



Capacitive proximity sensors



Capacitive proximity sensors

- High level of temperature stability
- Enhanced sensing ranges for functional reserve
- High level of immunity against:
 - Electrostatic discharge, e.g. in plastic or wood production
 - Electromagnetic interference, e.g. caused by radio transceivers and mobile telephones
 - Interference surge voltage caused by switching devices or solenoid valves
 - Conducted high frequency, e.g. frequency converters or switched-mode power supplies

Capacit



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CM series

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CQ series

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Capacitive proximity sensors →

Reliable for use in all branches of industry.



**Three housing designs.
Four types.**

18 or 30 mm cylindrical threaded housing, or a rectangular housing having an active sensing surface equipped with a 35 mm sensing face. The size of the sensing surface determines the choice of which sensor should be used. The larger it is, the greater the sensing distance, starting 3 to 8 mm for the CM 18 and ranges to 25 mm for the CM 30 and the CQ 35.



**Presence, filling, checking, testing.
In every branch of industry.**

Level and feed monitoring – that is one of attributes of capacitive sensors, irrespective of whether it involves a solid material such as paper or wood, granules or liquids. They reliably detect the status of the product in the production process and during final inspection.



**Electro-magnetic interference?
No problem!**

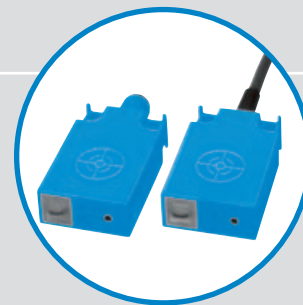
Even exercising the greatest of care, electro-magnetic interference in manufacturing and storage systems can never be totally eliminated. Solenoid valves, relays and switches or frequency converters in close proximity, or electro-static discharges from the contents in a container or silo have very little effect upon SICK capacitive sensors.

Presence is enough.

Metallic or non-metallic, solid or liquid, compacted or powder-like. Not all materials sensed by a capacitive sensor react in the same way. Nevertheless, they are detected equally well by a sensor, irrespective of their properties. Their mere presence in the electro-static field of the sensor detects any material, which is non-gaseous. Water-based materials are particularly easy to detect.

They are all robust and resistant to aggressive chemicals.

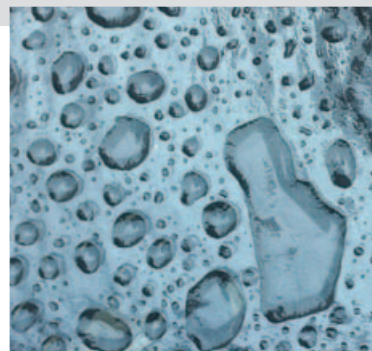
The capacitive sensors supplied by SICK are suitable for extremely adverse industrial environments. Protection to IP 67 is Standard, and in aggressive environments, the CM 18 PTFE operates particularly well. Due to its PTFE housing it resists virtually all chemicals, acids, alkalis and solvents, and is particularly hygienic – an advantage not only for food processing, but also, for the petro-chemical industry and in the semi-conductor industry for wafer manufacture.



Close at hand, but no disruption to work activity.

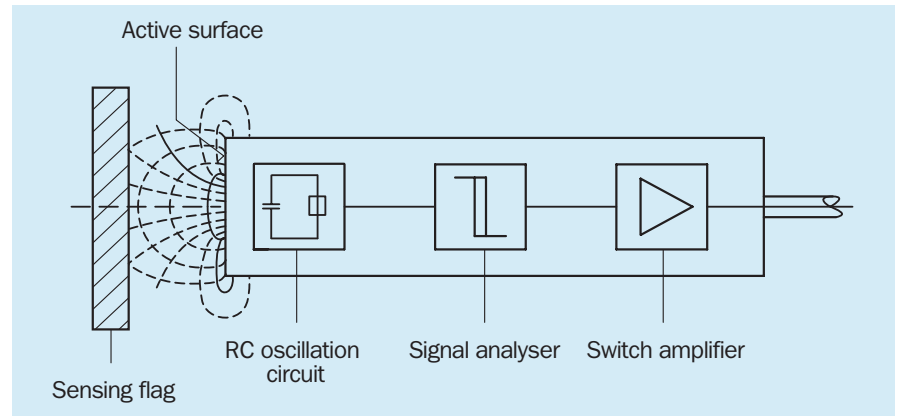
Capacitive sensors supplied by SICK are always convenient to use. Sensing ranges between 8 and 25 mm allow clearance in almost any installation situation and they are extremely adaptable for a wide range of applications.

