

CAPACITIVE SENSORS



HIGHLIGHTS:

- ✓ Synthetic or metal housings
- ✓ 4- or 2-wire devices
- ✓ Adjustable operating distances
- ✓ For the detection of all kinds of materials

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

Glossary

Index

HOUSING SIZE	OPERATING DISTANCE						OUTPUT		
	2.0 mm	4.0 mm	5.0 mm	8.0 mm	10 mm	15 mm	PNP changeover	NPN changeover	AC/DC 2-wire N.O.
M12	2.0 mm						✓	✓	
	4.0 mm						✓	✓	
M18		5.0 mm					✓	✓	✓
		8.0 mm					✓	✓	✓
M30			10 mm				✓	✓	✓
			15 mm				✓	✓	✓

MOUNTING		SUPPLY VOLTAGE RANGE U _B		CONNECTION		HOUSING			PAGE
Embeddable	Non-embeddable	PNP / NPN	AC/DC 2-wire N.O.	Connector S12	Cable	Metal	PPO	PTFE	
✓		10 ... 35 VDC		✓	✓	✓	✓	✓	246-247
	✓	10 ... 35 VDC		✓	✓	✓	✓	✓	247-248
✓		10 ... 35 VDC	20 ... 250 VAC / DC	✓	✓	✓	✓	✓	249-250, 256
	✓	10 ... 30 / 35 VDC	20 ... 250 VAC / DC	✓	✓	✓	✓	✓	250-251, 256
✓		10 ... 35 VDC	20 ... 250 VAC / DC	✓	✓	✓	✓	✓	252-253, 257
	✓	10 ... 30 / 35 VDC	20 ... 250 VAC / DC	✓	✓	✓	✓	✓	253-255, 257

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

Glossary

Index

CAPACITIVE SENSORS

INTRODUCTION

Capacitive sensors are used in machines, installations and vehicles for monitoring the levels of liquids, pastes and bulk material. These materials can even be detected through non-metallic dividing walls. In addition, capacitive sensors are suitable as limit switches, contact-free position switches, for monitoring and positioning, as pulse generators for counting purposes, distance and speed measurement, and much more.

OPERATING PRINCIPLE

The electrodes at the device's sensing face permit the sensor to detect the dielectric conditions in its close surroundings. Depending on the distance between the target (or material) to be detected and the capacitive sensor, the capacitance in the measuring zone changes. The capacitance is dependent not only on the above-mentioned distance, but also on the dielectric constant (ϵ_r) of the target, as well as its shape. As the sensor approaches the target, the capacitance increases. When the set threshold value is reached, the transistor-oscillator is activated. By means of the built-in electronics, a changeable, electrical current is generated which, depending on the execution of the device, is available as a linear current signal or as a binary voltage at the output.

Using capacitive sensors, electronic circuits and PLCs, as well as relays or contactors can be controlled directly.

Capacitive sensors are enclosed in synthetic or metal housings and potted in epoxy resin. They are, moreover, insensitive to dirt and shock.

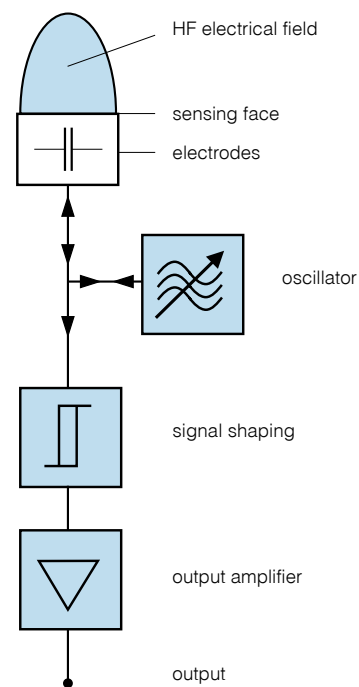


Fig. 16: operating principle

DELIVERY PROGRAM

The Contrinex delivery program consists of 4-wire devices in sizes M12, M18 and M30 (PNP or NPN, with changeover outputs) as well as 2-wire switches (AC/DC, NO) in sizes M18 and M30.

SERIES AND PARALLEL CONNECTION

Capacitive 2-wire sensors with binary output can be used in series or parallel connection, similar to mechanical contacts. Attention has to be paid to the device-specific voltage drop, i.e. the residual voltage U_d , which multiplies in the case of series connection according to the number of devices. In the case of parallel connection of sensors with thyristor output, the first switching output takes the whole load current.

ADJUSTMENT OF THE OPERATING DISTANCE

Equipped with a 20-turn potentiometer, these Contrinex sensors allow for adjustment of the operating distance, which can be either longer than or shorter than the rated operating distance. Under favorable conditions, an operating distance of up to the maximum given value can be set.

