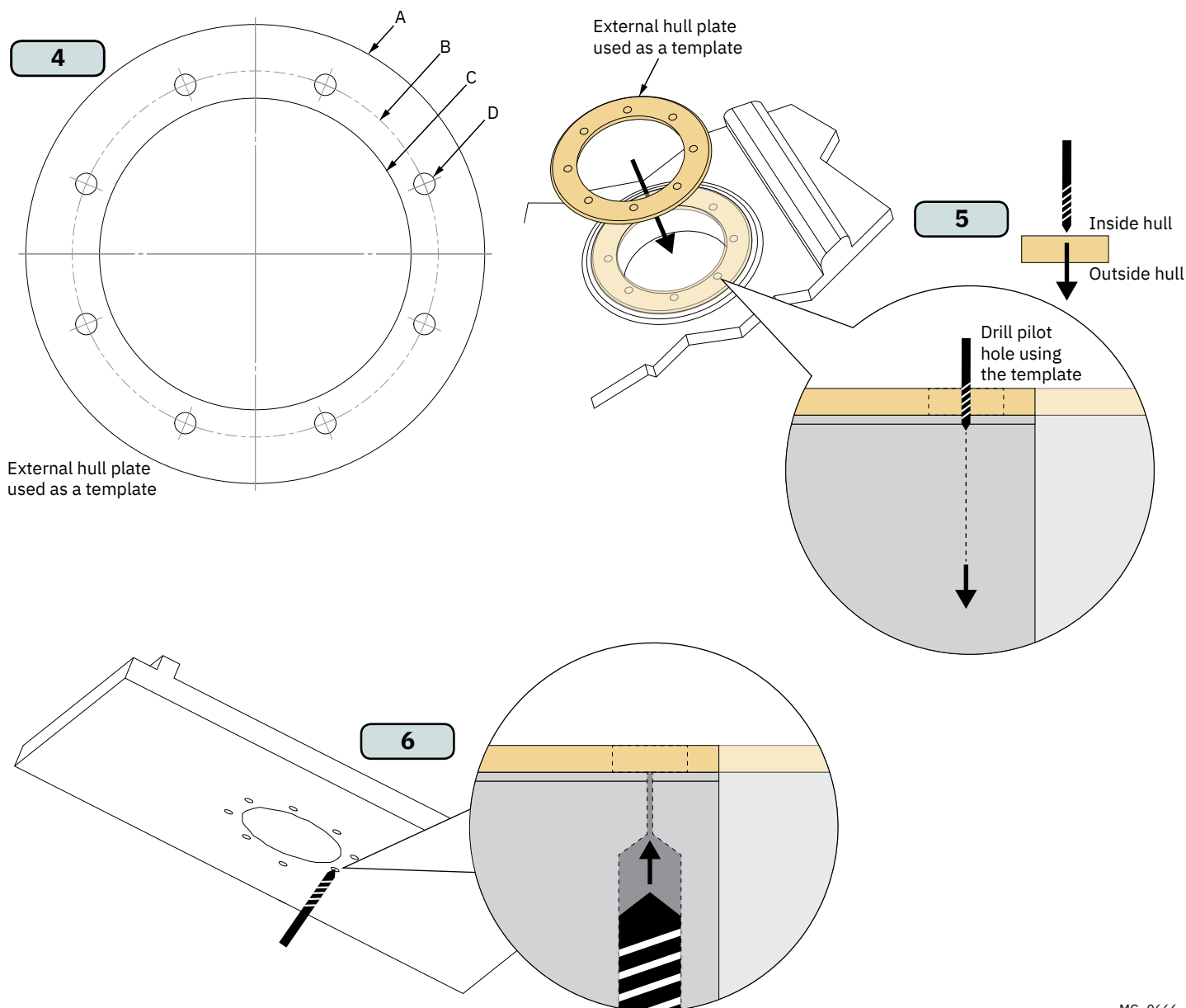
! Please refer to the graphic for special considerations relating to your model !

4. Mark the positions of the holes for the securing bolts. **(NB: Use the external hull plate as a template.)**

Dimension code	Dimension description	SPS60E		SPS70E		SPS80E		SPS100E	
		mm	inch	mm	inch	mm	inch	mm	inch
ØA	Hull plate external diameter	545	21.5	620	24.4	712	28	830	32.7
ØB	Hole positional diameter	504	19.8	554	21.8	640	25.2	755	29.7
ØC	Hull plate internal diameter	431	17	480.5	18.9	567	22.3	659	25.9
ØD	Hull plate hole diameter	26	0.8	26	1	31.9	1.3	32.3	1.3
Diameter of the drilled hole in the hull. (See step 6)		25	1	25	1	29	1.1	29	1.1

5. Drill a pilot hole using the external hull plate as a guide. **(NB: Drill pilot hole from inside the hull.)**

6. Complete the drilling to the defined hole diameter required. **(NB: Drill final hole from outside the hull.)**

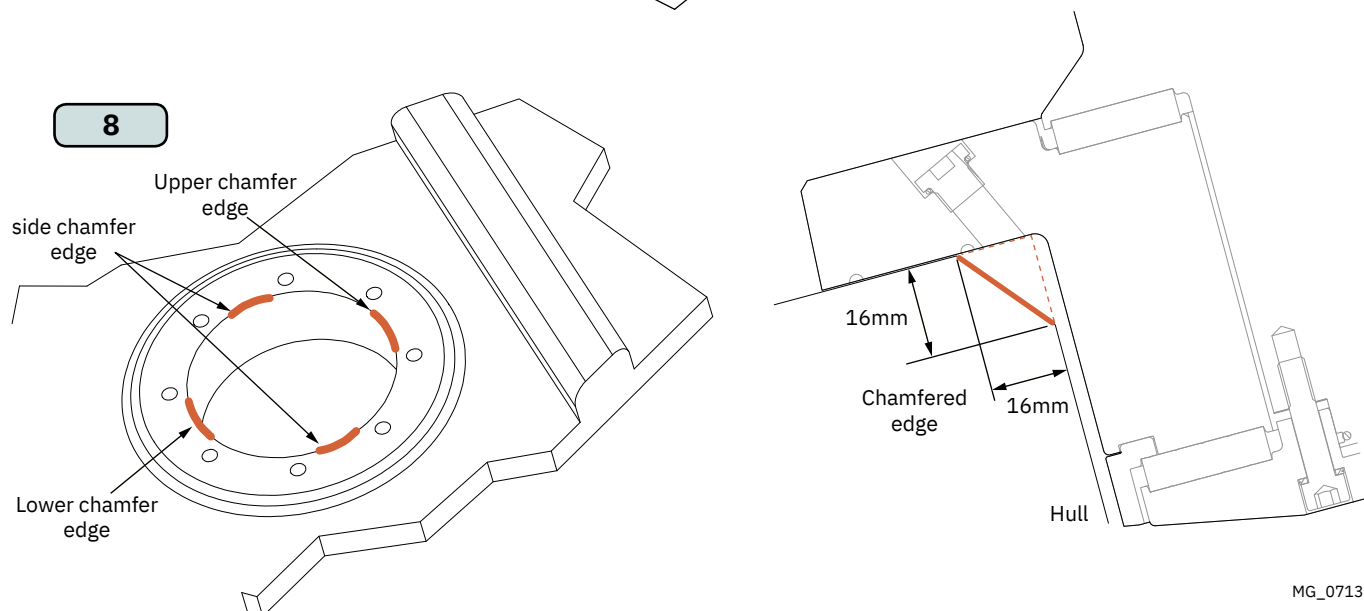
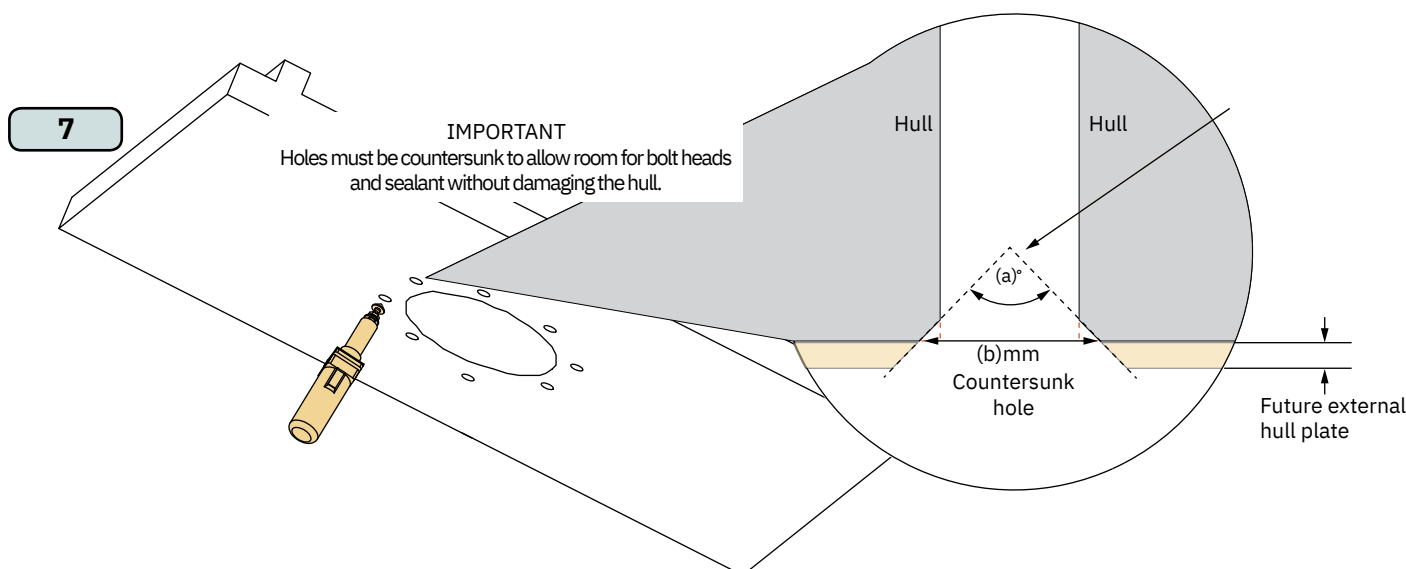


MG_0666

! Please refer to the graphic for special considerations relating to your model !

7. Countersunk all holes to allow space for bolt heads and sealant without damaging the hull.
8. At the area inside the vessel where the 4 injection filler ports are, create a chamfered edge. **(NB: The chamfer is to ensure an open area for the future injection of filler.)**

	a°	b
SPS60	90°	26mm
SPS70	90°	26mm
SPS80	60°	31.9mm
SPS100	60°	32.3mm



MG_0713

! Please refer to the graphic for special considerations relating to your model !

MOUNTING OF THE STABILIZER ACTUATOR ASSEMBLY

NOTE:

- Steps 9-17 must be finalized within the cure time of the watertight sealant being used. Step 18 can be initiated only after the sealant is cured.
- Apply watertight sealant to the mating surface of the hull and the actuator inside the boat. (NB: Sealant must be compatible with hull material. A naval architect/Boat builder must confirm this.)
 - Lower the Stabilizer Actuator Assembly into the hulls actuator hole. (NB: Use the actuator lifting eyes to thread lifting slings combined with a mechanical support to assist in a controlled lowering of the actuator.) (Lifting eye threads: M12x1,75)

IMPORTANT NOTES:

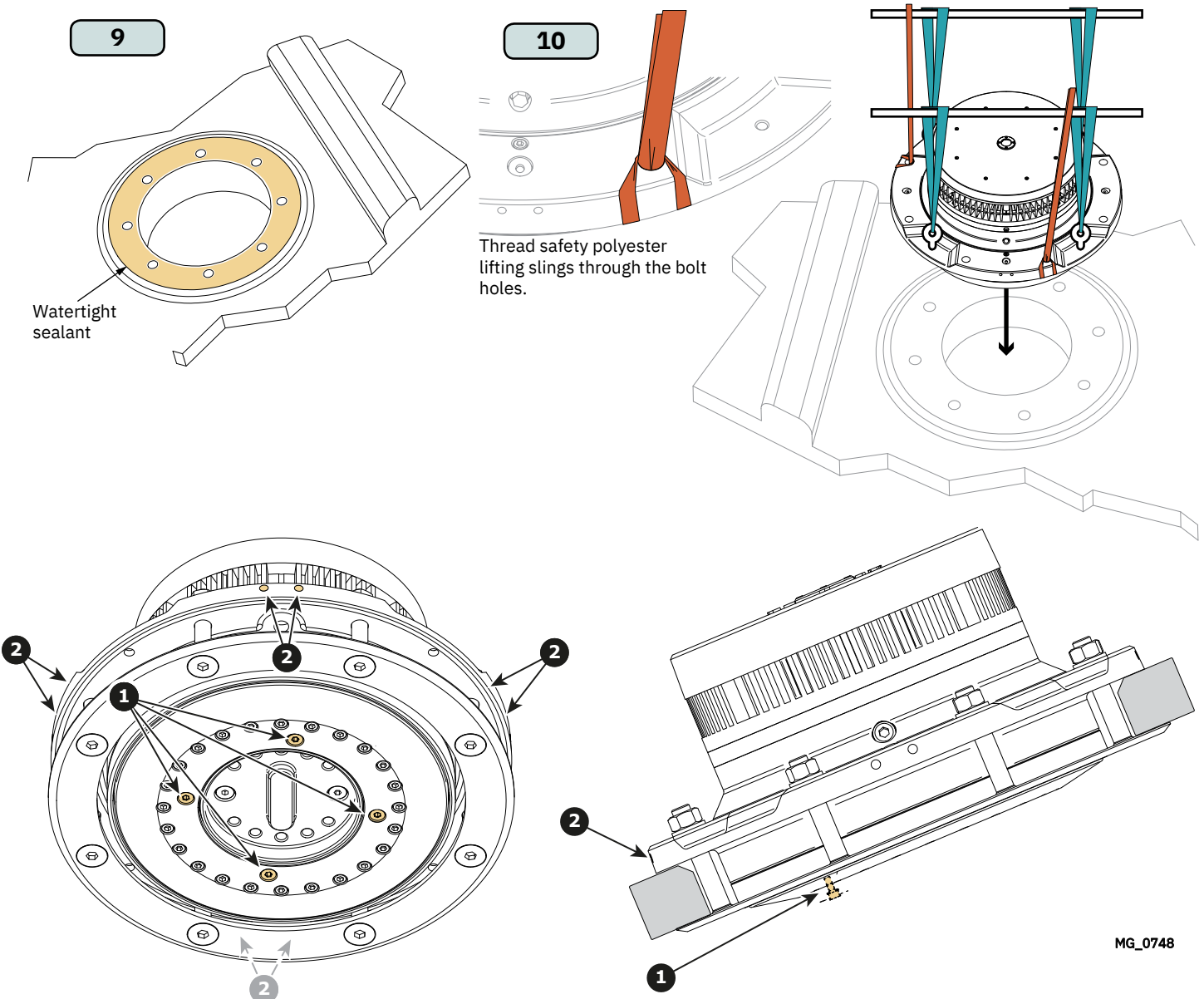
- Ensure that at least one of the oil drainage holes are at the lowest point of the installation angle. (Reference 1).
- Ensure that the condensation drain holes (Reference 2) are not covered by sealant or other material. Condensation on the actuator will flow into the void between the motor and hull assemblies, and must drain out through these holes. The condensation drain holes must always be at the actuators lowest point.

