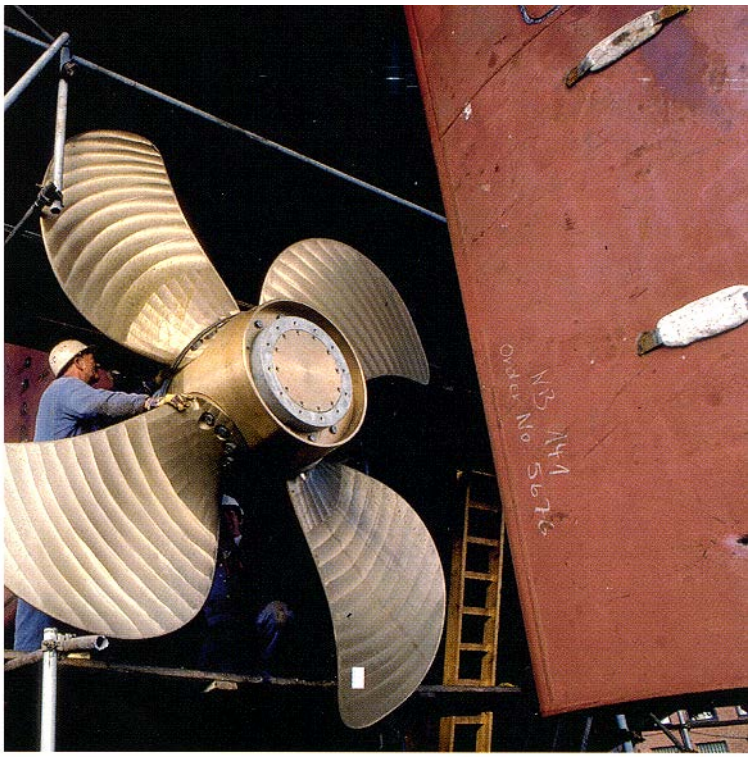
MANUAL FOR

BAC CORROSION CONTROL A/S

SHAFT GROUNDING ASSEMBLY WITH mV-METER AND AMPLIFIER FOR ALARM OUTPUTS



BAC ORDER NO: 539600

BAC CORROSION CONTROL A/S
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1 GENERAL DESCRIPTION

1.1 Control box with Amplifier for alarm

This system is a precautionary measure installed, in order to reduce the electrical potential between the propeller shaft and hull to below 80 mV, and thus prevent spark erosion damage to the main bearings and journals of the main engine. (A reading between 5 and 50 mV is considered as normal).

With Amplifier for alarm

1.2 The system consists of the following main components**:**

A. A silver alloy slip ring is mounted on the intermediate shaft.
B. Brush holders with silver/graphite brushes.
C. Grounding wire and grounding plate.
D. Monitoring box with mV-meter and alarm output (optional).
E. Resistivity of the silver should be less than 0.1µ Ohm x m.
   The total resistance from the shaft to hull must not exceed 0.01 Ohm
F. The total resistance of the cable from the brush holder to the hull, must not exceed 0.005 Ohm. Indication of less than 5mV can occur at low resistance.

The silver/graphite brushes are running on the slip ring. The two earthing brushes are connected to the hull through the grounding wire and the grounding plate welded to the hull. The monitoring brush is connected to the monitoring box.

1.3 Functioning and checking of the earthing/measuring device.

The meter normally reads 150 mV at full scale. If readings are above 150 mV, push the button on the front of the meter. The meter will now read 1500 mV at full scale.

The meter will read ”0” when the shaft is at rest. When the shaft is turning at sea, a reading of between 5 and 80 mV indicates proper grounding, although readings below 50 mV should be obtained with clean and properly contoured brushes.

With Amplifier for alarm

We will advise you to set a delay up to 5 min. or the alarm to avoid errors during manoeuvring of the engine.

Readings of ”0” when the shaft is turning at sea, indicates a defective mV-meter or loose or broken cable connections.

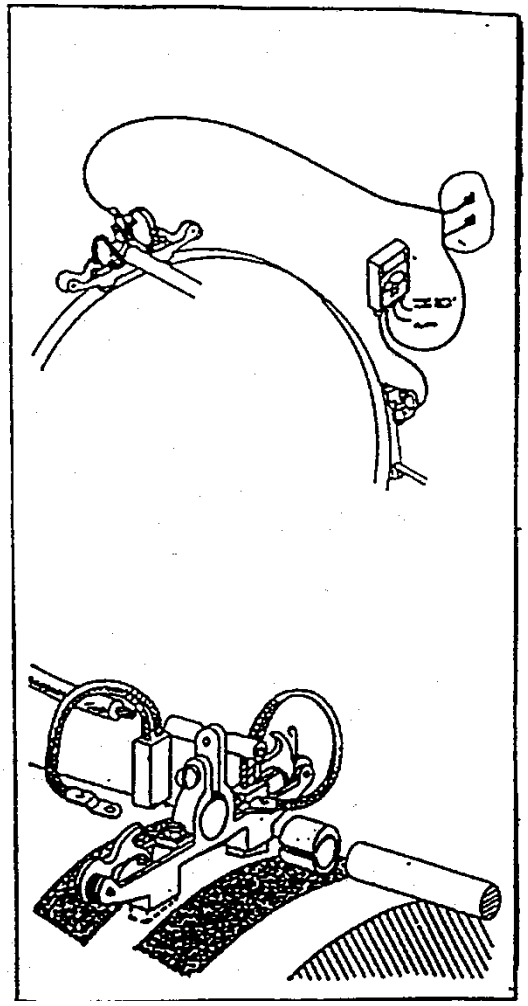
Checking the earthing device must be done when the shaft is rotating at sea and should be carried out once a month.

Release the earthing brushes from their contact with the slip ring; this should give high pulsating voltages of 100-400 mV reading on the meter. This indicates that the measuring circuit is in order. When the brushes are brought back to contact with the slip ring, the reading should fall below the 80mV limit. You can also read the result on the computer

It is important that the silver/graphite brushes are moving correctly in the brush holders with a spring load of 500-600 gr.

In some cases the copper lead on the brush will corrode, so it is recommendable to coat this lead with grease.

It is recommended that the readings of the mV-meter be recorded once a day in the engine logbook.



2 INSTALLATION INSTRUCTION

2.1
The slip ring usually located about 450 mm in front of the shaft coupling

2.2
Sand the area on the shaft between the two straps, until a bright steel surface appears.

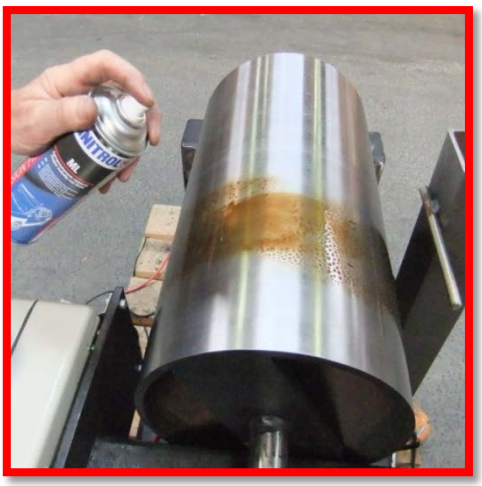
2.3
Clean the grinded area
Use metal cleaner, spray or liquid, see datasheet. (BAC does not supply this)

2.4
Starting with the 45° end, warp the silver band around the shaft so that the excess overlaps the 45° angle. Mark the edges, scribe a line between them

2.5
Cut the silverband

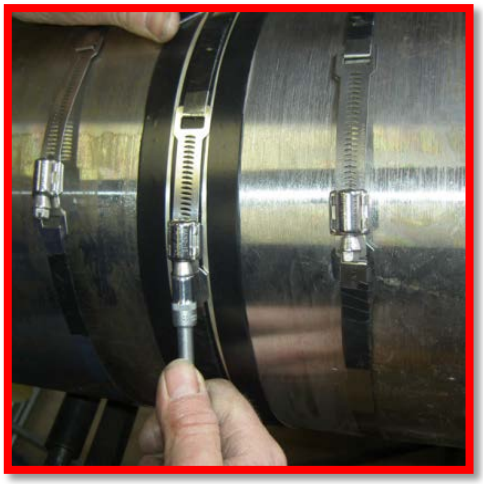
2.6
Lightly smooth skive joint with fine file to eliminate any roughness

