Table of Contents

Cylindrical Sensors

CYLINDRICAL INDUCTIVE PROXIMITY SENSORS

Altech Cylindrical sensors are available in diameters ranging from 8mm (.32 in.) to 30mm (1.18 in.) with sensing distances up to 15mm (0.59 in.). Most models feature nickel plated brass (BN) and stainless steel (SS). Both flush mount and non-flush mount sensors are available. Non-flush sensors have larger sensing distances than their flush mount counterparts. All Inductive sensors meet IP67 (NEMA1, 3, 4, 6, 12, 13) protection levels.

FLUSH MOUNT CYLINDRICAL SENSORS

Flush Mounted, sometimes called embedded or shielded sensors, have electromagnetic fields concentrated directly in front of the sensing heads and may be mounted directly onto metal mounting brackets or embedded directly into metal without causing a false output. **Figure 8** *(located on page 7)* also illustrates that on Cylindrical Flush Mount sensors there should be at least 1 diameter of distance between adjacent sensors, and no non-target metal surfaces should be less than 3 times the sensing distance Sn directly across from the sensing head. Also, two directly opposite sensors mounted in metal should be greater than 6 times the sensing distance apart.

NON-FLUSH CYLINDRICAL SENSORS

Sometimes called non-embedded or non-shielded, non-flush sensors have electromagnetic fields with a wide sensing angle and are unshielded (no metal surrounding the sensing head). Care must be taken to insure that no non-target metal comes in near proximity to the sensing head. Distances are demonstrated in **Figure 8**. Adjacent sensors should be separated by at least 2 times the diameter. Non-target metal should be at least 3 times the sensing distance directly across from the sensing head. Two directly opposite sensors should be at least 6 times the sensing distance apart.

OUTPUT CONNECTIONS

AC,DC – Normally Open (NO), and Normally Closed (NC).
DC – Complementary output (NO/NC) available on some models.

OUTPUT CABLES

Cylindrical Sensors are provided with 2 meter PVC fixed cables. 5 meter PVC, 2 and 5 meter PUR cables are optional. *Consult Altech for more information.*

QUICK DISCONNECT CONNECTORS

Altech sensors are available in a wide selection of Quick Disconnect styles for DC circuits. Virtually any sensor can be custom manufactured with a Quick Disconnect connector. *Consult Altech for more information.*

Cylindrical Sensors *(continued)*

Quick Disconnect models are designed to be user-friendly and to simplify installation.

Please see the product specification for sensors with quick disconnect connectors and matching cable assemblies on pages **26-31** in the accessory section.

HOUSING MATERIALS
AC – Nickel Plated Brass
DC – Nickel Plated Brass
Stainless Steel

TIP MATERIAL
PBTB – Polybutelyne Terephthalate

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.

Selection Guide

Sensing Distances – AC, DC, Cylindrical Style Sensors

Type	Voltage	Flush (mm)	Non-Flush (mm)
Short Body	DC	1.5 - 10	2 - 15
Standard Series	AC, DC	1.5 - 10	2 - 15
Extended Sensing Range	DC	4-8	–

Operating Voltages – AC, DC Cylindrical Style

AC	20 - 250VAC
DC	10 - 30VDC

Operating Current– AC, DC Cylindrical Style

AC	250 mA	
DC	120 mA	250mA

Sensor Wiring Systems – AC, DC Cylindrical Style

AC	2-Wire	
DC	2-Wire	3-Wire

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***.

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 housings 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) and personal computers with appropriate hardware and software. They also control relays, solenoids, valves, etc., up to their maximum output current.

Figure 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

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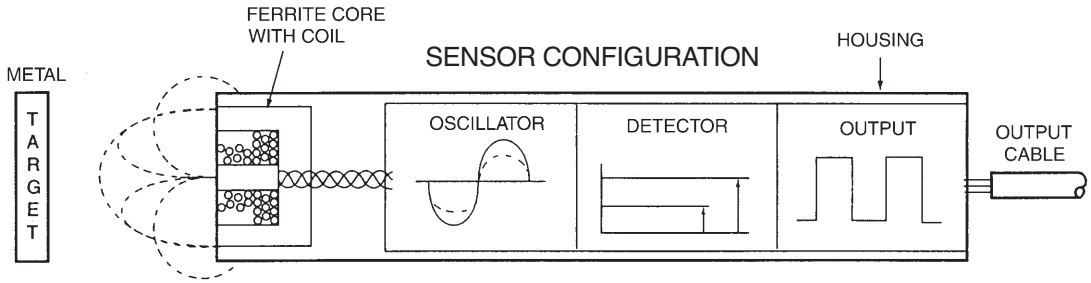
Figure 2



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 the ferrite core induces an 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.

OPERATING VOLTAGES

Most Altech Inductive Proximity Sensors are available in DC (10-30. VDC), AC (90-250VAC). 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).

DC Inductive Proximity Sensors are 3-wire. A 3 -wire DC sensor can be a 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 a NPN output transistor is required. A 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 metallic housing materials. Please refer to each product specification for specific information on housing materials.

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 page **26-31**.

FLUSH MOUNT AND NON-FLUSH MOUNT

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

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-embedded) 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. Refer to page **7** for more information.

Figure 3

ELECTRONIC OUTPUT CIRCUITS

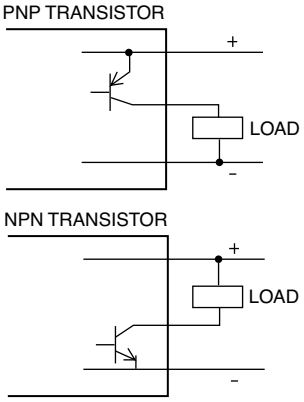


Figure 4

SENSOR ELECTRO- MAGNETIC FIELD

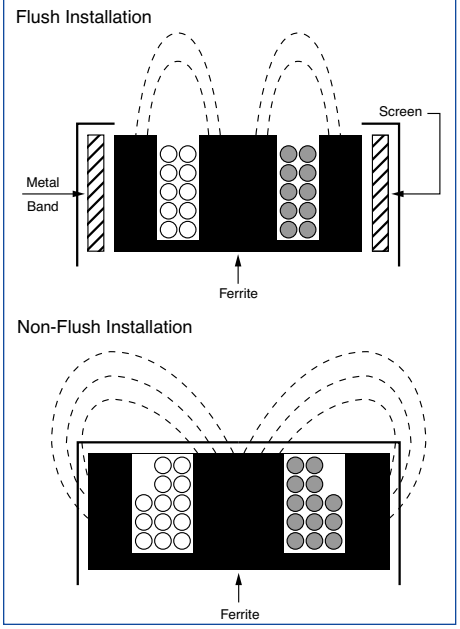
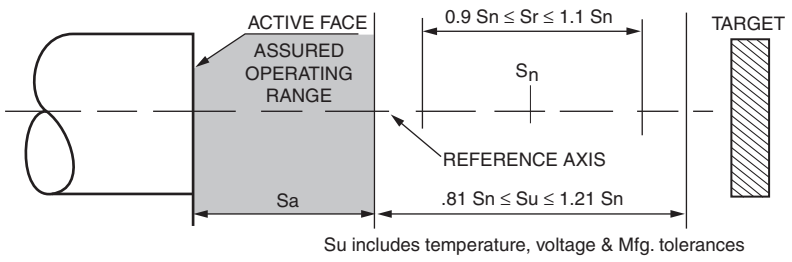


Figure 5



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 **32-33** 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 page **34**.

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≤Sr≤ 1.1 Sn

The usable sensing distance, (Su), takes into account temperature, voltage variations and manufacturing tolerances: .81 Sn≤ Su ≥ 1.21 Sn

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***.

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.

ACCESSORIES
Altech offers a full range of accessory products including quick disconnect cable assemblies, connectors, distribution boxes, etc. Please refer to each product specification and the accessory chapter starting on page **26**.

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.

Figure 6

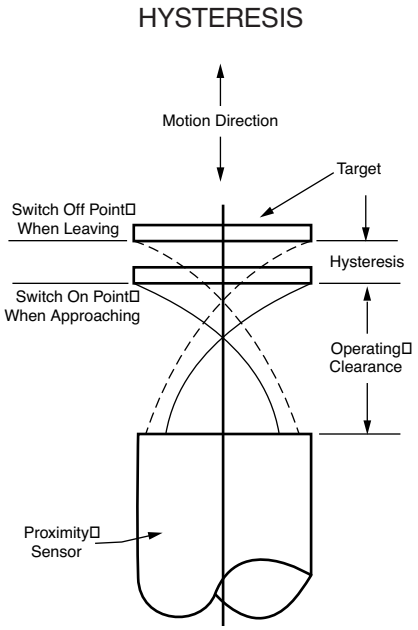


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Figure 7

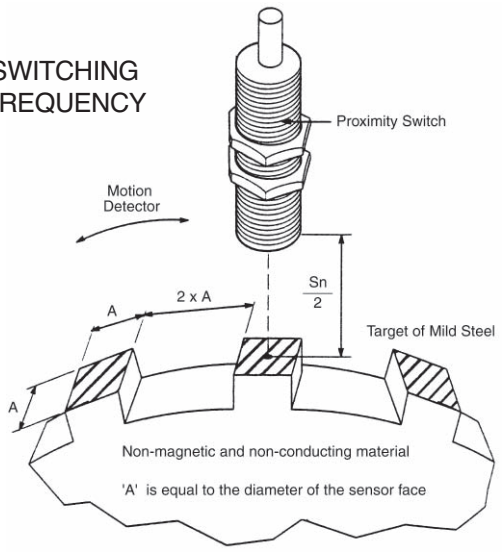
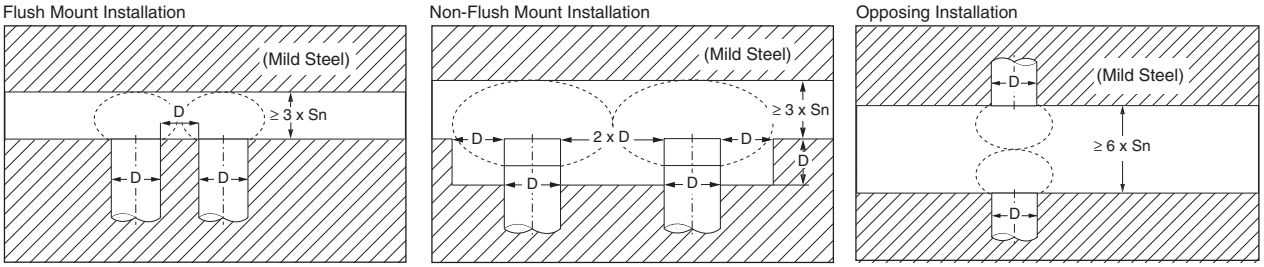


Figure 8

CYLINDRICAL SENSOR INSTALLATION



Series and Parallel Connection of Proximity Sensors

Series Connection of 3 and 4 wire DC switches (and Logic): Used when it is necessary to obtain two or more corresponding signals before an action is carried out. It is necessary to take into account the voltage drop Ud present at the output of each switch which will reduce the voltage available at the load correspondingly. (**see figure A**)

Parallel Connection of 3 and 4 wire DC switches (or Logic): Used when any one of the switches are required to activate the load. (**see figure B**)

Series Connection of 2 Wire AC and DC switches (or Logic): see previous note for Series connection of 3 and 4 wire switches. (**see figure C**)

Parallel Connection of 2 Wire and AC and DC switches (or Logic): It is necessary to take into account the cumulative no-load currents of each of the switches which would flow through the load in the unactuated condition of the switch. This could, under certain circumstances, trigger the load without actually operating the switch. (**see figure D**)

