For static applications
1- and 2-axis measurement | **IN68** | **CANopen**

The inclinometers in the IN68 series are used to detect 2-axis inclinations in the measuring range of ±85° or 1-axis inclinations of up to 360° via an acceleration measuring cell. Various parameters can be customized for individual requirements.
Thanks to their high robustness, the inclinometers are also ideally suited for outdoor use.

Features and benefits

- **Individual setting options**
  - Reset to factory setting
  - Center of the measurement as well as start and end point for 1-axis measurement
  - Switching the spirit level function on/off
  - Settings on the measuring range
  - Filter settings
- **Simple start-up and diagnostics**
  LED display for operating status and CANopen communication as well as for setting the center point position (spirit level function).
- **Precise measurement even under harsh environmental conditions**
  - Temperature range -40 °C ... +85 °C and protection level IP68 / IP69k
  - Protection against the influence of salt spray and rapid temperature changes

Order code 1-axis

8.IN68	.	1	7 ⓐ	2 ⓑ	1	.	11	X ⓒ
Type								

ⓐ *Measuring range*
7 = 0° ... 360° (±180°)

ⓑ *Interface*
2 = CANopen

ⓒ *Type of connection*
2 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin

Stock types
8.IN68.1721.113

Order code 2-axis

8.IN68	.	2	6 ⓐ	2 ⓑ	1	.	11	X ⓒ
Type								

ⓐ *Measuring range*
6 = ±85°

ⓑ *Interface*
2 = CANopen

ⓒ *Type of connection*
2 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin

Stock types
8.IN68.2621.113

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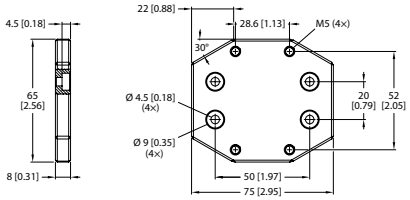
Accessories		Order no.
Adapter plate	For using existing mounting holes when replacing with an IS40 inclinometer 	**8.0010.4066.0000**
EMC shield terminal 	For an EMC-compliant installation of the cable - top-hat rail mounting - spring steel, galvanized - shield diameter 3.0 ... 12.0 mm	**8.0000.4G06.0312**

Cables and connectors		Order no.
Preassembled cables	M12 female connector with coupling nut for Bus in, 5-pin, A coded, straight single ended 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	M12 male connector with external thread for Bus out, 5-polig, A coded, straight single ended 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
	M12 female connector with coupling nut for Bus in, 5-polig, A coded, straight Deutsch connector, 6-pin, DT04 1 m [3.28'] PVC cable	**05.00.6091.22C7.001M**
Connectors	M12 female conn. with coupling nut for Bus in, 5-pin, A coded, straight (metal/plastic)	**05.B-8151-0/9**
	M12 male conn. with external thread for Bus out, 5-pin, A coded, straight (metal/plastic)	**05.BS-8151-0/9**

Further Kübler accessories can be found at: kuebler.com/accessories
Further Kübler cables and connectors can be found at: kuebler.com/connection-technology

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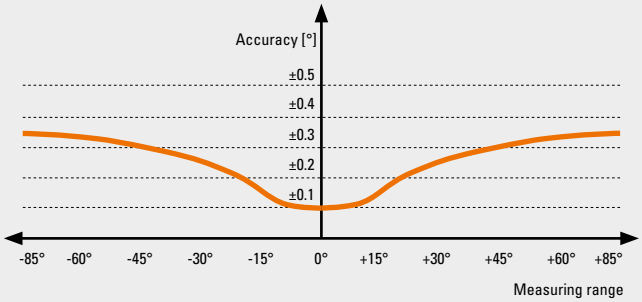
Technical data

General data 1-axis measurement

Measuring range	0 ... 360°
Resolution	0.01°
Repeat accuracy	≤0.2°
Temperature drift	≤ ±0.02 %/K
Linearity deviation	≤ ±0.2%
Accuracy (at 25°C)	≤ ±0.72°

General data 2-axis measurement

Measuring range (max.)	-85 ... +85°
Resolution	0.01°
Repeat accuracy	≤0.2°
Temperature drift	≤ ±0.02 %/K
Linearity deviation	≤ ±0.2%
Accuracy (at 25°C)	≤ ±0.1° depending on the measuring range



Mechanical characteristics

Electrical connection	M12 connectors, 5-pin
Weight	89 g [3.14 oz]
Protection acc. to EN 60529	IP68 / IP69k
Working temperature range	-40 °C ... +85 °C [-40 °F ... +185 °F]
Material housing	Plastic, polyetherimide
Vibration resistance (EN 60068-2-6)	20 g; 5 h/axis; 3 axes
Shock resistance (EN 60068-2-27)	150 g; 4 ms 1/2 sine
MTTF	339 years acc. to SN 29500 (Ed. 99) 40 °C
Dimensions	71.6 x 62.6 x 20 mm [2.82 x 2.46 x 0.79"]

Electrical characteristics

Supply voltage	8 ... 36 V DC
Residual ripple	≤ 10 % Uss
Isolation test voltage	≤ 0.5 kV
Wire breakage / Reverse polarity protection	yes
Current consumption	max. 80 mA

Interface characteristics CANopen

Communication protocol	CANopen
Node ID	1…127; factory setting: 62
Baud rate	125 / 250 / 500 / 1000 kbit/s factory setting: 250 kbit/s

Approvals

UL compliant in accordance with	File-Nr. E539414
CE compliant in accordance with	
EMV Directive	2014/30/EU
RoHS Directive	2011/65/EU

