Translation of the original manual

Explosion Protection Enclosure with integrated measuring system

Explosion Protection Enclosure - Type _A**58I:2

A*S-58I:2 / A*H-58I:2

A*V-58I:2

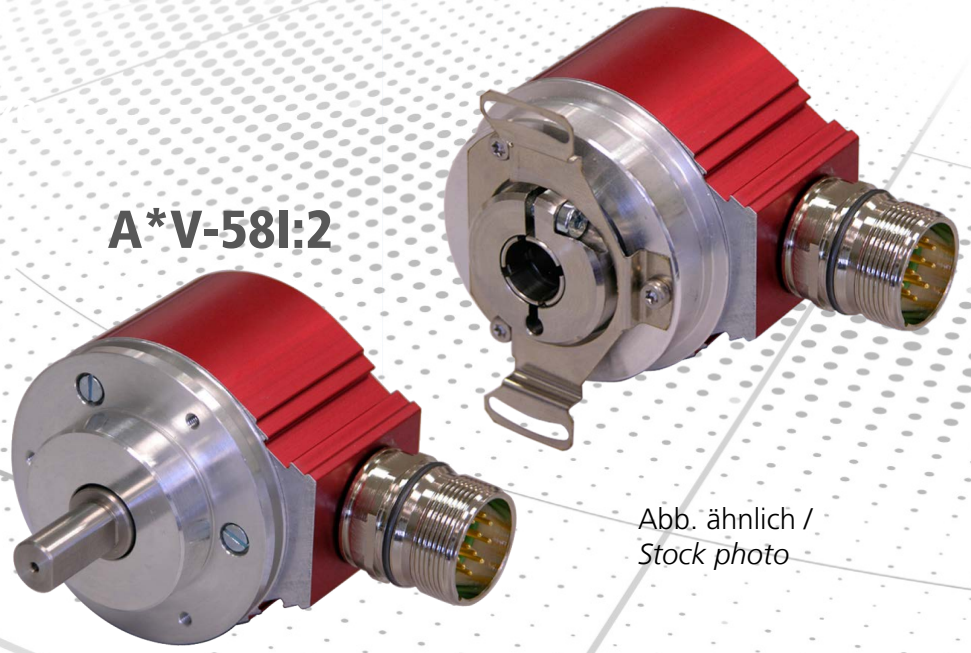

Abb. ähnlich /
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CE
II 3G Ex nAc IIC T3 X
II 3D Ex tc IIIC T175°C IP65 X
Date of manufacture: DD.MM.YYYY

CE
II 3G Ex nAc IIC T5 X
II 3D Ex tc IIIC T97°C IP65 X
Date of manufacture: DD.MM.YYYY

_Basic safety instructions
_Intended use
_Product description
_Technical data
_Explosion protection characteristics
_Assembly

User Manual

TR - ECE - BA - GB - 0130 - 00 02/10/2017

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Amendment-index

Amendment	Date	Index
First edition	02/10/17	00

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1 General

This Ex-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 Ex-User manual represents a supplement to the other documentation such as for example product data sheets, dimensional drawings and leaflets etc.

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

1.1 Type designation code, Explosion Protection Enclosure

* A	* 1	* 2	* 3	* 4	* 5	-	* 6	* 6	* 6	* 6	* 6

Position	Notation	Description
* A	A	Explosion protection enclosure (ATEX); Ex
* 1	E O	Optical scanning unit ≤ 10000 Pulses/Rev. Optical scanning unit > 10000 Pulses/Rev.
* 2	V S H W	Solid shaft Blind shaft Hollow shaft Draw wire
* 3	58	External diameter ∅ 58 mm
* 4	I	Incremental Encoder
* 5	2	Generation 2
* 6	-	Consecutive number

* = Wild cards

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1.2 Scope

This -User manual applies exclusively to the following explosion protection enclosure series:

AEV58I:2, AOV58I:2, AES58I:2, AOS58I:2

- Gas **II 3G Ex nAc IIC T5 X**
- Dust **II 3D Ex tc IIIC T97°C IP65 X**

AEH58I:2, AOH58I:2

- Gas **II 3G Ex nAc IIC T3 X**
- Dust **II 3D Ex tc IIIC T175°C IP65 X**

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

It thus applies together with the following documentation:

- the operator's system-specific operation instructions,
- this -User manual
- and the interface-specific user manual

1.3 Relevant directives and standards

The explosion protection enclosure is 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	Explosive atmospheres: General requirements
DIN EN 60079-14	Explosive atmospheres: Electrical installations design, selection and erection
EN 60079-15	Explosive atmospheres: Equipment protection by type of protection "n"
EN 60079-31	Explosive atmospheres: Equipment dust ignition protection by enclosure "t"
DIN EN 60529	Degrees of protection provided by enclosures (IP code)

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1.4 Used abbreviations / Terms

A**58I:2	Explosion protection enclosure with integrated measuring system of the 58 series, all versions.
EU	***E***uropean ***U***nion
EMC	***E***lectro***m***agnetic ***c***ompatibility
ESD	***E***lectro ***S***tatic ***D***ischarge
IEC	***I***nternational ***E***lectro-technical ***C***ommission
VDE	Association for Electrical, Electronic & Information Technologies

1.5 Product description

The aluminum explosion protection enclosure with built-in systems and integrated evaluation electronics serves the detection of changes in angle for fixed installations. The changes in angle are transmitted to the evaluation electronics via shaft.

