BALLUFF

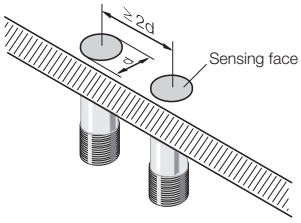
Safety Instructions and Functions and Features

- Please read the product description prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.
- The unit conforms to the relevant regulations and EC directives.
- Improper or non-intended use may lead to malfunctions of the unit or to unwanted effects in your application.
- That is why installation, electrical connection, set-up, operation and maintenance of the unit must only be carried out by qualified personnel authorized by the machine operator.
- The capacitive sensor detects without contact metals, almost all plastics, glass, ceramics, wood, paper, oils, greases, water and all hydrous materials and indicates their presence by providing a switched signal.

Mounting Restrictions

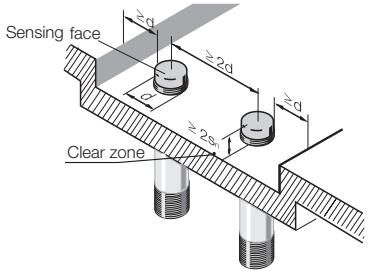
Flush-mount (shielded) proximity switches

... can be installed with their sensing faces flush to the metal. The distance between two proximity switches (in row mounting) must be ≥ 2d.



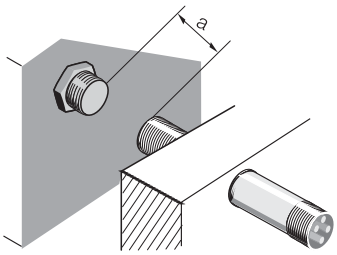
Unshielded proximity switches

The sensing face must extend ≥ $2s_n$ from the metallic installation medium. The distance between two proximity switches must be ≥ 2d.



Opposing installation of 2 sensors

... requires a minimum distance of a ≥ 4d between the sensing faces.



To ensure that the sensors are not mechanically destroyed during installation, make sure that you comply with the following torque figures.

Housing size	Material	Tightening torque
M5×0,5	V2A	3 Nm
M8×1	V2A	15 Nm
M12×1	V2A	40 Nm
M18×1	V2A	60 Nm
M30×1,5	V2A	90 Nm

Electrical Definitions

DC 3-/4-wire

PNP (+) sourcing

Cable/terminals

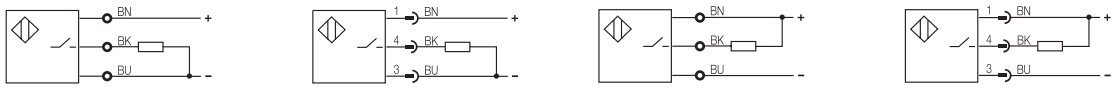
Connector

NPN (–) sinking

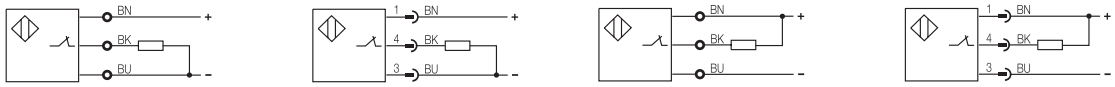
Cable/terminals

Connector

Normally open

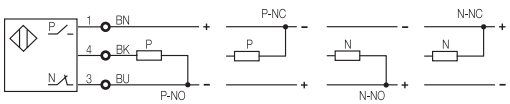


Normally closed



PNP/NPN selectable

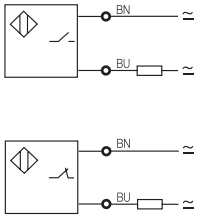
NO/NC user selectable (XDC - output)



AC/DC 2-wire

Normally open

Normally closed



Protection isolated (Protection Class II)

Cable/terminals

Switching function

N.O. (normally open): The sensor closes a circuit to the load when a target is detected or the sensor is operated. Contacts are open when the sensor is not operated and when there is no external force on the actuator.

N.C. (normally closed): The sensor opens a circuit to the load when a target is detected or the sensor is operated. Contacts are closed when the sensor is not operated and when there is no external force on the actuator.

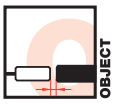
Wire colors, marking per DIN IEC 60757

BN	brown
BK	black
BU	blue
WH	white

Adjustment

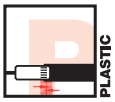
Flush (shielded) Sensors

Flush mountable sensors are normally being used for presence detection of objects or for indirect point level detection of solids, powders or liquids. The following two setup routines help to assure proper setup and operations. All BCS sensors allow sensitivity adjustment potentiometer.



Non-Flush (unshielded) Sensors

These capacitive sensors use a larger spherical electrical field which is especially suited as level detectors for liquids, granulates or powders.



