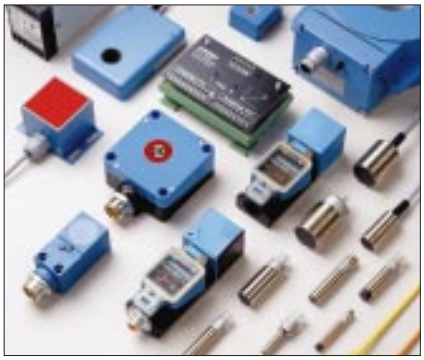
Table of Contents



OVERVIEW – Inductive Proximity Sensors

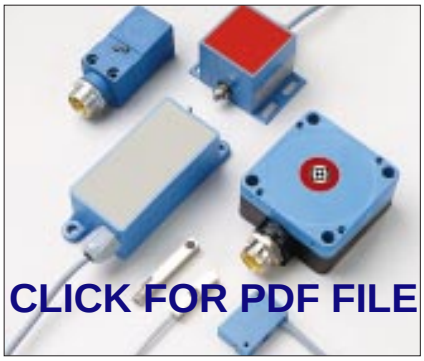
Introduction 4
Operation 5

CYLINDRICAL Inductive Proximity Sensors

Introduction/Operation 8
Selection Guide, DC styles.....12
Selection Guide, AC styles 14
Product Specifications.....16

LIMIT STYLE Inductive Proximity Sensors

Introduction/Operation 68
Selection Guide.....71
Product Specifications.....72



BLOCK STYLE Inductive Proximity Sensors

Introduction/Operation 80
Selection Guide.....82
Product Specifications.....84

RING STYLE Inductive Proximity Sensors

Introduction/Operation 98
Selection Guide.....100
Product Specifications.....102

OTHER INFORMATION

APPENDIX:
IP Codes 132
NEMA requirements 133
Cross Reference 134
Glossary.....135
Conversion Charts 137
INDEX 138

CLICK FOR PDF FILE

ACCESSORIES for Inductive Proximity Sensors

Introduction 113
Mounting Brackets 114
Cable Assemblies.....116
Switching Units.....122
Motion Detectors 128

All specifications subject to change without notice or obligation

Introduction

The Inductive Proximity Sensor (IPS) is a solid state device that generates an output signal when metal objects are either inside or entering into its sensing area from any direction. No physical contact is required nor desired. IPS's work best with ferrous metals, however, they also work well with non-ferrous metals (aluminum, brass, copper, etc.) at reduced sensing distances, see **Figure 1**.

Fig. 1

Rated Operating Distance Correction Factors

Target Material	*Correction Factor*
Mild Steel	1.0 x Sn
Nickel Chromium	0.9 x Sn
Stainless Steel	0.85 x Sn
Brass	0.5 x Sn
Aluminum	0.45 x Sn
Copper	0.40 x Sn

Other Factors

- Flat targets are preferable
- Targets larger than the sensing face may increase the sensing distance

First introduced in the mid 60's, Inductive Proximity Sensors were designed as an alternative to mechanical limit switches for many applications. Initially, IPS's were made with housing similar in size and dimension to the limit switch, but had short sensing distances. Following very good results with these new devices, market pressure led to the development of larger sensors with increased sensing distances.

Inductive Proximity Sensors have no moving parts, operate very fast, are extremely reliable, require no maintenance, and operate under extreme environmental conditions. They typically interface with Programmable Logic Controllers (PLC), process, and personal computers with appropriate hardware and software. They also can control relays, solenoids, valves, etc., up to their maximum output current.

Altech Inductive Proximity Sensors are manufactured by Pulsotronic in Germany. Pulsotronic, a well known European manufacturer, has been designing and manufacturing IPS's for over 30 years using state-of-the-art technology and is an 1S0 9001 certified company. Altech is Pulsotronic's North American marketing partner. Our Inductive Proximity Sensors meet National and International Standards and carry the CE Mark. (See page 7 for information on CE marking).

Altech offers 4 Inductive Proximity Sensor families.
Cylindrical Inductive Proximity Sensors represent the most popular device, and are available in diameters from 4mm (.159 in.) to 30mm (1.18in.) and sensing distances up to 40mm (1.57in.). Typically, Cylindrical models have low sensing distances and are used in applications requiring compact sizes that are easily mountable. Please refer to selection guide on pages 12-14 for more information.

