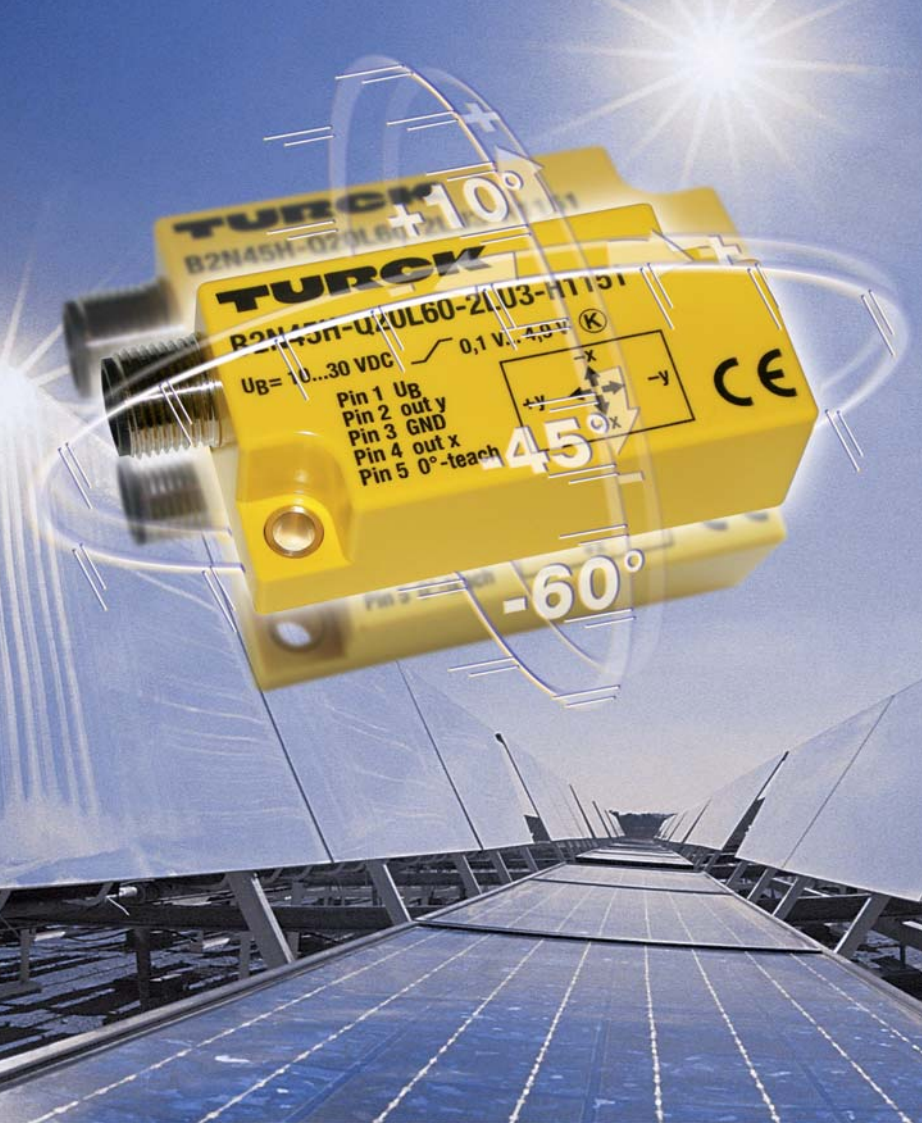# TURCK

Industrial Automation

INCLINOMETERS

Sense it! Connect it! Bus it! Solve it!

Inclinometers - Solutions for many applications

No matter if applied in harvesters, agricultural and construction machinery, in vehicles and airplanes or in machines, robots and solar plants: Sensors for measuring and monitoring inclination are universally applicable and help to improve the safety and efficiency of operation processes.

The TURCK inclinometer series Q20L60 and Q42 are also suitable for fast production sequences and withstand impacts. High precision and sensitivity are guaranteed through a proven micro-mechnical capacitive measuring element. These sensors are not only highly reliable, the rugged design and the easy handling pay off as well.
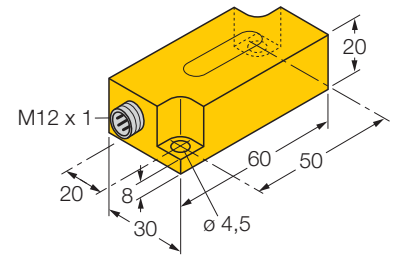
Solution 1:
Biaxial, ±10°, ±45°, ±60° with analog output

The standard product portfolio comprises cuboid-shaped inclinometers Q20L60, biaxial, with angular ranges of ±10°, ±45° and ±60°. They are available with analog voltage, current or ratiometric output.

