



Installation Guide

For AC Electric Thruster Models
SAC450, SAC520



SLEIPNER MOTOR AS

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Norway

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Responsibility of the Installer

The installer must read this document to ensure necessary familiarity with the product before installation.

Instructions in this document cannot be guaranteed to comply with all international and national regulations. It is the responsibility of the installer to follow all applicable international and national regulations when installing Sleipner products.

The recommendations given in this document are guidelines ONLY, and Sleipner strongly recommends that advice is obtained from a person familiar with the particular vessel and applicable regulations.

This document contains general installation instructions intended to support experienced installers. If you are not skilled in this type of work, please contact professional installers for assistance.

If required by local regulation, electrical work must be done by a licensed professional.

Appropriate health and safety procedures must be followed during installation.

Faulty installation of Sleipner products will render all warranties given by Sleipner Motor AS.

Ensure appropriate access to Sleipner products during installation planning for service, inspection and component replacement.

General Installation Consideration and Precaution Guidelines

For thruster systems

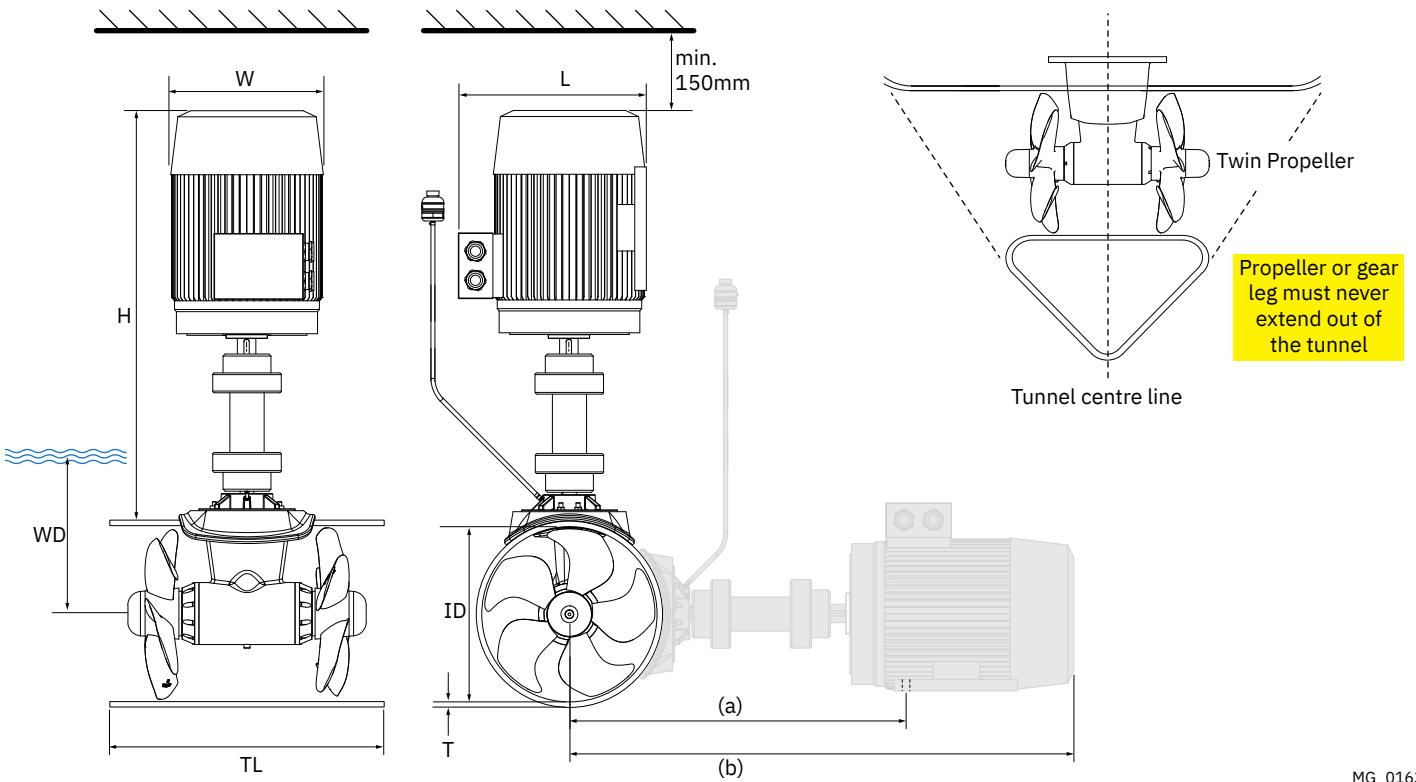
- Do not install the thruster in a position where you need to cut a stiffener/ stringer/ support that may jeopardise the hull integrity without checking with the boat builder this can be done safely.
- Paint the gear leg and propellers with anti-fouling. **(NB: Do not paint the anodes, sealing, rubber fittings or propeller shafts)**
- There is only room for a thin coat of primer and two layers of anti-fouling between the tunnel and the propellers.
- Never run the thruster out of water without load. Operated at no load, the thruster can reach extremely high speed, damaging the system.

For electric motor thrusters

- The thruster must NOT be installed in compartments that require ignition proof electric equipment. If necessary, make a separate compartment. **(NB: Sleipner Ignition Protected systems are tested and rated accordance with ISO 8846 and can be installed in areas with possible explosive gases.)**
- When installing the thruster in small compartments, ensure the compartment is dry and well ventilated to allow for cooling of the electric motor.
- If the height of the room you are installing the thruster is limited, the thruster can be installed horizontally or at any angle in-between.
 - If the electro motor is positioned more than 30 degrees off vertical, it must be supported separately.
 - Beware of keeping installation within advised measurements. No part of the propeller or gear leg must be outside the tunnel.
- The electric motor, components and cables must be mounted so they remain dry at all times.
- Do not finish the inside of the tunnel with a layer of gel-coat/ topcoat or similar. There is only room for a thin coat of primer and two layers of anti-fouling between the tunnel and the propellers.
- Do not install the electric motor close to easily flammable objects or equipment as it will reach over 100°C before the temperature switch is activated.
- Do not store items close to the thruster motor. Any loose items near the thruster motor is a potential fire hazard and can cause undesired short-circuiting.
- Do not lift it by internal cable connections, main terminals.
- The thruster power supply circuit must include the recommended sized fuse and a battery isolation switch.
- The electric/ hydraulic motor must be handled with care. Do not rest the thruster motor on its drive shaft as its weight can damage the shaft.

When installing an S-Link™ system connect ONLY original Sleipner S-Link™ products or other authorized control equipment directly to the S-Link™ bus. Connecting non-authorized third-party equipment, it must always be connected through a Sleipner supplied interface product. Any attempt to directly control or connect into the S-Link™ control system without a designated and approved interface will render all warranties and responsibilities of all of the connected Sleipner products. If you are interfacing the S-Link™ bus by agreement with Sleipner through a designated Sleipner supplied interface, you are still required to install at least one original Sleipner control panel to enable efficient troubleshooting if necessary.

Measurement code	Measurement description	SAC450		SAC520	
		mm	inch	mm	inch
ID	Internal tunnel diameter	386	15.2	386	15.2
T (min)	Tunnel thickness min.	10	.4	10	.4
T (max)	Tunnel thickness max.	15	.4	15	.4
TL	Minimum tunnel length	500	19.7	500	19.7
TL (recommended)	Recommended tunnel length	750	29.5	750	29.5
WD	Minimum water depth	580	22.8	580	22.8
H	Motor Height	999	39.3	999	39.3
W	Motor width	356	14	356	14
L	Motor length	439	17.3	439	17.3

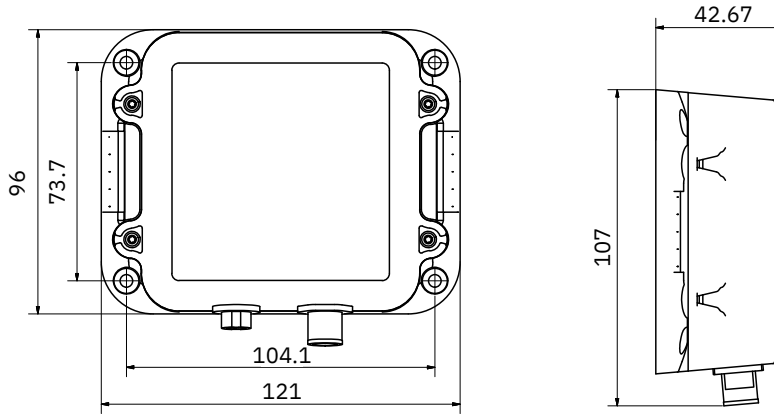


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Product	(a)		(b)	
	mm	inch	mm	inch
SAC450/386-C-2-H	736	29	1204	47.4
SAC450/386-C-2-V	615	24.2	1204	47.4
SAC450/386-C-4-H	736	29	1204	47.4
SAC450/386-C-4-V	615	24.2	1204	47.4
SAC450/386-C-4L-H	736	29	1204	47.4
SAC450/386-C-4L-V	615	24.2	1204	47.4

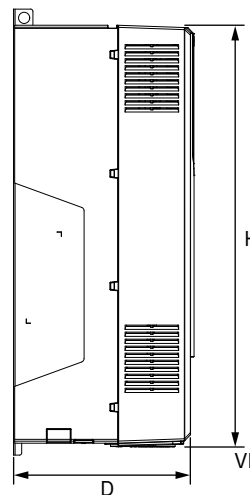
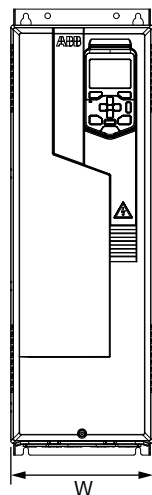
Product	(a)		(b)	
	mm	inch	mm	inch
SAC520/386-I-2-H	736	29	1204	47.4
SAC520/386-I-2-V	615	24.2	1204	47.4
SAC520/386-I-4-H	736	29	1204	47.4
SAC520/386-I-4-V	615	24.2	1204	47.4
SAC520/386-I-4L-H	736	29	1204	47.4
SAC520/386-I-4L-V	615	24.2	1204	47.4
SAC520/386-C-2-H	736	29	1204	47.4
SAC520/386-C-2-V	615	24.2	1204	47.4
SAC520/386-C-4-H	736	29	1204	47.4
SAC520/386-C-4-V	615	24.2	1204	47.4
SAC520/386-C-4L-H	736	29	1204	47.4
SAC520/386-C-4L-V	615	24.2	1204	47.4

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Thruster model	VFD model	Frame size	Weight Kg	D mm	W mm	H1 mm	DSU calc kWA	Amp calc
SAC450/386-C-2-H	ACS580-01-115A-2	R5	28.3	295	203	732	33	94.5
SAC450/386-C-2-V	ACS580-01-115A-2	R5	28.3	295	203	732	33	94.5
SAC450/386-C-4-H	ACS580-01-062A-4	R4	19	258	203	600	33	52
SAC450/386-C-4-V	ACS580-01-062A-4	R4	19	258	203	600	33	52
SAC450/386-C-4L-H	ACH580-31-062A-4	R6	61	383	252	771	33	52
SAC450/386-C-4L-V	ACH580-31-062A-4	R6	61	383	252	771	33	52
SAC520/386-I-2-H	ACS580-01-115A-2	R6	42.4	369	252	727	41	118
SAC520/386-I-2-V	ACS580-01-115A-2	R6	42.4	369	252	727	41	118
SAC520/386-I-4-H	ACS580-01-073A-4	R4	19	258	203	600	41	65
SAC520/386-I-4-V	ACS580-01-073A-4	R4	19	258	203	600	41	65
SAC520/386-I-4L-H	ACH580-31-073A-4	R6	61	383	252	771	41	65
SAC520/386-I-4L-V	ACH580-31-073A-4	R6	61	383	252	771	41	65
SAC520/386-C-2-H	ACS580-01-144A-2	R6	42.4	369	252	727	41	118
SAC520/386-C-2-V	ACS580-01-144A-2	R6	42.4	369	252	727	41	118
SAC520/386-C-4-H	ACS580-01-073A-4	R4	19	258	203	600	41	65
SAC520/386-C-4-V	ACS580-01-073A-4	R4	19	258	203	600	41	65
SAC520/386-C-4L-H	ACH580-31-073A-4	R6	61	383	252	771	41	65
SAC520/386-C-4L-V	ACH580-31-073A-4	R6	61	383	252	771	41	65

-H horizontal
 -V vertical
 -2 for 208-240V version
 -4 for 380-480V version
 -C operation mode
 -I operation mode. See specification table
 SAC1400/610 thruster model
 610 tunnel diameter
 1400/ thrust value



VFD protection: IP21

SAC240/250-C	SAC320/300-I	SAC360/300-C	SAC400/300-C	SAC450/386-C	SAC520/386-I	SAC520/386-C	SAC700/412-C	SAC750/513-I	SAC900/513-I	SAC1100/513-I	SAC1100/513-C	SAC1300/610-I	SAC1400/610-I
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Performance & sizing

Tunnel inside diameter (mm • in)	250 • 9.8	300 • 11.8	300 • 11.8	300 • 11.8	386 • 15.2	386 • 15.2	412 • 16.2	513 • 20	513 • 20	513 • 20	513 • 20	610 • 24	610 • 24
Thrust, continuous (kg • lbs)	240 • 529	280 • 617	360 • 794	400 • 882	450 • 992	450 • 992	700 • 1543	600 • 1323	750 • 1653	900 • 1984	1100 • 2425	1100 • 2425	1200 • 2646
Thrust, max. (kg • lbs)*	-	320 • 705	-	-	520 • 1146	520 • 1146	-	750 • 1653	900 • 1984	1100 • 2425	-	1300 • 2866	1400 • 3086
Motor output (kW • Hp)**	14 • 19	21 • 27	27 • 37	30 • 41	28 • 38	35 • 48	42 • 57	41 • 56	53 • 72	70 • 95	70 • 95	74 • 101	83 • 113
Typical boat size (m • ft)	13-23 • 42-75	17-31 • 55-100	18-33 • 59-108	18-33 • 59-108	22-35 • 75-110	25-40 • 85-140	29-44 • 95-145	29-44 • 95-145	30-45 • 100-150	32-49 • 105-160	32-49 • 105-160	40-52 • 130-170	40-55 • 130-175
Voltage range, 3-Phase supply	208-240/380-440V	208-240/380-440V	208-240/380-440V	208-240/380-440V	208-240/380-440V	208-240/380-440V	208-240/380-440V	380-440V	380-440V	380-440V	380-440V	380-440V	380-440V

Current draw max. ***

230V Systems:	51A	80A	106A	115A	127A	127A	150A	153A	193A	-	-	-	-
400V Systems:	28A	46A	62A	65A	73A	73A	87A	84A	106A	134A	134A	143A	160A
Generator load max:****	19,5 KVA	29 KVA	36 KVA	39 KVA	47 KVA	47 KVA	56 KVA	49 KVA	61 KVA	81 KVA	81 KVA	86 KVA	97 KVA

Features

CE approved	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DNV-GL type approved gear leg				Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes
Proportional speed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Propulsion system	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter	Twin Counter
Lubrication	Sealed	Gravity feed	Gravity feed	Gravity feed	Gravity feed	Gravity feed	Gravity feed	Gravity feed/ On water change (optional)	Gravity feed/ On water change (optional)	Gravity feed/ On water change (optional)	Gravity feed/ On water change (optional)	Gravity feed/ On water change (optional)	Gravity feed/ On water change (optional)
Galvanic separation	No	No	No	No	No	No	No	No	No	No	No	No	No

*) Max thrust is available until the motor winding temperature exceeds 130°C and the dynamic thrust limitation gradually decrease the thrust to continuous rated performance.

