SLEIPNER
Ocean born. Tech bred.

Installation manual

For E-vision Electric Retractable Thruster Models
ER-L&V130, ER-L&V170, ER-V210



DOCUMENT ID: 7241
REVISION: 23
YEAR: 2026

Installation Manual

Responsibility of the Installer 3

Product Measurements 5
Product clearance requirements 6
Product Specifications 6
Hull Specifications 6

Positioning of the Retract Thruster 7
Preparing a Sandwich Hull for Retract Systems 8
Marking and Trimming of SRF Flange 9
Cut out the hatch 10
Pre-mount the SRF flange and thruster housing 11
Positioning of the hatch attachment holes 12
Drilling the attachment holes in the hatch 13
Pre-install the hatch 14
SRF flange installation 17
Thruster housing installation 19
Hatch installation 20
V-Motor to House Installation 22
L-Motor to House Installation 23
Support For the Motor 24
Electrical Installation for e-vision retract thrusters 25
Motor lug connection 26
Electrical reference guide 27

Manual Main Switch Wiring Diagram 12V Retract Thruster 28
Automatic Main Switch Wiring Diagram 12V Retract Thruster 29
Manual Main Switch Wiring Diagram 24V Retract Thruster 30
Automatic Main Switch Wiring Diagram 24V Retract Thruster 31

S-Link System Description 32
Check drive shaft alignment 33
Calibrate drive shaft alignment 33
Actuator Configuration 33
LED Indication 33
Post Installation Checklist 33

Sleipner Group Waste Disposal and Recycling Guide 35

Service and Support 36
Product Spare Parts and Additional Resources 36
Warranty Statement 36
Patents 36

Warnings and safety

It is essential to read, understand, and follow all instructions, warnings, cautions, and procedures contained within this document. Failure to do so may result in serious injury, death, damage to property or equipment, product malfunction, and may affect warranty coverage.

Warnings and cautions requiring special attention are highlighted. Always read and understand the relevant safety information before using this product or performing any procedure described in this document.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or damage to the product.

General:

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

⚠ WARNING

Accidental activation of the retract mechanism can cause serious injury due to the high-pressure force used for closing the hatch. IF operating the hatch during any work/ maintenance around or inside the retract hatch, USE CAUTION.



MC_0627

For retract thrusters

- The installation position of stern-mounted retract thrusters must not conflict with the water flow from the propulsion propeller.
  Note: Consult a naval architect for an exact position.

- Apply anti-fouling paint to the inside of the retractable thruster housing.
  Note: Do not paint the drive shaft.

MC_0474

For Sleipner thruster systems:

- Do not install the thruster system in any position that requires modification of hull stiffeners or stringers, as this may compromise hull integrity. Consult the boat builder if modification is absolutely necessary.
- Never operate the thruster out of water. The propeller may reach extremely high speeds and cause damage.
- Handle the thruster motor with care. Do not rest the motor on its drive shaft, as this may cause damage.

MC_0425

For lithium batteries for proportional thruster systems:

If a lithium battery system is installed to supply proportional thrusters, ensure the battery is designed to output a continuous supply of the required thruster current. An under-rated battery management system can suddenly disconnect the load which may lead to dangerous situations. Ensure that you operate with high-quality batteries intended for maritime use.

- All Sleipner proportional thrusters are compatible with lithium batteries.
- When connected to a lithium battery, the PPC must be running firmware version 1.033 or later.

(Note: Operating products outside specified ratings will void the warranty).

MC_0502

Sleipner S-Link™ Systems

- Only Sleipner S-Link™ products or authorized third-party control equipment may be connected directly to the S-Link™ bus.
- Non-authorized third-party equipment must always be connected through a Sleipner interface product.
- Connecting unauthorized equipment directly to the S-Link™ bus will void all warranties for connected Sleipner products.
- If third-party control equipment is interfaced to the S-Link™ bus through a Sleipner interface product, at least one Sleipner control panel must be installed to enable efficient system diagnostics and troubleshooting.

MC_0105

For Sleipner eVision electric motors:

- When installing the thruster electric motor in small compartments, ensure the compartment is 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 house 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 props.
- Do not install the electric motor close to easily flammable objects or equipment.
- 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.

- eVision Thruster Motor must be upgraded to firmware version V1.015 or newer. eVision Thruster Motors shipped before November 28. 2022 needs to be upgraded.
- Control panel PJC2xx must be upgraded to firmware version V3.018 or newer. Control panel PJC2xx with hardware V2.000 or older will not support eVision Thruster Motors. Sleipner stopped the production of PJC2xx with HW version V2.000 in Q2 2020. Note that no mechanical modifications are required to replace older PJC2xx panels with PJC2xx HW version V3.000 or newer. Hardware version can be found in the panel info menu or using S-Link programmer. From HW version V3.000, the version is printed on the serial number label. Control panel PJC42x must be upgraded to firmware version V1.002 or newer. Control panel PJC3xx will not support eVision Thruster Motors.
- Retract controller 150000 must be upgraded to firmware version V1.036 or newer. Function must be configured to “ERV/ ERL” on both 150000 and eVision Thruster Motor. Retract controller SR 6 1242 will not support eVision Thruster Motors.
- Automatic Main Switch works with eVision Thruster Motor without additional firmware update. But an upgrade to the latest firmware is always recommended.
- Gateway works with eVision Thruster Motor without additional firmware update. But an upgrade to the latest firmware is always recommended.
- ESI-1 works with eVision Thruster Motor without additional firmware update. But an upgrade to the latest firmware is always recommended.
- S-link remote controller works with eVision Thruster Motor without additional firmware update. But an upgrade to the latest firmware is always recommended.

MC_0452

⚠ CAUTION

Do NOT remove the red spacer block until the hatch installation is complete. The “Hatch Installation” section specifies when it should be removed.



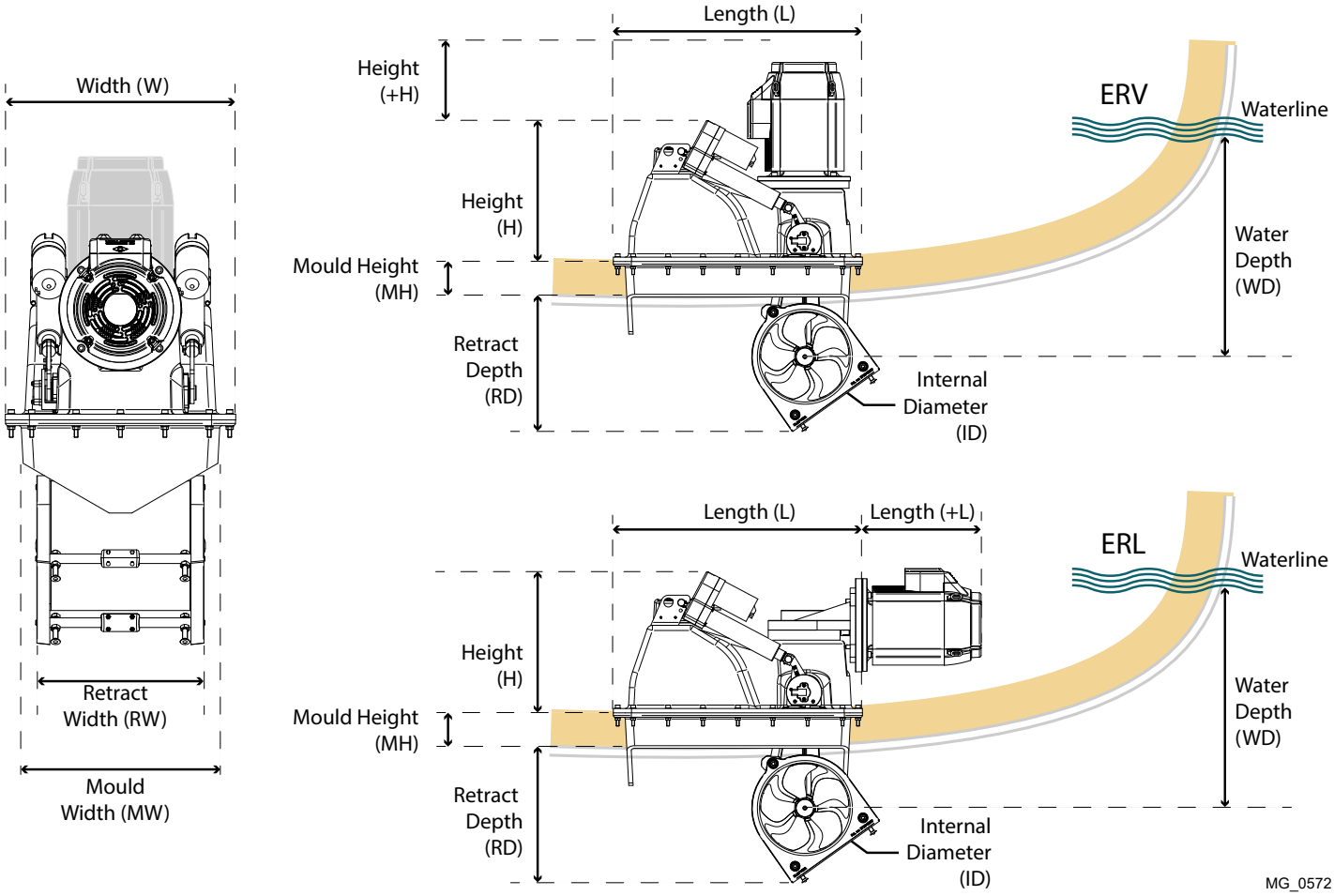
MC_1192

Product dimensions

Measurement code	Measurement description	ERV130 24V		ERV130 48V		ERV170 24V		ERV170 48V		ERV210 24V		ERV210 48V	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
L	SRF flange & motor housing length	687	27,04	687	27,04	687	27,04	687	27,04	687	27,04	687	27,04
+H	Motor supplementary measurement (Height)	120	4,72	120	4,72	120	4,72	120	4,72	159	6,2	159	6,2
H	Motor housing height	389	15,3	389	15,3	389	15,3	389	15,3	389	15,3	389	15,3
MH	SRF flange height	98	3,8	98	3,8	98	3,8	98	3,8	98	3,8	98	3,8
RD	Retracted hatch supplementary measurement	371	14,6	371	14,60	378	14,6	378	14,6	378	14,6	378	14,6
ID	Tunnel diameter	250	9,84	250	9,84	250	9,84	250	9,84	250	9,84	250	9,84
W	SRF flange & motor housing width	481	18,9	481	18,9	481	18,9	481	18,9	481	18,93	481	18,93
RW	Retracted hatch width	349	13,7	349	13,7	349	13,7	349	13,7	349	13,7	349	13,7
MW	SRF flange inner frame width	417	16,4	417	16,4	414	16,29	414	16,29	417	16,4	417	16,4
WD	Water depth - surface to tunnel center	250	9,84	250	9,84	250	9,84	250	9,84	250	9,84	250	9,84

Measurement code	Measurement description	ERL130 24V		ERL130 48V		ERL170 24V		ERL170 48V	
		mm	inch	mm	inch	mm	inch	mm	inch
L	SRF flange & motor housing length	687	27,04	687	27,04	687	27,04	687	27,04
+H	Motor supplementary measurement (Height)	9	0,35	9	0,35	9	0,35	9	0,35
H	Motor housing height	389	15,3	389	15,3	389	15,3	389	15,3
MH	SRF flange height	98	3,8	98	3,8	98	3,8	98	3,8
RD	Retracted hatch supplementary measurement	378	14,7	378	14,7	378	14,7	378	14,7
ID	Tunnel diameter	250	9,84	250	9,84	250	9,84	250	9,84
W	SRF flange & motor housing width	480	18,9	480	18,9	481	18,93	481	18,93
RW	Retracted hatch width	349	13,7	349	13,7	349	13,7	349	13,7
MW	SRF flange inner frame width	417	16,4	417	16,4	417	16,4	417	16,4
WD	Water depth - surface to tunnel center	250	9,84	250	9,84	250	9,84	250	9,84

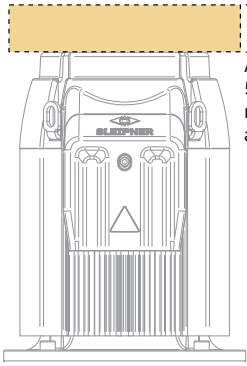
MG_0499



MG_0572

Product clearance requirements

This product has clearance considerations extending the base product footprint. Follow the clearance requirements when planning your installation.



Allow a minimum of 50mm above the fan to maintain appropriate airflow to the cooling fan.

Product specifications

Product	Nominal Operating Voltage	Maximum Operating Voltage	Thrust is kg / lbs at (V)	Power Output kW / Hp	Weight kg / lbs	Maximum Operation Time
ERV130 24V	21V	31V	130 kg / 284 lbs (21V)	5.1 kW / 6.8 hp	83.4/183.9	Runtime @ 100% thrust: 2-3min duty cyle at 20°C.
ERV130 48V	42V	62V	130 kg / 284 lbs (42V)	5.1 kW / 6.8 hp	83.2/183.4	
ERL130 24V	21V	31V	130 kg / 284 lbs (21V)	5.1 kW / 6.8 hp	92.5/203.9	
ERL130 48V	42V	62V	130 kg / 284 lbs (42V)	5.1 kW / 6.8 hp	92.3/203.5	
ERV170 24V	21V	31V	170 kg / 374 lbs (21V)	7.3 kW / 9.9 hp	83.9/185	
ERV170 48V	42V	62V	170 kg / 374 lbs (42V)	7.3 kW / 9.9 hp	83.7/184.5	
ERL170 24V	21V	31V	170 kg / 374 lbs (21V)	7.3 kW / 9.9 hp	93/205	
ERL170 48V	42V	62V	170 kg / 374 lbs (42V)	7.3 kW / 9.9 hp	92.8/204.6	
ERV210 24V	21V	31V	210 kg / 462 lbs (21V)	10.4 kW / 14 hp	90.8/200.2	
ERV210 48V	42V	62V	210 kg / 462 lbs (42V)	10.4 kW / 14 hp	90.6/199.7	

Electronic control unit 150000 specifications	
Minimum supply voltage	7VDC
Nominal supply voltage	12/24VDC
Maximum supply voltage	31VDC
Minimum supply voltage for deployment	11.7VDC for 12V retract thrusters 23.4VDC for 24V and 48V retract thrusters
Fuse	40A
Operating temperature	-10°C to +60°C 14°F to +140°F
Weight	0.5 kg/1.1 lbs

Hull specifications

⚠ CAUTION

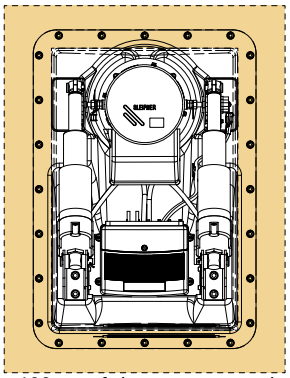
Use sealants, adhesives or bonding material compatible with the materials of your vessels hull and Sleipner product. For information regards the material in Sleipner products, see table below.

Product		Resin
Housing	SR(P)80/100	Polyester
Flange	SRF-185-GRP	Polyester
Flange	SRF-250-GRP	Polyester
Flange	SRF-300-GRP	Polyester
Flange	SRF-386-GRP	Polyester

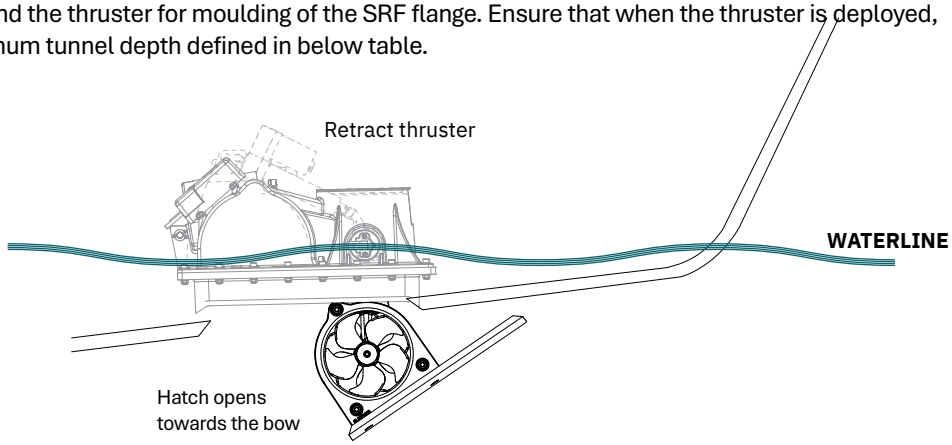
MC_0609

Retract Thruster

The thruster must always be installed so the hatch is opened towards the bow. Ensure enough space for the complete retract unit including room for installation of SRF flange and for future service.
Allow minimum 100mm of clear space around the thruster for moulding of the SRF flange. Ensure that when the thruster is deployed, the depth of the propeller exceeds the minimum tunnel depth defined in below table.

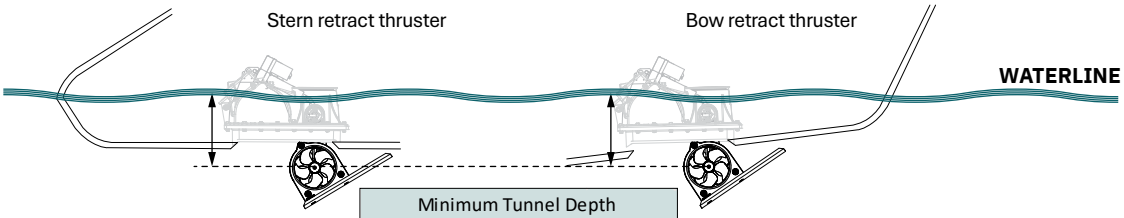


100mm of clear space around the thruster for moulding of the SRF flange.



Installing the thruster below the waterline as outlined is important for two reasons:

- Avoid drawing air from the surface which will reduce performance and increase noise levels.
- To get as much water pressure as possible to achieve maximum thrust.



