SENSE
Sensors & Instruments
Rua Tuiuti,1237 - Cep.: 03081-000 - São Paulo -SP - Brazil
Tel.: +55 11 2145-0444 Fax: +55 11 2145-0404
E-mail : vendas@sense.com.br - http://www.sense.com.br

Instructions Manual

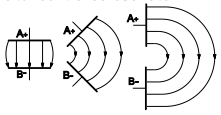
Capacitive

1 - Capacitive Proximity Sensors:

The capacitive proximity sensors are an electronic equipment able to detect the existence or approaching of: organic material, plastic, powder, liquids, wood, paper, metal, etc.

1.1 - Working Principle:

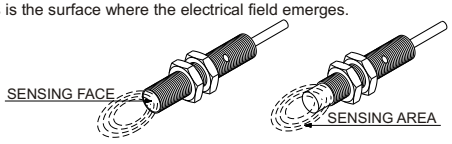
The working principle is based on an electrical field generation, developed by a capacitor controlled oscillator.



The capacitor is formed by two disks, charged with opposite electrical field outside the sensor, thus creating a capacitor which has the air as the dielectric. As the sensor oscillator is controlled by the front capacitor, when some material is approached, their capacitance also changes, bringing out a change in the oscillator circuit. This variation is converted into a continuous sign, which is compared to a pattern value and generate the output.

1.2 - Sensing Face:

This is the surface where the electrical field emerges.



1.3 - Nominal Sensing Distance (Rated Sn):

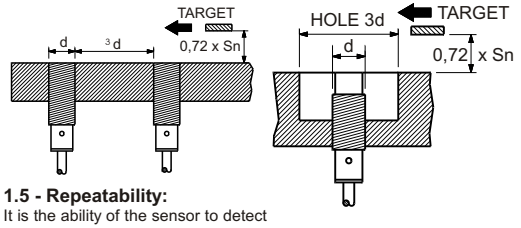
This is the theorical distance, which uses a standard test plate as a target. It does not consider variations caused by industrialization, ambient temperature and feed voltage. This is distance where the sensors are specified.

1.4 - Flushed:

This type of sensor can be mounted flush in a metal surface.
The field is only projected out the face of the sensor.
Any metal around the sensor body will not affect the sensing distance.

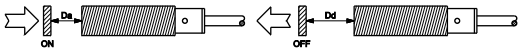
1.4.1 - No-Flushed:

This type of sensor cannot be mounted flush in a metal surface.
The field is projected around the entire end of the sensor.
This results in a longer sensing distance than a sensor of the same size that is shielded.



1.5 - Repeatability:

It is the ability of the sensor to detect a target at the same distance, regardless of changes in ambient temperature, fluctuations in the supply voltage, etc.



2.1 - Standard objective:

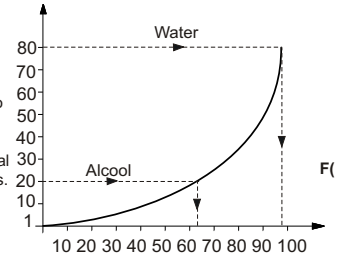
The sensing distances in the capacitive sensor are specified for the metallic plate made of steel SAE 1020 square, with side of 3 times the sensing distance for the not flushed models, (the great majority) and in some few cases of flushed capacitive sensors the side of the square is used as same of the sensor diameter.

2.2 - Effective Sensing Distance (Su):

Value influenced by the industrialization, specified for room temperature (23oC) and tension of nominal feeding:
Sr = ± 10% Sn

2.3 - Operational Sensing Distance (Sa):

This is what we can observe in practice, considering the industrialization factors (72% Sn) and a factor which is proportional to the dielectric material to be detected, which will reduce sensor distance according to the material dielectric characteristics.



Sa = 0,72 . Sn . F( )

Example given:
Water Sa = 0,72 x Sn x F(water) = 0,72 x Sn x 100% Sa = 0,72 Sn
Alcohol Sa = 0,72 x Sn x F(alcohol) = 0,72xSnx65% Sa = 0,47 Sn

2.4 - Material to be Detected:

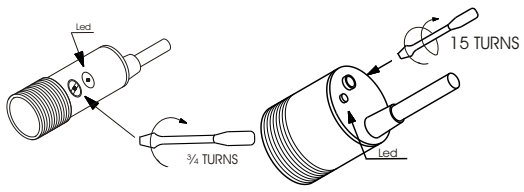
The main dielectric material is shown on the chart below, for comparison purpose; a practical test is always recommended to determine the effective sensor distance for the applied target.

