1 - Inductive Sensors: The inductive proximity sensors are able to detect the presence of metal parts, ferrous and non-ferrous elements, and can easily replace traditional mechanical switches. The detection does not require physical contact between the target and the sensor. Since there is no mechanical stress applied, the overall life of the sensor is considerably longer than that of mechanical device.

1.1 - Working Principle: The working principle is based on high frequency electromagnetic field generation. The field is projected from a coil mounted in the face of the sensor. This field is the sensing area. When a metallic object (ferrous or non-ferrous) enters the magnetic field it absorbs the energy from the field and electrical currents are induced on the surface of the target (currents of Foucault). The magnetic field collapses by the detection circuit and the output is activated.

1.2 - Sensing Face: It is the surface of the sensor where the electromagnetic field is projected.

1.3 - Sensing Distance: It is the distance at which the target when approaching the sensing face will cause the output of the sensor to change state.

1.4 - Nominal Sensing Distance (Rated Sn): It is the sensing distance when using a standard test plate as a target. It does not take into account the variations caused by manufacturing tolerances, operating temperature changes and supply voltage variations, etc.

This is the distance used in the proximity sensor specification. Also since a standard test plate is used, the nominal sensing distance specifies the maximum distance at which the sensor can operate.

1.5 - Standard Test Plate (IEC 60.957-6-2 Standard): It is a standard target to determine the nominal sensing distance of the sensor. It consists of a square steel sheet that is 1 mm thick. The side of this sheet is equal to the diameter of the sensor face or 3 times the nominal sensor.

L = D (if 3 x Sn or D on) or
L x D
D = diameter of the area of the field is projected.

1.6 - Actual Sensing Distance: It is the sensing distance at which the standard target can be reliably detected, taking into account the nominal supply voltage, and a standard ambient temperature (20°C). This value also accounts for manufacturing tolerances. Typically within ±10% of nominal distance:

0.9 Sn ± 1.1

1.7 - Effective Sensing Distance (Su) Value: It is the primary electrical induction, specially defined for proximity sensors. (230°C) and tension of nominal feeding: Sn ± 10% Sn

1.8 - Assured Distance Sensing (Assured Sa): It is the distance sensors that can be operated certainly, considering all of the industrialization variations, temperature and operation tension:

Sa = 72% Sn

1.9 - Target Material: The operational sensing distance is specified for mild steel and any other metal materials. When using a different material, the sensing distance can be recalculated by using the appropriate adjustment factor from the table on right. Multiply the rated sensing distance by the factor.

1.10 - Switching Hysteresis: It is the distance between the activation point (when the target is approaching the sensing face) and the deactivation point (when the target is moving away from the sensor). The difference ensures that the output will remain unchanged if there is a slight vibration or movement of the target.

1.11 - 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.

1.12 - Flush Sensing: This type of sensor can be mounted flush in a metal surface. Any metal around the sensor body will not affect the sensing distance.

1.13 - No-Flushed: This type of sensor cannot 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 affect the sensing distance.

1.14 - Semi-Flushed: The field is projected from active face, but is sensitive to any metal that may be close to the end of the sensor. The sensor can be mounted into a metal surface but the minimum clearance distance (h) must be maintained. See the table below:

<table>
<thead>
<tr>
<th>Sn</th>
<th>Diameter</th>
<th>Distance (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2mm</td>
<td>M8 x 1</td>
<td>0mm</td>
</tr>
<tr>
<td>4mm</td>
<td>M12 x 1</td>
<td>0.5mm</td>
</tr>
<tr>
<td>6mm</td>
<td>M16 x 1</td>
<td>2mm</td>
</tr>
<tr>
<td>10mm</td>
<td>M30 x 1.5</td>
<td>3mm</td>
</tr>
</tbody>
</table>

Note: For more sensor mounting and space instructions see the Installation Guide on our website.

2 - Caution: Please read the general precautions outlined in this section. Failure to do so may result in damage to the sensor or equipment. This may also void the warranty.

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

2.2 - Connecting Cable: Avoid applying excessive stress or strain on the sensor cable. This can cause damage to the cable and premature failure of the sensor.

2.3 - 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.

2.4 - Mounting Bracket: The sensor should not be mounted in a location where 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.

2.5 - Moving Parts: When making the initial setup of the sensor, please 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 actual object.

2.6 - Tightening Torque: Do not exceed the recommended tightening torque when mounting the sensor.

2.7 - Chemical Resistance: Ensure that 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.

2.8 - Environmental Conditions: Avoid using the sensor in locations where the ambient temperature exceeds the specified operating temperature.

10 - 30Vdc

2.9 - 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.

2.10 - 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, contacts, etc can damage the sensor.

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

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 is the method 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 mA when it is not activated and with ≤1mA if the target is sensing, when powered by 8V at a impedance of 4kΩ.

3.4 - Two Wire Sensors: Similar to the single phase 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 to verify the load activation considering a constant voltage drop across the sensor when the output is on.

3.4.1 - DC 2 Wires Sensors:

3.4.2 - AC 2 Wires Sensors with Cable or 4 Pins (V1) Connector:

4 - Sensor Materials:

Material Factor
Iron or Steel 1.0
Nickel Chromium 0.9
Brass 0.5
Aluminum 0.4
Copper 0.3

5 - Sensor Nominal Sensing Distance (Rated Sn):

<table>
<thead>
<tr>
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<td>10mm</td>
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<td>3mm</td>
</tr>
</tbody>
</table>

Note: for more sensor mounting and space instructions see the Installation Guide on our website.

6 - Sensor Wire Color:

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Diameter</th>
<th>Distance (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)NAMUR</td>
<td>2mm x 1</td>
<td>0mm</td>
</tr>
<tr>
<td>(-)NAMUR</td>
<td>2mm x 1</td>
<td>0.5mm</td>
</tr>
<tr>
<td>NC</td>
<td>2mm x 1</td>
<td>2mm</td>
</tr>
<tr>
<td>NO</td>
<td>2mm x 1</td>
<td>3mm</td>
</tr>
</tbody>
</table>

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

7 - AC and 4 Wires Sensors:

It is recommended when a voltage drop across the 2 wires sensor is not acceptable.

8 - DC and 2 Wires Sensors:

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

9 - Sensors with 3 Pins (V13) Connector:

All 2 wires sensors with 3 pins connector “Y13” on AC (models WA and WF) and AC/DC (models UA, UZAF, UF and UZHF) have ground terminal at pin number 1.

For complete information see the Instruction Manuals for the product in our website: www.sense.com.br

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