2.7
Spray presavation oil on the shaft
See datasheet. (BAC does not supply this)



2.8
Apply el-tape in 3 strips on the silver band

2.9
Assemble the 3 stainless steel band straps and apply the silver band with one band on the middle tape



2.10
Assemble the 2 other stainless steel band

2.11
Remove the middle stainless steel band and remove el-tape

2.12
Clean for oil and dirt before applying Silicon and tape
(metal cleaner, see datasheet)

2.13
Apply silicone longitudinal on the edge of the silver band in both sides

2.14
Seal the silicone with a wet finger all the way around in both sides

2.15
Wrap sensitive tape on one of the steel bands to make it absolutely tight

2.16
Wrap sensitive tape on other steel bands to make it absolutely tight

2.17
Cut the sensitive band so you can see the silver band between the two steel bands

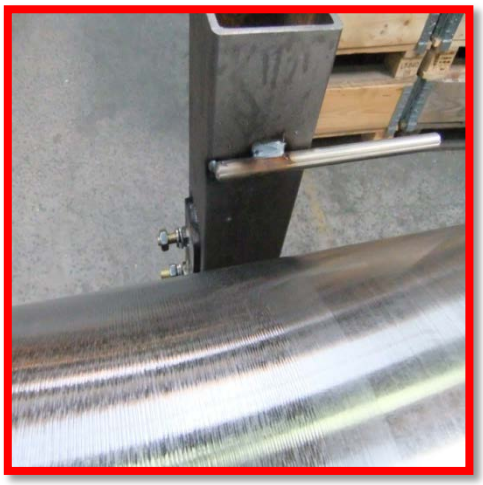
2.18
The finish mounting of the shaft grounding before finishing the silver band

2.19
Cut app. 2 mm of the edge of the glass brush

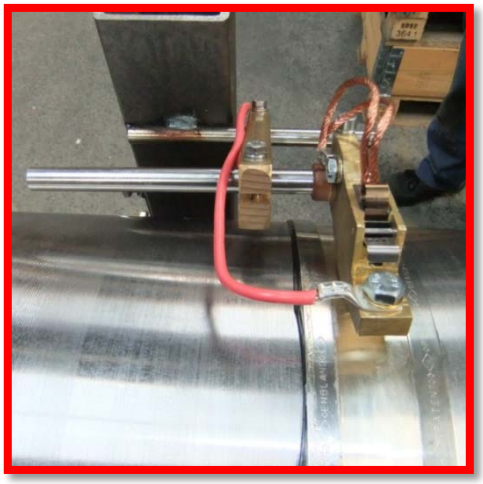
2.20
Clean the silver band with glass brush

2.21
Grounding plate must be welded as close as possible, in order for the wires to be as short as possible.

2.22
Ø12mm shaft are welded on the stand

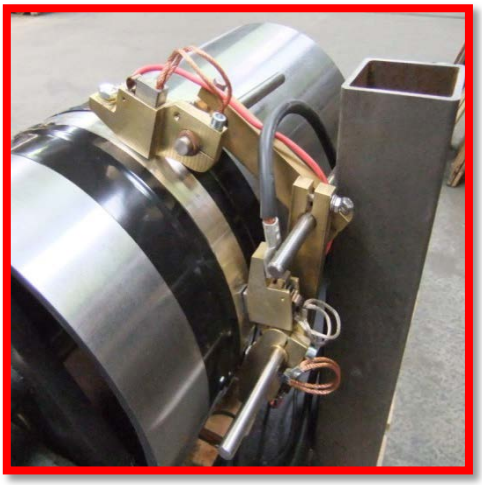


2.23
Mount the shaft holder



2.24
Mounting the silver graphite brush

2.25
Done



3 GENERAL DATA

3.1 Components

539172
Voltmeter for shaft-hull potential difference with amplifier for alarm

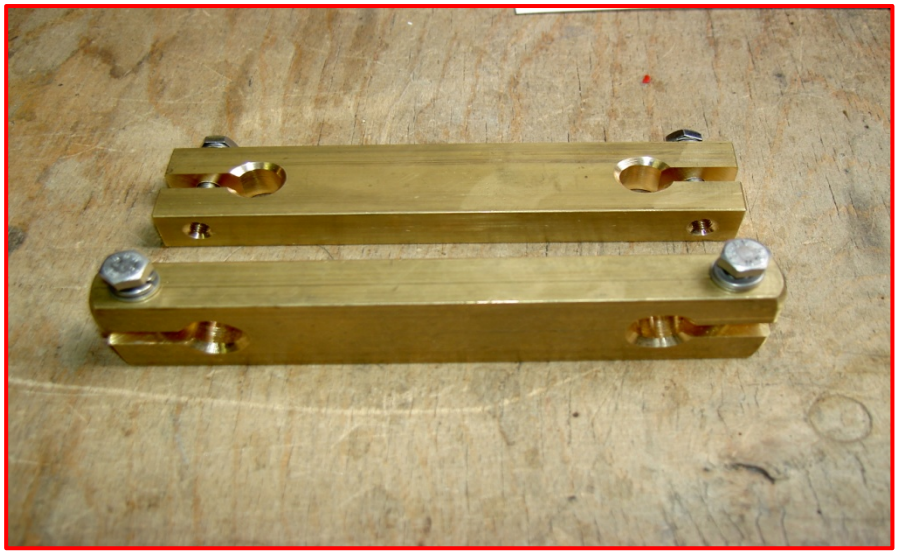
539170
Slip ring. Silver alloy band, 63,5 mm wide and approx. 100 mm longer that the circumference of the shaft.

539184 & 539185
EL tape + pressure sensitive tape

539180 & 539182
Holding straps. The permanent
holding straps are made of Stainless
Steel.

