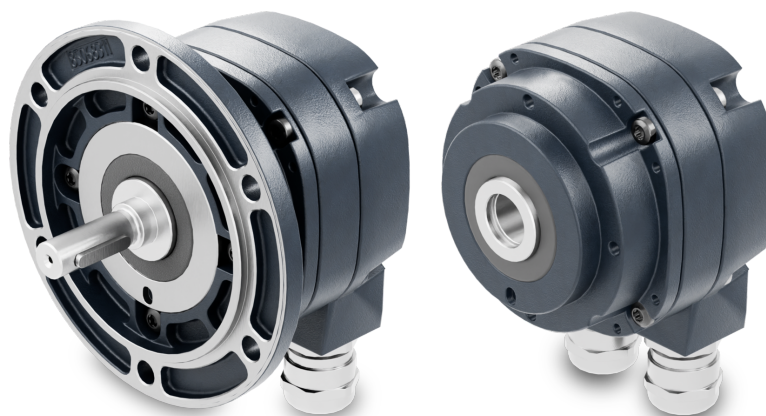




Operating Manual

HOG840, HOG860, HOG870, HOG890
Incremental encoder

EN-US

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1 About this document

1.1 Purpose

This operating manual (subsequently referred to as *manual*) allows the safe and efficient handling of the product .

The manual does not provide instructions on operating the machine in which the product is integrated. Information on this is found in the operating manual of the machine.

The manual is a constituent part of the product. It must be kept in the immediate vicinity of the product and must be accessible to personnel at all times.

Personnel must have carefully read and understood this manual before beginning any work. The basic prerequisite for safe working is compliance with all safety instructions and handling instructions given in this manual.

In addition, the local occupational health and safety regulations and general safety regulations apply.

The illustrations in this manual are examples only. Deviations are at the discretion of Baumer at all times.

1.2 Warnings in this manual

Warnings draw attention to potential personal injury or material damage. The warnings in this manual indicate different hazard levels:

Symbol	Warning term	Explanation
	DANGER	Indicates an imminent potential danger with high risk of death or serious personal injury if not being avoided.
	WARNING	Indicates potential danger with medium risk of death or (serious) personal injury if not being avoided.
	CAUTION	Indicates a danger with low risk, which could lead to light or medium injury if not avoided.
	NOTE	Indicates a warning of material damage.
	INFO	Indicates practical information and tips that enable optimal use of the devices.

1.3 Labels in this manual

Identifier	Usage	Example
<i>Dialog element</i>	Indicates dialog elements.	Click OK .
<i>Unique name</i>	Indicates the names of products, files, etc.	<i>Internet Explorer</i> is not supported in any version.
Code	Indicates entries.	Enter the following IP address: 192.168.0.250

1.4 Disclaimer

The manufacturer is not liable for personal injury and/or property damage resulting from improper use of the device.

1.5 Scope of delivery

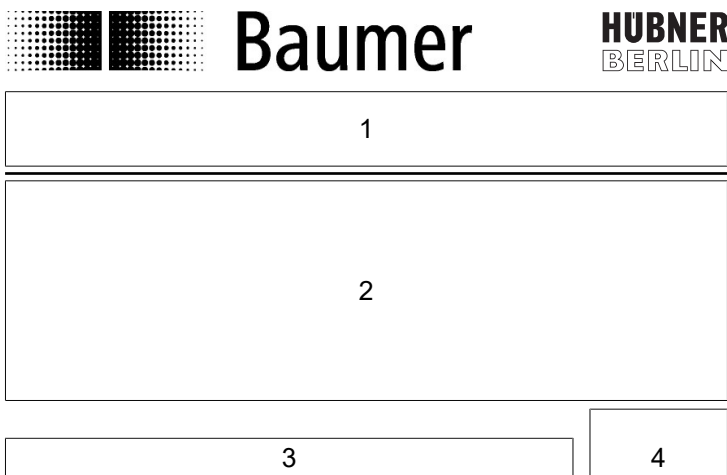
Delivery includes:

- Rotary encoder
- Torque plate with assembly kit (hollow shaft variants only)
- Protective shaft cap (solid shaft variants only)
- Quickstart
- General information sheet

1.6 Applicable documents

- Download at www.baumer.com:
 - Instruction manual
 - Manual BSS
 - Data sheet
 - EU Declaration of Conformity
 - Certificates and Approvals
- Attached to product:
 - General information sheet
 - Quickstart

1.7 **Name plate**



1	Product name, product code, material number	2	Serial number, technical data, MAC address
3	Baumer Website	4	Labels

1.8 **Maintenance and service life**

The device must not be opened unless for assembly and maintenance work as described in this instruction manual. Any repair or maintenance work requiring fully opening the device must be carried out by the manufacturer only.

Do not perform any modifications at the device.

The expected service life of the device depends on the ball bearings featuring permanent lubrication.

For any queries or subsequent deliveries refer to the product data specified on the device label, in particular type and serial number.

1.9 **Approvals and warranty**

Declaration of conformity according to the prevailing country-specific directives.

We grant a 2-year warranty in line with the conditions of the German Electrical and Electronic Manufacturers' Association (ZVEI).

INFO

warranty seal

Any breaking of the seal provided at the device will result in loss of warranty.

1.10 **Temperature range for operation and storage**

Device storage temperature: -15 ... +70 °C

Device operating temperature:

- HOG840: -30 °C ... +85 °C
- All other variants: -40 °C ... +100 °C

2 General information

Intended use

This product is a precision device and serves the detection of items, objects, or physical measurement variables and the preparation or provision of measured values as electric variables for the higher-level system.

Unless specifically labeled, this product may not be used in explosive environments.

Commissioning

Assembly, installation, and calibration of this product may only be performed by a specialist.

Installation

Only use the fasteners and fastener accessories intended for this product for installation. Outputs not in use must not be wired. Unused wires of cable outputs must be insulated. Do not go below the permissible cable bending radii. Disconnect the system from power before the product is electrically connected. Use shielded cables to prevent electro-magnetic interference. If the customer assembles plug connections on shielded cables, then EMC-version plug connections should be used and the cable shield must be connected to the plug housing across a large surface area.

Disposal (environmental protection)



Used electrical and electronic devices may not be disposed of in household waste. The product contains valuable raw materials that can be recycled. Therefore dispose of this product at the appropriate collection point. For additional information visit www.baumer.com.

3 Transport and storage

3.1 Transport

NOTICE

Material damage due to improper transport.

- a) Ensure maximum diligence when unloading the delivered packages as well as when transporting them inside the company.
- b) Note the information and symbols on the packaging.
- c) Only remove packaging immediately before mounting.

3.2 Delivery inspection

Upon receipt immediately inspect the delivery for completeness and transport damage.

Claim any defect as soon as it is detected. Damages can only be claimed within the applicable claims deadlines.

In case of externally visible transport damage, proceed as follows:

Instruction:

- a) Do not accept the delivery or only with reservations.
- b) Note the scope of the damage on the transport documents or the delivery slip of the carrier.
- c) Initiate the claim.

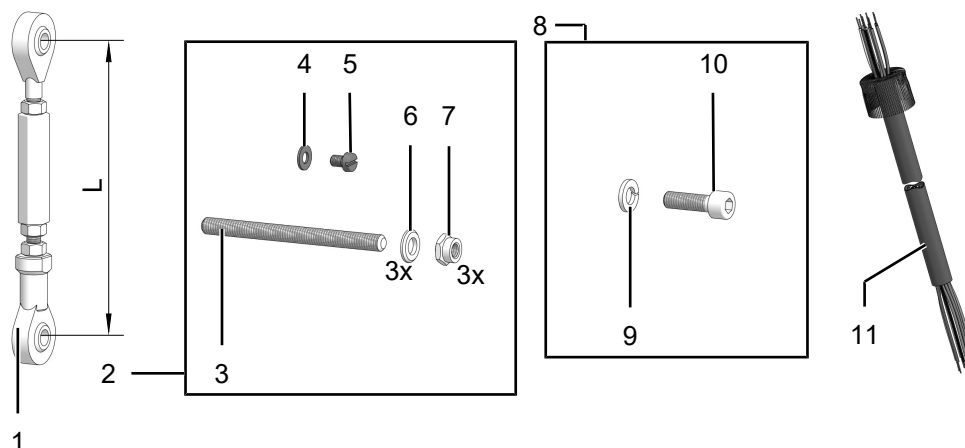
3.3 Storage

Store the product at the following conditions:

- Use the original packaging for storage.
- Do not store outdoors.
- Store dry and free from dust.
- Do not expose to aggressive media.
- Keep away from the sun.
- Avoid mechanical agitation.
- Storage temperature: -15 ... +70 °C..
- When storing for longer than 3 months, regularly check the general state of all parts and the packaging.