The condensation drain holes are always positioned straight above the oil drain hole, and there are four sets of oil- and condensation drain holes with a mutual offset of 90 degrees between the sets.



WARNING

Use a mechanical support to lower the actuator into position, as an actuator can weigh approx 300kg. Attach two safely slings through the bolt hole and remove just before lowering the actuator into its final position. Ensure at least one of the four oil drainage holes is at the lowest of the installation angle.



MG_0748

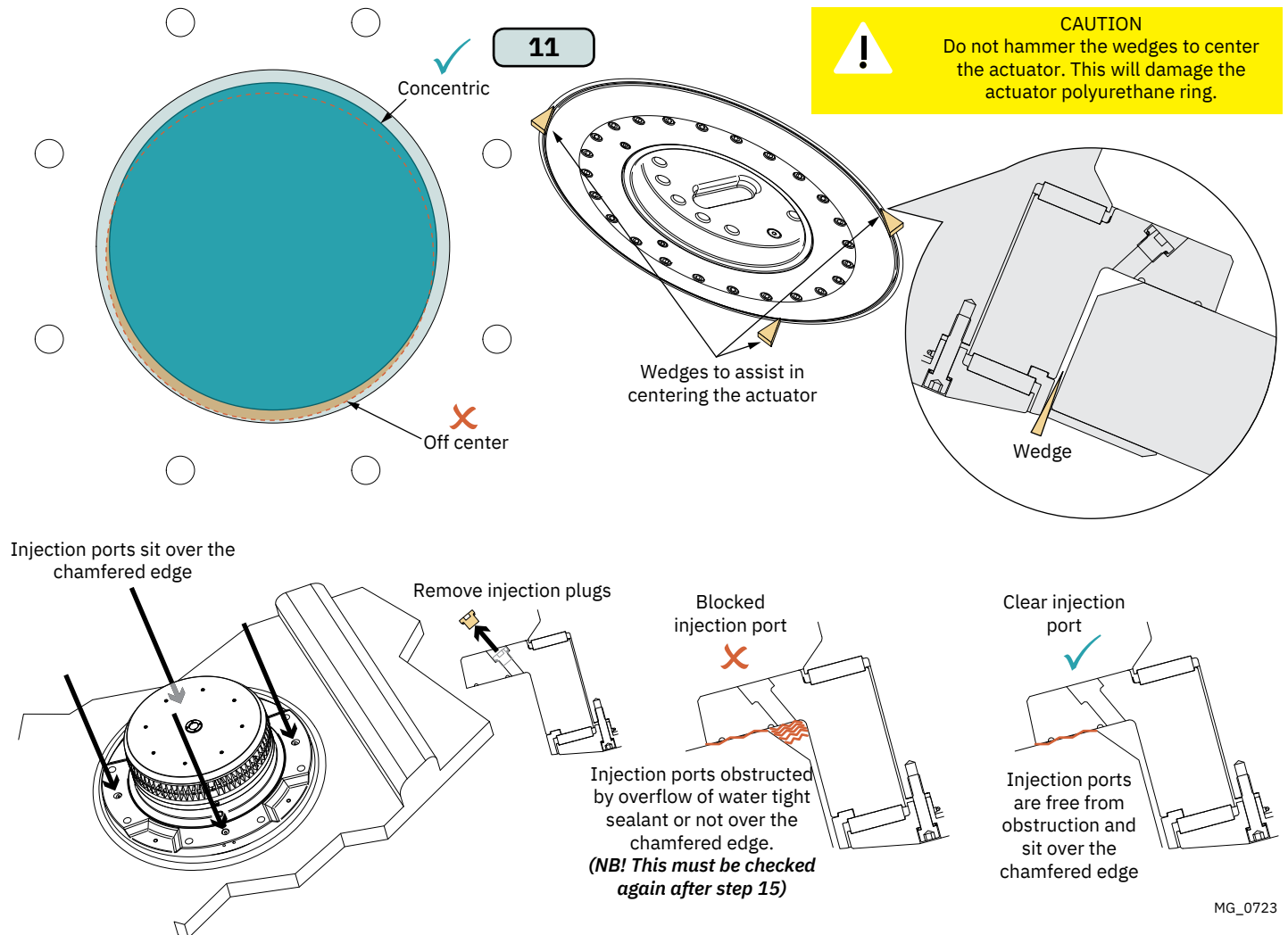
! Please refer to the graphic for special considerations relating to your model !

MOUNTING OF THE STABILIZER ACTUATOR ASSEMBLY

11. Ensure the actuator shaft core sits concentric to the hole. Ensure the 4 filler compound injection ports are over the chamfered edge and not obstructed. **(NB: Remove the injection port plugs to inspect the actuator sits over the chamfered edge and is clear from obstruction for the injection process.)**

(NB: Do not throw away injection plugs as they are needed later during installation.)

Scan the QR code for an injection procedure video.

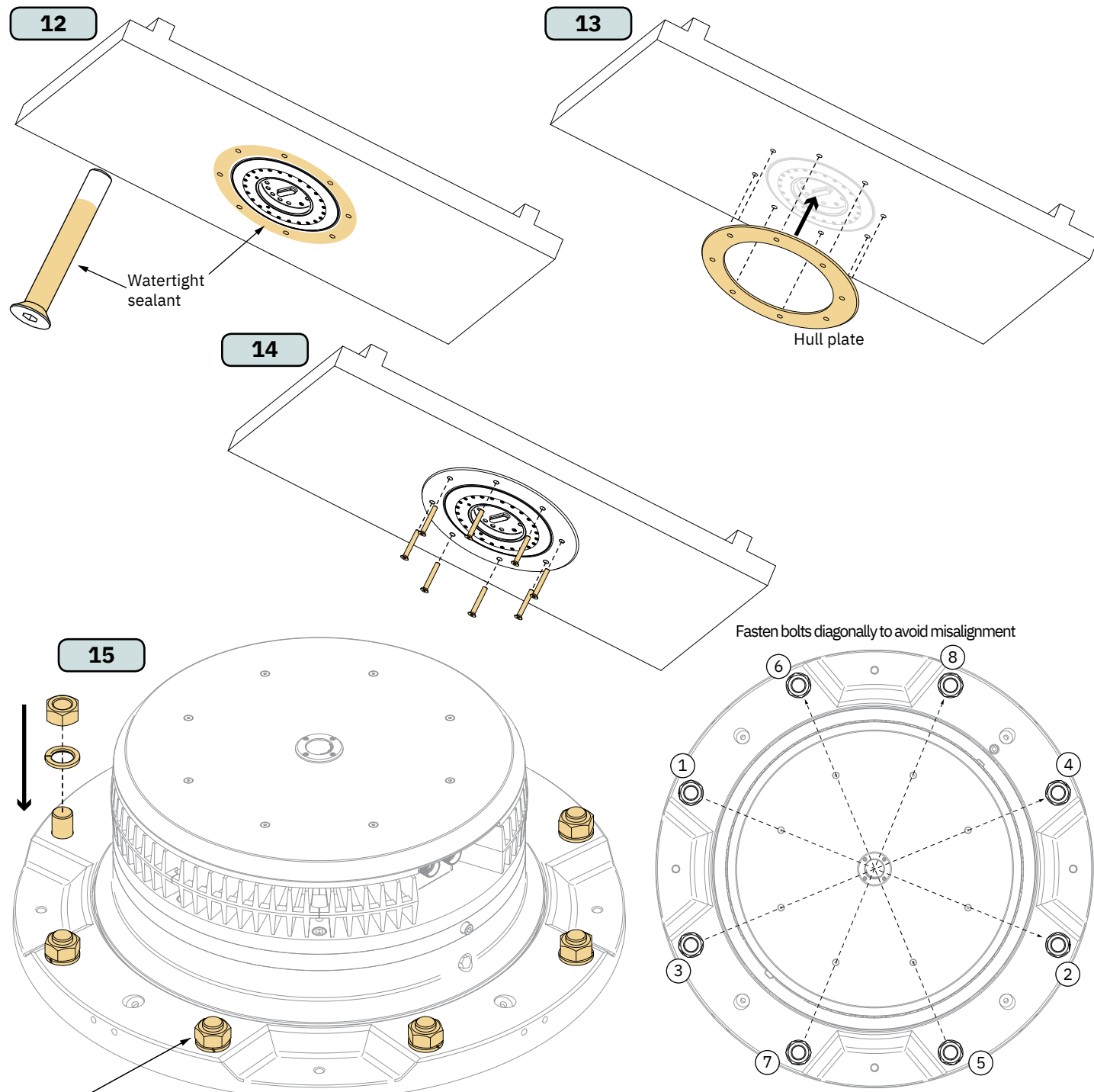


MG_0723

! Please refer to the graphic for special considerations relating to your model !

MOUNTING OF THE STABILIZER ACTUATOR ASSEMBLY

12. Apply watertight sealant to the Hull plate, can also be applied directly on the hull. Additional apply sealant on the bolt countersunk area to achieve proper sealing between bolt head, Hull plate and to the plate securing bolts.
13. Place the Hull plate over the Stabilizer shaft & onto the external hull mounting surface.
14. Insert actuator bolts with watertight sealant to the Hull plate.
15. Tighten & torque load the securing bolt nuts with washers in two stages following the defined number order to avoid misalignment.
Stage 1: Fasten each bolt to the defined tightening vaule and order.
Stage 2: Fasten each bolt to the defined tightening vaule and order.

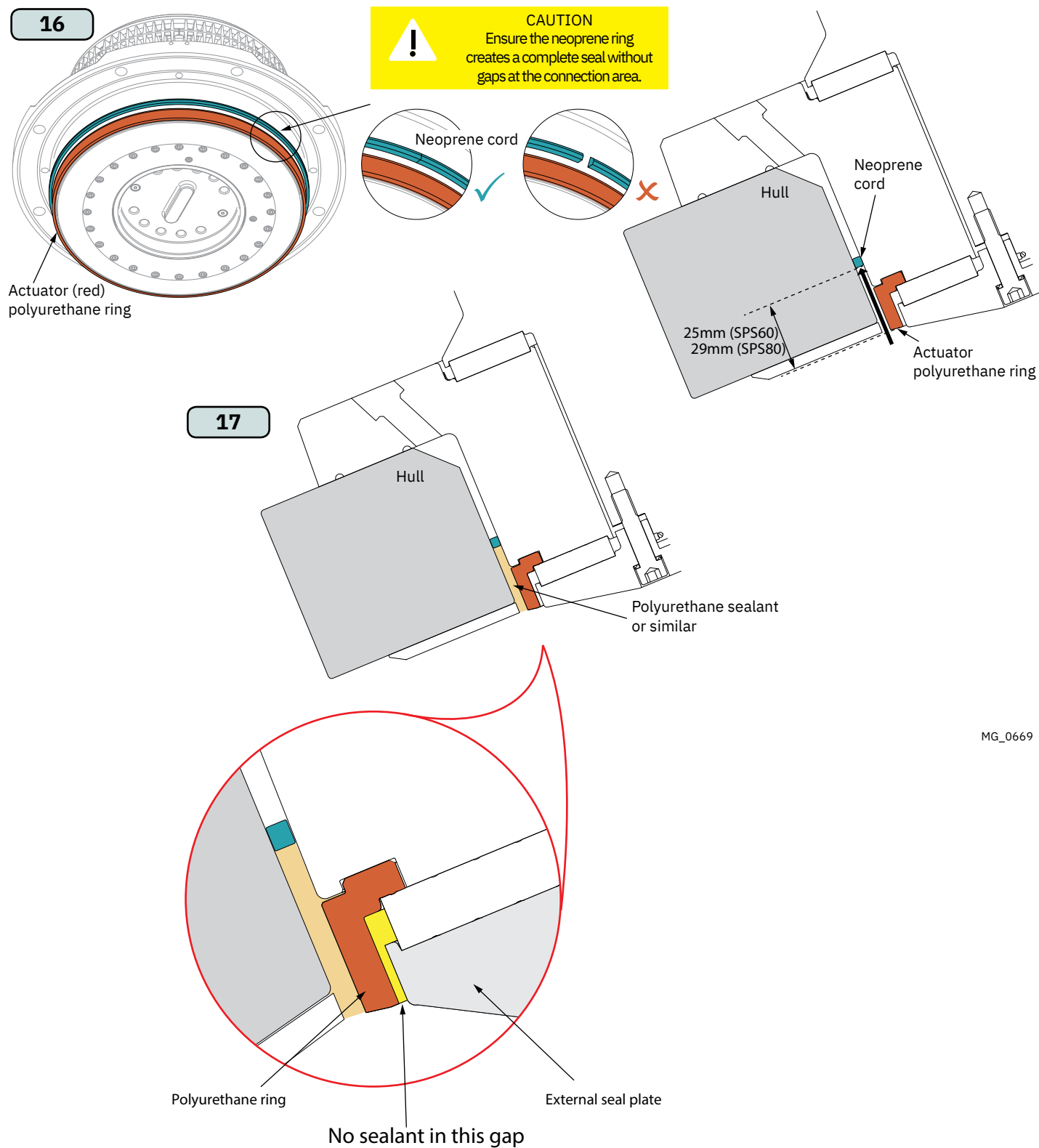


CAUTION
To prevent galling, add grease to the nut threads and fasten slowly.