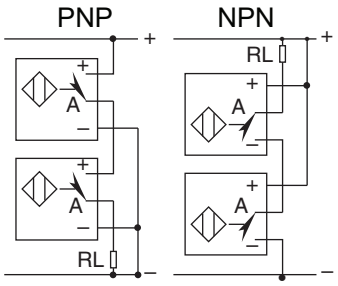


Figure A

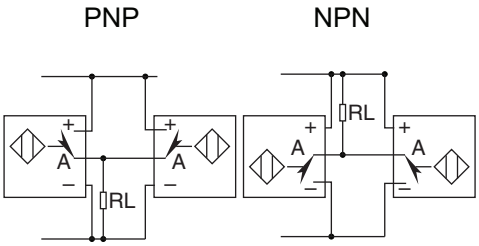


Figure B

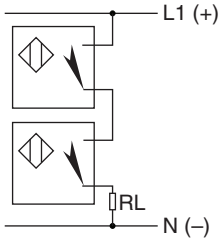


Figure C

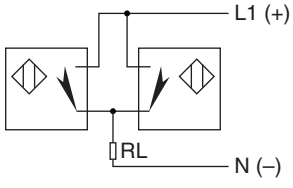


Figure D

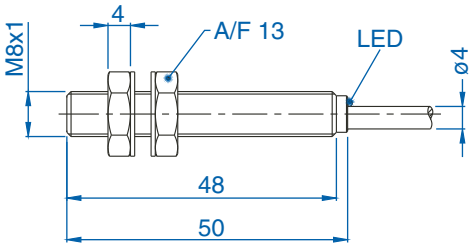
DC - 3 WIRE-STANDARD

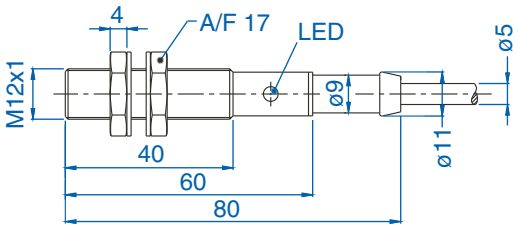
M8 Stainless Steel (SS), M12 Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 250mA, LED for Output Energized

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

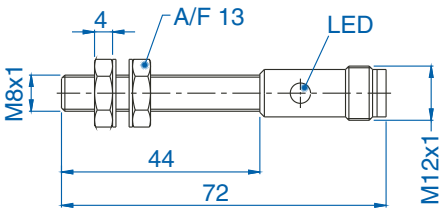
		M8 Flush Mount		M12 Flush Mount	
Sensing Distance		**1.5mm (0.06 in.)**		**2mm (.08 in.)**	
Cable or Connector Style Cat. No.		**Cable**	**65**	**Cable**	**65**
PNP	Normally Open	AIS08F1.5AP024-2M	AIS08F1.5AP024-Q65	AIS12F02AP024-2M	AIS12F02AP024-Q65
	Complementary NO/NC*			AIS12F02UP024-2M	AIS12F02UP024-Q65
NPN	Normally Open	AIS08F1.5AN024-2M	AIS08F1.5AN024-Q65	AIS12F02AN024-2M	AIS12F02AN024-Q65
	Complementary NO/NC*			AIS12F02UN024-2M	AIS12F02UN024-Q65
Ripple Voltage		≤ 10%		≤ 10%	
Voltage Range		10-30V		10-30V	
No-Load Current		≤ 11 mA		≤ 15mA	
Max. Load Current		250 mA		250 mA	
Voltage Drop Across Sensor		≤ 1.3V		≤ 2.5V	
Max. Leakage Currrent		≤ 1 µA		1µA	
Switching Frequency		2000 Hz		1000 Hz	
Hysterisis		≤ 0.15mm		≤ 0.2mm	
Temperature Drift		≤ ±3µm/K		±4µm/K	
Repeatability		≤ 0.05mm		≤ 0.1mm	

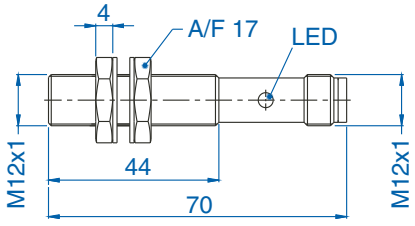
Fixed Cable
PVC 2m (6ft. 6in.). For other cable lengths and/or PUR cable, please consult Altech. M8 is supplied with stainless steel locknuts and M12 is supplied with brass, nickel plated locknuts.





65 Style Connector
4-pin, Micro style, 12mm (.47 in.). M8 is supplied with stainless steel locknuts and M12 is supplied with brass, nickel plated locknuts.





** Note short circuit protection is pending; contact Altech.*

Note: Sensor dimensions in mm.

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Metric/in. Conversion Table

1.5 mm = .06 in.	23.0 mm = .08 in.
2.0 mm = .08 in.	28.0 mm = 1.10 in
4.0 mm = .16 in	30.0 mm = 1.18 in.
5.0 mm = .20 in.	32.0 mm = 1.26 in.
6.0 mm = .23 in.	34.0 mm = 1.34 in.
8.0 mm = .31 in.	40.0 mm = 1.57 in.
10.0 mm = .39 in.	50.0 mm = 1.97 in.
12.0 mm = .47 in.	51.0 mm = 2.01 in.
15.0 mm = .59 in.	60.0 mm = 2.36 in.
18.0 mm = .70 in.	80.0 mm = 3.12 in.

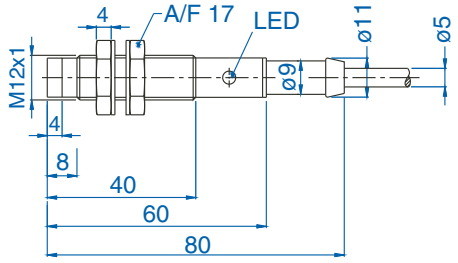
This table converts millimeters to inches in reference to the illustrations included on these pages.

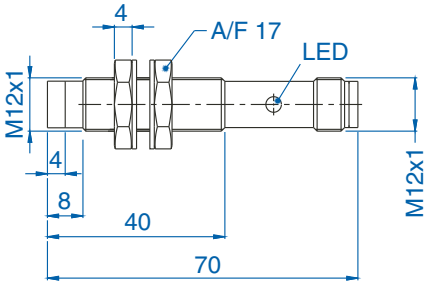
If you do not see a coverted dimension, multiply mm by 0.03937 to convert to inches.

M12 Non-Flush Mount

4mm (.16 in.)

Cable	65
AIS12N04AP024-2M	AIS12N04AP024-Q65
AIS12N04UP024-2M	AIS12N04UP024-Q65
AIS12N04AN024-2M	AIS12N04AN024-Q65
AIS12N04UN024-2M	AIS12N04UN024-Q65
≤ 10%	
10-30V	
≤ 15mA	
250 mA	
≤ 2.5V	
1µA	
1000 Hz	
≤ 0.6mm	
±8µm/K	
≤ 0.3mm	

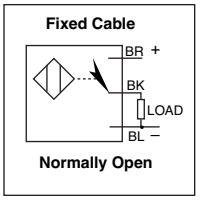


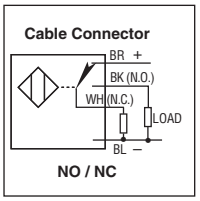


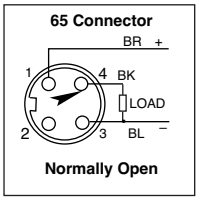
Wiring Diagrams

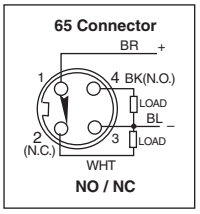
Note: Wire colors are applicable on cables purchased from Altech

PNP

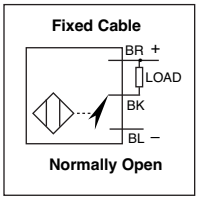


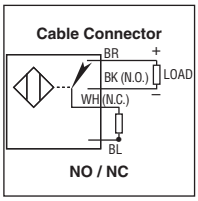


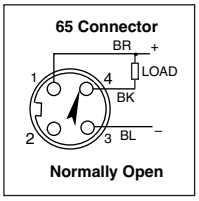


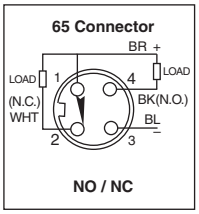


NPN









Note: Sensor dimensions in mm.

DC - 3 WIRE-STANDARD

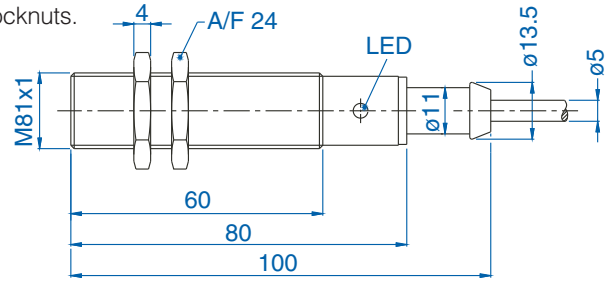
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 250mA, LED for Output Energized

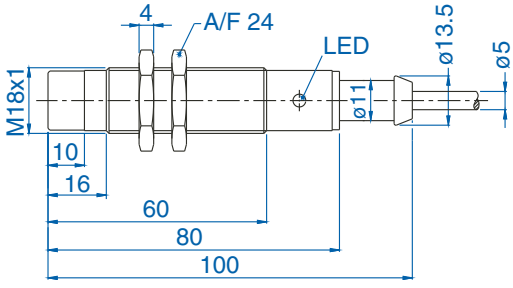
CE

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

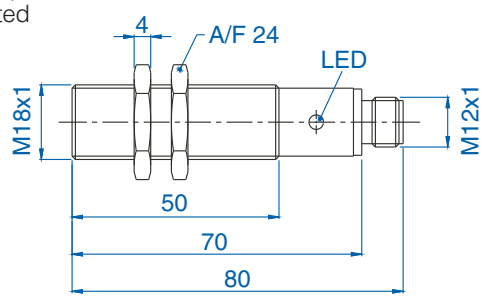
			M18 Flush Mount		Non-Flush 18 Flush Mount	
Sensing Distance			**5mm (.20 in.)**		**8mm (.31 in.)**	
Cable or Connector Style Cat. No.			**Cable**	**65**	**Cable**	**65**
PNP	Normally Open		AIS18F05AP024-2M	AIS18F05AP024-Q65	AIS18N08AP024-2M	AIS12N02AP024-Q65
	Complementary NO/NC*		AIS18F05UP024-2M	AIS18F05UP024-Q65	AIS18N08UP024-2M	AIS12N02UP024-Q65
NPN	Normally Open		AIS18F05AN024-2M	AIS18F05AN024-Q65	AIS18N08AN024-2M	AIS18N08AN024-Q65
	Complementary NO/NC*		AIS18F05UN024-2M	AIS18F05UN024-Q65	AIS18N08UN024-2M	AIS18N08UN024-Q65
Ripple Voltage			≤ 10%		≤ 10%	
Voltage Range			10-30V		10-30V	
No-Load Current			≤15 mA		≤15 mA	
Max. Load Current			250 mA		250 mA	
Voltage Drop Across Sensor			≤2.5V		≤ 2.5V	
Max. Leakage Currrent			≤ 1 µA		1µA	
Switching Frequency			500 Hz		500 Hz	
Hysterisis			0.5mm		≤0.8mm	
Temperature Drift			≤±10µm/K		≤±16µm/K	
Repeatability			≤0.2mm		≤0.4mm	

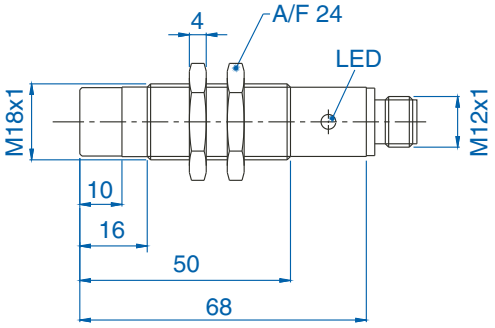
Fixed Cable
PVC 2m (6ft. 6in.). For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





65 Style Connector
4-pin, Micro style, 12mm (.47 in.). Supplied with brass, nickel plated locknuts.





**** Note short circuit protection is pending; contact Altech.***

Note: Sensor dimensions in mm.

