

## User-Manual



Figure ESW small Transmitter Ex-i M 10-25

## Electronic Vibration Monitoring Unit

### ESW<sup>®</sup>-small-Transmitter Ex-i M 10-<sup>\*\*</sup>

Versions:

- ESW-small-Transmitter-Ex-i 10-<sup>\*\*</sup>
- ESW-small-Transmitter-Ex-i M 10-<sup>\*\*</sup>
- ESW-small-Transmitter-Ex-i SIL10-<sup>\*\*</sup>
- ESW-small-Transmitter-Ex-i M-SIL 10-<sup>\*\*</sup>

State: 25.02.2018

Document: ESW\_small\_transmitter-Ex-i-M\_hb\_eng.doc

Technical changes reserved!

The company holthausen elektronik GmbH is certified according to DIN EN ISO 9001.

**Inhaltsverzeichnis:**

1. General basically safety-indications .....	Page 4
2. Packaging and transport .....	Page 4
3. Device description .....	Page 5
4. Function .....	Page 5
5. Connection technology .....	Page 6
6. Grounding concept .....	Page 7
7. Mounting of the vibration unit .....	Page 8
8. Information on commissioning .....	Page 9
9. Behaviour during operation and in case of failure	Page 9
10. Opening and closing of the vibration control unit..	Page 9
11. Maintenance .....	Page 10
12. Display- and operating elements .....	Page 10
13. Device versions .....	Page 10
14. Cable connection draft .....	Page 11
15. Housing size .....	Page 12
16. Safety Instructions	
Safety instructions for electrical equipment	
for explosion-hazard areas .....	Page 14

---

These operation instructions are to be read through completely and carefully heeded before starting the device. Failure to heed or adhere can result in claims on manufacturer's liability becoming null and void for damages ensuing there from.

Manual action of any manner on the device – with the exception of proper procedures and those described in these operation instructions – lead to forfeit of guarantee and exclusion from liability.

The device is solely intended for the usage as described below. It is particularly not intended for the direct or indirect protection of persons.

holthausen elektronik GmbH assumes no liability whatsoever as regards suitability for some specific purpose.

If any question should remain open, please never hesitate to contact us.

**holthausen elektronik GmbH**  
Wevelinghoven 38, 41334 Nettetal  
Tel.: +49 (0) 21 53 - 40 08  
Fax: +49 (0) 21 53 - 8 99 94  
Mail: [info@holthausen-elektronik.de](mailto:info@holthausen-elektronik.de)

## 1. General basically safety-indications

Don't use this device as the only invigilator, if a malfunctioning of ESW<sup>®</sup>-Compact/Ex could lead to damages on goods or Persons.

To obtain the desired result be sure, that the device with its technical data fits to the bulk of the object you want to supervise.

The device is sensitive to shock. A downfall out lower height to a hard substratum can damage the device.

The assembling place and the execution of the assembling of the sensor determine decisively the quality of the sensor signal. The assembling may only be performed by qualified and instructed persons.

A mistake by the connection can entail to faulty functions, outfall or ruination of the sensor and electronics.

Powerful noise sources for instance inverters, in direct closeness of the sensor, electronics or cabling, can result in faulty behaving of the apparatus.

Potential differences and balance currents in the mass guidance can result in faulty behaving too.

The connection cable is resistant against many but not every type of chemical and mechanical stress. Through a defect cable, short can be result, leakage currents flow or chemical can get inside the unit and destroy the electronic. There is a risk of malfunction and undefined behaviour of the measurement device.

Therefore the conditions from the mounting surrounding must be checked. Then the cover material from the cable has to be proofed if it resists these requirements. You can get an overview from the chemical resistance of the cover material from us.

## 2. Packaging and transport

### **Attention:**

- The device is sensitive to shock. Already a fall out of lower altitude to a hard substratum can destroy the device.
- Please do not kink or tie the cable.
- Protect the electronic against humidity.
- In case of a fall, clamping or squeezing, the housing, operating elements or the circuit board can be damaged.

Provide through an appropriate packaging and corresponding warning-labels, that the device is protected against external influences at transport and storage.

### 3. Device description

In many technical ranges there are vibrations, frequently are they to neglect or even necessary, but sometimes also undesirable or even dangerous. Besides that, can dangerously vibration-conditions start slinking or occur total unexpected.