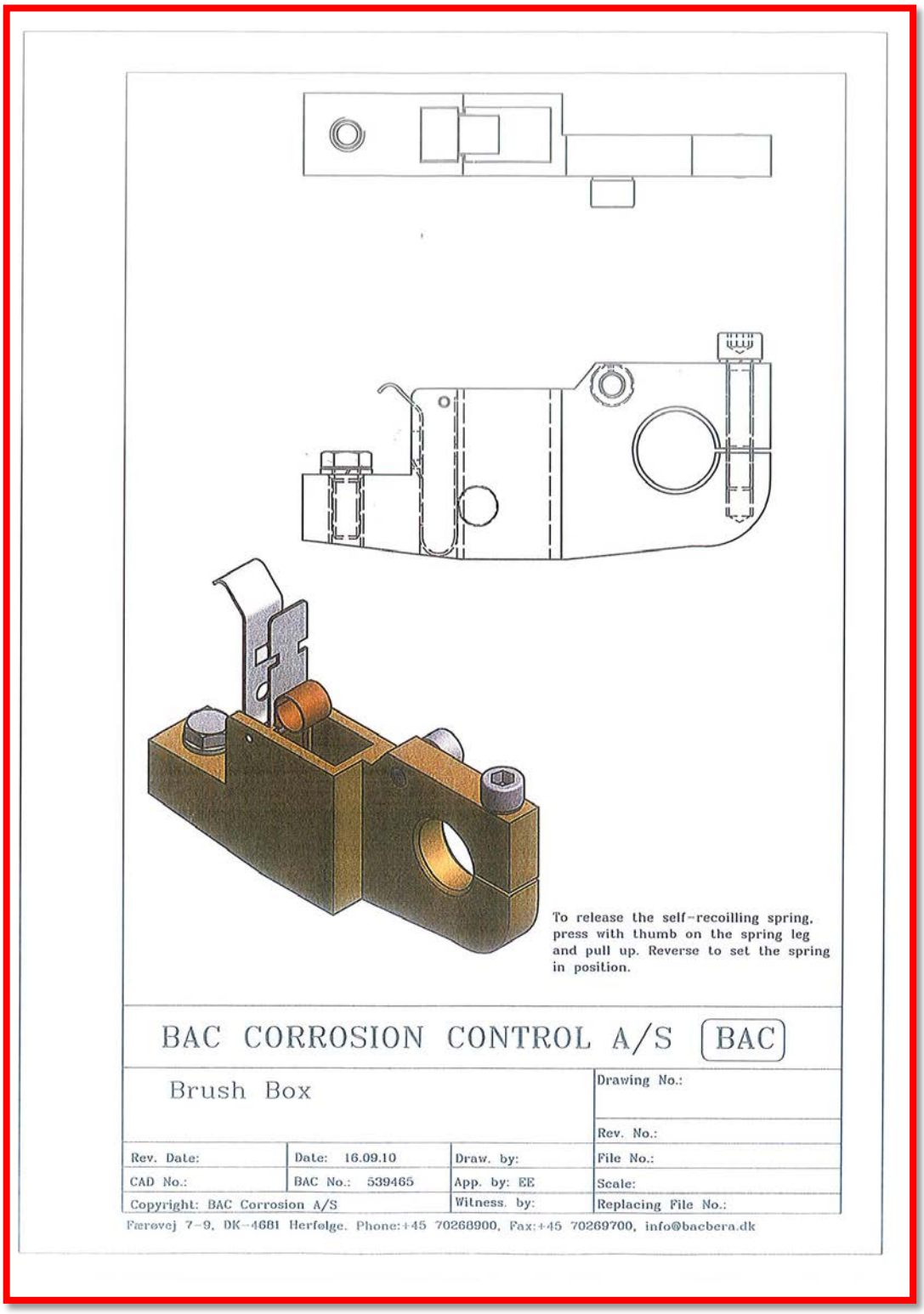
539264
St. steel shaft 12.0 x 180mm

539265
Brass shaft holder



539263 & 539262
ISO and Brass bushing
for shaft

539465 Brush box



539105
Silver graphite brush

539230
Grounding plate.
Place as close to the brush as possible

536354 & 536352
35²mm cable socket with 10 and 8 mm hole

520600 & 526060
6² mm cable socket with 8 mm hole

539125
Glass brush

94116
Silicone

94118
Preservation Oil, see datasheet
BAC does not supply this,
please by locally

94119
Metal Cleaner, see datasheet
BAC does not supply this,
Please buy locally

3.2 List of components

POS.	BAC PART No.	CLIENT PART No.	Q'ty	DESCRIPTION	CHECK
2	539172		1 pcs.	Voltmeter for shaft–hull potential difference incl. amplifier for alarm.	
3	539170		1 pcs.	Silver alloy band for shaft (90% silver and 10% copper)	
4	539184		1 roll	El tape 33+	
5	539185		1 roll	Pressure sensitive tape	
6	539180		3 pcs.	Permanent holding straps in St. steel, 12,5mm x 0,7mm x (shaft) O.D.	
7	539182		3 pcs.	Bandtightener in St. steel,	
8	539264		4 pcs.	St. steel shaft ø12.0 x 180mm	
9	539265		2 pcs.	Brass shaft holder	
10	539262		1 pcs.	Brass bushing for shaft	
11	539263		1 pcs.	ISO bushing for shaft	
12	539465		3 pcs.	Brush box	
13	539105		3 pcs.	Silver graphite brush (80% Ag)	
14	539230		1 pcs.	Grounding plate.	
15	523502		2 pcs.	Cable 35□ L=3m.	
16	526354		2 pcs.	35mm□ cable socket with 10mm hole.	
17	526352		2 pcs.	35mm□ cable socket with 8mm hole.	
18	520600		2 pcs.	Cable 6□ L=3m.	
19	526060		2 pcs.	6mm□ cable socket with 8mm hole.	
20	539105		3 pcs.	Spare silver graphite brush (80% Ag) Recommende spare parts (option)	
22	539125		1 pcs.	Glass brush	
23	539300		3 pcs.	Manual for amplifier	
25	94116		1 pcs.	Silicone Sealant	
26	94118		1 pcs.	Preservations Oil (Buy locally, BAC does not suppl)	
27	94119		1 pcs.	Metal Cleaner (Buy locally, BAC does not supply)	