Limit style (Versa-Prox) Inductive Proximity Sensors are physically larger than Cylindrical IPS's and have sensing distances up to 40mm(1.59in.). These units feature a unique 17 position rotating sensing head with snap and lock construction (no screws). Versa-Prox IPS's are used to replace mechanical limit switches and for applications where adjustment of the sending head is desired. Please refer to selection guide on page 71 for more information.

Block Inductive Proximity Sensors feature models with adjustable sensing distances up to 70mm (2.78in.). The largest Block is 100 x 50 x 40 mm (3.9 x 2 x 1.6 in.). Block sensors are used for applications where maximum sensing distances are required.
Please refer the selection guide on pages 82-83 for more information.

Ring Inductive Proximity Sensors are special devices that detect metal objects passing through the ring. Altech offers a wide range of ring diameters from 12mm (.47in.) to 300mm (11.91 in.). Our Ring IPS's are available in normal and high sensitivity models. Typical application are in stamping operations and detection for unwanted metals. Please refer the selection guide on page 100-101 for more information.

Altech/Pulsotronic Inductive Proximity Sensors, (except Ring & Flat-pack), offer a lifetime warranty subject to completing the registration form (see page 143), and the terms and conditions as specified on page 141.

Note: We have attempted to make this catalog as comprehensive as possible. However, not shown in this catalog are other Altech Proximity Sensors which are available. Details on request.

Operation

An Inductive Proximity Sensor consists of an oscillator, a ferrite core with coil, a detector circuit, an output circuit, housing, and a cable or connector, (see **Figure 2**). The oscillator generates a sine wave of a fixed frequency. This signal is used to drive the coil. The coil in conjunction with ferrite core induces a electromagnetic field. When the field lines are interrupted by a metal object, the oscillator voltage is reduced, proportional to the size and distance of the object from the coil. The reduction in the oscillator voltage is caused by eddy currents induced in the metal interrupting the field lines. This reduction in voltage of the oscillator is detected by the detecting circuit. In standard sensors, when the oscillator voltage drops below a present level, an output signal is generated. In an Analog Proximity Sensor, a pre-set level is not used. The Analog sensor circuitry utilizes the change of the oscillator output voltage to generate a DC output voltage proportional to the distance the metal object is from the sensing head.

OPERATING VOLTAGES

Most Altech Inductive Proximity Sensors are available in DC (10-30 VDC), AC (90-250VAC), AC/DC (20-250VAC/DC). Please refer to each product specification page for specific operating voltages.

OUTPUT CURRENT

Altech offers a range of IPS's with different output ratings from 5mA to 500mA. Please refer to each product specification page for specific output current.

OUTPUT CONFIGURATION

Outputs may be Normally Open (NO) or Normally Closed (NC). Some models feature both a normally open (NO) and normally closed (NC) output which is called a complementary output.
Limit style Versa-Prox sensors feature a programmable Normally Open (NO) and Normally Closed (NC) output.

DC Inductive Proximity Sensors may be 2-wire, 3-wire or 4-wire. A 3 -wire or 4-wire DC sensor can be an NPN or PNP output transistor. If the output load is connected to the negative power source then a sensor with a PNP output transistor is required. A PNP sensor is also known as a source sensor. If the output load is connected to the positive power source, then a sensor with an NPN output transistor is required. An NPN sensor is also known as a sink sensor.

Please see **Figure 3** for PNP and NPN electronic output circuits.
AC Inductive Proximity Sensors are 2-wire devices, except when using a sensor with a metal housing where a third wire is available for connection to system ground.

HOUSING MATERIALS

Altech Inductive Proximity Sensors use a variety of metal and non-metallic housing materials. Please refer to each product specification for specific information on housing materials, and page 136 of this catalog.

CONNECTIONS

Altech offers Inductive Proximity Sensors that feature either 2 meter fixed PVC cable or a variety of quick disconnects. All quick disconnect models require an optional matching cable assembly. Custom cable lengths and material choices are also available. For more information, please refer to each product specification or the cable assemblies section on pages 116-121.

FLUSH MOUNT AND NON-FLUSH MOUNT

Flush Mount sensors are sometimes called Shielded or Embeddable. A metal band surrounds the sensing head which contains a coil wound around a ferrite core as in **Figure 4**.

