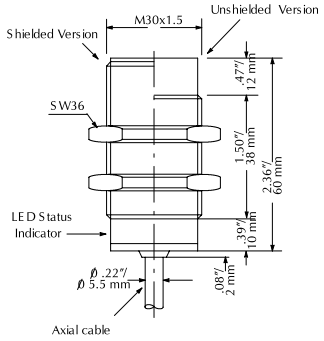
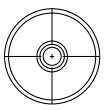
AT Series M30 DC Inductive Prox

Inductive Proximity Sensors
M30 (30mm) – DC

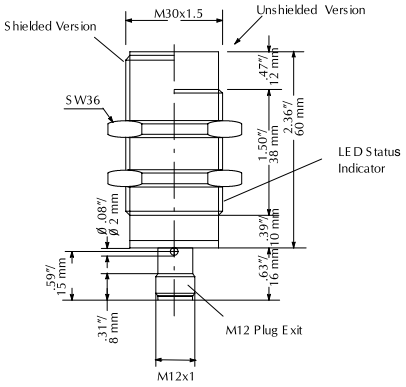
- Standard and extended distance models available
- Two-wire and three-wire models
- Axial cable or M12 plug models
- Complete overload protection
- IP67 protection degree
- LED status indicators are visible 360° around the cylinder

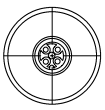
Dimensional Drawings





Models With Axial Cable



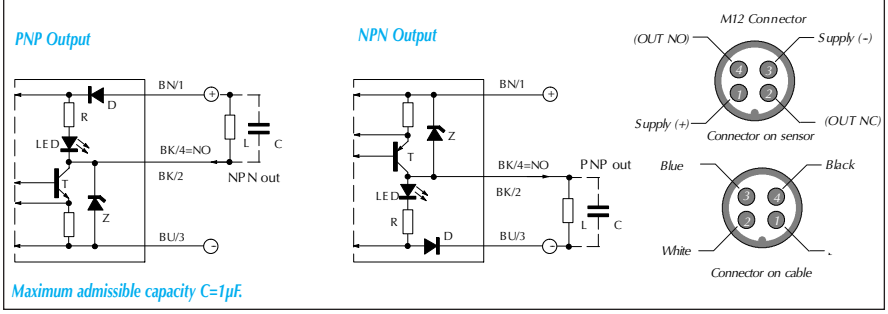


Models With M12 Connector

Cables and Accessories

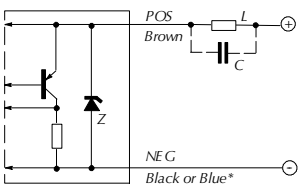
CD12L-0B-020-A0 — Cable for quick-disconnect sensors: 12mm, straight, axial plug, two-meter length
CD12M-0B-070-A1 — Cable for quick-disconnect sensors: 12mm, straight, axial plug, seven-meter length
CD12L-0B-020-C0 — Cable for quick-disconnect sensors: 12mm, right-angle, axial plug, two-meter length
CD12M-0B-070-C1 — Cable for quick-disconnect sensors: 12mm, right-angle, axial plug, seven-meter length
ST30A — Mounting bracket for 30mm sensors, straight, metal, 10 pk
ST30C — Mounting bracket for 30mm sensors, right angle, metal, 10 pk
GXM3PD2013 — Package of six extra hex nuts for installing 30mm sensors

Wiring Diagrams — Three -wire Models

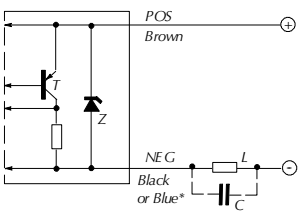


Maximum admissible capacity C=1µF.

Wiring Diagrams — Two-wire Models

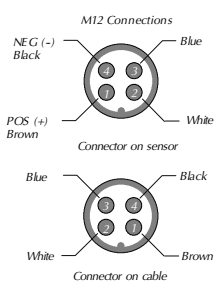


Wiring diagram when sensor is wired in sinking mode used with a sourcing module.



