

Capacitive Sensors



COMPANY PROFILE

Company Profile

Elco (Tianjin) Electronics Co., Ltd. is a leading enterprise in China's industrial automation. It was established in Tianjin in 2003, and its sales and service network covers the whole country. As a provider of local industrial automation products and a supplier of intelligent manufacturing solutions in China, Elco has occupied a leading position in automobiles, auto parts, construction machinery, robots, food and pharmaceutical, printing and packaging, textile machinery, logistics equipment, electronics manufacturing and many other fields.

ELCO provides the full range of services from system layer, control layer, network layer to execution layer to the implementation of overall planning of intelligent factory. The products and solutions are not limited to the ElcoCloud platform and include MES (Manufacturing Execution System), Industrial Fieldbus, Industrial Ethernet, Industrial wireless communication, IoT gateway chip, automated production lines consisting of robotics and intelligent equipments, integration of automatic & electric controlling system, intelligent logistics warehouse system, IoT integrated development solutions and services etc. This leads to a truly intelligent manufacturing and improves the productivity, efficiency and flexibility.

Over several years, ELCO provides comprehensive support for the development of China's manufacturing industry through innovative technology, excellent products and solutions. To meet the customers needs all over the world and to allow global availability and competitive prices, Elco has established a new branch in Germany: Elco Industrie Automation in Oberstenfeld.



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Capacitive sensor

Introduction

Operating Principle

The active element is formed by two metallic electrodes positioned much like an “opened” capacitor (Fig. 1). Electrodes A and B are placed in a feedback loop of a high frequency oscillator. When no target is present, the sensor’s capacitance is low, therefore the oscillation amplitude is small. When a target approaches the surface of the sensor, it increases the capacitance. This increase in capacitance results in an increased amplitude of oscillation. The amplitude of oscillation is measured by an evaluating circuit that generates a signal to turn on or off the output (Fig.2).

Switching Distance and Dielectric Constants

The switching distance of capacitive sensors is different. The maximum switching distance can be obtained by detecting metallic conductor (metal). When the metal is detected with a capacitive sensor, the attenuation coefficient for different metals is contrary to that of the inductive sensors. The switching distance of dielectric depends on the dielectric constant. The larger the dielectric constant of the object is, the longer switching distance is obtained.

The switching distance (S_r) is dependent on the dielectric constant (ϵ_r) of the target object. The maximum switching distance (100 %) is achieved with metallic objects while it is reduced with other materials in proportion to the dielectric constant of the target object.

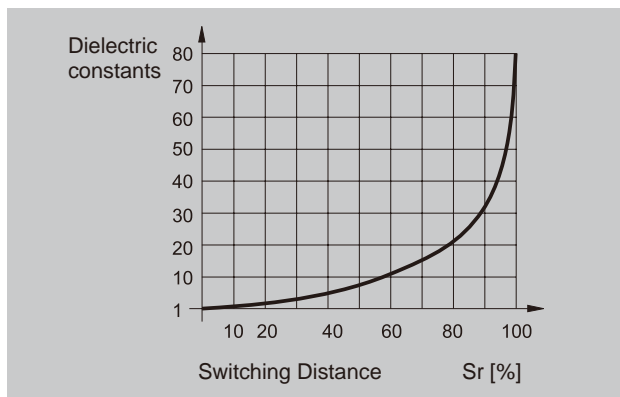
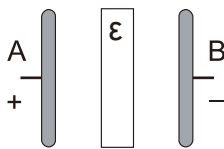


Table 1 (below) shows the dielectric constants of some important materials. As a result of the high dielectric constant value of water, wood exhibits relatively large fluctuations. Damp wood is therefore considerably better detected by capacitive sensors than dry wood.

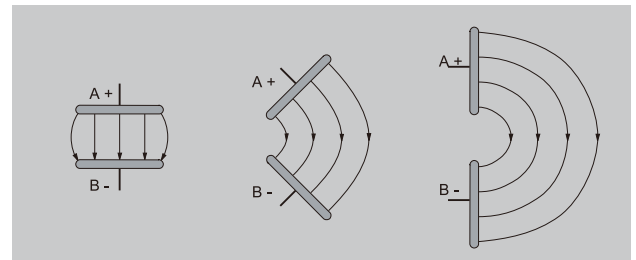


Fig. 1 Sensing Surface

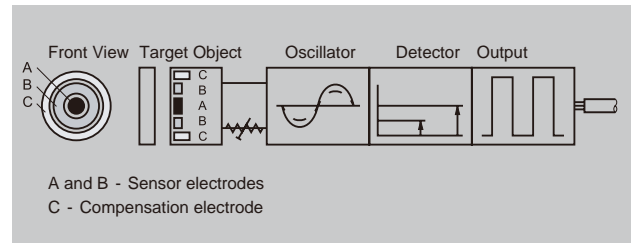


Fig. 2 Capacitive Sensors - Operating Principle

Table 1

Material	Dielectric constants
Air. vacuum	1
Teflon	2
Wood	2...7
Paraffin	2.2
Petroleum	2.2
Terpentine oil	2.2
Transformer oil	2.2
Paper	2.3
Polyethylene	2.3
Polypropylene	2.3
Cable compound	2.5
Soft rubber	2.5
Silicone rubber	2.8
PVC	2.9
Polystyrene	3
Celluloid	3
Perspex	3.6
Araldite	3.6
Bakelite	3.6
Quartz glass	3.7
Hard rubber	4
Oiled paper	4
Pressboard	4
Porcelain	4.4
Laminated paper	4.5
Quartz sand	4.5
Glass	5
Polyamide	5
Mica	6
Marble	8
Alcohol	25.8
Water	80

Housing material

Plastic and metal housing

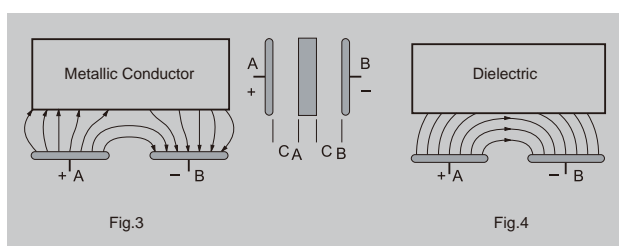
Target Object

Capacitive sensors are used for non-contact and non-destructive detection of metals (metallic conductor) and nonmetals (dielectric).

Types of interaction

Capacitive sensors are actuated by both conductive and non-conductive objects. Objects made of conductive materials form a counter-electrode to the sensor's active face. This forms two capacities, CA and CB connected in series, with the electrode surfaces A and B (Fig. 3). The capacity of this serial connection is always greater than the capacity of the uncovered electrodes A and B. Metals achieve the highest switching distances due to their very high conductivity. Reduction factors for differing metals – like those of inductive sensors – must be taken into account. Actuation by objects made of non-conductive materials (insulators): when one places an insulator between the electrodes of a condenser the capacity increases with the dielectric constant ϵ (Fig. 4) of the insulator.