MOUNTING

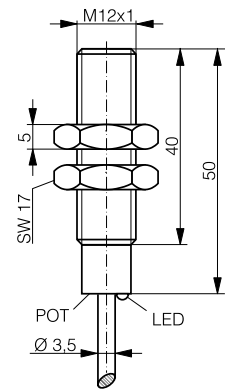
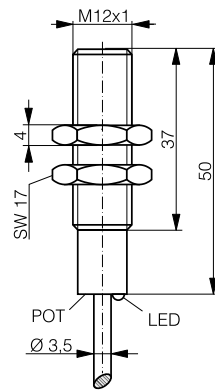
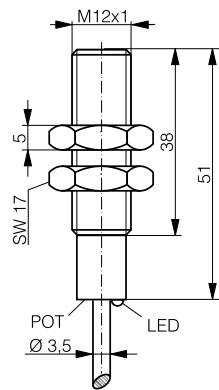
As with inductive sensors, two kinds of mounting are distinguished for capacitive sensors: embeddable or non-embeddable.

Sensors for embeddable installation in metal or other materials can be arranged side by side, and are particularly suitable for the contact-free detection of solid bodies or liquid levels through non-metallic dividing walls (max. wall thickness 4 mm).

When mounting two or more sensors for non-embeddable installation side by side in metal or other materials, some free space must be provided. Non-embeddable sensors are particularly suitable for applications where the medium to be detected comes into contact with the sensing head (e.g. level monitoring of bulk material, pastes or liquids).



HOUSING SIZE	M12		
OPERATING DISTANCE MM	2	2	2



- 1) Standard cable length 2 m. Non-standard cable lengths and types on request.
- 2) see page 258
- 3) see page 259
- 4) see page 268

TECHNICAL DATA

Op. distance min./max. adjustable	0.5 ... 5 mm	0 ... 6 mm	0 ... 6 mm
Housing material	PPO	Stainless steel V2A	PTFE
Sensing face	PPO	PTFE	PTFE
Connection ¹⁾	PUR 4 x 0.14 mm ²	PUR 4 x 0.14 mm ²	PUR 4 x 0.14 mm ²
Degree of protection	IP 67	IP 67	IP 67
Mounting	Embeddable	Embeddable	Embeddable
Max. switching frequency	500 Hz	500 Hz	500 Hz
Additional technical data ²⁾	Table 1	Table 1	Table 1
Wiring ³⁾	Diagram 1	Diagram 1	Diagram 1
LED	Green / yellow	Green / yellow	Green / yellow
Supply voltage range	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
Ambient temperature range	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
Output current	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
Approvals	CE, RoHS	CE, RoHS	CE, RoHS

PART REFERENCES

(bold: preferred types)			
NPN changeover outputs	CSK-1120-201	CSK-1120-101	CSK-1120-301
PNP changeover outputs	CSK-1120-203	CSK-1120-103	CSK-1120-303
Compatible connectors ⁴⁾			

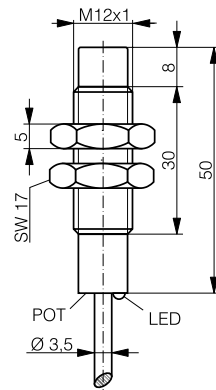
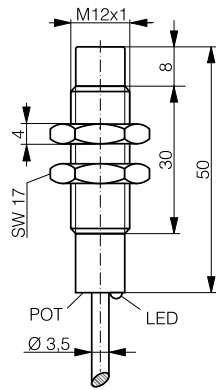
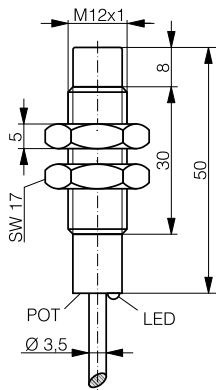
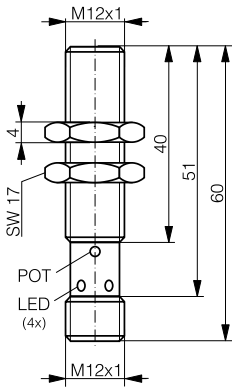
M12

2

4

4

4



0 ... 6 mm	1 ... 6 mm	0.5 ... 10 mm	0.5 ... 10 mm
Stainless steel V2A	PPO	Stainless steel V2A	PTFE
PTFE	PPO	PTFE	PTFE
Connector S12	PUR 4 x 0.14 mm ²	PUR 4 x 0.14 mm ²	PUR 4 x 0.14 mm ²
IP 67	IP 67	IP 67	IP 67
Embeddable	Non-embeddable	Non-embeddable	Non-embeddable
500 Hz	50 Hz	50 Hz	50 Hz
Table 1	Table 1	Table 1	Table 1
Diagram 1	Diagram 1	Diagram 1	Diagram 1
Yellow	Green / yellow	Green / yellow	Green / yellow
10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