**) Motor output @ 230/400V supply. Actual value may vary depending on supply voltage and thruster install.

***) Current draw values are max values set in the VFD parameter setup.

****) Listed generator load is the maximum load value at standard thruster setup. Note that this value is different from the required generator capacity. Required generator capacity will vary depending on generator characteristics and other loads on the system and have to be selected in cooperation with generator supplier. Side-Power SAC thrusters are in standard version powered by standard Variable Frequency Drives. Low harmonic drives (THD <5%) can be supplied on request. Indicative, recommended generator capacity to be 2 x listed generator load.

Aim to install the thruster as far forward as possible (1)

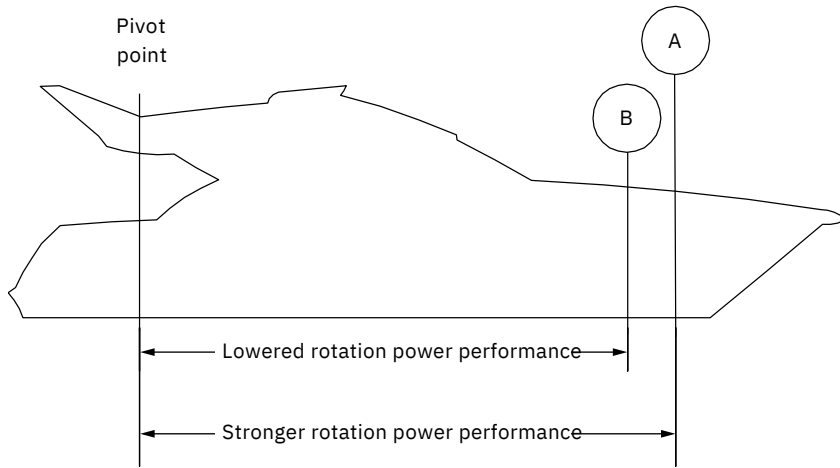
Due to the leverage effect around the boats' pivot point. The distance difference from the boat pivots' point to the thruster will determine the amount of real rotation power for the boat.

Aim to install the thruster as deep as possible under the waterline (2)

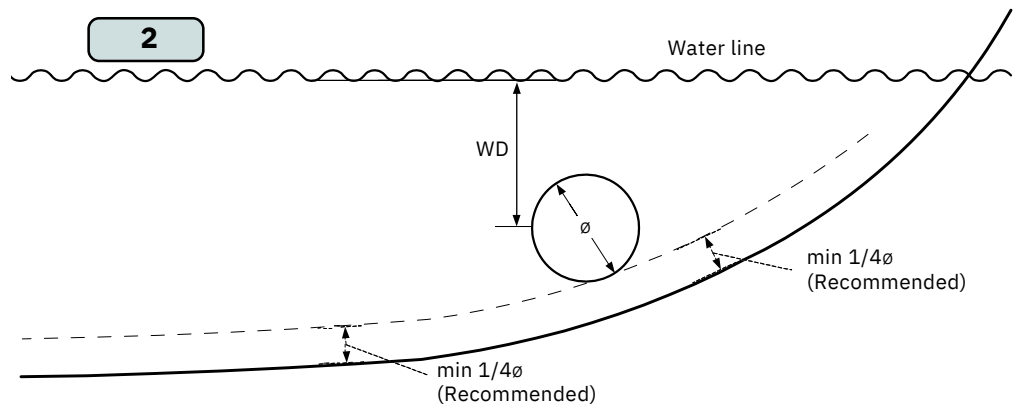
Deeper installations prevent air from being sucked into the tunnel from the surface, resulting in reduced thrust performance and increase noise levels during operation. Deeper installations increase water pressure for maximum efficiency from the thruster.

The centre of the tunnel should be as a general rule minimum of 1 x the tunnel diameter below the waterline. **(NB: Refer to product measurements to define your products recommended depth below the waterline.)** The installer must make evaluations based on thruster performance, boat type and operating conditions. As a general recommendation, the position of the tunnel should not be a minimum of 1/4 of the diameter of the tunnel from the boat keel. **(NB: This can be overlooked depending on the installation methods defined in this manual.)**

1



2



Optimal tunnel length

Achieving the correct tunnel length depends on many factors from the hull type, operation and environmental conditions.

Tunnels should avoid being longer than 4 x the tunnel diameter as this will reduce thruster performance. **(NB: Installing long length tunnels can flex/bend over time and may require additional support. Consult with a naval architect.)**

1. Do not allow the variable length of the tunnel walls to vary in length excessively.
EG. The top tunnel wall is x 4 longer than the bottom wall.
2. If the tunnel is too long, the friction inside will reduce the water speed and thereby the thrust.
3. If the tunnel is too short (typically only in the bottom section of the tunnel) cavitation problems can occur as water flow will not be able to "straighten" itself before reaching the propeller. This cavitation will reduce performance and increase noise during operation.

Thruster within the tunnel

It is important the propellers and the lower unit/ gear leg must be entirely inside the thruster tunnel. Propellers that protrude from the tunnel will not perform as intended.

4. Standard Use

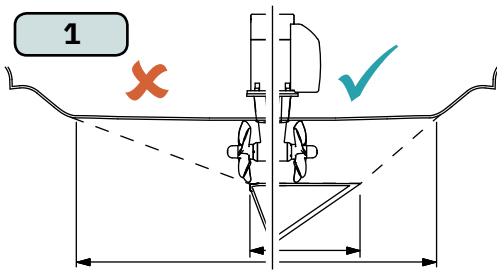
Tunnel length must be long enough to ensure the propellers are not extruding the tunnel. **(NB: Refer to product measurements to define your products recommended tunnel length.)**

5. Flat Bottom Hull

Tunnel lengths must be longer than the standard measurement outlined within the manual to ensure a circular vacuum is not created between the thruster and the bottom of the boat.

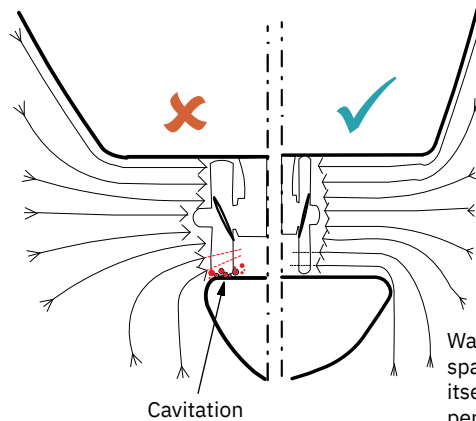
6. High-Speed Boats

Tunnel lengths must be increased to protect the propeller from damage when crashing against the water surface during high-speed cruising. **(NB: This can include the length of a spoiler)**



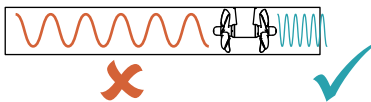
Do not allow the variable length of the tunnel walls to vary in length excessively.
EG. the top tunnel wall is x 4 longer than the bottom wall.

3

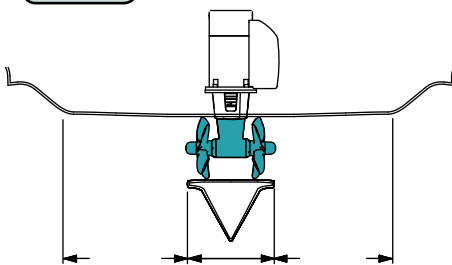


Water flow must have space to "straighten" itself for best performance.

2

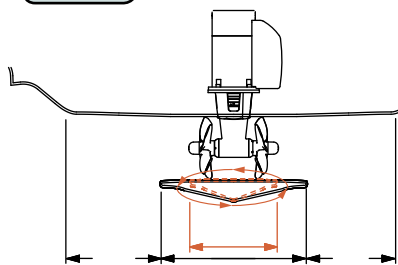


4 STANDARD USE



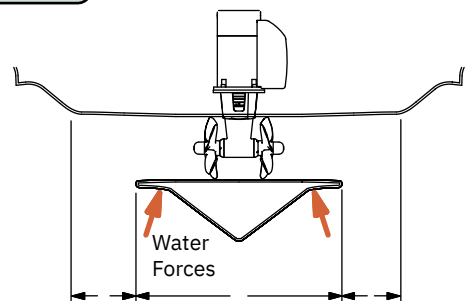
The gear leg/ propeller(s) must never extend out of the tunnel

5 FLAT BOTTOM HULL



Increase tunnel length to prevent a circular water vacuum cavity between the propeller and the hull of the boat.

6 HIGH-SPEED OPERATION



Increase tunnel length to protect the propeller from water forces when high-speed cruising.

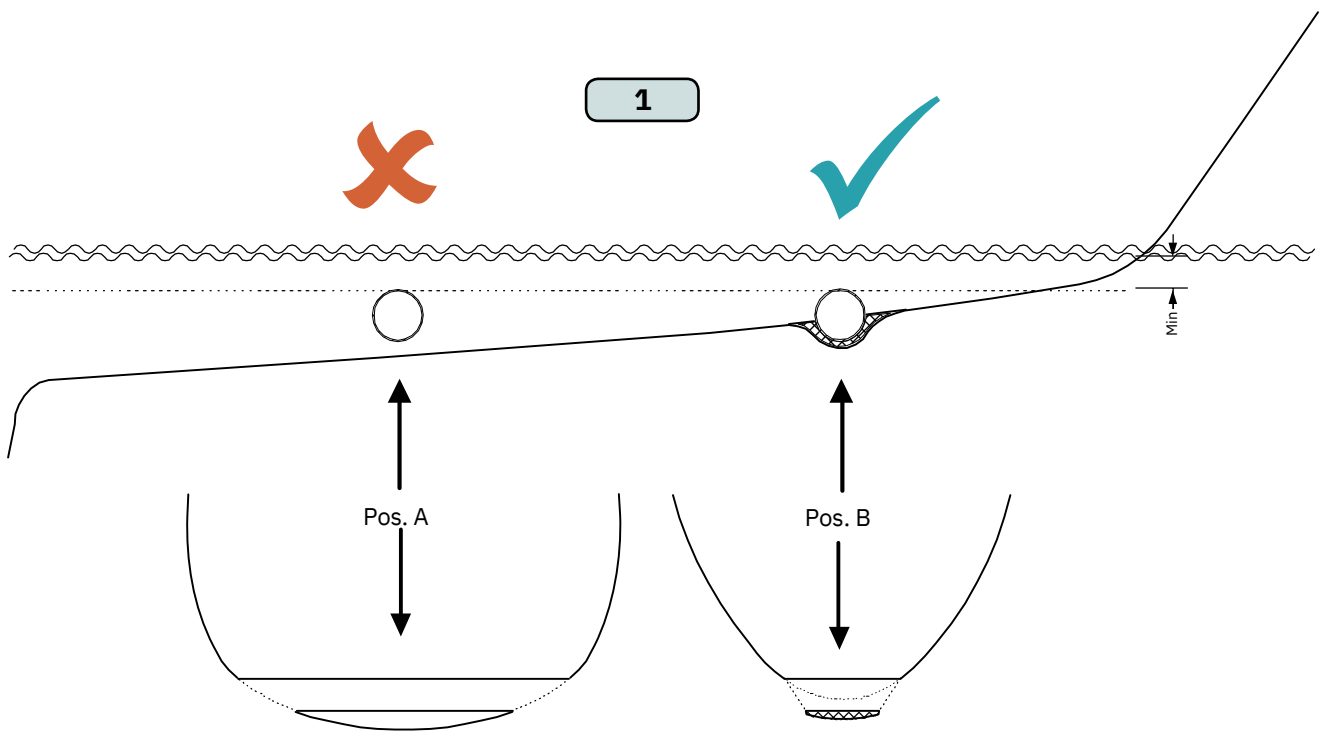
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Some sail boats have a flat bottom and shallow draft in the bow section. This can make installing the thruster as far forward from the boats main pivot point difficult. **(Fig. 1).**

However, it is possible to install a tunnel thruster in most sail boats, even when the hull does not directly support the fitting of a tunnel.

Instead fit the tunnel halfway into the underneath section of the existing hull. Strengthen it with a deflector/ spoiler directing the water flow around the tunnel. This will allow installation of the thruster in the proper position on the boat, maintaining the reliability and space advantages of the tunnel thruster.

This installation is being used by some of the world's largest sail boat builders and has proven to give little to no speed loss during normal cruising. This can also be an installation method for flat bottomed barges to avoid extremely long tunnels and large oval tunnel openings in the hull.