Wiring diagram when sensor is wired in sourcing mode used with a sinking module.

** Note: Negative (-) lead is Black on M12 quick-disconnect cables and Blue on axial cables.*



AT Series Part Numbers

The AT series uses a part numbering system similar to our other sensor products. For example: Part Number AT1-AP-2H would be a N.O., PNP, M30 inductive proximity sensor; standard distance, unshielded with a 15mm sensing range and an M12 connector fitting.

Series	
M30 inductive prox. sensor	AT1
Output State	
N.O. (normally open)	A
Logic	
NPN Output- 3 wire	N
PNP Output - 3 wire	P
Sink/source - 2 wire	0 (zero)
Sensing Range	
Standard shielded, 10mm	1
Standard unshielded, 15mm	2
Ext. distance, shielded, 15mm	3
Ext. distance, unshielded, 20mm	4
Type of Cable	
With 2m (6.5ft) axial cable	A
With M12 connector (N.O.)[1]	H

[1]Order quick-disconnect cable separately.

AT1-	AN-	1A

Note: Use this chart to help you understand the part numbering system. Not all combinations of letters and numbers form valid part numbers. See specifications table or price list for part numbers that we offer.

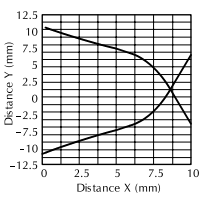
AT Series M30 DC Inductive Prox

Specifications	Standard Distance Models		Extended Distance Models	
Model	AT1-AN-1A AT1-AP-1A AT1-AN-1H AT1-AP-1H AT1-A0-1A AT1-A0-1H	AT1-AN-2A AT1-AP-2A AT1-AN-2H AT1-AP-2H AT1-A0-2A AT1-A0-2H	AT1-AN-3A AT1-AP-3A AT1-AN-3H AT1-AP-3H AT1-A0-3A AT1-A0-3H	AT1-AN-4A AT1-AP-4A AT1-AN-4H AT1-AP-4H AT1-A0-4A AT1-A0-4H
Type/(Sn) Nominal Sensing Distance (with 18x18mm FE360 target)	Shielded/10mm (0.394in)	Unshielded/15mm (0.591in)	Shielded/15mm (0.591in)	Unshielded/20mm (0.787in)
Operating Distance	0 to 8.1mm (0-0.319in)	0 to 12.1mm (0-0.476in)	0 to 12.1mm (0-0.476in)	0 to 16.2mm (0-0.638in)
Differential Travel	2 to 10%		2 to 15%	
Repeat Accuracy	3 wire: 2% / 2 wire: 5%		2 and 3 wire: 5%	
Operating Voltage	10-30VDC			
Ripple	≤10%			
Load Current	3 wire: ≤400mA / 2 wire: 3-100mA		2 and 3 wire:≤400mA	
Leakage Current	3 wire:≤10µA / 2 wire: ≤0.8mA max.		3 wire ≤8µA / 2 wire: ≤0.8mA max.	
Voltage Drop	3 wire: ≤1 volt max. / 2 wire: ≤2.8V		3 wire: ≤1 volt max. / 2 wire: ≤2.8V	
Output Type	Three wire: NPN or PNP/NO (normally open) / Two wire: sink/source, N.O. only			
Switching Frequency	3 wire: 200Hz / 2 wire: 150Hz		2 and 3 wire:150Hz	
(tv) Time Delay Before Availability	3 wire: 100ms / 2 wire: 50ms		3 wire:100ms / 2 wire: 50ms	
Input Voltage Transients Protection	Yes, as long as the transient peak does not exceed 30VDC			
Input Power Polarity Reversal Protection	Yes			
Output Power Short-Circuit Protection	Yes (switch autoresets after overload is removed)			
Temperature Range	-25° to + 70° C (-13° to 158° F)			
Temperature Drift	10% Sr			
Protection Degree (DIN 40 050)	IEC IP67			
LED Indicators	Yellow (NO output energized)			
Housing Material	Nickel-plated brass			
Sensing Face Material	PBT			
Tightening Torque	60Nm (44lb-ft)			
Weight	A type (w/ cable): 180g (6.35oz) H type: 110g (3.88oz)			

