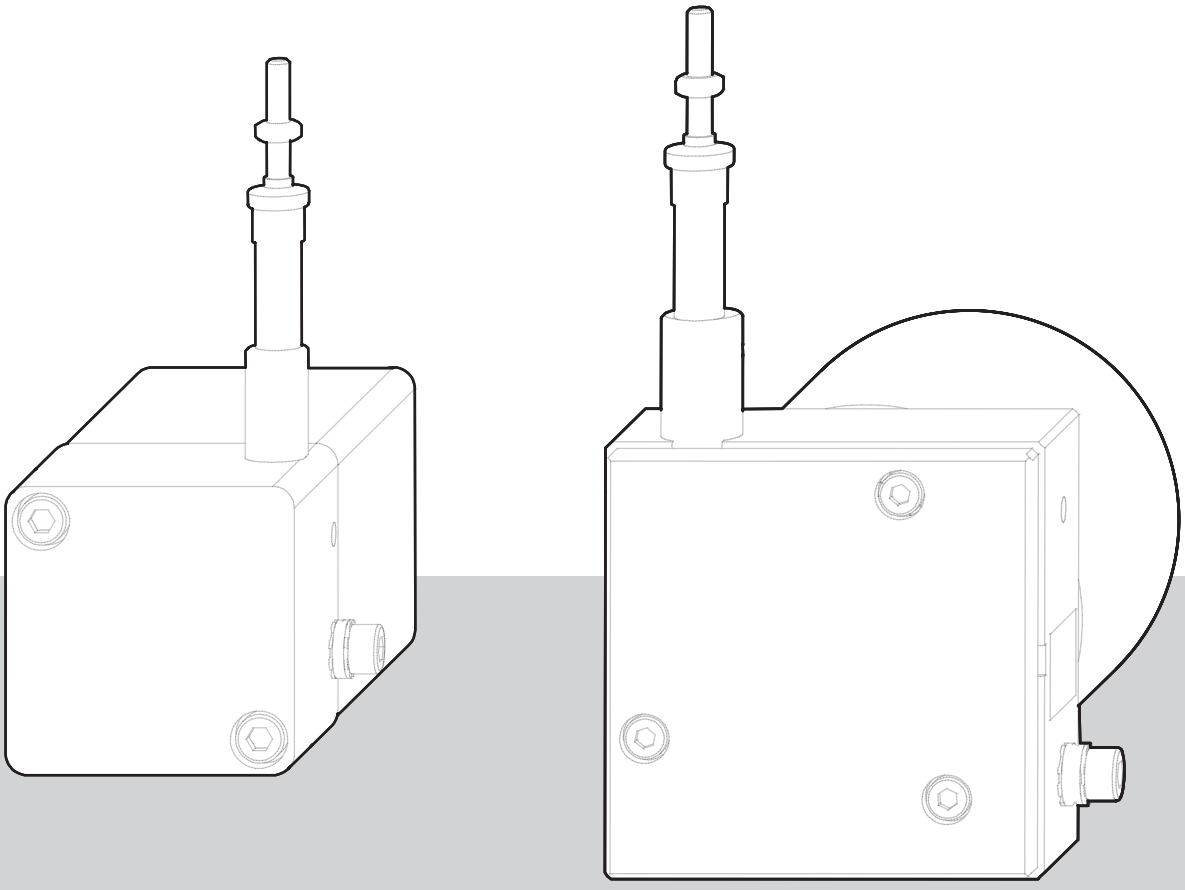
ASM®
perfect in sensors.

# posi**wire**®

## WS10EX, WS12EX

Cable Extension Position Sensors, dust-ex proof

**Installation and operation manual** **EN**



Please read carefully before installation and operation!

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Germany

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# 1 Safety instructions

## 1.1 Signal words and symbols



**WARNING, Risk of Injury:**
Indicates a potentially hazardous situation, which, if not avoided, can result in serious injury or property damage.

**⚠ DANGER**

**WARNING, Risk of Personal Injury or Death:**
Indicates a situation that can result in serious personal injury or death if not properly avoided.

**⚠ WARNING**

**WARNING, Risk of Personal Injury or Death:**
Indicates a situation that can result in moderate personal injury or death if not properly avoided.

**⚠ CAUTION**

**WARNING, Risk of Personal Injury:**
Indicates a situation that can result in minor personal injury if not properly avoided.

***NOTICE***

**WARNING, Risk of Property Damage:**
Indicates a situation that can result in minor to major property damage if not properly avoided.

**Product liability**

- Disregarding the following instructions may result in malfunction, damage to property and personal injury and releases the manufacturer from product liability.

**Safety regulations**

- National safety regulations must be observed!

## 1.2 General safety instructions

**⚠ DANGER**

**Danger of explosion! Danger of injury to persons or damage to the property**

- Mounting or servicing of the sensor only by qualified personnel who must have knowledge about the type of ex-protection, regulation and ordinance of operating equipment in ex-proof areas.

**Explosion risk due to use in non-conforming environment**

- The sensor must only be used in the specified environment.
- Special notes concerning the electrical installation of dust-ex proof sensors must be observed.

**⚠ WARNING**

**Danger of injury to the operator or damage to the property**

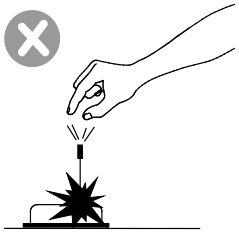
- Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by qualified personnel.
- Any alteration, reconstruction or extension of the sensor is not allowed!
- The sensor must be operated only within values specified in the catalog or datasheet.
- The danger of personal injury and danger of property damage due to a malfunction of the sensor in machines or systems must be excluded by additional safety measures.
- In safety-relevant applications, additional facilities must be provided for maintaining safety and preventing damage.
- Check whether the protection class of the sensor is suitable for the application.

