INSTALLATION INSTRUCTIONS AND SAFETY GUIDELINES - FOR SENSORS AND SAFETY SENSORS

- General notes
- Usage
- Applicable documents
- Certifications
- Commissioning
- Electrical connection
- Functional safety
- Handling the product
- Mounting examples
- Mounting accessories
- Tightening torques

GENERAL NOTES

GENERAL NOTES

The purpose of these installation instructions is to install the product in the correct manner so that it can be put into operation safely and without danger.

These instructions are designed for EPC's product portfolio, as well for safety sensors.

In the second part of this document, mounting examples for rotary encoders and cam switch units are shown, although not every individual design is discussed explicitly or separately. Due to the similarity of the products, the essential information and the associated requirements for using the product and its installation are explained. However, this document does not replace the product- and application-related documents and standards, but serves as a supplement.

Please follow the procedures and instructions given in this document to ensure the longest and most trouble-free use of the product. Until use, the product must be stored and transported properly, if possible in the original packaging. After use, the product must be disposed of in a professional and environmentally friendly manner.

Important information

Must be followed

APPLICABLE DOCUMENTS

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Various documents must be observed for the intended and correct use of a product. The type and number of documents may vary depending on the design of the product and the customer's agreement. The documents are mainly addressed to the different instances/employees of the individual development stages of an application: planning, development, purchasing, production, on-site assembly, support. They can also be used interdisciplinary. The documents also include electronic files, e.g. an EDS file.

Main documents

- Datasheet
- Manual
- Electrical connecting diagram TY (= pinout of connector, with presetting information, if applicable)

For explosion-protected units (ATEX) the following installation instructions must also be observed

- Zone 1 and zone 21: "Installation instructions for ATEX / Model 78" ***AN16370***
- Zone 2 and zone 22: "General safety instructions for EPC sensors - ATEX" ***ALG14080***

Further documents (if available)

- Installation drawing / step file for special versions with deviations from the datasheet
- Electronic datasheet for control system (e.g. EDS / ESI / GSD / GSDML / IODD etc.)
- xml file for EPC-CRC calculation program (safety checksum)
- Variant description for special versions
- Certificates, test reports, linearity letters
- EPC factory test certificates according to EN10204-2.1 / -2.2 / -3.1
- EU declaration of conformity 12467, IHK certificate of origin, EPC terms and conditions
- Update files and associated instructions
- Documents for accessories used (e.g. gear wheel or stator coupling / torque support)

CERTIFICATIONS

EXISTING CERTIFICATIONS FOR INCREASED SAFETY LEVEL (PRODUCT-DEPENDENT)

SIL2 or SIL3 according to IEC 61508

SIL2 IEC 61508 FUNCTIONAL SAFETY SENSOR

SIL3 IEC 61508 FUNCTIONAL SAFETY SENSOR

ASIL-D according to ISO 26262

ASIL D ISO 26262 FUNCTIONAL SAFETY SENSOR

PLd or PLe according to ISO 13849-1

PLd ISO 13849 FUNCTIONAL SAFETY SENSOR

PLe ISO 13849 FUNCTIONAL SAFETY SENSOR

AgPLd according to ISO 25119

AgPLd ISO 25119 FUNCTIONAL SAFETY SENSOR

CAT.3 or CAT.4 according to ISO 13849-1

CAT.3 ISO 13849 FUNCTIONAL SAFETY SENSOR

CAT.4 ISO 13849 FUNCTIONAL SAFETY SENSOR

cULus according to UL 50E and 61010-1

UL CERTIFIED OFFICIAL LISTED SENSOR

ATEX according to EU Directive 2014/34/EU and Standard IEC 60079 for the following zones:

Gas: zone 1 and zone 2
Dust: zone 21 and zone 22

EX ATEX/IECEx ZONE 1/21 EXPLOSION PROTECTION

EX ATEX/IECEx ZONE 2/22 EXPLOSION PROTECTION

OTHER MEASURES FOR INCREASED SAFETY LEVEL

R1 / R2 redundant - full redundant rotary encoder

R1 REDUNDANT FUNCTIONAL SAFETY SENSOR

R2 REDUNDANT FUNCTIONAL SAFETY SENSOR

Within the framework of the above-mentioned standards, the corresponding procedures and measures must be observed when handling the product. In order to meet the requirements of the standards, all components used must be designed according to the application. Details can be found in the respective product datasheet and product manual.