Fig. 2 SENSOR CONFIGURATION

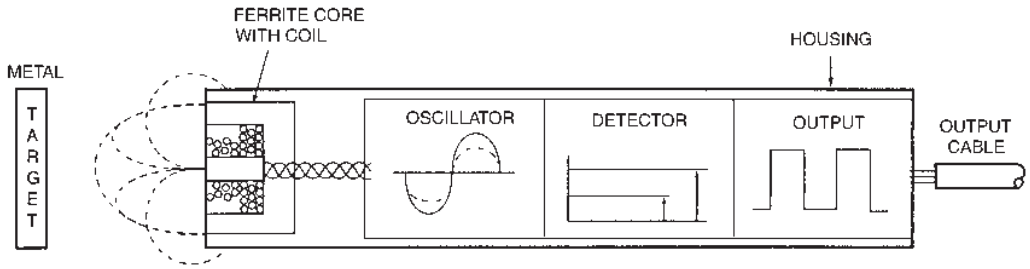


Fig. 3 ELECTRONIC OUTPUT CIRCUITS

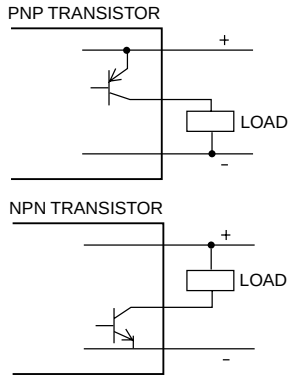
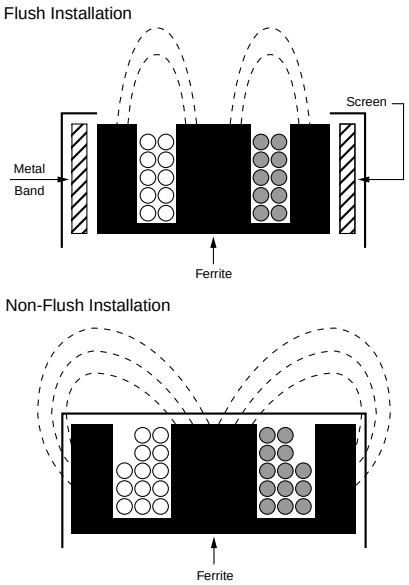


Fig. 4 SENSOR ELECTRO-MAGNETIC FIELD



The resulting electromagnetic field is directed in front of the sensor face. Flush sensors have a narrow sensing field which may be desirable in certain applications.
In a Non-Flush (Non-shielded or Non-embeddable) sensor, (**Figure 4**), there is no metal band and the resulting electromagnetic field lines are much wider than the sensor face. Non-Flush sensors have a larger sensing distance than Flush sensors.

OTHER CONSIDERATIONS:

SENSORS IN SERIES AND PARALLEL

Sensors may be wired in series or parallel. Please contact Altech for more information.

PROTECTION (Electrical)

Most of the Inductive Proximity Sensors Altech offers have short circuit, overload, reverse polarity, and wire break protection. Please refer to the Technical Glossary pages 135-136, and the product specification for more information.

PROTECTION (Sensor Housing)

All Altech sensors are rated in accordance with IEC Publication 529 which describes degrees of protection that enclosures or sensor housings are designed to provide, the degree of protection is indicated by two letters (IP) and two numerals, for additional information see the product specification and pages 132-133.

All Inductive sensors meet the following shock and vibration requirements: 30g's/11ms, and 10-55 Hz/mm.

SENSING DISTANCE

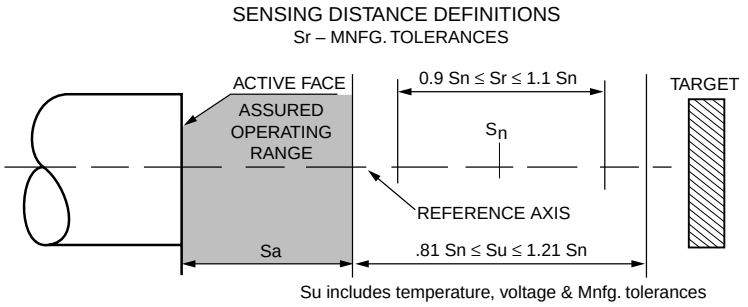
There are several sensing distance definitions used in industry. The nominal sensing distance (Sn), is the conventional quantity to designate the operational distance, it is specified in the ordering pages, and does not include variations in production tolerances, supply voltage tolerances, and ambient temperature tolerances.

