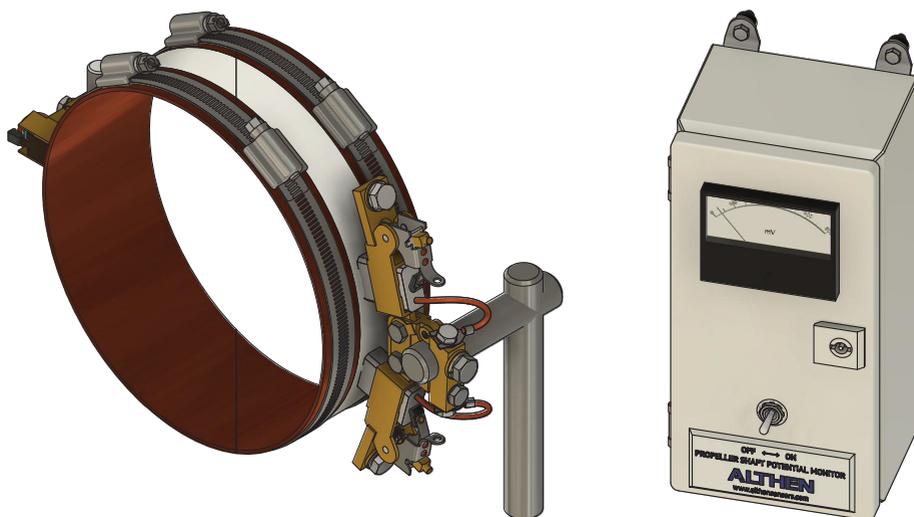




A

Propeller Shaft Earthing & Potential Monitoring



INSTALLATION & MAINTENANCE

■ 1. INTRODUCTION

On sea-going vessels and ships, the propeller blades and propeller shaft bearings are vulnerable to spark erosion as the turning propeller shaft becomes electrically insulated from the hull. This is even the case on vessels that are equipped with sacrificial anode systems. A propeller shaft earthing (PSE) system must be installed to avoid damage to the propulsion machinery which results in excessive maintenance costs.

In order to direct the electrical current that flows through the propeller shaft to the hull of the ship, a proper PSE system contains parts that have a very low electrical resistance. The main component of the Althen PSE system consists of is a copper slipring with a solid silver inlay that is supplied with two stainless steel clamping bands including dedicated connectors. Furthermore, a brush holder is supplied which holds two silver/graphite brushes (80% Ag) that run over the silver track of the slipring. The brushholder is connected to the hull of the ship by means of an earthing cable. It has been proven that this set ensures optimal electrical continuity, which reduces total cost of ownership.

In addition to our PSE system, a monitoring set can be installed in the engine room to visualize the potential difference between the propeller shaft and the hull of the ship. This system contains an additional brushholder with a single brush that runs over the silver track of the slipring. This brushholder is insulated from the hull of the ship and connected to an analog mV-meter that indicates if the PSE system is working properly. The advantage of this monitoring system is that it operates independently without the need of power supply.

The analog mV-meter on the monitoring unit has a range of 0-500mV. When the shaft earthing set is working properly, the mV-meter should indicate a value below 50mV. Exceeding the 50mV means malfunction of the PSE system, which may be related to filthy or worn parts, or incorrect installation.

Additionally the monitoring set can be supplied with a 4-20mA converter that offers an additional alarm function. This function can be used to send a signal to the bridge when the potential difference becomes too high due to malfunction of the PSE system.

■ 2. SAFETY INSTRUCTIONS

The PSE systems should be installed when the propeller shaft is not turning. Both the slipring and clamping band have sharp edges that may cause injuries during installation. Therefore it is recommended to wear gloves and a protective overall during installation.

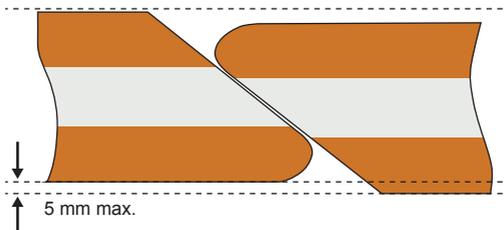
■ 3. SHAFT EARTHING SET 8047A

The shaft earthing set contains a copper/silver slipring, two stainless steel clamping bands with dedicated connectors, a double brushholder, and two silver/graphite earthing brushes. For proper installation we recommend to follow below instructions and drawing no. 8047A on page 8.

