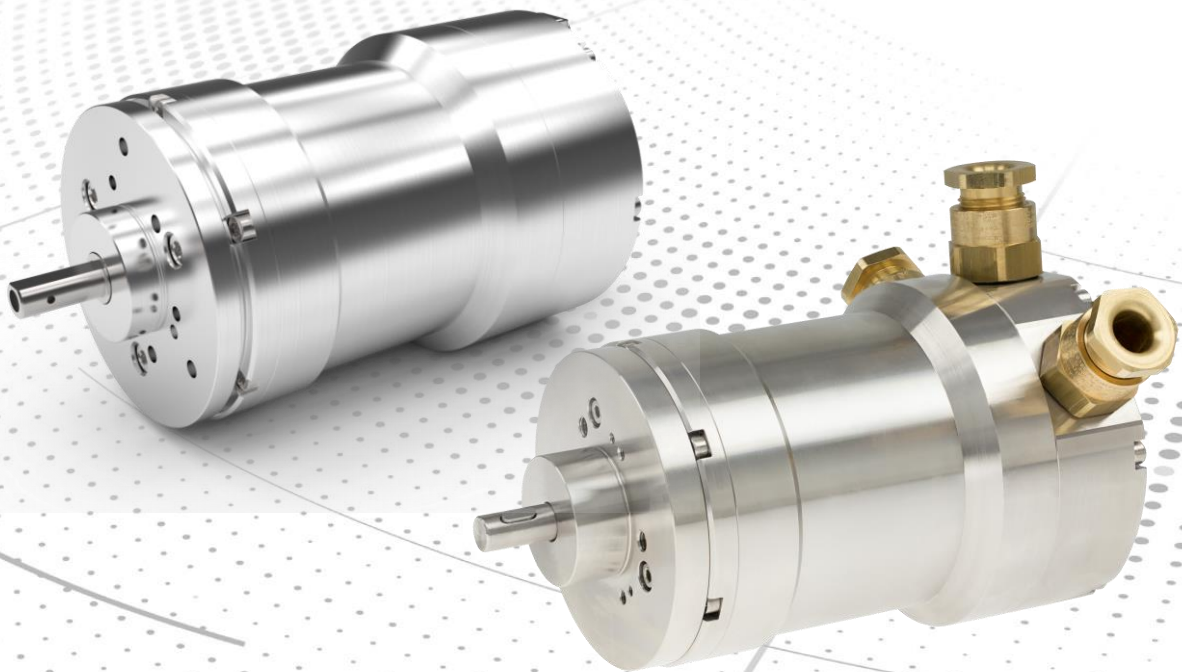


 **Rotary Encoder A\*\*100\***  
for use in  
potentially explosive areas



CE 0123

 II 2 G Ex db IIC T6...T4 Gb

 II 2 D Ex tb IIIC T80°C...T130°C Db

Date of manufacture: DD.MM.YYYY

- \_ Basic safety instructions
- \_ Intended use
- \_ Product description
- \_ Technical data
- \_ Explosion protection characteristics
- \_ Assembly

**Certifications**

- IBExU 17 ATEX 1042 X
- IECEx IBE 21.0024 X



**User Manual**

---

## **TR-Electronic GmbH**

D-78647 Trossingen  
Eglshalde 6  
Tel.: (0049) 07425/228-0  
Fax: (0049) 07425/228-33  
E-mail: info@tr-electronic.de  
http://www.tr-electronic.de

---

### **Copyright**

This manual, including the therein contained images, is protected by copyright. Third party usage of this manual, which deviates from copyright provisions, is prohibited. Reproduction, translation as well as electronic and photographic archiving or modification requires the author's written authorization. Infringements will lead to liability for damage compensation.

---

### **The right to amendment is reserved**

The right to make any changes in the interest of technical progress is reserved.

---

### **Document information**

Edition-/Rev.-Date:	09/27/2023
Document-/Rev.-No.:	TR-ECE-BA-GB-0138 v08
File name:	TR-ECE-BA-GB-0138-08.DOC
Author:	MÜJ

---

### **Text**

*Cursive* or **bold** text represents the title of a document or is used for emphasis.  
`Courier`-text shows text which is visible on the display or screen as well as software menu-selections.  
" < > " refers to keys on your computer keyboard (e.g. <RETURN>).

---

# Table of contents

<b>Table of contents</b> .....	<b>3</b>
<b>Amendment-index</b> .....	<b>5</b>
<b>1 General</b> .....	<b>6</b>
1.1 Type designation code, rotary encoder with explosion protection enclosure .....	6
1.2 Scope .....	7
1.3 Other applicable documents .....	7
1.4 Relevant directives and standards .....	8
1.5 Used abbreviations / Terms .....	8
1.6 Product description .....	9
<b>2 Basic safety instructions</b> .....	<b>10</b>
2.1 Symbol- and note definition.....	10
2.2 Obligation of the operator prior to commissioning .....	11
2.3 General dangers with the use of this product .....	11
2.4 Intended use .....	12
2.5 Non-intended use.....	13
2.6 Usage in safety-related applications .....	13
2.7 Warranty and liability.....	14
2.8 Organizational measures .....	14
2.9 Personnel selection and -qualification; basic obligations .....	15
2.9.1 Electrical installations design, device selection and erection.....	15
2.9.2 Inspection, maintenance and repair .....	15
2.10 First commissioning / Commissioning .....	16
2.11 Assembly, installation and dismantling .....	16
2.12 Inspection, maintenance and repair.....	17
2.13 Special conditions for safe use, marking "X" .....	18
<b>3 Transport / Storage</b> .....	<b>19</b>
<b>4 Technical data</b> .....	<b>20</b>
4.1 Power supply.....	20
4.2 Mechanical characteristics.....	20
4.3 Environmental conditions .....	20
4.5 Explosion protection characteristics.....	21
4.5.1 Ex-labeling, gas.....	21
4.5.2 Ex-labeling, dust.....	22
<b>5 Assembly</b> .....	<b>23</b>
5.1 Safety-related applications.....	23

## Table of contents


---

5.2 NON safety-related applications .....	24
5.2.1 Solid shaft .....	24
5.2.1.1 Flange-assembly.....	24
5.2.1.2 Clamp flange - assembly.....	25
<b>6 Temperatures / IP protection classes / Enclosure materials / Speeds.....</b>	<b>26</b>
6.1 Aluminum – Explosion protection enclosure .....	26
6.2 Stainless steel - Explosion protection enclosure.....	27
<b>7 Connection / Shielding.....</b>	<b>29</b>
7.1 Versions .....	29
7.2 Requirements for cable inlets and sealing plugs .....	30
7.3 Cable requirements.....	31
7.4 Connection / Perform shielding.....	32
7.5 Close securely the connection cap .....	35
7.6 Equipotential bonding conductor.....	36
<b>8 Disposal.....</b>	<b>36</b>
<b>9 Annex.....</b>	<b>37</b>
9.1 ATEX certificate .....	37
9.2 EU declaration of conformity, A**100.....	40
9.3 EC- / EU-declaration of conformity, A**100 + Functional safety .....	41
9.4 IECEx certificate .....	43
9.5 Accessories.....	47
9.6 Drawing.....	48


## Amendment-index


Amendment	Date	Index
First edition	11/19/2019	02
EU declaration of conformity updated	08/18/2020	03
<ul style="list-style-type: none"> <li>- Certifications according to IECEx system</li> <li>- "X" requirements, such as ESD ...</li> <li>- Correction of the mechanical characteristics -&gt; speed class: "shaft seal" omitted, see chapter 4.2</li> </ul>	08/20/2021	04
Updating the declaration of conformity	03/02/2022	05
Additional information: Minimum cable length of 3 m	08/04/2022	06
<ul style="list-style-type: none"> <li>- Existing safety-related declaration of conformity updated</li> <li>- General declaration of conformity included</li> <li>- Redundant scanning unit (R) included</li> </ul>	11/08/2022	07
Updating the declaration of conformity	09/27/2023	08

# 1 General

This -User manual contains all relevant explosion-safety information and includes the following topics:

- Basic safety instructions
- Intended use
- Product description
- Technical data
- Explosion protection characteristics
- Assembly

Since the documentation has a modular structure, this -User manual represents a supplement to the other documentation such as for example product data sheets, dimensional drawings and leaflets etc.

The -User manual is included, but can also be ordered separately.


## 1.1 Type designation code, rotary encoder with explosion protection enclosure







A	* 1	* 2	* 3	* 4	-	* 5	* 5	* 5	* 5	* 5
---	-----	-----	-----	-----	---	-----	-----	-----	-----	-----

Position	Notation	Description
A	A	Explosion protection (ATEX, IECEx)
* 1	E	Optical scanning unit ≤ 15 bit
	O	Optical scanning unit > 15 bit
	M	Magnetic scanning unit
	D	Redundant dual scanning unit, safety related
	P	Scanning unit with magnetical code disk
	R	Redundant scanning unit
* 2	V	Solid shaft
	S	Blind shaft
* 3	100	External diameter Ø 100 mm
* 4	S	Single turn
	M	Multi turn
* 5	-	Consecutive number

\* = Wild cards


## 1.2 Scope

This -User manual applies exclusively to the rotary encoder with explosion-proof housing type **A\*\*100\*-\*\*\*\*\*** in conjunction with the temperature classes or surface temperatures listed below:

- Gas, temperature class T4:  **II 2 G Ex db IIC T4 Gb**
- Gas, temperature class T5:  **II 2 G Ex db IIC T5 Gb**
- Gas, temperature class T6:  **II 2 G Ex db IIC T6 Gb**
  
- Dust, max. surface temperature T130°C:  **II 2 D Ex tb IIIC T130°C Db**
- Dust, max. surface temperature T95°C:  **II 2 D Ex tb IIIC T95°C Db**
- Dust, max. surface temperature T80°C:  **II 2 D Ex tb IIIC T80°C Db**

The products are labelled with affixed nameplates and are components of a system.

## 1.3 Other applicable documents

- the operator's system-specific operation instructions
- this -User manual
- interface-specific user manual
- Pin assignment
- Product data sheet
- optional: Safety Manual for safety-related applications

## 1.4 Relevant directives and standards

The rotary encoder with explosion protection enclosure was developed, constructed and finished under compliance with the applicable European- or International standards and directives.

EU-Directive 2014/30/EU	Electromagnetic compatibility
EU-Directive 2014/34/EU	Equipment and protective systems intended for use in potentially explosive atmospheres
EN 61000-6-2	EMC: Interference immunity
EN 61000-6-3	EMC: Interference emission
EN 60079-0 / IEC 60079-0	Explosive atmospheres: General requirements
EN 60079-1 / IEC 60079-1	Explosive atmospheres: Equipment protection by flameproof enclosures "d"
EN 60079-31 / IEC 60079-31	Explosive atmospheres: Equipment dust ignition protection by enclosure "t"
EN 60529	Degrees of protection provided by enclosures (IP code)

## 1.5 Used abbreviations / Terms

A**100*	Rotary encoder with explosion protection enclosure $\varnothing$ 100 mm, all variants
CoC	<b>C</b> ertificate of <b>C</b> onformity
EU	<b>E</b> uropean <b>U</b> ion
EMC	<b>E</b> lectro <b>m</b> agnetic <b>c</b> ompatibility
ESD	<b>E</b> lectro <b>S</b> tatic <b>D</b> ischarge
IEC	<b>I</b> nternational <b>E</b> lectro-technical <b>C</b> ommission
IECEX	<b>I</b> nternational <b>E</b> lectro-technical <b>C</b> ommission IEC certification system for potentially explosive areas
VDE	Association for Electrical, Electronic & Information Technologies

## 1.6 Product description

The rotary encoder type A\*\*100\* with built-in systems is used for the detection of changes in angle for fixed installations in potentially explosive gas and dust atmospheres of Ex-Zone 1 or Ex-Zone 21. The rotary encoder consists of a flameproof encapsulated enclosure (6) made of stainless steel or aluminum. The evaluation electronics for detection of the position change is installed by TR-Electronic. The signal of the position change respectively angle change is transmitted by a bearing-mounted shaft (5) by means of a rotary encoder.

