TURCK

Industrial
Automation

CAPACITIVE SENSORS

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

S1683/01

THE COMPANY

Turck is globally one of the leading companies in the field of industrial automation. The family run company has a turnover of nearly 300 million Euros with over 2600 employees in 25 countries as well as agencies in another 60 countries. With superior products and tailored solutions for production and process automation TURCK has been continuously setting new standards for over 40 years.

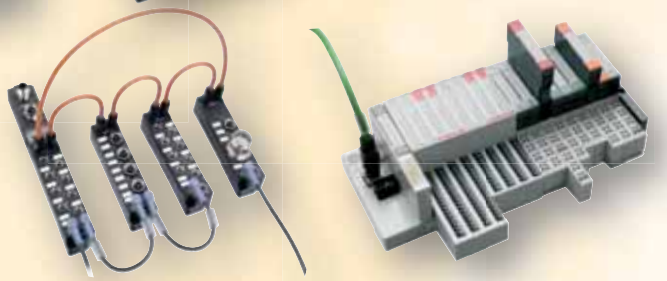
The international focus of the company started as early as 1975 with the founding of TURCK Inc. in Minneapolis, USA.

With state-of-the-art production facilities in Germany, Switzerland, the USA, Mexico and China, TURCK is now able to adapt itself worldwide to local market conditions. Despite the company's international activities, the core competences and central production facilities of the company are in Germany and shall remain so in the future.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

TURCK

Industrial Automation



THE PROGRAM

With over 13000 products for sensor, interface, connector and fieldbus technology, TURCK offers a comprehensive product range for manufacturing and process automation. *uprox*®+ inductive factor 1 sensor, the modular IP67 I/O system BL67 and excom®. No matter whether for machine & system engineering, the automotive sector, transport & handling, food & beverage or for chemical and pharmaceutical industries: TURCK products enhance the availability of your systems by using absolutely reliable technologies. Furthermore, they contribute to cost savings in purchase, inventory management, installation and maintenance processes through effective standardisation.

Capacitive sensors – Type codes

BCF5 – M12 – AP6X2 – H1141 / S..

Nominal switching distance [mm]

Special background suppression
F Filter

Function principle
C Capacitive

Mounting
B Flush
N Non-flush

Special option code
S90 Proximity switch with PUR cable
S100 Extended temperature range up to 100 °C
S250 Preset sensitivity

Factory code
1 Standard wiring

Number of contacts

Mechanical design
1 straight
3 straight with adapter

AP6X2

Connector type
H1 Type M12 x 1
V1 Type M8 x 1
B3 Type 1/2“

Function display
X LED
X2 2 LEDs

Voltage range
3 20...250 VAC
4 10…65 VDC
6 10…30 VDC

Output
N npn output
P pnp output
Z 2-wire AC

Function
A Normally open (N.O.)
F Connection programmable
R Normally closed (N.C.)
V Complementary outputs
Y0 DIN EN 60947-5-6 (NAMUR)
Y1 NAMUR ATEX approval

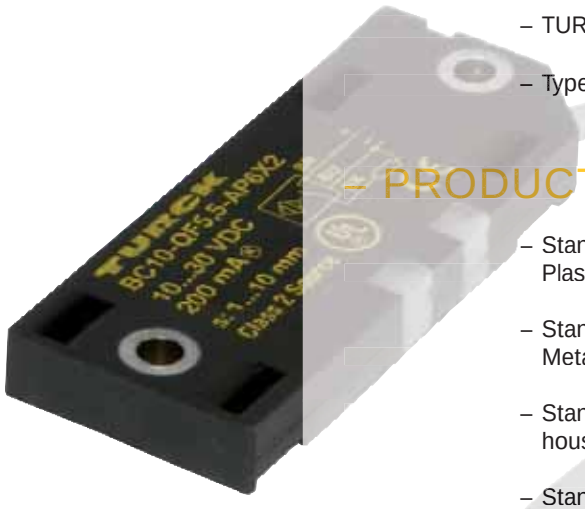
M12

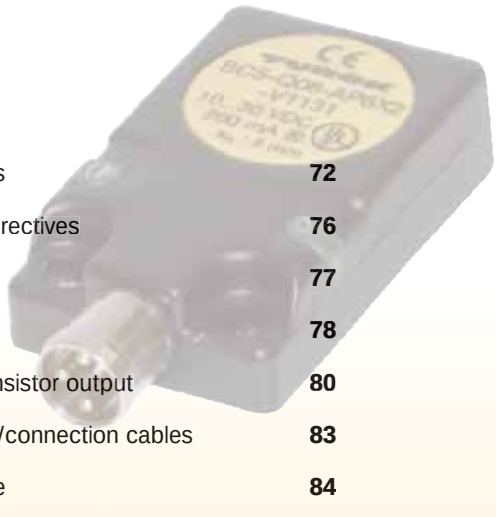
Series
CP40 Type (40 x 40)
CP80 Type (80 x 80)
K Smooth plastic barrel
KT Smooth teflon barrel
M Chrome plated brass barrel, Partly threaded
P Plastic barrel, fully threaded Thread
PT Teflon barrel, fully threaded
Q Rectangular plastic housing
QF Rectangular plastic housing, flat style
Q20L60 Type (20 x 60)
S Plastic barrel, partly threaded Thread
SR Terminal chamber chamber with straight or angled cable exit

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Capacitive sensors – Table of contents

TURCK
Industrial Automation





Capacitive sensors –
Standard, cylindrical housing styles (Plastic)

Capacitive sensors are non-contact and isolated sensors. Both electrically conductive and non-conductive materials can be detected reliably. Capacitive sensors are therefore also suitable for applications in which inductive sensors would not work.

A typical application of capacitive sensors is distance and position measuring, such as the measuring of bending, thickness, level, eccentricity, concentricity, distortion, wear and vibrations.

Regardless of whether a metal or a plastic housing is used: The standard cylinder housings with a diameter of 12 to 40 mm are available with outstandingly high switching distances and a wide product range.

Automatic humidity compensation

Interference caused by humidity or dew are automatically excluded.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S12 	60 x ∅ 12 mm	a / b , 4.5	© , PNP	BC3-S12-AP6X	2601200	Cable 2 m
	60 x ∅ 12 mm	a / b , 4.5	© , NPN	BC3-S12-AN6X	2601300	Cable 2 m
	60 x ∅ 12 mm	a / b , 4.5	© , PNP	BC3-S12-RP6X	2601202	Cable 2 m
S18 	70 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-S18-AP4X	25030	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	© , NPN	BC5-S18-AN4X	25031	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	¨ , PNP	BC5-S18-RP4X	2503020	Cable 2 m
	60 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-S18-AP4X-H1141/S250	2503602	Connector M12 x 1
	60 x ∅ 18 mm	a / b , 7.5	© , NPN	BC5-S18-AN4X-H1141/S250	2503108	Connector M12 x 1
	60 x ∅ 18 mm	a / b , 7.5	¨ , PNP	BC5-S18-RP4X-H1141/S250	2601209	Connector M12 x 1
S30 	63 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-S30-VP4X	2506110	Cable 2 m
	63 x ∅ 30 mm	a / b , 15	ª , NPN	BC10-S30-VN4X	2506000	Cable 2 m
	91 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-S30-VP4X-H1141	2506100	Connector M12 x 1
	91 x ∅ 30 mm	a / b , 15	ª , NPN	BC10-S30-VN4X-H1141	2506010	Connector M12 x 1
P30SR 	115 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-P30SR-VP4X2	25050	Terminal chamber
	115 x ∅ 30 mm	a / b , 15	ª , NPN	BC10-P30SR-VN4X2	25051	Terminal chamber
K34 	80 x ∅ 34 mm	a / b , 15	ª , PNP	BC15-K34-VP4X	2502124	Cable 2 m
	80 x ∅ 34 mm	a / b , 15	ª , NPN	BC15-K34-VN4X	2502127	Cable 2 m
	74.5 x ∅ 34 mm	a / b , 15	© , PNP	BC15-K34-AP4X-H1141	2502126	Connector M12 x 1
	74.5 x ∅ 34 mm	a / b , 15	© , NPN	BC15-K34-AN4X-H1141	2502125	Connector M12 x 1
	80 x ∅ 34 mm	b , 20	ª , PNP	NC20-KT34-VP4X2	2550300	Cable 2 m
	80 x ∅ 34 mm	b , 20	ª , NPN	NC20-KT34-VN4X2	2550100	Cable 2 m
K40SR 	90 x ∅ 40 mm	a / b , 30	ª , PNP	BC20-K40SR-VP4X2	25100	Terminal chamber
	90 x ∅ 40 mm	a / b , 30	ª , NPN	BC20-K40SR-VN4X2	25101	Terminal chamber
	90 x ∅ 40 mm	a / b , 30	ª , PNP	BC20-K40SR-VP4X2	25100	Terminal chamber
	90 x ∅ 40 mm	a / b , 30	ª , NPN	BC20-K40SR-VN4X2	25101	Terminal chamber
	90 x ∅ 40 mm	a / b , 30	ª , NPN	BC20-K40SR-VN4X2-H1141	2510104	Connector M12 x 1

Detailed technical data is provided from page 28.

Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors – Standard, cylindrical housing styles (Metal)

As well as the usual level of reliability, each capacitive sensor comes standard with features such as automatic humidity compensation, outstanding EMC performance, ESD resistance and maximum mounting flexibility. The flush mountable sensors generate a virtually straight detection field.

Sensor variants in all standard housing styles and connection options (cable, connector, Terminal chamber chamber) are available. A wide range of versions in different materials can be selected for special environmental conditions of the application concerned.

Automatic humidity compensation

Interference caused by humidity or dew are automatically excluded.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

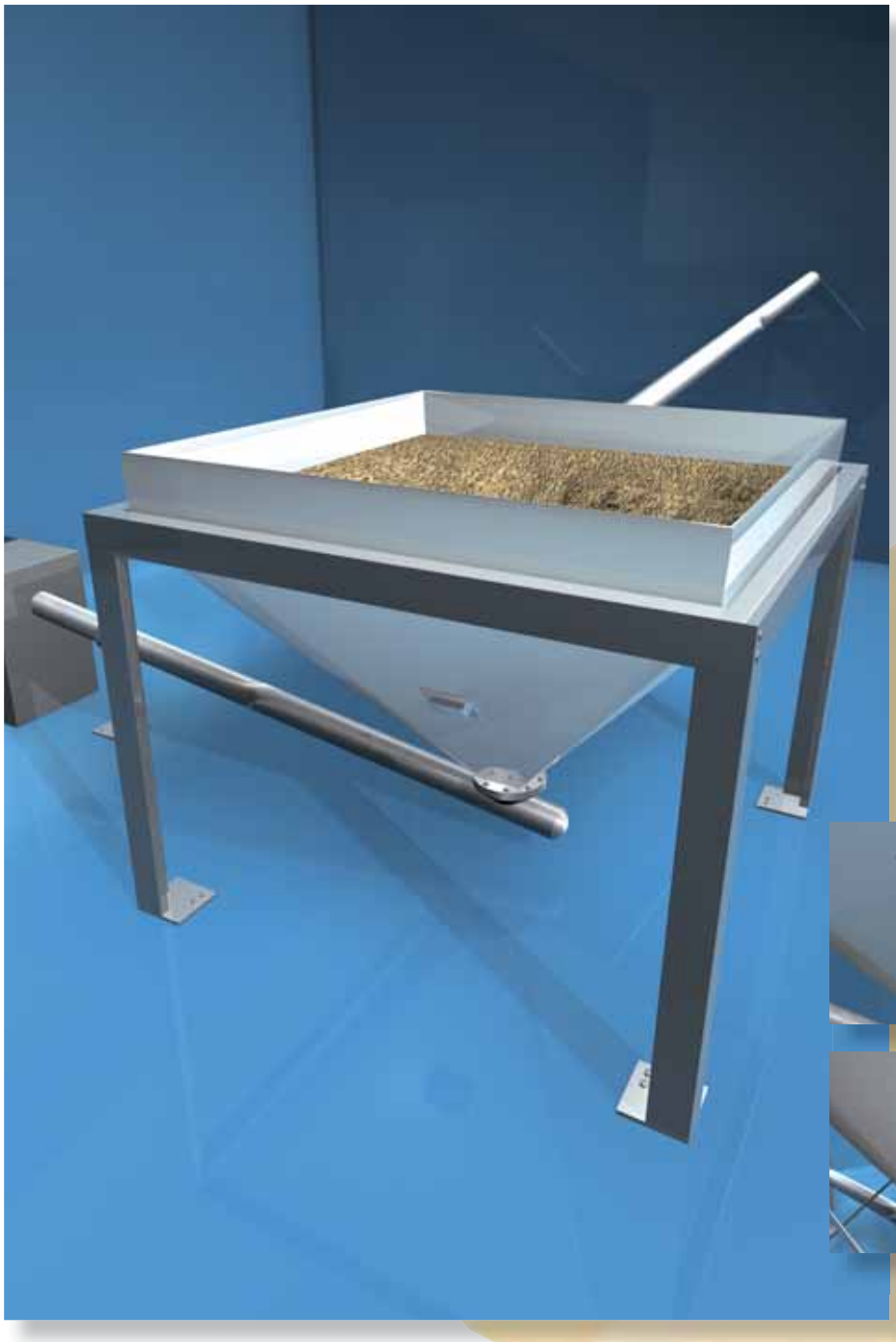
	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
M12 	60 x ∅ 12 mm	a / b , 4.5	© , PNP	BC3-M12-AP6X	2601000	Cable 2 m
	60 x ∅ 12 mm	a / b , 4.5	© , NPN	BC3-M12-AN6X	2601100	Cable 2 m
	60 x ∅ 12 mm	a / b , 4.5	¨ , PNP	BC3-M12-RP6X	2601103	Cable 2 m
M18 	70 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-M18-AP4X	2504001	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	© , NPN	BC5-M18-AN4X	2504002	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-M18-RP4X	2504026	Cable 2 m
	60 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-M18-AP4X-H1141/S250	2504024	Connector M12 x 1
	60 x ∅ 18 mm	a / b , 7.5	© , NPN	BC5-M18-AN4X-H1141/S250	2504025	Connector M12 x 1
	60 x ∅ 18 mm	a / b , 7.5	¨ , PNP	BC5-M18-RP4X-H1141/S250	2504023	Connector M12 x 1
M30 	81 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-M30-VP4X	25020	Cable 2 m
	81 x ∅ 30 mm	a / b , 15	ª , NPN	BC10-M30-VN4X	25021	Cable 2 m
	81 x ∅ 30 mm	a / b , 15	ª , NPN	BC10-M30-VN4X-H1141	2502120	Connector M12 x 1
	81 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-M30-VP4X-H1141	2502010	Connector M12 x 1

Detailed technical data is provided from page 34.

Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors –
Standard - rectangular housing styles



Capacitive sensors with rectangular housing styles offer an extremely compact solution. These sensors also offer outstandingly simple and uncomplicated mounting. This makes it possible for the prescribed metal-free zones to be considerably smaller.

In this way, the sensors simplify design on the one hand and increase the availability of your plant on the other. Another benefit for you – you save time and money.