High accuracy
With a repeatability of 0.1% of the measuring range, the Q20L60 series is the right solution for high-precision applications. Q20L60 and Q42 inclinometers feature a resolution of 0.04°.

Compact versions
The very small Q20L60 as well as the cuboid-shaped version Q42 can be mounted in all utility vehicles, agricultural and forestry machinery, in crane and hoisting technology as well as in the sector of industrial automation.

Solution 2:
Uniaxial, 360° with adjustable measuring range

Is the angular range of standard inclinometers not wide enough? Do you need devices which are individually tailored to your needs? Then choose the versions with extended functionality. They are the perfect solution for you.

Inclinometers that adapt perfectly to your requirements!
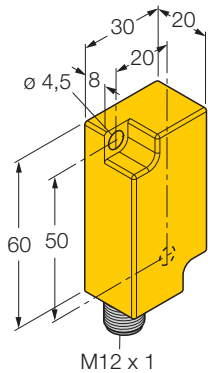
The version with extended functionality permit adjustments of the entire angular range of 360°. The measuring range is easily and securely programmed. The desired range of inclination is taught within seconds with the teach adapter VB2-SP3.

The uniaxial sensor is available as Q20L60 version with analog current or voltage output.

High protection classes
IP68 and IP67:
- 24 hrs. continuous storage at +70 °C
- 24 hrs. continuous storage at -25 °C
- 7 days submersion, depth 1m
- 10 thermal shock changes from +70 °C to -25 °C dwell cycle 1h

Zero point setting
The home position (zero point) is easily set with the teach adapter VB2-SP3. Move the sensor in the wanted position, press the teach adapter for just 1 second and the sensor is calibrated!

Solution 3:
Uniaxial, 360° with two programmable switchpoints

The version with switching output is also adjustable according to the full angular range 0 … 360°. The uniaxial inclinometer Q20L60 features two programmable switchpoints for limit value monitoring.
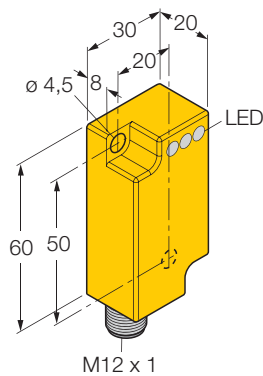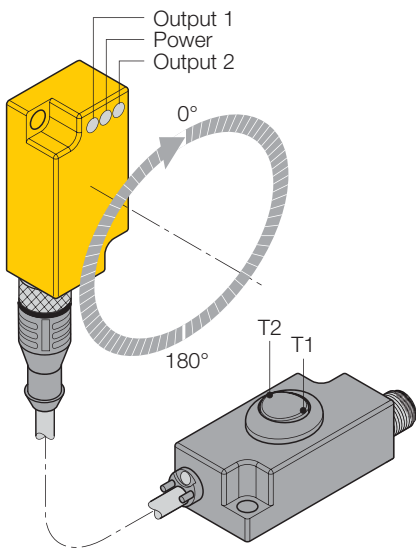
Switch ON/OFF points, travel paths and hysteresis are easily taught at the push of a button, using the teach adapter TX1-Q20L60.

Optimal fitting
The Q20L60 with two bores located diagonally opposite to each other and the Q42 with lateral bores are quickly and securely mounted. You only have to teach the sensors with the teach adapter and it is ready for operation. Further accessories are not required.
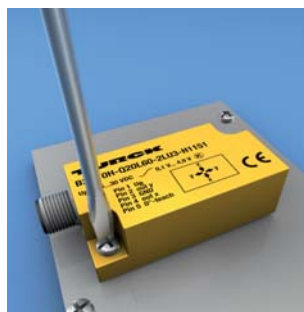
360° full angluar range
The uniaxial inclinometers exploit the full angular range of 360°. The individually needed measuring range is easily set with the teach adapter. Select the start value and press the teach adpater VB2-SP3 for 1 second. Then select the end value and press the teach adapter for 3 seconds.