The explosion protection enclosure consists of an electric part, the electronics with sensor and connection cable, and non-electric mounting components such as the mounting flange (4) and the shaft (5). The transmitting of the torque is performed about an external coupling.

The electrical assembly is connected via cables and up to three cable entries (1). The cable entries are available as axial outlets (A) or as radial outlets (B). The connection is either pre-assembled by TR-Electronic or can be performed by the customer.

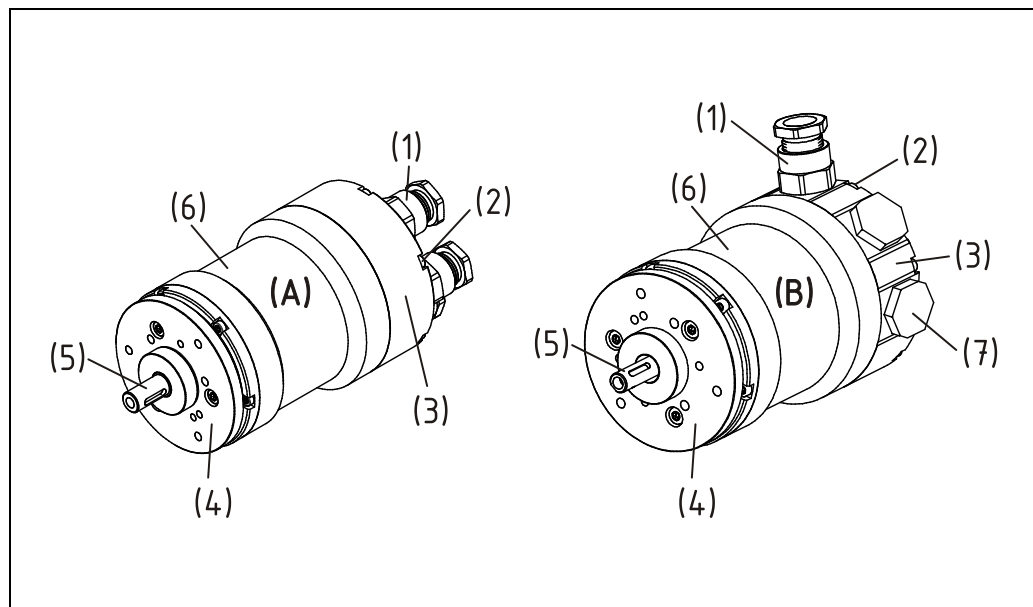


Figure 1: Examples of enclosures with axial (A) and radial (B) cable inlets

(1)	1...3 Cable inlets M20x1.5
(2)	6 Fastening screws M4x40-T20 A4-50 according to DIN EN ISO 14580
(3)	Connection cap
(4)	Flange
(5)	Shaft
(6)	Flameproof encapsulated enclosure
(7)	Sealing plug

## 2 Basic safety instructions

### 2.1 Symbol- and note definition



means that death or serious injury can occur if the required precautions are not met.

---



means that minor injuries can occur if the required precautions are not met.

---

---

**NOTICE**

means that damage to property can occur if the required precautions are not met.

---



indicates important information or features and application tips for the product used.

---



signifies that respective ESD-safety measures according to DIN EN 61340-5-1 supplement 1 are to be observed.

---

---

## 2.2 Obligation of the operator prior to commissioning

As an electronic device and for use in potentially explosive areas, the explosion protection enclosure with integrated measuring system is subject to the provisions of the EU-directives EMC and ATEX.

Therefore, commissioning of the device is only allowed once it has been established that the system/machine in which the device is to be installed, complies with the provisions of the EU-directives EMC and ATEX, the harmonized standards, European standards or the respective national standards.

For use in potentially explosive atmospheres outside the European single market (EU), the device has an approval according to the IECEx system. The corresponding national standards and international standards (IECEx) must therefore be observed during commissioning.

## 2.3 General dangers with the use of this product

The product, hereafter referred to as **equipment** is manufactured using the latest technology and according to recognized safety regulations. **Nevertheless, non-intended use can cause danger to life and limb of the user or third parties or cause damage to the equipment and other property!**

Only use the equipment for its intended use, with safety- and danger awareness and in compliance with the **Other applicable documents!**

The operator of an electrical system in a potentially explosive environment should keep the equipment in a proper condition, it should be properly operated and monitored and maintenance- as well as repairs are to be performed. This also includes inspection of the equipment for possible transport damage prior to commissioning.

De-energize the system before carrying out wiring work or opening and closing electrical connections. The equipment may not be operated in case of defects and dust deposits must be removed basically.

### 2.4 Intended use

The equipment is used for the detection of angular movements as well as the processing of the measurement data for a downstream control through industrial process- and control procedures.

The equipment is a fixed-installation device and may only be used in potentially explosive areas for

- Gases (G) within the Ex-Zones 1 and 2
- Dust (D) within the Ex-Zones 21 and 22:

Device group	(ATEX) Device category	Device protection level (EPL)	Zone		
			0 / 20	1 / 21	2 / 22
II	2G / 2D	Gb / Db	no	yes	yes

The assembly takes place through the established attachment possibilities. The electrical data provided on the nameplate, as well as the device category, temperature class, IP protection class, speed etc. for the place of use are to be observed.

The operating temperature range of the equipment has been divided into the ranges -40°C / -20°C...+40 °C / +50 °C / +60 °C / +75 °C

The maximum temperature depends on

- the temperature class (Gas: T4 / T5 / T6; Dust: T130°C / T95°C / T80°C)
- the IP protection class (IP65 / IP67)
- the material of the explosion protection enclosure (aluminum / stainless steel)
- the speed (3000 min<sup>-1</sup> / 6000 min<sup>-1</sup>)
- and the power class (3 W / 6 W)

A corresponding classification for each type is shown in chapter 6 from page 26 onwards, a compact table overview is presented in the type-examination certificate, see chapter 9.1 on page 37.

The actual operating temperature range for the equipment must therefore be taken from the nameplate.

#### **Intended use also includes:**

---

- observation of all instructions contained in the other applicable documents,
- observation of the nameplate, type examination certificate, certificate of conformity (IECEx CoC) and possible prohibition- or instruction labels on the equipment,
- observation of the enclosed documents,
- operating of the equipment within the limits indicated in the technical data.

---

## 2.5 Non-intended use

---

***Risk of death, bodily injury or damage resulting from non-intended use of the equipment!***

**⚠ WARNING**

- Since the equipment in the basic version is **not a safety component** according to the EU-machine directive, a plausibility test of the measuring-system-values has to be performed through the downstream control.
- It is compulsory for the operator to incorporate the equipment into their own safety system.

**NOTICE**

- The following uses are especially prohibited:
    - in environments with an explosive atmosphere of the Zones 0 and 20
    - for medical aims according to the directive for medical devices
    - commissioning of the equipment if the nameplate is no longer readable or is completely missing.
- 

## 2.6 Usage in safety-related applications

For usage in safety-related applications the safety measuring system is installed into the explosion protective enclosure A\*\*100\*.

The products are labeled with an additional safety marking on the nameplate:

**SIL..., PL..., KAT...**

The "Intended use", as well as all information for safe usage of the safety measuring system in safety-related applications are contained in the safety manual.

The safety measuring system built-in into the explosion protection enclosure can therefore be used for safety-related applications in explosive atmospheres.

As a result of the usage in safety-related applications additional requirements arise in relation to the assembly of the measuring system (fault exclusion).


These additional assembly requirements are component of the safety manual and must be taken into account. In general, the requirements and acceptance conditions for the complete system must be taken into account for mounting.

### 2.7 Warranty and liability

The "General terms and conditions" ("Allgemeine Geschäftsbedingungen") of the company TR-Electronic GmbH apply in general. This will be available to the operator with the contract confirmation or –conclusion at the latest. Warranty- or liability claims with regards to personal- and property damage are excluded, if they are the result of one or more of the following causes:

- Non-intended use of the equipment.
- Improper assembly, installation, commissioning, programming, maintenance or dismantling of the equipment.
- Improperly executed work on the equipment by unqualified personnel.
- Operating of the equipment in the presence of technical defects.
- The performance of unauthorized mechanical or electrical modifications of the equipment.
- The performance of unauthorized repairs
- Catastrophic incidents caused by external forces or acts of God.

### 2.8 Organizational measures

- The other applicable documents must always be kept within reach in the equipment's operating location.
- In addition to the other applicable documents, the generally applicable legal regulations and other mandatory directives for work safety, accident prevention and environmental conservation are to be observed and conveyed.
- The applicable national-, site- and system-specific provisions and requirements are to be observed and conveyed.
- The operator has the obligation to point out any special operational features and requirements to the personnel.
- Before starting work, the personnel responsible for work on or with the equipment must have read and understood the -User manual, in particular the chapter on "Basic safety instructions".
- The nameplate and possible affixed prohibition- or instruction labels on the equipment must be kept in a readable condition.
- Do not perform any mechanical or electrical modifications to the equipment, except those which are specifically described in the other applicable documents.
- Repairs may only be performed by the manufacturer, or by a person or body who carries the manufacturer's authorization.

---

## 2.9 Personnel selection and -qualification; basic obligations

### 2.9.1 Electrical installations design, device selection and erection

The project development of electrical systems, the selection of the devices and the installation in potentially explosive atmospheres may only be performed by persons whose training includes instruction in various types of ignition and installation techniques, applicable regulations and prescriptions as well as general principles of the Zone-classification. The persons must have the relevant competence for the type of work to be performed.

The personnel must regularly undergo corresponding further training or courses.

For definitions on the knowledge, expertise and competence of the "responsible persons", "manual workers" and "planners", the EN/IEC 60079-14 standard is to be additionally consulted [suppliers e.g. Beuth Verlag GmbH, VDE-Verlag GmbH].

### 2.9.2 Inspection, maintenance and repair

The inspection, maintenance and repair of electrical systems in potentially explosive environments may only be performed by experienced personnel who have also gained knowledge on the various types of ignition and installation procedures, the requirements of the EN/IEC 60079-17 standard, relevant national provisions and company regulations for the system as well as on the general principles of the Zone-classification during their training.

Personnel are to undergo appropriate further training or instruction regularly. Proof of the relevant experience and completed training must be available.

For definitions on the knowledge, expertise and competence of the "responsible persons", "expert person with leadership functions" and the "performing personnel", the EN/IEC 60079-17 standard is to be additionally consulted [suppliers e.g. Beuth Verlag GmbH, VDE-Verlag GmbH].

