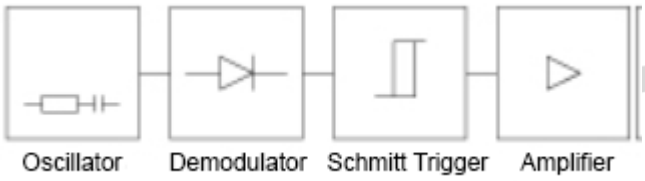
Capacitive sensors

Capacitive sensors are non-contact and non-electrical-contact sensors that can detect metals as well as most non-metals. They are suitable for level control in tanks filled with powdered, liquid or granular materials.

They can also be used as pulse generators for monitoring machine program status, for counters, and for detecting almost all metallic and non-metallic materials.

Operation:

The basic structure of these sensors consists of four parts.



The core part of the oscillator consists of two metal plates positioned in such a way that they form a capacitive element. When an object approaches the sensing surface, it changes the dielectric constant (E) of the capacitive field between the plates. This change in capacitance alters the output amplitude of the oscillator.

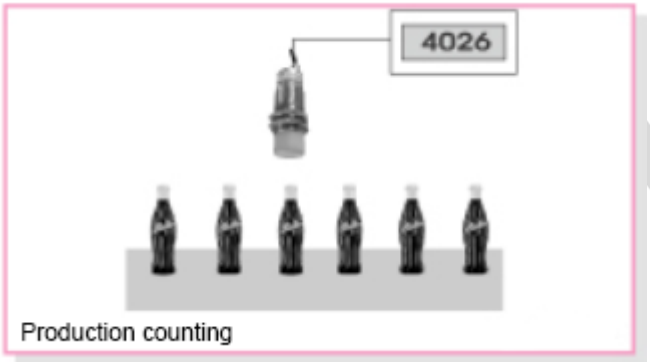
The demodulator detects the amplitude of the oscillator and compares it with a reference level. When the measured amplitude exceeds the reference threshold, the sensor output is activated.

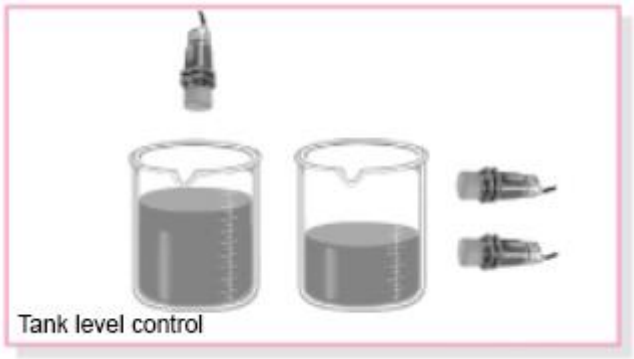
The output amplifier is responsible for supplying the load current.

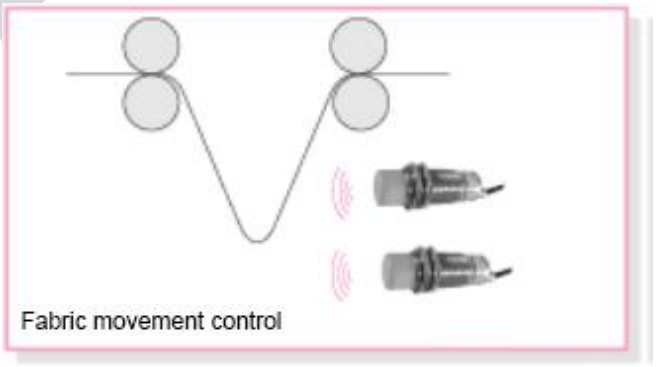
These sensors are manufactured in the following types:

- Two-wire AC
- Three-wire NPN and PNP
- Four-wire NPN and PNP

Application:







In the operation of capacitive sensors, factors such as air humidity, dust, and others can affect the switching distance. The switching distance depends on the type of target material, and the most important correction factors for different materials are shown in the table below.

Type of material	Correction factor
Metal	1
Water	1
Wood	0.2 – 0.6 *
PVC	0.6
Glass	0.5
Oil	0.1

* This factor depends on the moisture content of the wood.

When the switching distance for metal is known, the switching distance for glass can be calculated using the following formula:

S = Sn x KM
S = 20mm x 0.5 = 10 mm
10 mm

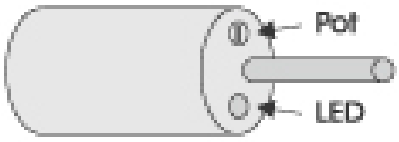
Therefore, the sensor will respond to glass at a reduced sensing distance.

Note:

When adjusting capacitive sensors, it is important to ensure that the switching distance does not exceed the nominal value specified in the sensor's specifications when a metal object is placed in front of the sensor.

Switching distance adjustment:

The switching distance of capacitive sensors can be adjusted using a potentiometer.
Turning the potentiometer clockwise increases the distance , while turning it counterclockwise decreases it.



Protective cover:

To protect capacitive sensors from abrasion caused by corrosive materials, a protective cover made of hard materials should be used.