CSS-1120-101	CSK-1120-211	CSK-1120-111	CSK-1120-311
CSS-1120-103	CSK-1120-213	CSK-1120-113	CSK-1120-313
M, N			

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

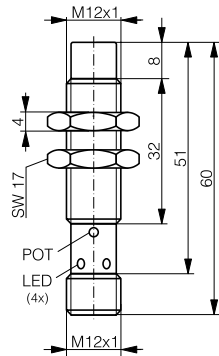
Accessories

Glossary

Index

HOUSING SIZE	M12		
--------------	-----	--	--

OPERATING DISTANCE MM	4		
-----------------------	---	--	--



1) Standard cable length 2 m.
Non-standard cable lengths
and types on request.

2) see page 258

3) see page 259

4) see page 268

TECHNICAL DATA

Op. distance min./max. adjustable	0.5 ... 10 mm		
Housing material	Stainless steel V2A		
Sensing face	PTFE		
Connection ¹⁾	Connector S12		
Degree of protection	IP 67		
Mounting	Non-embeddable		
Max. switching frequency	50 Hz		
Additional technical data ²⁾	Table 1		
Wiring ³⁾	Diagram 1		
LED	Yellow		
Supply voltage range	10 ... 35 VDC		
Ambient temperature range	-25 ... +70 °C		
Output current	≤ 2 x 250 mA		
Approvals	CE, RoHS		

PART REFERENCES

(bold: preferred types)			
NPN changeover outputs	CSS-1120-111		
PNP changeover outputs	CSS-1120-113		
Compatible connectors ⁴⁾	M, N		

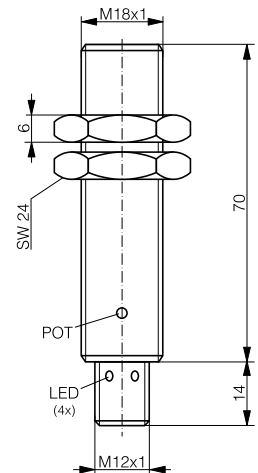
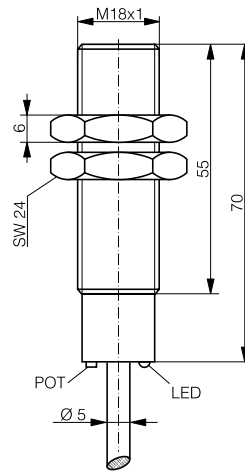
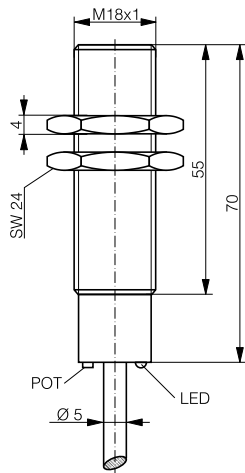
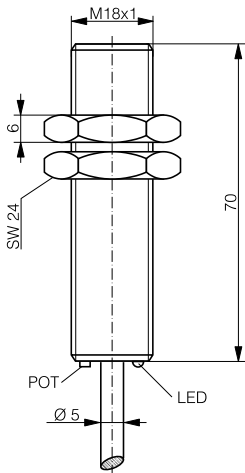
M18

5

5

5

5



0.5 ... 10 mm	0.5 ... 10 mm	0.5 ... 10 mm	0.5 ... 10 mm
PPO	Nickel-plated brass	PTFE	PPO
PPO	PTFE	PTFE	PPO
PVC 4 x 0.34 mm ²	PVC 4 x 0.34 mm ²	PVC 4 x 0.34 mm ²	Connector S12
IP 67	IP 67	IP 67	IP 67
Embeddable	Embeddable	Embeddable	Embeddable
300 Hz	300 Hz	300 Hz	300 Hz
Table 1	Table 1	Table 1	Table 1
Diagram 1	Diagram 1	Diagram 1	Diagram 1
Green / yellow	Green / yellow	Green / yellow	Yellow
10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