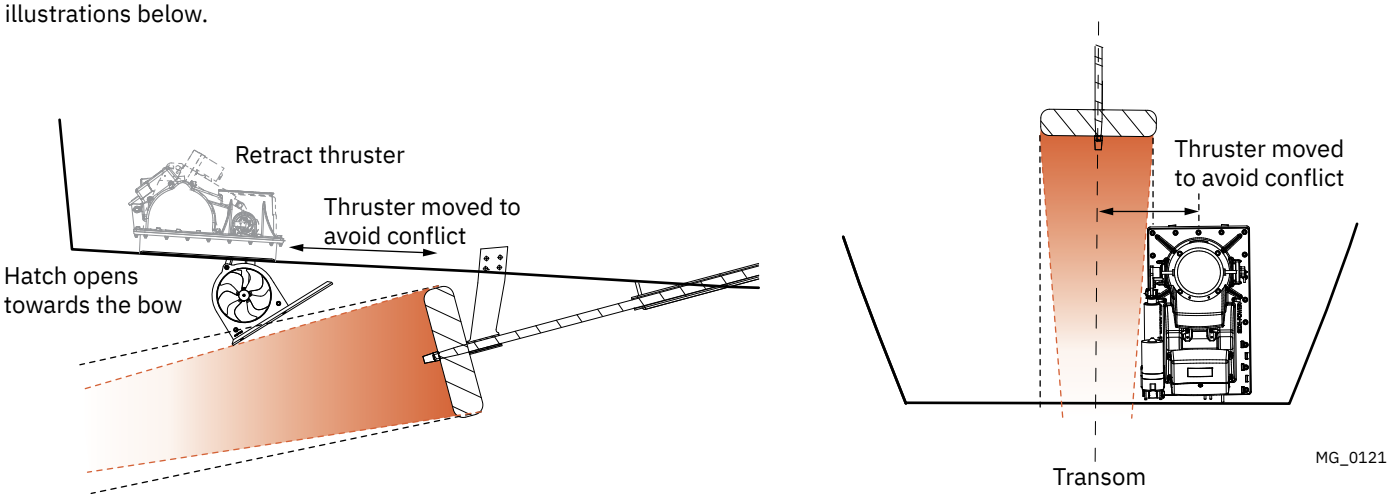
Minimum Tunnel Depth	
Retract system 80 to 100	185mm
Retract system 130 to 240	250mm
Retract system 250 to 300	300mm
Retract system 650	386mm

Bow installation

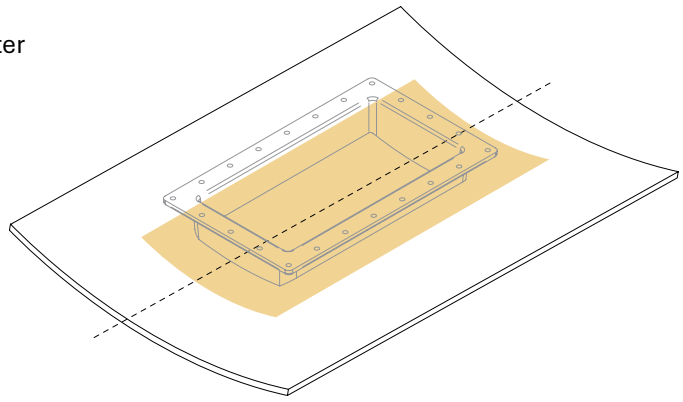
The thruster must be installed in the center line of the keel and as far forward as possible while following the minimum tunnel depth requirement.

Stern installation

To avoid conflict between the thruster and propulsion propellers, trim tabs or rudders, the stern installation can be offset from the keel center line.
See illustrations below.



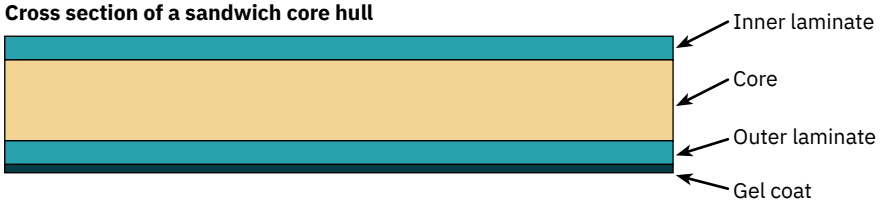
- Ensure to have a minimum of 100mm space around the thruster installation to have service access.
- Bow thrusters must be positioned on the boat center line.
- Stern thrusters can be positioned off the centre line.



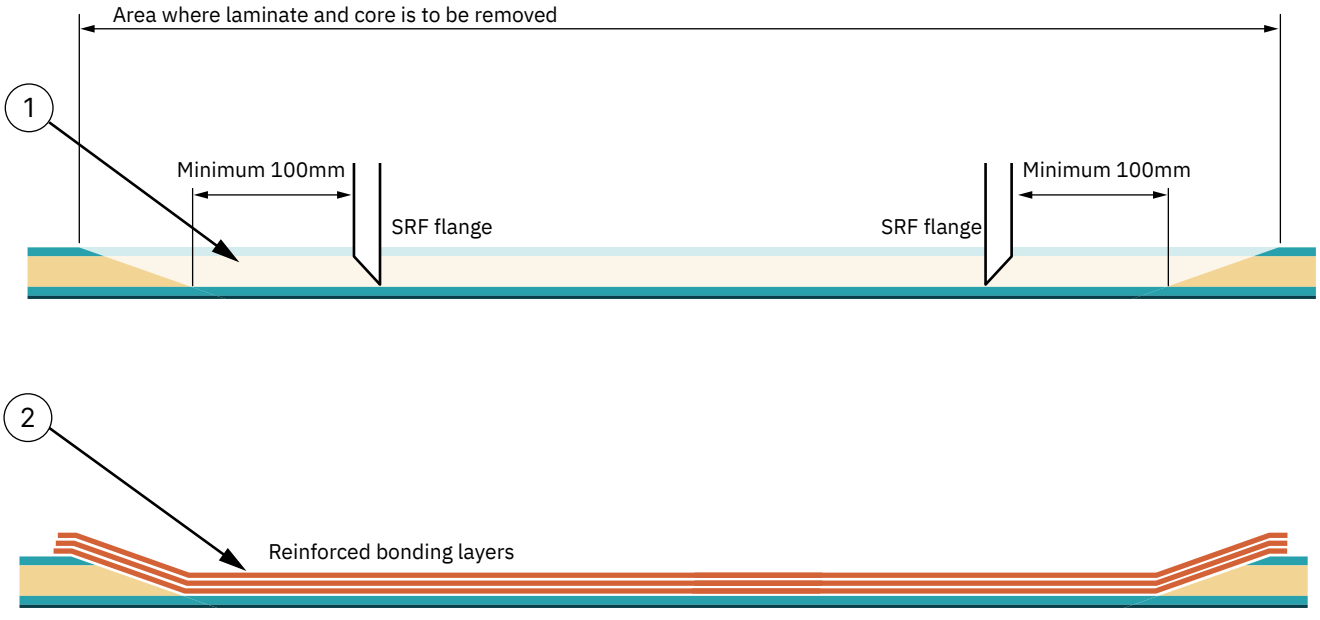
MC_0792

For vessels with sandwich hull construction, additional reinforcement of the area around the SRF flange is required.

Cross section of a sandwich core hull



1. To achieve maximum strength and bonding in the area around the installation of the SRF flange remove the inner laminate and core material to expose the outer laminate. Remove enough area for a 100mm (minimum) clearance surrounding the SRF flange.
2. Reinforce the area by applying several bonding layers to strengthen the hull for the operation of the retract thruster.



MG_0831

1. Flip the SRF flange upside down and position it at the identified installation location. MC_0773
   - For bow thrusters, this is usually symmetrical about the vessel centerline.
   - For stern thrusters, the position of the thruster may deviate from centerline.

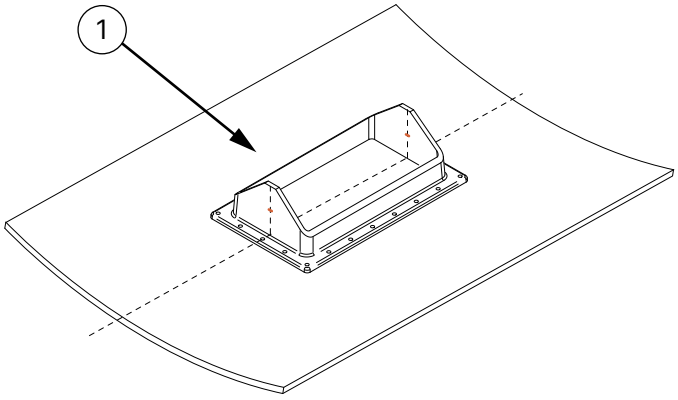
2. Use the internal edge to mark were to cut out the thruster hatch from the hull.

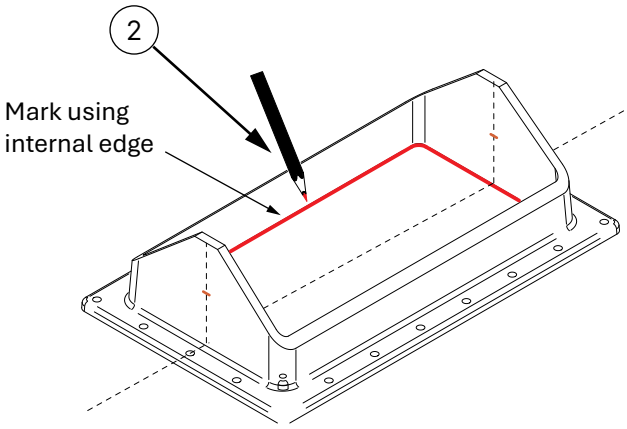
3. The SRF flange must be adapted so that the two longitudal edges on the SRF flange run flush with the hull. To do so the SRF flange must be trimmed down to match the hull profile curvature. Use a suitable tool to mark the cutting line on the SRF flange.

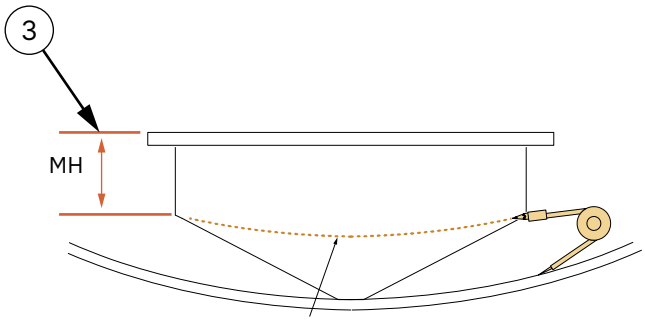
Important: The cutting line position must be according to the MH measurement for the actual thruster model. See table in topic "Thruster measurement".

For guidance or methods to transfer the hull profile to the SRF flange for cutting, consult a naval architect.

4. DO NOT cut the SRF flange length edge at this stage.



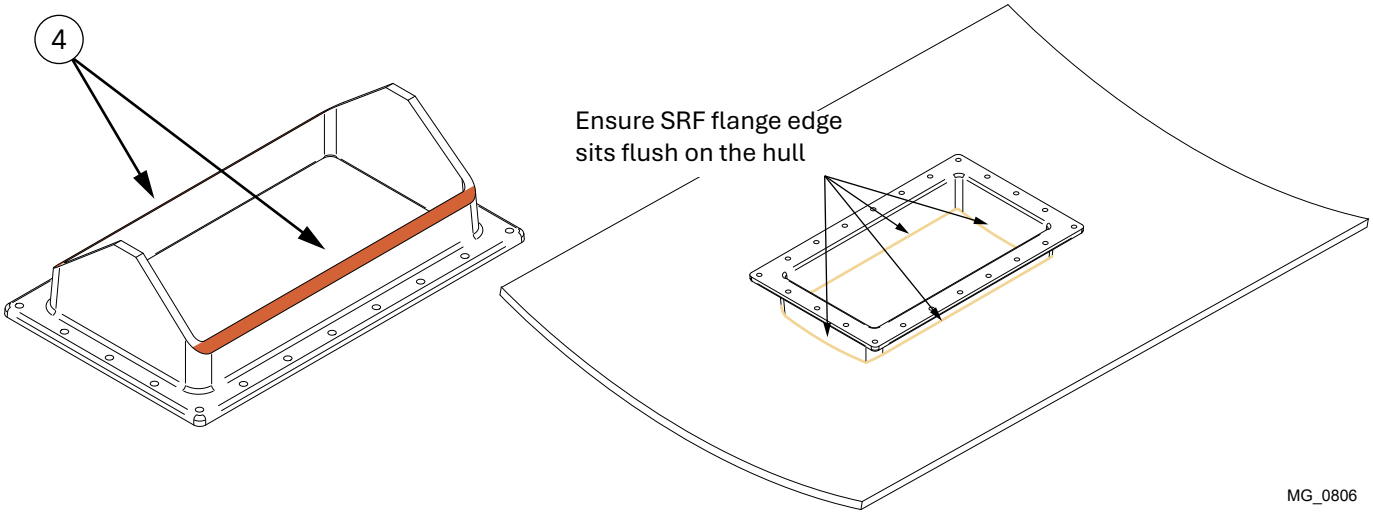




Important

The minimum SRF flange height is stated on the product measurment page (MH)

-Ø185mm = 72mm
-Ø250mm = 98mm
-Ø300mm = 115mm
-Ø386mm = 148mm



MG_0806

1. When cutting from inside, prepare for cutting by drilling 4 holes in each corner of the marked area at 45º angle inwards against the centerline.

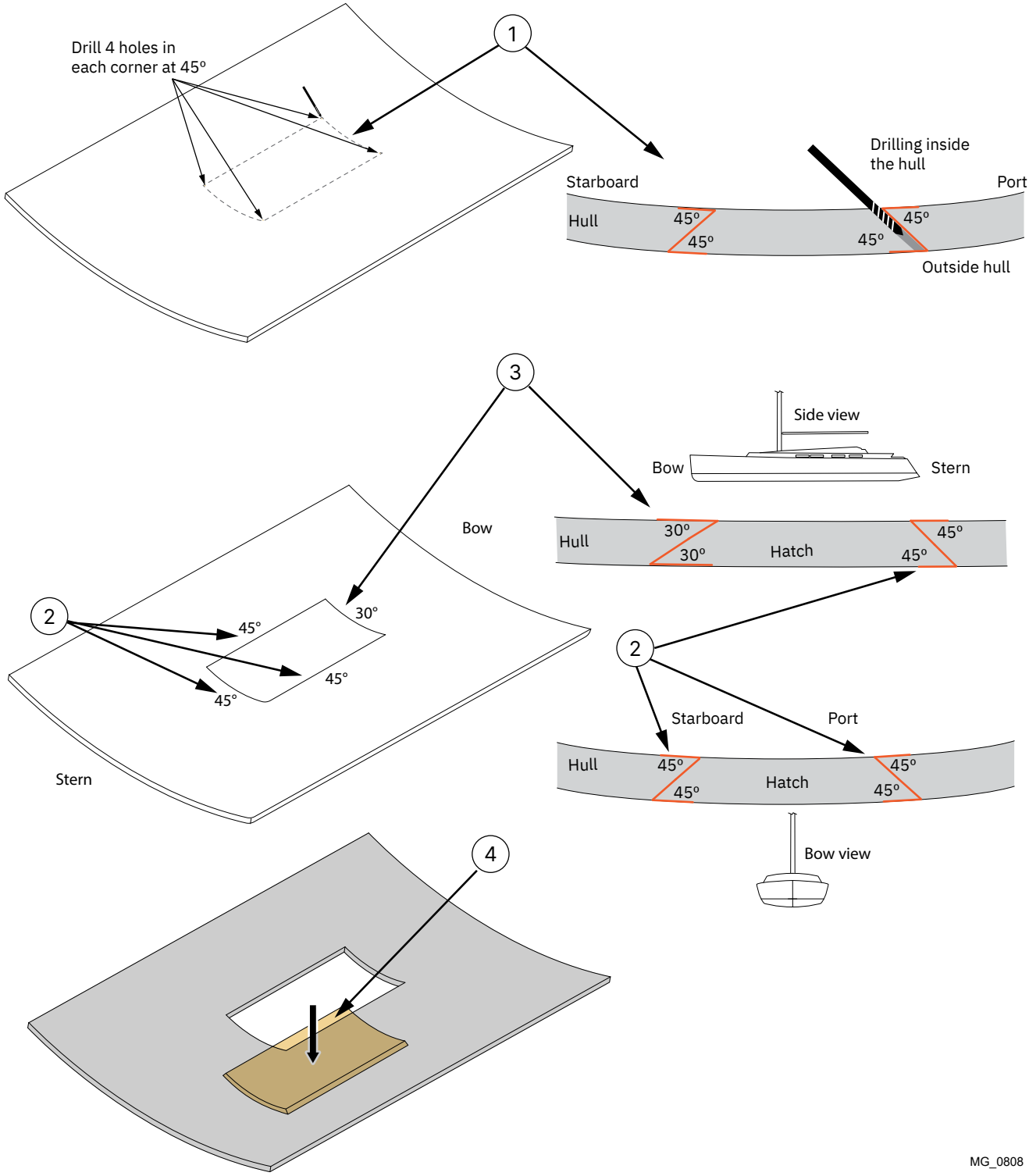
2. The hatch opening must be cut at an angle of **45º** on starboard, port and stern sides.

3. Cut angle **30º** on the side facing the bow . This ensures that forces from water hitting the closed hatch is absorbed by the hull.

MC_0774

Note: It is of great importance that these cutting angles are correct. Otherwise the hatch will jam during opening. Use a suitable cutting tool able to be set to the desired angle, e.g. a jigsaw.

