

## Proximity Sensors

Section 18



## Photoelectric Sensors

Section 19



## IEC Limit Switches

Section 20



## Encoders

Section 21



## Current Sensors

Section 22



## Pressure Sensors and Gauges

Section 23



## Temperature Sensors and Thermometers

Section 24

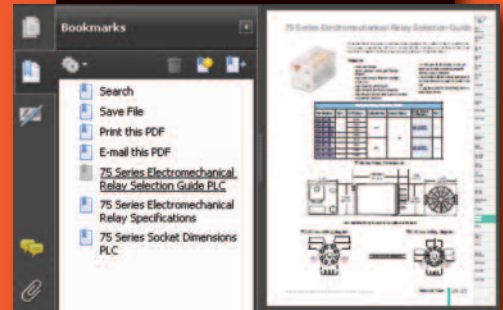


## Ultrasonic Level Sensors

Section 39



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- Click on part #s to link directly to our online store for current pricing, specs, stocking information and more



# Our Sensors at a Glance . . .

## Proximity Sensors [Section 18](#)

- Inductive, capacitive and ultrasonic technologies
- 3 mm to 30 mm round with standard sensing distance
- 8 mm to 30 mm round with double/triple sensing distance
- Rectangular formats
- Stainless steel round models
- AC and DC supply voltages available
- 2-, 3-, and 4-wire output configurations
- Embedded cables and quick-disconnects in M8 and M12
- IP69K rated made of FDA approved materials



## Photoelectric Sensors

### [Section 19](#)

- 18 mm threaded round, metal or plastic with diffuse, reflective, through-beam and background suppression sensing
- 12 mm threaded round in diffuse, reflective and through-beam styles
- 5 mm threaded round in diffuse and through-beam styles
- Straight or right-angle optics
- Rectangular formats with diffuse, reflective, through-beam and background suppression sensing
- Light screens
- IP69K rated made of FDA approved materials

## Fiber Optic Sensors [Section 19](#)

- Supreme noise protection and small sizes for tough applications
- 18 mm round and DIN-rail amplifiers
- 3, 4, 6 and 7 mm fiber heads available
- 2.2 mm diameter cuttable plastic fibers



## Limit Switches [Section 20](#)

### Over 100 different models

- Heavy-duty die-cast aluminum models
- Double-insulated PBT non-metal body models
- Miniature PBT non-metal body models
- Compact models with standard 22mm hole spacing for mounting

# High-Quality, Rugged Encoders Section 21



- **Light-duty incremental encoders**, Size 15 (1.5 inch / 38mm diameter encoder bodies), 6mm or 1/4" solid shafts, or 8mm hollow shafts, incremental resolutions from 100 to 2,500 pulses/revolution, line driver or NPN open collector outputs, IP40, IP50 rated
- **Medium-duty incremental encoders**, Size 20 or size 25 (2.5 inch flanges) (2.0 inch / 50mm diameter encoder bodies), 8mm or 3/8" solid shafts, or 8mm hollow shafts, incremental resolutions from 3 to 2,500 pulses/revolution, line driver or totem pole (push-pull) outputs, IP50, IP65 rated
- **Heavy-duty incremental encoders**, Size 30 (3.0 inch / 78mm diameter encoder bodies), 10mm solid shafts, incremental resolutions from 30 to 5,000 pulses/revolution, totem pole (push-pull) outputs, IP65 rated
- **Medium-duty absolute encoders**, Size 20 (2.0 inch / 50mm diameter encoder bodies), 8mm solid shafts, absolute gray code resolution from 32 to 1,024 pulses per revolution, NPN open collector outputs, IP65 rated

# Current Switches and Transducers Section 22

- ACT series **current transducers** have jumper-selectable current input ranges and 4-20mA or 0-10 VDC outputs
- ACTR series transducers combine a current transformer and true RMS signal conditioner
- ACS series **current operated switches** offer discrete outputs for low-cost alarming
- ACSX series switches include field-adjustable time delay to minimize nuisance trips



ACUAMP



prosense

# Pressure Sensors Section 23

- PSD series electronic **pressure switches** are an ideal alternative to mechanical piston pressure switches; available in 145, 1450 and 5800 psi ranges.
- PTD series compact **pressure and vacuum transmitters** provide an analog output for reliable pressure indication; available in 15, 30, 100, 500, 1,000 and 3,000 psi ranges, or 0 to 100 inches water column, with 4-20 mA or 0-10V output options
- QPS series **digital pressure switch/transmitters** provide
- Dial pressure gauges



# Temperature Sensors, Thermocouples and RTD Probes, Dial Thermometers Section 24

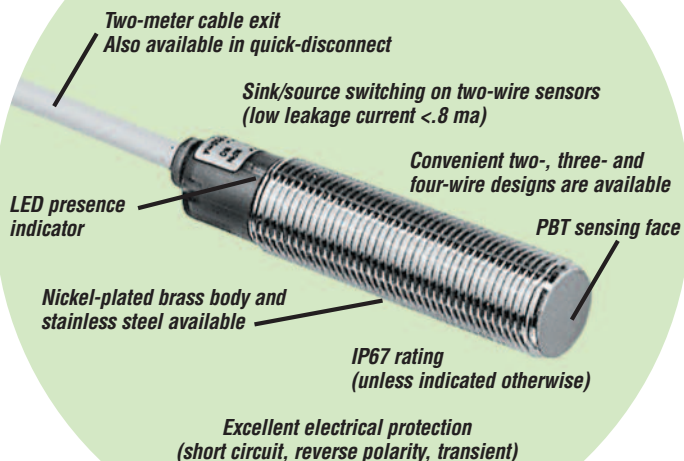
- TSD25 series high-performance **temperature switches** offer simple setup for temperature monitoring and control; Operating temperature range is -4 to 284°F (-20 to 140°C)
- TTD25 series temperature transmitters are compact measuring devices that provides a 4-20mA analog output over ranges of 0 to 100°C or 0 to 300°F.
- Use 4-wire 100 ohm platinum, Class A **RTD probes** and meet DIN EN 60751.
- **Thermowells** allow RTD probes to be inserted and removed without stopping or shutting down the process.
- Thermocouples and RTD probes
- Dial thermometers

prosense



# Name Brand Quality at an AutomationDirect Price

See the quality for yourself



30-day money-back guarantee

## Why buy a proximity sensor from AutomationDirect?

A sensor may only cost \$13.50, but it may be responsible for millions of dollars worth of product for you or your customer. That is why AUTOMATIONDIRECT only works with world class manufacturing companies that have been in the industry for decades, and operate in hundreds of thousands of installations around the world. Our customers can rest easy knowing we work with the best.

All of our sensors are certified by CE to ensure the highest quality, and most are certified by UL and CSA. Here are a few examples of how serious we are when it comes to design and manufacturing quality:

- Every proximity sensor is tested five times during the manufacturing process to ensure out of the box operation.
- Most proximity and photoelectric sensors are heat cycled from -25°C to 55°C for eight hours to eliminate startup failures.

### What's the difference? Better price!



- A vacuum of 30 mBar is pulled in the resin filling process of every proximity sensor to eliminate air bubbles which may form in the epoxy and cause long-term maintenance problems or short-term failures.

• Every proximity sensor has a resistor that is laser trimmed to .001 inches to ensure repeatable and accurate detection and provide you better product stability.

• Our sensor suppliers manufacture the printed circuit board (PCB), populate the PCB with components, and assemble and test the product from start to finish to ensure the highest quality.

But actions speak louder than words. That's why we back every sensor with a 30-day, money-back guarantee, and all proximity sensors carry a limited lifetime warranty. All this results in a return rate that is near zero.

### CHECK OUT OUR PRICES

Proximity Sensors	AutomationDirect	VS.	Allen-Bradley
5 mm three-wire DC prox with pico Q/D	\$43.50 PD1-AP-1F		\$138.65 871C-D1NP5-P3
8 mm three-wire DC prox with pico Q/D	\$21.00 AE1-AN-2F		\$93.55 872C-D3NN8-P3
12 mm two-wire DC shielded prox with 2 m cable	\$22.00 AM1-A0-2A		\$81.28 872C-D3NE12-A2
18 mm three-wire NPN DC shielded prox with 2 m cable	\$22.00 AK1-AN-1A		\$84.42 872C-DH5NN18-E2
18 mm shielded AC prox with 2 m cable	\$31.00 VK1-A0-1B		\$103.02 872C-A5N18-A2

Q/D = quick disconnect

All prices are U.S. published prices. AutomationDirect prices are from April 2012 Price List Prices and specifications may vary by dealer and configuration. Allen-Bradley prices are from [www.rockwellautomation.com/en/e-tools/2/20/12](http://www.rockwellautomation.com/en/e-tools/2/20/12). Prices subject to change without notice.

# Round Proximity Sensors For All Applications

## All the features you expect

These proximity sensors provide benefits to our customers on everything from price to quality:

- **Super low prices compared to the competition.** This allows OEM-like pricing on single item purchases. In fact, some of our sensors are actually cheaper than competitors' cables.
- **2-wire designs on the most popular models.** This makes for easier and faster terminations ( i.e., one less wire to terminate). Faster wiring time and fewer termination points (materials) result in lower system costs. This technology works with sinking or sourcing devices, eliminating the need for multiple sensors, since one sensor works both ways.
- **Most sensors are available in quick-disconnect cable versions.** Proximity sensors are subject to physical damage from machine overtravel, etc. and quick-disconnect sensors make for fast and easy replacement. Also, troubleshooting is much faster with quick-disconnect devices, as the user need only unscrew the connector and change out the sensor. This eliminates the need for disconnecting wires and cutting wire ties, and speeds up the replacement process with much less room for error.
- **Food and Beverage sensors available.** IP69K rated, stainless steel, made of FDA approved materials able to withstand 1500psi of 80°C water jet at varying angles, 4-6" away



## What do 2-, 3- or 4-wire outputs mean to me?

Benefits	
<b>2-wire</b>	<ul style="list-style-type: none"> <li>• Will work with sinking or sourcing devices</li> <li>• Only 2 wires to terminate</li> </ul>
<b>3-wire</b>	<ul style="list-style-type: none"> <li>• Most popular output - familiar to most users</li> <li>• Must select between NPN and PNP outputs</li> </ul>
<b>4-wire</b>	<ul style="list-style-type: none"> <li>• Allows configurability in one device</li> <li>• May have both NPN/PNP selection or NO/NC selection. Allows user to stock one part for numerous applications.</li> </ul>

- **Shielded or unshielded sensors are available for mounting variations.** Shielded versions allow flush mounting, but limit the target detection range, while unshielded versions do not allow flush mounting, but offer greater sensing distance and area.
- **All sensors feature electrical protection for short circuit, reverse polarity, and transient noise.** Whether the sensor is initially wired wrong, or wired into a noisy environment, it will still operate properly.
- **A lifetime warranty means you can install your proximity sensor and be assured of its quality and endurance.**

## Sometimes a round proximity sensor will not fit a square hole

### Rectangular sensors are the answer

Have you ever tried using a round sensor or short body sensor, and not been able to make it fit? We offer rectangular sensors to meet your needs. The same technology found in our standard round proximity sensor is put into a rectangular housing, including sensing distances, electrical protection and switching frequencies.

We currently offer the most popular formats available.



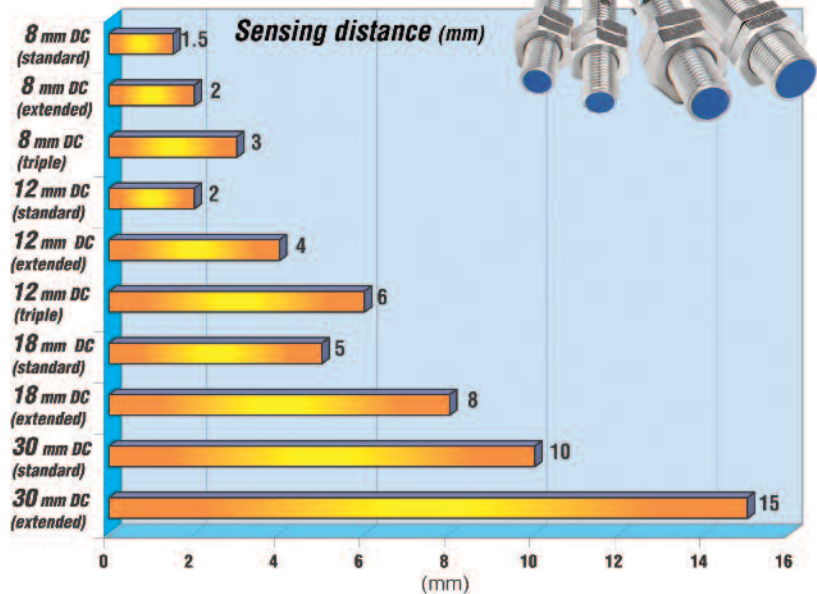
# Extended and Triple-sensing Distances for Tough-to-reach Applications

8 mm and 12 mm triple-sensing distance sensors

## Why extended distance?

In many applications, it might not be possible to mount a sensor close to the sensed object. In those cases, longer sensing distances are needed. For instance:

- Longer sensing distances may eliminate the need to buy more expensive high temperature sensors. If a sensor is placed too close to a hot temperature source, the sensor will fail quicker and require more maintenance.
- Mounting the sensor further from the detection object may eliminate unneeded contact with the sensor, which will extend the life of the sensor.



## Stainless Steel Triple-sensing Proximity Sensors

**IP68 rated:**  
to 290 psi or 669 ft. of water

With a unique sensing technology, this IP68 rated sensor (embedded cable version only) can be mounted under water up to 290 psi (or 669 feet of water). It will last a lifetime and pay for itself over and over again. This technology has many benefits:

### Triple sensing

This sensor offers three times the sensing distance of any standard proximity sensor for tremendous flexibility in your design.

### Virtually the same sensing distance for all metals

Sense iron, aluminum, brass, etc., all at the sensor-rated distance. Have you ever chosen a sensor with 10 mm sensing distance and had to reduce it to 2 mm or less because you were sensing an aluminum object? With this sensor, you can design the installation to use the entire 10 mm sensing distance.

### One-piece stainless steel body

The sensing technology allows object detection through stainless steel material. The sensor can be located in the harshest conditions, including oil or water submersion up to 290 psi (20 bars).



**STAINLESS STEEL**

**One-piece stainless steel body**



Three-wire DC

12 mm  
PMW  
series

18 mm  
PKW  
series

30 mm  
PTW  
series



# We sell good proximity sensors at great prices – and we back them up!

## AutomationDirect Lifetime Warranty

### Registration required

For inductive proximity sensors sold to the Original User for the lifetime of the original application.

The following terms apply to the LIFETIME WARRANTY in addition to the General Terms:

1. This warranty is available only to AUTOMATIONDIRECT's authorized Value Added Resellers and to the Original User. In the event the ownership of the product is transferred to a person, firm, or corporation other than the Original User, this WARRANTY shall terminate.

2. This WARRANTY is applicable only to the original installation of the product. In the event the machinery, equipment, or production line to which the product is connected, or on which it is installed, is substituted, changed, moved or replaced, the WARRANTY shall terminate.

3. This WARRANTY shall be valid only if the product was purchased by the Original User from AUTOMATIONDIRECT, or from an authorized AUTOMATIONDIRECT Value Added Reseller, or was an integral part of a piece of machinery and equipment obtained by the Original User from an original equipment manufacturer, where the part was purchased by the original equipment manufacturer directly from AUTOMATIONDIRECT or from an authorized AUTOMATIONDIRECT Value Added Reseller.

### Purchaser's remedies

This remedy shall apply to all WARRANTIES. If an AUTOMATIONDIRECT Value Added Reseller desires to make a WARRANTY claim, the Value Added Reseller shall, if requested by AUTOMATIONDIRECT, ship the product to AUTOMATIONDIRECT's facility in Cumming, GA postage or freight prepaid. If the Original User desires to make a WARRANTY Claim, they shall notify the authorized Value Added Reseller from whom it was purchased or, if purchased directly from AUTOMATIONDIRECT, shall notify AUTOMATIONDIRECT and, if requested by AUTOMATIONDIRECT, ship the Product to AUTOMATIONDIRECT's facility in Cumming, GA postage or freight prepaid. AUTOMATIONDIRECT shall, at its option, take any of the following two courses of action for any products which AUTOMATIONDIRECT determines are defective in materials or workmanship.

1. Repair or replace the product and ship the product to the Original User or to the authorized AUTOMATIONDIRECT Value Added Reseller, postage or freight prepaid; or
2. Repay to the Original User that price paid by the Original User; provided that if the claim is made under the lifetime warranty, and such product is not then being supplied by AUTOMATIONDIRECT, then the amount to be repaid by AUTOMATIONDIRECT to the Original User shall be reduced according to the following schedule:

Number of Years Since Date of Purchase by Original User	Percent of Original Purchase Price To Be Paid by AutomationDirect
10	50 percent
15	25 percent
20	10 percent
More than 20	5 percent

**REMEDIES OF PURCHASER'S AND VALUE ADDED RESELLERS SHALL BE LIMITED EXCLUSIVELY TO THE RIGHT OF REPLACEMENT, REPAIR OR REPAYMENT AS PROVIDED ABOVE AND DOES NOT INCLUDE ANY LABOR COST OR REPLACEMENT AT ORIGINAL USER'S SITE. AUTOMATIONDIRECT.COM SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF ANY WARRANTY, EXPRESSED OR IMPLIED, APPLICABLE TO THE PRODUCT, INCLUDING WITHOUT LIMITATION, ANY DAMAGES RESULTING FROM PROPERTY DAMAGE, PERSONAL INJURY OR BUSINESS INTERRUPTION, EVEN IF NOTIFIED OF THE POSSIBILITY OF SUCH DAMAGES.**

Inductive proximity sensors warranty form may be obtained online at:

<http://www.automationdirect.com/static/specs/proxwarranty.pdf>

# Proximity Sensor Lineup

Proximity sensors allow non-contact detection of objects. They are used in many industries, including manufacturing, robotics, semiconductor, etc. Inductive sensors detect metallic objects while capacitive sensors detect all other materials. Ultrasonic sensors detect all materials by using sound wave reflections to determine presence.

## Lifetime Warranty



12, 18, 30 mm  
IP69K FDA-approved materials

**PFM, PFK, PFT, VF & MAF SERIES**  
New! An assortment of AC and DC IP69K rated Q/D proximity sensors.  
Suitable for harsh environments

- 12 mm, from \$35.50
- 18 mm, from \$35.50
- 30 mm, from \$45.50

Starting from  
**\$35.50**



**Miniature**  
(3, 4, 5 mm)

**PY & PD SERIES**  
Three-wire DC  
3 mm prox, from \$79.00  
4 mm prox, from \$79.00  
5 mm prox, from \$43.50 (quick-disconnect)

Sensing distance:  
• Standard

Starting from  
**\$43.50**



**8 mm round**

**AE and PEW SERIES**  
Three-wire DC with embedded cable, M8 or M12 quick-disconnect

Sensing distance:  
• Standard, from \$21.00  
• Extended, from \$26.50  
• Triple, from \$61.00  
• Stainless Steel, from \$45.00

Starting from  
**\$21.00**



**12 mm round**

**AM and PBM SERIES**  
Two- and three-wire DC, embedded cable or M12 quick-disconnect

Sensing distance:  
• Standard, from \$13.50  
• Extended, from \$25.50  
• Triple, from \$65.00

Starting from  
**\$13.50**



**18 mm round**

**AK and PBK SERIES**  
Two- and three-wire DC, embedded cable or M12 quick-disconnect

Sensing distance:  
• Standard, from \$14.00  
• Extended, from \$26.50

Starting from  
**\$14.00**



**30 mm round**

**AT and PBT SERIES**  
Two- and three-wire DC, IP67 rating, embedded cable or M12 quick-disconnect

Sensing distance:  
• Standard, from \$16.50  
• Extended, from \$32.50

Starting from  
**\$16.50**



**5 mm x 5 mm rectangular**

**CR5 SERIES**  
Three-wire DC, IP67 rating, embedded cable or M8 quick-disconnect

Sensing distance:  
• Standard, from \$36.00  
• Extended, from \$53.00

Starting from  
**\$36.00**



**8 mm x 8 mm rectangular**

**CR8 SERIES**  
Three-wire DC with embedded cable or M8 quick-disconnect

Sensing distance:  
• Standard, from \$25.00  
• Extended, from \$34.50  
• Triple, from \$77.00

Starting from  
**\$25.00**



**10 mm x 16 mm rectangular**

**DR10 SERIES**  
Three-wire DC with embedded cable or M12 quick-disconnect, IP67 rating

Sensing distance:  
• Standard, from \$26.00  
• Extended, from \$26.00

Starting from  
**\$26.00**



**12 mm x 27 mm rectangular**

**APS4 SERIES**  
Three-wire DC with embedded cable, IP67 rating

Sensing distance: **Standard** from \$16.75

Starting from  
**\$17.50**



**Stainless steel triple sensing range**

**PKW, PTW and PMW SERIES triple**  
Three-wire DC, one-piece body, virtually same sensing distance of all metals, Q/D version is IP67 rated, cable version is IP68 to 290 psi

Sensing distance: **Triple**  
• 12 mm prox, from \$103.00  
• 18 mm prox, from \$114.00  
• 30 mm prox, from \$49.00

Starting from  
**\$103.00**



**Stainless steel round standard**

**PKW, PMW and PTW SERIES standard**  
Three and four-wire DC with M12 quick-disconnect, IP67 rating

Sensing distance: **Standard & Extended**  
• 12 mm prox, from \$38.50  
• 18 mm prox, from \$41.50  
• 30 mm prox, from \$49.00

Starting from  
**\$38.50**



**AC prox (12, 18, 30 mm)**

**V SERIES**  
Two-wire AC with embedded cable or quick-disconnect, 20-253 VAC input signals

Sensing distance: **Standard**  
• 12 mm, from \$35.50  
• 18 mm, from \$31.00  
• 30 mm, from \$37.50

Starting from  
**\$31.00**





## 40 mm x 40 mm rectangular

### LF SERIES

Three-wire and four-wire DC, IP67 rating, M12 quick-disconnect

- 3-wire, from \$39.00
- 4-wire, from \$42.00

Starting from **\$39.00**



## Capacitive (12, 18, 30 mm round, and rectangular)

**CM, CK, CT and CR SERIES**  
Two-wire AC and three-wire DC with M12 quick-disconnect or embedded cable

Starting from **\$59.00**



## Ultrasonic

**UK, SU, UT & TU SERIES**  
DC with discrete or analog output, embedded cable or quick-disconnect, IP67 rating

Sensing distance: **up to 3,500 mm**

- 18 mm, from \$99.00
- 30 mm, from \$185.00

Starting from **\$99.00**

Starting from **\$159.00**



### UHZ SERIES

DC, discrete output, through-beam pair, embedded cable

Sensing distance: **up to 300 mm**

- Rectangular, from \$159.00

## Short body round

### AE & AM SERIES

3-wire DC, embedded cable or quick-disconnect, IP67 rating

Sensing distance: **Extended**

- 8 mm, from \$31.00
- 12 mm, from \$31.00

Starting from **\$31.00**

## Proximity with analog output

### AE, AM, AK & AT ANALOG SERIES

DC with analog output (voltage/current), embedded cable or quick-disconnect, IP67 rating

Sensing distance: **Triple**

- 8 mm, from \$168.00
- 12 mm, from \$102.50
- 18 mm, from \$107.00
- 30 mm, from \$131.25

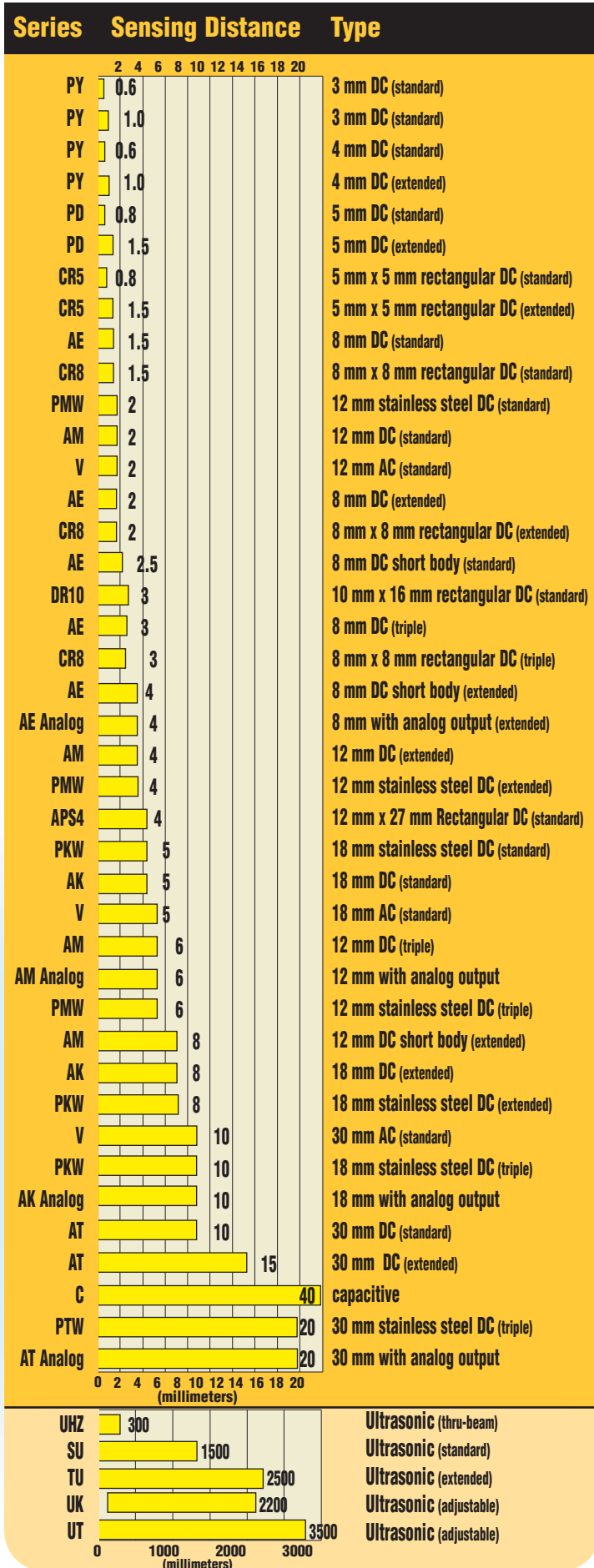
Starting from **\$102.50**

## Q/D extension cables

### CDP SERIES

Axial or right-angle connectors, M8 or M12 connector sizes, 1 m or 3 m lengths, IP67 rating

Starting from **\$10.50**



# How do I Choose the Right Proximity Sensor?

All applications have certain specific needs, but, in general, the following steps will help you choose the correct sensor for your application:

## Step 1:

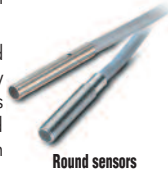
### What is the sensing distance required?

