

# Angle sensor AN2 series 30

**RE 95143**

Edition: 09.2016

Replaces: 06.2015



- ▶ Hall-effect sensor for angular measurement

**Features**

- ▶ Angle sensor element based on the Hall-effect principle
- ▶ Shaft can be turned through mechanically
- ▶ Integrated electronics with temperature compensation
- ▶ Output signal ratiometrically proportional to angle
- ▶ Zero point and sensitivity are calibrated

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## Ordering code

|            |    |    |    |    |             |
|------------|----|----|----|----|-------------|
| 01         | 02 | 03 | 04 | 05 | 06          |
| <b>AN2</b> |    |    |    |    | <b>/ 30</b> |

### Type

|    |                          |            |
|----|--------------------------|------------|
| 01 | Hall-effect angle sensor | <b>AN2</b> |
|----|--------------------------|------------|

### Version

|    |                        |           |
|----|------------------------|-----------|
| 02 | Without pin            | <b>V1</b> |
|    | With pin to the bottom | <b>V2</b> |
|    | With pin to the top    | <b>V3</b> |

### Characteristics

|    |                 |          |
|----|-----------------|----------|
| 03 | Positive course | <b>A</b> |
|    | Negative course | <b>B</b> |

### Angles

|    |      |           |
|----|------|-----------|
| 04 | ±17° | <b>17</b> |
|    | ±28° | <b>28</b> |
|    | ±35° | <b>35</b> |
|    | ±36° | <b>36</b> |
|    | ±41° | <b>41</b> |
|    | ±44° | <b>44</b> |

### Supply voltage      Signal voltage

|    |             |                      |           |
|----|-------------|----------------------|-----------|
| 05 | 5 ±0.5 V    | 10% to 90% $U_{sup}$ | <b>05</b> |
|    | 8 to 10.4 V | 25% to 75% $U_{sup}$ | <b>10</b> |

### Series

|    |  |           |
|----|--|-----------|
| 06 |  | <b>30</b> |
|----|--|-----------|

## Description

The AN2 angle sensor is used for angular measurement from ±17° to ±44°.

The sensor returns a ratiometric voltage with rising characteristic (positive course) or inverted characteristic (negative course).

This sensor is a typical part of an electro-hydraulic hitch control (EHC) and is supplied directly from a Rexroth EHR controller or an SRC controller.

This sensor is destined for the use in agricultural applications.

### Available variants

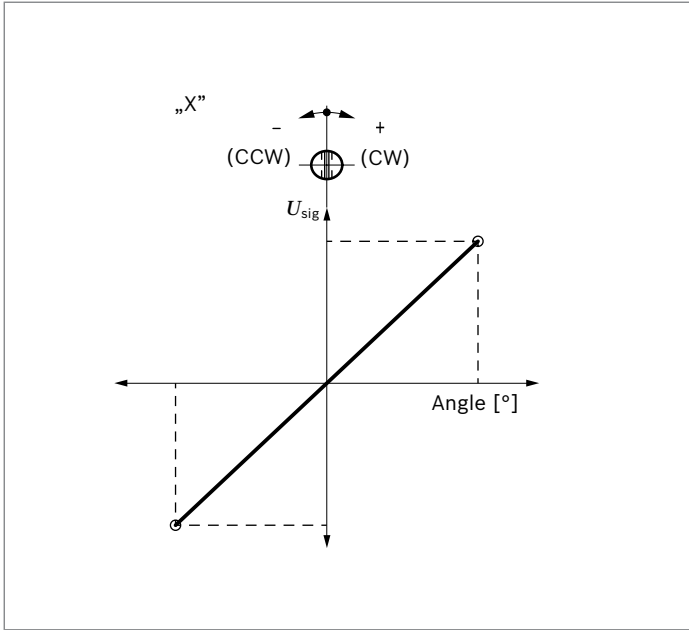
| Type |      |    |    |   |    |            | Material number |
|------|------|----|----|---|----|------------|-----------------|
| AN2  | V1 B | 35 | 05 | / | 30 | R917008154 |                 |
| AN2  | V1 B | 35 | 10 | / | 30 | R917005164 |                 |
| AN2  | V1 A | 41 | 05 | / | 30 | R917005568 |                 |
| AN2  | V1 A | 41 | 10 | / | 30 | R917005165 |                 |
| AN2  | V2 A | 36 | 05 | / | 30 | R917008155 |                 |
| AN2  | V2 A | 36 | 10 | / | 30 | R917005166 |                 |
| AN2  | V1 A | 44 | 05 | / | 30 | R917008160 |                 |
| AN2  | V1 A | 44 | 10 | / | 30 | R917004856 |                 |
| AN2  | V3 A | 28 | 05 | / | 30 | R917008156 |                 |
| AN2  | V3 A | 28 | 10 | / | 30 | R917005167 |                 |
| AN2  | V1 A | 17 | 05 | / | 30 | R917008157 |                 |
| AN2  | V1 A | 17 | 10 | / | 30 | R917005168 |                 |
| AN2  | V2 A | 41 | 05 | / | 30 | R917008158 |                 |
| AN2  | V2 A | 41 | 10 | / | 30 | R917005169 |                 |
| AN2  | V3 A | 41 | 05 | / | 30 | R917008159 |                 |