The explosion protection enclosure has the ignition protection type

- "n": non-sparking operating equipment (potential gas-explosive atmosphere) and
- "t": protection by the enclosure (potential dust-explosive atmosphere)

Through its manner of construction, the types of ignition protection and additional measures, the enclosure is suitable for the incorporation of non-explosion protected installation devices such as the measuring system of the series 58.

The construction, as well as the interaction of the individual components and the housing with regards to their possibilities for use in potentially explosive areas, are tested by the company TR-Electronic GmbH and confirmed by identification with the nameplate.

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2 Basic safety instructions

2.1 Symbol- and note definition

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

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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.

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 -***user manual*** and the ***interface specific user manual***!

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.

Power connections may not be connected or disconnected with the power engaged. Generally, wiring work as well as opening and closing of electrical connections may only be performed with the power switched off.

The equipment may not be used in case of defects, as a basic principle it may not be opened and dust deposits > 5 mm must be removed.

During operation surface temperatures of 170 °C or higher can occur and therefore danger of burning and fire.

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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 for use in the Ex-Zone 2 (potentially gas-explosive areas, II 3 G, device protection level Gc) or 22 (areas with combustible dust II 3 D, device protection level Dc).

The assembly takes place through the established attachment possibilities. The electrical data provided on the nameplate, as well as the device category, temperature class etc. for the place of use are to be observed. The operating temperature range of the equipment is -20°C to +60°C.

Intended use also includes:

- observation of all instructions contained in this Ex-User manual and in the interface-specific user manual,
- observation of the nameplate and possible prohibition- or instruction labels on the equipment,
- observation of the supplementary documentation e.g. the accompanying product sheet, connector assignments etc.,
- observation of the machine- or system manufacturer's operating manual,
- operating of the equipment within the limits indicated in the technical data (Ex-User manual/interface-specific user manual).

2.5 Non-intended use

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

⚠ WARNING

- Since the equipment is ***not a safety component*** according to the EC-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, 1, 20 and 21
  - for medical aims
  - commissioning of the equipment if the nameplate is no longer readable or is completely missing.

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2.6 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.

2.7 Organizational measures

- The Ex-User manual must always be kept within reach in the equipment's operating location.
- In addition to the Ex-User manual, 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 Ex-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 this Ex-User manual.
- Repairs may only be performed by the manufacturer, or by a person or body who carries the manufacturer's authorization.

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2.8 Personnel selection and -qualification; basic obligations

2.8.1 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 IEC 60079-14 or DIN EN 60079-14 standards are to be additionally consulted [suppliers e.g. Beuth Verlag GmbH, VDE-Verlag GmbH].

2.8.2 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 IEC / DIN EN 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 IEC 60079-17 or DIN EN 60079-17 standards are to be additionally consulted [suppliers e.g. Beuth Verlag GmbH, VDE-Verlag GmbH].

2.9 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 which is more than 5 mm thick is not permissible. 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.

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2.10 Assembly, installation and dismantling

Risk of fire due to high surface temperatures!

During operation surface temperatures of 170 °C or higher can occur.

- Before assembly, it must be ensured that an adequately large distance is maintained from inflammable materials and cables laid in the immediate vicinity. Furthermore, it must be ensured that heat losses can be adequately dissipated.

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 IEC 60079-14 and DIN EN 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 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.

In potentially explosive areas, the equipment's power supply line with mating connector respectively the connection cable is to be routed in such a way that it is protected from damage and mechanical failure. In case of connection cables without mating connectors the single wires mustn´t be damaged. The maximum connection information on the nameplate must be complied with.
Observe the information in chapter “ Special conditions for safe use, marking "X" ” on page 16.

For metal enclosures in potentially explosive areas an equipotential line with at least 4 mm^2 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.

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2.11 Inspection, maintenance and repair

Risk of burning due to high surface temperatures!

During operation surface temperatures of 170 °C or higher can occur.

➢ The temperature must therefore be checked before work can be carried out again on the equipment after operation.

The operator of an electrical system in a potentially explosive environment must keep the equipment in an good condition, operate it properly, monitor it and maintenance and repair work must be performed, also see IEC 60079-17 and DIN EN 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 Ex-User manual and the interface-specific user manual are to be adhered to!
The applicable laws and directives are complied with before recommissioning.

- The equipment does not require any maintenance by the operator. Nevertheless, inspections must be performed at regular intervals:
  - Visual inspection
    - of the enclosure for damages
    - of the supply line for external damages
    - for dust deposits
  - Type with connectors
    - Checking of the connection plug for a tight fit
  - Type with cable glands
    - Checking of the leading-in 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!

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2.12 Special conditions for safe use, marking "X"

The "X" symbol in the labeling of the equipment is used to indicate special application conditions:

The equipment's installation location and -manner are generally to be selected in such a way that it is protected from external mechanical influences and in a way that no function limitations can result.

Misappropriations of the equipment as

- support
- tread plank
- stirrup
- …

are prohibited.

- Type with connectors:

The mating connector must be secured against accidental disconnection through the use of a screw locking device.

- Type with cable glands:

The connection of the free end of the supply line must either take place outside of the potentially explosive area or within of an equipment which is permitted for the respective device category.