Solution 4:
Biaxial, ±10°, ±45°, ±60°
with CANopen interface

The newcomer Q42 features a standardized CANopen interface (acc. to CiA DS-301/CiA DSP-410). All measured values and parameters are accessible via the object directory (OV).
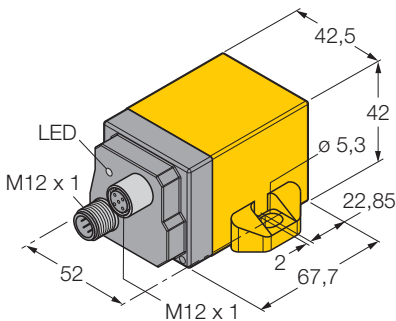
The individual configuration can be stored in the internal non-volatile storage (EEPROM). The following CANopen functions are available:

- Transmit data object (TP01) with four operating modes:
  - Individual polling via Remote-Transmit-Request-Telegram (RTR)
  - Cyclic transmission per time interval
  - Event-driven transmission triggered by angular change
  - Synchronized transmission after receipt of SYNC telegram
- Service-data object (Standard-SDO)
- Error message via emergency object (EMCY) supported by:
  - General error register (Error Register)
  - Manufacturer specific status-register (Manufacturer Status)
  - Error list (Pre-defined Error Field)
- Monitoring functions Heartbeat as well as Nodeguarding/Lifeguarding
- Memory and recovery function of all parameters (Store and Load Parameter Field)

- Indication of status and error via two-color LED (acc. to CiA CR-303-3)
- Adjustement of node ID as well as baud rate via OV
- Freely configurable cutoff frequency (digital filter)
- Configuration of the minimal change of angle for TDO1 send event
- Optional monitoring of internal device temperature
- Direction control of inclination

Programmable switchpoints

The inclinometer with digital output features two switchpoints programmable with the teach adapter TX1-Q20L60. Different positions of crane arms and utility vehicles can be detected and monitored for example.

Compact CANopen interface

Our inclinometers with CANopen interface (CIA DS-301) provide baud rates of 10 kbps up to 1Mbps, high sampling rates and bandwidths as well as a parameterizable vibrostability.

Technology

By inclination is meant, the relative angular tilt to the horizon or perpendicular. Any deviation from this home position (perpendicular) can be detected quickly and precisely with inclination sensors. Inclinometers make use of the local gravity resp. acceleration of gravity for the measurement of angular tilt. The measuring principle is similar to that of perpendicular drop, whereby the mass is directly related to the gravitational field (vector field). Following this principle, inclinometers use mechanical pendulums, bending beams or liquids like in water-levels.

The TURCK inclinometers incorporate a micro-mechanical pendulum based on MEMS technology (Mikro Elektro Mechanic Systems). The core piece is a micro-mechanical capacitive sensor element. A plate capacitor is composed of two parallely arranged conductive plate electrodes. If DC voltage is applied on both plates they are charged until the potential difference between the two plates is equal to the applied voltage. Thereby the stored voltage in the capacitor is proportional to the applied voltage. The quotient of both measurements is called capacitance.

A capacitive accelerometer basically consists of two parallely arranged 'plate' electrodes with a dielectric placed in the middle. If the sensor is accelerated, the dielectric in the middle moves and the capacitance ratio between both electrodes changes.

The deflexion caused by acceleration produces a measurable change of capacitance between the resilient element and the related electrode.
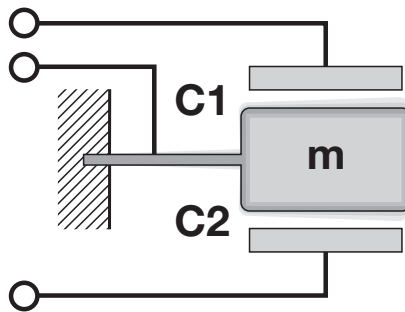
The dielectric in inclinometers made by TURCK is designed as a resilient pendulum. These sensors operate as spring-mass systems, whereby the springs and mass are made of silicon. The springs are bar-shaped and only measure a few microns.
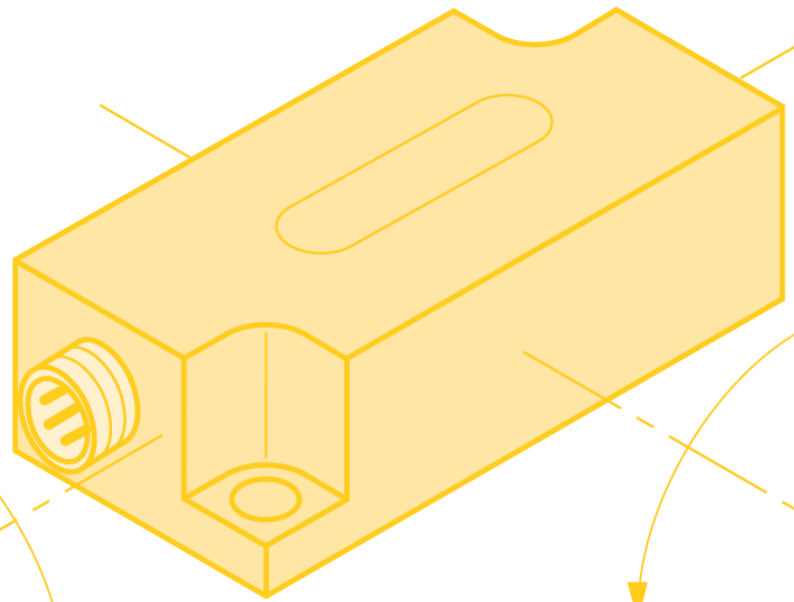
Product range

