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INSTRUCTION MANUAL

RI-CLDC-001 Ver. 1

Compact Line - DC

The Compact Line is our standard series of inductive proximity sensors, a complete range of products are offered for use in most applications.

1- Model: PS 15 - 30 GM 50 - A2 -V1

Inductive Sensors:

Nominal Sensing Distance:

Sn = 1,2,4,5,8,10,15mm

Diameter:

6.5, 8, M8x1, M12x1, M18x1, M30x1.5

Housing Type:

-- metallic (brass) flat tube
GM - metallic (brass) threaded tube - side led
GI - metallic (brass) threaded tube - back led
GX - metallic (stainless steel) threaded tube - back led
GT - metallic (brass) threaded Tefloncoated- back led
GP - plastic threaded tube - back led

Tube Length:

25 mm - M8 or 6.5mm, N
45mm - M8 or 6.5mm, E and E2
50mm - M12, M18 and M30
60mm - 6.5mm, M8, M12, W
70mm - M12, M18 and M30

Electrical Connection:

N - Namur 2 wire DC sensors
N4 - DC 2 wire NO
N5 - DC 2 wire NC
E - DC NPN 3 wire NO
A - DC NPN 4 wire NO+NC
E2 - DC PNP 3 wire NO
A2 - DC PNP 4 wire NO+NC
UA - AC/DC 2 wire NO
UF - AC/DC 2 wire NC
UZA - AC/DC NO with short circuit protection
UZF - AC/DC NC with short circuit protection
WA - AC 2 wire NO
WF - AC 2 wire NC
W3A - AC 3 wire NO
W3F - AC 3 wire NC

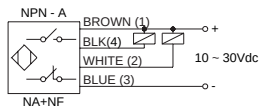
Connection:

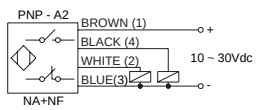
-- - standard - PVC cable 2m long
6 - PVC cable 6m long
PU - polyurethane 2m long
V1 - 4 pin male M12 connector
V8 - 3 or 4 pin male M8 connector

Specifications Type E, E2, A and A2:

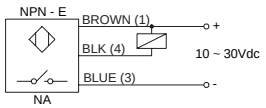
Operation Voltage	10~30 Vdc(ripple <10%)
Max. Output current	200mA
Current consumption	<10mA (excluding M18/M30 A/A2 <20mA)
Output protection	Short circuit and overload protection
Output voltage drop	2V
Indicator	led
Hysteresis	5%
Repeatability	< 0,01mm
EMC	IEC947-5-2/ IEC1000-4-2 3, 4, 5/ EN:50082-2
Ambient temperature	-25 °C ~ +70 °C
Vibration withstand	b< 30g / t 11ms
Protection class	IP67
Metallic housing	Nickel plated brass
Plastic housing	Rynite thermoplastic

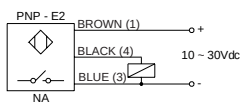
Models A(NPN) and A2(PNP) cable	Sn mm	Φ mm	Plate mm	Mtng.	Freq. Hz
PS2-12GM(GI;GP)50-A (A2)	2	12	□ 12	N	800
PS2-12GM(GI)60-A (A2)	2	12	□ 12	N	800
PS2-12GI70(GP)70-A (A2)	2	12	□ 12	N	800
PS4-12GM(GI;GP)50-A (A2)	4	12	□ 12	O	400
PS4-12GI(GP)70A (A2)	4	12	□ 12	O	400
PS5-18GM(GI;GP)50-A (A2)	5	18	□ 12	N	500
PS5-18GI(GP)70-A (A2)	5	18	□ 12	N	500
PS8-18GM(GI;GP)50-A (A2)	8	18	□ 12	O	200
PS8-18GI(GP)70-A (A2)	8	18	□ 12	O	200
PS10-30GM(GI;GP)-50-A (A2)	10	30	□ 12	N	300
PS10-30GI(GP)-70-A (A2)	10	30	□ 18	N	300
PS15-30GM(GI;GP)-70-A (A2)	15	30	□ 18	O	100
PS15-30GI(GP)-70-A (A2)	15	30	□ 18	O	100
Models A(NPN) and A2(PNP) connector	**Sn mm**	**Φ mm**	**Plate mm**	**Mtng.**	**Freq. Hz**
PS2-12GI(GP)50-A-V1 (-A2)	2	12	□ 12	N	800
PS4-12GI(GP)50-A-V1 (-A2)	4	12	□ 12	O	400
PS5-18GI(GP)50-A-V1 (-A2)	5	18	□ 18	N	500
PS8-18GI(GP)50-A-V1 (-A2)	8	18	□ 24	O	200
PS10-30GI(GP)50-A-V1 (-A2)	10	30	□ 30	N	300
PS15-30GI(GP)50-A-V1 (-A2)	15	30	□ 45	O	100