CSK-1180-201	CSK-1180-101	CSK-1180-301	CSS-1180-201
CSK-1180-203	CSK-1180-103	CSK-1180-303	CSS-1180-203
			M, N

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

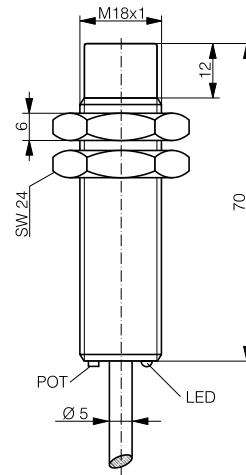
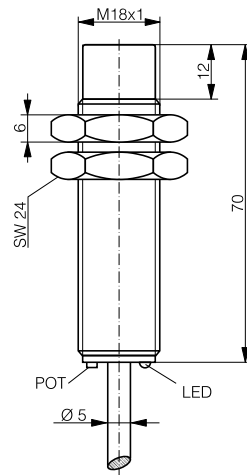
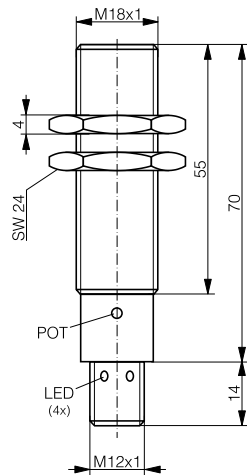
Accessories

Glossary

Index

HOUSING SIZE	M18		
--------------	-----	--	--

OPERATING DISTANCE MM	5	8	8
-----------------------	---	---	---



- 1) Standard cable length 2 m. Non-standard cable lengths and types on request.
- 2) see page 258
- 3) see page 259
- 4) see page 268

TECHNICAL DATA

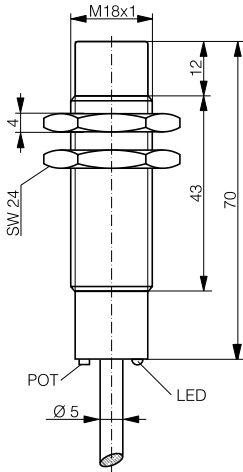
Op. distance min./max. adjustable	0.5 ... 10 mm	1 ... 10 mm	0.5 ... 15 mm
Housing material	Nickel-plated brass	PPO	PPO
Sensing face	PTFE	PPO	PPO
Connection ¹⁾	Connector S12	PVC 4 x 0.34 mm ²	PVC 4 x 0.34 mm ²
Degree of protection	IP 67	IP 67	IP 67
Mounting	Embeddable	Non-embeddable	Non-embeddable
Max. switching frequency	300 Hz	50 Hz	50 Hz
Additional technical data ²⁾	Table 1	Table 3	Table 1
Wiring ³⁾	Diagram 1	Diagram 1	Diagram 1
LED	Yellow	Yellow	Green / yellow
Supply voltage range	10 ... 35 VDC	10 ... 30 VDC	10 ... 35 VDC
Ambient temperature range	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
Output current	≤ 2 x 250 mA	≤ 2 x 200 mA	≤ 2 x 250 mA
Approvals	CE, RoHS	CE, RoHS	CE, RoHS

PART REFERENCES

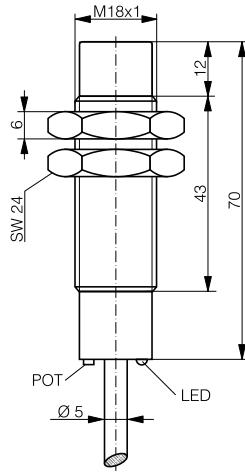
(bold: preferred types)			
NPN changeover outputs	CSS-1180-101		CSK-1180-211
PNP changeover outputs	CSS-1180-103	CSK-1181-213	CSK-1180-213
Compatible connectors ⁴⁾	M, N		

M18

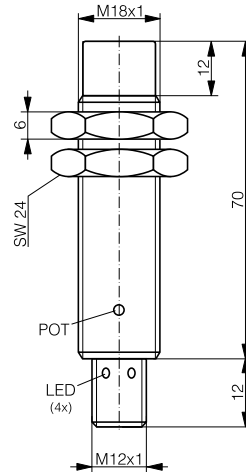
8



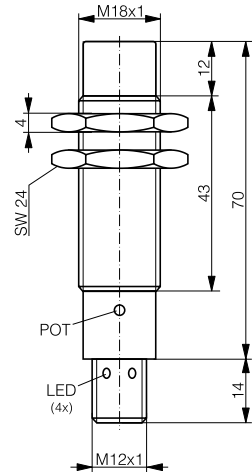
8



8



8



0.5 ... 15 mm	0.5 ... 15 mm	0.5 ... 15 mm	0.5 ... 15 mm
Nickel-plated brass	PTFE	PPO	Nickel-plated brass
PTFE	PTFE	PPO	PTFE
PVC 4 x 0.34 mm ²	PVC 4 x 0.34 mm ²	Connector S12	Connector S12
IP 67	IP 67	IP 67	IP 67
Non-embeddable	Non-embeddable	Non-embeddable	Non-embeddable
50 Hz	50 Hz	50 Hz	50 Hz
Table 1	Table 1	Table 1	Table 1
Diagram 1	Diagram 1	Diagram 1	Diagram 1
Green / yellow	Green / yellow	Yellow	Yellow
10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