4 Description

4.1 Mounting accessories hollow shaft (not included)



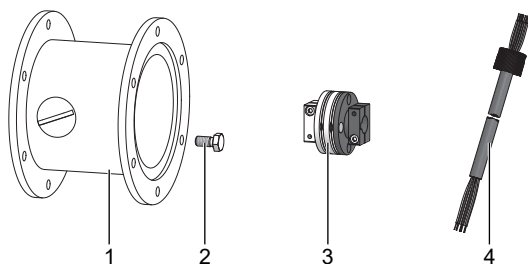
III. 1: Mounting accessories

1	Torque arm of length L (see table)	2	Mounting set, order number 11077197
3	Threaded rod M6 (1.4104), variable length (≤ 210 mm)	4	Washer B6.4 for grounding strap (ISO 7090)
5	Cylinder screw M6x8 mm, for ground-strap (ISO 1207)	6	Washer B6.4 (ISO 7090)
7	Self-locking nut M6 (ISO 10511)	8	Mount/dismount kit, order number 11077087
9	Spring washer 6 (DIN 7980)	10	Cylinder screw M6x30 mm (ISO 4762)
11	Sensor cable HEK 8		

The torque arm is available in different versions:

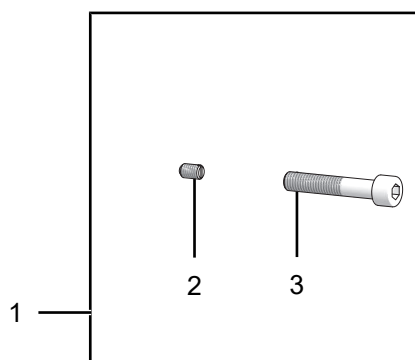
Torque arm	Order number
Standard	
67 - 70 mm	11043628
125 (± 5) mm, may be shortened down to ≥ 71 mm	11004078
440 (+20/15) mm, may be shortened down to ≥ 131 mm	11002915
Insulated	
67 - 70 mm	11054917
125 (± 5) mm, may be shortened down to ≥ 71 mm	11072795
440 (+20/15) mm, may be shortened down to ≥ 131 mm	11082677
Stainless	
67 - 70 mm	11054918
125 (± 5) mm, may be shortened down to ≥ 71 mm	11072787
440 (+20/15) mm, may be shortened down to ≥ 131 mm	11072737

4.2 Mounting accessories solid shaft (not included)



1	Attachment device (customer-specific)
2	Fastening screws for attachment device (M6x16 mm, ISO 4017)
3	Flexible coupling
4	Sensor cable HEK 8

4.3 Accessories for dismount (not included in the delivery)



III. 2: Accessory for dismount

1	Mount/dismount kit, order number 11077087	2	Threaded pin M6x10 mm (ISO 7436)
3	Cylinder screw M8x45 mm (ISO 4762)		

5 Installation

NOTICE

Equipment damage due to mechanical impact

Strong vibration may lead to overload by constraining force.

- a) Never apply force. If properly performed, all components can be mounted smoothly.

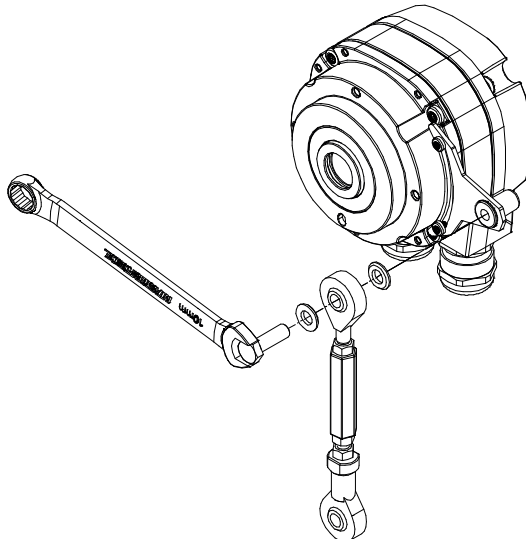
NOTICE

Equipment damage by adhering liquids

Sticky liquids may damage sensing unit and ball bearings. Disassembling a device which is stuck to the axis can lead to destruction.

- a) Do not use adhesive liquids to fasten the device.

5.1 Mounting the torque arm



III. 3: Detaching the torque arm

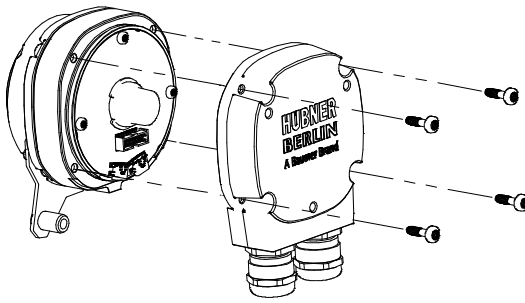
Tool

- 10 mm

Instruction:

- ◆ Screw torque arm with washers to the torque plate using a hexagon screw (M6 x 24).

5.2 Unscrewing the terminal box



III. 4: Unscrewing the terminal box

Tool

- TX 20

Instruction:

- ◆ Loosen the housing screws and detach the terminal box.

5.3 Mounting the encoder

⚠ DANGER

Injuries caused by shaft rotation

Hair and clothing can get tangled in rotating shafts. This can lead to serious injuries.

- a) Make sure that the device is idle.
- b) Prior to performing any work at the device, make sure power supply is and will remain off.

⚠ DANGER

Explosion

Sparks may cause fire or explosion.

- a) Do not use the device in the near vicinity of explosive or highly flammable materials.

NOTICE

Severe runout errors of the drive shaft reduce service life and may cause angular errors.

Severe runout errors of the drive shaft cause vibrations that cut down on the encoder service life and may cause angular errors.

- a) Keep runout errors of drive shaft down to a minimum (recommended: ≤ 0.03 mm; maximum: ≤ 0.2 mm).