## Technical data

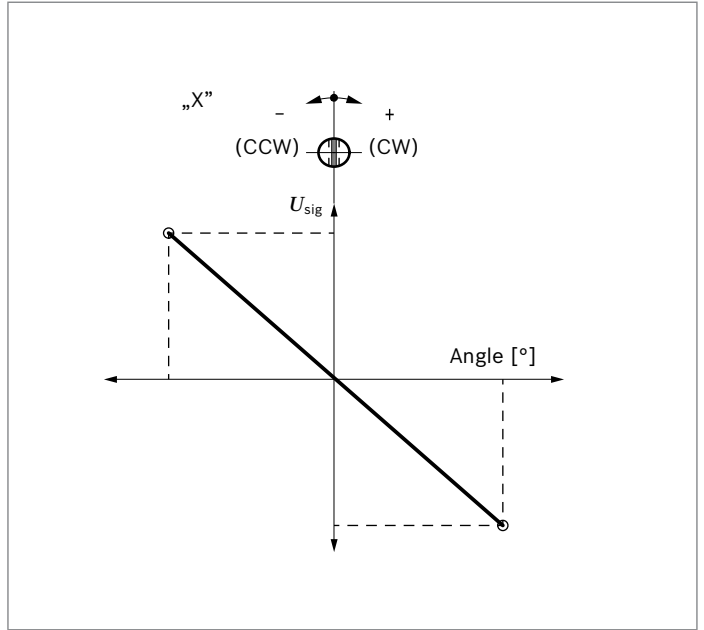
| Type   | AN2   |  |      |                      |      |      |
|--|---|--|------|----------------------|------|------|
| Measuring principle  | Hall effect<br>Maximum permissible external magnetic field: 0.3 mT                          |  |      |                      |      |      |
| Nominal angular range  | ±17°  | ±28°   | ±35° | ±36°                 | ±41° | ±44° |
|  | Shaft can be mechanically rotated   |  |      |                      |      |      |
| Starting torque  | ≤ 5 Ncm   |  |      |                      |      |      |
| Shaft loading  | radial  | ≤ 10 N                                       |      |                      |      |      |
|  | axial   | ≤ 20 N                                       |      |                      |      |      |
| Supply voltage $U_{sup}$   | 8 to 10.4 V DC  |  |      | 5 ±0.5 V DC          |      |      |
| Supply current $I_{sup}$   | ≤ 15 mA   |  |      | ≤ 15 mA              |      |      |
| Signal voltage $U_{sig}$ (ratiometric)                               | 25% to 75% $U_{sup}$  |  |      | 10% to 90% $U_{sup}$ |      |      |
| Load resistance  | > 3 kΩ  |  |      | ≥10 kΩ               |      |      |
| Linearity  | < ±1%   |  |      |                      |      |      |
| Zero position  | Marking on shaft (see drawing)  |  |      |                      |      |      |
| Sensitivity of the end points  | < ±1% of the supply voltage   |  |      |                      |      |      |
| Hysteresis   | Immeasurable  |  |      |                      |      |      |
| Resolution   | 0.025% $U_{sup}$  |  |      |                      |      |      |
| Temperature coefficient of zero point                                | ≤ ±0.15% / 10 °C  |  |      |                      |      |      |
| Temperature coefficient of sensitivity                               | ≤ ±0.2% / 10 °C   |  |      |                      |      |      |
| Operating temperature range  | -30 °C to +85 °C  |  |      |                      |      |      |
| Storage temperature range  | -35 °C to +100 °C   |  |      |                      |      |      |
| Housing material   | PBT GF 30   |  |      |                      |      |      |
| Shaft material   | X 5 CrNi 18   |  |      |                      |      |      |
| Type of protection with installed mating connector (IEC 60529)       | IP67 and IP69K  |  |      |                      |      |      |
| Connector  | 3-pin connector with dust boot and single-wire seal   |  |      |                      |      |      |
| Insulation resistance to housing                                     | > 100 MΩ  |  |      |                      |      |      |
| Dielectric strength of insulation to housing                         | < 200 V   |  |      |                      |      |      |
| Electromagnetic compatibility EMC<br>(ISO 11452-2)                   | 1 MHz to 1 GHz  | 200 V/m, permissible deviation 1% $U_{sup}$  |      |                      |      |      |
|  | 1 GHz to 4 GHz  | 100 V/m, permissible deviation 1% $U_{sup}$  |      |                      |      |      |
| Electrostatic discharge ESD<br>(ISO TR 10605, intensity IV)          | Contact discharge   | ±8 kV  |      |                      |      |      |
|  | Air discharge   | ±15 kV                                       |      |                      |      |      |
| Overvoltage / inverse-polarity protection / short circuit resistance | Overvoltage protection up to 18 V<br>Resistance against inverse-polarity and short circuits |  |      |                      |      |      |
| Dynamic tests  | Broadband noise test (IEC 68-2-64)  | $a_{eff} = 0.05 g^2/Hz$ , 10 to 2000 Hz      |      |                      |      |      |
|  | Transport shock (IEC 60068-2-27)  | 15 g, 11 ms, 3x each direction (pos./neg.)   |      |                      |      |      |
|  | Continuous shock (IEC 60068-2-29)   | 25 g, 6 ms, 1000x each direction (pos./neg.) |      |                      |      |      |