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Metric/in. Conversion Table

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4.0 mm = .16 in	30.0 mm = 1.18 in.
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6.0 mm = .23 in.	34.0 mm = 1.34 in.
8.0 mm = .31 in.	40.0 mm = 1.57 in.
10.0 mm = .39 in.	50.0 mm = 1.97 in.
12.0 mm = .47 in.	51.0 mm = 2.01 in.
15.0 mm = .59 in.	60.0 mm = 2.36 in.
18.0 mm = .70 in.	80.0 mm = 3.12 in.

This table converts millimeters to inches in reference to the illustrations included on these pages.

If you do not see a coverted dimension, multiply mm by 0.03937 to convert to inches.

M30 Flush Mount

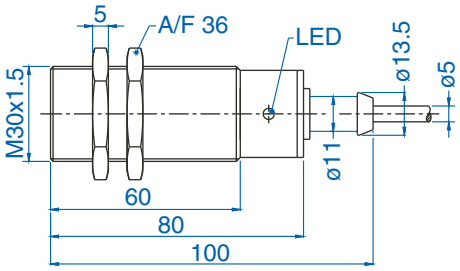
10mm (.39 in.)

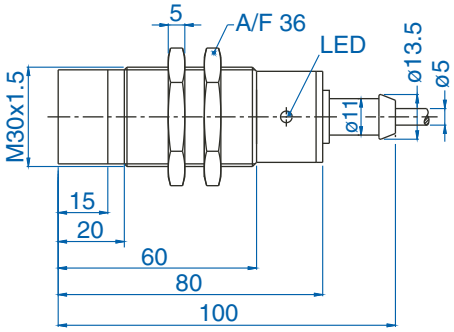
Cable	65
AIS30F10AP024-2M	AIS30F10AP024-Q65
AIS30F10UP024-2M	AIS30F10UP024-Q65
AIS30F10AN024-2M	AIS30F10AN024-Q65
AIS30F10UN024-2M	AIS30F10UN024-Q65
≤10%	
10-30V	
≤15 mA	
250 mA	
≤2.5V	
≤1 µA	
300 Hz	
1.0mm	
≤±20µm/K	
≤0.5mm	

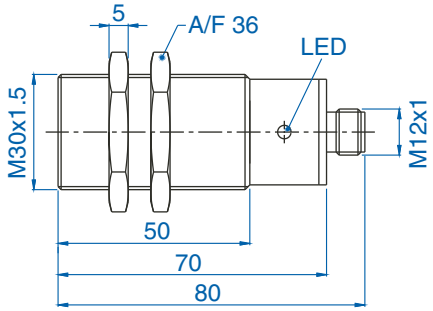
M30 Non-Flush Mount

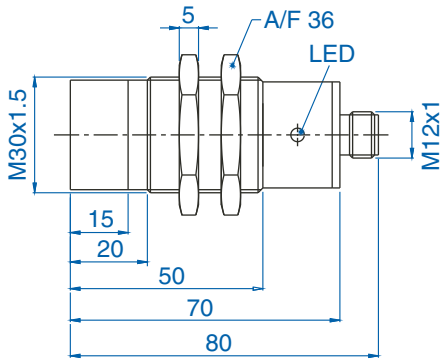
15mm (.59 in.)

Cable	65
AIS30N15AP024-2M	AIS30N15AP024-Q65
AIS30N15UP024-2M	AIS30N15UP024-Q65
AIS30N15AN024-2M	AIS30N15AN024-Q65
AIS30N15UN024-2M	AIS30N15UN024-Q65
≤10%	
10V-30V	
≤15 mA	
250 mA	
≤2.5V	
≤1 µA	
300 Hz	
≤1.5mm	
≤±30µm/K	
≤1.0mm	





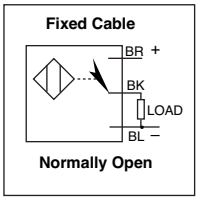


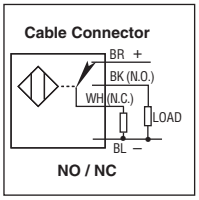


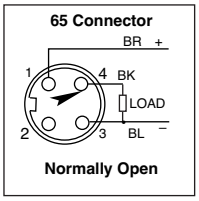
Wiring Diagrams

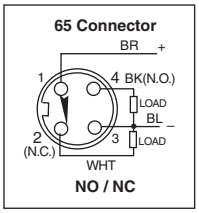
Note: Wire colors are applicable on cables purchased from Altech

PNP









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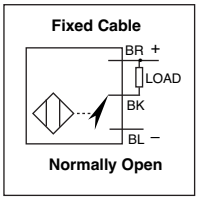
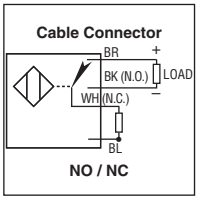
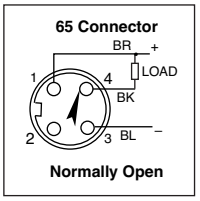
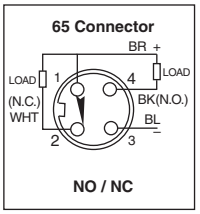








Note: Sensor dimensions in mm.

DC - 3 WIRE-EXTENDED SENSING DISTANCE

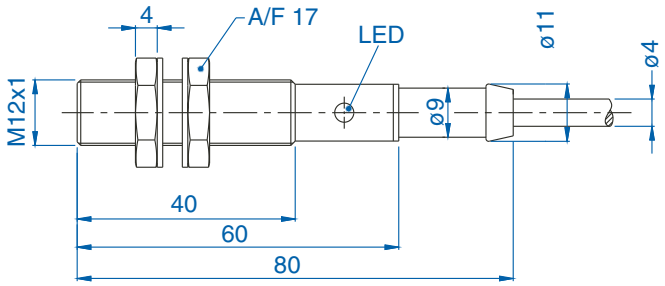
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 200mA, LED for Output Energized

CE

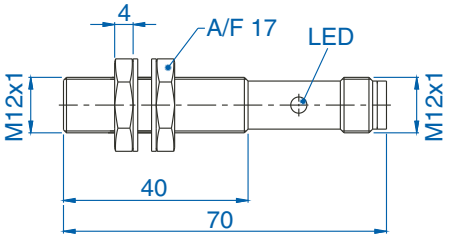
- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

	M12 Flush Mount	
Sensing Distance	**4mm (.16 in.)**	
Cable or Connector Style Cat. No.	**Cable**	**65**
PNP Normally Open	AIS12F04AP024-2M	AIS12F04AP024-Q65
NPN Normally Open	AIS12F04AN024-2M	AIS12F04AN024-Q65
Ripple Voltage	≤10%	
Voltage Range	10-30V	
No Load Current	≤15mA	
Max. Load Current	200 mA	
Voltage Drop Across Sensor	≤2.5V	
Max. Leakage Currrent	≤1µA	
Switching Frequency	1000 Hz	
Hysterisis	≤0.4mm	
Temperature Drift	≤±8µm/K	
Repeatability	≤0.2mm	

Fixed Cable
PVC 2m (6ft. 6in.). For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.



65 Style Connector
4-pin, Micro style, 12mm (.47 in.). Supplied with brass, nickel plated locknuts.



Note: Sensor dimensions in mm.

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Metric/in. Conversion Table

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6.0 mm = .23 in.	34.0 mm = 1.34 in.
8.0 mm = .31 in.	40.0 mm = 1.57 in.
10.0 mm = .39 in.	50.0 mm = 1.97 in.
12.0 mm = .47 in.	51.0 mm = 2.01 in.
15.0 mm = .59 in.	60.0 mm = 2.36 in.
18.0 mm = .70 in.	80.0 mm = 3.12 in.

This table converts millimeters to inches in reference to the illustrations included on these pages.

If you do not see a coverted dimension, multiply mm by 0.03937 to convert to inches.

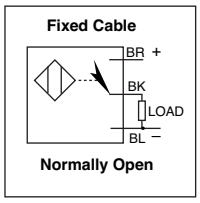
M18 Flush Mount

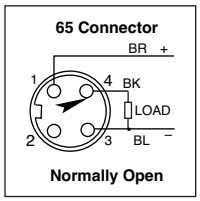
8mm (.31 in.)	
Cable	**65**
AIS18F08AP024-2M	AIS18F08AP024-Q65
AIS18F08AN024-2M	AIS18F08AN024-Q65
≤10%	
10-30V	
≤15 mA	
200 mA	
≤2.5V	
≤1 µA	
500 Hz	
≤0.8mm	
≤±12µm/K	
≤0.4mm	

Wiring Diagrams

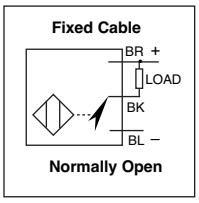
Note: Wire colors are applicable on cables purchased from Altech

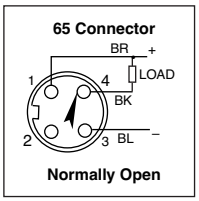
PNP

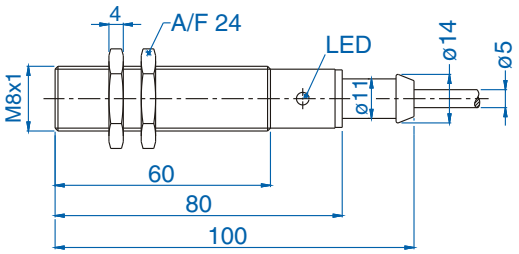


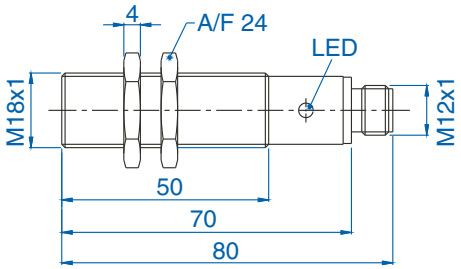


NPN









Note: Sensor dimensions in mm.

