



SIDE-POWER Thruster Systems

AC

- 450/300 I
- 520/386 I
- 520/386 C

Installation Manual



SLEIPNER MOTOR AS

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Norway
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SM905273	SAC520/386-C-4-V - AC Thruster ø386 mm 400V
SM907986	SAC450/386-C-4L-H - AC Thruster ø386mm 400V
SM907983	SAC450/386-C-2-H - AC Thruster ø386mm 230V
SM907984	SAC450/386-C-2-V - AC Thruster ø386mm 230V
SM907988	SAC450/386-C-5-X01 - AC Thruster ø386mm 690V
SM907987	SAC450/386-C-4-V - AC Thruster ø386mm 400V
[Archived]	SAC520/386-I-4H - AC Thr.>520 kg ø386 mm 400V
SM907989	SAC520/386-C-2-H - AC Thruster ø386mm 230V
SM905274	SAC520/386-I-4-H - AC Thruster ø386mm 400V
SM907990	SAC520/386-C-2-V - AC Thruster ø386mm 230V
SM907991	SAC520/386-C-4-H - AC Thruster ø386mm 400V
SM907993	SAC520/386-I-2-V - AC Thruster ø386mm 230V
SM907992	SAC520/386-I-2-H - AC Thruster ø386mm 230V
SM907985	SAC450/386-C-4-H - AC Thruster ø386mm 400V
SM907994	SAC520/386-I-4-V - AC Thruster ø386mm 400V

DECLARATION OF CONFORMITY

MC_0020



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

Declare that this product with accompanying standard control systems complies with the essential health and safety requirements according to:

DIRECTIVE 2013/53/EU
DIRECTIVE 2014/30/EU
DIRECTIVE 2014/35/EU

It is the installers responsibility

When installing Side-Power equipment to follow the outlined regulations/ classification rules (electrical/ mechanical) according to international or special national regulations. Instructions in this guide cannot be guaranteed to comply with global electric/ mechanic regulations/ classification rules.

To follow all health and safety laws in accordance with their local outlined regulations/ classification rules.

Before installation, it is important that the installer reads this guide to ensure necessary acquaintance with this product.

The recommendations made in this manual are guidelines ONLY, and Sleipner Motor AS (Side-Power) strongly recommend that before installation, advice is obtained from a naval architect familiar with the particular vessel and regulations/ classifications.

This manual is intended to support educated/ experienced staff and is therefore not sufficient in all details for professional installation. *(NB: These instructions are only general instruction. If you are not skilled to do this work, please contact professional installers for assistance.)*

All electrical work must be done by a licensed professional.

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

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Bow Installation Considerations and Precautions

MC_0031

- The thruster must NOT be installed in compartments that require ignition proof electric equipment. If necessary, make a separate compartment. ***(NB: Ignition Protected systems are tested to be installed in areas with possible explosive gases in accordance with ISO 8846)***
- The electromotor will generate some carbon dust so any storage compartments must be separated from the thruster to prevent nearby items becoming dusty/ dirty. ***(NB: IP version motors generate dust but are enclosed.)***
- When installing the thruster electromotor in small compartments, ensure the compartment is well ventilated to allow for cooling of the electromotor.
- 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 electromotor 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 house must be outside the tunnel.
- 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.
- The electromotor, components and cables must be mounted so they remain dry at all times.
- We advise painting the gear house and propellers with antifouling. ***(NB: Do not paint the anodes, sealings, rubber fittings or propeller shafts)***
- Do not finish the inside of the tunnel with a layer of gelcoat/ topcoat or similar. There is only room for a thin coat of primer and two layers of anti-fouling between the tunnel and the props.
- Don't install the electromotor 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.

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Thruster Installation Considerations and Precautions

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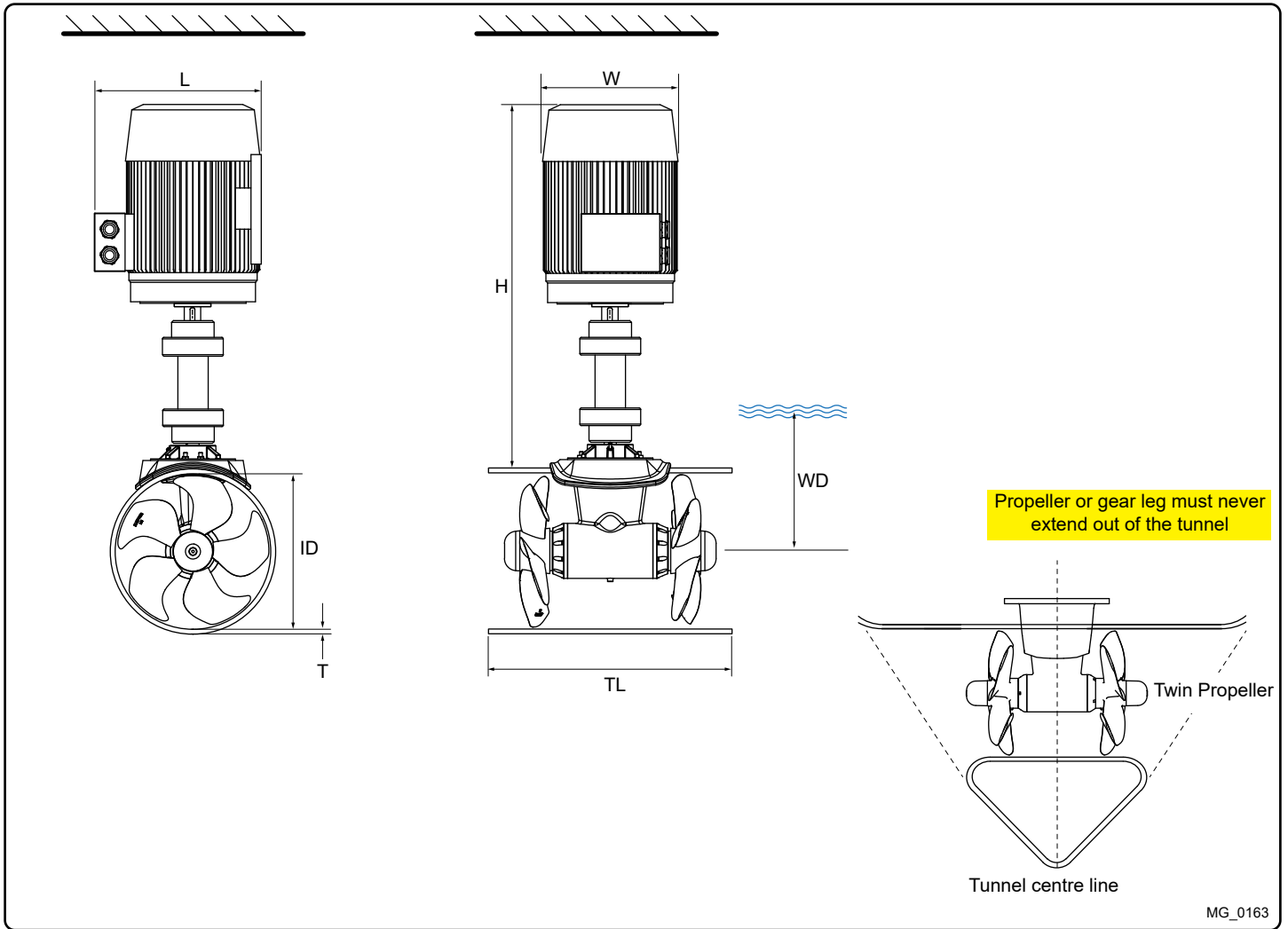
Before installation, it is important that the installer reads this guide to ensure necessary acquaintance with this product.

- The electromotor must be handled with care. Do not lift it by internal cable connections, main terminals or placed down on the driveshaft.
- The thruster power supply circuit must include the recommended sized fuse and a battery isolation switch.
- Never run the thruster out of water.
- It is important to follow the guidelines in this manual. Failure can result in severe damage to the thruster.

IMPORTANT

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

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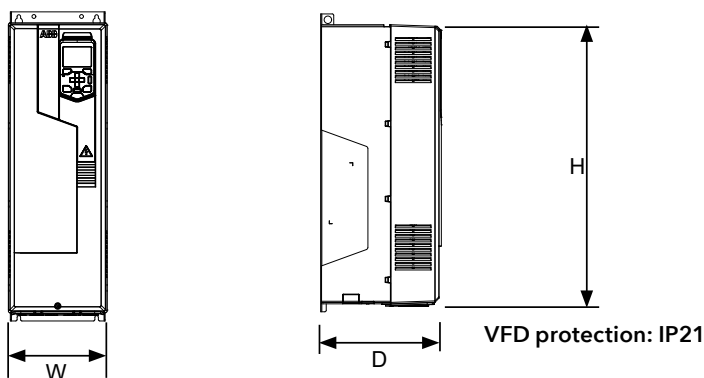
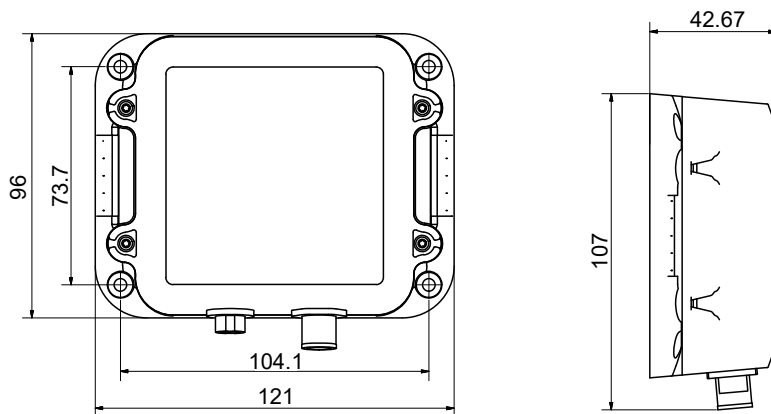


MG_0163

EN **Thruster Measurements** MC_0322

Measurement code	Measurement description	*450		*520	
		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

Motor:	AC Electric type.
Gearhouse:	Seawater resistant bronze.
Gears:	Hardened precision gears.
Lubrication:	Oil bath from tank (API GL-5, SAE 80W-90)
Material:	Seawater resistant bronze, protected with anodes.
Motor bracket:	Seawater resistant aluminium.
Tunnel:	Cross spun with rowing G.R.P tunnel Steel & aluminium tunnels available at request.
Propeller:	Composite 4-blade kaplan propeller.
Control System:	S-LINK. cables and control panel not included.
Safety:	Flexible coupling between AC motor and driveshaft protects gearsystem against peak loads.