**⚠ CAUTION**

**Risk of crushing and cutting injury due to pre-tensioned spring being released from housing when opened!**

- Do not open the sensor.

**Risk of cutting injury due to uncontrolled retraction of the cable**



- Do not damage the measuring cable!
- Do not let the measuring cable and the cable fixing spring back uncontrolled!
- Do not exceed the maximum cable extension range!
- Do not bend the measuring cable!
- Do not let the measuring cable be dragged on objects!

**NOTICE**

**Mechanical damage or destruction of the sensor**

- Avoid impact and shock to the sensor.
- Do not allow the measuring cable to spring back uncontrolled.
- Do not pull out the measuring cable beyond the range of the sensor.

**Malfunction due to the accumulation of dirt on the measuring cable**

- Do not oil or lubricate the measuring cable.

## 1.3 Dust-ex proof marking

The Dust-ex proof marking according to the guideline 2014/34/EU is lasered on the sensor housing.

These are:

**WS10EX:**

 II 3D
Ex tc IIIC T80°C Dc X

**WS12EX**

 II 3D
Ex tc IIIC T80°C Dc

This means:

| | | |
|---|---|---|
| II | = | Equipment-group II: Equipment **not** intended for use in underground parts of mines, as well as their overground plants, which are endangered by firedamp or/and combustible dusts |
| 3 | = | Equipment category 3: Normal level of safety – application in dust explosion hazardous areas. Equipment in this category is intended for use in areas in which explosive atmospheres – in the case of this sensor caused by dispersed dust – are unlikely to occur, or, if they do occur, are likely to do so only infrequently and for a short period only. Equipment in this category ensures the requisite level of protection during normal operation. |
| D | = | Air/dust mixture |
| EX | = | This symbol indicates that the electrical equipment complies with one or more types of protection |
| tc | = | Ignition protection class: protection by enclosure IP65 |
| IIIC | = | Group for conductive dust |
| T80°C | = | Maximum surface temperature of the Cable Extension Position Sensor |
| Dc | = | Equipment Protection Level (EPL): EPL „Dc“ complies with the categorie 3D |
| X | = | Resists an impact with reduced impact energy of 4J, without X the sensor resists an impact of 7J impact energy |

## 1.4 Intended use

posiwire® Cable Extension Position Sensors are intended for linear position measurement of linear guided objects. For determining measuring range, environmental compatibility and connection data of the sensor, please note the data sheet. Use the sensor as intended by operating within its specified technical data and ambient conditions. The environmental conditions are specified in the dust-ex proof category of the sensor.

The installation and operating instructions supplied with the unit must be observed and all maintenance and service work must be carried out. The data sheet of the respective sensor is part of this instruction manual. If not yet available, it may be requested by stating the respective model number.

The sensor must not be used in applications with an explosive gas atmosphere or higher explosive dust atmosphere that requires a higher rated device.

Do not use the sensor in the following environmental conditions:

- abrasive dust e.g. dust including metal or metaloxid, stone dust, glass dust, ceramic dust
- corrosive and aggressive media e.g. atmospheres containing chloride.

# 2 Transport and storage

**⚠ DANGER**

**Loss of explosion protection in case of shipment damages**

- Check sensor immediately for shipment damage.
- Damaged sensors may no longer meet the specified EX rating and must not be mounted and operated in explosion-risk areas.

**NOTICE**

**Risk of damage to the measuring cable or cable fixing**

- Do not lift the sensor by the cable or cable attachment.

Observe storage and transport temperatures according to the operating temperature (see data sheet).
Max. rel. humidity 60%, condensation must be excluded.
The device must be secured against slipping and tipping during transport.

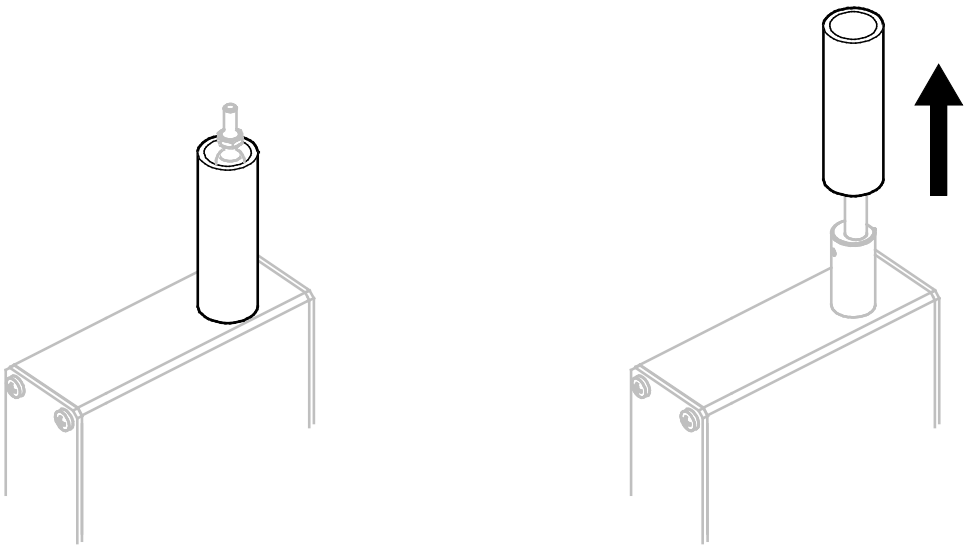
**Unpacking**

Do not unpack sensor by pulling cable or cable clip.

