

Inductive & Capacitive Proximity Sensor Control Technology

Inductive and Capacitive Proximity Sensors are devices that will make an electrical change in a circuit as a result of material approaching the sensor head. Inductive sensors are metal sensing devices, whereas capacitive types detect all material including liquids, powders and pastes. Advances in integrated circuits and solid-state technology have allowed design engineers to overcome previous problems and develop both inductive and capacitive proximity sensors that can perform in industrial environments for many years with few problems

Normal Operating Distance

The Normal Operating Distance, or Sensing Range, is defined as the distance between the detector and the target when the change (switching) in the logic state of the proximity switch occurs. This distance and the tests associated in obtaining this distance are outlined in CENELEC EN 50010 Standards. From this standard, the target for establishing the Normal Operating Distance is an iron (FE 37) square, 1mm thick. For cylindrical switches the size is as shown in the table to the right.

Diameter (mm)	Nominal Distance SN (mm)	Fe 37 Actuator (mm)
8 - shielded	1	8x1
8 - unshielded	2	8x1
12 - shielded	2	12x1
12 - unshielded	4	12x1
18 - shielded	5	18x1
18 - unshielded	8	24x1
30 - shielded	10	30x1
30 - unshielded	15	45x1

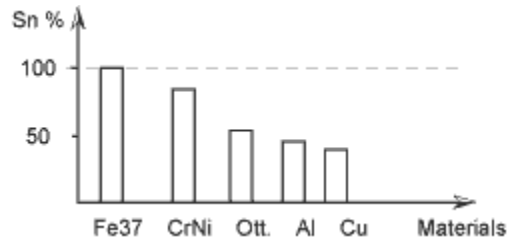
CENELEC EN 50010 Standards for Inductive Sensors

Correction Factor

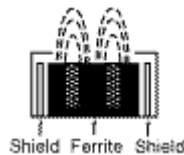
Inductive Sensors: When using inductive proximity sensors with non-ferrous metals it is necessary to apply a correction factor to the operating distance (sensing range) as follows:

Aluminum	Distance	x. 0.45
Brass	Distance	x. 0.50
Chrome Nickel Alloy	Distance	x. 0.85
Copper	Distance	x. 0.40

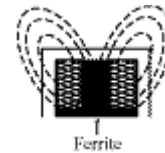
Capacitive Sensors: Capacitive sensors have an adjustable detection range, and are dependant upon the type of material to be sensed (shown below).



Shielded & Non-shielded

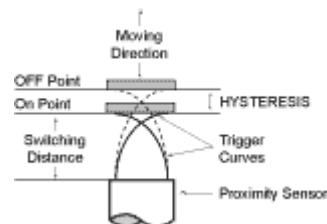


Shielded construction includes a metal band which surrounds the ferrite core and coil arrangement. This helps to direct the electromagnetic field to the front of the sensor. Non-shielded sensors do not have this metal band, therefore they can be side sensitive.



Hysteresis

Hysteresis is the travel of the target between the "switch-on" point and the "switch-off" point. This distance is required to allow the switch to properly detect the target, and reduces the possibility of false trips.



Current Source and Current Sink

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DC Proximity Sensors are made to interface with solid state controllers such as Programmable Controllers (PLCs). The inputs described in the instruction manuals of these devices often ask for a Current Source or Current Sink input. NPN type sensors are designed to be a Current Sink device. Current from the controller is supplied to the sensor and it will "sink" the current to ground when the sensor is activated. PNP type sensors are designed to be a Current Source device. Current is supplied from the sensor as a "source" to the controller when the sensor is activated.

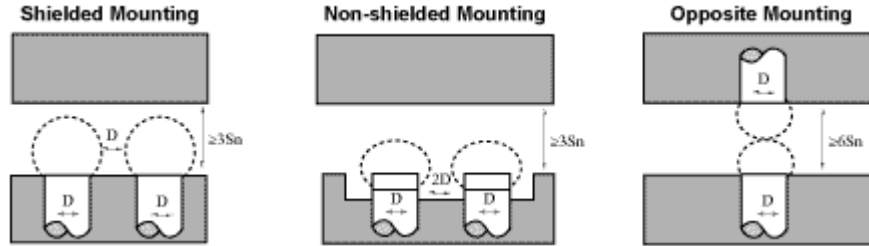
Mounting

Because of possible interference of the electromagnetic fields generated by the oscillators, minimum spacing is required between adjacent or opposing "active surfaces" of proximity switches.

Shielded Mounting: The "active surface" may be flush with the metal in which the switch is mounted.

Non-shielded Mounting: The "active surface" must have a free zone in which no metal is present.

Opposite Mounting: When mounting proximity switches in this manner where the "active surfaces" are opposite each other, there must be a minimum distance between them.



AC Models	Brass or Plastic Housing
Supply Voltage	20 to 250 VAC
Voltage Drop	<8 VAC @ 400mA
Max. Load	400mA
Max. Leakage	1.8mA
No Load Current	5mA
Surge Current	5A (20ms)
Response Time	10ms/10ms
Switching Frequency	25Hz
Short Circuit Protection	No
Hysteresis	<15%
Repeat Accuracy	<1% full range
Temperature Range	-25 °C to +70 °C
Temperature Drift	<10% full range
Protection Rating	IP67

DC Models	Brass or Metal Housing	Stainless Steel Housing
Supply Voltage	10 to 30 VDC	5 to 36 VDC
Voltage Drop	<3V	<1V
Max. Load	100mA	200mA
Max. Leakage	<0.01mA	
No Load Current	<10mA	
Response Time	0.1ms/0.1ms	
Frequency Response	as rated on each sensor	
Short Circuit Protection	Yes	
Hysteresis	<15%	
Repeat Accuracy	<1% full range	
Temperature Range	-25 °C to +70 °C	
Temperature Drift	<10% full range	
Protection Rating	IP67	

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