INSTALLATION INSTRUCTIONS AND SAFETY GUIDELINES - FOR SENSORS AND SAFETY SENSORS

INSTRUCTIONS FOR COMMISSIONING

PRECONDITION

- As an electronic device, the measuring system is subject to the regulations of the EMC Directive. Commissioning of the product is only permitted once it has been ensured that the application in which the product is to be installed complies with the provisions of the EU EMC Directive, the harmonised standards, European standards or the corresponding national standards.
- Observe international, national, regional and company regulations and standards.
- Observe the regulations on accident prevention and environmental protection.
- General and current EPC terms and conditions (e.g. warranty conditions).

ENVIRONMENT

The following points in particular must be taken into account in accordance with the datasheet:

- Sensor system . . . . . external magnetic fields (for magnetic sensors)
- IP protection class . . . . . wetness and water pressure (also observe mating plugs and cables)
- Operating temperature range . . . . . ambient temperature
- EMC / ESD . . . . . surrounding electromagnetic and electrostatic fields (also supply lines)
- Enclosure material . . . . . acids, salty environment, food suitability

DOCUMENTATION

- Application-specific operating instructions for the operator
- Higher-level documentation (e.g. for the bus system used for data transmission)
- Documents assigned to the product incl. accessories (see page 2)

RESPONSIBILITY

- Installation and commissioning of the product/application only by competent and trained personnel. They must be assigned and responsible.
- If necessary, a second person of staff must be present if the installation and commissioning suggests it.

PROCEDURE

- Only use the product as intended to avoid danger to life and limb and material assets.
- Check the type plate of the product to determine whether it is the intended product.
- Observe and do not remove information signs affixed to the product. (e.g. "Not certified" in the case of prototypes of delivered devices).
- Ensure that the product is in flawless condition and may therefore be installed.
- Use suitable assembly materials (original accessories if available) and appropriate tools.
- The mounting surface and the parts to be installed must be clean and level.
- Use fixing elements according to specification (e.g. tighten screws with suitable tightening torque).
- Assemble, lay and connect cables / plugs according to specification (e.g. observe the bending radius).
- The IP protection class specified in the device datasheet only applies in conjunction with suitable mating connectors and proper cable installation. TThe mating connector must be plugged and sufficiently tight.
- Do not use the product in potentially explosive atmospheres (ATEX) unless it has been expressly intended for this purpose. See safety instruction for ATEX zone 1/21: ***AN16370*** and for zone 2/22: ***ALG14080***.

MISCELLANEOUS

- Ensure sufficient cooling of the product in hot environments.
- Do not carry out any repairs or modifications to the product (see Handling of the product).
- If necessary, dispose of the product in a professional and environmentally friendly manner.

ELECTRICAL CONNECTION

NOTES ON THE ELECTRICAL CONNECTION

The following must be observed for the electrical connection.

- Observe the pin assignment TY (pin assignment / strand colors) and the datasheet.
- Only connect or disconnect plug connections or other electrical connections when device is switched off.
- Ensure the supply voltage is as bounce-free as possible.
- Use metallized plugs if possible.
- Connect the shielding to the connector housing.
- Use shielded cables if possible - if necessary with twisted pair strands for certain functions.
- Take into account the minimum bending radii of the cables used.
- Use suitable cables (e.g. drag chain suitable / highly flexible). Use EPC accessories if necessary.
- Mount mating connector and cable according to manufacturer's instructions for compliance with IP protection class.
- Route signal cables as far away as possible from power cables (e.g. from motors).
- Make a low-impedance connection between enclosure and earth ground.

- Use a suitable and approved power supply, fuse product separately if necessary. E.g. for ATEX devices and/ or UL certified devices. See safety instructions for ATEX sensors zone 1/21: ***AN16370*** and for zone 2/22: ***ALG14080***.
- For electronic cam switches, ensure that the switching contacts are correctly integrated into the safety chain. If a relay/contactor (with coil) is switched with the switching contacts, protective elements must be used to reduce reverse voltages when the unit is switched off (diodes).