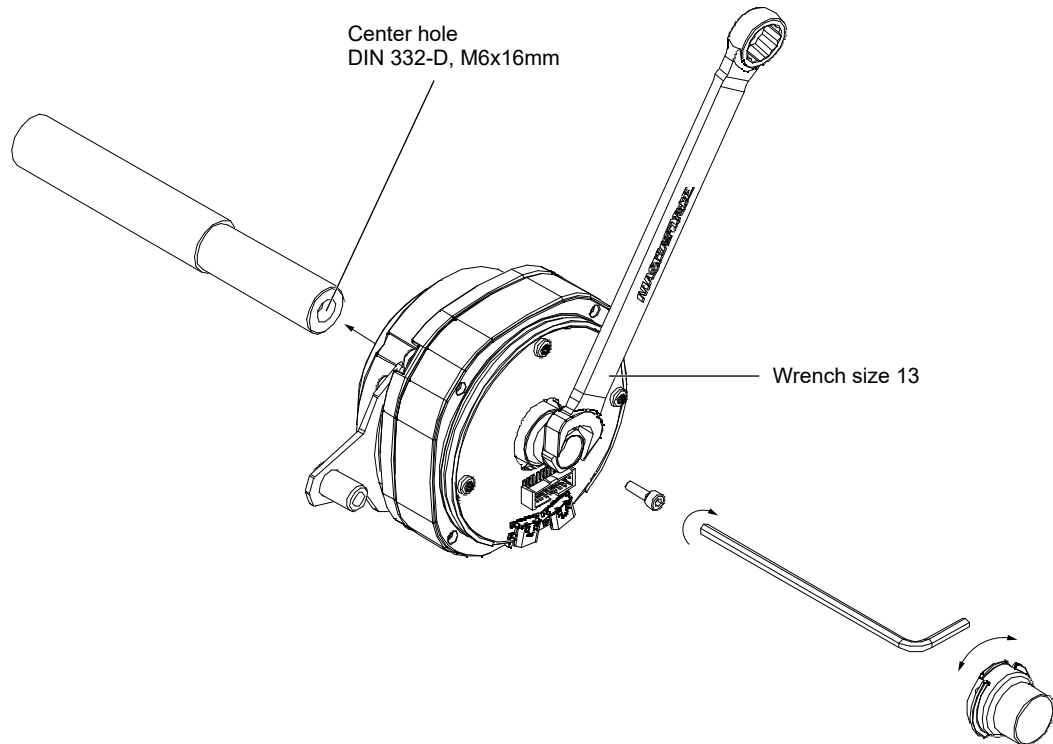
NOTICE

Equipment damage by mechanical overload

Rigid mounting may cause overload by constraining forces.

- a) Do not limit the device mobility.
- b) Observe the mounting instructions.
- c) Adhere to the specified distances and/or angles.

5.3.1 Mounting preparations - non-through hollow shaft



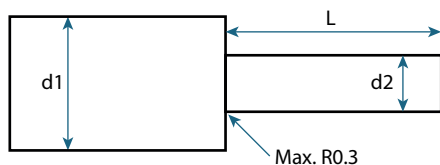
III. 5: Mounting the encoder

Tool:

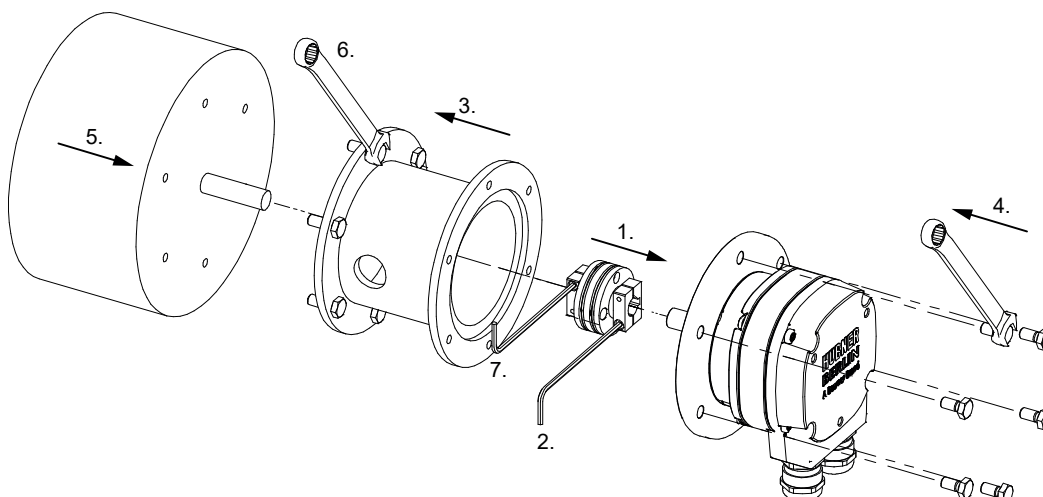
- 5 mm
- 13 mm

Instruction:

- a) Remove the cover (bayonet fitting).
- b) Apply grease onto the drive shaft.
- c) Check the drive shaft. The drive shaft should have the smallest possible runout error, as this will lead to angular errors. Runout errors cause vibrations that may shorten the service life.
- d) Slide the rotary encoder onto the shaft.
- e) Screw the encoder into the central bore of the connecting shaft with M6 screw (torque 6 Nm).
Select a screw that will engage in the central thread by at least 9 mm. For doing so we recommend the *Hübner Berlin assembly and disassembly kit; order number 11077087*.
- f) Mount the encoder in a way ensuring the electrical connection is protected against direct water ingress.
- g) Reattach the cap (bayonet catch).

Recommended connecting shaft

Ød1	Ød2	L	Tolerance
≥24 mm	12 mm	min. 40 mm max. 53 mm	h6, js6, h7, g6, f7
≥24 mm	16 mm	min. 40 mm max. 53 mm	h6, js6, h7, g6, f7

5.3.2**Preparing installation****III. 6: Mounting the encoder****Tool:**

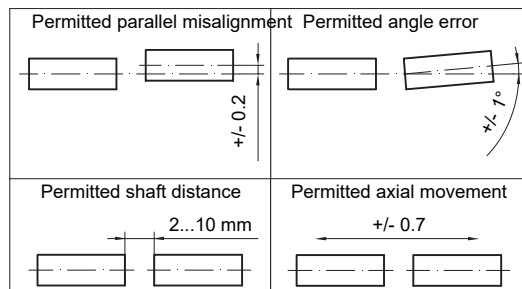
- 2.5 mm

Instruction:

- Attach the washer to the encoder shaft at a torque of $M_t=1 \text{ Nm}$ (1), (2).
- Prior to installation, check runout error and drive dimensions.
- Mount the encoder in a way ensuring the electrical connection is protected against direct water ingress.
- Apply grease onto the drive shaft.
- Mount the attachment device (customer-specific) to the drive (5), (6) using the fastening screws.

- f) Mount encoder using suitable screws, e.g. M6 x 16mm (ISO 40179) (3), (4).
- g) Fasten the washer at the specified torque (7).

Maximum permitted mounting error when using the Baumer Hübner K35 flexible coupling



NOTICE

Damage to the encoder ball bearings.

Avoid hard impacts on the encoder shaft during installation on the already mounted washer.

- a) During encoder installation keep runout error and angular errors down to the minimum.
- b) Observe the maximum permitted mounting error tolerances.

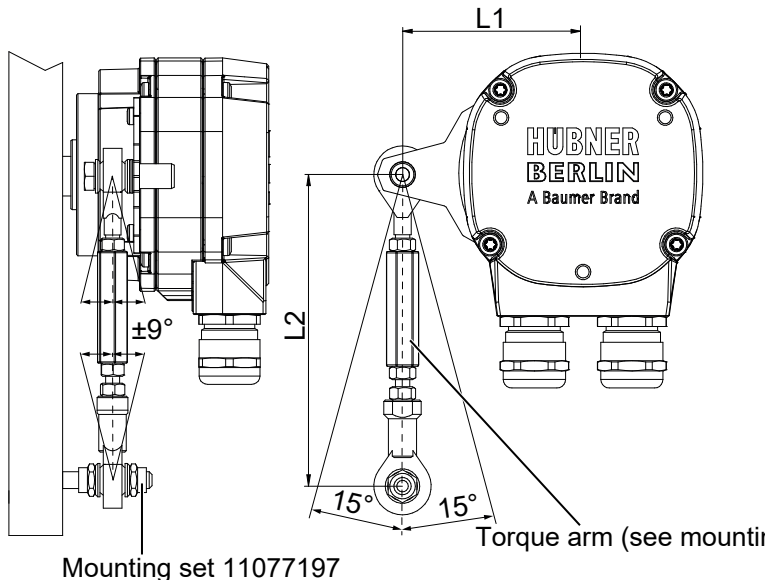
5.4 Mounting torque arm to drive

NOTICE

Incorrect mounting of the torque arm may reduce service life and cause angular errors

For example, ± 0.03 mm torque arm backlash would result in a run-out error of 0.06 mm at the drive shaft and may entail severe angular errors.

- a) No backlash in torque arm mounting.



Mounting set 11077197

- a) Mount the torque arm in a way that the shift towards the torque plate's right angle does not exceed 15° to the left or right.
- b) Mount the torque arm in away that the shift towards the vertical encoder axis does not exceed 9° towards the back or front.