As a result, these sensors remain unaffected by interference and malfunctions. Impurities and contamination, dust and airborne spray particles have little effect upon them as does electro-magnetic interference. No wonder that they are installed in the most diverse branches of industry. In the food industry, car industry or in storage and conveying technology.

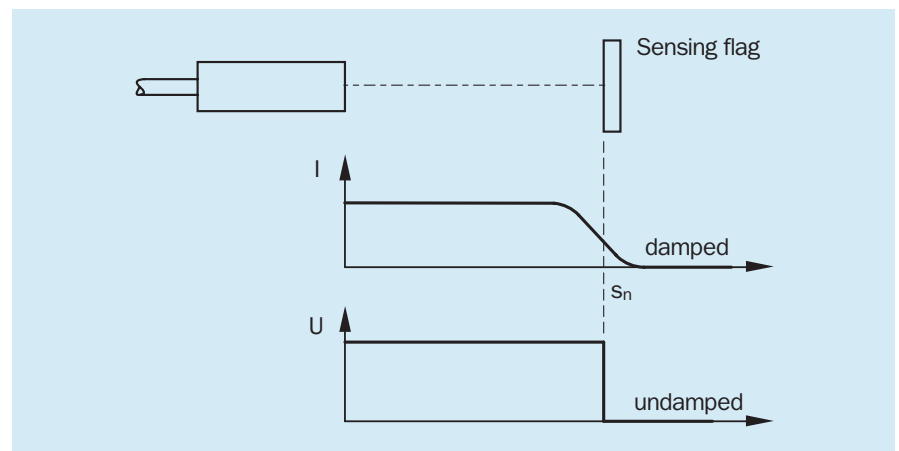


Operating principle

The active element in a capacitive proximity sensor consists of a sensor electrode and shielding. Together, these two electrodes form the capacitor.



On the approach of a sensing flag (metallic or non-metallic object), a change in capacity takes place in the electrical field of this capacitor, i.e. the capacitor of the RC oscillation circuit is arranged in such a way that its capacity increases when an object approaches. The oscillator is set in such a way that it only becomes capable of oscillation through this increase in capacity. The start in oscillation when an object approaches is detected by the signal analyser and output via the signal amplifier.



Reduction factor R

As with the inductive proximity sensors, the reduction factor depends on the material. It describes the factor by which the sensing range s is reduced by a certain material, with reference to the nominal sensing range s_n , which results from the use of an earthed ST37 metal plate as sensing flag.

The most important reduction factors for capacitive proximity sensors are:

Iron, earthed	1.0	Oil	0.2
Water	1.0	PVC	0.4
Wheat	0.3 ... 0.6	PE	0.37
Wood	0.2 ... 0.9	Ceramic material	0.3
Glass	0.3 ... 0.7		

The reduction factor heavily depends on the moisture content of the material.

Test	Standard	Product Standard EN 60497-5-2	General interference immunity Generic Standard EN 50082-2	SICK Capacitive Sensors
Electrostatic Discharge ESD	EN 61000-4-2 (IEC 1000-4-2)	4 kV cd ¹⁾ / 8 kV ad ²⁾	4 kV cd ¹⁾ /8 kV ad ²⁾	17 kV cd ¹⁾ /ad ²⁾
HF radiated	EN 61000-4-3 (IEC 1000-4-3)	3 V/m 80 ... 1000 MHz	10 V 80 ... 1000 MHz	> 15 V/m 80 ... 1000 MHz
HF wire conducted	EN 61000-4-6 (IEC 1000-4-6)	–	10 V 0.15 ... 80 MHz	> 10 V/m
Burst	EN 61000-4-4 (IEC 1000-4-4)	1 kV	2 kV	4 kV
Surge	IEC 255-5	1 kV, 500 Ohm	–	2.5 kV, 500 Ohm

¹⁾ cd = Contact discharge

²⁾ ad = Air discharge

The same installation notes apply as for the inductive proximity sensors (see p. 210).