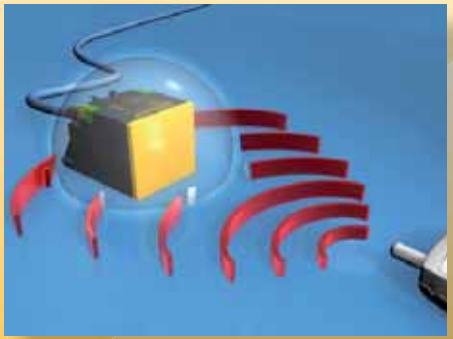
Technology
in a limited space

The implementation of high quality components in a compact and stable housing allows us to offer you as yet unknown installation and detection options.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
Q08 	32 x 20 x 8 mm	a / b , 5	© , PNP	BC5-Q08-AP6X2/S250	26200	Cable 2 m
	32 x 20 x 8 mm	a / b , 5	© , NPN	BC5-Q08-AN6X2/S250	26201	Cable 2 m
	32 x 20 x 8 mm	a / b , 5	¨ , PNP	BC5-Q08-RP6X2/S250	2530108	Cable 2 m
	32 x 20 x 8 mm	a / b , 5	© , PNP	BC5-Q08-AP6X2-V1131/S250	26210	Connector Ø8 mm
	32 x 20 x 8 mm	a / b , 5	© , NPN	BC5-Q08-AN6X2-V1131/S250	26211	Connector Ø8 mm
	32 x 20 x 8 mm	a / b , 5	¨ , PNP	BC5-Q08-RP6X2-V1131/S250	2620152	Connector Ø8 mm
Q10 	42 x 25 x 10.8 mm	a / b , 8	© , PNP	BC8-Q10-AP6X2/S250	2621200	Cable 2 m
	42 x 25 x 10.8 mm	a / b , 8	© , NPN	BC8-Q10-AN6X2/S250	2621203	Cable 2 m
	42 x 25 x 10.8 mm	a / b , 8	¨ , PNP	BC8-Q10-RP6X2/S250	2621205	Cable 2 m
	42 x 25 x 10.8 mm	a / b , 8	© , PNP	BC8-Q10-AP6X2-V1131/S250	2621201	Connector M8 x 1
	42 x 25 x 10.8 mm	a / b , 8	© , NPN	BC8-Q10-AN6X2-V1131/S250	2621202	Connector M8 x 1
	42 x 25 x 10.8 mm	a / b , 8	¨ , PNP	BC8-Q10-RP6X2-V1131/S250	2621204	Connector M8 x 1
Q14 	52 x 30 x 14 mm	a / b , 10	© , PNP	BC10-Q14-AP4X2	2530001	Cable 2 m
	52 x 30 x 14 mm	a / b , 10	© , NPN	BC10-Q14-AN4X2	2530010	Cable 2 m
	52 x 30 x 14 mm	a / b , 10	¨ , PNP	BC10-Q14-RP4X2	2530014	Cable 2 m
	52 x 30 x 14 mm	a / b , 10	© , PNP	BC10-Q14-AP4X2-V1131	2530002	Connector M8 x 1
	52 x 30 x 14 mm	a / b , 10	© , NPN	BC10-Q14-AN4X2-V1131	2530011	Connector M8 x 1
Q20 	68 x 40 x 20 mm	a / b , 20	© , PNP	BC20-Q20-AP4X2	2530100	Cable 2 m
	68 x 40 x 20 mm	a / b , 20	© , NPN	BC20-Q20-AN4X2	2530110	Cable 2 m
	68 x 40 x 20 mm	a / b , 20	¨ , PNP	BC20-Q20-RP4X2	2530106	Cable 2 m
	52 x 30 x 20 mm	a / b , 20	¨ , PNP	BC20-Q20-RP4X2-V1131	2501007	Connector M8 x 1
	68 x 40 x 20 mm	a / b , 20	© , PNP	BC20-Q20-AP4X2-H1141	2530101	Connector M12 x 1
	68 x 40 x 20 mm	a / b , 20	© , NPN	BC20-Q20-AN4X2-H1141	2530111	Connector M12 x 1
	68 x 40 x 20 mm	a / b , 20	¨ , PNP	BC20-Q20-RP4X2-H1141	2530107	Connector M12 x 1
QF5,5 	50 x 20.3 x 5.5 mm	a / b , 10	© , PNP	BC10-QF5,5-AP6X2	2620117	Cable 2 m
	50 x 20.3 x 5.5 mm	a / b , 10	© , NPN	BC10-QF5,5-AN6X2	2620121	Cable 2 m
	50 x 20.3 x 5.5 mm	a / b , 10	© , PNP	BC10-QF5,5-AP6X2/S250	2620115	Cable 2 m
	50 x 20.3 x 5.5 mm	a / b , 5	© , PNP	BC5-QF5,5-AP6X2/S250	2620116	Cable 2 m
CP40 	114 x 40 x 40 mm	a / b , 20	ª , PNP	BC20-CP40-VP4X2	25160	Terminal chamber
	114 x 40 x 40 mm	a / b , 20	ª , NPN	BC20-CP40-VN4X2	25161	Terminal chamber
	114 x 40 x 40 mm	a / b , 20	ª , PNP	BC20-CP40-VP4X2-H1141	2516102	Connector M12 x 1
CP80 	80 x 80 x 40.5 mm	b , 50	ª , PNP	NC50-CP80-VP4X2	2580202	Terminal chamber
	80 x 80 x 40.5 mm	b , 50	ª , NPN	NC50-CP80-VN4X2	2580102	Terminal chamber
	80 x 80 x 40.5 mm	b , 50	ª , PNP	NC50-CP80-VP4X2-H1141	2580400	Connector M12 x 1

Detailed technical data is provided from page 38.



Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors – Standard BCF

In difficult applications conventional sensors don't offer sufficient detection reliability. Particularly with conductive coatings, detection problems can occur that may cause total failures.

This source of errors can now be excluded thanks to the new switching technology of the BCF sensors combined with electrode and compensation optimisation.

The potentiometer with which the switching distance is set on conventional capacitive sensors is located in the sensitive generator area. This has the disadvantage that the sensor is very sensitive to RF interference and other interference sources. TURCK capacitive sensors are therefore always designed with the potentiometer located in a less sensitive area of the circuit.

Additional protective measures are mostly required for environments in which extreme interference is present. The BCF series offers the following solution: All sensors of this series are fully resistant to radiated and conducted RF interference, burst interference, and electrostatic discharge (ESD).

- Detection reliability also with difficult applications
- Increased EMC performance (also with high frequency technology)

New background suppression

Capacitive sensors react to all materials with a dielectric constant ε_r higher than 1. A so-called compensation probe was integrated in order to prevent the detection of dirt deposits and humidity on the active surface of the sensor. The electrode enables a signal to be generated in the close proximity of the sensor surface that counteracts the main signal. This therefore produces an area close to the electrode in which targets may be located (i.e. also dirt and humidity) that are not detected by the sensor. Thanks to a new type of circuit technology, this background suppression can also function correctly with conductive films.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S18 	70 x ∅ 18 mm	a / b , 7.5	© , PNP	BCF5-S18-AP4X	250301	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	© , NPN	BCF5-S18-AN4X	2503012	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	¨ , NPN	BCF5-S18-RN4X	2503008	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	¨ , PNP	BCF5-S18-RP4X/S90	2503006	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	© , PNP	BCF5-S18-AP4X/S90	2503014	Cable 2 m
	60 x ∅ 18 mm	a / b , 7.5	© , PNP	BCF5-S18-AP4X-H1141/S250	2503010	Connector M12 x 1
	60 x ∅ 18 mm	a / b , 7.5	© , NPN	BCF5-S18-AN4X-H1141/S250	2503016	Connector M12 x 1
S30 	63 x ∅ 30 mm	a / b , 15	ª , PNP	BCF10-S30-VP4X	2506111	Cable 2 m
	63 x ∅ 30 mm	a / b , 15	ª , NPN	BCF10-S30-VN4X	2506011	Cable 2 m
	91 x ∅ 30 mm	a / b , 15	ª , PNP	BCF10-S30-VP4X-H1141	2506117	Connector M12 x 1
	91 x ∅ 30 mm	a / b , 15	ª , NPN	BCF10-S30-VN4X-H1141	2506016	Connector M12 x 1
K34 	80 x ∅ 34 mm	a / b , 15	¨ , PNP	BCF15-K34-RZ3X	2502135	Cable 2 m
	80 x ∅ 34 mm	a / b , 15	© , PNP	BCF15-K34-AZ3X	2502136	Cable 2 m
Q20L60 	60 x 30 x 20 mm	b , 10	© , PNP	BCF10-Q20L60-AP4X	2504028	Cable 2 m
	60 x 30 x 20 mm	b , 10	© , PNP	BCF10-Q20L60-AP4X-H1141	2504027	Connector M12 x 1

Detailed technical data is provided from page 46.

Increased EMC performance

In addition to the requirements of EN 60947-5-2, TURCK capacitive sensors are also resistant to radiated and conducted RF and burst interference, as well as ESD.

Capacitive sensors – Chemically resistant sensors

The PVDF (polyvinylidenefluoride) high-performance plastic combines outstanding chemical resistance with good mechanical properties. PVDF materials belong to the group of so-called fluoride plastics and offer a high mechanical strength on account of their high fluoride content, a high resistance to creep under a continuous load, good temperature characteristics and a high temperature resistance.

The Dyflor (PVDF) capacitive sensors are the ideal solution for any application in the pharmaceutical, chemical or food industry. The proven and innovative sensor features help optimise all kinds of applications, for instance, in dairies, breweries, the manufacture of bakery products and frozen foods, or in the packaging and filling of foods.

Resistant

The “Chemically Resistant Sensors” series consists of sensors made from materials that are resistant to all common acid and alkaline cleaning agents and disinfectants. This therefore prevents the occurrence of damage through the use of aggressive cleansers.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S185 	74.5 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-S185-AP4X	25035	Cable 2 m
PT30 	80 x ∅ 30 mm	a / b , 15	[a] , PNP	BC10-PT30-VP4X2	2507010	Cable 2 m
	80 x ∅ 30 mm	a / b , 15	[a] , NPN	BC10-PT30-VN4X2	2507020	Cable 2 m
	80 x ∅ 30 mm	a / b , 15	NAMUR	BC10-PT30-Y0X	2020000	Cable 2 m

Detailed technical data is provided from page 50.

Automatic humidity compensation

Interference caused by humidity or dew are automatically excluded.

Capacitive sensors –
Sensors for high temperature ranges

An increasing number of applications require sensors to be resistant to temperatures outside of the standard range of -25 °C …+70 °C. Appropriate solutions are implemented by means of suitable temperature resistant components and ingeniously designed passive cooling concepts that are internally and externally fan free.

If components are not specified for the required range, they must be able to withstand artificial aging in the laboratory at the appropriate temperature. Only those modules that can pass these tests are used.

The capacitive sensors of the “high temperature” programme are designed for an extended temperature range: from -25 °C...+100 °C.

Extended temperature range (-25 °C ... +100 °C)

In response to the growing demand for sensors with an increased temperature range, TURCK has developed sensors optimally tailored to these requirements.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

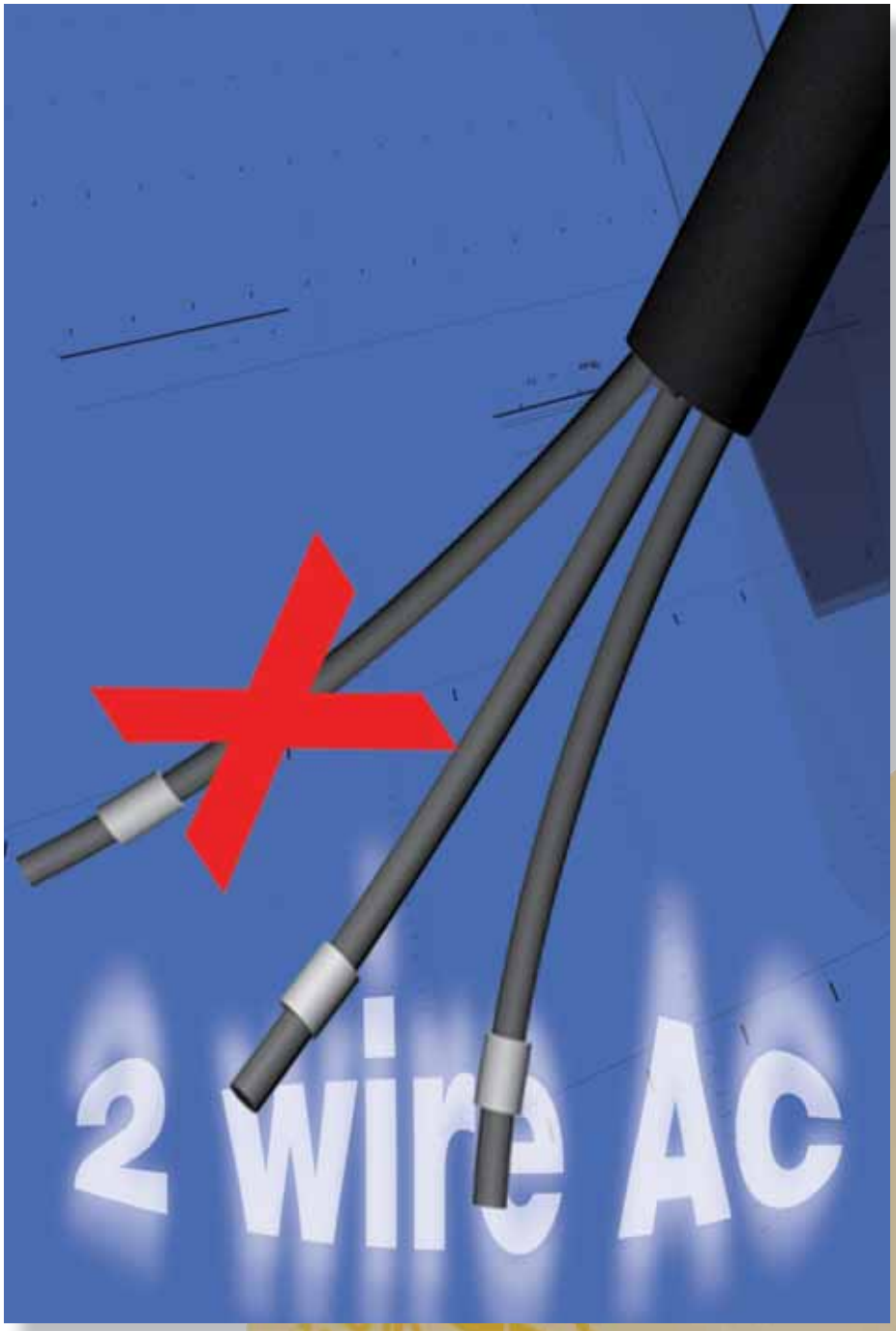
	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S12 	60 x ∅ 12 mm	a / b , 4.5	© , PNP	BC3-S12-AP6X/S100	2601201	Cable 2 m
S18 	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S18-Y1X/S100	2006021	Cable 2 m
S185 	74.5 x ∅ 18 mm	a / b , 7.5	© , PNP	BC5-S185-AP4X/S100	2503502	Cable 2 m
	74.5 x ∅ 18 mm	a / b , 7.5	© , NPN	BC5-S185-AN4X/S100	2503551	Cable 2 m

Detailed technical data is provided from page 52.

Automatic humidity compensation

Interference caused by humidity or dew are automatically excluded.

Capacitive sensors –
Standard AC 2-wire sensors



Two-wire switching elements can normally be used in all areas where mechanical switches are used. The advantage compared to three-wire switching elements is the reduced wiring required.

The wide range of AC 2-wire sensors rounds off the capacitive sensor programme perfectly.

