

Capacitive uniaxial inclination sensor with analog output

BSI R11A0-XB-CX...-S75G



EU Directive 2004/108/EC (EMC Directive) and EMC Law
 Generic Standards: EN 61000-6-4 (Emissions), EN 61000-6-2 (Noise Immunity)
 Emissions testing: Radio interference emissions EN 55011 Group 1, Class A and B

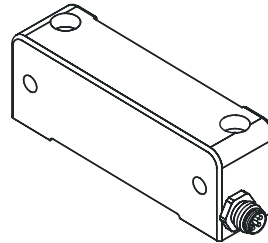
Scope

These instructions describe the structure, function, installation and operation of the following inclination sensors:

Order code	Type
BSI0002	BSI R11A0-XB-CXS045-S75G (Measuring range $\pm 45^\circ$)
BSI0004	BSI R11A0-XB-CXP360-S75G (Measuring range 360°)

Downloading the user's guide

This user's guide can be found on the Internet at www.balluff.com. It is also available in other languages.



Intended use

The inclination sensor was built to monitor the tilt angle in the direction of an axis.

Inclination sensors are installed for use in, for example, machines, equipment, devices and systems whose tilt position has to be determined precisely and set exactly via connected PLC controllers and motors. Flawless function in accordance with the specifications in the technical data is ensured only when using original Balluff accessories, and use of any other components will void the warranty. Typical applications are, for example, detecting the inclination of operating tables, solar panels, and excavators.

Modifications to the sensor or non-approved use are not permitted and will result in loss of warranty and void any liability claims against the manufacturer.

Safety Notes



Before commissioning, read the user's guide carefully!
 These sensors must not be used in applications in which the safety of persons is dependent on the function of the device (not a safety component according to EU Machinery Directive).

Installation and startup are to be performed by trained technical personnel only.

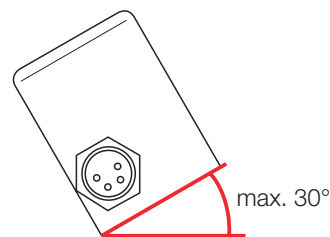
The **operator** is responsible for ensuring that local safety regulations are observed.

In particular, the operator must take measures to ensure that a defect in the measuring system will not result in hazards to persons or equipment.

If defects or non-clearable faults in the sensor occur, take it out of service and secure against unauthorized use.

Properties

- 1-axial fluid inclination sensor
- Clockwise and counterclockwise measuring direction
- High measuring accuracy across the entire temperature range and measuring range
- High repeat accuracy and precision
- Can be used anywhere on the planet, because the measuring value is independent of the gravitational acceleration value at the measuring location.
- Low lateral angle sensitivity of $\pm 0.1^\circ$ at a lateral tilt of up to max. 30°



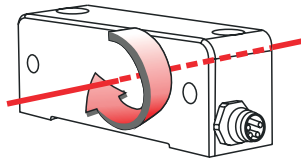
- Extended temperature range of -40 to 85°C with internal temperature compensation
- Extremely low temperature drift
- Compact, robust metal housing with IP 67 degree of protection for use in harsh conditions

Capacitive uniaxial inclination sensor with analog output BSI R11A0-XB-CX...-S75G

Rotation axis

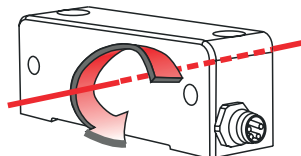
The sensor's counting direction depends on its rotation alignment:

- Clockwise from 0° to 359.99° or from 0° to 45°



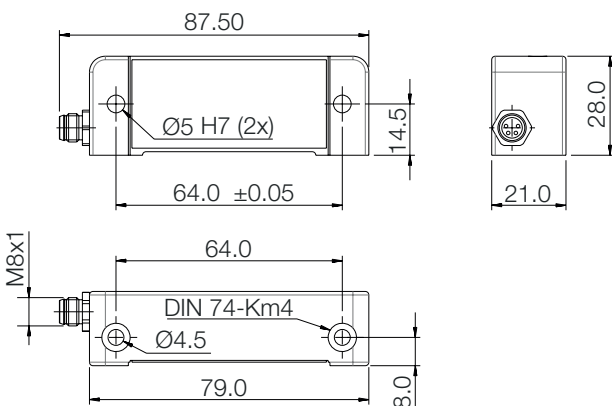
CW: 4 ---> 19,99 mA

- Counterclockwise from 359.99° to 0° or from 0° to -45°



CCW: 19,99 ---> 4 mA

Dimensions



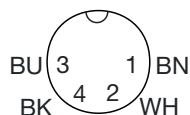
Electrical connections



Caution!

Only establish the electrical connection in a deenergized state.