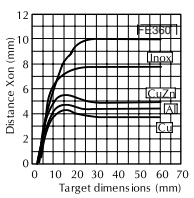
Characteristic Curves – Standard Distance Models

Extended Shielded Models (10mm range)

Detection Area

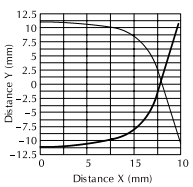


Distance/Target Size

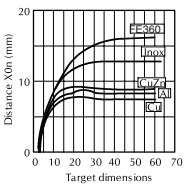


Extended Unshielded Models (15mm range)

Detection Area



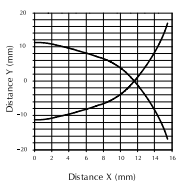
Distance/Target Size



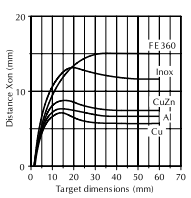
Characteristic Curves – Extended Distance Models

Shielded Models (15mm range)

Detection Area

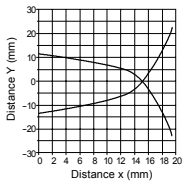


Distance/Target Size

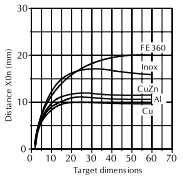


Unshielded Models (20mm range)

Detection Area



Distance/Target Size



Never use this catalog for installation or operation of equipment; refer to the product documentation.

NOTE: See our Web site for updated information on capacitive proximity sensors.

Introduction – How do inductive proximity switches work?

Inductive proximity switches are used to detect the presence of metallic objects without actually contacting the object. Their high-speed switching and small size makes them indispensable in automation applications.

Inductive proximity switches consist of a coil driven by an oscillator. The oscillator creates an electromagnetic field which appears at the active face of the switch. If a metal target enters this area, the electromagnetic field is reduced and the switch turns on or off.

Some typical inductive sensor applications are: counting metallic objects, monitoring the position of elements in a machine, sensing the presence of metallic parts like screws, etc., and measuring the rotational speed of axial detecting cams.

Technical Terms

The following descriptions refer to the European standard EN 60947-5-2. of Sept. 95.

The specifications given here are intended to be minimum performance values described by the standard.

Shielded Proximity Switches

A metal housing surrounds the coil, and only the front of the active face is sensitive. The device allows flush installation on metal plates without any performance change. Shielded units will not interfere with each other when installed side-by-side.

Unshielded Proximity Switches

The sensor housing does not cover the side of the sensing head. This type sensor has a higher sensing range than the shielded type.

Standard Target

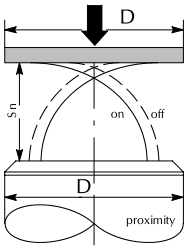
A standard target is square, 1mm thick, and made from type FE360 carbon steel. The length of the side of the square is equal to the diameter of the sensor's active surface, or three times the rated operating distance (Sn), whichever is greater.

Operating Distance (Sensing Range) (S)

The operating distance is the distance at which a standard target approaching the active face of the sensor causes a sensor output state change.

Rated Operating Distance — (Nominal Sensing Distance) (Sn)

This distance does not take into account manufacturing tolerances (±10%) or variations due to external conditions such as voltages and temperatures not falling within the rated values.



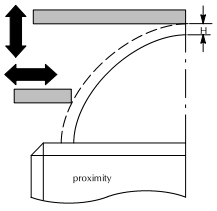
Rated Operating Distance

Repeat Accuracy (R)

The repeat accuracy of the effective operating distance (Sr) is measured over an eight hour period at an ambient temperature of 73°F (±9°) [23°C (± 5°)] at a specified humidity and with a specified supply voltage. The difference between the measurements shall not exceed the specified value, or if not specified, 10% of Sr.