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FUNCTIONAL SAFETY

NOTES ON FUNCTIONAL SAFETY (AVAILABLE PRODUCT CERTIFICATES SEE PAGE 3)

Especially for devices that are developed and used in the application within the scope of functional safety, special measures must be taken into account in order to use the safety functions and not to jeopardise their effect. However, they apply to all products and applications for professional installation.

The functional safety standards listed on page 3 only apply to the certified EPC product. The correct installation and connection of the product is the responsibility of the user, taking into account the standards applicable to the application (e.g. Machinery Directive, application-specific safety standards, etc.).

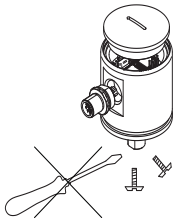
- Check the validity of the certificates for the product and the application and have them available.
- Necessary documents and instructions for the product must be at hand.
- The product must be mounted firmly and must not rotate.
- The shaft coupling must be designed to avoid rotation of the shaft within the coupling (e.g. with feather key).
- The product must be adequately protected within the scope of its specification (environmental influences).
- The product must be connected to the control unit via a suitable and secure cable connection.
- The control system must be suitable for the product and the application (safety control system).
- The control program must meet the required safety criteria (safe reading + processing of data, CRC checks).
- Access to the product (changing of parameters) may only be carried out by trained specialist personnel who are aware of the effect of the changes.
- Regular checks must ensure the functional safety of the application and the product during lifetime.

INSTALLATION INSTRUCTIONS AND SAFETY GUIDELINES - FOR SENSORS AND SAFETY SENSORS

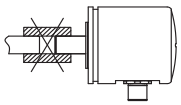
HANDLING THE PRODUCT

The following must be observed during general handling. Improper handling will result in the loss of the warranty claims.

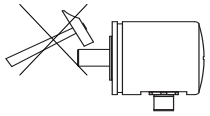
- Do not allow aggressive media (acid etc.) to act on the product.
- The unit must not be opened or dismantled. There is a risk of damage and malfunction.



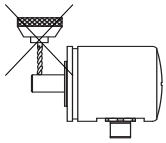
- Do not connect the unit and drive shaft with a rigid coupling. We recommend flexible and torsionally stiff couplings. Accessories available on www.encoder.com.



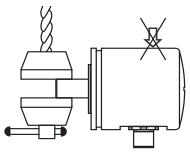
- Do not hit the shaft or the housing. There is a risk of internal damage.



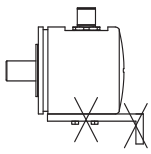
- The shaft must not be drilled or ground. There is a risk of internal damage.



- Do not apply higher axial or radial forces than specified to the shaft.



- Do not use inappropriate assembly methods. There is a risk of malfunction.



MOUNTING EXAMPLES FOR ROTARY ENCODERS AND CAM SWITCHES

USAGE OF ROTARY ENCODERS AND ELECTRONIC CAM SWITCHES

Rotary encoders serve the purpose of detecting a rotational movement - for example that of a mechanical output shaft of a motor or another mechanical application. This rotational movement is converted into an electrical signal (digital or analog) by means of the encoder in order to transmit it over a certain distance and to process it with a controller assigned to the application. The control system carries out open-loop and closed-loop control processes in order to achieve the desired result of the application optimally and safely. In the case of electronic cam switch units, additional relay switching contacts are present that usually fulfill safety-related functions, for example in a safety chain that initiates an emergency shutdown of the application based on the signal of a component. Therefore, it is necessary to design the mechanical and the electrical connection of the product in a fault-free manner in terms of the specifications for avoiding damage on the encoder and application side. Actions on the product that are not permitted or recommended and should be avoided.

Incorrect use and installation can also cause malfunctions of the components, making the angle of rotation detection and other functions faulty. **In addition, the listed documents and applicable standards of the respective product and application must always be observed for further details.**

Below are some examples of how an encoder can be mounted, partly with the help of accessories. Since the installation situation depends on the application, the following information does not claim to be exclusive.

A shaft coupling (e.g. jaw coupling) is used to compensate for a static and dynamic offset of the output and encoder shaft (axial and radial). But it is torsionally stiff in order to exclude a rotation angle error. Output shaft and encoder shaft must protrude sufficiently far into the coupling (overlap >≈ 10 mm). Especially when using a feather key or a woodruff key at functional safety applications.