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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

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4 Technical data

4.1 Power supply

Rated Voltage ..... 24 V DC
Power consumption ..... ≤ 2 W

4.2 Mechanical characteristics

Mechanically permissible speed ..... ≤ 6000 min^{-1}
Shaft load
A*V58I:2 ..... ≤ 50 N axial, ≤ 100 N radial; flange + 10 mm
A*S58I:2, A*H58I:2 ..... Own mass
Bearing life time ..... ≥ 3,9 * 10^{10} revolutions at
Operating temperature ..... ≤ 60 °C
Speed 6.000 min^{-1}
Angular acceleration ..... ≤ 10^4 rad/s^2
Moment of inertia ..... typically 2.5 * 10^{-6} kg m^2
Start-up torque at 20 °C
A*V58I:2, A*S58I:2 ..... 0.5 Ncm
A*H58I:2 ..... 3.7 Ncm
Concentricity tolerance, supplied by the customer
A*S58I:2, A*H58I:2 ..... ± 0.03 mm
Mass ..... 0.3…0.5 kg

4.3 Environmental conditions

Vibration, DIN EN 60068-2-6 ..... ≤ 100 m/s^2, sine 50-2000 Hz
Shock, DIN EN 60068-2-27 ..... ≤ 1000 m/s^2, half-sine 11ms
EMC
Immunity to disturbance, DIN EN 61000-6-2
Transient emissions, DIN EN 61000-6-3
Working temperature ..... -20 °C…+60 °C
Storage temperature ..... -30 °C…+80 °C, dry
Relative humidity, DIN EN 60068-3-4 ..... 98 %, non-condensing
[1] Protection class ..... **IP65**: Degrees of protection provided by enclosures according to DIN EN 60529

[1] Observe instructions for safe use, see chapter 2.12 on page 16

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4.4 Enclosure materials

Aluminum design

Enclosure material ..... Al Mg Si 0.5 F22

Flange material..... EN AW-AlCu6BiPb

Shaft, stainless steel ..... WN 1.4305, corrosion resistant

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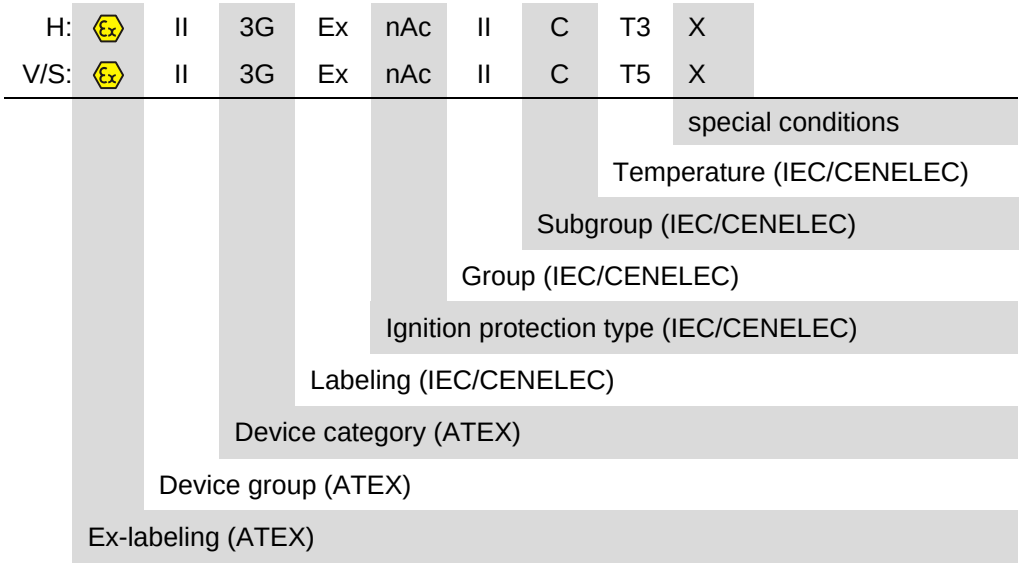
4.5 Explosion protection characteristics

4.5.1 Ex-labeling, gas

Hollow shaft H:
II 3G Ex nAc IIC T3 X

Solid shaft, Blind shaft V/S:
II 3G Ex nAc IIC T5 X



Device group..... **II**: potentially gas-explosive areas

Device category..... **3G**: Zone 2
adequate safety with normal operation

Ignition protection type ..... **nAc**: non-sparking equipment
Ex-Atmosphere cannot be ignited in case of defined malfunction conditions