The sensing distance is the distance between the tip of the sensor and the object to be sensed. The selection guide and the specifications table for each sensor family lists the sensing distances.

#### Some things to keep in mind are:

**A.** In many applications, it is beneficial to place the sensor as far as possible from the sensing object due to temperature concerns. If a sensor is placed too close to a hot temperature source, the sensor will fail quicker and require more maintenance.

Greater distance may be achieved with extended and triple range sensors. In many applications, a sensor may not be mountable close to the sensed object. In this case, longer sensing distances are needed. Extended sensing distance sensors are offered in 8mm to 30mm dimeters, and triple sensing distance sensors in 8mm and 12mm formats.



Round sensors

In many cases, using an extended distance sensor to get the sensor farther away from the detected object can be beneficial to the life of the sensor. For example, without an extended distance sensor you may not be able to place the sensor close enough to the detectable object, or you may need to buy more expensive high temperature sensors.



Rectangular sensors

Another example would be a mechanical overshoot situation, where mounting the sensor farther from the detection object may eliminate unneeded contact with the sensor, thereby extending the life of the sensor.

These are just a few examples, but the benefits of using extended distance sensors are obvious in many applications. Think of how extended distance sensors could save you time and money in your application.

**B.** The material being sensed (i.e. brass, copper, aluminum, steel, etc.) makes a difference in the type of sensor needed.

Note: If you are sensing a non-metallic object, you must use a capacitive sensor.

The sensing distances specified in this catalog were calculated using FE360 material. Many materials are more difficult to sense and require a shorter distance from the sensor tip to the object sensed.

If sensing a material that is difficult to sense, you may consider using our unique stainless steel sensing technology. This will measure virtually all materials at the specified sensing distances.

## Step 2:

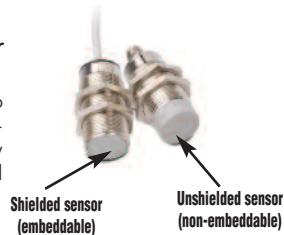
### How much space is available for mounting the sensor?

Have you ever tried using a round sensor or short body version, and not been able to make it fit? Our rectangular sensors can meet your needs. The same technology used in a standard round proximity sensor is enclosed in a rectangular housing. This technology includes sensing distances, electrical protection and switching frequencies similar to round sensors.

## Step 3:

### Is a shielded or unshielded sensor needed?

Shielded and unshielded sensors are also referred to as embeddable and non-embeddable. Unshielded sensors allow longer sensing distances but shielded sensors allow flush mounting.



Shielded sensor (embeddable)

Unshielded sensor (non-embeddable)

## Step 4:

**Consider environmental placement concerns.** Will the sensor be placed underwater, in a high-temperature environment, continually splashed with oil, etc.? This will determine the type of sensor you may use. In the selection table and in the specification tables for each sensor family, we list the environmental protection degree ratings. Most of our sensors are rated IEC-IP67 and

others are rated IP65 or IP68.

These ratings are defined as:

**IP65:** Protection from live or moving parts, dust, and protection from water jets from any direction.

**IP67:** Protection from live or moving parts, dust, and protection from immersion in water.

**IP68:** Protection from live or moving parts, dust, and protection from submersion in water under pressure.

**P69K:** Protection against high-pressure/steam-jet cleaning.

## Step 5:

### What is the sensor output connected to?

Note: If using AC sensors, please skip this step.

The type of output required must be determined (i.e., NPN, PNP or analog). Most PLC products will accept either output. If connecting to a solid state relay, a PNP output is needed.

## Step 6a:

### Do I need 2, 3, or 4-wire discrete outputs?

This is somewhat determined by what the sensor will be connected to. Some simple guidelines to use are:

Type	Guidelines
2-wire	<ul style="list-style-type: none"> <li>Will work with sinking or sourcing ... devices.</li> <li>Only 2 wires to terminate.</li> <li>Higher leakage current.</li> </ul>
3-wire	<ul style="list-style-type: none"> <li>Most popular output. Familiar to most users. (Must select between NPN and PNP outputs.)</li> </ul>
4-wire	<ul style="list-style-type: none"> <li>Allows configurability in one device. ... May have both NPN/PNP selection or NO/NC selection. Allows user to stock one part for numerous applications.</li> </ul>

## Step 6b:

### Do I need analog outputs?

This is determined by the sensor application and what the sensor will be connected to. Sensors with analog outputs produce an output signal approximately proportional to the target distance.

Type	Guidelines
1-5mA	available on AM9, AK9 and AT9 series analog inductive sensors
4-20mA	available on AM9, AK9 and AT9 series analog inductive sensors
0-5VDC	available on AM9, AK9 and AT9 series analog inductive sensors
0-10VDC	available on AE9, AM9, AK9 and AT9 series analog inductive sensors and SU and TU ultrasonic sensors

## Step 7:

### Determine output connection type.

Do you want an axial cable factory attached to the sensor (pigtail) or a quick-disconnect cable?

There are many advantages to using a quick-disconnect cable, such as easier maintenance and replacement. All proximity sensors will fail in time and using a Q/D (quick-disconnect) cable allows for simple replacement.

Factory attached axial cables come in a 2 meter length. CD08/CD12 Q/D cables come in 2 meter, 5 meter, and 7 meter lengths. Extension cables are available in 1 meter and 3 meter lengths to extend the length of the standard Q/D cables.

Q/D cables are offered in PVC and PUR jackets for meeting the requirements of all applications. Axial cables typically come with a PVC jacket. PVC is a general purpose insulation while PUR provides excellent oxidation, oil and ozone resistance. PUR is beneficial if the cable is exposed to oils or placed in direct sunlight.

There are also advantages to a factory attached axial cable:

**Cost:** The cable is integrated into the sensor and included in the price. Q/D cables must be purchased separately.

**Environmental impact:** Since the cable is sealed into the sensor, there is less chance of oil, water or dust penetration into the sensor, which could cause failure.

# Proximity Sensor Selection Guide



Specifications	PY Stainless Steel DC	PD Stainless Steel DC	AE Series DC	AM Series DC	AK Series DC
<b>Description</b>	Miniature inductive proximity sensors, 3 mm and 4 mm, DC, stainless steel	Miniature inductive proximity sensors, 5 mm, DC, stainless steel	Inductive proximity sensors, 8 mm, DC, metal, standard and short body lengths	Inductive proximity sensors, 12 mm, DC, metal, standard and short body lengths	Inductive proximity sensors, 18 mm, DC, metal
<b>Sensing Distances</b>	Standard distance: 0.6 mm Extended distance: 1mm	Standard distance: 0.8 mm Extended distance: 1.5 mm	Standard distance: 0 to 1.5 mm, 0 to 2.5 mm Extended distance: 0 to 2 mm, 0 to 4 mm Triple distance: 0 to 3 mm	Standard distance shielded: 0 to 2 mm unshielded: 0 to 4 mm Extended distance: shielded: 0 to 4 mm unshielded: 0 to 8 mm Triple distance: shielded: 6 mm	Standard distance: shielded 5 mm, unshielded 8 mm Extended distance: shielded 8 mm, unshielded 12 mm
<b>Output State</b>	N.O.	N.O.	N.O.	N.O.	N.O.
<b>Logic Output</b>	NPN / PNP	NPN / PNP	NPN / PNP	NPN / PNP / Sink / Source	NPN / PNP / Sink / Source
<b>Connection Type</b>	Axial cable	Axial cable / M8 connector	Axial cable /M8 / M12 connector	Axial cable / M12 connector	Axial cable / M12 connector
<b>Supply Voltage</b>	10 to 30 VDC	10 to 30 VDC	10 to 30 VDC	10-to-30 VDC	10 to 30 VDC
<b>Switching Frequency</b>	Standard distance: 5kHz Extended distance: 3kHz	Standard distance: 5kHz Extended distance: 3kHz	Standard distance: shielded: 3kHz unshielded: 2.5kHz Extended distance: shielded/unshielded: 3kHz Triple distance: shielded: 1kHz	Standard distance shielded/unshielded: 3 wire 2 kHz, 2-wire: 1.5kHz Extended distance shielded/unshielded: 1kHz Triple distance shielded: 800Hz	Standard distance shielded: 600Hz, Standard distance unshielded Extended distance shielded/unshielded: 300Hz
<b>Protection Degree</b>	IEC-IP67	IEC-IP67	IEC-IP67	IEC-IP67	IEC-IP67



Specifications	AT Series DC	PB Series DC	PEW Stainless Steel DC	PMW Stainless Steel DC	PKW Stainless Steel DC
<b>Description</b>	Inductive proximity sensors, 30 mm, DC, metal,	Inductive proximity sensors, 12 mm, 18 mm, 30 mm DC, metal,	Inductive proximity sensors, 8 mm, DC, stainless steel	Inductive proximity sensors, 12 mm, DC, stainless steel	Inductive proximity sensors, 18 mm, DC, stainless steel
<b>Sensing Distances</b>	Standard distance: shielded: 10 mm, unshielded: 15 mm Extended distance: shielded: 15 mm unshielded: 20 mm	M12: shielded: 2 mm unshielded: 4 mm M18: shielded: 5 mm unshielded: 8 mm M30: shielded: 10 mm unshielded: 15 mm	Standard distance: 2 mm	Standard distance: 2 mm Extended distance: 3 mm, 4 mm Triple distance: 6 mm	Standard distance: 5 mm Extended distance: 8 mm Triple distance: 10 mm
<b>Output State</b>	N.O.	N.O.	N.O.	N.O.; N.O. / N.C.	N. O.; N.O. / N.C.
<b>Logic Output</b>	NPN / PNP / Sink / Source	NPN / PNP	PNP	NPN / PNP	NPN / PNP
<b>Connection Type</b>	Axial cable / M12 connector	M12 connector	M8 / M12 connector	Axial Cable / M12 connector	Axial cable / M12 connector
<b>Supply Voltage</b>	10 to 30 VDC	15 to 30 VDC	10 to 36 VDC	10 to 30 VDC PMW-AP-1H:10 to 36 VDC	10 to 30 VDC; PKW-AP-1H:10 to 36 VDC
<b>Switching Frequency</b>	Standard distance shielded/unshielded: 2 wire: 150Hz, 3-wire 200Hz. Extended distance shielded /unshielded: 2-wire and 3-wire: 150Hz	M12 shielded/unshielded, 3 wire: 800Hz M18 shielded: 3-wire: 400Hz unshielded: 3-wire: 300Hz M30 shielded/unshielded: 3 wire: 200Hz	Standard distance, shielded: 100Hz	Standard/extended distance: 2kHz Triple distance: 400Hz	Standard/extended distance: 1kHz Triple distance: 200Hz
<b>Protection Degree</b>	IEC-IP67	IEC-IP67	PEW-AP-1F: IEC-IP67 PEW-AP-1H: IEC-IP67 and IP68	Standard/extended distance: IEC-IP67/68 Triple distance: IEC-IP67 connector / IP68 (cable)	Standard/extended distance: IEC-IP67/68 Triple distance: IEC-IP67 connector / IP68 (cable)

# Proximity Sensor Selection Guide

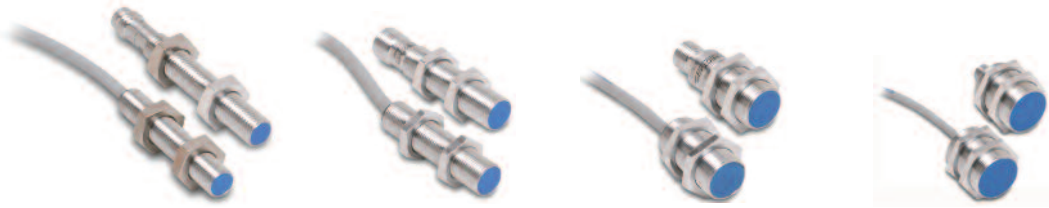


Specifications	PTW Stainless Steel DC	V Series AC	CR5 Rectangular DC	CR8 Rectangular DC	LF40 Rectangular DC
<b>Description</b>	30 mm inductive proximity sensors, DC, stainless steel	12 mm/18 mm/30 mm inductive proximity sensor, AC, metal	5 x 5 rectangular inductive proximity sensors, DC, metal	8 x 8 rectangular inductive proximity sensors, DC, metal	40 x 40 x 66 rectangular inductive proximity sensors, DC, plastic
<b>Sensing Distances</b>	PTW-A*-5: 20 mm PTW-AP-1: 10 mm	M12 models shielded: 2 mm Unshielded: 4 mm M18 models shielded: 5 mm Unshielded: 8 mm M30 models shielded 10 mm unshielded:15 mm	Standard: 0.8 mm Extended distance: 1.5 mm	Standard distance: shielded: 0 to 1.5mm Extended distance: shielded: 0 to 2mm Triple distance: shielded: 3mm	Shielded: 20mm Unshielded: 35mm
<b>Output State</b>	N.O.	N.O.	N.O.	N.O.	N.O.; N.O. / N.C. Complementary
<b>Logic Output</b>	PTW-A*-5: NPN / PNP PTW-AP-1: PNP	-	NPN / PNP	NPN / PNP	PNP
<b>Connection Type</b>	PTW-A*-5: Axial Cable / M12 connector PTW-AP-1: M12 connector	Axial cable / M12 connector	Axial cable / M8 connector	Axial cable / M8 connector	M12 connector
<b>Supply Voltage</b>	PTW-A*-5: 10 to 30 VDC; PTW-AP-1: 10 to 36 VDC	20 to 253 VAC, 50/60Hz	10 to 30 VDC	10 to 30 VDC	10 to 36 VDC
<b>Switching Frequency</b>	PTW-A*-5:100Hz; PTW-AP-1: 50Hz	25Hz	Standard distance: 5kHz Extended distance: 3kHz	1kHz	Shielded: 100Hz Unshielded: 80Hz
<b>Protection Degree</b>	PTW-A*-5:IEC-IP67 (connector/ IP68 cable) PTW-AP-1: IEC-IP67, IP68	IEC-IP67	IEC-IP67	IEC-IP67	IEC-IP67



Specifications	DR10 Rectangular DC	APS4 Rectangular DC	CM Capacitive DC	CK Capacitive DC	CT Capacitive DC, AC/DC	CR Capacitive DC
<b>Description</b>	10 x 16 rectangular inductive prox sensor, DC, plastic	12 x 27 compact rectangular inductive prox, DC, plastic	12 mm capacitive proximity sensors; DC, metal	18 mm capacitive proximity sensors; DC, plastic	30 mm capacitive proximity sensors, DC, AC/DC, plastic and metal	Rectangular capacitive proximity sensors; DC, plastic
<b>Sensing Distances</b>	Shielded: 3 mm Unshielded: 6 mm	4 mm	Shielded: 6 mm Unshielded: 12 mm	12 mm	Shielded: 15 mm Unshielded: 20 mm, 40 mm	12 mm
<b>Output State</b>	N.O.	N.O.	N.O.	N.O./N.C.	N.O., N.C., N.O./N.C.	N.O./N.C.
<b>Logic Output</b>	NPN/ PNP	NPN/ PNP	PNP	NPN/ PNP	NPN/ PNP, NPN, PNP	NPN/ PNP
<b>Connection Type</b>	Axial cable / M8 connector	Axial cable	M12 connector	M12 connector	Axial cable, M12 connector and 1/2 inch AC micro connector	Axial cable
<b>Supply Voltage</b>	10 to 30 VDC	10 to 30 VDC	10-36 VDC	10-36 VDC	10 to 30 VDC, 10 to 36 VDC, 20 to 250 VDC/30 to 250 VAC	10-36 VDC
<b>Switching Frequency</b>	3kHz	200Hz	50Hz	10Hz	100Hz, 10Hz	10Hz
<b>Protection Degree</b>	IEC-IP67	IEC-IP67	IEC-IP65	IEC-IP65, IEC-IP67	IEC-IP65, IEC-IP67	IEC-IP65, IEC-IP67

# Proximity Sensor Selection Guide



Specifications	AE Analog Prox	AM Analog Prox	AK Analog Prox	AT Analog Prox
<b>Description</b>	Analog inductive proximity sensors, 8 mm, metal	Analog inductive proximity sensors, 12 mm, metal	Analog inductive proximity sensors, 18 mm, metal	Analog inductive proximity sensors, 30 mm, metal
<b>Sensing Distance</b>	4 mm	6 mm	10 mm	20 mm
<b>Output</b>	0 to 10VDC	0 to 5 VDC, 1-5mA / 0 to 10 VDC, 4 to 20mA	0 to 5 VDC, 1-5mA / 0 to 10 VDC, 4 to 20mA	0 to 5 VDC, 1-5mA / 0 to 10 VDC, 4 to 20mA
<b>Supply Voltage</b>	15 to 30 VDC	10 to 30 VDC / 15 to 30 VDC	10 to 30 VDC / 15 to 30 VDC	10 to 30 VDC / 15 to 30 VDC
<b>Connection Type</b>	Axial cable / M8 connector	Axial cable / M12 connector	Axial cable / M12 connector	Axial cable / M12 connector
<b>Protection Degree</b>	IEC-IP67	IEC-IP67	IEC-IP67	IEC-IP67



Specifications	UK1 Ultrasonic Sensor	SU Ultrasonic Sensor	TU Ultrasonic Sensor	UHZ Ultrasonic Sensor
<b>Description</b>	Ultrasonic Sensor, 18 mm, plastic, DC and analog output models	Ultrasonic Sensor, 18mm, plastic, DC and analog output models	Ultrasonic Sensor, 30mm, plastic, DC and analog output models	Ultrasonic Sensor, 30 mm x 20 mm, plastic, thru-beam models
<b>Sensing Distances</b>	50 to 2200 mm	100 to 600 mm 200 to 1500 mm	300 to 2500 mm	300 mm
<b>Output</b>	DC models: PNP, N.O./N.C. Analog models: 0-10VDC or 4-20mA	DC models: PNP, N.O. Analog models: 0-10VDC	DC models: PNP, N.O. Analog models: 0-10VDC	PNP/NPN, N.O./N.C.
<b>Supply Voltage</b>	15-30VDC	DC models: 15-30VDC Analog models: 18-30VDC	19-30VDC	18-30VDC
<b>Connection Type</b>	M12 connector	Axial cable/M12 connector	M12 connector	2 meter Axial cable
<b>Protection Degree</b>	IEC-IP67	IEC-IP67	IEC-IP67	IEC-IP67

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/Lights

Process

Relays/Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

Product Index

Part # Index

# Proximity Sensors Selection Guide



Specifications	PFM Series DC	PFK Series DC	PFT Series DC	VF Series AC
<b>Description</b>	Food and Beverage Inductive Proximity Sensors 12 mm stainless steel, DC	Food and Beverage Inductive Proximity Sensors 18 mm stainless steel, DC	IP69K-rated Inductive Proximity Sensors 30 mm stainless steel, DC	IP69K-rated Inductive Proximity Sensors 18 mm/30 mm stainless steel, AC
<b>Sensing Distances</b>	Standard Shielded: 2 mm Unshielded: 4 mm Extended Shielded: 4 mm Unshielded: 7 - 8 mm	Standard Shielded: 5mm Unshielded: 8 mm Extended Shielded: 8 mm Unshielded: 12 mm	Shielded: 14 - 15 mm Unshielded: 22 mm	18 mm models: Shielded: 5 mm Unshielded: 12 mm 30 mm models: Shielded: 14 mm Unshielded: 22 mm
<b>Output State</b>	N.O./N.C. selectable; N. O.		N. O.	N. O.
<b>Logic Output</b>	NPN/PNP	NPN/PNP	PNP	-
<b>Connection Type</b>	M12 connector			1/2" micro AC
<b>Supply Voltage</b>	N.O. only: 10 to 36 VDC; N.O./N.C.: 10 to 30 VDC		10 to 36 VDC	20 to 140 AC/DC, 47 to 63 Hz AC
<b>Switching Frequency</b>	N.O. only - 800Hz N.O./N.C. - 2000Hz	N.O. only - Shielded: 600Hz Unshielded: 300Hz N.O./N.C. - 1500 Hz	N.O. only - Shielded: 50Hz Unshielded: 100Hz	AC - 25Hz DC 18 mm - 300Hz DC 30 mm - 100Hz
<b>Protection Degree</b>	IEC IP68, IP69K			