**Shipment damages**

Check sensor immediately for shipment damage. In case of any damage, please contact your supplier.

**Removing kink protection**



The kink protection prevents the cable fixing from buckling and damaging the cable. Remove in the direction of the cable.

**Shipment content**

- Sensor
- Installation and operation manual

# 3 Installation and initial operation

## 3.1 Mechanical installation

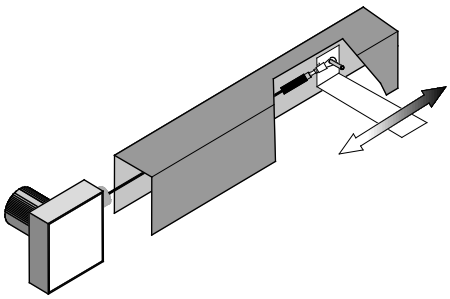
**⚠ CAUTION**

**Risk of injury from touching the moving measuring cable or moving parts during operation**

- Operate the sensor only with a suitable protective device (e.g. cable cover) to prevent injury!

**Choice of installation position**

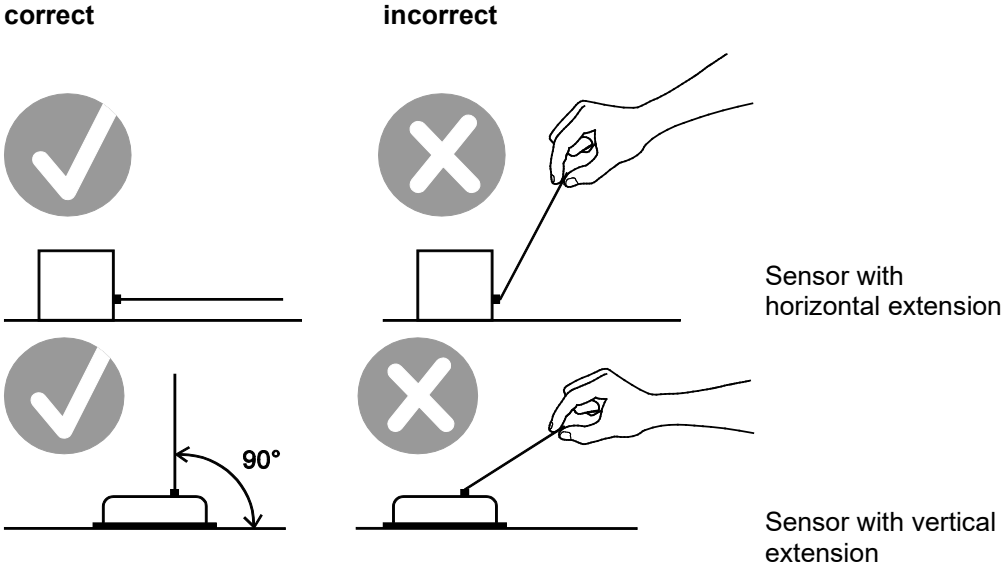
- Select a protected installation position for the measuring cable.
  This prevents damage of the measuring cable.
- Preferably mount the sensor with the cable outlet pointing downwards.
  This prevents liquids from entering through the cable outlet.
- Screw the sensor onto a flat surface or provide a three-point mounting.
  This avoids distortion and damage to the sensor.
- In harsh environments provide protection for the measuring cable.



**NOTICE**

**Cable travel should only be axial to the cable outlet - no misalignment is allowed**

- Cable misalignment shortens service life of sensor and causes error in measurement. Warranty will not be granted for damage caused by misalignment.




- If the measuring cable cannot be extended in the axial direction of the cable outlet opening due to the measuring task, the SR2 cable pulley must be used to redirect the cable.
- For special applications, extension cables with cable clips attached on both ends are available.

**Fixing the sensor**

Depending upon the sensor model, holes in the base plate, threads, mounting brackets or T-slots in the sensor housing enable attachment of the sensor. Required dimensions are listed in the data sheet.

**Mount the sensor on flat surface.**

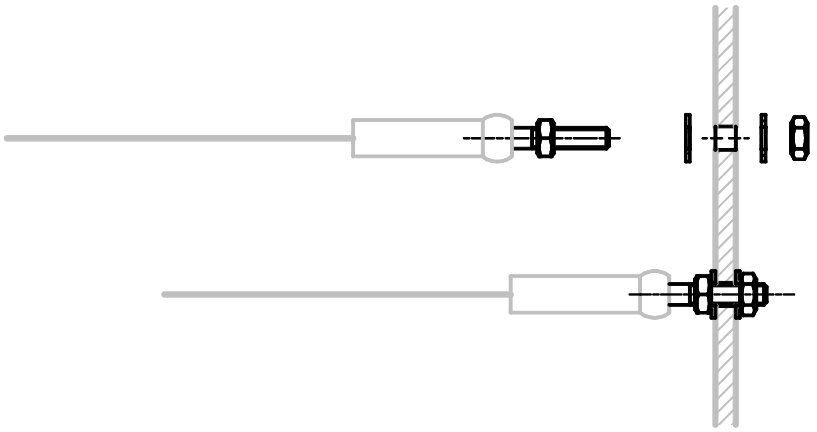
Use flat washers and/or thread locker if necessary.