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

Subgroup ..... **C**: typical gas: Hydrogen, acetylene

Temperature

A*H58I:2..... **T3**: max. enclosure surface-temperature ≤ 200 °C

A*V58I:2, A*S58I:2..... **T5**: max. enclosure surface-temperature ≤ 100 °C

Special conditions..... **X**: see chapter 2.12 on page 16

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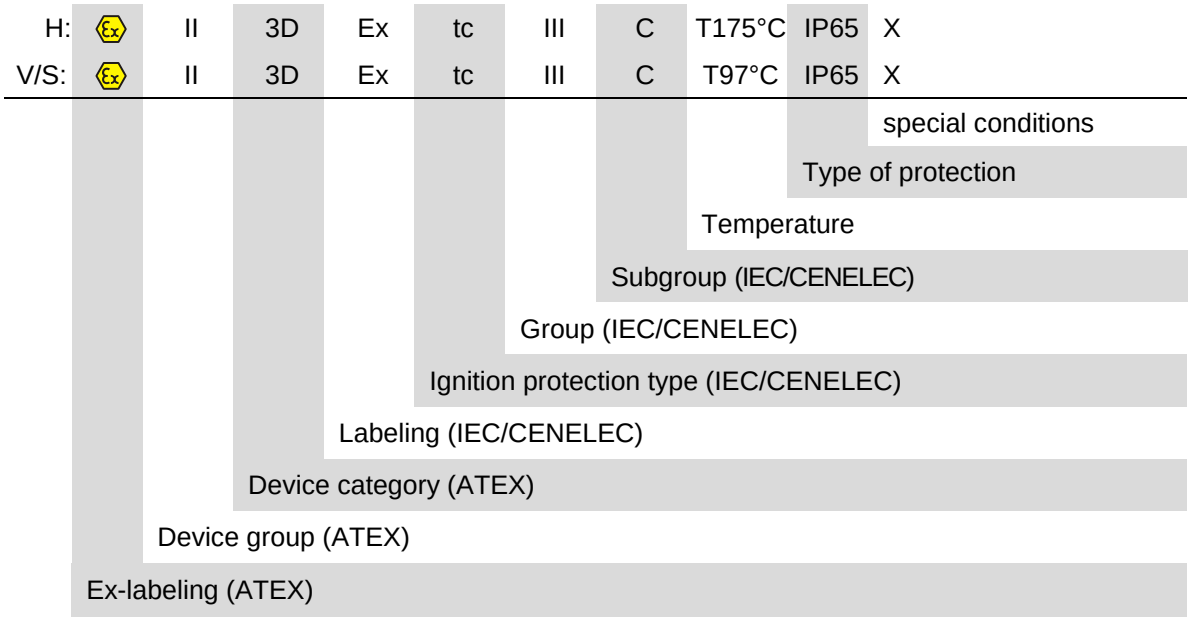
4.5.2 Ex-labeling, dust

Hollow shaft H:
- II 3D Ex tc IIIC T175°C IP65 X

Solid shaft, Blind shaft V/S:
- II 3D Ex tc IIIC T97°C IP65 X



Device group..... **II**: potentially dust-explosive areas

Device category..... **3D**: Zone 22
adequate safety with normal operation

Ignition protection type ..... **tc**: Protection by enclosure
with adherence to the type of protection and within the surface temperature limits, Ex-atmosphere cannot be ignited

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

Subgroup ..... **C**: Type of dust: conductive dust

Temperature

A*H58I:2..... **T175°C**: max. enclosure surface-temperature ≤ 175 °C

A*V58I:2, A*S58I:2..... **T97°C**: max. enclosure surface-temperature ≤ 97 °C

[2] Protection class..... **IP65**: Degrees of protection provided by enclosures according to DIN EN 60529

Special conditions..... **X**: see chapter 2.12 on page 16

[2] Observe instructions for safe use, see chapter 2.12 on page 16

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5 Assembly

- Dimensions must be taken from the customer-specific drawing
- Tolerance specifications of the coupling manufacturer are to be adhered to

5.1 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.

⚠ 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 18.
- Adhere to the assembly and operating instructions of the manufacturer.

5.1.1 Flange-assembly

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

1: ATEX-conformant coupling
2: Machine
3: Centring collar

Principle

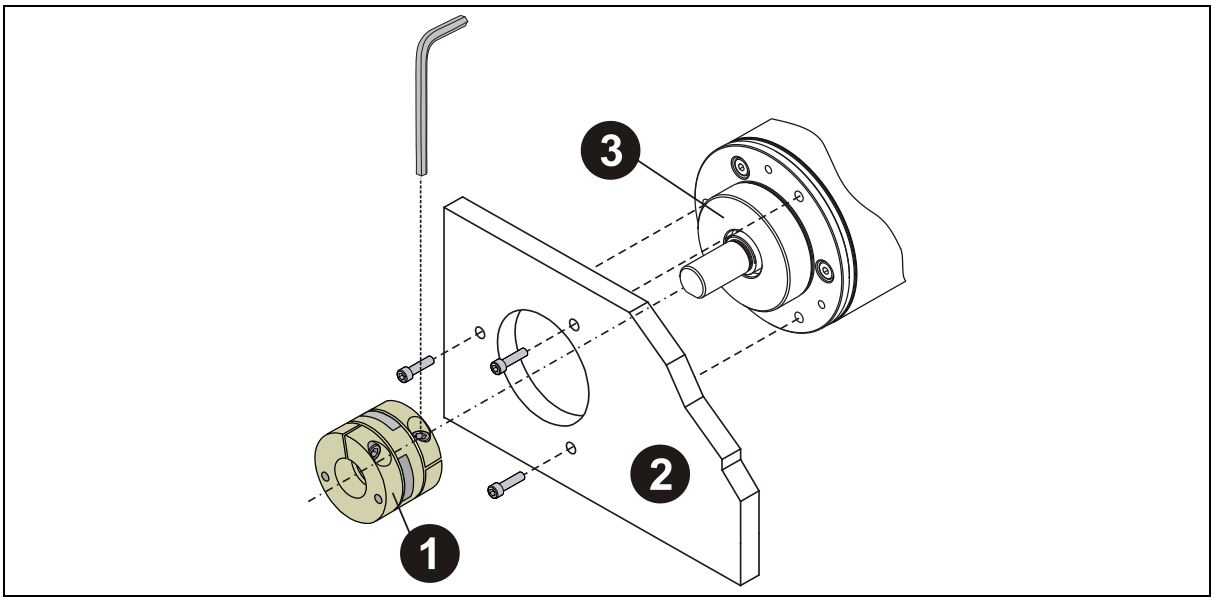

Figure 1: Flange-assembly

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5.1.2 Clamp flange - assembly