■ 3.1 SLIPRING INSTALLATION

Unless otherwise specified, sliprings for propeller shaft diameters above 260mm are supplied as a full ring with one 45° cut. To avoid severe deformation of these sliprings, slightly open up the slipring and work it gently around the propeller shaft. Sliprings for propeller shaft diameters up to 260mm are supplied as two equal halves with two 45° cuts in opposite direction. Each slipring is supplied with a set of two stainless steel clamping bands and two dedicated connectors. To install the slipring correctly, one should follow below instructions carefully.

1. Clean the propeller shaft with a degreasing detergent over the full mounting surface of the slipring in order to remove dirt, moisture, grease, oil, rust, or any other form of pollution that may be present as this will affect a proper operation of the PSE system.
2. Remove the blue film from the slipring.
3. Place the slipring carefully around the propeller shaft without deforming or damaging it.
4. Shift the cutting edges in the direction that makes the slipring fit the propeller shaft tightly (see below). The maximum allowable shift is 5mm.



5. Put one stainless steel clamping band on each side of the silver inlay in the middle of the copper track.
6. Slip both ends of the stainless steel clamping bands into the dedicated connectors and fasten the connector screws to 10Nm. Do not fasten the screws too tight.

Tip: To prevent bouncing brushes, the slipring must have a smooth surface over its full length.

3.2 EARTHING BRUSHHOLDER INSTALLATION

The brushholder for the earthing brushes must be mounted on a $\varnothing 20\text{mm}$ rod which is welded or bolted to the ship's structure. This rod, as well as the 25mm^2 earthing cable, should be supplied by the shipyard. The brushholder has two adjustable spring tensioners that are pre-set to a minimum pressure of approx. 790 grams on each brush.

Please refer to the following instructions for mounting of the earthing brushholder and brushes:

1. Shift the brushholder over the $\varnothing 20\text{mm}$ rod.
2. Align the brushholder in such a way that both brushes may run over the center of the silver inlay on the copper slipring.
3. Tighten the small bolt on top of the brushholder so the brushholder cannot move.
4. Position both arms of the brushholder so they follow the radius of the slipring.
5. Tighten the two bolts on front of the brushholder in order to fix the arms in the desired position.
6. Open the clamps with the spring tensioners, put the earthing brushes in the brushholder, and close the clamps again.
7. Connect the cable lugs of both earthing brushes to the small bolts on both sides of the brushholder.
8. Connect one end of a short 25mm^2 bonding cable to the large bolt on top of the brushholder.
9. Connect the other end of the short 25mm^2 bonding cable to the ship hull.

3.3 SHAFT EARTHING SET INSTALLATION CHECK

When the shaft earthing set is installed, it needs to be checked for smooth operation. One may use below checklist to ensure proper installation of the shaft earthing set.

1.	Is the slipring tightly mounted to the propeller shaft so it cannot move?	<input type="checkbox"/>
2.	Is the blue film removed from the slipring?	<input type="checkbox"/>
3.	Is the slipring clean and free from oil, grease, or any other contaminants?	<input type="checkbox"/>
4.	Is the slipring free from bumps, pits, or any other damages?	<input type="checkbox"/>
5.	Is there a tight fit of the slipring cutting edges with no gap in between?	<input type="checkbox"/>
6.	Is the double brushholder fixed and secured to the mounting rod?	<input type="checkbox"/>
7.	Do the earthing brushes move freely in the brushholder?	<input type="checkbox"/>
8.	Do the earthing brushes run smoothly over the slipring?	<input type="checkbox"/>
9.	Do the earthing brushes run over the middle of the slipring's silver inlay?	<input type="checkbox"/>
10.	Is the 25mm^2 earthing cable connected to the brushholder and hull?	<input type="checkbox"/>

■ 3.4 SHAFT EARTHING MAINTENANCE

The shaft earthing set should be checked and cleaned every seven days to maintain smooth operation. If there has been a build-up of oil on the slipping face this should be removed with some degreaser. Inspect and clean the brushes and brushholder to prevent blocking from dirt. Inspect the brush- copper- leads to ensure they have not become loose or corroded. The brush-wear-down should be noted and the compression of the hold down-springs on the brushes should be adjusted to ensure good electrical contact.