The torques of the fixing screws depend on the material used (see p.13).

**Cable attachment device**

The cable clip can be fastened as follows:

- M4 cable connection in cable outlet direction

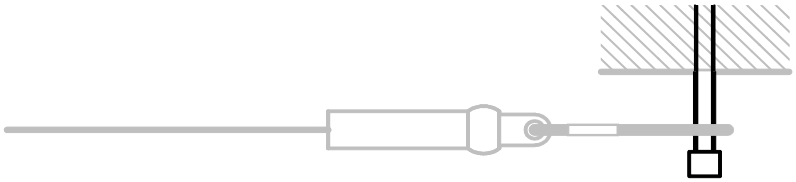


**NOTICE**

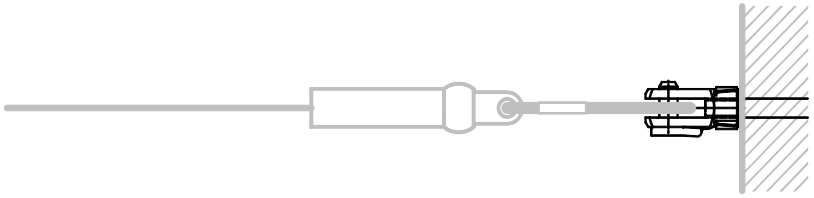
The M4 connection is mounted with a through hole, two washers and a M4 nut.

Do not rotate the M4 connection during assembly, otherwise the measuring cable will be twisted!

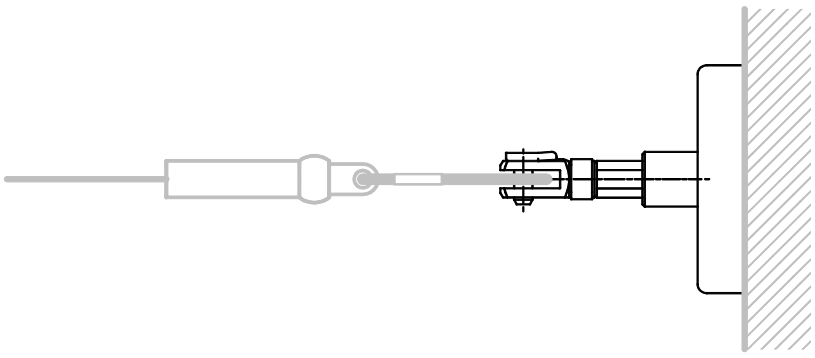
- Cable clip with Allen screw M5: standard fixing.



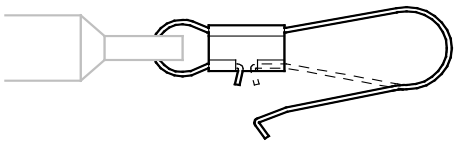
- Cable clip with attachment head (accessory GK1: metal, GK2: plastic): fast cable attachment, easy to remove

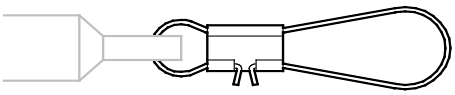


- Cable clip with magnetic clamp (accessory MAG1): with this device the sensor can be easily used at several measuring points with ferromagnetic surface.



### Cable clip attachment





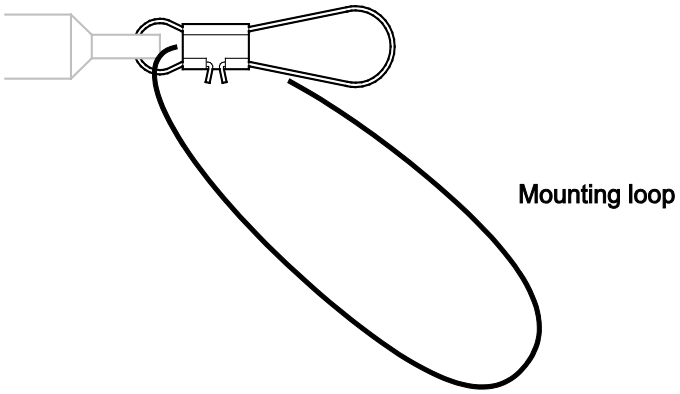
The cable clip (see drawing above) can be opened for easy attachment of the measuring cable. If possible, fasten cable fixing with cable in retracted position.

**⚠ CAUTION**

**Danger of cutting injuries due to cable clips during cable connection**

- Before connecting the cable clip into the fixture read the mounting instructions.

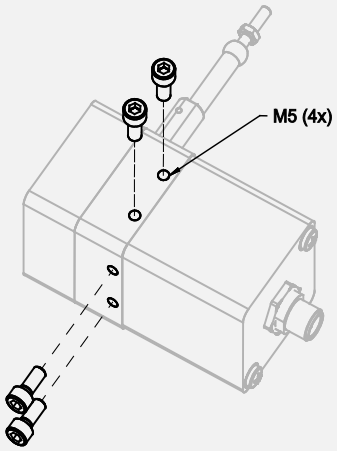
### Mounting aid for adverse installation conditions




For example, fit a mounting loop and put it around your wrist. Do not remove the mounting loop until after final installation.