CSK-1180-111	CSK-1180-311	CSS-1180-211	CSS-1180-111
CSK-1180-113	CSK-1180-313	CSS-1180-213	CSS-1180-113
		M, N	M, N

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

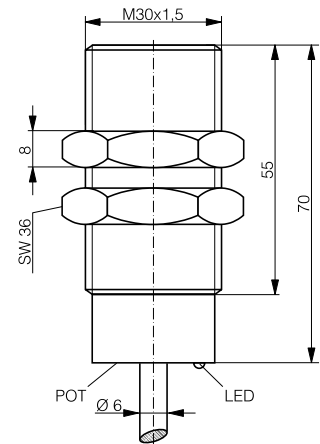
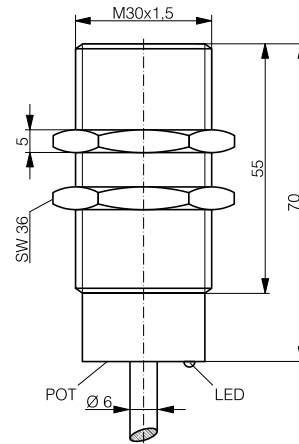
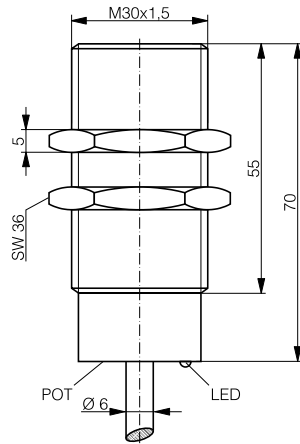
Accessories

Glossary

Index

HOUSING SIZE	M30		
--------------	-----	--	--

OPERATING DISTANCE MM	10	10	10
-----------------------	----	----	----



- 1) Standard cable length 2 m. Non-standard cable lengths and types on request.
- 2) see page 258
- 3) see page 259
- 4) see page 268

TECHNICAL DATA

Op. distance min./max. adjustable	0.5 ... 25 mm	0.5 ... 25 mm	0.5 ... 25 mm
Housing material	PPO	Nickel-plated brass	PTFE
Sensing face	PPO	PTFE	PTFE
Connection ¹⁾	PVC 4 x 0.5 mm ²	PVC 4 x 0.5 mm ²	PVC 4 x 0.5 mm ²
Degree of protection	IP 67	IP 67	IP 67
Mounting	Embeddable	Embeddable	Embeddable
Max. switching frequency	200 Hz	200 Hz	200 Hz
Additional technical data ²⁾	Table 1	Table 1	Table 1
Wiring ³⁾	Diagram 1	Diagram 1	Diagram 1
LED	Green / yellow	Green / yellow	Green / yellow
Supply voltage range	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
Ambient temperature range	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
Output current	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
Approvals	CE, RoHS	CE, RoHS	CE, RoHS

PART REFERENCES

(bold: preferred types)			
NPN changeover outputs	CSK-1300-201	CSK-1300-101	CSK-1300-301
PNP changeover outputs	CSK-1300-203	CSK-1300-103	CSK-1300-303
Compatible connectors ⁴⁾			

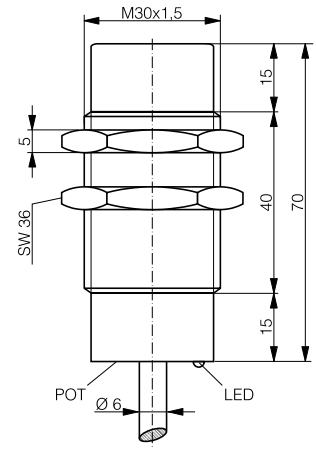
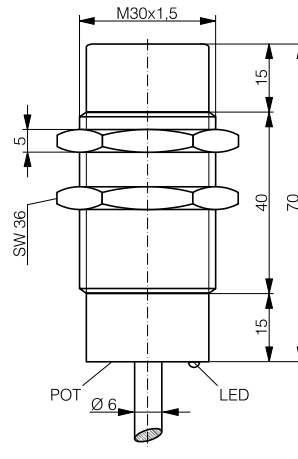
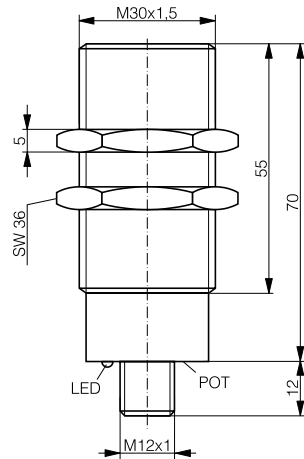
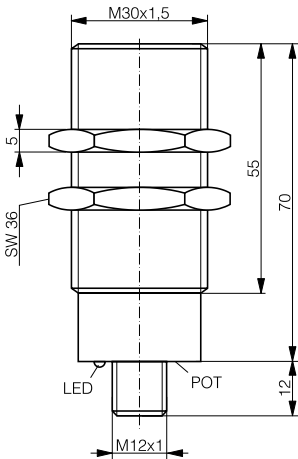
M30