### 2.10 First commissioning / Commissioning

Prior to the first commissioning the equipment is to be checked regarding its suitability in the respective zone according to its labeling. The values indicated on the nameplate are not to be exceeded. With use of the equipment in areas which are potentially explosive because of dust, a deposit of dust on the top-side of the equipment shall be avoided. Here the installation of an additional covering may be required in circumstances where the deposit of dust cannot be reliably avoided.

The operational safety of the equipment and the correct functional arrangement of the equipment inside the plant must be checked before commissioning. It may only be used in a clean and undamaged condition.

### 2.11 Assembly, installation and dismantling

With installation and operation of the explosion protective equipment, one should consider protection against hazardous environmental influences which limit the intended use of the equipment. This could be protection against aggressive fluids or weather protection for example. During installation, the EN/IEC 60079-14 as well as other national standards and regulations applicable at the installation site are to be adhered to.

The information on the nameplate and in the type examination certificate must be complied with.

The assembly of the equipment takes place according to the enclosure's established mounting possibilities, but impacts on the shaft such as from hammer blows are to be avoided.

When bolts are screwed into the drilled blind holes, at least one thread winding is to remain free at the drill base.

When the equipment is connected, the cleavage surfaces shall not be damaged, the O-ring must be present and may not have any signs of wear, also see Figure 13 on page 35.

If cable inlets or dummy plugs are mounted, the threads may not be damaged. In particular, the cable inlet must be suitable for the required cable diameter. The used cable inlets respectively dummy plugs must have the igniting type of protection "d" for flame-proof encapsulation.

In potentially explosive areas the connection lines are to be routed in such a way that they are protected from damage and mechanical failure. The individual wires must not be damaged. The maximum connection information on the nameplate and also the references in chapter "Special conditions for safe use, marking "X" " on page 18 are to be observed.

For metal enclosures in potentially explosive areas an equipotential line with at least 4 mm<sup>2</sup> is required.

Wiring work, opening and closing of electrical connections may only be performed with the power switched off.  
Do not perform any welding work once the equipment has already been wired and switched on.



Touching the equipment-connection contacts with bare hands is to be avoided, or the respective ESD-protective measures are to be implemented.

---

## 2.12 Inspection, maintenance and repair

The operator of an electrical system in a potentially explosive environment must keep the equipment in a good condition, operate it properly, monitor it and maintenance and repair work must be performed, also see EN/IEC 60079-17 in this respect.

Maintenance work and defect repairs may only be performed by trained professionals. Before the maintenance or repair, the specified safety precautions are to be observed. The warning notes on the equipment and in the other applicable documents are to be adhered to!

The applicable laws and directives are complied with before recommissioning.

The existing thread pitches must be protected. They may not be subsequently modified or painted.

The replacement of defective parts of the flameproof enclosure and also the connection cap may only be performed by the manufacturer. Interchangeable components such as the O-Ring for the connection cap and fastening screws shall be requested as original part in the event of absence or damage, see chapter 9.5 on page 47.



- The equipment does not require any maintenance by the operator. Nevertheless, inspections must be performed at regular intervals:
    - Visual inspection
      - of the O-Ring in the connection cap for wear and tear (whenever the connection cap is opened)
      - of the flameproof enclosure for damages
      - of the cables for external damages
      - for dust deposits
    - Checking of the cable entries for a tight fit
  - In case of damages, the equipment is to be taken out of service immediately and to be repaired by the manufacturer!
  - The general instructions for repairs are to be adhered to, see the chapter " Special conditions for safe use, marking "X" " on page 18.
-

### 2.13 Special conditions for safe use, marking "X"

The "X"-symbol in the certificate numbers:

"IBExU 17 ATEX 1042 X" and "IECEX IBE 21.0024 X" are used to indicate special conditions for use:

- The maximum ambient temperature of the equipment depends on the temperature class, the design with shaft seal (IP67) or without shaft seal (IP65), the material of the explosion protection enclosure, the maximum power dissipation and the speed. A corresponding classification for each type is shown in chapter 6 from page 26 onwards; a compact table overview is presented in the type-examination certificate, see chapter 9.1 on page 37. The actual operating temperature range for the equipment must therefore be taken from the nameplate.
- Optionally, the equipment may be fitted with cable inlets, the conditions and safety instructions contained in the relevant certification must be observed.
- In general, selected components, such as cables, cable inlets and sealing plugs, must be suitable and certified for the potentially explosive area and ambient temperature used. For this purpose, the guidance given in EN/IEC 60079-14 shall be taken into account, in particular to the topics "Cables and wiring systems", "Cable entry systems and blanking elements" as well as the multiple given notes to the topic "Additional requirements for type of protection "d" – Flameproof enclosures". Concrete requirements for cable inlets and sealing plugs, see chapter 7.2 on page 30.  
When the equipment is used at ambient temperatures  $\geq +40$  °C, the selected connecting cable shall have an increased temperature resistance, see chapter 7.3 on page 31.
- Glands for cable entries that are not required must be sealed permanently using closures appropriately certified for the group IIC according to EN/IEC 60079-1 (Explosive atmospheres). The component manufacturer's assembly and safety instructions must be complied with.
- Contrary to the passage in the certificate numbers  
IBExU17ATEX1042 X and IECEX IBE 21.0024 X:  
"Repairs of the flameproof joints must be made in compliance with the constructive specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 3 and 4 of EN/IEC 60079-1."  
any type of repair to the equipment is prohibited. The repair of the flameproof joints is an option which is not currently provided for.
- Only the fastening screws, M4x40-T20 A4-50 according to DIN EN ISO 14580, specified by the manufacturer shall be used for the connection cap, see chapter 9.5 on page 47.
- To avoid electrostatic charges, strong charge-generating processes, such as particles moving rapidly along a surface, pneumatic transport of dust and the spraying of charges during an electrostatic coating process, must be excluded when using the equipment in potentially explosive atmospheres.
- The connection of the free ends of the cables must either take place outside of the potentially explosive area or within of an equipment which is permitted for the respective device category.

## 3 Transport / Storage

### Transport – instructions

---

***Do not drop the device or allow hard impacts!***

***Only use the original packaging!***

Inappropriate packaging material may cause damage to the device during transport.

### Storage

---

Storage temperature: -30 to +80°C

Store in a dry place

## 4 Technical data

### 4.1 Power supply

Nominal Voltage..... 24 V DC

#### Power consumption

Power class ..... 3.0 W

Power class ..... 6.0 W

### 4.2 Mechanical characteristics

#### Mechanically permissible speed

Speed classes .....  $\leq 3000 \text{ min}^{-1}$  respectively  $\leq 6000 \text{ min}^{-1}$ ,  
see chapter 6 starting from page 26

Shaft load, at the shaft end.....  $\leq 40 \text{ N axial}$ ,  $\leq 60 \text{ N radial}$

Bearing life time.....  $\geq 3.68 \cdot 10^{10}$  revolutions at

Speed .....  $\leq 3000 \text{ min}^{-1}$

Operating temperature .....  $\leq 60 \text{ }^\circ\text{C}$

Shaft load, at the shaft end .....  $\leq 20 \text{ N axial}$ ,  $\leq 30 \text{ N radial}$

### 4.3 Environmental conditions

Vibration, DIN EN 60068-2-6.....  $\leq 100 \text{ m/s}^2$ , sine 50-2000 Hz

Shock, DIN EN 60068-2-27 .....  $\leq 1000 \text{ m/s}^2$ , half-sine 6 ms

#### EMC

Immunity to disturbance, DIN EN 61000-6-2

Transient emissions, DIN EN 61000-6-3

#### Working temperature ranges

Min.....  $-40 \text{ }^\circ\text{C}$  /  $-20 \text{ }^\circ\text{C}$

Max.....  $+40 \text{ }^\circ\text{C}$  /  $+50 \text{ }^\circ\text{C}$  /  $+60 \text{ }^\circ\text{C}$  /  $+75 \text{ }^\circ\text{C}$

Storage temperature.....  $-30 \text{ }^\circ\text{C}$ ... $+80 \text{ }^\circ\text{C}$ , dry


Relative humidity, DIN EN 60068-3-4 ..... 95 %, non-condensing

Protection class, DIN EN 60529..... IP 65

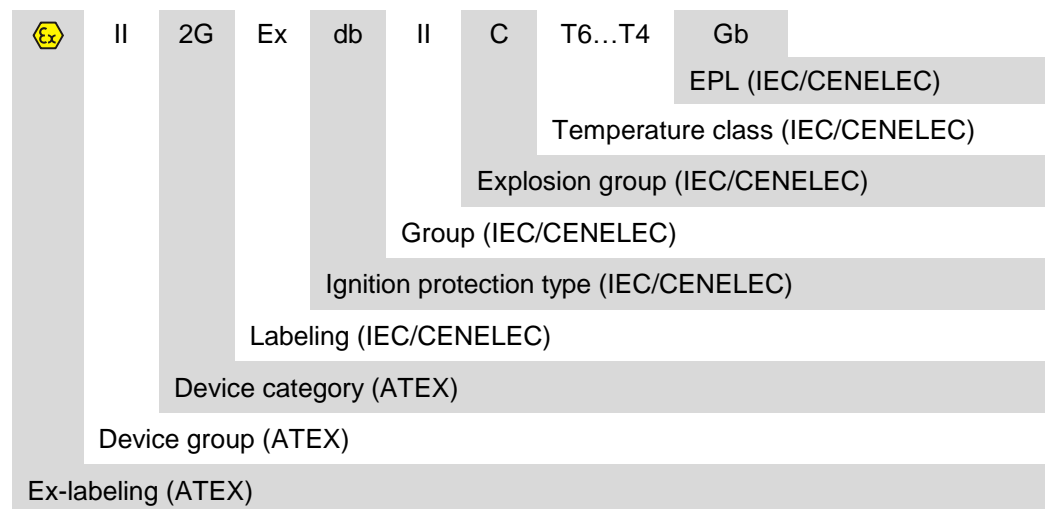
Optional with shaft sealing ring..... IP 67

## 4.5 Explosion protection characteristics

The conformity assessment procedure, with quality assurance of production / product according to the ATEX directive 2014/34/EU, takes place with the participation of the notified body:

 0123, TÜV SÜD Product Service GmbH,  
 Gottlieb-Daimler-Strasse 7,  
 70794 Filderstadt  
 Certificate QS product ("2G...d", "2D...t"): EX3A 18 07 34446 005

### 4.5.1 Ex-labeling, gas



**Device group** ..... **II**: on the surface applications

**Device category** ..... **2G**: Zone 1  
adequate safety in case of predictable failures

**Ignition protection type** ..... **db**: flameproof enclosure  
no ignition of the external ex-atmosphere

**Group** ..... **II**: potentially gas-explosive areas

**Explosion group** ..... **C**: typical gas: Hydrogen, acetylene

**Temperature class** ..... max. enclosure surface-temperature


T4 ..... ≤ 135 °C

T5 ..... ≤ 100 °C

T6 ..... ≤ 85 °C

**EPL (Device protection level) ... G "b" (Zone 1)**:  
adequate safety in case of predictable failures

4.5.2 Ex-labeling, dust

	II	2D	Ex	tb	III	C	T80°C...T130°C	Db
EPL (IEC/CENELEC)								
max. surface temperature								
Explosion group (IEC/CENELEC)								
Group (IEC/CENELEC)								
Ignition protection type (IEC/CENELEC)								
Labeling (IEC/CENELEC)								
Device category (ATEX)								
Device group (ATEX)								
Ex-labeling (ATEX)								

**Device group** .....II: on the surface applications

**Device category** .....2D: Zone 21  
adequate safety in case of predictable failures

**Ignition protection type**.....tb: Protection by enclosure  
Ex-Atmosphere is kept away from the ignition source

**Group** .....III: potentially dust-explosive areas

**Explosion group** .....C: Type of dust: conductive dust

**Temperature** .....max. enclosure surface-temperature

T130°C .....≤ 130 °C

T95°C .....≤ 95 °C

T80°C .....≤ 80 °C

**EPL (Device protection level) ...D “b” (Zone 21):**  
adequate safety in case of predictable failures

## 5 Assembly

---

### **WARNING**

***Danger of explosion through the use of couplings which are not suitable for use in potentially explosive areas!***

### **NOTICE**

- Only couplings may be used which are approved for use in potentially explosive areas and which meet the requirements of the defined characteristics, see the chapter “Technical data”, as from page 20.
  - Adhere to the assembly and operating instructions of the manufacturer.
- 



- Observe references of the “Assembly, installation and dismantling” chapter, see page 16
  - Dimensions and requirements to the customer shaft must be taken from the customer-specific drawing
  - Tolerance specifications of the coupling manufacturer are to be adhered to
- 

### 5.1 Safety-related applications

The assembly in safety-related applications is to be made in accordance with the Safety Manual, see chapter “Usage in safety-related applications” on page 13.