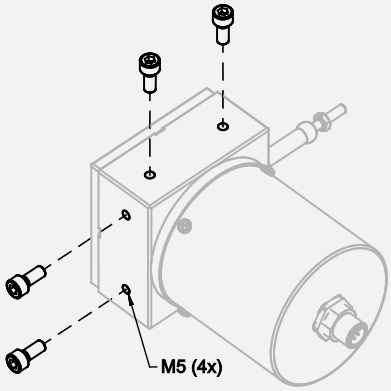
### Fixing screws

**WS10EX**




| Model | Screw | Screw material | Torque [Nm] |
|---|---|---|---|
| **WS10EX** | M5, 8 mm deep | A2 | 2,0 |

**WS12EX**




| Model | Screw | Screw material | Torque [Nm] |
|---|---|---|---|
| **WS12EX** | M5, 10 mm deep | A2 | 2.0 |

### Special notes concerning the mounting of posiwire® dust-ex proof sensors

**⚠ DANGER**

**Explosion risk due to incorrect installation**

- Installation must only be taken in non-explosive conditions!
- Dust deposits are to be avoided!
- Do not mount the sensor in the dust particle stream!
- Protect the sensor against damage!

The housings have been examined with the impact energy DIN EN 60079-1:

- WS10EX at 4 Joule
- WS12EX at 7 Joule

Ambient temperature: -20°C to 40°C
Maximum cable velocity: vmax = 2m/s

## 3.2 Electrical connection

**⚠ DANGER**

**Explosion risk!**

- Mounting / removal of the sensor must only be undertaken in non-explosive conditions.

**NOTICE**

**Damage or destruction of the sensor due to excessive operating voltage or mounting error**

- The applied operating voltage must not exceed the value specified in the data sheet.
- Operate the sensor only within the limits specified in the data sheet.
- Connect to the power supply only by qualified personnel and in accordance with the applicable safety regulations for electrical equipment.
- Do not connect or disconnect the sensor under tension!

**Corrosion in the sensor due to moisture penetration**

- Use the sensor only according to protection class.
- Avoid crossing the dew point.
- Cable outputs must be installed in such a way that no moisture can get into the cable.

**Damage of the sensor cable due to mechanical stress**

- Do not strain the connection cable.
- A separate strain relief is recommended.

**Connector Pin assignment**

Must be in accordance with the output types contained in the appendix.

**Supply voltage**

See specification in the data sheet of the sensor. The maximum operating voltage must not be exceeded.

**Connection example: current output 420A**

To convert the 4 ... 20 mA signal into a voltage signal, it needs a load resistor $R_M$ (measuring resistor) as shown in the diagram. The maximum value of $R_M$ depends on the cable resistance $R_L$ and the excitation voltage UB:

$$\mathbf{R_{Mmax} = ((UB - 12\ V)/0{,}02\ A) - R_L}$$

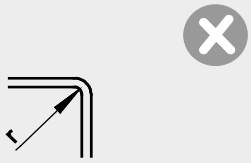
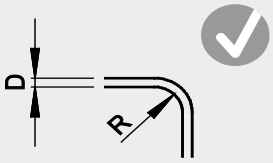
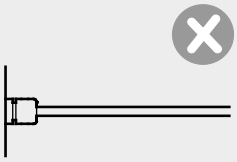
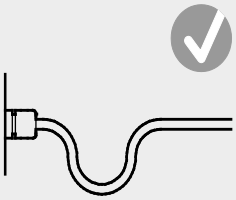
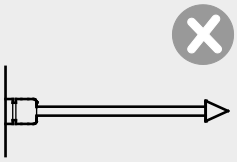
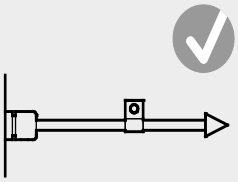
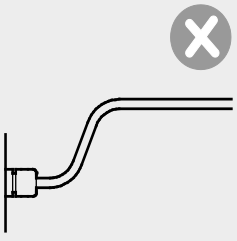
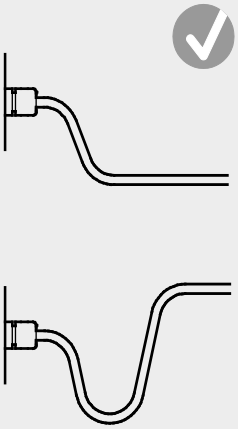
With an excitation of 24 V DC and a cable resistance $R_L$ = 500 Ω a maximum value of $R_M$ = 100 Ω can be used (see from page 19).

### Special notes concerning the electrical installation of Dust-EX-proof sensors

**⚠ DANGER**

- Installation according to DIN EN 60079-14.
- Cable must be properly secured and protected against damage.
- Cable must be protected from UV-radiation!
- The sensor, the wire shield and the wire must be connected to the local equalization system.
- The connection cross-section of the sensor must be at least 4 $mm^2$.

### Installation of the sensor supply cable

| | incorrect | correct |
|---|---|---|
| Admissible bending radius of the cable must be observed:<br>R ~ 5 x D<br>R ~ 10 x D (underwater cable) |  |  |
| Length compensation for the cable must be observed |  |  |
| A separate cord grip for cable strain relief is recommended |  |  |
| Observe cable routing in case of splashing water, water condensation and humidity |  |  |

**Electromagnetic Compatibility (EMC)**

Electromagnetic compatibility of posiwire® Cable Extension Position Sensors dust-ex proof is influenced by the sensor wiring.

**NOTICE**

**Possible malfunction of the sensor when used in systems with highly interference-prone components such as frequency inverters**

**Recommended wiring:**

- Use single shielded sensor cable with twisted pair conductors for power supply and signal output.
- Connect the cable shield to ground on one side of the control cabinet. Connect the shield connection over a large area using cable clamps before or at the cable entry into the control cabinet. When preassembled cables are delivered, the screen is not connected to the housing on the sensor side.
- Do not install sensor cables close to power conductors such as motor or contactor control cables (use separate cable ducts for signal and power cables).
- Install the cables in metal cable ducts which are connected to the same earth bonding as the dust-ex proof sensors.