10

10

15

15



0.5 ... 25 mm	0.5 ... 25 mm	2 ... 25 mm	2 ... 25 mm
PPO	Nickel-plated brass	PPO	Nickel-plated brass
PPO	PTFE	PPO	PPO
Connector S12	Connector S12	PVC 4 x 0.5 mm ²	PVC 4 x 0.5 mm ²
IP 67	IP 67	IP 67	IP 67
Embeddable	Embeddable	Non-embeddable	Non-embeddable
200 Hz	200 Hz	50 Hz	50 Hz
Table 1	Table 1	Table 3	Table 3
Diagram 1	Diagram 1	Diagram 1	Diagram 1
Green / yellow	Green / yellow	Yellow	Yellow
10 ... 35 VDC	10 ... 35 VDC	10 ... 30 VDC	10 ... 30 VDC
-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 200 mA	≤ 2 x 200 mA
CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

CSS-1300-201	CSS-1300-101	CSK-1301-213	CSK-1301-113
CSS-1300-203	CSS-1300-103		
M, N	M, N		

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

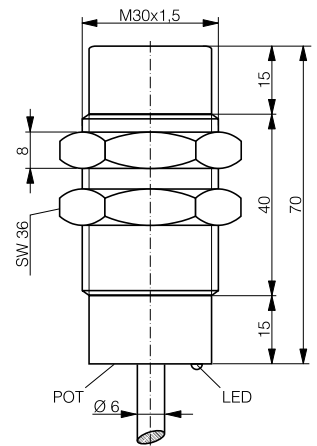
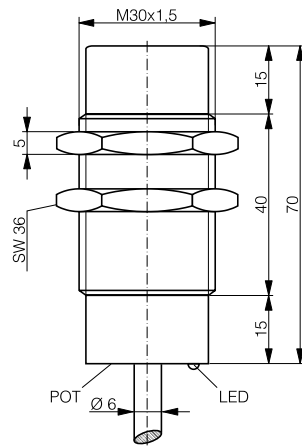
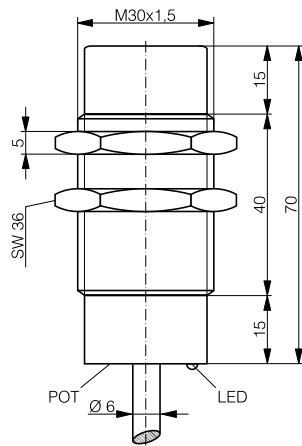
Accessories

Glossary

Index

HOUSING SIZE	M30		
--------------	-----	--	--

OPERATING DISTANCE MM	15	15	15
-----------------------	----	----	----



1) Standard cable length 2 m.
Non-standard cable lengths and types on request.

2) see page 258

3) see page 259

4) see page 268

TECHNICAL DATA			
----------------	--	--	--

Op. distance min./max. adjustable	1 ... 30 mm	1 ... 30 mm	1 ... 30 mm
Housing material	PPO	Nickel-plated brass	PTFE
Sensing face	PPO	PTFE	PTFE
Connection ¹⁾	PVC 4 x 0.5 mm ²	PVC 4 x 0.5 mm ²	PVC 4 x 0.5 mm ²
Degree of protection	IP 67	IP 67	IP 67
Mounting	Non-embeddable	Non-embeddable	Non-embeddable
Max. switching frequency	50 Hz	50 Hz	50 Hz
Additional technical data ²⁾	Table 1	Table 1	Table 1
Wiring ³⁾	Diagram 1	Diagram 1	Diagram 1
LED	Green / yellow	Green / yellow	Green / yellow
Supply voltage range	10 ... 35 VDC	10 ... 35 VDC	10 ... 35 VDC
Ambient temperature range	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
Output current	≤ 2 x 250 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
Approvals	CE, RoHS	CE, RoHS	CE, RoHS