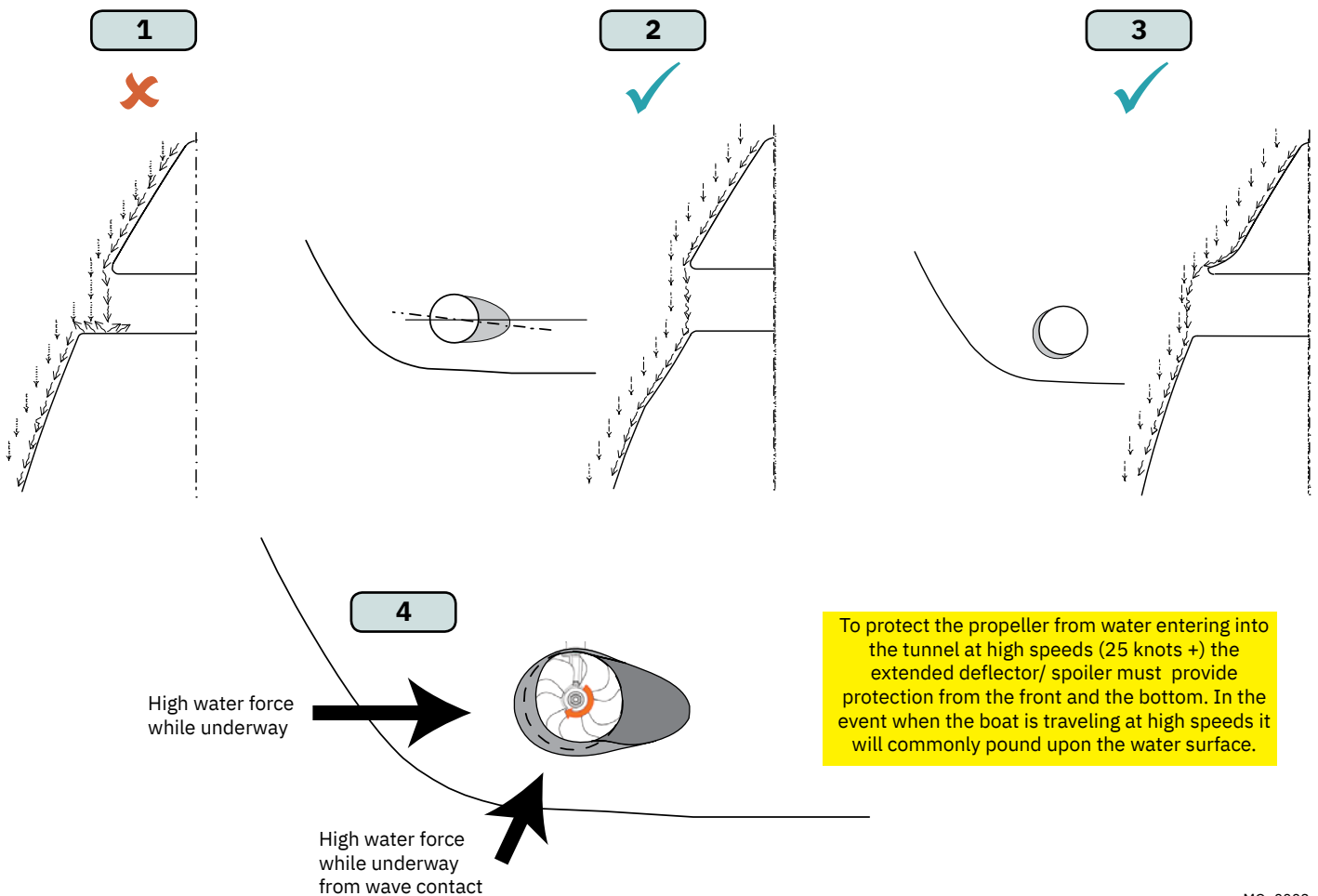
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1. A possible problem in sail boats or fast powerboats is that a non-rounded surface can generate drag from the back face of the tunnel, as it creates a "flat" area facing the flow of water.

This problem can be solved in two different ways, depending on what is possible or easier to perform.

2. The best solution which generally reduces the most drag is to make a recess in the hull at the back of the tunnel. As the back face is removed water can flow freely past the tunnel entry. The depth and shape of this recess will depend on the boat and the angle facing up/ down aft of the tunnel insert. Normally it is angled slightly down because of the water flow on this area.
3. Making a deflector/ spoiler in front and underneath the tunnel can also reduce damage to the thruster and drag. The deflector/ spoiler will push the water flow out from the hull so water can pass by the back face of the tunnel. The shape and size of this deflector/ spoiler will depend on the hull shape. The easiest way of making the deflector/ spoiler is to retain a part of the lower forward area of the tunnel while installing the tube. Use this area as support to mould a soft curve/spoiler shape from the hull.
4. The thruster propeller can spin (passively) producing noise while sailing or cruising as water is forced through the tunnel. Water-flow directed through the tunnel at high speeds, during turning or as the boat bumps waves while underway can also damage the thruster.

(NB: As a rule, you should not see the back face of the tunnel when standing directly in front of the boat looking aft.)



Rounded tunnel ends will maximise thrust and minimise noise and cavitation.

For best performance round the tunnel connection to the hull-side as much as possible. The minimum rounding has a radius of 10% of the diameter of the tunnel.

Significant advantages of a rounded tunnel over a sharp tunnel to hull connections are:

1. A rounded tunnel end will prevent the creation of turbulence/ cavitation created from a sharp tunnel end when water passes by the tunnel.
 - The turbulence/ cavitation will block the outer area of the tunnel and thereby reduces the effective tunnel diameter and thrust.
 - Turbulence/ cavitation on the propeller will lessen the thrusters performance and create excess noise.
2. For steel/ aluminium hulls angled tunnel ends also offer similar performance as a rounded connection.
3. A rounded tunnel end makes the thruster draw water from along the hull-side, creating a vacuum that will suck the boat sideways and thereby give additional thrust.
 - With a sharp tunnel end, the thruster will be unable to take water from along the hull-side, and you will not gain the desired vacuum and additional thrust. This “free” extra thrust in optimal installations be 30 - 40% of the total thrust.

(NB: A Slooper thruster propeller does not produce cavitation at working speed. Therefore, any cavitation and cavitation noise in the tunnel will be caused during improper tunnel installation.)

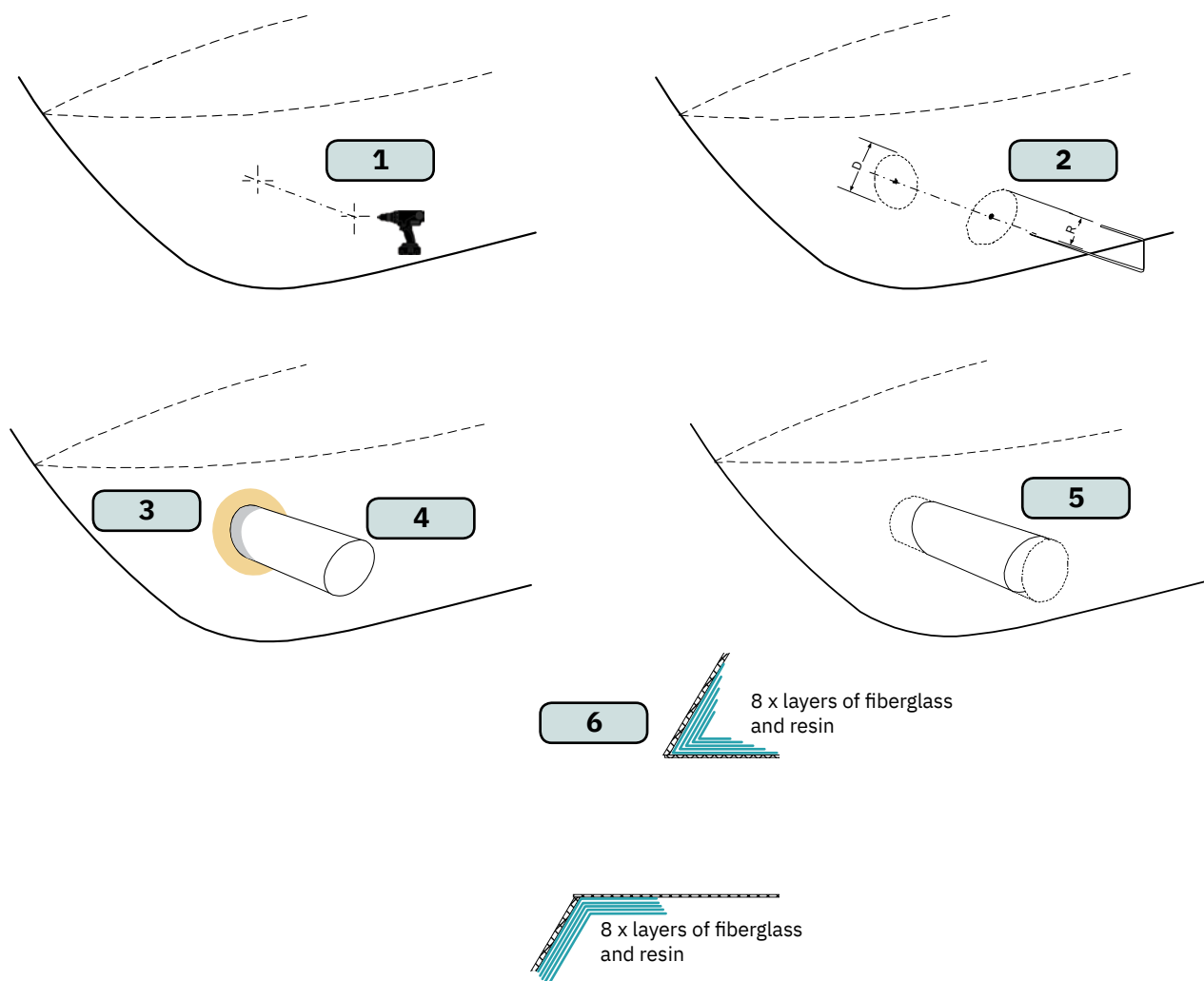


IMPORTANT

We recommend that a professional does the fibreglass, steel or aluminium fitting of the tunnel. These instructions are only general instructions and do not explain in any way the details of fibreglass work. Problems caused by faulty installation of the tunnel, are the installers full responsibility.

1. Find the position in the boat considering the information earlier in this manual and the applicable measurements for the thruster model you are installing. Mark the centre of the tunnel on both sides of the hull. Drill a hole horizontally at these marks.
2. Mark the circle for the tunnel opening (outside diameter of the tunnel) and cut the hole.
3. Grind off the gel coat to the “real fibreglass” area 12cm around the hole on both inside and outside the hull to cast the tunnel to the hull (**Fig. 3**).
4. Insert the tunnel and mark its shape to fit the hull. (**NB: if you are installing with a deflector/ spoiler, leave a part of the tunnel in the front and underside of the tunnel that will cover the back face.**)
5. Cut the tunnel ends to the desired shape and lightly sand its surface. Clean the area with acetone or similar where you are going to apply fibreglass. (**NB: Do not cast or add fibreglass to the area were the thruster will be placed.**)
6. Cast the tunnel to the inside of the hull, use at least eight layers of 300g fibreglass and resin, preferably alternating mat and rowing types of fibreglass. To round the tunnel ends to a 10% radius make further layers inside to preserve the desired hull thickness.

(NB: Ensure gaps between the tunnel and the hull are completely filled with resin/ fibreglass. In areas where you can not access to make layers of resin/ fibreglass, a resin/ fibreglass mixture must be used in that area.)

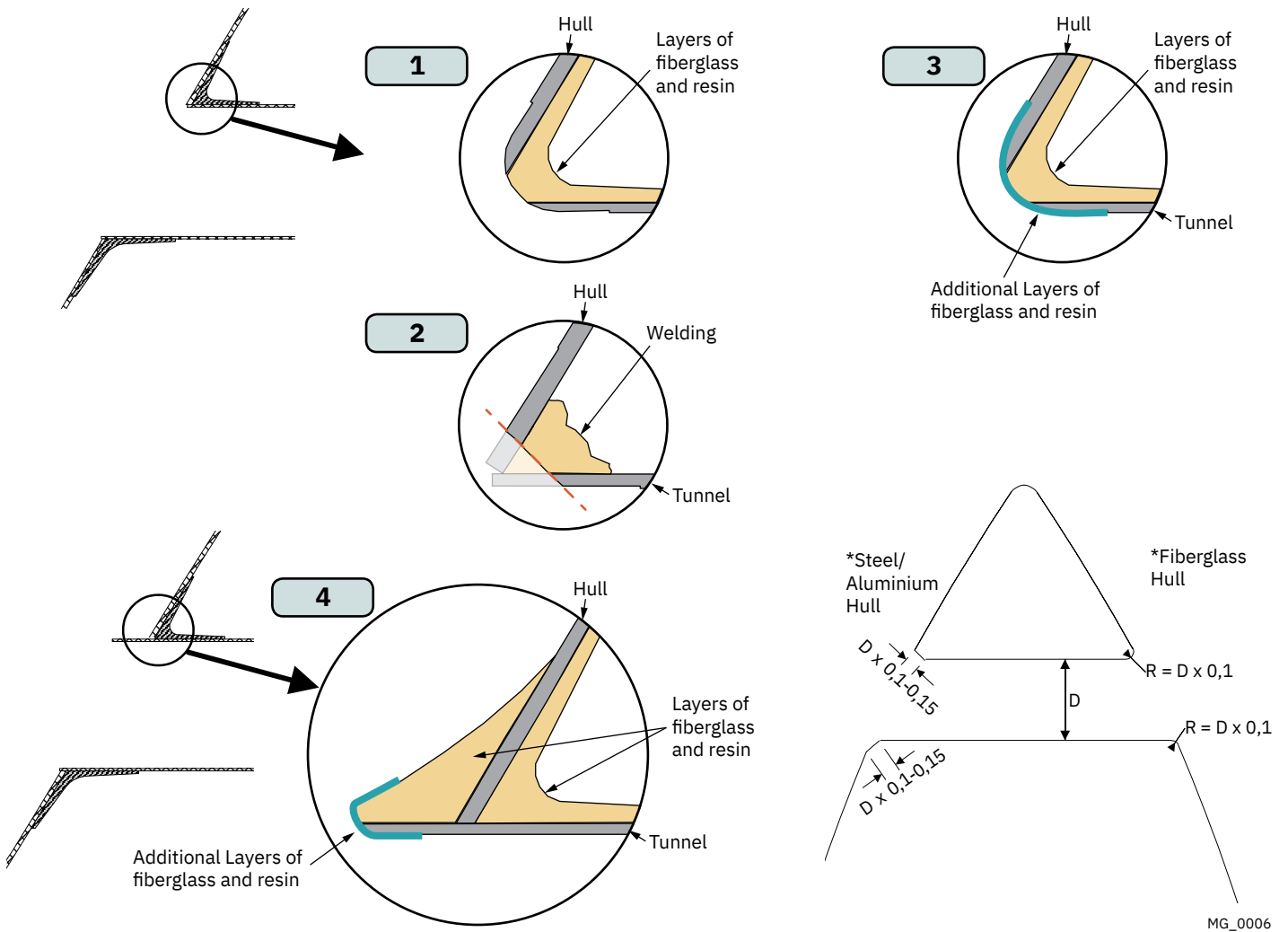


With tunnel installed and cast.

