

CYLINDRICAL SENSORS,
CABLES, AND CONNECTORS

Industrial automation is changing daily in its operational requirements. This most often affects companies on all levels and must be addressed component to component from the bottom up. Sensors, cables, and connectors are a critical factor and must offer flexibility and robustness to the user.

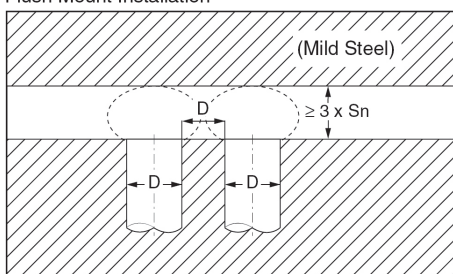


In today's growing automation market, where smart factories are connected using the Industrial Internet of Things (IIoT) and Industry 4.0 technologies, a number of key factors come into play. Ease of installation, replacement, and repair are viewed as valuable additions to every system being manufactured. When it comes to the plant floor, these aspects will save time, resources, and money.

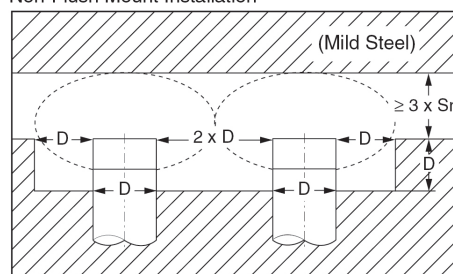
Cylindrical sensors, such as inductive proximity sensors used in a wide range of applications and under a variety of environments, offer specifications suitable for automation on multiple levels. Proximity sensors from Altech are available in two mounting configurations.

Flush mounted cylindrical sensors (also called embedded or shielded sensors), have electromagnetic fields that are concentrated directly in front of the sensing heads, which allows them to be mounted directly onto metal mounting brackets or embedded directly into metal without causing a false output. Where systems are continually getting more compact and smaller, this mounting option can become a requirement. Although there are restrictions.

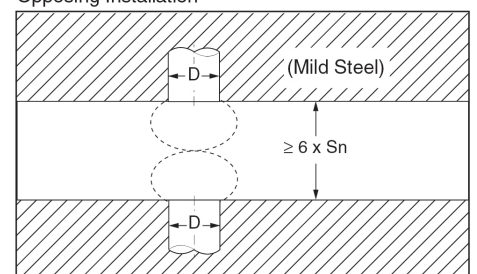
Flush Mount Installation



Non-Flush Mount Installation



Opposing Installation



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Flush mounted sensors must have a minimum of one diameter of distance between adjacent sensors. There must be no non-target metal surfaces within three times the sensing distance across from the sensing head, and six times the sensing distance if sensors are mounted directly opposite one another. These conditions are typically easy to include since most designs use the least number of sensors they can to save on material costs.

Non-flush mounted sensors (non-embedded or non-shielded) have electromagnetic fields that exhibit a wide sensing angle and have no metal surrounding the sensing head. This means that care must be taken to assure that no *non-target* metal comes within a near proximity to the sensing head. Slightly different from flush mounted sensor requirements, adjacent non-flush mounted sensors should be separated by at least two times the diameter. Non-target metal should be separated from the sensor head at least three times the sensing distance. Two directly opposite sensors should be at least six times the sensing distance apart.

Sizes and Features

Altech's cylindrical sensors come in diameters ranging from 8mm (0.32 in.) to 30mm (1.18 in.) and offer sensing distances up to 15mm (0.59 in.). The solid state operation of an inductive proximity sensor generates an output signal whenever a metal object is either inside or entering into its sensing area—from any direction. Physical contact is not required or desired. These devices work best with ferrous metals, but also work well with non-ferrous metals such as aluminum, brass, and copper but at a reduced sensing distance. Know the correction factor for each metal. For example if your target material is mild steel, use a correction factor of 1.0 x Sn as illustrated in the chart below. Note that

flat targets are preferable and that targets larger than the sensing face may increase the sensing distance.

Rated Operating Distance Correction Factors for Standard Target Materials

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

The majority of models feature a combination of nickel-plated brass and stainless steel. Although non-flush mounted sensors offer a larger sensing distance than their flush mounted counterparts, all the inductive sensors meet IP67 protection levels. IP67 is the most common standard for connectivity products and provides 100 percent protection against solid objects such as dust, dirt, and sand, and will work for a minimum of 30 minutes while under 15cm to 1m of water.

Additional features include both AC and DC output connections that can be configured as Normally Open (NO) or Normally Closed (NC) with complementary NO/NC DC outputs available on some models. Altech sensors are available in a wide selection of M8/M12 Quick Disconnect styles or with fixed cables attached. Quick Disconnect models are designed to be user-friendly and to simplify and speed initial installation as well as replacement and repair.