Specifications	MAF Series DC
<b>Description</b>	IP69K-rated Magnetic Proximity Sensors 12 mm or 18 mm stainless steel, DC
<b>Sensing Distances</b>	12 mm housing - 60 mm (with AW-MAG) 18 mm housing - 70 mm (with AW-MAG)
<b>Output State</b>	N.O.
<b>Logic Output</b>	PNP
<b>Connection Type</b>	M12 connector
<b>Supply Voltage</b>	10 to 30 VDC
<b>Switching Frequency</b>	5kHz
<b>Protection Degree</b>	IEC IP68, IP69K

# PY Series Inductive Proximity Sensors

## Miniature Ø3 (3 mm) and M4 (4 mm) stainless steel – DC



- Smallest self-contained inductive proximity sensor available on the U.S. market
- Eight models available
- Complete overload protection
- IP67 rated
- Stainless steel construction
- LED status indicator
- Lifetime warranty

## Dimensions

mm [inches]

Figure 1

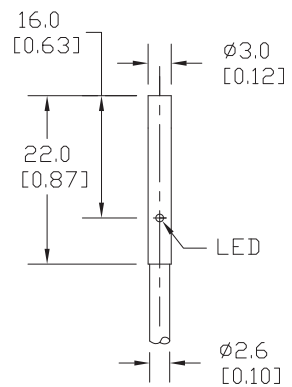
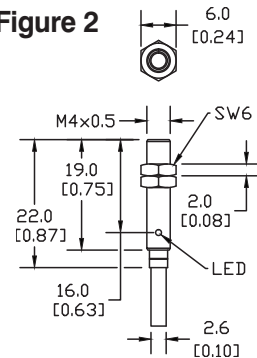
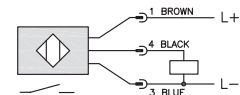


Figure 2

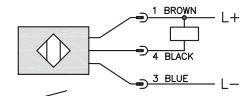


## Wiring diagrams

### PNP Output



### NPN Output



PY Series Ø3 and M4 DC Inductive Prox Selection Chart								
Part Number	Price	Size	Sensing Range	Housing	Output State	Logic	Connection	Dimensions
<b>Standard Distance</b>								
PY3-AN-1A	<--->	Ø3*	0.6 mm (0.024 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Figure 1
PY3-AP-1A	<--->	Ø3*				PNP	2 m (6.5') axial cable	Figure 1
PY4-AN-1A	<--->	4 mm				NPN	2 m (6.5') axial cable	Figure 2
PY4-AP-1A	<--->	4 mm				PNP	2 m (6.5') axial cable	Figure 2
<b>Extended Distance</b>								
PY3-AN-3A	<--->	Ø3*	1 mm (0.039 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Figure 1
PY3-AP-3A	<--->	Ø3*				PNP	2 m (6.5') axial cable	Figure 1
PY4-AN-3A	<--->	4mm				NPN	2 m (6.5') axial cable	Figure 2
PY4-AP-3A	<--->	4mm				PNP	2 m (6.5') axial cable	Figure 2

\*Smooth barrel, no threads

PY Series Specifications	Ø3		M4	
	Standard Distance		Extended Distance	
Mounting Type	Shielded			
Nominal Sensing Distance	0.6 mm (0.024 in)		1 mm (0.039 in)	
Operating Distance	N/A		N/A	
Material Correction Factors	See Material Influence table #1 later in this section.			
Output Type	NPN or PNP/N.O. only/3-wire			
Operating Voltage	10 to 30 VDC			
No-load Supply Current	≤10mA			
Operating (Load) Current	≤100mA			
Off-state (Leakage) Current	≤10µA		≤0.1mA	
Voltage Drop	≤2.0 V			
Switching Frequency	5 kHz		3 kHz	
Differential Travel (% of Nominal Distance)	≤10%			
Repeat Accuracy	≤5%			
Ripple	≤20%			
Time Delay Before Availability (tv)	10 ms			
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature	-25° to +70°C (-13° to 158 F)			
Protection Degree (DIN 40050)	IEC IP67			
Indication/Switch Status	Yellow (output energized)			
Housing Material	Stainless steel			
Sensing Face Material	Polyester			
Shock/Vibration	See terminology section.			
Tightening Torque	0.8 Nm (7.08 in./lbs.)			
Weight	23 g (0.81 oz)		22 g (0.78 oz)   26 g (0.92oz)	
Connection	2 meter PVC cable			
Agency Approvals	UL file E328811			

# PD Series Inductive Proximity Sensors

## Miniature M5 (5 mm) stainless steel – DC



- Eight models available
- Stainless steel construction
- Axial cable or M8 quick-disconnect models
- Complete overload protection
- IP67 rated
- Smallest self-contained inductive proximity sensor available on the U.S. market
- LED status indicator
- Lifetime warranty



## Dimensions

mm [inches]

Figure 1

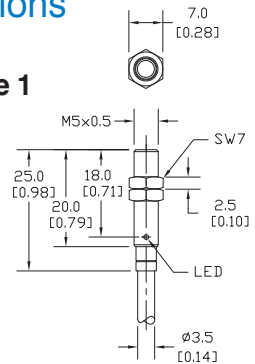
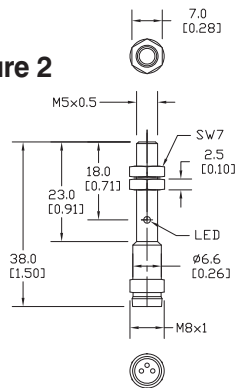


Figure 2

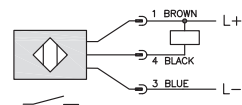


PD Series M5 DC Inductive Prox Selection Chart							
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Dimensions
<b>Standard Distance</b>							
PD1-AN-1A	<--->	0.8 mm (0.03 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Figure 1
PD1-AP-1A	<--->				PNP	2 m (6.5') axial cable	Figure 1
PD1-AN-1F	<--->				NPN	M8 (8 mm) connector	Figure 2
PD1-AP-1F	<--->				PNP	M8 (8 mm) connector	Figure 2
<b>Extended Distance</b>							
PD1-AN-3A	<--->	1.5 mm (0.059 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Figure 1
PD1-AP-3A	<--->				PNP	2 m (6.5') axial cable	Figure 1
PD1-AN-3F	<--->				NPN	M8 (8 mm) connector	Figure 2
PD1-AP-3F	<--->				PNP	M8 (8 mm) connector	Figure 2

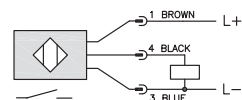
PD Series Specifications		
Mounting Type	Standard Distance	Extended Distance
		Shielded
Nominal Sensing Distance	0.8 mm (0.03 in)	1.5 mm (0.059 in)
Operating Distance	N/A	
Material Correction Factors	See Material Influence table #1 later in this section	
Output Type	NPN or PNP/N.O. only/3-wire	
Operating Voltage	10 to 30 VDC	
No-load Supply Current	≤10mA	
Operating (Load) Current	≤200mA	
Off-state (Leakage) Current	≤10µA	≤0.1mA
Voltage Drop	≤2.0 V	
Switching Frequency	5 kHz	3 kHz
Differential Travel (% of Nominal Distance)	≤10%	
Repeat Accuracy	≤1.5%	
Ripple	≤20%	
Time Delay Before Availability (tv)	10 ms	
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25° to +70°C (-13° to 158°F)	
Protection Degree (DIN 40050)	IEC IP67	
Indication/Switch Status	Yellow (output energized)	
Housing Material	Stainless steel	
Sensing Face Material	Polybutylene Terephthalate (PBT)	Polyester
Shock/Vibration	See terminology section.	
Tightening Torque	1.5 Nm (13.3 lb./in.)	
Weight	43 g (1.52 oz)/10 g (0.36 oz)	34 g (1.20 oz)/4 g (0.14 oz)
Connection	2 meter PVC axial cable / M8 connector	
Agency Approvals	UL file E328811	

## Wiring diagrams

### NPN Output

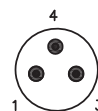


### PNP Output



## Connector

### M8 connector





# AE Series Inductive Proximity Sensors



## M8 (8 mm) metal – DC

- 24 standard length models available
- 8 short body length models available
- Compact metal housing
- Axial cable, M8 or M12 quick-disconnect models
- Complete overload protection
- IP67 rated
- LED status indicators are visible 360° around the cylinder
- Lifetime warranty



### AE1 Series Standard Length M8 DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
AE1-AN-1A	<-->	0 to 1.5 mm (0-0.059 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AE1-AP-1A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
AE1-AN-1H	<-->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AE1-AP-1H	<-->				PNP	M12 (12 mm) connector	Diagram 2	Figure 2
AE1-AN-1F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 3
AE1-AP-1F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 3
AE1-AN-2A	<-->	0 to 2.5 mm (0-0.098 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AE1-AP-2A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
AE1-AN-2H	<-->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AE1-AP-2H	<-->				PNP	M12 (12 mm) connector	Diagram 2	Figure 2
AE1-AN-2F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 3
AE1-AP-2F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 3
<b>Extended Distance</b>								
AE1-AN-3A	<-->	0 to 2 mm (0-0.079 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AE1-AP-3A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
AE1-AN-3F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 3
AE1-AP-3F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 3
AE1-AN-4A	<-->	0 to 4 mm (0-0.157 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AE1-AP-4A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
AE1-AN-4F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 3
AE1-AP-4F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 3
<b>Triple Distance</b>								
AE1-AN-5A	<-->	0 to 3 mm (0-0.118 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AE1-AP-5A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
AE1-AN-5F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 4
AE1-AP-5F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 4

### AE6 Series Short Body M8 DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Extended Distance</b>								
AE6-AN-3A	<-->	0 to 2 mm (0-0.079 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 5
AE6-AP-3A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 5
AE6-AN-3F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 6
AE6-AP-3F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 6
AE6-AN-4A	<-->	0 to 4 mm (0-0.157 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 5
AE6-AP-4A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 5
AE6-AN-4F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 6
AE6-AP-4F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 6

# AE Series Inductive Proximity Sensors

AE Series Specifications					
Mounting Type	Standard Distance Models		Extended Distance Models		Triple Distance Models
	Shielded	Unshielded	Shielded	Unshielded	Shielded
Nominal Sensing Distance	1.5mm (0.059in)	2.5mm (0.098in)	2mm (0.079in)	4mm (0.157in)	3mm (0.118in)
Operating Distance	N/A				
Material Correction Factors	See Material Influence table #1 later in this section			See Material Influence table #2 later in this section	
Output Type	NPN or PNP/N.O. only/3-wire				
Operating Voltage	10 to 30 VDC				
No-load Supply Current	≤20mA		≤10mA		
Operating (Load) Current	≤200mA				
Off-state (Leakage) Current	≤10μA		≤120μA		
Voltage Drop	≤1.2 V				≤2.0 V
Switching Frequency	3 kHz	2.5 kHz	3 kHz	1 kHz	
Differential Travel (% of Nominal Distance)	2 to 10%		1 to 20		≤10%
Repeat Accuracy	≤2%		≤5%		
Ripple	≤10%				≤20%
Time Delay Before Availability (tv)	100 ms (5 ms for AE6 short body models)				50 ms
Reverse Polarity Protection	Yes				
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)				
Operating Temperature	-25° to +70°C (-13° to 158°F)				
Protection Degree (DIN 40050)	IEC IP67				
Indication/Switch Status	Yellow (output energized)				
Housing Material	Nickel-plated brass			Chrome-plated brass	
Sensing Face Material	Polybutylene Terephthalate (PBT)				
Shock/Vibration	See terminology section				
Tightening Torque	4 Nm (2.95 lb-ft)				
Weight (cable/M8 connector/M12 connector)	43 g (1.52 oz)/16 g (0.56 oz)/20 g (0.71 oz)			54 g (1.90 oz)/26 g (0.92 oz)/(N/A)	
Connection	2 meter PVC axial cable / M8 connector / M12 connector				
Agency Approvals	N/A			UL file E328811	

## Wiring diagrams

Diagram 1

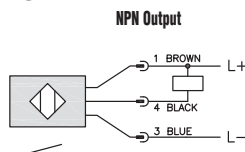
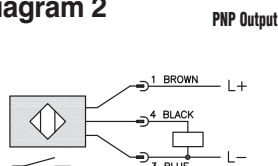
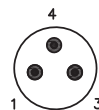


Diagram 2

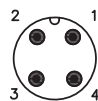


## Connectors

M8 connector



M12 connector

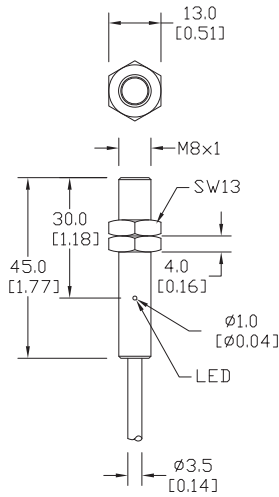


# AE Series Inductive Proximity Sensors

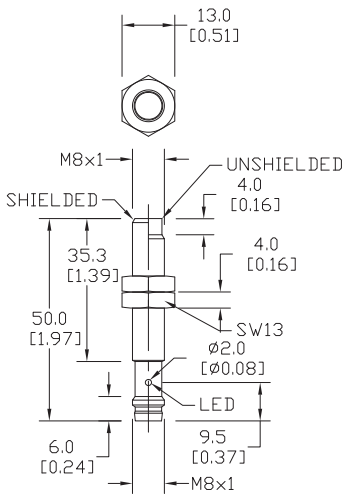
## Dimensions

mm [inches]

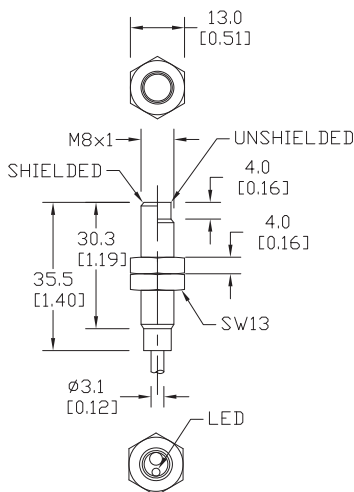
**Figure 1**



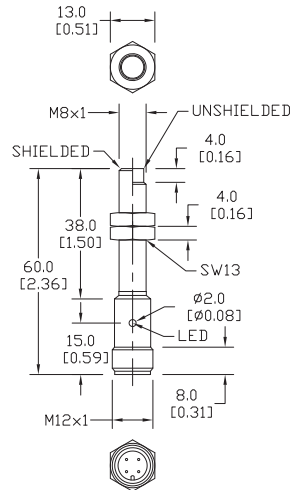
**Figure 3**



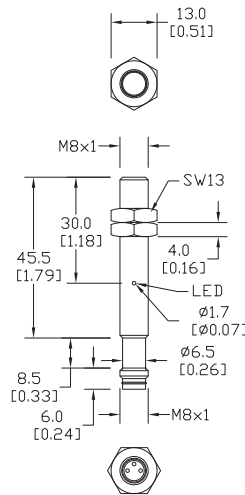
**Figure 5**



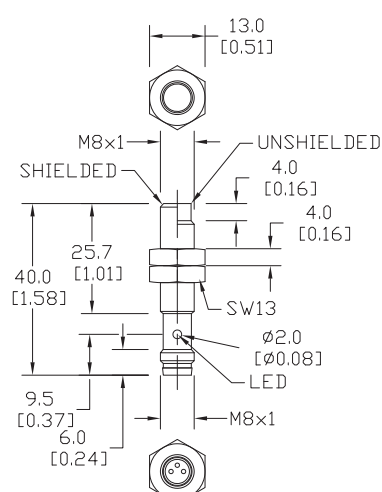
**Figure 2**



**Figure 4**



**Figure 6**



# AM Series Inductive Proximity Sensors



## M12 (12 mm) metal – DC

- 26 standard length models available
- 8 short body length models available
- 2-wire and 3-wire models
- Metal housing
- Axial cable or M12 quick-disconnect models
- Complete overload protection
- IP67 rated
- LED status indicator
- DC powered
- Several sensing distances available
- Lifetime warranty



**AM1 Series Standard Length M12 DC Inductive Prox Selection Chart**

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
AM1-AN-1A	<--->	0 to 2 mm (0-0.079 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AP-1A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AO-1A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AM1-AN-1H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AP-1H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AO-1H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AM1-AN-2A	<--->	0 to 4 mm (0-0.157 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AP-2A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AO-2A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AM1-AN-2H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AP-2H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AO-2H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
<b>Extended Distance</b>								
AM1-AN-3A	<--->	0 to 4 mm (0-0.157 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AP-3A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AO-3A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AM1-AN-3H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AP-3H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AO-3H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AM1-AN-4A	<--->	0 to 8 mm (0-0.314 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AP-4A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AM1-AO-4A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AM1-AN-4H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AP-4H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AM1-AO-4H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
<b>Triple Distance</b>								
AM1-AN-5H	<--->	6 mm (0.236 in)	Shielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 3
AM1-AP-5H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 3

**AM6 Series Short Body M12 DC Inductive Prox Selection Chart**

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Extended Distance</b>								
AM6-AN-3A	<--->	0 to 4 mm (0-0.157 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 4
AM6-AP-3A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 4
AM6-AN-3H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 5
AM6-AP-3H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 5
AM6-AN-4A	<--->	0 to 8 mm (0-0.314 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 4
AM6-AP-4A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 4
AM6-AN-4H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 5
AM6-AP-4H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 5

# AM Series Inductive Proximity Sensors

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

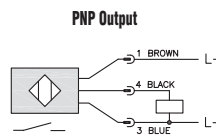
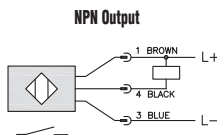
Product Index

Part # Index

AM Series Specifications					
Mounting Type	Standard Distance Models		Extended Distance Models		Triple Distance Models
	Shielded	Unshielded	Shielded	Unshielded	Shielded
Nominal Sensing Distance	2 mm (0.079 in)	4 mm (0.157 in)	4 mm (0.157 in)	8 mm (0.315 in)	6 mm (0.236 in)
Operating Distance	N/A				
Material Correction Factors	See Material Influence table #1 later in this section			See Material Influence table #2 later in this section	
Output Type	NPN or PNP/N.O. only/3-wire				
Operating Voltage	10 to 30 VDC				
No-load Supply Current	≤20mA		≤10mA		
Operating (Load) Current	3-wire: ≤200mA / 2-wire: 3-100mA		3-wire: ≤200mA / 2-wire: 3-100mA		≤200mA
Off-state (Leakage) Current	3-wire: ≤10µA / 2-wire: ≤0.8mA		3-wire: ≤120µA / 2-wire: ≤0.8mA		≤100µA
Voltage Drop	3-wire: 1.2 volts max. / 2-wire: 2.8 volts max.				≤2.0 V
Switching Frequency	3-wire: 2kHz / 2 wire: 1.5 kHz		3-wire: 2kHz / 2 wire: 1 kHz		800 Hz
Differential Travel (% of Nominal Distance)	2 to 10%		1 to 20		
Repeat Accuracy	≤2%		≤5%		
Ripple	≤10%			≤20%	
Time Delay Before Availability (tv)	3-wire: 100ms / 2 wire: 50ms		100 ms		
Reverse Polarity Protection	Yes				
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)				
Operating Temperature	-25° to +70°C (-13° to 158°F)				
Protection Degree (DIN 40050)	IEC IP67				
Indication/Switch Status	Yellow (output energized)				
Housing Material	Nickel-plated brass		Chrome-plated brass		
Sensing Face Material	Polybutylene Terephthalate (PBT)				
Shock/Vibration	See terminology section				
Tightening Torque	10 Nm (7.37 lb-ft)				
Weight (cable/M12 connector)	70 g (2.47 oz)/30 g (1.06 oz)		96 g (3.39 oz)/34 g (1.2 oz)		
Connection	2 meter PVC axial cable / M12 connector				
Agency Approvals	N/A			UL file E328811	

## Wiring diagrams

Diagram 1



Connector

M12 connector

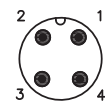
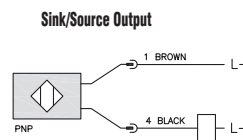
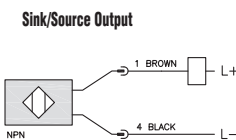


Diagram 2



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

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

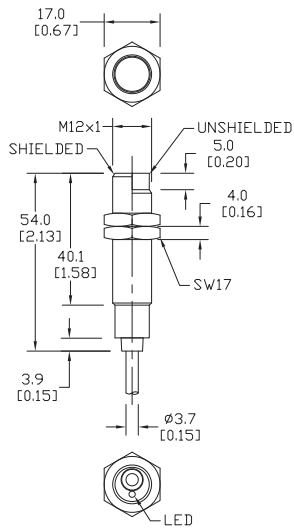
Note: Negative (-) lead is black on M12 quick disconnect cables and Blue on axial cables.