The correct tightening torque of the mounting screws must be observed. This is determined by the thread size (e.g. M4 or M6), the strength class of the screw material (e.g. 6.8 or 8.8 or A2-70) and, to a certain extent, also by the screw-in depth into the thread of the encoder or the mounting angle (→ screw length), by its strength (material) and, in some cases if applicable, by other boundary conditions. Relevant information material for the components used must be consulted. Example: screw (steel) with thread M4 and strength class 8.8: Tightening torque = 3 Nm. Tightening torques for independent components supplied by EPC (e.g. couplings) can be found on page 14.

Fixing material is usually not included in the scope of delivery (screws, washers, etc.). Suitable material (e.g. with sufficiently high strength class) must be used. All fastening screws must be secured against unintentional loosening, for example by gluing or other securing measures (spring washer).

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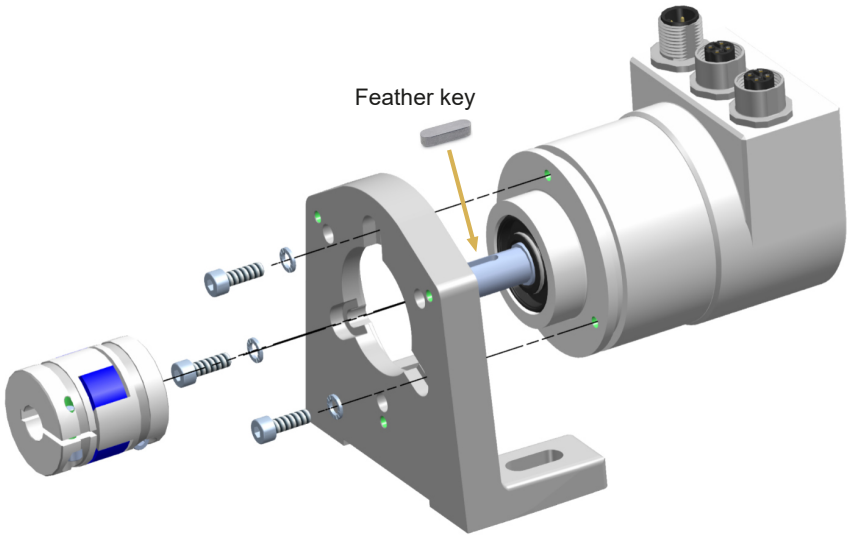
MOUNTING EXAMPLES FOR ROTARY ENCODERS AND CAM SWITCHES

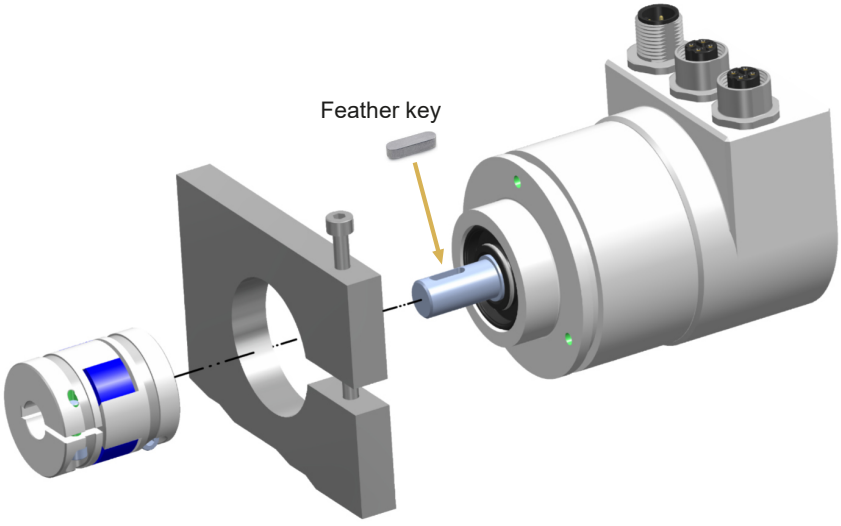
ROTARY ENCODER WITH SOLID SHAFT AND CLAMPING FLANGE ON MOUNTING BRACKET

Use of the mounting thread holes at the front. Connection between output shaft and encoder shaft with jaw coupling. For functional safety applications use a feather key or a woodruff key for both shafts or at least shafts with flats to ensure that the shafts do not rotate within the suitable coupling. Ensure that the front fixing screws at the mounting bracket are tightened with the correct torque. Secure the screws with locking varnish if necessary.