	Thruster model	VFD model	Weight Kg	D mm	W mm	H1 mm
SAC240	SAC240/250-C-2-H/V	ACS580-01-060A-2	11,8	228	203	454
	SAC240/250-C-4-H/V	ACS580-01-033A-4	11,8	228	203	454
SAC320	SAC320/300-C-2-H/V	ACS580-01-089A-2	28,3	295	203	636
	SAC320/300-C-4-H/V	ACS580-01-046A-4	11,8	228	203	454
SAC360	SAC360/300-C-2-H/V	ACS580-01-115A-2	28,3	295	203	732
	SAC360/300-C-4-H/V	ACS580-01-073A-4	19	258	203	636
SAC400	SAC400/300-C-2-H/V	ACS580-01-115A-2	28,3	295	203	732
	SAC400/300-C-4-H/V	ACS580-01-073A-4	19	258	203	636
SAC450	SAC450/386-C-2-H/V	ACS580-01-115A-2	28,3	295	203	732
	SAC450/386-C-4-H/V	ACS580-01-062A-4	19	258	203	600
SAC520	SAC520/386-I-2-H/V	ACS580-01-144A-2	42,4	369	252	727
	SAC520/386-I-4-H/V	ACS580-01-088A-4	28,3	295	203	636
	SAC520/386-C-2-H/V	ACS580-01-144A-2	42,4	369	252	727
	SAC520/386-C-4-H/V	ACS580-01-088A-4	28,3	295	203	636
SAC700	SAC700/412-C-2-H/V	ACS580-01-171A-2	54	370	284	880
	SAC700/412-C-4-H/V	ACS580-01-106A-4	28,3	295	203	732
SAC750	SAC750/513-I-4-H/V	ACS580-01-088A-4	28,3	295	203	372
SAC900	SAC900/513-I-4-H/V	ACS580-01-106A-4	28,3	295	203	732
SAC1100	SAC1100/513-I-4-H/V	ACS580-01-145A-4	42,4	369	252	727
	SAC1100/513-C-4-H/V	ACS580-01-145A-4	54	370	284	880
SAC1300	SAC1300/610-I-4-H/V	ACS580-01-169A-4	54	370	284	880
SAC1400	SAC1400/610-I-4-H/V	ACS580-01-169A-4	54	370	284	880

-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

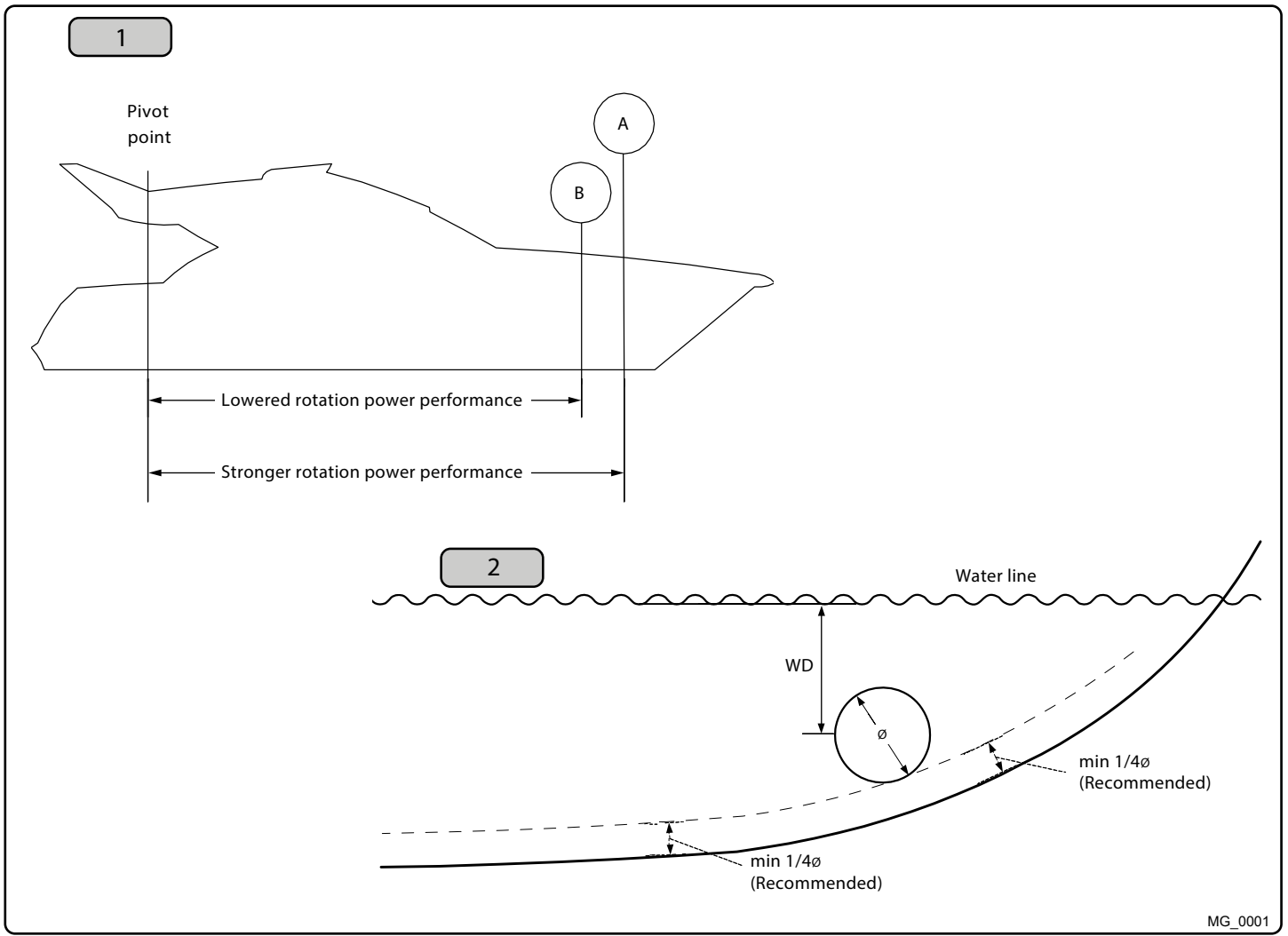
Performance & sizing													
SAC240/250-C	SAC320/300-I	SAC360/300-C	SAC400/300-C	SAC450/386-C	SAC520/386-I	SAC520/386-C	SAC700/412-C	SAC750/513-I	SAC900/513-I	SAC1100/513-I	SAC1100/513-C	SAC1300/610-I	SAC1400/610-I
250 • 9.8	300 • 11.8	300 • 11.8	300 • 11.8	386 • 15.2	386 • 15.2	386 • 15.2	412 • 16.2	513 • 20	513 • 20	513 • 20	513 • 20	610 • 24	610 • 24
240 • 529	280 • 617	360 • 794	400 • 882	450 • 992	450 • 992	520 • 1146	700 • 1543	600 • 1323	750 • 1653	900 • 1984	1100 • 2425	1100 • 2425	1200 • 2646
-	320 • 705	-	-	520 • 1146	520 • 1146	-	750 • 1653	750 • 1653	900 • 1984	1100 • 2425	-	1300 • 2866	1400 • 3086
14 • 19	21 • 27	27 • 37	30 • 41	28 • 38	35 • 48	35 • 48	42 • 57	41 • 56	53 • 72	70 • 95	70 • 95	74 • 101	83 • 113
13-23 • 42-75	17-31 • 55-100	18-33 • 59-108	18-33 • 59-108	22-35 • 75-110	25-40 • 85-140	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
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	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.



MG_0001

EN **Positioning of the tunnel / thruster** **MC_0003**

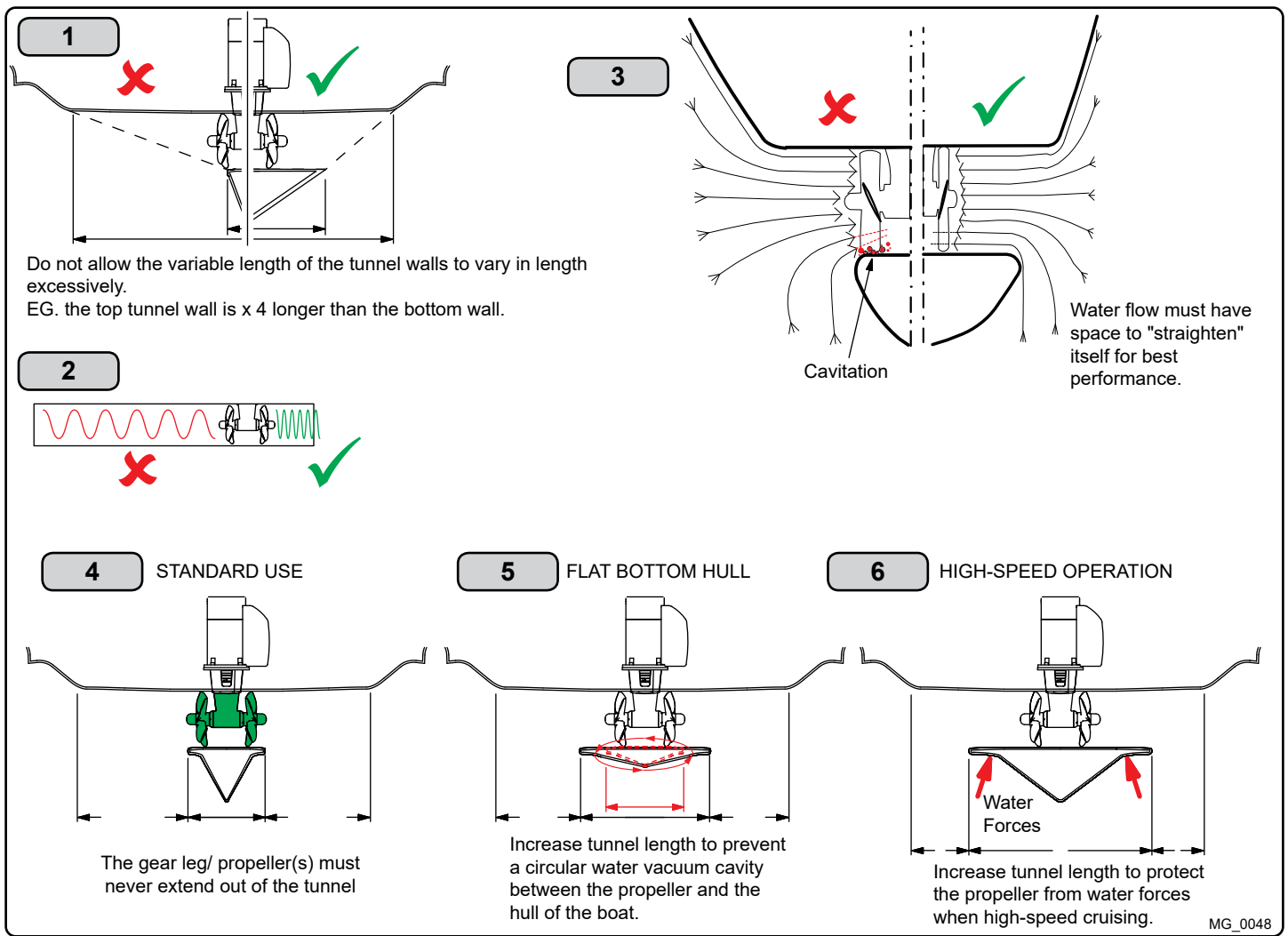
Aim to install the thruster as far forward as possible (1)

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 a minimum of 1 x the tunnel diameter 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.)**



EN **Tunnel Length** **MC_0003**

Optimal tunnel length

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

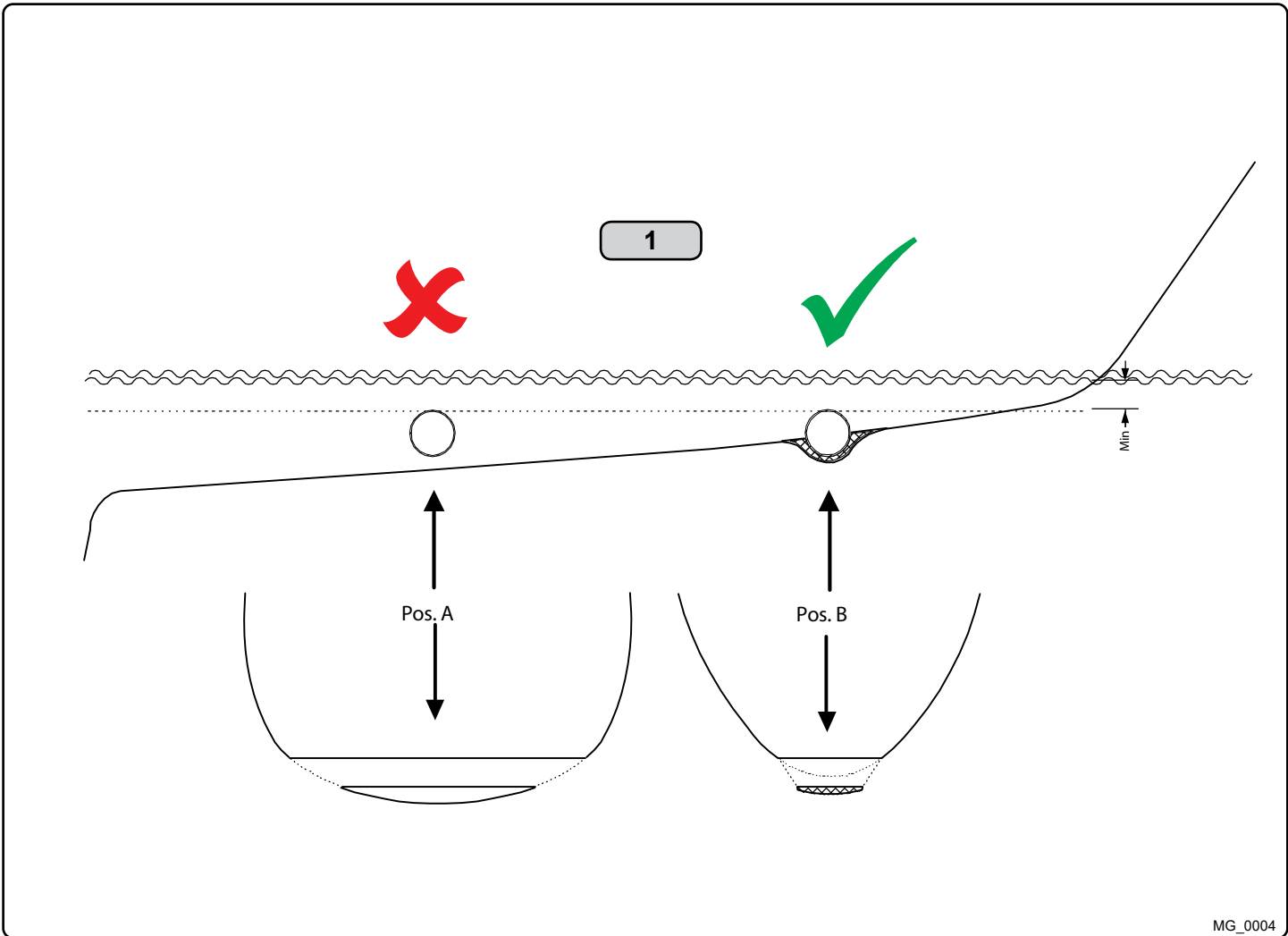
Tunnels should avoid being longer than 4 x the tunnel diameter as this will reduce thruster performance. **(NB: Installing long length tunnels can flex/bend over time and may require additional support. Consult with a naval architect.)**