The reason for it often lies in mechanical defectives or improper handling of the machine. The consequences are maybe diminution of the product quality or even loss of production and endangering of the security, at least a raised wear and tear. Increasing automation as well as a high noise level, often prevents an acoustically or visual surveillance. Thereby offers early detection, taking care of the material and limitation of damage a considerable potential to the reduction in costs.

The ESW<sup>®</sup>-small-Transmitter Ex-i M monitors the vibration-level at the running process and provides a current as analog signal, which is proportional to the vibration acceleration.

The frequency range results from the characteristics of the measured object and the environmental conditions. In order to tune the device optimally to the vibration problem, the measuring and frequency range can be adapted ex-factory. Either the vibration speed or the vibration acceleration can be selected as the quantity measured. Depending on the measuring task, the signal assessment occurs in according to the crest value or the effective value of the measurement.

Particular attention should be donated to the assembling place of the sensor. Decisively is the source of the signal that shall be measured and its main vibration direction. The assembling place of the sensor and alignment of the measurement axis of the sensor have to be selected so that the vibration as possibly can be directly captured and not corrupted by interfering noise, subdued crossings or insufficient coupling.

### 4. Function

The vibration-monitoring unit is generally mounted on the place, where inadmissible vibration occurs or can be recognised. The vibration monitoring unit is therefore permanently exposed to the real conditions directly on the object. The mechanical vibrations thereby recorded will be acquired by the sensor and converted into a corresponding electrical alternating signal. The subsequent electronic filters and amplifies the alternating signal and forms, depending on the specification a velocity or an acceleration signal, which is normalized to the given measuring range.

The electronic vibration monitoring unit works as current sink with a current consumption of max. 25mA and a linear range of 4mA to 20mA.

The device so is taking 4mA at rest, increasing the current consumption in the range of 4mA to 20mA, proportional and depending on the present vibration strength and can take upon 25mA at override.

Attention:

Depending on measurand and frequency range, different averaging times and thus different response times to input-signal changes can result. The response time normally arise from  $5 \times 1/f_u$ , the lower cutoff frequency.

Please note your response time of your application.

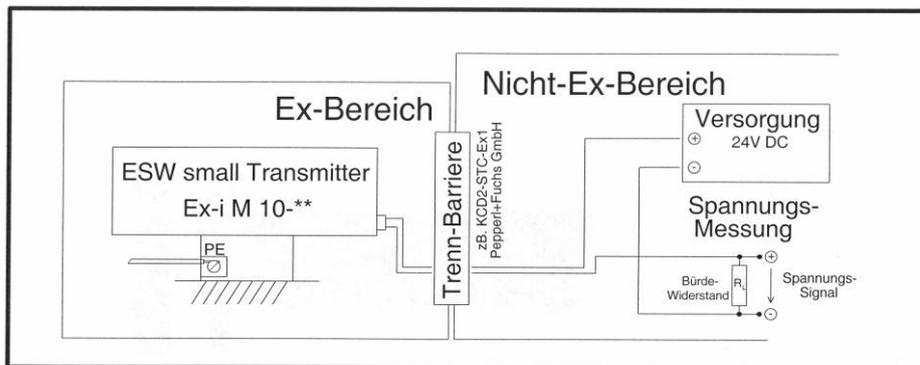
## 5. Connection technology

The ESW<sup>®</sup>-small-Transmitter Ex-i M 10-<sup>\*\*</sup> works as current sink in two-conductor technique.

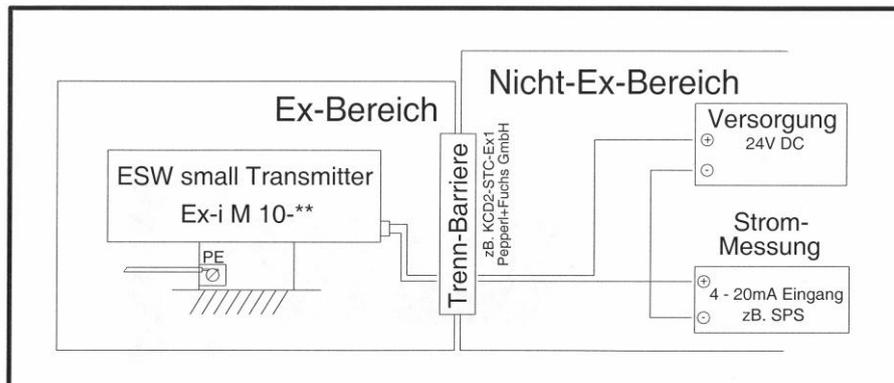
### Two-conductor technique

Although the term is defined, there are various interpretations of the same. In order to avoid misunderstanding, a brief description of the use of the device is given below.