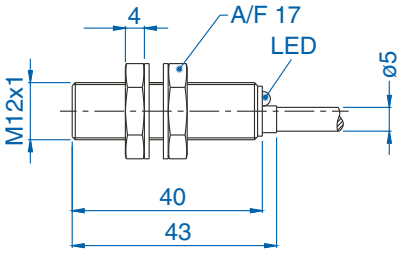
DC - 3 WIRE-SHORT BODY

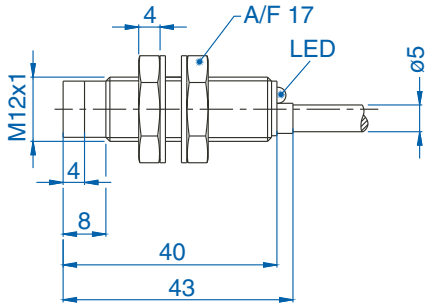
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 250mA, LED for Output Energized

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

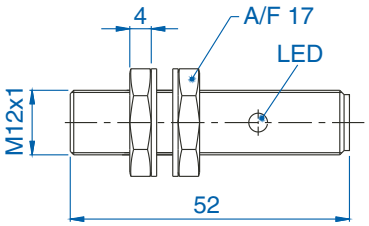
		M12 Flush Mount		M12 Non-Flush Mount	
Sensing Distance		**2mm (0.08 in.)**		**4mm (.16 in.)**	
Cable or Connector Style Cat. No.		**Cable**	**65**	**Cable**	**65**
PNP	Normally Open	AIK12F02AP024-2M	AIK12F02AP024-Q65	AIK12N04AP024-2M	AIK12N04AP024-Q65
	Normally Open	AIK12F02AN024-2M	AIK12F02AN024-Q65	AIK12N04AN024-2M	AIK12N04AN024-Q65
Ripple Voltage		≤ 10%		≤ 10%	
Voltage Range		10-30V		10-30V	
No-Load Current		≤ 15 mA		≤ 15mA	
Max. Load Current		250 mA		250 mA	
Voltage Drop Across Sensor		≤ 2.5V		≤ 2.5V	
Max. Leakage Currrent		≤ 1 µA		1µA	
Switching Frequency		1000 Hz		1000 Hz	
Hysterisis		≤ 0.2mm		≤ 0.6mm	
Temperature Drift		≤ ±4µm/K		±8µm/K	
Repeatability		≤ 0.1mm		≤ 0.3mm	

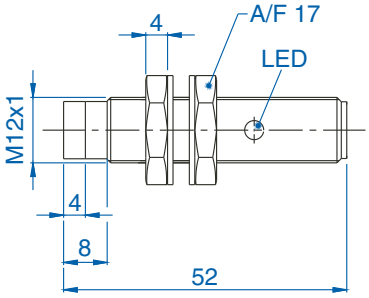
Fixed Cable
PVC 2m (6ft. 6in.). For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





65 Style Connector
4-pin, Micro style, 12mm (.47 in.). Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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4.0 mm	= .16 in	30.0 mm	= 1.18 in.
5.0 mm	= .20 in.	32.0 mm	= 1.26 in.
6.0 mm	= .23 in.	34.0 mm	= 1.34 in.
8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
15.0 mm	= .59 in.	60.0 mm	= 2.36 in.
18.0 mm	= .70 in.	80.0 mm	= 3.12 in.

This table converts millimeters to inches in reference to the illustrations included on these pages.

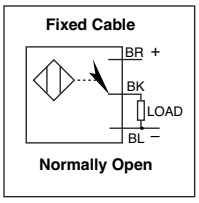
If you do not see a coverted dimension, multiply mm by 0.03937 to convert to inches.

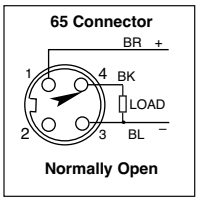
M18 Flush Mount		M18 Non-Flush Mount	
5mm (.20 in.)		8mm (.31 in.)	
Cable	65	Cable	65
AIK18F05AP024-2M	AIK18F05AP024-Q65	AIK18N08AP024-2M	AIK18N08AP024-Q65
AIK18F05AN024-2M	AIK18F05AN024-Q65	AIK18N08AN024-2M	AIK18N08AN024-Q65
≤10%		≤10%	
10-30V		10V-30V	
≤15 mA		≤15 mA	
250 mA		250 mA	
≤2.5V		≤2.5V	
≤1 µA		≤1 µA	
500 Hz		500 Hz	
≤0.5mm		≤0.8mm	
≤±10µm/K		≤±16µm/K	
≤0.2mm		≤0.4mm	

Wiring Diagrams

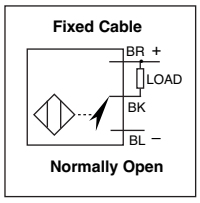
Note: Wire colors are applicable on cables purchased from Altech

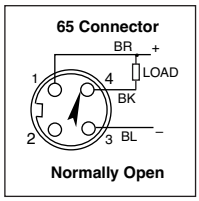
PNP

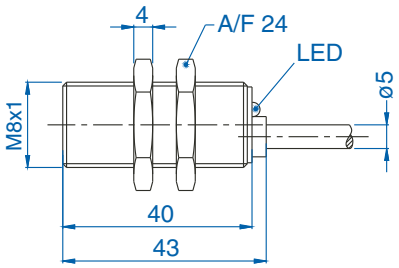


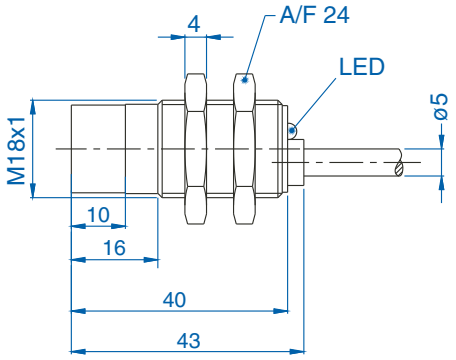


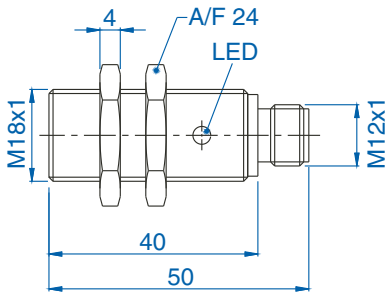
NPN

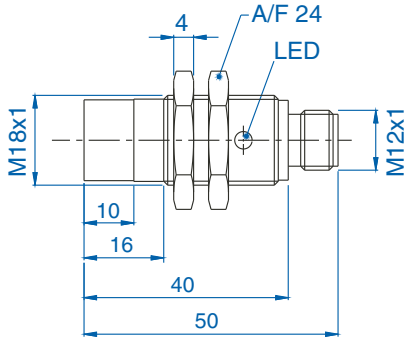












Note: Sensor dimensions in mm.

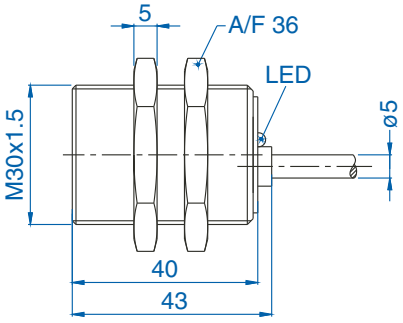
DC - 3 WIRE-SHORT BODY

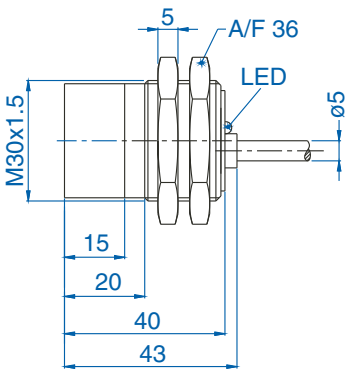
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 250mA, LED for Output Energized

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

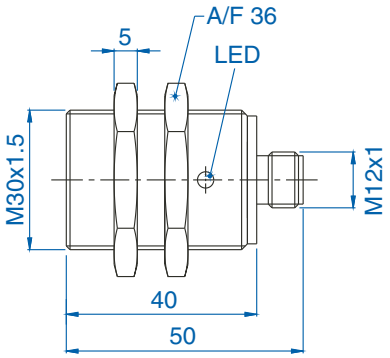
		M30 Flush Mount		M30 Non-Flush Mount	
Sensing Distance		**10mm (.39 in.)**		**15mm (.59 in.)**	
Cable or Connector Style Cat. No.		**Cable**	**65**	**Cable**	**65**
PNP	Normally Open	AIK30F10AP024-2M	AIK30F10AP024-Q65	AIK30N15AP024-2M	AIK30N15AP024-Q65
NPN	Normally Open	AIK30F10AN024-2M	AIK30F10AN024-Q65	AIK30N15AN024-2M	AIK30N15AN024-Q65
Ripple Voltage		≤10%		≤10%	
Voltage Range		10-30V		10-30V	
Supply Current		≤15 mA		≤15 mA	
Max. Load Current		250 mA		250 mA	
Voltage Drop Across Sensor		≤2.5V		≤2.5V	
Max. Leakage Currrent		≤1 µA		≤1 µA	
Switching Frequency		300 Hz		300 Hz	
Hysterisis		≤1.0mm		≤1.5mm	
Temperature Drift		≤±20µm/K		≤±30µm/K	
Repeatability		≤0.5mm		≤1.0mm	

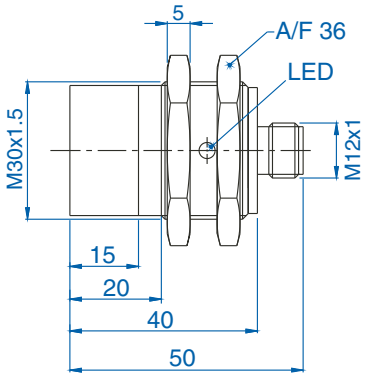
Fixed Cable
PVC 2m (6ft. 6in.). For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





65 Style Connector
4-pin, Micro style, 12mm (.47 in.). Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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Metric/in. Conversion Table

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5.0 mm	= .20 in.	32.0 mm	= 1.26 in.
6.0 mm	= .23 in.	34.0 mm	= 1.34 in.
8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
15.0 mm	= .59 in.	60.0 mm	= 2.36 in.
18.0 mm	= .70 in.	80.0 mm	= 3.12 in.

This table converts millimeters to inches in reference to the illustrations included on these pages.

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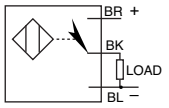
Wiring Diagrams

Note: Wire colors are applicable on cables purchased from Altech

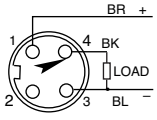
PNP

Fixed Cable



Normally Open

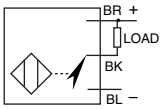
65 Connector



Normally Open

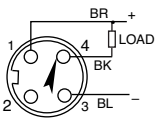
NPN

Fixed Cable



Normally Open

65 Connector



Normally Open

DC - 2 WIRE-STANDARD

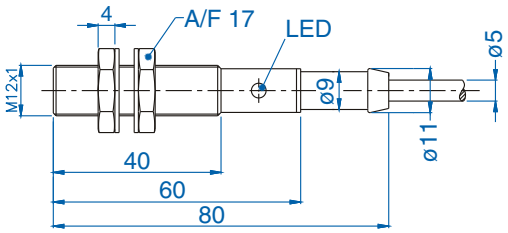
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 200mA, LED for Output Energized

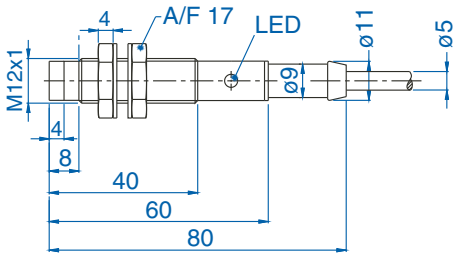
CE

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

	M12 Flush Mount	M12 Non-Flush Mount
Sensing Distance	**2mm (.08 in.)**	**4mm (.16 in.)**
Cable or Connector Style Cat. No.	**Cable**	**Cable**
Normally Open	AIS12F02AD024-2M	AIS12N04AD024-2M
Normally Closed	AIS12F02RD024-2M	AIS12N04RD024-2M
Ripple Voltage	≤10%	≤10%
Voltage Range	10-30V	10-30V
Holding Current	≤4mA	≤4mA
Max. Load Current	200 mA	200 mA
Voltage Drop Across Sensor	≤4.5V	≤4.5V
Max. Leakage Currrent	≤1mA	≤1mA
Switching Frequency	400 Hz	400 Hz
Hysterisis	≤0.2mm	≤0.6mm
Temperature Drift	≤±4µm/K	≤±8µm/K
Repeatability	≤0.1mm	≤0.3mm

Fixed Cable
PVC 2m (6ft. 6in.) encapsulated oil resistant cable. For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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6.0 mm	= .23 in.	34.0 mm	= 1.34 in.
8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
15.0 mm	= .59 in.	60.0 mm	= 2.36 in.
18.0 mm	= .70 in.	80.0 mm	= 3.12 in.