PART REFERENCES			
-----------------	--	--	--

(bold: preferred types)			
NPN changeover outputs	CSK-1300-211	CSK-1300-111	CSK-1300-311
PNP changeover outputs	CSK-1300-213	CSK-1300-113	CSK-1300-313
Compatible connectors ⁴⁾			

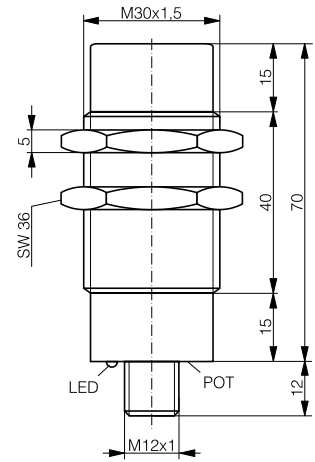
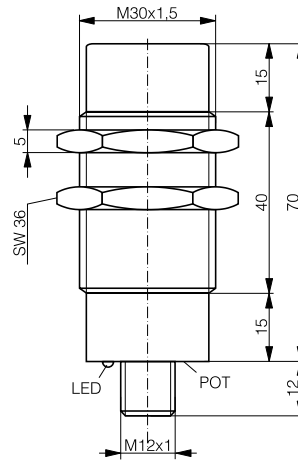
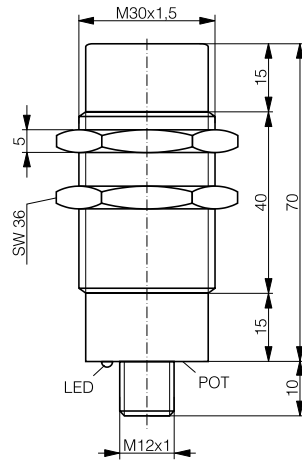
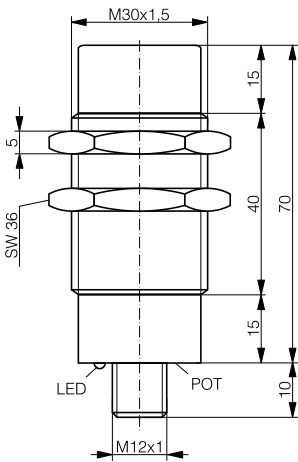
M30

15

15

15

15



2 ... 25 mm	2 ... 25 mm	1 ... 30 mm	1 ... 30 mm
PPO	Nickel-plated brass	PPO	Nickel-plated brass
PPO	PPO	PPO	PTFE
Connector S12	Connector S12	Connector S12	Connector S12
IP 67	IP 67	IP 67	IP 67
Non-embeddable	Non-embeddable	Non-embeddable	Non-embeddable
50 Hz	50 Hz	50 Hz	50 Hz
Table 3	Table 3	Table 1	Table 1
Diagram 1	Diagram 1	Diagram 1	Diagram 1
Yellow	Yellow	Green / yellow	Green / yellow
10 ... 30 VDC	10 ... 30 VDC	10 ... 35 VDC	10 ... 35 VDC
-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C
≤ 2 x 200 mA	≤ 2 x 200 mA	≤ 2 x 250 mA	≤ 2 x 250 mA
CE, RoHS	CE, RoHS	CE, RoHS	CE, RoHS

		CSS-1300-211	CSS-1300-111
CSS-1301-213	CSS-1301-113	CSS-1300-213	CSS-1300-113
M, N	M, N	M, N	M, N

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

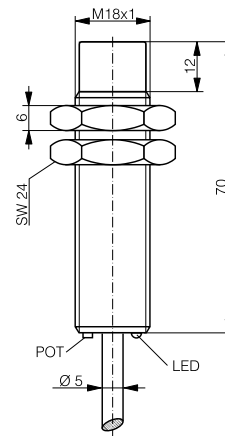
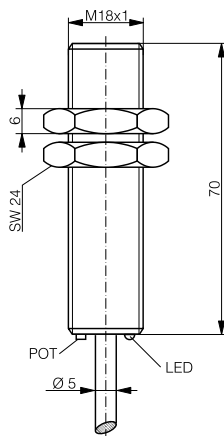
Glossary

Index

HOUSING SIZE	M18	
--------------	-----	--

OPERATING DISTANCE MM	5	8
-----------------------	---	---

AC / DC 2-WIRE



- 1) Standard cable length 2 m.
Non-standard cable lengths and types on request.
- 2) see page 258
- 3) see page 259
- 4) see page 268