Tighten	SPS60E	SPS70E	SPS80E	SPS100E
Stage 1	30Nm	30Nm	30Nm	30Nm
Stage 2	160Nm	160Nm	250Nm	250Nm

! Please refer to the graphic for special considerations relating to your model !

16. Clean away any overflowed watertight sealant if necessary and seal the lower gap with a EPDM cord. Push the EPDM cord 25/28mm (for SPS60 / SPS80), past the actuator polyurethane ring (See illustration below). **(NB: The polyurethane ring is identifiable as a red ring on the lower actuator.)**
17. Fill the lower void with polyurethane sealant or similar to create a create a water tight seal between the hull and the actuator. Sealant must be completely cured before proceeding to the next step.



MG_0669

! Please refer to the graphic for special considerations relating to your model !

18. Remove the blind plugs, insert the injection plugs with thread tape added and attach the hoses to the injection plugs.

Inject filler compound through the lower injection holes on the actuator base plate. Continue injecting the filler compound until it flows out of the upper injection hole.

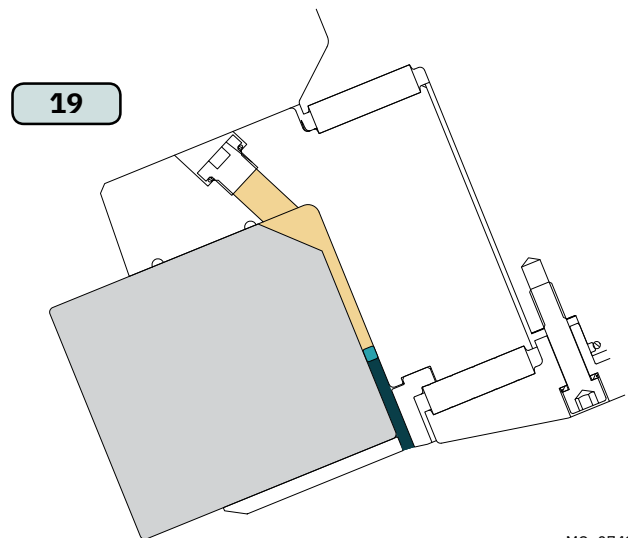
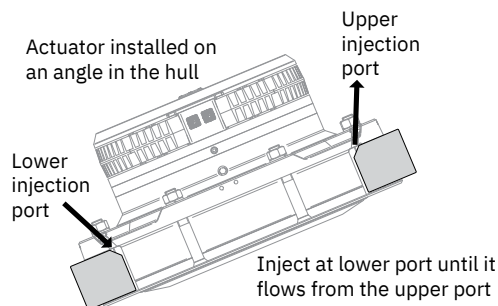
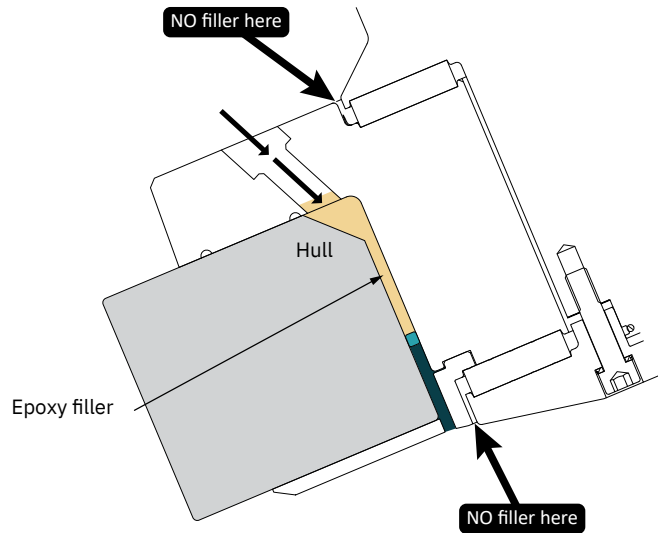
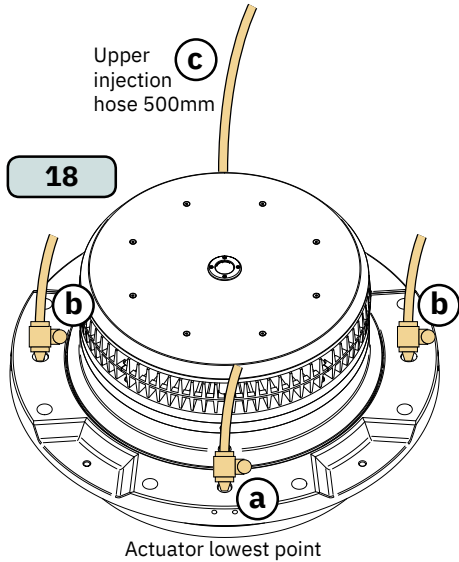
(NB: Commonly the actuator is installed on a slight angle.)

The lower injection port is defined as lowest port on the base plate.)

- Press the filler compound into the lowest point.
- When clean filler compound without bubbles comes out of drain port 1 and 2, close the drain ports.
- Continue filling until a small reservoir forms in the last (top) drain to allow flow back during the cure time process. **(NB: Recommend hose length is 500mm for the upper injection hose to allow flow back during the curing process.)**

Approved filler compounds
Chock Fast Orange PR610TCF
Steel Blue
Epocast 36
Locktite PC7202

19. After the filler compound has hardened, remove all four hoses and insert injection plugs.



WARNING
After injection is complete. Remove all remaining compound containers from the vessel due to fire risk. (exotherm curing process)

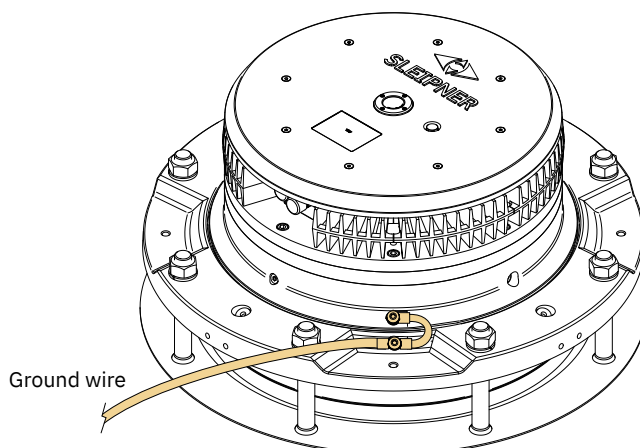
MG_0743

1. Plan the installation

The installation should be planned according to available cable length and placement recommendations for the different components. A system overview is shown in the Wiring Diagram chapter.

2. Connect Actuator ground wire

Connect a ground wire from the vessel's main bonding/ anode system to each actuator. The wire must be connected to both the positions indicated.



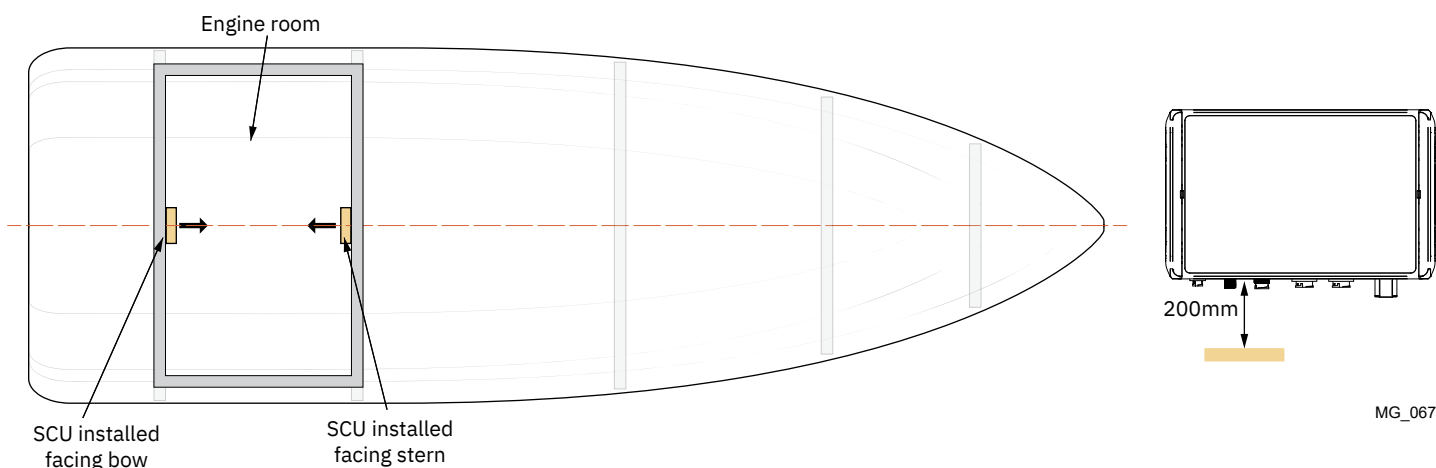
MG_0691

3. Stabilizer Control Unit (SCU)

The motion sensor used by the stabilisation algorithm is located inside the SCU. It is important to mount the SCU to a stable surface perpendicular to the keel, preferably on a bulkhead and as central as possible in the boat. A typical location is the forward or aftward engine room bulkhead. During system configuration it is specified in the control panel if the SCU is mounted facing bow or stern. The SCU must be installed with the connectors facing down and clearance for cables bend radius. The cable to be used between the SCU and the actuator is available in several predefined lengths, with a maximum length of 30-meters. The location of the SCU must be selected so that it is in reach of the eFD or SPS40E actuator with one of the available cable lengths.

Connect the supplied SCU Power Cable between connector X1 on SCU and a 24V DC supply protected with a 15A fuse. It is recommended to have a dedicated switch on the 24V supply to the SCU to enable a complete shut-down of the system.

Connect an S-Link spur cable between connector X2 on SCU and a T-Connector on the S-Link back bone cable.



MG_0673

SCU Cable Installation

SCU cable

- Connect the actuator on starboard side to connector X5 on SCU and connect actuator on port side to connector X6 on SCU.
- Cables for connection of stabilizer system are available in the following standard lengths shown in the table:

Order number	151370-040	151370-070	151370-100	151370-150	151370-200	151370-250	151370-300
Cable Length	4m	7m	10m	15m	20m	25m	30m

1. SPS Electronic Fin Drive (eFD)

The eFD is supplied with 2.5 / 4.5 meter long encoder- and power cables for connection to the actuator. Mount the eFD in proximity of the actuator to ensure that the cables can be connected.

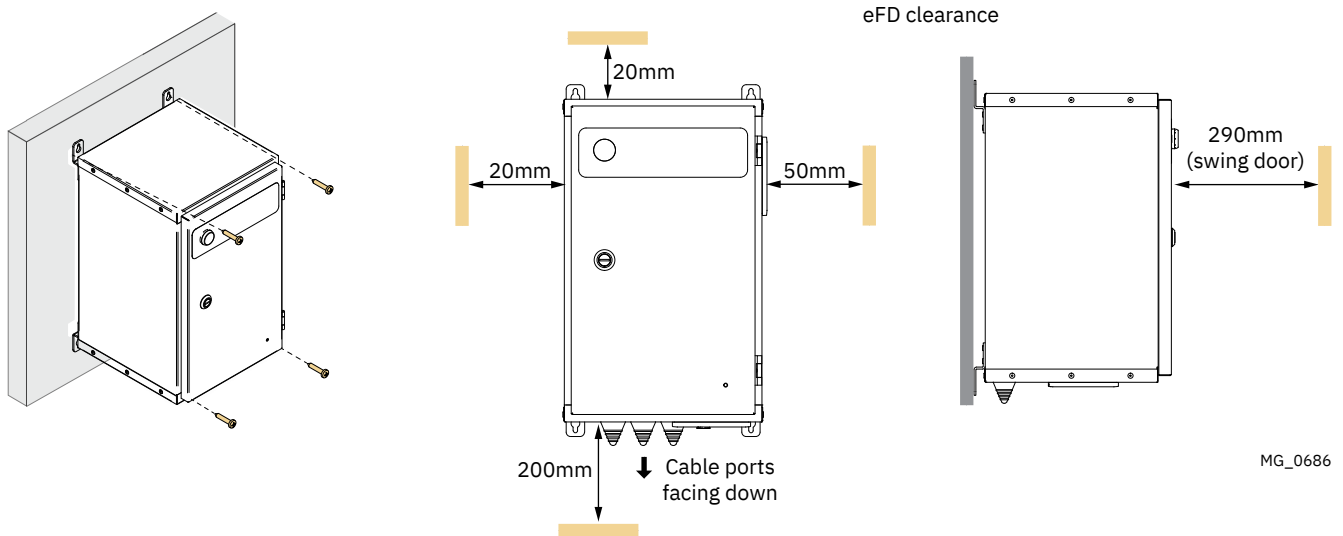
Use four screws with a maximum diameter of 6mm and a maximum head diameter of 12mm to fasten the eFD. First fasten the screws for the top brackets, hook on the eFD and then fasten the screws for the bottom brackets. When the eFD is held in place by the top and bottom screws, tighten all screws to ensure the eFD is securely mounted.

The eFD should be mounted with the cables pointing down and clearance for air circulations, opening of the door and cable bend radius. See sketch below for required clearance.