1. Round the edges with a radius of 10% of the tunnel diameter.
2. For steel/ aluminium hulls make a slope with a length of 10-15% of the tunnel diameter.
(NB: If this is not possible, round the tunnel end as much as possible.)
3. Additionally cast two layers on the outside of the tunnel/ hull in a 10cm area
4. Follow the same method if making the deflector/ spoiler.

You must apply gel coat to areas you have grounded/ moulded to make waterproof. These areas allow water access to the hull which is typically not waterproof without these applications outside. *(NB: All original Sleipner tunnels are fully waterproof when delivered except in the areas where you have cut and bonded it to the hull.)*

IMPORTANT
Avoid all casting where the motor-bracket is to be placed, as this will cause misfit and possible failure to the gear house.



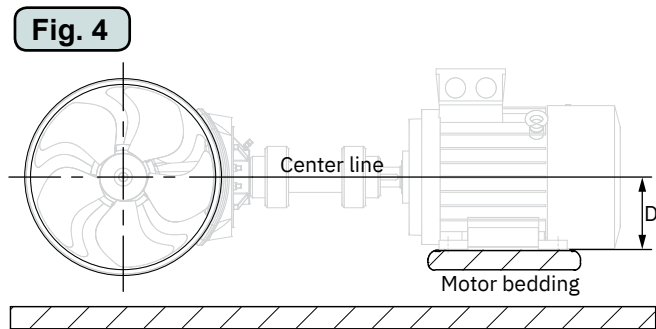
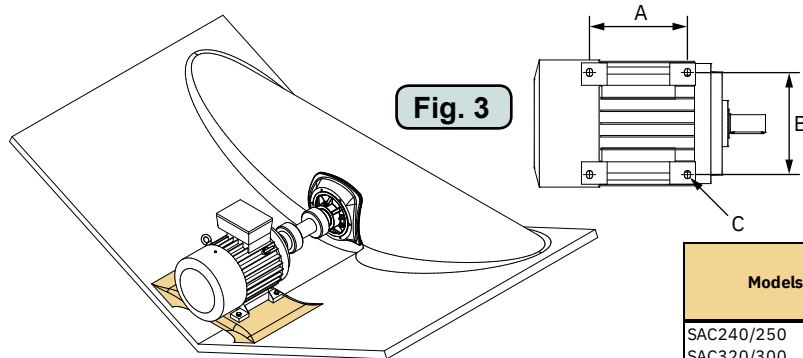
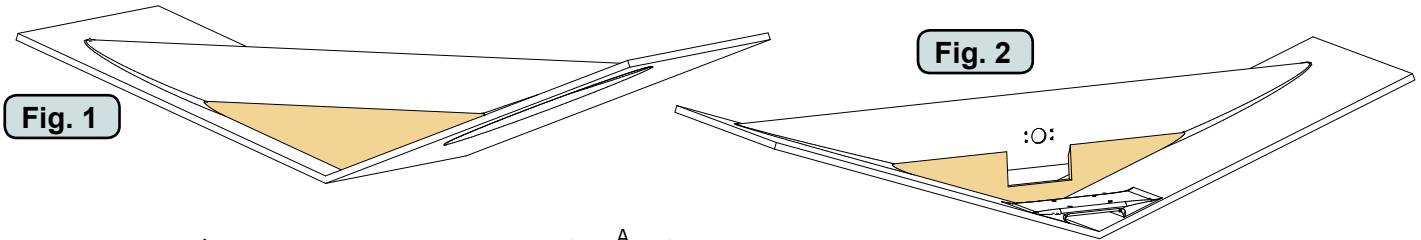
Consult a naval architect if added support is required for the tunnel at its deepest point to the hull as suggested in (fig. 1 & 2).

The motor must be mounted on separate bedding placed according to (fig. 3). The bedding must be rigid and dimensioned to support the weight and torque specified in the technical data of the product.

The bedding must be in the correct height so that the angle of the cardan shaft does not exceed +/- 1.5 degrees (fig. 4).

Reference the distance from the centreline of the tunnel to the top of the bedding for the specific thruster/ motor combination. Ensure that the bedding is parallel to the centreline by checking the distance in both ends of the bedding.

Mounting holes in the bedding should be drilled according to measurements for the specific thruster/ motor model.

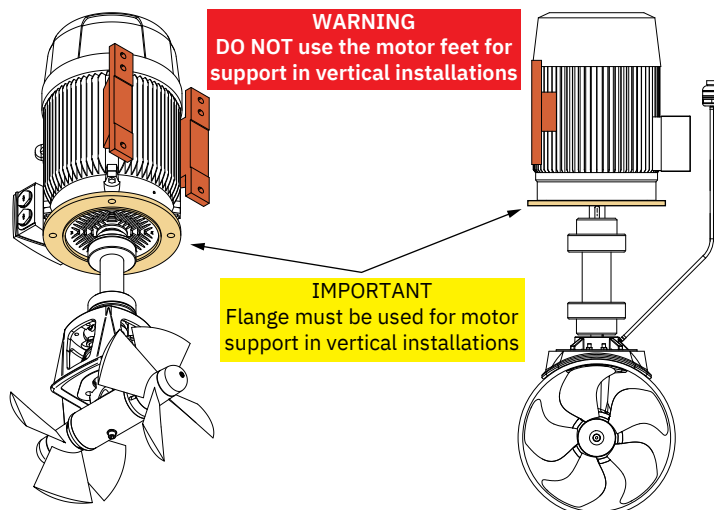


Models	Measurements							
	A		B		ØC		D	
	mm	inch	mm	inch	mm	inch	mm	inch
SAC240/250	140	5.5	216	8.5	12	0.47	132	5.2
SAC320/300								
SAC360/300								
SAC400/300	210	8.3	254	10	14.5	0.57	160	6.3
SAC450/386								
SAC520/386	241	9.5	279	10.98	15	0.59	180	7.09
SAC700/412								
SAC750/513	305	12	318	12.52	18.5	0.73	200	7.87
SAC900/513	286	11.26	356	14	19	0.74	225	8.8
SAC950/610	311	12.24	356	14	19	0.74	225	8.8
SAC1100/513-I-4-H								
SAC1100/513-I-4-V	286	11.26	356	14	19	0.74	225	8.8
SAC1100/513-I-4L-H								
SAC1100/513-I-4L-V								
SAC1100/513-C-4-H								
SAC1100/513-C-4-V								
SAC1100/513-C-4L-H	349	13.74	406	16	24	0.94	250	9.8
SAC1100/513-C-4L-V								
SAC1100/610-I-4-H								
SAC1100/610-I-4-V								
SAC1300/610	368	14.49	457	18	24	0.94	280	11
SAC1400/610								

MG_0008

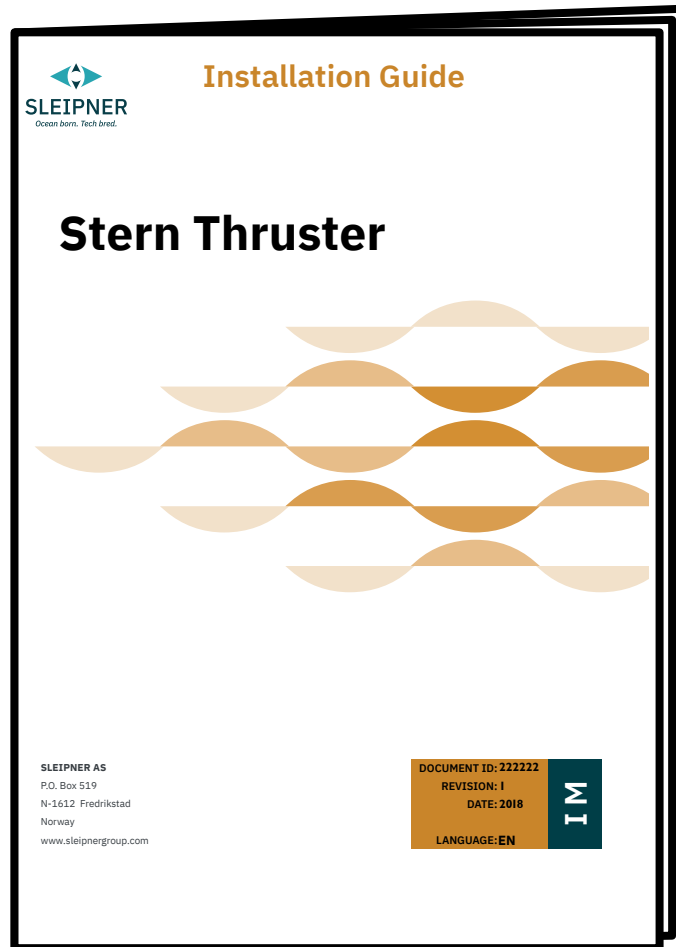
Vertical or Horizontal Thruster Installation

MC_0003



MG_0712

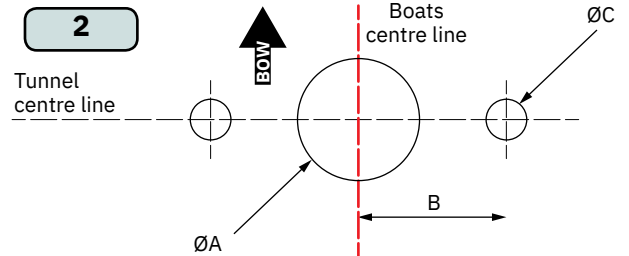
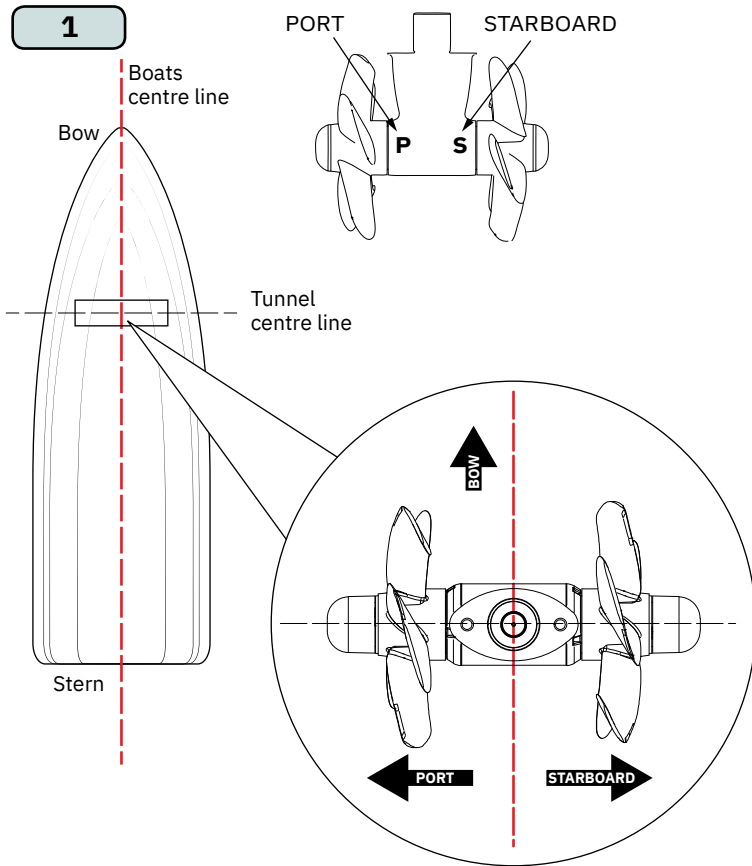
For **Stern Thruster** installation please refer to the supplied manual in your Sleipner product delivery



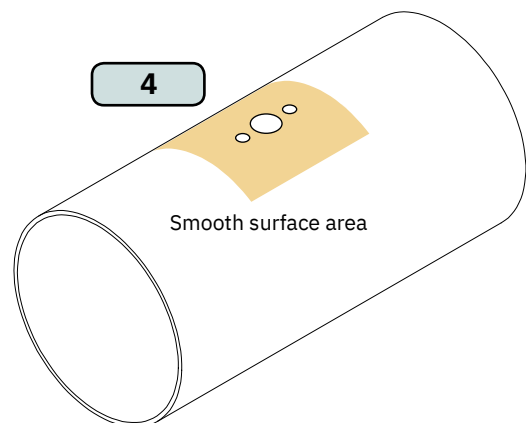
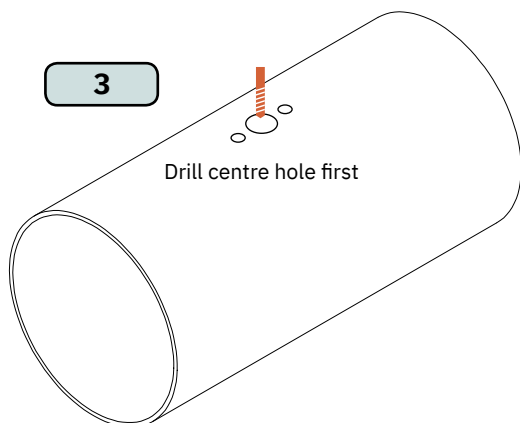
For supporting stern tunnel installation documentation, we advise you to visit our website www.sleipnergroupp.com and find your Sleipner stern tunnel model.

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

1. Mark the tunnel centreline and the boat's centreline. **(NB: Install the gear leg and propeller as shown for the thrust direction to correspond with the control panel. Position gear leg with the P-mark facing port and the S-mark facing starboard.)**
2. Use the gasket or template (recommended) to mark the hole centres and double-check the measurements. The centre hole MUST be placed using the boat centreline as shown above. **(NB: All holes must be in-line with the tunnels' centreline for correct installation, clearance between the propeller and the tunnel is minimal.)**
3. Drill the main centre hole followed by the two screw-holes.
4. Smooth the surface of the tunnel. A rough surface will cause possible failure/movement of the gear leg. The motor bracket must rest steadily on the tunnel.