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.
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)**



MG_0004

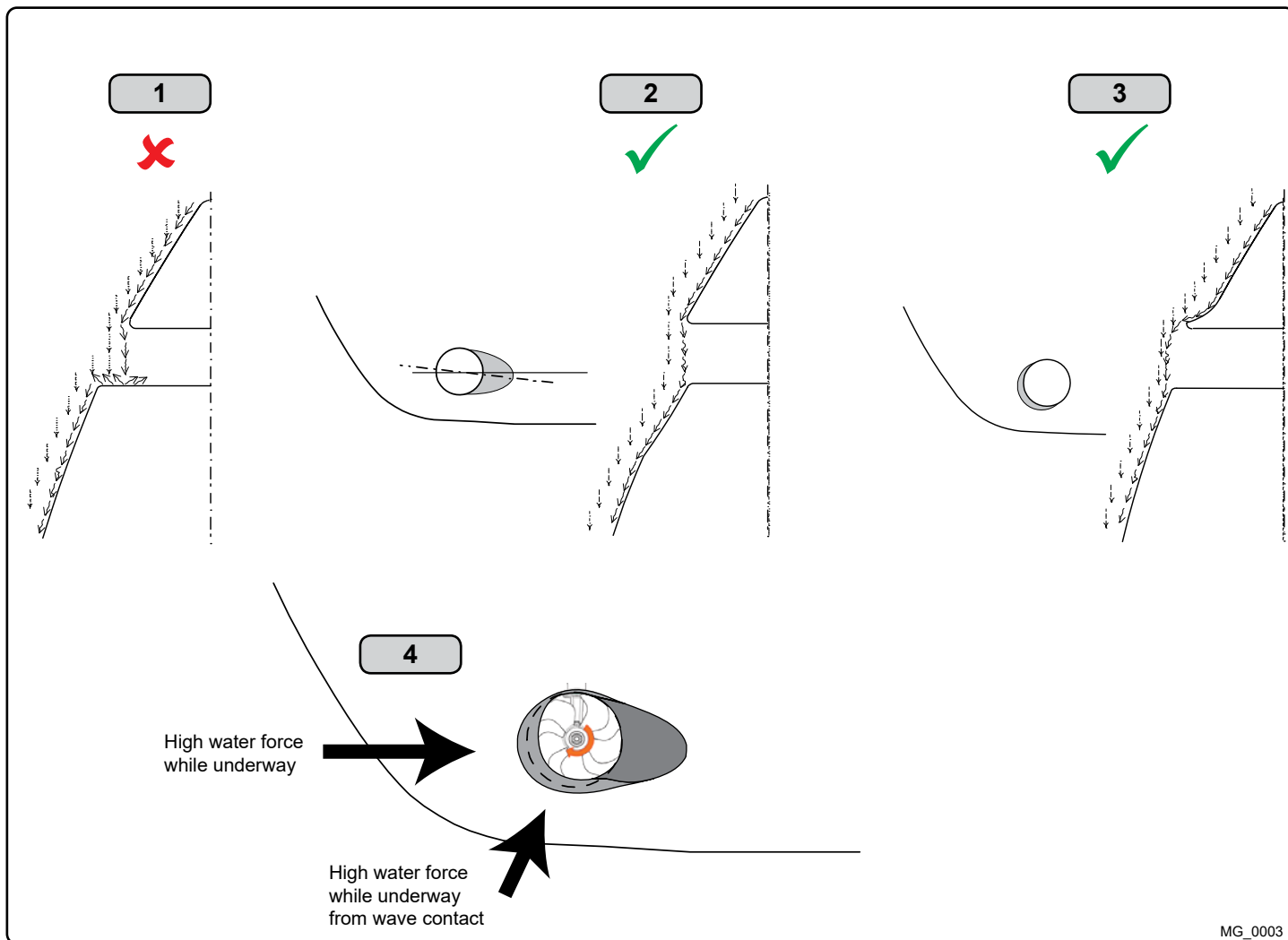
EN **Tunnel installation in sailboats** **MC_0003**

Some sailboats 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 sailboats, 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 sailboat 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.



MG_0003

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Water Deflection

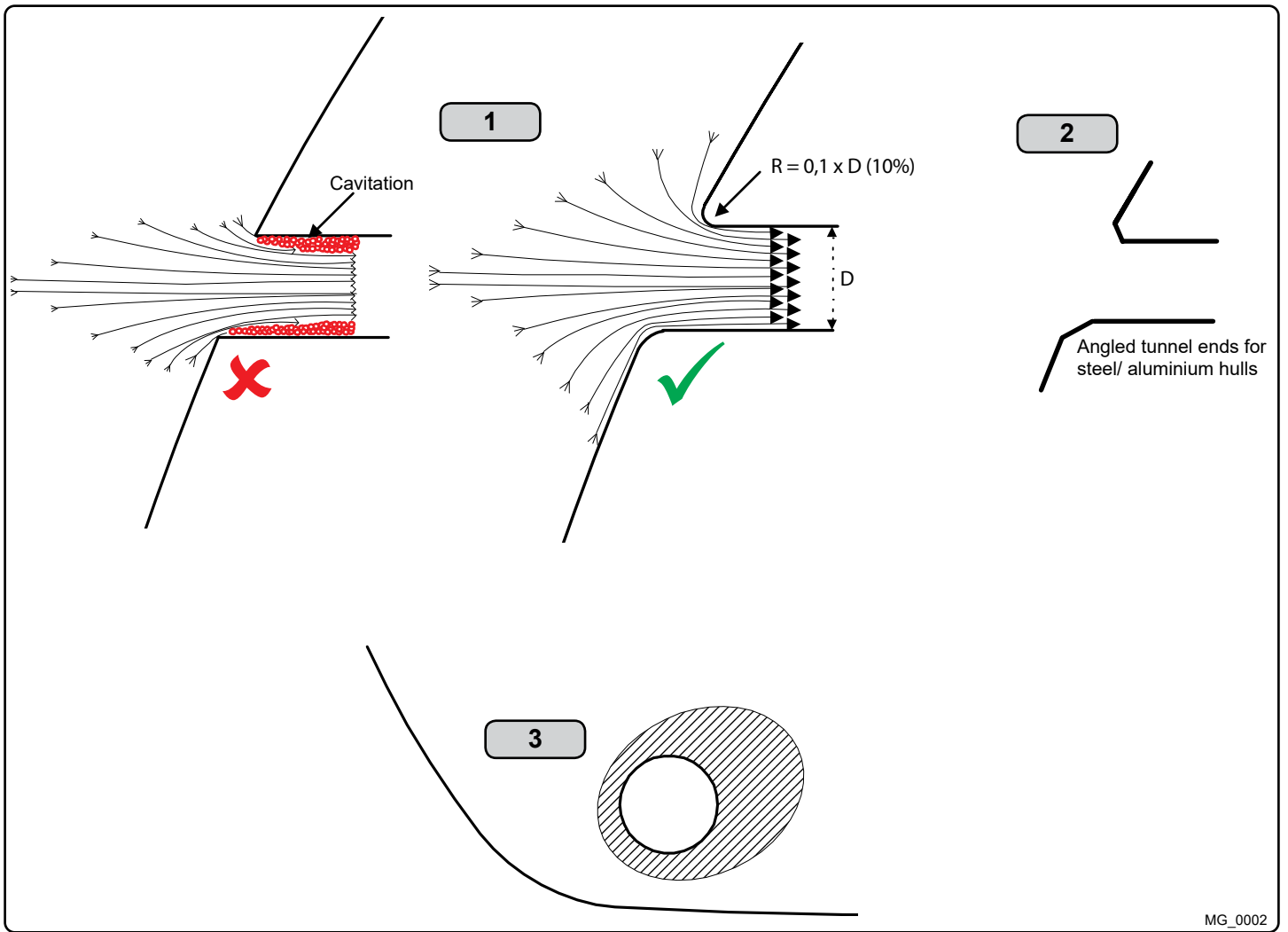
MC_0003

1. A possible problem in sailboats 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 (1).

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 (2).
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. (3).
4. The thruster propeller can spin (passively) producing noise while sailing or cruising as water is forced through the tunnel. Waterflow directed through the tunnel at high speeds, during turning or as the boat bumps waves while underway can also damage the thruster (4).

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



MG_0002

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Tunnel ends

MC_0003

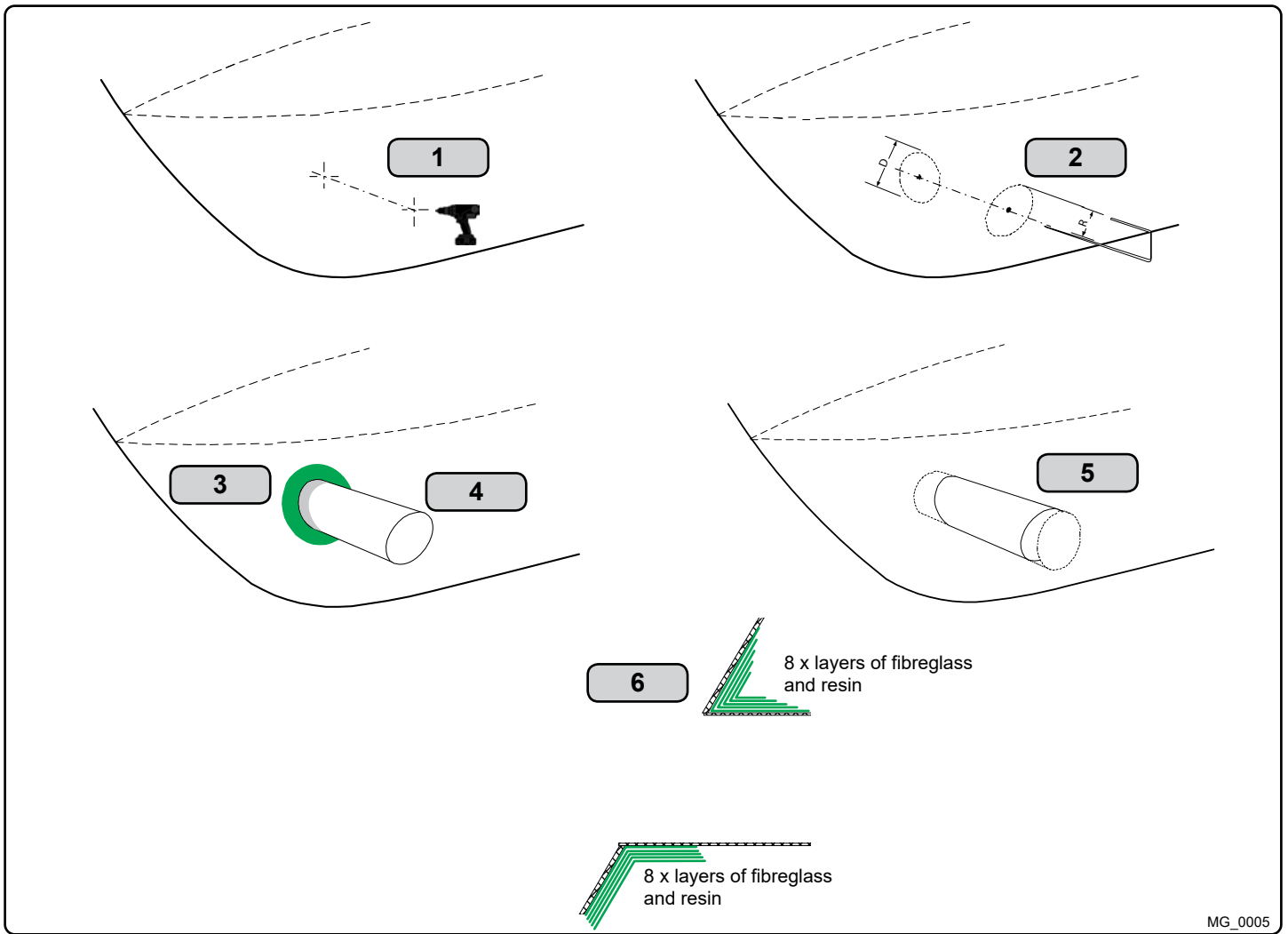
Rounded tunnel ends will maximise thrust and minimise noise and cavitation.