5.5 Avoiding and calculating angular errors

Instruction:

- a) Make sure that the drive runout error does not exceed 0.2 mm (0.03 mm recommended) to prevent angular errors.
- b) Keep angular errors by concentricity run-out at a minimum by increasing gap L1. For doing so, various torque plates for are available on request.
- c) Note that length L2 of the torque arm should be $\geq L1$.
- d) Angular error Δp_{mech} calculation is as follows (mit R = runout error in mm and L1 = vertical gap of torque arm towards device center in mm):

$$\Delta p_{\text{mech}} = \pm 90^\circ / \pi \times R / L1$$
 calculation example:
 R= 0.06 mm and L1 = 69.5 mm equals an angular error of Δp_{mech} von $\pm 0.025^\circ$.

6 Electrical installation

DANGER

Injury by to secondary damage

Encoder failure or incorrect signals may entail system control errors.

- a) Eliminate secondary encoder damage by the relevant safety precautions in the downstream electronics.

NOTICE

Sensor damage due to faulty power supply.

The sensor can be damaged due to faulty power supply.

- a) Operate the sensor only with protected low voltage and safe electrical isolation of protection class III.

NOTICE

Sensor damage or unintended operation due to work on live parts.

Work on live parts may lead to unintentional operation.

- a) Disconnect the power before carrying out any cable.
- b) Disconnect the power before connecting or disconnecting electrical connections.

NOTICE

Sensor damage by excessive switching voltage.

The sensor's overload limit is for protection only and not intended as limit for the permanently switching voltage.

- a) Make sure that the maximum permitted switching voltage is not exceeded.

6.1 Connecting the supply cable to the encoder

NOTICE

Equipment damage by ESD

The electronic components in the device are sensitive to high voltage

- a) Do not touch terminals or electronic components.
- b) Protect output terminals from external voltage.
- c) Do not exceed the maximum operating voltage.

NOTICE

Equipment damage by soiling

Soiling may cause short circuiting and damage of the sensing unit.

- a) Ensure absolute cleanliness at all times when working with the device.
- b) Prevent any oil or grease from penetrating inside the device.

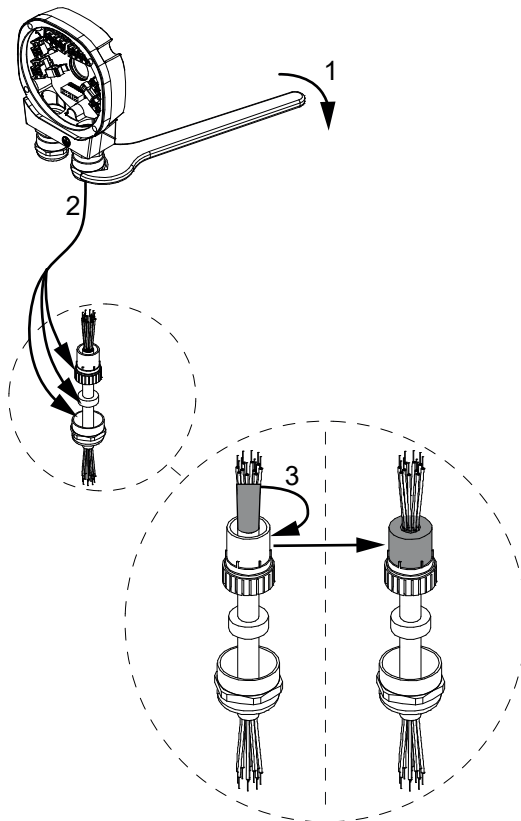
NOTICE**Equipment damage due to dust or moisture**

Inappropriate cable diameters may entail ingress of dust or moisture. In this case, the protection class is no longer ensured causing device failure or malfunction.

- a) Use only appropriately sized cables to make sure the specified protection class is being ensured.

**INFO**

Connection cables are not included in delivery.

Preparing the cable**III. 7: Preparing the cable**

Recommended to use the Baumer sensor cable HEK 8 or alternatively a shielded cable twisted in pairs. Cable routing should be in one piece and away from power supply cables.

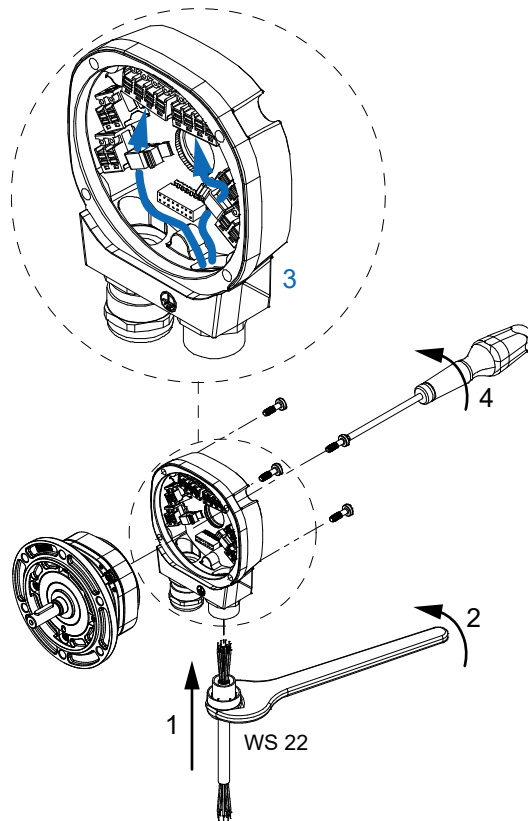
- Differential cable connection:
 - HTL: 1 ... 3 k Ω
 - TTL: 120 Ω
- Use wire end ferrules of correct size.
- Outside diameter: $\varnothing 5 \dots 13$ mm

Tool:

- 22
- TX 20

Instruction:

- a) Loosen cable gland (1) and guide the prepared cable through the cable gland (2).
- b) Drag the cable shield over the EMC ring (3).

Cable connection**III. 8: Cable connection****Instruction:**

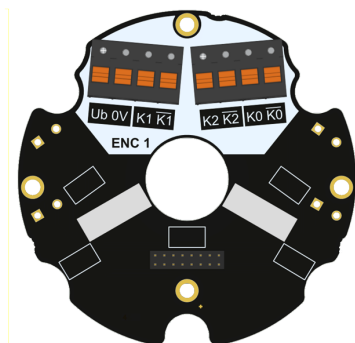
- Guide the cable through the opening into the terminal box (1).
- Tighten the cable gland at a torque of 8 Nm (2).
- Position the wires at the terminal.
 - Make sure the signal wires are twisted in pairs.
- After doing so, check wires and cable again whether they are securely in place.
- Secure the cables with the cable holders (3).
- Screw on the terminal box at a torque of 2 ... 3 Nm(4).

Further information on mounting:

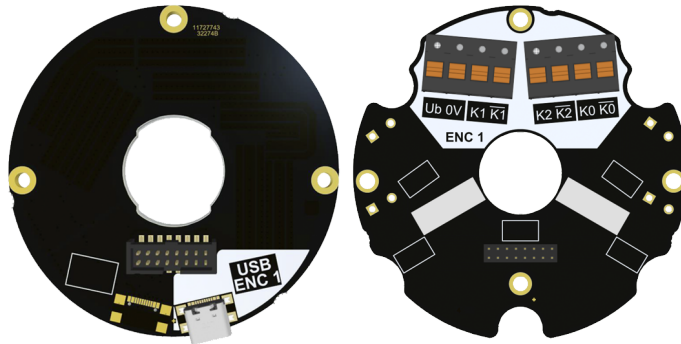
- When mounting the encoder make sure it is oriented in a way that prevents any water accumulation at the cable inlet.
- Ensure sufficient strain relief at the cable.
- We recommend labeling the cable.