## 5.2 NON safety-related applications

### 5.2.1 Solid shaft

The equipment with solid shaft is connected to the drive shaft via an elastic coupling. Deviations in axial and radial direction between the equipment and drive shaft are absorbed by means of the coupling. This avoids excessive loads.

#### 5.2.1.1 Flange-assembly

The centering collar with proper fit assures the centering of the shaft. Attachment to the machine takes place via bolts in the flange.

- 1: EX-conformant coupling
- 2: Machine
- 3: Centering collar

Principle

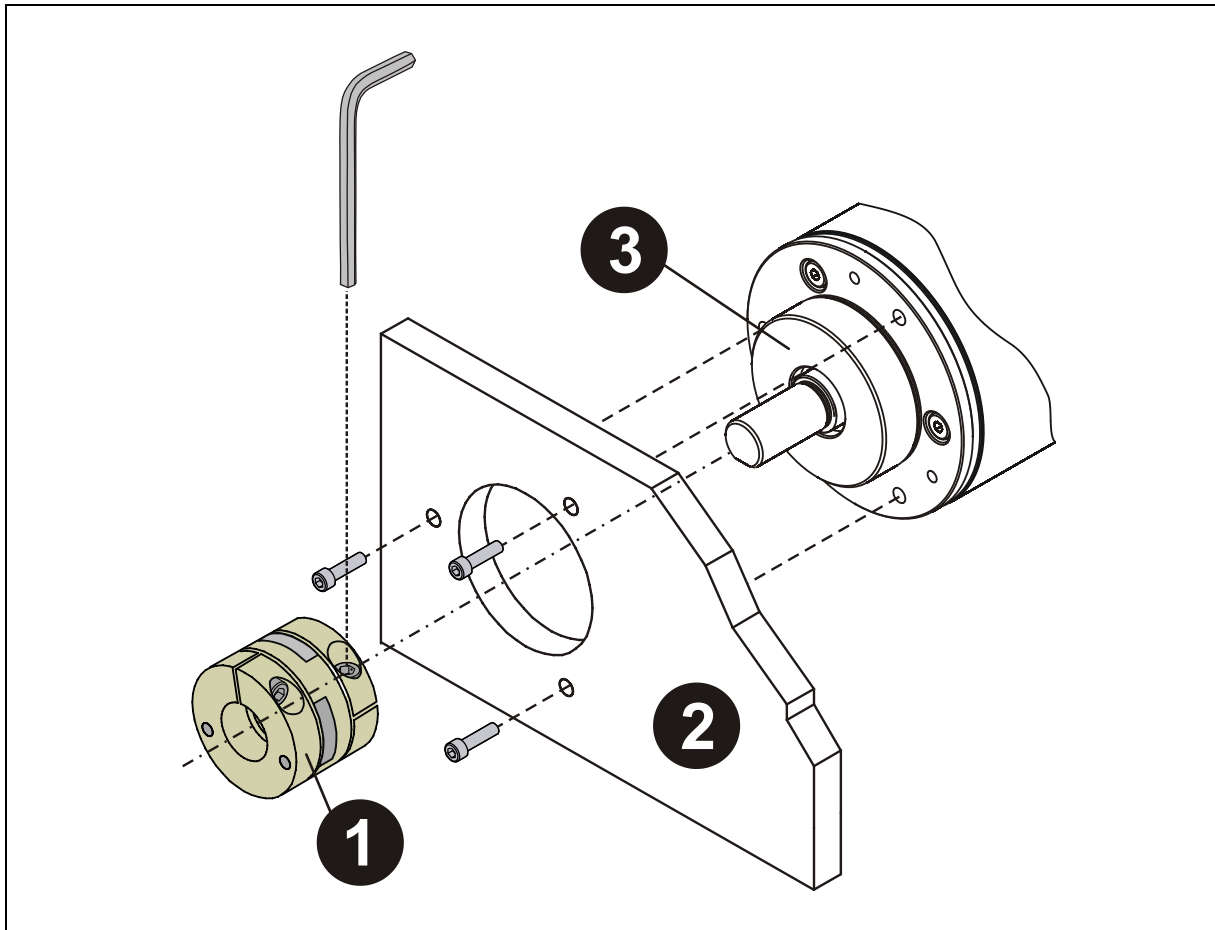


Figure 2: Flange-assembly

### 5.2.1.2 Clamp flange - assembly

The centering collar with proper fit assures the centering of the shaft. Attachment to the machine takes place via a clamp flange.

- 1: EX-conformant coupling
- 2: Clamp flange
- 3: Centering collar

Principle

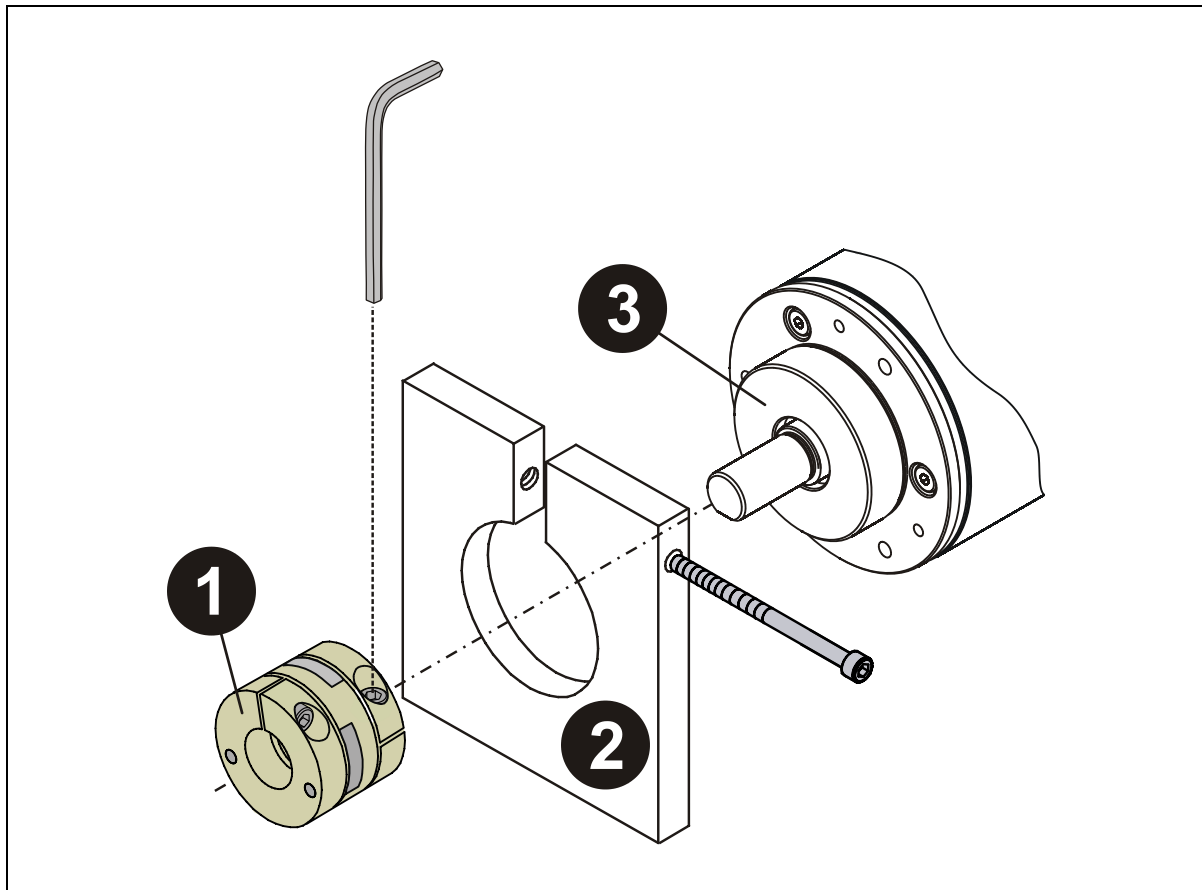


Figure 3: Clamp flange - assembly

## 6 Temperatures / IP protection classes / Enclosure materials / Speeds

Usually the conditions of use for the following parameters are available or are fixed:

- Temperature class for gas/dust: T4/T130°C, T5/T95°C or T6/T80°C
- IP protection class IP65 (without shaft seal ring) or IP67 (with shaft seal ring) and
- Explosive protective enclosure material of aluminum or stainless steel

Depending on the speed class (top speed) of 3000 min<sup>-1</sup> or 6000 min<sup>-1</sup>, this results in the individual maximum ambient temperatures of +40 °C, +50 °C, +60 °C or +75 °C respectively the possible power classes for the integrated measuring system electronics of 3 W or 6 W.

The values applicable to the equipment are indicated on the nameplate.

### 6.1 Aluminum – Explosion protection enclosure

#### Parameter configuration 1:

Temperature class for gas/dust: T4/T130°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

<b>IP protection class</b>	<b>IP65 / IP67</b>
<b>Speed class</b>	<b>≤ 6000 min<sup>-1</sup></b>
Ambient temperature	≤ 75 °C
Power class	≤ 6 W

The evaluation shows that there are no restrictions on the absolute limit values and that the full performance potential of the aluminum explosion protection enclosure can be used.

#### Parameter configuration 2:

Temperature class for gas/dust: T5/T95°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

<b>IP protection class</b>	<b>IP67</b>		<b>IP65</b>	
<b>Speed class</b>	<b>3000 min<sup>-1</sup></b>	<b>6000 min<sup>-1</sup></b>	<b>3000 min<sup>-1</sup></b>	<b>6000 min<sup>-1</sup></b>
Ambient temperature	60 °C	50 °C	75 °C	60 °C
Power class	6 W	3 W	6 W	6 W

The evaluation shows that there are limitations in ambient temperatures and power classes compared to parameter configuration 1.

**Parameter configuration 3:**

Temperature class for gas/dust: T6/T80°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

IP protection class	IP67		IP65	
	Speed class	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	3000 min <sup>-1</sup>
Ambient temperature	50 °C	40 °C	60 °C	50 °C
Power class	6 W			

The evaluation shows that there are further limitations in ambient temperatures compared to parameter configuration 2.