Our solutions for your requirements

Biaxial with analog output
- ±10°, ±45°, ±60°
- Current 4 … 20 mA
- Voltage 0.1 … 4.9 V
- Ratiometric voltage
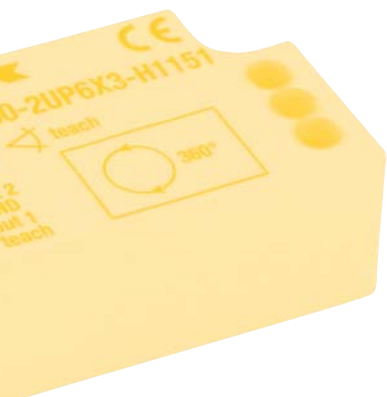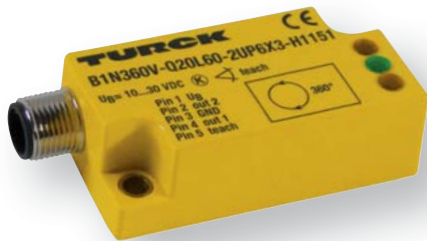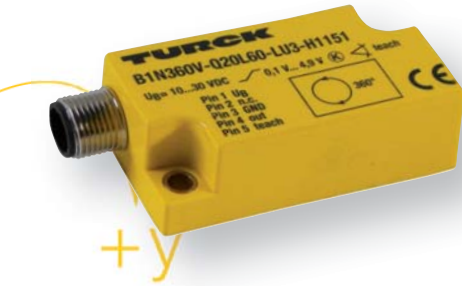
Uniaxial 360° with analog output
- Current 4 … 20 mA
- Voltage 0.1 … 4.9 V
- Measuring range, adjustable

Uniaxial 360° with two switchpoints
- Two switchpoints, adjustable
- Hysteresis, adjustable
- Travel path, adjustable
- Switch state indication by LEDs

Biaxial with CANopen interface
- ±10°, ±45°, ±60°

Order your new inclinometer today!

TURCK

Type code	Angular range	Reso-lution	Output	
B2N10H-Q20L60-2LI2-H1151	±10°	≤ 0,04°	4…20 mA	Biaxial, analog output
B2N45H-Q20L60-2LI2-H1151	±45°	≤ 0,1°		
B2N60H-Q20L60-2LI2-H1151	±60°	≤ 0,14°		
B2N10H-Q20L60-2LU3-H1151	±10°	≤ 0,04°	0.1 … 49 V	Biaxial, analog output
B2N45H-Q20L60-2LU3-H1151	±45°	≤ 0,1°		
B2N60H-Q20L60-2LU3-H1151	±60°	≤ 0,14°		
B2N10H-Q20L60-2LU5-H1151	±10°	≤ 0,04°	ratiometric	Biaxial, analog output
B2N45H-Q20L60-2LU5-H1151	±45°	≤ 0,1°		
B2N60H-Q20L60-2LU5-H1151	±60°	≤ 0,14°		
B1N360V-Q20L60-LI2-H1151	360°	≤ 0,14°	4…20 mA	Uniaxial 360°, analog output, adjustable measuring range
B1N360V-Q20L60-2LU3-H1151	360°	≤ 0,14°	0.1 … 4.9 V	Uniaxial 360°, analog output, adjustable measuring range
B1N360V-Q20L60-2UP6X3-H1151	360°	≤ 0,14°	digital PNP NC/NO progra-mable	Uniaxial 360°, adjustable switchpoints
B2N10H-Q42-CNX2-2H1150	±10°	≤ 0,05°	analog, CANopen interface	Biaxial
B2N45H-Q42-CNX2-2H1150	±45°	≤ 0,1°		
B2N60H-Q42-CNX2-2H1150	±60°	≤ 0,1°		

- Connection: M12 x 1 connector
- Supply voltage: 10 … 30 VDC, except for ratiometric voltage: 4.75 … 5.25 VDC
- Protection class: IP68

www.turck.com