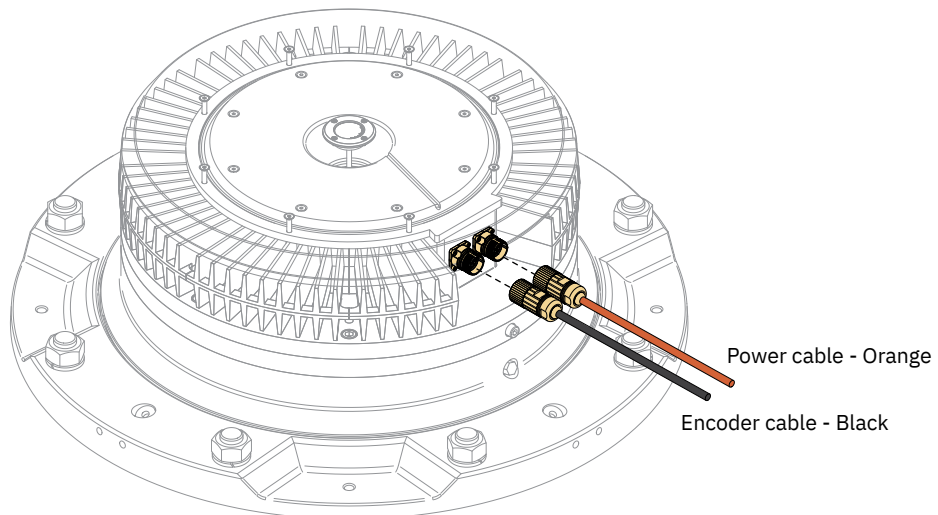
Warning. High system voltage present.
Electrical installation must be performed by authorized personnel.

MG_0869



MG_0686

Connect the encoder- and power cable to the actuator.



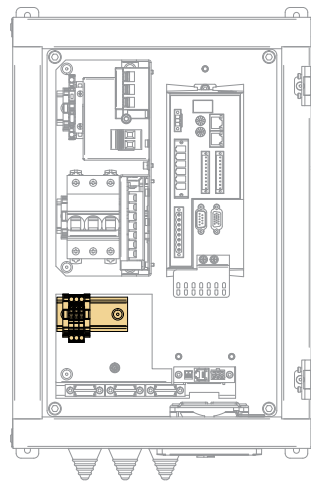
MG_0677

Each eFD should have a separate power supply cable with a dedicated fuse as shown in the Wire Diagram chapter. AC supply wire size and fuse rating should be chosen according to table below.

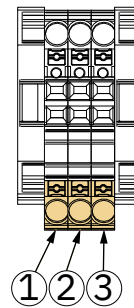
eFD	Supply Voltage nominal	Supply phases	Supply Current nominal	Peak Power (0.5s)	Recommended fuse rating	Recommended wire size
eFD60-230-1	220-240V 50/60Hz	1+N	16A	5.5kW	16A	2.5mm ²
eFD80-230-3	220-240V 50/60Hz	3+N	25A	8.5kW	25A	4mm ²
eFD80-400-3	380-440V 50/60Hz	3+N	16A	8.5kW	16A	2.5mm ²
eFD100-400-3	380-440V 50/60Hz	3+N	16A	11kW	16A	2.5mm ²

To get access to the power supply terminals of the eFD, open the lid by rotating the lock handle. Connect AC supply to the eFD according to instructions below.

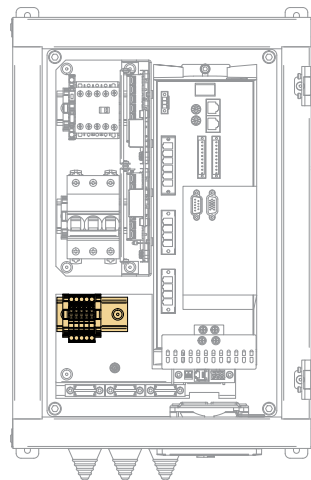
eFD-60-230-1-K



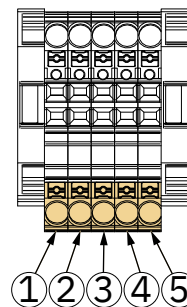
Terminal	Signal	Description
1	L	Line
2	N	Neutral
3	PE	Protective Earth



eFD-80-400-3-K



Terminal	Signal	Description
1	L1	Line 1
2	L2	Line 2
3	L3	Line 3
4	N	Neutral
5	PE	Protective Earth



MG_0674

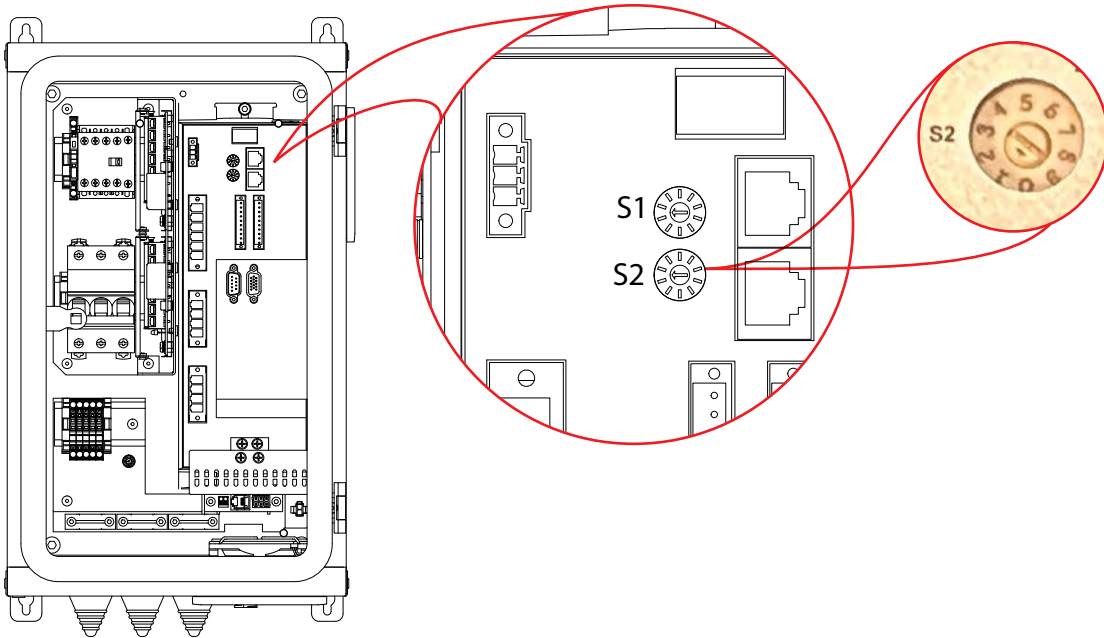
The eFD units in the complete stabilizer system must be configured as port and starboard eFD.

This configuration is selected by the S2 switch on the driver module inside the eFD cabinet.

Use a small flat screwdriver to operate the switch, and turn it so that the small arrow on the switch points towards the correct position.

- Set S2 switch to position “1” for the starboard stabilizer
- Set S2 switch to position “2” for the port stabilizer.

The S2 location is shown in the illustration below.



MG_0867

1. Control panel

Install control panel according to instructions in the Installation Guide accompanying the control panel.

2. GPS receiver

SCU requires speed data from a GPS to operate the stabilizers. GPS signal must be interfaced through the S-Link Gateway (GW-1).

A GPS can be interfaced either through the NMEA 0183- or the NME 2000 port on GW-1.

See GW-1 user manual, document number 3057, for detailed information on connection of GPS and installation.

If using NMEA 2000 GPS input, ensure that signal is available at all times when stabilizer operation is required.

If using NMEA 0183 it is recommended to power the GPS from GW-1. If GPS is installed with dedicated power supply the GPS must always be powered when S-Link power is turned on.

Connect GW-1 to S-Link as shown in the Wiring Diagram chapter.

The GPS antenna should be installed where it can get a clear view of the sky and not be in the shadow of obstructions.

3. Reverse detection

To ensure proper operation and avoid damage the fins must be put in centre position when the vessel transmission is set in reverse for astern movement. The SCU offers three solutions for reverse detection. Ensure to select SCU-KIT order number according to desired reverse detection solution.

Revers Detection	SCU order number	Comment
NMEA 2000	SCU-KIT-2F-NMEA	GW-1 included for NMEA 2000 and GPS integration.
Pressure switches	SCU-KIT-2F-TD	Two pressure switches for Twin Disk transmission included. GW-1 included for GPS integration.
	SCU-KIT-2F-ZF	Two pressure switches for ZF transmission included. GW-1 included for GPS integration.
Reverse solenoid interface	SCU-KIT-2F-SO	Reversing Solenoid Interface included. GW-1 included for GPS integration.

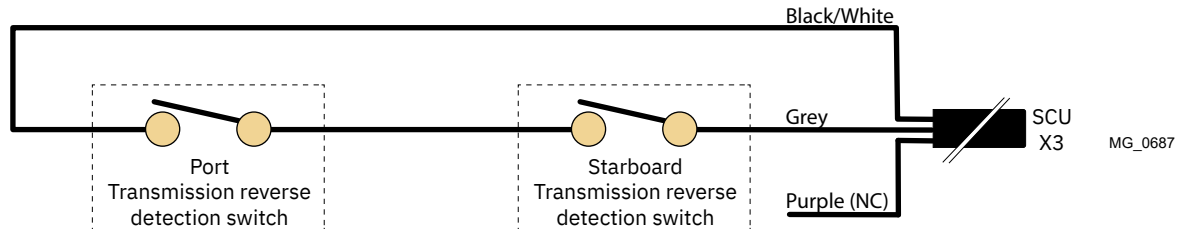
NMEA 2000

If main engine transmission PGN127493 is available on NMEA 2000, this bus can be connected to GW-1 and the PGN made available for the SCU.

Pressure switches

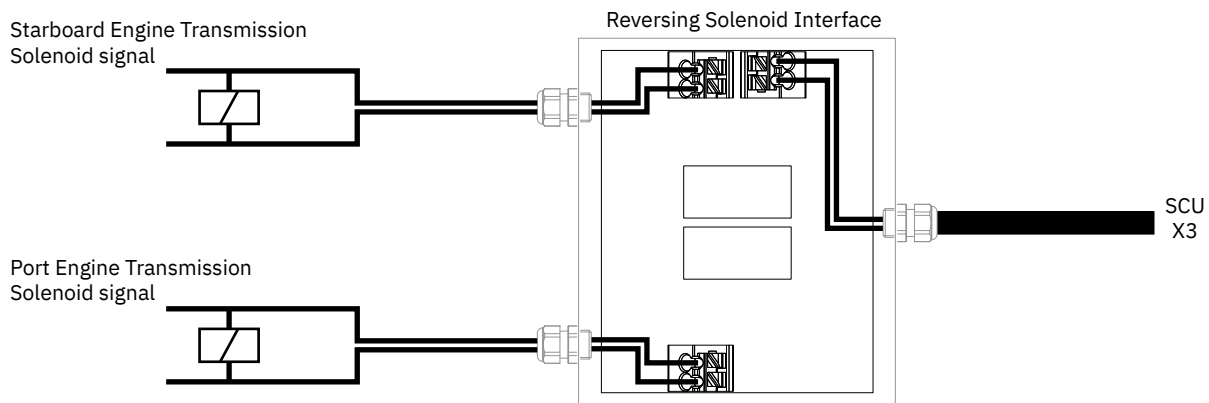
For some types of engines, pressure sensors can be installed on the main engine transmission. The drive direction can be monitored by detecting the pressure level in the gearbox control. Sensor port position can vary between different transmission models. Please contact engine supplier for instructions.

Both switches shall be connected in series and connect to connector X3 on SCU by using the supplied Reverse Detection Cable. An open switch is interpreted as transmission is put in reverse.



Reverse solenoid interface

For vessels not having available ports for pressure switches, connecting to 24V transmission solenoid signals could be an option. The solenoid signals must be connected to the Reversing Solenoid Interface box and the Reverse Detection Cable shall be connected between connector X3 on SCU and the Reversing Solenoid Interface box.



4. S-Link

See the S-Link System Description chapter for detailed information on the installation of the S-Link Power cable, END Terminator and additional S-Link components.

S-Link is a CAN-based control system used for communication between Sleipner products installed on a vessel. The system uses BACKBONE Cables as a common power and communication bus with separate SPUR Cables to each connected unit. Only one S-Link POWER cable shall be connected to the BACKBONE Cable. Units with low power consumption are powered directly from the S-Link bus.

Main advantages of S-Link system:

- Compact and waterproof plugs.
- BACKBONE and SPUR Cables have different colour coding and keying to ensure correct and easy installation. BACKBONE Cables have blue connectors and SPUR Cables have green connectors.
- Different cable lengths and BACKBONE Extenders make the system scalable and flexible to install.