Models E(NPN) and E2(PNP) cable	Sn mm	Φ mm	Plate mm	Mtng.	Freq. Hz
PS1,5-6,5-45-E (-E2)	1,5	6,5	□ 8	N	1K
PS1,5-8-45-E (-E2)	1,5	8	□ 8	N	1K
PS1,5-8GM45-E (-E2)	1,5	8	□ 8	N	1K
PS2-6,5-45-E (-E2)	2	6,5	□ 8	O	600
PS2-8-45-E (-E2)	2	8	□ 8	O	600
PS2-8GM45-E (-E2)	2	8	□ 8	O	600
PS2-12GM(GI;GP)50-E (-E2)	2	12	□ 12	N	800
PS2-12GI(GP)70-E (-E2)	2	12	□ 12	N	800
PS4-12GM(GI;GP)50-E (-E2)	4	12	□ 12	O	400
PS4-12GI(GP)70-E (-E2)	4	12	□ 12	O	400
PS5-18GM(GI;GP)50-E (-E2)	5	18	□ 18	N	500
PS5-18GI70-E (-E2)	5	18	□ 18	N	500
PS8-18GM(GI;GP)50-E (-E2)	8	18	□ 24	O	200
PS8-18GI70-E (-E2)	8	18	□ 24	O	200
PS10-30GM(GI;GP)50-E (-E2)	10	30	□ 30	N	300
PS10-30GI70-E (-E2)	10	30	□ 30	N	300
PS15-30GM(GI;GP)50-E (-E2)	15	30	□ 45	O	100
PS15-30GI70-E (-E2)	15	30	□ 45	O	100
Models E(NPN) and E2(PNP) connector	**Sn mm**	**Φ mm**	**Plate mm**	**Mtng.**	**Freq. Hz**
PS1,5-6,5-60-E-V8 (-E2)	1,5	6,5	□ 8	N	1K
PS1,5-8GM45-E-V1 (-E2)	1,5	8	□ 8	N	1K
PS1,5-8GM60-E-V8 (-E2)	1,5	8	□ 8	N	1K
PS2-6,5-60-E-V8 (-E2)	2	6,5	□ 8	O	600
PS2-8GM45-E-V1 (-E2)	2	8	□ 8	O	600
PS2-8GM60-E-V8 (-E2)	2	8	□ 8	O	600
PS2-12GM50-E-V1 (-E2)	2	12	□ 12	N	800
PS2-12GP50-E-V1 (-E2)	2	12	□ 12	N	800
PS4-12GM50-E-V1 (-E2)	4	12	□ 12	O	400
PS4-12GP50-E-V1 (-E2)	4	12	□ 12	O	400

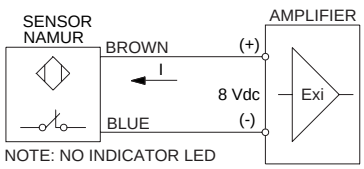




Note: If the supplied sensor isn't listed in the tables above, but uses the same type of output with the codes "E, E2, A, A2, N, N4 and N5" these instructions are applicable EG: PS2-12GX60-WA (special model with stainless steel tube).

n= Flush Mounting o = Non Flush Mounting

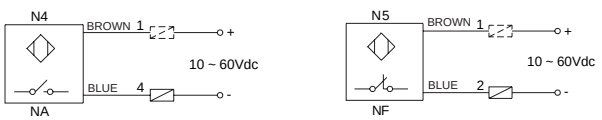
Models NAMUR cable	Sn mm	Φ mm	Plate mm	Mtng.	Freq. Hz
PS1-6,5-25-N	1	6,5	□ 8	N	1K
PS1-8-25-N	1	8	□ 8	N	1K
PS1-8GM25-N	1	8	□ 8	N	1K
PS2-6,5-25-N	2	6,5	□ 8	O	600
PS2-8-25-N	2	8	□ 8	O	600
PS2-8GM25-N	2	8	□ 8	O	600
PS2-12GM(GP)50-N	2	12	□ 12	N	800
PS4-12GM(GP)50-N	4	12	□ 12	O	400
PS5-18GM(GP)50-N	5	18	□ 18	N	500
PS8-18GM(GP)50-N	8	18	□ 24	O	200
PS10-30GM(GP)50-N	10	30	□ 30	N	300
PS15-30GM(GP)50-N	15	30	□ 45	O	100