# AM Series Inductive Proximity Sensors

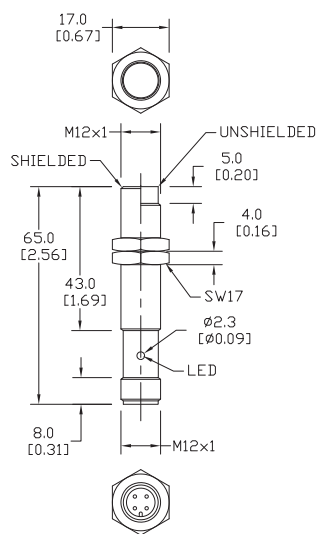
## Dimensions

mm [inches]

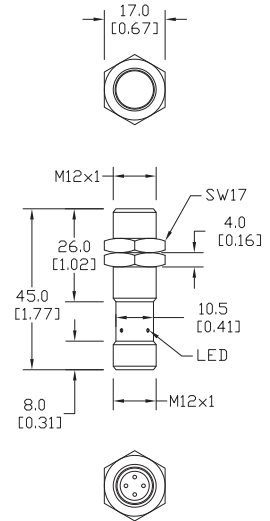
**Figure 1**



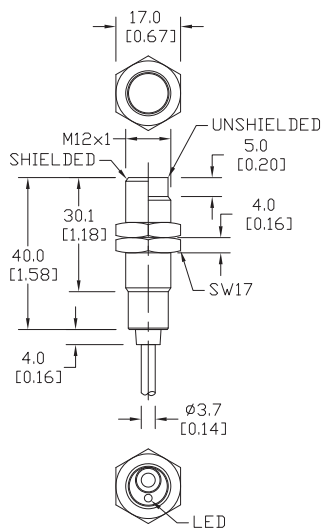
**Figure 2**



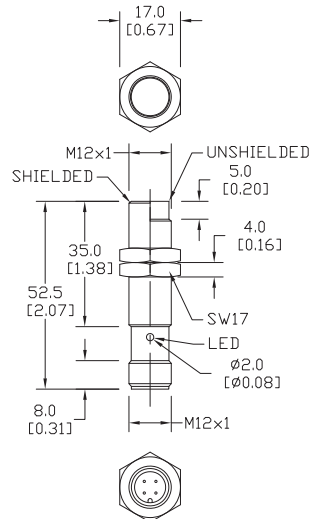
**Figure 3**



**Figure 4**



**Figure 5**



# AK Series Inductive Proximity Sensors

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

Product Index

Part # Index



## M18 (18 mm) metal – DC

- 24 models available
- Standard and extended distance models available
- 2-wire and 3-wire models
- Axial cable or M12 quick-disconnect models available
- Complete overload protection
- IP67 rated
- LED status indicators are visible 360° around the cylinder
- Lifetime warranty



AK Series M18 DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
AK1-AN-1A	<--->	5 mm (0.197 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-1A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-1A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-1H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-1H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-1H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AK1-AN-2A	<--->	8 mm (0.315 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-2A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-2A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-2H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-2H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-2H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
<b>Extended Distance</b>								
AK1-AN-3A	<--->	8 mm (0.315 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-3A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-3A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-3H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-3H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-3H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AK1-AN-4A	<--->	12 mm (0.472 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-4A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-4A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-4H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-4H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-4H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2

## Dimensions

mm [inches]

Figure 1

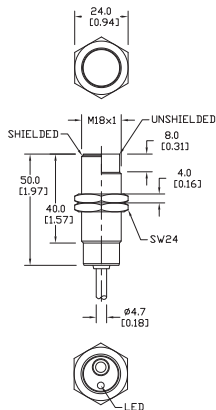
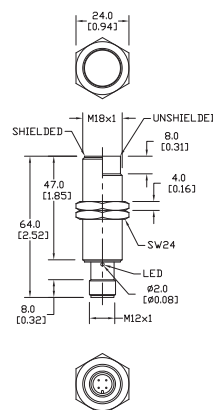


Figure 2



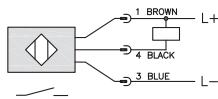
# AK Series Inductive Proximity Sensors

AK Series Specifications				
Mounting Type	Standard Distance		Extended Distance	
	Shielded	Unshielded	Shielded	Unshielded
Nominal Sensing Distance	5 mm (0.197 in)	8 mm (0.315 in)	8 mm (0.315 in)	12 mm (0.472 in)
Operating Distance	N/A			
Material Influence Factors	See Material Influence table #1 later in this section			
Output Type	3-wire: NPN or PNP/N.O. (normally open) / 2-wire: sink/source, N.O. only			
Operating Voltage	10 to 30 VDC			
No-load Supply Current	≤ 20 mA for 3 mins			
Operating (Load) Current	3-wire: ≤400mA / 2-wire: 3-100mA			
Off-state (Leakage) Current	3-wire: ≤10µA / 2-wire: ≤0.8mA max			
Voltage Drop	3-wire: 1 volt max. / 2-wire: ≤2.8V max.			
Switching Frequency	600 Hz		300 Hz	
Differential Travel (% of Nominal Distance)	2 to ≤10%		2 to ≤15%	
Repeat Accuracy	≤2%		≤5%	
Ripple	≤10%			
Time Delay Before Availability (tv)	3-wire: 100ms / 2-wire: 50ms			
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature	-25° to +70°C (-13° to 158°F)			
Protection Degree (DIN 40050)	IEC IP67			
Indication/Switch Status	Yellow (N.O. output energized)			
Housing Material	Nickel-plated brass			
Sensing Face Material	Polybutylene Terephthalate (PBT)			
Shock/Vibration	See terminology section.			
Tightening Torque	25 Nm (18.44 lbs-ft.)			
Weight	A type (w/ cable): 130 g (4.59 oz)    H type: 55 g (1.94 oz)			
Connection	2 meter PVC axial cable / M12 connector			
Agency Approvals	N/A			

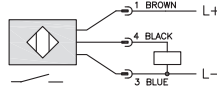
## Wiring diagrams

Diagram 1

NPN Output



PNP Output



Connector

M12 connector

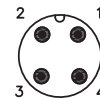
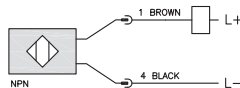


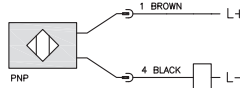
Diagram 2

Sink/Source Output



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

Sink/Source Output



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

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



# AT Series Inductive Proximity Sensors

## M30 (30 mm) metal – DC



- 24 models available
- Standard and extended distance models available
- 2-wire and 3-wire models
- Axial cable or M12 quick-disconnect models
- LED status indicators are visible 360° around the cylinder
- Complete overload protection
- IP67 rated
- Lifetime warranty

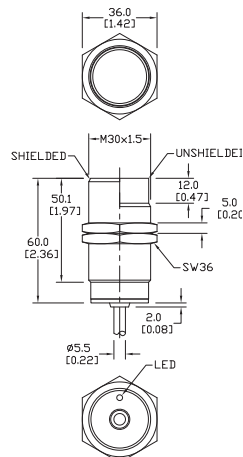
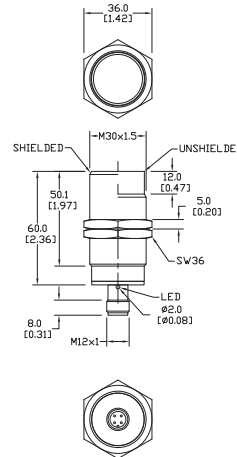


### AT Series M30 DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
AT1-AN-1A	<--->	10 mm (0.394 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AP-1A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AO-1A	<--->				Sink/source	2m (6.5') axial cable	Diagram 2	Figure 1
AT1-AN-1H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AP-1H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AO-1H	<--->				Sink/source	M12 (12mm) connector	Diagram 2	Figure 2
AT1-AN-2A	<--->	15 mm (0.591 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AP-2A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AO-2A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AT1-AN-2H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AP-2H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AO-2H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
<b>Extended Distance</b>								
AT1-AN-3A	<--->	15 mm (0.591 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AP-3A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AO-3A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AT1-AN-3H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AP-3H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AO-3H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AT1-AN-4A	<--->	20 mm (0.787 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AP-4A	<--->				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AT1-AO-4A	<--->				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AT1-AN-4H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AP-4H	<--->				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AT1-AO-4H	<--->				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2

## Dimensions

mm[inches]

**Figure 1**

**Figure 2**


# AT Series Inductive Proximity Sensors

AT Series Specifications				
Mounting Type	Standard Distance Models		Extended Distance Models	
	Shielded	Unshielded	Shielded	Unshielded
Nominal Sensing Distance	10 mm (0.394 in)	15 mm (0.591 in)	15 mm (0.591 in)	20 mm (0.787 in)
Operating Distance	N/A			
Material Correction Factors	See Material Influence table #1 later in this section			
Output Type	Three wire: NPN or PNP/N.O. (normally open) / Two wire: sink/source, N.O. only			
Operating Voltage	10 to 30 VDC			
No-load Supply Current	≤ 20 mA for 3 mins			
Operating (Load) Current	3 wire: ≤400mA / 2-wire: 3-100mA		2-wire and 3-wire: ≤400mA	
Off-state (Leakage) Current	3-wire: ≤10µA / 2-wire: ≤0.8mA max.		3-wire ≤8µA / 2-wire: ≤0.8mA max.	
Voltage Drop	3-wire: ≤1 volt max. / 2-wire: ≤2.8V≤10%		3-wire: ≤1 volt max. / 2-wire: ≤2.8V	
Switching Frequency	3-wire: 200Hz / 2-wire: 150Hz		2-and 3-wire:150Hz	
Differential Travel	2 to 10%		2 to 15%	
Repeat Accuracy	3-wire: 2% / 2-wire: 5%		2-wire and 3-wire: 5%	
Ripple	≤10%			
Time Delay Before Availability (tv)	3-wire: 100ms / 2-wire: 50ms		3-wire:100ms / 2-wire: 50ms	
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature	-25° to + 70°C (-13° to 158°F); drift: 10% Sr			
Protection Degree (DIN 40050)	IEC IP67			
Indication/Switch Status	Yellow (N.O. output energized)			
Housing Material	Nickel-plated brass			
Sensing Face Material	Polybutylene Terephthalate (PBT)			
Shock/Vibration	See terminology section.			
Tightening Torque	50 Nm (36.88 lbs-ft.)			
Weight	A type (w/ cable): 180 g (6.35 oz) H type: 110 g (3.88 oz)			
Connection	2 meter axial cable or M12 connector			
Agency Approvals	N/A			

## Wiring diagrams

## Connector

M12 connector

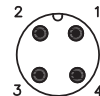
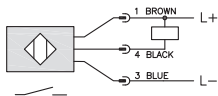


Diagram 1

NPN Output



PNP Output

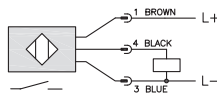
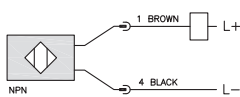
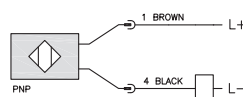


Diagram 2

Sink/Source Output



Sink/Source Output



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

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

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

# PB Series Inductive Proximity Sensors

## Nickel-plated Brass - DC



PBT-AN-1H PBT-AN-2H

- Low cost/high performance
- Twelve models available
- IP67 rated
- LED status indicators
- M12 quick-disconnect; purchase cable separately
- Lifetime warranty

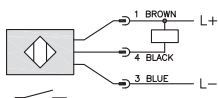


Basic Series Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>M12 Models</b>								
PBM-AN-1H	<-->	2 mm (0.079 in)	Shielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 1
PBM-AP-1H	<-->				PNP	M12 (12 mm) connector	Diagram 2	
PBM-AN-2H	<-->	4 mm (0.157 in)	Unshielded		NPN	M12 (12 mm) connector	Diagram 1	
PBM-AP-2H	<-->				PNP	M12 (12 mm) connector	Diagram 2	
<b>M18 Models</b>								
PBK-AN-1H	<-->	5 mm (0.197 in)	Shielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 2
PBK-AP-1H	<-->				PNP	M12 (12 mm) connector	Diagram 2	
PBK-AN-2H	<-->	8 mm (0.315 in)	Unshielded		NPN	M12 (12 mm) connector	Diagram 1	
PBK-AP-2H	<-->				PNP	M12 (12 mm) connector	Diagram 2	
<b>M30 Models</b>								
PBT-AN-1H	<-->	10 mm (0.394 in)	Shielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 3
PBT-AP-1H	<-->				PNP	M12 (12 mm) connector	Diagram 2	
PBT-AN-2H	<-->	15 mm (0.590 in)	Unshielded		NPN	M12 (12 mm) connector	Diagram 1	
PBT-AP-2H	<-->				PNP	M12 (12 mm) connector	Diagram 2	

## Wiring diagrams

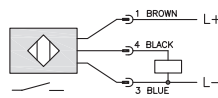
### Diagram 1

#### NPN Output



### Diagram 2

#### PNP Output



### Connector

#### M12 connector



# PB Series Inductive Proximity Sensors

PB Series Specifications	M12 Models		M18 Models		M30 Models	
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	2 mm (0.079 in)	4 mm (0.157 in)	5 mm (0.197 in)	8 mm (0.315 in)	10 mm (0.394 in)	15 mm (0.590 in)
<b>Operating Distance</b>	N/A					
<b>Material Correction Factors</b>	See Material Influence table #2 later in this section.					
<b>Output Type</b>	NPN or PNP, N.O. only					
<b>Operating Voltage</b>	15 to 30 VDC					
<b>No-load Supply Current</b>	<15 mA					
<b>Operating (Load) Current</b>	100 mA					
<b>Off-state (Leakage) Current</b>	<0.1 mA					
<b>Voltage Drop</b>	<2.5 V					
<b>Switching Frequency</b>	800Hz		400Hz	300Hz		200Hz
<b>Differential Travel (% of Nominal Distance)</b>	N/A					
<b>Repeat Accuracy</b>	N/A					
<b>Ripple</b>	N/A					
<b>Time Delay Before Availability (tv)</b>	N/A					
<b>Reverse Polarity Protection</b>	Yes					
<b>Short-circuit Protection</b>	Yes, pulsed					
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)					
<b>Protection Degree (DIN 40050)</b>	IEC IP67					
<b>Indication/Switch Status</b>	Yellow (output energized)					
<b>Housing Material</b>	Housing: brass, nickel-plated; Lock nuts: brass					
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)					
<b>Shock/Vibration</b>	See terminology section					
<b>Tightening Torque</b>	7.0 Nm (5.16 lb-ft)		35.0 Nm (25.8 lb-ft)		50.0 Nm (36.8 lb-ft)	
<b>Weight</b>	1.70 g (0.06 oz)		2.83 g (0.10 oz)		8.50 g (0.30 oz)	5.70 g (0.20 oz)
<b>Connectors</b>	M12 connector. 2 lock nuts included					
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS					

## Dimensions

mm [inches]

Figure 1

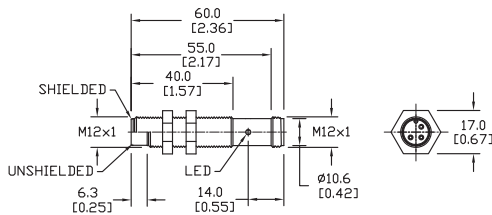


Figure 2

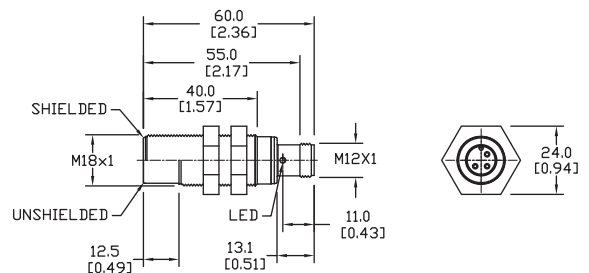
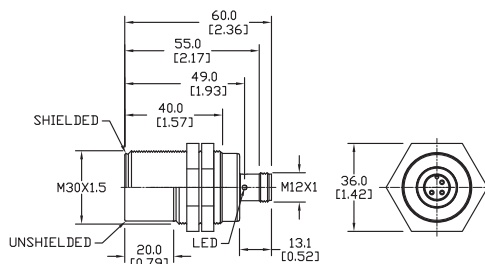


Figure 3



# PEW Series Inductive Proximity Sensors

## M8 (8 mm) stainless steel - DC



PEW-AP-1H

- Four flush-mountable models available
- Low cost/high performance
- Metal sensing face for extreme environments
- LED status indicators are visible at a wide angle.
- Sensing face withstands up to 1450 psi.
- M8 or M12 quick-disconnect models
- 2 M8 stainless steel lock nuts included
- Purchase cable separately
- Lifetime warranty



PEW Series DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Extended Distance</b>								
PEW-AN-1F	<-->	2 mm (0.079 in)	Shielded	N.O.	NPN	M8 (8 mm) quick disconnect	Diagram 1	Figure 1
PEW-AP-1F	<-->	2 mm (0.079 in)	Shielded	N.O.	PNP	M8 (8 mm) quick disconnect	Diagram 2	Figure 1
PEW-AN-1H	<-->	2 mm (0.079 in)	Shielded	N.O.	NPN	M12 (12 mm) quick disconnect	Diagram 1	Figure 2
PEW-AP-1H	<-->	2 mm (0.079 in)	Shielded	N.O.	PNP	M12 (12 mm) quick disconnect	Diagram 2	Figure 2

## Wiring diagrams

Diagram 1

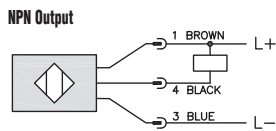
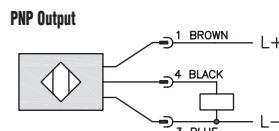
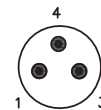


Diagram 2

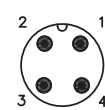


## Connectors

M8 connector



M12 connector



## Dimensions mm[inches]

Figure 1

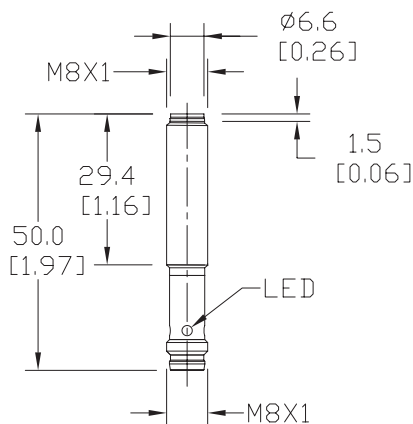
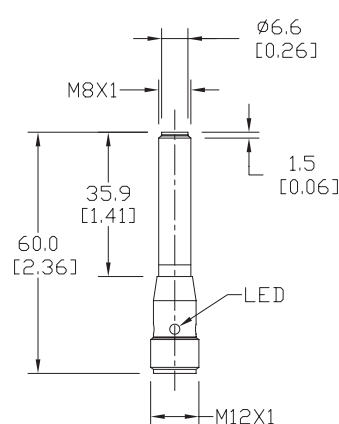


Figure 2



# PEW Series Inductive Proximity Sensors

Specifications	PEW-AN-1F	PEW-AP-1F	PEW-AN-1H	PEW-AP-1H
<b>Mounting Type</b>	Shielded			
<b>Nominal Sensing Distance</b>	2 mm (0.079 in) ± 10%			
<b>Operating Distance</b>	0 to 1.6 mm (0.06 in)			
<b>Material Correction Factors</b>	See Material Influence table #2 later in this section.			
<b>Output Type</b>	NPN, N.O. only	PNP, N.O. only	NPN, N.O. only	PNP, N.O. only
<b>Operating Voltage</b>	10 to 36 VDC			
<b>No-load Supply Current</b>	< 20 mA			
<b>Operating (Load) Current</b>	100 mA			
<b>Off-state (Leakage) Current</b>	< 0.1 mA			
<b>Voltage Drop</b>	< 2.5 V			
<b>Switching Frequency</b>	100 Hz			
<b>Differential Travel (% of nominal Distance)</b>	1 to 20% of Sr		1 to 15% of Sr	
<b>Repeat Accuracy</b>	N/A			
<b>Ripple</b>	N/A			
<b>Reverse Polarity Protection</b>	Yes			
<b>Short-Circuit Protection</b>	Yes (non-latching)			
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)			
<b>Protection Degree (DIN 40050)</b>	IEC IP67		IEC IP67/68	
<b>Indication/Switch Status</b>	4 Yellow			
<b>Housing Material</b>	316L stainless steel			
<b>Sensing Face Material</b>	316L stainless steel			
<b>Shock/Vibration</b>	See terminology section			
<b>Tightening Torque</b>	3.5 Nm (2.58 lb-ft)			
<b>Weight</b>	18 g (0.63 oz)		20 g (0.71 oz)	
<b>Connection</b>	M8 plug with gold-plated pins		M12 plug with gold-plated pins	
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS			

# PMW Series Inductive Proximity Sensors

## M12 (12 mm) stainless steel – DC



- Twelve models available
- Low cost/high performance
- LED status indicators are visible at a wide angle.
- Triple distance models (shown) sense all metals at virtually the same distance, have one-piece stainless design, and are fully submersible up to 290 psi.
- Axial cable or M12 quick-disconnect models
- Purchase cable separately (for quick-disconnect models).
- Lifetime warranty

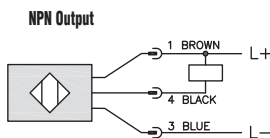


### PMW Series M12 DC Inductive Prox Selection Chart

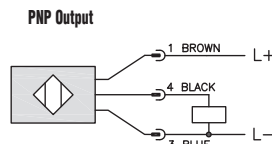
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
<b>PMW-0N-1H</b>	<--->	2 mm (0.079 in)	Shielded	N.O./N.C	NPN	M12 (12 mm) connector	Diagram 3	Figure 1
<b>PMW-0P-1H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 4	Figure 1
<b>PMW-AN-1H</b>	<--->	3 mm (0.118 in)		N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 4
<b>PMW-AP-1H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 4
<b>Extended Distance</b>								
<b>PMW-0N-2H</b>	<--->	4 mm (0.157 in)	Unshielded	N.O./N.C	NPN	M12 (12 mm) connector	Diagram 3	Figure 1
<b>PMW-0P-2H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 4	Figure 1
<b>PMW-AN-2H</b>	<--->	6 mm (0.236 in)		N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 5
<b>PMW-AP-2H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 5
<b>Triple Distance</b>								
<b>PMW-AN-5A</b>	<--->	6 mm (0.236 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 2
<b>PMW-AP-5A</b>	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 2
<b>PMW-AN-5H</b>	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 3
<b>PMW-AP-5H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 3

## Wiring diagrams

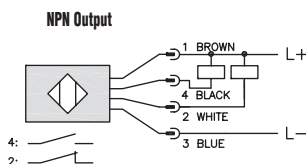
### Diagram 1



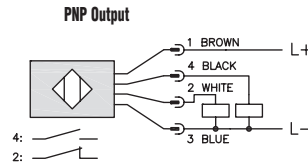
### Diagram 2



### Diagram 3

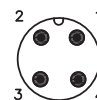


### Diagram 4



## Connector

### M12 connector



**Note: Pin 2 is not present on some models.**

# PMW Series Inductive Proximity Sensors

Specifications	Standard Distance Models	Extended Distance Models	Triple Distance Models	PMW-A*-1H	PMW-A*-2H
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	2 mm (0.079 in) <sup>1</sup>	4 mm (0.157 in) <sup>1</sup>	6 mm (0.236 in)	3 mm (0.118 in)	6 mm (0.236 in)
<b>Operating Distance</b>	N/A			0 to 2.4 mm (0.09 in)	0 to 4.9 mm (0.19 in)
<b>Material Correction Factors</b>	See Material Influence Table 2 later in this section.				
<b>Output Type</b>	NPN or PNP and N.O./N.C. complementary		NPN or PNP, N.O. only		NPN or PNP, N.O. only
<b>Operating Voltage</b>	10 to 30 VDC			10 to 36 VDC	
<b>No-load Supply Current</b>	≤15 mA		≤10 mA	≤20 mA	≤25 mA
<b>Operating (Load) Current</b>	≤100 mA		≤200 mA	≤100 mA	≤100 mA
<b>Off-state (Leakage) Current</b>	≤10μA		≤100μA		
<b>Voltage Drop</b>	≤1.2 V		≤2.0 V	≤2.5 V	
<b>Switching Frequency</b>	2k Hz		400 Hz	100 Hz	500 Hz
<b>Differential Travel (% of Nominal Distance)</b>	2 to 10%		≤15%	≤20%	
<b>Repeat Accuracy</b>	≤5%			Not available	
<b>Ripple</b>	≤10%		≤20%	Not available	
<b>Time Delay Before Availability (tv)</b>	100 ms		≤10 ms	negligible	
<b>Reverse Polarity Protection</b>				Yes	
<b>Short-circuit Protection</b>				Yes	
<b>Operating Temperature / Temperature Drift</b>	-25° to 70°C (-13° to 158°F) / 10%Sr			-25° to 70°C (-13° to 158°F) / 20%Sr	0° to 100°C (32° to 212°F)
<b>Protection Degree (DIN 40050)</b>	IEC IP67/68		IEC IP67 <sup>2</sup> (connector/IP68 (cable))	IEC IP67/68	IEC IP65/67/68/69K
<b>Indication/Switch Status</b>	Yellow (N.O. output energized)				
<b>Housing Material</b>	Stainless steel		Stainless steel	Stainless steel. 2 lock nuts included.	
<b>Sensing Face Material</b>	PPS		Stainless steel	Stainless steel	
<b>Shock/Vibration</b>	See terminology section				
<b>Tightening Torque</b>	10 Nm (7.25 lb-in)			20 Nm (14.5 lb-in)	
<b>Weight</b>	35 g (1.23 oz)		89 g (3.14 oz)	29 g (1.023 oz.)	30 g (1.058 oz.)
<b>Connections</b>	M12 connector with gold-plated contacts				
<b>Agency Approvals</b>	-		UL file E328811, RoHS	cULus file E328811, CE, RoHS	

Notes: <sup>1</sup>With 12 x 12mm FE360 target <sup>2</sup>Fully submersible to 290 psi.