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 Side-power 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.)



MG_0005

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Tunnel installation

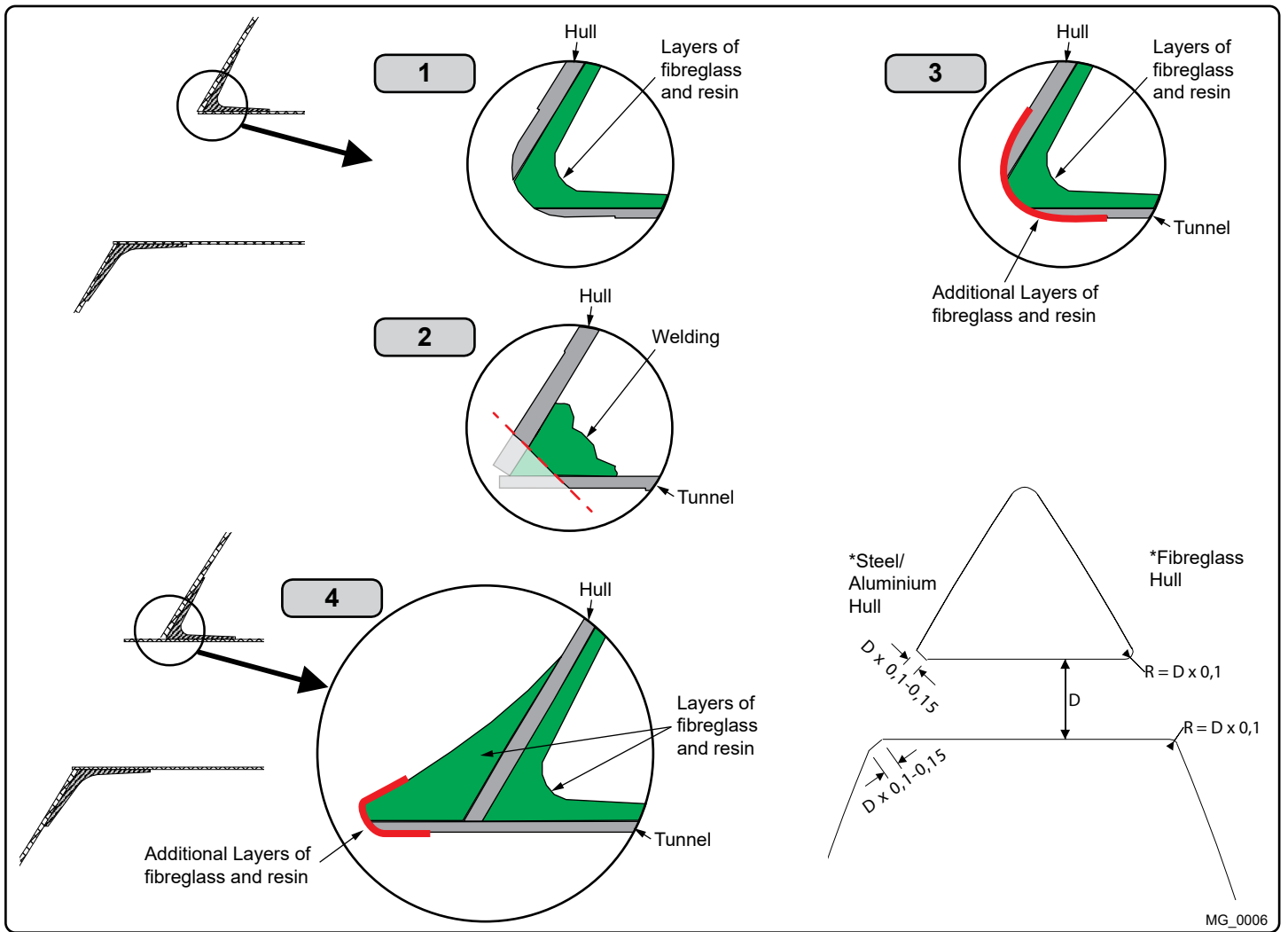
MC_0003

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 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.)



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Tunnel installation

MC_0003

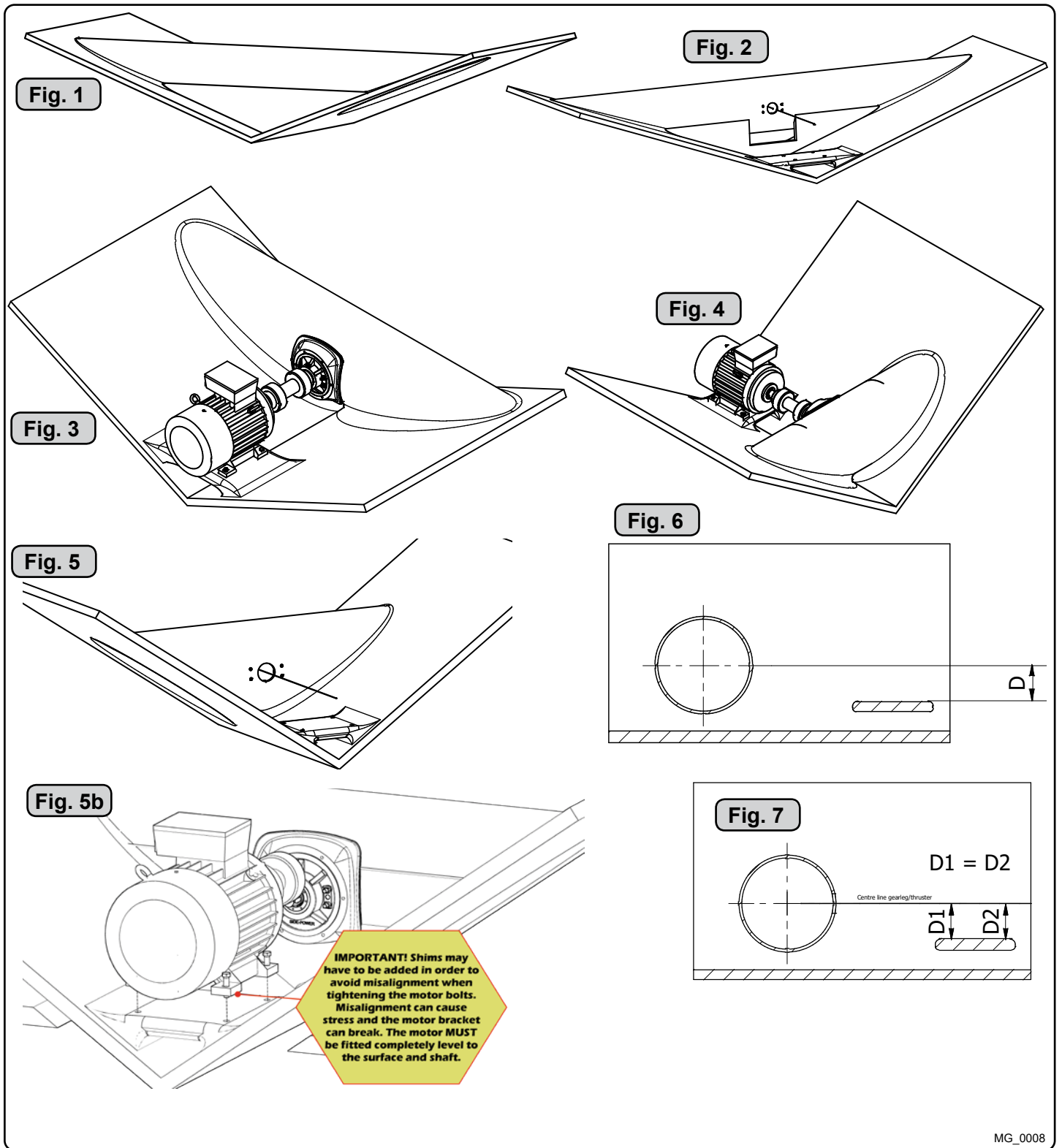
With tunnel installed and cast.

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 Side-Power 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.



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Supporting the thruster

MC_0003

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 & 4). 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. 5).

The distance from the centerline (fig. 6) of the tunnel to the top of the bedding for the specific thruster/ motor combination is found as measurement G on the technical data of the product. Ensure that the bedding is parallel to the centerline by checking the distance in both ends of the bedding (Fig.5) Mounting holes in the bedding should be drilled according to measurements J on the technical data of the product for the specific thruster/ motor combination.

Stern thruster installation has extra considerations and precautions and thruster installation procedures.

See the attached manual supplied in the stern thruster kit



It is the installers responsibility

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MC_0038



Bow Installation Considerations and Precautions

MC_0031

- The thruster must NOT be installed in compartments that require ignition proof electric equipment. If necessary, make a separate compartment. **(NB: Ignition Protected systems are tested to be installed in areas with possible explosive gases in accordance with ISO 8846)**
- The electromotor will generate some carbon dust so any storage compartments must be separated from the thruster to prevent nearby items becoming dusty/ dirty. **(NB: IP version motors generate dust but are enclosed.)**
- When installing the thruster electromotor in small compartments, ensure the compartment is well ventilated to allow for cooling of the electromotor.
- 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 electromotor 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 house must be outside the tunnel.
- 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.
- The electromotor, components and cables must be mounted so they remain dry at all times.
- We advise painting the gear house and propellers with antifouling. **(NB: Do not paint the anodes, sealings, rubber fittings or propeller shafts)**
- Do not finish the inside of the tunnel with a layer of gelcoat/ topcoat or similar. There is only room for a thin coat of primer and two layers of anti-fouling between the tunnel and the props.
- Don't install the electromotor 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.