■ 4. MONITORING SET 8047M

The monitoring set contains a monitoring unit with an analog mV-meter, a single brushholder, and one silver/graphite monitoring brush. For proper installation we recommend to follow below instructions and drawing no. 8047M on page 10 and drawing no. 8047A-8047M on page 9.

■ 4.1 MONITORING UNIT INSTALLATION

The monitoring unit is equipped with 4 suspension eyes in which a vibration damper with screwthread is mounted. The monitoring unit must be mounted to the ship's structure on a location with minimum vibration and a maximum distance of 10 meter from the shaft earthing set. Once the monitoring units is mounted, connect one end of a 4mm² cable to the E(-)-terminal inside the monitoring unit and the other end to the ship's structure. Make sure the earthing connection of the 4mm² cable is separated from the earthing connection of the 25mm² bonding cable on the double brushholder.

Tip: Make sure to install the monitoring unit on a place with minimum vibrations.

In case of the monitoring unit with alarm function, a 4-20mA converter is included in the monitoring unit. This requires an additional power supply of 19,2V to 30Vdc. A 4mA output corresponds with 0mV while 20mA output corresponds with 500mV. Since the treshold of a proper operating PSE system is 50mV, the alarm function setpoint must be set to $\pm 5,6$ mA. Please refer to drawing no. 8047M-4-20 on page 11 for installation instructions.

■ 4.2 MONITORING BRUSHHOLDER INSTALLATION

The monitoring brushholder is insulated from the ship's structure by means of an insulating bush which is supplied with the brushholder. The brushholder for the monitoring brush must be mounted on a $\varnothing 12\text{mm}$ rod which is welded or bolted to the ship's structure. This rod, as well as a 4mm^2 cable, should be supplied by the shipyard. The brushholder has a fixed spring that provides the right amount of pressure on the monitoring brush.

Please refer to the following instructions for mounting of the monitoring brushholder and brush:

1. Put the monitoring brush in the brushholder and connect the cable lug to one of the small bolts on top of the brushholder.
2. Shift the brushholder over the $\varnothing 12\text{mm}$ rod. Make sure the insulating bush that is supplied with the monitoring brushholder is in its position.
3. Align the brushholder in such a way that the brush may run over the center of the silver inlay on the copper slipring.
4. Tighten the small bolt on the side of the brushholder so the brushholder cannot move.
5. Connect one end of a 4mm^2 cable to the other small bolt on top of the brushholder.
6. Connect the other end of the 4mm^2 cable to the P(+)-terminal inside the monitoring unit.

■ 4.3 MONITORING SET INSTALLATION CHECK

When the monitoring set is installed, it needs to be checked for smooth operation. One may use below checklist to ensure proper installation of the monitoring set.

1.	Is the monitoring brushholder fixed and secured to the mounting rod?	<input type="checkbox"/>
2.	Does the monitoring brush move freely in the brushholder?	<input type="checkbox"/>
3.	Does the monitoring brush run smoothly over the slipring?	<input type="checkbox"/>
4.	Does the monitoring brush run over the middle of the slipring's silver inlay?	<input type="checkbox"/>
5.	Is one end of one 4mm^2 cable connected to the E-terminal inside the monitoring unit and the other end to the hull?	<input type="checkbox"/>
6.	Is one end of the other 4mm^2 cable connected to the P-terminal inside the monitoring unit and the other end to the monitoring brush?	<input type="checkbox"/>

5. MAINTENANCE OF SHAFT EARTHING AND MONITORING SET

To ensure proper operation of the shaft earthing and monitoring set it is recommended to clean and check both sets on a weekly base.