## Dimensions mm[inches]

Figure 1

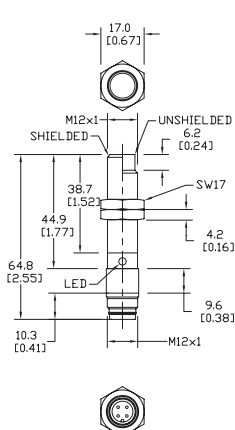


Figure 2

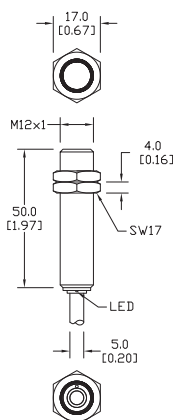


Figure 3

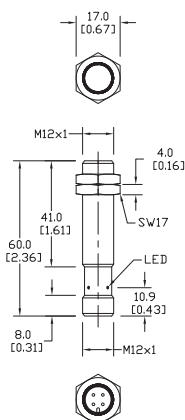


Figure 4

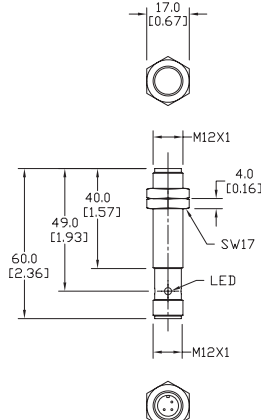
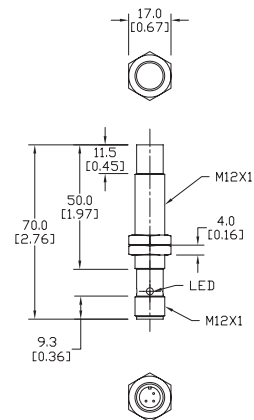


Figure 5



Note: Pin 2 is not present on some models.



# PKW Series Inductive Proximity Sensors



## M18 (18 mm) stainless steel - DC

- Twelve models available
- Low cost/high performance
- LED status indicators are visible at a wide angle.
- Triple distance models (shown) sense all metals at virtually the same distance, have one-piece stainless design, and are fully submersible up to 290 psi.
- Axial cable or M12 quick-disconnect models
- Purchase cable separately (for quick-disconnect models).
- Lifetime warranty



PKW Series M18 DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
PKW-0N-1H	<--->	5 mm (0.197 in)	Shielded	N.O./N.C	NPN	M12 (12 mm) connector	Diagram 3	Figure 1
PKW-0P-1H	<--->				PNP	M12 (12 mm) connector	Diagram 4	Figure 1
PKW-AN-1H	<--->	5 mm (0.197 in)	Shielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 4
PKW-AP-1H	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 4
<b>Extended Distance</b>								
PKW-0N-2H	<--->	8 mm (0.315 in)	Unshielded	N.O./N.C	NPN	M12 (12 mm) connector	Diagram 3	Figure 1
PKW-0P-2H	<--->				PNP	M12 (12 mm) connector	Diagram 4	Figure 1
PKW-AN-2H	<--->	12 mm (0.472 in)	Unshielded	N.O.	NPN	M12 (12 mm) connector	Diagram 1	Figure 4
PKW-AP-2H	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 4
<b>Triple Distance</b>								
PKW-AN-5A	<--->	10 mm (0.394 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 2
PKW-AP-5A	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 2
PKW-AN-5H	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 3
PKW-AP-5H	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 3

## Wiring diagrams

Diagram 1

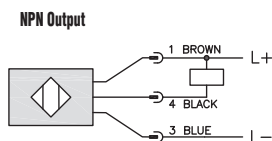


Diagram 2

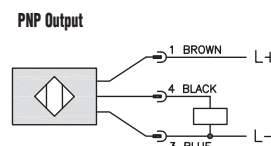


Diagram 3

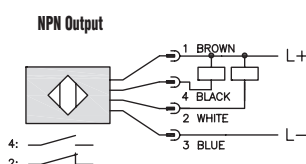
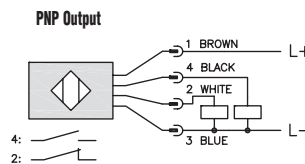
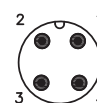


Diagram 4



## Connector

### M12 connector



Note: Pin 2 is not present on some models.

# PKW Series Inductive Proximity Sensors

Specifications	Standard Distance Models	Extended Distance Models	Triple Distance Models	PKW-A*-1H	PKW-A*-2H
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	5 mm (0.197 in) <sup>1</sup>	8 mm (0.315 in) <sup>1</sup>	10 mm (0.394 in)	5 mm (0.197 in)	12 mm (0.472 in)
<b>Operating Distance</b>	N/A			0 to 4 mm	0 to 9.7 mm (0.38in)
<b>Material Correction Factors</b>	See Material Influence Table 2 later in this section.				
<b>Output Type</b>	NPN or PNP and N.O./N.C. complementary		NPN or PNP, N.O. only		NPN or PNP, N.O. only
<b>Operating Voltage</b>	10 to 30 VDC			10 to 36 VDC	10 to 30 VDC
<b>No-load Supply Current</b>	15 mA		10 mA	20 mA	25 mA
<b>Operating (Load) Current</b>	≤400 mA		≤200 mA	100 mA	
<b>Off-state (Leakage) Current</b>	≤10μA		≤100μA	<0.1 mA	
<b>Voltage Drop</b>	≤0.8 V		≤2.0 V	<2.5 V	
<b>Switching Frequency</b>	1 kHz		200 Hz	100 Hz	500 Hz
<b>Differential Travel (% of Nominal Distance)</b>	2 to 10%		≤15%	≤20%	
<b>Repeat Accuracy</b>	≤5%		—	—	
<b>Ripple</b>	≤10%		≤20%	—	
<b>Time Delay Before Availability (tv)</b>	100 ms		≤10 ms	negligible	
<b>Reverse Polarity Protection</b>	Not available			Yes	
<b>Short-circuit Protection</b>	Not available			Yes (non-latching)	
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)				0° to 100°C (32° to 212°F)
<b>Protection Degree (DIN 40050)</b>	IEC IP67/68		IEC IP67 <sup>2</sup> , (connector) IP68 <sup>2</sup> (cable)	IEC IP67, IP68	IEC IP65/67/68/69K
<b>Indication/Switch Status</b>	Yellow (N.O. output energized)				
<b>Housing Material</b>	Stainless steel				
<b>Sensing Face Material</b>	Polyphenylene Sulfide (PPS)		Stainless steel	Stainless steel	Stainless steel
<b>Shock Resistance / Vibration Resistance</b>	See terminology section				
<b>Tightening Torque</b>	40 Nm (29 lb-ft)		50 Nm (37 lb-ft)	50 Nm (37 lb-ft)	
<b>Weight</b>	70 g (2.47 oz)		114 g (4.02 oz) /50 g (1.76 oz)	56 g (1.98 oz)	
<b>Connection</b>	M12 connector		2 m (6.5') axial cable or M12 connector	M12 connector. 2 lock nuts included	
<b>Agency Approvals</b>	N/A		UL file E328811, RoHS	cULus file E328811, CE, RoHS	

Notes: <sup>1</sup>With 12 x 12mm FE360 target <sup>2</sup>Fully submersible to 290 psi.

## Dimensions

mm [inches]

Figure 1

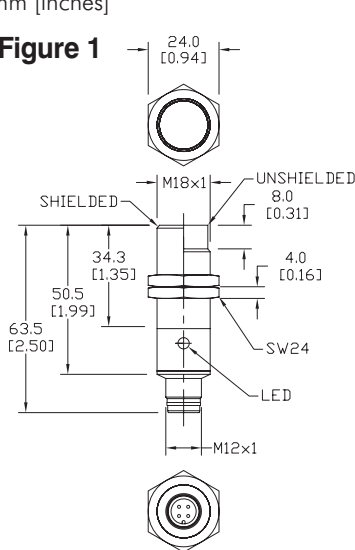


Figure 2

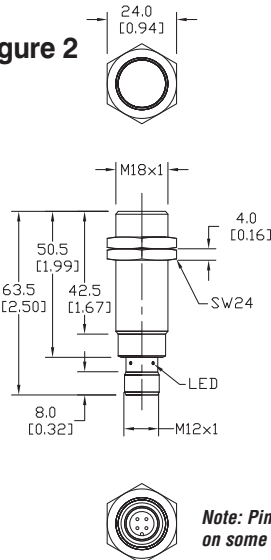


Figure 3

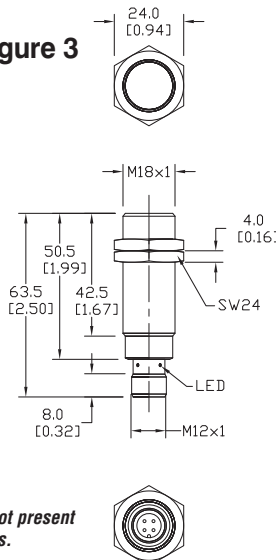
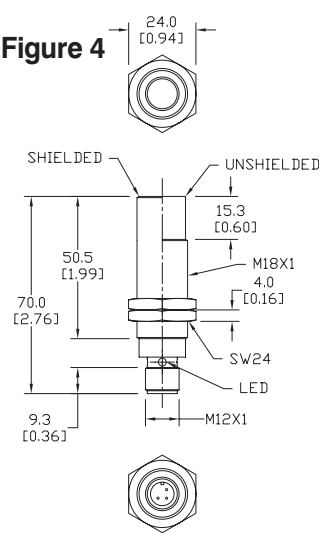


Figure 4



Note: Pin 2 is not present on some models.

# PTW Series Inductive Proximity Sensors



## M30 (30 mm) stainless steel - DC

- Eight low cost, high performance models available
- Metal sensing face for extreme environments
- LED status indicators are visible at a wide angle.
- Triple-sensing models sense all metals at the same distance.
- One-piece stainless design
- Axial cable or M12 quick-disconnect models
- Purchase cable separately (for quick-disconnect models).
- Lifetime warranty

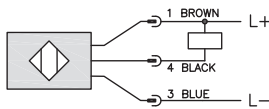


PTW Series M30 DC SS Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
<b>PTW-AN-1H</b>	<--->	10 mm (0.394 in)	Shielded	N.O	NPN	M12 (12 mm) connector	Diagram 1	Figure 1
<b>PTW-AP-1H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 1
<b>Extended Distance</b>								
<b>PTW-AN-2H</b>	<--->	25 mm (0.984 in)	Unshielded	N.O	NPN	M12 (12 mm) connector	Diagram 1	Figure 1
<b>PTW-AP-2H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 1
<b>Triple Distance</b>								
<b>PTW-AN-5A</b>	<--->	20 mm (0.787 in)	Shielded	N.O	NPN	2 m (6.5') axial cable	Diagram 1	Figure 2
<b>PTW-AP-5A</b>	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 2
<b>PTW-AN-5H</b>	<--->				NPN	M12 (12 mm) connector	Diagram 1	Figure 3
<b>PTW-AP-5H</b>	<--->				PNP	M12 (12 mm) connector	Diagram 2	Figure 3

## Wiring diagrams

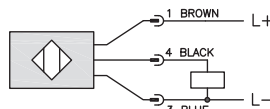
### Diagram 1

NPN Output



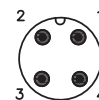
### Diagram 2

PNP Output



### Connector

M12 connector



**Note: Pin 2 is not present on some models.**

# PTW Series Inductive Proximity Sensors

Specifications	PTW-A*-1H	PTW-A*-2H	PTW-A*-5*
<b>Mounting Type</b>	Shielded	Unshielded	Shielded
<b>Nominal Distance</b>	10 mm (0.394 in)	25 mm (0.984 in)	20 mm (0.787 in)
<b>Operating Distance</b>	0 to 8.1 mm (0.32 in)	0 to 24.3 mm (0.96 in)	N/A
<b>Material Correction Factors</b>	See Material Influence Table 2 later in this section.		
<b>Output Type</b>	NPN or PNP, N.O. only		
<b>Operating Voltage</b>	10 to 36 VDC		10 to 30 VDC
<b>No-load Supply Current</b>	20 mA	25 mA	10 mA
<b>Operating (Load) Current</b>	100 mA		≤200 mA
<b>Off-state (Leakage) Current</b>	<1 mA		≤100 μA
<b>Voltage Drop</b>	<2.5V		≤2.0V
<b>Switching Frequency</b>	50 Hz	250 Hz	100 Hz
<b>Differential Travel (% of Nominal Distance)</b>	≤20%		≤15%
<b>Repeat Accuracy</b>	Not available		≤5%
<b>Ripple</b>	Not available		≤20%
<b>Time Delay Before Availability (tv)</b>	negligible	Not available	≤10 ms
<b>Reverse Polarity Protection</b>	Yes		
<b>Short-circuit Protection</b>	Yes (non-latching)		
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)	0° to 100°C (32° to 212°F)	-25° to 70°C (-13° to 158°F)
<b>Protection Degree (DIN 40050)</b>	IEC IP67, IP68 (coolant)	IEC IP65/67/68/69K	IEC IP67 <sup>1</sup> (connector) IP68 <sup>1</sup> (cable)
<b>Indication/Switch Status</b>	Yellow (4 x 90°)		Yellow (N.O. output energized)
<b>Housing Material</b>	Stainless steel		Stainless steel
<b>Sensing Face Material</b>	Stainless steel		Stainless steel
<b>Shock Resistance / Vibration Resistance</b>	See terminology section		
<b>Tightening Torque</b>	80 Nm (50 lb-in)		150 Nm (111 lb-in)
<b>Weight</b>	145 g (5.11 oz)		114 g (4.02 oz) / 50 g (1.76 oz)
<b>Connections</b>	M12 connector, 2 lock nuts included		2 m (6.5') axial cable or M12 connector
<b>Agency Approvals</b>	cULus, UL file E328811, CE, RoHS		UL file E328811, CE, RoHS

Note:<sup>1</sup> Fully submersible to 290 psi (20 bar).

## Dimensions

mm [inches]

Figure 1

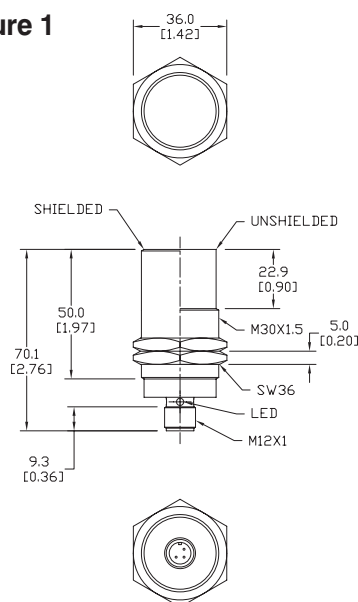


Figure 2

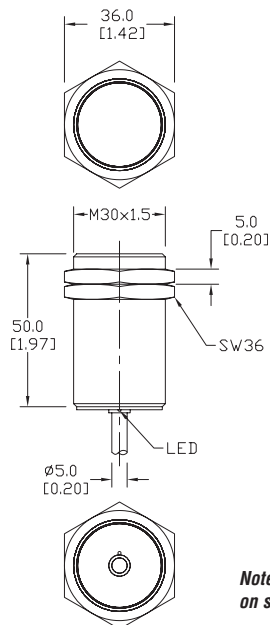
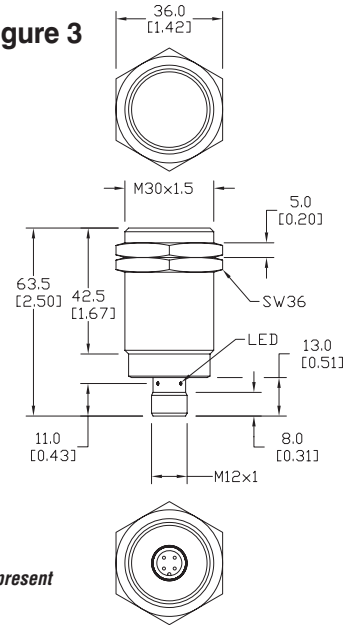


Figure 3



Note: Pin 2 is not present on some models.

# V Series AC Inductive Proximity Sensors

M12 (12 mm), M18 (18 mm), M30 (30 mm) metal – AC



- Multi-voltage: 20 to 253 VAC
- 2-wire
- Metal housing
- Axial cable with tang or quick-disconnect models; purchase cable separately
- IP67 rated
- LED status indicator
- Lifetime warranty

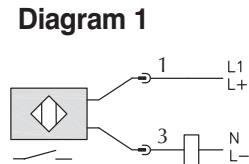


## V Series M12/18/30 AC Inductive Prox Selection Chart

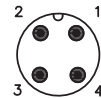
Part Number	Price	Sensing Range	Housing	Output State	Connection	Wiring	Dimensions
<b>M12 Models</b>							
VM1-A0-1B	<--->	2 mm (0.079 in) <sup>1</sup>	Shielded	N.O.	2 m (6.5') axial cable	Diagram 1	Figure 1
VM1-A0-2B	<--->	4 mm (0.157 in) <sup>1</sup>	Unshielded		2 m (6.5') axial cable	Diagram 1	Figure 1
VM1-A0-1H	<--->	2 mm (0.079 in) <sup>1</sup>	Shielded		M12 (12 mm)	Diagram 1	Figure 2
VM1-A0-2H	<--->	4 mm (0.157 in) <sup>1</sup>	Unshielded		M12 (12 mm)	Diagram 1	Figure 2
<b>M18 Models</b>							
VK1-A0-1B	<--->	5 mm (0.197 in) <sup>2</sup>	Shielded	N.O.	2 m (6.5') axial cable	Diagram 1	Figure 3
VK1-A0-2B	<--->	8 mm (0.315 in) <sup>2</sup>	Unshielded		2 m (6.5') axial cable	Diagram 1	Figure 3
VK1-A0-1H	<--->	5 mm (0.197 in) <sup>2</sup>	Shielded		M12 (12 mm)	Diagram 1	Figure 4
VK1-A0-2H	<--->	8 mm (0.315 in) <sup>2</sup>	Unshielded		M12 (12 mm)	Diagram 1	Figure 4
<b>M30 Models</b>							
VT1-A0-1B	<--->	10 mm (0.394 in) <sup>3</sup>	Shielded	N.O.	2 m (6.5') axial cable	Diagram 1	Figure 5
VT1-A0-2B	<--->	15 mm (0.591 in) <sup>3</sup>	Unshielded		2 m (6.5') axial cable	Diagram 1	Figure 5

<sup>1</sup>With 12x12 Fe360 target    <sup>2</sup>With 18x18 Fe360 target    <sup>3</sup>With 30x30 Fe360 target

## Wiring diagram



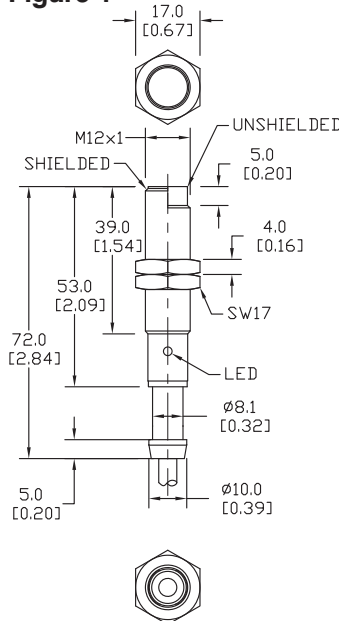
## Connector M12 connector



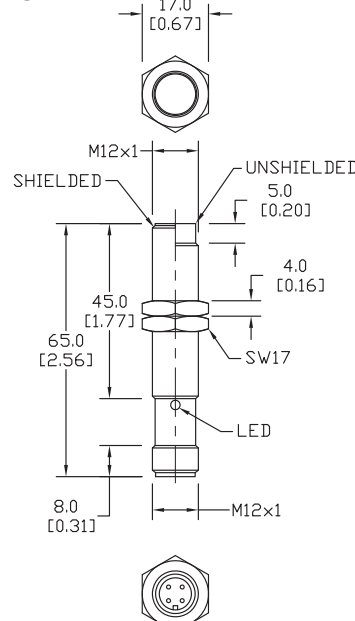
## Dimensions

mm [inches]

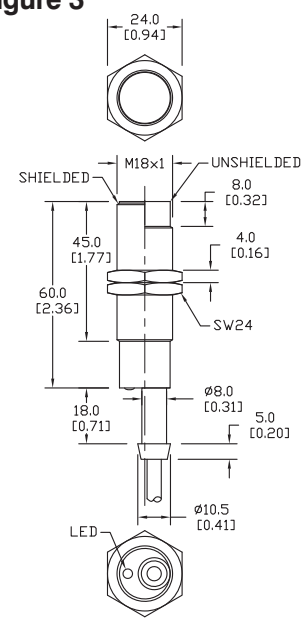
**Figure 1**



**Figure 2**



**Figure 3**



# V Series AC Inductive Proximity Sensors

Specifications	M12 Models		M18 Models		M30 Models	
	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	2	4	5	8	10	15
<b>Operating Distance</b>	N/A					
<b>Material Correction Factors</b>	See Material Influence table #1 later in this section.					
<b>Output Type</b>	Triac/N.O./2-wire					
<b>Operating Voltage</b>	20 to 253 VAC, 50/60 Hz					
<b>No-load Supply Current</b>	N/A					
<b>Operating (Load) Current</b>	5 to 300 mA (RMS)					
<b>Off-state Leakage Current</b>	1.0 mA max. (RMS)					
<b>Voltage Drop</b>						
<b>Switching Frequency</b>	25 Hz					
<b>Differential Travel (% of Nominal Distance)</b>	2 to 10%					
<b>Repeat Accuracy</b>	5%					
<b>Ripple</b>	N/A					
<b>Time Delay Before Availability (tv)</b>	200 ms					
<b>Reverse Polarity Protection</b>	N/A					
<b>Short Circuit Protection</b>	No					
<b>Operating Temperature</b>	-25° to +70°C (-13° to 158°F)					
<b>Protection Degree (DIN 40 050)</b>	IEC IP67					
<b>LED Indicators</b>	Yellow (output energized)					
<b>Housing Material</b>	Nickel-plated brass					
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)					
<b>Shock/Vibration</b>	See Terminology Section					
<b>Tightening Torque</b>	10 Nm (11 lb-ft)		25 Nm (18.44 lb-ft)		50 Nm (36.88 lb-ft)	
<b>Weight</b>	70 g (2.47 oz)		120 g (4.23 oz)		300 g (10.6 oz)	
<b>Connection</b>	2 m (6.5') axial cable or M12 (12 mm) connector					
<b>Agency Approvals</b>	CE, ULRecognized file E130644					
<i>Use only 2M or 7M cables for AC sensors with M12 connectors.</i>						

## Dimensions

mm [inches]

Figure 4

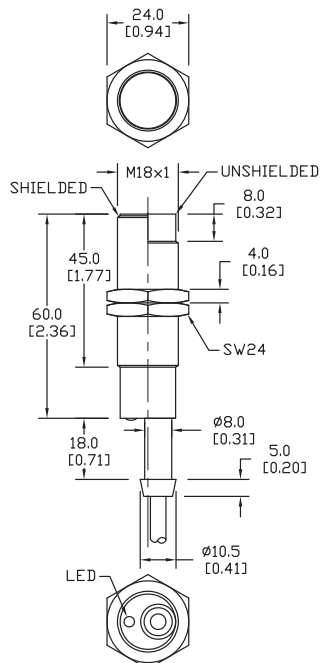
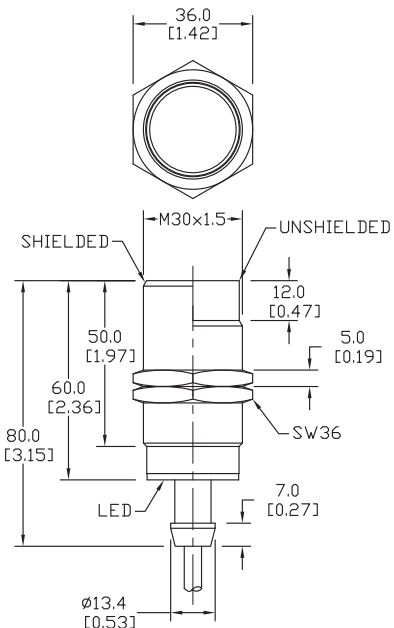