The dielectric constant of all solids and liquids is greater than air ($\epsilon_{\text{air}} = 1$; see Table 2). Similarly, objects made of non-conductive materials have an effect on the active face of a capacitive sensor by increasing the coupling capacity. Materials with greater dielectric constants achieve longer switching distances. When scanning organic materials (wood, grain, etc.) it should be noted that the achievable switching distance is very strongly influenced by the water content ($\epsilon_{\text{water}} = 80!$)



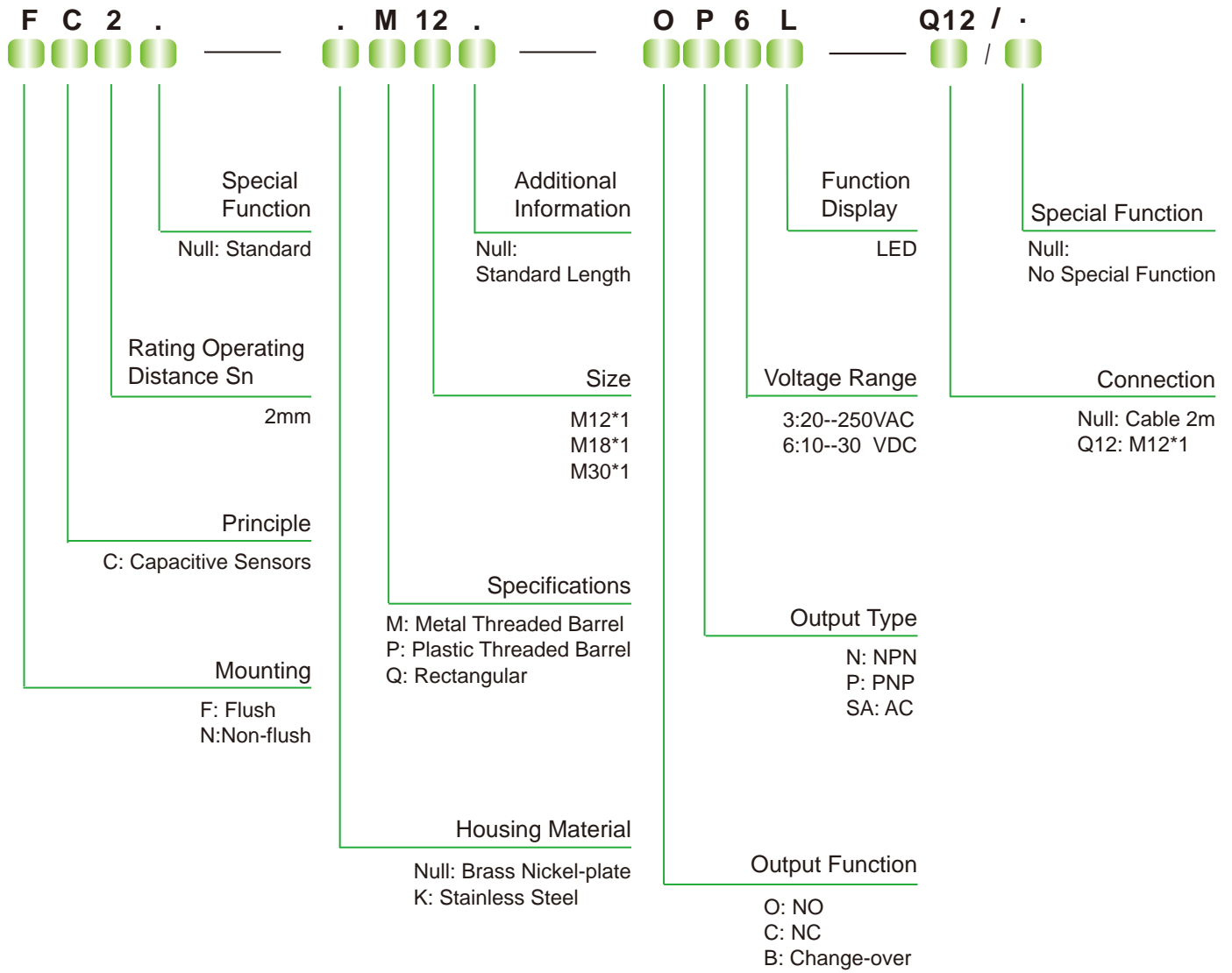
Switching distance adjustment

Almost all ELCO capacitive sensors can be adapted to specific applications by adjusting the potentiometer.

<< Capacitive sensor

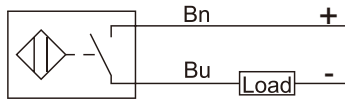
Type Code

Type Code



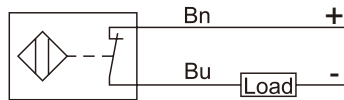
Wiring Diagram

Cable Version



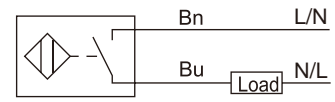
DC-2 wire NO

C01



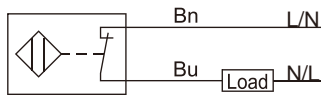
DC-2 wire NC

C02



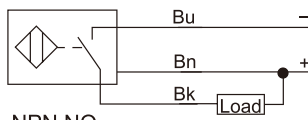
AC-2 wire NO

C03



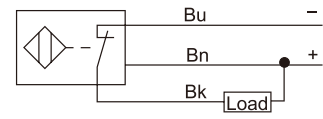
AC-2 wire NC

C04



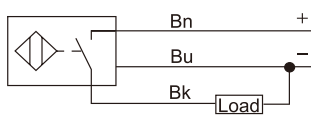
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C05



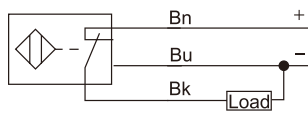
NPN NC

C06



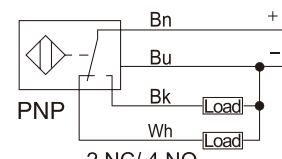
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C07



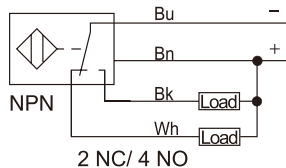
PNP NC

C08



PNP

2 NC/ 4 NO
C09

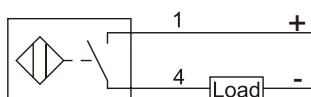


NPN

2 NC/ 4 NO

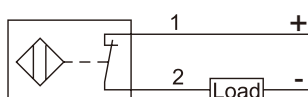
C010

Connector Version



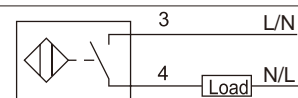
DC-2 wire NO

C011



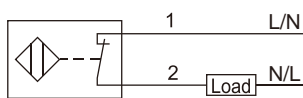
DC-2 wire NC

C012



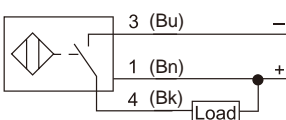
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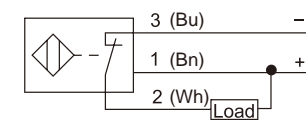
AC-2 wire NC

C014



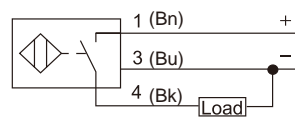
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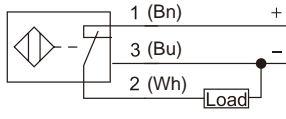
NPN NC