4. Remove the hatch from the hull. Prevent the hatch from falling down, ensure proper support to the hatch when cutting.



MG_0808

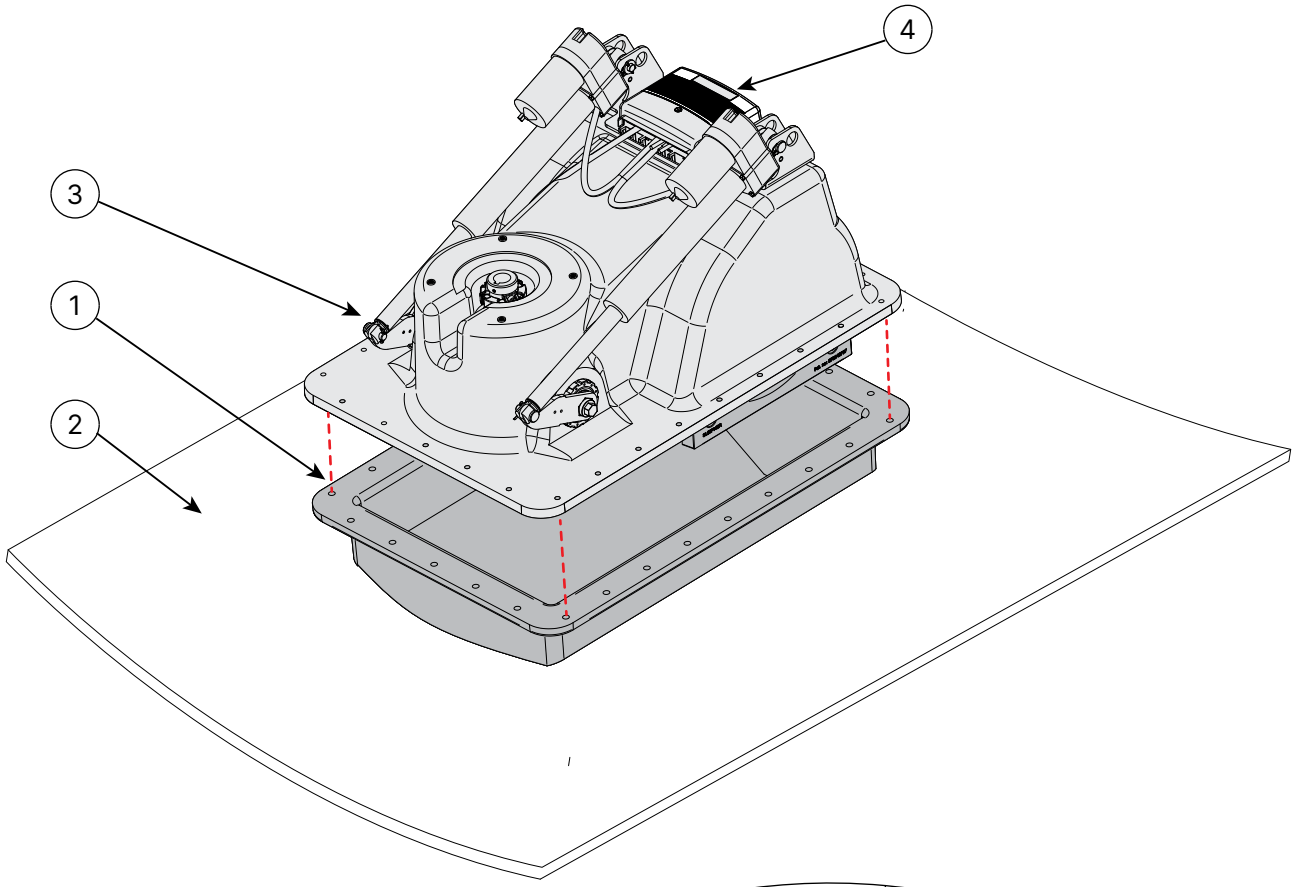
1. Position the trimmed SRF flange in the correct position over the hatch cut-out in the hull (**Reference 2**).

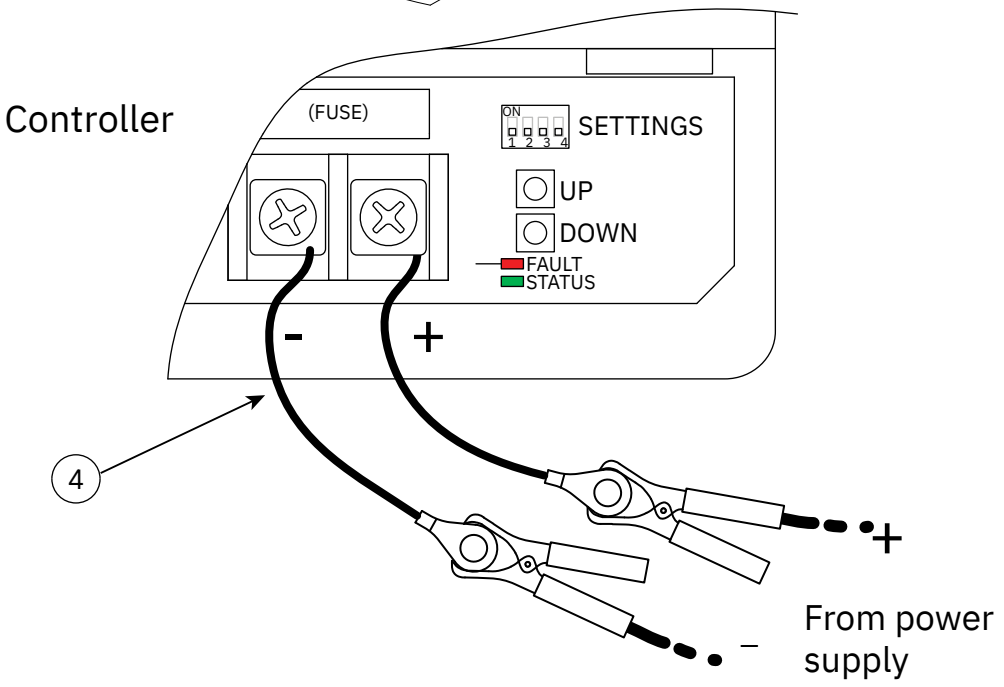
3. Install the thruster housing provisionally on the SRF flange, and secure it with 4 screws. Verify that the complete thruster assembly (SRF flange and thruster housing) is still inn correct position.

4. Prepare two power supply cables from the retract controller. Do not connect to the power supply yet.

Tip: For some thruster models, the motor is mounted on the thruster housing when delivered. The pre- mount process may be easier if the motor is removed from the housing before the pre- mount process is performed as shown in the figure below.

MC_0777





MG_0836

- Ensure that the SRF flange and the thruster housing are positioned correctly inside the hull. (See the previous topic).

1. Use a suitable aid, e.g. adhesive tape, straight edge, laser or other adequate aid to follow a straight line over the center of the hatch bolt holes, in two directions. See also detail in the bubble.

2. Apply marks on the hull, at the edges of the used aid, on the side facing the center of the bolt holes.

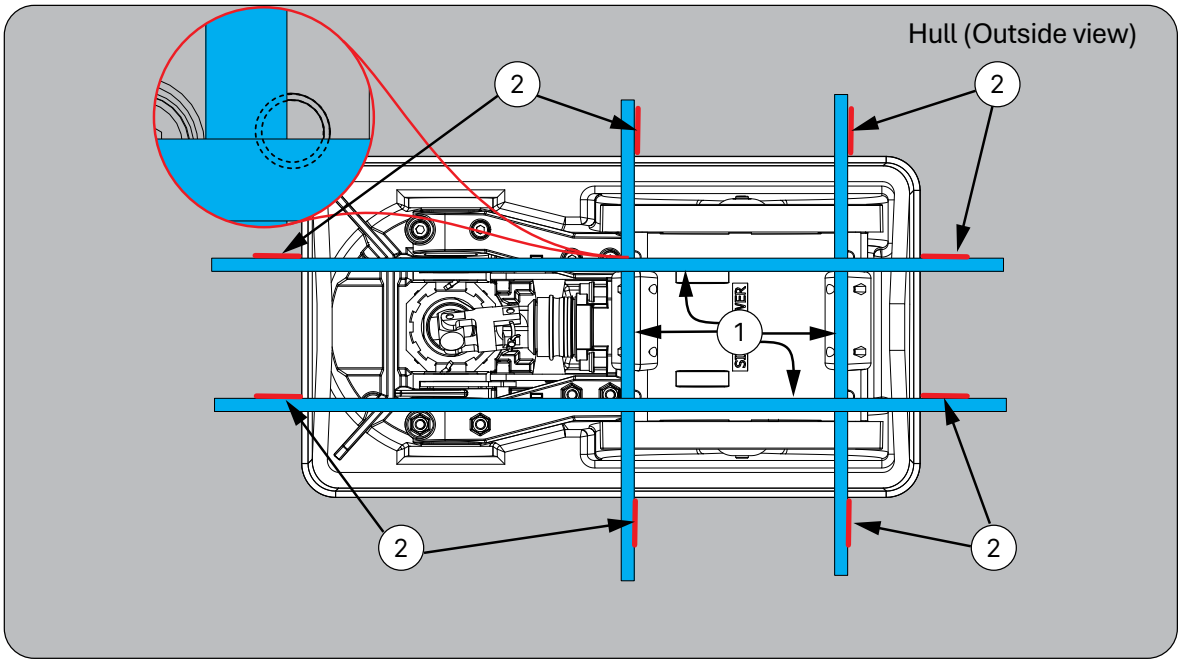
- Remove the adhesive tape (or other used aid).

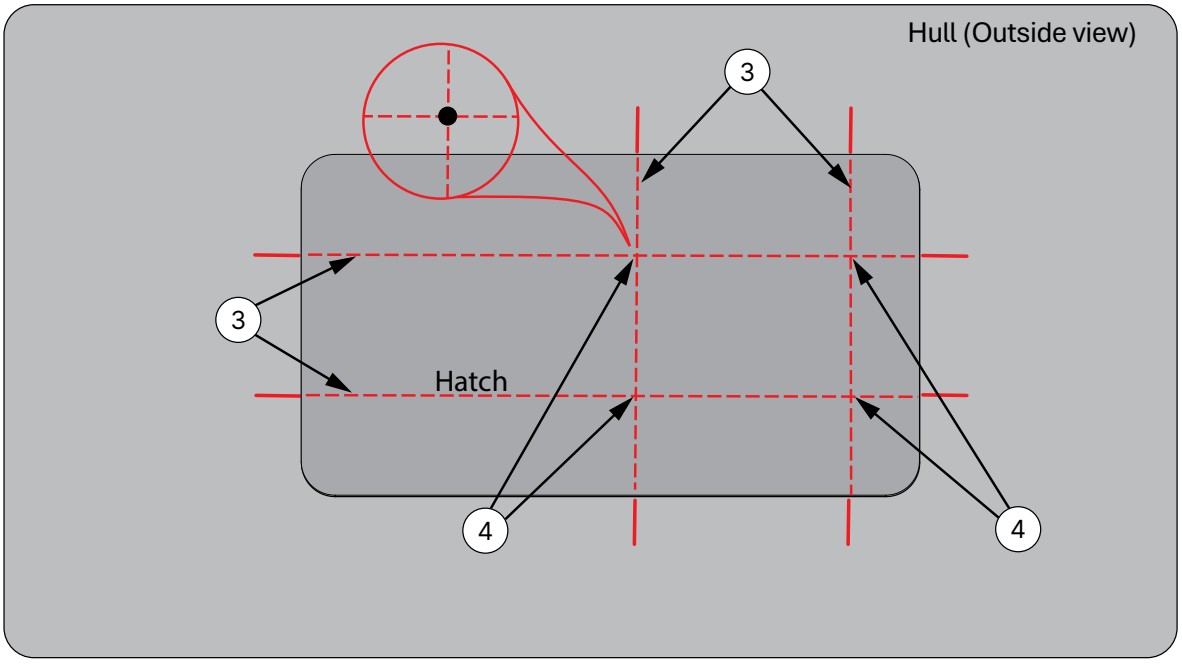
- Position the pre-cut hatch in the opening in the hull, and support it in its position.

3. Use a flexible ruler or similar to draw extended lines on the hatch, between the marks created on the hull.

4. The correct position of the hatch attachment holes are now in the intersection of the extended lines on the hatch. Make a mark in each intersection.

MC_0776



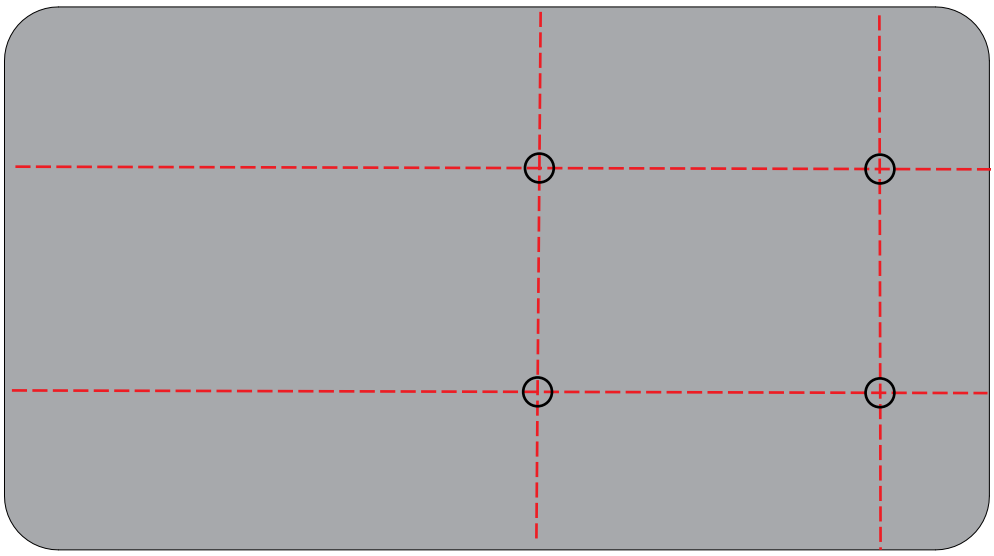


_0807

Drilling the attachment holes in the hatch

- Drill four Ø11mm holes in the center of each marking created in the previous step.
- It is recomended to use a pillar drill with a proper construction surface to ensure that the holes are drilled perpendicular to the hatch.
- Countersunk the holes after drilling.

MC_0778



MG_0811

Temporarily setting up the complete installation to ensure no conflicts during the final operation of the thruster.

1. Temporarily attach the hatch to the thruster housing by using the M10 countersunk bolts through the drilled holes in the hatch and screw them in to the hatch bolt holes.
   Note: Ensure correct orientation for the thruster to open the hatch facing the bow. Remember attachment is for temporary checking of thruster operation only.

2. Ensure that the hatch is in proper place.

- Connect the prepared power supply cables from the thruster controller to a power supply.
  (NB: Refer to the label on actuators for correct voltage)

- Set switch no. 4 on the DIP-switch marked “SETTINGS” to ON (Service mode).
  Note: **When the thruster is in Service Mode, the actuator can be moved beyond the calibration mark. Always observe the calibration mark during installation to ensure proper alignment.**

3. Press “DOWN” to extend the tunnel and check the hatch opens fully without touching the hull.

4. If the hatch is obstructed by the hull in the front, the SRF flange must be adapted so that the hatch does no longer touch the hull when in open position.

5. If necessary:
   Grind the front and side egdes of the flange a necessary amount to obtain space between the hull and the hatch.
   Note that the reference 5 illustration shows an excessive grind down in the shaded area to clarify the operation.

6. Ensure that there is a space between the twist ring and the hatch during the grinding process. **Do not allow this space to be zero**.

IMPORTANT

- If the space between the hull and the hatch is not obtained by the grinding process alone, (still with a space between the twist ring and the hatch), the flange must in addition be lifted in the aft end. Use wedges to obtain the correct height (**Reference 7**).
  When correct position is obtained, mark the wedge positions, and note the distance between the flange and the hull.

Note: The hatch contact edges and the hull contact edges MUST work as the mechanical end stop. During cruising, slamming forces from the water must be absorbed by these areas, not the thruster.

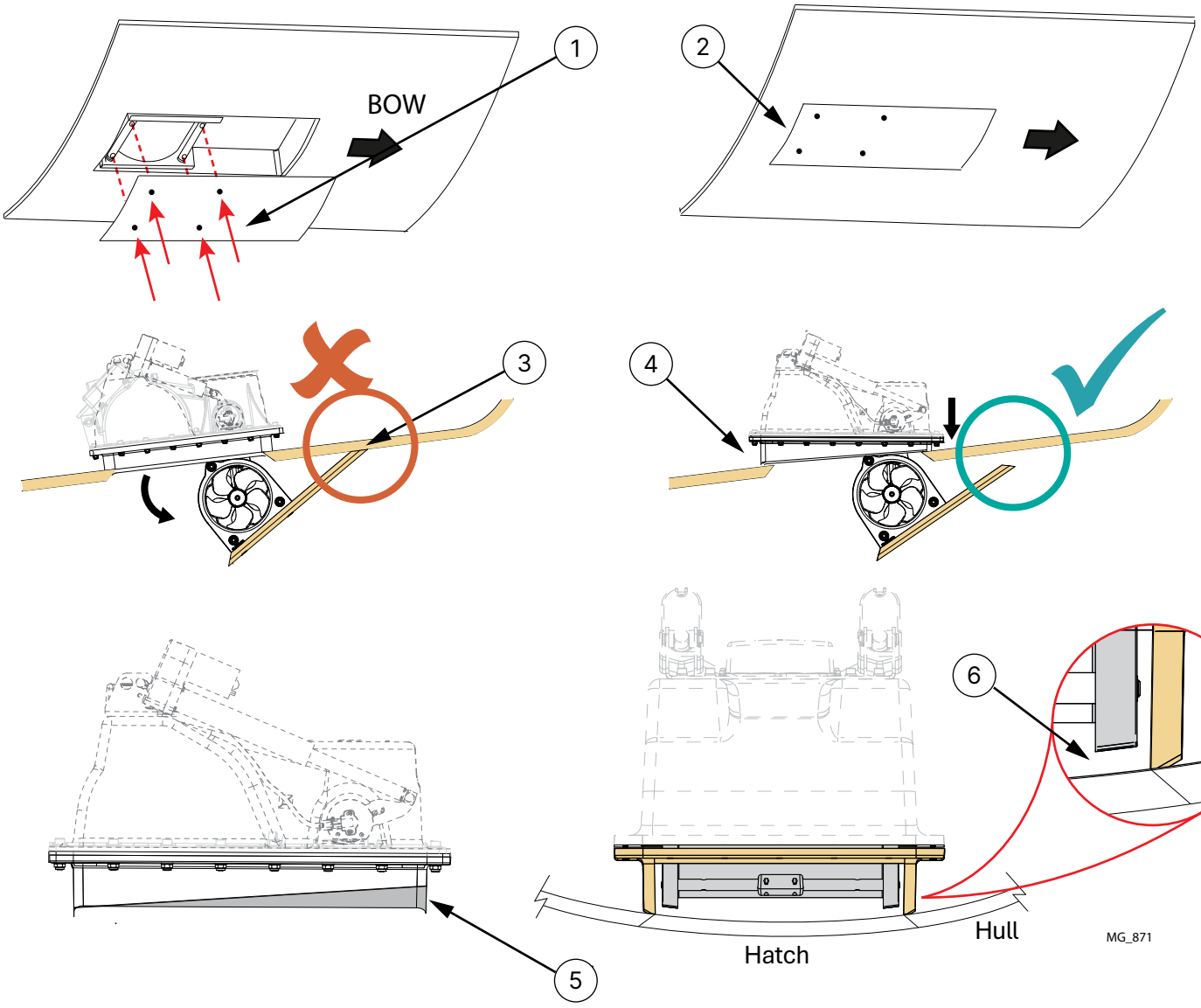
MC_0779

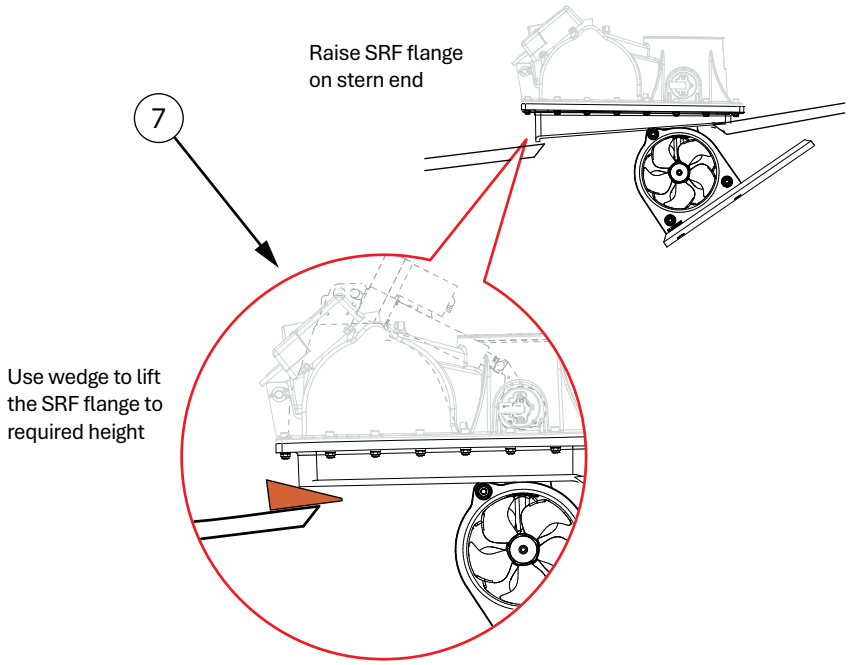
WARNING

Accidental activation of the retract mechanism can cause serious injury due to the high-pressure force used for closing the hatch. IF operating the hatch during any work/ maintenance around or inside the retract hatch, USE CAUTION.