## Characteristics

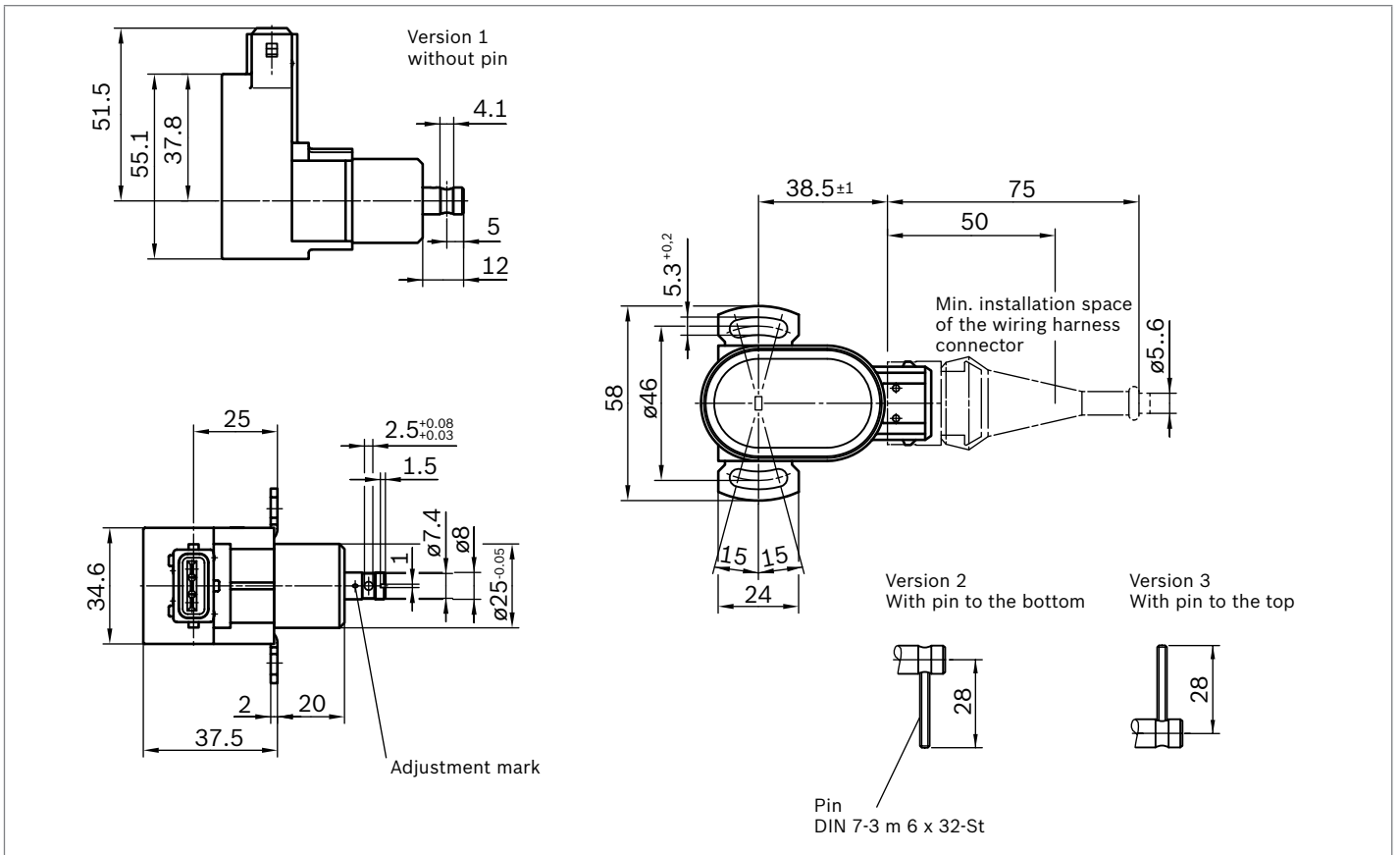
### ▼ Positive course



### ▼ Negative course

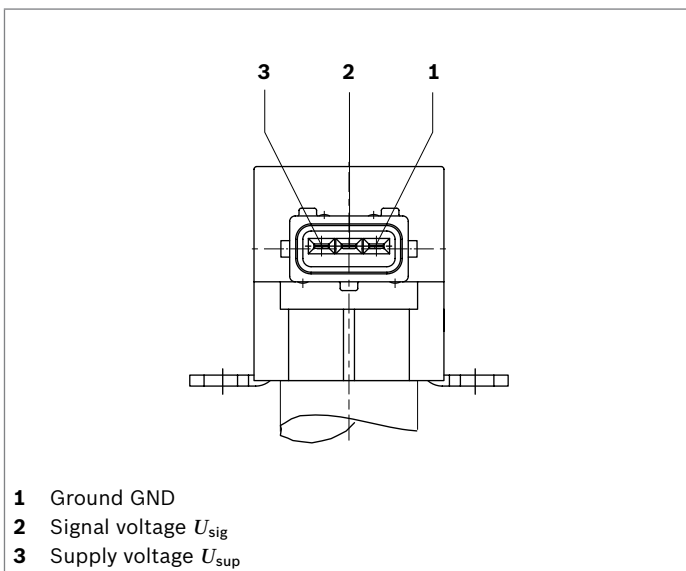


