Capacitive Proximity Sensors Manual

CA/CB/CC Type

■ English

www.ema-electronic.com

Application

Capacitive proximity sensors can sense metals and non-metals, such as wood, ceramics, water, oil, and etc. They are mainly used to detect liquids, solids in funnels, storage tanks, and granaries.

Influence between sensing object and sensing range.(Fig.1)

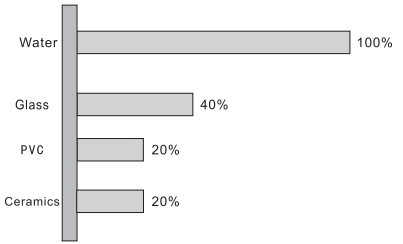


Fig.1

Mounting

1. There are two ways of mounting the sensor: flush and non-flush, depending on the surrounding condition.
2. No-contact mounting, can sense through plastic tank or pipe for level detection and be used as liquid level sensor or leakage sensor.

UL Markings - Please follow the instruction as below:

a. “Maximum Ambient Temperature 40°C”.
b. Type 1 enclosure rating.
c. *Maximum rating of the overcurrent protection maximin 5 A, minimum 36 V dc or equivalent statement for model CA and CB.

Type & Mounting

Type	Mounting	Mounting size
CA	Standard mounting with nut	1.Nut: M18 2.Vent: 18.2<D<22(mm) 3.Non-flush mounting
CB	Standard mounting with nut	1.Nut: M30 2.Vent: 30.2<D<34(mm) 3.Non-flush mounting
CC	Mounting clamp	1.Nut for clamp: M5 2.Vent: 34.2<D<40(mm) 3.Non-flush mounting

Mounting requirement

1 . There should be a non-metallic area around the sensing face.The range of this area is D and 2S. (Fig.2)
Notice: S- Sensing range, D- Diameter of sensor

2. There should be no metallic object within 3S of the sensing face. (Fig.3) Notice: S- Sensing range.

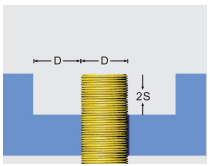


Fig2

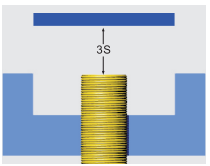


Fig3

Connection

PNP & NPN mode of connection

Two-wire(Fig. 4, Fig. 5)

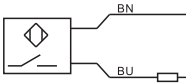


Fig. 4 AC/DC

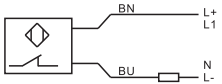


Fig. 5 AC/DC

PNP mode of connection(Fig. 6, Fig. 7)

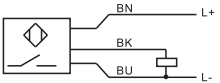


Fig. 6 PNP

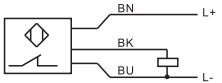


Fig. 7 PNP

NPN mode of connection(Fig. 8, Fig. 9)

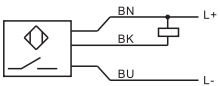


Fig. 8 NPN

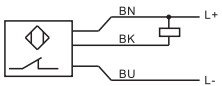


Fig. 9 NPN

Four–wire :PNP&NPN mode of connection(Fig.10,Fig.11)

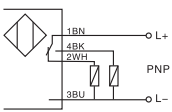


Fig.10 PNP

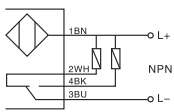


Fig.11 NPN

Series connection and parallel connection

1. Series connection of three-wire\four-wire DC and three-wrie\four -wire DC sensor.(Fig.10)
2. Parallel connection of three-wire \four-wire DC and three-wire\four -wire DC sensor.(Fig.11)
3. Series connection of two-wire AC sensor.(Fig.12)
4. Parallel connection of two-wire AC sensor.(Fig.13)
5. Series connection of mechanical switch and AC sensor.(Fig.14)
6. Parallel connection of mechanical switch and AC sensor.(Fig.15)

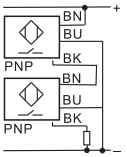


Fig. 10

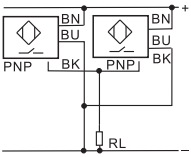


Fig. 11

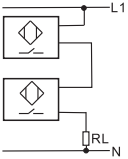


Fig. 12

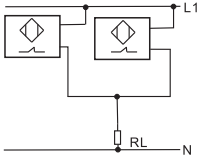


Fig. 13

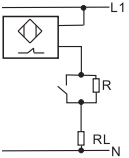


Fig. 14

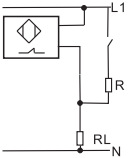


Fig. 15

Sensing range setting

■ Sensitivity

The sensing range of the capacitive sensor is set with a screw driver (included).In order to ensure operational safety ,the sensing range of the capacitive sensors should not exceed the rated sensing range. Notice: The rated sensing range of the sensor is set in the factory.