Models	Measurements					
	ØA		B		ØC	
	mm	inch	mm	inch	mm	inch
SE/SEP/SE IP/SEP IP 80/185T SE/SEP/SE IP/SEP IP 100/185T E100/185T SH100/185T	32	1.3	28	1.1	9	0.4
SE/SEP/SE IP/SEP IP 120/215T SE/SEP/SE IP/SEP IP 130/250T SE/SEP/SE IP/SEP IP 170/250TC SE/SEP/SE IP/SEP IP 210/250TC E130/250T E150/215T E170/250TC E210/250TC E240/250TC SH160/215T SH240/250TC SAC 240/250TC	46	1.8	40	1.6	11	0.4
SE/SEP/SE IP/SEP IP 250/300TC SE/SEP/SE IP/SEP IP 300/300TC E250/300TC E300/300TC SH300/300TC SH320/300TC SAC320/300TC SH360/300TC SH400/300TC SAC360/300TC SAC400/300TC	51	2	48	1.9	11	0.4
SH420/386TC SH550/386TC SH700/412 SAC450/386TC SAC520/386TC SAC700/412	67	2.6	48	1.9	11	0.4
	83	3.3	70	2.8	17	0.7



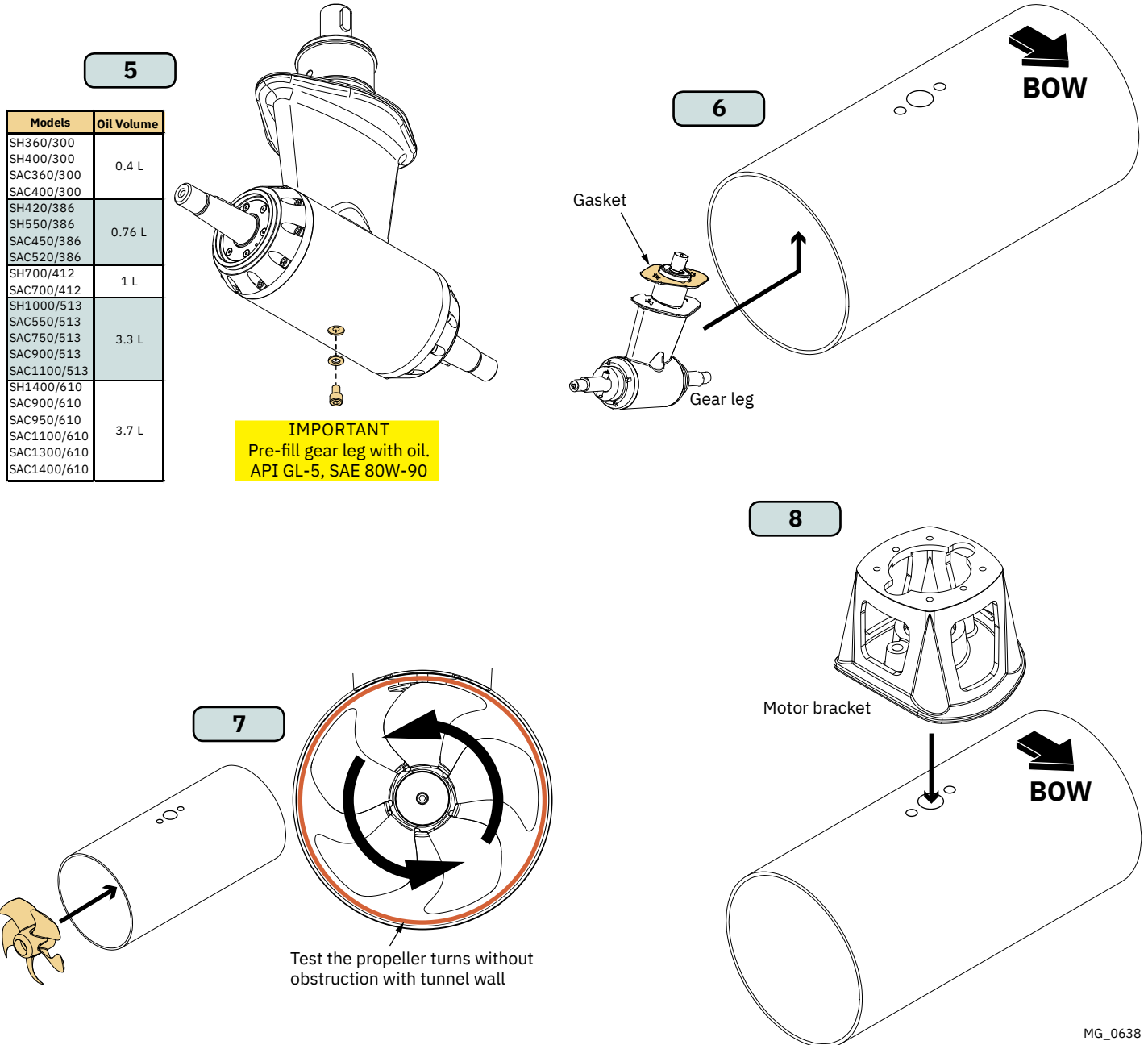
! Please refer to the graphic for special considerations relating to your model !

5. Fill the gear leg with oil as shown above through the hole of the oil drain screw. Ensure to insert the copper gasket and fasten after adding oil into the gear leg.

IMPORTANT

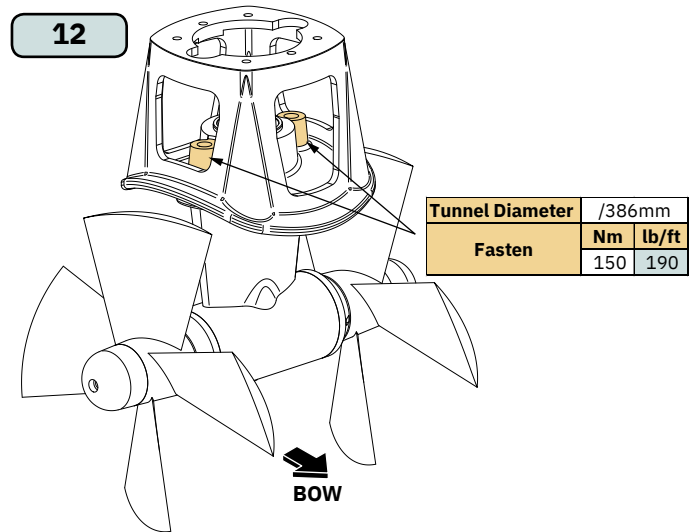
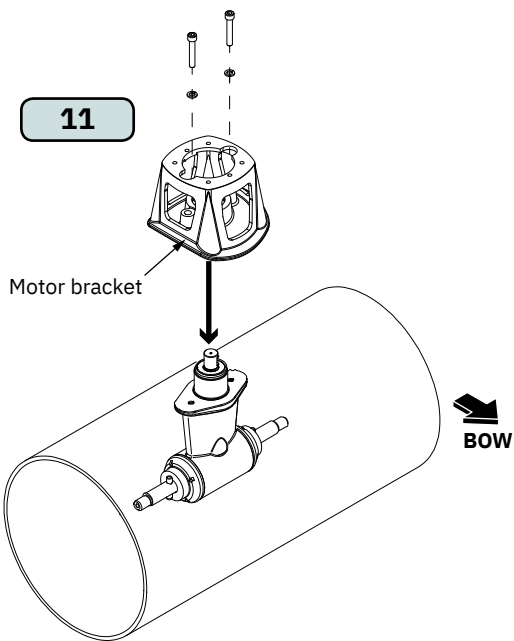
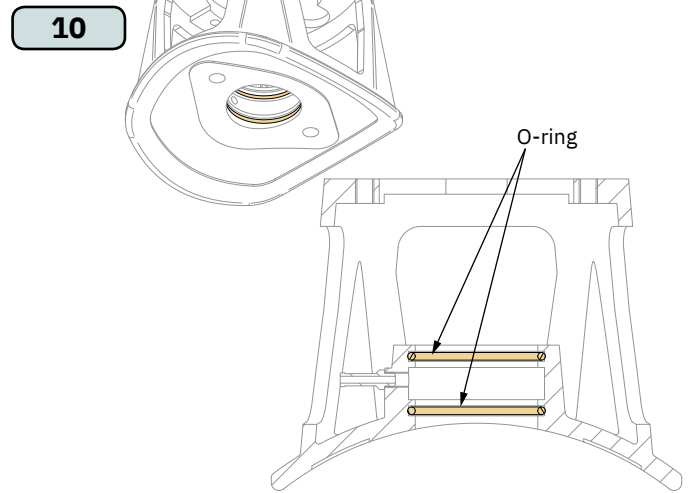
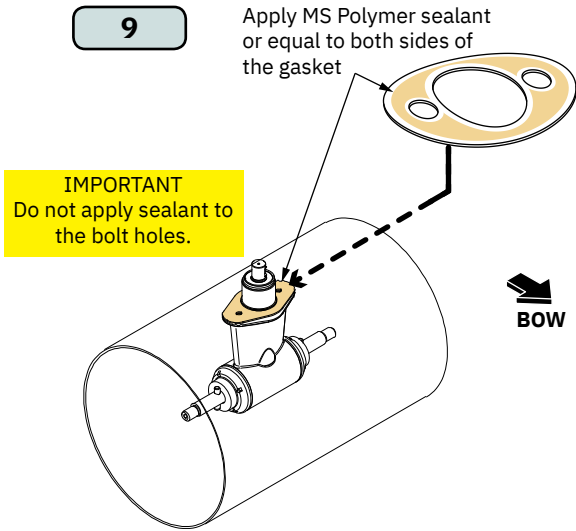
Ensure there is oil or grease on the O-rings in the motor bracket before mounting with the gear house. No lubrication could cause serious damage to the O-rings. NB: The gear leg neck and the inner surface of the motor bracket must remain clean.

6. Place the gear leg (without the propeller) with the gasket on inside the tunnel.
7. Place the propeller on the gear leg (**NB: Do not secure the propeller with securing parts**) to ensure it is centred and rotates freely with the same clearance from each blade to the tunnel wall.
8. Place top motor bracket and bolt plate to measure the drive shaft has come through the motor bracket at the correct height. Remove the gear leg and propeller for final installation.



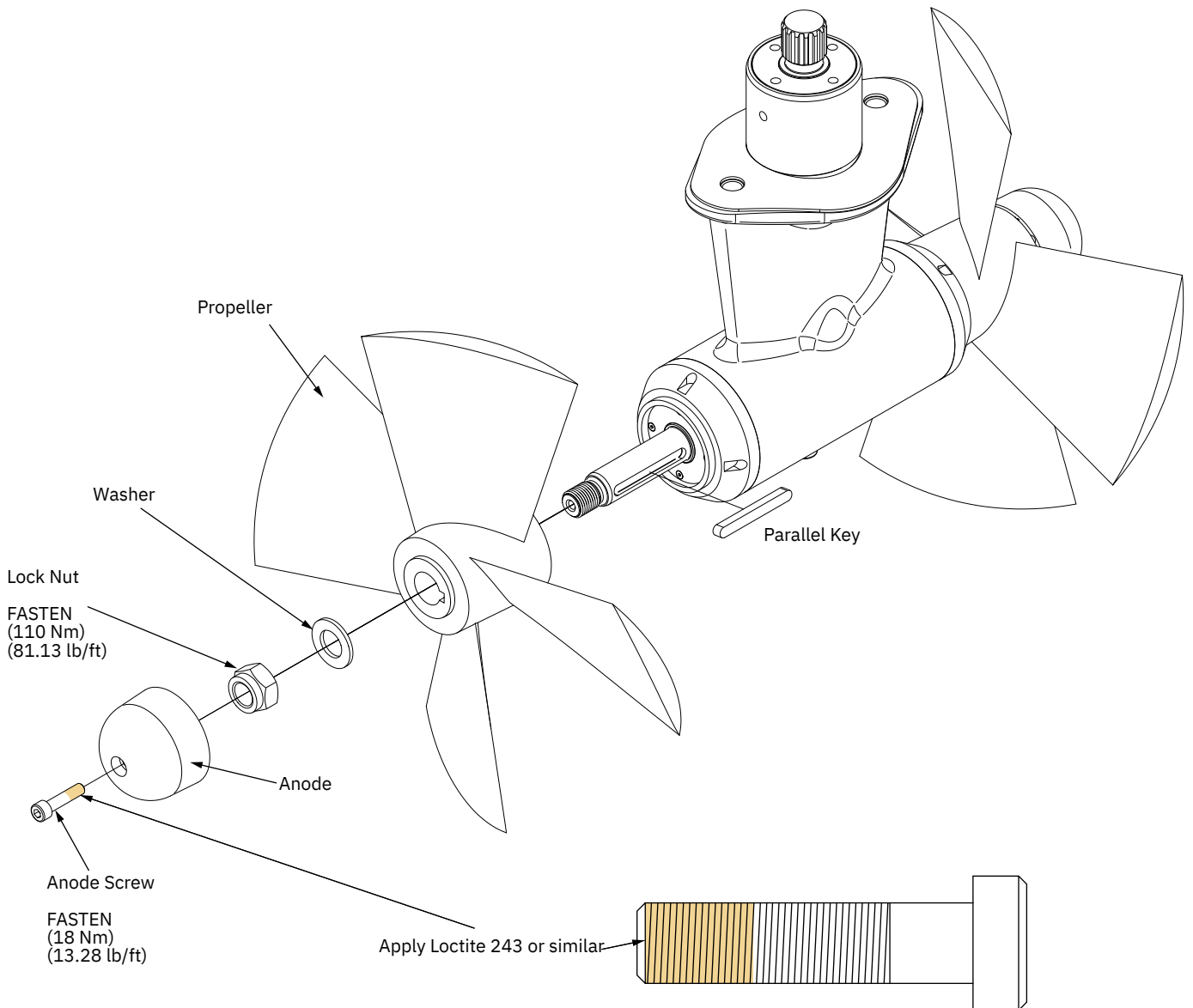
! Please refer to the graphic for special considerations relating to your model !

9. Apply appropriate sealant to both sides of the gasket and place on the gear leg. Place the gear leg in the tunnel (without the propeller). Use appropriate sealant to ensure that no leakages occur. **(NB: See your sealant data sheet for the correct application process.)**
10. Apply a little oil or grease on the O-rings in the motor bracket before mounting it together with the gear house, to prevent damaging the O-rings during insertion. **(NB: The gear leg neck and the inner surface of the motor bracket must remain clean.)**
11. Install the top motor bracket and gear leg gently together.
12. Fasten the gear leg and the motor bracket with the bolts provided. Tighten to torque as shown.



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

1. Rotate the propeller shaft, so the propeller key is on top. Remove the tape holding the propeller key in its recess on the propeller shaft. **(NB: Ensure waterproof grease applied from the factory is still covering the propeller shaft, if of not apply waterproof grease or similar on the propeller shaft to ensure the removal of propellers for future maintenance)**
2. Insert the propeller onto the propeller shaft until the propeller key aligns into the slot/ groove in the propeller. **(NB: Installation requires almost no gap (approximately 1mm) between the propeller and the gear leg.)**
3. Insert the washer on the propeller shaft and fasten the propeller lock-nut. **(NB: Ensure the propeller turns freely.)**
4. Insert the anode to the end of the propeller and fasten the anode holding screw. Apply a thread glue (Loctite or similar) to ensure that the anode holding screw does not unscrew itself from during the rotation of the propeller.