ROTARY ENCODER WITH SOLID SHAFT AND CLAMPING FLANGE ON CUSTOMER'S CLAMPING DEVICE

Use of the 36 mm clamping collar of the flange. The encoder can be rotated as desired and then fixed. Connection to output shaft with jaw coupling. For functional safety applications use a feather key or a woodruff key for both shafts or at least shafts with flats to ensure that the shafts do not rotate within the suitable coupling. Ensure that the clamping flange is firmly seated in the clamping device and cannot rotate. Secure the fastening screw with locking varnish if necessary.



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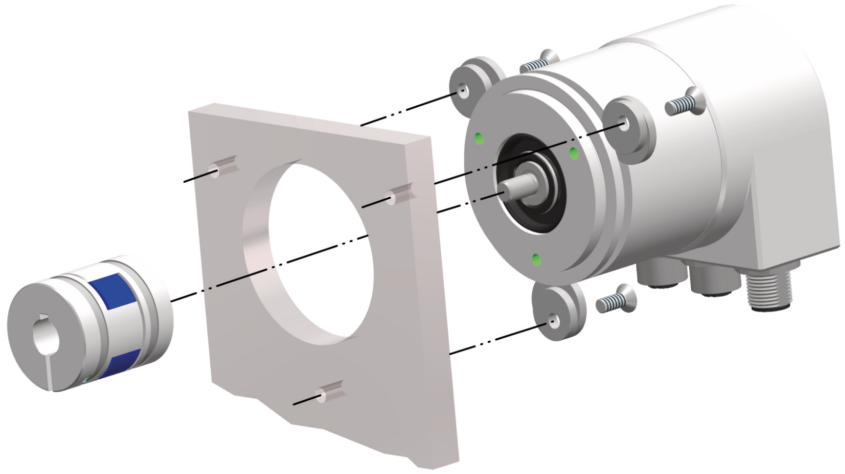
MOUNTING EXAMPLES FOR ROTARY ENCODERS AND CAM SWITCHES

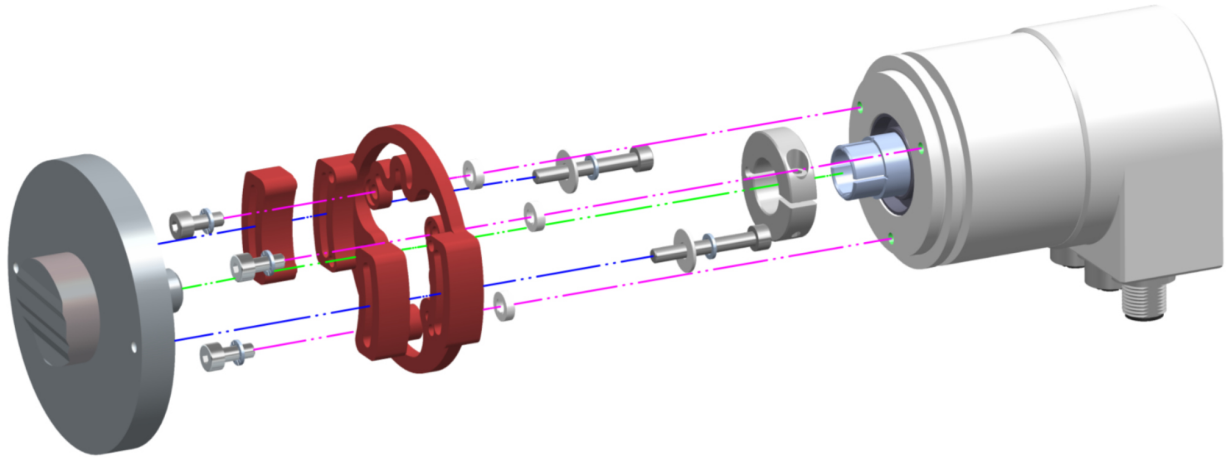
ROTARY ENCODER WITH SOLID SHAFT AND SYNCHRO FLANGE ON CUSTOMER'S MOUNTING PLATE

Use of synchro clamps (3 pieces). The encoder can be rotated as desired and then fixed. Connection to output shaft with jaw coupling. For functional safety applications use a feather key or a woodruff key for both shafts or at least shafts with flats to ensure that the shafts do not rotate within the suitable coupling. Ensure that the synchro clamps are firmly seated in the encoder groove with maximum overlap and with a slight tilt (not flat) on the mounting plate to prevent the encoder from rotating. Secure the synchro clips and screws with locking varnish if necessary.