1. Clean the slipping and brushes with a degreasing detergent in order to remove dirt, moisture, grease, oil, rust, or any other form of pollution.
2. Check if the slipping surface is smooth and if the brushes run smoothly over the slipping.
3. Check if the earthing brushes and monitoring brush move freely in the brushholders.
4. If necessary, adjust the spring tensioners to ensure good electrical contact between the brushes and silver track of the slipping.
5. Check the wear of the brushes. If they brushes are worn too far, replace them immediately.
6. Inspect the connections of the copper leads of the brushes, as well as the connections of the bonding cable, and make sure they are all free of corrosion.

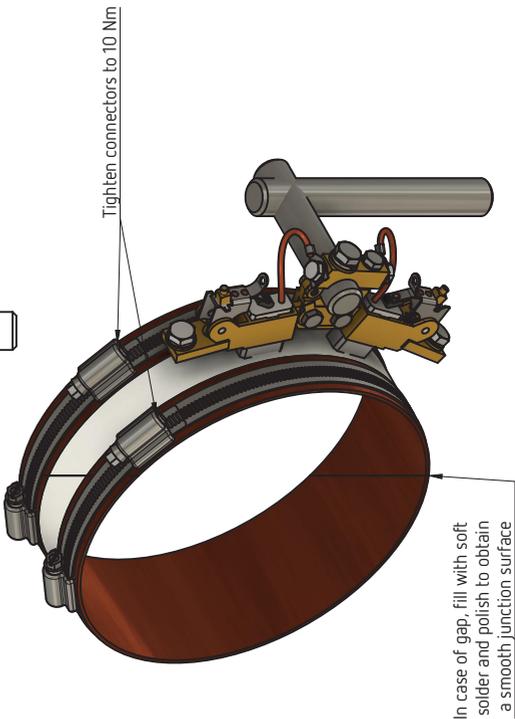
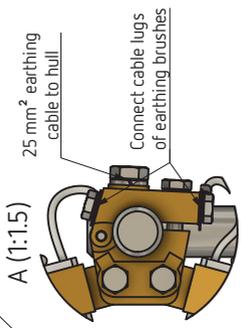
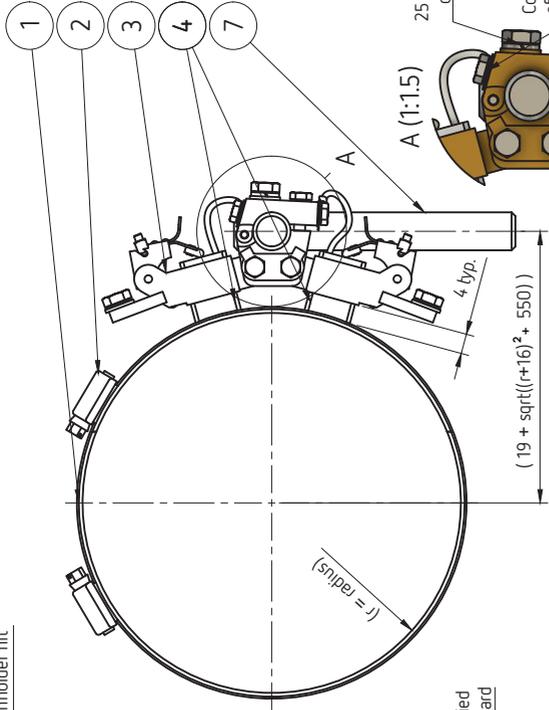
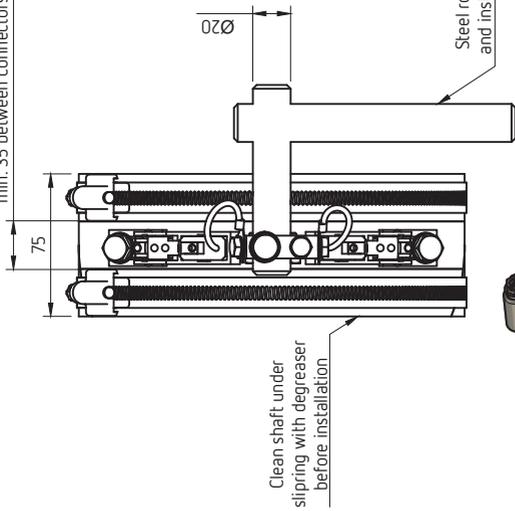
6. SPARE PARTS LIST

All parts of the PSE system are available as spare part. Below shows a list of all spare parts including the Althen item number, item name, item description, HS code, and weight.