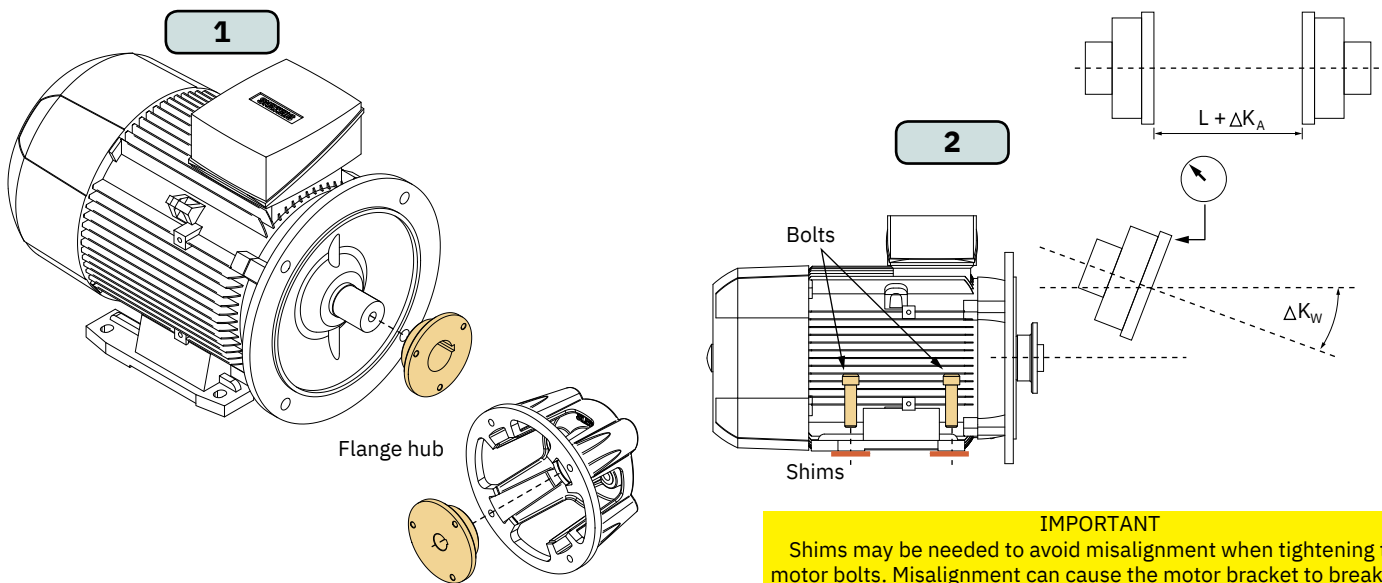
Parts must be aligned with precision to ensure the longevity and effectiveness of the coupling, consider the combination of axial, radial and angular misalignment.

IMPORTANT

Only use original bolts delivered with the Slepner thruster. Also, avoid contact between the AC motor shaft and the coupling drive shaft.

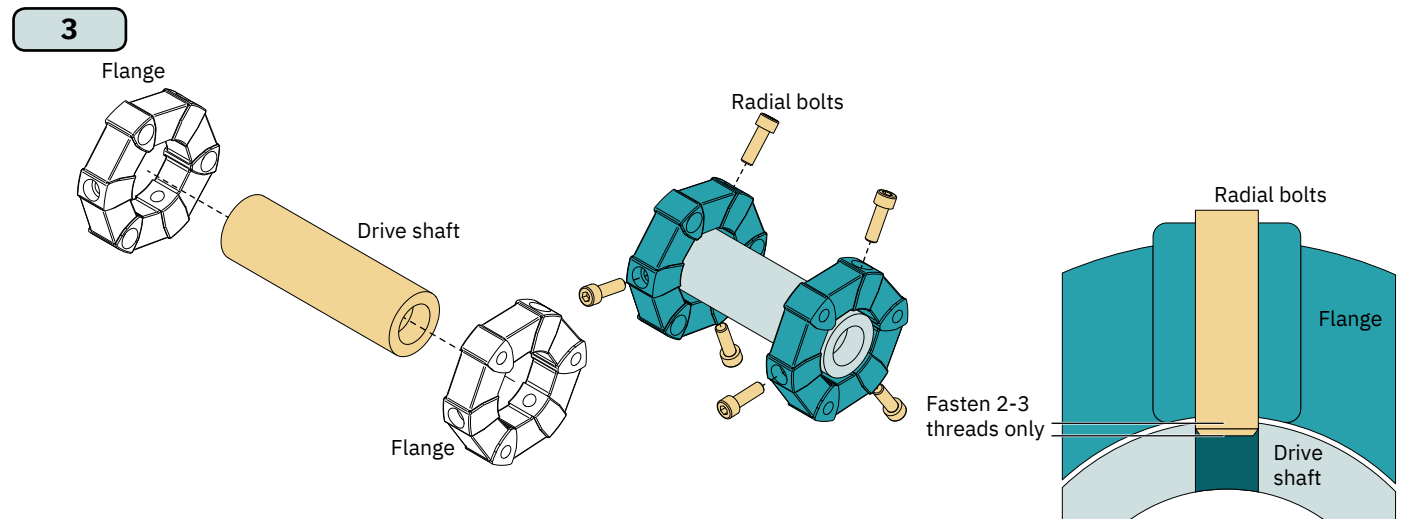
Centa has applied retention Inbus Plus all glue to all bolts. **(NB: The glue will harden within 4-5 hours at 20 °C.)** Additional use of any loctite or anaerobic adhesives will destroy the natural vulcanisation of the rubber. Do not use oil or grease on bolts except a small amount of grease at the contact areas between bolt heads and rubber element bushings. Grease will avoid the twisting of the rubber element during bolt fastening.

1. Insert the flange hub on AC motor shaft and gear leg shaft. **(NB: Insert the Gear leg shaft flange hub against the limit stop/ shaft shoulder.)**
Insert the AC motor shaft flange hub according to hub depth.)
2. Install the AC motor after you have lined up according to tolerances given in the provided table.
3. Insert the drive shaft inside the rubber elements. Insert radial bolts into radial sections of the rubber elements, and fasten 2-3 threads only into the drive shaft.



IMPORTANT

Shims may be needed to avoid misalignment when tightening the motor bolts. Misalignment can cause the motor bracket to break. The motor must be fitted completely level to the drive shaft



IMPORTANT

Shims may be needed to avoid misalignment when tightening the motor bolts. Misalignment can cause the motor bracket to break. The motor must be fitted completely level to the drive shaft

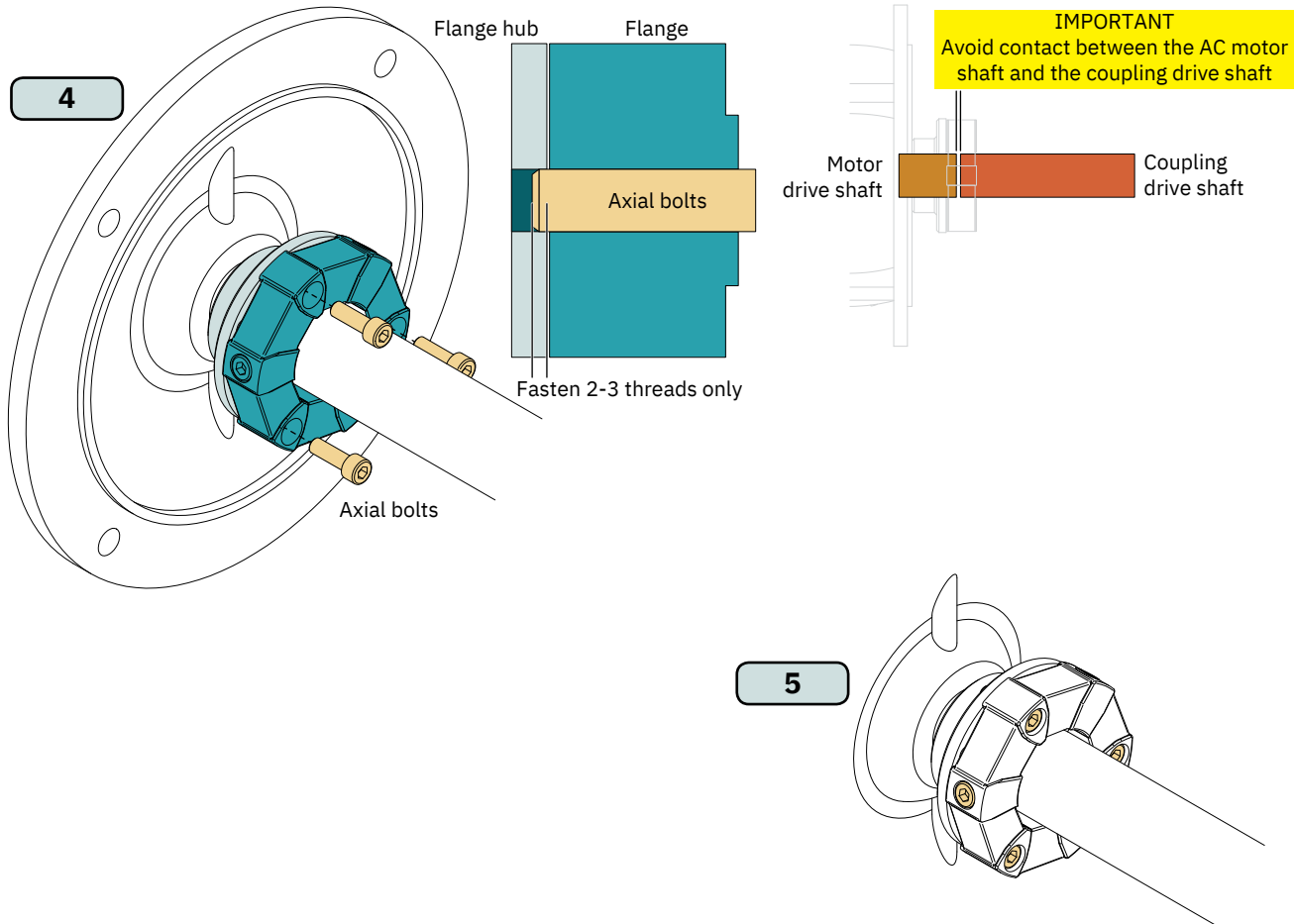
- Install the pre-mounted rubber elements and shaft between the two flange hubs. Insert the Axial bolts and fasten 2-3 threads only into the flange hubs.
- First fasten radial bolts, then the axial bolts according to the table above. **(NB: Ensure rubber elements are not twisted during fastening the bolts.)**

IMPORTANT

Fastening bolts by hand/ user judgment is not sufficient as this will result in a final bolt torque too low for operation. A low bolt torque will allow the bolts to loosen over time, destroying the shaft. A torque wrench must be used to fasten bolts to specified torque tension.

Maintenance and Safety Precaution:

The coupling is entirely maintenance free. Avoid contact with oil and similar substances since the natural rubber is not oil resistant. For a detailed Universal Joint Shaft installation manual, contact your Sleipner dealer. Add protection to the Universal Joint Shaft according to relevant safety regulations. **(NB: A protection guard is not a part of Sleipner delivery)**



Model	Coupling Size	Axial and radial bolts		L*) mm	Axial tolerances Complete shaft ΔKa (mm)			Angular misalignment Each joint ΔKw
		Dim.	Torque		@1o	@2o	@3o	
SAC240/250	4	M8 x 25	25 Nm	150	+/-2	+/-2	+/-1,25	3°
SAC320/300	8	M10 x 30	50 Nm	150	+/-3	+/-1,75	+/-1,25	3°
SAC360/300	11	M10 x 30	50 Nm	150	+/-3	+/-1,75	+/-1,25	3°
SAC400/300	11	M10 x 30	50 Nm	150	+/-3	+/-1,75	+/-1,25	3°
SAC450/386	12	M10 x 30	50 Nm	200	+/-3	+/-1,75	x	2°
SAC520/386	12	M10 x 30	50 Nm	200	+/-3	+/-1,75	x	2°
SAC700/412	16	M12 x 35	85 nm	200	+/-4	+/- 3	+/- 1,5	3°
SAC750/513	25	M14 x 40	140 Nm	200	+/-4	+/- 3	+/- 1,5	3°
SAC900/513	25	M14 x 40	140 Nm	200	+/- 4	+/- 3	+/- 1,5	3°
SAC1100/513	30	M16 x 50	220 Nm	200	+/-5	+/- 4,5	+/- 2,75	3°
SAC1300/610	50	M16 x 50	220 Nm	200	+/- 5	+/- 4,5	x	2°
SAC1400/610	50	M16 x 50	220 Nm	200	+/- 5	+/- 4,5	x	2°

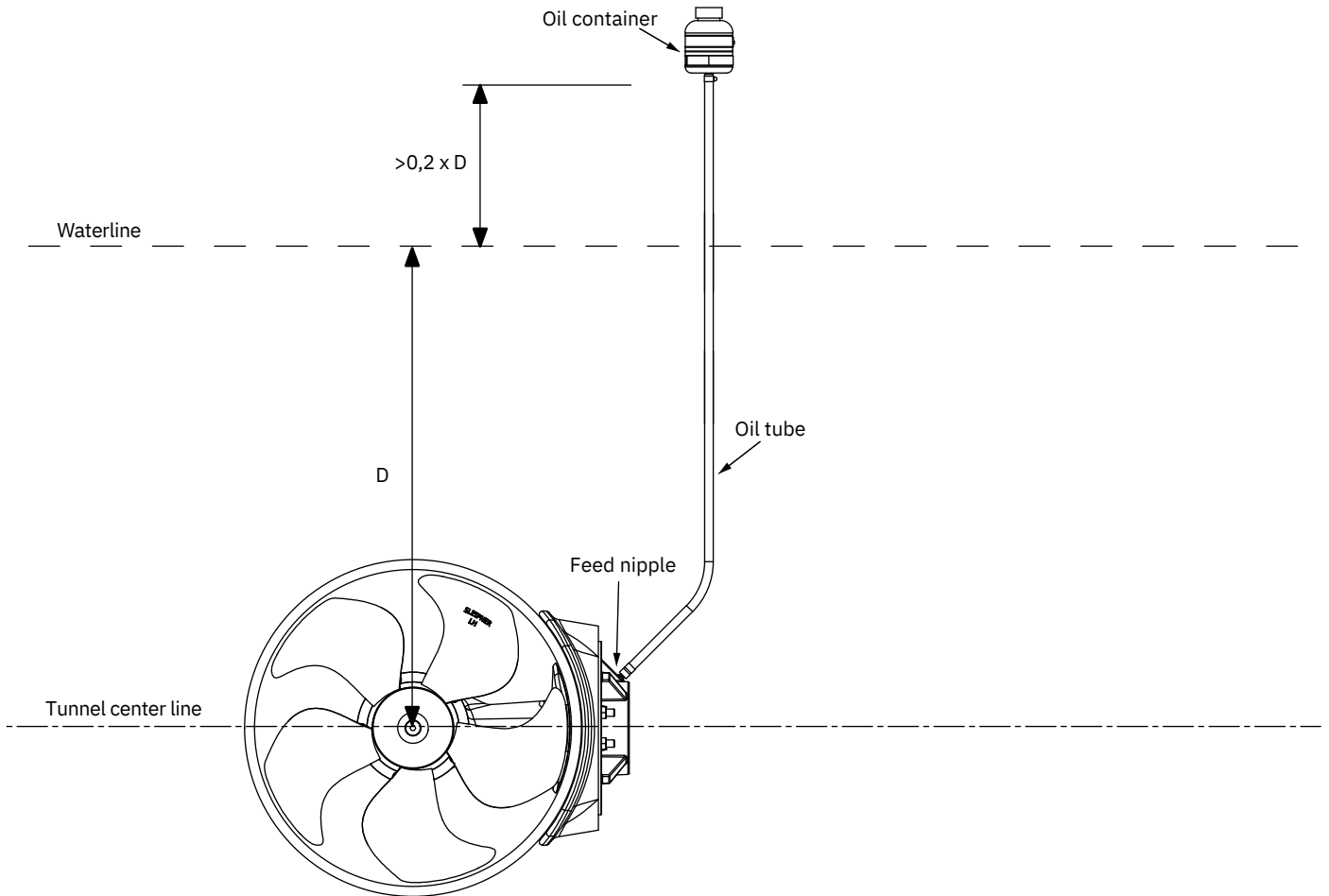
Note! All installation tolerances require a rigid AC motor installation.