BAC Corrosion Control A/S BAC

PART–LIST FOR
SHAFT–GROUNDING

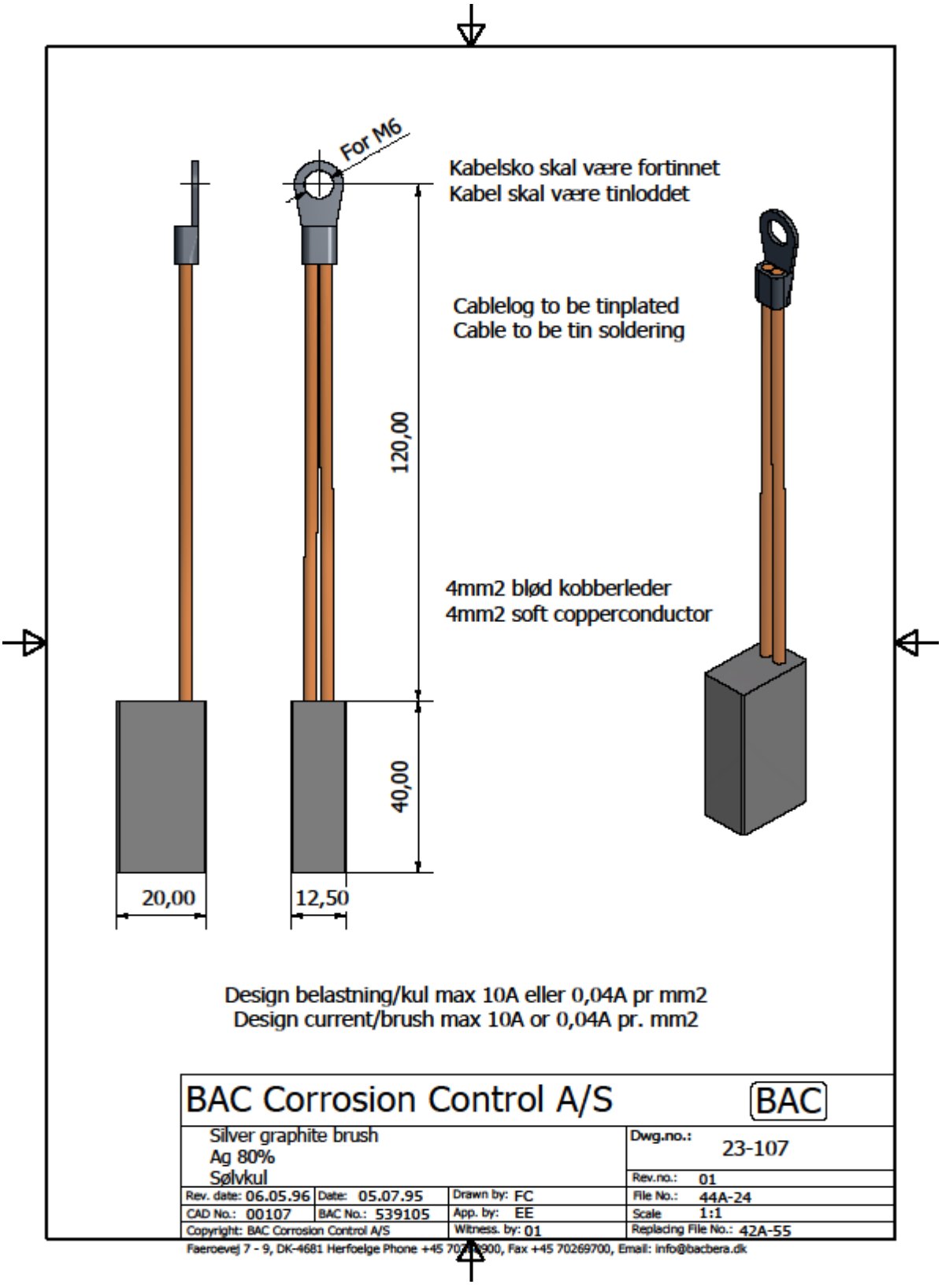
Drawing No.: (43–501E1)
23–103–539600

Rev. No.: 03

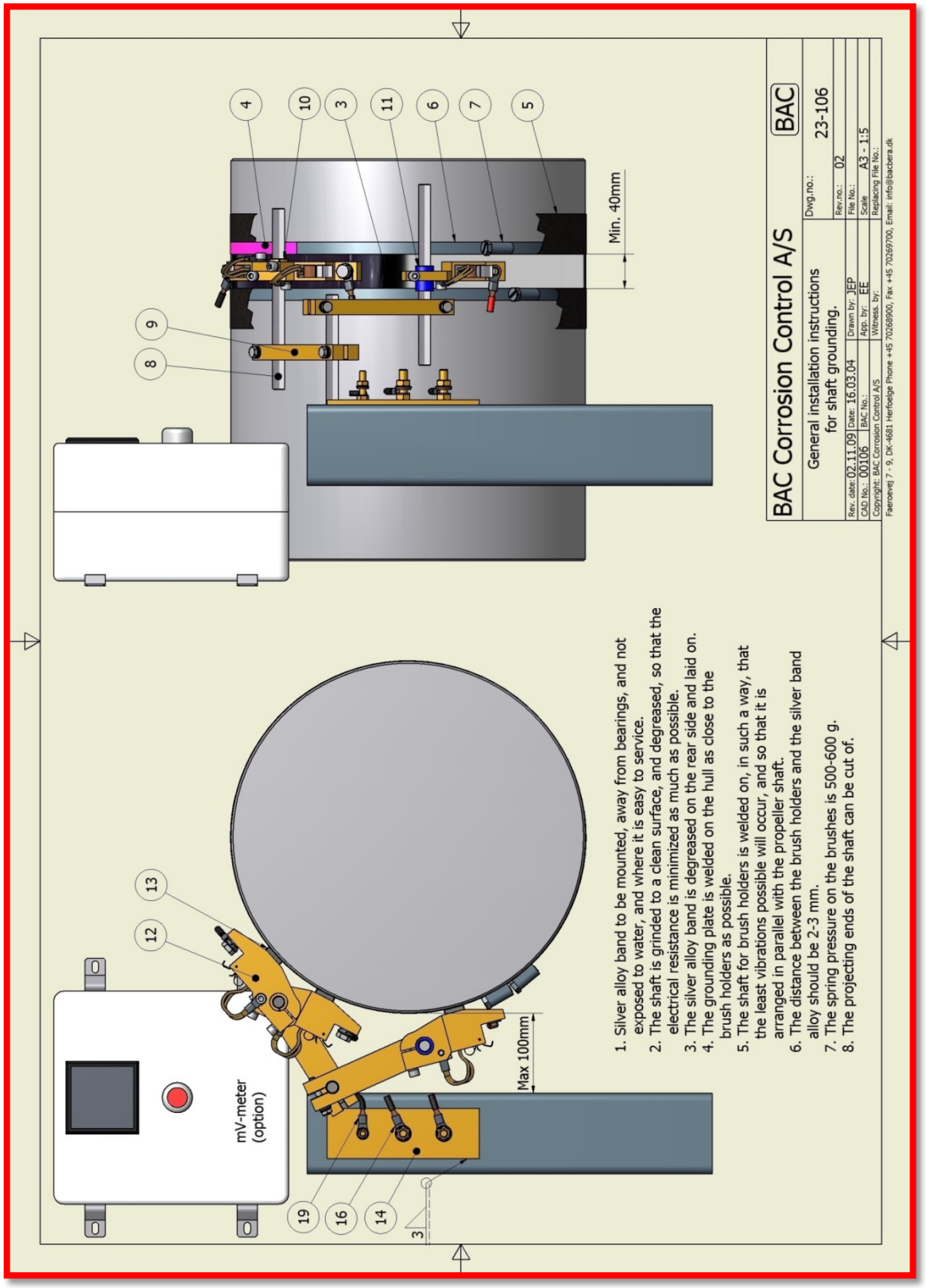
Rev. Date: 02.11.09	Date: 12.10.93	Draw. by: FC	File No.:
CAD No.: 00103	BAC No.:539600	App. by: EE	Scale: 1 : 1
Copyright: BAC Corrosion Control A/S		Witness. by:	Replacing File No.:

Faeroevej 7 – 9, DK–4681 Herfoelge. Phone:+45 70268900, Fax:+45 70269700, E–mail: info@bacbera.dk