Differential Travel (H)

The differential travel is given as a percentage of the effective operating distance (Sr) and is the maximum difference between the switching distances. The differential is intentionally introduced to guarantee the stability of the output state in case the target is positioned near the switching points.



Differential Travel

Ripple

This is given as a percentage of the mean supply voltage. It is the maximum peak-to-peak value of the admitted ripple voltage. A ripple voltage of <10% Ue is desirable.

Voltage Drop (Ud)

This is the voltage measured across the active output of the proximity switch when the rated operational current (Ie) flows in the load at the rated supply voltage and the temperature is at 73°F (±9°) [(23°C (±5°)]. Unless specified differently, the following values are guaranteed:

Two-wire DC models <8VDC
Three-wire DC models <3.5VDC
Two-wire AC models <10VDC

Technical Terms

Rated Insulation Voltage (Ui)

Unless specified differently, all of the sensors with a supply voltage of up to 50VAC and 75VDC are tested at 500VAC.

Sensors with a supply voltage up to 250VAC are tested as follows:

Class 1 (with earth terminal) at 1500VAC
Class 2 (with double insulation, without earth terminal) at 3000VAC.

OFF-State (Leakage) Current (Ir)

This is the current which flows through the load circuit of the proximity switch in the OFF state at the maximum supply voltage.

Make Function (NO; Normally Open)

A make function causes load current to flow only when a target is detected.

Break Function (NC; Normally Closed)

A break function causes load current to flow only when a target is not detected.

Output Type and Load Connections – Three-wire NPN

There are two power wires and one output wire. The switching element is connected between the output wire and the negative terminal, and the load is connected between the output wire and the positive terminal. In the ON state, the current sinks from the load into the switching element.

Output Type and Load Connections – Three-wire PNP

There are two power wires and one output wire. The switching element is connected between the output wire and the positive terminal, and the load is connected between the output wire and the negative terminal. In the ON state, the current flows from the switching element into the load.

Four-wire NPN or PNP (programmable output state)

There are two power wires, one NO/NC selection input and one output wire. The output state is programmable, connecting the input wire to one of the power supply lines.

Four-wire NPN or PNP (complementary outputs)

There are two power wires, one NO output and one NC output.

Four-wire NPN and PNP

There are two power wires, the output type is wiring programmable. NPN output is available by connecting the PNP terminal to the negative power suppy line. PNP output is available by connecting the NPN terminal to the positive power supply line.

Open Collector

The output transistor is not internally connected to a pull-up or pull-down load. It is therefore possible to connect an external load supplied by an external voltage.

Short-Circuit Protection

All DC sensors have integrated short-circuit protection. AC sensors should not be protected externally by such devices as fuses.

Polarity Reversing Protection

No damage will occur to proximity switches if the supply wires are reversed.

Overvoltage Protection

No damage will occur in the presence of surge pulses exceeding UB and energy less than 0.5J.

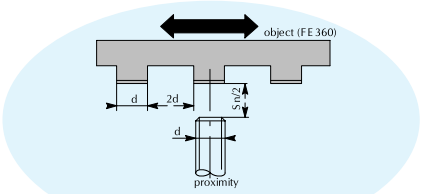
Protection Against Inductive Loads

Unless otherwise specified, DC sensors are protected against inductive overvoltage by use of a surge diode or a zener diode.

Switching Frequency (f)

Switching frequency is the maximum output switching frequency performed by the output circuit when standard targets cross the sensing field at a distance of Sn/2. The targets are spaced 2d.

For DC sensors, the minimum output pulse width must not fall below 50µS.
For AC sensors, the minimum output pulse must not fall below half a sine period
(ie. for 60 Hz, 1/60÷2 = 8.33ms.)