*) To be checked prior to installation. Lengths can vary depending on customer requirements.

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

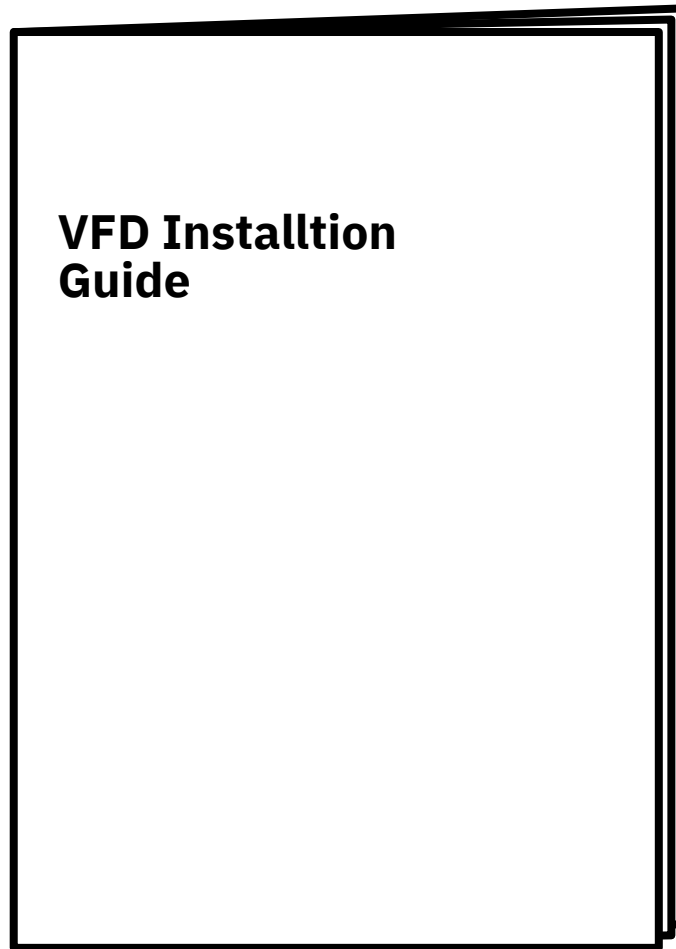
1. Install the oil container above the waterline by at least 20% of the distance from the waterline to the centre of the tunnel. This ensures enough overpressure for the oil in the gear leg.
2. Install the oil tube from the oil container to the feed nipple on the motor bracket. Fasten both the tube clamp screws. **(NB: Ensure the oil tube has no loops and forms an airlock to stop the oil flow. Ensure the oil tube angle is sufficient to allow oil to flow freely into the gear leg.)**
3. Fill the oil container with the same gear oil used in the gear leg. The oil container works as an indicator to ensure oil is in the gear leg at all times.

(NB: Fill and drain the gear leg simultaneously while replacing the oil to ensure the system is never empty.)



MG_0046

For **Variable-frequency Drive** installation please refer to the Installation Guide accompanying the VFD device.



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

The PDC 301 proportional drive controller controls the speed and direction signals for the Variable Frequency Drive (VFD) controlling the electric motor. The user control panels transmit this information to the Controller. VFD status and alarm signals, as well as motor speed feedback is received by the PDC 301 and transmitted to the control panels. **(NB: Installation of the VFD must be done by certified electricians, and according to the VFD installation manual.)**

PDC-301 Controller Technical Specifications:

Supply Voltage	9-31V, Powered from the S-link bus
Power consumption	Less than 1W
Operating temperature	-20°C to 70°C (-4°F to 158°F)
Weight	150g/5.3oz
IP Rating	IP-66

S-Link LED status

Continuous GREEN	Flashing GREEN
S-link communication is OK	No S-link communication

VFD (RS-485) LED status

Continuous GREEN	Flashing GREEN
communication with VFD is OK	No communication with VFD



MG_0170

Startup and Commissioning

MC_0412

Before the first start ensure the propeller shaft rotates freely, and the thruster is safe to operate. **(NB: The ABB variable frequency drive-controlling the motor will perform a motor ID run on the first start.)**

If the control panel displays the "Set-up Assistant", select "Exit & don't show at power up". The drive is already correctly set up before delivery.

1. Place the VFD in local mode on the front panel by pressing the Loc/Rem button. **(NB: The panel should display Local in the upper left corner.)**
2. Start the drive by pressing the Start button on the VFD panel. The panel will indicate that the ID run is in progress and when it has completed. **(NB: This procedure takes a few seconds.)**

This procedure takes a few seconds.)

3. Press the Stop button when the ID run is complete. Configure the drive in Remote mode by pressing the Loc/Rem button. After being placed in Remote mode, the thruster can now operate from the Side-Power joystick panels.

(NB: The PDC-301 drive controller is configured as a bow thruster By default. If operated as a stern thruster or in a catamaran configuration, change the thruster instance from the setup menu of the PJC-2xx control panel.)

PMS (Power Management System) ~ Optional:

The thruster control system comes preconfigured for the thruster, but additional configuration is required if integration to a Power Management System.

For ACS580 to activate PMS, the VFD parameter 20.12 "Run enable 1 source" must be set to DI1. It is set by default to "Not selected".

For ACH580 to activate PMS, the VFD parameter 20.40 "Run permissive" must be set to DI1. It is set by default to "Not selected".

For ACS880 to activate PMS, the VFD parameter 20.12 "Run enable 1 source" must be set to DIIL. It is set by default to "Not selected".

When any panel is turned on the PDC-301 will activate the relay output on the VFD for Thruster power request from PMS. Then when the PMS is ready it sends a Thruster Enable signal back to the VFD as a "ready signal" before the thruster can run. If the PDC-301 is not getting the "Thruster Enable" signal within 60 seconds, it will fault displaying fault code 36101.1.200 VFD PMS TIMEOUT. If the Thruster enable signal is lost while the thruster is running it will fault displaying fault code 36101.1.204 PMS SIGNAL LOST.

Motor protection functions:

Dynamic thrust limitation:

If the electric motor winding temperature exceeds 130°C, the PDC 301 limits the maximum thrust output. The maximum thrust permitted will decrease proportionally to increasing temperatures higher than 130°C. **(NB: Joystick panel will give an alert when the temperature exceeds 130°C. In this situation, the thruster can still be operated. Motor temperature can be monitored from the PJC panel)**

Motor over temperature shut-down:

If the electric motor winding temperature exceeds 150°C the motor will stop and 'Motor Over-temp' is displayed on the connected control panels. The thruster is prohibited from running until the motor has cooled down.

Limited Power ~ Optional:

By default, the digital input DI2 on the VFD is set to limit the power by limiting the VFD torque when the input is +24V.

When in "Limited Power" mode a flashing "LIMITED POWER" text alert will display on the PJC panel.

To change the torque level, change these VFD parameters:

- 30.23 Minimum torque 2 -50.0 % (default value)
- 30.24 Maximum torque 2 50.0 % (default value)

Emergency Stop:

Where an Emergency Stop circuit is required, Slepner recommend implementing the circuit based on the ABB STO(Safe Torque Off) function.

This safety circuit require two parallel circuits switching simultaneously. The circuit diagram can be found in figure xx.

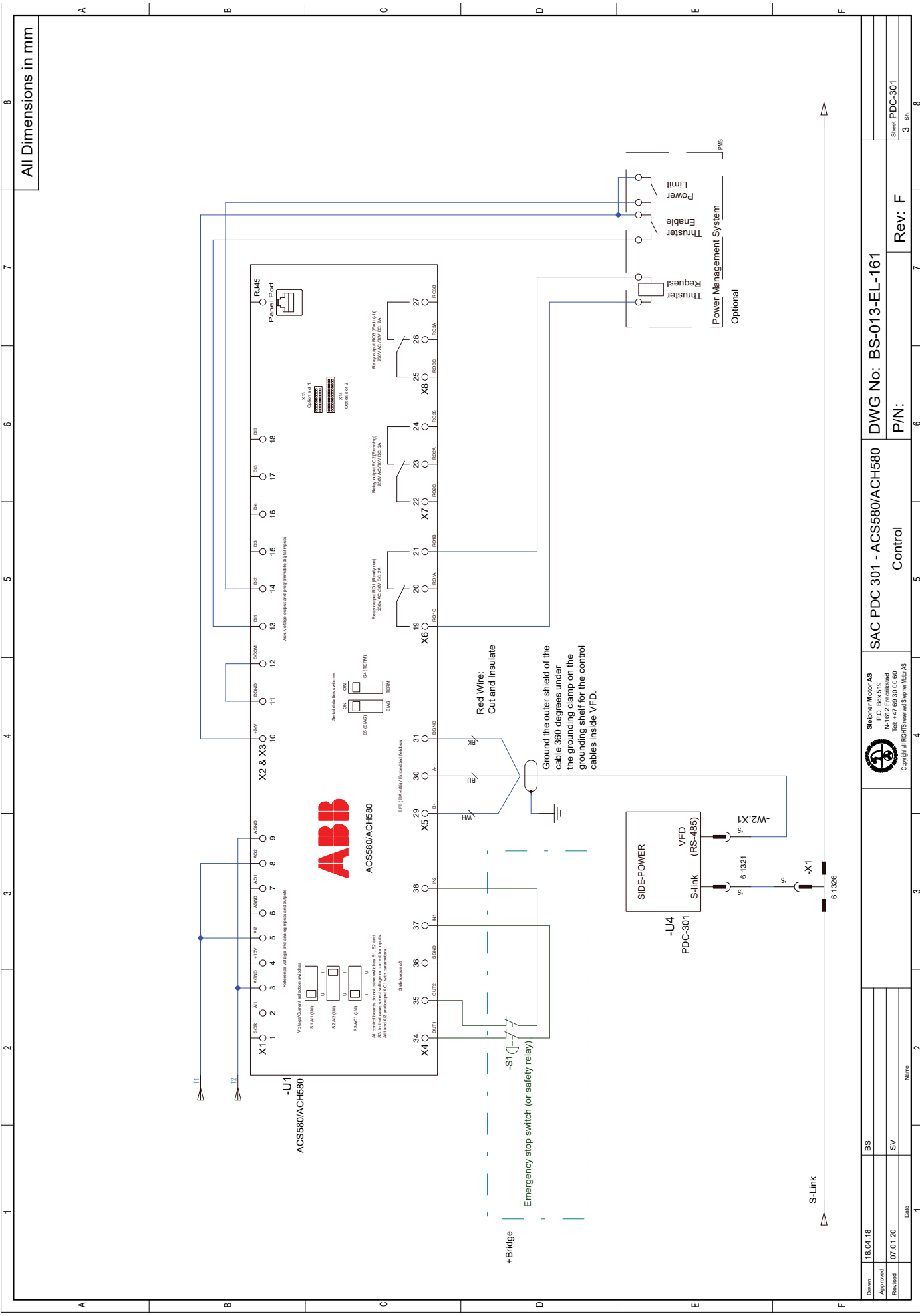
For further information on the STO circuit, refer to ABB HW manual for the drive model installed, where the Safe Torque Off function is described in detail.

Power Cable Dimensions

Item no.	Supply Voltage	Max current draw A	Minimum power cable dimensions	
			Temp class 70	Temp class 90
			Multi core mm ²	Multi core mm ²
SAC240/250-x-2	208-240V 3-phase	51	25	10
SAC240/250-x-4	380-440V 3-phase	28	10	4
SAC320/300-x-2	208-240V 3-phase	80	35	25
SAC320/300-x-4	380-440V 3-phase	46	16	10
SAC360/300-x-2	208-240V 3-phase	106	70	35
SAC360/300-x-4	380-440V 3-phase	62	35	25
SAC400/300-x-2	208-240V 3-phase	115	95	50
SAC400/300-x-4	380-440V 3-phase	65	35	25
SAC450/386-x-2	208-240V 3-phase	106	70	35
SAC450/386-x-4	380-440V 3-phase	62	25	16
SAC520/386-x-2	208-240V 3-phase	127	95	50
SAC520/386-x-4	380-440V 3-phase	73	35	25
SAC700/412-x-2	208-240V 3-phase	160	120	70
SAC700/412-x-4	380-440V 3-phase	90	50	25
SAC750/513-x-4	380-440V 3-phase	84	50	25
SAC750/513-x-2	208-240V 3-phase	153	120	70
SAC900/513-x-4	380-440V 3-phase	106	70	50
SAC1100/513-x-2	208-240V 3-phase	193	150	95
SAC1100/513-x-4	380-440V 3-phase	134	95	50
SAC1300/610-x-4	380-440V 3-phase	143	95	70
SAC1400/610-x-4	380-440V 3-phase	160	120	70

IMPORTANT

Installation must be done by certified electricians, and according to the VFD install manual. This table is a general recommendation and installer must consider relevant regulations, temperature conditions and cable lengths.