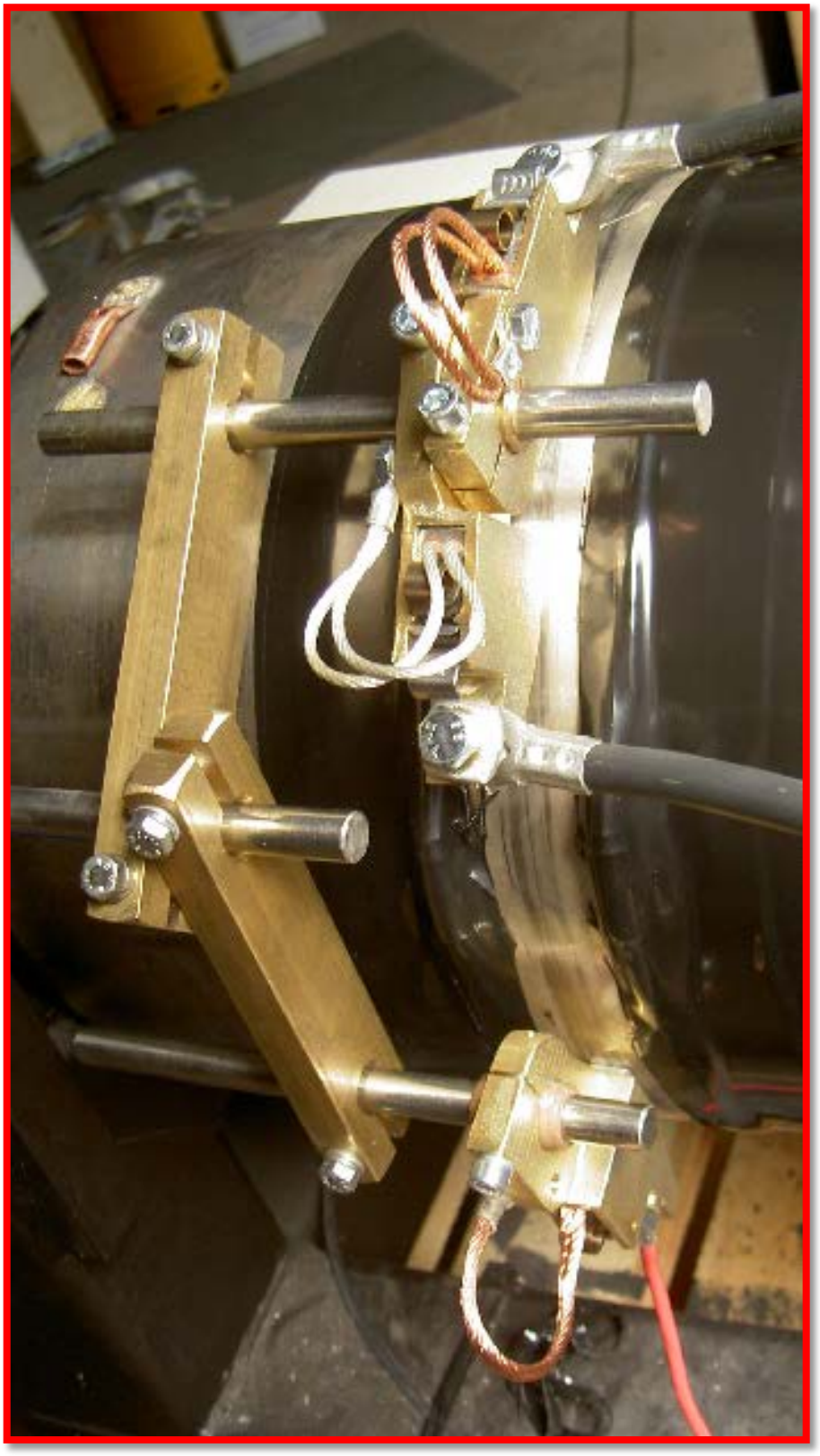
3.3 Silver Brush drawing



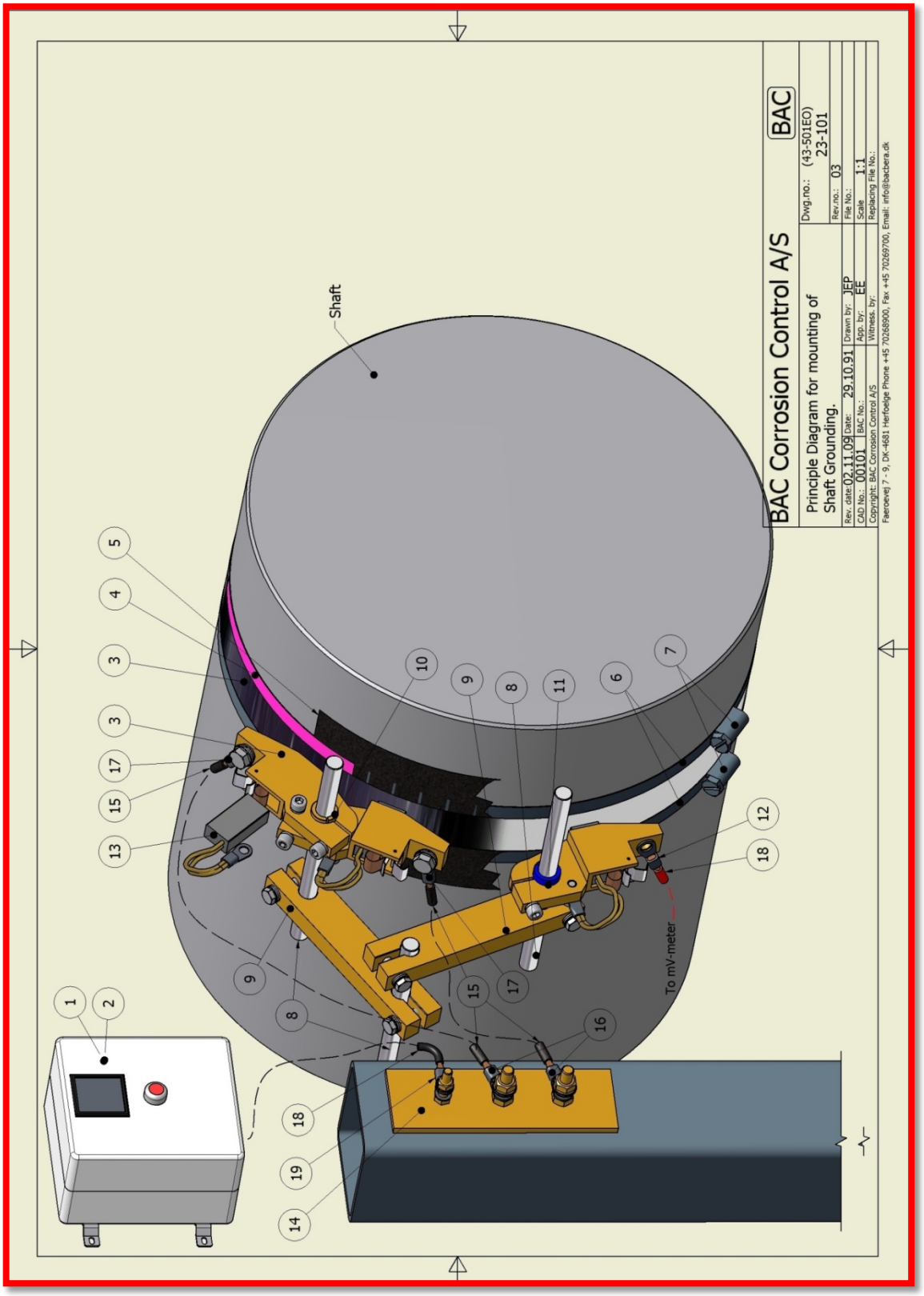
3.4 Installation instruction



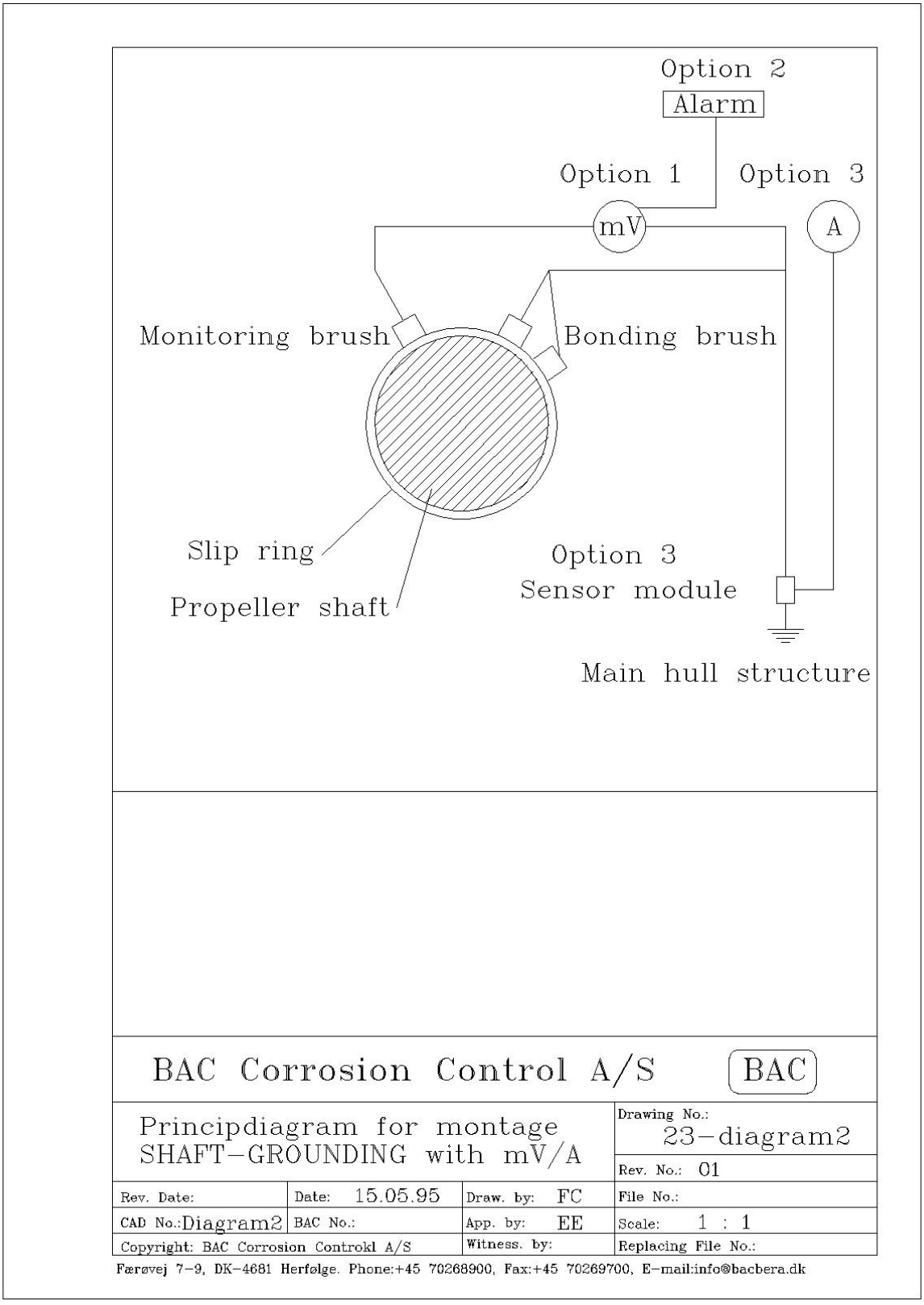
3.5 Installation instruction picture



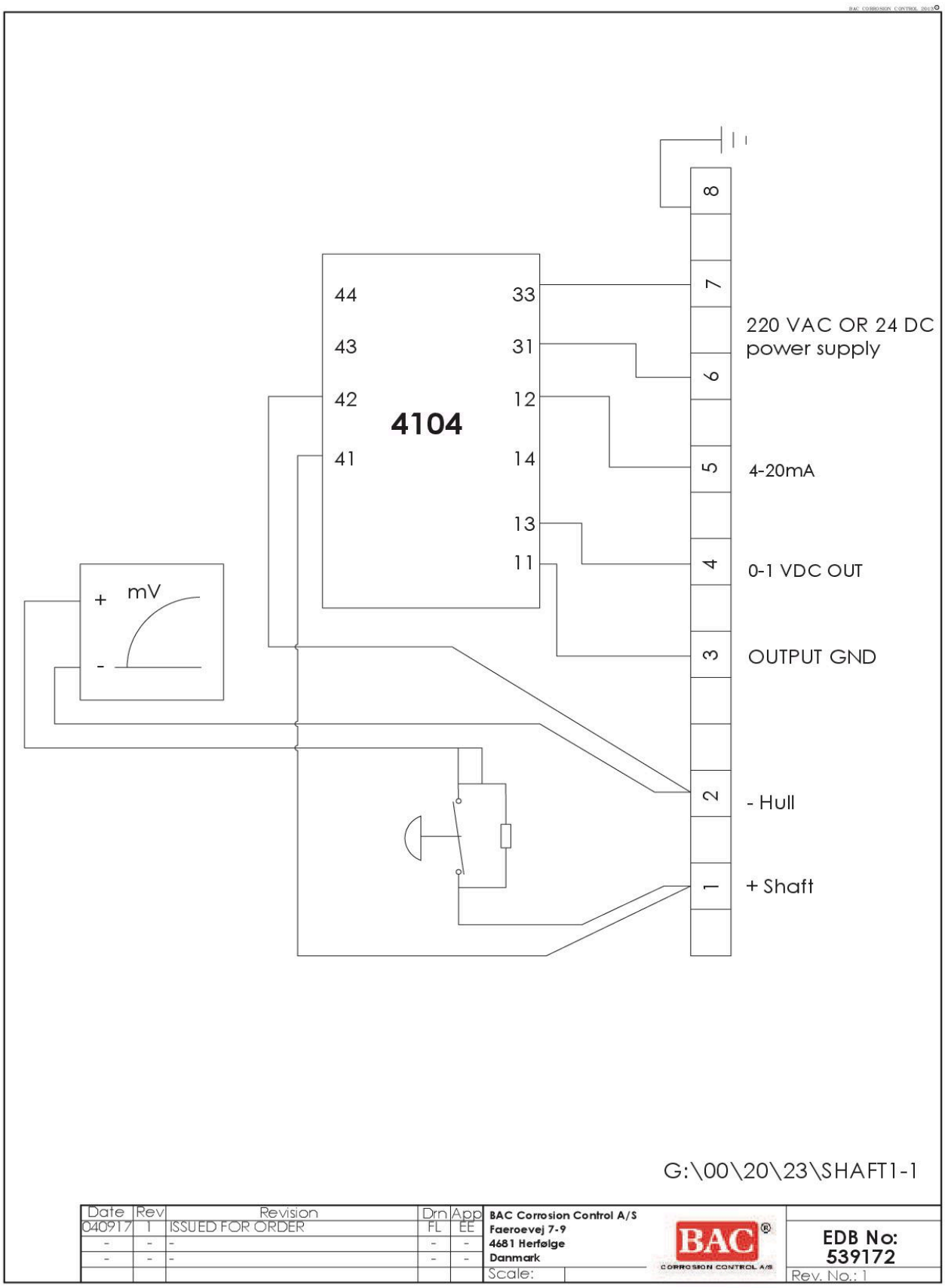
3.6 Principdiagram for mounting



3.7 Principdiagram for montage



4 SHAFT-HULL MILLIVOLTMETER ASSY



5 ISOLATION AMPLIFIER 4104

4104

– Measures and outputs uni-/bipolar voltage and current signals
– Works with both passive and active inputs and outputs
– Uses the 4501 display for programming and process monitoring
– Fast < 20 ms response time and excellent < 0.05% accuracy
– Universally powered by 21.6…253 VAC / 19.2...300 VDC

Application

- Fast < 20 ms response time for measuring signals produced by torque, position, current & acceleration sensors.
- User configurable bipolar or unipolar I/O means the 4104 is suitable for nearly any voltage or current conversion.
- The excitation source enables measurement of two or three wire transmitters.
- The active or passive I/O makes the 4104 perfect for power matching current loops.
- Converts narrow bipolar inputs to wide bipolar or unipolar outputs, e.g., ±1 volt input = ±10 volt or 4...20 mA output.
- Selectable direct or inverse I/O makes the 4104 suitable for proportional control applications.
- The "V-curve" function outputs 100% – 0 – 100% when a 0 – 100% input signal is present.

Technical characteristics

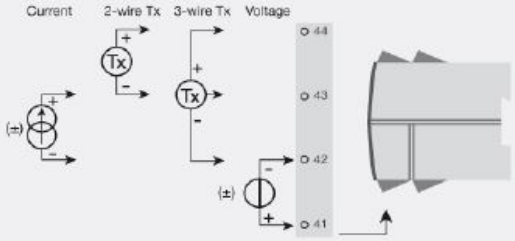
- The latest analog and digital techniques are used to obtain maximum accuracy and immunity to interference.
- The current output can drive up to 800 Ohms, with an adjustable response time of 0.0…60.0 seconds.
- Exceptional mA output load stability of < 0.001% of span/100 Ohm.
- Meets the NAMUR NE21 recommendations, ensuring high accuracy in harsh EMC environments.
- Meets the NAMUR NE43 recommendations, allowing the control system to easily detect a sensor error.
- Each unit is tested to a high 2.3 kVAC, 3-port galvanic isolation level.
- Excellent signal to noise ratio of > 60 dB.

Mounting / installation / programming

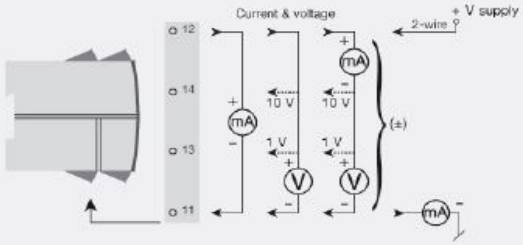