Thruster Installation Considerations and Precautions

MC_0257

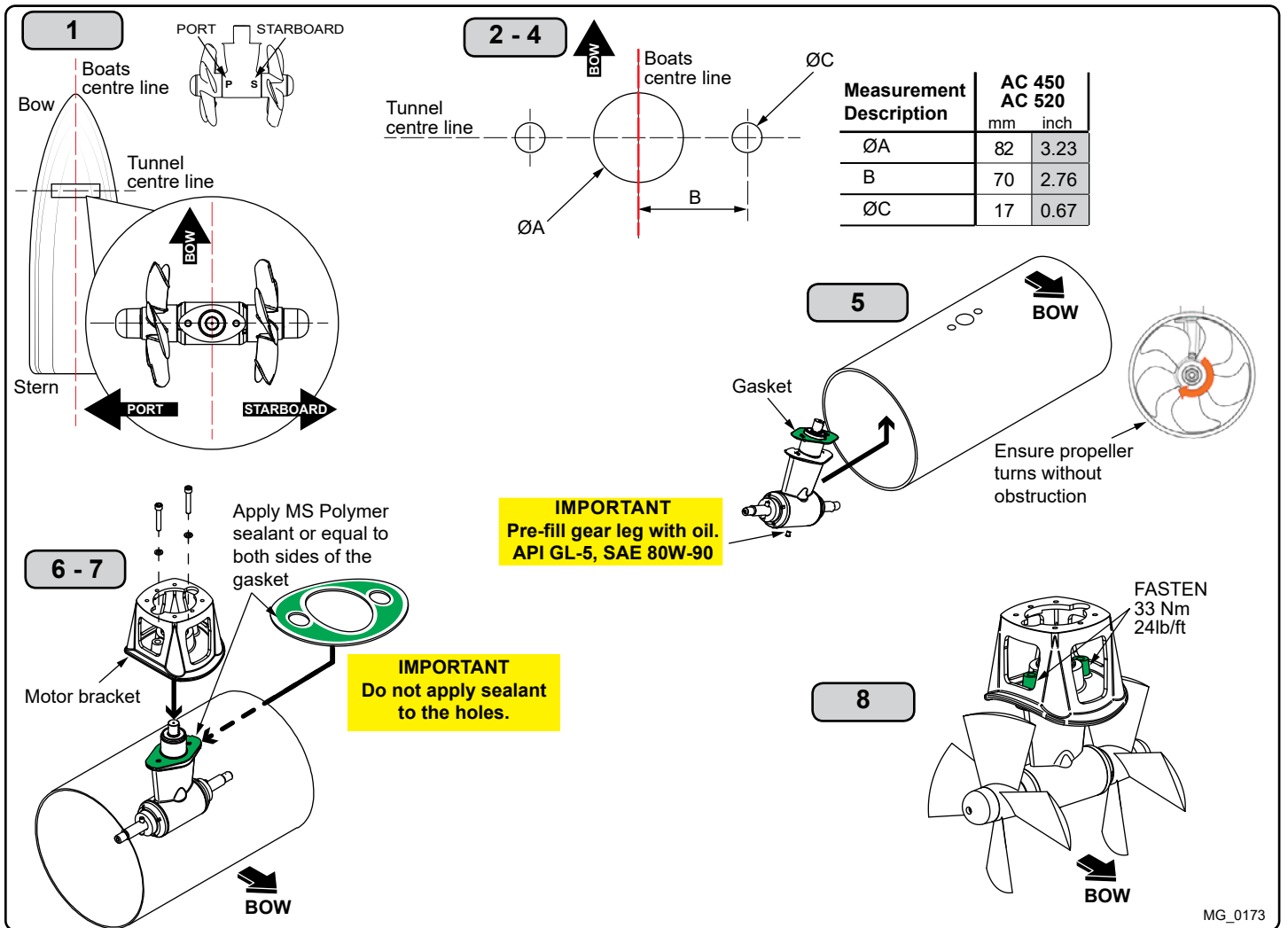
Before installation, it is important that the installer reads this guide to ensure necessary acquaintance with this product.

- The electromotor must be handled with care. Do not lift it by internal cable connections, main terminals or placed down on the driveshaft.
- The thruster power supply circuit must include the recommended sized fuse and a battery isolation switch.
- Never run the thruster out of water.
- It is important to follow the guidelines in this manual. Failure can result in severe damage to the thruster.

IMPORTANT

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

MC_0265



MG_0173

EN Gear Leg & Motor Bracket Installation MC_0002

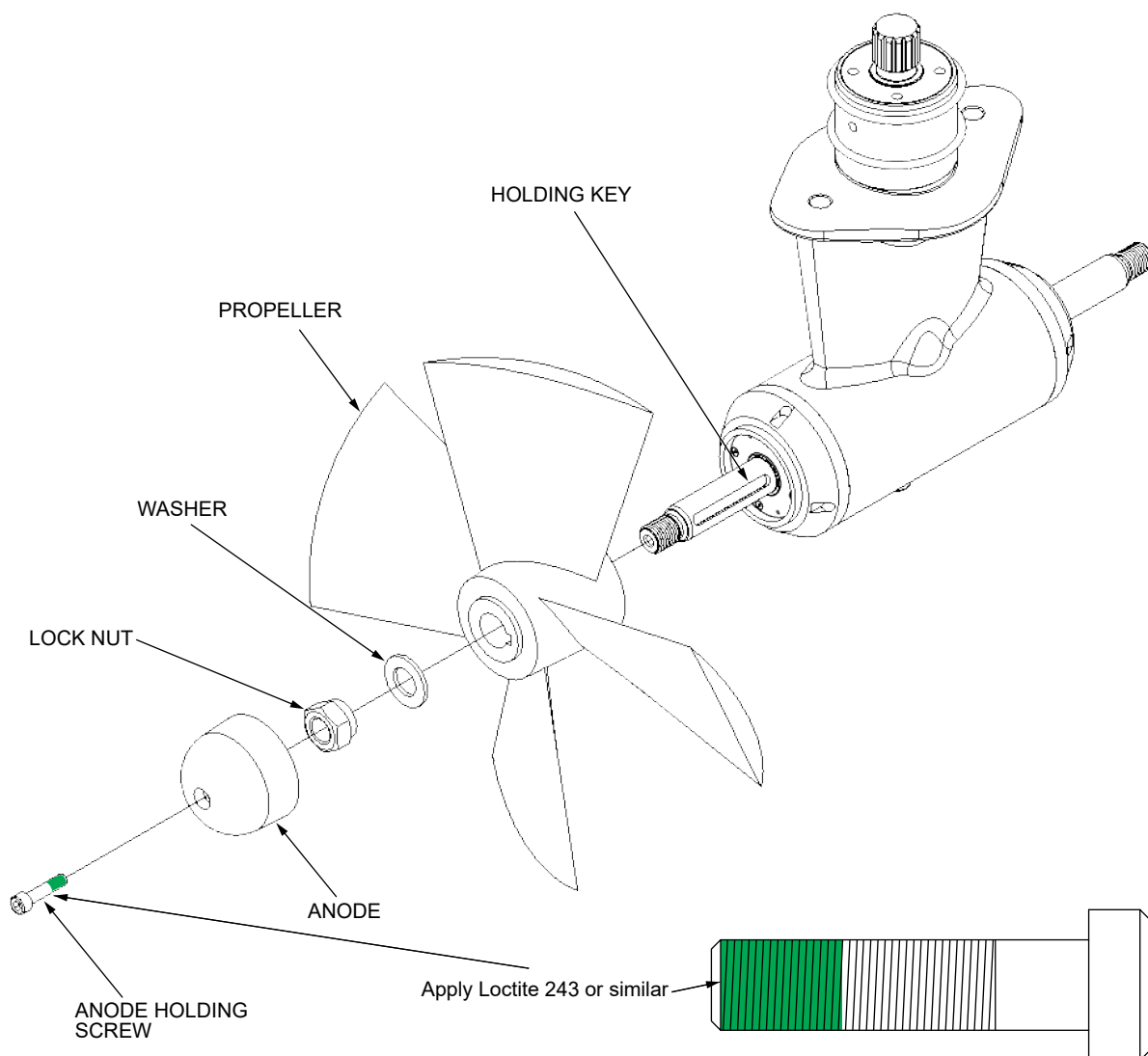
! Please refer to the graphic for special considerations relating to your model !

1. Mark the tunnel centreline and the boat's centreline. **(NB: Install the gear leg and propeller as shown above 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. 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.
4. Drill the main centre hole followed by the two screw-holes.
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 gearhouse. Nolubrication 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. Place the propeller on the gear leg to ensure it is centred and rotates freely with the same clearance from each blade to the tunnel wall. Place top motor bracket to measure the driveshaft has come through the motor bracket at the correct height. Remove the gear leg and propeller for final installation.
7. 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).
8. Install the top motor bracket and gear leg gently together. Use appropriate filler to ensure that no leakages occur. **(NB: See your sealant datasheet for the correct application process.)**
9. Fasten the gear leg and the motor bracket with the bolts provided. Fasten to torque as shown above.



MG_0038

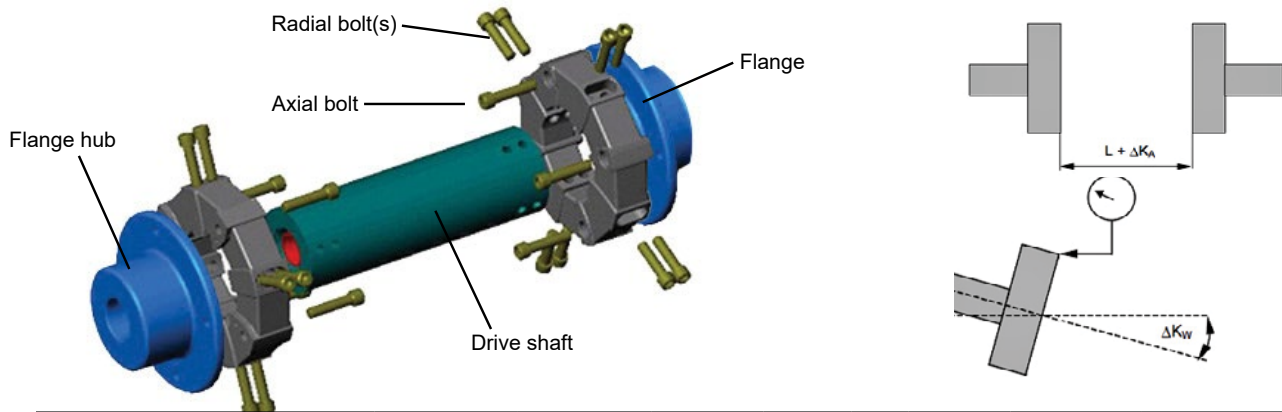
EN

Propeller Installation

MC_0021

! 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 un-screw itself from during the rotation of the propeller.



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

MG_0167



Coupling Installation

MC_0027

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

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 Side-Power thruster. Also, avoid contact between the AC motor shaft and the coupling drive shaft.