Specifications Type Namur N:

Standard ..... Namur (DIN19234)
Voltage range .....7~12 Vdc
Operation Voltage ..... 8 Vdc 5%
Current consumption with active face covered 1mA
Current consumption with active face uncovered 3mA
Hysteresis 5%
Repeatability ..... < 0,01mm
EMC IEC947-5-2/ IEC1000-4-2,3, 4, 5/ EN:50082-2
Ambient temperature ..... -25°C~ +100°C
Vibration withstand ..... f 55 Hz/a 1mm
Maximum cable impedance 100
Protection class IP67
Indicator ..... led
Metallic housing ..... Nickel plated brass
Plastic housing ..... Rynite thermoplastic

Models N4 and N5 with cable and connector	Sn mm	Φ mm	Plate mm	Mtng.	Freq. Hz
PS2-12GM50-N4 (-N5)	2	12	□ 12	N	500
PS2-12GI50-N4 (-N5)-V1	2	12	□ 12	N	500
PS2-12GP50-N4 (-N5)-V1	2	12	□ 12	N	500
PS4-12GM50-N4 (-N5)	4	12	□ 12	O	300
PS4-12GI50-N4 (-N5)-V1	4	12	□ 12	O	300
PS4-12GP50-N4 (-N5)-V1	4	12	□ 12	O	300
PS5-18GM50-N4 (-N5)	5	18	□ 18	N	500
PS5-18GI50-N4 (-N5)-V1	5	18	□ 18	N	500
PS5-18GP50-N4 (-N5)-V1	5	18	□ 18	N	500
PS8-18GM50-N4 (-N5)	8	18	□ 24	O	300
PS8-18GI50-N4 (-N5)-V1	8	18	□ 24	O	300
PS8-18GP50-N4 (-N5)-V1	8	18	□ 24	O	300
PS10-30GM50-N4 (-N5)	10	30	□ 30	N	500
PS10-30GI50-N4 (-N5)-V1	10	30	□ 30	N	500
PS10-30GP50-N4 (-N5)-V1	10	30	□ 30	N	500
PS15-30GM50-N4 (-N5)	15	30	□ 45	O	300
PS15-30GI50-N4 (-N5)-V1	15	30	□ 45	O	300
PS15-30GP50-N4 (-N5)-V1	15	30	□ 45	O	300

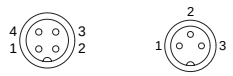


Specifications Type N4 and N5:

Operation Voltage ..... 10~60 Vdc(ripple <10%)
Max. Output current 100mA
Current consumption ..... <2.5mA
Output protection ..... Short circuit and overload protection
Output voltage drop ..... <7V
Hysteresis 5%
Repeatability ..... < 0,01mm
EMC IEC947-5-2/ IEC1000-4-2,3, 4, 5/ EN:50082-2
Ambient temperature ..... -25 °C ~ +70 °C
Vibration withstand ..... f 55Hz/a 1mm
Protection class IP67
Metallic housing ..... Nickel plated brass
Plastic housing ..... Rynite thermoplastic

Connections:

Connector V1 Connector V8



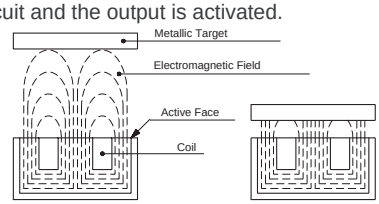
BW - brown (MR)
BL - blue (AZ)
BK - black (PR)
WH - white (BR)

2 - Inductive Proximity Sensors:

An inductive proximity sensor is able to detect the presence of metal parts, components, machine elements, etc. without directly contacting the part. It can easily replace traditional mechanical switches. This detection does not require physical contact between the target and the sensor, and since there is no mechanical stress applied, the overall life of the sensor is considerably longer than that of a mechanical device.