## 3.3 Operating temperature

| | |
|---|---|
| posiwire® WS10EX | -20 … +40°C |
| posiwire® WS12EX | -20 … +40°C |

# 4 Maintenance and disposal

## 4.1 Maintenance and repair

**⚠ DANGER**

**Explosion risk!**

- Maintenance may only be undertaken in non-explosive atmospheric conditions.

**⚠ CAUTION**

**Risk of crushing and cutting injury due to pre-tensioned spring being released from housing when opened!**

- Do not open the sensor.
- Due to possible risk of injury by improper handling, we strongly advise against repair attempts.

**Maintenance interval**

- Within maintenance activities, especially those parts of the sensor which are associated with the risk of ignition must be checked (e.g. the integrity of connectors, cables, seals etc.). Maintenance intervals are application specific and must be determined by the customer depending on the operating conditions.
- Dust concentrations are not allowed – remove any dust deposit – appropriate maintenance intervals must be scheduled.

Check sensor regularly for possible damage:

| Inspection of … | Measures |
|---|---|
| Check for dust deposit | Remove dust |
| Integrity of housing | Send damaged sensor to ASM for repair |
| Integrity of connector, cable | Replace damaged parts resp. send sensor to ASM for repair |
| Mounting elements | Tighten mounting parts with recommended torque, if applicable use bolt adhesive |
| Cable | Damaged cable, spliced or bended cable: send sensor to ASM for repair |

***NOTICE***

**Opening the sensor by the customer will void the protection type:**

- Do not open the sensor.

**Calibration**

The recommended calibration interval is 1 year.

Test protocol and traceable calibration certificate (ISO9001 / ISO10012) is available on request.

## 4.2 Deinstallation (dust-ex proof standard-compliant)

**⚠ DANGER** **Danger of explosion due to incorrect deinstallation**

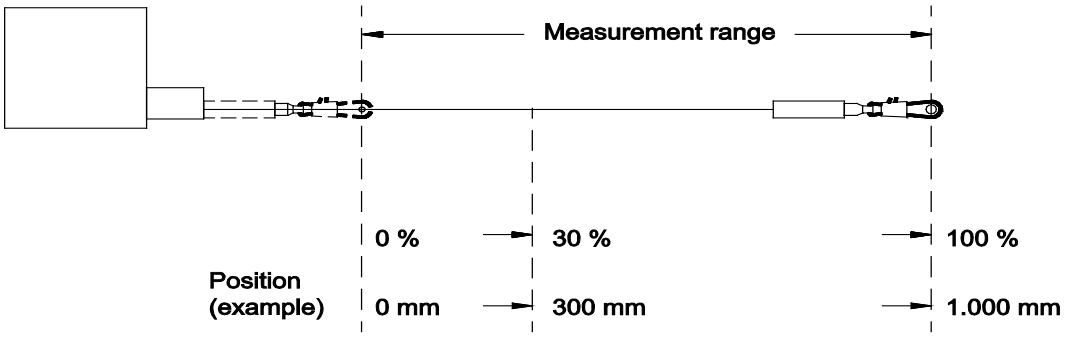
- Remove sensor only in de-energized condition.
- Removal of the sensor must only be undertaken in non-explosive conditions.

## 4.3 Disposal

Disposal according to applicable government regulations.

# 5 Output specification

## 5.1 Measurement signal and range




**Analog, not calibrated**
Output: voltage divider, sensitivity not adjustable
Resistance range is used from about 3% to 97%. 0% or 100% is not possible.
Individual sensitivity is specified on the label.

| | | | |
|---|---|---|---|
| **Position** | 0% | 30% | 100% |
| **Measurement value** | approx. 3% | approx. 30% | approx. 97% |

**Analog, calibrated**
Integrated signal conditioner, sensitivity adjusted
Measuring range corresponds to the electrical measuring range (e.g. 4...20 mA).

| | | | |
|---|---|---|---|
| **Position** | 0% | 30% | 100% |
| **Measurement value** | 4 mA | 8.8 mA | 20 mA |

## 5.2 Analog output

**Voltage divider**

| | | |
|---|---|---|
| **R1K**<br>Potentiometer<br> | Excitation voltage | 24 V DC (32 V DC max. at 1 kΩ, max. power 1 W) |
| | Potentiometer impedance | 1 kΩ ±10 % |
| | Thermal coefficient | ±25 x $10^{-6}$ / °C f.s. |
| | Sensitivity | Depends on the measuring range, individual sensitivity of the sensor is specified on the label |
| | Voltage divider utilization range | approx. 3 % … approx. 97 % |
| | Operating temperature | Refer to output specification |
| | EMC | DIN EN 61326-1:2013 |

**NOTICE**

**The metal wiper of the potentiometer must be protected against current load**

- Electrical current flow impact on the wiper causes linearity errors and shortens the lifetime of the potentiometer.