ITEM NO.	ITEM NAME	ITEM DESCRIPTION	HS CODE	WEIGHT
A110-40304-002	SE 2400081	Silver / graphite earthing brush (80% Ag) 25x12,5x33mm	85452000	0,06 kg
A113-40303-002	SE 2100045/2	Double balancing earthing brushholder with brush pressure setting	85030099	0,3 kg
A113-40303-001	SE 2200014 item 1&2	Monitoring brushholder complete with clamp and insulator	85030099	0,13 kg
A110-40304-001	SE 2400082	Silver / graphite monitor brush (80% Ag) 20x10x32mm	85452000	0,04 kg
A109-40302-001-xxx	SE 2100045/1	Silver / copper slipping	71070000	n/a
A111-40302-002-xxx	SE 2100045/4	Set stainless steel banding incl. of connectors (set is 2 off)	85030099	0,3 kg
A022-40305-001	SE 2400084/1	Complete enclosure for shaft earthing monitoring	90303900	3,3 kg
C003-40301-002-900	SE 2400084/1-420	Complete enclosure for shaft earthing monitoring with 4-20mA output	90303900	3,5 kg
A112-40305-002	SE 2400084/2	mVolt-meter for shaft earthing monitoring	90303900	0,1 kg
A022-40305-003	SE 2400084/3	Shock absorber set for monitoring Ø20x15	40169997	0,01 kg
A003-40305-004	SE 2400084/4	Switch (for monitoring unit)	90303900	0,02 kg

* diameter (mm) x 0.00427 = kg

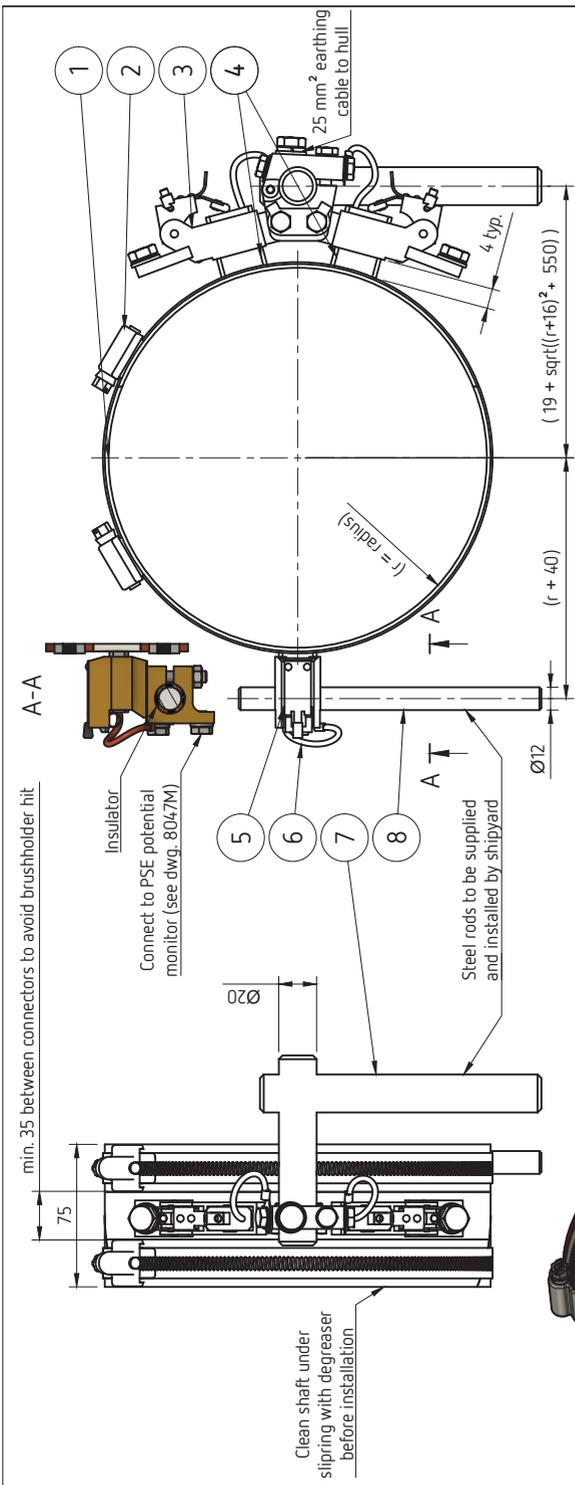
min. 35 between connectors to avoid brushholder hit