TECHNICAL DATA		
----------------	--	--

Op. distance min./max. adjustable	1 ... 5 mm	2 ... 8 mm
Housing material	PPO	PPO
Sensing face	PPO	PPO
Connection ¹⁾	PUR 2 x 0.34 mm ²	PUR 2 x 0.34 mm ²
Degree of protection	IP 67	IP 67
Mounting	Embeddable	Non-embeddable
Max. switching frequency	25 Hz	25 Hz
Additional technical data ²⁾	Table 2	Table 2
Wiring ³⁾	Diagram 2	Diagram 2
LED	Yellow	Yellow
Supply voltage range	20 ... 250 VAC / DC	20 ... 250 VAC / DC
Ambient temperature range	-25 ... +70 °C	-25 ... +70 °C
Output current	≤ 330 mA	≤ 330 mA
Approvals	CE, RoHS	CE, RoHS

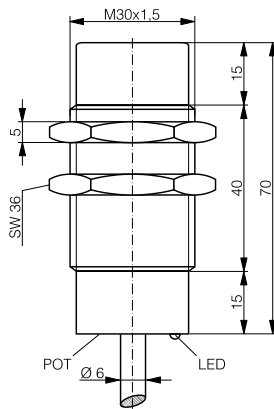
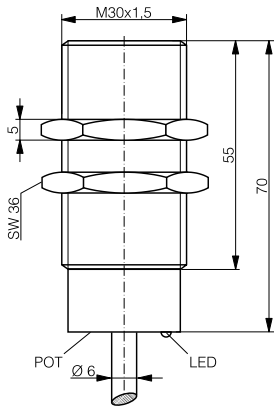
PART REFERENCES		
-----------------	--	--

(bold: preferred types)		
AC / DC 2-wire N.O.	CSK-1180-207	CSK-1180-217
Compatible connectors ⁴⁾		

M30

10

15



2 ... 15 mm	2 ... 20 mm	
PPO	PPO	
PPO	PPO	
PVC 2 x 0.75 mm ²	PVC 2 x 0.75 mm ²	
IP 67	IP 67	
Embeddable	Non-embeddable	
25 Hz	25 Hz	
Table 2	Table 2	
Diagram 2	Diagram 2	
Yellow	Yellow	
20 ... 250 VAC / DC	20 ... 250 VAC / DC	
-25 ... +70 °C	-25 ... +70 °C	
≤ 330 mA	≤ 330 mA	
CE, RoHS	CE, RoHS	

CSK-1300-207	CSK-1300-217	

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

Glossary

Index

TECHNICAL DATA

	Table 1	Table 2	Table 3
Permissible ripple content	≤ 10 %	---	≤ 5 %
No-load supply current	15 mA typ.	2.5 mA typ.	≤ 8 mA
Min. load current	---	5 mA	---
Voltage drop, switched state	≤ 2 V	≤ 6 V	≤ 2 V
Hysteresis % s_r	≤ 20 %	≤ 20 %	≤ 20 %
Repeat accuracy	≤ 0.02 mm	≤ 0.02 mm	≤ 0.02 mm
(T_A constant)			
Short-circuit protection	built-in	---	built-in
Polarity reversal protection	built-in	--- (non polarized)	built-in

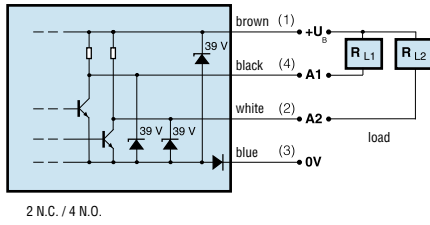
TIGHTENING TORQUE

	PPO	PTFE	Nickel-plated brass	Stainless steel
M12 x 1	1 Nm	0.2 Nm	16 Nm	25 Nm
M18 x 1	1.7 Nm	0.5 Nm	28 Nm	60 Nm
M30 x 1.5	8 Nm	2.5 Nm	82 Nm	200 Nm

WIRING DIAGRAMS

Diagram 1

NPN changeover outputs



PNP changeover outputs

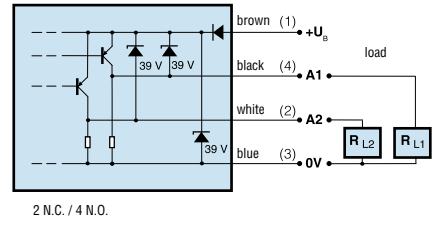
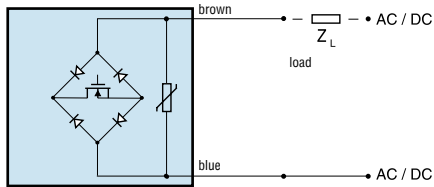


Diagram 2

2-wire AC/DC normally open (N.O.)



Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

Glossary

Index