■ Sensitivity adjustment

A. When no detected object is present in front of the capacitive level sensor (empty level), turn the sensitivity potentiometer clockwise until the sensor runs in a constant red LED state. Then, the sensor operation is set to ON."

B. Turn the sensitivity potentiometer counterclockwise within about 0.5 turns (until LED turns off). Then the sensor operation is set to OFF, and the setting is complete.

※ Adjusting the potentiometer clockwise is the maximum and counterclockwise is the minimum. If adjusted slightly to the left or right, it will not stop.

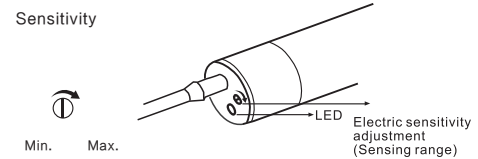


Fig. 16

Notice

■ Installation

1.Mounting for thread type :Do not twist the torque too tight (Fig.17)
2.Mounting for cylinder type : Adjusting torque range 2-4kgf-cm.(Fig.18)
3.Lead protection: Please fasten the lead which is located 10cm away from the sensor by a clip in order to avoid damage of sensor resulted from the lead affected by an external force. (Fig. 19)
4.To prevent the mutual influences between the sensors: When mounting in facing way or opposed way, please follow the instruction in (Fig.20) to avoid of the false operation from the mutual influences.
Notice: S-Sensing range; D-Diameter of sensor.

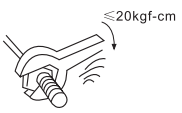


Fig. 17

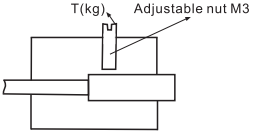


Fig. 18

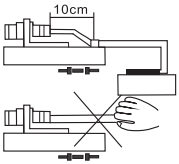


Fig. 19

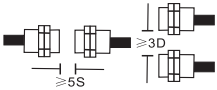


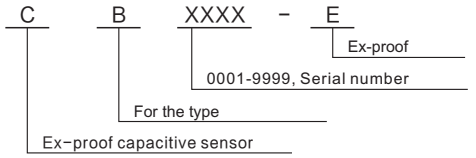
Fig. 20

5. DC sensor should adopt insulation transformer to ensure stable voltage, in order to prevent the sensor from damage or false action, covering the metal bushing on the sensor lead-wire and grounding it to the earth.
6. Dynamic and power lines should not pass the surroundings of sensor.
7. Please set the sensing range of the sensor within the rated range to avoid the effects from temperature and supply voltage.
8. Wiring while power-on is strictly prohibited. Connecting the wires strictly according to the wiring diagram and output return elementary diagram.
9. In order to maintain reliable and long-life operation, please avoid the (outdoor)occasion beyond the stipulated ambient temperature. Do not drench it with water or water-soluble cutting lubricant when it is used with cover, even though the sensor is waterproof. Please do not use in the conditions with chemical agents, especially as strong base acid, nitric acid, hot strong sulfuric acid . If there is any special requirement to the sensor like water proof, oil proof, acid proof, base proof, high temperature proof or with any other specification, the users are required to give clear indication when placing an order. We can customize according to user requirements.

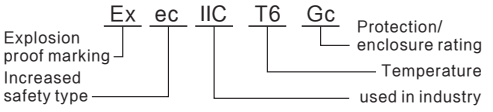
■ Maintenance

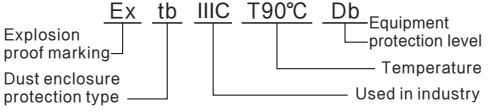
In order to ensure the reliable operation for a long time, the following regular examinations should be performed:
1.Check the installation position of detected object and proximity sensor if any deviation, looseness or deformation exists.
2.Check the attached wires and connecting parts if any looseness bad contact or wire disconnected exists.
3.Check if there is any accumulation of metallic powder attached.
4.Check if the temperature condition and environment are normal.
5.Check if the detection distance is normal .