7	1	Steel rod 2	To be supplied and installed by shipyard
4	2	SE2400081	Silver/graphite earthing brush (80% Ag)
3	1	SE2100045-2	Double balancing earthing brush holder
2	1	SE2100045-4	Stainless steel banding incl. connectors (set of 2)
1	1	SE2100045-1	Silver/copper slipping
Item	Qty	Part Name	Description

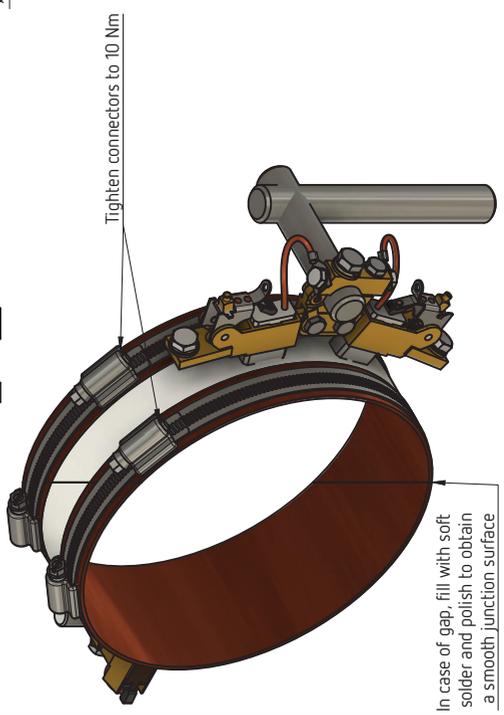
Parts List		DWG. NO.: 8047A	STATUS: FINAL
TITLE: Propeller-shaft earthing installation		DESIGNED: DRAWN: SHE JDD	CHECKED: MLU THA
		08/06/19	20/02/20
		SCALE: 1:2	30/03/20
		UNITS: mm	SHEET: 1/1
			REV: 2



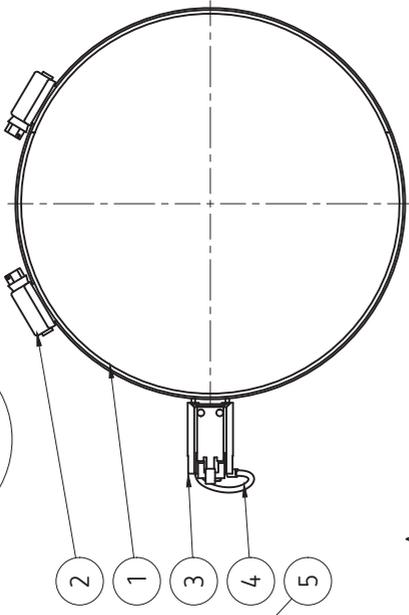
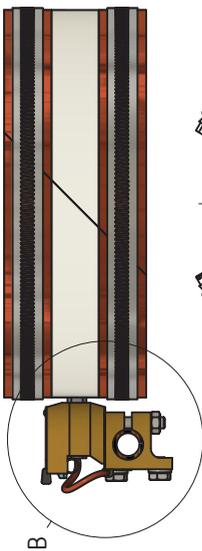