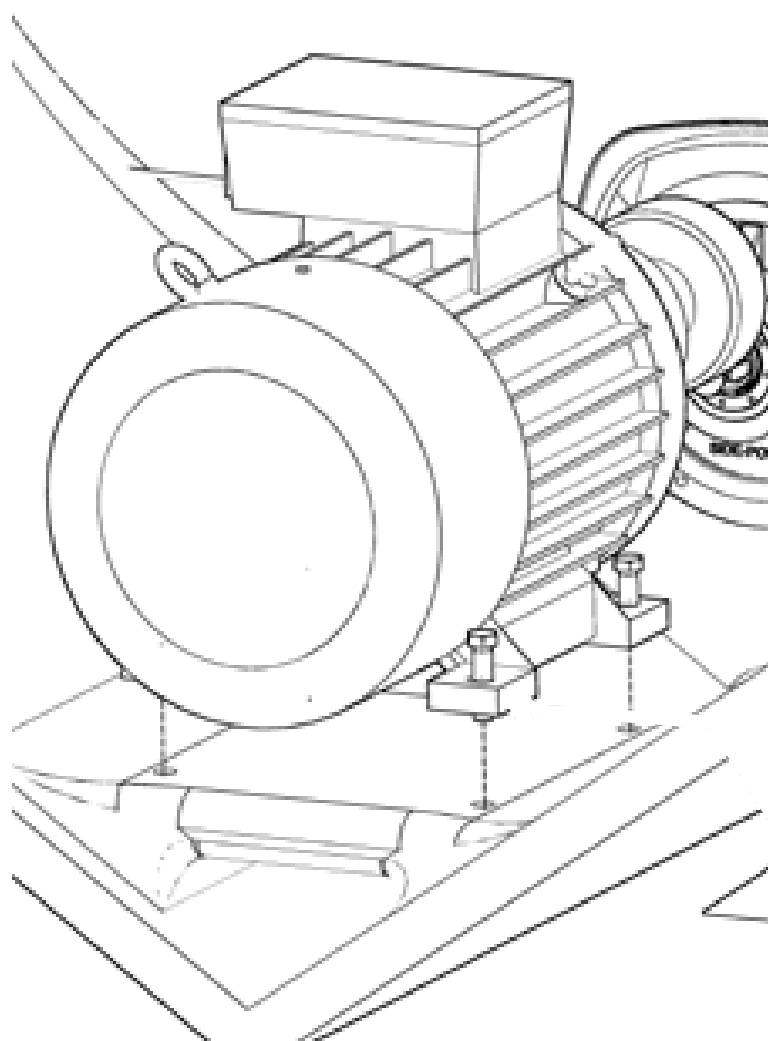
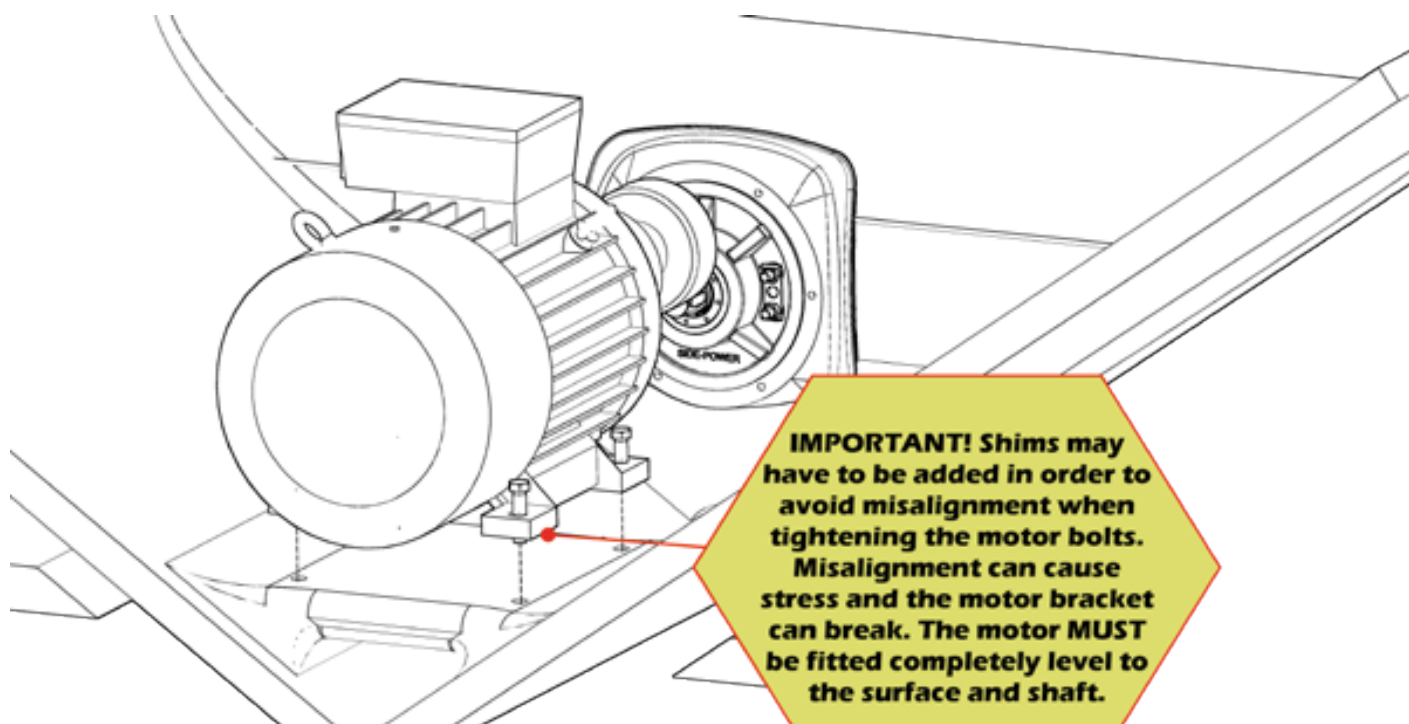
Centa has applied retention Inbus PlusAll glue to all bolts. **(NB: The glue will harden within 4-5 hours at 20°C.)** Additional use of any loctite or anaerobic adhesives will destroy the natural vulcanisation of the rubber. Do not use oil or grease on bolts except a small amount of grease at the contact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

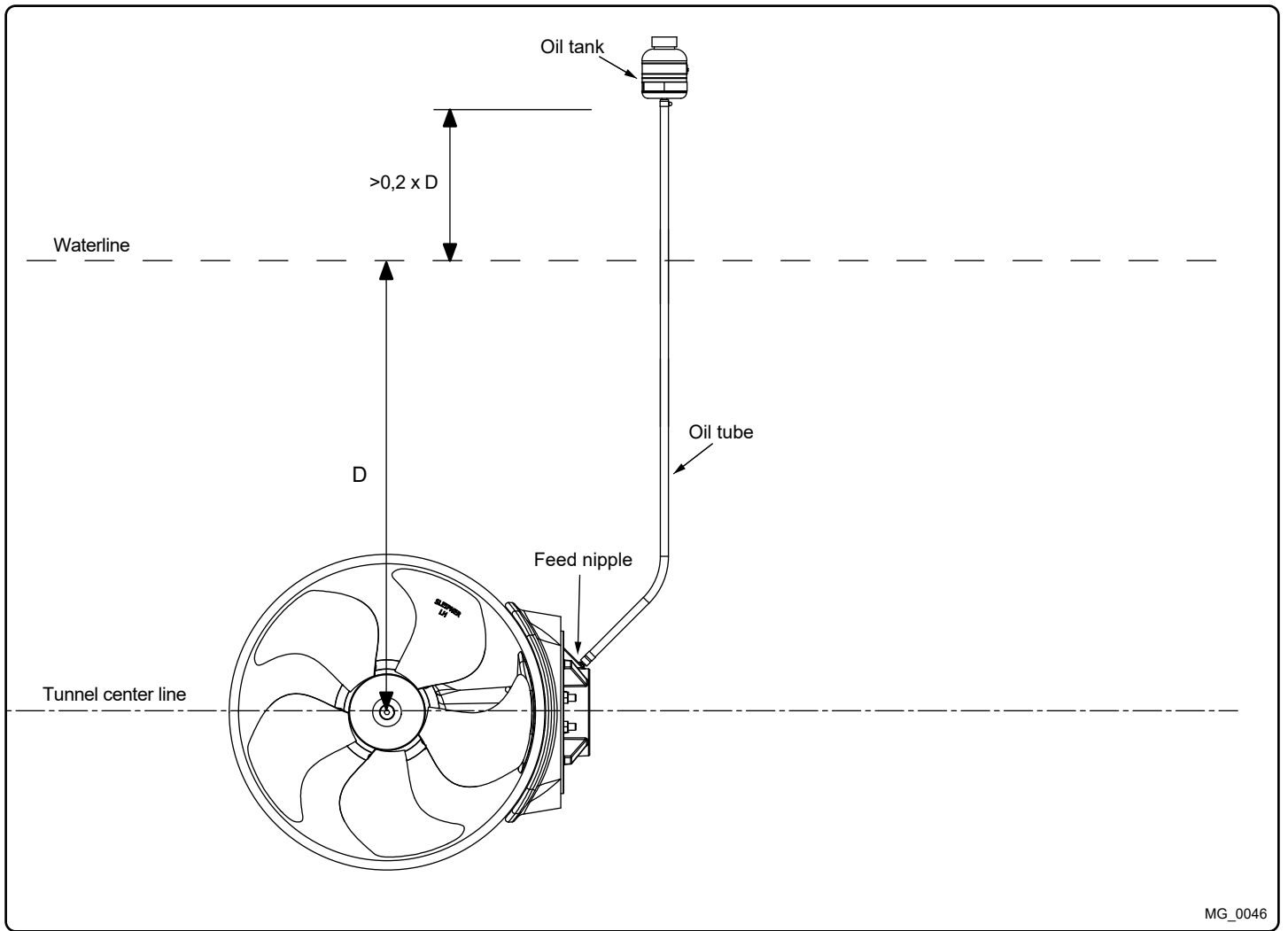
1. Insert the flange hub on AC motor shaft and gear leg shaft. **(NB: Insert the Gear leg shaft flange hub against the limit stop/ shaft shoulder.) Insert the AC motor shaft flange hub according to hub depth.)**
2. Install the AC motor after you have lined up according to tolerances given in the above 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.
4. 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.
5. First fasten radial bolts, then the axial bolts according to the table above. **(NB: Ensure rubber elements are not twisted during fastening the bolts.)**

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 Side-Power dealer. Add protection to the Universal Joint Shaft according to relevant safety regulations. **(NB: A protection guard is not a part of Side-Power delivery)**





MG_0046

EN

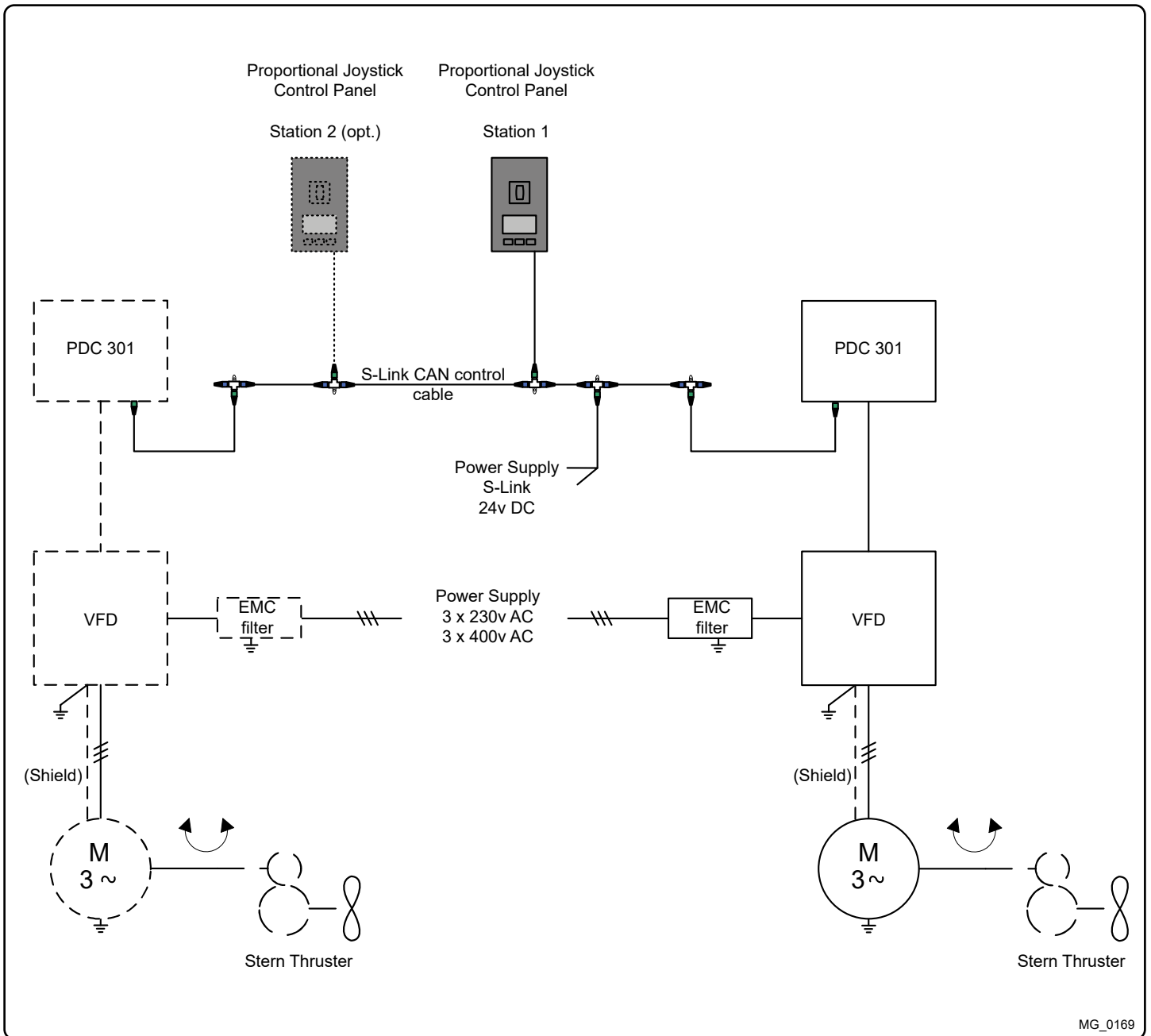
Oil Tank Installation

MC_0023

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

1. Install the oil tank 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 tank oil tank to the feed nipple on the motor bracket. Fasten the two 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 tank with the same gear oil used in the gear leg. The oil tank works as an indicator to ensure there is oil 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.)