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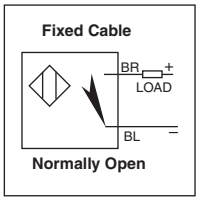
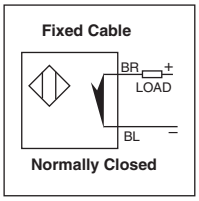
Wiring Diagrams

Note: Wire colors are applicable on cables purchased from Altech





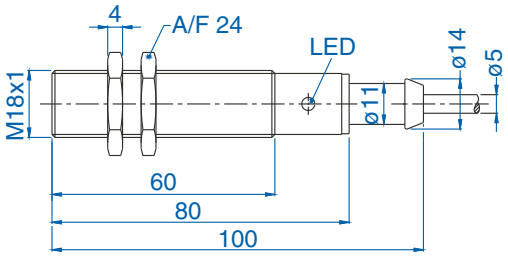
DC - 2 WIRE-STANDARD

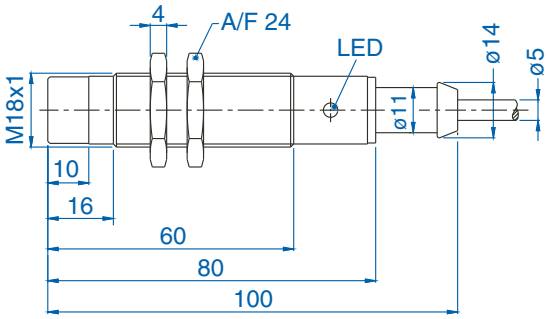
Brass, Nickel Plated (BN), Cylindrical, Threaded, 10-30V DC, 200mA, LED for Output Energized

- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Short Circuit Protection
- Overload Protection
- Reverse Polarity Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

	M18 Flush Mount	M18 Non-Flush Mount
Sensing Distance	**5mm (.20 in.)**	**8mm (.31 in.)**
Cable or Connector Style Cat. No.	**Cable**	**Cable**
Normally Open	AIS18F05AD024-2M	AIS18N08AD024-2M
Normally Closed	AIS18F05RD024-2M	AIS18N08RD024-2M
Ripple Voltage	≤10%	≤10%
Voltage Range	10-30V	10-30V
Holding Current	≤4mA	≤4mA
Max. Load Current	200 mA	200 mA
Voltage Drop Across Sensor	≤4.5V	≤4.5V
Max. Leakage Currrent	≤1mA	≤1mA
Switching Frequency	200 Hz	200 Hz
Hysterisis	≤0.5mm	≤0.8mm
Temperature Drift	≤±10µm/K	≤±16µm/K
Repeatability	≤0.2mm	≤0.4mm

Fixed Cable
PVC 2m (6ft. 6in.) encapsulated oil resistant cable. For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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Metric/in. Conversion Table

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8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
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18.0 mm	= .70 in.	80.0 mm	= 3.12 in.

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Wiring Diagrams

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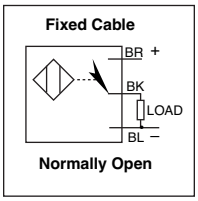
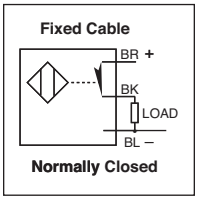




AC - 2 WIRE-STANDARD

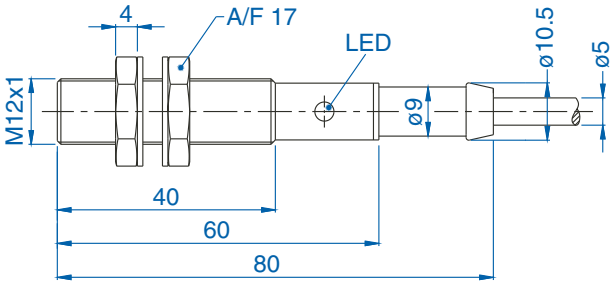
Brass, Nickel Plated (BN), Cylindrical, Threaded, 90-250V AC, 250mA, LED for Output Energized

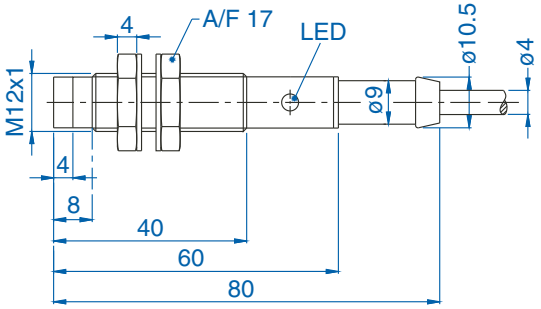
- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Overload Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

CE

	M12 Flush Mount	M12 Non-Flush Mount
Sensing Distance	**2mm (.08 in.)**	**4mm (.16 in.)**
Cable or Connector Style Cat. No.	**Cable**	**Cable**
Normally Open	AIS12F02AW220-2M	AIS12N04AW220-2M
Normally Closed	–	–
Ripple Voltage	–	–
Voltage Range	90-250V	90-250V
Supply Current	≥10mA	≥10mA
Max. Load Current	250 mA	250 mA
Voltage Drop Across Sensor	≤9V	≤9V
Max. Leakage Currrent	≤3mA	≤3mA
Switching Frequency	10 Hz	10 Hz
Hysterisis	≤0.4mm	≤0.6mm
Temperature Drift	≤±4µm/K	≤±8µm/K
Repeatability	≤0.1mm	≤0.4mm

Fixed Cable
PVC 2m (6ft. 6in.) encapsulated oil resistant cable. For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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6.0 mm	= .23 in.	34.0 mm	= 1.34 in.
8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
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18.0 mm	= .70 in.	80.0 mm	= 3.12 in.

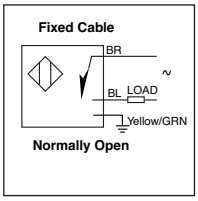
This table converts millimeters to inches in reference to the illustrations included on these pages.

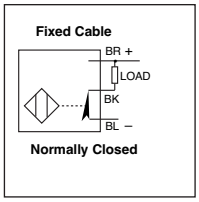
If you do not see a coverted dimension, multiply mm by 0.03937 to convert to inches.

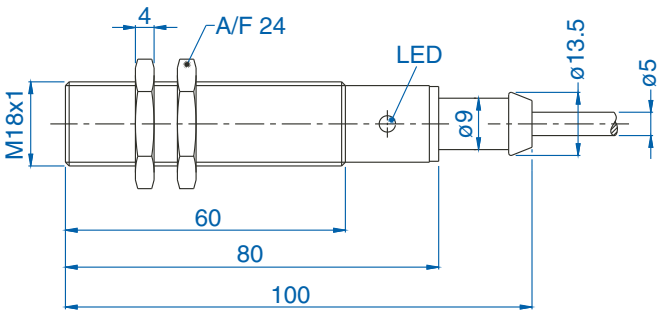
M18 Flush Mount	M18 Non-Flush Mount
5mm (.20 in.)	**8mm (.31 in.)**
Cable	**Cable**
AIS18F05AW220-2M	AIS18N08AW220-2M
AIS18F05RW220-2M	AIS18N08RW220-2M
–	–
90-250V	90-250V
10mA	≥10mA
250 mA	250 mA
9V	≤9V
3mA	≤3mA
10 Hz	10 Hz
0.5mm	≤0.8mm
≤±10µm/K	≤±16µm/K
≤0.2mm	≤0.4mm

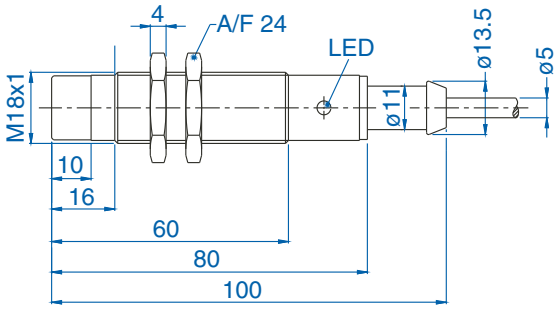
Wiring Diagrams

Note: Wire colors are applicable on cables purchased from Altech









Note: Sensor dimensions in mm.

AC - 2 WIRE-STANDARD

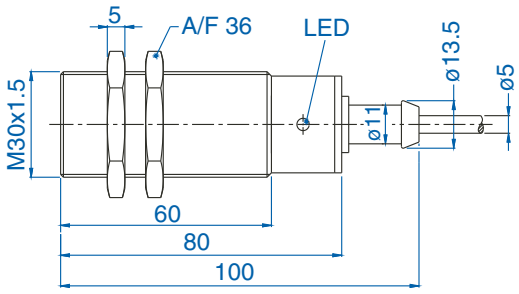
Brass, Nickel Plated (BN), Cylindrical, Threaded, 90-250V AC, 250mA, LED for Output Energized

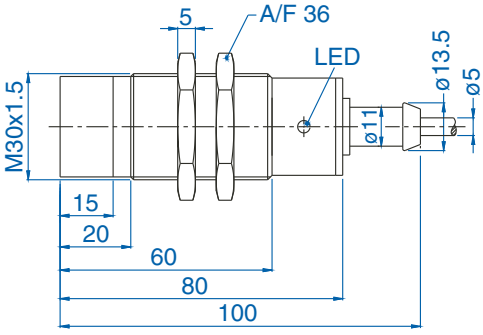
- IEC (529) IP67 (NEMA 1, 3, 4, 6, 12, 13) Protection
- Overload Protection
- Wire Break Resistance
- Transient Voltage Protection
- Temperature Range: -25 to 70°C (-13 to 158°F)

CE

	M30 Flush Mount	M30 Non-Flush Mount
Sensing Distance	**10mm (.39 in.)**	**15mm (.59 in.)**
Cable or Connector Style Cat. No.	**Cable**	**Cable**
Normally Open	AIS30F10AW220-2M	AIS30N15AW220-2M
Normally Closed	AIS30F10RW220-2M	AIS30N15RW220-2M
Ripple Voltage	–	–
Voltage Range	90-250V	90-250V
Supply Current	≥10mA	≥10mA
Max. Load Current	250 mA	250 mA
Voltage Drop Across Sensor	≤9V	≤9V
Max. Leakage Currrent	≤3mA	≤3mA
Switching Frequency	10 Hz	10 Hz
Hysterisis	≤1.0mm	≤1.5mm
Temperature Drift	≤±20µm/K	≤±30µm/K
Repeatability	≤0.3mm	≤0.5mm

Fixed Cable
PVC 2m (6ft. 6in.) encapsulated oil resistant cable. For other cable lengths and/or PUR cable, please consult Altech. Supplied with brass, nickel plated locknuts.





Note: Sensor dimensions in mm.