8	1	Steel rod 1	To be supplied and installed by shipyard
7	1	Steel rod 2	To be supplied and installed by shipyard
6	1	SE2400082	Silver/graphite monitoring brush (80% Ag)
5	1	SE2100014-1&2	Monitoring brush holder with insulator
4	2	SE2400081	Silver/graphite earthing brush (80% Ag)
3	1	SE2100045-2	Double balancing earthing brush holder
2	1	SE2100045-4	Stainless steel banding incl. connectors (set of 2)
1	1	SE2100045-1	Silver/copper slipring
Item	Qty	Part Name	Description

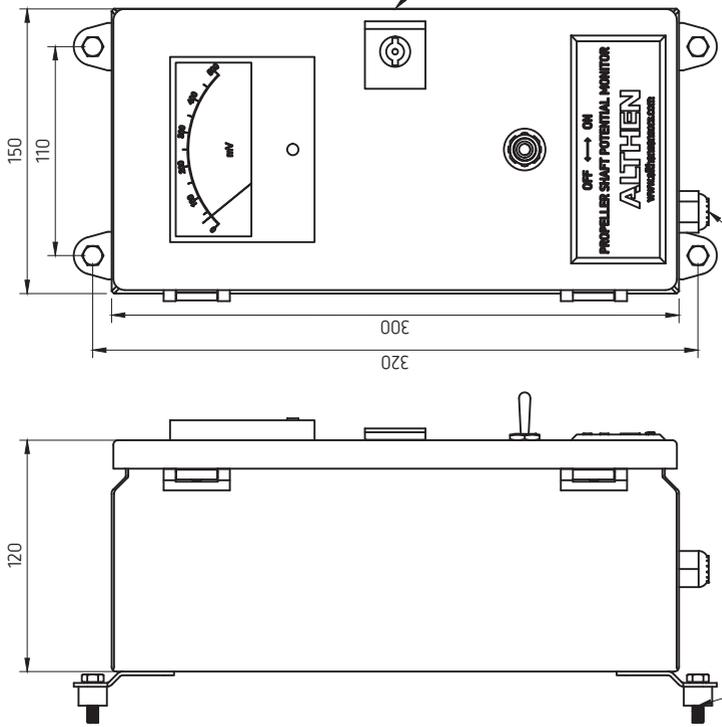
Parts List			
TITLE: PS earthing and monitoring installation		DWG. NO.: 8047A-8047M	STATUS: FINAL
DESIGNED:	DRAWN:	CHECKED:	APPROVED:
JDD	SHE	MLU	THA
08/06/19	20/02/20	24/03/20	30/03/20
SCALE: 1:2	UNITS: mm	SHEET: 1/1	REV: 2



A-A (1:2)

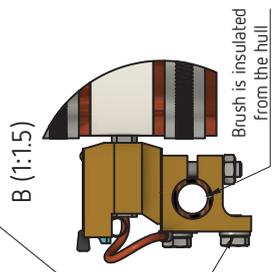


A T T A



Make sure to mount enclosure in a location with minimal vibration

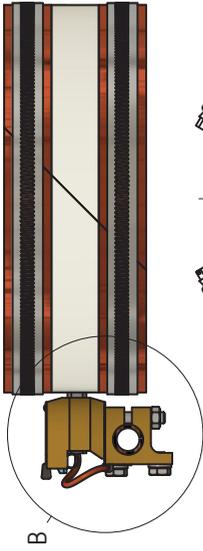
Connect to enclosure with 4 mm² cable of max length 10m from monitoring brush