**A)** Voltage is measured across the load resistance, which is proportional to the current and thus to the measured value:



**B)** The current is measured using an ammeter (e.g. SPS), which is proportional to the Measured value:



**Please pay attention to the following notes for the use of two-conductor technique:**

The voltage drop across the load resistance (sketch A) is directly proportional to the current flowing through the resistor (Ohm's law:  $U = R \times I$ ) and thus corresponds to the measurement.

An ammeter (sketch B) can e.g. to be the input (4 to 20mA) of a SPS.

The voltage drop across the load resistance  $R_L$  respectively the internal resistance of the current input at a maximum current of 27mA, in combination with the voltage drop across the electronic with 10V are not able to exceed the value of the supply voltage of 24V.

The load resistance  $R_L$  so have to be chosen that the voltage drop  $U_R$  across  $R_L$  is also less at  $I_{max}$ , than the supply voltage, reduced by the voltage drop across the electronic.

$$U_b > U_{min} + U_R$$

The device operates linearly up to 22mA output current. However a maximum current of 27mA can occur when the measuring range is crossed

Formula for calculation of the maximum load and internal resistance:

$$R_L = \frac{U_b - U_{min}}{I_{max}}$$

**Examples:**

Voltage supply: 24V DC

$R_L = (24V - 10V) / 27mA = 518,5 \Omega \text{ max.}$

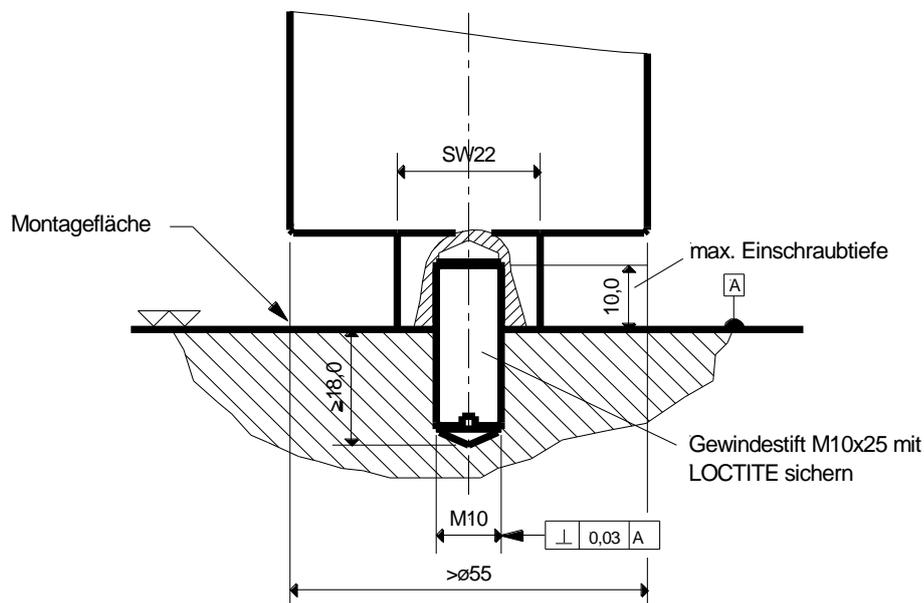
**Warning:** In the SIL-version, the load resistance may not be greater than 100R.  
In the SIL-version, the supply voltage must amount 24V +/-10%.

## 6. Grounding concept

When using the ESW small Transmitter Ex-i M 10-\*\* in the Ex-zone, the housing of the ESW small Transmitter is to be integrate into the equipotential bonding of the Ex-area. For this purpose, there is a ground terminal at the bottom of the housing, type BARTEC, 4,0mm<sup>2</sup>.

## 7. Mounting of the vibration unit

- Whole mounting-, connecting- and adjustment-work should be done from qualified personal only!
- Protect the ESW<sup>®</sup>-small-Ex-Transmitter definitely against drop, stroke and other mechanical shock!
- The case of the unit must be involved over the attachment or optional the ground-on-earth-Terminal with the potential equalization of the monitored machine. The connection must be extremely low resistive as well as for long time stable. Doing this, take urgent notice to the valid VDE-regulations.