C016



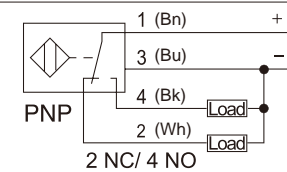
PNP NO

C017



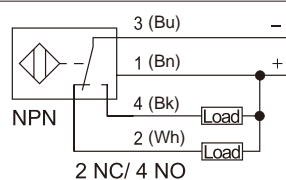
PNP NC

C018



PNP

2 NC/ 4 NO
C019



NPN

2 NC/ 4 NO

C020

<< Capacitive sensor

Metal Barrel-M12



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC2-M12-OP6L	2mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC2-M12-ON6L	2mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC2-M12-CP6L	2mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC2-M12-CN6L	2mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC2-M12-OP6L-Q12	2mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC2-M12-ON6L-Q12	2mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC2-M12-CP6L-Q12	2mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC2-M12-CN6L-Q12	2mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

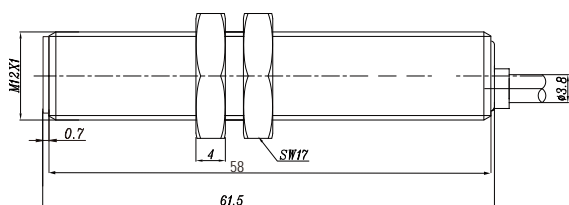


Fig.1

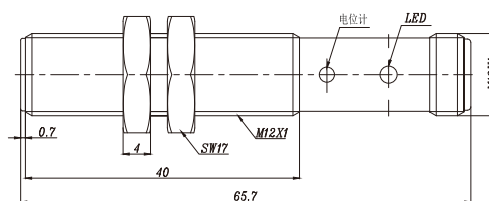


Fig.2

Metal Barrel-M12



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC4-M12-OP6L	4mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC4-M12-ON6L	4mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC4-M12-CP6L	4mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC4-M12-CN6L	4mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC4-M12-OP6L-Q12	4mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC4-M12-ON6L-Q12	4mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC4-M12-CP6L-Q12	4mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC4-M12-CN6L-Q12	4mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

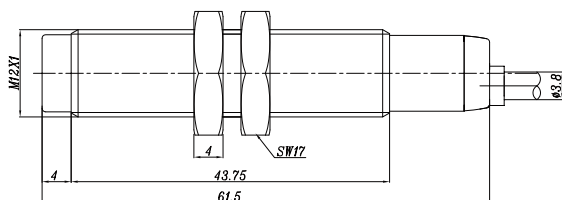


Fig.1

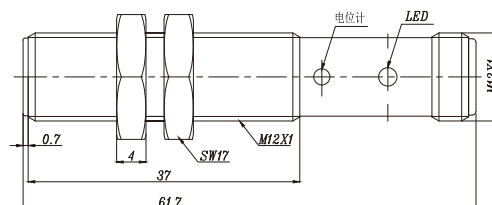


Fig.2

<< Capacitive sensor

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC5-M18-OP6L	5mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-ON6L	5mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-CP6L	5mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-CN6L	5mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-OP6L-Q12	5mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC5-M18-ON6L-Q12	5mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC5-M18-CP6L-Q12	5mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC5-M18-CN6L-Q12	5mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

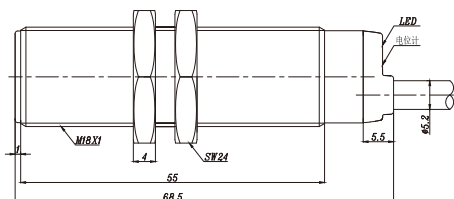


Fig.1

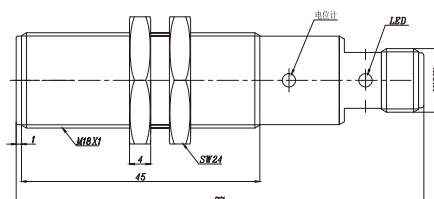


Fig.2

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC8-M18-OP6L	8mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-ON6L	8mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-CP6L	8mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-CN6L	8mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-OP6L-Q12	8mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC8-M18-ON6L-Q12	8mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC8-M18-CP6L-Q12	8mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC8-M18-CN6L-Q12	8mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

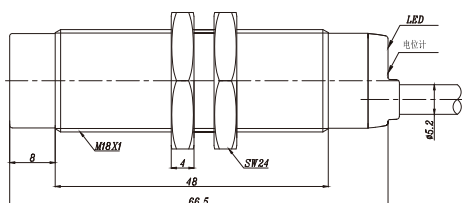


Fig.1

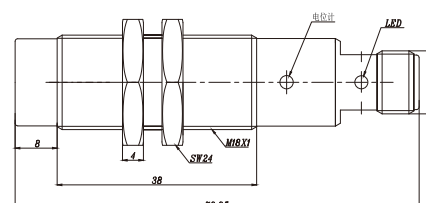


Fig.2

<< Capacitive sensor

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- DC 4-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC5-M18-BP6L	5mm	Flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-BN6L	5mm	Flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC5-M18-BP6L-Q12	5mm	Flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC5-M18-BN6L-Q12	5mm	Flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

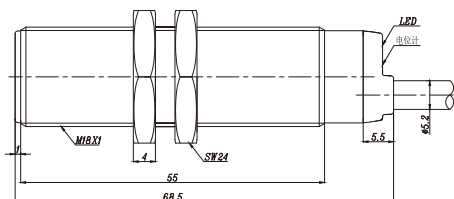


Fig.1

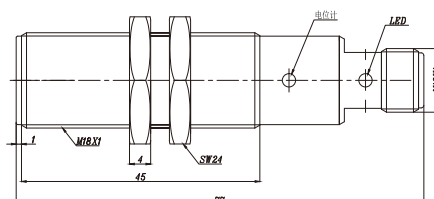


Fig.2

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- DC 4-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC8-M18-BP6L	5mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-BN6L	5mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC8-M18-BP6L-Q12	5mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC8-M18-BN6L-Q12	5mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

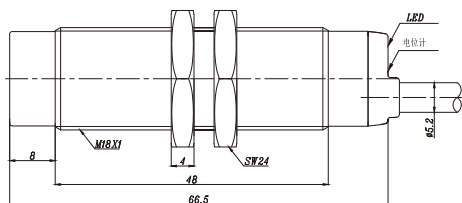


Fig.1

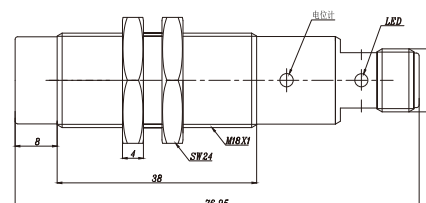


Fig.2

<< Capacitive sensor

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- AC 2-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC5-M18-OSA3L	5mm	Flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC5-M18-CSA3L	5mm	Flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC5-M18-OSA3L-Q12	5mm	Flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC5-M18-CSA3L-Q12	5mm	Flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

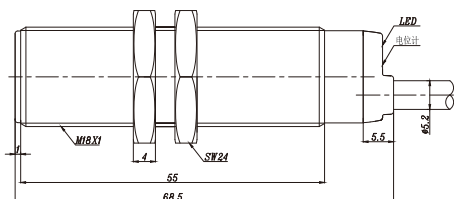


Fig.1

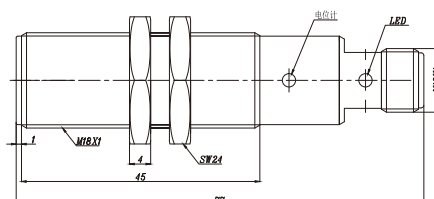


Fig.2

Metal Barrel-M18



- Brass nickel-plated
- Threaded barrel
- AC 2-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC8-M18-OSA3L	8mm	Non-flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC8-M18-CSA3L	8mm	Non-flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC8-M18-OSA3L-Q12	8mm	Non-flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC8-M18-CSA3L-Q12	8mm	Non-flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