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8.0 mm	= .31 in.	40.0 mm	= 1.57 in.
10.0 mm	= .39 in.	50.0 mm	= 1.97 in.
12.0 mm	= .47 in.	51.0 mm	= 2.01 in.
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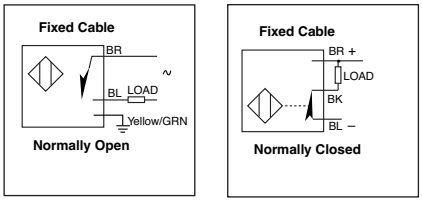
Wiring Diagrams

Note: Wire colors are applicable on cables purchased from Altech

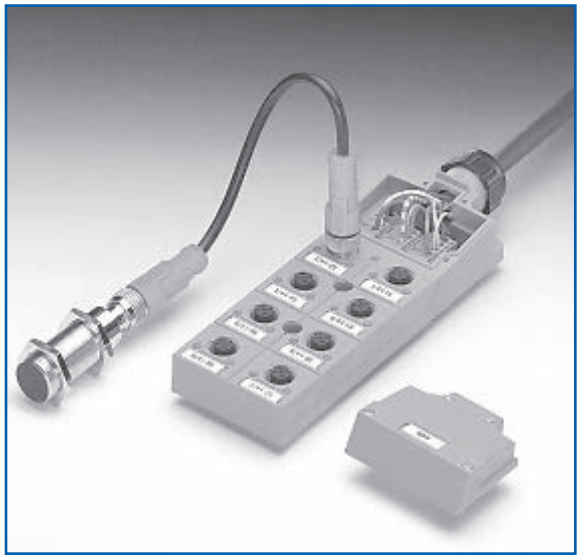


Connectors and Distribution Boxes

- *Straight or 90° connectors*
- *M12 and M8 models*
- *PVC cable for standard applications*
- *PUR cable for moving applications*
- *Cable length up to 40 m*
- *Distribution Boxes with cable or to be wired*
- *UL/CSA approval*

c UL us LISTED

File# E223770



PVC cable connectors

These cables are suitable for medium mechanical stresses in a dry environment. They can be mounted on machine tools, packing machines assembly or productions lines. They can withstand oils, chemical substances and abrasion to a limited extent.

PUR cable connectors

These cables are intended for use in robotics, machine tools, metal working, assembly and production lines. They are made without silicone and varnish potted substances and they can withstand abrasion. The external sleeve can withstand oils and chemical substances and can bear the use of cable chains. The external sleeve is made through a co-extrusion process where the external part is PUR and internal part is PVC. Single wires are isolated with PVC.

Male/Female connectors to be wired

When manufacturing small series quanties or special tools, highly flexible cable solutions are neccesary. M8 and M12 connectors and cables, easliy meet this requirement. The angled model can rotate by 90°. Once connected, all the models comply with IP67 protection degree norms.

Male/Female cable connectors

The connection between the sensor and the distribution box is achieved through male/female cable connectors when the distance is shorter than 3m. These connectors can be straight or with a 90° angle, with PUR cable for moving applications. The cables are equipped with label holders, which allow easy marking.

Distribution boxes

Thanks to the wide range of distribution boxes and the relative connectors, you can make an easy, inexpensive, quick, versatile, IP67 protected installation. Altech can offer distribution boxes fully equipped with 5m cable for moving applications (PUR) or distribution boxes with quick and easy connection through spring cage terminal blocks.

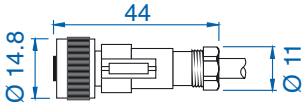
65 Style Connectors - M12, 3 and 4 Wire
Female with 5m Cables

File# E223770

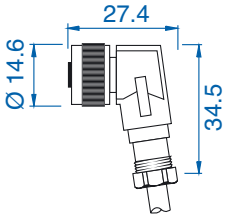
Connector Size/Mount	M12 with PVC Cable			M12 with PUR Cable		
Cable Length *	5m			5m		
Cable Type	4 wire	3 wire with LED		4 wire	3 wire with LED	
		with PNP LED	with NPN LED		with PNP LED	with NPN LED
90° Angle KF90C54	**KF90C53P**	**KF90C53N**	**KF90C54R**	**KF90C53PR**	**KF90C53NR**	
Straight	**KFDC54**	**KFDC53P**	**KFDC53N**	**KFDC54R**	**KFDC53PR**	**KFDC53NR**

Dimensions (mm)

M12 straight female connector

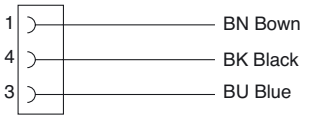


M12 90° female connector

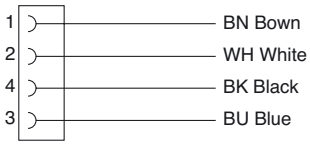


Contact Configuration

M12 3 wire female connector



M12 4 wire female connector



	PVC Cable	PUR Cable
Connector Polarity	3 and 4 wire	3 and 4 wire
Nominal Voltage	320V DC/ 250V AC	320V DC/ 250V AC
Nominal Current	4A	4A
Contact Resistance	<5mΩ	<5mΩ
Test Voltage in Accordance with DIN VDE 0110	2.5KV	2.5KV
Contact Material	CuSn	CuSn
Contact Surface Covering Material	Au	Au
Connector Material	TPU (thermoplastic polyurethane)	
Connector Color	Grey-RAL 7035	Grey-RAL 7035
Connector Operating Temperature Limits	-25° / +90°C	-25° / +90°C
Protection Degree in Accordance with EN 60529	IP67	IP67
Wiring Nut Features	14.8mm external dia. M12x1 threading	14.8mm external dia. M12x1 threading
Cable Type	PVC/PVC	PVC/PVC
External Sleeve Color	Grey-RAL 7001	Grey-RAL 7001
Cable External Diameter	3 and 4 wires = 5.2mm (±0.2mm)	3 and 4 wires = 5.2mm (±0.2mm)
Wire Sleeve Material	PVC	PVC
No. of Conductors on Cable Section	3x0.34mm^2 and 4x0.34mm^2	3x0.34mm^2 and 4x0.34mm^2
Conductors Structure	42x0.1mm in class 6	42x0.1mm in class 6
Cable Bending Radius	15 times external diameter moving installation 10 times external diameter steady installation	15 times external diameter moving installation 10 times external diameter steady installation
Temperature Limits	-30°C / +70°C (steady installation)	-30°C / +90°C (steady installation)
Isolation Voltage	2500V; 50Hz; 5min.	2500V; 50Hz; 5min.
Cable Marks	PVC/PVC UL/CSA	PVC/PVC UL/CSA
Weight	5m 190g • 10m 380g • 15m 520g	5m 190g • 10m 380g • 15m 520g

* Other cable lengths available on request.

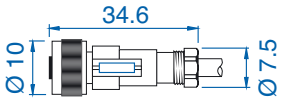
M8 4 Wire Female Connectors with 5m Cables

LISTED
File# E223770

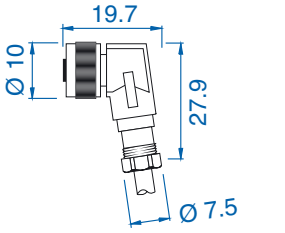
Connector Size/Mount	M8 with PVC Cable	M8 with PUR Cable
Cable Length	**5m**	**5m**
Cable Type *	**4 wire**	**4 wire**
90° Angle	K2F90V5	K2F90V5R
Straight	K2FDV5	K2FDV5R

Dimensions (mm)

M8 straight female connector

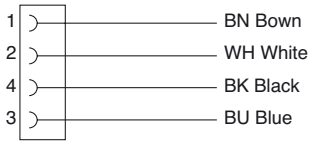


M8 90° female connector



Contact Configuration

M8 4 wire female connector



	PVC Cable	PUR Cable
Connector Polarity	3 and 4 wire	3 and 4 wire
Nominal Voltage	320V DC/ 250V AC	100V DC (160V in cat. II)
Nominal Current	4A	4A
Contact Resistance	<5mΩ	<5mΩ
Test Voltage in Accordance with DIN VDE 0110	1.5KV	1.5KV
Contact Material	CuSn	CuSn
Contact Surface Covering Material	Au	Au
Connector Material	TPU (thermoplastic polyurethane)	
Connector Color	Grey-RAL 7035	Grey-RAL 7035
Connector Operating Temperature Limits	-25° / +90°C	-25° / +90°C
Protection Degree in Accordance with EN 60529 (IEC 60529 AND DIN VDE 0470-1)	IP67	IP67
Wiring Nut Features	14.8mm external dia. M12x1 threading	14.8mm external dia. M8x1 threading
Cable Type	PVC/PVC	PUR/PVC
External Sleeve Color	External Sleeve Color	Grey-RAL 7001
Cable External Diameter	3 wires = 4.4mm (±0.2mm) 4 wires = 4.7mm (±0.2mm)	3 wires = 4.4mm (0.2mm) 4 wires = 4.7mm (0.2mm)
Wire Sleeve Material	PVC	PVC
No. of Conductors on Cable Section	3x0.25mm^2 and 4x0.25mm^2	3x0.25mm^2 and 4x0.25mm^2
Wire Color	in accordance with DIN 0293	in accordance with DIN 0293
Conductors Structure	32x0.1mm in class 6	30x0.1mm in class 6
Cable Bending Radius	15 times external diameter moving installation 10 times external diameter steady installation	15 times external diameter moving installation 10 times external diameter steady installation
Temperature Limits	-30°C / +70°C (steady installation)	-30°C / +90°C (steady installation)
Isolation Voltage	2500V; 50Hz; 5min.	2500V; 50Hz; 5min.
Cable Marks	PVC/PVC UL/CSA	PVC/PVC UL/CSA
Weight	5m 150g • 10m 300g • 15m 450g	5m 150g • 10m 300g • 15m 450g

* 3 Wire type connectors available on request.

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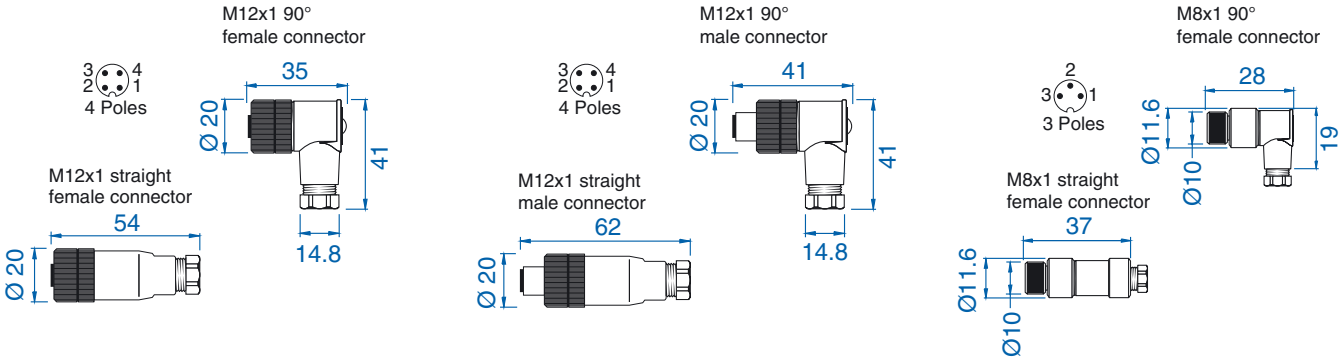
M8 and M12, 3 and 4 Wire Male/Female Connectors

Connector Size/Mount	M12 4 Wire Connector		M8 3 Wire Connector
Type	Female	Male	Female
90° Angle KF90	KM90	K1F90VA	
Straight	KFD	KMD	K1FDVA