Material	
air, vacuous, ABS, cement, paper	1 to 2
oil, paper, gas, petroleum, PTFE, silicon, poliuretano	2 to 3
baquelite, porcelain, acrylic, sand, sugar, cellulose, cereal	3 to 5
glass, silicon, neoprene, wood, corn, marble	5 to 10
acetone, alcohol, ammonia, wet wood	10 to 20
water, acids, solution of caustic solder	20 to 80

2.5 - Sensitivity Adjustment:

The sensibility adjustment is mainly to reduce the influence of the surrounding, caused by the materials near of the sensibility area of the sensor, reducing the sensing distance.
It allows although to detected some material inside others, for instance: liquids inside of bottles or plastic tubes, reservoirs with glass view finders, powders inside of packing.

M18: **M30 (and 32):**



Take Care ! when adjustment of the sensibility use an appropriate screw driver and don't try to turn the potentiometer after its end, because it will permanently be able to damage the sensor.
Note 1: check if there is an object in the neighborhood of sensor face which can be detected by the sensor.
Note 2: The level detection with capacitive sensor on glass view finders (thickness up to 5mm for sensor M30) it should previously be tested which the controlled product and it should not adhere or to deposit layers on the glass.

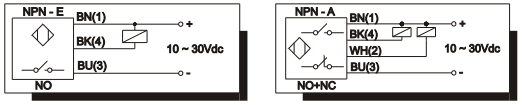
2 - Procedure of adjustment of Capacitive Sensor:

- set up the sensor in your bracket (for level detection to lean the sensor in the viewfinder), verify if it doesn't exist any part or piece of the mounting bracket near to the sensor, that can actuate the sensor,
- feed the sensor according it's connections diagram,
- without the product to be detected, the sensor should not be actuated, then turn the potentiometer in the counterclockwise until output led lights and afterwards reduces the sensibility until the led turns off,
- give an margin of safety decreasing, a little more the sensibility adjust,
- put the product to be detected in its position and distance and verify the if the sensor output activity,
- remove the product again and check if the sensor turns off,
- repeat the two previous procedures verifying the stability of the detection, if the sensor stays on when the product leaves, reduce a little more the sensibility and repeating the tests again.
- in case the detection is not stable uses other sensor with sensing distance larger.

3 - Wiring Diagram:

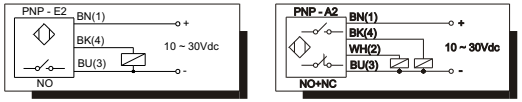
3.1 - NPN Output (Sink):

This type of output switches the load to the negative terminal. The load is connected between the sensor output and the positive terminal.



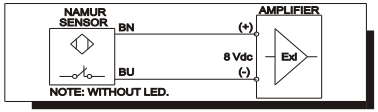
3.2 - PNP Output (Source):

This type of output switches the load to the positive terminal. The load is connected between the sensor output and the negative terminal.



3.3 - Namur Sensors:

This sensor is similar to the standard proximity sensor but is specifically designated to operate in hazardous area where there is the possibility of an explosion, and it must be used with intrinsically safe barriers.
Namur sensors operate with ³ 3mA when it is not actived and with £ 1mA if the target is sensing, when powered by 8V at a impedance of 1kW.

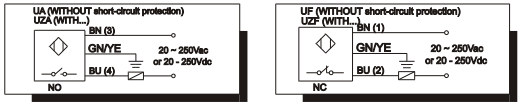


3.4 - Two Wire Sensors:

Similar to mechanical switches, they are wired in series with the load. Observe that a slight amount of current will flow through the load when the sensor output is off, this is required for the sensor powering.
So verify the load activation also considering a constant voltage drop across the sensor when the output is on.

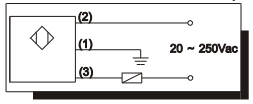
3.5 - AC/DC 2 Wires Sensor ?

It is multi voltage sensor, able to operate at any voltage level between 20 to 250 volts AC and DC.



* Note: Sensor with connector with 4 pins don't have ground connection.

3.6 - Sensors with 3 Pins (V13) Connector:



All 2 wires sensors with 3 pins connector "V13" on AC/DC (models UA and UF) have ground terminal at pin number 1.

4 - Special Cares on Capacitive Sensor:

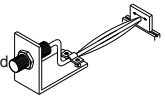
Capacitive sensor are sensitive for most of the materials, special careful should be been to liquids don't reach it's sensibility area, as well as: greases, cloths of cleaning, tows, plant shavings and powders in general, originating from dirt or products.

4.1 - Wiring:

Pay close attention to the wiring diagrams, specially to wires color and connector terminals. Insure that before applying power to the sensor.

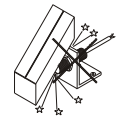
4.2 - Connecting Cable:

To avoid that the cable of connection of the sensor is submitted the any type of mechanical effort.