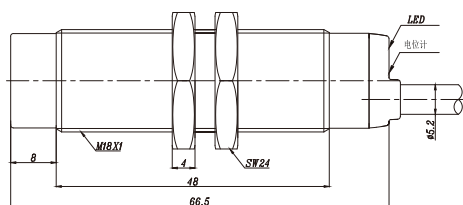


Fig.1

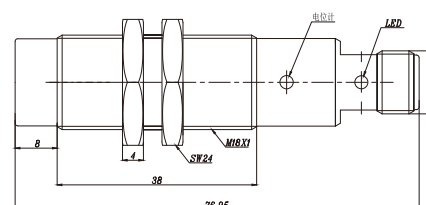


Fig.2

<< Capacitive sensor

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC10-M30-OP6L	10mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-ON6L	10mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-CP6L	10mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-CN6L	10mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-OP6L-Q12	10mm	Flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC10-M30-ON6L-Q12	10mm	Flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC10-M30-CP6L-Q12	10mm	Flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC10-M30-CN6L-Q12	10mm	Flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

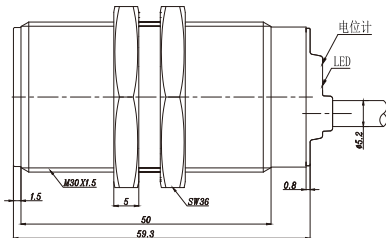


Fig.1

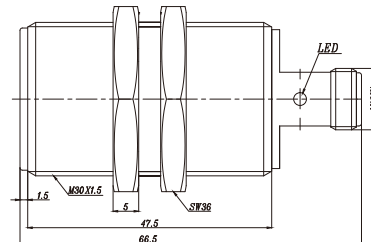


Fig.2

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC15-M30-OP6L	15mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-ON6L	15mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-CP6L	15mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-CN6L	15mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-OP6L-Q12	15mm	Non-flush	PNP NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC15-M30-ON6L-Q12	15mm	Non-flush	NPN NO	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC15-M30-CP6L-Q12	15mm	Non-flush	PNP NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC15-M30-CN6L-Q12	15mm	Non-flush	NPN NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

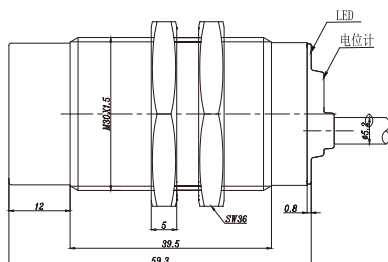


Fig.1

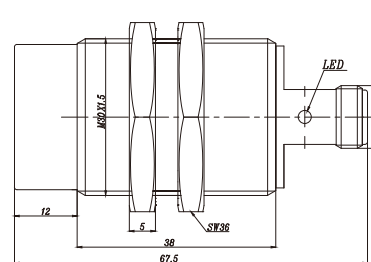


Fig.2

<< Capacitive sensor

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- DC 4-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC10-M30-BP6L	10mm	Flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-BN6L	10mm	Flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
FC10-M30-BP6L-Q12	10mm	Flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
FC10-M30-BN6L-Q12	10mm	Flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

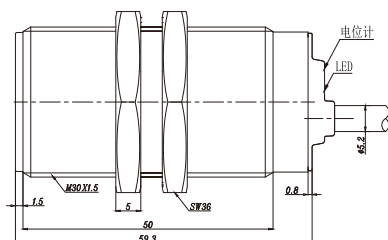


Fig.1

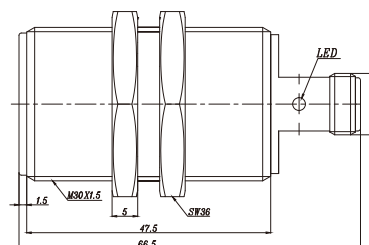


Fig.2

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- DC 4-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC15-M30-BP6L	15mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-BN6L	15mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	2m cable	Fig.1
NC15-M30-BP6L-Q12	15mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2
NC15-M30-BN6L-Q12	15mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	50Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

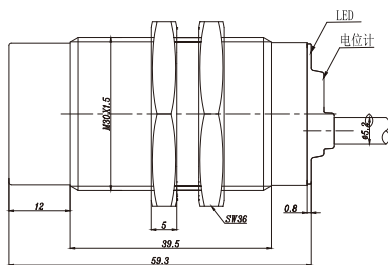


Fig.1

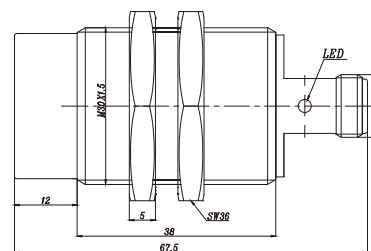


Fig.2

<< Capacitive sensor

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- AC 2-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC10-M30-OSA3L	10mm	Flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC10-M30-CSA3L	10mm	Flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC10-M30-OSA3L-Q12	10mm	Flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC10-M30-CSA3L-Q12	10mm	Flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

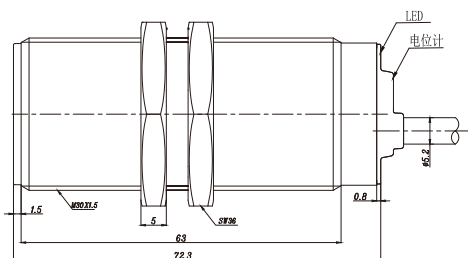


Fig.1

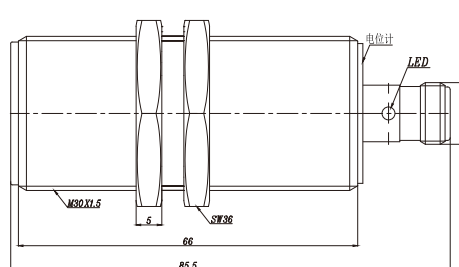


Fig.2

Metal Barrel-M30



- Brass nickel-plated
- Threaded barrel
- AC 2-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC15-M30-CSA3L	15mm	Non-flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC15-M30-OSA3L	15mm	Non-flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC15-M30-OSA3L-Q12	15mm	Non-flush	AC NO	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC15-M30-CSA3L-Q12	15mm	Non-flush	AC NC	20...250VAC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