All Dimensions in mm

Drawn: 18.04.18	BS	DWG No: BS-013-EL-161	Silver PDC-301
Approved: 07.01.20	SV	P/N: Control	3 sh.
Rev: 1	Date	Name	Rev: F
1	1	2	3
4	5	6	7
8	5	6	7
8	5	6	7

All Dimensions in mm

1 2 3 4 5 6 7 8

A L1 L2 L3 PE

A L1 L2 L3 PE

Module Circuit Breaker: 3p
-F1

-U2

-U1
ACS580/ACH580

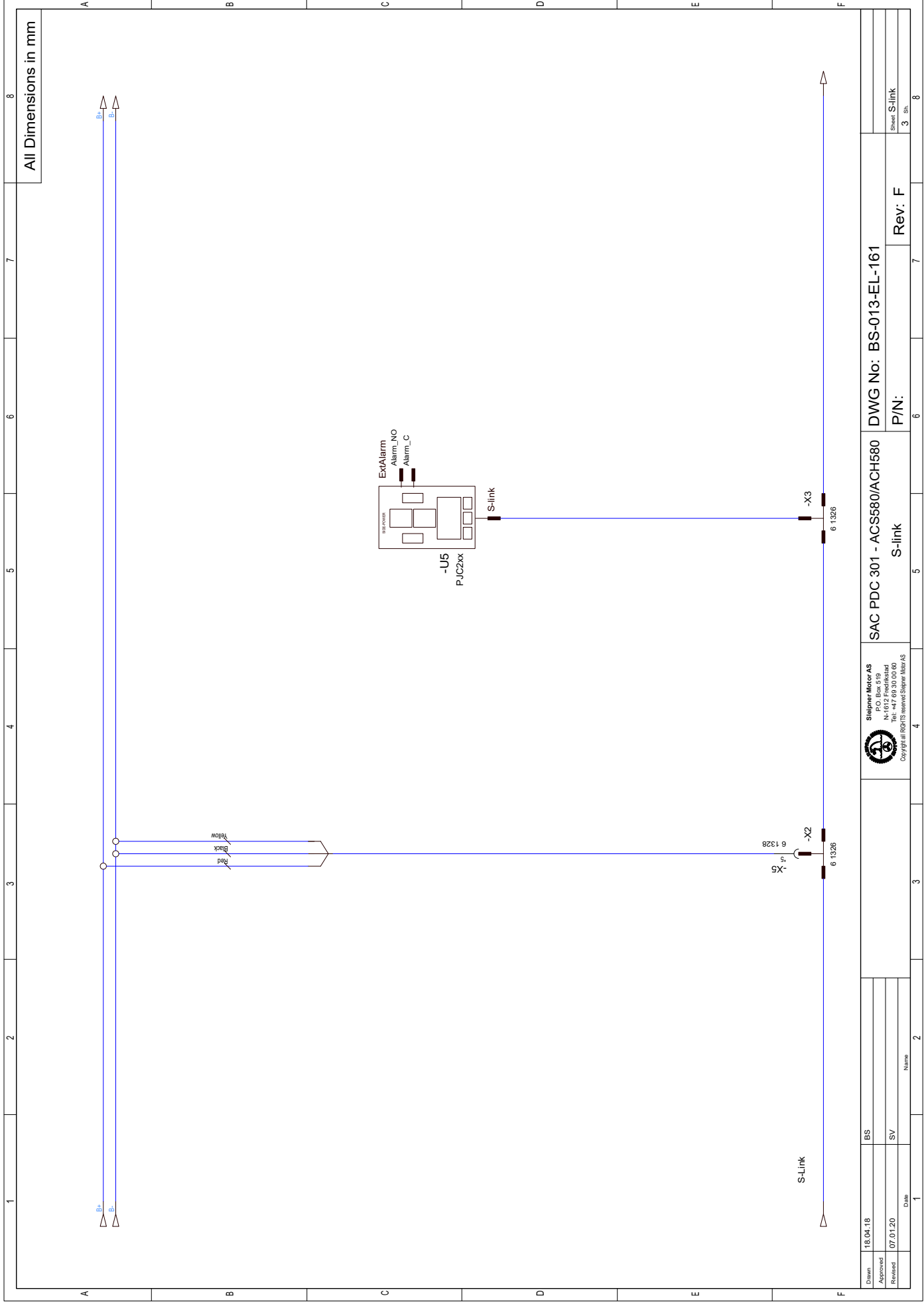
High voltage DC bus.
Do not connect.
Use shielded cable designed for use
with variable frequency drives.

-M1
AC Motor 3

Temperature Sensor

Drawn	18.04.18	BS	SAC PDC 301 - ACS580/ACH580 VFD Power	DWG No: BS-013-EL-161	Rev: F	Sheet AC 3 Sh
Approved						
Revised	07.01.20	SV				
Date		Name	1	2	3	4
			5	6	7	8





Drawn	18.04.18	BS	SAC PDC 301 - ACS580/ACH580	DWG No: BS-013-EL-161	Rev: F	Sheet	3	5th
Approved		SIV						
Revised	07.01.20							
Drawn		Name						

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 N-1872 Froland
 Norway
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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.

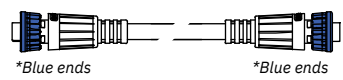
Installation of S-Link cables:

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 also recommended to install cables such that water and condensation do not run along the cables and into the connectors.

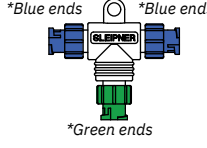
The POWER Cable should ideally be connected around the middle of the BACKBONE bus to ensure an equal voltage drop at each end of the BACKBONE Cable. The yellow and black wire in the POWER Cable shall be connected to GND and the red wire connected to +12VDC or +24VDC.

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.

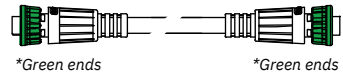
SPUR cables can be left unterminated to prepare for the installation of future additional equipment. In such cases, ensure to protect open connectors from water and moisture to avoid corrosion in the connectors.




BACKBONE Cable
Forms the communication and power bus throughout a vessel. Available in different standard lengths.




T-Connector
Used for connection of SPUR or POWER Cable to the BACKBONE Cable. One T-Connector for each connected cable.



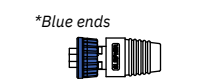
SPUR Cable
Used to connect S-Link compliant products to the backbone cable. One SPUR Cable must be used for each connected component, with no exceptions. Recommended to be as short as practically possible. Available in different standard lengths.



BACKBONE Extender
Connects two BACKBONE Cables to extend the length.

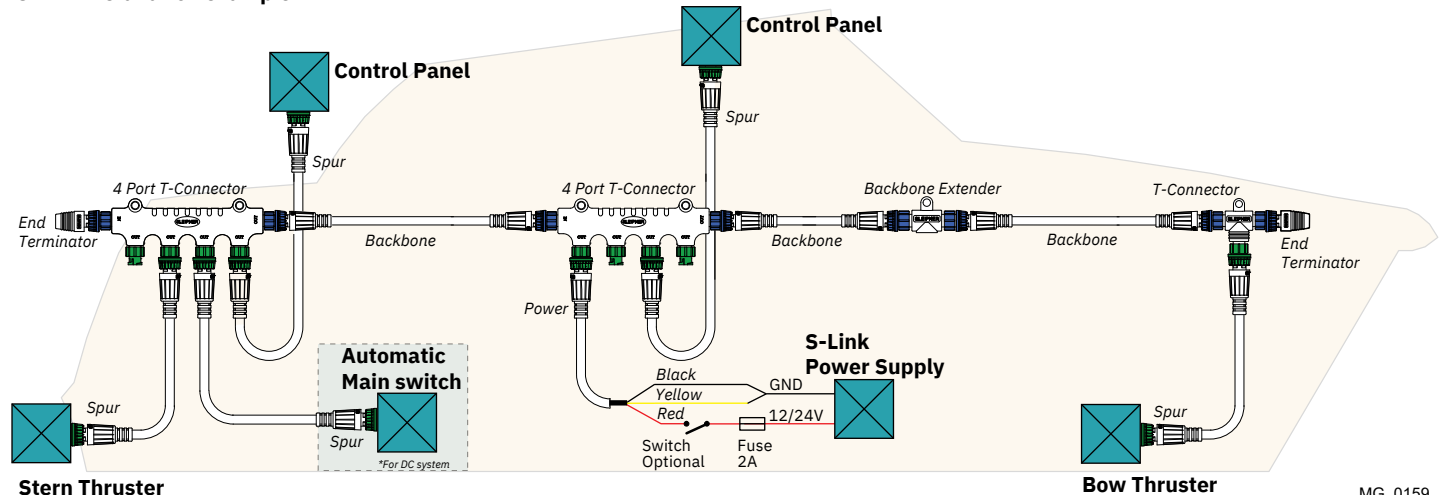


POWER Cable
Required in all installations for connection of BACKBONE Cable to a power supply and should be protected with a 2A fuse.



4-Port T-Connector
The 4-PORT T-connector allows multiple SPUR Cables to be connected. The 4-PORT T-connector comes with two sealing caps to protect unused ports.

S-Link installation example



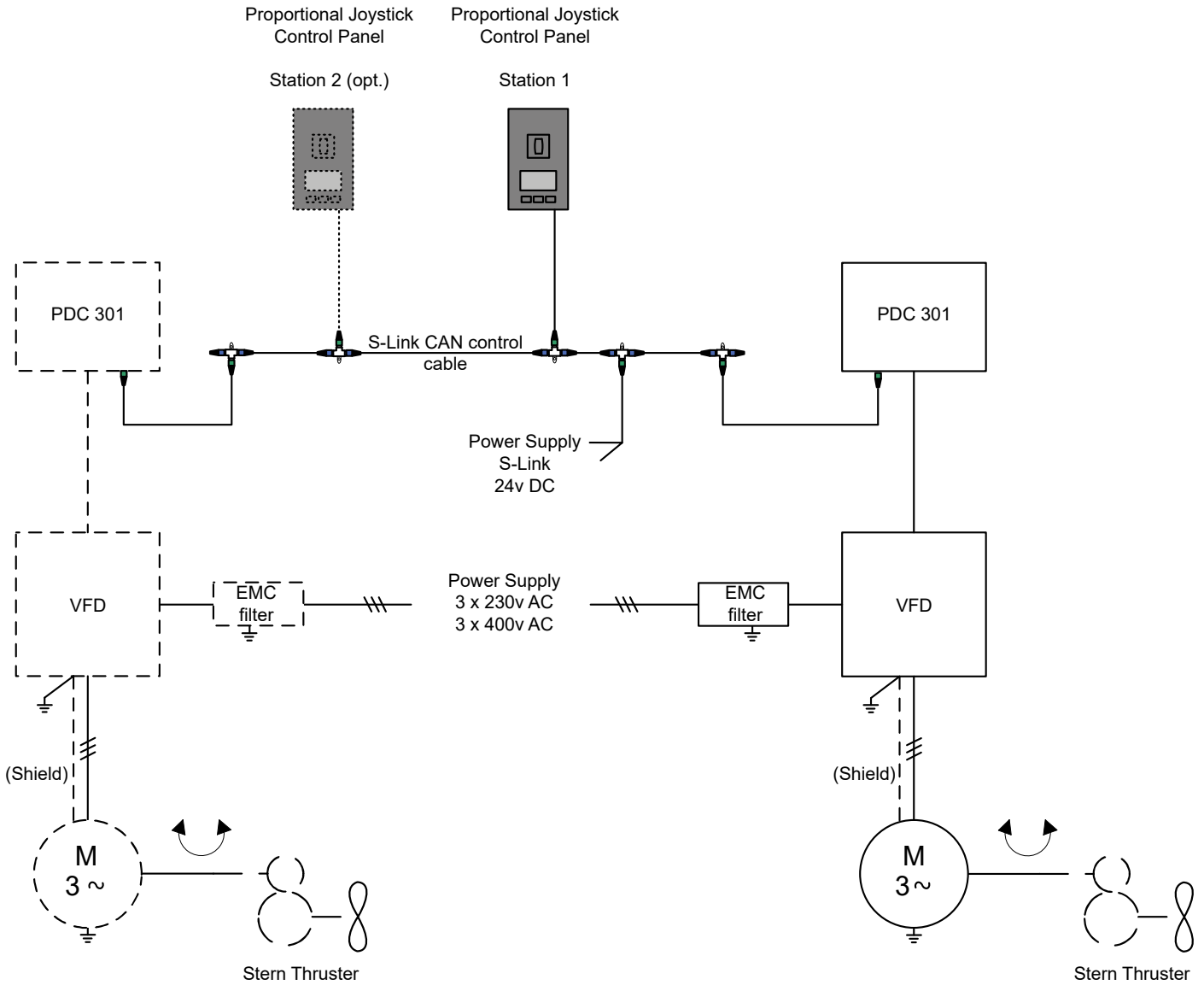
! Please refer to the graphic for special considerations relating to your model !

- All Sleipner control panels can be used in any combination.
- All control panels can be installed using:
 - Y-connectors - for standard on/off
 - T-connectors - for S-Link proportional power system.

(NB: If two or more control panels are operated at the same time in opposite directions, the electronic control box will stop the thruster until it receives a single signal or thrust in one direction.)

- Sleipner on/off equipment it is entirely “plug & play” and require no additional configuration setup.

See the Control panel manual for more information.



For **Control Panel** installation please refer to the Installation Guide accompanying the control panel to be installed.



- Propeller is fastened correctly to the shaft.
- Propeller turns freely in tunnel.
- Lower-unit is filled with gear oil.
- Oil-drain screw is tightened and the copper seal is present.
- The anode holding screw is tightened well with thread glue.
- Anti-fouling have been applied to the gear house and propeller but NOT on the anode or the gear house lid where the propeller is fastened.
- Oil tank is fitted above the waterline as required and filled with gear oil.
- Correct drive direction as per control panel.
- The bolts holding the gear house and motor bracket together are tightened correctly.
- The bolts holding the motor to its bracket are tightened correctly.

The thruster has been installed as per the instructions in this manual and all points in checklist above have been controlled.

Signed:

Date:

Extra pre-delivery tests by installer / yard who does not use other quality control systems !

Thruster type:

Serial number:.....

Date of delivery:.....

Correct drive direction as per control panel:

The compartment for the thruster has been isolated from general bilge water and has no obvious or suspected risks for flooding:

.....
.....
.....

Other comments by installer:

.....

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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