6.2 Connection assignment

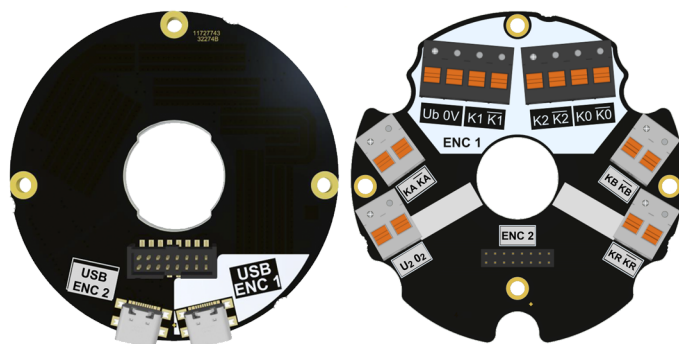
HOG840



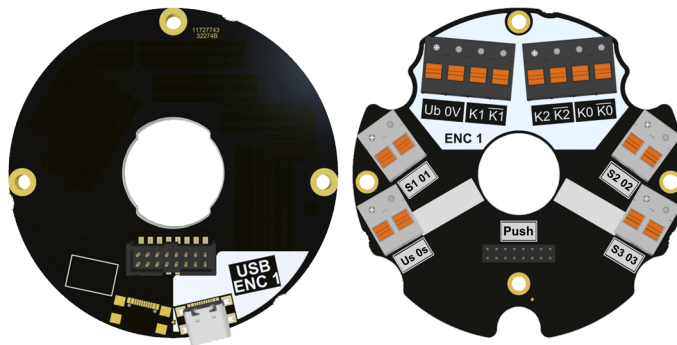
Ub	Operating voltage - encoder 1
0V	Ground connection - encoder 1
K0	Zero pulse (reference signal) - encoder 1
$\overline{K0}$	Zero pulse inverted - encoder 1
K1	Output signal channel 1 - encoder 1
$\overline{K1}$	Output signal channel 1 inverted - encoder 1
K2	Output signal channel 2 - encoder 1
$\overline{K2}$	Output signal channel 2 inverted - encoder 1

HOG860, HOG860 Smart

Ub	Operating voltage - encoder 1
0V	Ground connection - encoder 1
K0	Zero pulse (reference signal) - encoder 1
$\overline{K0}$	Zero pulse inverted - encoder 1
K1	Output signal channel 1 - encoder 1
$\overline{K1}$	Output signal channel 1 inverted - encoder 1
K2	Output signal channel 2 - encoder 1
$\overline{K2}$	Output signal channel 2 inverted - encoder 1
HOG860 Smart	
USB ENC1	USB-C for parameterization

HOG870, HOG870 Smart

Ub	Operating voltage - encoder 1
0V	Ground connection - encoder 1
K0	Zero pulse (reference signal) - encoder 1
$\overline{K0}$	Zero pulse inverted - encoder 1
K1	Output signal channel 1 - encoder 1
$\overline{K1}$	Output signal channel 1 inverted - encoder 1
K2	Output signal channel 2 - encoder 1
$\overline{K2}$	Output signal channel 2 inverted - encoder 1
U2	Operating voltage - encoder 2
O2	Ground connection - encoder 2
KR	Zero pulse (reference signal) - encoder 2
$\overline{KR}$	Zero pulse inverted - encoder 2
KA	Output signal channel 1 - encoder 2
$\overline{KA}$	Output signal channel 1 inverted - encoder 2
KB	Output signal channel 2 - encoder 2
$\overline{KB}$	Output signal channel 2 inverted - encoder 2
HOG870 Smart	
USB ENC1	USB-C for parameterization - encoder 1
USB ENC2	USB-C for parameterization - encoder 2

HOG890

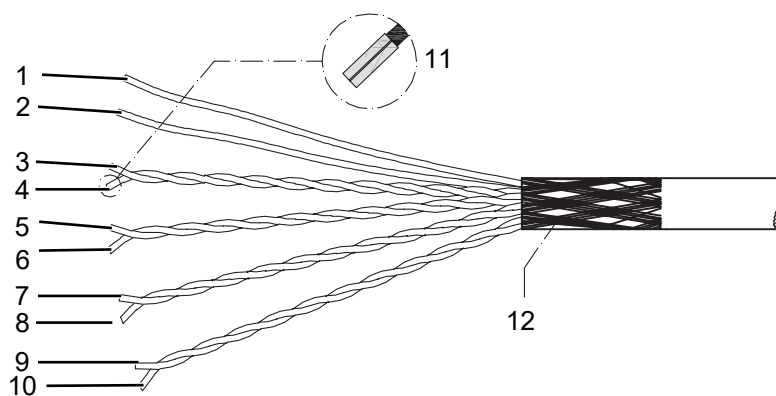
Ub	Operating voltage - encoder 1
0V	Ground connection - encoder 1
K0	Zero pulse (reference signal) - encoder 1
$\overline{K0}$	Zero pulse inverted - encoder 1
K1	Output signal channel 1 - encoder 1
$\overline{K1}$	Output signal channel 1 inverted - encoder 1
K2	Output signal channel 2 - encoder 1
$\overline{K2}$	Output signal channel 2 inverted - encoder 1
Us	Operating voltage - Push output
0s	Ground connection - Push output
S1	Push switching output 1
S2	Push switching output 2
S3	Push switching output 3
01	Ground connection - Push output 1
02	Ground connection - Push output 2
03	Ground connection - Push output 3
USB ENC1	USB-C for parameterization

6.3 HEK 8 - Sensor cable**INFO**

Recommended to use Baumer Hübner HEK 8 sensor cable or alternatively a shielded cable twisted in pairs. Cable routing should be in one piece and away from power supply cables.

Cable connection:

- HTL: 1 ... 3 k Ω
- TTL: 120 Ω



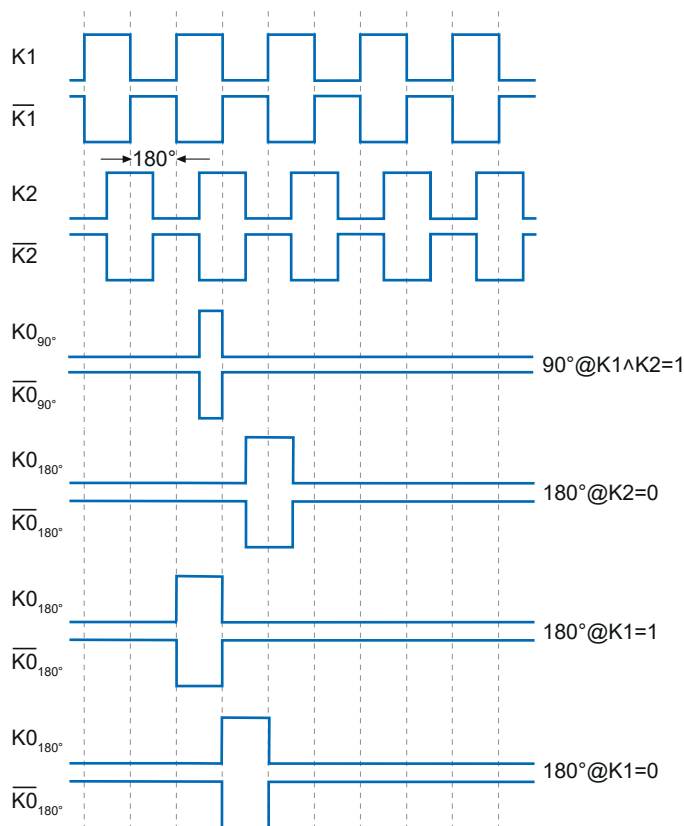
III. 9: Sensor cable HEK 8

1	Red = +UB	2	Blue = 0V ($\perp$)
3	White = K1	4	Brown = $\overline{K1}$
5	Green = K2	6	Yellow = $\overline{K2}$
7	Gray = K0	8	Pink = $\overline{K0}$
9	Do not use	10	Do not use
11	Use ferrules	12	Cable shield