Additional information:
https://www.asm-sensor.com/en/downloads.html?file=files/asmTheme/pdf/ws_poti_technote_en.pdf

**Signal wiring**

| Output signals | Cable color |
|---|---|
| Poti + | white |
| Poti GND | brown |
| Poti slider | green |
| Not connected | yellow |
| Not connected | grey |
| Not connected | pink |
| Not connected | blue |
| Not connected | red |

| | | |
|---|---|---|
| **10V**<br>Voltage output | Excitation voltage | 24 V DC non stabilized (18 ... 27 V DC) |
| | Excitation current | 20 mA max. |
|  | Output voltage | 0 ... 10 V DC |
| | Output current | 2 mA max. |
| | Output load | > 5 kΩ |
| | Stability (temperature) | ±50 x $10^{-6}$ / °C f.s. |
| | Protection | Reverse polarity, short circuit |
| | Output noise | 0.5 $mV_{RMS}$ |
| | Operating temperature | Refer to output specification |
| | EMC | DIN EN 61326-1:2013 |

| **Signal wiring** | **Output signals** | **Cable color** |
|---|---|---|
| | Excitation + | white |
| | Excitation GND* | brown |
| | Signal + | green |
| | Signal GND* | yellow |
| | Not connected | grey |
| | Not connected | pink |
| | Not connected | blue |
| | Not connected | red |

*: internally connected

| | | |
|---|---|---|
| **420A**<br>Current output (2 wire)<br> | Excitation voltage | 24 V DC non stabilized (12 ... 27 V DC), measured at the sensor terminals |
| | Excitation current | 35 mA max. |
| | Output current | 4 ... 20 mA equivalent for 0 ... 100 % range |
| | Stability (temperature) | ±100 x $10^{-6}$ / °C f.s. |
| | Protection | Reversed polarity, short circuit |
| | Output noise | 0.5 $mV_{RMS}$ |
| | Operating temperature | Refer to output specification |
| | EMC | DIN EN 61326-1:2013 |

| **Signal wiring** | **Signal** | **Cable color** |
|---|---|---|
| | Signal + | white |
| | Signal - | brown |
| | Not connected | green |
| | Not connected | yellow |
| | Not connected | grey |
| | Not connected | pink |
| | Not connected | blue |
| | Not connected | red |

| | | |
|---|---|---|
| **420T**<br>Current output (3 wire)<br><br> | Excitation voltage | 24 V DC non stabilized (18 ... 27 V DC) |
| | Excitation curren | 40 mA max. |
| | Load resistor | 350 Ω max. |
| | Output current | 4 ... 20 mA equivalent for 0 ... 100 % range |
| | Stability (temperature) | ±50 x $10^{-6}$ / °C f.s. |
| | Protection | Reverse polarity, short circuit |
| | Output noise | 0.5 $mV_{RMS}$ |
| | Operating temperature | Refer to output specification |
| | EMC | DIN EN 61326-1:2013 |

| **Signal wiring** | **Output signals** | **Cable color** |
|---|---|---|
| | Excitation + | white |
| | Excitation GND | brown |
| | Signal + | green |
| | Not connected | yellow |
| | Not connected | grey |
| | Not connected | pink |
| | Not connected | blue |
| | Not connected | red |

## 5.3 Output information

### Voltage divider R1K

Potentiometer




**NOTICE**

**Electrical current flow impact on the wiper causes linearity errors and shortens the lifetime of the potentiometer**

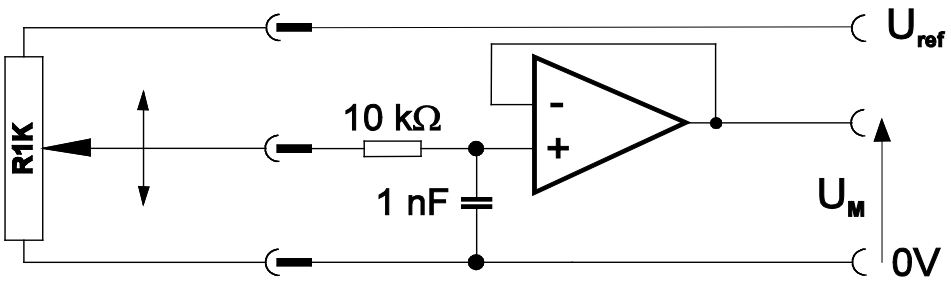
- The metal wiper of the potentiometer must be protected against current load!

Additional information:

**https://www.asm-sensor.com/en/downloads.html?file=files/asmTheme/pdf/ws_poti_technote_en.pdf**

The output signal is the ratiometric voltage of a potentiometer. The potentiometer is supplied by a reference voltage source. The ratio of the output signal to the reference voltage is proportional to the measuring cable extension. For optimum performance of the sensor 94% (3% to 97%) of the potentiometers total span is used for the specified measurement range. Provision for setting the electrical zero and voltage amplification must be made in the subsequent signal processing circuit.