Automatic humidity compensation

Interference caused by humidity or dew are automatically excluded.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S18 	70 x ∅ 18 mm	a / b , 7.5	©	BC5-S18-AZ3X	2305500	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	¨	BC5-S18-RZ3X	2305400	Cable 2 m
M18 	70 x ∅ 18 mm	a / b , 7.5	©	BC5-M18-AZ3X	2305000	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	¨	BC5-M18-RZ3X	2305100	Cable 2 m
	83 x ∅ 18 mm	a / b , 7.5	©	BC5-M18-AZ3X-B3331/S250	2305001	Connector 1/2“
	83 x ∅ 18 mm	a / b , 7.5	¨	BC5-M18-RZ3X-B3331/S250	2305101	Connector 1/2“
S30 	63 x ∅ 30 mm	a / b , 15	©	BC10-S30-AZ3X	2310700	Cable 2 m
	63 x ∅ 30 mm	a / b , 15	¨	BC10-S30-RZ3X	2310800	Cable 2 m
	63 x ∅ 30 mm	a / b , 15	©	BCF10-S30-AZ3X	2506015	Cable 2 m
	63 x ∅ 30 mm	a / b , 15	¨	BCF10-S30-RZ3X	2506013	Cable 2 m
	91 x ∅ 30 mm	a / b , 15	©	BC10-S30-AZ3X-B3131	2310710	Connector 1/2“
	91 x ∅ 30 mm	a / b , 15	©	BCF10-S30-AZ3X-B3131	2506012	Connector 1/2“
	91 x ∅ 30 mm	a / b , 15	¨	BCF10-S30-RZ3X-B3131	2506014	Connector 1/2“
	91 x ∅ 30 mm	a / b , 15	¨	BC10-S30-RZ3X-B3131	2310810	Connector 1/2“
M30 	81 x ∅ 30 mm	a / b , 15	©	BC10-M30-AZ3X	23100	Cable 2 m
	81 x ∅ 30 mm	a / b , 15	¨	BC10-M30-RZ3X	23098	Cable 2 m
	80 x ∅ 30 mm	a / b , 15	©	BC10-M30-AZ3X-B3131	2310030	Connector 1/2“
	80 x ∅ 30 mm	a / b , 15	¨	BC10-M30-RZ3X-B3131	2310100	Connector 1/2“
P30SR 	115 x ∅ 30 mm	a / b , 15	program.	BC10-P30SR-FZ3X2	23104	Terminal chamber
K34 	80 x ∅ 34 mm	a / b , 15	©	BCF15-K34-AZ3X	2502136	Cable 2 m
	80 x ∅ 34 mm	a / b , 15	¨	BCF15-K34-RZ3X	2502135	Cable 2 m
	80 x ∅ 34 mm	a / b , 15	©	BC15-K34-AZ3X	2310008	Cable 2 m
	80 x ∅ 34 mm	a / b , 15	¨	BC15-K34-RZ3X	2310110	Cable 2 m
K34SR 	106 x ∅ 34 mm	a / b , 15	program.	BC15-K34SR-FZ3X2	2310009	Terminal chamber
K40SR 	90 x ∅ 40 mm	a / b , 30	program.	BC20-K40SR-FZ3X2	23103	Terminal chamber
CP80 	80 x 80 x 40.5 mm	b , 50	program.	NC50-CP80-FZ3X2	2310600	Terminal chamber

Detailed technical data is provided from page 54.

Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors – Standard NAMUR

NAMUR sensors are polarised 2-wire sensors that change their internal resistance (continuous linear/current characteristics) depending on the distance from the target. They are designed for connection to external switching amplifiers which convert the current changes into a binary output signal.

Advantages of NAMUR sensors

- Usable in explosion hazardous areas in conjunction with an approved switching amplifier
- Optional permanent wire-breakage and short-circuit detection via switching amplifier

Ex-area approved.

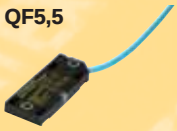
Zone 0
This is an area in which dangerous explosive atmospheres consisting of a mixture of air and flammable gases, vapours or mists are present continuously, frequently or for long periods.

Zone 1
This is an area in which dangerous explosive atmospheres consisting of a mixture of air, flammable gases, vapours or mists may form occasionally.

Sensor monitoring integrated

NAMUR sensors used with switching amplifiers enable continuous wire-break and short-circuit monitoring.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

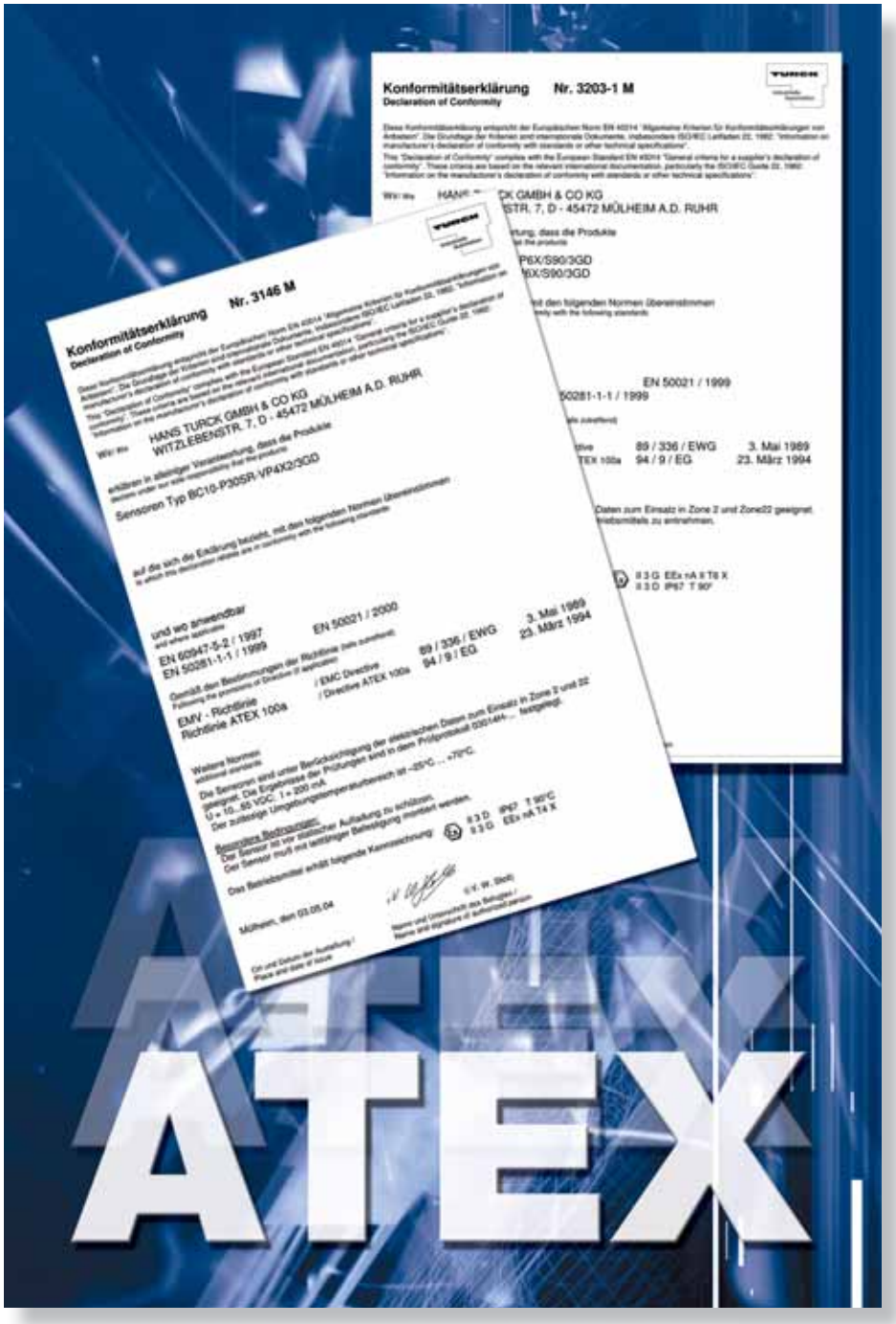
	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S18 	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S18-Y1X	20060	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S18-Y1X/S100	2006021	Cable 2 m
S185 	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S185-Y0X/S90 4M	2003522	Cable 4 m
S30 	63 x ∅ 30 mm	a / b , 15	NAMUR	BC10-S30-Y1X	20100	Cable 2 m
PT30 	80 x ∅ 30 mm	a / b , 15	NAMUR	BC10-PT30-Y0X	2020000	Cable 2 m
QF5,5 	50 x 20.3 x 5.5	a / b , 5	NAMUR	BC5-QF5,5-Y1X/S250	2030000	Cable 2 m

Detailed technical data is provided from page 62.

Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors – Sensors for the Ex area



Capacitive sensors with ATEX approval are now indispensable in many applications. They are used in plants in the chemical and petrochemical industry, in the pharmaceutical industry, in mills and in processing plants for food and animal feed.

ATEX stands for ATmosphere EXplosive and requires that the employer and/or user, prevents the occurrence of explosions and ensures that sufficient protection is provided. With regard to explosion protection in a potentially explosive atmosphere, the ATEX Directive 94/9/EC and 1999/92/EC have priority over machinery directives and must be applied.

Category II 3 G, (Gas Ex Zone 2)
This is an area in which dangerous explosive atmospheres consisting of a mixture of air and flammable gases, vapours or mists do not normally occur or only temporarily.

Category II 3 D (Dust Ex Zone 22)
This is an area in which dangerous explosive atmospheres in the form of flammable dust contained in the air normally do not occur or only occur temporarily.

Zone 0
This is an area in which dangerous explosive atmospheres consisting of a mixture of air and flammable gases, vapours or mists are present continuously, frequently or for long periods.

Zone 1
This is an area in which dangerous explosive atmospheres consisting of a mixture of air, flammable gases, vapours or mists may form occasionally.

ATEX approval

The non-intrinsically safe 3-wire sensors are approved for use in explosion hazardous areas:
Zone 2 (gases, vapours and mists)
Category II 3 G: Zone 22 (non-conductive dusts)
Category II 3 D: The requirements of directive 94/9/EC 94/9/EC are fulfilled.
The sensors thus make a contribution to increased safety!

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Dimensions	Mounting conditions/ Sensing range S_n	Output	Type	Ident no.	Connection
S12 	60 x ∅ 12 mm	a / b , 4.5	¨ , PNP	BC3-S12-RP6X/S90/3GD	2601204	Cable 2 m
M12 	60 x ∅ 12 mm	a / b , 4.5	© , PNP	BC3-M12-AP6X/S90/3GD	2601003	Cable 2 m
P30SR 	115 x ∅ 30 mm	a / b , 15	ª , PNP	BC10-P30SR-VP4X2/3GD	2505006	Terminal chamber
S18 	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S18-Y1X	20060	Cable 2 m
	70 x ∅ 18 mm	a / b , 7.5	NAMUR	BC5-S18-Y1X/S100	2006021	Cable 2 m
S185 	70 x ∅ 18 mm	a / b , 7,5	NAMUR	BC5-S185-Y0X/S90 4M	2003522	Cable 4 m
S30 	63 x ∅ 30 mm	a / b , 15	NAMUR	BC10-S30-Y1X	20100	Cable 2 m
PT30 	80 x ∅ 30 mm	a / b , 15	NAMUR	BC10-PT30-Y0X	2020000	Cable 2 m
QF5,5 	50 x 20.3 x 5.5	a / b , 5	NAMUR	BC5-QF5,5-Y1X/S250	2030000	Cable 2 m

Detailed technical data is provided from page 64.

Excellent EMC performance

Thanks to special protective measures, the sensors ensure a high level of EMC, even in environments with increased electromagnetic interference (industrial environments).

Capacitive sensors – Product overview accessories

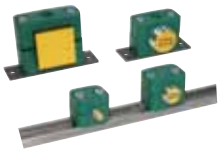
BS...

Type	Discription	Diameter	Ident no.
BS12	Fixing clamp for cylindrical sensors	Ø 12 mm	69470
BS18	Fixing clamp for cylindrical sensors	Ø 18 mm	69471
BS34	Fixing clamp for cylindrical sensors	Ø 34 mm	6946300
BS40	Fixing clamp for cylindrical sensors	Ø 40 mm	69466

BSN18

BSN18	Fixing clamp for cylindrical sensors	Ø 18 mm	69472

BSS...



BSS12	2 x half-shells for M12 x 1		6901321
BSS18	2 x half-shells for M18 x 1		6901320
BSS30	2 x half-shells for M30 x 1		6901319
BSS-CP40	2 x half-shells for 40 x 40 mm		6901318

BSS-SPV...

BSS-SPV1	weld-on base plate for M8 und M12		6901317
BSS-SPV2	weld-on base plate for M18		6901316
BSS-SPV4	weld-on base plate for M30		6901347
BSS-SPV5	weld-on base plate for 40 x 40 mm		6901324
BSS-TSM	2 x DIN rail nuts		6901323

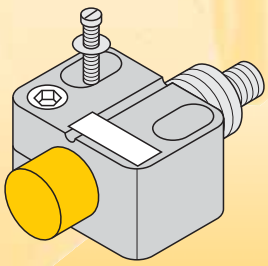
JS 025/037

JS 025/037	mounting rail for CP 40 and CK 40		69429

Detailed technical data is provided from page 68.

Fixing clamps:

- Position of the fixing clamps is retained when the sensor is exchanged
- Modular design with mounting aid possible
- Labelling plates can be used universally



Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Discription	Diameter	Ident no.
MAP... 	MAP-K40	mounting adapter K40		6950014
	MAP-M18	mounting adapter M18		6950012
	MAP-M30	mounting adapter M30		6950013
MH... 	MH-Q14	mounting accessories Q14		6950011
	MH-Q20	mounting accessories Q20		6950010
MW... 	MW-12	mounting bracket for M12		6945003
	MW-18	mounting bracket for M18		6945004
	MW-30	mounting bracket for M30		6945005
MW-Q08/ Q10 	MW-Q08/Q10	mounting bracket for Q08/Q10		6945007
	MW-Q14/Q20	mounting bracket for Q14/Q20		6945006
SG40 SG40/2 	SG40	protective housing for CP40		69500
	SG40/2	temperature resistant housing for CP 40		69497
TB2 	TB2	test box for sensors		967103

Detailed technical data is provided from page 68.

TURCK offers a large selection of accessories for the mounting and protection of capacitive sensors.

Matching mounting clamps as well as quick-mount clamps are offered for all M12 x 1, M18 x 1 und M30 x 1.5 cylindrical housing types.

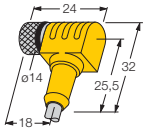
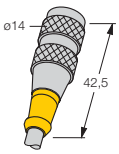
The mounting rail JS 025/037 facilitates mounting and alignment of the sensor types CP40.

The protective mounting clamps offer additional protection against physical damage as well as simplifying the mounting of the CP40 types.

Capacitive sensors – Connectors

Sensor type:		Matching connector			
Connection code	**Connector code**	**straight, cable type**		**angled, cable type**	
…-AP4, …-AP6, …-AN4, …-AN6	…-V1131	SKP3-**L**/S90[1])	**M8**	SWKP3-**L**/S90[1])	**M8**
…-AP4, …-AP6, …-AN4, …-AN6	…-H1141	WAK3-**L**/**Q**[1])	**M12**	WWAK3-**L**/**Q**[1])	**M12**
…-VP4, …-VP6, …-VN4, …-VN6	…-H1141	WAK4-**L**/**Q**[1])	**M12**	WWAK4-**L**/**Q**[1])	**M12**
…AP6, …AN6	…-H1141	WAK4-**L**/S398[1])	**M12**	WWAK4-**L**/S398[1])	**M12**
…-Y0, …-Y1	…-H1141	WAK4.21-**L**/P00[1]) Cable: blue	**M12**	WWAK4.21-**L**/P00[1]) Cable: blue	**M12**

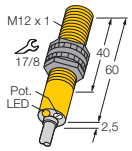
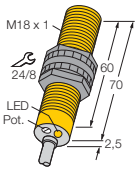
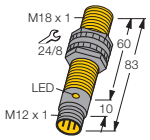
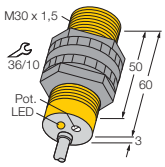
Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Sensor type:		Matching connector	
Connection code	**Connector code**	**straight, cable type**	**angled, cable type**
…-AZ3, …-RZ3	…-B3131 …-B3331		WKB3T-2/S68 **1/2“** 
…-AZ3, …-RZ3 …-FZ3	…-B3131 …-B3331	RK30-2 **7/8“** 	

1) **L:** Selectable cable length:
2 = 2 m **5** = 5 m **10** = 10 m
Q: Cable quality:
P00 = PVC cable, type LIFYY-0
PUR = PVC cable, type LIFYY-11Y

2) DeviceNet™ cable, PVC jacket,
2 x 2 x 22 AWG, standard
length 6 m, other lengths on request

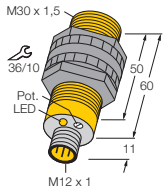
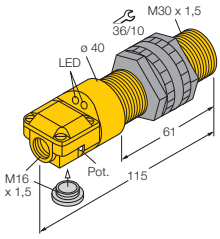
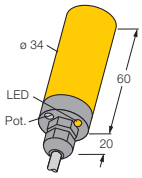
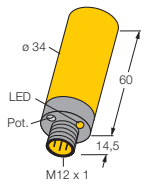
Technical data capacitive sensors – Standard, cylindrical housing styles (Plastic)