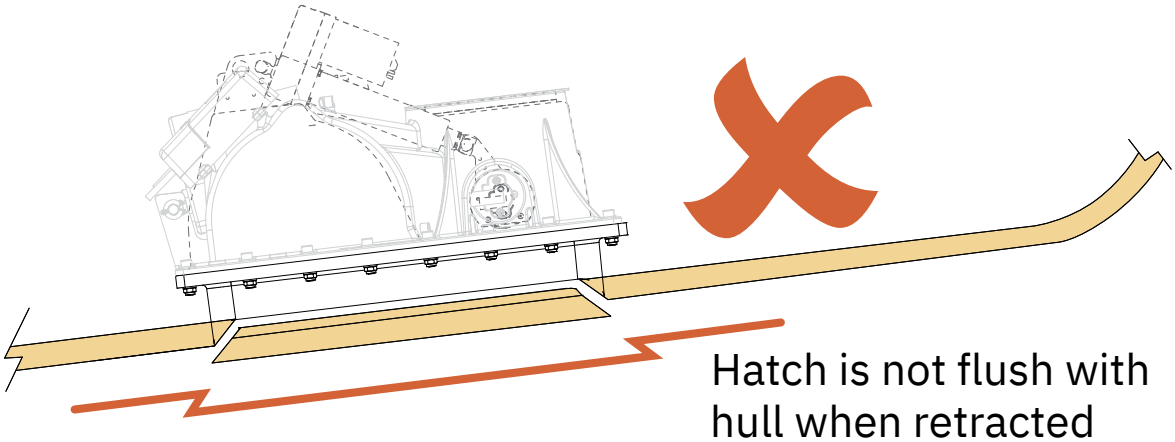
MC_0627

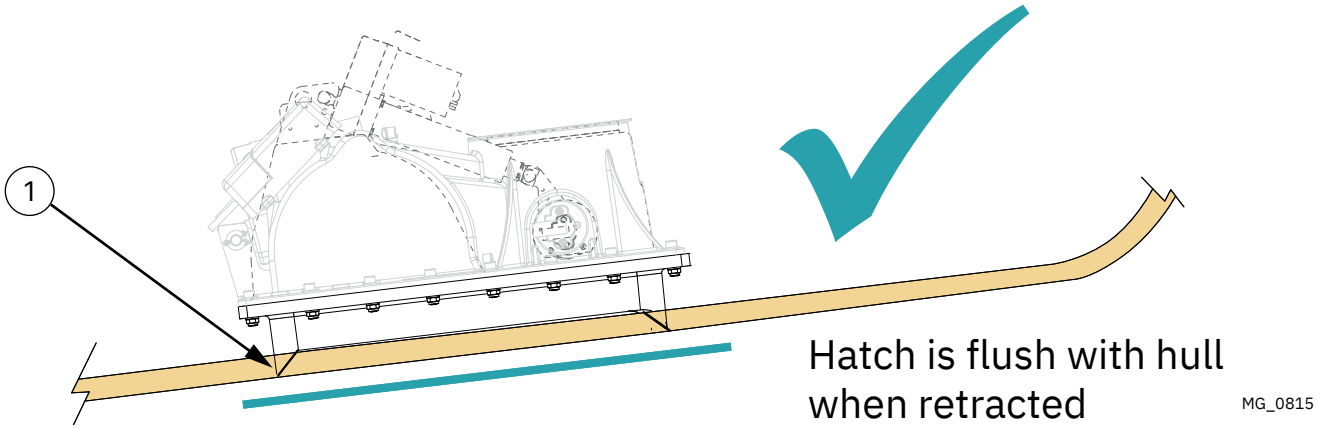

1
BOW
2
3
4
5
6
Hatch
Hull
MG_871


Raise SRF flange
on stern end
7
Use wedge to lift
the SRF flange to
required height

- Press “UP” to retract the tunnel.
- Ensure that the hatch is fitted in the hatch opening, and that the hatch is aligned flush with the hull at all edges. (**Reference 1**).
- Ensure that there is pressure on all the contact surfaces between the hatch and the hull when the hatch is closed.
- If the hatch is not closing with pressure on all the contact surfaces, the entire SRF flange must be raised to obtain this.
- When the thruster is operating as required, ensure that the position of the SRF flange can be recreated by adding position marks and leveling measurements.
- Remove the thruster housing from the SRF flange.

MC_0781





MG_0815

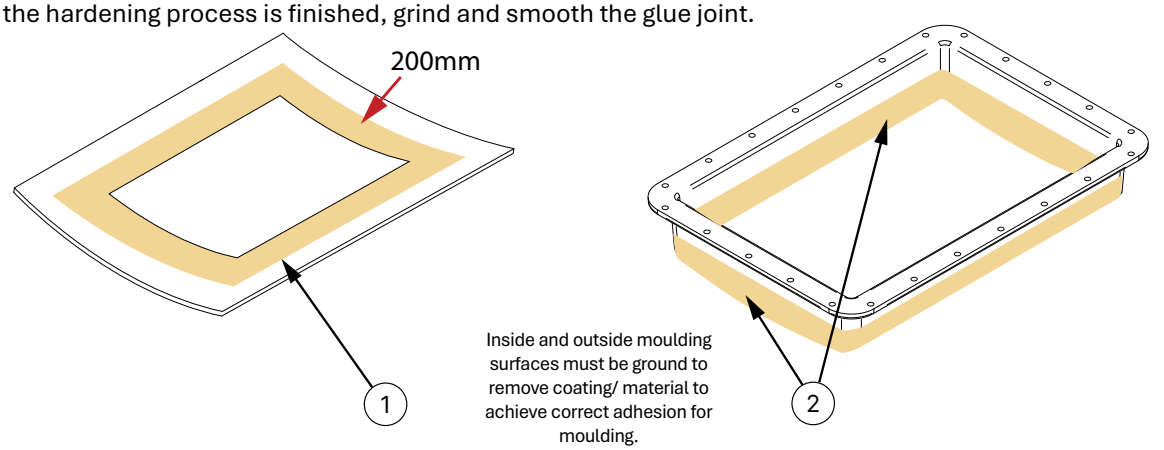
CAUTION

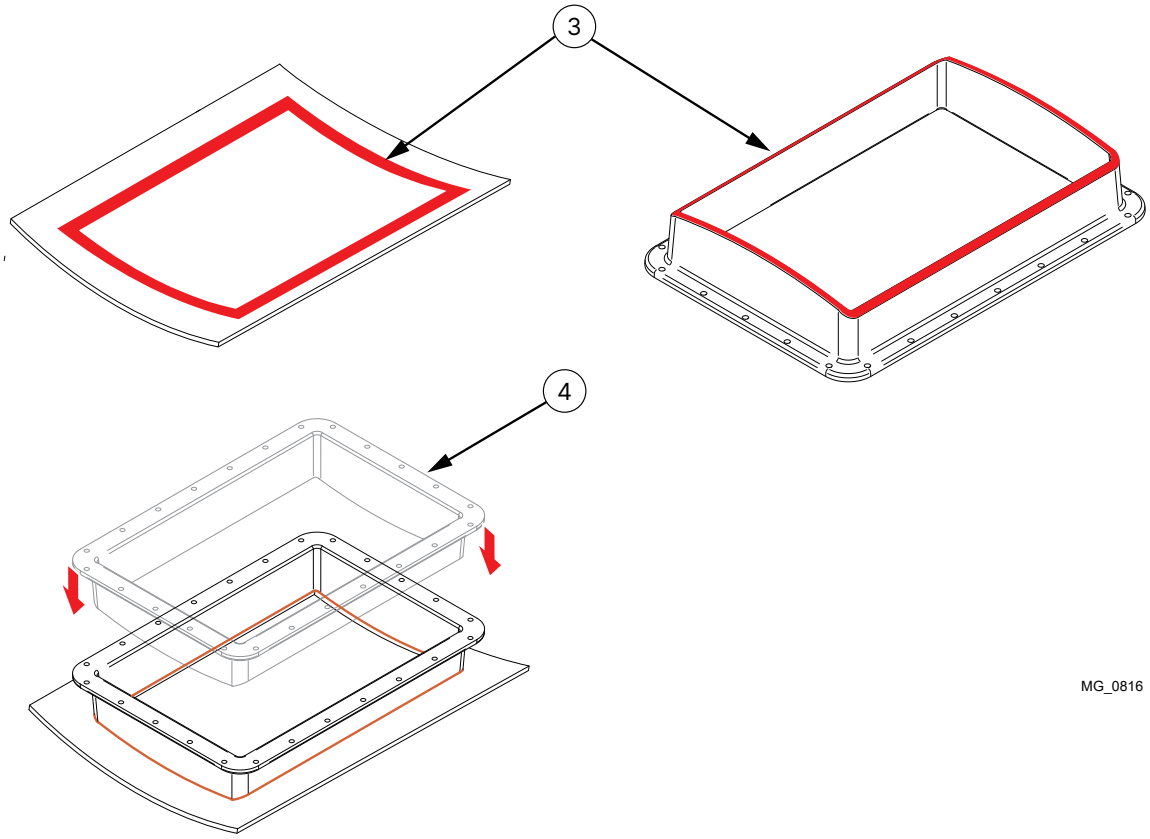
Before grinding of hull and SRF flange, precautions must be taken against grinding dust inside the boat. Surfaces to be moulded/bonded must be ground to remove coating and material to achieve sufficient adhesion.

1. Grind and smooth the surface around the inside of the hull opening to remove the gelcoat over a width of 200 mm.
2. Grind the inner and outer surfaces of the SRF flange to remove the gelcoat.
3. Apply a suitable adhesive to the inner surface of the hull around the opening and to the underside of the SRF flange.
   Apply sufficient adhesive to fill any gaps between the raised SRF flange and the hull.
   If wedges were used during the pre-installation procedure, reinstall them to ensure the correct height at the aft end of the flange.
4. Lower the SRF flange on to the hull, and position it according to the marks and measurement performed in the previous steps.

- After the SRF is positined correctly, remove the excessive glue before the hardening process starts.
- After the hardening process is finished, grind and smooth the glue joint.

MC_0782



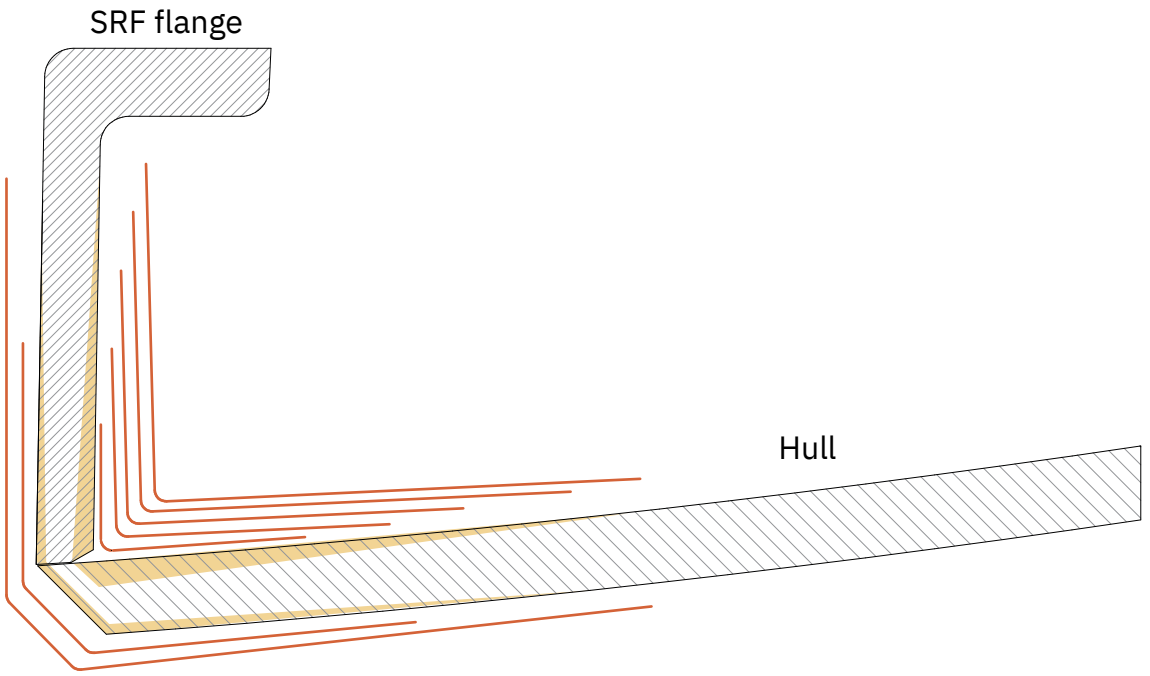


MG_0816

- After the glue / adhesive has hardened completely, the inside and outside of the SRF flange and hull must be laminated.
  Apply several layers of fibreglass and ensure that the resin and fibreglass is compatible with hull and flange materials.

MC_0783

- When the laminated ares has cured properly, smooth all moulded surfaces and apply coating.
- Apply putty before coating if necessary.



MG_0818

1. Apply MS Polymer or equivalent on SRF flange top surface to seal and avoid water leakage. Ensure that the polymer is applied over the entire surface of the flange as shown in the illustration.
   (Note: Ensure that glue is compatible with the SRF flange and retract housing materials.)

2. Place washers as spacers on the SRF flange corners.
   (Note: This Allow the MS Polymer or equivalent to semi-cure without compression, improving water tight sealing.)

3. Place the thruster housing on the SRF flange.

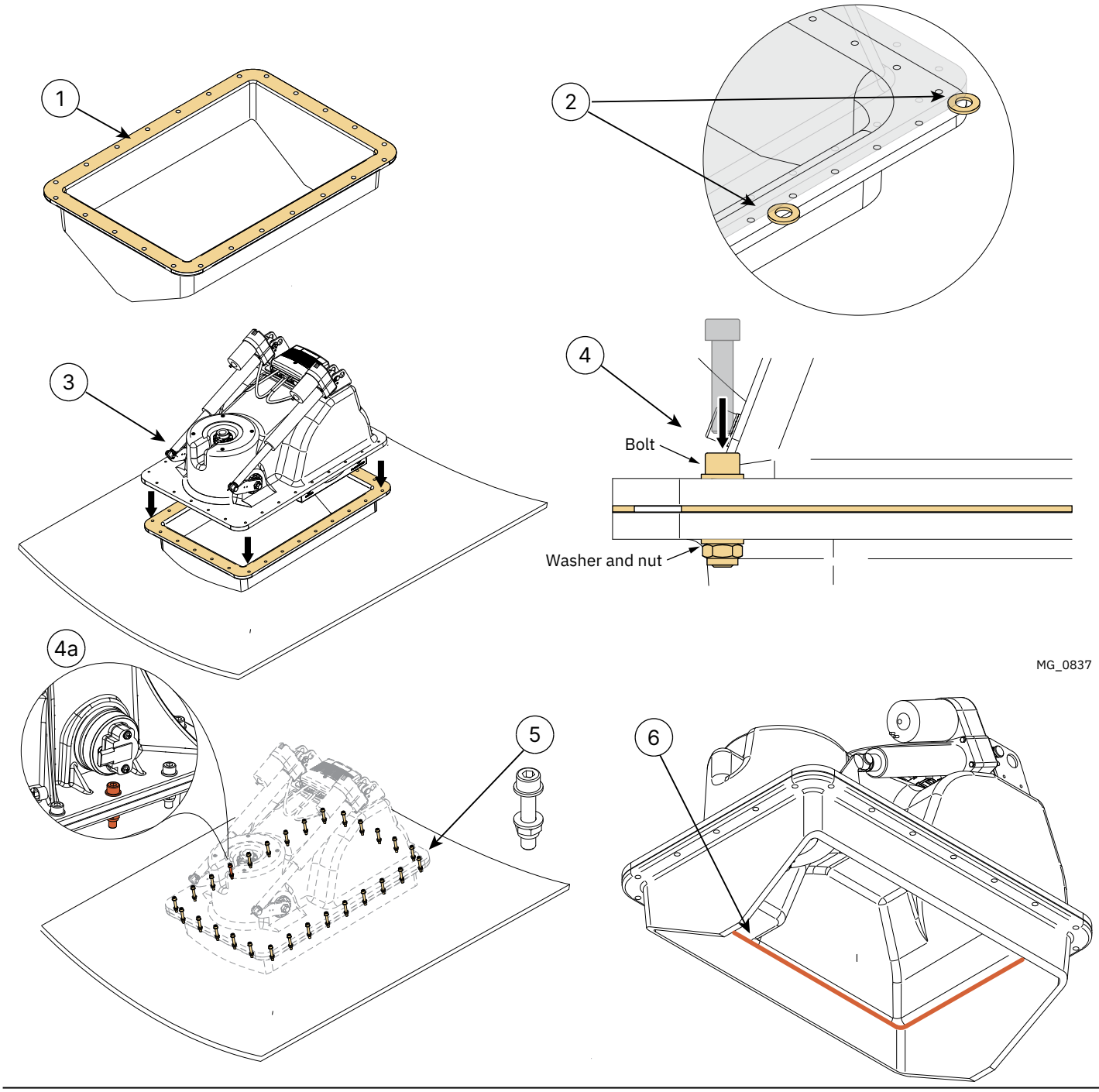
4. Insert and lightly fasten bolts to allow for the future removal of the washer spacers.
   a. **Note: It may be necessary to insert the bolts from the underside of the SRF flange, then with the nut on the top to avoid conflict with the position sensor.**

   - Allow the MS Polymer or equivalent to semi-cure and then remove the washers.