ROTARY ENCODER WITH CLAMPING SHAFT AND STATOR COUPLING / TORQUE SUPPORT ATTACHED TO THE APPLICATION

Direct (rigid) connection to the output shaft by means of the encoder's clamping shaft. Tolerance compensation (e.g. eccentricity) of the shafts by flexible but torsionally stiff torque support ZMS (see datasheet ***12939***). Fixing of the stator coupling / torque support ZMS to a fixed housing component of the customer's application (left). For functional safety applications use a clamping shaft which can accommodate an output shaft with feather key or woodruff key to ensure that the output shaft does not rotate within the clamping shaft.



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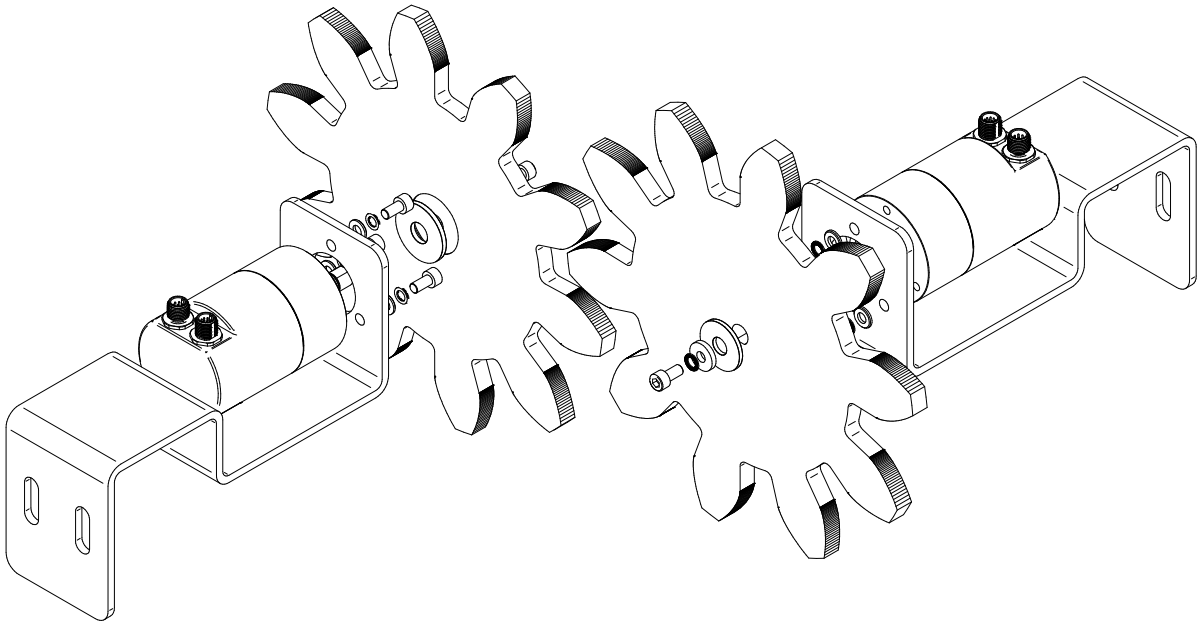
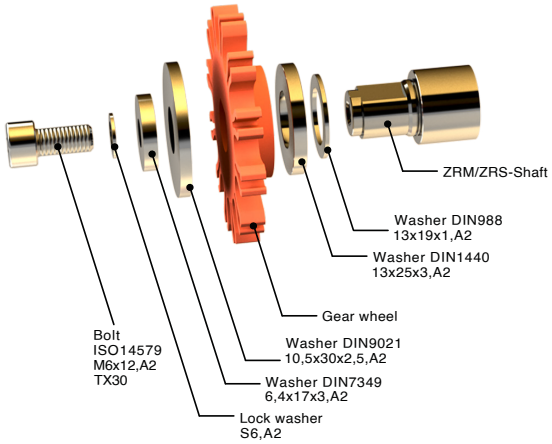
MOUNTING EXAMPLES FOR ROTARY ENCODERS AND CAM SWITCHES