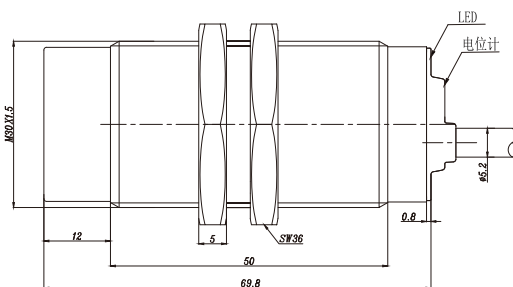


Fig.1

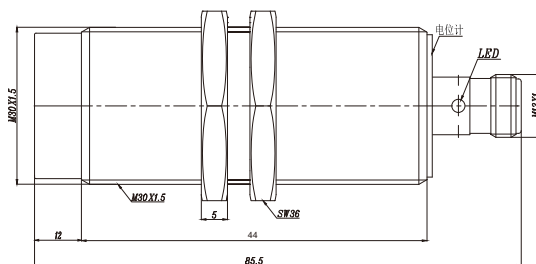


Fig.2

<< Capacitive sensor

Plastic Rectangular -Q07



- Plastic housing
- Rectangular 30x50x7mm
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC8-Q07-OP6L	8mm	Non-flush	PNP NO	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC8-Q07-ON6L	8mm	Non-flush	NPN NO	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC8-Q07-CP6L	8mm	Non-flush	PNP NC	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC8-Q07-CN6L	8mm	Non-flush	NPN NC	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1

Dimensions

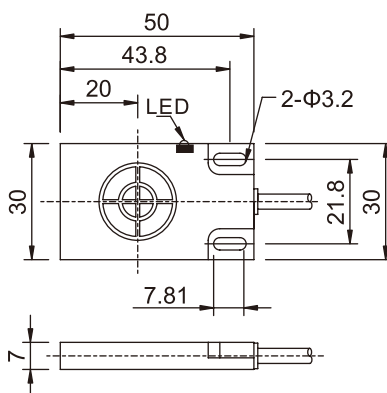
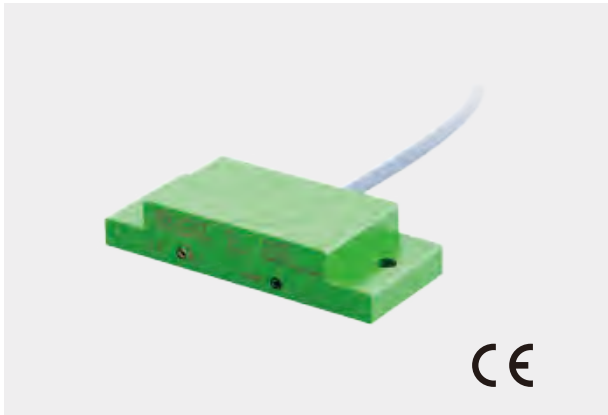


Fig.1

Plastic Rectangular -Q34



- Plastic housing
- Rectangular 50x20x10mm
- DC 3-wire output
- Potentiometer adjustment
- IP67
- LED indicator

See the wiring diagram on page 18 for your reference.

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC10-Q34-OP6L	10mm	Non-flush	PNP NO	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC10-Q34-ON6L	10mm	Non-flush	NPN NO	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC10-Q34-CP6L	10mm	Non-flush	PNP NC	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1
NC10-Q34-CN6L	10mm	Non-flush	NPN NC	10...30VDC	≤200mA	30Hz	-25...70°C	2m cable	Fig.1

Dimensions

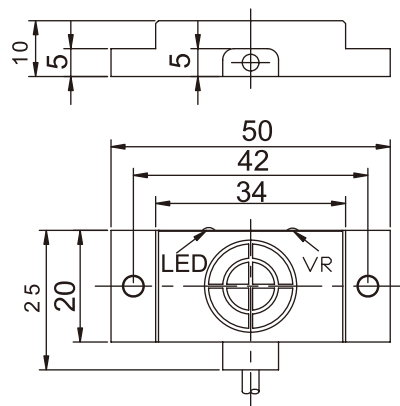


Fig.1

<< Capacitive sensor

Tube Mounting-F43

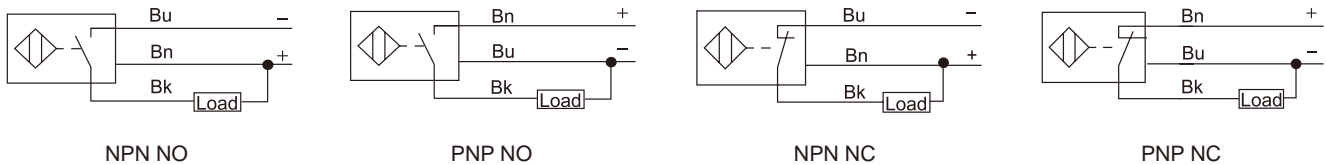


Plastic pipe square, DC 3-wire output, corresponding to various pipe diameters, not affected by pipe and liquid color, potentiometer adjustment, IP67 protection class, LED indicator.

Technical Data

Type	Tube Wall Thickness	Applicable tube diameter	Output	Voltage Range UB	Rated Type Current	Ambient Temperature	Connection	Mechanical drawing
NC5-F43D11-ON6L	≤1mm	φ8-11mm	PNP NO	10...30VDC	≤200mA	-25...70°C	2m cable	Drawing 1
NC5-F43D11-OP6L	≤1mm	φ8-11mm	NPN NO	10...30VDC	≤200mA	-25...70°C	2m cable	Drawing 1
NC5-F43D11-CN6L	≤1mm	φ8-11mm	PNP NC	10...30VDC	≤200mA	-25...70°C	M12 Connector	Drawing 1
NC5-F43D11-CP6L	≤1mm	φ8-11mm	NPN NC	10...30VDC	≤200mA	-25...70°C	M12 Connector	Drawing 1
NC3-F43D26-ON6L	≤1.5mm	φ12-26mm	PNP NO	10...30VDC	≤200mA	-25...70°C	2m cable	Drawing 2
NC3-F43D26-OP6L	≤1.5mm	φ12-26mm	NPN NO	10...30VDC	≤200mA	-25...70°C	2m cable	Drawing 2
NC3-F43D26-CN6L	≤1.5mm	φ12-26mm	PNP NC	10...30VDC	≤200mA	-25...70°C	M12 Connector	Drawing 2
NC3-F43D26-CP6L	≤1.5mm	φ12-26mm	NPN NC	10...30VDC	≤200mA	-25...70°C	M12 Connector	Drawing 2