Selection table

Housing		Sensing range S _n in mm		Switching output P ¹⁾	Output function Com. ²⁾	Connection		Electr. config.	From page
Design, size in mm, material		Flush	Non-flush			C ³⁾	Co. ⁴⁾		
with thread									
CM 18	M18, Plastic	8	12					DC	362
CM 18	M18, PTFE	8						DC	364
CM 30	M30, Plastic	16	25					DC	366
CM 30	M30, Plastic	16	25					AC	368
Cuboid									
CQ 35	35x55x15, Plastic	16	25					DC	372

¹⁾ P = PNP

³⁾ C = Cable

²⁾ Com. = Complementary

⁴⁾ Co. = Connector

Type code

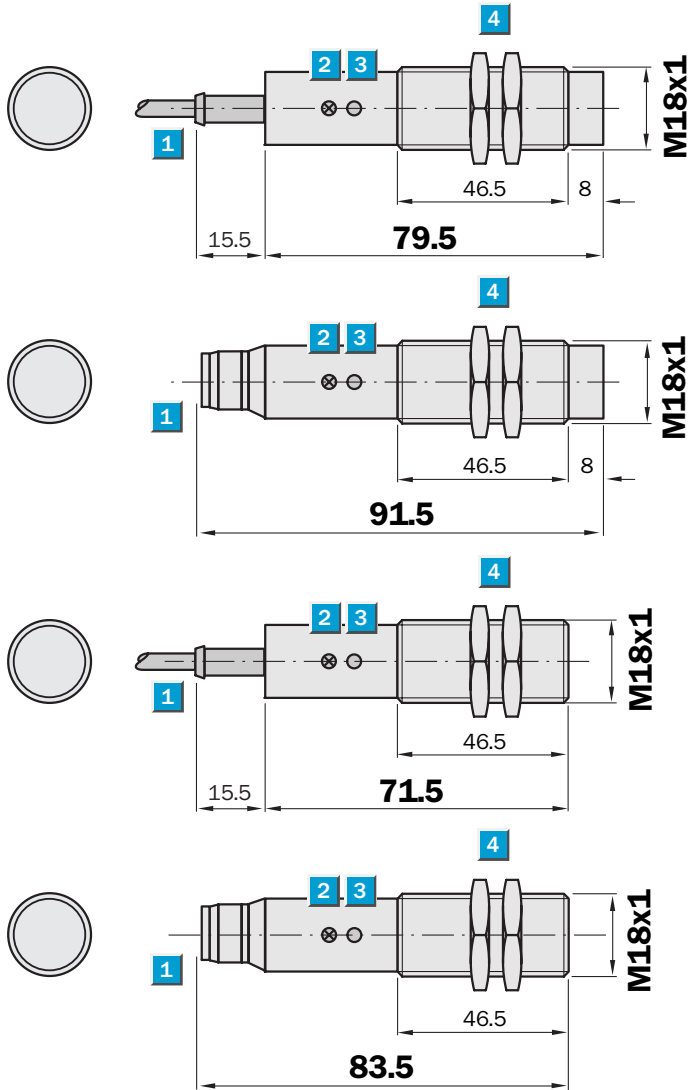
	CM	18	-	08B	N	P	-	K	W	O	
Sensor technology											Other codes
Capacitive	C									O	–
Design											Cables and connectors
Cylinder with thread		M							W		Cable, PVC
Cuboid		Q							C		Connector M12 x 1
Housing shape											Housing material
Metric external thread 18			18					K			Plastic
Metric external thread 30			30					T			PTFE (Teflon®)
Edge length of sensing face 35			35								Output
Sensing range/installation										P	Complementary
Flush				B							Interface
Non flush				N	P						PNP, 4-wire, 10 ... 40 V DC
8 mm, flush				08B	N						NPN, 4-wire, 10 ... 40 V DC
25 mm, non flush				25N	A						2-wire, 20 ... 265 V AC

Sensing range
8 / 12 mm

Capacitive sensor

- High EMC immunity
- Short-circuit protection (pulsed)
- Complementary output function
- Enclosure rating IP 67
- LED status indicator

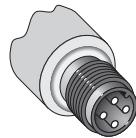
Dimensional drawing



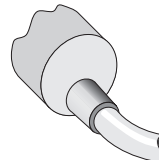
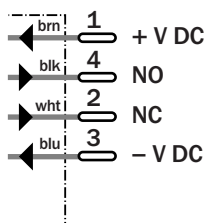
- 1 Connection
- 2 Display LED
- 3 Potentiometer
- 4 Fastening nuts (2 x); width across 24, Plastic

Connection type

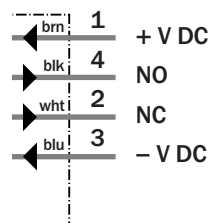
CM18-08BNP-KC1	CM18-08BNP-KW1
CM18-08BPP-KC1	CM18-08BPP-KW1
CM18-12NPP-KC1	CM18-12NPP-KW1
CM18-12NPP-KC1	CM18-12NPP-KW1