Dimensions/Housing style		Features	Sensing range S_n	Output	Operational voltage U_B	Operational current I_e	
		(☞ 90)	(☞ 90)	(☞ 90)	[V]	[mA]	
	**S12**]	–	4.5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	4.5 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	4.5 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**S18**]	–	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
	**S18** {	–	5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	5 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
	**S30**]	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC3-S12-AP6X	2601200	S001	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC3-S12-AN6X	2601300	S004	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC3-S12-RP6X	2601202	S054	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S18-AP4X	25030	S001	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S18-AN4X	25031	S004	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S18-RP4X	2503020	S054	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S18-AP4X-H1141/S250	2503602	S002	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BC5-S18-AN4X-H1141/S250	2503108	S005	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BC5-S18-RP4X-H1141/S250	2601209	S056	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BC10-S30-VP4X	2506110	S007	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC10-S30-VN4X	2506000	S010	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ

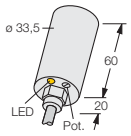
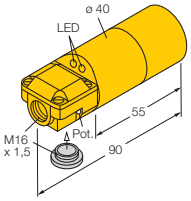
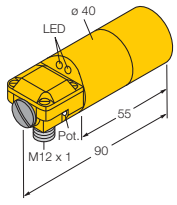
Technical data capacitive sensors – Standard, cylindrical housing styles (Plastic)

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S30** {	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**P30SR** }	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**K34**]	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**K34** {	–	15 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC10-S30-VP4X-H1141	2506100	S008	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BC10-S30-VN4X-H1141	2506010	S011	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BC10-P30SR-VP4X2	25050	S009	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC10-P30SR-VN4X2	25051	S012	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC15-K34-VP4X	2502124	S007	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BC15-K34-VN4X	2502127	S010	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BC15-K34-AP4X-H1141	2502126	S002	0.1	-25...+70	IP67	PBT	PBT	–	–	ñ
	BC15-K34-AN4X-H1141	2502125	S005	0.1	-25...+70	IP67	PBT	PBT	–	–	ñ

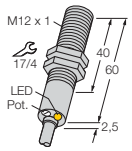
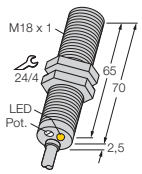
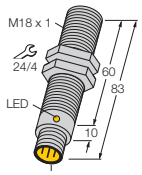
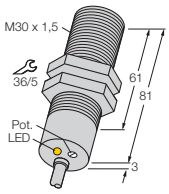
Technical data capacitive sensors – Standard, cylindrical housing styles (Plastic)

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**KT34**]	–	20 mm, b	ª , PNP	10...65 VDC	200 mA, ö	
		–	20 mm, b	ª , NPN	10...65 VDC	200 mA, ö	
	**K40SR** }	–	30 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	30 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
		–	30 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	30 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**K40SR** {	–	30 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	NC20-KT34-VP4X2	2550300	S007	0.2	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ
	NC20-KT34-VN4X2	2550100	S010	0.2	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ
	BC20-K40SR-VP4X2	25100	S009	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC20-K40SR-VN4X2	25101	S012	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC20-K40SR-VP4X2	25100	S009	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC20-K40SR-VN4X2	25101	S012	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC20-K40SR-VN4X2-H1141	2510104	S011	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ

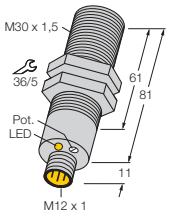
Technical data capacitive sensors – Standard, cylindrical housing styles (Metal)

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**M12**]	–	4,5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	4,5 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	4,5 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**M18**]	–	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
	**M18** {	–	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
		–	7.5 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
	**M30**]	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC3-M12-AP6X	2601000	S001	0.1	-25...+70	IP67	CuZn-Cr	ABS	PVC 2 m	–	ñ
	BC3-M12-AN6X	2601100	S004	0.1	-25...+70	IP67	CuZn-Cr	ABS	PVC 2 m	–	ñ
	BC3-M12-RP6X	2601103	S054	0.1	-25...+70	IP67	CuZn-Cr	ABS	PVC 2 m	–	ñ
	BC5-M18-AP4X	2504001	S001	0.1	-25...+70	IP67	CuZn-Cr	PBT	PVC 2 m	–	ñ
	BC5-M18-AN4X	2504002	S004	0.1	-25...+70	IP67	CuZn-Cr	PBT	PVC 2 m	–	ñ
	BC5-M18-RP4X	2504026	S001	0.1	-25...+70	IP67	CuZn-Cr	PBT	PVC 2 m	–	ñ
	BC5-M18-AP4X-H1141/S250	2504024	S002	0.1	-25...+70	IP67	CuZn-Cr	PBT	-	–	ñ
	BC5-M18-AN4X-H1141/S250	2504025	S005	0.1	-25...+70	IP67	CuZn-Cr	PBT	-	–	ñ
	BC5-M18-RP4X-H1141/S250	2504023	S056	0.1	-25...+70	IP67	CuZn-Cr	PBT	-	–	ñ
	BC10-M30-VP4X	25020	S007	0.1	-25...+70	IP67	CuZn-Cr	PA	PVC 2 m	–	ñ
	BC10-M30-VN4X	25021	S010	0.1	-25...+70	IP67	CuZn-Cr	PA	PVC 2 m	–	ñ

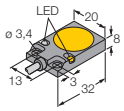
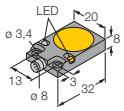
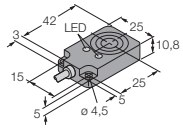
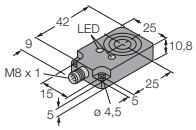
Technical data capacitive sensors – Standard, cylindrical housing styles (Metal)

Dimensions/Housing style		Features	Sensing range S_n	Output	Operational voltage U_B	Operational current I_e	
		(☞ 90)	(☞ 90)	(☞ 90)	[V]	[mA]	
	**M30**	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
	{	–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC10-M30-VP4X-H1141	2502010	S008	0.1	-25...+70	IP67	CuZn-Cr	PA	–	–	ñ
	BC10-M30-VN4X-H1141	2502120	S011	0.1	-25...+70	IP67	CuZn-Cr	PA	–	–	ñ

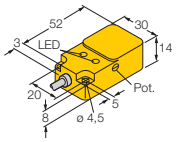
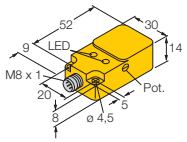
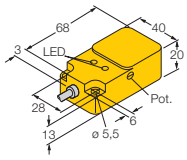
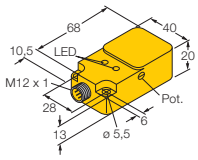
Technical data capacitive sensors – Standard - rectangular housing styles

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**Q08**]	–	5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	5 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	5 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**Q08** {	–	5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	5 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	5 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**Q10**]	–	8 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	8 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	8 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**Q10** {	–	8 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	8 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
		–	8 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
BC5-Q08-AP6X2/S250	26200	S001	0.1	-25...+70	IP67	GD-Zn	PA	PVC 2 m	ñ	ñ
BC5-Q08-AN6X2/S250	26201	S004	0.1	-25...+70	IP67	GD-Zn	PA	PVC 2 m	ñ	ñ
BC5-Q08-RP6X2/S250	2530108	S054	0.1	-25...+70	IP67	GD-Zn	PA	PVC 2 m	ñ	ñ
BC5-Q08-AP6X2-V1131/S250	26210	S002	0.1	-25...+70	IP67	GD-Zn	PA	–	ñ	ñ
BC5-Q08-AN6X2-V1131/S250	26211	S005	0.1	-25...+70	IP67	GD-Zn	PA	–	ñ	ñ
BC5-Q08-RP6X2-V1131/S250	2620152	S175	0.1	-25...+70	IP67	GD-Zn	PA	–	ñ	ñ
BC8-Q10-AP6X2/S250	2621200	S001	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC8-Q10-AN6X2/S250	2621203	S004	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC8-Q10-RP6X2/S250	2621205	S054	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC8-Q10-AP6X2-V1131/S250	2621201	S002	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC8-Q10-AN6X2-V1131/S250	2621202	S005	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC8-Q10-RP6X2-V1131/S250	2621204	S056	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ

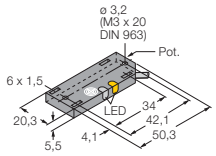
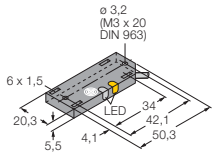
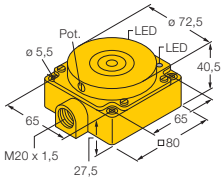
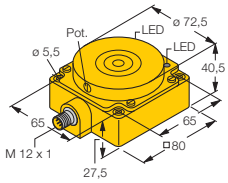
Technical data capacitive sensors – Standard - rectangular housing styles

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**Q14**]	–	10 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	10 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
		–	10 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
	**Q14** {	–	10 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	10 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
		–	10 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
	**Q20**]	–	20 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	20 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
		–	20 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	
	**Q20** {	–	20 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	20 mm, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
		–	20 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
BC10-Q14-AP4X2	2530001	S001	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC10-Q14-RP4X2	2530014	S054	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC10-Q14-AN4X2	2530010	S004	0.1	-25...+70	IP67	PBT	PBT	PVC 2 m	ñ	ñ
BC10-Q14-AP4X2-V1131	2530002	S002	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC20-Q20-RP4X2-V1131	2501007	S175	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC10-Q14-AN4X2-V1131	2530011	S005	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC20-Q20-AP4X2	2530100	S001	0.1	-25...+70	IP67	PBT	PBT	PUR 2 m	ñ	ñ
BC20-Q20-RP4X2	2530106	S054	0.1	-25...+70	IP67	PBT	PBT	PUR 2 m	ñ	ñ
BC20-Q20-AN4X2	2530110	S004	0.1	-25...+70	IP67	PBT	PBT	PUR 2 m	ñ	ñ
BC20-Q20-AP4X2-H1141	2530101	S002	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC20-Q20-RP4X2-H1141	2530107	S056	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
BC20-Q20-AN4X2-H1141	2530111	S005	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ

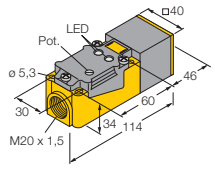
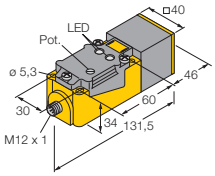
Technical data capacitive sensors – Standard - rectangular housing styles

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**QF5.5**]	–	10 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	10 mm, a / b	© , NPN	10...30 VDC	200 mA, ö	
	**QF5.5**]	–	5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
		–	10 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
	**CP80** }	–	50 mm, b	a , PNP	10...65 VDC	200 mA, ö	
		–	50 mm, b	a , NPN	10...65 VDC	200 mA, ö	
	**CP80** {	–	50 mm, b	a , PNP	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
BC10-QF5,5-AP6X2	2620117	S001	0.1	-25...+70	IP67	PP	PP	PUR 2 m	ñ	ñ
BC10-QF5,5-AN6X2	2620121	S004	0.1	-25...+70	IP67	PP	PP	PUR 2 m	ñ	ñ
BC5-QF5,5-AP6X2/S250	2620116	S001	0.1	-25...+70	IP67	PP	PP	PUR 2 m	ñ	ñ
BC10-QF5,5-AP6X2/S250	2620115	S001	0.1	-25...+70	IP67	PP	PP	PUR 2 m	ñ	ñ
NC50-CP80-VP4X2	2580202	S009	0.2	-25...+70	IP67	PBT	PBT	–	ñ	ñ
NC50-CP80-VN4X2	2580102	S012	0.2	-25...+70	IP67	PBT	PBT	–	ñ	ñ
NC50-CP80-VP4X2-H1141	2580400	S008	0.2	-25...+70	IP67	PBT	PBT	–	ñ	ñ

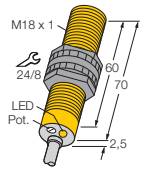
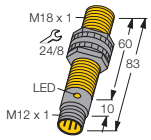
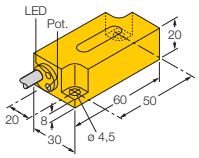
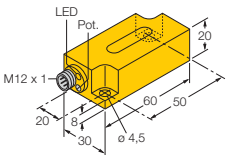
Technical data capacitive sensors – Standard - rectangular housing styles

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**CP40** }	–	30 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	30 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**CP40** {	–	30 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC20-CP40-VP4X2	25160	S009	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
	BC20-CP40-VN4X2	25161	S012	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ
	BC20-CP40-VP4X2-H1141	2516102	S008	0.1	-25...+70	IP67	PBT	PBT	–	ñ	ñ

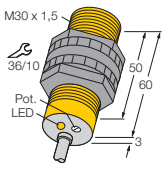
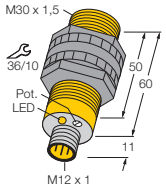
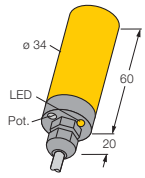
Technical data capacitive sensors – Standard BCF

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S18**]	–	7.5, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	7.5, a / b	© , NPN	10...65 VDC	200 mA, ö	
		–	7.5, a / b	¨ , NPN	10...65 VDC	200 mA, ö	
		–	7.5, a / b	¨ , PNP	10...65 VDC	200 mA, ö	
		–	7.5, a / b	© , PNP	10...65 VDC	200 mA, ö	
	**S18** {	–	7.5, a / b	© , PNP	10...65 VDC	200 mA, ö	
		–	7.5, a / b	© , NPN	10...65 VDC	200 mA, ö	
	**Q20L60**]	–	10, a / b	© , PNP	10...65 VDC	200 mA, ö	
	**Q20L60** {	–	10, a / b	© , PNP	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BCF5-S18-AP4X	2503011	S001	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BCF5-S18-AN4X	2503012	S004	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BCF5-S18-RN4X	2503008		0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BCF5-S18-RP4X/S90	2503006	S054	0.1	-25...+70	IP67	PA	PA	PUR 2 m	–	ñ
	BCF5-S18-AP4X/S90	2503014	S001	0.1	-25...+70	IP67	PA	PA	PUR 2 m	–	ñ
	BCF5-S18-AP4X-H1141/S250	2503010	S002	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BCF5-S18-AN4X-H1141/S250	2503016	S005	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BCF10-Q20L60-AP4X	2504028	S001	0.1	-25...+70	IP67	PBT-GF20	PBT	PVC 2 m	–	ñ
	BCF10-Q20L60-AP4X-H1141	2504027	S002	0.1	-25...+70	IP67	PBT-GF20	PBT	–	–	ñ

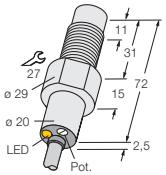
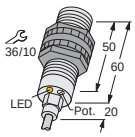
Technical data capacitive sensors – Standard BCF

Dimensions/Housing style		Features	Sensing range S_n	Output	Operational voltage U_B	Operational current I_e	
		(☞ 90)	(☞ 90)	(☞ 90)	[V]	[mA]	
	**S30**]	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**S30** {	–	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	ª , NPN	10...65 VDC	200 mA, ö	
	**K34**]	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BCF10-S30-VP4X	2506111	S007	0.1	-25...+70	IP67	PA	PA	PVC 2 m	ñ	ñ
	BCF10-S30-VN4X	2506011	S010	0.1	-25...+70	IP67	PA	PA	PVC 2 m	ñ	ñ
	BCF10-S30-VP4X-H1141	2506117	S008	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BCF10-S30-VN4X-H1141	2506016	S012	0.1	-25...+70	IP67	PA	PA	–	–	ñ
	BCF15-K34-AZ3X	2502136	S092	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BCF15-K34-RZ3X	2502135	S094	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ

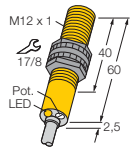
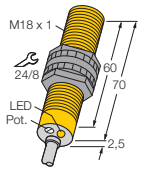
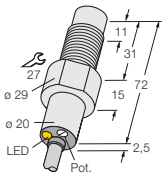
Technical data capacitive sensors – Chemically resistant sensors

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S185**	–	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
	**PT30**]	–	15 mm, a / b	[a] , PNP	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	[a] , NPN	10...65 VDC	200 mA, ö	
		–	15 mm, a / b	NAMUR	nom. 8.2 VDC	–	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC5-S185-AP4X	25035	S001	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ
	BC10-PT30-VP4X2	2507010	S007	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ
	BC10-PT30-VN4X2	2507020	S010	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ
	BC10-PT30-Y0X	2020000	S025	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ

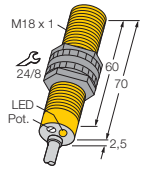
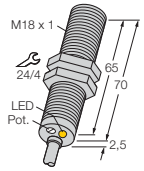
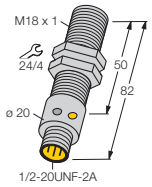
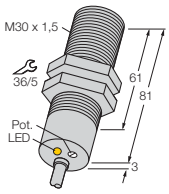
Technical data capacitive sensors – Sensors for high temperature ranges

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S12**]	ô	4.5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
	**S18**]	ô	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**S185**]	ô	7.5 mm, a / b	© , PNP	10...65 VDC	200 mA, ö	
		ô	7.5 mm, a / b	© , NPN	10...65 VDC	200 mA, ö	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC3-S12-AP6X/S100	2601201	S001	0.1	-25...+100	IP67	PA	PA	PUR 2 m	–	ñ
	BC5-S18-Y0X/S100	2006021	S025	0.1	-25...+100	IP67	PA	PA	PUR 2 m	–	ñ
	BC5-S185-AP4X/S100	2503502	S001	0.1	-25...+100	IP67	PVDF	PVDF	PUR 2 m	–	ñ
	BC5-S185-AN4X/S100	2503551	S004	0.1	-25...+100	IP67	PVDF	PVDF	PUR 2 m	–	ñ

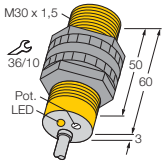
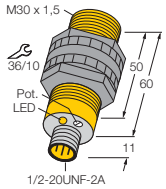
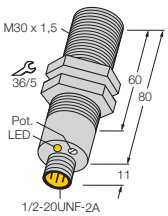
Technical data capacitive sensors – Standard AC 2-wire sensors

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S18**]	–	7.5 mm, a / b	©	20...250 VAC	500 AC	
		–	7.5 mm, a / b	¨	20...250 VAC	500 AC	
	**M18**]	–	5 mm, a / b	©	20...250 VAC	500 AC	
		–	5 mm, a / b	¨	20...250 VAC	500 AC	
	**M18** {	–	7,5 mm, a / b	©	20...250 VAC	500 AC	
		–	7,5 mm, a / b	¨	20...250 VAC	500 AC	
	**M30**]	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC5-S18-AZ3X	2305500	S092	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S18-RZ3X	2305400	S094	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-M18-AZ3X	2305000	S092	0.02	-25...+70	IP67	CuZn-Cr	PBT	PVC 2 m	–	ñ
	BC5-M18-RZ3X	2305100	S094	0.02	-25...+70	IP67	CuZn-Cr	PBT	PVC 2 m	–	ñ
	BC5-M18-AZ3X-B3331/S250	2305001	S092	0.02	-25...+70	IP67	CuZn-Cr	PBT	–	–	–
	BC5-M18-RZ3X-B3331/S250	2305101	S094	0.02	-25...+70	IP67	CuZn-Cr	PBT	–	–	–
	BC10-M30-AZ3X	23100		0.02	-25...+70	IP67	CuZn-Cr	PA	PVC 2 m	–	ñ
	BC10-M30-RZ3X	23098		0.02	-25...+70	IP67	CuZn-Cr	PA	PVC 2 m	–	ñ

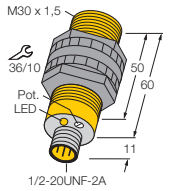
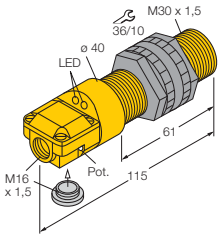
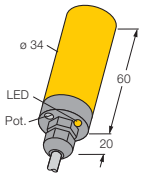
Technical data capacitive sensors – Standard AC 2-wire sensors

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S30**]	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
		–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
	**S30** {	–	15 mm, a / b	©	20...250 VAC	500 AC	
	**M30** {	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
BC10-S30-AZ3X	2310700	S092	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BC10-S30-RZ3X	2310800	S094	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BCF10-S30-AZ3X	2506015	S092	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BCF10-S30-RZ3X	2506013	S094	0.02	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BC10-S30-AZ3X-B3131	2310710	S152	0.02	-25...+70	IP67	PA	PA	–	–	ñ
BC10-M30-AZ3X-B3131	2310030	S152	0.02	-25...+70	IP67	CuZn-Cr	PA	–	–	ñ
BC10-M30-RZ3X-B3131	2310100	S094	0.02	-25...+70	IP67	CuZn-Cr	PA	–	–	ñ

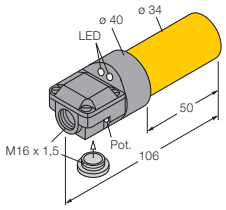
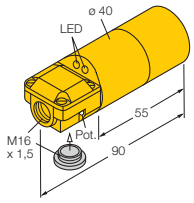
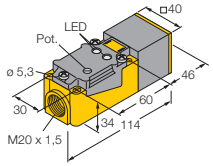
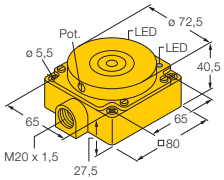
Technical data capacitive sensors – Standard AC 2-wire sensors

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S30** {	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
	**P30SR** }	–	15 mm, a / b	program.	20...250 VAC	500 AC	
	**K34**]	–	15 mm, a / b	©	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
		–	15 mm, a / b	¨	20...250 VAC	500 AC	
		–	15 mm, a / b	©	20...250 VAC	500 AC	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BCF10-S30-AZ3X-B3131	2506012	S152	0.02	-25...+70	IP67	PA	PA	–	–	ñ
	BCF10-S30-RZ3X-B3131	2506014	S092	0.02	-25...+70	IP67	PA	PA	–	–	ñ
	BC10-S30-RZ3X-B3131	2310810	S094	0.02	-25...+70	IP67	PA	PA	–	–	–
	BC10-P30SR-FZ3X2	23104	S016	0.02	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC15-K34-AZ3X	2310008	S092	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BC15-K34-RZ3X	2310110	S094	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BCF15-K34-RZ3X	2502135	S094	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ
	BCF15-K34-AZ3X	2502136	S092	0.02	-25...+70	IP67	PBT	PBT	PVC 2 m	–	ñ

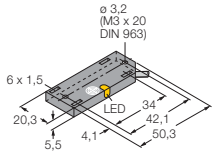
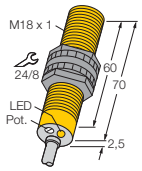
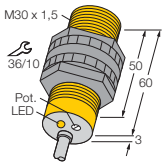
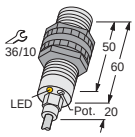
Technical data capacitive sensors – Standard AC 2-wire sensors

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**K34** }	–	15 mm, a / b	program.	20...250 VAC	500 AC	
	**K40SR** }	–	30 mm, a / b	program.	20...250 VAC	500 AC	
	**CP40** }	–	30 mm, a / b	program.	20...250 VAC	500 AC	
	**CP80** }	–	50 mm, b	program.	20...250 VAC	500 AC	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC15-K34SR-FZ3X2	2310009	S016	0.02	-25...+70	IP67	PBT	PBT	–	ñ	ñ
	BC20-K40SR-FZ3X2	23103	S016	0.02	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC20-CP40-FZ3X2	23105	S016	0.02	-25...+70	IP67	PBT	PBT	–	ñ	ñ
	NC50-CP80-FZ3X2	2310600	S016	0.02	-25...+70	IP67	PBT	PBT	–	ñ	ñ

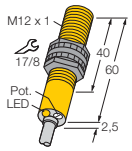
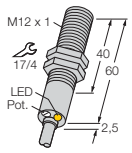
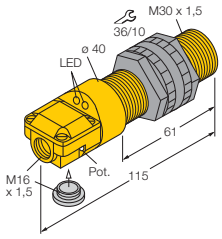
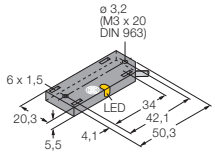
Technical data capacitive sensors – Standard NAMUR

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**QF5.5**]	É II 2 G, SIL2	5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**S18**]	É II 1 G, É II 1 D, SIL2	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
		-	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	200 mA, ö	
		-	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**S30**]	É II 1 G, É II 1 D, SIL2	15 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**PT30**]	–	15 mm, a / b	NAMUR	nom. 8.2 VDC	–	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC5-QF5,5-Y1X/S250	2030000	S025	0.1	-25...+70	IP67	PP	PP	PVC 2 m	–	ñ
	BC5-S18-Y1X	20060	S025	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC5-S185-Y0X/S90 4M	2003522	S025	0.1	-25...+70	IP67	PA	PA	PUR 4 m	–	ñ
	BC5-S18-Y1X/S100	2006021	S025	–	-25...+100	IP67	PA	PA	PUR 2 m	–	ñ
	BC10-S30-Y1X	20100	S025	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
	BC10-PT30-Y0X	2020000	S025	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ

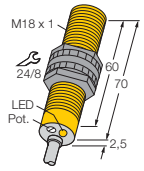
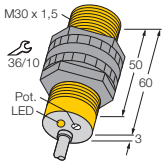
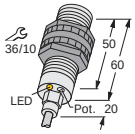
Technical data capacitive sensors – Sensors for the Ex area

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S12**]	É II 3 G É II 3 D	4.5 mm, a / b	¨ , PNP	10...30 VDC	200 mA, ö	
	**M12**]	É II 3 G É II 3 D	4,5 mm, a / b	© , PNP	10...30 VDC	200 mA, ö	
	**P30SR** }	É II 3 G É II 3 D	15 mm, a / b	ª , PNP	10...65 VDC	200 mA, ö	
	**QF5.5**]	É II 2 G, SIL2	5 mm, a / b	NAMUR	nom. 8.2 VDC	–	

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

	Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
	BC3-S12-RP6X/S90/3GD	2601204	S054	0.1	-25...+70	IP67	PA	PA	PUR 2 m	–	ñ
	BC3-M12-AP6X/S90/3GD	2601003	S001	0.1	-25...+70	IP67	CuZn-Cr	ABS	PUR 2 m	–	ñ
	BC10-P30SR-VP4X2/3GD	2505006	S009	0.1	-25...+70	IP67	ABS	ABS	–	ñ	ñ
	BC5-QF5,5-Y1X/S250	2030000	S025	0.1	-25...+70	IP67	PP	PP	PVC 2 m	–	ñ

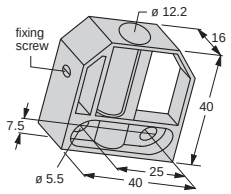
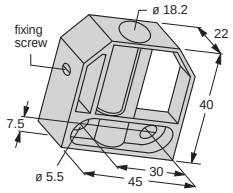
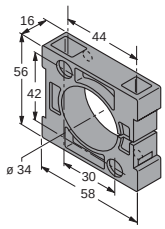
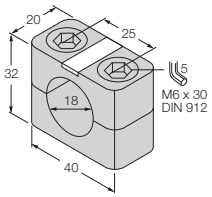
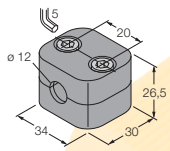
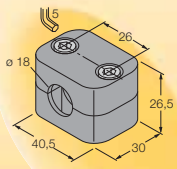
Technical data capacitive sensors – Sensors for the Ex area

Dimensions/Housing style		Features (☞ 90)	Sensing range S_n (☞ 90)	Output (☞ 90)	Operational voltage U_B [V]	Operational current I_e [mA]	
	**S18**]	É II 1 G, É II 1 D, SIL2	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
		-	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	200 mA, ö	
		-	7.5 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**S30**]	É II 1 G, É II 1 D, SIL2	15 mm, a / b	NAMUR	nom. 8.2 VDC	–	
	**PT30**]	–	15 mm, a / b	NAMUR	nom. 8.2 VDC	–	

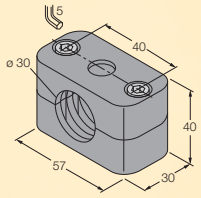
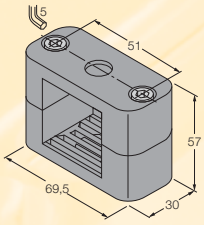
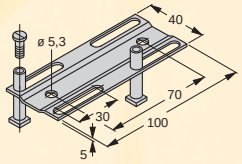
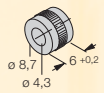
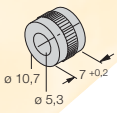
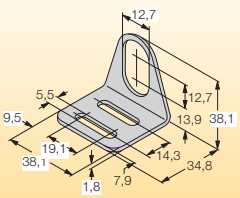
Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Type	Ident no.	Connection	Switching frequency [kHz]	Temperature range [°C]	Degree of protection	Materials Housing	Materials Active face (☞ 90)	Materials Cable	LED U_B	LED ü
BC5-S18-Y1X	20060	S025	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BC5-S185-Y0X/S90 4M	2003522	S025	0.1	-25...+70	IP67	PA	PA	PUR 4 m	–	ñ
BC5-S18-Y1X/S100	2006021	S025	0.1	-25...+100	IP67	PA	PA	PUR 2 m	–	ñ
BC10-S30-Y1X	20100	S025	0.1	-25...+70	IP67	PA	PA	PVC 2 m	–	ñ
BC10-PT30-Y0X	2020000	S025	0.1	-25...+70	IP67	PVDF	PVDF	PVC 2 m	–	ñ

Technical data for capacitive sensors – Mounting accessories

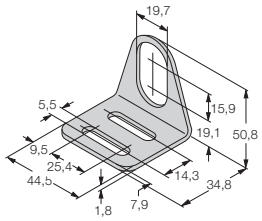
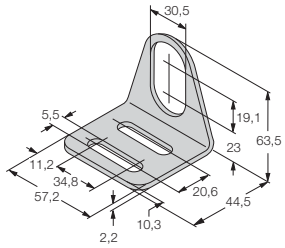
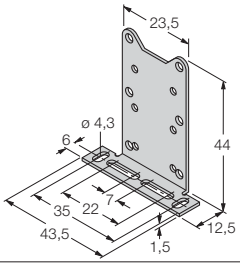
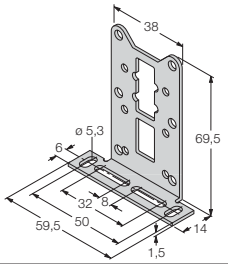
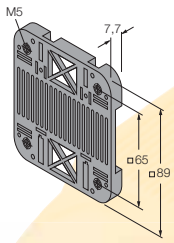
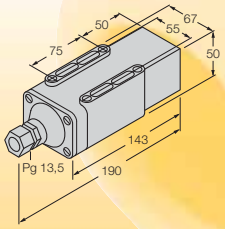
Dimensions/Housing style	Type	Ident no.	Material	For sensor types
	**BS12**	69470	PBT	Accessory for threaded barrel M12
	**BS18**	69471	PA6	Accessory for threaded barrel M18
	**BS34.1**	6946010	PA6	Accessory for threaded barrel M30
	**BSN18**	69472	PBT-GF20	Accessory for threaded barrel M18
	**BSS-12**	6901321	PP	Accessory for threaded barrel M12
	**BSS-18**	6901320	PP	Accessory for threaded barrel M18

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

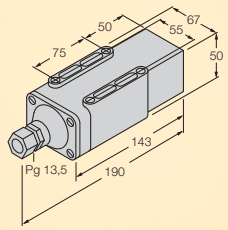
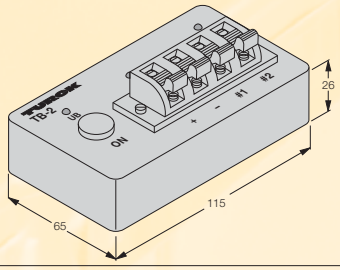
Dimensions/Housing style	Type	Ident no.	Material	For sensor types
	**BSS-30**	6901319	PP	Accessory for threaded barrel M30
	**BSS-CP40**	6901318	PP	Accessory for rectangular CP40
	**JS025/037**	69429	VA	Accessory for rectangular CP40
	**MH-Q14**	6950011	CuZn	Accessory for rectangular Q14
	**MH-Q20**	6950010	CuZn	Accessory for rectangular Q20
	**MW-12**	6945003	VA	Accessory for threaded barrel M12

3

Technical data for capacitive sensors – Mounting accessories

Dimensions/Housing style	Type	Ident no.	Material	For sensor types
	**MW-18**	6945004	VA	Accessory for threaded barrel M18
	**MW-30**	6945005	VA	Accessory for threaded barrel M30
	**MW-Q08/Q10**	6945007	VA	Accessory for rectangular Q08/Q10
	**MW-Q14/Q20**	6945006	VA	Accessory for rectangular types Q14-Q20
	**SMBDX80DIN**	3077161	ABS	Accessory for rectangular CP80, DX80, K80, Q80
	**SG40/2**	69497	Ultem	Accessory for rectangular CP40

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Dimensions/Housing style	Type	Ident no.	Material	For sensor types
	**SG40**	69500	PA	Accessory for rectangular types CP40
	**TB-2**	6967103	–	Universal test device for NPN- PNP- and NAMUR sensors

Glossary of terms

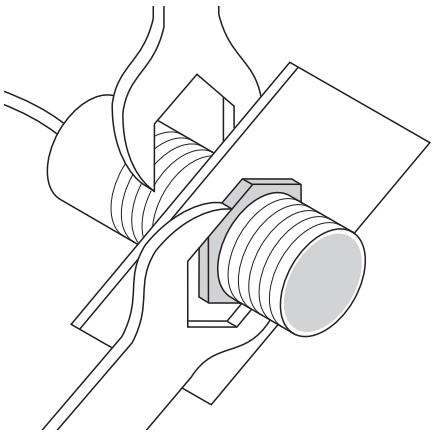


Fig. 1

Active face
- The point where the high-frequency magnetic field leaves the sensor. Regarding threaded barrel sensors, the active face is at the front (except sensors of the HS series). Concerning rectangular PVC sensors, the zone of the active face is either marked with a target or indicated in a different colour on the housing.