Order No. for the sensor and the principle



The conception of explosion proof marking.





Notice

1. The product is installed on the pipe must be properly connected to the equipotential grounding system.
2. The medium temperature range of the product: -25℃ to +70℃.
3. The electrical safety parameters of the product: rated voltage 10–36 VDC or 20–250 VAC, maximum load current 250 mA.
4. When the product is used or maintained in an explosive atmosphere, "Do not open in the presence of an explosive environment" must be followed.
5. When use or maintain in an explosive environment, the heat resistance temperature of the connecting cables for field wiring must be at least 90℃.
6. When the product is used in an explosive dust environment, its surface should be cleaned regularly to prevent dust accumulation on the housing. However, compressed air must not be used for cleaning.
7. Users must not replace the components of the product on their own. Any failure should be solved with the manufacturer to prevent the damage.
8. The installation, the usage, and maintenance of the product must comply with the product manual as well as the following relevant standards and specifications:
   GB/T 3836.13-2021 Explosive atmospheres
   Part 13: Equipment repair, overhaul, reclamation, and modification
   GB/T 3836.15-2017 Explosive atmospheres
   Part 15: Equipment design, selection, and installation
   GB/T 3836.16-2022 Explosive atmospheres
   Part 16: Inspection and maintenance of electrical installation
   GB 50257-2014 Code for construction and acceptance of electrical apparatus installation engineering in explosive and fire hazardous atmospheres
   GB 15577-2018 Safety regulations for dust explosion prevention

M-CD-EN-V2.1

Smart Capacitive Proximity Sensors Manual

CD Type

■ English

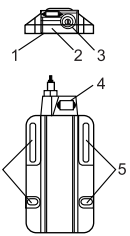
IP67

www.ema-electronic.com

■ Features:

Smart capacitive proximity switches can be used to detect dry, bulk materials and liquid, especially the material with dielectric constant lower than 20 (e. g. : oil).It can detect whether the medium exist and provide switching signals.

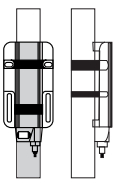
1.Operating zone is sensing surface
2.Contacting surface
3.Electric connection
4.Red/Yellow/Green LED
5.Four mounting holes



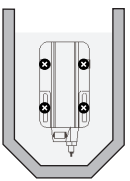
Function:
Detecting medium through wall of container (only used for non-metal container).
The best mode is at full adjustment or empty adjustment.
NO and NC is selectable when the sensor is operating.

■ Mounting

As the following picture, the sensor is surrounded on the pipe and fixed by the wire crossing the mounting holes of the sensor.

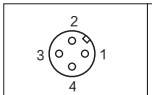


① wire mounting



② screws mounting

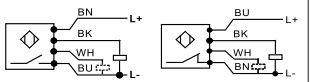
■ Connection



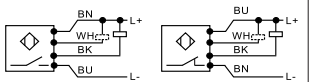
1: BN−Brown
2: WH−White
3: BU−Blue
4: BK−Black

▭ Load
▭ for remote setting

PNP mode of connection



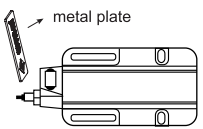
NPN mode of connection



■ Operation

Operation of this sensor runs by approaching contacting face or remote setting.

I.Approaching contact surface
As the right picture, the contacting face is acting while a metal object (e. g. : metal plate) approaching the label zone⊕. It will stop acting if remove the metal object away from the label zone.



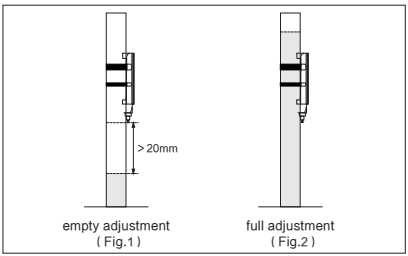
II.Remote setting
Through remote control, the sensor can realize the same function as that of approaching contacting face.

Notice: Approaching contacting face is prior to be considered, compared to remote control.