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Component Materials

As mentioned, both flush mounted and non-flush mounted sensors are made from a combination of nickel-plated brass and stainless steel. Additionally, tip material is Polybutylene Terephthalate (PBTB) for long life. PBTB is a crystalline, high molecular weight thermoplastic engineered polymer that provides an excellent balance of properties and processing characteristics, which allows short mold cycles. The material also has low water absorption, has very good dimensional stability, exhibits high heat resistance, and is chemical resistant. All these factors add to a highly operational and robust sensor for a wide variety of environments.

Cables and Connectors

It is essential to consider cables and connectors when integrating sensors into your automation system. The greatest number of sensors will be used to interconnect sensors and actuators used in collecting and monitoring production data from all levels of machine equipment as well as for executing pertinent commands. What is known as A-code cable assemblies, these components are designed for a wide variety of applications such as robotics,

production machinery, packaging systems, and other equipment where high temperatures and harsh environments are common—for robust and reliable operation.

D-coded cable and connector interfaces were designed for interface Industrial Ethernet, Ethernet/IP, EtherCAT, and PROFINET protocols used in more and more high-level industrial controls that must interact with real-time data feeds. These connectors and cables are also used in a wide variety of industrial applications.







A more recent addition to the connector and cable market are X-coded connectors, which are meant to handle Ethernet speeds of up to 10 GB. These components are used when high-speed, extremely accurate data is needed. These speeds are great for camera operated equipment such as vision systems that must transfer large amounts of data quickly. Other applications include virtual reality as well as security.

Both M8 and M12 cables are used depending only on your application and its environment. When designing your system, be sure to look for

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M8/M12 – THE CODINGS

A-coding:	Actuator-sensor plug connections for DeviceNet, IO link and Profibus	
B-coding:	Fieldbus connections for Profibus and Interbus	
D-coding:	Industrial Ethernet, Profinet, Ethernet/IP and EtherCat	
S-coding:	Motor, Frequency-converters, motor operated switches, PSUs for Power, 620 V, 12 A	
T-coding:	Fieldbus comp, passive distribution boxes, motors, PSUs for Power, 63 V, 12 A	
X-coding:	Cat6A, high-speed 10Gbit rugged industrial Ethernet applications IEC 61076-2-109	

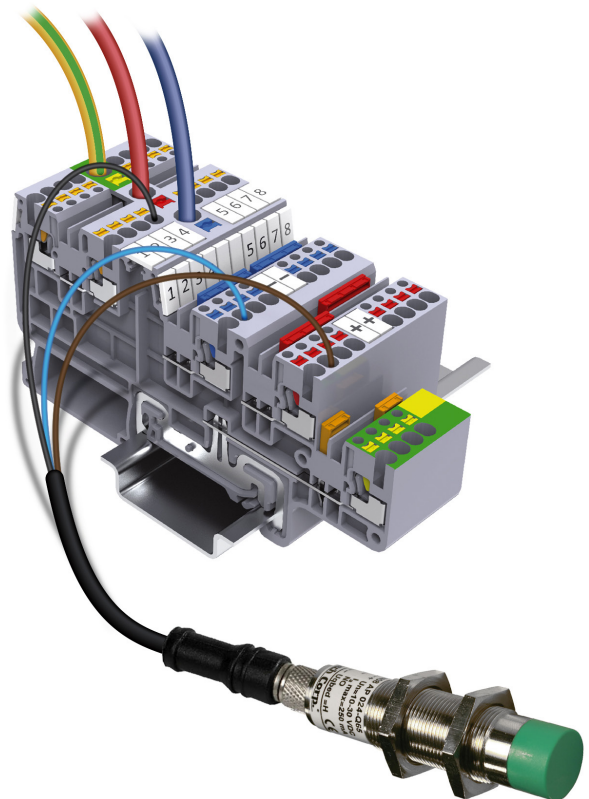
a company that offers a wide variety of viable solutions and the in-house expertise to answer your pertinent application questions. When it comes to product selection, note that Altech offers full lines of M8 and M12 molded male and female cable assemblies, field wired connectors, as well as panel feed-through connectors. When buying sensors as those mentioned above, the cylindrical sensors are provided with 2m PVC fixed cables. Two-meter and 5m PUR cables can be purchased as an option.

For a quick rundown of features, let's begin with the company's M8 and M12 molded male and female cable assemblies. These PVC and PUR cables are available in 1, 2, 3, and 10m standard cable lengths with custom lengths available. The connector comes in straight- and right-angle versions with 3, 4, 5, 8, and 12 pole interconnections. Field wired M8 and M12 connectors are available in male and female versions with screw and solder connections and 3, 4, 5, and 8 poles. Female and male versions of the M8 and M12 panel feed-through connectors are available as front or rear mounted and offer various

cable lengths. M8 connectors are either 3 or 4 pole, which the M12 connectors are available in 4, 5, 8, and 12 pole versions.

Conclusion

Flexibility is always important in today's industrial automation world. Environmental needs can vary greatly. Ease of installation, long life, and ease of maintenance are critical factors in saving costs in the short and long run. The need for the proper sensors, connectors, and cables can vary greatly from application to application. When considering components for your industrial needs, be sure to select a company that not only has a wide variety of components but also offers the years of experience necessary to help you make the right choice for your specific needs.



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