M12, 4-pin



4 x 0.34 mm²



See chapter Accessories

Connector, M12, 4-pin
Mounting systems

Technical specifications		CM18-	08BNP-KC1	08BNP-KW1	08BPP-KC1	08BPP-KW1	12NNP-KC1	12NNP-KW1	12NPP-KC1	12NPP-KW1		
Sensing range S_n	8 mm											
	12 mm											
Electrical configuration	DC 4-wire											
Supply voltage V_s	DC 10 ... 40 V											
Ripple U _{pp}	≤ 10 % ¹⁾											
Voltage drop U _d	≤ 2.5 V ²⁾											
Power consumption	≤ 10 mA ³⁾											
Continuous current I_a	≤ 200 mA											
Time delay before availability t _v	≤ 100 ms											
Hysteresis H, of s _r	4 ... 20 %											
Repeatability R	≤ 5 % (U _b and T _a constant) ⁴⁾											
Temperature drift, of s _r	± 10 %											
EMC	According to EN 60947-5-2											
Switching output	NPN											
	PNP											
Output function	Complementary											
Installation	Flush											
	Non-flush											
Connection type	Connector, M12, 4-pin											
	Cable, PVC, 2 m											
Enclosure rating	IP 67 ⁵⁾											
Max. switching frequency	30 Hz											
Dimensions	M18 x 1 ⁶⁾											
Short-circuit protection	✓ ⁷⁾											
Reverse polarity protection	✓											
Power-up pulse suppression	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
Ambient temperature operation	-25 °C ... +80 °C											
Housing material	Plastic											
Tightening torque	2.6 Nm											

¹⁾ of U_b
²⁾ at I_a max

³⁾ without load
⁴⁾ of s_r

⁵⁾ according to EN 60529
⁶⁾ Thread diameter x pitch (mm)

⁷⁾ (pulsed)

Order information	
Type	Order no.
CM18-08BNP-KC1	6 021 456
CM18-08BNP-KW1	6 021 455
CM18-08BPP-KC1	6 020 388
CM18-08BPP-KW1	6 020 136
CM18-12NNP-KC1	6 021 458
CM18-12NNP-KW1	6 021 457
CM18-12NPP-KC1	6 020 410
CM18-12NPP-KW1	6 020 389

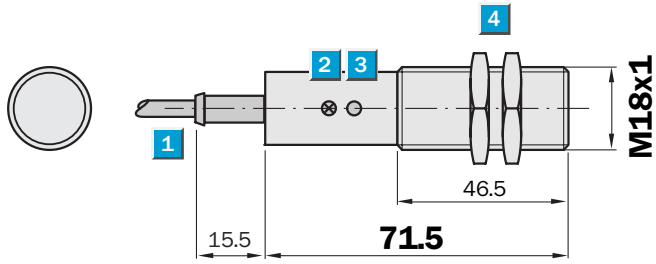


Sensing range
8 mm

Capacitive sensor

- PTFE housing with M18 x 1 mm
- High EMC immunity
- Short-circuit protection (pulsed)
- Complementary output function
- Enclosure rating IP 67
- LED status indicator

Dimensional drawing

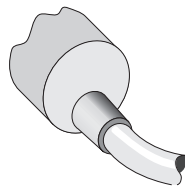


- 1 Connection
- 2 Display LED
- 3 Potentiometer
- 4 Fastening nuts (2 x); width across 24, PTFE

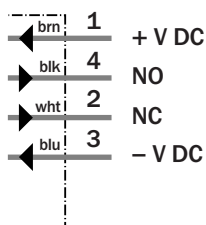


Connection type

- CM18-08BNP-TWO
- CM18-08BPP-TWO



4 x 0.34 mm²



See chapter Accessories

Mounting systems

Technical specifications		CM18-	08BNP-TWO	08BPP-TWO								
Sensing range S_n	8 mm											
Electrical configuration	DC 4-wire											
Supply voltage V_s	DC 10 ... 40 V											
Ripple U_{pp}	$\leq 10\%$ ¹⁾											
Voltage drop U_d	$\leq 2.5\text{ V}$ ²⁾											
Power consumption	$\leq 10\text{ mA}$ ³⁾											
Continuous current I_a	$\leq 200\text{ mA}$											
Time delay before availability t_v	$\leq 100\text{ ms}$											
Hysteresis H, of s_r	4 ... 20 %											
Repeatability R	$\leq 5\%$ (U_b and T_a constant) ⁴⁾											
Temperature drift, of s_r	$\pm 10\%$											
EMC	According to EN 60947-5-2											
Switching output	NPN											
	PNP											
Output function	Complementary											
Installation	Flush											
Connection type	Cable, PVC, 2 m											
Enclosure rating	IP 67 ⁵⁾											
Max. switching frequency	30 Hz											
Dimensions	M18 x 1 ⁶⁾											
Short-circuit protection	✓ ⁷⁾											
Reverse polarity protection	✓											
Power-up pulse suppression	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
Ambient temperature operation	-25 °C ... +60 °C											
Housing material	PTFE/teflon											
Tightening torque	2.6 Nm											