Figure 5



# CR5 Series Inductive Proximity Sensors

## 5 x 5 mm rectangular metal - DC



- Eight models available
- Compact 5 x 5 x 25 mm metal housing
- Axial cable or M8 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- Screws included
- Lifetime warranty



CR5 Series 5x5 Rectangular DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
CR5-AN-1A	<-->	0.8 mm (0.03 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
CR5-AP-1A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
CR5-AN-1F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 2
CR5-AP-1F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 2
<b>Extended Distance</b>								
CR5-AN-2A	<-->	1.5 mm (0.059 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
CR5-AP-2A	<-->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
CR5-AN-2F	<-->				NPN	M8 (8 mm) connector	Diagram 1	Figure 2
CR5-AP-2F	<-->				PNP	M8 (8 mm) connector	Diagram 2	Figure 2
Specifications			Standard Distance Models		Extended Distance Models			
Mounting Type			Shielded		Shielded			
Nominal Distance			0.8 mm (0.03 in)		1.5 mm (0.059 in)			
Operating Distance			N/A					
Material Correction Factors	See Material Influence table #1 later in this section							
Output Type	NPN or PNP/N.O. only/3-wire							
Operating Voltage	10 to 30 VDC							
No-load Supply Current	≤10 mA							
Operating (Load) Current	≤200 mA							
Off-state (Leakage) Current	≤10µA							
Voltage Drop	≤2.0 V							
Switching Frequency			5 kHz		3 kHz			
Differential Travel (% of Nominal Distance)	≤10%							
Repeat Accuracy	≤1.5%							
Ripple	≤20%							
Time Delay Before Availability (tv)	10 ms							
Reverse Polarity Protection	Yes							
Short Circuit Protection	Yes (switch auto-resets after overload is removed)							
Operating Temperature	-25° to +70°C (-13° to 158°F)							
Protection Degree (DIN 40050)	IEC IP67							
Indication/Switch Status	Yellow (output energized)							
Housing Material	Nickel-plated brass							
Sensing Face Material	Polyester							
Shock/Vibration	See Terminology Section							
Tightening Torque	1.5 Nm (1.1 lb-in)							
Weight			26 g (0.92 oz)		27 g (0.95 oz)			
Connection	2 m (6.5') axial cable or M8 (8 mm) connector							
Agency Approvals	UL file E328811							

## Dimensions

mm [inches]

Figure 1

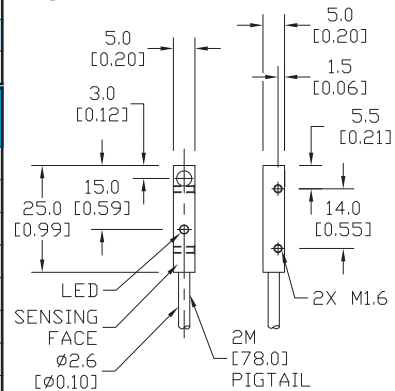
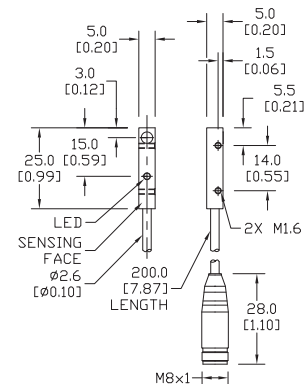


Figure 2



## Wiring diagrams

Diagram 1

NPN output

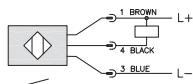
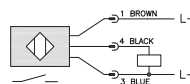


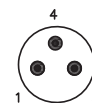
Diagram 2

PNP output



Connector

M8 connector



# CR8 Series Inductive Proximity Sensors



## 8 x 8 mm rectangular metal – DC

- 12 models available
- Compact 8 x 8 x 40 mm metal housing
- Axial cable or M8 quick-disconnect models; purchase cable separately
- Complete overload protection
- IP67 rated
- Screws included
- Lifetime warranty



CR8 Series 8x8 Rectangular DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard Distance</b>								
CR8-AN-1A	<--->	0 to 1.5 mm (0 to 0.059 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
CR8-AP-1A	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
CR8-AN-1F	<--->				NPN	M8 (8 mm) connector	Diagram 1	Figure 2
CR8-AP-1F	<--->				PNP	M8 (8 mm) connector	Diagram 2	Figure 2
<b>Extended Distance</b>								
CR8-AN-2A	<--->	0 to 2 mm (0 to 0.079 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
CR8-AP-2A	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
CR8-AN-2F	<--->				NPN	M8 (8 mm) connector	Diagram 1	Figure 2
CR8-AP-2F	<--->				PNP	M8 (8 mm) connector	Diagram 2	Figure 2
<b>Triple Distance</b>								
CR8-AN-3A	<--->	3 mm (0.118 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
CR8-AP-3A	<--->				PNP	2 m (6.5') axial cable	Diagram 2	Figure 1
CR8-AN-3F	<--->				NPN	M8 (8 mm) connector	Diagram 1	Figure 2
CR8-AP-3F	<--->				PNP	M8 (8 mm) connector	Diagram 2	Figure 2

## Wiring diagrams

Diagram 1

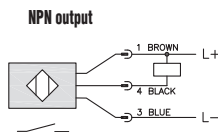
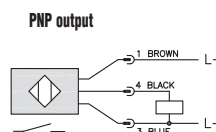
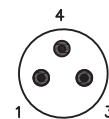


Diagram 2



Connector

M8 connector



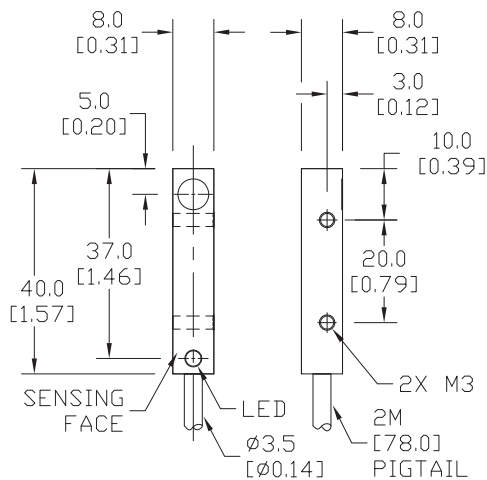
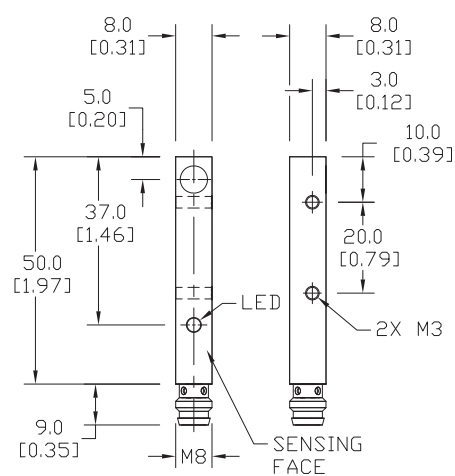


# CR8 Series Inductive Proximity Sensors

Specifications	Standard Distance Models	Extended Distance Models	Triple Distance Models
<b>Mounting Type</b>	Shielded	Shielded	Shielded
<b>Nominal Distance</b>	1.5 mm (0.059 in)	2 mm (0.079 in)	3 mm (0.118 in)
<b>Operating Distance</b>	N/A	N/A	N/A
<b>Material Correction Factors</b>	See Material Influence table #1 later in this section		See Material Influence table #2
<b>Output Type</b>	NPN or PNP/N.O. only/3-wire		
<b>Operating Voltage</b>	10 to 30 VDC		
<b>No-load Supply Current</b>	≤10 mA		
<b>Operating (Load) Current</b>	≤200 mA		
<b>Off-state (Leakage) Current</b>	≤10µA		
<b>Voltage Drop</b>	≤2.0 V		
<b>Switching Frequency</b>	1 kHz		
<b>Differential Travel (% of Nominal Distance)</b>	≤10%		
<b>Repeat Accuracy</b>	≤5%		
<b>Ripple</b>	≤20%		
<b>Time Delay Before Availability (tv)</b>	10 ms		50 ms
<b>Reverse Polarity Protection</b>	Yes		
<b>Short-Circuit Protection</b>	Yes (switch auto-resets after overload is removed)		
<b>Operating Temperature</b>	-25° to +70°C (-13° to 158°F)		
<b>Protection Degree (DIN 40050)</b>	IEC IP67		
<b>Indication/Switch Status</b>	Yellow (output energized)		
<b>Housing Material</b>	Nickel-plated brass		Chrome-plated brass
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)		
<b>Shock/Vibration</b>	See Terminology Section		
<b>Tightening Torque</b>	4 Nm (2.95 lb-ft)		
<b>Weight (cable/M8 connector)</b>	43 g (1.52 oz)/15 g (0.53 oz)		54 g (1.90 oz)/21 g (0.74 oz)
<b>Connection</b>	2 m (6.5') axial cable or M8 (8 mm) connector		
<b>Agency Approvals</b>	UL file E328811, CE		

## Dimensions

mm [inches]

**Figure 1**

**Figure 2**


# LF40 Series Inductive Proximity Sensors

40x40x66 mm rectangular plastic - DC



LF40-AP-2H

- Two shielded and two unshielded models available
- Sensing face has five selectable positions.
- IP67 rated
- LED power (green) and status (yellow) indicators are visible at a wide angle.
- Rotatable and locking M12 connector
- Single and complementary outputs available
- Purchase cable separately.
- Lifetime warranty



LF40 Series DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
LF40-AP-1H	<--->	20 mm (0.79 in)	Shielded	N.O.	PNP	M12 (12 mm) quick disconnect	Diagram 1	Figure 1
LF40-OP-1H	<--->	20 mm (0.79 in)	Shielded	N.O./N.C. Complementary	PNP	M12 (12 mm) quick disconnect	Diagram 2	Figure 1
LF40-AP-2H	<--->	35 mm (1.38 in)	Unshielded	N.O.	PNP	M12 (12 mm) quick disconnect	Diagram 1	Figure 1
LF40-OP-2H	<--->	35 mm (1.38 in)	Unshielded	N.O./N.C. Complementary	PNP	M12 (12 mm) quick disconnect	Diagram 2	Figure 1

NOTE: CLASS 2 POWER SUPPLY REQUIRED

## Wiring diagrams

Diagram 1

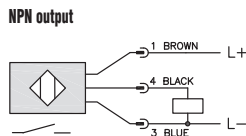
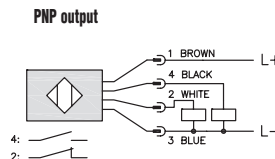
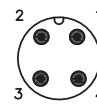


Diagram 2



Connector

M12 Connector



# LF40 Series Inductive Proximity Sensors

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

Product Index

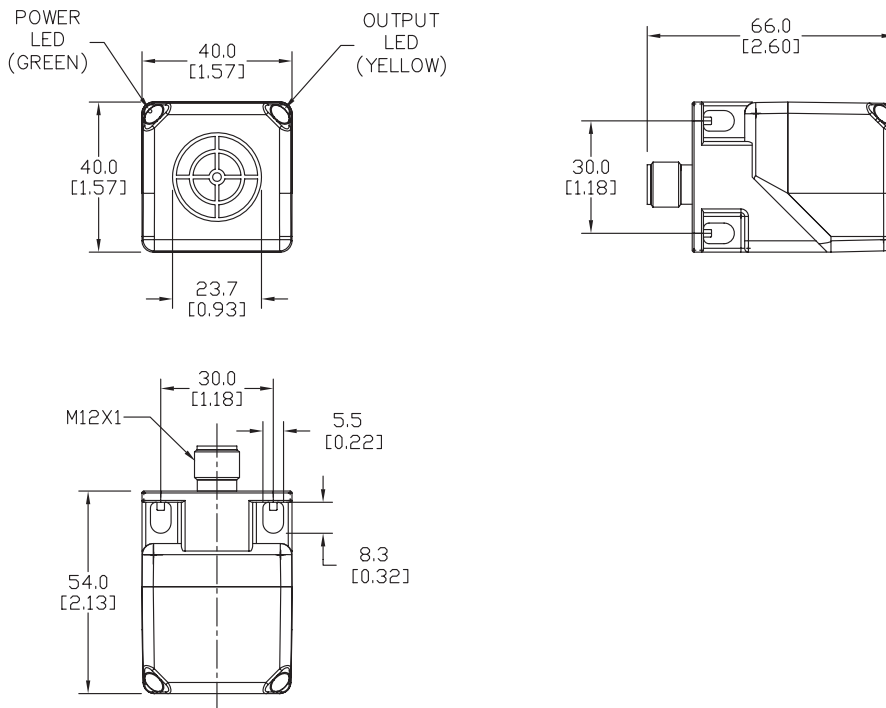
Part # Index

LF40 Series Specifications	LF40-AP-1H	LF40-AP-2H	LF40-OP-1H	LF40-OP-2H
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Unshielded
<b>Nominal Distance</b>	20 mm ± 10%	35 mm ± 10%	20 mm ± 10%	35 mm ± 10%
<b>Operating Distance</b>	0 to 16.2 mm (0 to 0.64 in)	0 to 28.3 mm (0 to 1.11 in)	0 to 16.2 mm (0 to 0.64 in)	0 to 28.3 mm (0 to 1.11 in)
<b>Material Correction Factors</b>	See Material Influence table #2 later in this section.			
<b>Output Type</b>	PNP, N.O. only		PNP, N.O. N.C. Complementary	
<b>Operating Voltage</b>	10 to 36 VDC			
<b>No-load Supply Current</b>	< 20 mA			
<b>Operating (Load) Current</b>	200 mA			
<b>Off-state (Leakage) Current</b>	< 0.1 mA			
<b>Voltage Drop</b>	< 2.5 V			
<b>Switching Frequency</b>	100 Hz	80 Hz	100 Hz	80 Hz
<b>Differential Travel (% of Nominal Distance)</b>	1 to 20 % of Sr			
<b>Repeat Accuracy</b>	N/A			
<b>Ripple</b>	N/A			
<b>Time Delay Before Availability (tv)</b>	N/A			
<b>Reverse Polarity Protection</b>	Yes			
<b>Short-Circuit Protection</b>	Yes (non-latching)			
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)			
<b>Protection Degree (DIN 40050)</b>	IEC IP67			
<b>Indication/Switch Status</b>	Power: Green    Switching status: Yellow			
<b>Housing Material</b>	PPE: diecast zinc nickel-plated			
<b>Sensing Face Material</b>	Polyamide (PA)			
<b>Shock Resistance / Vibration</b>	See terminology section			
<b>Tightening Torque</b>	N/A			
<b>Weight</b>	146 g (5.15 oz)	151 g (5.33 oz)	147 g (5.19 oz)	153 g (5.4 oz)
<b>Connection</b>	M12 quick disconnect			
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS			

## Dimensions

Figure 1

mm [inches]



# DR10 Series Inductive Proximity Sensors

## 10 x16 mm plastic –DC



- Eight models available
- Compact plastic housing
- Axial cable or M8 quick-disconnect models
- Complete overload protection
- IP67 rated
- Purchase cable separately
- Lifetime warranty



### DR10 Series Rectangular DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
DR10-AN-1A	<--->	3mm (0.118in)	Shielded	N.O.	NPN	2m (6.5') axial cable	Diagram 1	Figure 1
DR10-AP-1A	<--->				PNP	2m (6.5') axial cable	Diagram 2	Figure 1
DR10-AN-1F	<--->				NPN	M8 (8mm) connector	Diagram 1	Figure 2
DR10-AP-1F	<--->				PNP	M8 (8mm) connector	Diagram 2	Figure 2
DR10-AN-2A	<--->	6mm (0.236in)	Unshielded	N.O.	NPN	2m (6.5') axial cabl	Diagram 1	Figure 1
DR10-AP-2A	<--->				PNP	2m (6.5') axial cable	Diagram 2	Figure 1
DR10-AN-2F	<--->				NPN	M8 (8mm) connector	Diagram 1	Figure 2
DR10-AP-2F	<--->				PNP	M8 (8mm) connector	Diagram 2	Figure 2

### Specifications

<b>Mounting Type</b>	Shielded	Unshielded
<b>Nominal Distance</b>	3mm (0.118in)	6mm (0.236in)
<b>Operating Distance</b>	N/A	
<b>Material Correction Factors</b>	See Material Influence table #1	
<b>Output Type</b>	NPN or PNP/N.O. only/3-wire	
<b>Operating Voltage</b>	10-30VDC	
<b>No-load Supply Current</b>	≤10mA	
<b>Operating (Load) Current</b>	≤300mA	
<b>Off-state (Leakage) Current</b>	≤10µA	
<b>Voltage Drop</b>	≤1.5 V	
<b>Switching Frequency</b>	3kHz	
<b>Differential Travel</b>	≤1-10%	
<b>Repeat Accuracy</b>	≤1%	
<b>Ripple</b>	≤10%	
<b>Time Delay Before Availability (tv)</b>	2ms	
<b>Reverse Polarity Protection</b>	Yes	
<b>Short-Circuit Protection</b>	Yes (switch auto-resets after overload is removed)	
<b>Operating Temperature</b>	-25° to +75° C (-13° to 167° F)	
<b>Protection Degree (DIN 40050)</b>	IEC IP67	
<b>Indication/Switch Status</b>	Yellow (output energized)	
<b>Housing Material</b>	Plastic	
<b>Sensing Face Material</b>	Plastic	
<b>Shock/Vibration</b>	See Terminology Section	
<b>Tightening Torque</b>	N/A	
<b>Weight</b>	113g (3.99oz)/6g (0.21oz)	
<b>Connection</b>	2m (6.5') axial cable or M8 (8mm) connector	
<b>Agency Approvals</b>	CE	

### Dimensions

mm [inches]

Figure 1

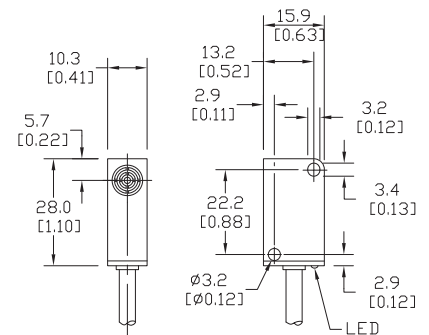
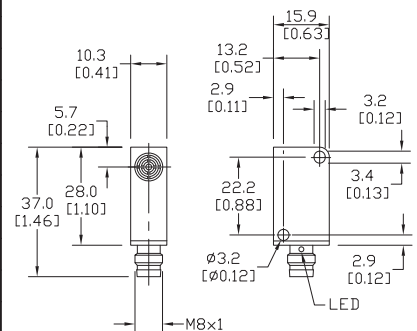


Figure 2



### Wiring diagrams

Diagram 1

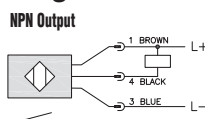
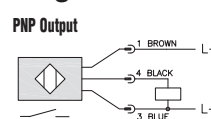
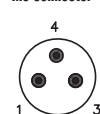


Diagram 2



### Connector

M8 connector



# APS4 Inductive Proximity Sensors

## Compact 12 x27 mm plastic – DC



APS4-12S-E-D  
APS4-12S-E2-D

APS4-12M-E-D  
APS4-12M-E2-D

- 4 models available
- Compact polycarbonate housing; comes with mounting plate
- High-frequency oscillation type
- DC 3-wire, NPN or PNP / N.O.
- Axial cable
- LED indicator
- IP67 rated
- Lifetime warranty

Compact Rectangular DC Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
APS4-12M-E-D	<--->	4mm (0.157in)	Unshielded	N.O.	NPN	2m (6.5') axial cable	Diagram 1	Figure 1
APS4-12M-E2-D	<--->				PNP		Diagram 2	Figure 1
APS4-12S-E-D	<--->				NPN		Diagram 1	Figure 2
APS4-12S-E2-D	<--->				PNP		Diagram 2	Figure 2

Specifications	
Mounting Type	Unshielded
Nominal Distance	4mm (0.157in)
Operating Distance	N/A
Material Correction Factor	See Material Influence table #1 later in this section
Output Type	NPN or PNP
Operating Voltage	10-30VDC
No-load Supply Current	≤10mA
Operating (Load) Current	≤50mA
Off-state (Leakage) Current	≤0.1mA
Voltage Drop	≤1.0VDC
Switching Frequency	200Hz
Differential Travel	N/A
Repeat Accuracy	N/A
Ripple	N/A
Time Delay Before Availability (tv)	5ms
Reverse Polarity Protection	N/A
Short Circuit Protection	N/A
Operating Temperature	-10° to +50° C (14° to 122° F)
Protection Degree (DIN 40 050)	IEC IP67
Indication/Switch Status	Displays operation status
Housing, Sensing Face Material	Polycarbonate
Shock/Vibration	See Terminology Section
Tightening Torque	N/A
Weight (cable/M8 connector)	1.41oz. (40g)
Connection	2m (6.5') axial cable
Agency Approvals	CE

## Dimensions

mm [inches] Figure 1

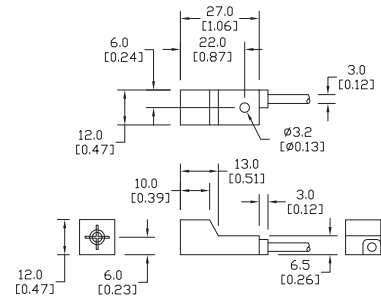
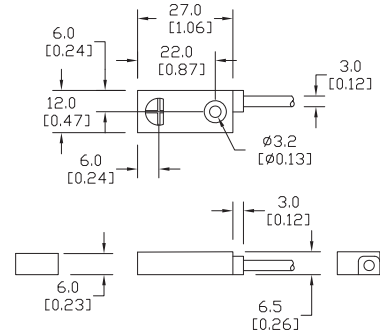


Figure 2



## Wiring diagrams

Diagram 1

NPN Output

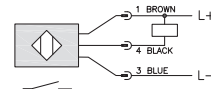
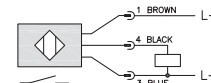
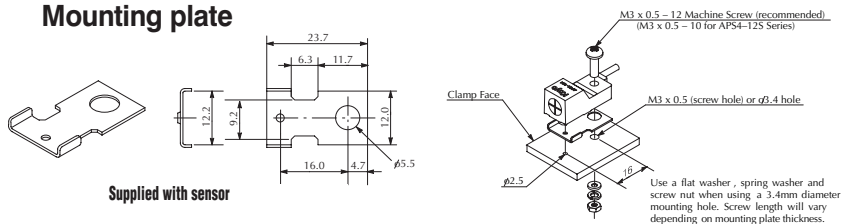


Diagram 2

PNP Output



## Mounting plate



Supplied with sensor

# CM Series Capacitive Proximity Sensors

## M12 (12 mm) metal – DC



- Sensitivity adjustment via potentiometer
- IP65 rated
- LED status indicators
- M12 quick-disconnect; purchase cable separately
- Lifetime warranty