2.1 - Operating Principle:

The principle of operation is based on high frequency electro-magnetic field generation, the field is projected from a coil mounted in the face of the sensor. This magnetic field is the sensing area. When a metallic object (ferrous or non ferrous) is introduced into the projected field, eddy currents are induced in the surface of the target and absorb the energy from the field. This change in the field will be detected by the detection circuit and the output is activated.



2.2 - Sensing Face:

The surface of the sensor where the magnetic field is projected.

2.3 - Sensing Distance:

The distance at which the target when approaching the sensing face will cause the output of the sensor to change state.

2.4 - Nominal Sensing Distance (Sn):

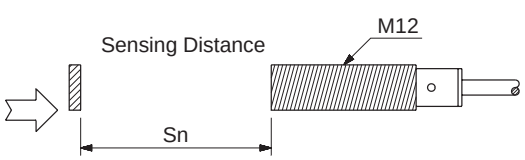
This is the theoretical sensing distance, when using a standard test plate as a target. It does not take into account the variations caused by manufacturing tolerances, operating temperature changes, supply voltage variations, etc. This is the distance used in the proximity sensor specification. Also since a standard test plate is used, the nominal sensing distance specifies the maximum distance at which the sensor can operate.

L = D (3 x Sn < D) or
L = 3 x Sn (3 x Sn > D)
D - diameter of the area where the magnetic field is projected.
Sn - nominal sensing distance

2.5 - Operational Sensing Distance:

The distance that the sensor will operate reliably, regardless of temperature changes, power supply fluctuations, etc.

0 < Sa < 0.81 = Sn

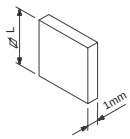


Note: If the supplied sensor isn't listed in the tables above, but uses the same type of output with the codes "E, E2, A, A2, N, N4 and N5" these instructions are applicable EG: PS2-12GX60-WA (special model with stainless steel tube).

n= Flush Mounting o = Non Flush Mounting

Electrical Configuration DC
RI-CLDC-001 Ver.1

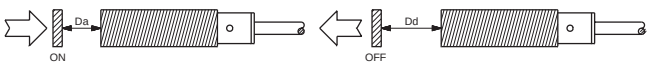
2.6 - Standard Test Plate:
The standard target that is used to calibrate the nominal sensing distance during the manufacturing process.



2.7 - Target Material:
The sensing distance is specified with mild steel and will vary with other materials. When used in an application with a target other than steel, the actual distance may be reduced. To calculate the actual sensing distance multiply the rated sensing distance by the factor shown in the table on the right.

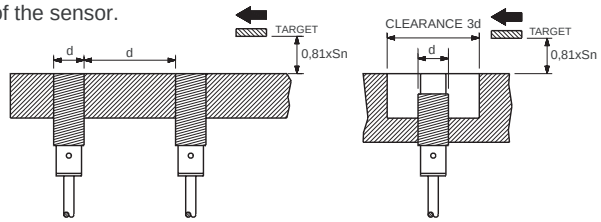
Material	Factor
iron or steel	1,0
nickel chromium	0,9
stainless steel	0,85
brass	0,5
aluminum	0,4

2.8 - Hysteresis:
The difference between the activation point (Da - when the target is approaching the sensor) and the deactivation point (Dd - when the target is moving away from the sensor) is known as Hysteresis. This difference assures that the output will remain constant if there is a slight vibration or movement of the target.

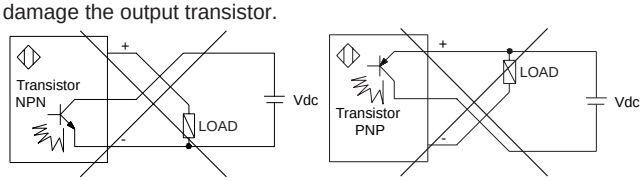


3.1.1 - Shielded:
A shielded sensor can be mounted flush in a metal surface. The field is only projected out from the face of the sensor. Any metal around the sensor body will not affect the operation of the sensor.

3.1.2 - Non Shielded:
A non shielded sensor cannot be mounted flush in a metal surface. The field is projected around the entire end of the sensor. This results in a sensing distance that is greater than a sensor of the same size that is shielded.

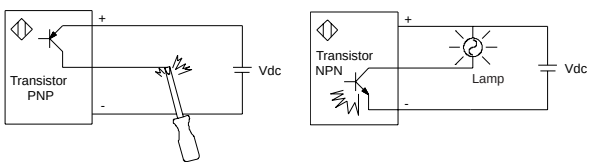


4 - Output Switching Current:
This is an important feature of the sensor, this specify's the type of load that can be used. It is defined as the maximum current that can be switched without damaging the output transistor. If the sensor does not have short circuit protection any overload can permanently damage the output transistor.