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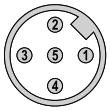
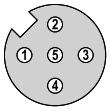
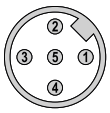
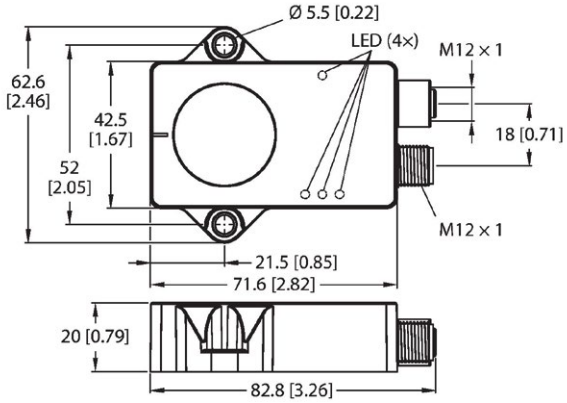
Terminal assignment

Interface	Type of connection	1 x M12 connector, male contacts, 5-pin					
2 CANopen	2		Bus IN				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Interface	Type of connection	2 x M12 connector, male contacts, 5-pin					
2 CANopen	3		Bus OUT				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5
			Bus IN				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Dimensions

Dimensions in mm [inch]



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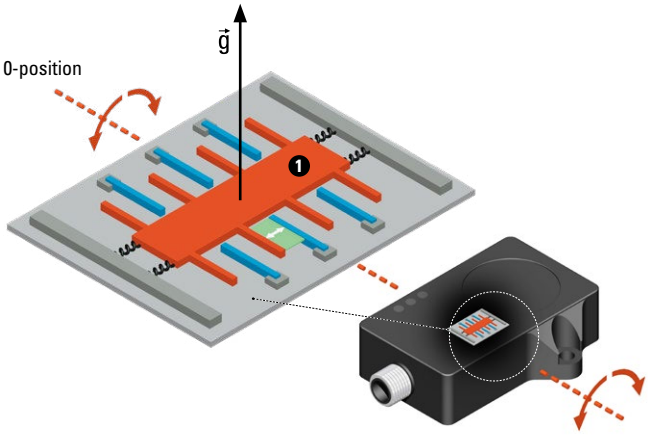
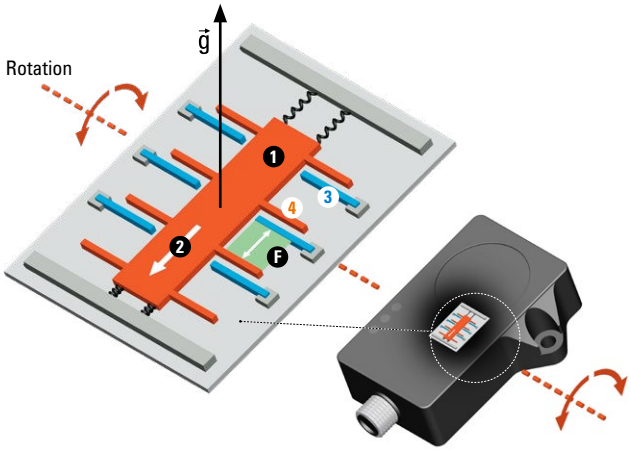
Technology in detail

Exact angular position via acceleration measurement

Acceleration measurement
In the acceleration measuring cell, the absolute angular position is determined capacitively in relation to the gravity acceleration $\vec{g}$.

The displacement ❷ of a test mass ❶ changes the distance and therefore also the capacity Ⓕ between fixed ③ and moving ④ electrodes in the measuring cell. This measured capacity is directly related to the inclination of the sensor.

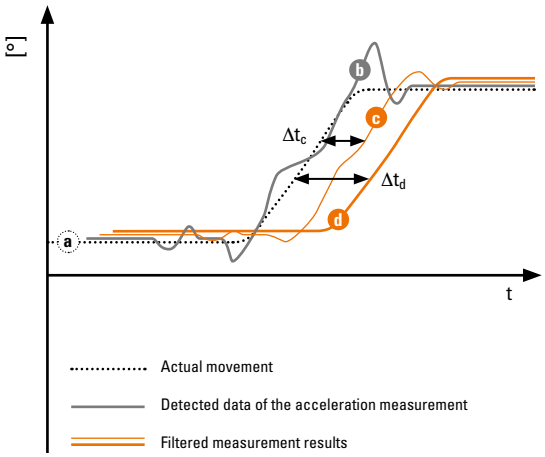




Optimization of the measurement using filter functions
The inertia of the test mass, particularly in the case of fast or rapidly changing rotations and vibrations, can lead to inaccuracies in the detected measurement data ⓑ compared to the actual movement ⓐ. To compensate for these undesirable effects, various filters ⓒ + ⓓ can be parameterized in the inclinometer.

Restrictions due to filters
However, this leads to a time delay ($\Delta t_c + \Delta t_d$) for the output of the measurement result (the more precise the desired measurement, the greater the time delay).

Further optimization with dynamic inclinometers
This time delay is not relevant for many static applications (such as solar panels, crane masts, etc.). In dynamic applications (e.g. vehicles in motion), however, this can lead to problems, as a reaction to the movement can only occur with a delay. In this case, it is advisable to use a dynamic inclinometer IN78 with intelligent sensor fusion from Kübler for further optimization of the measurement result.



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Technology in detail

Easy start-up

Operating status – LED green / red

Permanent light green	Appliance ready for operation Staus CANopen
Permanent light red	Error CANopen

Spirit level function – LED(s) yellow

Permanent light	Center position reached
Blinking with increasing frequency	Approaching the center position
Blinking with decreasing frequency	Move away from center position

1-axis = 3 LEDs

2-axis = 4 LEDs