ROTARY ENCODER / CAM SWITCH WITH GEAR SHAFT ON GEAR WHEEL AND CUSTOMER'S MOUNTING BRACKET

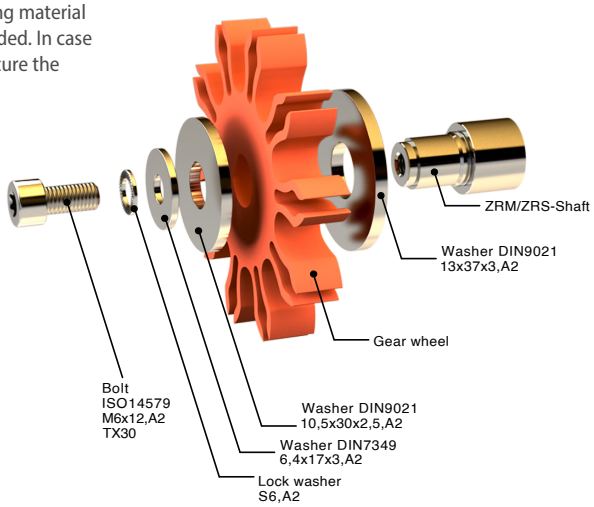
Gear wheels (standard: ZRM or backlash compensating: ZRS) with mounting material are available from EPC (see datasheet ***ZRM13229*** and ***ZRS11877***). Easy mounting is possible thanks to the special ZRM/ZRS gear shaft on the encoder. The appearance of the mounting bracket is randomly chosen.



Below:
Fastening a TWK gear wheel ZRS to the special gear shaft of a TWK encoder using the mounting material supplied. For the tightening torque of the M6x12 screw made of VA (A2), 6 Nm are recommended. In case of increased stress due to environmental conditions (e.g. vibrations), it is recommended to secure the screw with a suitable threadlocker compound (e.g. Loctite, medium-strength).



Mounting material for small gear wheels (module < 6) with reduced thickness at teeth area and slightly reduced thickness at middle area (→ additional washer on shaft side).



Standard mounting material for standard gear wheels. At gear wheels with small diameter the washer 13x37x3 may be replaced by a smaller one (e.g. 13x25x3).

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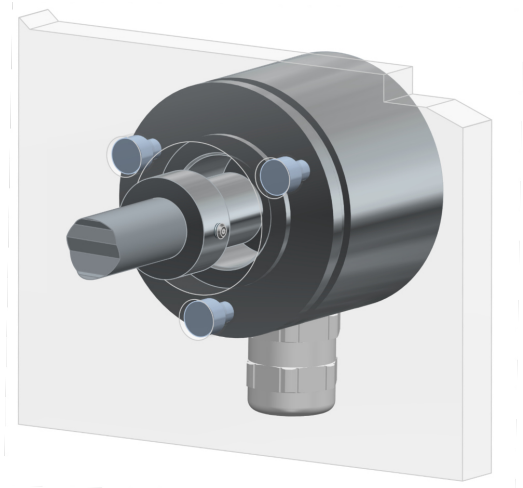
MOUNTING EXAMPLES FOR ROTARY ENCODERS AND CAM SWITCHES

BEARING-FREE ENCODER WITH MAGNETIC HUB ON CUSTOMER'S MOUNTING PLATE

For different designs and details - e.g. exact position tolerances of the magnet / magnet hub - see datasheet ***12580***.

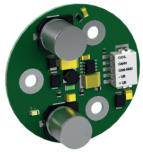
Example TBx50: Shown on the right is the fully assembled encoder on a mounting plate with the magnetic hub (attached to the output shaft) located at the recommended / optimal position. The hub now rotates without contact in the recess of the encoder.

The permitted position tolerances of the magnet hub or the supplied magnet (if the complete EPC magnet hub is not used) are shown below. All positions that lie within the cylinder indicated in green are permitted in order to obtain the specified output signal of the bearingless encoder. Shown is the recommended magnet position (black) and are two maximum offset magnet positions (grey) - each still within the green cylinder. A slight tilting of the magnet is permitted. Details and exact dimensions are given in datasheet ***12580***.