6.4

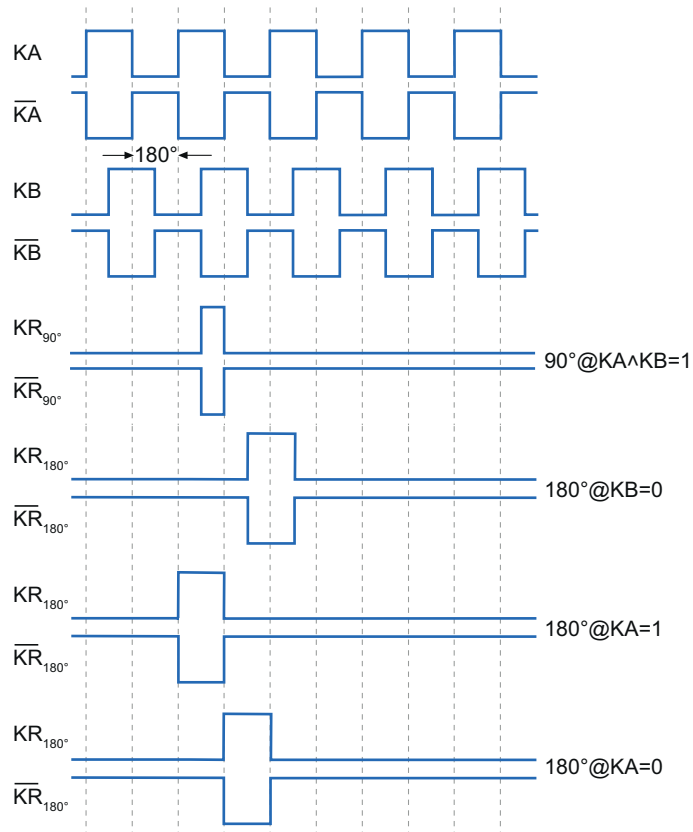
Output signals

Output signals all variants



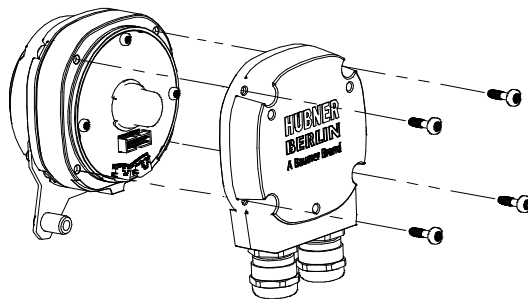
III. 10: Output signal behavior at positive direction of rotation

Output signals redundant variants (Encoder 2)



III. 11: Output signal behavior at positive direction of rotation

6.5 Mounting the terminal box



III. 12: Mounting the terminal box

Tool

- TX 20

Instruction:

- ◆ Attach the terminal box using a Torx screw driver (TX20). Tighten the screws applying a torque of 2-3 Nm.

7 Disassembly

NOTICE

Equipment damage due to mechanical impact

Strong vibration may lead to overload by constraining force.

- a) Never apply force. If properly performed, all components can be uninstalled smoothly.
- b) Use only suitable tools to uninstall.

NOTICE

Equipment damage by adhering liquids

Sticky liquids may damage sensing unit and ball bearings. Disassembling a device which is stuck to the axis can lead to destruction.

- a) Do not use adhesive liquids to fasten the device.

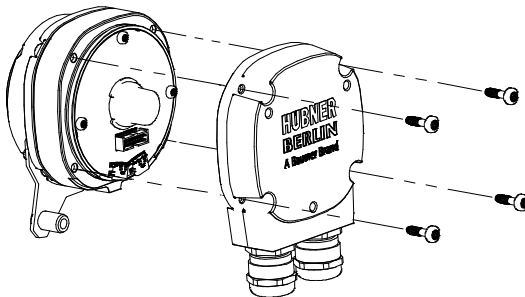


NOTICE

The device can be easily removed via the cheese-head screw (M8x45 mm, ISO 4762) and threaded pin (M6x10 mm, ISO 7436).

7.1 Detaching encoders with blind hollow shaft

Unscrewing the terminal box



III. 13: Unscrewing the terminal box

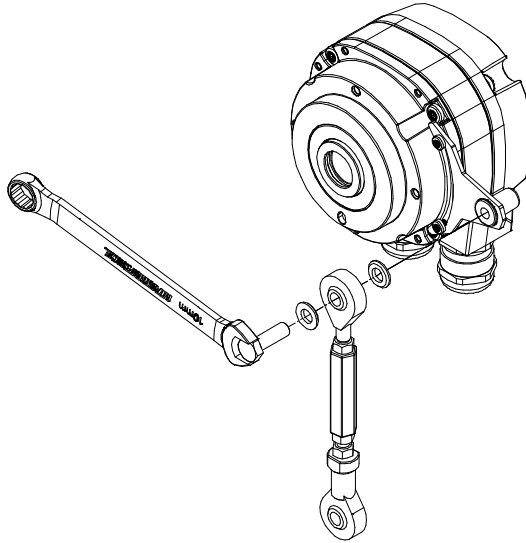
Tool

- TX 20

Instruction:

- ◆ Loosen the housing screws and detach the terminal box.

Detaching the torque arm



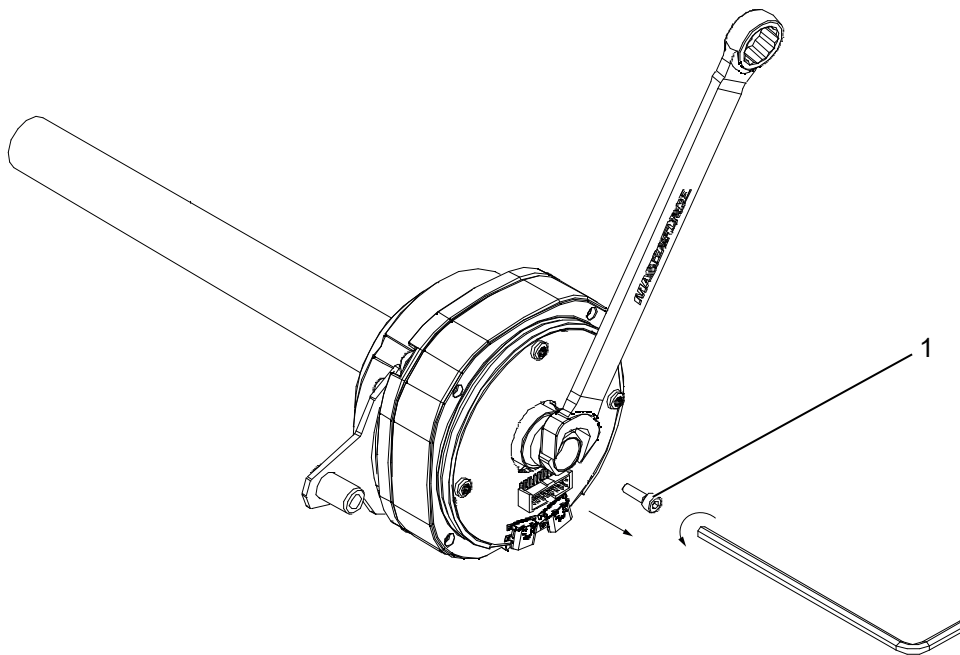
III. 14: Detaching the torque arm

Tool

- 10 mm

- a) Loosen the screw at the torque arm.
- b) Loosen the cylinder screw at grounding strap.