4.3 - Vibration:

The sensor body is encapsulated with resin making it applicable for use on equipment that is moving. Ensure that the cable is securely fastened at both ends. Do not allow the cable to flex where it enters the sensor body, this can cause damage to the cable and premature failure of the sensor.

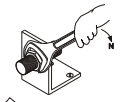


4.4 - Mounting Bracket:

The sensor should not be mounted in a location when there is a risk of impact with other parts or pieces of equipment. Also do not use the sensor as a support. If impacts can not be avoided use a protective bracket around the sensor.

4.5 - Moving Parts:

When making the initial setup of the sensor, ensure that there is sufficient clearance between the sensor and the target, so that the sensor will not be damaged by an impact with the actuator.



4.6 - Tightening Torque:

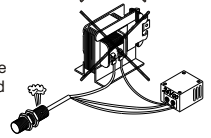
Do not exceed the recommended tightening torque when mounting the sensor.

4.7 - Chemical Resistance:

When using the sensor in areas where it may get in contact with hazardous chemicals, ensure that the sensor will not react with the chemicals. If necessary selecting an appropriate sensor for your application.

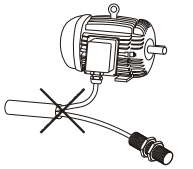
4.8- Environment Conditions:

Avoid using the sensor in locations where the ambient temperature exceeds the specified operating temperature.



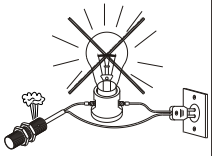
4.9 - High Current Loads:

Using the sensor to activate inductive high current loads, can damage permanently the output section of non-short circuit protected sensors. This type of loads also generates high voltage spikes in the power supply which may shorten the life of the sensor.
Note: see our website on Sensor Instructions Guide with recommendation for DC and AC sensor loads.



4.10 - Cabling:

Do not run the sensor cable next to the high-voltage lines or motor leads, also do not run together in the same conduit or raceway. **Note :** even though there are filters in the sensor to make them tolerant to electrical noise in the power supply, the induced voltage from large inductive loads such as motors, electric brakes, solenoids, contactors, etc can damage the sensor.



4.11 - Incandescent Bulb:

Do not use the sensor to directly power incandescent bulbs.
When the filament is cold it require high current which can damage the sensor.
Note: also inductive loads such as contractors, relays, solenoids, etc. must be checked, to insure that the inrush current will not damage the output of the sensor.

Wire color: BN brown - BK black - BU blue - WH white - GN/YE green/yellow - **Output Function:** NO - Normally Open and NC - Normally Closed

Certification information:

The certification process is coordinated by Inmetro (National Institute of Metrology and Standardization Insdustrial) that uses the ABNT (Brazilian Technical Standards Association) for the development of technical standards for various types of protection.

The certification process is conducted by OCPs (Product Certification Body accredited by Inmetro), using approved laboratories for type tests on the products and issue the Certificate.

For intrinsically safe the only laboratory accredited to date, is the Labex in downtown Cepel laboratories in Rio de Janeiro, where there are specialized facilities and technicians to perform the various procedures as required by the rules, even to conduct controlled explosions with representative gases of each family.

Certificate of conformity

The figure below illustrates a certificate of conformity issued by the OCP Cepel after the tests and trials carried out in Cepel / Labex laboratory:

CENTRO DE PESQUISAS DE ENERGIA ELÉTRICA

Certificado de Conformidade

Certificate CEPEL 06.1046X

Marking:

In marking the **Proximity Sensors Capacitive NAMUR, model CSa-bGcd-N-J-e** shall contain the following information:

Segurança

CEPEL

INMETRO OCP 0007

CEPEL 06.1046X

Ex ia IIC T6 Ga IP66 **Ex tb IIIC T100° Db IP66**

Ui = 15V
Ii - 53 mA
Pi = 0,2W
Li = Desprezível
Ci = 110 nF

-20°C ≤ Ta ≤ +55°C

Observations:

1. The certificate number is terminated by the letter "X" to indicate that the sensors must have registration or platelets with the following warning:
"WARNING - Risk of electrostatic charge potential - see instructions";
The Solenoid equipment has no special considerations for use;
2. equipment input cable glands are not part of this avalização. The equipment must be installed using cable glands certified and compatible degree of protection. If the thought cable has different degree of protection, the set is replaced whichever is less.

Certification for Dust Explosive Atmospheres

Certificate CEPEL 16.2415X

Marking:

Marking of Capacitive Proximity Sensors Inductive must contain the following information :

Segurança

CEPEL

INMETRO OCP 0007

CEPEL 16.2415X

Ex tb IIIC T100°C Db IP66

⚠ Attention

The CEPEL 16.2415X certificate is finished by the letter "X" to indicate the following special conditions for safe use :
The plastic housing versions can not be installed in zone 20 , by virtue of the possibility of electrostatic charge buildup on its surface.