Caution:
For sensors that do not have internal short circuit protection be extremely careful during installation or maintenance. Any short circuit will instantly damage the sensor output due to the high current draw.

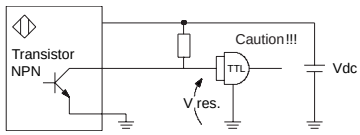
4.1 - High Current Devices:
Solenoid valves, incandescent lights, contactors, etc. have extremely high inrush currents that can damage the output of a sensor if it does not have short circuit protection.



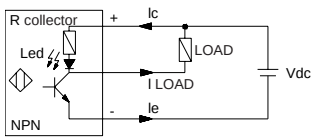
4.2 - Supply Voltage:
Proximity sensors usually have a specified range for the supply voltage. The sensor will operate properly if the voltage is within this range, for example 10 to 30 VDC.

4.3 - Short Circuit Protection:
Some DC sensors have the output protected against short circuits and reverse polarity. The protection circuit will disable the output transistor until the overload condition or short circuit is cleared. However this protection circuit cannot protect against electrical noise or high voltage spikes.

4.4 - Voltage Drop:
There is a voltage drop between the collector and the emitter of the output transistor when it is conducting (saturated), this voltage drop is usually less than 2 volts.
Precaution: When using an NPN sensor to switch TTL logic levels (5V) verify that this voltage drop is less than 0.5V, a higher voltage level could be interpeted as a logic level of 1 by the TTL circuit.



4.5 - Output Collector Resistance:
Most sensors will have some resistance in the collector circuit of the output transistor, however some sensors do not. If it is required to operate the load properly this will need to be checked on a case by case basis.



5 - Two Wire DC Sensors:
This type of sensor has only two wires, and is connected in series with the load. There are several factors that must be considered when using this type of device. The first is the fact that there will be a slight amount of current that flows through the load when the sensor output is off, this is required for the sensor to operate. Verify that the load will not activate at this level of current flow. There is also a voltage drop across the sensor, again this is required for the sensor to operate.

5.1 - Residual Voltage Drop:
The sensor will have a voltage drop across it when activated so the actual voltage level that is available to the load will be the supply voltage minus this voltage drop. The voltage drop could be up to 5VDC, and is required for the sensor to operate and must be taken into consideration. (e.g. With a 24 VDC power supply the load will have 19 volts for operation, at 12 VDC only 7 volts) verify that this level is sufficient for the load to activate.

5.2 - Residual Current Flow:
This is the current (up to 2.5mA) that flows through the load when the sensor output is off, it is required to operate the sensor. Verify that this current flow will not activate the load.

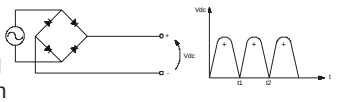
5.3 - Minimum Load:
A two wire device requires a certain level of current flow (approx. 5mA). The load should be able to draw at least this amount of current for proper operation.

5.4 - Programmable Output:
The model N45 two-wire sensor, has a reversible output that can be changed from NO to NC by reversing the connection to the sensor.

6 - Power Supply:
A regulated power supply should be selected that has protection against both noise and short circuits. This will provide reliable operation for the sensors and associated equipment connected to the power supply.

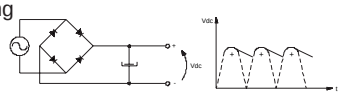
6.1 - Full Wave Bridge Rectified Power Supply:

This type of power supply is not suitable for use with sensors due to the amount of ripple (>10%) and the drop in voltage at T1 and T2, also the peak voltage is much higher than the average.



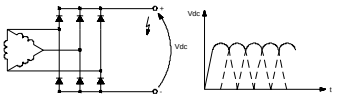
6.2 - Filtered Power Supply:

This type can be used depending upon the amount of ripple. This must be calculated for the total load connected to the source. Typically for loads under 300mA.



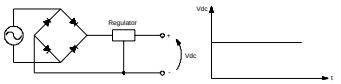
6.3 - Three Phase Power Supply:

This type usually has <5% ripple without using a filter capacitor. It can be used to power sensors if there are only a few inductive loads that could generate noise back into the supply.