EN Control Panel Cable Installation MC_0041

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

- All Sidepower 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.)

- Sidepower on/off equipment it is entirely "plug & play" and require no additional configuration setup.

See the Control panel manual for more information.

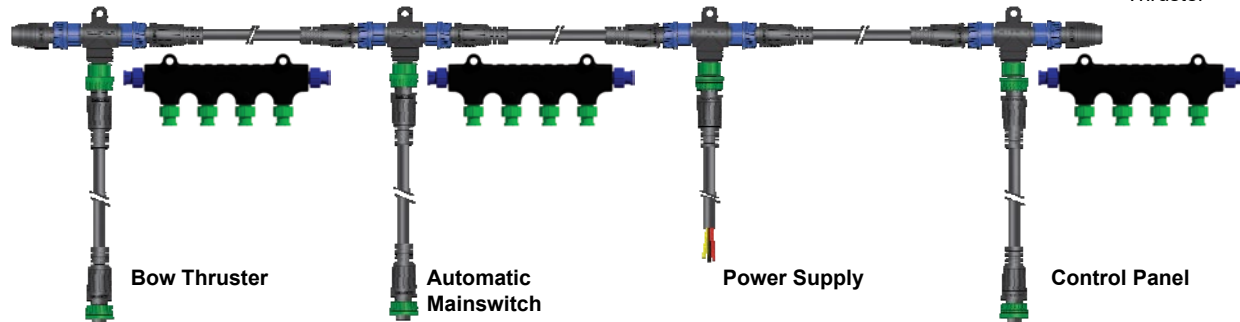
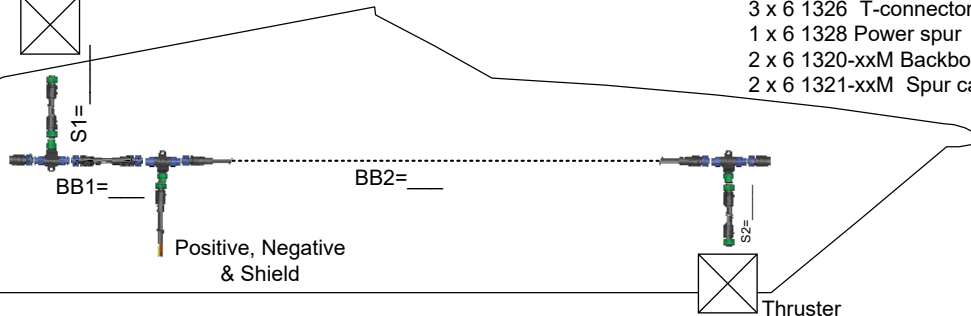
Example of the control wiring with S-link system for boats with one control position and one thruster.

Control Panel



You need:

- 2 x 6 1327 End terminators
- 3 x 6 1326 T-connectors
- 1 x 6 1328 Power spur
- 2 x 6 1320-xxM Backbone cables
- 2 x 6 1321-xxM Spur cables



BACKBONE Cable

Forms the main "loop" around the boat.



T- Connector

Must be one for each spur, including power cable



SPUR Cable

Must be used to connect all parts to the backbone cable (One for each component, no exceptions). Recommended to be as short as practically possible.



BACKBONE extender

Connects two BACKBONE cables to extend length.



POWER Cable

Must be one in each system, length 2.5m



END terminator

Must be one for each end of the BACKBONE "loop".



4-Port T Connector

The 4-port T-connector allows multiple spur cables to be connected. *(NB: Comes with two sealing caps to protect.)*

MG_0159



S-link Planning & Precautions

MC_0120

S-link is a "CAN" based control system with full intelligent communication between all units in the system.

Main advantages include:

- Round, compact and waterproof plugs with unique keying and colour coding to avoid faulty hookup.
- An unlimited number of commands or information transfer on a single cable.
- Proprietary Slepner commands but built 100% on NMEA 2000 standard.

Routing the Backbone:

Keep routing backbone spur cables to a minimum. Avoid routing the S-link cables close to equipment that might cause interference to the S-link signals such as radio transmitter equipment, antennas or high voltage cables. The backbone MUST be terminated at each end with the 6 1327 End Terminator.

Spur cables:

Spur cables can be left unterminated *(NB: Routing can be prepared for future additional equipment)*. Make sure to protect open connectors from water and moisture to avoid corrosion in the connectors.



MG_0170

EN MC_0157

PDC 301

! 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

EN MC_0157

Startup and Commissioning

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.)**
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. To activate for PMS the VFD parameter 20.12 "Run enable 1 source" must be set to DI1, 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 thruster is running it will fault displaying fault code 36101.1.204 PMS SIGNAL LOST.

PDC-301 Load Sharing

The Load Sharing limitation allows the system to limit the combined load on the generator from a bow and stern thruster when both thrusters are used at the same time. The load sharing will dynamically limit the thrust request for each thruster depending on the joystick position and limit settings. Load Sharing is configured by adjusting the PDC-301 parameter "Load share limit" in SETUP from any PJC2xx panel. See AC series thruster user manual (document ID 6054) for a detailed explanation and setup guide.

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 overtemperature shutdown:

If the electric motor winding temperature exceeds 150°C the motor will stop and 'Motor Overtemp' 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)

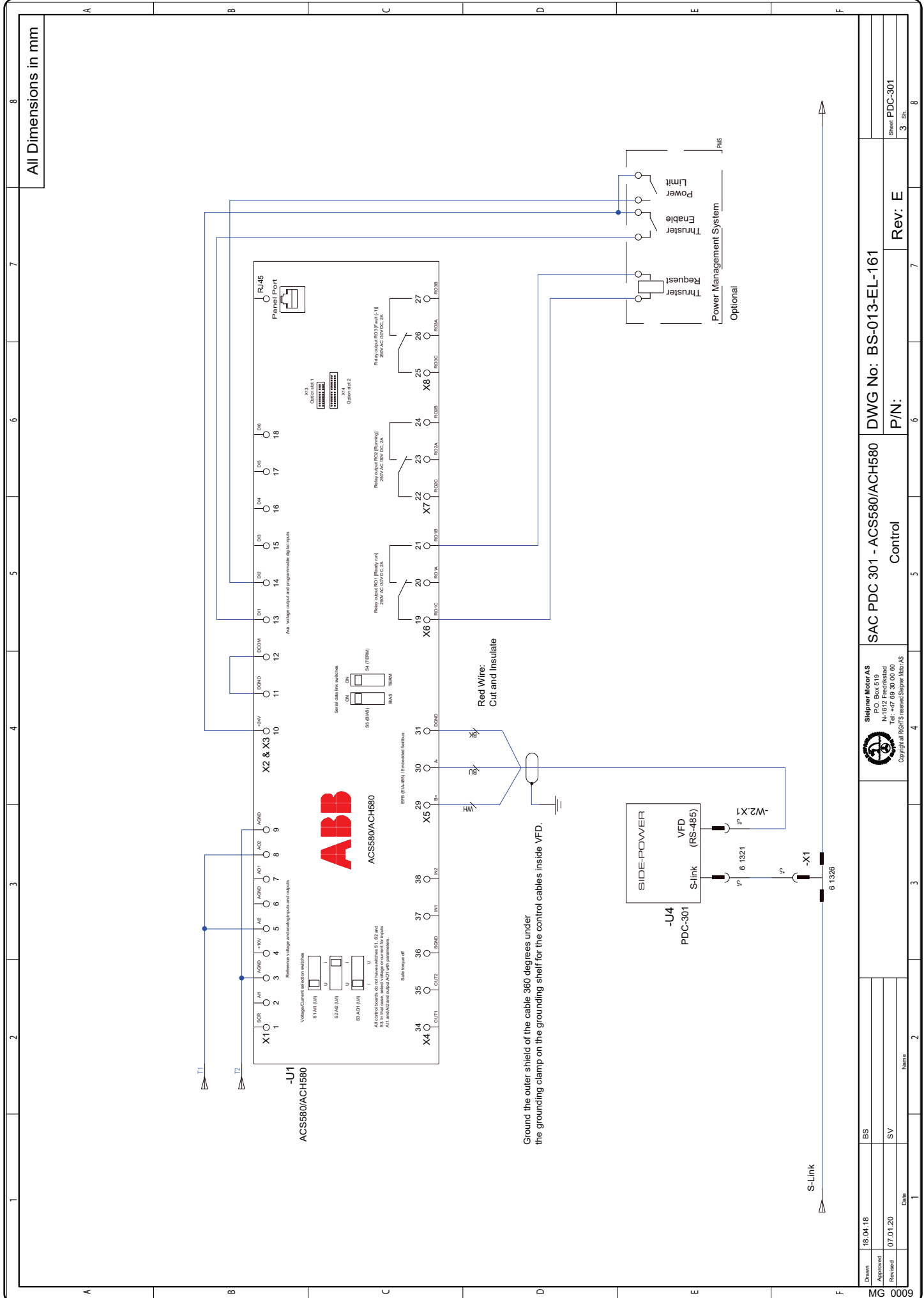
Item no.	Supply Voltage	Max current draw A	Minimum power cable dimensions	
			Temp class 70 Multi core mm ²	Temp class 90 Multi core mm ²
SAC240/250-x-2	208-240V 3-phase	51	25	10
SAC240/250-x-4	380-440V 3-phase	28	10	4
SAC320/300-x-2	208-240V 3-phase	80	35	25
SAC320/300-x-4	380-440V 3-phase	46	16	10
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

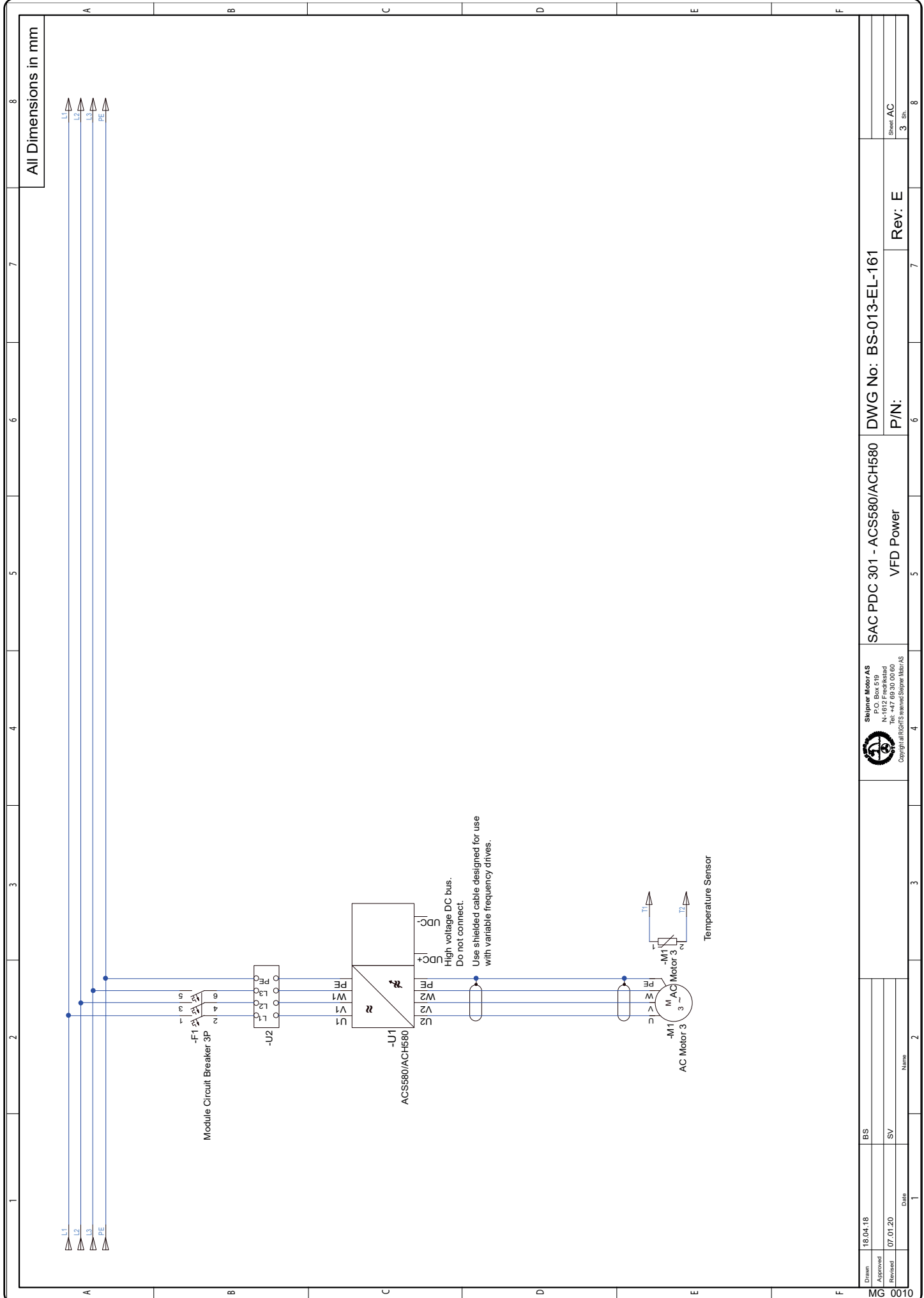


Ground the outer shield of the cable 360 degrees under the grounding clamp on the grounding shelf for the control cables inside VFD.