¹⁾ of U_b
²⁾ at I_a max

³⁾ without load
⁴⁾ of s_r

⁵⁾ according to EN 60529
⁶⁾ Thread diameter x pitch (mm)

⁷⁾ (pulsed)

Order information	
Type	Order no.
CM18-08BNP-TWO	6 026 194
CM18-08BPP-TWO	6 026 195

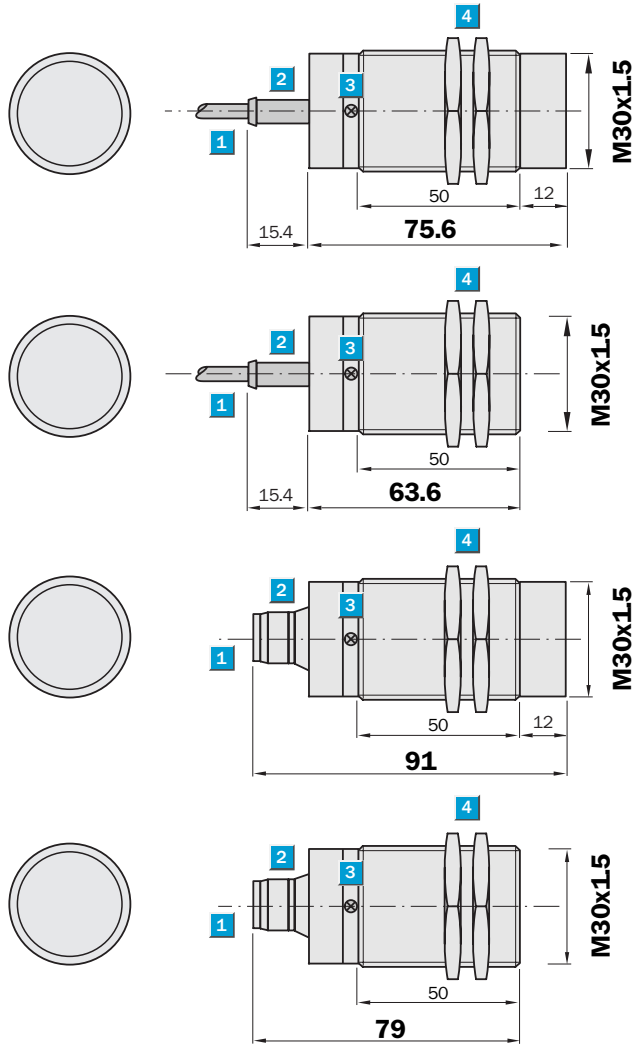
Sensing range
16 / 25 mm

Capacitive sensor

- High EMC immunity
- Short-circuit protection (pulsed)
- Complementary output function
- Enclosure rating IP 67
- LED status indicator



Dimensional drawing

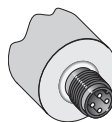


- 1 Connection
- 2 Potentiometer
- 3 Display LED
- 4 Fastening nuts (2 x); width across 36, Plastic

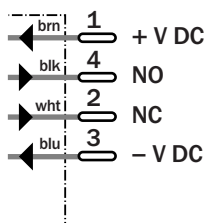


Connection type

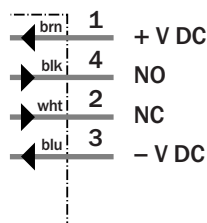
CM30-16BNP-KC1	CM30-16BNP-KW1
CM30-16BPP-KC1	CM30-16BPP-KW1
CM30-25NPP-KC1	CM30-25NPP-KW1
CM30-25NPP-KC1	CM30-25NPP-KW1