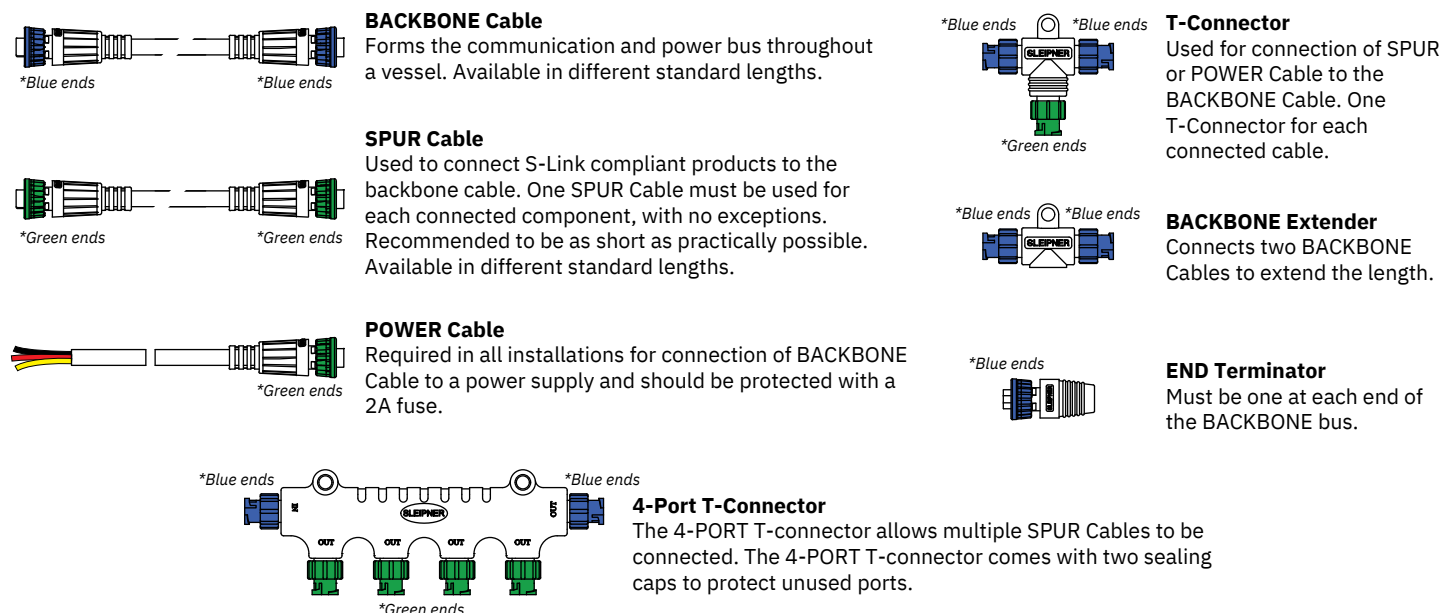
Installation of S-Link cables:

Select appropriate cables to keep the length of BACKBONE- and SPUR Cables to a minimum. In case of planned installation with total BACKBONE Cable length exceeding 100 meters please consult your local distributor. The S-Link cables should be properly fastened when installed to avoid sharp bend radius, cable chafing and undesired strain on connectors. Locking mechanism on connectors must be fully closed. To ensure long lifetime, cables, T-Connectors and Extenders should not be located so that they are permanently immersed in water or other fluids. It is recommended to install cables in such a way that water and condensation do not flow along the cables into the connectors. This can be done for example by introducing a u-shape bend before the cable enters the product connector.

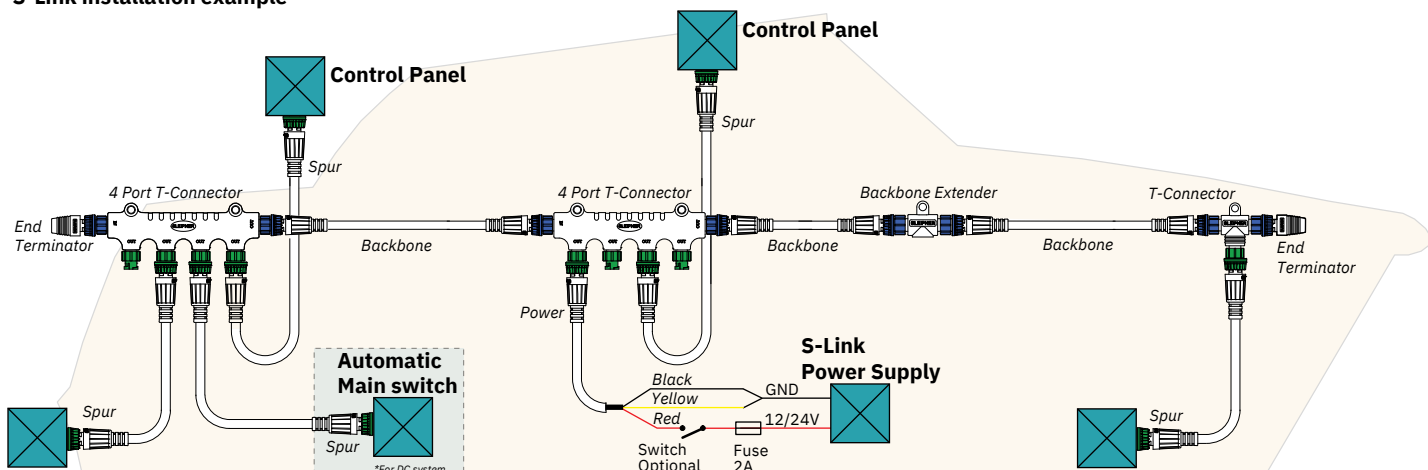
Ideally, the POWER Cable should be connected to the middle of the BACKBONE bus to ensure an equal voltage drop at both ends of the BACKBONE Cable. The yellow and black wire in the POWER Cable shall be connected to GND and the red wire connected to +12VDC or +24VDC.

To reduce the risk of interference, avoid routing the S-Link cables close to equipment such as radio transmitters, antennas or high voltage cables. The backbone must be terminated at each end with the END Terminator.

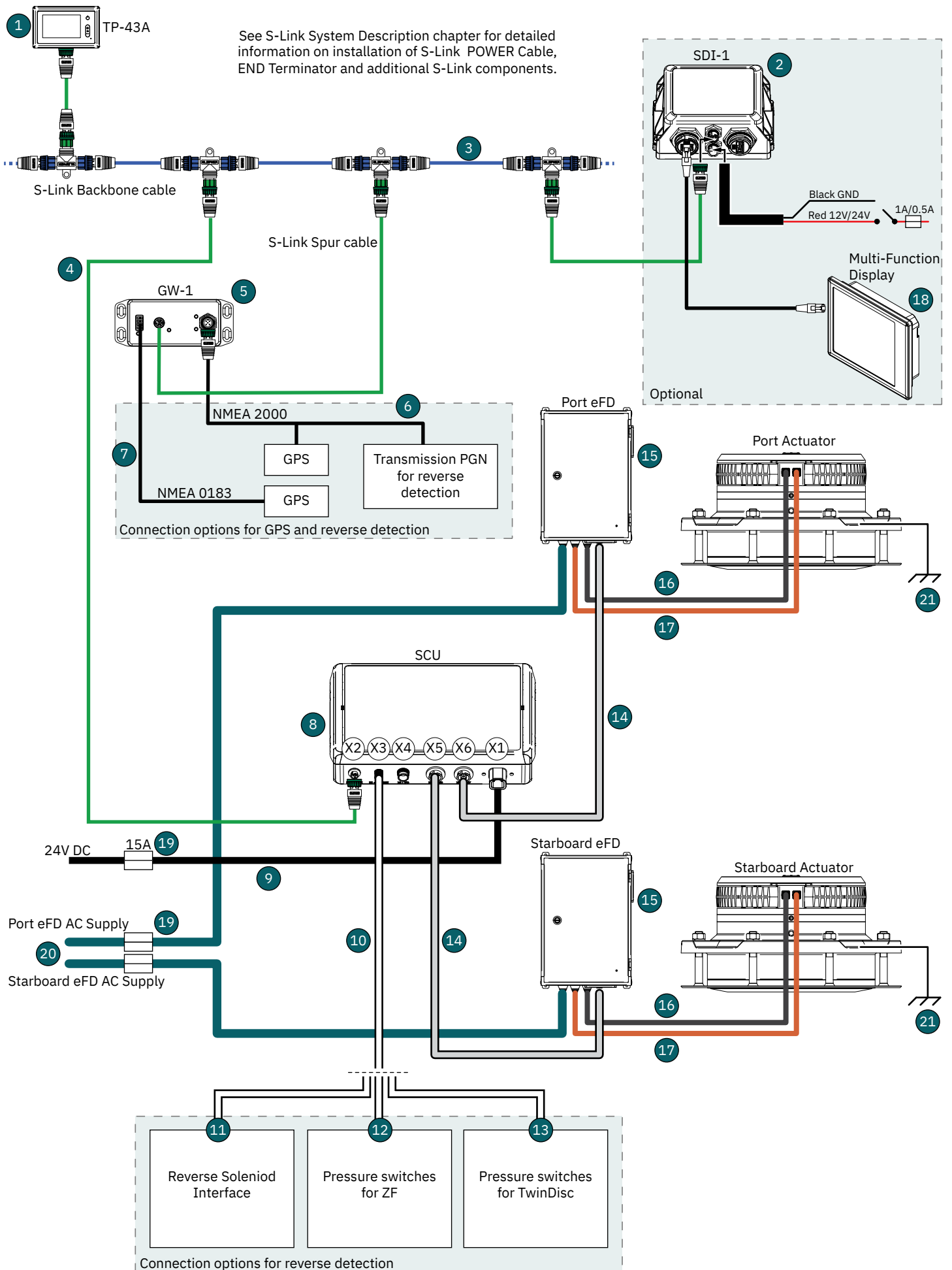
SPUR cables can be left unterminated to prepare for the installation of future additional equipment. In such cases, ensure to protect open connectors from water and moisture to avoid corrosion in the connectors.



S-Link installation example



Wiring Diagram for SPS60E & SPS80E



MG_0655

Reference Number	Item Number	Description
1	TP-43A	Stabilizer control panel. Included in all SCU-kits
2	SDI-1	S-Link Display Interface. Optional. Can be used for monitoring and configuration of thrusters and stabilizer
3	S-Link Backbone cable	Available in different lengths
	6 1320-0,2M	S-Link™ backbone control cable 0,2m
	6 1320-2M	S-Link™ backbone control cable 2m
	6 1320-4M	S-Link™ backbone control cable 4m
	6 1320-7M	S-Link™ backbone control cable 7m
	6 1320-10M	S-Link™ backbone control cable 10m
	6 1320-15M	S-Link™ backbone control cable 15m
	6 1320-20M	S-Link™ backbone control cable 20m
4	S-Link Spur cable	Available in different lengths
	6 1321-0,4M	S-Link™ spur control cable 0,4m
	6 1321-1M	S-Link™ spur control cable 1m
	6 1321-3M	S-Link™ spur control cable 3m
	6 1321-5M	S-Link™ spur control cable 5m
	S-Link	Other available S-Link components
	6 1328	S-Link™ spur power cable 2,5m
	6 1322	S-Link™ backbone extender
	6 1326	S-Link™ T-connector
	6 1403	S-Link™ 4-Port T-connector
	6 1327	S-Link™ terminator
5	GW-1	S-Link™ gateway Included in all SCU-kits
6	NMEA 2000 Network	Not supplied by Sleipner Used for GPS connection and/or reverse detection by NMEA engine control.
7	321714	GPS-receiver for S-Link™ Gateway NMEA 0183 GPS for speed data to Stabilizer system, cable 9m.
8	SCU-12	DMC SCU 2-fin Included in all SCU-kits
9	151371-025	SCU Power Cable 2.5m Included in all SCU-kits
10	151375-100	SCU Reverse Detection Cable 10m Included in SCU-KIT-2F-SO, SCU-KIT-2F-ZF and SCU-KIT-2F-TD
11	151380	Reversing Solenoid Interface w/dual relays Included in SCU-KIT-2F-SO
12	321270	Pressure switch 1/4" 0.1-1 bar NC Included in SCU-KIT-2F-ZF
13	321272	Pressure switch 1/4" 1-10 bar NC Included in SCU-KIT-2F-TD
14	SCU cable	Available in different lengths Different length on port and starboard side can be used.
	151370-040	SCU-FCU cable 4m
	151370-070	SCU-FCU cable 7m
	151370-100	SCU-FCU cable 10m
	151370-150	SCU-FCU cable 15m
	151370-200	SCU-FCU cable 20m
	151370-250	SCU-FCU cable 25m
	151370-300	SCU-FCU cable 30m
15	EFD-75-400-3-K	SPS Electric Fin Drive 400VAC 3 phase. One for port and one for starboard actuator.
16	Encoder cable	Encoder cable 2.5m Connected to eFD by Sleipner.
17	Power cable	Actuator power cable 2.5m Connected to eFD by Sleipner
18	Multi-Functional Displays	Not supplied by Sleipner Optional. MFDs can be used for monitoring and configuration of thruster and stabilizer systems when connected to SDI-1. TP-43A is always required.
19	Fuse	Not supplied by Sleipner Fuses for SCU and eFD power cables.
20	eFD power cable	Not supplied by Sleipner For voltage supply to eFD.
21	Ground wire	Not supplied by Sleipner For connection between vessel's main bonding system and actuator.

NOTE:

The keel alignment tool is not a part of the standard delivery, and can be purchased from Sleipner. Part numbers are listed in the table below. Alternatively, any custom-made device that serves the same purpose may also be used.

Use of the alignment tool:

1. Clamp a straightedge ruler to the bracket. The recommended distance "L" is depended of the actuator type, see the table below.