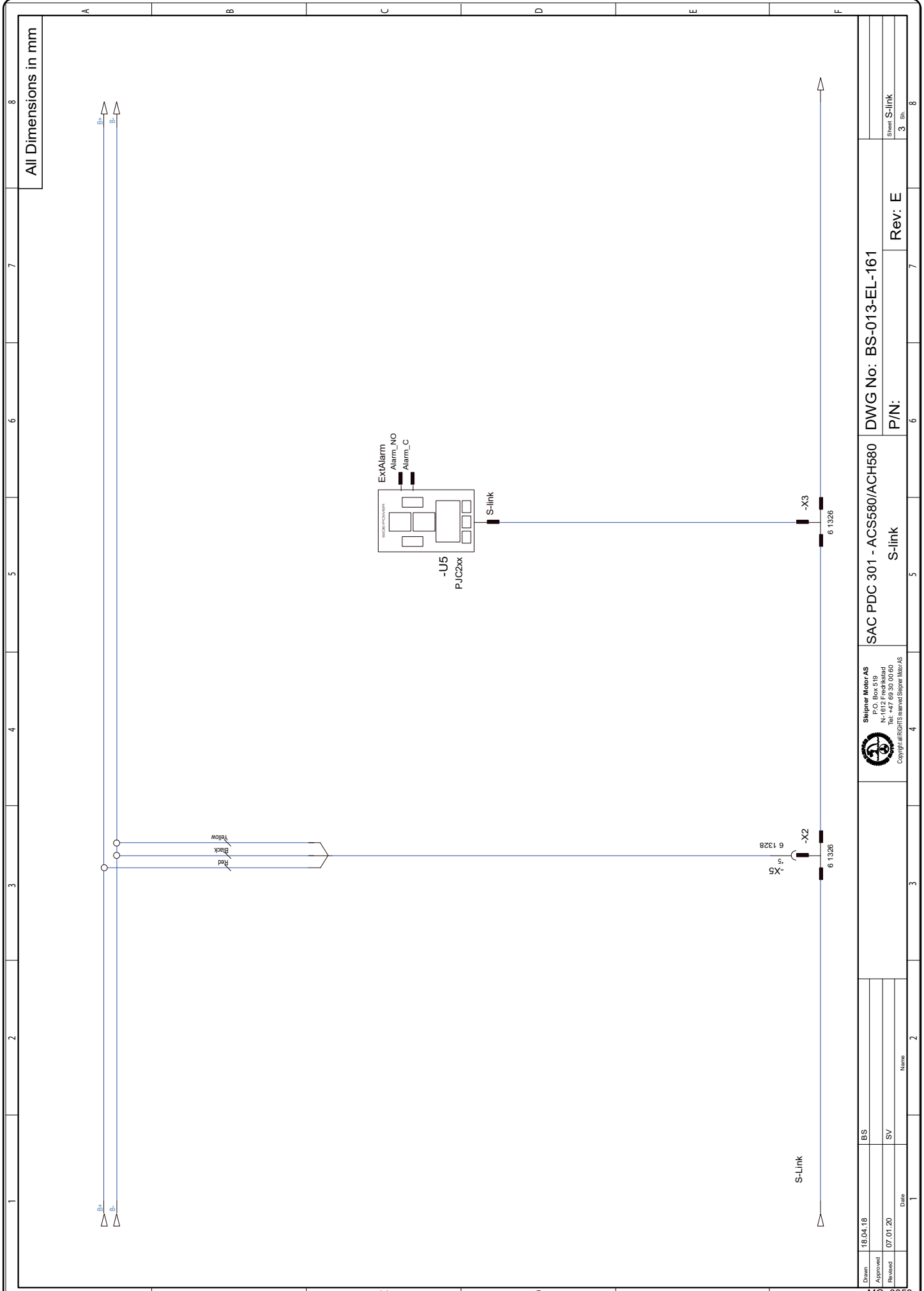
Drawn	18.04.18	BS
Approved		
Revised	07.01.20	SV
Design		
Name		
SAC PDC 301 - ACS580/ACH580 Control		
DWG No: BS-013-EL-161		Rev: E
P/N:		3 Sh.
SAC PDC 301 - ACS580/ACH580 Control		Sheet PDC-301
Slipdrive Motor AS P.O. Box 519 N-1612 Frestekland Tel. +47 69 30 00 80		
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All Dimensions in mm



Drawn	18.04.18	BS	DWG No: BS-013-EL-161
Approved			
Revised	07.01.20	SV	P/N: 6
			Rev: E
			3 Sh.
			8

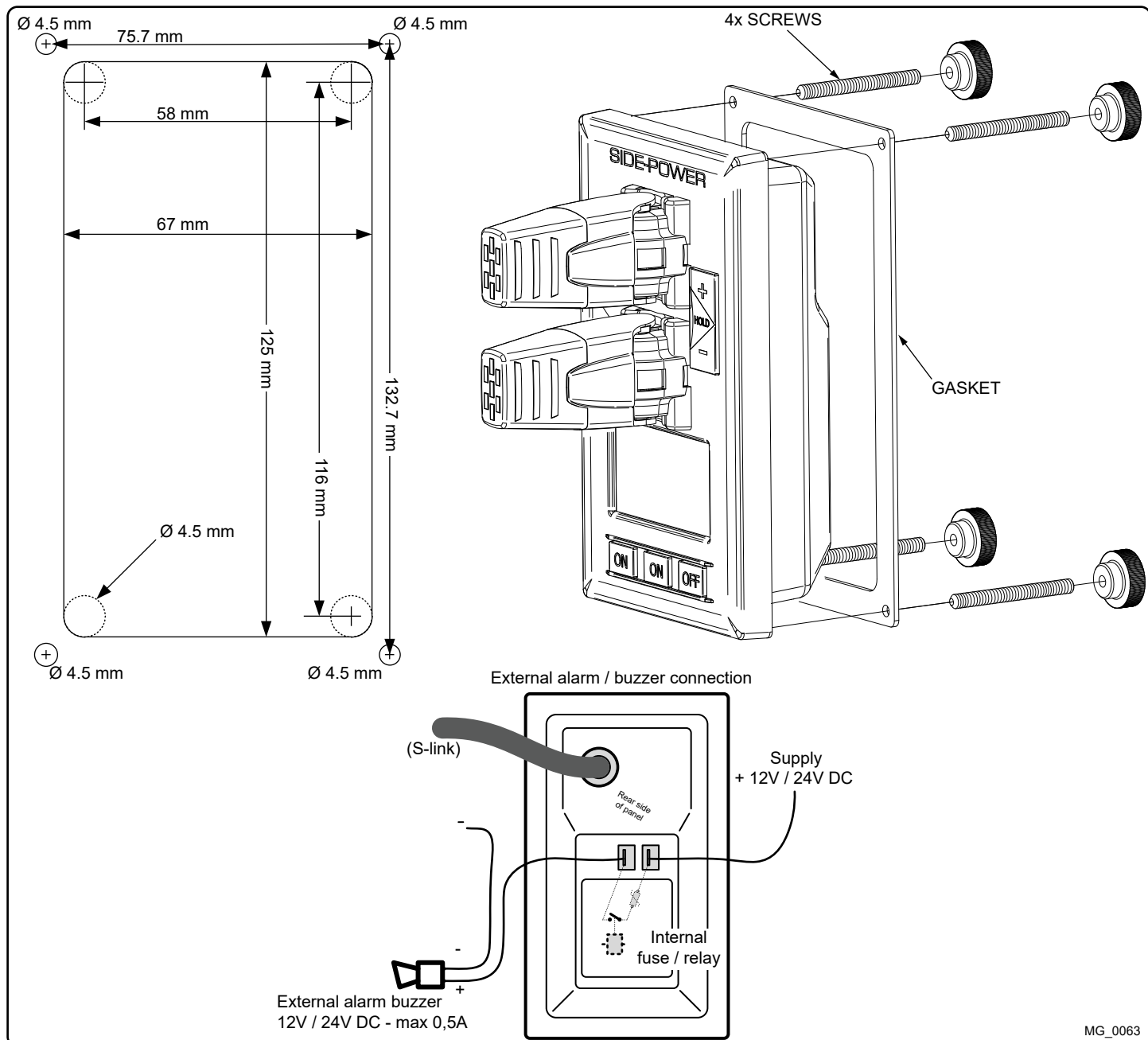
Shipper Motor AS
 P.O. Box 519
 N-1612 Frestkaland
 Tel: +47 69 30 00 60
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All Dimensions in mm

1	2	3	4	5	6	7	8
A	B	C	D	E	F		
Drawn	BS			SAC PDC 301 - ACS580/ACH580		DWG No: BS-013-EL-161	
Approved	SV			S-link		P/N:	
Revised	07.01.20			S-link		Rev: E	
Date				S-link		Sheet S-link	
				S-link		3 Sh.	
MG 0358							


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 Tel: +47 699 30 00 60
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Control Panel Installation

MC_0042

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

Find a suitable location for the control panel where it does not obstruct or is obstructed by other devices. Install the control panel on a flat surface where it is easy to use.

1. Use the supplied cut-out template to mark the area to remove on your control dash.
2. Cut out the area per template for the control panel. **(NB: If the front surface around your cut out is jagged or chipped, use a sealant to assist the gasket.)**
3. Place the gasket to the back face of the panel
4. Plug cables into the connectors at the rear of the control panel.
5. Insert the control panel in place and fasten screws.
6. Insert the control panels covering caps.

- Propeller is fastened correctly to the shaft.
- Propeller turns freely in tunnel.
- Lower-unit is filled with gearoil.
- 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 gearhouse and propeller but NOT on the anode or the gearhouse lid where the propeller is fastened.
- Oil tank is fitted above the waterline as required and filled with gearoil.
- Correct drive direction as per controlpanel.
- The bolts holding the gearhouse and motorbracket 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 controlpanel:

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:

.....

For the most up to date documentation, we advise you to visit our website www.side-power.com for the spare parts list.

For additional supporting documentation, we advise you to visit our website www.side-power.com for the spare parts list.

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

Dotted lines for writing notes.

Worldwide sales and service



www.side-power.com



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

The information given in the document was correct at the time it was published. However, Sleipner Motor AS can not accept liability for any inaccuracies or omissions it may contain. Continuous product improvement may change the product specifications without notice. Therefore, Sleipner Motor AS can not accept liability for any possible differences between product and document.

MC_0030