The ESW<sup>®</sup>-small-Ex-Transmitter Ex-i M 10-\*\* will be mounted via one threaded pin AM10\*25 per DIN 913 on the machine to be monitored.  
The material of the threaded pin must be V4A (1.4571).  
The maximum tightening torque of the threaded pin AM10\*25 is 48Nm.

### **Important:**

1. Measuring axis of the ESW<sup>®</sup>-small-Transmitter Ex-i M 10-\*\* has to be coinciding with vibration excitation axis (see case drawing).
2. Take note of the label with instruction notes.
3. The surface has to be plain, clean and free of paint and rust.
4. The tap hole has to be perpendicular to the surface and free of metal-cuttings or other foreign material. Further more the tap hole and the screw have to be free of paint, rust, grease or other isolating components.
5. The material of the threaded pin must be V4A (1.4571).
6. The grub screw has to be locked with liquid thread protection against unintended loosening.
7. The unit has to be fixed, tight on the surface.
8. The device should be mounted with a tightening torque of approx. 48Nm.
9. The notes to opening of the vibration control unit are absolutely to note.

## 8. Information on commissioning

One possibility for the function check exists, when the device is connected but still is not screwed on. As soon as you are starting to shake the device at the vibration direction, the current consumption must rise and at rest fall to 4mA.

The observation of the inrush current permits a general function check. Immediately after the turn on, the current consumption jumps to a value between 14 to 16mA and then fall down to 4mA within 2 to 3 seconds. The green led indicates that the supply voltage is applied.

Once more check the device for firm fit, the installation site for loose parts and the cable laying on correct execution. The measuring direction is supposed to be agreeing with the main vibration direction and the casing cover must be tightly closed.

## 9. Behavior during operation and in case of failure

The normal operation exists, when the output signal remains in the range of 4 to 20mA and the measurement values remain at the expected range.

At normal operation, the device does not need any maintenance.

At sudden or gradual changes of the output signal, the operational conditions obviously have changed at the measuring location. The situation must be check. If no changes can be detected, the functionality of the device must be doubted. The device must be declared defective and replaced by a new device.

As soon as the output signal is less than 3,8mA or greater than 22mA or despite active machine remained at 4mA, it must emanate from a defect of the vibration monitoring unit. The device is immediately declared as defective and replaced by an intact device.

## 10. Opening and closing of the vibration control unit

The operator of the measuring device must switch of the power supply of the device before opening the measuring device. To open the unit the operator needs a forehead key with two-bore nut, with size of 4mm.

Before the installation of the housing cover, the o-ring must be examined. If it is brittle, deformed, damaged or already a few month in use, the o-ring must be replaced by a new one (45 x 1,5mm of NBR70, purchasing option via holthausen elektronik GmbH).

Please pay attention that the thread and the interior room are oil- and dirt- free. Cleaning around and inside the unit should be done only with clean and dry cloth.

## Advices for dismantling

Before dismantling the measurement unit, the power supply must be switched off. The connection cable has to be loosened from the supporting surface to avoid damaging of the cable. The vibration control unit should be set free via a 22mm wrench key.

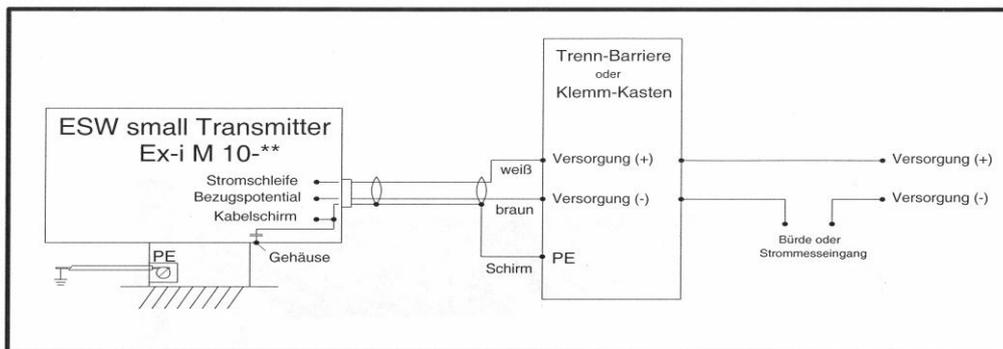


frequency range: 2Hz to 2kHz  
signal output: current sink

(\*The statement of 10g is only valid at measuring range, not transversely to the measuring range)