Fixing torque (Fig. 1)
- Concerning threaded barrel sensors, the maximum admissable fixing torque must be observed in order to avoid torsional stress.
- Depending on the sensor version the following values apply:
  M5 = 5 Nm
  M8 = 10 Nm
  M12 = 10 Nm (MT12 = 7 Nm)
  M18 = 25 Nm (MT18 = 15 Nm)
  M30 = 75 Nm
  G47 = 90 Nm
  Values shown in the tables relate to the nuts that come with each sensor. If strong vibrations are likely, use liquid threaded fastener on anaerobic base (e.g. loctite 242).

Rated operating current (I_e)
- Maximum load current

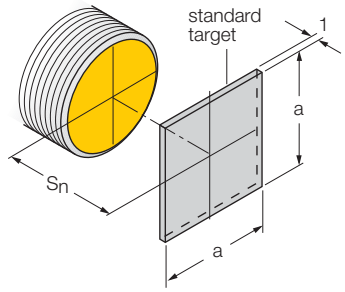


Fig. 2

Nominal switching distance/Rated operating distance (S_n) (Fig. 2)
- Is measured with axial approach of a standard target.
- Manufacturing tolerances and external influences are not considered.
- The tables only indicate the rated operating distance.

Flush and non-flush mounting
- Sensors for flush mounting can be mounted in metal up to the active face, sensors for non-flush mounting have to protrude the metal.
- Non-flush mountable sensors have larger sensing ranges.

Wire-break protection
- If the supply cable is cut, the output stays off (no malfunction).

Electromagnetic capability (EMC)
- Test and limit values for proximity switches are defined by the product standard EN 60947-5-2

Assured sensing range(S_a)
- Distance at which the sensor is securely actuated.
- Correlation to rated operating distances$_a$ $S_a < 0{,}72 \cdot S_n$

Hysteresis (H) (Fig. 3)
- Differential between the switch-on and the switch-off point of the sensor with axial motion of the target relative to the active face
- Indicated as percentages of the rated operating distance (S_n)

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Glossary of terms

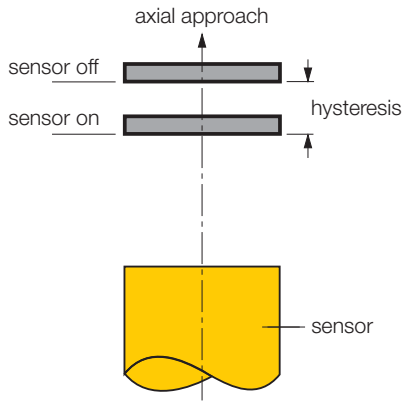


Fig. 3: Hysteresis H

Insulation groups (VDE 0110b)

The classification of insulation groups per VDE 0110 is determined by

- the application
- the decrease of insulation resistance caused by environmental influences such as dust, dirt, humidity, wetting, ageing and corrosion
- and the possible impacts of an insulation failure at the place of installation .

Insulation group B comprises equipment for use in private, sales or business premises,

Insulation group C comprises equipment which is used mainly in industrial, trading and agricultural locations, in unheated storage rooms, in workshops, in tanks, on tooling machinery etc.

Minimum operational current (I_m)

- Minimum current in a switched state to maintain the function.
- Indicated for 2-wire sensors only.

Storage temperature

- The storage temperature may range from -30...+85 °C.
  If the ambient temperature range is higher, this value applies.

No-load current I (I_0)

- Current flow between supply voltage and 0 V.
- Indicated for 3 and 4-wire sensors only.

Magnetic-field immune

- Magnetic-field immune sensors are insensitive to magnetic fields, as they occur in welding systems for example. All capacitive sensors are immune to magnetic DC or AC fields due to their special function principle.

Close-up range suppression

- Prevents the detection of dirt deposits and humidity by integrated self-compensation.

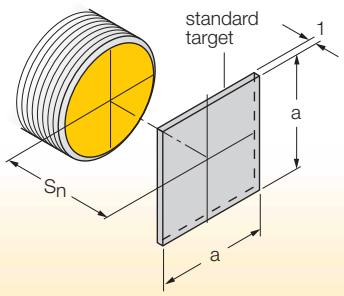


Fig. 4

Nominal switching distance / Rated operating distance Sn (Fig. 4)

- The nominal switching distance indicates the maximum possible distance of the standard target to initiate a switching operation. Factory set tolerances, temperature and voltage fluctuations are not considered in this characteristic value. The standard target is rectangular, 1mm thick and made of St37. The edge length „a“ corresponds to $3*S_n$. In order to ensure similar switching distances the standard target should be earthed.

Measuring range

- Rectangular metal plate for determination of the rated operating distance S_n
- Material: St37
- Thickness: 1 mm
- Edge lengths $3 \cdot S_n$, if $3 \cdot S_n$ is greater than the diameter of the active face, otherwise just the diameter of the active face.

Glossary of terms

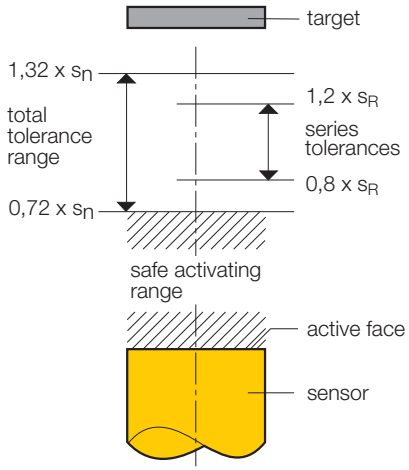


Fig. 5

Usable operating distance (S_u)
- Operating distance which is guaranteed within the permitted temperature and voltage range
- Correlation to rated operating distance
  Capacitive sensors:
  $0,8 \times S_r < S_r < 1,2 \times S_r$
  $0,72 \times S_n < S_n < 1,32 \times S_n$

Real switching distance (S_r)
- Switching distance under fixed temperature and supply conditions
- Factory set tolerances are taken into account
- Correlation to related operating distance
  $0,9 \cdot s_n < s_r < 1,1 \cdot s_n$

Reduction factor R
- The variable of the reduction factor is material-dependent. The reduction factor indicates to which fraction the switching distance is reduced in relation to the nominal switching distance S_n.

$$R = \frac{S}{S_n}$$

R = R% = R x 100%

Off-state current(I_r)
- For 2-wire sensors: the current which flows in a non-active condition.
- For 3 and 4-wire sensors: The current which flows in a non-active condition between the output and 0 V (pnp output), i.e. between output and supply voltage (npn output).

Ripple
- Residual AC voltage superimposed on the DC supply voltage.
- Usually 10 % ripple (peak to peak) of the applied supply voltage is tolerable.

Switching distance (s)
- Distance at which a change of signal is produced with axial approach.

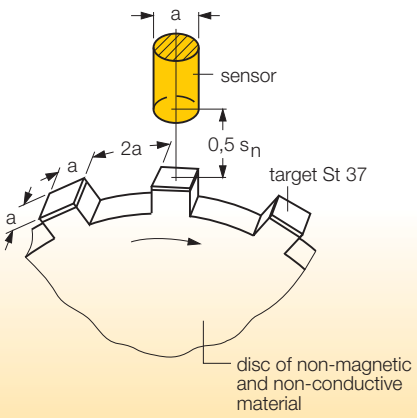


Abb. 6: Switching frequency f

Switch element function
- Normally open: (N.O.): output is open when the sensor is non-activated and closed when the sensor is activated.
- Normally closed (N.C.): output is closed when the sensor is non-activated and open when the sensor is activated.
- Complementary: one of the two outputs is closed when the sensor is non-acitvated and the other one when the sensor is activated.

Switching frequency (f) (Fig. 4)
- Maximum number of changes form the activated to the non-activated and back to the acitvated sensor state per second [Hz].
- Measured with the standard disc (see Fig. 4)
- Maximum switching frequency at an operating distance of $s = S_n/2$ (with a standard disc)

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Glossary of terms

Degree of protection
- Protection against the ingress of water or foreign matter, touch protection
- IP65: full protection against ingress of dust and water.
- IP67: full protection against ingress of dust and protection against submersion of water at 1 m depth for 30 minutes at constant temperature.

Voltage drop (U_d)
- Voltage of a switched output

Surge current
- The surge current is the current which can flow through the output for a short time.

Temperature drift
- Alteration of the switching point or the output values in case of temperature changes.

Reverse polarity protection
- Indicates if the sensor is protected agains connection errors. Capacitive sensors made by TURCK for DC and AC current are fully reverse polarity protected. Connection errors related to polarity of the power supply and / or the output do not result into damages of the sensor.

Repeat accuracy
- Sensors with switching output (digital):
  Deviation of the switch point indicated in percentage after often repeated switching, under identical conditions and with the same sensor.

Applicable Standards and Directives

1) Standards

EN 60947-5-2
Low-voltage switchgear and controlgear
Part 5: Control circuit devices and switching elements, Section 2: Proximity switches

EN 60079-0
Electrical equipment for use in explosion hazardous areas:
General requirements

EN 60079-11
Electrical equipment for use in explosion hazardous areas: Intrinsic safety “i”

EN 60079-15
Electrical equipment for use in explosion hazardous areas:
Type of protection “N”

EN 61241-0
General requirements of electrical equipment for use in areas with flammable dusts

EN 61241-1
Electrical equipment for use in areas with dust, protection by enclosures

EN 61000-6-4
Electromagnetic compatibility (EMC); Generic standard for emitted interference

EN 61000-6-2
Electromagnetic compatibility (EMC); Generic standard for interference immunity

IEC 60529/EN 60529/ DIN VDE 0298 -1
Protection provided by enclosures IP code

EN 60947-5-6 (NAMUR)
Control circuit devices and switching elements, proximity sensors, DC interface for proximity sensors and switching amplifiers (NAMUR)

IEC 61508 (SIL):
Functional safety of safety-related electrical/electronic/programmable systems

2) Directives

73/23/EC
Low-voltage

89/336/EC
Electromagnetic compatibility

2004/108/EC
CE mark

94/9/EC
Explosion protection (ATEX)

CE The CE mark is neither a seal of quality nor a test sign but is used to facilitate free trade within the European Community.

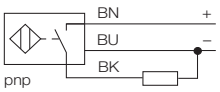
By affixing the CE mark to the products distributed, the manufacturer assures that the protective aims of the applicable directives are fulfilled for these products.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

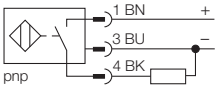
Wiring diagrams

Industrial Automation

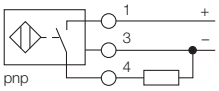
(S001)



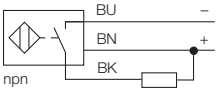
(S002)



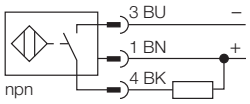
(S003)



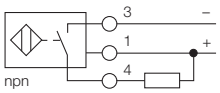
(S004)



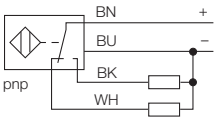
(S005)



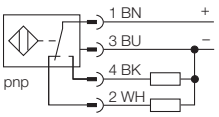
(S006)



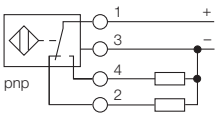
(S007)



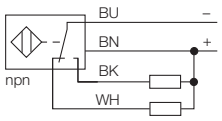
(S008)



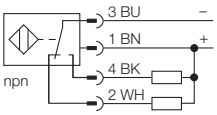
(S009)



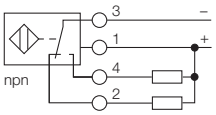
(S010)



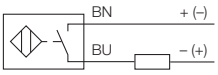
(S011)



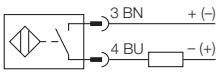
(S012)



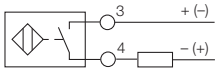
(S013)



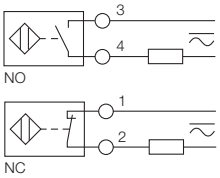
(S014)



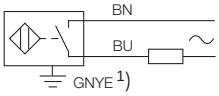
(S015)



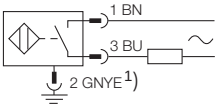
(S016)



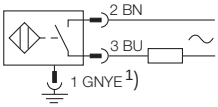
(S017)



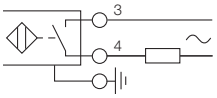
(S018)



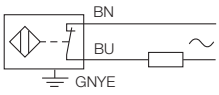
(S019)



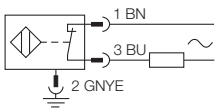
(S020)



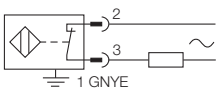
(S021)



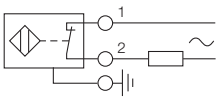
(S022)



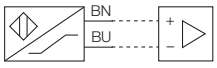
(S023)



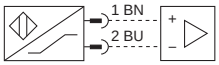
(S024)



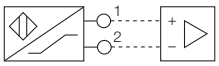
(S025)



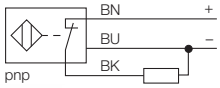
(S026)



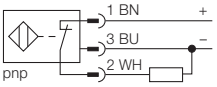
(S027)



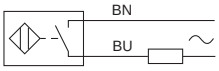
(S054)



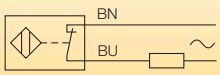
(S056)



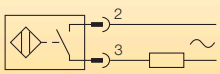
(S092)



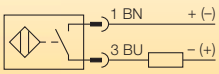
(S094)



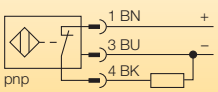
(S152)



(S155)



(S175)



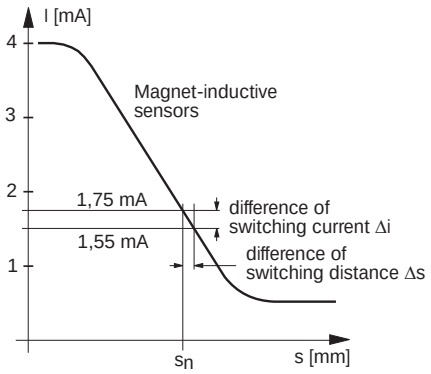
4

NAMUR sensors according to EN 60947-5-6

NAMUR sensors according to EN 60947-5-6 are polarised 2-wire sensors which change their internal resistance depending on the distance from the sensor (constant distance/current characteristic). They are designed for connection to external switching amplifiers which convert the current changes into a binary output signal.