Presence Detection of Solid Objects

The following procedures are outlined for setting a normally open capacitive sensor for ideal sensing conditions:
1. Mount the sensor in the actual sensing position
2. Set up the target for the worst case condition. This means for a presence detection application to move the object to the farthest occurring position from the sensor.
3. All BCS capacitive sensors are already factory preset to their maximum operational sensing range. The sensor has to move closer to the target object, if the farthest object position does not assure a reliable switching. Alternatively, a larger sensor with a larger sensing range can be chosen.
4. The sensitivity can now be reduced by turning the potentiometer CCW until the sensor switches off. Increase now the sensitivity CW by 1/2 turn to set the sensor to its optimal sensitivity setting.

Example:
In the following example, a shielded capacitive sensor in a M12 tubular housing will be used to detect a ceramic plate.
The sensor is factory preset to a maximum rated switching distance sn of 4 mm to metal or by approximation to your hand. When moving the sensor towards the target object, the rated switching distance sn to the ceramic plate has been reduced to approx. 2mm. This distance is now the maximum permissible switching distance for the ceramic plate.

Note:
To ensure that Balluff's BCS capacitive sensors work reliably within their technical specifications, they have a greater sensing distance than the indicated maximum rated switching distance sn in the datasheet. If the user decides to adjust the sensor to a switching distance greater than 2mm for the above described ceramic plate, the sensor will operate in an unreliable mode. This entails a risk that temperature and other environmental factors or electrical interferences may lead to unreliable switching conditions.

Point-Level Detection through Container Walls

Empty Setup (normally open)
1. Mount the sensor in the actual level sensing position flush to the non-metallic container wall.
2. All BCS capacitive sensors are already factory preset to their maximum operational sensing range. The sensor will initially trigger on the container wall material.
3. The sensitivity has to be reduced by turning the potentiometer CCW until the sensor switches off. Increase now the sensitivity CW by 1/2 turn to set the sensor to its optimal sensitivity setting.
4. The sensor should switch on at 40% to 50% sensing area coverage - readjust the sensitivity CCW if the coverage is above 50% and CW if it is below 40%.

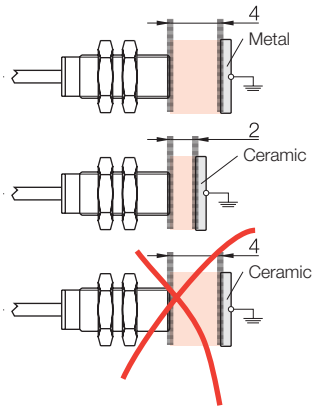
Full Setup (normally open)
1. Mount the sensor in the actual level sensing position flush to the non-metallic container wall.
2. All BCS capacitive sensors are already factory preset to their maximum operational sensing range. The sensor will initially switch on to the container wall.
3. The sensitivity has to be reduced by turning the potentiometer CCW until the sensor switches off. Increase now the sensitivity CW by 1/2 turn to set the sensor to its optimal sensitivity setting.
4. The sensor should switch on at 40% - 50% sensing area coverage - readjust the sensitivity CCW if the coverage is above 50% and CW if it is below 40%.

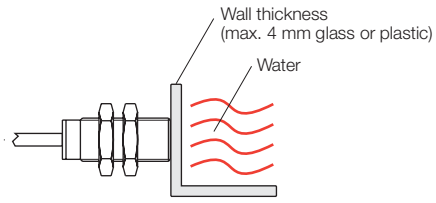
Note:
The partition wall may only be made of glass or plastic. A rule of thumb for the maximum thickness of the wall yields a value of approx. 10 to 20% of the sensor's rated switching distance, but max. 4 mm. SMARTLevel sensors can sense through up to 12mm of wall, but are limited to water-based or conductive liquids.
For very small amounts of liquids and small tank radiuses which do not allow a tight form-fitting mounting, the sensors should be adjusted for approx. 30% sensing area.

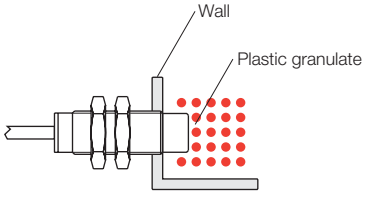
Direct Point-Level detection

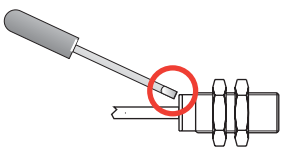
Full Setup (normally open)
1. Mount the sensor in the actual level sensing position with regards to the minimum clearance guide line in our mounting reference.
2. All BCS capacitive sensors are already factory preset to their maximum operational sensing range. The sensor will initially switch on contact with the target material.
3. The sensitivity has to be reduced by turning the potentiometer CCW until the sensor switches off. Now increase the sensitivity CW by 1/2 turn to set the sensor to its optimal sensitivity setting.

This setup procedure assures that the influence of temperature and material build-up has been reduced to a minimum. In some instances,the target material creates extensive material build-up or has a very high relative dielectric constant (conductivity) leading to uncontrollable repetitive false triggering.









Important: Different material properties and conditions have to be taken into consideration during the calibration process.

All Balluff BCS capacitive sensors are therefore equipped with highly accurate trim potentiometers to adjust the device's sensitivity. Turning the potentiometer clockwise (CW) increases the sensitivity, whereas counter-clockwise (CCW) turning reduces it.