## 6.2 Stainless steel - Explosion protection enclosure

**Parameter configuration 1:**

Temperature class for gas/dust: T4/T130°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

IP protection class	IP67			IP65
	Speed class	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	
Ambient temperature	60 °C	50 °C	40 °C	75 °C
Power class	6 W	3 W	6 W	6 W

The evaluation in case of IP65 shows that there are no restrictions on the absolute limit values and that the full performance potential of the stainless steel explosion protection enclosure can be used.

The evaluation in case of IP67 shows that there are limitations in ambient temperatures and power classes.

**Parameter configuration 2:**

Temperature class for gas/dust: T5/T95°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

IP protection class	IP67		IP65		
	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	
Ambient temperature	not allowed		60 °C	50 °C	40 °C
Power class	not allowed		6 W	3 W	6 W

The evaluation in case of IP65 shows that there are limitations in ambient temperatures and power classes compared to parameter configuration 1.

The evaluation in case of IP67 shows that this configuration cannot be implemented in the stainless steel version.

**Parameter configuration 3:**

Temperature class for gas/dust: T6/T80°C

IP protection class IP65 or IP67

Max. limit values allowed for this parameter configuration:

IP protection class	IP67		IP65		
	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	3000 min <sup>-1</sup>	6000 min <sup>-1</sup>	
Ambient temperature	not allowed		50 °C	40 °C	X
Power class	not allowed		3 W	6 W	X

The evaluation in case of IP65 and speed class 3000 min<sup>-1</sup> shows that there are further limitations in ambient temperatures and power classes compared to parameter configuration 2. The evaluation in case of IP65 and speed class 6000 min<sup>-1</sup> shows that this configuration cannot be implemented in the stainless steel version.

The evaluation in case of IP67 shows that this configuration also cannot be implemented in the stainless steel version.

## 7 Connection / Shielding

### 7.1 Versions

Depending on the connection configuration, the explosion protection enclosure is equipped with at least one thread hole (1x M20x1.5) or with a maximum of three thread holes (3x M20x1.5), which may be axial or radial. Depending on the required connection configuration, the threaded holes may be equipped with or without cable inlets or with sealing plugs.

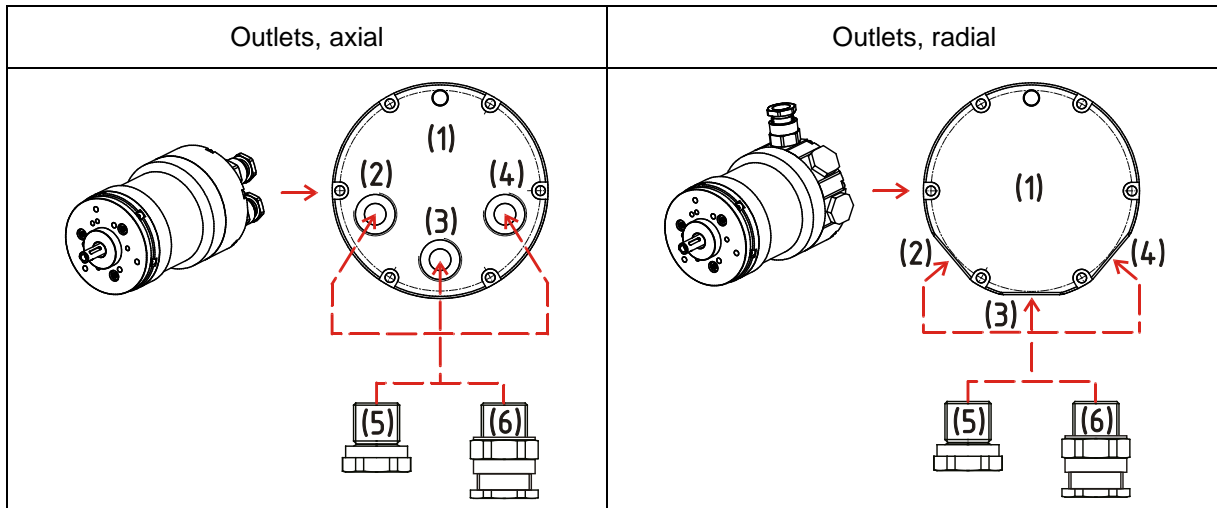


Figure 4: Connection variants

(1):	Connection cap, top view
(2), (3), (4):	One to a maximum of three threaded holes M20x1.5 In the case of one or two threaded holes, the position within the defined positions (2), (3) or (4) is variable.
(5):	Sealing plug M20x1.5, compliant according to 2014/34/EU or IECEx system and type-examination certificate
(6):	Cable inlet M20x1.5, compliant according to 2014/34/EU or IECEx system and type-examination certificate

## 7.2 Requirements for cable inlets and sealing plugs

If the explosion protection enclosure is delivered without cable inlets or sealing plugs, separate verified and certified pressure resistant “Ex d” cable inlets and sealing plugs shall only be used in accordance with EU Directive 2014/34/EU or the IECEx system. These shall meet the minimum requirements or characteristics listed below.

<b>Thread size</b> .....	M20x1.5
<b>Thread length</b> .....	15 mm
<b>Material</b> .....	Brass or stainless steel
<b>Clamping range</b> .....	must be compatible with the cable used
<b>Area of application (EX-zones)</b> .....	1, 21
<b>Gas explosion protection</b> .....	II 2G Ex db IIC Gb
<b>Dust explosion protection</b> .....	II 2D Ex tb IIIC Db
<b>Min. temperature resistance</b>	
At ambient temperature, min. .... -40 °C or -20 °C	
<b>Max. temperature resistance, aluminum – explosion protection enclosure</b>	
Ambient temperature, max.	
at +40...+60 °C <sup>1</sup> .....	+80 °C
at +60...+75 °C .....	+100 °C
<b>Max. temperature resistance, stainless steel – explosion protection enclosure</b>	
Ambient temperature, max.	
at +40...+50 °C <sup>1</sup> .....	+80 °C
at +50...+75 °C .....	+100 °C
<b>IP protection class</b>	
without shaft sealing ring .....	IP65
with shaft sealing ring .....	IP67

### Recommendation

Manufacturer .....	CMP Products Ltd, UK
Distributor .....	R. STAHL Schaltgeräte GmbH, Germany
Cable inlet.....	CMP, Ex d, series A2F
Sealing plug .....	CMP, Ex d, series 757

<sup>1</sup> In the speed class 6000 min<sup>-1</sup> **AND** the power class 6.0 W, the maximum ambient temperatures must be reduced by 10 °C.

### 7.3 Cable requirements

Basically, the electrical installations design, selection and erection of electrical plants shall comply with EN/IEC 60079-14, see also chapter 2.13 on page 18.

The cables used shall be suitable for permanent installation and the material used shall be selected in such a way as to comply with local requirements concerning working conditions.

The cables must be

- covered with a thermoplastic, duraplastic or elastomeric material. They must be circular and compact. Any embedding or coats must be extruded. Filling agents, if present, must not be hygroscopic; or
- mineralized metal coated with sealing
- compatible with the clamping range of the cable inlet



If the existing cable inlet does not comply with EN/IEC 60079-14, chapter 10.6.2, **Version a)** "...sealed with a hardening sealing compound...", then according to **Version b)**, among other things, a minimum cable length of 3 m is required.

The minimum length is required to prevent flame propagation to the external environment through the cable.

The temperature resistance of the cable used must be adapted to the conditions of use:

**Min. temperature resistance**

At ambient temperature, min. .... -40 °C or -20 °C

**Max. temperature resistance, aluminum – explosion protection enclosure**

Ambient temperature, max.

at +40...+60 °C <sup>2</sup>..... +80 °C

at +60...+75 °C ..... +100 °C

**Max. temperature resistance, stainless steel – explosion protection enclosure**

Ambient temperature, max.

at +40...+50 °C <sup>2</sup>..... +80 °C

at +50...+75 °C ..... +100 °C

<sup>2</sup> In the speed class 6000 min<sup>-1</sup> **AND** the power class 6.0 W, the maximum ambient temperatures must be reduced by 10 °C.

7.4 Connection / Perform shielding

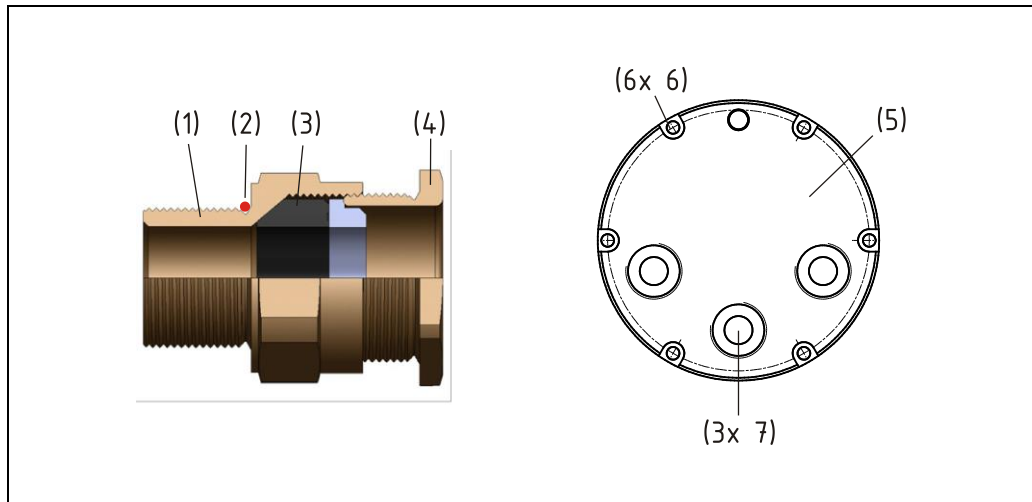


Figure 5: Connection components

(1)	Connection element, cable inlet
(2)	O-ring, available optionally
(3)	Sealing
(4)	Grommet nut
(5)	Connection cap, example with axial cable inlets
(6)	6 Fastening screws M4x40-T20 A4-50 according to DIN EN ISO 14580
(7)	1...3 threaded holes M20x1.5



Generally, the conditions and safety-related notices contained in the corresponding certificates for the used cable inlets respectively sealing plugs must be observed.

Prepare the cable inlet as shown below and ensure that it is not damaged, fat-free and clean. In particular, the O-ring (2) shall be checked for correct seat and damage.