- Very low power consumption means units can be mounted side by side without an air gap – even at 60°C ambient temperature.
- Approved for marine applications.
- Programming, monitoring, and 2-point process calibration is accomplished with the 4501 detachable display.
- All programming can be password protected.

Applications

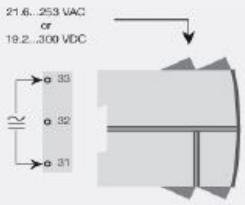
Input signals



Output signals



Supply



Environmental Conditions

Operating temperature	-20°C to +60°C
Storage temperature	-20°C to +85°C
Calibration temperature	20...28°C
Relative humidity	< 95% RH (non-cond.)
Protection degree	IP20
Installation in	Pollution degree 2 & measurement / overvoltage cat. II

Mechanical specifications

Dimensions (HxWxD)	109 x 23.5 x 104 mm
Dimensions (HxWxD) w/ 4501 / 4511	109 x 23.5 x 116 / 131 mm
Weight approx.	250 g
DIN rail type	DIN EN 60715/35 mm
Wire size	0.13...2.08 mm² AWG 26...14 stranded wire
Screw terminal torque	0.5 Nm
Vibration	IEC 60068-2-6
2...13.2 Hz	±1 mm
13.2...100 Hz	±0.7 g

Common specifications

Supply

Supply voltage, universal	21.6...253 VAC, 50...60 Hz or 19.2...300 VDC
Max. required power	≤ 2.5 W
Internal power dissipation	≤ 2.0 W

Isolation voltage

Isolation voltage, test / working	2.3 kVAC / 250 VAC

Response time

Response time (0...90%, 100...10%)	< 20 ms

Auxiliary supplies

2-wire loop supply	> 16 V / 20 mA
3-wire loop supply	> 18 V / 20 mA
Loop supply limitation	30 mA
Programming	Communication enabler 4511 / Programming front 4501
Signal / noise ratio	> 60 dB
Accuracy	Better than 0.05% of selected range
Cut-off frequency (3 dB)	> 40 Hz
EMC immunity influence	< ±0.5% of span
Extended EMC immunity: NAMUR NE21, A criterion, burst	< ±1% of span

Input specifications

Current input

Signal range	±23 mA
Programmable measurement ranges	0...20 and 4...20 mA
Programmable measurement ranges	± 10 and ± 20 mA
Input voltage drop	1.4 V @ 20 mA
Loop error detection, 4...20 mA: Low	< 3.6 mA
Loop error detection, 4...20 mA: High	> 21 mA

Voltage input

Signal range	±12 V
Programmable measurement ranges	0/0.2...1, 0/1...5, 0/2...10 VDC
Programmable measurement ranges	±1, ±5 and ±10 V
Input resistance	> 2 MΩ