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

1: ATEX-conformant coupling
2: Clamp flange
3: Centring collar

Principle

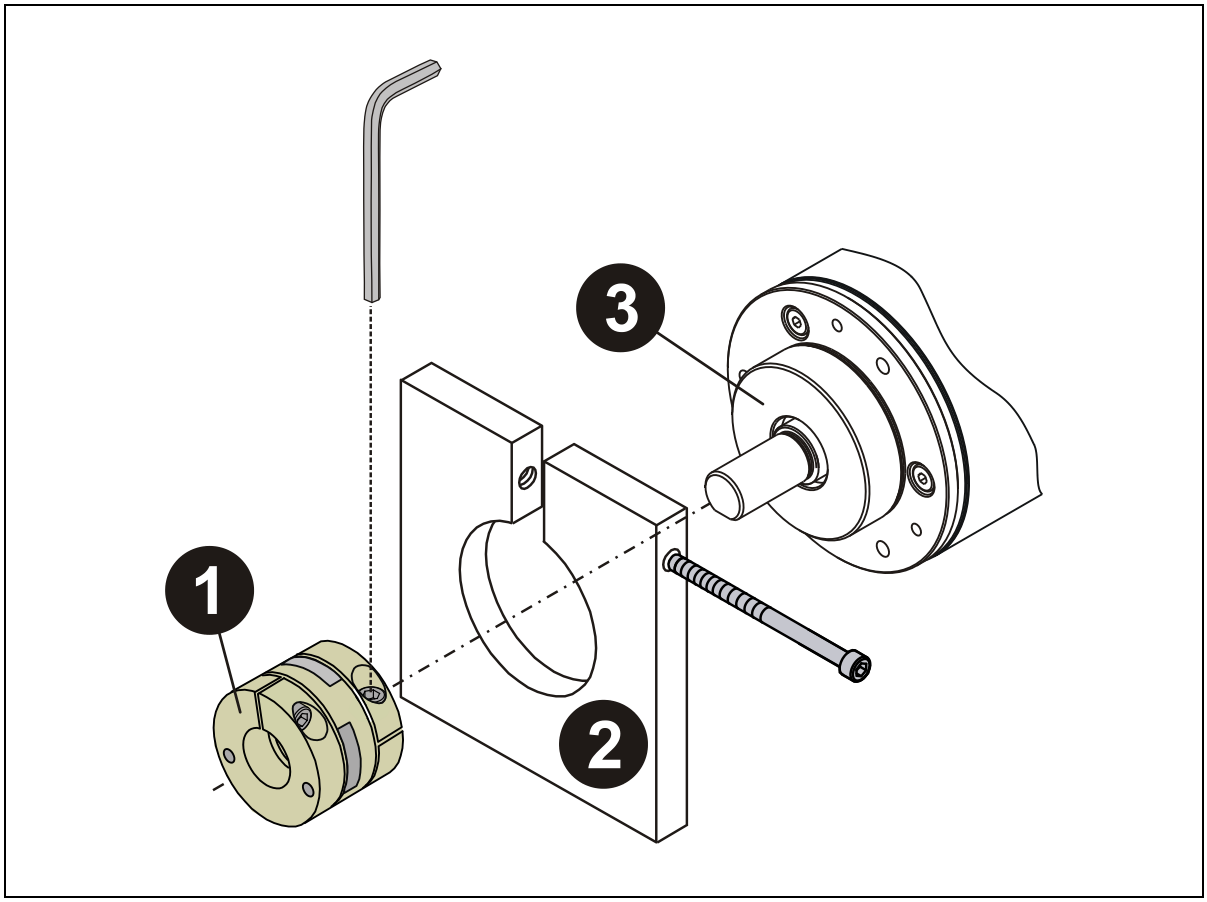

Figure 2: Clamp flange - assembly

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5.1.3 Fixing clamps - assembly

The centring collar with proper fit assures the centring of the shaft. Attachment to the machine takes place via 2 fixing clamps, which are mounted with 4 bolts.