M12, 4-pin



4 x 0.34 mm²



See chapter Accessories
 Connector, M12, 4-pin
 Mounting systems

Technical specifications		CM30-	16BNP-KC1	16BNP-KW1	16BPP-KC1	16BPP-KW1	25NNP-KC1	25NNP-KW1	25NPP-KC1	25NPP-KW1		
Sensing range S_n	16 mm											
	25 mm											
Electrical configuration	DC 4-wire											
Supply voltage V_s	DC 10 ... 40 V											
Ripple U _{pp}	≤ 10 % ¹⁾											
Voltage drop U _d	≤ 2.5 V ²⁾											
Power consumption	≤ 10 mA ³⁾											
Continuous current I_a	≤ 200 mA											
Time delay before availability t _v	≤ 100 ms											
Hysteresis H, of s _r	4 ... 20 %											
Repeatability R	≤ 5 % (U _b and T _a constant) ⁴⁾											
Temperature drift, of s _r	± 10 %											
EMC	According to EN 60947-5-2											
Switching output	NPN											
	PNP											
Output function	Complementary											
Installation	Flush											
	Non-flush											
Connection type	Connector, M12, 4-pin											
	Cable, PVC, 2 m											
Enclosure rating	IP 67 ⁵⁾											
Max. switching frequency	50 Hz											
Dimensions	M30 x 1.5 ⁶⁾											
Short-circuit protection	✓ ⁷⁾											
Reverse polarity protection	✓											
Power-up pulse suppression	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
Ambient temperature operation	-25 °C ... +80 °C											
Housing material	Plastic											
Tightening torque	7.5 Nm											

¹⁾ of U_b
²⁾ at I_a max

³⁾ without load
⁴⁾ of s_r

⁵⁾ according to EN 60529
⁶⁾ Thread diameter x pitch (mm)

⁷⁾ (pulsed)

Order information	
Type	Order no.
CM30-16BNP-KC1	6 021 460
CM30-16BNP-KW1	6 021 459
CM30-16BPP-KC1	6 020 475
CM30-16BPP-KW1	6 020 473
CM30-25NNP-KC1	6 021 462
CM30-25NNP-KW1	6 021 461
CM30-25NPP-KC1	6 020 477
CM30-25NPP-KW1	6 020 476

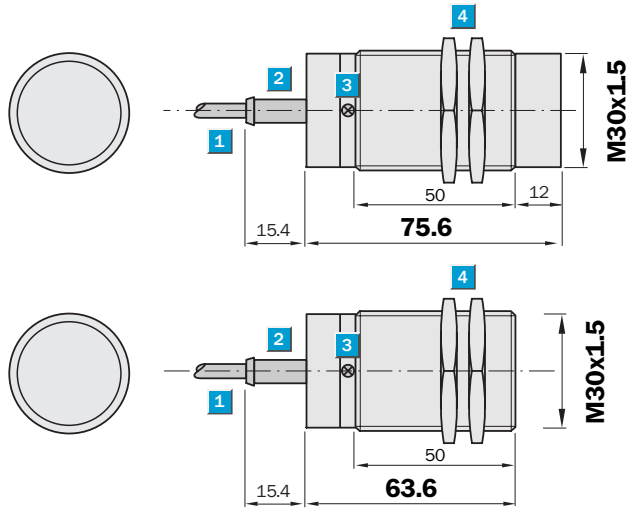
Capacitive sensor, CM30, AC 2-wire, Plastic

Sensing range
16 / 25 mm

Capacitive sensor

- AC 2-wire, 250 V
- High EMC immunity
- Configurable output function
- Enclosure rating IP 67
- LED status indicator

Dimensional drawing



- 1 Connection
- 2 Potentiometer
- 3 Display LED
- 4 Fastening nuts (2 x); width across 36, Plastic

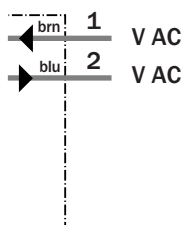


Connection type

- CM30-25NAP-KW1
- CM30-16BAP-KW1



2 x 0.5 mm²



See chapter Accessories
Mounting systems

Technical specifications		CM30-	25NAP-KW1	16BAP-KW1										
Sensing range S_n	25 mm													
	16 mm													
Electrical configuration	AC 2-wire													
Supply voltage V_s	AC 20 ... 250 V													
Ripple U_{pp}	$\leq 10\%$ ¹⁾													
Voltage drop U_d	$\leq 10\%$ ²⁾													
Power consumption	$\leq 10\text{ mA}$ ³⁾													
Continuous current I_a	$\leq 500\text{ mA}$													
Time delay before availability t_v	$\leq 100\text{ ms}$													
Hysteresis H, of s_r	4 ... 20 %													
Repeatability R	$\leq 5\%$ (U_b and T_a constant) ⁴⁾													
Temperature drift, of s_r	$\pm 10\%$													
EMC	According to EN 60947-5-2													
Output function	Configurable													
Installation	Non-flush													
	Flush													
Connection type	Cable, PVC, 2 m													
Enclosure rating	IP 67 ⁵⁾													
Max. switching frequency	10 Hz													
Dimensions	M30 x 1.5 ⁶⁾													
Reverse polarity protection	✓													
Power-up pulse suppression	✓													
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm													
Ambient temperature operation	-25 °C ... +80 °C													
Housing material	Plastic													
Tightening torque	7.5 Nm													