Actuator type	SPS40E	SPS50E	SPS60E	SPS70E	SPS80E	SPS100E
Distance "L"	600 mm	800 mm	800 mm	1200 mm	1200 mm	1500 mm
Tool part no.	SM200125	SM200179	SM196426	SM200188	SM200276	SM200328

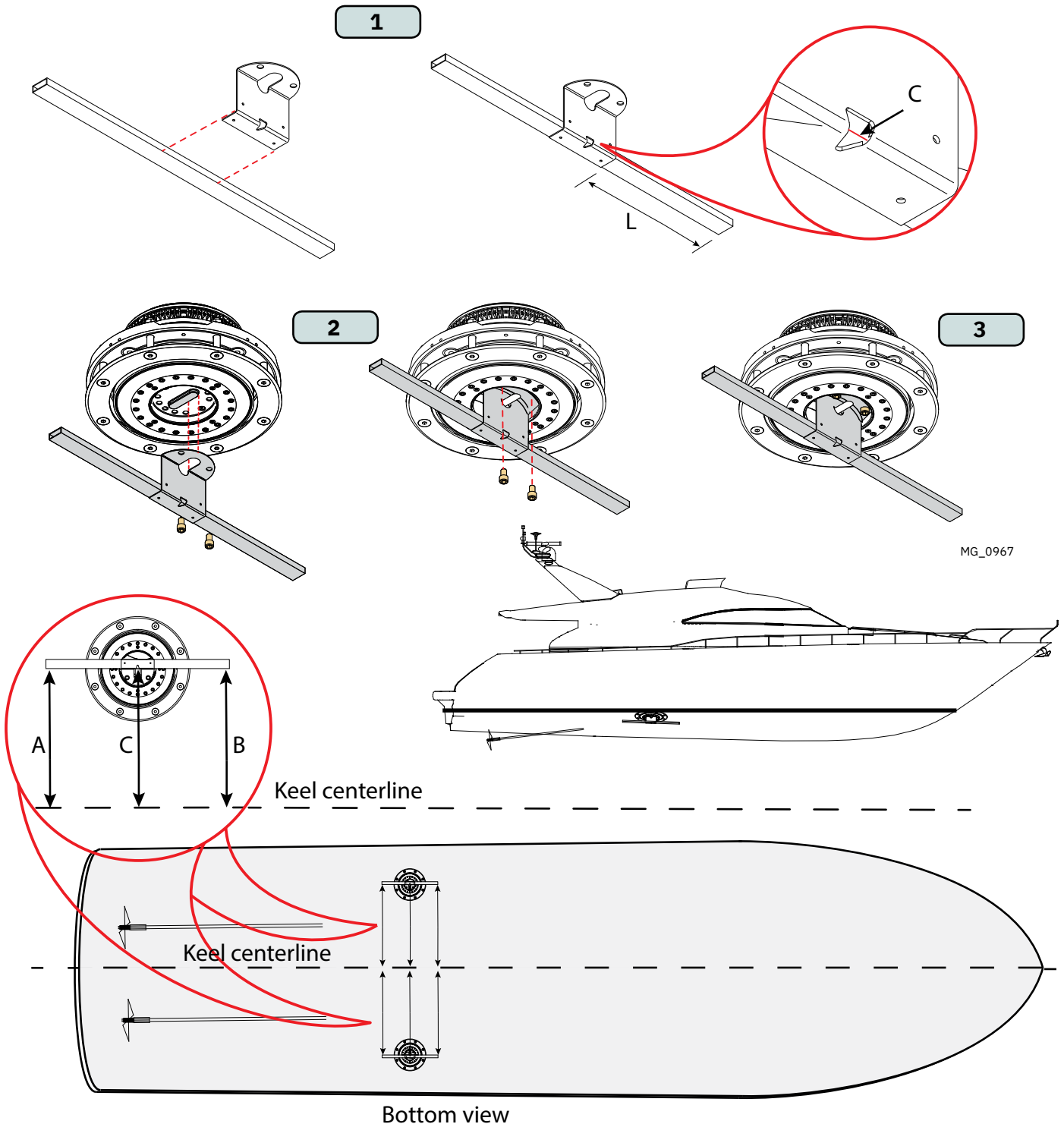
Before performing the keel alignment procedure, assemble the alignment tool to the actuator:

2. Align the bracket with the bump on the actuator fin hub.
3. Enter the screws in the corresponding holes on the actuator hub and tighten.

When the bracket with the straightedge ruler is assembled to the actuator, the actuator centerpoint will be at the indicated position "C".

Perform the Keel alignment procedure as described on the following page.

Verify that the straight ruler on the alignment tool is parallel to the keel by ensuring that the distance from both A and B to the keel center is approximately equal to the distance between the actuator centerpoint "C" and the keel center.



MG_0967

Bottom view

CAUTION

Keep clear of the alignment tool during startup of the system. It may rotate, and a possible danger of personal injuries.

Preparations

The keel alignment procedure must be carried out with the vessel on shore, before the fins are mounted.

This is a one-time procedure. Do not repeat unless an actuator encoder has been replaced.

If the vessel is out of water and fin is installed, the procedure will fail.

- Verify that the complete stabilizer system with all its components are correctly installed and wired.
- Install the fin alignment tool to the actuator according to the “Keel alignment tool setup” procedure.
- Turn the complete system ON. (S-link, TP43, SCU)
- “Wake up” the TP-43 panel if it is dark by touching the ON/OFF button.
- Select the “Startup and maintenance” menu.
- Enter the PIN code (1234 -> Enter)

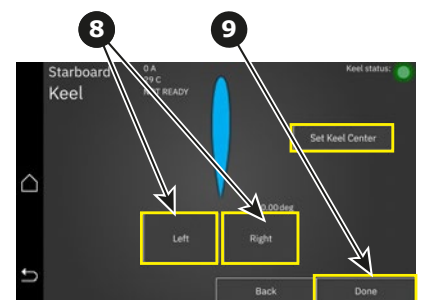
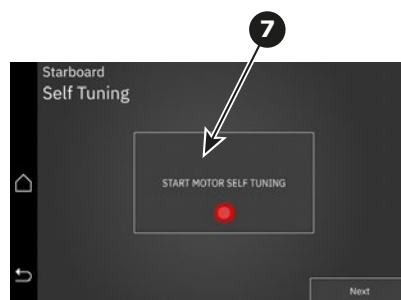
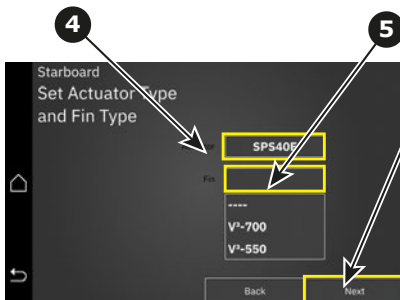
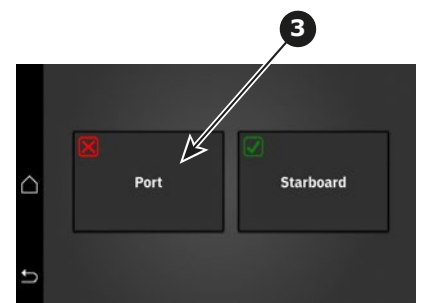
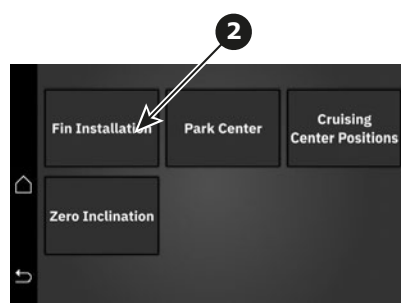
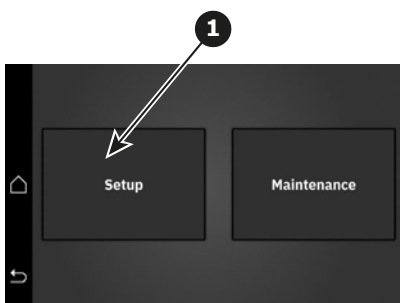


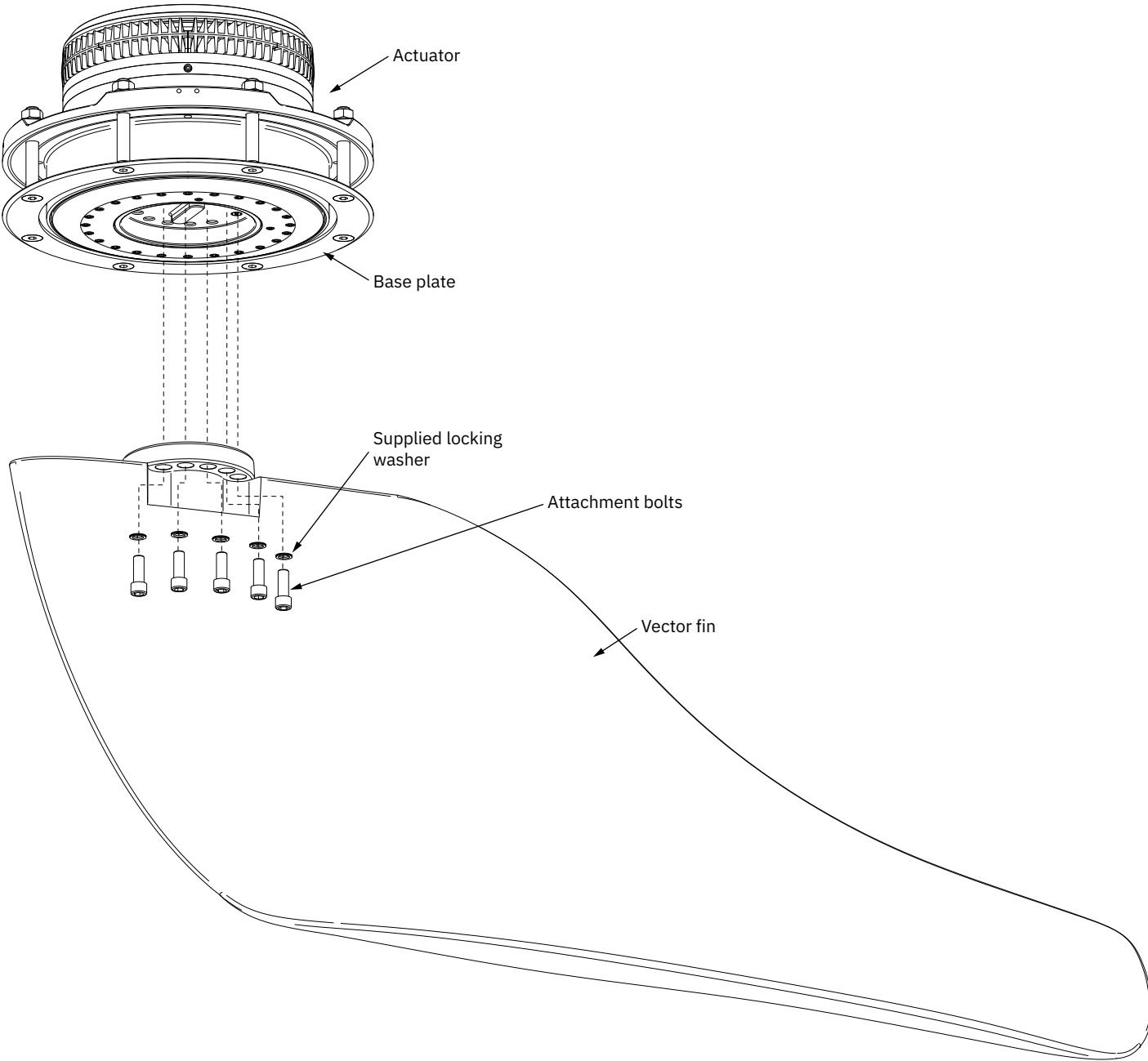
Keel alignment setup procedure

From the TP-43 panel Startup and maintenance menu:

1. Select Setup
 2. Select Fin installation.
 3. Select Port
 4. Select correct actuator from the dropdown menu.
 5. Select correct fin type from the dropdown menu.
 6. Select Next.
 7. Select “Start motor self tuning”, and wait until the process is completed.
 8. Measure the distance perpendicular from the keel to each end of the alignment tool.
 9. Press “Left” or “Right” button to adjust the actuator alignment tool parallel with the keel.
 9. Press the “Done” button when ready.
- Repeat steps 3 - 9 for the starboard fin.

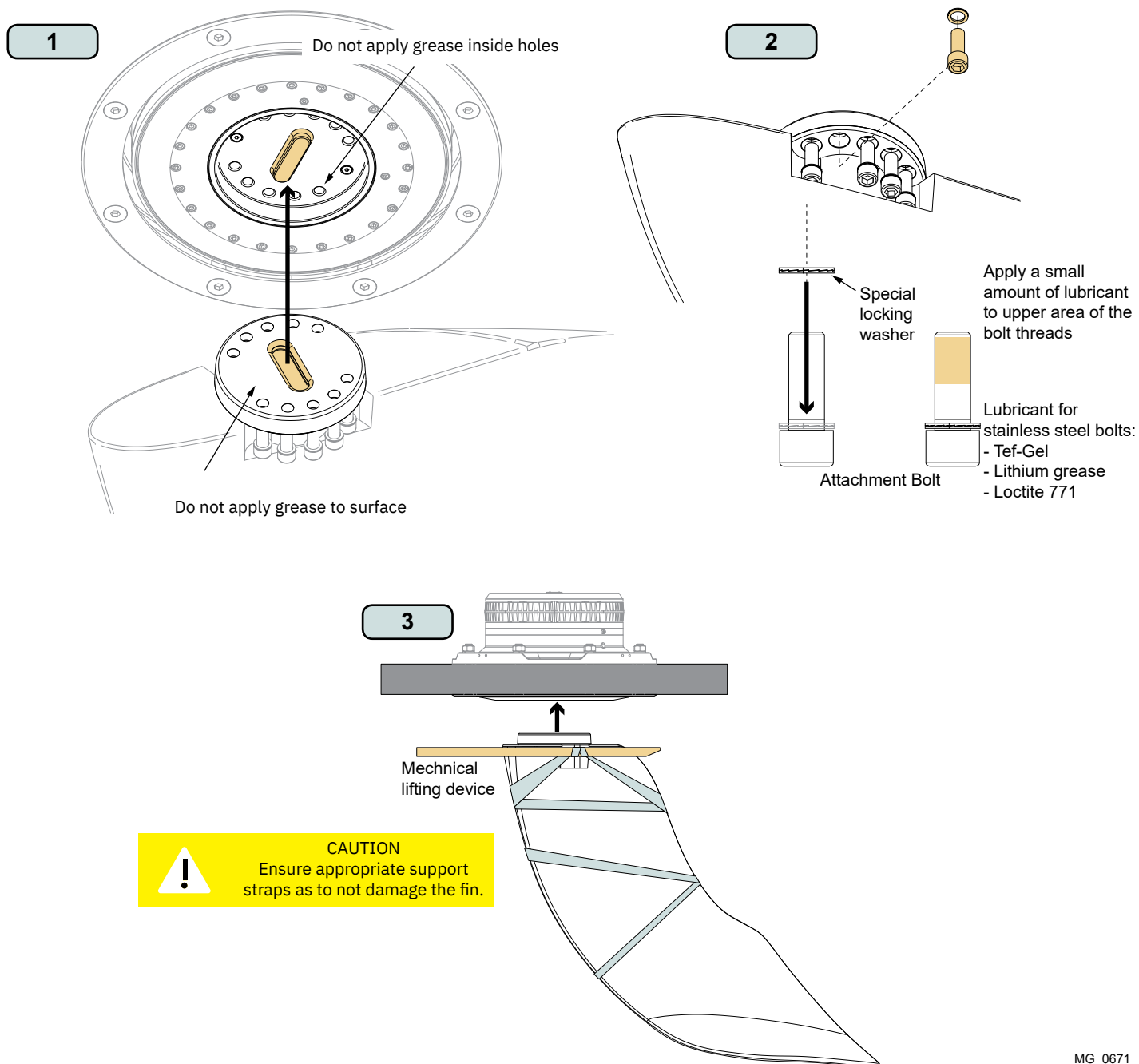
When completed, return to fin installation procedure





! Please refer to the graphic for special considerations relating to your model !