1: ATEX-conformant coupling
2: Machine
3: Centring collar
4: Fixing clamps, 2x

Principle

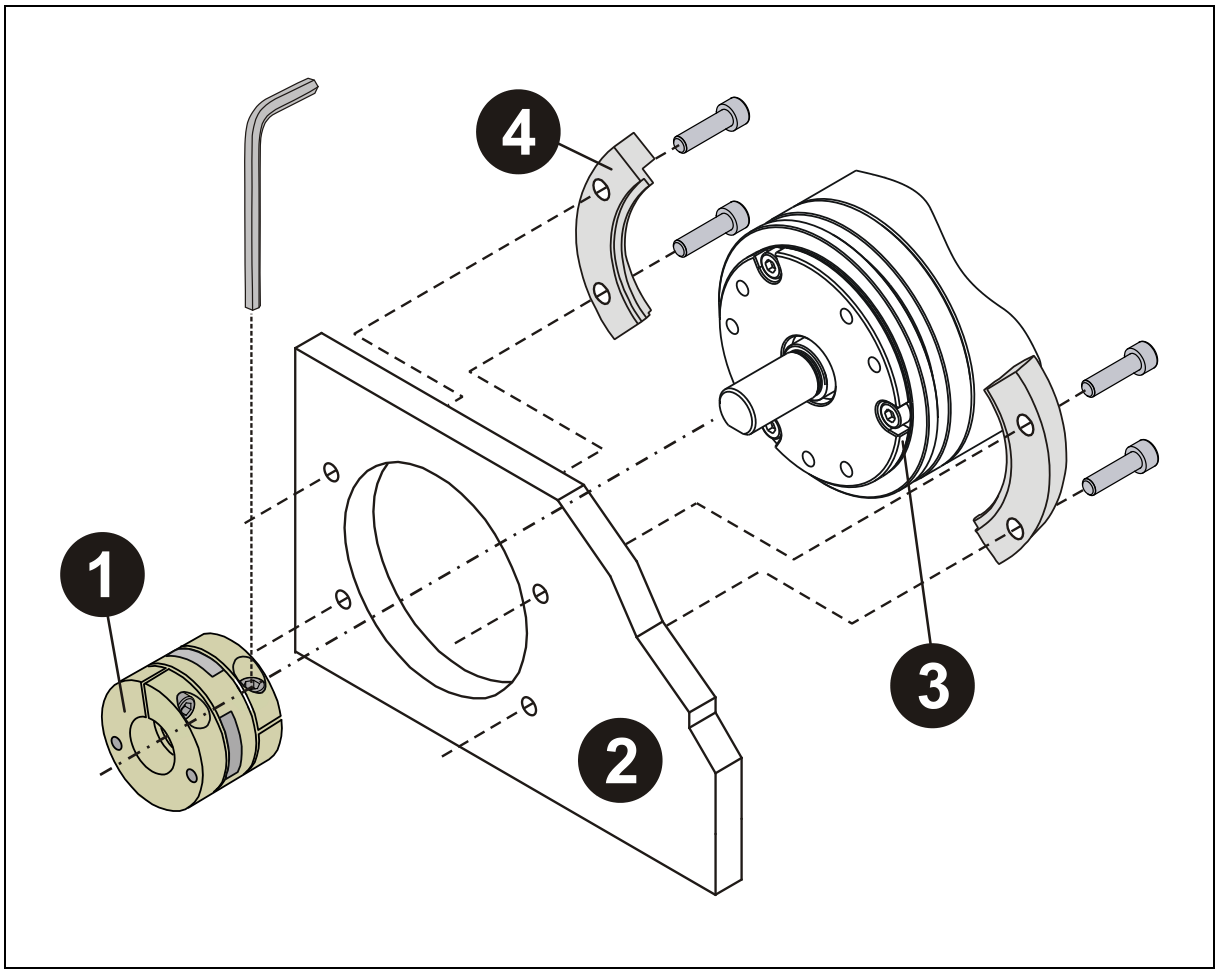

Figure 3: Fixing clamps - assembly

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5.1.4 Servo clamps - assembly

The centring collar with proper fit assures the centring of the shaft. Atachment to the machine takes place via three servo clamps