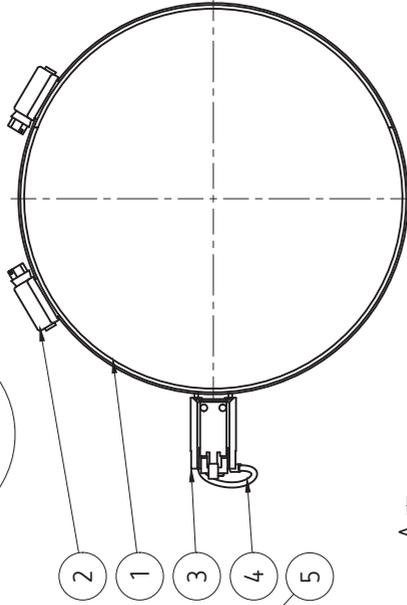
5	1	SE2400084-1	Complete enclosure with mVolt-meter
4	1	SE2400082	Silver / graphite monitoring brush (80% Ag)
3	1	SE2100014-1&2	Monitoring brush holder with insulator
2	1	SE2100045-4	Stainless steel banding incl. connectors (set of 2)
1	1	SE2100045-1	Silver / copper slipring
Item	Qty	Part Name	Description
Parts List			
TITLE: Propeller-shaft monitoring installation			DWG. NO.: 8047M
DESIGNED: JDD			DRAWN: SHE
JDD			SHE
08/06/19			20/02/20
SCALE: 1:2			UNITS: mm
STATUS: FINAL			CHECKED: MLU
APPROVED: THA			THA
30/03/20			30/03/20
SHEET: 1/1			REV: 2



A-A (1:2)

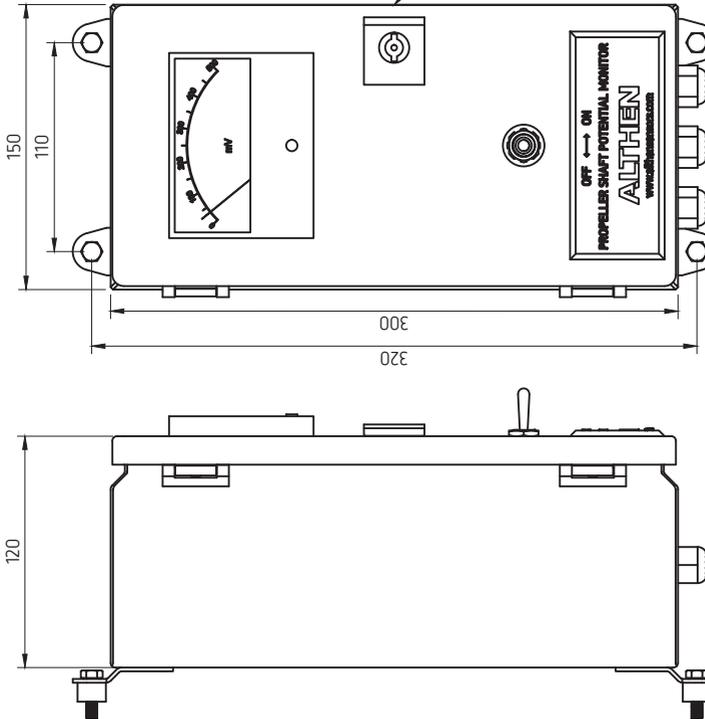


B



A ↑

↑ A



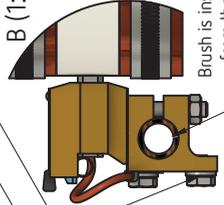
Connect to enclosure with 4 mm² cable of max length 10m from monitoring brush

Connect to power supply (19.2-30V)

Connect to current loop (4-20mA)

Make sure to mount enclosure in a location with minimal vibration

B (1:1.5)



Brush is insulated from the hull

5	1	SE 2400084-1 4-20mA	Complete enclosure with mVolt-meter and 4-20mA output
4	1	SE2400082	Silver / graphite monitoring brush (80% Ag)
3	1	SE2100014-1&2	Monitoring brush holder with insulator
2	1	SE2100045-4	Stainless steel banding incl. connectors (set of 2)
1	1	SE2100045-1	Silver / copper slipring
Item	Qty	Part Name	Description

Parts List

TITLE: Propeller-shaft monitoring 4-20 mA			DWG. NO.: 8047M-4-20	STATUS: FINAL
DESIGNED: JDD		DRAWN: SHE	CHECKED: MLU	APPROVED: THA
DATE: 08/06/19		DATE: 20/02/20	DATE: 24/03/20	DATE: 30/03/20
SCALE: 1:2	UNITS: mm	SHEET: 1/1	REV: 1/1	REV: 2





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