#### 14. Cable connection draft

ESW<sup>®</sup>-small-Transmitter Ex-i M



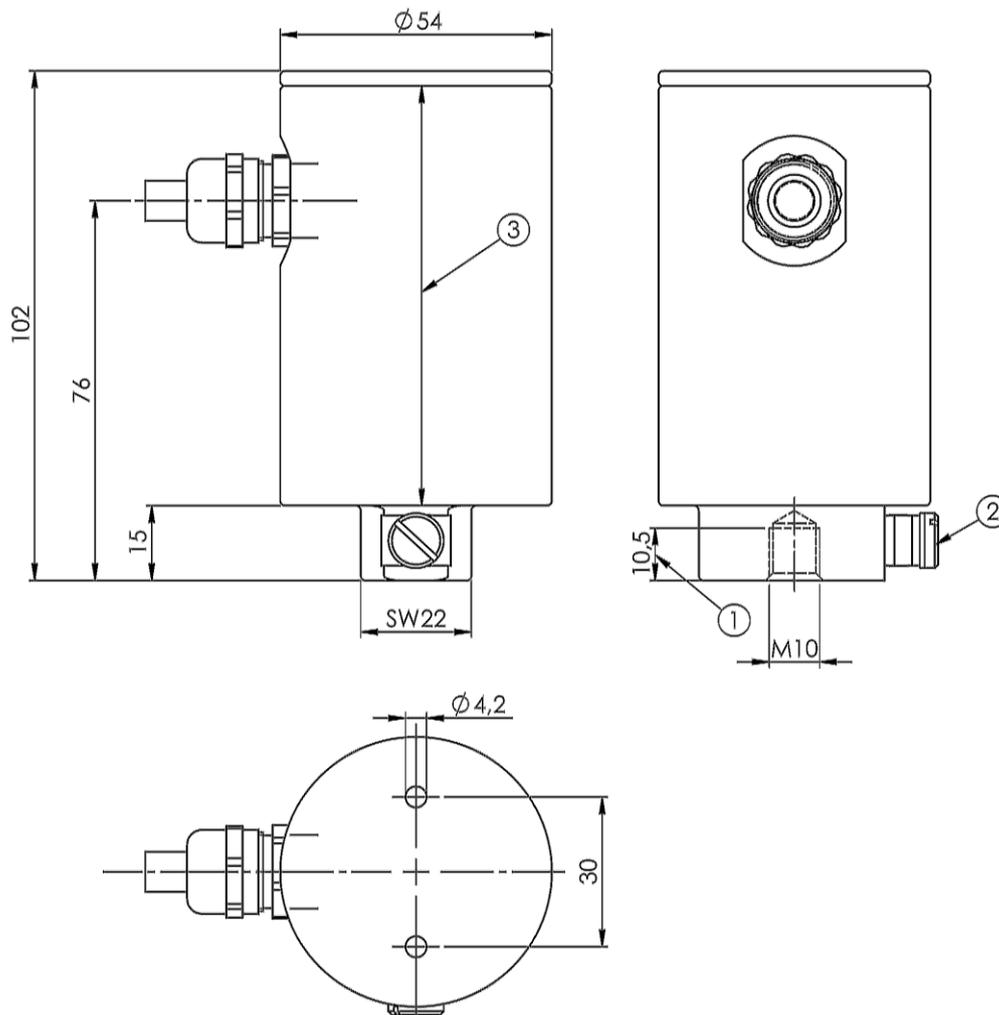
The cores of the connection cable to the ESW small Transmitter are color-marked. In order to avoid reverse polarity, it is absolutely to be noted to the correct connection.

- |        |   |  |
|--------|---|--|
| white  | > | +Versorgung                                  |
| brown  | > | -Versorgung                                  |
| shield | > | shielding (without connection to the supply) |

## 15. Housing size (dimensions in mm)

Housing version M in V4A-version

Picture 1



- ① max. useable depth of thread
- ② ground terminal 4mm<sup>2</sup> (optional)
- ③ measuring axis

The mounting take place by a threaded pin M10 (1 piece), material V4A (1.4571)



## 16. Safety Instructions

**Safety instructions for electrical equipment for using in explosive atmosphere in accordance with DIN EN 60079-0, point 30, operating instruction.**

### 16.1 Object and Type

ESW small Transmitter Ex-i M 10-\*\*

In the complete type designation, the asterisks are replaced by digits, in order to mark miscellaneous device variations, which differ in measuring range, frequency range and signal evaluation.

These variants don't have influence at the explosion protection or at the safety-related key figures.