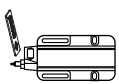
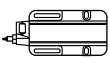
■ Calibration

⚠ No object or interference source is behind or near the pipe.
Set the system into empty adjustment after installation.
Setting Steps: empty adjustment(Fig.1)➡full adjustment(Fig.2)

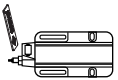
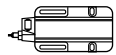
- When setting empty adjustment, keep the medium away sensing face over 20mm.



*Empty Adjustment Setting

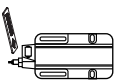
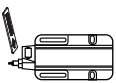
	➡	Under unlock mode, enter empty adjustment setting mode through the metal plate approaching to contacting face, Until the LED green start blinking slowly(or enter into remote setting).remove the metal plate in 5 seconds,(or stop remote setting) .then it enter into empty adjustment setting.
	➡	LED green keeps on, indicating the empty adjustment setting is finished .The system can enter operating mode from empty status.

*Full Adjustment Setting

	Under unlock mode, keep the metal plate approach contacting face about 5 seconds, （or enter into remote setting), LED green would blink slowly first , then it glow quickly . Remove the small screw driver(or stop remote setting) ,then it enter into full adjustment setting .
	LED green keeps on, indicating the full adjustment setting is finished .The system can enter operating mode from full status.

* Lock/Unlock Setting

Default setting is under Unlock mode when power is ON. The user can calibrate empty adjustment and full adjustment directly. The user can also lock the product in manual if needed.

	Lock: Approaching metal plate to sensing face, green LED flashes slowly to quickly. Further, green LED and red LED flash alternatively （Lock）.
	Under lock mode : Approaching sensing face by metal plate, green light flashes for a while, and after 15 second, green LED and red LED flash alternatively（Unlock）.

■ Equipment Setting

After mounting, connect the wire and adjust the status to detect whether the system works orderly. Through empty and full container, it can detect whether the switching status is correct and whether LED display is consistent with its correspondent function.
LEDs display and function output detection

LED Green	ON=System being starting status. Flashes slowly=Empty adjustment. Flashes quickly=Full adjustment.
LED Yellow	OFF=Switching output invalid. ON=Switching output valid.
LED Red	ON=Critical point instruction and background automatic correcting instruction. Flash=Under error alarm system work
LEDs Green+Red flash	Lock/Unlock
LEDs Yellow light OFF or flash	Short-circuit protection

■ Notice:

I.Within 5 seconds after power on, the system will detect environment parameter automatically. And metal objects should be far away from the label zone ⊕ on contacting face.
II.There will appear a critical point and switching point automatically while setting empty adjustment. The system will re-scan sensing signals.
III.Setting full status is based on empty adjustment, so setting empty adjustment is required before set full adjustment. Moreover, a sensing target is also required at this moment; otherwise the setting would be wrong with a warning.
Ⅳ.When the flow rate is below 1mm/min, it is not recommended to use the product.

■Tips:

I. How to determine whether the system is in lock mode or unlock mode ?

Method: Keep the metal plate approaching contacting face (or remote setting) , then observe the changes with LED green .

(1) If LED green would flash once , it indicates that the system operates under the lock mode. Then remove the metal plate (or stop remote setting) at this time .

(2) If LED green would keep flashing slowly, than keep the metal plate approach contacting face (or maintain remote setting).LED green would flash slowly → LED green flash quickly → both LED green and LED red flash quickly. It indicates that the system operates under the lock mode. Then remove the metal plate (or stop remote setting) at this time .

II. How to restore factory settings ?

Description : Restoring factory settings is an important method for the user to adjust the systemic parameters after running for a long time .

Method : Start to calibrate empty adjustment, then enter into full adjustment without changing the detecting medium.There would be an alert that the system is in an error mode al plate approach contacting face for a moment, then remove it (or stop remote setting) , both LED yellow and LED red would flash. When LED yellow and LED red are off, the factory set

Potentiometer Capacitive Proximity Sensors Manual

CD0011/12

■ English

IP67 RoHS

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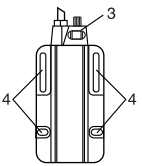
Application

The sensor can be used for conductive or non-conductive liquids such as water, pure water, oil, chemical liquids, corrosive liquids, etc. It can also be used as liquid level detection or leakage sensor to avoid liquid leakage.