### Suggested output circuit



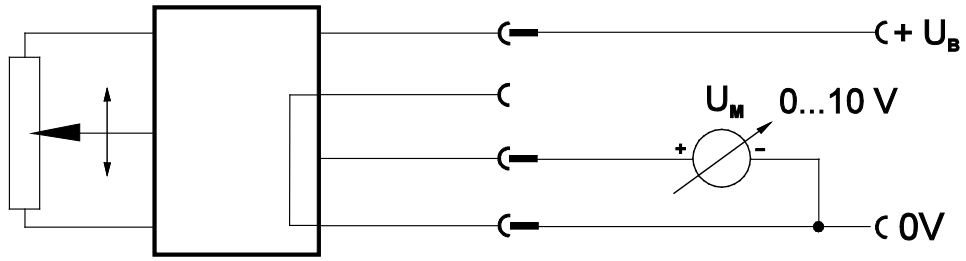
### Voltage output 10V

0 … 10 V

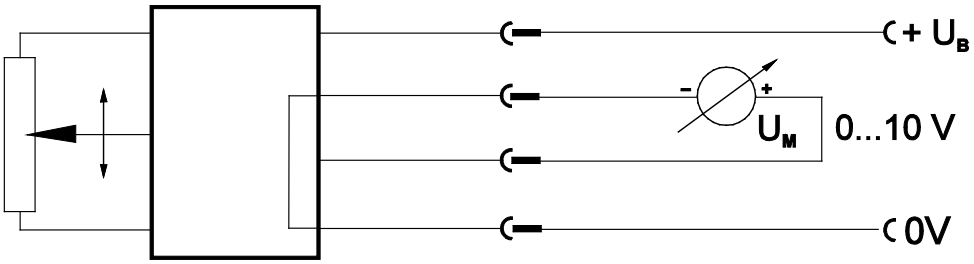



This output signal is 0 to 10 Volts proportional to the measuring cable extension of 0 to 100%. This is an industry standard output which is widely accepted because of its simple signal processing and suitability for all display, recording and automation systems. For analog signal processing the voltage output is the proven best choice, e.g. for Waveform Analyzers, Data Loggers and for analog and digital Oscilloscopes. ASM´s 0...10 V output supports a wide range of excitation voltages and is well protected against electromagnetic interference.

### Suggested output circuit




**3 wire**




**4 wire**

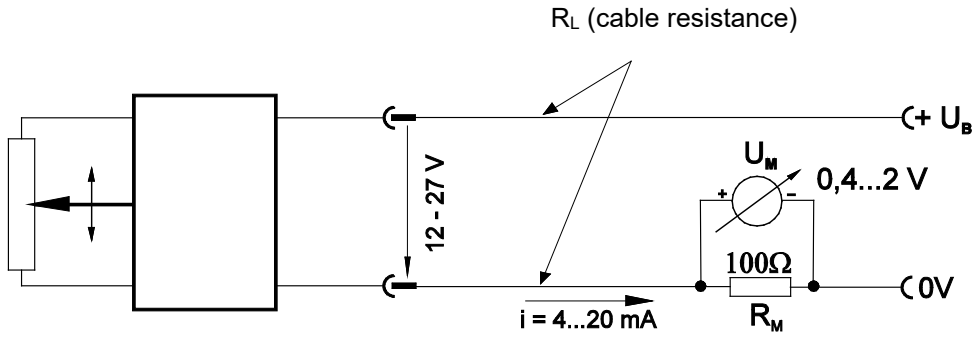
### Current output 420A

4 … 20 mA (2 wire)




This output signal is a 4 to 20 mA current loop proportional to the measuring cable extension of 0 to 100%. It is an industry standard two-wire system for the transmission of measured values. The current loop is both measurement signal and sensor excitation current. The measured value is represented as a voltage drop across a load resistor $R_M$. The current is constant and the signal cable resistance ($R_L$) will have no effect on the measured value. Therefore long signal cables can be used, limited only by the cable resistance (impedance). Signal cable disconnection or failure can be detected by a 0 mA current signal.

### Suggested output circuit



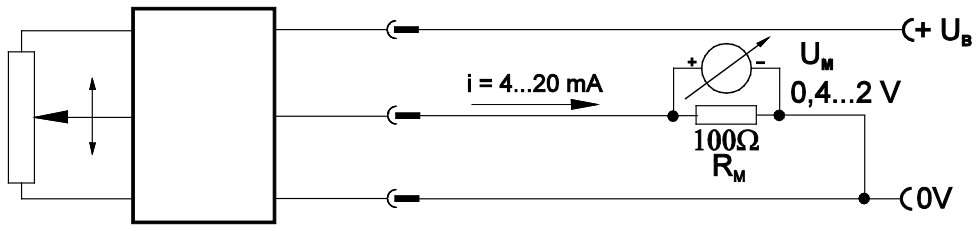

### Current output 420T

4 … 20 mA (3 wire)




This output signal is a 4 to 20 mA current loop (alternatively 0 to 20 mA) proportional to the measuring cable extension of 0 to 100%. The 3 wire current loop system is especially resistant to electromagnetic interference because of the separate sensor excitation and the low resistance (impedance) of the signal processing electronics. As in the two-wire system the measured value is represented as a voltage drop across a load resistor $R_M$ and is, within limits, independent of the cable resistance (impedance).

### Suggested output circuit



# 6 EU Declaration of Conformity

CE

We: **ASM Automation Sensorik Messtechnik GmbH**
Am Bleichbach 18-24
85452 Moosinning
Germany

declare under our sole responsibility that the product

**Name:** **posiwire® Cable Extension Position Sensor, dust-ex proof**

**Type:** **WS10EX II 3D Ex tc IIIC T80°C Dc X**
**WS12EX II 3D Ex tc IIIC T80°C Dc**

Options: - R1K, - 10V, - 420A, - 420T

to which this declaration relates is in conformity with the following EU harmonization standards and other normative documents:

| | | |
|---|---|---|
| Directives: | 2014/30/EU | (EMC) |
| | 2011/65/EU, 2015/863/EU | (RoHS-3) |
| | 2014/34/EU | |

Standards: EN 61326-1:2013
EN 60079-0 (September 2019)
EN 60079-31 (December 2014)

Moosinning, July 6, 2021

Dr.-Ing. Gunnar Kamp
Head of Mechanical Engineering

Peter Wirth
Head of Electronic Development

perfect in sensors.

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