¹⁾ of U_b
²⁾ at I_a max
³⁾ without load
⁴⁾ of s_r
⁵⁾ according to EN 60529
⁶⁾ Thread diameter x pitch (mm)

Order information

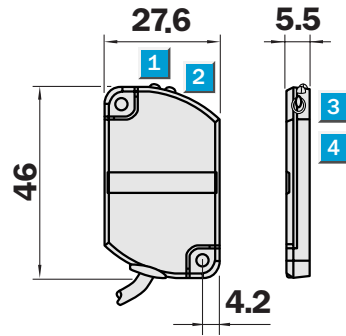
Type	Order no.
CM30-25NAP-KW1	6 028 413
CM30-16BAP-KW1	6 028 411

Sensing range
10 mm

Capacitive sensor

- Thin profile:
28 x 46 x 5.5 mm (w x h x d)
- Adjustable sensing range
1 ... 10 mm, non-flush
- Short circuit and
reverse polarity protection
- Teach-in via button or COM-input

Dimensional drawing

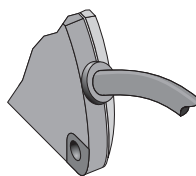


- 1 Indicator LED green
- 2 Indicator LED yellow
- 3 Teach button
- 4 Sensing area

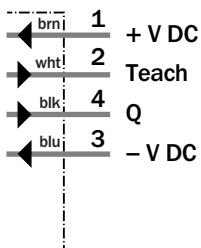


Connection type

CQ28-10NPP-KW1
CQ28-10NPP-KW1



4 x 0.14 mm²



Technical specifications		CQ28-	10NNP-KW1	10NPP-KW1									
Sensing range S_n	10 mm												
Electrical configuration	DC 4-wire												
Supply voltage V_s	DC 10 ... 30 V												
Ripple U_{pp}	$\leq 10 \%$												
Voltage drop U_d	$\leq 2.5 V^1$												
Power consumption	$\leq 12 mA^2$												
Continuous current I_a	$\leq 200 mA$												
Time delay before availability t_v	300 ms												
Hysteresis H, of s_r	Depending on teach adjustment												
Repeatability R	$\leq 5 \%$ (U_b and T_a constant) ³⁾												
Temperature drift, of s_r	$\pm 10 \%$												
EMC	According to EN 60947-5-2												
Switching output	NPN												
	PNP												
Output function	Programmable												
Installation	Non-flush												
Connection type	Cable, PVC, 2 m												
Enclosure rating	IP 68 ⁴⁾												
Max. switching frequency	10 Hz												
Dimensions	28 x 46 x 5.5 mm ⁵⁾												
Short-circuit protection	✓												
Reverse polarity protection	✓												
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm												
Ambient temperature operation	-20 °C ... +85 °C												
Ambient temperature storage	-40 °C ... +85 °C												
Housing material	Plastic, PBT												