1: ATEX-conformant coupling
2: Machine
3: Centring collar
4: Servo clamps, 3x

Principle

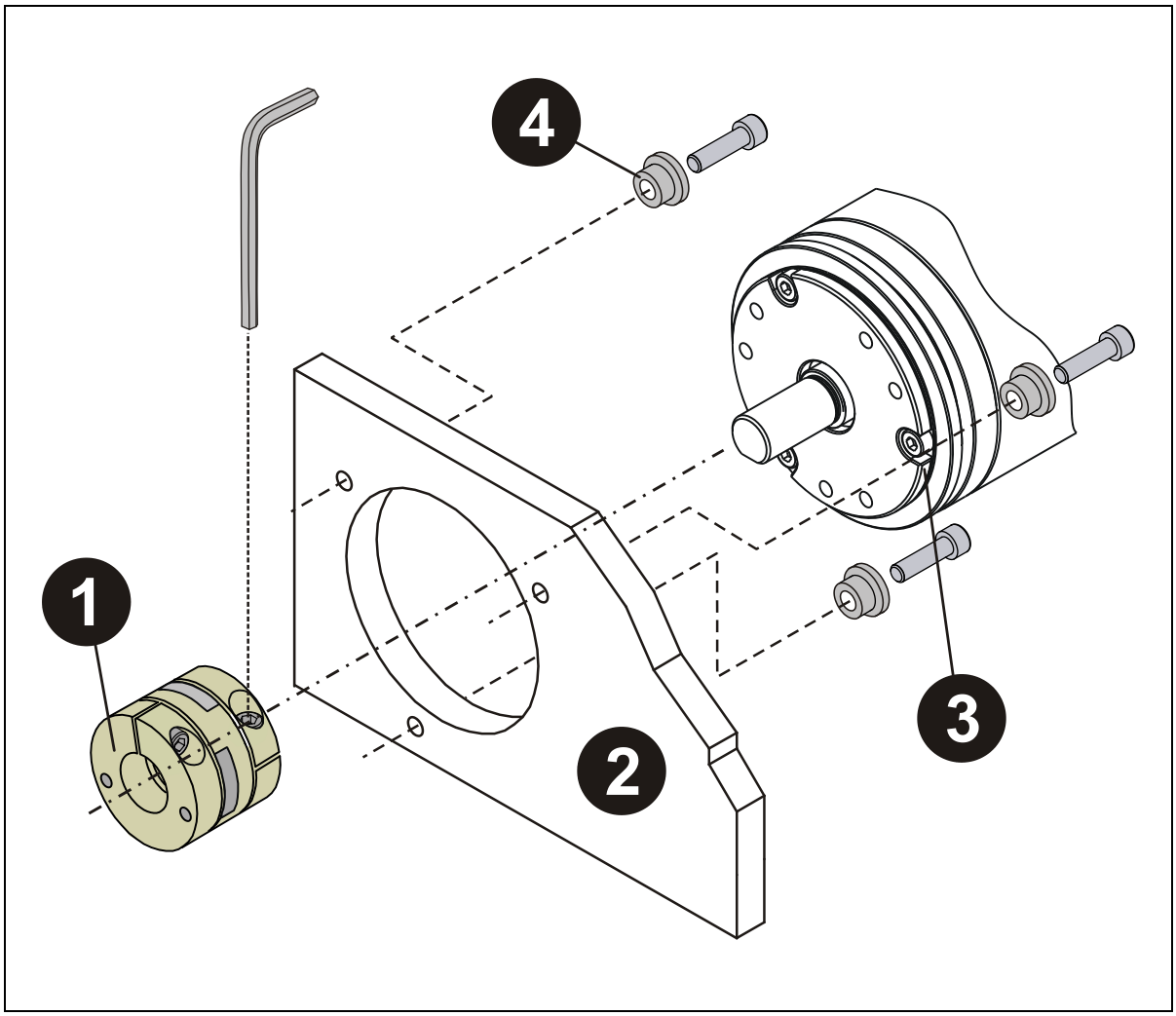

Figure 4: Servo clamps - assembly

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5.2 Blind hollow shaft, Hollow shaft

The equipment's are connected to the drive shaft via a clamp ring. The rotating of the equipment, caused by the resulting torque, is prevented through a torque holder (spring plate). The occurring axial- or radial displacements are offset and the machine vibrations damped at the same time.