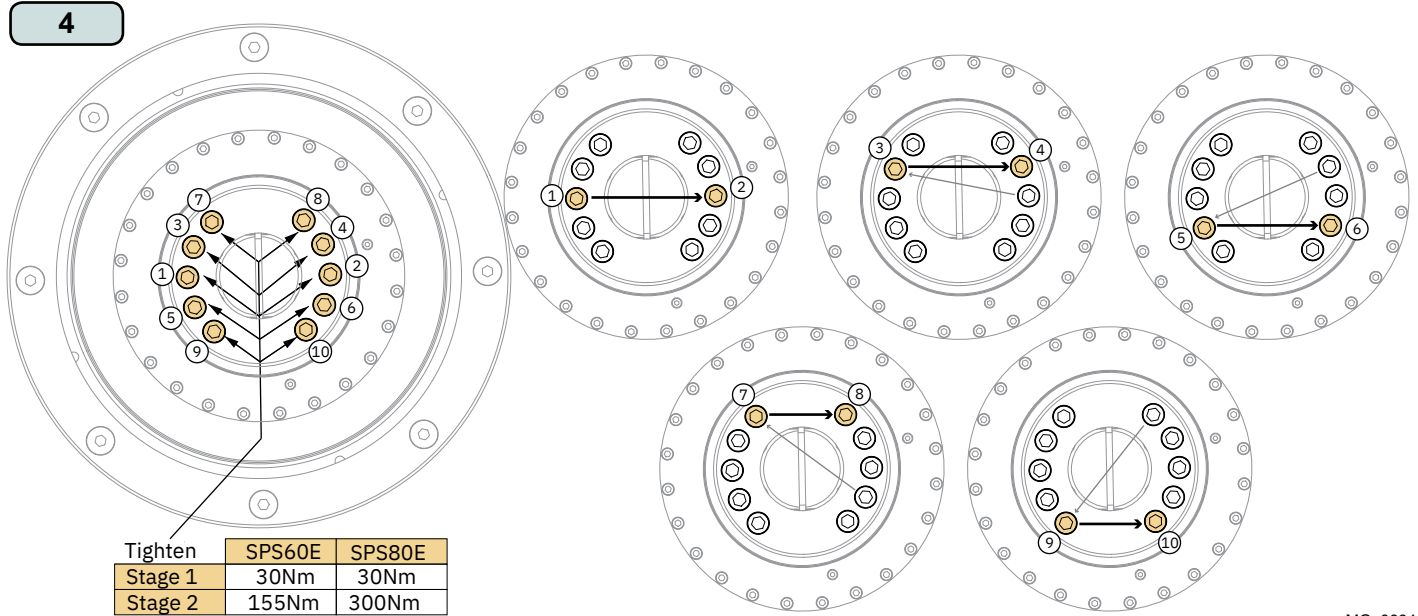
1. Align tongue and groove on the fin and the fin hub. **(NB: Do not apply grease to the bolt holes or the surface plate of the fin.)**
2. Place the locking washer to each bolt and apply a small amount of lubricant to the bolt threads. Insert the 10 attachment bolts to the fin.
3. Lift the fin into position.



MG_0671

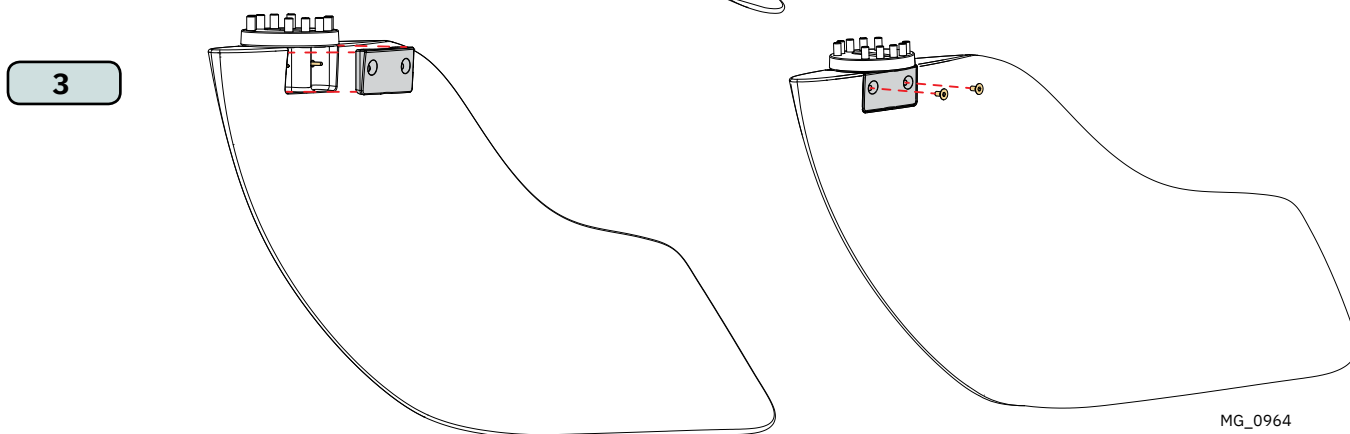
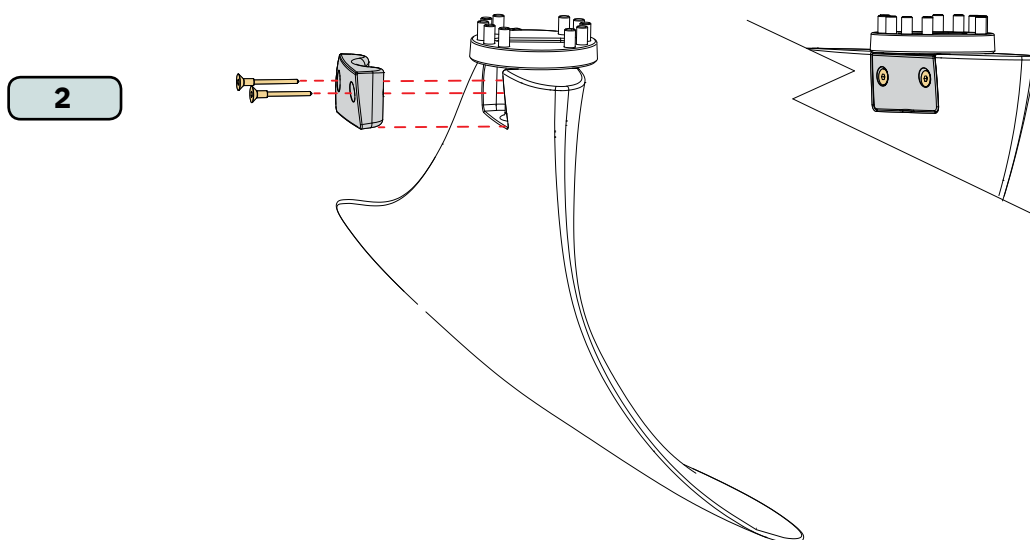
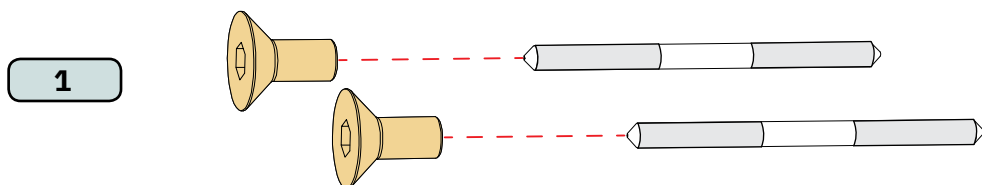
! Please refer to the graphic for special considerations relating to your model !

4. Tighten & torque load the 10 attachment bolts in two stages following the defined number order.
 Stage 1: Fasten each bolt to the defined tightening value and order.
 Stage 2: Fasten each bolt to the defined tightening value and order.
5. Attached shaft covers.



MG_0684

1. Apply threadlock, e.g. Loctite 243, on the setscrews, enter them in to the countersunk screwheads, and screw them all the way in.
2. Place the shaft cover in the fin, and enter the pre-mounted screwheads.
- NOTE: The two shaft covers are not equal, they only fit in one of the sides each. This is easy to identify.**
3. Place the other cover in the opposite side of the fin. Apply threadlock on the setscrew, and enter the screwheads on the setscrews. Screw them all the way in, and tighten.



MG_0964

Purpose

The purpose with this set up is to calibrate the vessels horizontal position in to the stabilizer system. This is important for the system to operate correctly.

The zero inclintation procedure can be performed at any time, either on shore or at sea, but before the Sea trial procedure.

Preparation

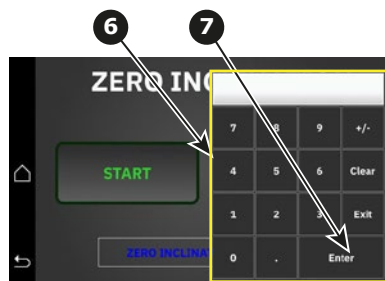
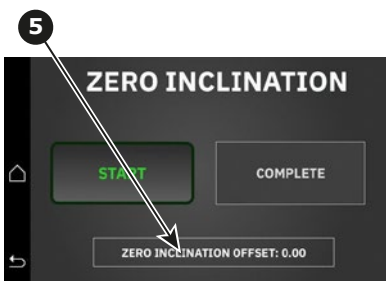
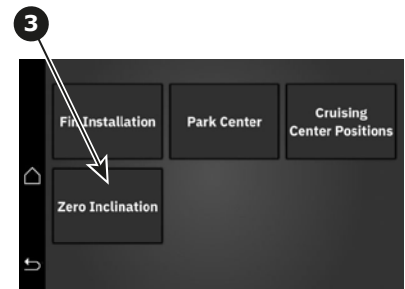
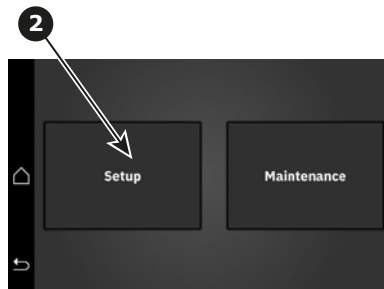
Ensure that the vessel is in horizontal position in the sideways direction. If not possible, jump to the “Manual calibration” section.

Automatic calibration:

1. From the main menu, select the “Startup and maintenance” menu, and enter the PIN code (1234 -> Enter)
2. Select the “Setup” menu
3. Select the “Zero inclination” menu.
4. Select “Start”, and the system will calibrate.
 - Wait until the process is completed (Approx. 5 sec).

Manual calibration:

- Verify the vessels deviation from the horizontal sideways position.
 - Perform the steps 1 to 3 in the Automatic calibration procedure above.
5. Select “Zero inclination offset”.
 - Vessel heeling to the port side - enter a positive value. Vessel heeling to the starboard side - enter a negative value
 6. Enter the roll angle offset value in the numeric keyboard that shows up.
 7. Press enter in the numeric keyboard.
 8. Verify that the value shown in the stabilizer view corresponds with the vessel heeling.



MG_0938

Purpose

Dynamic centers allowing the fins to operate at the ideal attack angle depending on the boat speed. By unlocking the fins and let them free float in five different speeds in the vessels speed range, the system will operate with the ideal angle of attack throughout the vessels speed range. This will minimize the drag from the fins, and also reduce the fuel consumption. This is illustrated as an example in the figure below. The fin position will be interpolated between the different speeds, so it is important to have speed both before and after the planing mode, as the water flow over the fins often changes during the transition to planing mode.

Run the vessel on flat water, or, if not possible, with the waves straight against the bow to minimize roll. Keep a steady course during the setting process. It is not possible to get a good result in large wave conditions.