## Dimensions



## AMP connector

### ▼ Pin assignment



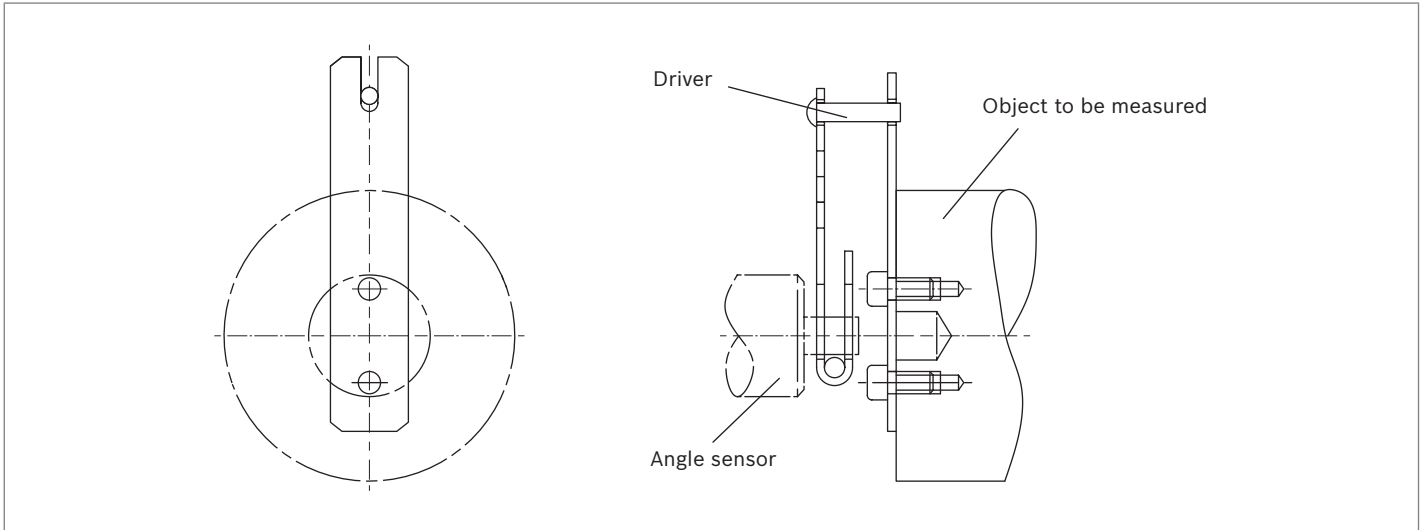
### ▼ Mating connector R917000515<sup>1)</sup>