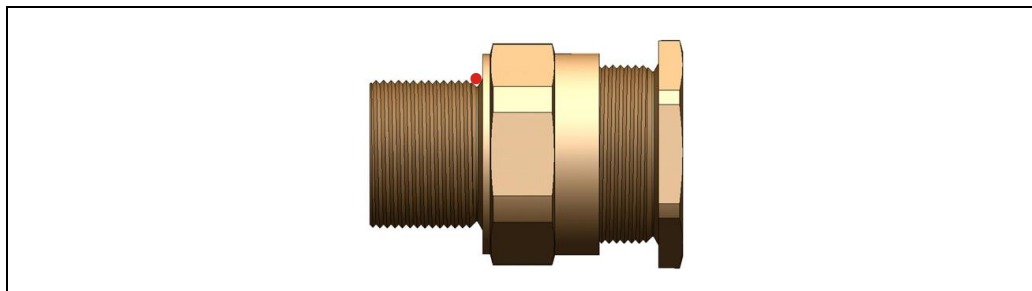
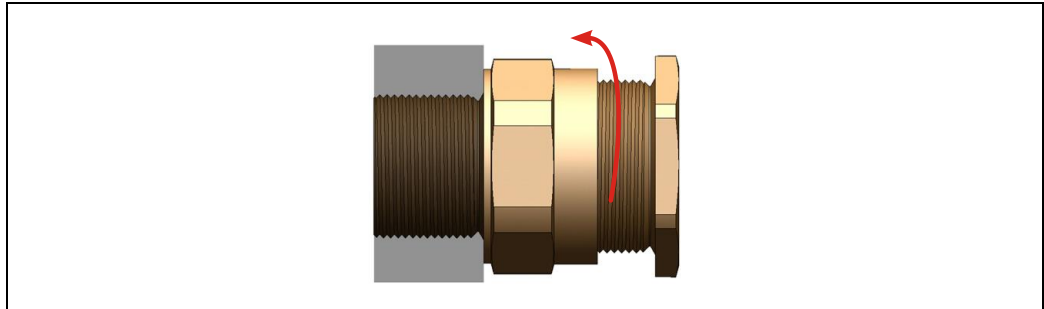


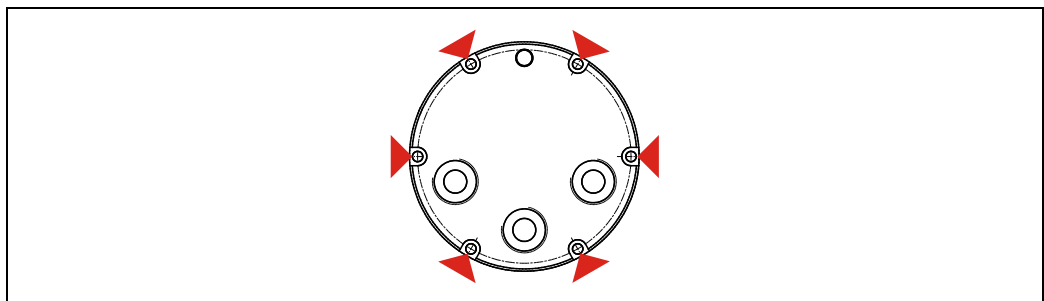
Figure 6: Cable inlet M20x1.5

Adapt the cable inlet into the threaded hole (7) of the connection cap (5) and fully tighten the connection element (1).



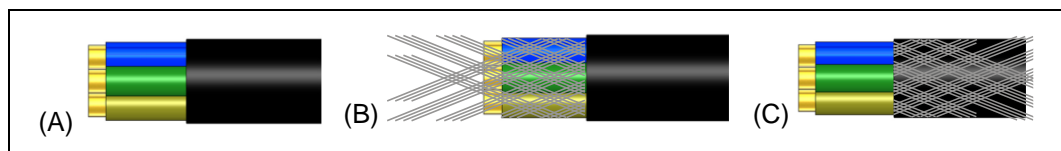
**Figure 7: To screw in the cable inlet into the connection cap**

Remove the six fastening screws (6) and pull off the connection cap (5) without canting.



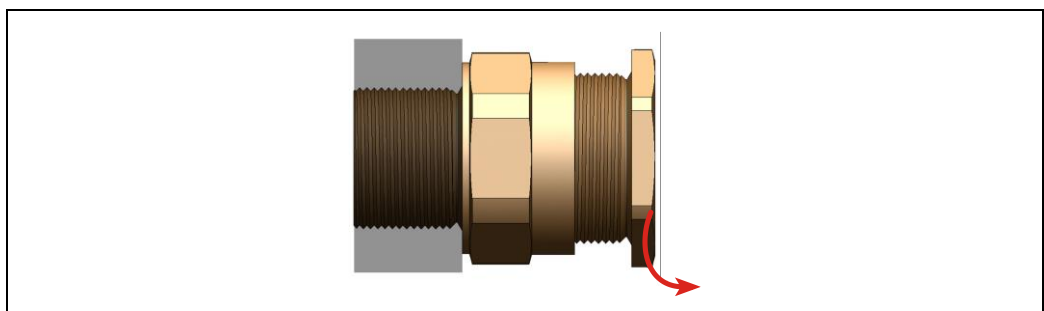
**Figure 8: Remove connection cap**

Determine the length of the conductor (A) and the length of the shielding braid (B) required for installation. The cable is prepared by partially removing the outer enclosure where the isolated conductors need to be exposed (A). Pull back the shielding braid over the enclosure (C).



**Figure 9: Prepare cable**

Loosen grommet nut (4), to loose the sealing (3).



**Figure 10: Loosen grommet nut**

Put through the cable with the shielding braid through the cable inlet and move it to the desired position (A). Then tighten the grommet nut (4) manually by hand until a drag force is felt when the seal is placed around the cable. Finally, retighten the grommet nut with the screw key for another turn. Crosscut the shielding braid so that the shielding braid in the end position is located only in the clamp area of the cable clamp; see Figure 11 (B) and Figure 12.

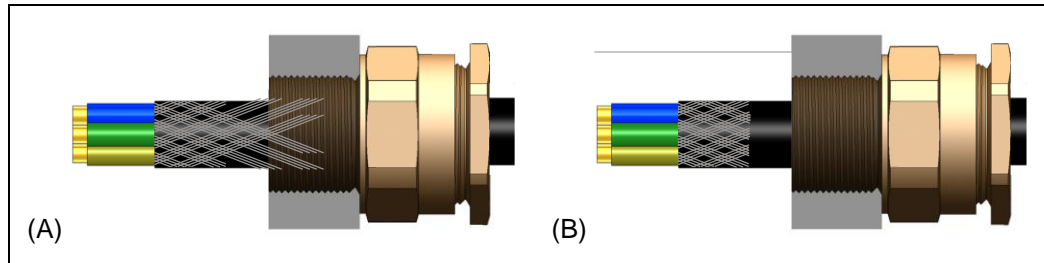


Figure 11: Cable inlet with the installed cable

Carry out terminal connection in accordance with the pin assignment. The connection board (2) is located inside the connection cap (1). Position shielding braid (4) according to the clamping range of the cable clamp (3), tighten screws of the cable clamp (3).

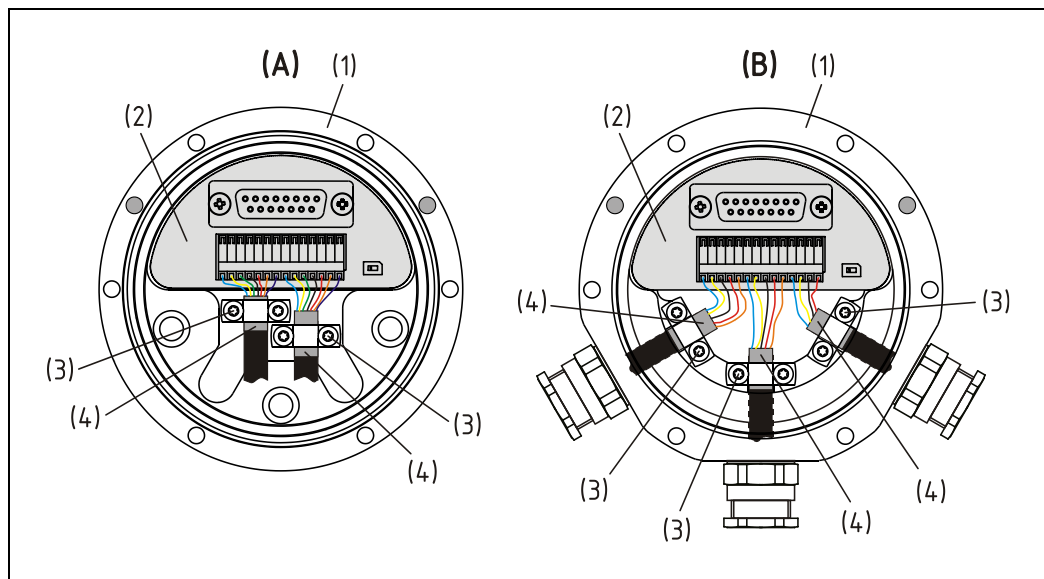


Figure 12: Connection cap with axial (A) and radial (B) cable inlets

## 7.5 Close securely the connection cap

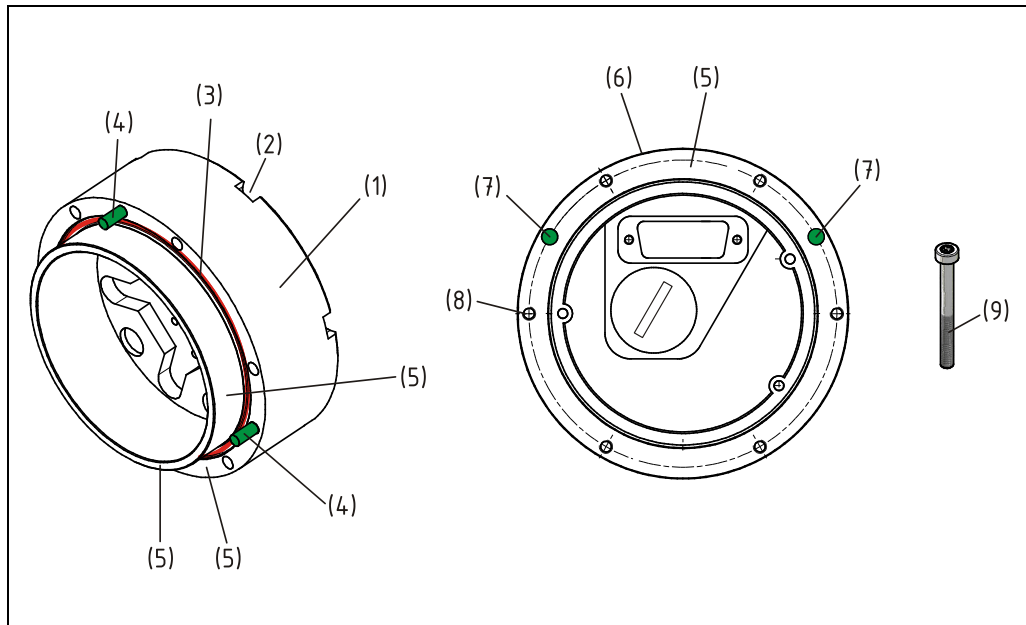


Figure 13: Connection cap / cleavage surfaces

(1)	Connection cap, example with axial cable inlets
(2)	6 Through-holes for the fastening screws (9)
(3)	O-ring
(4)	2 Dowel pins
(5)	Cleavage surfaces
(6)	Explosion protection enclosure, flameproof encapsulated
(7)	2 Fitting holes for mounting the dowel pins (4)
(8)	6 M4 Threaded holes for mounting the fastening screws (9)
(9)	6 Fastening screws M4x40-T20 A4-50 according to DIN EN ISO 14580

Ensure that the cleavage surfaces (5) of the connection cap (1) and the explosion protection enclosure (6) are not damaged, fat-free and clean. In particular, the O-ring (3) must be checked for correct seat and damage. Damaged components must not be mounted and shall be requested as an accessory part, see chapter 9.5 on page 47. Only the manufacturer may replace the connection cap.