5. Tighten the bolts with a torque of 4Nm - 2,9lb/ft. Start with a corner bolt, then continue tighten the bolts in a cross pattern.

6. After assembly, apply a polymer sealant bead to the joint between the flange and the housing on the inside.

MC_0784



MG_0837

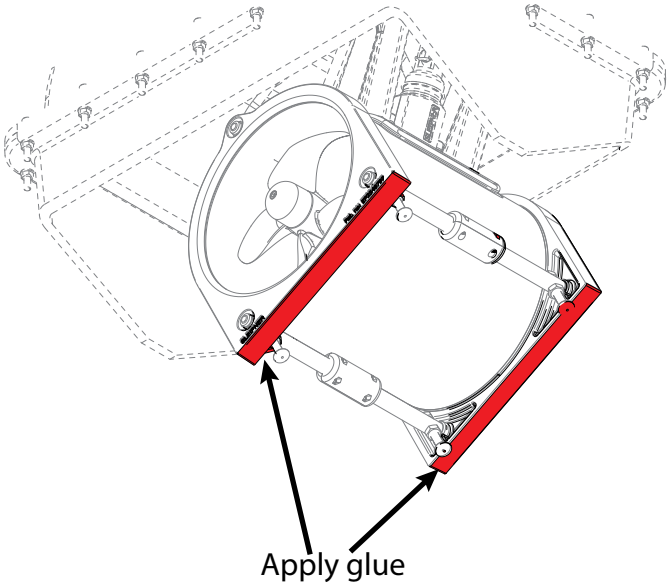
- Ensure that the thruster is in the outer position
- Apply glue on the twist ring facing the hatch.

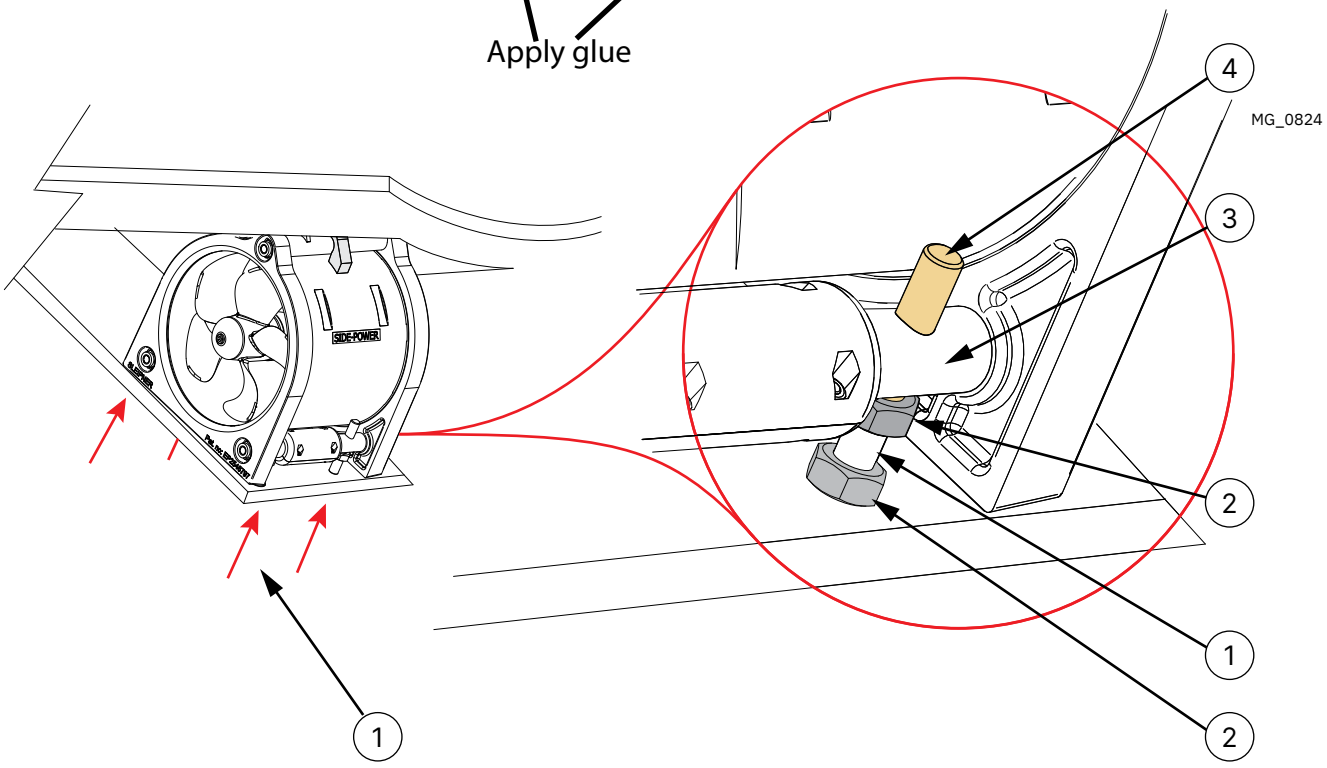
1. Enter the hatch bolts through the hatch,
2. Enter the lock nuts on the bolt. Position the nuts close to the inside of the hatch, but do not tighten.
3. Enter the bolts in to the bolt holes in the thruster housing.
4. Bolt the hatch to the tunnel. Ensure the bolts do NOT conflict with the tunnel.
   (NB: Bolts can be cut, depending on hatch thickness.)

- When all four bolts are tightened so that the hatch is in tight connection to the twist rings, tighten the lock nuts (**Reference 2**) to the hatch and bolt holes in the tunnel housing respectively.

MC_0786

- Retract the thruster to verify that the movement is smooth, and that the hatch is in correct position when the thruster is in both open and closed position.





- Lower down the thruster.

1. Apply a layer of aluminium or duct tape on hatch opening edges on the hull. This is for masking out for the adhesive in the next step.

2. Apply filler or equivalent to hatch edges in such amount that it will fill the gap between the hull and the hatch.

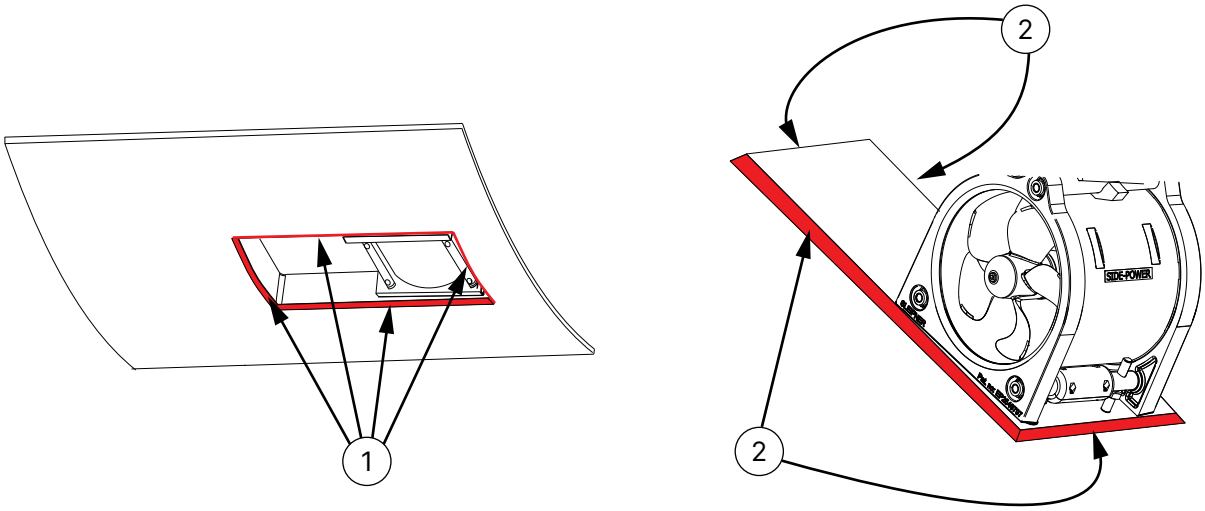
- Operate the thruster to “IN” position. Smooth out the filler and add more if needed. After curing time, grind and smooth the surface. Apply glue on twist rings contact surface.

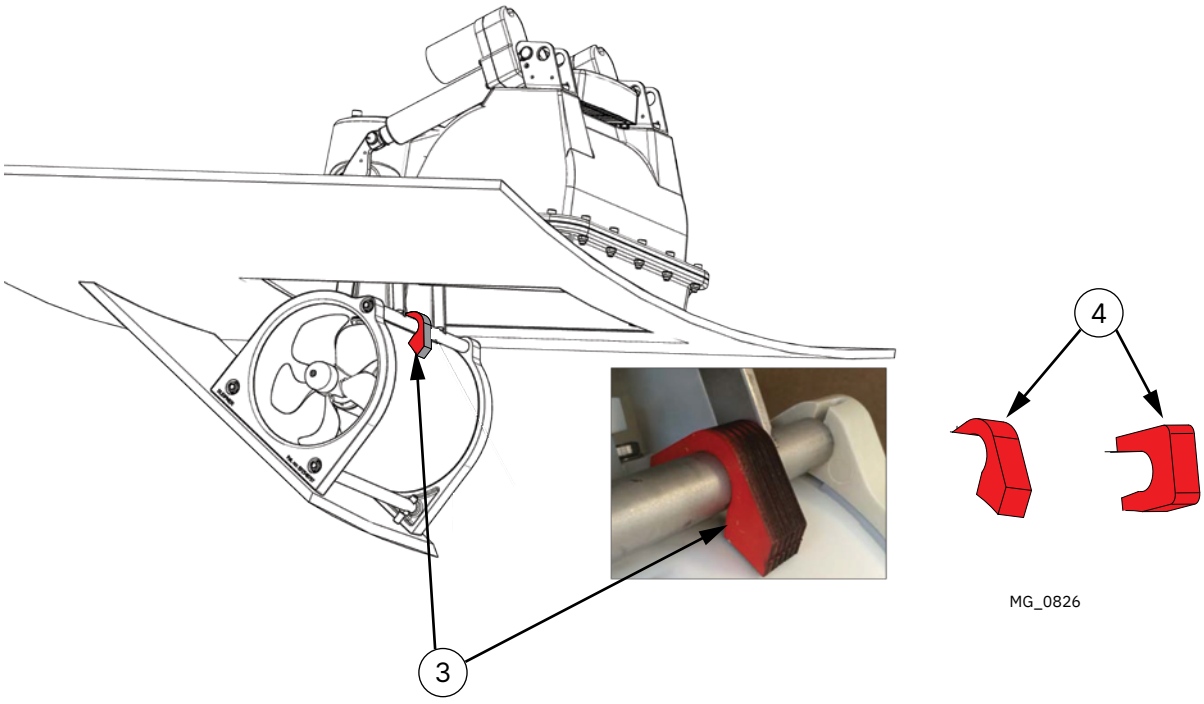
- Apply coating inside and outside of the hatch and on the hull to cover the fiberglass and filler.

3. Remove the red spacer block located above the tunnel.

4. **Note: Several types and numbers of spacer block may be used.**

MC_0788





MG_0826

1. Position the gasket between the motor and the bracket, and install the motor onto the motor bracket ensuring the couplings and the drive shafts have locked together.

   Depending on your coupling you may need to wiggle the motor into place. Ensure that the couplings are correctly engaged, and make sure the motor cable terminals remain accessible for the electrical installation later.

2. Enter the bolts with washers holding the motor to the motor bracket.
   Tightening torque 33Nm (24lb/ft)

3. Check the drive shafts engage by rotating the propeller. It is required the propeller can rotate via hand power. Note that rotating the propellers can be hard because of the gear reduction and the motor.

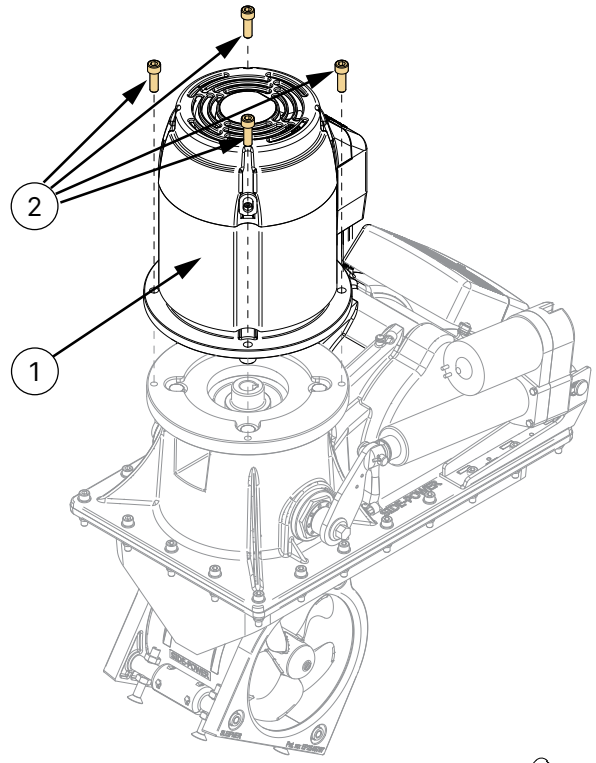
4. Apply grease to the internal drive shaft. We advise painting the gear house and propellers with anti-fouling.
   Note: Do not paint the anodes, sealing, rubber fittings or propeller shafts

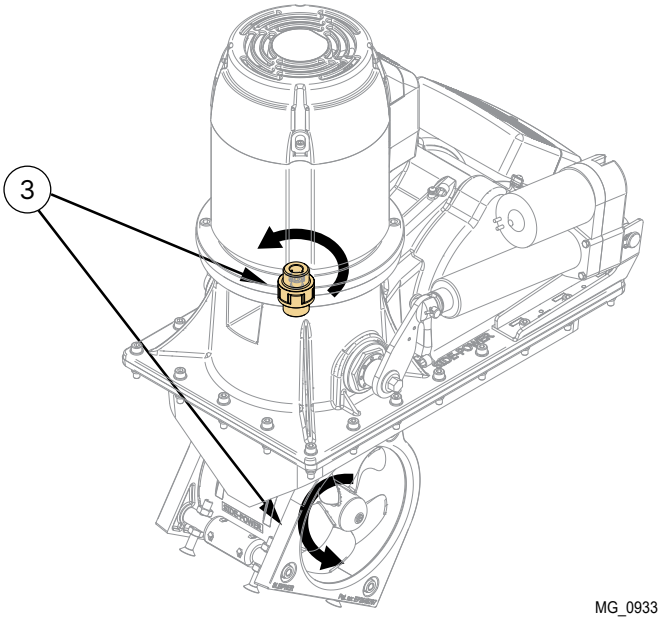
Note: The motor must be covered to avoid dust from fabrication/ maintenance operation entering the motor . After fabrication maintenance operations have ceased the cover must be removed before operating the thruster.

MC_0789

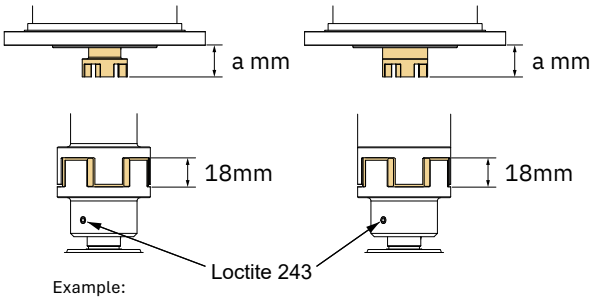
WARNING

WARNING. The propeller blades may be sharp.



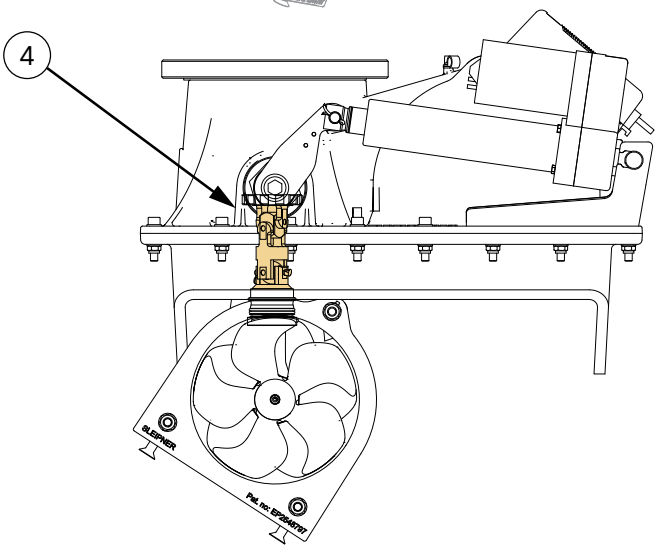


MG_0933



Example:
height A = 47mm - 48mm.
The correct placement of the lower flexible coupling unit should be measured from the top surface of the motor bracket to the bottom inner surface of the lower flexible coupling. ***(NB: The extra 1mm is added to eliminate the risk of compression to the rubber element between the two couplings.)***

IMPORTANT!
The rubber/plastic element must be in its correct position, fully inserted but not compressed.



CAUTION

Always handle the shaft ends with care. Do not hammer or drop shaft/coupling ends in any circumstances.

1. Install the motor onto the motor bracket ensuring the couplings and the drive shafts have locked together.

   Depending on your coupling you may need to wiggle the motor into place. Ensure that the couplings are correctly engaged, and make sure the motor cable terminals remain accessible for the electrical installation later.