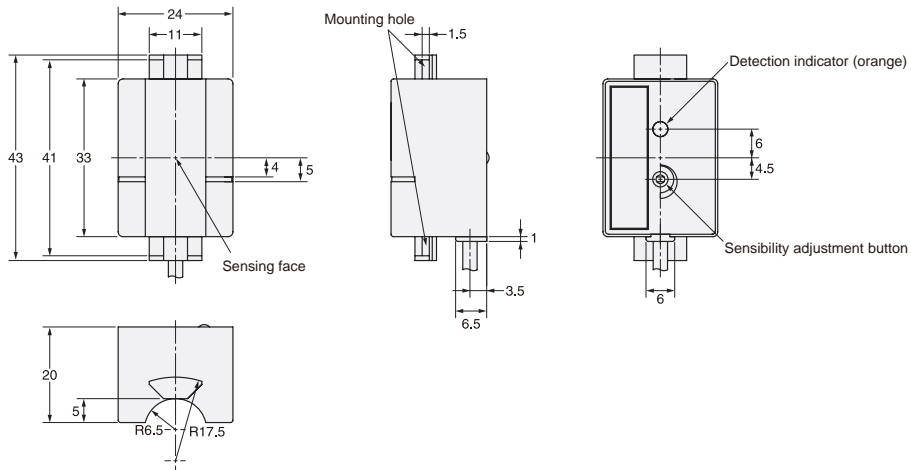
Connection Diagram



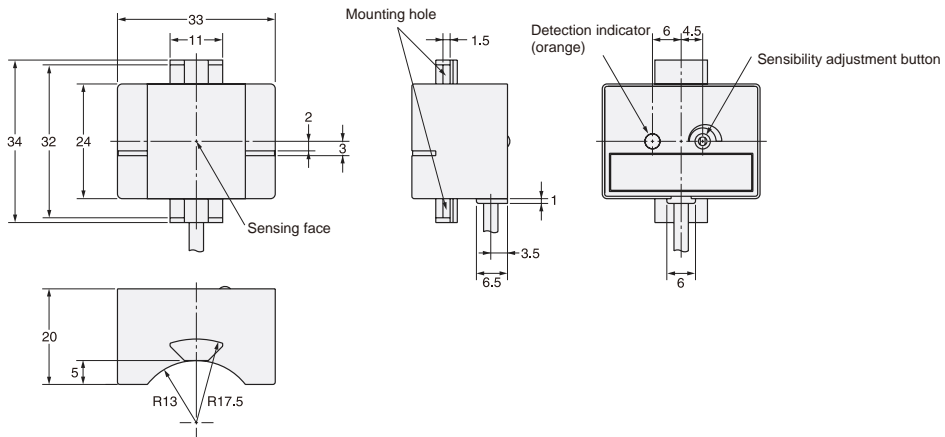
Tube Mounting-F43

Mechanical Drawing

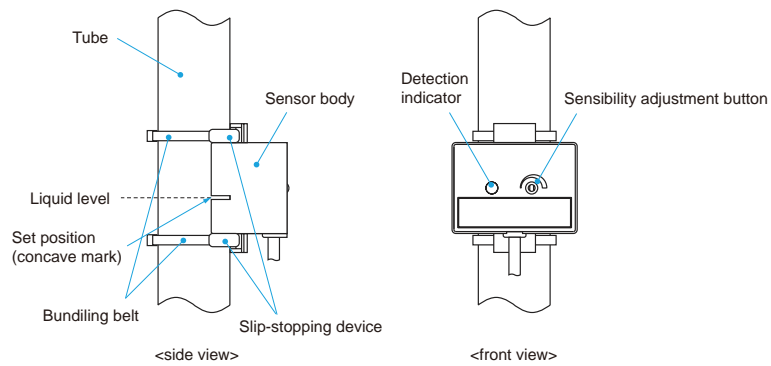
Drawing 1



Drawing 2



Installation Drawing



<< Capacitive sensor

Long-Sensing-M18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC8-KM18-OP6L	8mm	Flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-ON6L	8mm	Flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-CP6L	8mm	Flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-CN6L	8mm	Flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-OP6L-Q12	8mm	Flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-KM18-ON6L-Q12	8mm	Flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-KM18-CP6L-Q12	8mm	Flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-KM18-CN6L-Q12	8mm	Flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

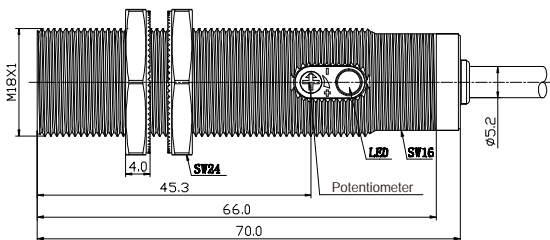


Fig.1

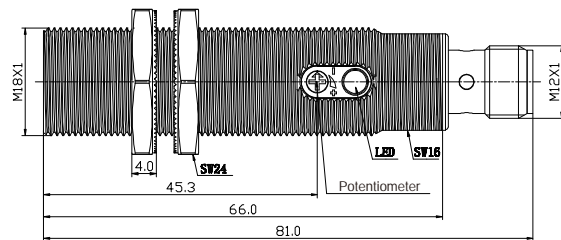


Fig.2

Long-Sensing-M18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC12-KM18-OP6L	12mm	Non-flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-ON6L	12mm	Non-flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-CP6L	12mm	Non-flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-CN6L	12mm	Non-flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-OP6L-Q12	12mm	Non-flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-KM18-ON6L-Q12	12mm	Non-flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-KM18-CP6L-Q12	12mm	Non-flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-KM18-CN6L-Q12	12mm	Non-flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

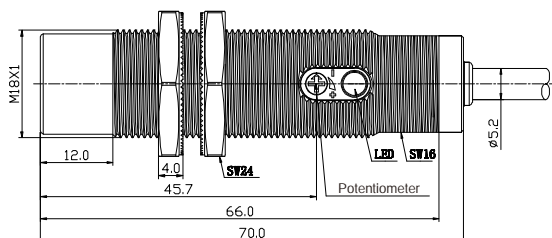


Fig.1

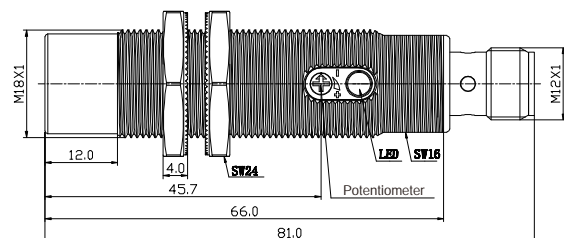


Fig.2

<< Capacitive sensor

Long-Sensing-M18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 4-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC8-KM18-BP6L	8mm	Flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-BN6L	8mm	Flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-KM18-BP6L-Q12	8mm	Flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-KM18-BN6L-Q12	8mm	Flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

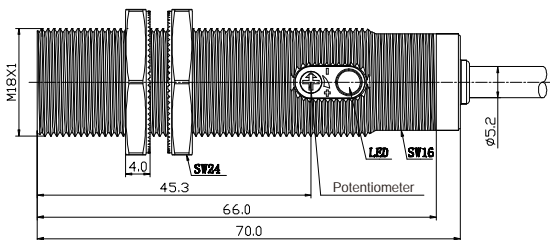


Fig.1

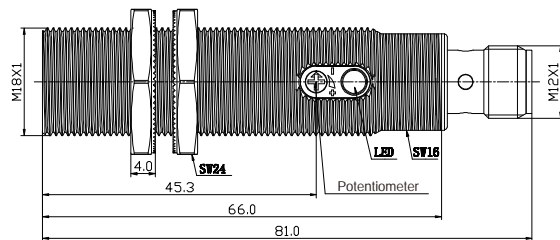


Fig.2

Long-Sensing-M18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 4-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC12-KM18-BP6L	12mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-BN6L	12mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-KM18-BP6L-Q12	12mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-KM18-BN6L-Q12	12mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