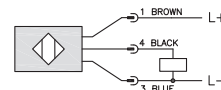
CM Series Capacitive Prox Selection Chart								
Part Number	Price	Sensing Distance	Housing	Output State	Logic	Connection	Wiring	Dimensions
CM1-AP-1H	<--->	6 mm (0.236 in)	Shielded	N.O.	PNP	M12 (12 mm) quick disconnect	Diagram 1	Figure 1
CM1-AP-2H	<--->	12 mm (0.472 in)	Unshielded	N.O.	PNP	M12 (12 mm) quick disconnect	Diagram 1	Figure 1

CM Series Specifications	CM1-AP-1H	CM1-AP-2H
<b>Mounting Type</b>	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	6 mm (0.236 in)	12 mm (0.472 in)
<b>Operating Distance</b>	N/A	
<b>Material Correction Factors</b>	N/A	
<b>Output Type</b>	PNP; N.O. only	
<b>Operating Voltage</b>	10 to 36 VDC	
<b>No-load Supply Current</b>	<12 mA	
<b>Operating (Load) Current</b>	100 mA	
<b>Off-state (Leakage) Current</b>	N/A	
<b>Voltage Drop</b>	<2.5V	
<b>Switching Frequency</b>	50Hz	
<b>Differential Travel (% of Nominal Distance)</b>	N/A	
<b>Repeat Accuracy</b>	N/A	
<b>Ripple</b>	N/A	
<b>Time Delay Before Availability (tv)</b>	N/A	
<b>Reverse Polarity Protection</b>	Yes	
<b>Short-circuit Protection</b>	Yes, pulsed	
<b>Operating Temperature</b>	-25° to 70°C (-13° to 158°F)	
<b>Protection Degree (DIN 40050)</b>	IEC IP65	
<b>Indication/Switch Status</b>	Yellow (output energized)	
<b>Housing Material</b>	Stainless steel	
<b>Sensing Face Material</b>	Polyether Ether Ketone (PEEK)	
<b>Shock/Vibration</b>	See terminology section	
<b>Tightening Torque</b>	5.0 Nm	
<b>Weight</b>	54g (1.90 oz)	
<b>Connectors</b>	M12 connector. 2 lock nuts included	
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS	

## Wiring diagrams

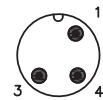
### Diagram 1

PNP Output



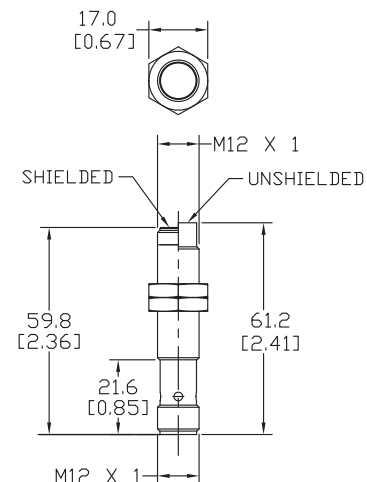
### Connectors

M12 connector



## Dimensions mm [inches]

Figure 1



# CK Series Capacitive Proximity Sensors

## M18 (18 mm) plastic – DC



- N.O./N.C. selectable
- IP65/IP67 rated
- LED status indicators
- M12 quick-disconnect; purchase cable separately
- Lifetime warranty
- Auto-detect circuit
- Push button teach
- Mounting accessories available



Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/Lights

Process

Relays/Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

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Appendix

Product Index

Part # Index

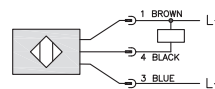
CK Series Capacitive Prox Selection Chart								
Part Number	Price	Sensing Distance	Housing	Output State	Logic	Connection	Wiring	Dimensions
CK1-00-2H	<--->	12 mm (0.472 in)	Unshielded	N.O./N.C.	NPN/PNP	M12 (12 mm) quick disconnect	Diagram 1	Figure 1

CK Series Specifications	CK1-00-2H
<b>Mounting Type</b>	Unshielded
<b>Nominal Sensing Distance</b>	12 mm (0.472 in)
<b>Operating Distance</b>	N/A
<b>Material Correction Factors</b>	N/A
<b>Output Type</b>	NPN/PNP; N.O./N.C.
<b>Operating Voltage</b>	10 to 36 VDC
<b>No-load Supply Current</b>	<20 mA
<b>Operating (Load) Current</b>	200 mA
<b>Off-state (Leakage) Current</b>	N/A
<b>Voltage Drop</b>	<2.5V
<b>Switching Frequency</b>	10Hz
<b>Differential Travel (% of Nominal Distance)</b>	N/A
<b>Repeat Accuracy</b>	N/A
<b>Ripple</b>	N/A
<b>Time Delay Before Availability (tv)</b>	N/A
<b>Reverse Polarity Protection</b>	Yes
<b>Short-circuit Protection</b>	Yes, pulsed
<b>Operating Temperature</b>	-25° to 80°C (-13° to 176°F) Sensing face: -25° to 110°C (-13° to 230°F)
<b>Protection Degree (DIN 40050)</b>	IEC IP65/IP67
<b>Indication/Switch Status</b>	Yellow (output energized)
<b>Housing Material</b>	Polybutylene Terephthalate (PBT)
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)
<b>Shock/Vibration</b>	See terminology section
<b>Tightening Torque</b>	2.0 Nm
<b>Weight</b>	59g (2.08 oz)
<b>Connectors</b>	M12 connector. 2 lock nuts included
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS

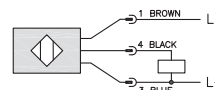
## Wiring diagrams

### Diagram 1

NPN Output

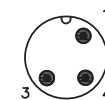


PNP Output



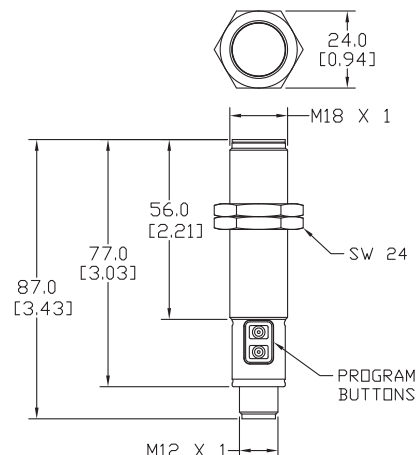
### Connectors

M12 connector



## Dimensions mm [inches]

Figure 1



# CT Series Capacitive Proximity Sensors



## M30 (30 mm) metal, plastic – DC, AC/DC

### Plastic Housings:

- Auto-detect circuit (CT1-00-2H only)
- Push button teach
- N.O./N.C. selectable
- IP65/IP67 rated
- LED status indicators
- M12 or 1/2 inch Micro AC quick-disconnect; purchase cable separately
- Lifetime warranty
- Mounting accessories available

### Metal Housings:

- N.O. or N.C. options
- IP65 rated
- 2m axial cable
- LED status indicators
- Lifetime warranty
- Mounting accessories available



CT Series Capacitive Prox Selection Chart								
Part Number	Price	Sensing Distance	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Plastic Housing</b>								
CTV-00-2M	<--->	40 mm (1.575 in)	Unshielded	N.O./N.C.	-	1/2 inch micro AC quick disconnect	Diagram 1	Figure 1
CT1-00-2H	<--->				NPN/PNP	M12 (12 mm) quick disconnect	Diagram 2	Figure 2
<b>Metal Housing</b>								
CT1-AN-1A	<--->	15 mm (0.59 in)	Shielded	N.O.	NPN	2m (6.5') axial cable	Diagram 3	Figure 3
CT1-AP-1A	<--->				PNP		Diagram 4	
CT1-AN-2A	<--->	20 mm (0.70 in)	Unshielded		NPN		Diagram 3	
CT1-AP-2A	<--->				PNP		Diagram 4	
CT1-CN-2A	<--->	20 mm (0.70 in)	Unshielded	N.C.	NPN		Diagram 3	
CT1-CP-2A	<--->				PNP		Diagram 4	

## Wiring diagrams

Diagram 1

AC Output

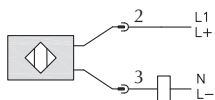


Diagram 2

NPN Output

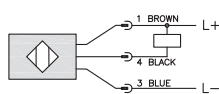


Diagram 3

NPN Output

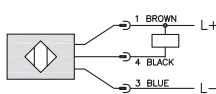
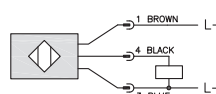


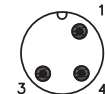
Diagram 4

PNP Output

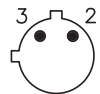


Connectors

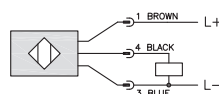
M12 connector



1/2" micro AC



PNP Output

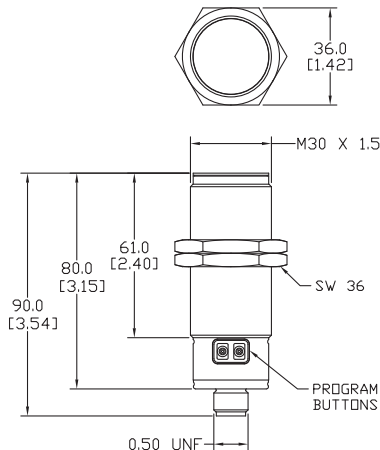
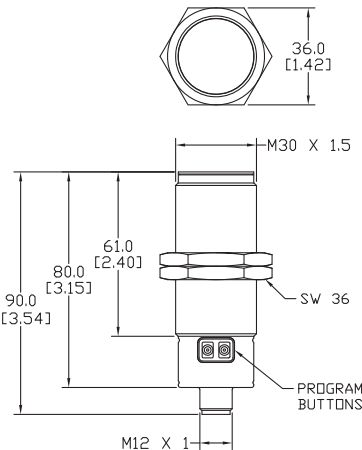
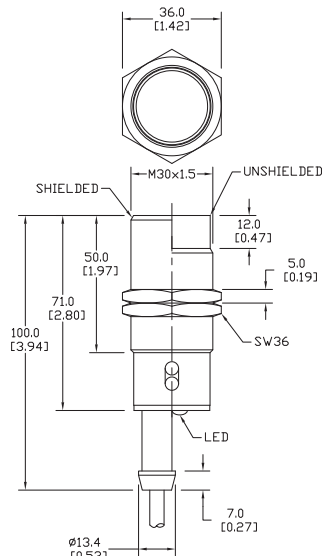




# CT Series Capacitive Proximity Sensors

CT Series Specifications	CT1-AN-1A	CT1-AP-1A	CT1-AN-2A	CT1-AP-2A	CT1-CN-2A	CT1-CP-2A	CT1-00-2H	CTV-00-2M
<b>Mounting Type</b>	Shielded		Unshielded					
<b>Nominal Sensing Distance</b>	15 mm (0.59 in)		20 mm (0.70 in)			40 mm (1.575 in)		
<b>Operating Distance</b>	N/A							
<b>Material Correction Factors</b>	N/A							
<b>Output Type</b>	NPN/PNP; N.O./N.C.						AC/DC; N.O./N.C.	
<b>Operating Voltage</b>	10 to 30 VDC				10 to 36 VDC		20 to 250 VDC/ 30 to 250 VAC	
<b>No-load Supply Current</b>	8 mA				<20 mA		N/A	
<b>Operating (Load) Current</b>	≤200 mA				200 mA		150 mA (40°C)/ 100 mA (80°C) continuous or 1.0 A (20 ms/ 0.5 Hz) peak	
<b>Off-state (Leakage) Current</b>	≤10 μA				N/A		<2.5 mA (250 VAC)/ <1.7 mA (110 VAC)/ <1.5 mA (24 VDC)	
<b>Voltage Drop</b>	1.8 volts maximum				<2.5 VDC		<8 VDC/ <10 VAC	
<b>Switching Frequency</b>	100Hz				10Hz			
<b>Differential Travel (% of Nominal Distance)</b>	2 to 20%				N/A			
<b>Repeat Accuracy</b>	10%				N/A			
<b>Ripple</b>	≤10%				N/A			
<b>Time Delay Before Availability (tv)</b>	100 ms				N/A			
<b>Reverse Polarity Protection</b>	Yes							
<b>Short-circuit Protection</b>	Yes (switch auto-resets after overload is removed)				Yes, pulsed		No	
<b>Operating Temperature</b>	-25° to +70°C (-13° to 158°F)				-25° to 80°C (-13° to 176°F) Sensing face: -25° to 110°C (-13° to 230°F)			
<b>Protection Degree (DIN 40050)</b>	IEC IP65				IEC IP65/IP67			
<b>Indication/Switch Status</b>	Green (supply, Red (N.O. output energized)				Yellow (output energized)			
<b>Housing Material</b>	Nickel-plated brass				Polybutylene Terephthalate (PBT)			
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)							
<b>Shock/Vibration</b>	See Terminology Section							
<b>Tightening Torque</b>	50 Nm (37 lb-ft)				8.0 Nm			
<b>Weight</b>	280g (19.88oz)				117g (4.13 oz)		122g (4.30 oz)	
<b>Connectors</b>	2m (6.5') axial cable 2 lock nuts included				M12 connector 2 lock nuts included		1/2 inch micro AC connector 2 lock nuts included	
<b>Agency Approvals</b>	CE				cULus file E328811, CE, RoHS			

## Dimensions mm [inches]

**Figure 1**

**Figure 2**

**Figure 3**


# CR Series Capacitive Proximity Sensors

## Rectangular plastic - DC



- Low profile housing ideal for sight glass applications
- N.O./N.C. selectable
- IP65/IP67 rated
- LED status indicators
- Lifetime warranty
- Auto-detect circuit
- Push button teach
- Mounting accessories available

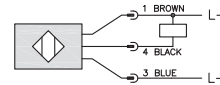
CR Series Capacitive Prox Selection Chart								
Part Number	Price	Sensing Distance	Housing	Output State	Logic	Connection	Wiring	Dimensions
CR1-00-2A	<--->	12 mm (0.472 in)	Unshielded	N.O./N.C.	NPN/PNP	2 m (6.5 ft.) axial cable	Diagram 1	Figure 1

CR Series Specifications	CR1-00-2A
<b>Mounting Type</b>	Unshielded
<b>Nominal Sensing Distance</b>	12 mm (0.472 in)
<b>Operating Distance</b>	N/A
<b>Material Correction Factors</b>	N/A
<b>Output Type</b>	NPN/PNP; N.O./N.C.
<b>Operating Voltage</b>	10 to 36 VDC
<b>No-load Supply Current</b>	<17 mA
<b>Operating (Load) Current</b>	100 mA
<b>Off-state (Leakage) Current</b>	N/A
<b>Voltage Drop</b>	<2.5V
<b>Switching Frequency</b>	10Hz
<b>Differential Travel (% of Nominal Distance)</b>	N/A
<b>Repeat Accuracy</b>	N/A
<b>Ripple</b>	N/A
<b>Time Delay Before Availability (tv)</b>	N/A
<b>Reverse Polarity Protection</b>	Yes
<b>Short-circuit Protection</b>	Yes, pulsed
<b>Operating Temperature</b>	-25° to 80°C (-13° to 176°F)
<b>Protection Degree (DIN 40050)</b>	IEC IP65/IP67
<b>Indication/Switch Status</b>	Yellow (output energized)
<b>Housing Material</b>	Polybutylene Terephthalate (PBT)
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)
<b>Shock/Vibration</b>	See terminology section
<b>Tightening Torque</b>	N/A
<b>Weight</b>	92g (3.25 oz)
<b>Connectors</b>	2 meter axial cable
<b>Agency Approvals</b>	cULus file E328811, CE, RoHS

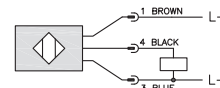
## Wiring diagrams

### Diagram 1

#### NPN Output

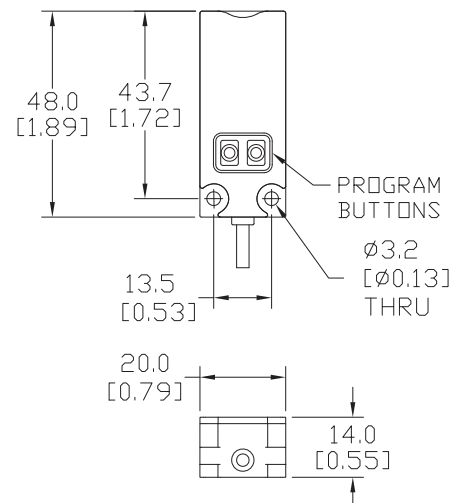


#### PNP Output



## Dimensions mm [inches]

Figure 1



# Capacitive Proximity Sensors - Accessories



**Mounting Well**

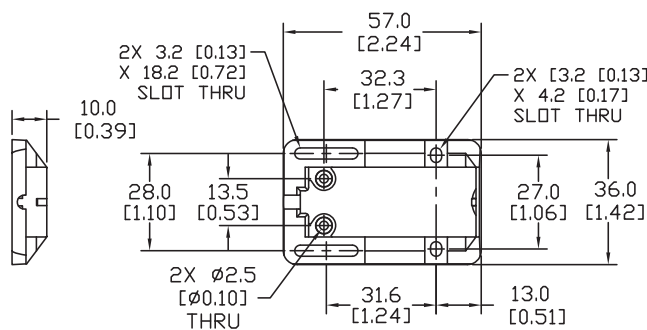
**Mounting Adapter**

Capacitive Proximity Sensors Accessory Chart				
Part Number	Price	Description	Material	Dimensions
<b>Mounting Adapter</b>				
<b>CR1-ADPTR</b>	<--->	Adapter for CR1 series capacitive sensors	Housing: Polybutylene Terephthalate (PBT) Included Screws: M3 x 6 Steel (0.5 Nm)	Figure 1
<b>Mounting Wells</b>				
<b>MWT-01</b>	<--->	30 mm sensor mounting well	PTFE - Polytetrafluoroethylene (Teflon®) Temp: -25° to 246°C (-13° to 474.8°F) Max. pressure: 100 PSI (6.9 bar)	Figure 2
<b>MWK-01</b>	<--->	18 mm sensor mounting well		Figure 3

**Dimensions** mm[inches]

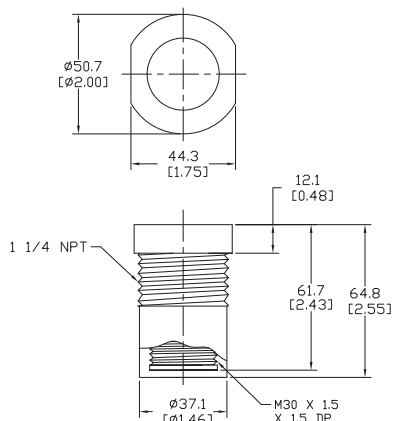
**Figure 1**

**CR1 Adapter**



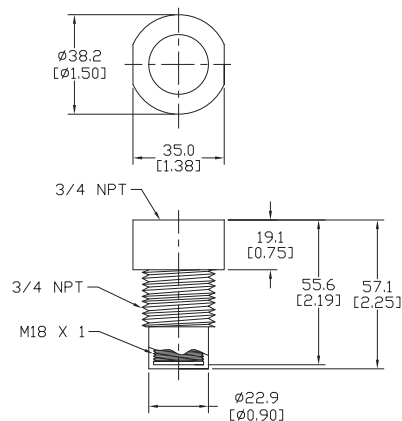
**Figure 2**

**30mm Sensor Mounting Well**



**Figure 3**

**18mm Sensor Mounting Well**



# AE Series Analog Inductive Proximity Sensors



## M8 (8 mm) metal – analog output

- 4 models available
- Compact metal housing
- Axial cable or M8 quick-disconnect models
- IP67 rated
- Purchase cables separately (for quick-disconnect model)
- Lifetime warranty

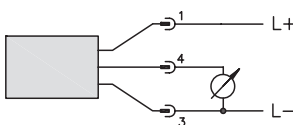


AE Series M8 Analog Inductive Prox Selection Chart							
Part Number	Price	Sensing Range	Housing	Output	Connection	Wiring	Dimensions
AE9-10-1A	<--->	0 to 4mm (0-0.157in)	Shielded	0-10VDC	2m (6.5') axial cable	Diagram 1	Figure 1
AE9-10-1F	<--->				M8 (8mm) connector	Diagram 1	Figure 2

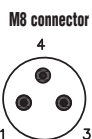
Specifications	
<b>Mounting Type</b>	<b>AE9-10-1*</b> Shielded
<b>Nominal Distance</b>	0 to 4mm (0-0.157in)
<b>Operating Distance</b>	N/A
<b>Material Correction Factors</b>	See Material Influence Table 2 later in this section.
<b>Output Type</b>	0-10VDC
<b>Operating Voltage</b>	15-30VDC
<b>No-load Supply Current</b>	≤10mA
<b>Operating (Load) Current</b>	1kΩ
<b>Off-state (Leakage) Current</b>	N/A
<b>Voltage Drop</b>	≤2.0 V
<b>Switching Frequency</b>	N/A
<b>Differential Travel (% of Nominal Distance)</b>	N/A
<b>Repeat Accuracy</b>	±0.01mm
<b>Ripple</b>	≤20%
<b>Response Time</b>	0.6mcs
<b>Time Delay Before Availability (tv)</b>	≤50ms
<b>Reverse Polarity Protection</b>	Yes
<b>Short-Circuit Protection</b>	Yes (switch auto-resets after overload is removed)
<b>Operating Temperature</b>	-25° to +70° C (-13° to 158° F)
<b>Protection Degree (DIN 40050)</b>	IEC IP67
<b>Indication/Switch Status</b>	N/A
<b>Housing Material</b>	Chrome-plated brass
<b>Sensing Face Material</b>	Polybutylene Terephthalate (PBT)
<b>Shock/Vibration</b>	See Terminology Section
<b>Tightening Torque</b>	4Nm (2.95 lb-ft.)
<b>Weight (cable/M8 connector)</b>	50g (1.76 oz.) / 20g (0.71 oz.)
<b>Connection</b>	2m (6.5') axial cable or M8 (8mm) connector
<b>Agency Approvals</b>	UL file E328811

## Wiring diagram

Diagram 1



## Connector



## Dimensions

mm [inches]

Figure 1

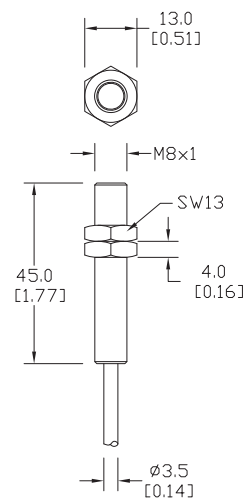
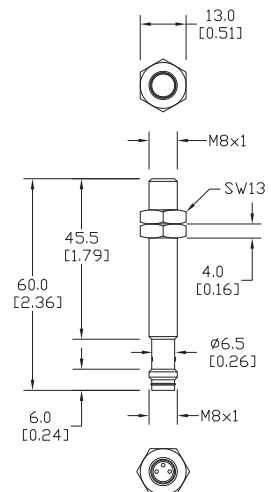


Figure 2



# AM Series Analog Inductive Proximity Sensors



## M12 (12 mm) metal – analog output

- Voltage or current analog output
- 4 models available
- Metal housing
- Axial cable or M12 quick-disconnect models
- IP67 rated
- Purchase cable separately (for quick-disconnect model)
- Lifetime warranty



### AM Series M12 Analog Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output	Connection	Dimensions
AM9-05-1A	<--->	0 to 6mm (0-0.24in)	Shielded	0 - 5VDC or 1-5mA	2m (6.5') axial cable	Figure 1
AM9-05-1H	<--->				M12 (12mm) connector	Figure 2
AM9-10-1A	<--->	0 to 6mm (0-0.24in)		0-10VDC or 4-20mA	2m (6.5') axial cable	Figure 1
AM9-10-1H	<--->				M12 (12mm) connector	Figure 2

## Dimensions

mm [inches]

Figure 1

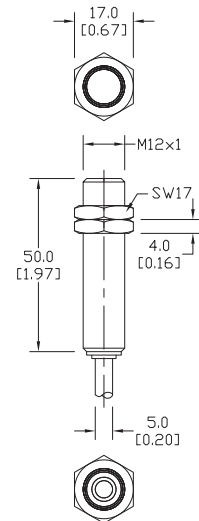
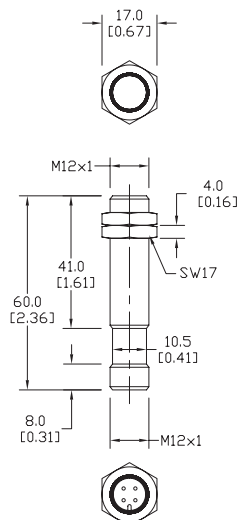


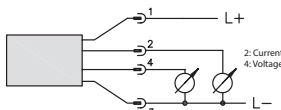
Figure 2



### Specifications

Mounting Type	AM9-05-1*	AM9-10-1*
	Shielded	
Nominal Sensing Distance	0 to 6mm (0-0.24in)	0 to 6mm (0-0.24in)
Operating Distance	N/A	
Material Correction Factors	See Material Influence Table 2 later in this section.	
Output Type	0-5VDC or 1-5mA	0-10VDC or 4-20mA
Current Output Max. Load / Power Supply	1kΩ / 10VDC; 5kΩ / 30VDC	0.5kΩ / 15VDC; 1kΩ / 30VDC
Voltage Output Min. Load	500Ω	1kΩ
Operating Voltage	10 -30VDC	15 -30VDC
No-load Supply Current	≤10mA	≤12mA
Operating (Load) Current	1kΩ	0.5kΩ
Off-state (Leakage) Current	N/A	
Voltage Drop	≤2.0 V	
Switching Frequency	N/A	
Differential Travel (# of Nominal Distance)	N/A	
Repeat Accuracy	±0.01mm	
Ripple	≤20%	
Response Time	1ms	
Time Delay Before Availability (tv)	≤50ms	
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25° to +70° C (-13° to 158° F)	
Protection Degree (DIN 40050)	IEC IP67	
Indication/Switch Status	N/A	
Housing Material	Chrome-plated brass	
Sensing Face Material	Polybutylene Terephthalate (PBT)	
Shock / Vibration	See Terminology Section	
Tightening Torque	10 Nm (7.37 lb-ft)	
Weight (cable/M12 connector)	95g (3.35 oz.) / 33g (1.16 oz.)	
Connection	2m (6.5') axial cable or M12 (12mm) connector	
Agency Approvals	UL file E328811	

## Wiring diagram



## Connector

M12 connector



Sensors with M12 connectors must use 2M or 7M cables (4-wire).