Unscrewing cylinder screw

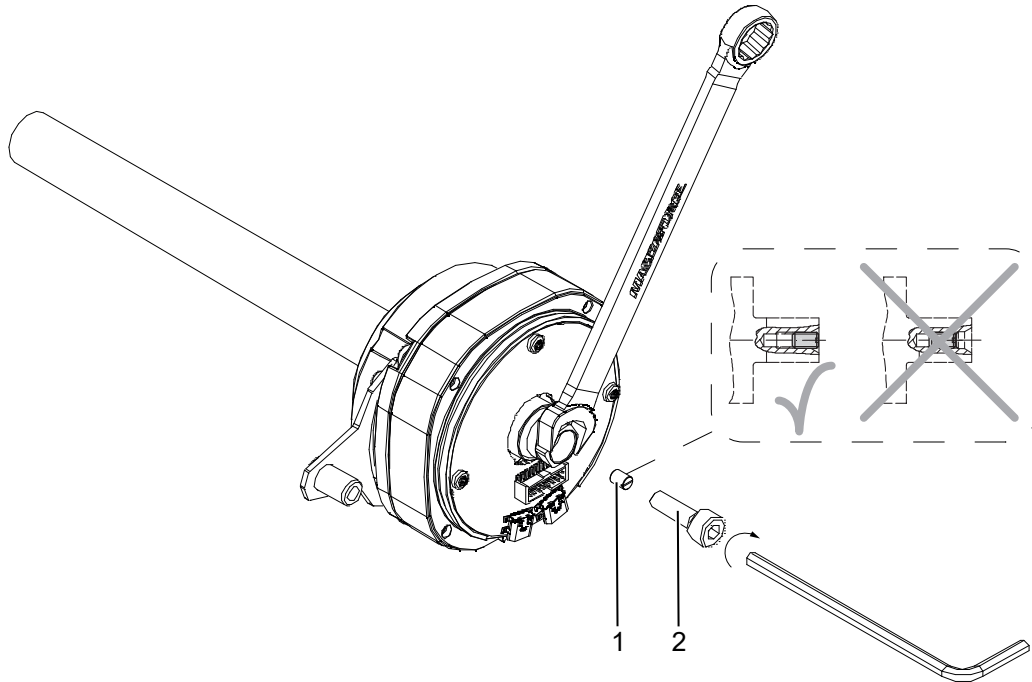


III. 15: Unscrewing cylinder screw

- | | |
|---|------------------------------------|
| 1 | Cylinder screw M6x30 mm (ISO 4762) |
|---|------------------------------------|

Tool

- 5 mm
- 13 mm
- ◆ Unscrew the cylinder screw and secure at the hollow shaft using a wrench.

Uninstall encoder from drive shaft

1 Threaded pin M6

2 Cylinder screw M8x45 mm (ISO 4762)

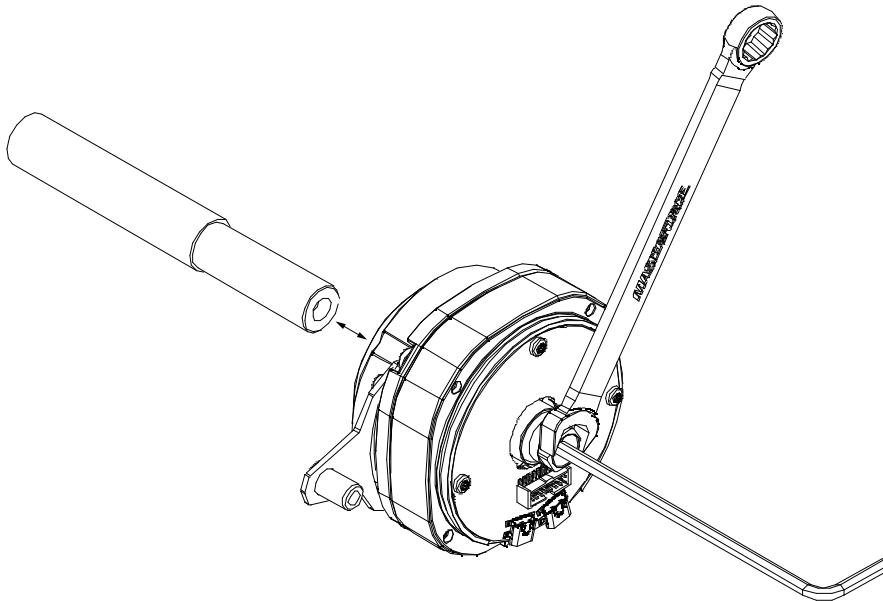
Tool

- 6 mm
- 13 mm

- a) Screw the M6 grub screw into the central bore to protect the drive shaft.
- b) Slide encoder off the drive shaft by tightening the M8 cylinder screw while securing at the hollow shaft using a wrench.

Result:

- ✓ The encoder comes off the drive shaft.



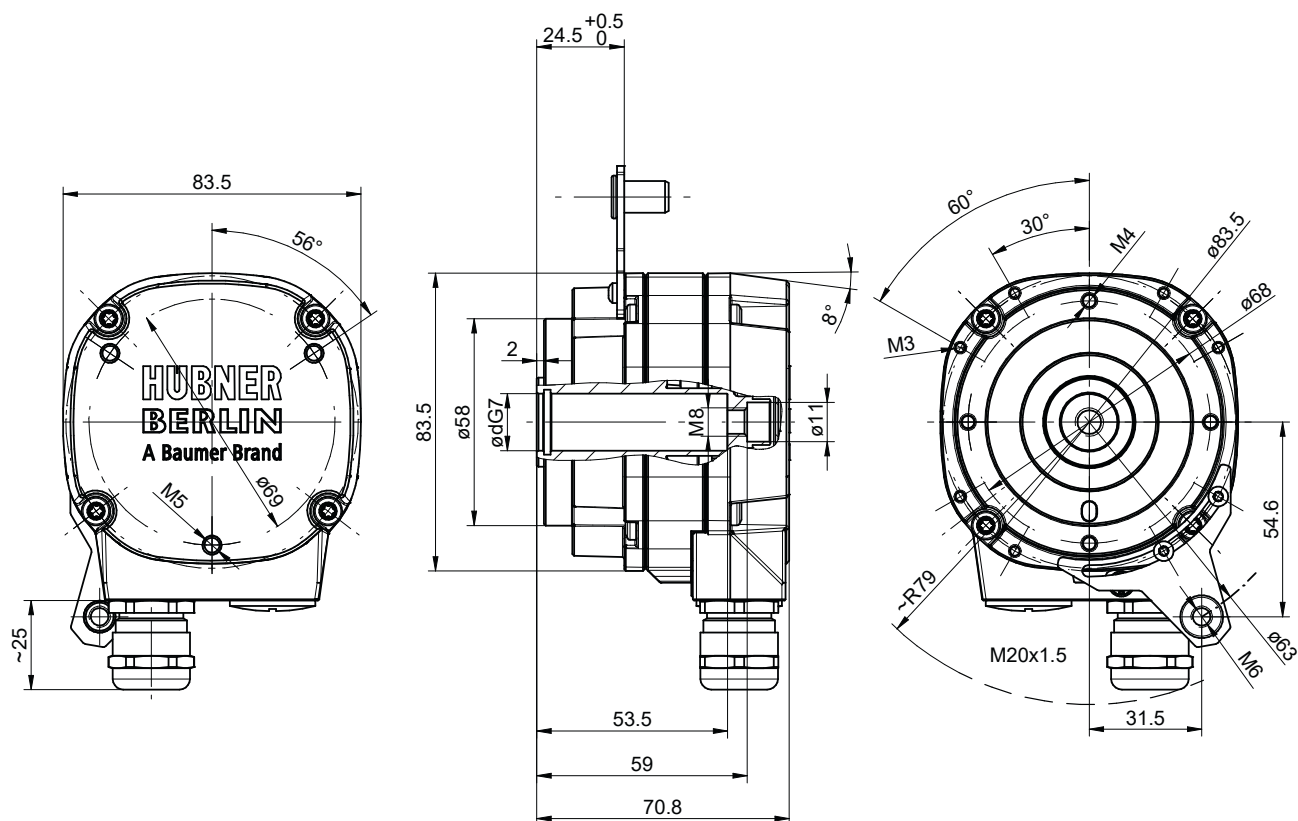
8 Maintenance

The device is maintenance-free. No special preventive maintenance is required. Any repair or maintenance work that require opening the device must be carried out by the manufacturer only.