2. Enter the bolts with washers holding the motor to the motor bracket.

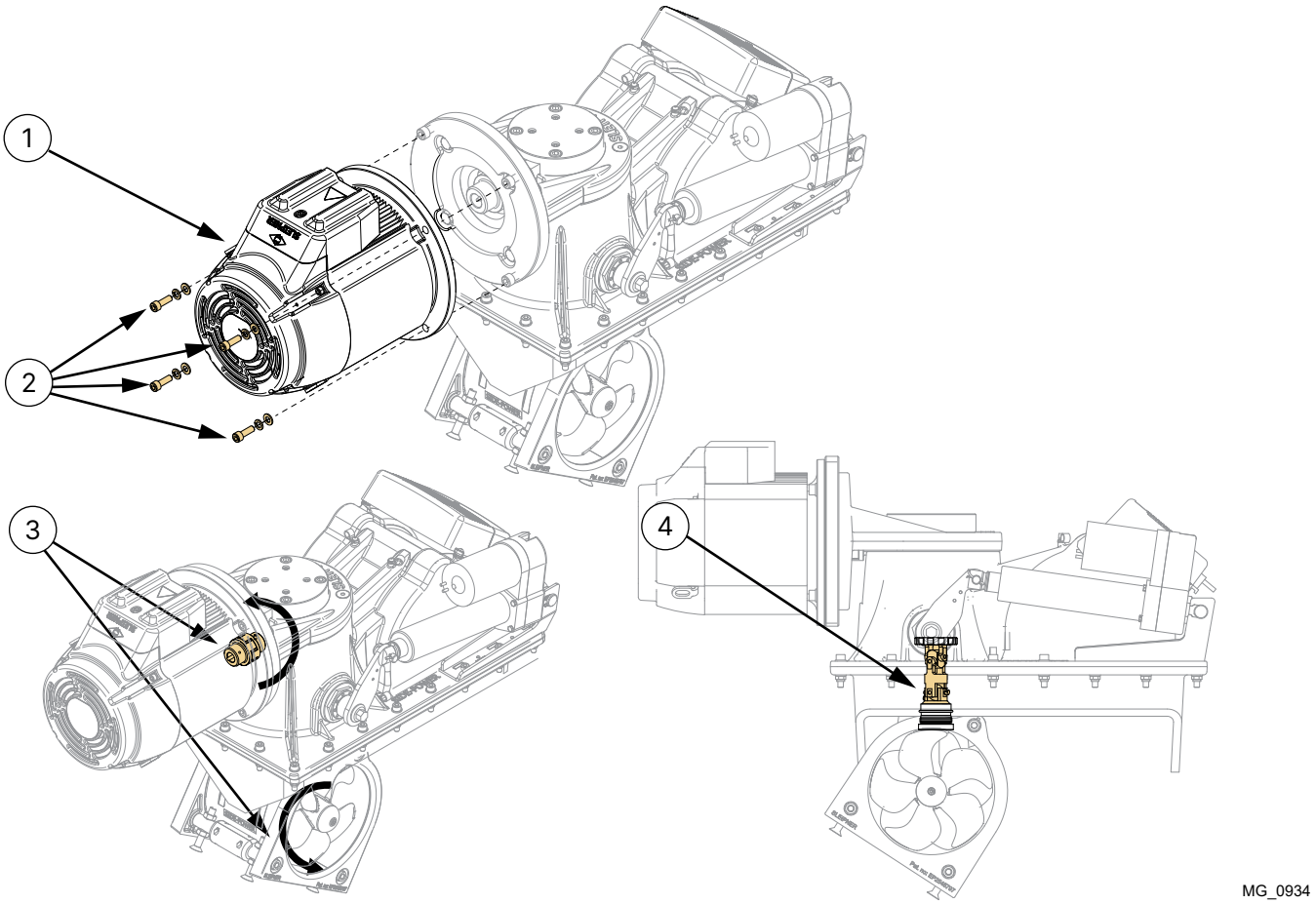
3. Check the drive shafts engage by rotating the propeller. It is required the propeller can rotate via hand power. Note that rotating the propellers can be hard because of the gear reduction and the motor.

4. Apply grease to the internal drive shaft. We advise painting the gear house and propellers with anti-fouling. ***Note: Do not paint the anodes, sealing, rubber fittings or propeller shafts.***

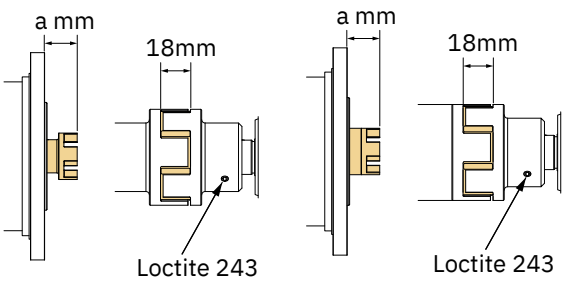
Note: The motor must be covered to avoid dust from fabrication/ maintenance operation entering the motor . After fabrication maintenance operations have ceased the cover must be removed before operating the thruster. MC_0790

WARNING

WARNING. The propeller blades may be sharp.



MG_0934



Example:
height A = 47mm - 48mm.
The correct placement of the lower flexible coupling unit should be measured from the top surface of the motor bracket to the bottom inner surface of the lower flexible coupling. ***(NB: The extra 1mm is added to eliminate the risk of compression to the rubber element between the two couplings.)***

IMPORTANT!
The rubber/plastic element must be in its correct position, fully inserted but not compressed.

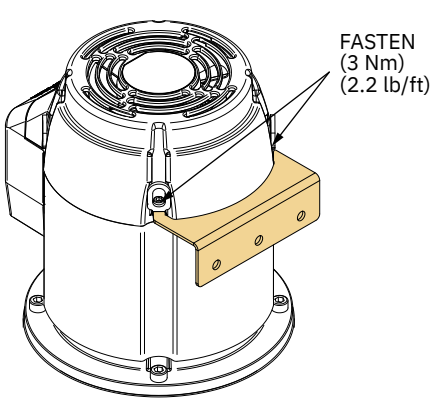
CAUTION

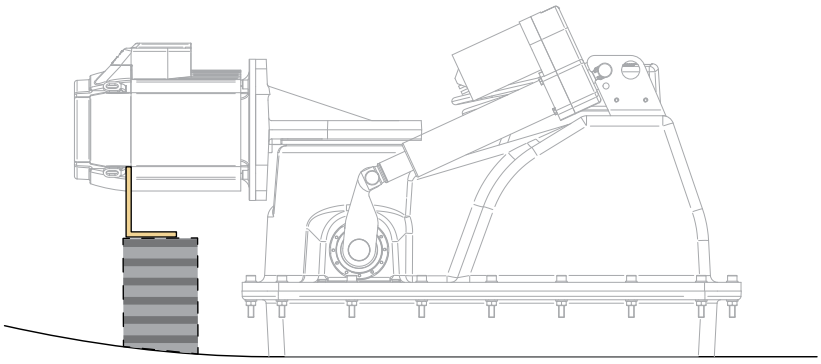
Always handle the shaft ends with care. Do not hammer or drop shaft/coupling ends in any circumstances.

Support for the motor

If the motor is installed with an angle more than 30 degrees from vertical position, the installation will require an extra motor support.

MC_1152



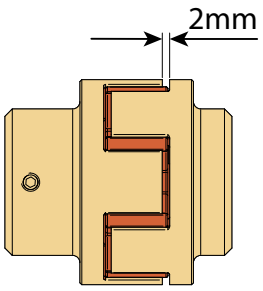


MG_0573

Verifying the shaft coupling

The shaft coupling is pre-assembled from the factory with the correct distance between them.
But to ensure that they are still in position, verify that the dictance between the two halves of the shaft coupling is approximately 2mm.

MC_1093



MG_1097

1. Plan the location of electrical components before starting with the electrical installation. Main electrical components will typically consist of battery, fuse, main switch and thruster motor, see Wiring Diagram chapter for an overview.

   MC_0626

   Sleipner offers both manual main switches and Automatic Main Switches (AMS). Sleipner AMS is controlled by the control panel in addition to the option of manual operation. Turning on the control panel also turn on the automatic main switch. When the control panel is turned off the automatic main switch is turned off. This ensures that the control electronics and motor are only energized when the control panel is turned on. Sleipner offers AMS supporting either S-Link or ON/OFF control panels. Note that the AMS requires a separate power supply which should be protected by a dedicated fuse. Ensure to select an AMS with a voltage rating according to the chosen motor- and battery voltage.

   Electrical products installed in gasoline engine spaces or other areas potentially exposed for explosive gases must be Ignition Protected. Products installed in such locations should conform to the ISO 8846, SAE J1171 or UL 1500 standard.

2. Estimate the total length of the power cables to determine the recommended cross-section. The total power cable length is defined as the distance from the positive battery terminal, via fuse, main switch, and thruster motor, and all the way back to the negative battery terminal.

3. Find the recommended power cable cross-section for the installation by using the estimated total power cable length and the table shown in the chapter Electrical Reference Guide.

4. Select the recommended fuse size by using the table shown in the chapter Electrical Reference Guide.

5. Use an appropriate dimensioned battery with Cold Cranking Amps (CCA) according to recommendations given in the Electrical Reference Guide chapter. Battery voltage must be compliant with the voltage rating of the thruster motor and control circuitry. The capacity and rated discharge current of the battery should be according to the rated nominal current drawn and the typical duty cycle for thruster operation. The nominal current drawn is listed in the Electrical Reference Guide chapter.

   The actual voltage at the motor while running the thruster determines the motor current draw. Using a smaller cross-section than recommended or a low-capacity battery could reduce performance and efficiency.

   Installing a battery close to the thruster reduces the length of the power cables and potentially increases the performance, due to lower voltage drop in the power cables. For installations on large vessels with bow and stern thrusters or catamarans a dedicated battery for each thruster should be considered.

6. Install the cable from the retract mechanism as described in the chapter Retract Thruster Controller Cable Installation.

7. Install and connect the electrical components according to the applicable Wiring Diagram chapter.

   For safety reasons it is always recommended to install a fuse and a main switch on the power cables and as close as possible to the positive battery terminal. The main switch must be installed such that it is easily accessible so that the thruster can be electrically disconnected to a safe state when not on-board or in the case of an emergency.

   For dual thruster systems using only one battery bank a dedicated fuse and main switch should be installed for each thruster. These should be installed close to the battery bank.

   Follow the instructions in the Motor Lug Connection chapter when fastening the power cables to the motor.

⚠ CAUTION

Battery terminal polarity must be observed and connected correctly.

8. Fuse and main switch should be installed according to the installation manual accompanying the products.

9. Install the control panel according to the instructions in the Installation Guide included with the control panel.

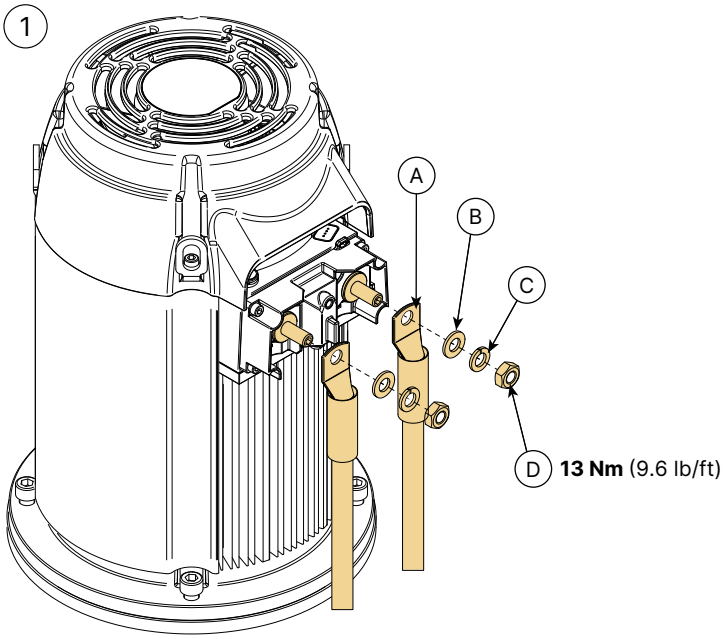
10. See the S-Link System Description chapter for detailed information on the installation of the S-Link Power cable and additional S-Link components.

⚠ CAUTION

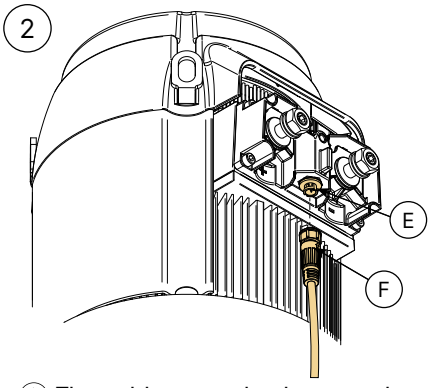
After all electrical connections have been completed, turn off main switch and check the following with an ohmmeter:
- There is no electrical connection between motor flange and the positive terminal on the motor.
- There is no electrical connection between motor flange and the negative terminal on the motor.

If unsure contact skilled personnel.

Lug connections



A) Lug
B) Washer
C) Spring washer
D) End nut
E) S-Link connector
F) S-Link cable

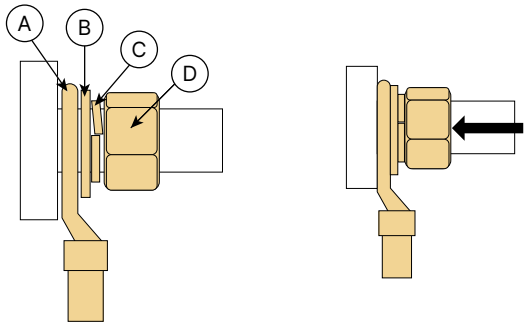


ⓘ The cables can also be routed out through the side of the cover over the terminals. An opening for the cables can be snapped off in the cover.

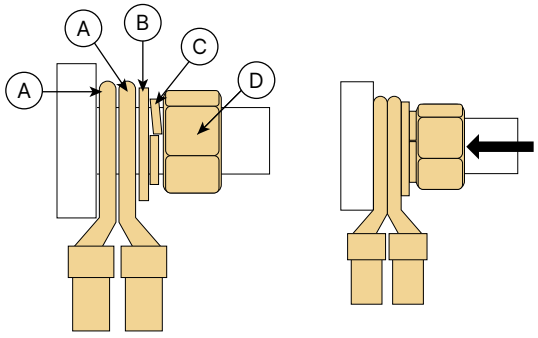
⚠ WARNING

Do NOT place washers between electrical lug contact surfaces. Improper assembly may cause overheating or fire.

Single-lug configuration



Multi-lug configuration



MG_0523

Model size	System voltage	Nominal current	*Min. battery CCA	Rec. fuse	Cross section guide for power cables											
					Unit	<7m total + & -		7-14m total + & -		15-21m total + & -		22-28m total + & -		28-35m total + & -		36-45m total + & -	
						Min.	Rec.	Min.	Rec.	Min.	Rec.	Min.	Rec.	Min.	Rec.	Min.	Rec.
ERV/L 130/250	24V	300 A	DIN: 300 SAE: 570 EN: 510	ANL 250	mm^2	50	50	50	70	70	95	95	120	120	2 x 70	2 x 95	2 x 95
					AWG	1/0	1/0	1/0	2/0	2/0	3/0	3/0	4/0	3/0	2 x 2/0	2 x 3/0	2 x 3/0
	48V	180 A	DIN: 180 SAE: 342 EN: 306	ANL 125	mm^2	50	50	50	70	70	95	95	120	120	2 x 70	2 x 95	2 x 95
					AWG	1/0	1/0	1/0	2/0	2/0	3/0	3/0	4/0	3/0	2 x 2/0	2 x 3/0	2 x 3/0
ERV/L 170/250	24V	420 A	DIN: 420 SAE: 798 EN: 714	ANL 400	mm^2	70	70	70	95	95	120	120	2 x 95	2 x 95	2 x 95	2 x 120	2 x 120
					AWG	2/0	2/0	2/0	3/0	3/0	4/0	4/0	2 x 3/0	2 x 3/0	2 x 3/0	2 x 4/0	2 x 4/0
	48V	225 A	DIN: 225 SAE: 428 EN: 383	ANL 200	mm^2	70	70	70	95	95	120	120	2 x 70	2 x 70	2 x 95	2 x 120	2 x 120
					AWG	2/0	2/0	2/0	3/0	3/0	4/0	4/0	2 x 2/0	2 x 2/0	2 x 3/0	2 x 4/0	2 x 4/0
ERV 210/250	24V	600 A	DIN: 600 SAE: 1140 EN: 1020	ANL 500	mm^2	95	95	95	120	120	2 x 70	120	2 x 95	2 x 95	2 x 95	2 x 120	2 x 120
					AWG	3/0	3/0	3/0	4/0	4/0	2/0	4/0	2 x 3/0	2 x 3/0	2 x 3/0	2 x 4/0	2 x 4/0
	48V	320 A	DIN: 320 SAE: 608 EN: 544	ANL 300	mm^2	70	70	70	95	95	120	120	2 x 70	2 x 70	2 x 95	2 x 95	2 x 120
					AWG	2/0	2/0	2/0	3/0	3/0	4/0	4/0	2 x 2/0	2 x 2/0	2 x 3/0	2 x3/0	2 x 4/0

eVision thrusters have high efficiency and can therefore offer long run times. The proposed cable cross sections in above table are only for reference. Dependent on system voltage, the stated nominal current is measured with 21V or 42V at the motor terminals.

Lover voltage level at the motor terminals will increase the current drawn by the thruster. To avoid significant voltage drop and excessive heat generation in cables and other system components selection of battery and cable cross section is critical.

Higher current consumption can also be caused by incorrect thruster installation and marine growth in the tunnel and on the propeller.