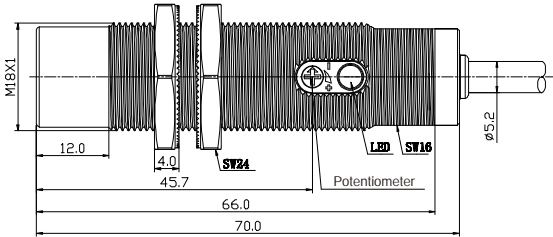


Fig.1

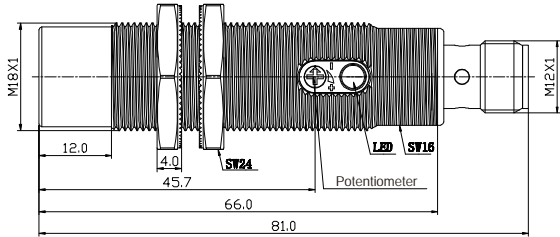


Fig.2

<< Capacitive sensor

Long-Sensing-M30



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC15-KM30-OP6L	15mm	Flush	PNP NO	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-ON6L	15mm	Flush	NPN NO	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-CP6L	15mm	Flush	PNP NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-CN6L	15mm	Flush	NPN NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-OP6L-Q12	15mm	Flush	PNP NO	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
FC15-KM30-ON6L-Q12	15mm	Flush	NPN NO	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
FC15-KM30-CP6L-Q12	15mm	Flush	PNP NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
FC15-KM30-CN6L-Q12	15mm	Flush	NPN NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

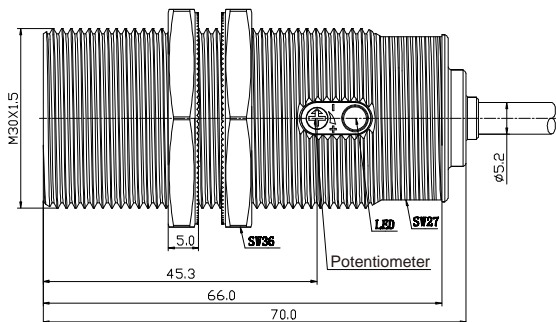


Fig.1

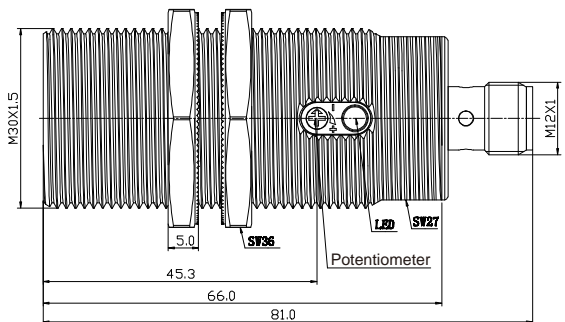
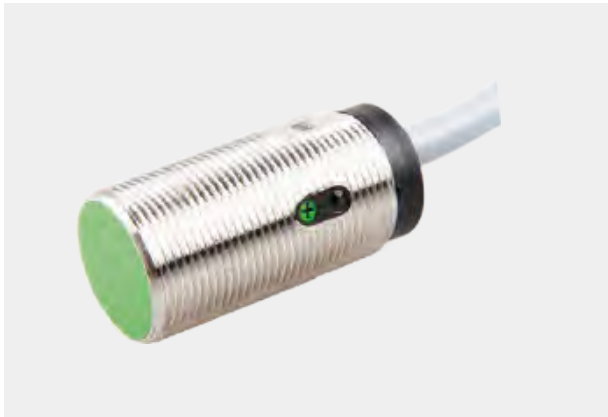


Fig.2

Long-Sensing-M30



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC22-KM30-OP6L	22mm	Non-flush	PNP NO	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-ON6L	22mm	Non-flush	NPN NO	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-CP6L	22mm	Non-flush	PNP NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-CN6L	22mm	Non-flush	NPN NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-OP6L-Q12	22mm	Non-flush	PNP NO	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
NC22-KM30-ON6L-Q12	22mm	Non-flush	NPN NO	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
NC22-KM30-CP6L-Q12	22mm	Non-flush	PNP NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
NC22-KM30-CN6L-Q12	22mm	Non-flush	NPN NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

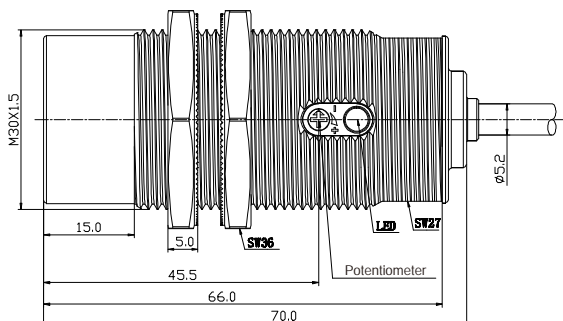


Fig.1

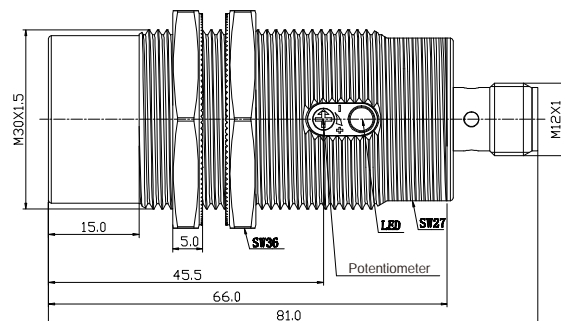


Fig.2

<< Capacitive sensor

Long-Sensing-M30



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC15-KM30-BP6L	15mm	Flush	PNP NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-BN6L	15mm	Flush	NPN NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
FC15-KM30-BP6L-Q12	15mm	Flush	PNP NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
FC15-KM30-BN6L-Q12	15mm	Flush	NPN NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

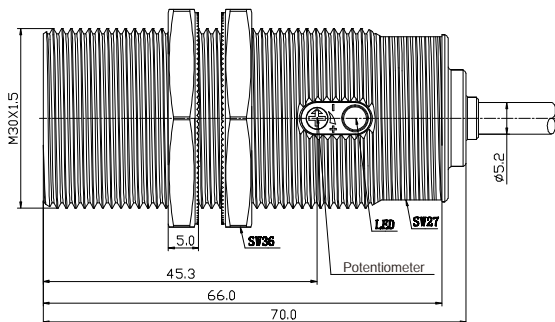


Fig.1

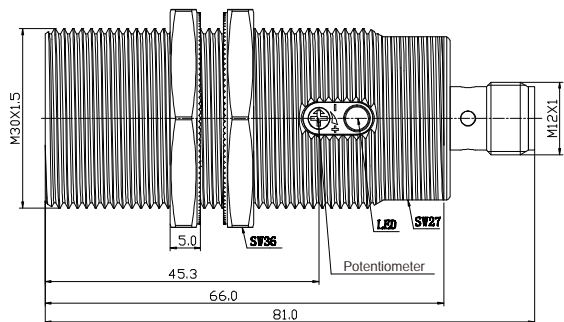
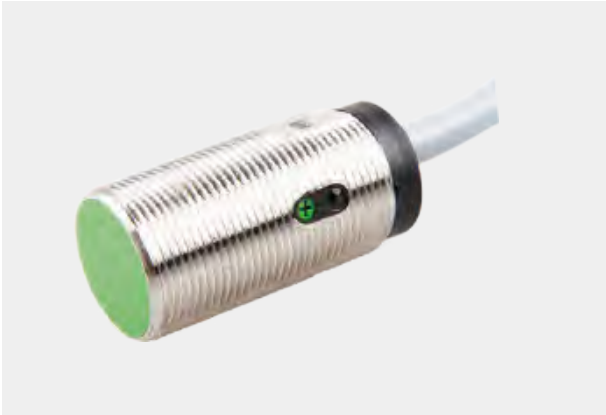