Pin	Connection
1, brown	Supply +
2, white	
3, blue	GND
4, black	Input-output signal



Connection notes:

- Use shielded cables only!
- Pin 2 can either be connected to pin 1 or left alone.
- The output signal is measured between pin 4 and pin 3.

Installation



Caution!

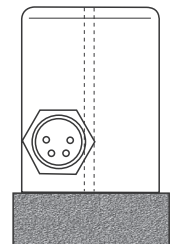
Note the alignment of the rotation axis during installation.

- Always install the inclination sensors in a deenergized state!
- The measurement values can be inexact for equipment that vibrates heavily. Ensure sufficient vibration isolation.
- In highly accelerated systems, the sensor does not provide exact measurement values.

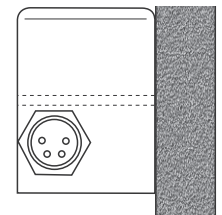
Installation

Make sure that the installation surface is clean and level. The inclination sensor can be installed on the object in two ways. To obtain precise measured values, the reference surface on the underside of the sensor has to be perfectly level and the side reference surface has to be aligned perfectly vertical.

1. Installation on the object.
Screw the sensor to the object using 2 countersunk screws (max. thread diameter of 4.5 mm).



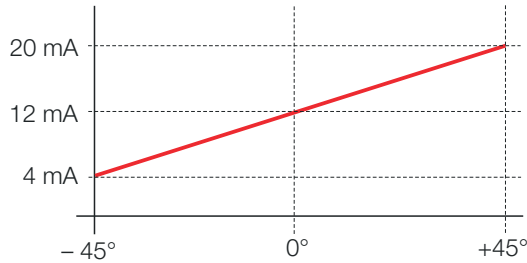
2. Installation on the side of the object.
Install the sensor on the side of the object using 2 elements, e.g. pass shoulder screws or pins (suitable for inner bore Ø 5H7).



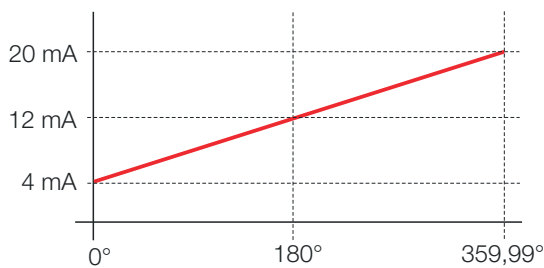
Capacitive uniaxial inclination sensor with analog output BSI R11A0-XB-CX...-S75G

Output signal current 4 mA to 20 mA

Inclination sensors BSI R11A0-XB-CXS045-S75G, measuring range $\pm 45^\circ$



Inclination sensor BSI R11A0-XB-CXP360-S75G, measuring range 360°



Maintenance

The device is maintenance-free in principle. The housing can be cleaned as needed using a damp cloth and non-corrosive cleaning solution when the device is switched off.

Decommissioning

Always uninstall the device in a deenergized state.

Disposal

The device must be disposed of according to European Directives 2002/96/EC and 2003/108/EC (Waste Electrical and Electronic Equipment). Old devices should be disposed of separately from domestic waste!

Technical data

General data	
Measuring range type BSI -...CXS045-... Type BSI -...CXP360-...	$\pm 45^\circ$ 360°
Measurement axes	1
Direction of rotation	Clockwise and counterclockwise
Measuring principle	Capacitive
Protection class	3
Electrical data	
Supply voltage U_s	10 to 30 V DC
Output	4 to 20 mA
Output signal Type BSI -...CXS045-... Type BSI -...CXP360-...	4 mA at -45° 20 mA at 45° 4 mA at 0° 20 mA at 359.99°
Error signal	1 mA
Load max.	$(U_s - 7[V]) / I_{max}$
Resolution max.	$\pm 0.01^\circ$
Residual ripple	$< 0.01\%$
Polarity reversal protected	Yes
Short-circuit protected	Yes
Sampling rate	< 150 ms
Accuracy (characteristic deviation)	$\pm 0.1\%$ (min. 0.1°)
Temperature drift	$\pm 0.01\%/10$ K
Lateral angle sensitivity	$\pm 0.1^\circ$ at a lateral tilt of up to max. 30°
Current draw	< 31 mA
Settling time	< 1 s
Mechanical data	
Housing material	Aluminum
Dimensions	79×28×20 mm
Weight	Approx. 80 g
Connection plug connector	M8, 4-pin
Ambient conditions	
Ambient temperature range	-40 to $+85$ °C
Degree of protection as per IEC 60529	IP 67



Capacitive uniaxial inclination sensor with analog output BSI R11A0-XB-CX...-S75G

Balluff GmbH
Schurwaldstrasse 9
73765 Neuhausen a.d.F.
Germany
Phone +49 7158 173-0
Fax +49 7158 5010
balluff@balluff.de
 www.balluff.com