### 16.2 Description

The Transmitter type ESW small Ex-i M 10-\*\* is served as electronic vibration monitoring unit. He is mounted with a threaded bolt at the to be monitored machine and convert the occurring vibrations into a 4 to 20mA current signal.

The Transmitter represents a passive intrinsically safe operating material and is suitable for the usage at areas, which require EPL Gb. All circuits have the level of protection of IIC ia.

The Transmitter has stainless steel housing with removable cover.

The electronics are shed inside of the housing.

An indication-led is guided out of the grouting and can be seen after unscrew the housing cover.

The supply is provided via a fixed connected conduction (max. length 20m)

### 16.3 Parameters

#### 16.3.1 Electrical parameters

maximum input voltage $U_i$	28,8V DC
maximum input current $I_i$	125 mA
maximum input power $P_i$	1 W

The effective capacity  $C_i$  and the effective inductivity  $L_i$  composed of (concentrated) capacity and inductivity of the device and the capacitive and inductive behavior of the connected conduction.

effective concentrated capacity	10nF
effective concentrated Inductivity	30 uH
conduction capacity	211 nF/km
conduction inductivity	0,65 mH/km

#### 16.3.2 Mechanical environment

Supply and signal circuit by fixed connected conduction,  
2x 0,75mm<sup>2</sup> shielded, cores white (+) and brown (-)

#### 16.3.3 Environment

Ambient temperature range	-40°C .. 50°C
---------------------------	---------------

### 16.4 Labeling

The labeling is performed by 3 stickers.

1. One sticker with all data, outside at the housing, opposite of the cable entry.
2. A sticker with warning instructions, outside at the housing, below the cable entry.
3. A sticker with the data in abbreviated form inside at the housing cover.

The labeling (clearly visible, legible and indelible) included the following data:

Name and address of the manufacturers	Holthausen Elektronik GmbH 41334 Nettetal Wevelinghoven 38
Device name	ESW small Transmitter Ex-i M 10-**  II 2G Ex ia IIC T4 Gb
Serial-number with CW and year of production	e.g. 4815-0196 ( CW + Year - lfd. Nr.)
Certificate number	BVS 15 ATEX E 109
Temperature range	-40 °C ≤ Ta ≤ 50 °C

Identification number of the notified body, which has executed the quality inspection.  
CE-marking CE0035 ???

#### 16.4.1 Sample of the sticker for labeling

Aufkleber 1, 65 x 46

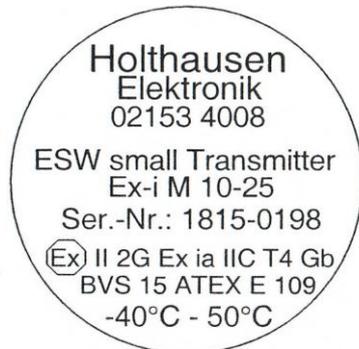


16.4.1.1 Sticker with all data

Aufkleber 2, 25 x 112



16.4.1.2 Sticker with warning instructions



Aufkleber 3, d= 32

#### 16.4.1.3 Sticker with data in abbreviated form

#### 16.5 Potential equalization

The housing of the ESW small Transmitter must be involved into potential equalization of the ex- area. For this purpose, there is a ground-on-earth-Terminal, type BARTEC, 4,0mm<sup>2</sup> at the bottom of the housing.

#### 16.6 Device-Connection

The cores of the connection cable to the ESW small Transmitter are color-marked. In order to avoid reverse polarity, it is absolutely to be noted to the correct connection.

white	>	+Supply
brown	>	-Supply
shield	>	shielding (without connection to the supply.)

#### 16.7 Use of a barrier

For the use of the device in the ex-area, the connection to the non ex-area is done with a protective barrier.

The following barrier can be used:

SMART-Transmitterspeisegerät  
KCD2-STC-Ex1  
Pepperl+Fuchs GmbH Mannheim

- 
- Information, which allow a decision without doubt, if the use of the device at the intended area, can safely be done at the expected conditions.
    - The housing must be tightly screwed at the mounting place and closed, the connection cable must be safely routed.
    - The cable and housing must not be damaged
    - After turn on, the device must take more than 3,5mA and less than 5,5mA at smooth machine.
  
  - List of the directives and standards inclusive of the issue date, by which match with the electrical device:
    - 2014/30/EU (EMC)
    - directive 2014/34/EU (ATEX)
    - EN 60079-0:2012 + A11:2013
    - EN 60079-11:2012