Size and Contact Configuration

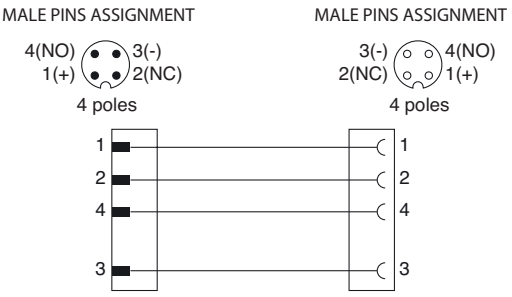


	M12 4 pole male/female	M8 3 pole female
Connector Polarity	4 pole	3 pole
Nominal Voltage	125V DC/ 150V AC (III/3)	60V DC/ 75V AC (III/3)
Nominal Current	4A	4A
Contact Resistance	<8mΩ	<5mΩ
Mass Resistivity	$>10^{12}$Ω cm	$>10^{10}$Ω cm
Test Voltage	1250V (not connected)	1200V (not connected)
Contact Material	CuSnZn	CuZn
Contact Surface Covering Material	Ni	Au
Connector Material	PBT/PA (PBT thermoplastic material -polyester PA polyamide)	PA (polyamide 6.6) - nickel-plated brass
Connector Plastic Parts Color	Black - RAL 9005r	Black - RAL 9005r
Connector Operating Temperature Limits	-40° / +85°C	-25° / +90°C
Protection Degree in Accordance with EN 60529 (IEC 60529 AND DIN VDE 0470-1)	IP67	IP67
Cable Gland	PG7	–
Cable Gland Nut Tightening Torque	–	2.5 Nm
Material of Conductors External Diameter	–	PVC-TPE flexible and semiflexible
Single Conductors External Diameter	–	1.0-1.3mm (with black moving) 6-8 (mm)
External Min/Max Diameter of the Cable to be Wired	6-8 (mm)	3.0-5.0 (mm)
Section to be Wired with Flexible Conductors	0.25-0.75 mm^2	0.14-0.25 mm2 / AWG 26-24 0.25-0.34 mm2 / AWG 24-22
Wiring Nut Features	20mm external dia M12x1 threading Nickel-plated brass	10mm external dia M8x1 threading Nickel-plated brass
Combustibility Class According to UL94	HB	V0
Connection	screw	Piercecon

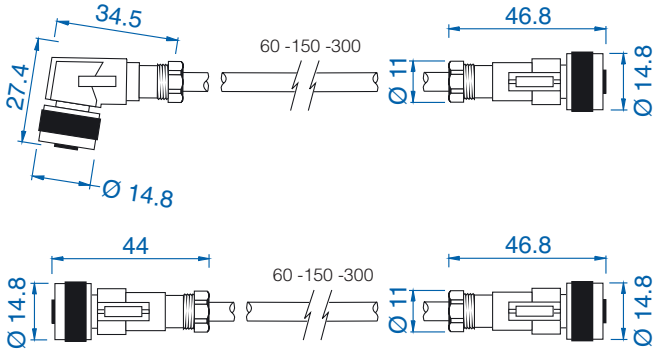
M12, Female and Male PUR Cable Connectors

Cable Length	10 ft.
90° Angle Female	KFM90D300R
Axial Female	KFMDD300R
Y-Connector (for use with distribution boxes)	KFMY

Contact Configuration

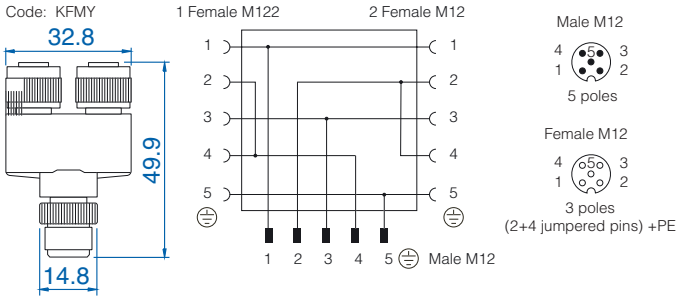


Dimensions (mm)



Accessories

The use of this accessory together with a double assigned slots distribution box permits to connect two sensors with a contacts configuration compatible with each available slot.



	PUR Cable
Connector Polarity	3 and 4 wire
Nominal Voltage	320V DC / 250V AC
Nominal Current	4A
Contact Resistance	<5mΩ
Test Voltage in Accordance with DIN VDE 0110	2.5KV
Contact Material	CuSn
Contact Surface Covering Material	Au
Connector Material	Inflamable and self-extinguishing
Connector Color	Grey - RAL 7035
Connector Operating Temperature Limits	-25°C / +90°C
Protection Degree in Accordance with EN 60529 (IEC 60529 and DIN VDE 0470-1)	IP67
Wiring Nut Features	14.8mm external dia., M12x1 threading
Cable Type	PVC/PVC
External Sleeve Color	Grey - RAL 7001
Cable External Diameter	3 and 4 wires = 5.2mm (0.2mm)
Wire Sleeve Material	PVC
No. of Conductors on Cable Section	3 x 0.34mm^2 and 4 x 0.34 mm^2
Conductors Structure	42 x 0.1mm in class 6
Cable Bending Radius	15 times external diameter moving installation 10 times external diameter steady installation
Temperature Limits	-30°C / +70°C (steady installation)
Isolation Voltage	2500V; 50Hz; 5 min.
Cable Marks	PVC/PVC UL/CSA

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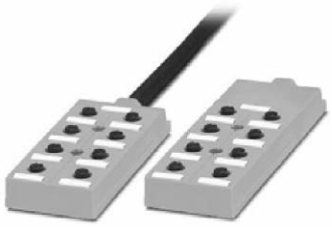
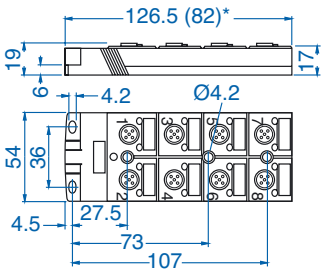
M12, Distribution Boxes With and Without Connected Master Cable



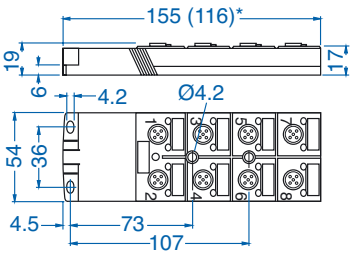
Type	Single Assigned Slot		Double Assigned Slot	
No. of Slots	**4 Slot Box**	**8 Slot Box**	**4 Slot Box**	**8 Slot Box**
Without Operation LED & Without Cable	KB4	KB8	KB4D	KB8D
With Operation LED & Without Cable	KB4P	KB8P	KB4DP	KB8DP
With Smal Master Cable	KB4CS	KB8CS	KB4DCS	KB8DCS
With Operation LED & 5m Master Cable	KB4PC5	KB8PC5	KB4DPC5	KB8DPC5

Dimensions (mm)

Single assigned slot



Double assigned slot

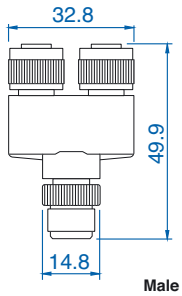


* The dimensions in brackets refer to 4 slot models

Accessories

The use of this accessory together with a double assigned slot distribution box permits to connection of two sensors with a contact configuration compatible with each available slot.

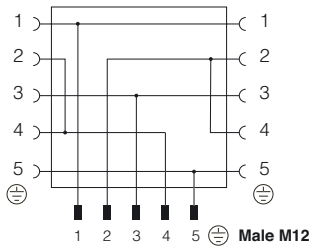
Code: KFMY



Male M12

5 poles

1 Female M12 **2 Female M12**



Female M12

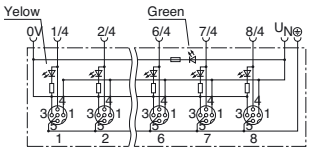
3 poles (2+4 jumpered pins) +PE

Wiring diagrams for single assigned slot boxes

Assignment diagram for single assigned slot boxes

Core color M12 connector/position (potential)	
WH	1 / 4 (A)
GN	2 / 4 (A)
YE	3 / 4 (A)
GY	4 / 4 (A)
PK	5 / 4 (A)
RD	6 / 4 (A)
BK	7 / 4 (A)
VT	8 / 4 (A)
BN	1-8 / (+24 V/120 V)
BU	1-8 / 3 (0 V)
GN / YE	1-8 / 5 (PE)

Circuit diagram for single assigned slot



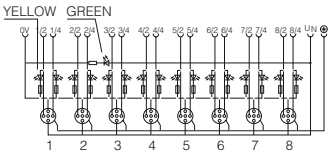
PINS ASSIGNMENT

Wiring diagrams for double assigned slot boxes

Assignment diagram for double assigned slot boxes

Core color M12 connector/position (potential)	
WH	1 / 4 (A)
GY / PK	1 / 2 (B)
GN	2 / 4 (A)
RD / BU	2 / 2 (B)
YE	3 / 4 (A)
WH / GN	3 / 2 (B)
GY	4 / 4 (A)
BN / GN	4 / 2 (B)
PK	5 / 4 (A)
WH / YE	5 / 2 (B)
RD	6 / 4 (A)
YE / BN	6 / 2 (B)
BK	7 / 4 (A)
WH / GY	7 / 2 (B)
VT	8 / 4 (A)
GY / BN	8 / 2 (B)
BN	1-8 / (+24 V/120 V)
BU	1-8 / 3 (0 V)
GN / YE	1-8 / 5 (PE)

Circuit diagram for double assigned slot



PINS ASSIGNMENT

Technical data

Nominal Voltage	120V AC / 120V DC
Maximum Permitted Operating Voltage	135V AC / 135V DC
Maximum Current Carrying Capacity per Channel	2A
Maximum Current Carrying Capacity per Slot	4A
SACB Total Current	12A
Ambient Temperature	-25°C up to +75°C

Material specifications

Housing Material (Color)	Polyamide 66 VO (Grey)
Contact Socked Carrier (Color)	Polyamide 66 VO (Black)
Sealing Compound (Color)	PUR (Grey)
Contact Material Specification	
- Live Parts	Copper alloy
- Surface Plating	Gold plated

Glossary of Technical Definitions and Terminology

Active Surface:
Portion of the sensor from which the electromagnetic field radiates.

Correction Factors:
Multiplication factors taking into account variations in the target material composition. When calculating actual sensing distance, this figure should be multiplied by the normal sensing distance, Sn.

Current Sinking: See NPN

Current Sourcing: See PNP

Damping Material:

Material which causes a decrease in the strength of the electromagnetic or electrical field produced by the sensing coil.

Differential Travel: See Hysteresis.

Effective Operating Distance - 'Sr':
The operating distance of an individual proximity switch measured at stated temperature and voltage. It takes into account variations in manufacturing tolerances.

Ferrous Metal: Any metal containing iron.

Flush Mounting:
A shielded or embedded proximity sensor can be flush mounted in metal. It can be surrounded by metal up to the active sensing face.

Hysteresis:

The difference, in percentage (%) of the nominal sensing distance between the operate (switch on) and release point (switch off) when the target is moving away from the sensor's active face. Without sufficient hysteresis a proximity sensor will "chatter" (continuously switch on and off) when there is a significant vibration applied to the target or sensor.

Leakage Current:
Current which flows through the output when the output is in an "off" condition or de-energized.

LED:
Light Emitting Diode used to indicate sensor status.

Load:
A device that consumes power to perform a function.

Maximum Load Current:
The maximum current at which the proximity sensor can be continuously operated.

Minimum Inrush Current:
The maximum current level at which the proximity sensor can be operated for a short period of time.

Minimum Load Current:

The minimum amount of current required by the sensor to maintain reliable operation.

Nominal Sensing Distance:

The distance,Sn, at which an approaching target activates (changes state of) the proximity output. This is also called the rated operating distance.

Non-Ferrous Metal:

Any metal which does not contain iron.

Non-Flush Mounting:
Unshielded, or non-embedded sensors must have a so called "free zone" around the sensor head, with no non-target metal present to operate satisfactorily.

Normally Closed:
Output opens when an object is detected in the active switching area.

Normally Open:
Output closes when an object is detected in the active switching area.

NPN:
The sensor switches the load to the positive terminal. The load should be connected between the sensor output and positive terminal.

Operating Distance, Assured:
Between 0 and 81% of the rated operating distance for inductive proximity switches. It is specified as Sa.

Overload Protected:
The ability of a sensor to withstand load currents between continuous load rating and a short circuit condition without any damage.

PNP:
The sensor switches the load to the negative terminal. The load should be connected between the sensor output and negative terminal.