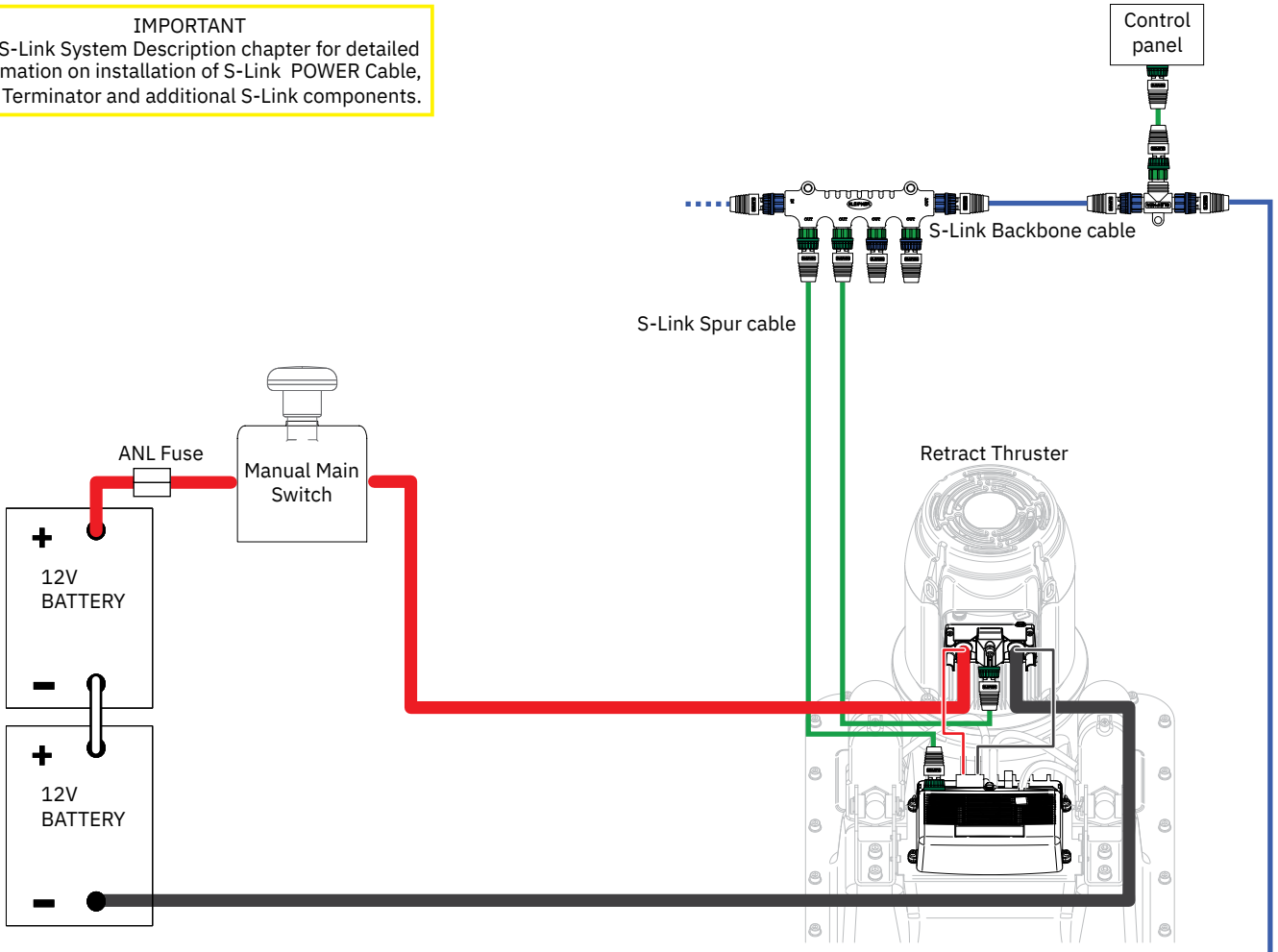
Current draw will depend on many factors such as but not limited to:

- Voltage drop
- Battery health
- Cable lengths and dimensions
- Performed tunnel installation
- Ventilation
- Obstructing marine growth

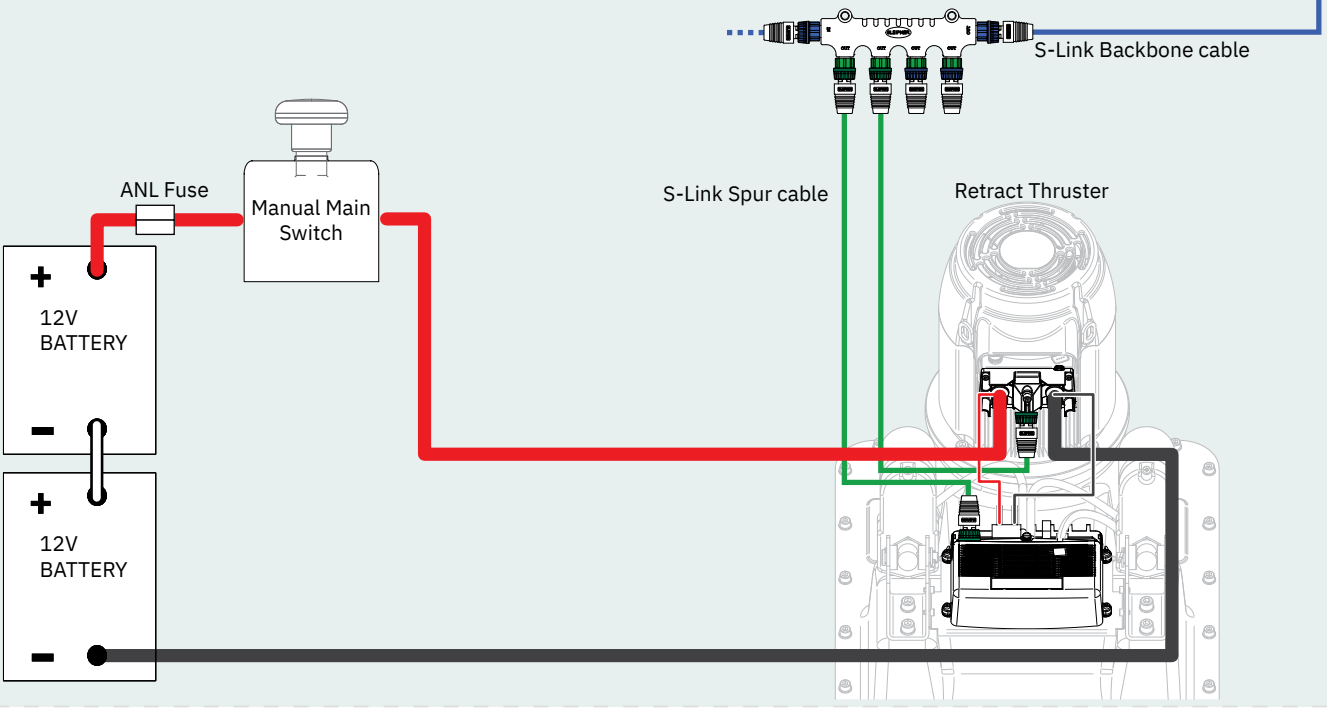
For each installation an experienced electrician should be consulted for cable cross section calculations and selection of fuses, main circuit and batteries.

The Top wiring diagram is for a single bow or stern thruster system

IMPORTANT
See S-Link System Description chapter for detailed information on installation of S-Link POWER Cable, END Terminator and additional S-Link components.



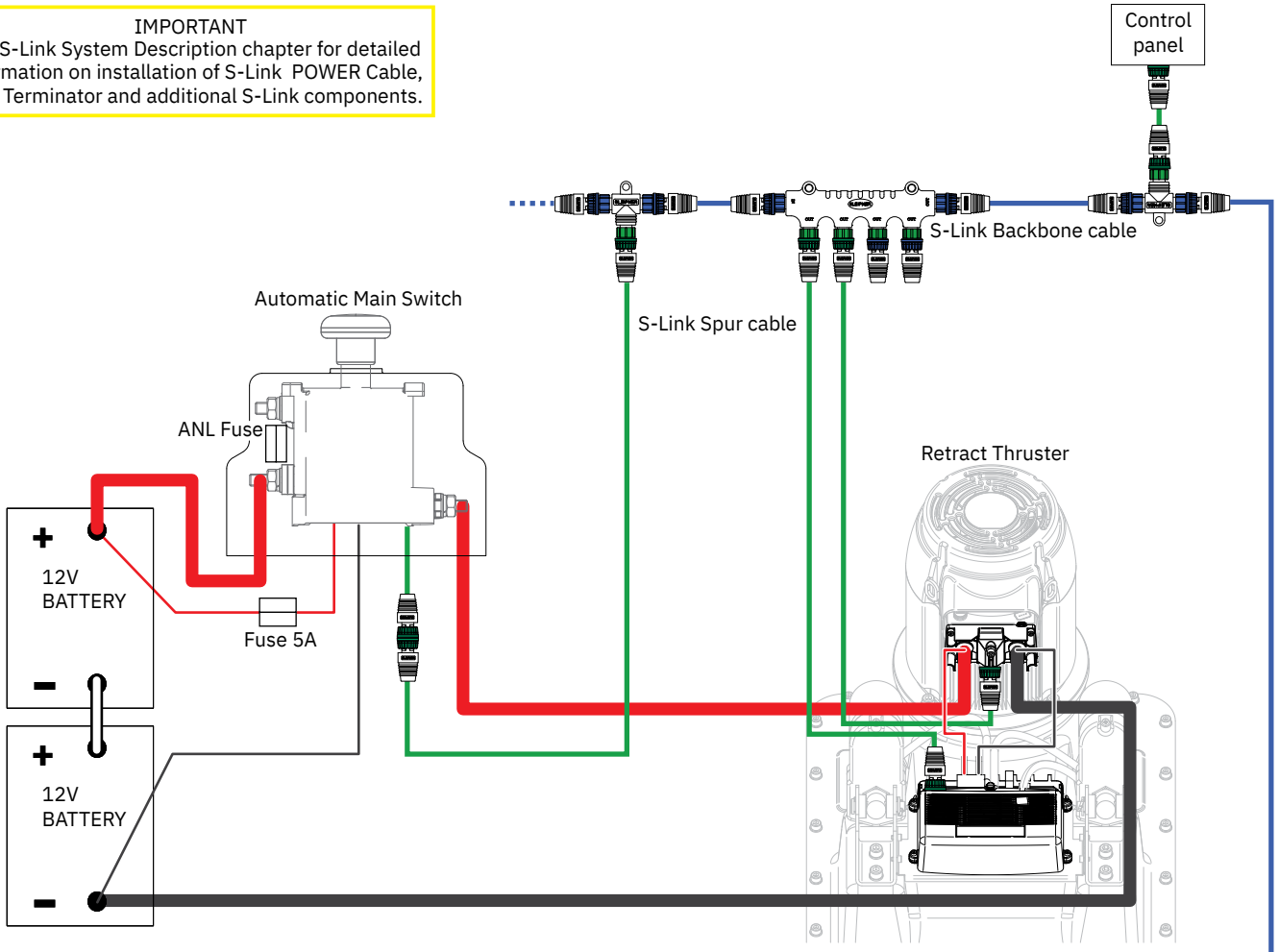
The top and bottom wiring diagram is for a dual thruster system, for example a bow and stern installation.



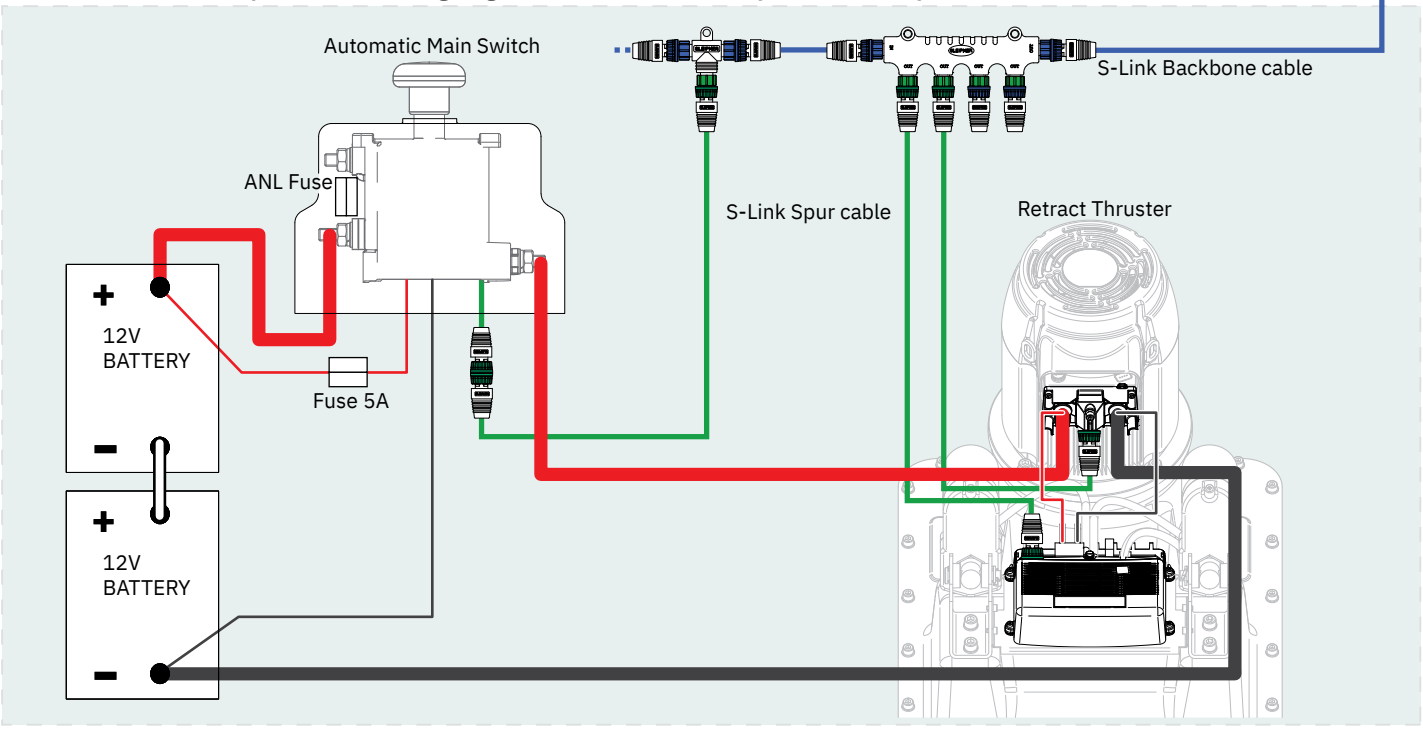
MG_0625

The Top wiring diagram is for a single bow or stern thruster system

IMPORTANT
See S-Link System Description chapter for detailed information on installation of S-Link POWER Cable, END Terminator and additional S-Link components.



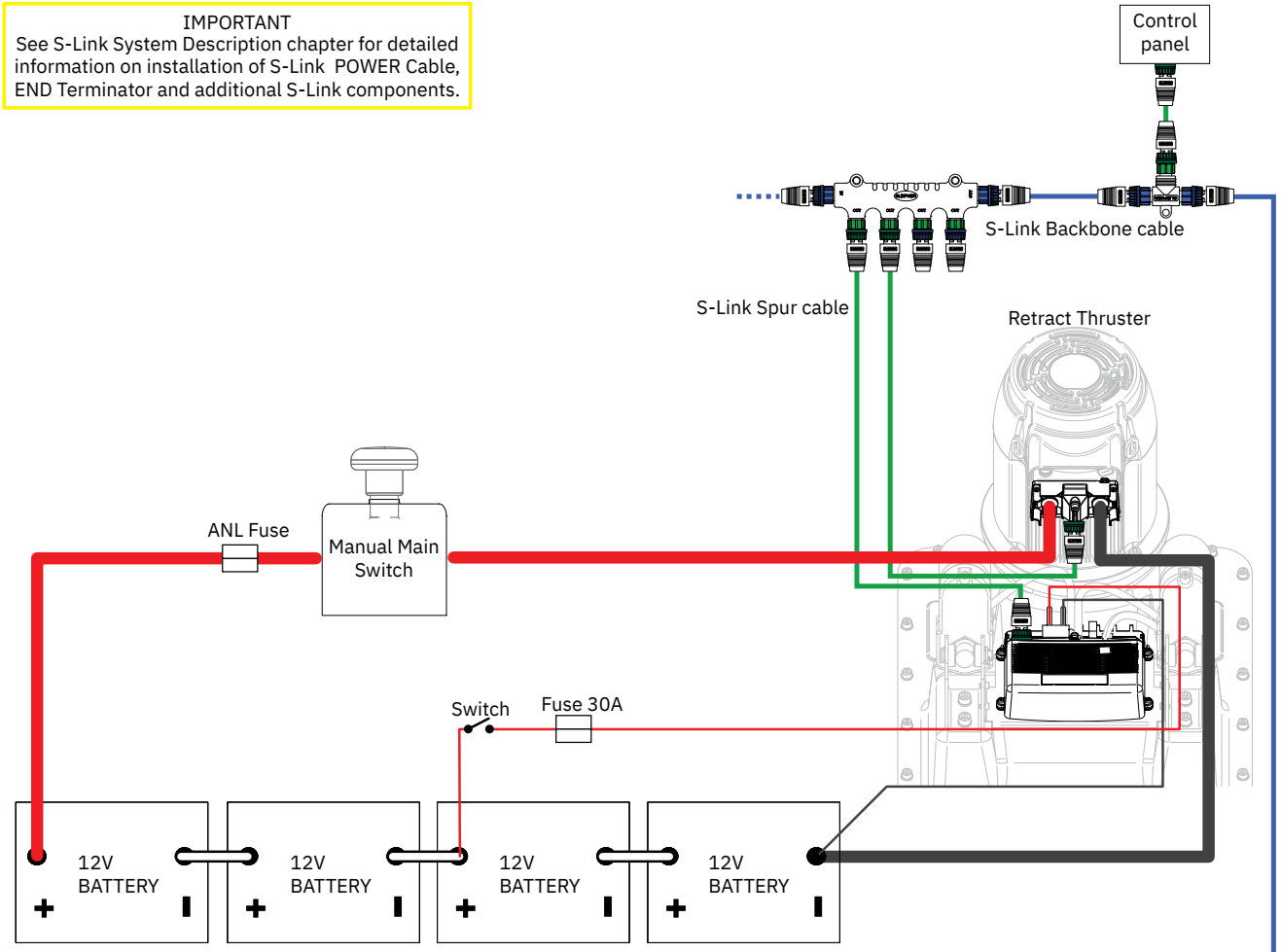
The top and bottom wiring diagram is for a dual thruster system, for example a bow and stern installation.