9 Dimensional drawings

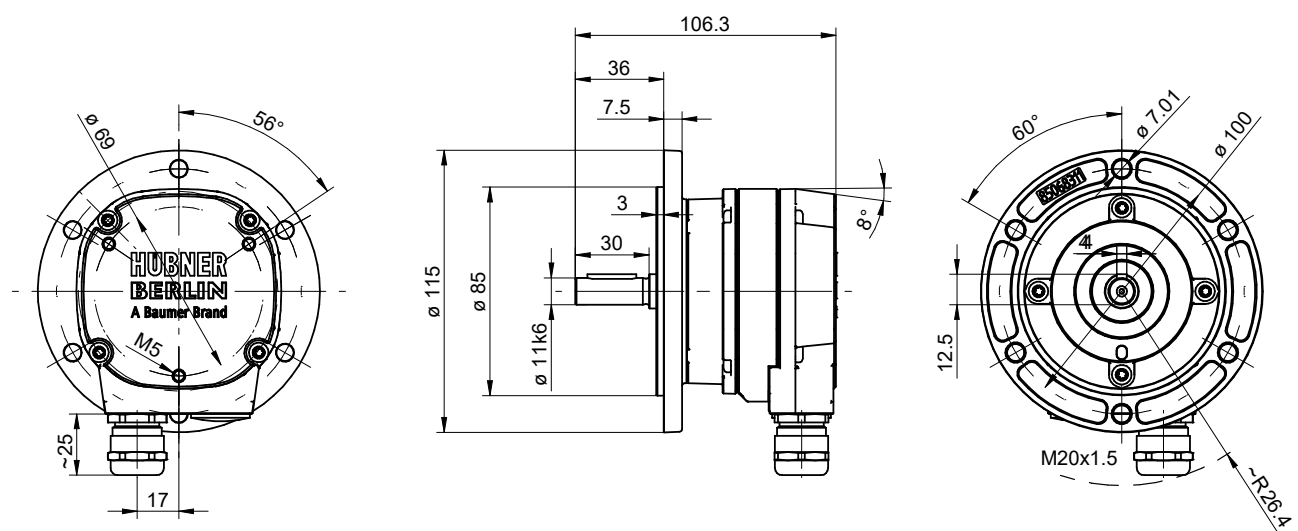
9.1 Dimensional drawings HOG840, HOG860

Hollow shaft



III. 16: Dimensions of blind hollow shaft in mm (unless specified otherwise)

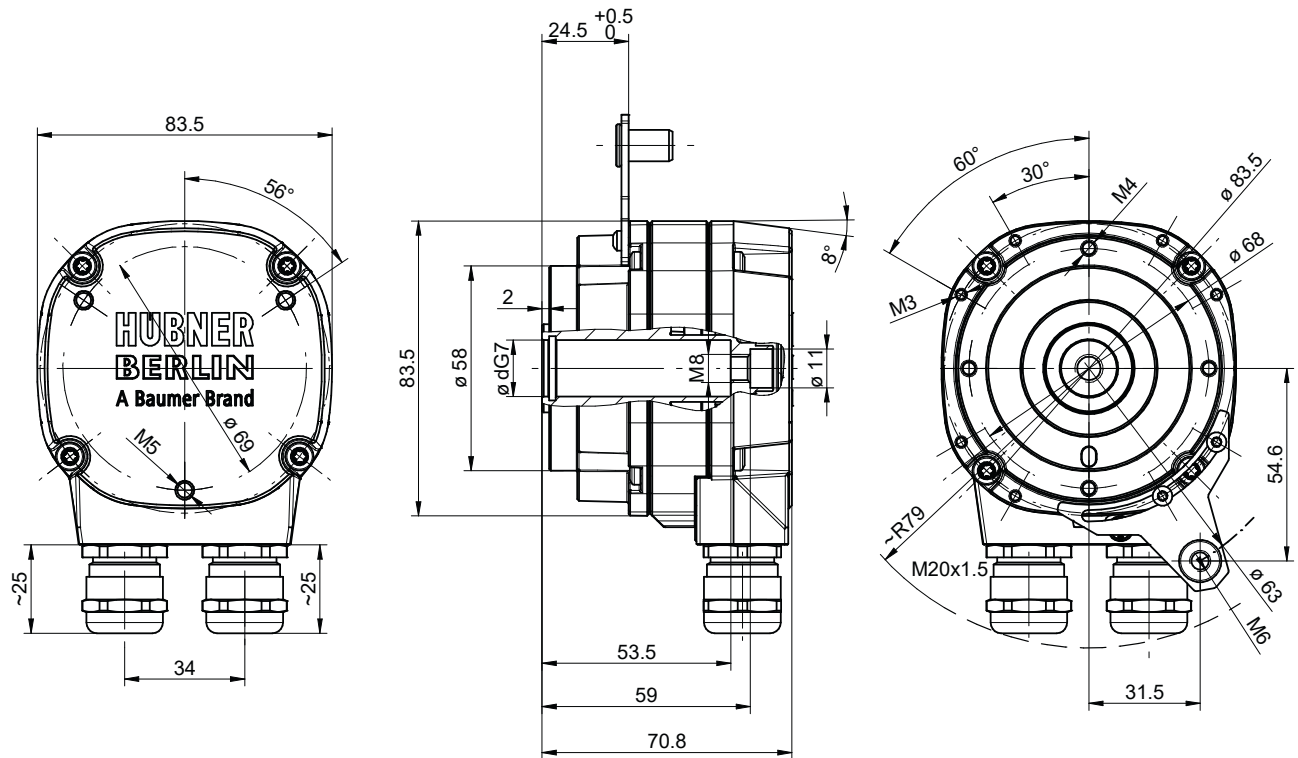
Solid shaft



III. 17: Hollow shaft dimensions (in mm, unless specified otherwise)

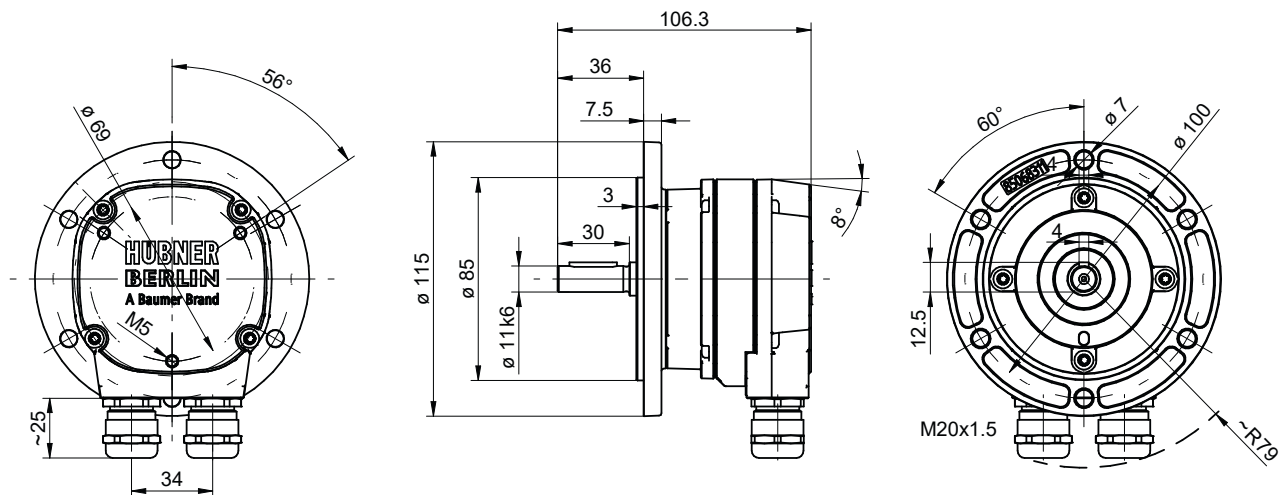
9.2 Dimensional drawings HOG870 and HOG890

Hollow shaft



III. 18: Dimensions of blind hollow shaft in mm (unless specified otherwise)

Solid shaft



III. 19: Hollow shaft dimensions (in mm, unless specified otherwise)

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