Rated Operating Distance - 'Sn':
Sometimes called nominal operating distance, it does not take into account manufacturing tolerances or variations in temperature or voltage.

Repeatability:
The repeat accuracy of a sensor to detect an object at the same distance away from the active sensing face. It is expressed as a percentage of the sensing distance, or can be calculated as a specific measurement value.

Residual Voltage:
The voltage across the sensor output while energized and switching the maximum load. It is the voltage drop across the sensor.

Response Time: See Switching Frequency

Reverse Polarity Protection:
Proximity sensors which are protected against a reversal in voltage polarity.

Ripple:
The variance between peak-to-peak values in DC voltage. It is expressed as a percentage of rated voltage.

Sensing Face:
A surface of the proximity sensor parallel to the target, from which the operating distance is measured

Shielded:
Sometimes called Flush or Embedded.

Short Circuit Protection:
Sensor protected from damage when a shorted condition exists for an indefinite period of time without change.

Static Output:
A sensor output that stays energized as long as the target is present.

Supply Current:

The current consumed by the proximity switch when the output transistor is in the off condition.

Switching Frequency:
The maximum number of times per second the sensor can change state, (ON and OFF), usually expressed in Hertz (Hz)., as measured by DIN EN 50010.

Target:
Object which activates the sensor.

Transient Voltage Protection:
Protection against damage caused by transient supply line voltages.

Temperature Drift:
Specification used to indicate the change in switching point caused by temperature variations within a specified ambient temperature range. Expressed as a percentage of the sensing distance.

Useable Operating Distance - 'Su':
The operating distance measured over a voltage range of 85% to 110% of its rated voltage. It allows for manufacturing tolerances.

Voltage Drop:

The maximum voltage drop across a conducting sensor.

Wire Break Protection:

The output is off if either power supply wire is broken.

SENSOR HOUSING MATERIALS

PBTP: Polybutelyne terephthalate, used in block sensors and front caps of cylindrical nickel plated brass units. Excellent mechanical strength and temperature resistance. Self-extinguishing and flame retardant. Weld splash proof.

PUR: Polyurethane, used in cables and cable assemblies. Elastic, abrasion proof, impact resistant, unaffected by oil, grease and solvents.

PVC: Polyvinylchloride, used on cables and cable assemblies. Good mechanical strength, resistant to chemicals.

METALS: Brass, Nickel Plated, used on cylindrical sensors. Rugged, resists thread damage.

APPENDIX

IP Codes (International Protection) Protection Levels - IEC 529/ EN 60529, DIN, VDE 0470 Part 1

IEC 529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e., tools, dust, fingers) and moisture. This classification system utilizes the letter "IP" (International or Ingress Protection) followed by two digits. (An "X" is used for one of the digits if there is only one class of protection; i.e., IP X4 which addresses moisture resistance only.)

First Digit
Degree of protection against contact with moving parts (other than smooth rotating shafts, etc.) and the ingress of solid foreign bodies.

Second Digit
Degree of protection against the harmful entry of various forms of moisture (i.e., dripping, spraying, submersion, etc.

1st digit	Protection From Solid Objects	2st digit	Protection From Moisture
0	No special protection	0	No special protection
1	Protection from a large part of the body such as a hand (but no protection from deliberate access); from solid objects greater than 50mm in diameter.	1	Protection from dripping water
2	Protection against fingers or other objects not greater than 80mm in length and 12mm in diameter.	2	Protection from vertically dripping water
3	Protection from entry by tools, wires, etc., with a diameter or thickness greater that 2.5mm	3	Protection from sprayed water
4	Protection from entry by solid objects with a diameter or thickness greater than 1.0mm	4	Protection from splashed water
5	Protection from the amount of dust that would interfere with the operation of equipment	5	Protection from water projected from a nozzle
6	Dust-tight	6	Protection against heavy seas, or powerful jets of water
		7	Protection against immersion
		8	Protection against complete continuous submersion in water

Note: All first digits and second digits up to and including characteristic digit **6**, imply compliance also with the requirements for all lower characteristic digits in their respective series (first or second). Second digits **7** and **8** do **not** imply suitability for exposure to water jets (second characteristic digit **5** or **6**) unless dual coded; i.e., **IP _5/IP_7**.

NEMA Enclosure Standards

The following information is derived from the NEMA Standard #250, dated May 1988. Altech is providing this information as a guideline. Please consult the NEMA Standards for your specific requirements.

HAZARDOUS LOCATIONS	TESTS CONDUCTED
TYPE 1 enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment.	*Rust entry* *Rust resistance*
TYPE 2 enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling water and dirt.	*Rod entry* *Drip* *Rust resistance*
TYPE 3 enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; and to be undamaged by the formation of ice on the enclosure.	*Rain* *Dust* *External icing* *Rust resistance*
TYPE 3R enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain; and to be undamaged by the formation of ice on the enclosure.	*Rod entry* *Rain* *External icing* *Rust resistance*
TYPE 3S enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet, and to provide for operation of external mechanisms when ice laden.	*Rain* *Dust* *External icing* *Rust resistance*
TYPE 4 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water.	*Hosedown* *External icing* *Rust resistance*
TYPE 4X enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water.	*Hosedown* *External icing* *Corrosion resistance*

HAZARDOUS LOCATIONS	TESTS CONDUCTED
TYPE 6 enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against the entry of water during temporary submersion at a limited depth.	*Submersion* *External icing* *Rust resistance*
TYPE 6P enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against the entry of water during prolonged submersion at a limited depth.	*Air pressure* *External icing* *Corrosion resistance*
TYPE 12 enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids.	*Drip* *Dust* *Rust resistance*
TYPE 13 enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying water, oil, and non-corrosive coolant.	*Oil exclusion* *Rust resistance*

HAZARDOUS LOCATIONS	TESTS CONDUCTED
TYPE 7 enclosures are intended for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the *National Electrical Code*.	*Explosion* *Hydrostatic* *Temperature*
TYPE 9 enclosures are intended for indoor use in locations classified as Class II, Groups E, F or G, as defined in the *National Electrical Code*.	*Dust Penetration* *Temperature*

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Commonly used metric and other useful conversions

Length		
inch [in.]	x25.4	=millimeters
millimeters [mm]	x0.03937	=inches
meters [m]	x3.281	=feet
miles [mi]	x1.609	=kilometers
kilometers [km]	x0.6214	=miles
Torque		
Newtonmeter [Nm]	x0.738	=lb-ft
lb-ft	x1.356	=Nm
lb-in	x0.113	=Nm
oz-in	x0.0071	=Nm
Power		
kilowatt [kW]	x1.341	=hp
hp	x0.7457	=kW
Moment of Inertia (WR^2)		
$lb\text{-}ft^2$	x0.042	$=kgm^2$
kilogrammeter^2 [kgm^2]	23.720	$=lb\text{-}ft^2$
Weight Mass and Force		
Newton [N]	x0.02248	=pounds
kilogram [kg]	x2.205	=pounds
pound [lb]	x4.448	=N
pound [lb]	x0.4536	=kg

Metric Cross-Sectional Areas[1]	American Wire Gauge		Metric Cross-Sections Areas[a]	American Wire Gauge	
Cross-Sectional Area mm²	Equivalent Metric Area mm²	AWG or MCM	Cross-Sectional Area mm²	Equivalent Metric Area mm²	AWG or MCM
0.50	0.519	20 AWG		21.15	4 AWG
0.75	0.653	19	25.0	26.67	3
	0.823	18	35.0	33.63	2
	1.04	17		42.41	1
	1.31	16	50.0	53.48	1/0
1.5				67.43	2/0
	1.65	15	70.0		
	2.08	14	95.0	85.03	3/0
2.5					
	2.62	13		107.20	4/0
			120.0	126.64	250 MCM
	3.31	12	150.0	152.00	300
4.0	4.17	11		177.35	350
	5.26	10	185.0	202.71	400
6.0			240.0	253.35	500
	6.63	9			
	8.37	8	300.0		
			400.0	380.00	750
10.0					
	10.55	7	500.0	506.71	1000
	13.30	6			
16.0	16.77	5	625.0		

[a]As per IEC Publ. 228

DEGREES CELCIUS VERSUS DEGREES FAHRENHEIT

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	° C	°F
-80	-112.0	-20	-4.0	5	41.0	30	86.0	55	131.0	80	176.0	105	221.0	130	266.0	200	392
-70	-94.0	-19	-2.2	6	42.8	31	87.8	56	132.8	81	177.8	106	222.8	131	267.8	210	410
-60	-65.0	-18	-0.4	7	44.6	32	89.6	57	134.6	82	179.6	107	224.6	132	269.6	220	428
-50	-58	-17	+1.4	8	46.4	33	91.4	58	136.4	83	181.4	108	226.4	133	271.4	230	446
-45	-49.1	-16	3.2	9	48.2	34	93.2	59	138.2	84	183.2	109	228.2	134	273.2	240	464
-40	-40.0	-15	5.0	10	50.0	35	95.0	60	140.0	85	185.0	110	230.0	135	275.0	250	482
-39	-38.2	-14	6.8	11	51.8	36	96.8	61	141.8	86	186.8	111	231.8	136	276.8	300	572
-38	-36.4	-13	8.6	12	53.6	37	98.6	62	143.6	87	188.6	112	233.6	137	278.6	350	662
-37	-34.6	-12	10.4	13	55.4	38	100.4	63	145.4	88	189.4	113	235.4	138	280.4	400	752
-36	32.8	-11	12.2	14	57.2	39	102.2	64	147.2	89	192.2	114	237.2	139	282.2	500	932
-35	-31.0	-10	14.0	15	59.0	40	104.0	65	149.0	90	194.0	115	239.0	140	284.0	600	1112
-34	29.2	-9	15.8	16	60.8	41	105.8	66	150.8	91	195.8	116	240.8	141	285.8	700	1292
-33	-27.4	-8	17.6	17	62.6	42	107.6	67	152.6	92	197.6	117	242.6	142	287.6	800	1472
-32	-25.6	-7	19.4	18	64.4	43	109.4	68	154.4	93	199.4	118	244.4	143	289.4	900	1652
-31	-23.8	-6	21.2	19	66.2	44	111.2	69	156.2	94	201.2	119	246.2	144	291.2	1000	1832
-30	-22.0	-5	23.0	20	68.0	45	113.0	70	158.0	95	203.0	120	248.0	145	293.0	1100	2012
-29	-22.0	-4	24.8	21	69.8	46	114.8	71	159.8	96	204.8	121	249.8	146	294.8	1200	2192
-28	-18.4	-3	26.6	22	71.6	47	116.8	72	161.6	97	206.6	122	251.6	147	296.6	1300	2372
-27	-16.6	-2	28.4	23	73.4	48	118.4	73	163.4	98	208.4	123	253.4	148	298.4	1400	2552
-26	-14.8	-1	30.2	24	75.2	49	120.2	74	165.2	99	210.2	124	255.2	149	300.2	1500	2732
-25	-13.0	0	32.0	25	77.0	50	122.0	75	167.0	100	212.0	125	257.0	150	302.0	1600	2912
-24	-11.2	1	33.8	26	78.8	51	123.8	76	168.8	101	213.8	126	258.8	160	320.0	1700	3092
-23	-9.4	2	35.6	27	80.6	52	125.6	77	170.6	102	215.6	127	260.6	170	338.0	1800	3272
-22	-7.6	3	37.4	28	82.4	53	127.4	78	172.4	103	217.4	128	262.4	180	356.0	1900	3452
-21	-5.8	4	39.2	29	84.2	54	129.2	79	174.2	104	219.2	129	264.2	190	374.0	2000	3632

Conversion Formula °F = 9/5°C + 32° °C = 5/9(°F-32°)

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