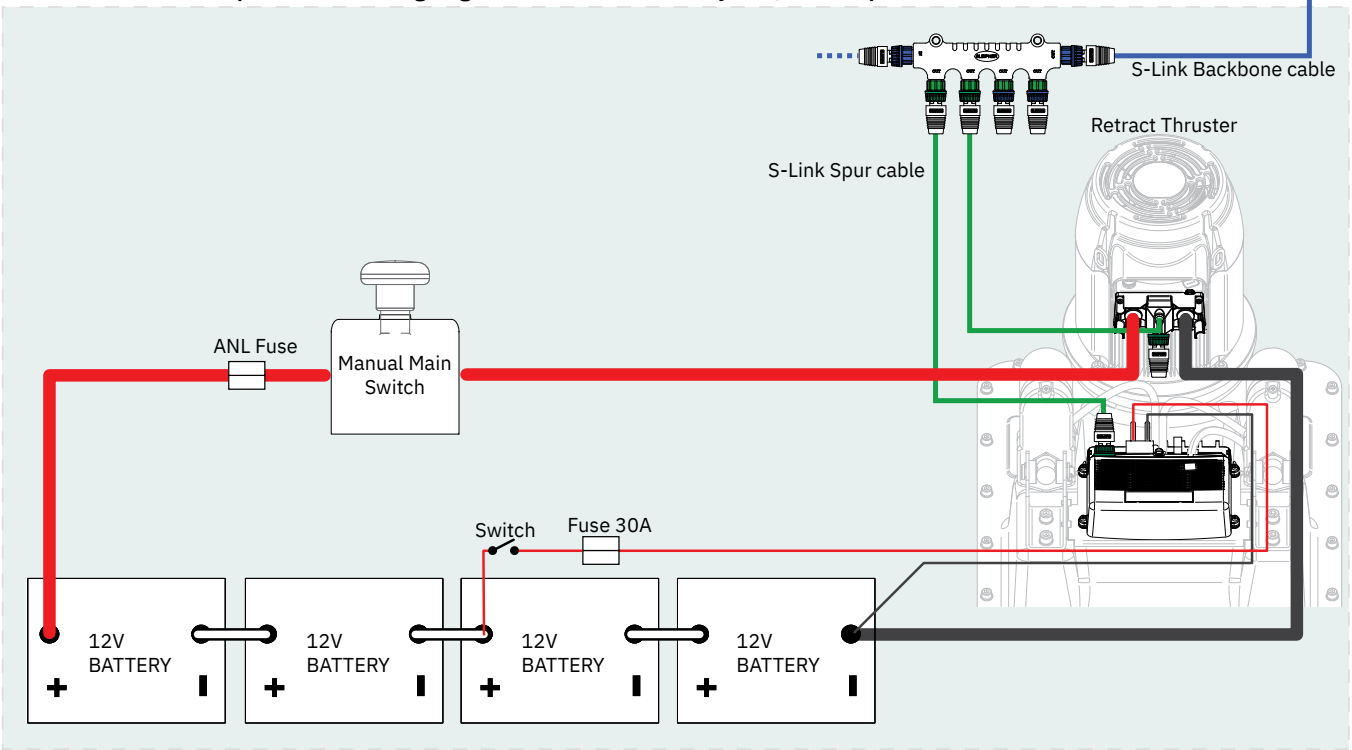
MG_0585

The Top wiring diagram is for a single bow or stern thruster system

IMPORTANT
See S-Link System Description chapter for detailed information on installation of S-Link POWER Cable, END Terminator and additional S-Link components.



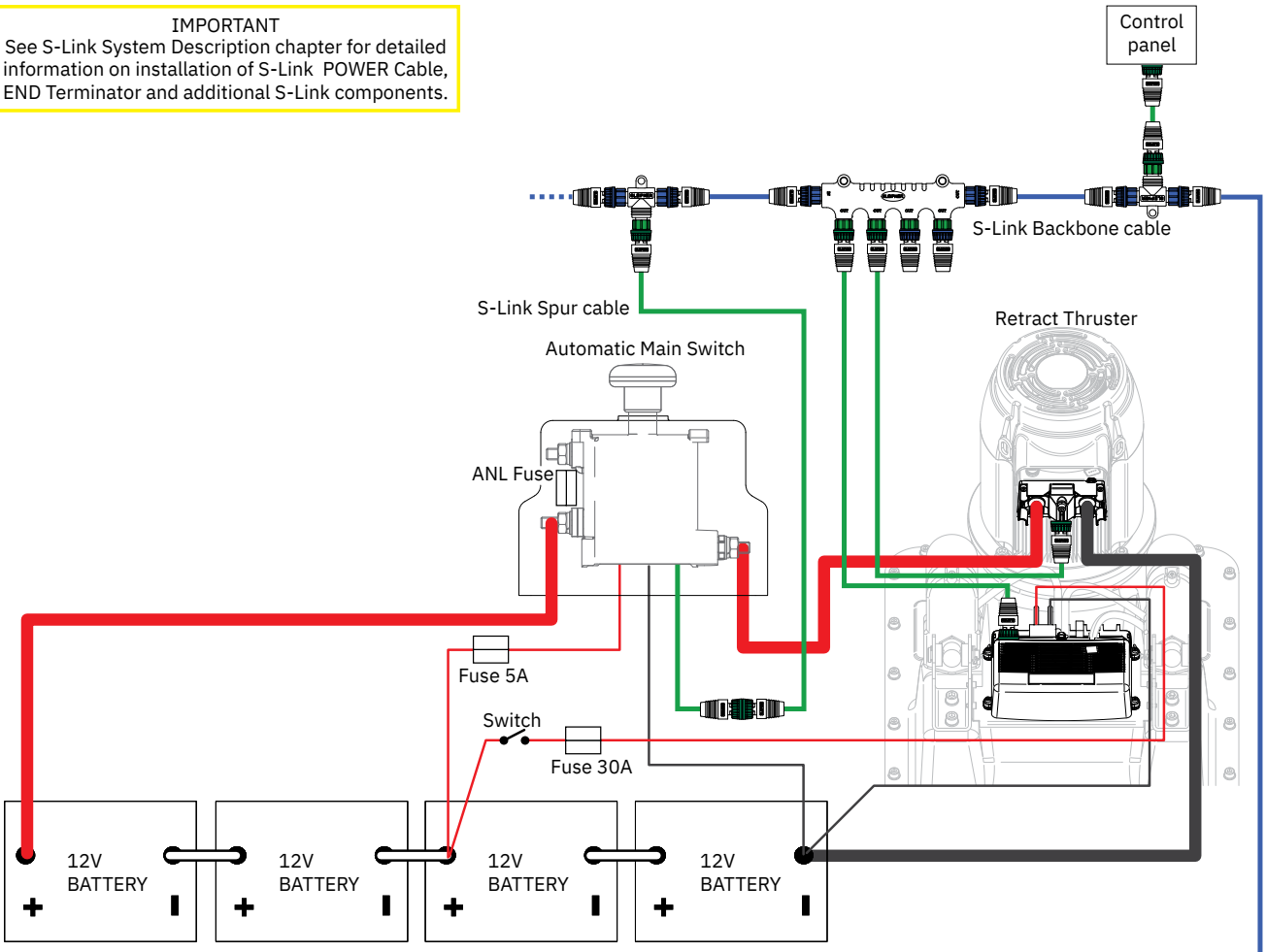
The top and bottom wiring diagram is for a dual thruster system, for example a bow and stern installation.



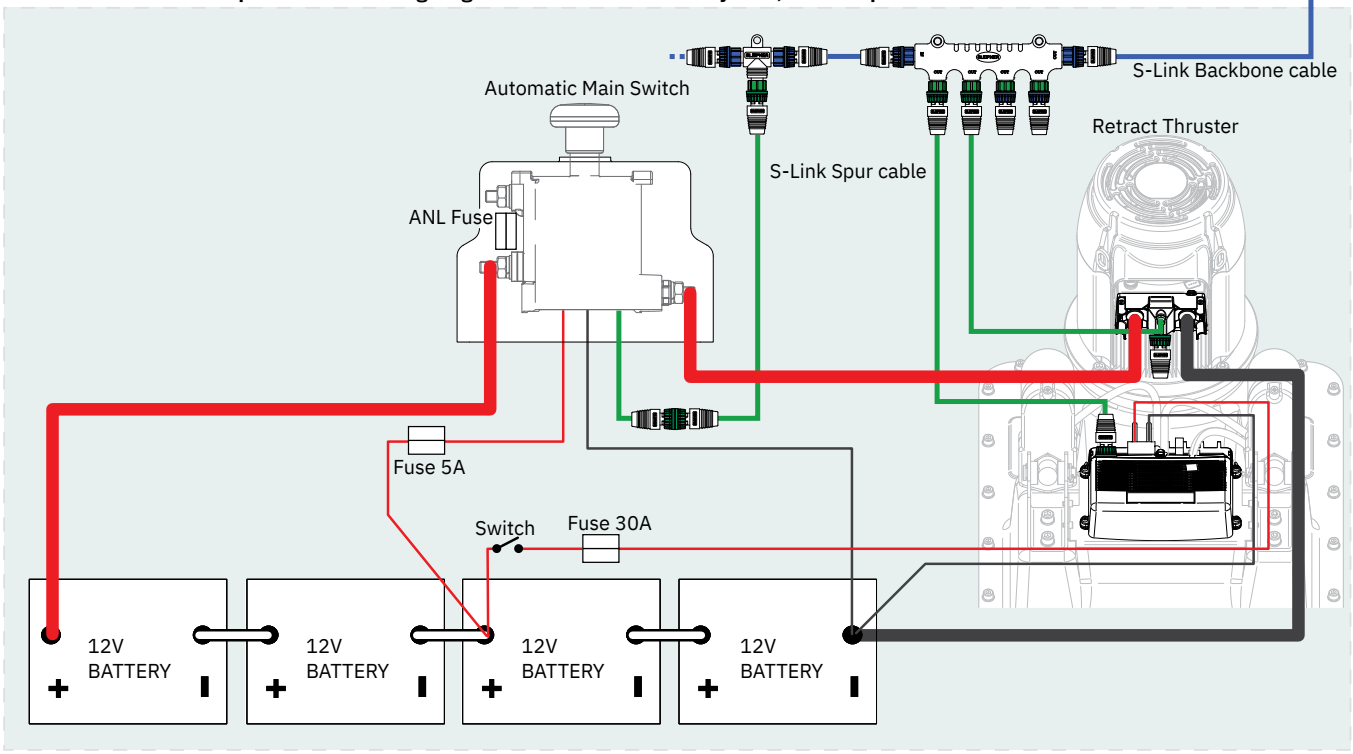
MG_0626

The Top wiring diagram is for a single bow or stern thruster system

IMPORTANT
See S-Link System Description chapter for detailed information on installation of S-Link POWER Cable, END Terminator and additional S-Link components.



The top and bottom wiring diagram is for a dual thruster system, for example a bow and stern installation.



MG_0586

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

Main advantages of S-Link system:

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

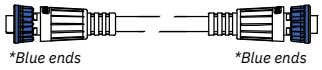
Installation of S-Link cables:

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

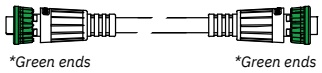
Ideally, the POWER Cable should be connected to the middle of the BACKBONE bus to ensure an equal voltage drop at both ends of the BACKBONE Cable. The yellow and black wire in the POWER Cable shall be connected to GND and the red wire connected to +12VDC or +24VDC.

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

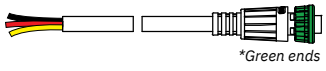
SPUR cables can be left unterminated to prepare for the installation of future additional equipment. In such cases, ensure to protect open connectors from water and moisture to avoid corrosion in the connectors.



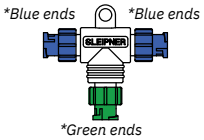
BACKBONE Cable
Forms the communication and power bus throughout a vessel. Available in different standard lengths.



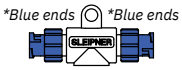
SPUR Cable
Used to connect S-Link compliant products to the backbone cable. One SPUR Cable must be used for each connected component, with no exceptions. Recommended to be as short as practically possible. Available in different standard lengths.



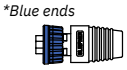
POWER Cable
Required in all installations for connection of BACKBONE Cable to a power supply and should be protected with a 2A fuse.



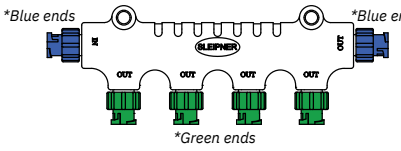
T-Connector
Used for connection of SPUR or POWER Cable to the BACKBONE Cable. One T-Connector for each connected cable.



BACKBONE Extender
Connects two BACKBONE Cables to extend the length.

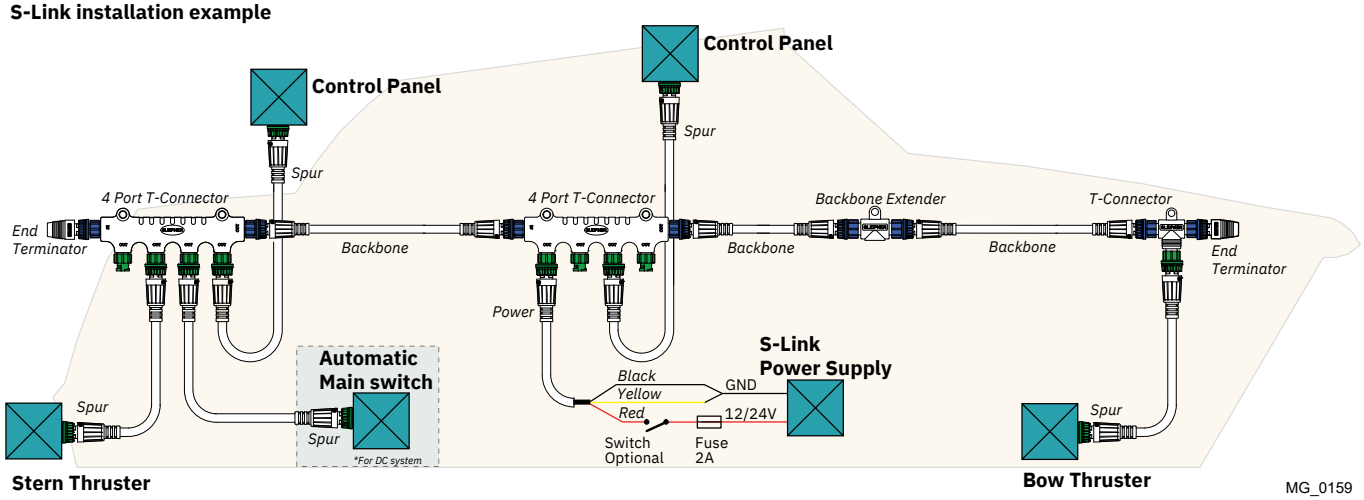


END Terminator
Must be one at each end of the BACKBONE bus.



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

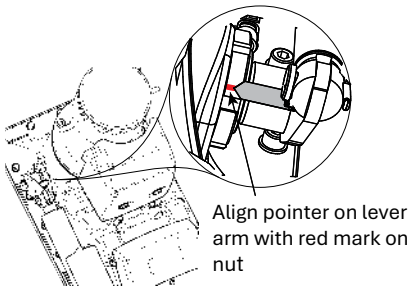


Check drive shaft alignment

(Note: Before the thruster motor is operated, check the drive shaft alignment is completely straight when it reaches the end position form the control panel operation)

1. Connect power to thruster and S-link system.
2. Sett DIP-switch on the controller to OFF.
3. Turn on the panel. (The thruster deploys.)
4. The actuator lever arm is set to alignment marking on the nut.
5. If marks align, turn panel off. The thruster retracts.
6. If the marks do not align, proceed to calibrate drive shaft.





Calibrate drive shaft alignment

(Note: The drive shaft is correctly aligned when manufactured.)

1. With dip-switches select 'Service Mode'.
2. Align the arrow on the actuator arm with the calibration mark, using the UP/DOWN buttons.
3. With dip-switches select 'Sensor Calibration Mode'.
4. Press and hold both UP and DOWN buttons until STATUS LED light up green.
   (Note: If FAULT LED light-up red, then the calibration is out of position wrong align mark.)
5. With dip-switches select 'Operation Mode', thruster retracts.



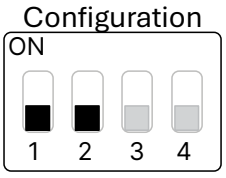


Actuator configuration

Dip-switch number 1 & 2 configures the actuator(s).

- No.1 set to OFF when the retract has two actuators.
- No.1 set to ON when the retract only has one actuator.
- No.2 set to OFF when the retract does not have P8 type actuator(s).
- No.2 set to ON when the retract has the P8 type actuator(s).

(Note: If dip-switch no.2 is set to ON and the actuator gives a rattling noise when the door closes, then there probably is not P8 actuator(s) and dip-switch no.2 needs to be set to OFF.)



The actuator is a P8 type:

- If the actuator has a plastic cap at the back where you can adjust the actuator manually.
- If it is marked with a sticker with P8
  -If the manufacturer label says P8

LED indication

Continuous red light:

- Motor over-temp, Controller over-temp, Controller no communication, Motor relay failure, Low battery voltage, Position sensor failure, No power to actuators, Retractable unit failure, Temp sensor open circuit.

Flashing red light:

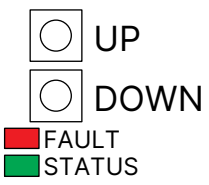
- Red light fast blinking: Dip-switch in an invalid position.
- Red light short flash every 2 seconds: Shaft not calibrated, or shaft calibrated out of range.

Continuous green light:

- Normal mode, Service mode (actuators operated by UP/DOWN buttons).
- Re-calibrated "down"-position.

Flashing green light:

- No S-Link communication.



MC_0069

[]..... The bolts holding the gearleg and main bracket together are tightened correctly.

[]..... The bolts holding the motor to its bracket are tightened correctly.

[]..... All electrical connections are clean, dry and tight, and the correct cable, fuse and main switch size.

[]..... Check that there is no electrical connection between the electro motor body and positive terminal on the motor, and between the electro motor body and the negative terminal on the motor with an ohm meter.

[]..... Anti-fouling has been applied to the gearleg and propeller but NOT anodes, sealing/rubber fittings or propeller shafts.

[]..... Propeller is fastened correctly to the shaft.

[]..... Propeller turns freely in tunnel.

[]..... The anode is in position, and that its fastening screw is tightened well with thread glue.

[]..... Check the boat for potential water leakage around installation areas.

[]..... Correct drive direction as per control panel.

[]..... User Manual is supplied to the owner. MC_0033

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

Signed: .....

Date: .....

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: .....

.....

.....

Introduction:

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

Electric motors and electronics

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

Metals:

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

Plastics:

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

Hazardous materials:

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

General disposal instructions:

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

Safe disposal practices:

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

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

MC_0848

Serivce and support

Find your local certified Sleipner dealer for expert service and support.

Scan the QR code or visit: sleipnergroup.com/support

Spare parts and documentation

Find spare parts, technical documentation, and additional resources for your Sleipner product.

Scan the QR code or visit: sleipnergroup.com/spare-parts

Patents

Learn more about Sleipner's patented designs and technological innovations in the marine industry.

Scan the QR code or visit: sleipnergroup.com/patents

MC_0024

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.sleipnergroup.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.

MC_1161

MC_0037

MC_0037



SLEIPNER MOTOR AS

P.O. Box 519

N-1612 Fredrikstad

Norway

www.sleipnergroup.com

Made in Norway

© Sleipner Motor AS. All rights reserved.
The information in this document was correct at the time of publication. However, Sleipner Motor AS accepts no liability for any inaccuracies or omissions it may contain. Continuous product improvement may result in changes to product specifications without prior notice. Consequently, Sleipner Motor AS accepts no liability for any differences between the product and this document. This document may contain content prepared with the assistance of artificial intelligence (AI). AI-assisted content has been reviewed and approved by Sleipner employees prior to publication.