PRINTED CIRCUIT BOARD (PCB) VERSIONS TKX OF ENCODERS (INSTALLATION KIT)

In addition to the encoders in housing discussed above, EPC also offers PCB versions of encoders with magnetic scanning. These are always specially adapted to the customer application (e.g. cable pulleys) and cannot be shown here due to the variety. The corresponding datasheet should always be consulted. Above all, the recommended distance magnet ↔ position sensor must be observed in order to ensure the specified accuracy.



Examples:
Interface 'CANopen' TKN with Datasheet ***14963***
Interface 'analogue' TKA with Datasheet ***11407***

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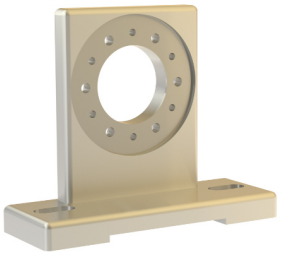
MOUNTING ACCESSORIES FOR ROTARY ENCODERS AND CAM SWITCHES

GENERAL MECHANICAL ACCESSORIES

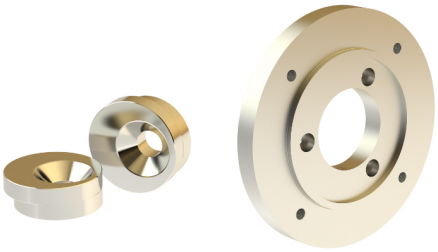
Mounting brackets

e.g. MW-A-02 ..... Datasheet ***10111***



Mounting brackets

e.g. KL66-2-S ..... Datasheet ***10111***

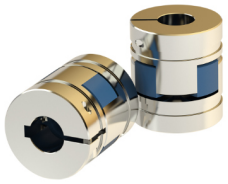


SHAFT COUPLINGS

For connecting the encoder shaft to the output shaft (others on request)

Jaw couplings

KK14 ..... Datasheet ***12301***



Bellows couplings

BKA ..... Datasheet ***15029***
BKM ..... Datasheet ***11995***
BKK ..... Datasheet ***11840***

Oldham couplings

400/184 ..... Datasheet ***13036***

Recommended tightening torques: see page 14.

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MOUNTING ACCESSORIES FOR ROTARY ENCODERS AND CAM SWITCHES, TIGHTENING TORQUES

STATOR COUPLING / TORQUE SUPPORT

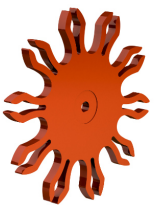
Encoder bracket for encoder version with 'clamping shaft' (see page 10)

ZMS ..... Datasheet ***12939***

GEAR WHEELS

Simple interfacing of a gear rim/ gear wheel to an encoder (see page 11)

ZRS ..... Datasheet ***11877*** (backlash compensating)
ZRM ..... Datasheet ***13229*** (standard)



PRE-FLANGES

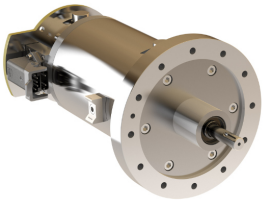
To increase axial and radial shaft load capacity

ZHF ..... Datasheet ***13508***

PROTECTIVE HOUSINGS

For protection against extreme environmental conditions

SGWC ..... Datasheet ***13405***



TIGHTENING TORQUES

Product	Screws used	Tightening torque [Nm]
Coupling BKA (datatsheet ***15029***)	Clamping screw, M3 x 12	2.3
Coupling BKK (datasheet ***11840***)	Clamping screw, M3 x 12	2.3
Coupling BKM (datasheet ***11995***)	Threaded pin, M3 x 4	1.3
Coupling KK14 (datasheet ***12301***)	Clamping screw, M3 x 12	1.34
Clamping ring for encoder shaft („SN" / „SR")	Clamping screw, M3 x 10	1.5
Installation via the threaded holes on the flange side: The appropriate tightening torque must be determined by the customer, taking into account the type of screw used, its strength class and screw-in depth.		

REVISION HISTORY

Version	Date	Change
AN 16169 FE	14-JAN-2026	Creation