Fig.2

Long-Sensing-M30



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire output
- Stainless steel housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC22-KM30-BP6L	22mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-BN6L	22mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	2m cable	Fig.1
NC22-KM30-BP6L-Q12	22mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2
NC22-KM30-BN6L-Q12	22mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	10Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

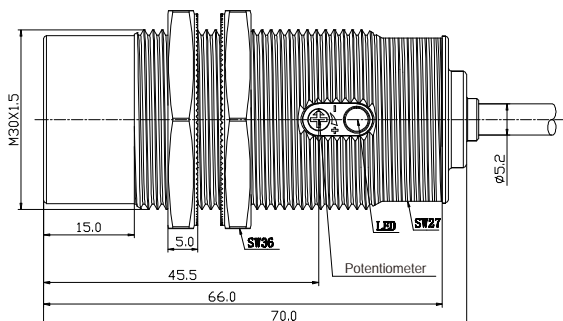


Fig.1

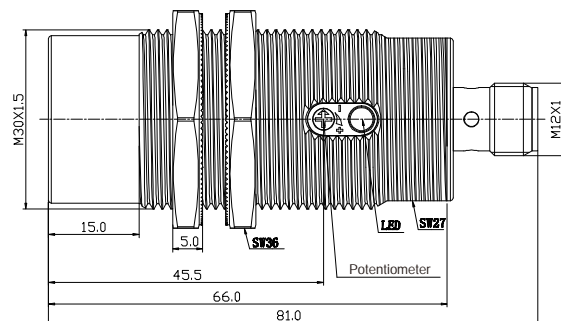


Fig.2

<< Capacitive sensor

Long-Sensing-P18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire, 4-wire output
- Plastic housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC8-P18-OP6L	8mm	Flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-ON6L	8mm	Flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-CP6L	8mm	Flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-CN6L	8mm	Flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-OP6L-Q12	8mm	Flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-P18-ON6L-Q12	8mm	Flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-P18-CP6L-Q12	8mm	Flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-P18-CN6L-Q12	8mm	Flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

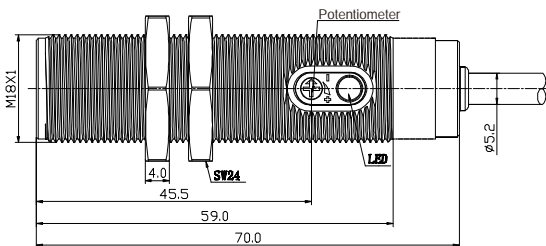


Fig.1

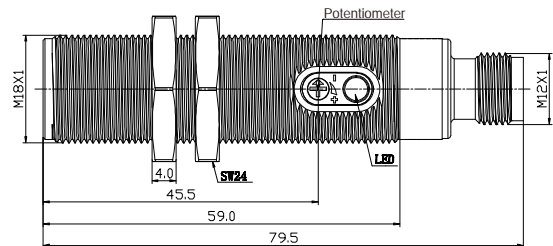


Fig.2

Long-Sensing-P18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire, 4-wire output
- Plastic housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC12-P18-OP6L	12mm	Non-flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-P18-ON6L	12mm	Non-flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-P18-CP6L	12mm	Non-flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-P18-CN6L	12mm	Non-flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
NC12-P18-OP6L-Q12	12mm	Non-flush	PNP NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-P18-ON6L-Q12	12mm	Non-flush	NPN NO	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-P18-CP6L-Q12	12mm	Non-flush	PNP NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-P18-CN6L-Q12	12mm	Non-flush	NPN NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

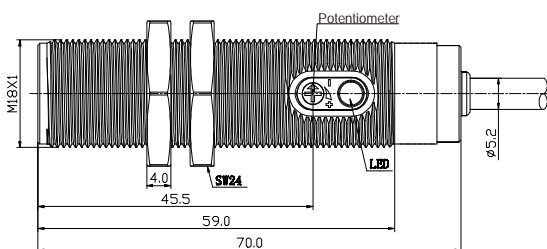


Fig.1

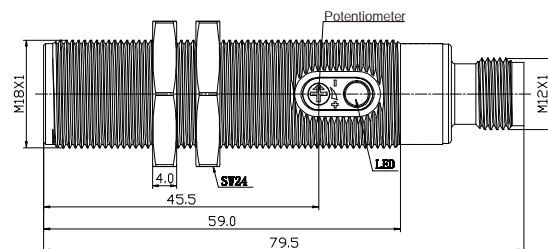


Fig.2

<< Capacitive sensor

Long-Sensing-P18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire, 4-wire output
- Plastic housing
- Potentiometer adjustment

Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
FC8-P18-BP6L	8mm	Flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-BN6L	8mm	Flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
FC8-P18-BP6L-Q12	8mm	Flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
FC8-P18-BN6L-Q12	8mm	Flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

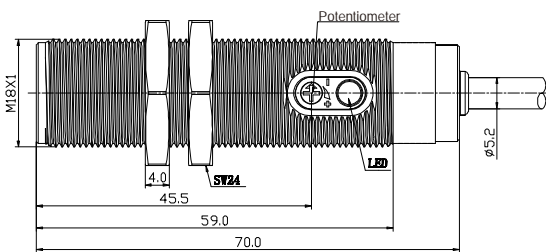


Fig.1

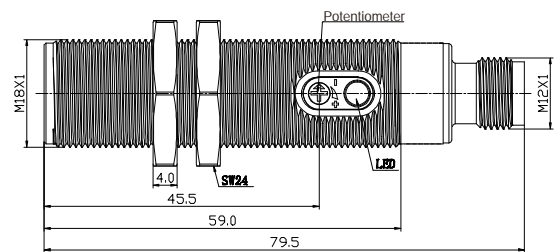


Fig.2

Long-Sensing-P18



- Doubled sensing distance
- Threaded cylindrical shape
- IP67
- Bright LED indication
- DC 3-wire, 4-wire output
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Technical Data

Type	Rated Operating Distance Sn	Mounting	Output	Voltage Range UB	Rated Type Current	Switching Frequency	Ambient Temperature	Connection	Fig
NC12-P18-BP6L	12mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	2m cable	Fig.1
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NC12-P18-BP6L-Q12	12mm	Non-flush	PNP NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2
NC12-P18-BN6L-Q12	12mm	Non-flush	NPN NO+NC	10...30VDC	≤200mA	15Hz	-25...70°C	M12 Connector	Fig.2

Dimensions

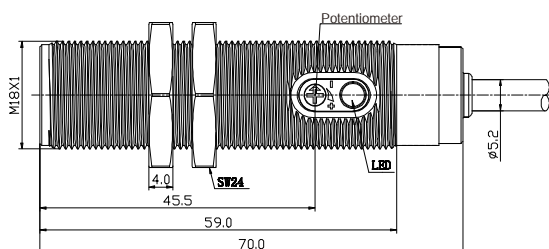


Fig.1

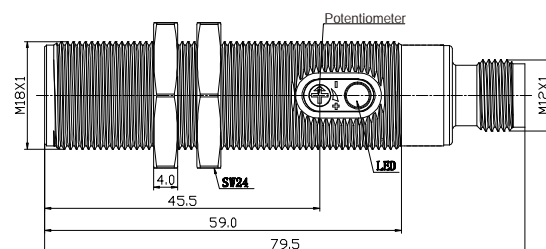


Fig.2

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