Switching Frequency

Turn On Time

Turn on time is the elapsed time from the time the target enters the sensing range until the output switches.

Turn Off Time

Turn off time is the elapsed time from the time the target is removed until the output switches.

LED Status Indicators

Proximity switches may incorporate one or more color indicators. The meaning of the colors are:

CONTINUOUS GREEN: Power ON
CONTINUOUS YELLOW: Output ON
CONTINUOUS RED: Fault
(on AC models, RED = output on

Degree of Protection

If not otherwise specified, proximity switches (*when installed in accordance with manufacturer's instructions*) have minimum IP65 protection against dust and water jets.

Temperature Range

Unless otherwise specified, the minimum temperature range is –13 to +158°F (-25 to +70°C)

Shocks

In accordance with IEC 68-2-27

Pulse shape: half-sine

Peak acceleration: 30g

Pulse duration: 11ms

Vibration

In accordance with IEC 68-2-6

Frequency range: 10-55Hz

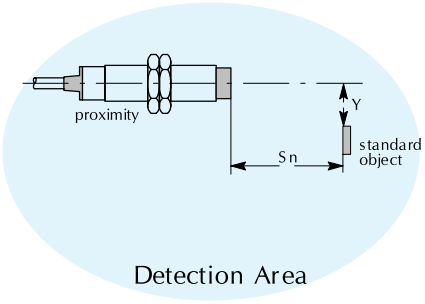
Amplitude: 1mm

Sweep cycle duration: 5min.

Duration of endurance at 55Hz: 30 min. in each of the three axis directions

Detection Area Graph

This is a graph of the parallel displacement needed to switch on (switch off, dashed line) as a function of the target distance. The construction of the curve is obtained by measuring the lateral distance between the sensor axis and the edge of the target necessary to switch on or off at any target distance (see figure below).



Distance/target Size Graph

Indicates the ON switching distance when target material and size changes.

Below are some typical values for different target material of standard dimension:

Inox Steel: 0.6-1 x Sn

Brass: 0.35-0.50 x Sn

Aluminum: 0.35-0.50 x Sn

Copper: 0.25-0.45 x Sn

Mutual Interference

This paragraph describes the meaning of the minimum distance between a sensor or sensors and damping materials to avoid interaction.

Unless otherwise specified, the following data is the minimum guaranteed:

D1: Minimum distance between the sensing faces with devices mounted on parallel axes.

D2: Minimum distance between the sensing faces with devices mounted in front of each other.

D3: Minimum distance between the sensing face and a metallic surface in front of the device.

D4: Minimum depth of the area free from damping material embedding the sensor.

D5: Minimum diameter of the area free from damping material embedding the sensor.

D6: Minimum distance between the sensing faces of two sensors mounted at 90°.

Installation Notes

Select a sensor compatible with the operating environment: verify the compatibility between building materials, the presence of chemicals, temperature range, protection degree, vibrations, shocks, EMC, supply voltage available, load type, etc.

Select the sensor by referring to the size and type of material to be detected.

Check the minimum distances between sensor and damping materials or another sensor.

Check that the number of operations does not exceed the maximum switching frequency. If the phase of the output signal is important, check the turn on and turn off time.

Metallic chips or dust must not accumulate on the sensing face.

The distance between the sensor and the object to detect must not exceed the assured operating distance Sa; the best operating distance is Sn/2.

Check the effect of vibrations.

Install the sensor using the installation accessories and do not exceed the maximum tightening torque.

Electrical Connections

Keep sensor cables and power cables separated to avoid electrical interference.

The power supply voltage must not exceed the specified limits UB.

If a non-stabilized supply voltage is used for DC sensors, the maximum voltage peak under minimum power consumption conditions and minimum voltage peak under maximum power consumption must not exceed UB limits.

If the power supply of the sensor is also used to switch inductive loads, a suppression device must be provided. A fuse to protect the power supply line is also recommended.