Place the connection cap (1) in such a way that the two dowel pins (4) are located above the explosion protection enclosure (6) fitting holes (7).

Place the connection cap (1) with the hand vertically and without any cants on the explosion protection enclosure (6).

Insert fastening screws (9) via the through holes (2) and screw them through the threaded holes (8) using a Torx key in pairs and cross according to Figure 14 with a torque of 3 Nm.

Lost fastening screws shall be replaced only by original screws, see chapter 9.5 on page 47.

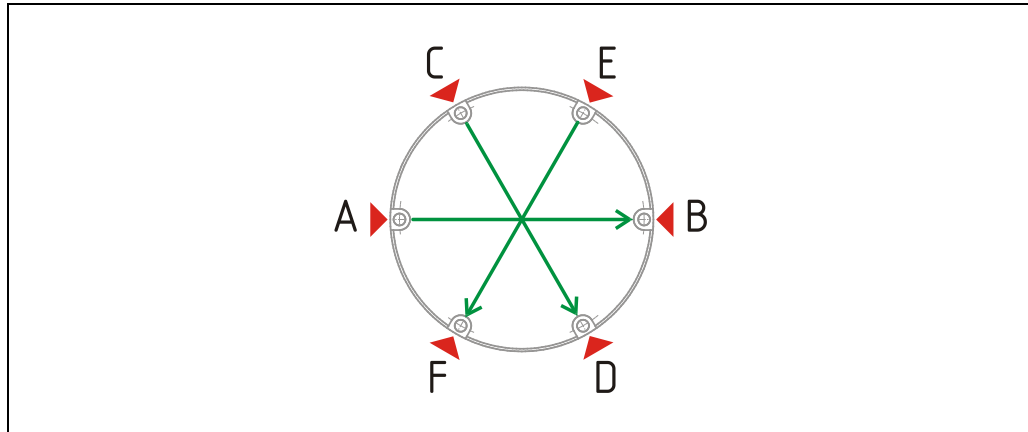


Figure 14: To screw the connection cap - sequence

## 7.6 Equipotential bonding conductor

An equipotential is required for systems in potentially explosive areas. This is to be done with a minimum wire diameter of 4 mm<sup>2</sup>.

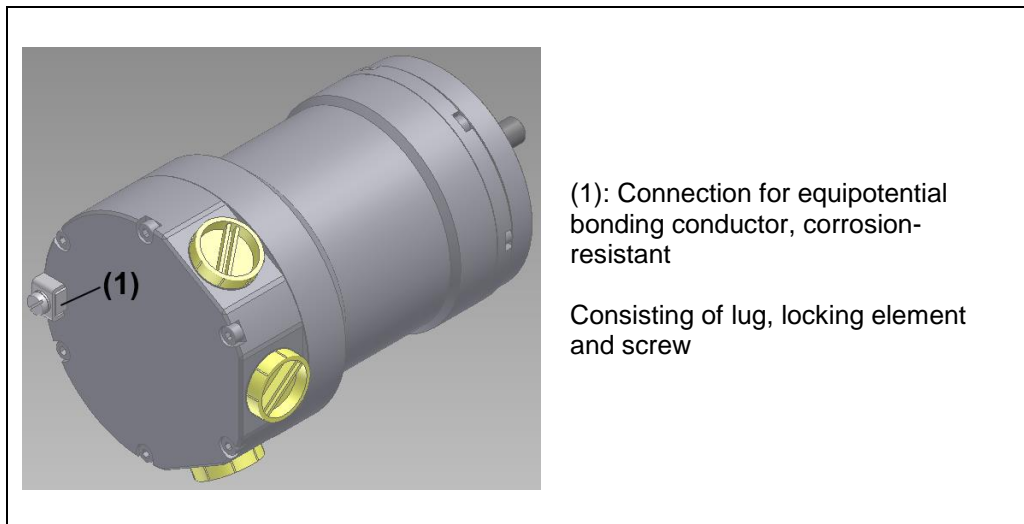


Figure 15: Equipotential bonding conductor – Connection


## 8 Disposal

Electronic waste is hazardous waste. The applicable country-specific regulations are to be adhered to for disposal.

## 9 Annex

### 9.1 ATEX certificate

**IBExU Institut für Sicherheitstechnik GmbH**  
An-Institut der TU Bergakademie Freiberg

[1] **EU-TYPE EXAMINATION CERTIFICATE - TRANSLATION** 

[2] Equipment and protective systems intended for use in potentially explosive atmospheres, directive 2014/34/EU

[3] EU-Type Examination Certificate Number **IBExU17ATEX1042 X** | Issue 1

[4] Equipment: **Rotary encoder**  
Type: A\*\*100\*-\*\*\*\*\*

[5] Manufacturer: TR-Electronic GmbH

[6] Address: Eglishalde 6  
78647 Trossingen  
GERMANY

[7] This product and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.



[8] IBExU Institut für Sicherheitstechnik GmbH, Notified Body number 0637 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the essential health and safety requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.  
The examination and test results are recorded in the confidential test report IB-21-3-0089.

[9] Compliance with the essential health and safety requirements has been assured by compliance with:  
**EN IEC 60079-0:2018/AC:2020-02 EN 60079-1:2014/AC:2018-09 EN 60079-31:2014**  
Except in respect of those requirements listed at item [18] of the schedule.

[10] The sign "X" placed after the certificate number indicates that the product is subject to the specific conditions of use specified in the schedule to this certificate.


[11] This EU-type examination certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.


[12] The marking of the product shall include the following:

 II 2G Ex db IIC T6...T4 Gb  
 II 2D Ex tb IIC T80 °C...T130 °C Db  
 -40 °C ≤ T<sub>a</sub> ≤ +40 ... +75 °C

IBExU Institut für Sicherheitstechnik GmbH  
Fuchsmühlenweg 7  
09599 Freiberg, GERMANY

Phone: +49 (0)3731 3805-0  
Fax: +49 (0)3731 3805-10

By order  
  
Dipl.-Ing. (FH) Henker

  
 (Notified Body number 0637)

Certificates without seal and signature are not valid. Certificates may only be duplicated completely and unchanged. In case of dispute, the German text shall prevail.

Freiberg, 2021-09-27

FB106100 | 1

Page 1/3  
IBExU17ATEX1042 X | 1

TR-ECE-TI-GB-0316-01

**IBExU Institut für Sicherheitstechnik GmbH**  
An-Institut der TU Bergakademie Freiberg

[13]

**Schedule**

[14]

**Certificate number IBExU17ATEX1042 X | Issue 1**[15] **Description of product**

The Rotary encoder type A\*\*100\*-\*\*\*\*\* is used with built-in systems to record angle modifications for the stationary use in explosive gas and dust atmospheres in the equipment categories 2G and 2D. It consists of a flameproof enclosure from stainless steel or aluminium, into which the evaluation electronic is placed to record the position variation. The signal of the position respectively angle modification is transmitted by beared shaft (encoder).

Technical data:

- Nominal voltage: 11 up to 27 V DC
- Max. power input: 3 W (Type „58“)  
6 W (Type „75“)
- Max. speed: 3,000 or 6,000 min<sup>-1</sup>
- Ambient temperature range: -40 °C up to +40 °C ... 75 °C
- Property class fastening screws: A4-50
- IP-Degree of protection according to EN 60529: IP65 (without shaft seal)  
IP67 (with shaft seal)

Maximum ambient temperature	Speed (min <sup>-1</sup> )					
	Temp. class	with shaft seal		without shaft seal		
		3000	6000	3000	6000	
Alu	T4 / T130 °C	75 °C				
	Power	6 W				
	T5 / T95 °C	60 °C	50 °C	75 °C	60 °C	
	Power	6 W	3 W	6 W	6 W	
	T6 / T80 °C	50 °C	40 °C	60 °C	50 °C	
	Power	6 W				
Inox	T4 / T130 °C	60 °C	50 °C	40 °C	75 °C	
	Power	6 W	3 W	6 W	6 W	
	T5 / T95 °C	X		60 °C	50 °C	40 °C
	Power	X		6 W	3 W	6 W
	T6 / T80 °C	X		50 °C	40 °C	X
	Power	X		3 W	6 W	

Changes compared to issue 0 of this certificate:

The encoder complies with the requirements of the current standard editions of EN 60079 and is marked with the equipment protection level.

[16] **Test report**

The test results are recorded in the confidential test report IB-21-3-0089 of 2021-09-27. The test documents are part of the test report and they are listed there.

Summary of the test results

The Rotary encoder type A\*\*100\*-\*\*\*\*\* fulfils the requirements of the explosion protection for equipment of group II, category 2G in the type of protection flameproof enclosure "db" as well as group II, category 2D in type of protection dust explosion protection by enclosure "tb".

**IBExU Institut für Sicherheitstechnik GmbH**  
An-Institut der TU Bergakademie Freiberg

**[17] Special conditions for use**

1. The maximum ambient temperature of the equipment depends on the temperature class, the design with or without shaft seal, the maximum dissipation power and the speed. The appropriate classification for each design is specified in the above table as well as in the operating instruction.
2. The Rotary encoder is equipped with cable glands by the manufacturer or the operating company. At own selection it has to be noticed that they are suitable and certified for the service temperature given in the operating instruction. The special conditions and safety instructions contained in the respective certificate have to be observed.
3. Also the higher service temperatures for the single variants have to be noticed at the selection of the cable, the accurate values are specified in the operating instruction. The requirements of EN 60079-14, paragraph 10.6, also have to be observed.
4. Unused openings for cable entries have to be closed durably with suitable screw plugs, which are confirmed for explosion protection according to EN 60079-1, Group IIC.
5. Repairs of the flameproof joints must be made in compliance with the constructive specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 3 and 4 of EN 60079-1.
6. Only fastening screws M4x40-T20 A4-50 according to EN ISO 14580, specified by the manufacturer, shall be used.
7. High charging processes have to be avoided at use in explosive dust atmospheres.

**[18] Essential Health and Safety Requirements**

In addition to the essential health and safety requirements (EHSRs) covered by the standards listed at item [9], the following are considered relevant to this product, and conformity is demonstrated in the test report:

- not applicable -

**[19] Drawings and documents**

The documents are listed in the test report.