A standard target used to specify sensing distance is a square piece of mild steel having a thickness of 1mm (0.04 in.). The sides of the square are equal to the diameter of the circle inscribed on the sensor face or three times the rated operating distance Sn, whichever is greater.
The assured operation distance (Sa) is the smallest useful sensing distance which guarantees operation under variations in temperature, voltage and manufacture. It is given as 81% of Sn. See **Figure 5**.
$0<Sa<.81\ Sn$.

The effective sensing distance (Sr), is measured at nominal supply voltage and nominal ambient temperature and takes into account manufacturing tolerances:
$0.9\ Sn \leq Sr \leq 1.1\ Sn$

The usable sensing distance, (Su), takes into account temperature, voltage variations and manufacturing tolerances:
$.81\ Sn \leq Su \geq 1.21\ Sn$

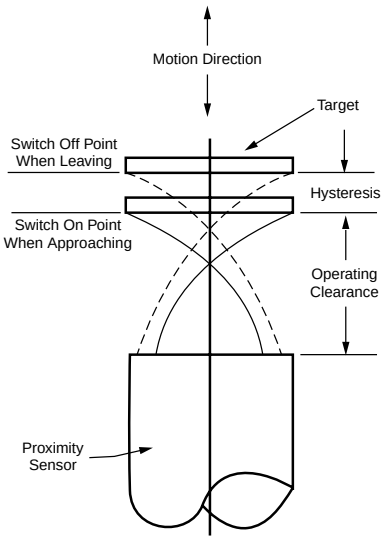
Fig. 5



HYSTERESIS

Hysteresis is the switch-on point when the object approaches the sensor's active surface, and switch-off point, when the object is moving away from the sensor's active surface. Without sufficient Hysteresis, an Inductive Proximity Sensor would chatter (continuously switching on and off), so it is designed into the sensor circuitry. The differential travel (Hysteresis) is given as a percent of the expected rated operating distance Sr.
(See **Figure 6**).

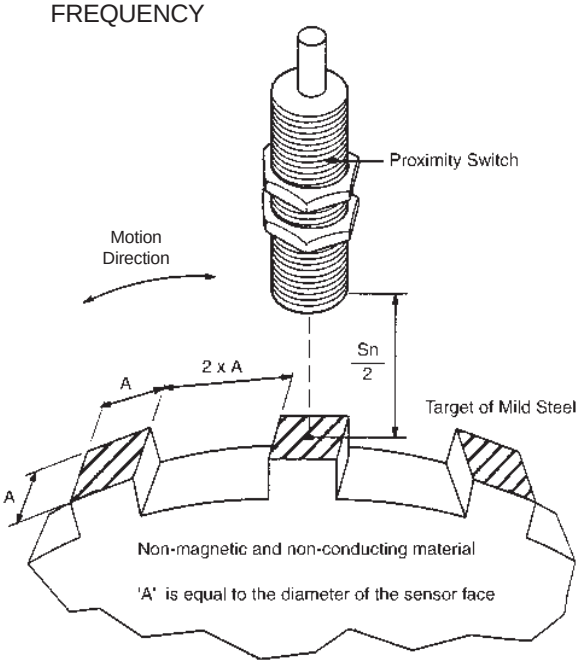
Fig. 6 HYSTERESIS



MAXIMUM SWITCHING FREQUENCY

The switching frequency indicates the maximum number of switching operations of a sensor per second. The value listed in the product specifications is achieved with the conditions shown in **Figure 7**. The value is always dependent on target size, distance from sensing face and speed of target. Using a smaller target or space may result in a reduction of a specific sensor maximum switching frequency.

Fig. 7 SWITCHING FREQUENCY



ACCESSORIES

Altech offers a full range of accessory products including quick disconnect cable assemblies, mounting clamps and brackets, liquid tight strain reliefs, amplifiers, switching units, etc. Please refer to each product specification and the accessory chapter starting on page 113.

CE MARK

GENERAL INFORMATION

The CE Mark is a compliance symbol, which means that the product meets the standards set by the European Committee for Electrotechnical Standardization (CENELEC), and the International Electrotechnical Commission (IEC).

Products containing the CE mark are allowed to have free movement within the European Union (EU), and European Economic Area (EEA). Products manufactured in the USA that are exported to the EU and EEA should have the CE marking and utilize components also having the CE marking.