1. Leakage of lubricating oil and hydraulic oil in mechanical equipment
2. Leakage of condensate liquid in semiconductor production
3. Leakage of chemical liquid at the pipe joint
4. Leakage of corrosive liquids such as sulfuric acid and alkali
5. Liquid flowing out from the chemical storage tank
6. Horizontal detection, large volume materials and liquids

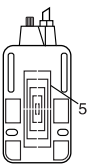
Features

1. Potentiometer
2. Electric connection
3. Red/Green LED
4. Four mounting holes
5. Sensing surface



Front view

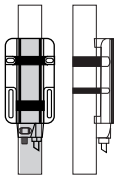
Function:
Detecting medium through wall of container
(only used for non-metal container, such as plastic and glass).



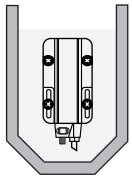
Back view

Mounting

As the following picture, the sensor is surrounded on the pipe and fixed by the wire crossing the mounting holes of the sensor.

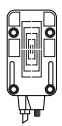


① wire mounting

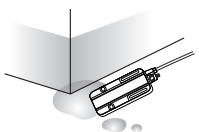


② screws mounting

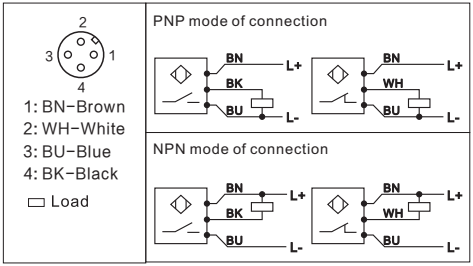
If used as a leakage sensor,
a pad can be mounted at the bottom



③ pad mounting

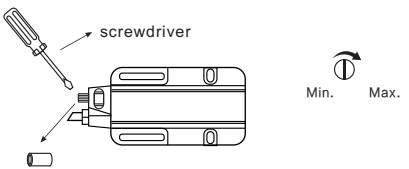


Connection



Operation

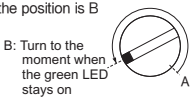
The operation of the switch is achieved by positioning near the sensing surface and calibrating the potentiometer to adjust the sensitivity with a screwdriver.



Sensitivity adjustment

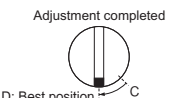
1. Under the condition by positioning near the sensing surface, adjust the sensitivity potentiometer clockwise during the empty level until the sensor runs in a constant red LED state. At this time,adjust the potentiometer position to A

2. When the sensor is in an empty level and the red LED is always ON, adjust the sensitivity potentiometer counterclockwise until the green LED is always ON. At the moment when the red LED turn to the green LED, the position is B



3. When set to position B, you can continue adjusting 1/4 counterclockwise, which is the maximum sensing position C of the sensor

4. Adjust the potentiometer to the best position D between C and B. If necessary, repeat step 1 and 2 until the best state is reached

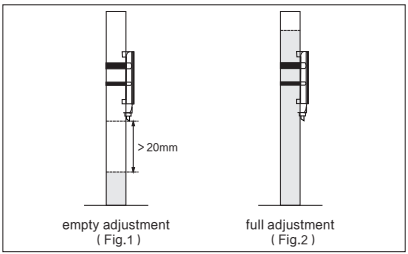


※ Adjusting the potentiometer clockwise is the maximum and counterclockwise is the minimum. If adjusted slightly to the left or right, it will not stop.

※ After the adjustment is completed, move the sensor and keep the green LED during the empty level. During the full level, the red LED keeps ON, ensure the switching of LED status when moving up and down.

■ Level recognition

- When adjusting the empty level, the medium must be more than 20mm away from the sensing surface.
- During the setting, no objects or interference devices should be placed behind the pipe.



■ Maintenance

To ensure the long-term and stable operation of capacitive sensor, please perform the following regular inspection:

1. Whether the installation position of the object and capacitive sensor is offset, loose, or deformed;
2. Inspect wiring and connection for looseness, poor contact, or broken wires;
3. Is there any adhesive metal powder or other substances present;
4. Check whether the temperature and surrounding environment are working normally;
5. Check whether the sensing distance is working normally.