Output specifications

Current output

Signal range	0...23 mA (unipolar)
Signal range	-23...+23 mA (bipolar)
Current limit	≤ 28 mA (unipolar)
Current limit	± 28 mA (bipolar)
Load stability	≤ 0.001% of span / 100 Ω
Response time, programmable	0.0...60.0 s
Output limitation, on 4...20 and 20...4 mA signals	3.8...20.5 mA
Output limitation, on other unipolar mA signals	0 and 115% of max. value
Output limitation, on bipolar mA signals	±115% of min. & max. values
Sensor error indication, at 4...20 mA input: selectable	Low, High, Zero, None

Active unipolar and bipolar mA output

Programmable ranges	0...20 and 4...20 mA
Programmable ranges	±10 and ±20 mA
Programmable ranges	Direct or Inverted Action
V-curve function, active signals, 100-0-100%	20-0-20 mA
Load (@ current output)	≤ 800 Ω

Passive 2-wire mA output

Programmable ranges	0...20 and 4...20 mA
Programmable ranges	Direct or Inverted action
V-curve function, 100-0-100%	20-0-20 mA
External loop supply	3.5 - 26 V

Voltage output

Programmable signal ranges	0/0.2...1; 0/1...5 ; 0/2...10 V
Programmable signal ranges	±1, ±5 and ±10 V
Programmable signal ranges	Direct or Inverted action
V-curve function, 100-0-100%	1-0-1, 5-0-5 and 10-0-10 V
Load (@ voltage output)	≥ 500 kΩ
Response time, programmable	0.0...60.0 s
Output limitation - outside range: on unipolar V signals starting from 0	0 and 115% of max. value
Output limitation - outside range: on unipolar V signals with offset	-5% of min. value and 115% of max. value
Output limitation - outside range: on bipolar V signals	±115% of min. & max. values
Sensor error indication, at 4...20 mA input: selectable	Low, High, Zero, None

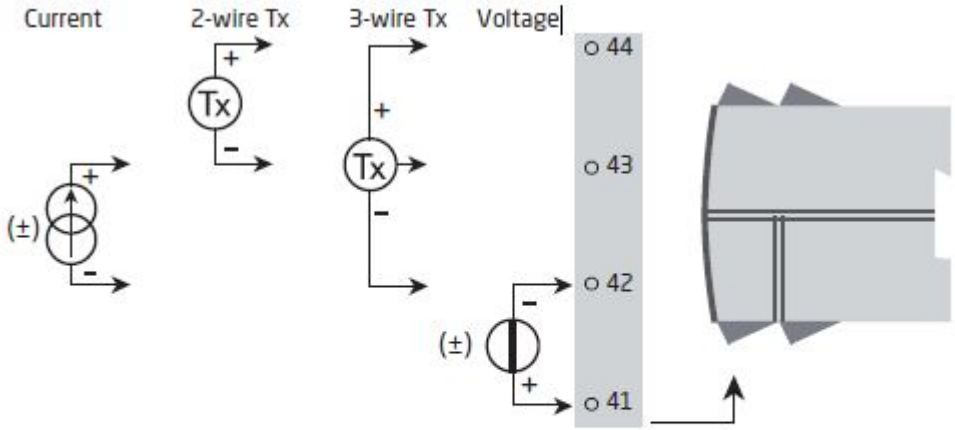
Observed authority requirements

EMC	2014/30/EU
LVD	2014/35/EU
EAC	TR-CU 020/2011

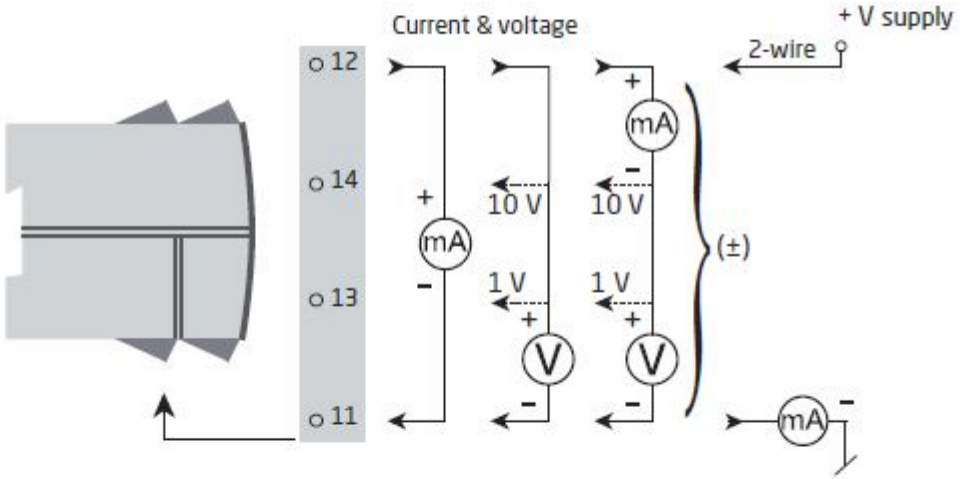
Approvals

UL	UL 508 / C22.2 no. 14
FM	3025177
DNV-GL Marine	Stand. f. Certific. No. 2.4

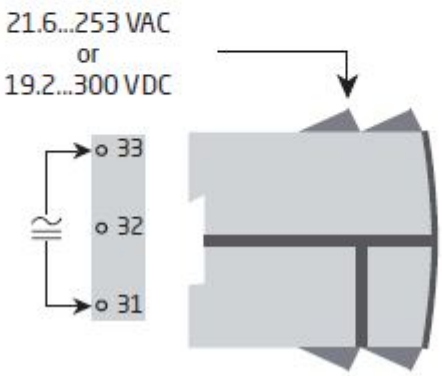
Input signals:



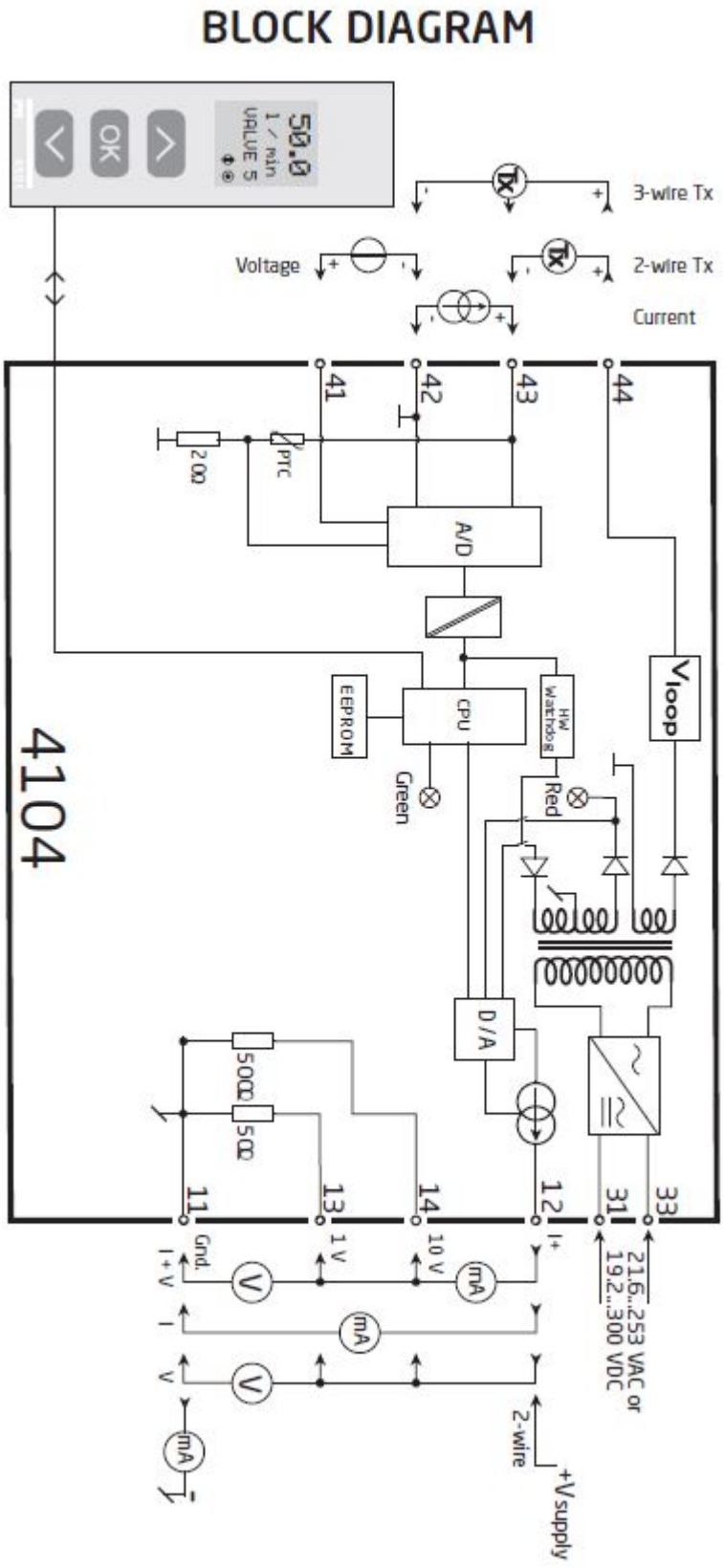
Output signals:



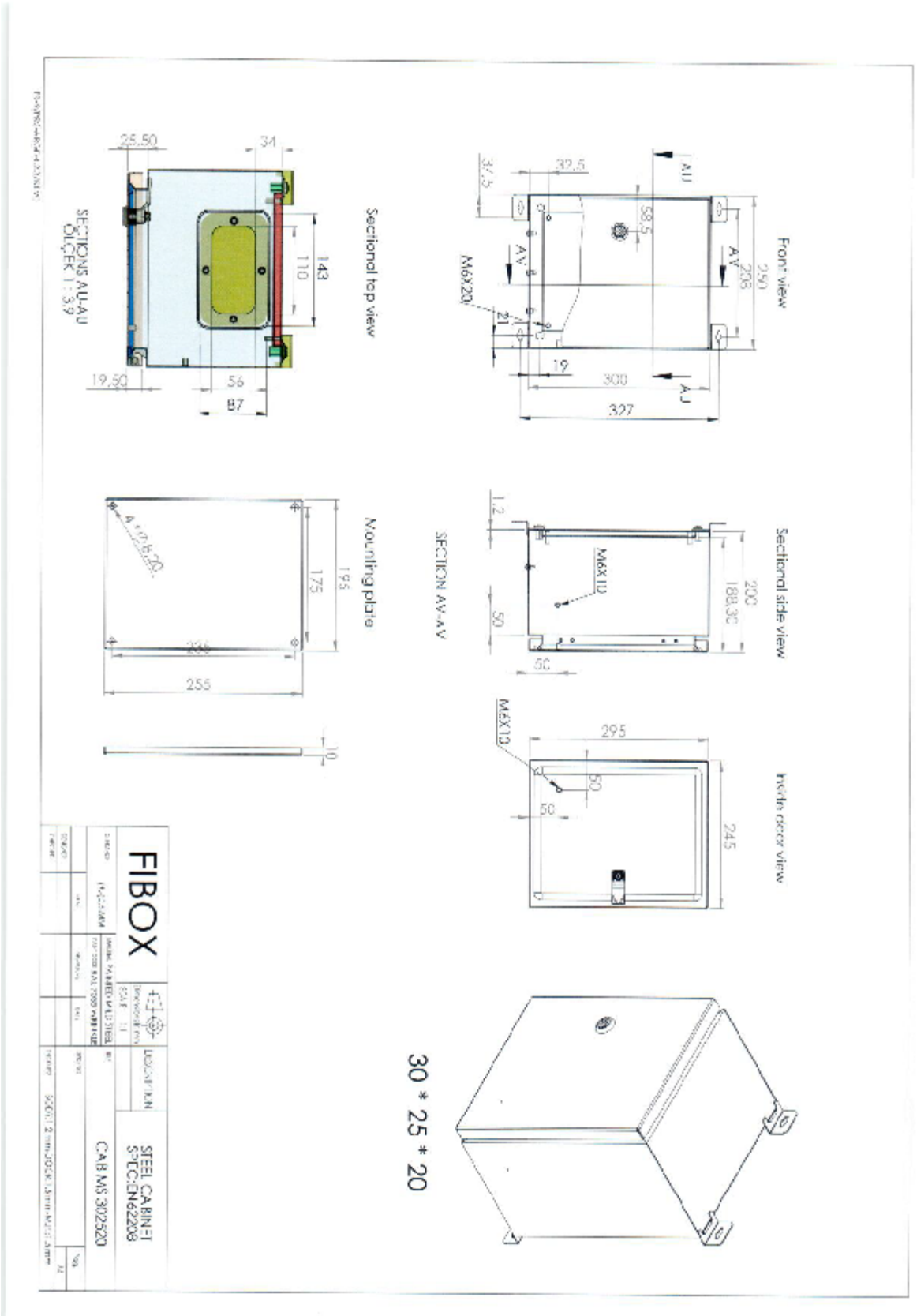
Supply:



5.13 Block diagram



6 CONTROLBOX, PLACEMENTS OF HOLES



http://gateway.solar.dk/SGS/weblink/media/pdf/dk/106660/CAB%20MS%20302520.pdf

January 29 th, 2016

MANUFACTURER'S DECLARATION

This declaration is to certify that the enclosure products described below, distributed by Fibox Oy Ab, Finland, conform to the following product characteristics and standards.

CAB MS series

Materials Used :

Body of enclosure : Painted Mild Steel
Door of enclosure : Painted Mild Steel
Mounting plate of enclosure : Galvanised Steel
Gasket : Polyurethane foam gasket

Temperature range

In continuous use	*-40°C - +80°C*
Short term use	*-40°C - +120°C*

Ingress Protection : IP 65

Impact Strength : IK 10

The products conform to the following standards:
EN/IEC 62208, Empty enclosures for low-voltage switchgear and controlgear assemblies

Pawel Wieliński
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Email: info@fibox.fi
www.fibox.com

7 MAINTENANCE OF SHAFT-GROUNDING SYSTEMS

1. Always keep the system clear of dust, grease and water.
2. When cleaning the silver bands of grease and dust, a Metal cleaner should be used.
3. When polishing the silver bands, use the glass brush, which is delivered with the system.

Never use abrasive cloth, file or other abrasives.

4. Once a month (or when needed) clean the brushes and brush boxes of dust, because the dust can cause the brushes to stick in the brush box and thereby cause a bad connection between the silver band and the brush.
5. The spring pressure of the brushes should be 500-600 gr.
6. Make sure that there is always a good electrical contact at all screw- and bolt connections.
7. Make sure that the earthing plate is in welded connection with the hull all the times.

8 BAC SHAFT GROUNDING DEVICES

BAC NO: 539525
STANDARD SHAFT GROUNDING ASSEMBLY

This system forms connection between shaft and hull without any kind of monitoring, which means that there is no possibility of knowing if the connection and safety of the system is functioning correctly.

BAC NO: 539500
SHAFT GROUNDING ASSEMBLY WITH mV- METER FOR MONITORING

This system is identically with BAC Shaft Grounding for computer control, though this system consists of a steel box with instrument for monitoring.

BAC recommends this system as the most sold and versatile solution on the market.

BAC NO: 539600
SHAFT GROUNDING ASSEMBLY WITH mV- METER AND AMPLIFIER
FOR ALARM OUTPUTS

This system is identically with BAC Shaft Grounding assembly with mV-meter for monitoring, though this system is extended with an isolation amplifier. This makes it possible to connect the system directly to the alarm computer in the ship with a signal on 4-20 mA or it can be used with a signal on 0-20 mA.

BAC NO: 539800
SHAFT GROUNDING ASSEMBLY FOR MAN ENGINE

With reference to specification from MAN, info no. 300155, Ident no. 0792182-1. Shaftline earthing device.

Please note following:
When you order a BAC Shaft Grounding system the price of the silver band is depending on the size of the shaft, and therefore the cost of the silver band will be quoted separately. Please contact BAC; we can help you with commercial terms and calculations.

It is very important that the Shaft Grounding system is equipped with a kind of measuring instrument, which can show the function of the system.

BAC is able to update the different BAC Shaft Grounding systems. For instance with a mV-meter for monitoring or amplifier for alarm output giving you a better and precisely measure of the system.
BAC can further more offer you an alarm system to ensure that the connection between the shaft and hull is according to BAC standard specifications.

9 DOCUMENTATION ON CD

10 Data sheet