| Designation      | Number | Material number                             |
|------------------|--------|---|
| Housing          | 1      | 1928402579 <sup>2)</sup>                    |
| Protection cap   | 1      | 1280703022 <sup>2)</sup>                    |
| Contacts         | 3      | 929939 <sup>3)</sup>                        |
| Single-wire seal | 3      | 828905-1 <sup>3)</sup> with FLK cable type  |
|                  | 3      | 828904-1 <sup>3)</sup> with FLKr, FLX cable |

1) The mating connector is not included in the scope of supply.  
2) Available from Bosch  
3) Available from AMP

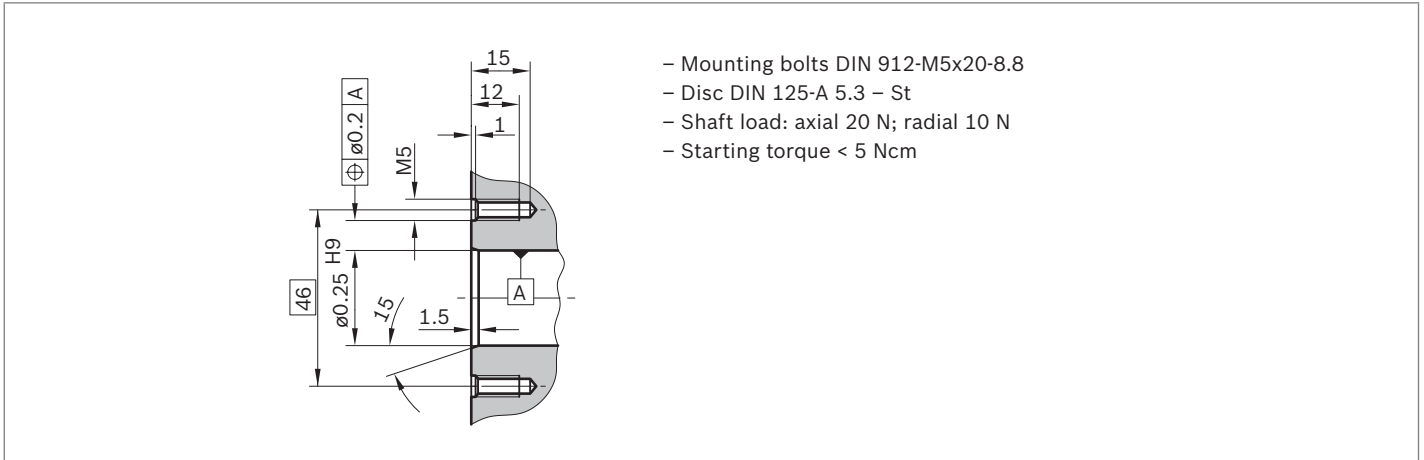
## Installation instructions

### ▼ Coupling example



The angle sensor shaft is to be coupled to the measurement object as free of force and play as possible.