IBExU Institut für Sicherheitstechnik GmbH  
Fuchsmühlenweg 7  
09599 Freiberg, GERMANY

By order



Dipl.-Ing. (FH) Henker

Freiberg, 2021-09-27

## 9.2 EU declaration of conformity, A\*\*100



### EU Declaration of Conformity

#### The Rotative Measuring System A\*\*100 with "TR-Explosion Protection Enclosure"

Type: AEV100, AOV100, AMV100, ARV100, APV100, AES100, AOS100, AMS100, ARS100, APS100  
 Order-No.: A\*\*100\*-\*\*\*\*\*

was developed, designed and manufactured to comply with the EU-Directives

Electromagnetic Compatibility	<b>2014/30/EU</b>	(L 96/79)
Equipment and protective systems intended for use in potentially explosive atmospheres	<b>2014/34/EU</b>	(L 96/309)
Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)	<b>2011/65/EU</b>	(L 174/88)

under the sole responsibility of  
 TR-Electronic GmbH  
 Eglshalde 6  
 D - 78647 Trossingen  
 Tel.: +49 7425/228-0  
 Fax: +49 7425/228-33  
 Germany

#### The following harmonized standards were applied:

EN 61000-6-2: 2005/AC:2005	Generic standards - Electromagnetic compatibility (EMC) Part 6-2: Immunity (industrial environment)
EN 61000-6-3: 2007/A1:2011	Generic standards - Electromagnetic compatibility (EMC) Part 6-3: Emission (residential environment)
EN IEC 60079-0: 2018	Explosive atmospheres Part 0: Equipment - General requirements
EN 60079-1: 2014	Explosive atmospheres Part 1: Equipment protection by flameproof enclosures "d"
EN 60079-31: 2014	Explosive atmospheres Part 31: Equipment dust ignition protection by enclosure "t"
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

#### Other applied standards:

DIN EN 60529: 2014	Degrees of protection provided by enclosures (IP code)
--------------------	--

The products are marked additionally with the following characteristics on the name plate:

II 2G Ex db IIC T6...T4 Gb; II 2D Ex tb IIIC T80 °C...T130 °C Db  
 -40 °C ≤ T<sub>a</sub> ≤ +40 ... +75 °C

The Type Examination Test was carried out by:

**NB0637, IBExU Institut für Sicherheitstechnik GmbH,**  
 Fuchsmühlenweg 7,  
 09599 Freiberg, GERMANY  
 No. of the EU type-examination certificate: IBExU 17 ATEX 1042 X | 1

Trossingen, 11/08/2022

Mr. Klaus Tessari, CEO

TR-ECE-KE-DGB-0379-00.DOC

### 9.3 EC- / EU-declaration of conformity, A\*\*100 + Functional safety



#### EC- / EU-Declaration of Conformity

The Rotative Measuring System **ADV100 with Functional Safety and "TR-Explosion Protection Enclosure"**

Type: ADV100  
Order-No.: ADV100\*\_\*\*\*\*\*

was developed, designed and manufactured to comply with the EU-Directives

Electromagnetic Compatibility (EMC)	<b>2014/30/EU</b> (L 96/79)
Machinery Directive	<b>2006/42/EC</b> (L 157/24)
Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)	<b>2014/34/EU</b> (L 96/309)
Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)	<b>2011/65/EU</b> (L 174/88)

under the sole responsibility of

**TR Electronic GmbH**  
Eglishalde 6  
D - 78647 Trossingen  
Tel.: +49 7425/228-0  
Fax: +49 7425/228-33  
Germany


The following harmonized standards were applied:

EN 61000-6-2:2005/AC:2005 with increased test standards: DIN EN 61326-3-1:2018	Generic standards - Electromagnetic compatibility (EMC) Immunity (industrial environment)
EN 61000-6-3:2007/A1:2011	Generic standards - Electromagnetic compatibility (EMC) Emission (residential environment)
EN 61800-5-2:2007	Adjustable speed electrical power drive systems Safety requirements - Functional
EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems General principles for design
EN 60204-1:2018 (in extracts)	Safety of machinery - Electrical equipment of machines General requirements
EN IEC 62061:2021	Safety of machinery - Functional safety of safety-related control systems
EN ISO 20607:2019	Safety of machinery - Instruction handbook - General drafting principles
EN IEC 60079-0:2018	Explosive atmospheres Equipment - General requirements
EN 60079-1:2014	Explosive atmospheres Equipment protection by flameproof enclosures "d"
EN 60079-31:2014	Explosive atmospheres Equipment dust ignition protection by enclosure "t"
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

**Other applied standards:**

DIN EN 61508 Part 1-7:2011	Functional safety of electrical/electronic/programmable electronic safety-related systems
DIN EN 60529:2014	Degrees of protection provided by enclosures (IP code)

The products are marked additionally with the following characteristics on the name plate:

 $-40\text{ °C} \leq T_a \leq +40 \dots +75\text{ °C}$
---

The EU type examination according to the ATEX Directive for the Explosion Protection Enclosure was carried out by the notified body:

**NB0637, IBExU Institut für Sicherheitstechnik GmbH,**  
 Fuchsmühlenweg 7,  
 09599 Freiberg, GERMANY  
 No. of the EU type-examination certificate: IBExU 17 ATEX 1042 X | 1

The EU type examination and certification according to the Machinery Directive as Logic Unit For Safety Functions was carried out by the notified body:

**NB0035, TÜV Rheinland Industrie Service GmbH,**  
 Alboinstr. 56,  
 12103 Berlin, GERMANY  
 No. of the EU type-examination certificate: 01/205/5518.xx/xx (internal series 75)

**Authorized to compile the technical file:**

TR Electronic GmbH, Eglshalde 6, 78647 Trossingen, Germany

Trossingen, 09/22/2023



Mr. Klaus Tessari, CEO

## 9.4 IECEx certificate

		<h1>IECEX Certificate of Conformity</h1>	
<b>INTERNATIONAL ELECTROTECHNICAL COMMISSION</b> <b>IEC Certification System for Explosive Atmospheres</b> <small>for rules and details of the IECEx Scheme visit <a href="http://www.iecex.com">www.iecex.com</a></small>			
Certificate No.:	<b>IECEX IBE 21.0024X</b>	Page 1 of 4	<a href="#">Certificate history:</a>
Status:	<b>Current</b>	Issue No: 0	
Date of Issue:	2021-09-27		
Applicant:	<b>TR-Electronic GmbH</b> Eglshalde 6 Trossingen 78647 Germany		
Equipment:	<b>Rotary encoder A**100*..*****</b>		
Optional accessory:			
Type of Protection:	<b>Flameproof enclosure "d"; Protection by enclosure "t"</b>		
Marking:	Ex db IIC T6...T4 Gb Ex tb IIIC T80 °C...130 °C Db -40 °C ≤ T <sub>a</sub> ≤ +40 °C ... +75 °C		
Approved for issue on behalf of the IECEx Certification Body:		<b>Alexander Henker</b>	
Position:		<b>Deputy Head of department Certification Body</b>	
Signature: (for printed version)			
Date:			
1. This certificate and schedule may only be reproduced in full. 2. This certificate is not transferable and remains the property of the issuing body. 3. The Status and authenticity of this certificate may be verified by visiting <a href="http://www.iecex.com">www.iecex.com</a> or use of this QR Code.			
Certificate issued by:			
<b>IBEXU Institut für Sicherheitstechnik GmbH</b> Fuchsmühlenweg 7 09599 Freiberg Germany			
TR-ECE-TI-GB-0381-00			



## IECEX Certificate of Conformity

Certificate No.: **IECEX IBE 21.0024X**

Page 2 of 4

Date of issue: 2021-09-27

Issue No: 0

Manufacturer: **TR-Electronic GmbH**  
Eglishalde 6  
Trossingen 78647  
Germany

Additional  
manufacturing  
locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

#### STANDARDS :

The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Explosive atmospheres - Part 0: Equipment - General requirements  
Edition:7.0

IEC 60079-1:2014-06 Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"  
Edition:7.0

IEC 60079-31:2013 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"  
Edition:2

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

#### TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Report:

[DE/IBE/ExTR21.0031/00](#)

Quality Assessment Report:

[DE/TPS/QAR21.0007/00](#)

TR-ECE-TI-GB-0381-00



## IECEX Certificate of Conformity

Certificate No.: **IECEX IBE 21.0024X**

Page 3 of 4

Date of issue: 2021-09-27

Issue No: 0

### EQUIPMENT:

Equipment and systems covered by this Certificate are as follows:

The Rotary encoder type A\*\*100\*-\*\*\*\*\* is used with built-in systems to record angular motions for the stationary use in explosive gas and dust atmospheres in the Equipment Protection Level Gb and Db.

It consists of a flameproof enclosure from stainless steel or aluminium, in which the evaluation electronics to record the position variation is placed. The signal of the position or angular motions is transferred by a beared shaft (encoder).

### Technical data:

- Nominal voltage: 11 up to 27 V DC
- Maximum power input: 3 W (type „58“)  
6 W (type „75“)
- Maximum speed: 3000 rpm or 6000 rpm
- Ambient temperature range: -40 °C up to +40 °C ... +75 °C
- Property class fastening screws: A4-50
- IP-degree of protection according to EN 60529: IP65 (without shaft seal), IP67 (with shaft seal)

For type specific thermal parameters (maximum ambient temperature and temperature class) see following page (equipment continued).

### SPECIFIC CONDITIONS OF USE: YES as shown below:

- The maximum ambient temperature of the equipment depends on the temperature class, the design with or without shaft seal, the maximum dissipation power and the The appropriate classification for each design is specified in the General product information as well as in the operating instruction.
- The Rotary encoder is equipped with cable glands by the manufacturer or the operating company. At own selection it has to be noticed that they are suitable and certified for the service temperature given in the operating instruction. The special conditions and safety instructions contained in the respective Certificate have to be observed.
- Also the higher service temperatures for the single variants have to be noticed at the selection of the cable, the accurate values are specified in the operating instruction. The requirements of EN 60079-14, paragraph 10.6, also have to be observed.
- Unused openings for cable entries have to be closed durably with suitable screw plugs, which are confirmed for explosion protection according to EN 60079-1, Group IIC.
- Repairs of the flameproof joints must be made in compliance with the constructive specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 3 and 4 of EN 60079-1.
- Only fastening screws M4x40-T20 A4-50 according to EN ISO 14580, specified by the manufacturer, shall be used.
- High charging processes have to be avoided at use in explosive dust atmospheres.

TR-ECE-TI-GB-0381-00



## IECEx Certificate of Conformity

Certificate No.: **IECEx IBE 21.0024X**

Page 4 of 4

Date of issue: 2021-09-27

Issue No: 0



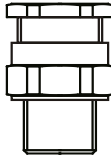
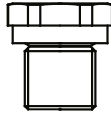

**Equipment (continued):**

With regard to the limit values for the respective temperature class the following assignments to ambient temperatures 40 °C, 50 °C, 60 °C or 75 °C are valid:

maximum T <sub>ambient</sub>		Rotation speed (min <sup>-1</sup> )				
		with simmerring (shaft seal)		without simmerring (shaft seal)		
	Temp.class	3000	6000	3000	6000	
Alu enclosure	T4 / T130 °C	75 °C				
	power	6 W				
	T5 / T95 °C	60 °C	50 °C	75 °C	60 °C	
	power	6 W	3 W	6 W	6 W	
	T6 / T80 °C	50 °C	40 °C	60 °C	50 °C	
	power	6 W				
Inox enclosure	T4 / T130 °C	60 °C	50 °C	40 °C	75 °C	
	power	6 W	3 W	6 W	6 W	
	T5 / T95 °C	not applicable		60 °C	50 °C	40 °C
	power	not applicable		6 W	3 W	6 W
	T6 / T80 °C	not applicable		50 °C	40 °C	not applicable
	power	not applicable		3 W	6 W	

TR-ECE-TI-GB-0381-00

## 9.5 Accessories

Article	Figure	Order-No.:
<p>O-ring,  <math>\varnothing 80</math> mm according to DIN 3771,            suitable for the connection cap</p>		<p>on request</p>
<p>Fastening screws (Torx)            M4x40-T20 A4-50 according to            DIN EN ISO 14580</p>		<p>on request</p>
<p>Cable inlet Ex "d"            M20x1.5, 15 mm            Brass / Stainless steel</p>		<p>on request</p>
<p>Sealing plug Ex „d“            M20x1.5, 15 mm            Brass / Stainless steel</p>		<p>on request</p>
<p>Connection cable</p>		<p>on request</p>