¹⁾ at I_a max

²⁾ without load

³⁾ of s_r

⁴⁾ according to EN 60529

⁵⁾ Width x height x depth

Order information

Type	Order no.
CQ28-10NNP-KW1	6 030 133
CQ28-10NPP-KW1	6 030 132

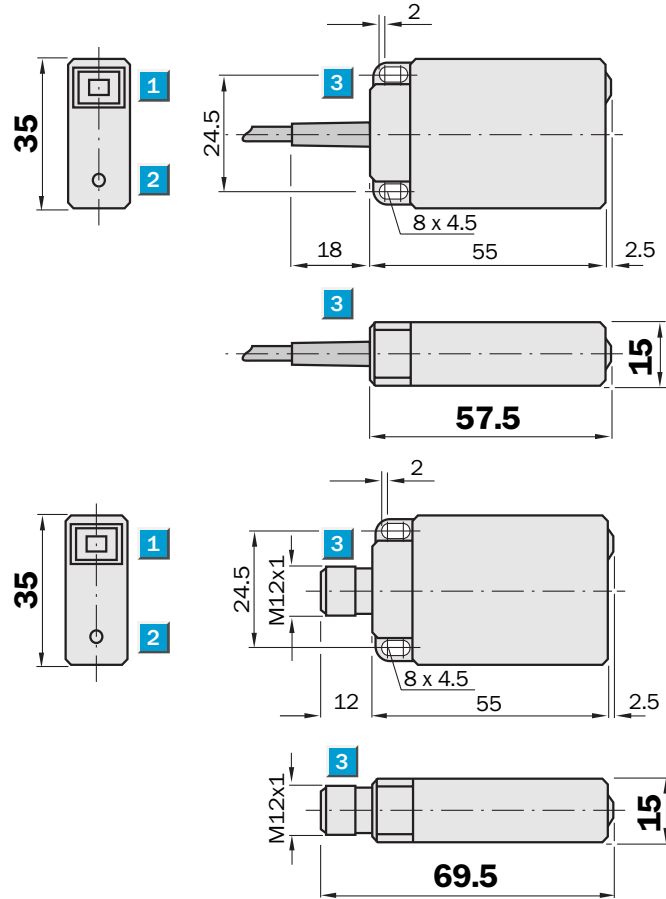
Capacitive sensor, CQ35, DC 4-wire, Plastic

Sensing range
25 mm

Capacitive sensor

- High EMC immunity
- Short-circuit protection (pulsed)
- Complementary output function
- Enclosure rating IP 67
- LED status indicator

Dimensional drawing



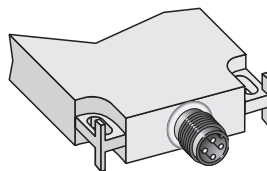
- 1 Display LED
- 2 Potentiometer
- 3 Connection



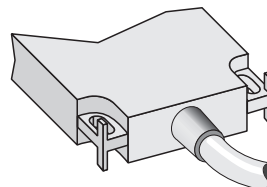
Connection type

CQ35-25NPP-KC1
CQ35-25NPP-KC1

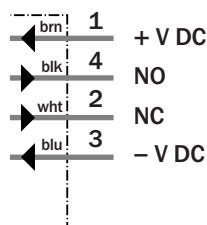
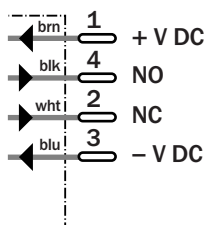
CQ35-25NPP-KW1
CQ35-25NPP-KW1



M12, 4-pin



4 x 0.34 mm²



See chapter Accessories

Connector, M12, 4-pin

Technical specifications		CQ35-	25NPP -KC1	25NPP -KW1	25NPP -KC1	25NPP -KW1						
Sensing range S_n	25 mm											
Electrical configuration	DC 4-wire											
Supply voltage V_s	DC 10 ... 40 V											
Ripple U_{pp}	$\leq 10\%$ ¹⁾											
Voltage drop U_d	$\leq 2.5\text{ V}$ ²⁾											
Power consumption	$\leq 10\text{ mA}$ ³⁾											
Continuous current I_a	$\leq 200\text{ mA}$											
Time delay before availability t_v	$\leq 100\text{ ms}$											
Hysteresis H, of s_r	4 ... 20 %											
Repeatability R	$\leq 5\%$ (U_b and T_a constant) ⁴⁾											
Temperature drift, of s_r	$\pm 10\%$											
EMC	According to EN 60947-5-2											
Switching output	NPN											
	PNP											
Output function	Complementary											
Installation	Non-flush											
Connection type	Connector, M12, 4-pin											
	Cable, PVC, 2 m											
Enclosure rating	IP 67 ⁵⁾											
Max. switching frequency	50 Hz											
Dimensions	35 x 15 x 69.5 mm ⁶⁾											
	35 x 15 x 57.5 mm ⁶⁾											
Short-circuit protection	✓ ⁷⁾											
Reverse polarity protection	✓											
Power-up pulse suppression	✓											
Shock/vibration stress	30 g, 11 ms/10 ... 55 Hz, 1 mm											
Ambient temperature operation	-25 °C ... +75 °C											
Housing material	Plastic											

¹⁾ of U_b
²⁾ at I_a max

³⁾ without load
⁴⁾ of s_r

⁵⁾ according to EN 60529
⁶⁾ Width x height x depth

⁷⁾ (pulsed)

Order information

Type	Order no.
CQ35-25NPP-KC1	6 021 464
CQ35-25NPP-KW1	6 021 463
CQ35-25NPP-KC1	6 020 479
CQ35-25NPP-KW1	6 020 478