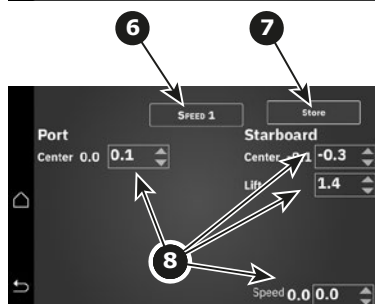
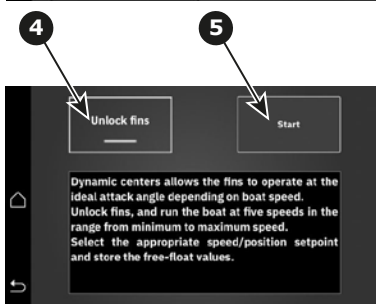
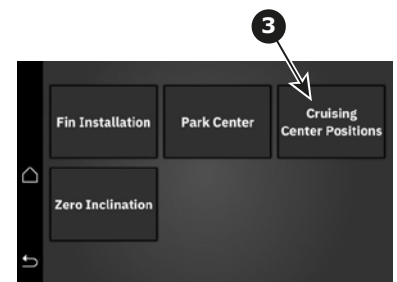
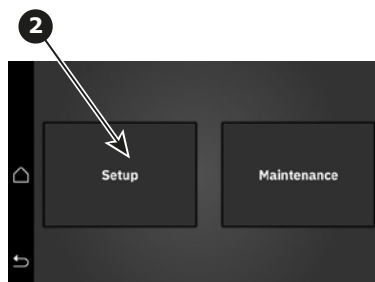
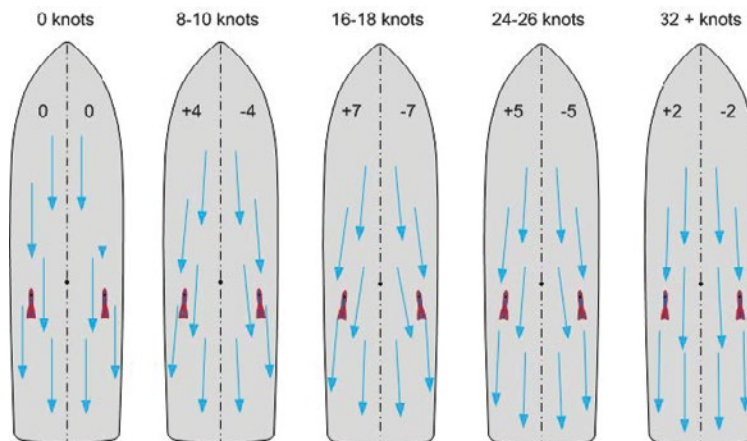
If the vessel has interceptors or trim flaps, these are to be used as normal during the setup procedure.

Speeds must be increasing, ie. speed 1 is the lowest speed and speed 5 is the top speed.

Speed 1 is normally set close to parked position, to reduce the roll movement of the vessel when turning off the system, which will center the fins.

Procedure

- From the main menu, select the “Startup and maintenance” menu, and enter the PIN code (1234 -> Enter) (**Reference 1**).
- Select the “Setup” menu. (**Reference 2**).
- Select the “Cruising center positions” menu. (**Reference 3**).
- Select the “Unlock fins” menu. (**Reference 4**).
- Select “Start”. (**Reference 5**).
- Set idle speed forward. Select “Speed 1” in the dropdown menu (**Reference 6**).
- When the speed is constant, and fin positions are stable, press “Store” (**Reference 7**) to register the speed and corresponding fin position.
- Proceed through the speed settings 2 to 5.
- Note that it also is possible to enter the speed and fin position manually.
- For each speed, while the stabilizer system is active, use the lift setting to optimize the boat speed.
- Note that it also is possible to enter the speed and fin position manually.



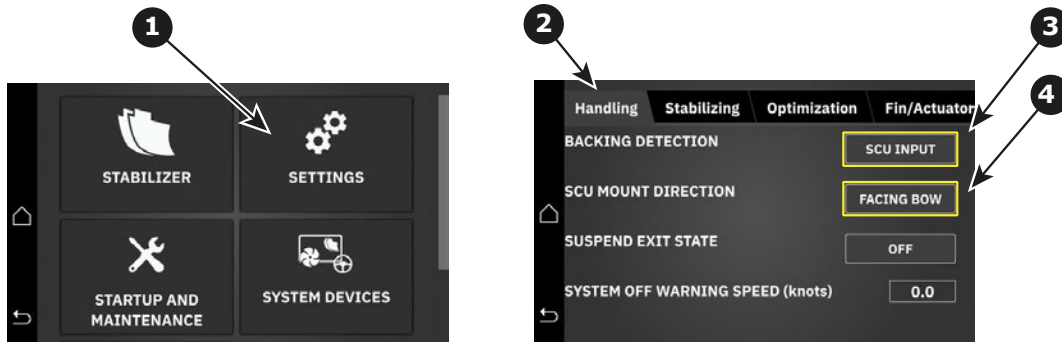
Stabilizer settings procedure

The setting parameters in the Stabilizing, Optimization and Fin/Actuator tabs in the settings menu will differ from vessel to vessel. Generic parameters is set as standard values in the system. Sleipner can provide more specific parameters for certain hull / vessel types. Contact your dealer for more info.

Anyhow; the parameters in the Settings -> Handling tab must be set by the installer.

Handling tab settings

1. Select the "Settings" menu.
2. Select the "Handling" tab
3. Select Backing detection, and select the correct input from the dropdown menu.
4. Select SCU Mount direction and select the SCU installation direction from the dropdown menu.
This refers to how the SCU is mounted, see installation manual for reference.



Stabilizing-, Optimization-, and Fin/Actuator tabs

The setting parameters will differ from vessel to vessel. In order to have a easy set up procedure, generic parameters is set as standard values in the system.

Sleipner will provide more specific parameters for certain hull / vessel types. Contact your dealer for more info.

The numbers shown in the illustrations below are just examples and not to be used.

The boat builder or advanced users are able to optimize and set new values for all the parameters for optimizing the system to the vessel.

When it is necessary to enter new values:

Select the value that need to be changed, a keyboard shows up in the display.

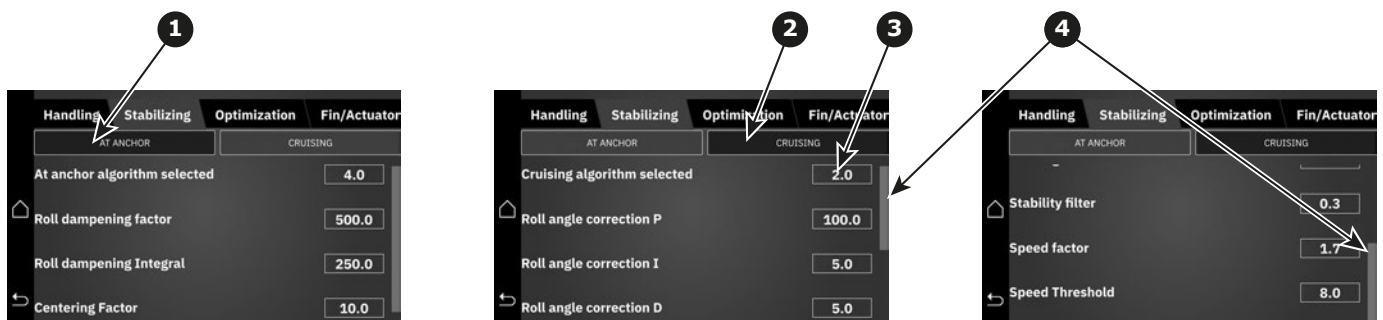
Enter the new value, and confirm.

The Stabilizing-, Optimization- and Fin/Actuator tabs are quite similar in sub menus and how to adjust the values. As an example, the Stabilizing tabs are shown in the illustrations below.

The menu tabs has sub menus; At anchor (**Reference 1**) and Cruising (**Reference 2**).

The parameter values are changed by selecting the numeric value connected to the actual parameter (**Reference 3**), and entering the new value in the numeric keyboard that shows up in the display. Confirm with enter on the keyboard.

Slide the side bar (**Reference 4**) to see all the parameter settings in the menus.

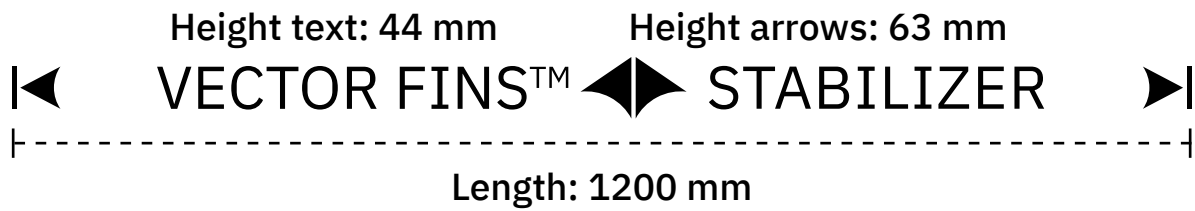


Fin Location Label

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

Safety Labels

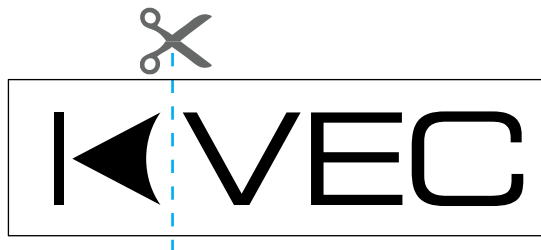
To ensure crane operators and swimmers are aware of the fin's location and operation area, please mount the safety labels on the hull



Adjustable length, fits all Sleipner Vector Fins™.

For application, get your ✂ and follow instructions in the manual.

Use scissors to cut the end arrow symbols on the label.



Place the label to the hull and place the end arrow labels to cover the length of the stabiliser fin.



Introduction:

At Sleipner Group, we prioritize sustainability and encourage the repair and re-manufacturing of products to extend their life cycles. If disposal is necessary, please follow these guidelines to recycle and manage waste responsibly, ensuring our efforts align with environmental protection efforts.

Electric Motors and Electronics:

- Disconnect from any power sources and dismantle them carefully.
- Recycle components through certified e-waste recycling centers that can adequately handle and recover electronic materials.
- Dispose of any non-recyclable electronic parts according to local environmental regulations.

Metals:

- Collect and sort metal parts for recycling as scrap metal.
- To increase recycling efficiency, ensure that metals are clean and free from non-metal attachments.

Plastics:

- Identify recyclable plastics based on local recycling guidelines.
- Remove any non-plastic components and clean them before recycling to improve the quality of the recycled material.

Hazardous Materials:

- Correctly identify any hazardous substances within components, such as batteries or capacitors etc.
- Follow local regulations for the safe disposal of hazardous materials to prevent pollution and protect environmental health.

General Disposal Instructions:

- Consult local recycling programs to determine the acceptability of various materials.
- Use authorized disposal services to ensure compliance with environmental standards.

Safe Disposal Practices:

- Adhere to local laws and regulations for waste management to minimize environmental impact and ensure community safety.

This guide is designed to help reduce our products' environmental footprint through responsible end-of-life management. Please contact your local waste management supplier or our support team for more specific disposal information or further assistance.

Find your local professional dealer from our certified worldwide network for expert service and support. visit our website www.sleipnergrouper.com/support

Product spare parts and additional resources

For additional supporting documentation, we advise you to visit our website www.sleipnergrouper.com and find your Sleipner product.

Warranty statement

1. Sleipner Motor AS (The "Warrantor") warrants that the equipment (parts, materials, and embedded software of products) manufactured by the Warrantor is free from defects in workmanship and materials for purpose for which the equipment is intended and under normal use and maintenance service (the "Warranty").
2. This Warranty is in effect for two years (Leisure Use) or one year (Commercial and other Non-leisure Use) from the date of delivery/purchase by the end user, with the following exceptions:
 - (a) For demonstration vessels, or vessels kept on the water, the dealer is considered as the end user from 6 months after their launch of the vessel;
 - (b) The warranty period starts no later than 18 months after the first launch of the vessel.

Please note that the boat manufacturer and dealer must pay particular attention to correct maintenance and service both by the products manuals as well as general good practice for the location the boat is kept in the period the boat is in their care. In cases where the 6 and 18 months grace periods for boat builders and dealers are passed, it is possible to obtain a full warranty upon inspection and approval of the warrantor or such representative.
3. Certain parts, classified as wearable or service parts, are not covered by the warranty. A failure to follow the required maintenance and service work as described in the product manual render all warranty on parts or components directly or indirectly affected by this void. Please also note that for some parts, time is also a factor separately from actual operational hours.
4. This Warranty is transferable and covers the equipment for the specified warranty period.
5. The warranty does not apply to 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. In case the equipment seems to be defective, the warranty holder (the "Claimant") must do the following to make a claim:
 - (a) Contact the dealer or service centre where the equipment was purchased and make the claim. Alternatively, the Claimant can make the claim to a dealer or service centre found at www.sleipnergrouper.com. The Claimant must present a detailed written statement of the nature and circumstances of the defect, to the best of the Claimant's knowledge, including product identification and serial nbr., the date and place of purchase and the name and address of the installer. Proof of purchase date should be included with the claim, to verify that the warranty period has not expired;
 - (b) Make the equipment available for troubleshooting and repair, with direct and workable access, including dismantling of furnishings or similar, if any, either at the premises of the Warrantor or an authorised service representative approved by the Warrantor. Equipment can only be returned to the Warrantor or an authorised service representative for repair following a pre-approval by the Warrantor's Help Desk and if so, with the Return Authorisation Number visible postage/shipping prepaid and at the expense of the Claimant.
7. Examination and handling of the warranty claim:
 - (a) If upon the Warrantor's or authorised service Representative's examination, the defect is determined to result from defective material or workmanship in the warranty period, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense. If, on the other hand, the claim is determined to result from circumstances such as described in section 4 above or a result of wear and tear exceeding that for which the equipment is intended (e.g. commercial use of equipment intended for leisure use), the costs for the troubleshooting and repair shall be borne by the Claimant;
 - (b) No refund of the purchase price will be granted to the Claimant, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. In the event that attempts to remedy the defect have failed, the Claimant may claim a refund of the purchase price, provided that the Claimant submits 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.
8. Warranty service shall be performed only by the Warrantor, or an authorised service representative, and any attempt to remedy the defect by anyone else shall render this warranty void.
9. No other warranty is given beyond those described above, implied or otherwise, including any implied warranty of merchantability, fitness for a particular purpose other than the purpose for which the equipment is intended, and any other obligations on the part of the Warrantor or its employees and representatives.
10. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives based on this Warranty for injury to any person or persons, or damage to property, loss of income or profit, or any other incidental, consequential or resulting damage or cost claimed to have been incurred through the use or sale of the equipment, including any possible failure or malfunction of the equipment or damages arising from collision with other vessels or objects.
11. This warranty gives you specific legal rights, and you may also have other rights which vary from country to country.

Patents

At Sleipner we continually reinvest to develop and offer the latest technology in marine advancements. To see the many unique designs we have patented, visit our website www.sleipnergrouper.com/patents

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Learn more about our products at
www.sleipnergroun.com



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