1: Clamp ring
2: Drive shaft
3: Torque holder

Principle

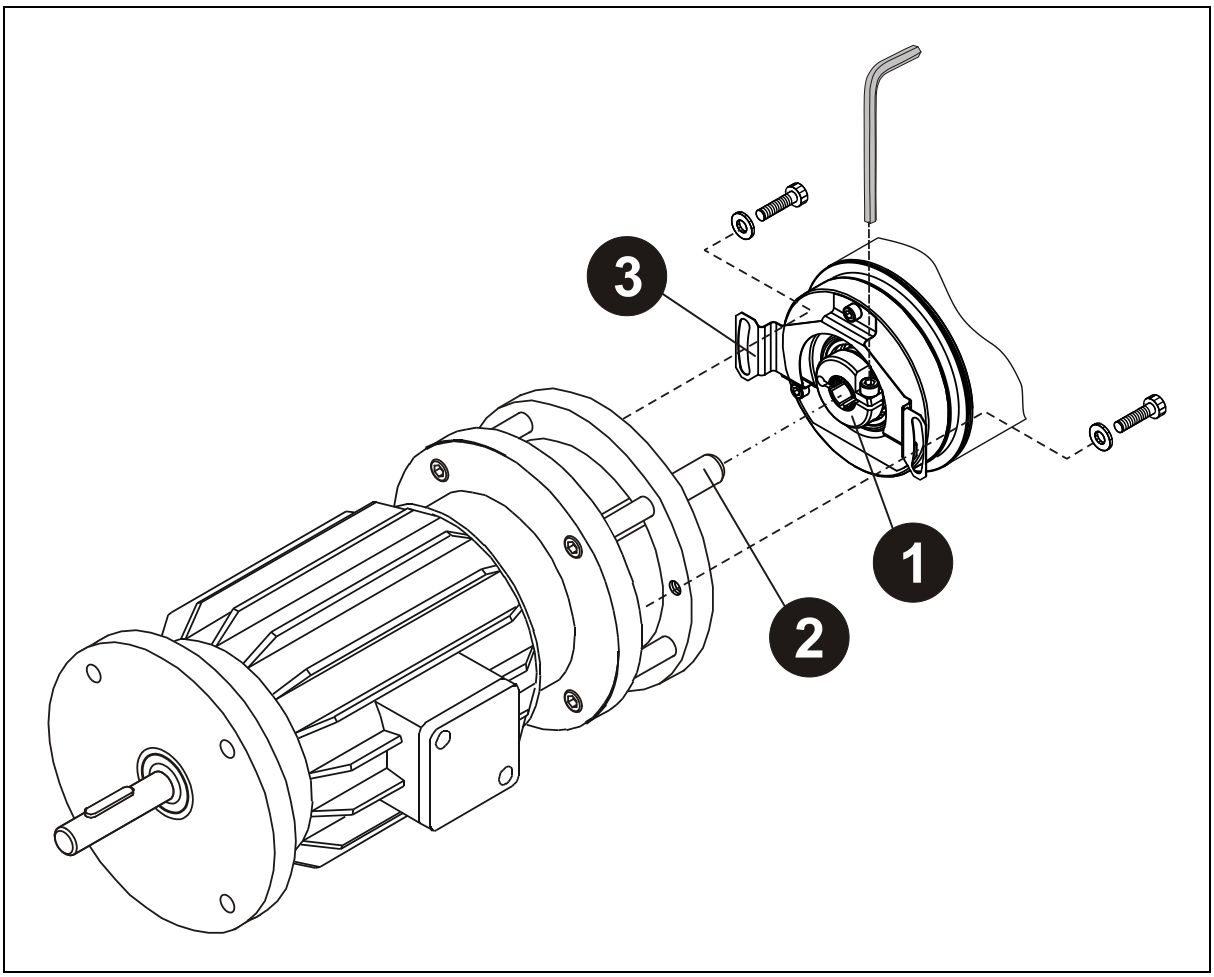

Figure 5: Clamp ring/Torque holder - assembly

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6 Equipotential bonding conductor - Connection

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

Product similar to illustration

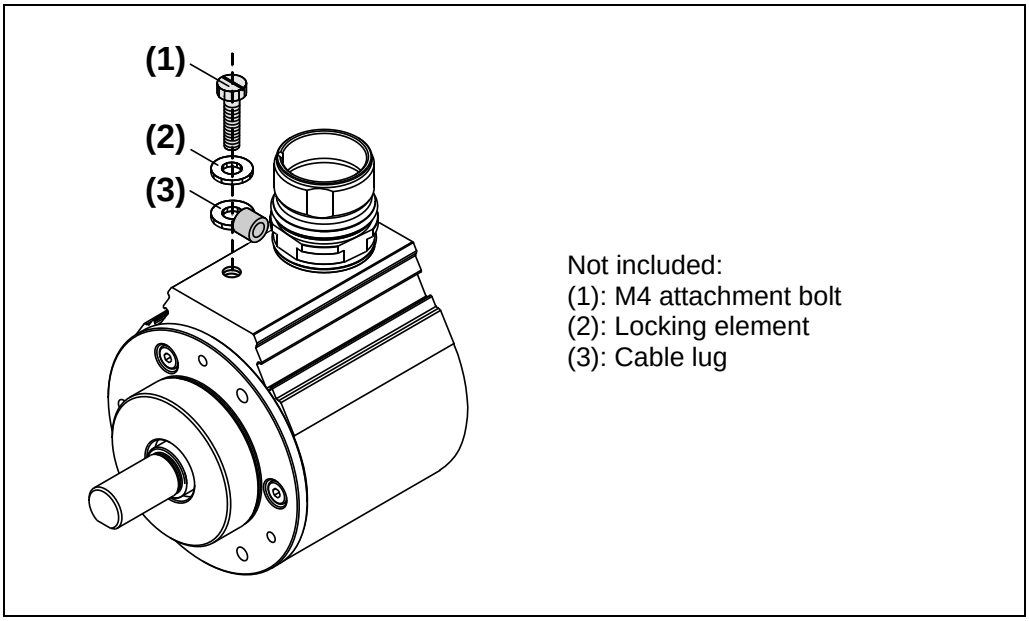

Figure 6: Equipotential bonding conductor - Connection

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7 Disposal

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

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8 Annex

8.1 EU declaration of conformity

TR electronic

EU Declaration of Conformity

The Rotative Measuring System Series A58I:2 with Explosion Protection Enclosure**

Type: AEV58I:2, AES58I:2, AEH58I:2, AOV58I:2, AOS58I:2, AOH58I:2
Order-No.: A**58I2-xxxxx

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

Electromagnetic Compatibility	**2014/30/EU** (L 96/79)
Equipment and protective systems intended for use in potentially explosive atmospheres	**2014/34/EU** (L 96/309)

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	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 60079-0: 2012/A11:2013	Explosive atmospheres Part 0: Equipment - General requirements
EN 60079-15: 2010	Explosive atmospheres Part 15: Equipment protection by type of protection "n"
EN 60079-31: 2014	Explosive atmospheres Part 31: Equipment - Dust ignition protection by enclosure “t”

Other applied standards:

DIN EN 60079-14: 2014	Explosive atmospheres Part 14: Electrical installations design, selection and erection
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 of the assembly:

A*V58I:2, A*S58I:2 : Ex II 3G Ex nAc IIC T5 X Ex II 3D Ex tc IIIC T97°C IP65 X
A*H58I:2 : Ex II 3G Ex nAc IIC T3 X Ex II 3D Ex tc IIIC T175°C IP65 X

Trossingen, 03.11.2016

Thanassakis Andreas, Business Management

TR-ECE-KE-DGB-0345-00.DOC

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8.2 Accessories

http://www.tr-electronic.com/products/rotary-encoders/accessories

8.2.1 Interface-specific user manual

Document-No.:	Description
TR-ECE-BA-DGB-0119	Incremental Encoder Series Ixx-58:2, Generation 2

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