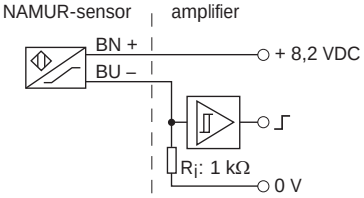
Advantages of NAMUR sensors

- Combined with suitably arproved switching amplifiers NAMUR sensors can be used in in explosion hazardous areas.
- The switching amplifier allows the implementation of a permanent wire-breakage and short-circuit monitoring.
- Sensors with a NAMUR output are also suitable for the detection of rapid movements and high speeds. Compared to sensors of the same type, NAMUR sensors enable higher switching frequencies.



Nominal operating values

- The nominal operating values are defined in EN 60947-5-6 as follows:
  U_0 = 8.2 VDC $I_{activated}$ ≤ 1.2 mA
  R_i = 1000 Ω $I_{not\ activated}$ ≥ 2.1 mA
- TURCK NAMUR sensors are specified precisely in the middle of the "NAMUR window" at 1.55 mA for s_n and 1.75 mA at s_n + Δs (see characteristics).
- Reverse polarity protected
- Hysteresis H 1...10 %
- Temperature drift
  < ± 10 % (normal temperature range -20...+70 °C)
  < ± 20 % (extended temperature range -40/-25...+100/120 °C)
- Repeat accuracy R < 2 %



Switching status indication (LED)

- The special operating principle of inductive sensors with a NAMUR output means that they have an inverted LED function: The LED is not lit when the sensor is damped but when it is undamped. This is because only a very low current is present (NAMUR curve) when damped, which is insufficient to activate an LED. In the undamped state, however, sufficient current is available for the LED.

Ambient conditions

- Protection degree (IEC 60529/ EN 60529) IP67
- Pollution degree 3
- Shock resistance 30 × g (11 ms)
- Vibration resistance 55 Hz (1 mm)

Application in Ex areas

When used in Ex areas (hazardous areas) NAMUR sensors must be connected to approved switching amplifiers with intrinsically safe control circuits. TURCK offers a wide range of EX approved amplifiers in the *interfacemodul, multisafe® and multicart®* housing styles:

- Supply and evaluation via externally approved switching amplifiers Coding: ...-Y1.-...
- Protection type EEx ia IIC T4…T6 (approved for use in Ex areas; EC type examination certificate to EN 50020 and EN 50014 (EN 60079-0); approval to Directive 94/9/EC, KEMA 02 ATEX 1090 X)
- Prevention of static charge with sensor types CA40, CK40, CP40, CP80, DSU26, DSU35, K40, K90, MP, Q80
- Mounting conditions as per certificate and operating instructions

Applications in safety-related installations in accordance with IEC 61508

Virtually all NAMUR sensors from the TURCK range are suitable for use in safety systems (including SIL2 according to IEC 61508). This has been certified by a well-established and independent test body (TÜV). The certificate applies to all TURCK sensors with a standard NAMUR output. These sensors are 100 % compatible with all standard NAMUR devices as well as for (safety) PLC systems with NAMUR inputs.

Failure probability (PFDavg)

- 7.00×10^{-6} with 1 year test interval
- 3.50×10^{-6} with 5 year test interval
- Safe failure fraction (SFF) 0.9

Series or parallel connection of NAMUR sensors

Not permissible on TURCK switching amplifiers

Maximum cable length
To determine the maximum permissible cable length, two conditions must be taken into account:

Condition 1: EN 60947-5-6 specifies a maximum cable resistance of 50 ò . The maximum cable length can be determined as follows, in combination with the cable cross section:

l = R x Q / d
l = max. cable length in m
R = max. resistance in ò
Q = Cable cross section in mm^2
d = Specific resistance of the Cable material (0.0175 for copper) in ò x mm^2 x m
Example of a copper cable with cable cross section
Q = 0.34 mm^2:
l = 50 x 0.34 / 0.0175 = 971 m
The calculated value must also be divided by two since NAMUR sensors are operated via two cables. This example produces the following maximum cable length:
971 / 2 = 485.5 m

Note: Bear in mind that this calculation does not take into account any additional resistances such as from corrosion or transient resistances at the Terminal chambers!

Condition 2:
If the sensor is operated in an explosion hazardous area, the maximum inductance and capacitance must also be taken into account. The relevant values are stated on the data sheets of the NAMUR sensors and switching amplifiers.

Example:
– Isolating switching amplifier IM1-22Ex-R:
C_{max} 830 nF ; L_{max} 5 mH (for EEx ia IIC)
– Sensor Bi5-EG18SK-Y1X: C_i = 150 nF; L_i = 150 µH

The following values for the cable are calculated by subtracting the values for the switching amplifier and sensor:
C = 680 nF ; L = 4,85 mH.

Cable suppliers usually state the values for inductance and capacitance per metre. For this 110 nF/km and 1 mH/km are guide values for the inductance and capacitance of the cables.

For example, the basis for these guide values can be used to calculate the following maximum cable lengths:
max. cable length at 110 nF/km:
680 nF / 110 nF = 6.18 km
max. cable length at 1 mH/km:
4.85 mH / 1 mH = 4.85 km

The maximum permissible cable length is the lowest value calculated taking both conditions into account.In this example the following values were determined:

– Condition 1
Cable resistance: 485.5 m
– Condition 2
a) Inductance of the cable: 6.18 km
b) Capacitance of the cable: 4.85 km

The maximum cable length in this example 485.5 m taking both conditions into account.

Sensors with transistor output, 3/4 wire DC

Advantages
- Very low OFF-state current
- Easy connection to relays or PLC
- Series or parallel connection possible

Power supply
- Operating voltage U_B 10...30 VDC
- 10...55 VDC or 10...65 VDC
- Ripple W_{ss} 10 %

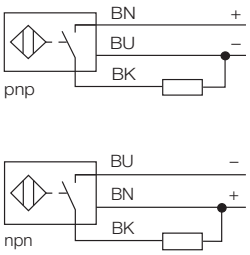
Switching output
- Normally open (N.O.) or normally closed (N.C.) for 3-wire sensors
- Complementary for 4-wire sensors
- Cyclical short-circuit protection (Overload trip point > I_e + 20 mA) with devices with the symbol ö in in the operating current column
- Wire breakage protected
- Fully reverse-polarity protected

- Off-state current I_r < 0.1 mA
- Voltage drop U_d < 1.8 V
  Si…K08/K10: < 0.7 V
  Bi/Ni.../S34: < 2.5 V
- Hysteresis H: 3...15 %
- Temperature drift
  < ± 10 % (normal temperature range -25...+70 °C)
  < ± 15 % *uprox*® and *uprox*®+ with a temperature range -30...+85 °C
  < ± 20 % (extended temperature range -40/-25...+100/120 °C)
- Repeat accuracy: R < 2 %
  Bi0,8-Q5SE-AP/AN… < 5 %
- Utilisation category 13
- Rated insulation voltage U_i 0.5 kV
- Rated conditional short-circuit current 100 A

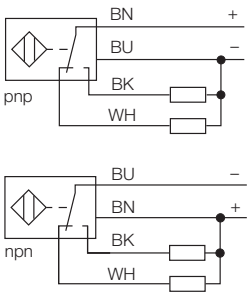
Ambient conditions
- Degree of protection (IEC 60529/ EN 60529) IP67/IP68/IP69K (according to sensor type)
- Pollution degree 3
- Shock resistance 30 × g (11 ms)
- Vibration resistance 55 Hz (1 mm)

Series or parallel connection
- When sensors are connected in series, the voltage drops and the time delays of the individual sensors must be added up.

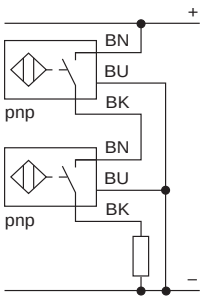
3-wire DC



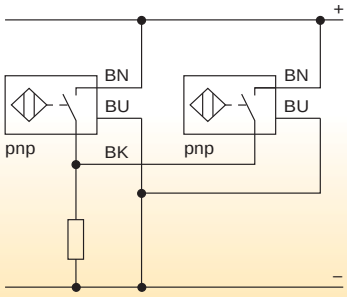
4-wire DC



3-wire DC
Series connection



3-wire DC
Parallel connection



Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

2-wire AC

Advantages
- Only two connection cables
- Can be connected to DC and AC voltage
- Short-circuit protected (types ADZ, RDZ, FDZ)

Supply voltage
- Operating voltage U_B 20...250 VAC

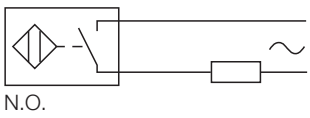
Switching function
- Normally open (N.O.)
  Coding: ... AZ
- Normally closed (N.C.)
  Coding: ... RZ
- Normally open (N.O.) or normally closed (N.C.)
  connection programmable
  Coding: ... FZ
- Off-state current I_r ≤ 1.7 mA (AC)
  ≤ 1.5 mA (DC)
- Voltage drop U_d < 6 V_{rms}
- Hysteresis H 3...15 %
- Temperature drift
  < ± 10 % (normal temperature range -25...+70 °C)
  < ± 20 % (extended temperature range -40/-25...+100/120 °C)
- Repeat accuracy R < 2 %
- Utilisation category AC 140/DC 13
- Rated insulation voltage
  U_i = 1.5 kV
- Rated conditional short-circuit current 100 A

Ambient conditions
- Protection degree (IEC 60529/ EN 60529) IP67
- Pollution degree 3
- Shock resistance 30 × g (11 ms)
- Vibration resistance 55 Hz (1 mm)

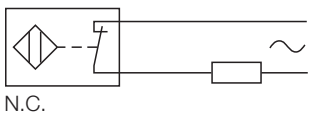
Series connection of 2-wire AC/DC sensors
Normally open: AND configuration
Normally closed: NOR configuration

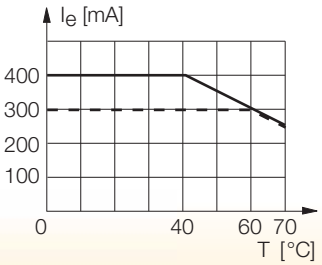
When sensors are series connected, voltage drops of the individual sensors must be added up. This reduces the usable voltage at the load. Care must be taken not to undershoot the minimum admissible supply voltage at the load (take main supply fluctuations into account).

2-wire AC, normally open

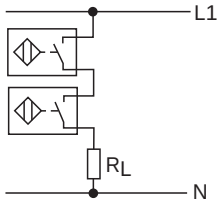


2-wire AC, normally closed





Series connection 2-wire AC sensors



4

2-wire AC sensors

Series connection of mechanical switches with AC sensors
The open contact interrupts the power supply for the sensor. If the mechanical contact is closed if the sensor is damped, a temporary malfunction may occur. The time delay of the (t ≤ 80 ms) of the sensor prevents immediate switching.

Recommendation: A resistor, connected in parallel to the mechanical contact, supplies the sensor even when the contact is open so that the time delay before availability no longer has any effect. For 230 VAC the resistance value is approx. 91 kΩ/1 W.

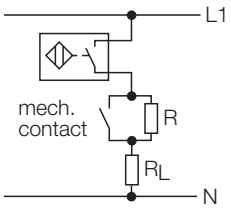
Approximate value:
Approx. 400 Ω/V

Parallel connection of mechanical switches with AC sensors
The closed contact short circuits the power supply for the sensor. After the contact opens, the sensor is only operational after the availability time delay (t ≤ 80 ms) has elapsed.

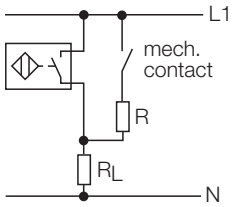
Recommendation: A resistor in series with the contact is provided to ensure that the minimum power supply voltage for the sensor. This therefore prevents the time delay before availability after the mechanical contact has opened.

Formula for calculating the resistance value:
$R = 10\ V / I_{load}$ $P = I^2_{load} \times R$

Parallel connection with mech. switches



Parallel connection with mech. switches



Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Housing Materials – Plastics

	Material	Characteristics
ABS	Acrylnitril-Butadien-Styrol	Impact resistant, rigid
PA	Polyamide	Good mechanical strength, temperature resistant, PA6/12 approved in the food industry
PBT	Polybutylenterephthalate	High mechanical strength and temperature resistance, good chemical resistance flame-retardant and self-extinguishing (UL94-V0), good (UL94-V0), transparent and UV resistant
PP	Polypropylene	Very good resistance to chemicals, even acids, alkalis and solvents can do little damage. High temperature resistance, high mechanical strength
PUR	Polyurethane	Elastic, abrasion-proof, impact resistant; oil, grease and solvent tolerant
PVC	Polyvinyl chloride	Good mechanical strength, impact resistant, resistant to chemicals
PVDF	Polyvinylidenfluoride	Resistant to high temperatures, good resistance to chemicals (similar to PTFE), high mechanical strength

Housing Materials – Metals

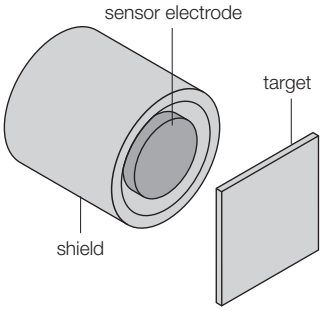
	Metals	Features
CuZn-Cr	Chrome-plated brass	Standard housing material
CuZn-OP	Brass, Optaloy coated	Standard housing material
CuZn-T	Teflon-coated brass	Teflon caps for protection against weld splatter
GD-Al	Aluminium, die-cast	Low specific weight, good strength and durability
GD-Zn	Zinc, die-cast	Good strength and durability

Connection cables for sensors

Cable	Characteristics	Code* (added to the standard type)
PVC cable jacket **PVC** wire insulation	Standard quality, fine litz-wire construction highly flexible (Li**f**YY)	
PUR Cable jacket **PVC** wire insulation	Resistant to all industrial oils and lubricants. Fine wire litz-construction, resistant to vibration and bending stress; small bending radius	**.../S90**

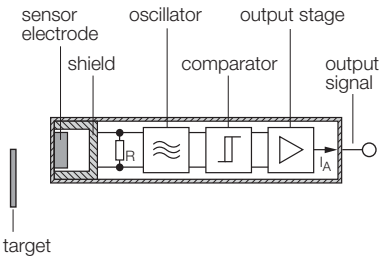
Operating principle

Capacitive Sensors

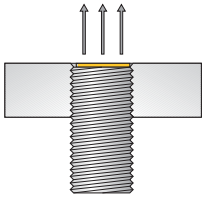


Capacitive sensors react to metals and non-metals. They are non-contact and isolated sensors. They also detect non-conductive materials and are therefore suitable for applications in which inductive sensors cannot be used.

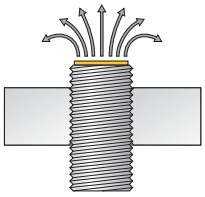
Application examples for capacitive sensors include distance and position measuring, such as the measuring of bending, thickness, level, eccentricity, concentricity, distortion, wear and vibrations.



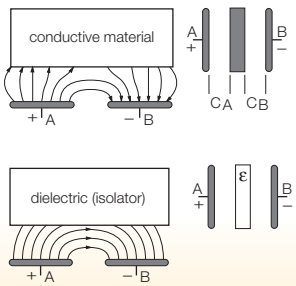
Construction and functions
The active element of a capacitive sensor is a sensor electrode and a shield. These two electrodes form a capacitor.
When a target approaches (metallic or non-metallic object) the capacitance within the electrical field of this capacitor changes, i.e. the capacitor of the RC oscillator circuit is arranged so that its capacitance increases when an object approaches (capacitance change delta C).
The oscillator is adjusted so that it can only be oscillated by this capacitance change. This oscillation when an object approaches is detected by a comparator and output via the output stage.



Flush version
These sensors generate a straight electrical field. They can detect solid materials (e.g. plastic blocks and plates, cartons, stacks of paper, bottles, chips) from a distance or liquid through a glass or plastic partition.