### ▼ Mounting hole



## Safety instructions

### General Instructions

- ▶ Before finalizing your design, request a binding installation drawing.
- ▶ The proposed circuits do not imply any technical liability for the system on the part of Bosch Rexroth.
- ▶ It is not permissible to open the sensor or to modify or repair the sensor. Modifications or repairs to the wiring could result in dangerous malfunctions.
- ▶ The sensor may only be assembled/disassembled in depressurized and deenergized state.
- ▶ System developments, installation and commissioning of electronic systems for controlling hydraulic drives must only be carried out by trained and experienced specialists who are sufficiently familiar with both the components used and with the complete system.
- ▶ While commissioning the sensor, the machine may pose unforeseen dangers. Before commissioning the system, you must therefore ensure that the vehicle and the hydraulic system are in a safe condition.
- ▶ Make sure that nobody is in the machine's danger zone.
- ▶ No defective or incorrectly functioning components may be used. If the sensor should fail or demonstrate faulty operation, it must be replaced.
- ▶ Despite every care being taken when compiling this document, it is not possible to take into account all feasible applications. If instructions for your specific application are missing, you can contact Bosch Rexroth.
- ▶ Sensors do not fall under the scope of EMC-RL 2004/108/EC or 2014/30/EU. A declaration of conformity and the CE marking for individually sold sensors is not required, since the sensors are only sold to machine manufacturers (OEM) or to companies with the necessary expertise (i.e. certified Bosch Rexroth partners or companies with trained and qualified service personnel). Furthermore, the responsibility of the above mentioned companies for machine EMC testing remains unaffected in principle.
- ▶ The use of sensors by private users is not permissible, since these users do not typically have the required level of expertise.

### Notes on the installation location and position

- ▶ Do not install the sensor close to parts that generate considerable heat (e.g. exhaust).
- ▶ Lines are to be routed with sufficient distance from hot or moving vehicle parts.
- ▶ A sufficiently large distance to radio systems must be maintained.
- ▶ The connector of the sensor is to be unplugged during electrical welding and painting operations.
- ▶ Cables/wires must be sealed individually to prevent water from entering the device.

### Notes on transport and storage

- ▶ Please inspect the device for any damages which may have occurred during transport. If there are obvious signs of damage, please immediately inform the transport company and Bosch Rexroth.
- ▶ If it is dropped, the sensor must not be used any longer as invisible damage could have a negative impact on reliability.

### Notes on wiring and circuitry

- ▶ Lines to the sensors must be designed as short as possible and be shielded. The shielding must be connected to the electronics on one side or to the machine or vehicle ground via a low-resistance connection.
- ▶ The sensor should only be plugged and unplugged when it is in a de-energized state.
- ▶ The sensor lines are sensitive to radiation interference. For this reason, the following measures should be taken when operating the sensor:
  - Sensor lines should be attached as far away as possible from large electric machines.
  - If the signal requirements are satisfied, it is possible to extend the sensor cable.
- ▶ Lines from the sensor to the electronics must not be routed close to other power-conducting lines in the machine or vehicle.
- ▶ The wiring harness should be fixated mechanically in the area in which the sensor is installed (spacing < 150 mm). The wiring harness should be fixated so that in-phase excitation with the sensor occurs (e.g. at the sensor mounting points).
- ▶ If possible, lines should be routed in the vehicle interior. If the lines are routed outside the vehicle, make sure that they are securely fixed.

- ▶ Lines must not be kinked or twisted, must not rub against edges and must not be routed through sharp-edged ducts without protection.

#### **Intended use**

- ▶ The sensor is designed for use in mobile working machines provided no limitations/restrictions are made to certain application areas in this data sheet.
- ▶ Operation of the sensor must generally occur within the operating ranges specified and released in this data sheet, particularly with regard to voltage, temperature, vibration, shock and other described environmental influences.
- ▶ Use outside of the specified and released boundary conditions may result in danger to life and/or cause damage to components which could result in consequential damage to the mobile working machine.

#### **Improper use**

- ▶ Any use of the sensor other than that described in chapter "Intended use" is considered to be improper.
- ▶ Use in explosive areas is not permissible.
- ▶ Damages which result from improper use and/or from unauthorized, interference in the component not described in this data sheet render all warranty and liability claims with respect to the manufacturer void.

#### **Use in safety-related functions**

- ▶ The customer is responsible for performing a risk analysis of the mobile working machine and determining the possible safety-related functions.
- ▶ In safety-related applications, the customer is responsible for taking suitable measures for ensuring safety (sensor redundancy, plausibility check, emergency switch, etc.).
- ▶ Product data that is necessary to assess the safety of the machine can be provided on request or are listed in this data sheet.

#### **More detailed information**

- ▶ Further information about the sensor can be found at [www.boschrexroth.com/mobile-electronics](http://www.boschrexroth.com/mobile-electronics).
- ▶ The sensor must be disposed according the national regulations of your country.