6.4 - Regulated Power Supply:

This type of power supply is appropriate for use with inductive proximity sensors, the output voltage will remain constant regardless of variations in the AC supply voltage.



6.5 - Switching Power Supply:

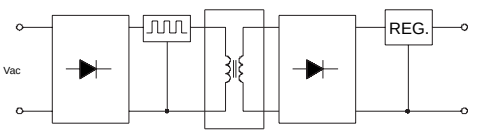
A switching power supply will usually have the output protected against short circuits, overloads, and over voltage conditions. The output voltage will remain constant regardless of variations in the AC supply voltage. Some have been designed for use with high inrush devices such as motors, solenoids, etc. This type of power supply is desirable for use with proximity sensors and other electronic equipment since it will provide a reliable power source for the devices connected to it.

6.6 - Ripple:

Ripple is the AC voltage that is injected onto the DC voltage, this must be less than 10% (peak to peak above the DC average voltage) to maintain the stability of the internal circuits in a proximity sensor.

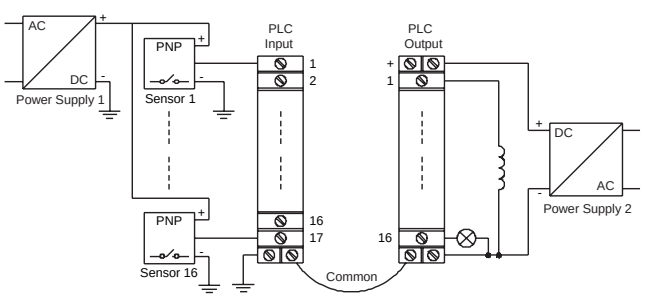
6.7 - Line Noise:

A DC power supply will sometimes have electrical peaks induced into the DC output voltage from solenoid valves, electromagnets, motors, etc. this noise can result in erroneous signals or damage to the sensors and electronic devices that are connected to the power supply. This condition should be avoided if possible.



6.8 - Connection Example With PLC:

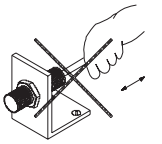
Two power supplies are used in this example. Power supply #1 is a regulated supply used to power only the input devices connected to the PLC input card. Power supply #2 is a common rectified supply used with the output section to supply power to the devices that require more current and may generate noise into the system.



7 - General Precautions:

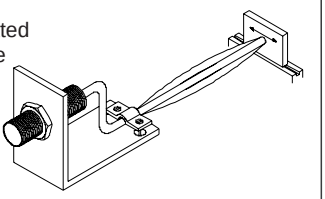
7.1 - Connecting Cable:

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



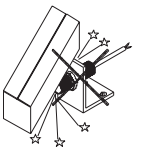
7.2 - Vibration:

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.



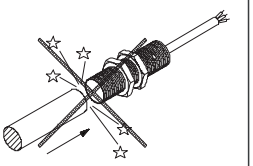
7.3 - Mounting Bracket:

The sensor should not be mounted in a location where it will be subjected to damage due to impact with other parts or pieces of equipment, Also do not use the sensor as a support. If impacts cannot be avoided use a protective bracket around the sensor body.



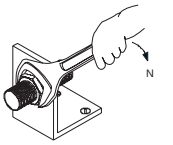
7.4 - Moving Parts:

When performing the inital setup of the sensor, please verify that there is sufficient clearance between the sensor and the target. The sensor should not be damaged by an impact with the actuator.



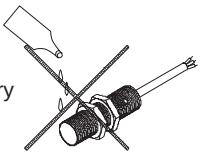
7.5 - Maximum Torque:

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



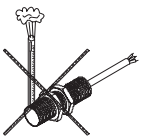
7.6 - Chemical Resistance:

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



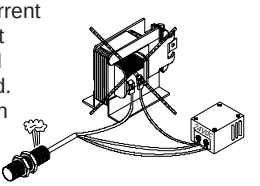
7.7 - Environmental Conditions:

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



7.8 - High Current Loads:

Using the sensor to activate high current inductive loads can cause the output section of non short circuit protected sensors to be permanently damaged. This type of load also generates high voltage spikes back into the power supply which may shorten the life of the sensor.



7.9 - Cabling:

Do not run the sensor cable next to 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 sensors to make them tolerant to electrical noise, the induced voltage from large inductive loads such as motors, electric brakes, solenoids, contactors, etc. can damage the sensor.