Non-flush version
These sensors generate a conical electrical field. They are designed to contact the product to be detected (such as granulate, oil or water) with their active surface.



Influencing factors
Capacitive sensors are also used to detect non-conductive materials such as plastic, wood, glass etc.

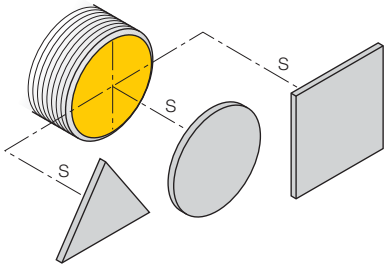
Targets made from conductive material form a counter electrode to the sensor electrode which generate two capacitances CA and CB with the electrode surfaces A and B, which are connected in series.

The capacitance of this series connection is always larger than the capacitance of the uncovered electrodes A and B.

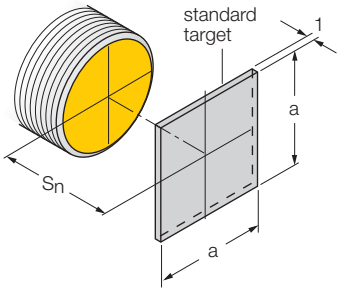
Due to their high conductivity, metals achieve the largest switching distances. Reduction factors must not be considered. Non-conductive targets (isolators), placed between the electrodes of a capacitor, have an increased switching distance depending on the dielectric constant ε_r.
The dielectric constant of all liquid and solid materials is always higher than that of air. The higher the number the greater the achievable distance.
With organic materials (wood, grain etc.) the obtainable switching distance largely depends on their water content.

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Capacitive Sensors



Switching distance S
It is the distance between the active sensor surface and the object at which the signal changes when the object approaches.
The switching distance of capacitive sensors depends on the following:
- the sensor diameter
- the material of the approaching body
- the mass of the approaching body
- the type of mounting (flush/non-flush)



Nominal switching distance S_n
The nominal switching distance describes the maximum distance that a standard target may have in order to trigger a switch operation.
This is purely a characteristic value for which production tolerances, temperature or voltage deviations are not taken into account.
The standard target has a rectangular shape with a thickness of 1 mm and is made from St37. The length of edge “a” corresponds to 3* S_n. The target must be earthed in order to ensure comparable switching distances.

Properties of capacitive sensors:
- **Non-contact detection of metals and non-metals**
- **Large switching distances (adjustable)**
- **Short-circuit and reverse polarity protection**
- **Connector, cable connection and terminal chamber**
- **Plastic, metal or Dyflor housing types**
- **EMC protection (high EMC immunity)**
- **ESD resistant**
- **New background suppression**
- **LED switch status indication**
- **Degree of protection up to IP67**

Influence of environmental conditions

Ambient temperature sensitivity
TURCK capacitive sensors are temperature resistant with a range from -25 to +70 °C. Normally with slightly higher temperature drifts than that of inductive sensors (≤ 0.2 s_r for $s_r < s_n$).

Influence by earthing
A slight increase in switching distance occurs when targets made of conductive materials are connected to the earth potential (≤ 0.2 x s_r). Adjustment of the sensitivity control can be used to compensate this effect.

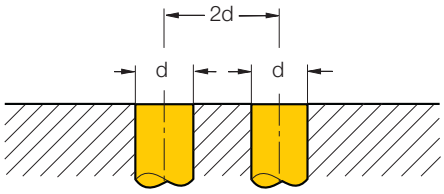
Humidity, dew, ice
In practice, sensors can be affected by moisture, dew, ice etc. causing false switching. To combat this effect, each sensor is provided with a compensating electrode which forms part of a negative feedback circuit.

In some cases, the humidity compensation may be oversensitive. For example, a single sheet of paper can be detected from a certain distance, but the compensation may operate if the paper is brought too near to the active face. This “slight influence” is felt as a disturbance and the switch command is neutralized.

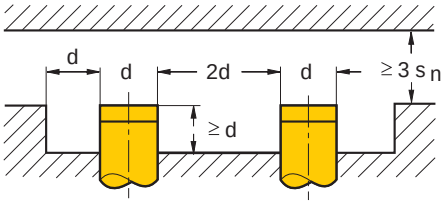
Mounting and installation

Mounting
All capacitive sensors manufactured by TURCK incorporate an internal metal shield which ensures that the electrical field is only effective in front of the active face. They are therefore suitable for flush mounting in any material – conductive & non-conductive (exception NC50-CP80 and NC20-KT34). When sensors are flush mounted, the effect on the switching distance is minimal and can be corrected by means of the potentiometer.
In the non-flush mounting mode the admissible switching distance is increased by 50 % compared to flush-mounting.

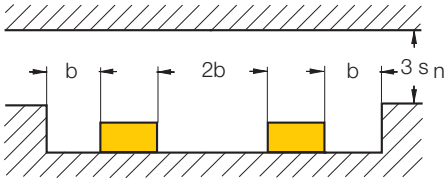
Minimum separation distances to avoid the possibility of “cross-talk”



Flush mounting of cylindrical sensors

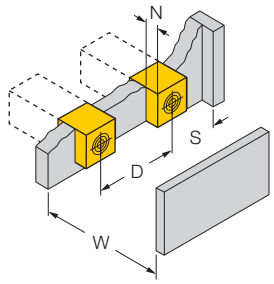


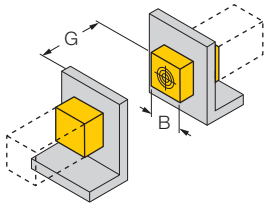
Non-flush mounting of cylindrical sensors



Non-flush mounting of rectangular sensors

Housing type CP40



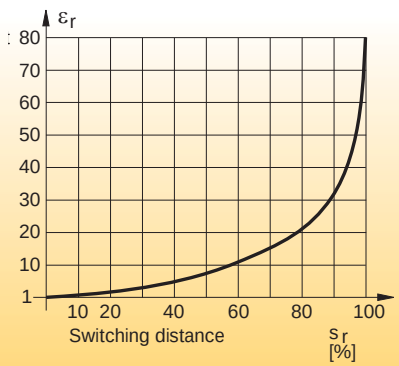


Mounting guidelines CP40:
Distance D = 80 mm
Distance W = 60 mm
Distance S = 40 mm
Distance G = 120 mm
Width of active surface 40 mm

Switching distance and dielectric constant

As illustrated by the graph, the switching distance (S_r) depends on the dielectric constant (ε_r) of the target. The maximum switching distance (100 %) is achieved with metal targets; with other materials the switching distance is reduced relative to target’s dielectric constant.

Table 1 shows the dielectric constants of some important materials. The constant for wood varies due to the high dielectric constant of water. Therefore, it is easier for capacitive sensors to detect damp than dry wood.



Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

Adjustment guidelines

Basic adjustment

The majority of TURCK capacitive sensors have a twenty-turn helical potentiometer for fine adjustment of the switching distance. During manufacturing, the range is set to 0.7...0.8 S_n using an earthed square steel target measuring 3 x s_n. All Technical Data is based on this target.

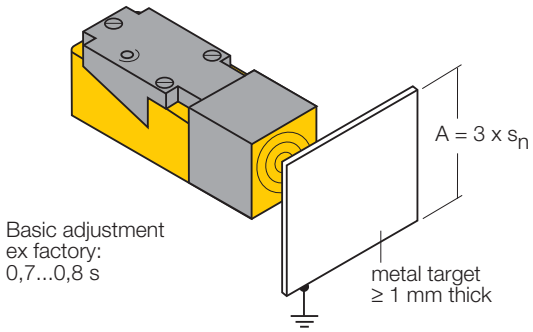
When sensing targets with a low dielectric constant (paper, glass) the sensitivity can be increased by rotating the potentiometer clockwise. It should be noted that any such increase produces a very critical switching point that can be influenced by environmental changes (e.g. temperature, humidity, dust, etc.) or it may stay continuously switched after a single actuation.

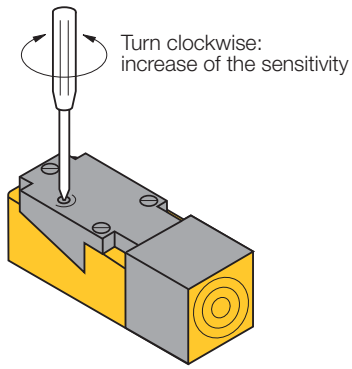
If in doubt, it is recommended that tests are carried out using an earthed target (as mentioned above). Adjustments up to $s_r \leq 1.2\ s_n$ for flush mounting and $s_r \leq 1.5\ s_n$ for non-flush mounting are not considered critical.

Note:
Adjustments $s_r \geq s_n$ can considerably increase the switching hysteresis.

Serial adjustment

A reference measurement should be carried out using an earthed standard target when a large number of capacitive sensors have to be adjusted for the same target. Having established the switching distance of the first proximity sensor, the remaining sensors can be adjusted accordingly.





Dielectric constants of different materials

Air. vacuum	1	Perspex	3.2
Teflon	2	Araldite	3.6
Wood	2...7	Bakelite	3.6
Paraffin	2.2	Quartz glass	3.7
Petroleum	2.2	Hard rubber	4
Turpentine	2.2	Oil-impregnated paper	4
Transformer oil	2.2	Presipan	4
Paper	2.3	Porcelain	4.4
Polyethylene	2.3	Hard paper	4.5
Polypropylene	2.3	Quartz sand	4.5
Cable sealing compound	2.5	Glass	5
Soft rubber	2.5	Polyamide	5
Silicone	2.8	Glimmer	6
Polyvinyl chloride	2.9	Marble	8
Polystyrol	3	Alcohol	25.8
Celluloid	3	Water	80

Index of types – Capacitive sensors

Special features, materials, symbols – Capacitive sensors

	Special features
É	sensor acc. to EN 60947-5-6 (NAMUR)
É II 1 G	ATEX group II category 1 G
É II 1 D	ATEX group II category 1 D
É II 2 G	ATEX group II category 2 G
É II 3 D	ATEX group II category 3 D
É II 3 G	ATEX group II category 3 G
SIL2	functional safety up to SIL2 (inclusively)

	Materials
ABS	Acrylnitril-Butadien-Styrol
CuZn-Cr	Chrome-plated brass
GD-Zn	Zink-Druckguss
CuZn	Zinc, die-cast
ULTEM	ULTEM (PEI), Polyetherimide
VA	Stainless steel
PA	Polyamide
PBT	Polybutylenterephthalate
PBT-GF20	Polybutylenterephthalate/fibre-optic 20 %
PP	Polypropylene
PVC	Polyvinylchloride
PVDF	Polyvinylidenfluoride

	Symbols
a	flush mounting
b	non-flush mounting
]	cable
{	connector
}	terminal chamber connection
©	normally open (N.O.)
¨	normally closed (N.C.)
ª	SPDT contact
ö	short circuit proteced
program.	normally closed (N.C.) / normally open (N.O.) programmable via connection
ô	high temperature ranges

Hans Turck GmbH & Co.KG • Witzlebenstraße 7 • D–45472 Mülheim/Ruhr • Tel. 0208 4952-0 • Fax 0208 4952-264 • www.turck.com

SERVICE & SUPPORT

A fast shipment service and a comprehensive e-support system perfectly complement the extensive TURCK programme.

The product database provided at www.turck.com enables you to quickly find the solution for your task, round the clock and seven days a week, from anywhere in the world and in six different languages.

Approximately 13 000 products are clearly structured and fully documented on the Internet website for immediate viewing by you – with all the information you need for your special application. See for yourself: www.turck.com.

TURCK

Industrial
Automation

TURCK WORLD-WIDE HEADQUARTERS

GERMANY
Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr
P. O. Box 45466 Mülheim an der Ruhr
Tel. +49 208 4952-0
Fax +49 208 4952-264
E-Mail more@turck.com

BAHRAIN
TURCK Middle East S.P.
P.O. Box 18370
Manama - Kingdom of Bahrain
Tel. +973 17 814920
Fax +973 17 814925
E-Mail
turckmiddleeast@turck.com

BELGIUM
Multiprox N. V.
P. B. 71
Lion d'Orweg 12
9300 Aalst
Tel. +32 53 766566
Fax +32 53 783977
E-Mail mail@multiprox.be

CZECH REPUBLIC
TURCK s.r.o.
Hradecká 1151
500 03 Hradec Králové 3
Tel. +420 49 5518-766
Fax +420 49 5518-767
E-Mail czech@turck.com

PR OF CHINA
TURCK (Tianjin) Sensor Co. Ltd.
18,4th Xinghuazhi Road,
Xiqing Economic
Development Area,
300381 Tianjin
Tel. +86 22 83988-188
83988-199
Fax +86 22 83988-111
E-Mail turcktj@public1.tpt.tj.cn

FRANCE
TURCK BANNER S.A.S
3, Rue de Courtalin
Magny-Le-Hongre
77703 Marne-La-Vallee Cedex 4
Tel. +33 1 6043-6070
Fax +33 1 6043-1018
E-Mail info@turckbanner.fr

GREAT BRITAIN
TURCK BANNER LIMITED
Blenheim House
Hurricane Way
Wickford, Essex SS11 8YT
Tel. +44 1268 578888
Fax +44 1268 763648
E-Mail info@turckbanner.co.uk

HUNGARY
TURCK Hungary kft.
Könyves Kalman Krt.76
1087 Budapest
Tel. +36 1 4770-740
Fax +36 1 4770-741
E-Mail hungary@turck.com

INDIA
TURCK India Automation Pvt Ltd.
A-603/604, ICC Trade Towers,
6th Floor, Senapati Bapat Road,
Pune - 411016,
Maharashtra - India
Tel. + 91 20 25630039
25630040
Fax + 91 20 25630040
E-Mail sales.india@turck.com

ITALY
TURCK BANNER S. R. L.
Via S.Domenico, 5
20010 Bareggio (MI)
Tel. +39 02 90364-291
Fax +39 02 90364-838
E-Mail info@turckbanner.it

JAPAN
TURCK Japan Corporation
#202 MBD Bldg. 2F, 3-3-23,
Minami-Aoyama,
Minato-ku, 107-0062, Tokyo,
Japan
Tel. + 81 3 57722820
Fax + 81 3 34082571
E-Mail info@turck.jp

KOREA
TURCK Korea Co. Ltd.
Room No 406, Gyeonggi
Technopark
1271-11, Sa 1-Dong,
Sangnok-Gu, Ansan-city,
Gyeonggi-Do, Korea
Tel. +82 31 5004-555
Fax +82 31 5004-558
E-Mail sensor@sensor.co.kr

MEXICO
TURCK Mexico S. DE R.L. DE C.V.
Carr. Saltillo-Zacatecas km 4.5 s/n
Parque Industrial "La Angostura"
Saltillo, COAH. 25070
Tel. +52 844 4826-924
Fax +52 844 4826-926
E-Mail ventasmexico@turck.com

THE NETHERLANDS
TURCK B. V.
Postbus 297
8000 AG Zwolle
Tel. +31 38 4227-750
Fax +31 38 4227-451
E-Mail info@turck.nl

POLAND
TURCK sp.z o.o
Zeromskiego 1
45-053 Opole
Tel. +48 77 4434-800
Fax +48 77 4434-801
E-Mail poland@turck.com

ROMANIA
TURCK Automation Romania SRL
Str. Iuliu Tetrat nr. 18 Sector 1
011914 Bukarest
Tel. +40 21 2300279
2300594
Fax +40 21 2314087
E-Mail: romania@turck.com

RUSSIA
TURCK Rus O.O.O.
Altufyevskoe shosse, 1/7
127106 Moskau
Tel. +7 495 2342661
Fax +7 495 2342665
E-Mail russia@turck.com

SINGAPORE
TURCK Singapore Pte. Ltd.
25 International Business Park
#03-22/23 German Centre
609916 Singapore
Tel. +65 65628716
Fax +65 65628719
E-Mail singapore@turck.com

USA
TURCK Inc.
3000 Campus Drive
Minneapolis, MN 55441-2656
Tel. +1 763 553-9224
553-7300
Fax +1 763 553-0708
E-Mail mailbag@turck.com

... and more than 60 representatives and agencies world-wide.

www.turck.com

D101683 1107