# AK Series Analog Inductive Proximity Sensors



## M18 (18 mm) metal – analog output

- Voltage or current analog output
- 4 models available
- Metal housing
- Axial cable or M12 quick-disconnect models
- IP67 rated
- Purchase cable separately (for quick-disconnect model)
- Lifetime warranty



AK Series M18 Analog Inductive Prox Selection Chart						
Part Number	Price	Sensing Range	Housing	Output	Connection	Dimensions
AK9-05-1A	<--->	0 to 10mm (0-0.39in)	Shielded	0 - 5VDC or 1-5mA	2m (6.5') axial cable	Figure 1
AK9-05-1H	<--->				M12 (12mm) connector	Figure 2
AK9-10-1A	<--->	0 to 10mm (0-0.39in)		0-10VDC or 4-20mA	2m (6.5') axial cable	Figure 1
AK9-10-1H	<--->				M12 (12mm) connector	Figure 2

Specifications		
Mounting Type	AK9-05-1*	AK9-10-1*
Nominal Sensing Distance	0 to 10mm (0-0.39in)	0 to 10mm (0-0.39in)
Operating Distance	N/A	
Material Correction Factors	See Material Influence Table 2 later in this section.	
Output Type	0-5VDC or 1-5mA	0-10VDC or 4-20mA
Current Output Max. Load / Power Supply	1kΩ / 10VDC; 5kΩ / 30VDC	0.5kΩ / 15VDC; 1kΩ / 30VDC
Voltage Output Min. Load	500Ω	1kΩ
Operating Voltage	10 -30VDC	15 -30VDC
No-load Supply Current	≤10mA	≤12mA
Operating (Load) Current		
Off-state (Leakage) Current		N/A
Voltage Drop		≤2.0 V
Switching Frequency		N/A
Differential Travel (% of Nominal Distance)		N/A
Repeat Accuracy		±0.02mm
Ripple		≤20%
Response Time		2ms
Time Delay Before Availability (tv)		≤50ms
Input Voltage Transient Protection		Up to 30VDC
Reverse Polarity Protection		Yes
Short-Circuit Protection		Yes (switch auto-resets after overload is removed)
Operating Temperature		-25° to +70° C (-13° to 158° F)
Protection Degree (DIN 40050)		IEC IP67
Indication/Switch Status		N/A
Housing Material		Chrome-plated brass
Sensing Face Material		Polybutylene Terephthalate (PBT)
Shock/Vibration		See Terminology Section
Tightening Torque		30 Nm (22 lb-ft)
Weight (cable/M8 connector)		110g (3.88 oz.) / 50g (1.76 oz.)
Connection		2m (6.5') axial cable or M12 (12mm) connector
Agency Approvals		UL file E328811

## Dimensions

mm [inches]

Figure 1

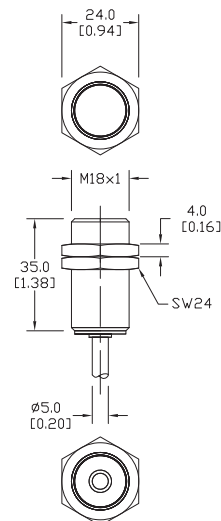
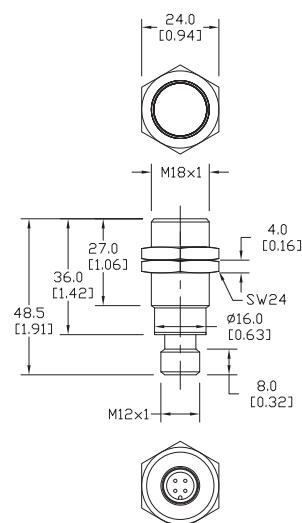
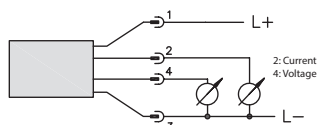


Figure 2



## Wiring diagram



## Connector

M12 connector



Sensors with M12 connectors must use 2M or 7M cables (4-wire).

# AT Series Analog Inductive Proximity Sensors

## M30 (30 mm) metal – analog output



- Voltage or current analog output
- 4 models available
- Metal housing
- Axial cable or M12 quick-disconnect models
- IP67 rated
- Purchase cable separately (for quick-disconnect model)
- Lifetime warranty



AT Series M30 Analog Inductive Prox Selection Chart						
Part Number	Price	Sensing Range	Housing	Output	Connection	Dimensions
AT9-05-1A	<--->	0 to 20mm (0-0.79in)	Shielded	0 - 5VDC or 1-5mA	2m (6.5') axial cable	Figure 1
AT9-05-1H	<--->				M12 (12mm) connector	Figure 2
AT9-10-1A	<--->	0 to 20mm (0-0.79in)		0-10VDC or 4-20mA	2m (6.5') axial cable	Figure 1
AT9-10-1H	<--->				M12 (12mm) connector	Figure 2

## Dimensions

mm [inches]

Figure 1

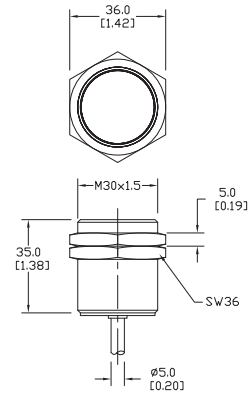
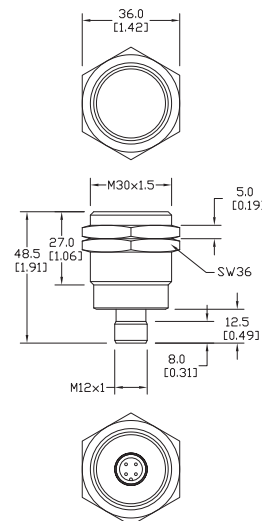
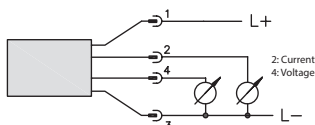


Figure 2



Specifications		
Mounting Type	AT9-05-1*	AT9-10-1*
	Shielded	
Nominal Sensing Distance	0 to 20mm (0-0.79in)	0 to 20mm (0-0.79in)
Operating Distance	N/A	
Material Correction Factors	See Material Influence Table 2 later in this section.	
Output Type	0 to 5VDC or 1 to 5mA	0 to 10VDC or 4 to 20mA
Current Output Max. Load / Power Supply	1kΩ / 10VDC; 5kΩ / 30VDC	0.5kΩ / 15VDC; 1kΩ / 30VDC
Voltage Output Min. Load	500Ω	1kΩ
Operating Voltage	10 to 30VDC	15 to 30VDC
No-load Supply Current	≤10mA	≤12mA
Operating (Load) Current		
Off-state (Leakage) Current		N/A
Voltage Drop		≤2.0 V
Switching Frequency		N/A
Differential Travel (% of Nominal Distance)		N/A
Repeat Accuracy		±0.05mm
Ripple		≤20%
Response Time		5ms
Time Delay Before Availability (tv)		≤50ms
Reverse Polarity Protection		Yes
Short-Circuit Protection		Yes (switch auto-resets after overload is removed)
Operating Temperature		-25° to +70° C (-13° to 158° F)
Protection Degree (DIN 40050)		IEC IP67
Indication/Switch Status		N/A
Housing Material		Chrome-plated brass
Sensing Face Material		Polybutylene Terephthalate (PBT)
Shock/Vibration		See Terminology Section
Tightening Torque		60 Nm (44 lb-ft)
Weight (cable/M8 connector)		190g (6.71 oz.) / 135g (4.76 oz.)
Connection		2m (6.5') axial cable or M12 (12mm) connector
Agency Approvals		UL file E328811

## Wiring diagram



## Connector

M12 connector



Sensors with M12 connectors must use 2M or 7M cables (4-wire).

# UK1 Series Ultrasonic Sensors

## M18 (18 mm) plastic – Discrete or analog output

- 15 to 30 VDC
- Discrete models available with adjustable sensitivity
- Analog output models available
- Models available with analog and discrete switching outputs
- Complete overload protection
- IP67 rated
- LED status indicators
- Mounting hex nuts included
- Purchase cable for M12 plug separately
- Lifetime warranty



**M12 Quick Disconnect**



**2m Output Cable**

UK 1A Series Ultrasonic Discrete or Analog Output Sensor Selection Chart						
Part Number	Price	Sensing Range	Output State	Connection	Wiring	Function
UK1A-EN-0E	<--->	50 to 400 mm (1.97 to 15.75 in)	NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 1	1
UK1A-EN-0A	<--->		NPN, N.O./N.C. selectable	2m output cable	Diagram 1	1
UK1A-EP-0E	<--->		PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 2	1
UK1A-EP-0A	<--->		PNP, N.O./N.C. selectable	2m output cable	Diagram 2	1
UK1A-E1-0E	<--->		0 to 10 VDC analog output	M12 quick disconnect	Diagram 3	2
UK1A-E1-0A	<--->		0 to 10 VDC analog output	2m output cable	Diagram 3	2
UK1A-E2-0E	<--->		4 to 20 mA analog output	M12 quick disconnect	Diagram 3	2
UK1A-E2-0A	<--->		4 to 20 mA analog output	2m output cable	Diagram 3	2
UK1A-E3-0E	<--->		NPN, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 4	3
UK1A-E3-0A	<--->		NPN, 2 N.O./N.C. selectable	2m output cable	Diagram 4	3
UK1A-E4-0E	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1A-E4-0A	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UK1A-E5-0E	<--->		PNP, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 6	3
UK1A-E5-0A	<--->		PNP, 2 N.O./N.C. selectable	2m output cable	Diagram 6	3
UK1A-E6-0E	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1A-E6-0A	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1A-E7-0E	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1A-E7-0A	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1A-E9-0E	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1A-E9-0A	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4



# UK1 Series Ultrasonic Sensors

**UK 1C Series Ultrasonic Discrete or Analog Output Sensor Selection Chart**

Part Number	Price	Sensing Range	Output State	Connection	Wiring	Function
UK1C-EN-0E	<--->	100 to 900 mm (3.94 to 35.43 in)	NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 1	1
UK1C-EN-0A	<--->		NPN, N.O./N.C. selectable	2m output cable	Diagram 1	1
UK1C-EP-0E	<--->		PNP, N.O./ N.C. selectable	M12 quick disconnect	Diagram 2	1
UK1C-EP-0A	<--->		PNP, N.O./N.C. selectable	2m output cable	Diagram 2	1
UK1C-E1-0E	<--->		0 to 10 VDC analog output	M12 quick disconnect	Diagram 3	2
UK1C-E1-0A	<--->		0 to 10 VDC analog output	2m output cable	Diagram 3	2
UK1C-E2-0E	<--->		4 to 20 mA analog output	M12 quick disconnect	Diagram 3	2
UK1C-E2-0A	<--->		4 to 20 mA analog output	2m output cable	Diagram 3	2
UK1C-E3-0E	<--->		NPN, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 4	3
UK1C-E3-0A	<--->		NPN, 2 N.O./N.C. selectable	2m output cable	Diagram 4	3
UK1C-E4-0E	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1C-E4-0A	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UK1C-E5-0E	<--->		PNP, 2 N.O./ N.C. selectable	M12 quick disconnect	Diagram 6	3
UK1C-E5-0A	<--->		PNP, 2 N.O./ N.C. selectable	2m output cable	Diagram 6	3
UK1C-E6-0E	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1C-E6-0A	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1C-E7-0E	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1C-E7-0A	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1C-E9-0E	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1C-E9-0A	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4

**UK 1D Series Ultrasonic Discrete or Analog Output Sensor Selection Chart**

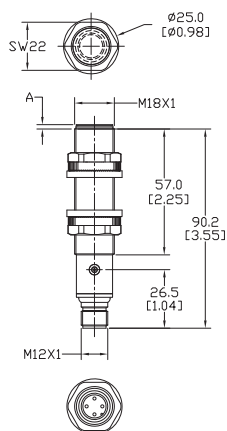
Part Number	Price	Sensing Range	Output State	Connection	Wiring	Function
UK1D-EN-0E	<--->	150 to 1600 mm (5.90 to 62.99 in)	NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 1	1
UK1D-EN-0A	<--->		NPN, N.O./N.C. selectable	2m output cable	Diagram 1	1
UK1D-EP-0E	<--->		PNP, N.O./ N.C. selectable	M12 quick disconnect	Diagram 2	1
UK1D-EP-0A	<--->		PNP, N.O./N.C. selectable	2m output cable	Diagram 2	1
UK1D-E1-0E	<--->		0 to 10 VDC analog output	M12 quick disconnect	Diagram 3	2
UK1D-E1-0A	<--->		0 to 10 VDC analog output	2m output cable	Diagram 3	2
UK1D-E2-0E	<--->		4 to 20 mA analog output	M12 quick disconnect	Diagram 3	2
UK1D-E2-0A	<--->		4 to 20 mA analog output	2m output cable	Diagram 3	2
UK1D-E3-0E	<--->		NPN, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 4	3
UK1D-E3-0A	<--->		NPN, 2 N.O./N.C. selectable	2m output cable	Diagram 4	3
UK1D-E4-0E	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1D-E4-0A	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UK1D-E5-0E	<--->		PNP, 2 N.O./ N.C. selectable	M12 quick disconnect	Diagram 6	3
UK1D-E5-0A	<--->		PNP, 2 N.O./ N.C. selectable	2m output cable	Diagram 6	3
UK1D-E6-0E	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1D-E6-0A	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1D-E7-0E	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1D-E7-0A	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1D-E9-0E	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1D-E9-0A	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4

# UK1 Series Ultrasonic Sensors

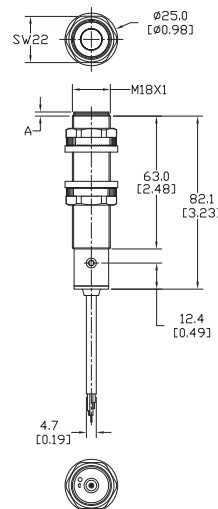
UK 1F Series Ultrasonic Discrete or Analog Output Sensor Selection Chart						
Part Number	Price	Sensing Range	Output State	Connection	Wiring	Function
UK1F-EN-0E	<--->	200 to 2200 mm (7.87 to 86.61 in)	NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 1	1
UK1F-EN-0A	<--->		NPN, N.O./N.C. selectable	2m output cable	Diagram 1	1
UK1F-EP-0E	<--->		PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 2	1
UK1F-EP-0A	<--->		PNP, N.O./N.C. selectable	2m output cable	Diagram 2	1
UK1F-E1-0E	<--->		0 to 10 VDC analog output	M12 quick disconnect	Diagram 3	2
UK1F-E1-0A	<--->		0 to 10 VDC analog output	2m output cable	Diagram 3	2
UK1F-E2-0E	<--->		4 to 20 mA analog output	M12 quick disconnect	Diagram 3	2
UK1F-E2-0A	<--->		4 to 20 mA analog output	2m output cable	Diagram 3	2
UK1F-E3-0E	<--->		NPN, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 4	3
UK1F-E3-0A	<--->		NPN, 2 N.O./N.C. selectable	2m output cable	Diagram 4	3
UK1F-E4-0E	<--->		4 to 20 mA output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1F-E4-0A	<--->		4 to 20 mA output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UK1F-E5-0E	<--->		PNP, 2 N.O./N.C. selectable	M12 quick disconnect	Diagram 6	3
UK1F-E5-0A	<--->		PNP, 2 N.O./N.C. selectable	2m output cable	Diagram 6	3
UK1F-E6-0E	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1F-E6-0A	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1F-E7-0E	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UK1F-E7-0A	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UK1F-E9-0E	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UK1F-E9-0A	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4

## Dimensions

mm [inches]



DRAWING NO.	DIM A
UK1A and UK1C	1.0 [0.04]
UK1D	1.5 [0.06]
UK1F	2.5 [0.08]



DRAWING NO.	DIM A
UK1A and UK1C	1.0 [0.04]
UK1D	1.5 [0.06]
UK1F	2.5 [0.08]

# UT1 Series Ultrasonic Sensors

## M30 (30mm) plastic – Discrete or analog output

- 12-30 VDC, 15 to 30 VDC (0 to 10 VDC)
- Discrete models available with adjustable sensitivity
- Analog output models available
- Models available with analog and discrete switching outputs
- Complete overload protection
- IP67 rated
- LED status indicators
- Mounting hex nuts included
- Purchase cable for M12 plug separately
- Lifetime warranty



UT1B-E4-0E



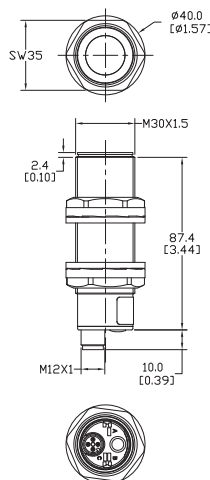
UT1B-E4-0A

UT 1B Series Ultrasonic Discrete or Analog Output Sensor Selection Chart

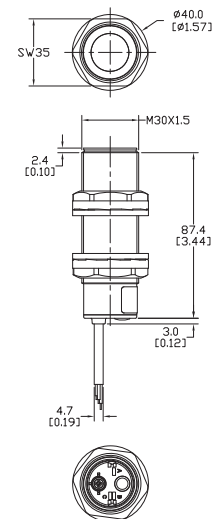
Part Number	Price	Sensing Range	Output State	Connection	Wiring	Function
UT1B-E4-0E	<--->	250 to 3500 mm (9.84 to 137.8 in)	4 to 20 mA analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UT1B-E4-0A	<--->		4 to 20 mA analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UT1B-E6-0E	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UT1B-E6-0A	<--->		4 to 20 mA analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UT1B-E7-0E	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	M12 quick disconnect	Diagram 7	4
UT1B-E7-0A	<--->		0 to 10 VDC analog output, PNP, N.O./N.C. selectable	2m output cable	Diagram 7	4
UT1B-E9-0E	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	M12 quick disconnect	Diagram 5	4
UT1B-E9-0A	<--->		0 to 10 VDC analog output, NPN, N.O./N.C. selectable	2m output cable	Diagram 5	4
UT1B-EM-0E	<--->		NPN, 2 outputs, hysteresis + window functions	M12 quick disconnect	Diagram 4	5
UT1B-EM-0A	<--->		NPN, 2 outputs, hysteresis + window functions	2m output cable	Diagram 4	5
UT1B-EW-0E	<--->		PNP, 2 outputs, hysteresis + window functions	M12 quick disconnect	Diagram 6	5
UT1B-EW-0A	<--->		PNP, 2 outputs, hysteresis + window functions	2m output cable	Diagram 6	5

## Dimensions

mm [inches]



UT1 Series M12 Quick Disconnect



UT1 Series 2m Cable

# UK1/UT1 Series Ultrasonic Sensors

Specifications					
Model	UK1A	UK1C	UK1D	UK1F	UT1B
<b>Nominal Sensing Distance</b>	50 to 400 mm (1.97 to 15.75 in)	100 to 900 mm (3.94 to 35.43 in)	150 to 1600 mm (5.90 to 62.99 in)	200 to 2200 mm (7.87 to 86.61 in)	250 mm to 3500 mm (9.84 in to 137.80 in)
<b>Operating Distance (Sensing Range)</b>	100 to 400 mm (3.94 to 15.75 in)	100 to 900 mm (3.94 to 35.43 in)	150 to 1600 mm (5.90 to 62.99 in)	200 to 2200 mm (7.87 to 86.61 in)	250 mm to 3500 mm (9.84 in to 137.80 in)
<b>Output Type</b>	See "Output State" column in selection chart				
<b>Operating Voltage</b>	15 to 30 VDC				12 to 30 VDC, 15 to 30 VDC (0 to 10 VDC)
<b>No-load Supply Current</b>	≤50 mA				
<b>Operating (Load) Current</b>	100 mA				
<b>Off-state (Leakage) Current</b>	10 µA @ 30 VDC				<10 µA (VDC max)
<b>Analog Output</b>	Voltage: minimum load is 3 kOhms / Current: maximum load is 500 Ohms at 24 VDC supply				
<b>Voltage Drop</b>	2.2 volts max@ 100 mA				
<b>Switching Frequency</b>	10 Hz	4 Hz	2 Hz	1 Hz	2 Hz
<b>Repeat Accuracy</b>	0.5%				0.2%
<b>Time Delay Before Availability (tv)</b>	≤500 ms; ≤900 ms (UK1*-E5/E3-0*)				≤300 ms; <900 ms for UT1B-EM/W-0*
<b>Reverse Polarity Protection</b>	Yes				
<b>Short-Circuit Protection</b>	Yes				
<b>Linearity Error</b>	<1%				0.5%
<b>Ultrasonic Frequency</b>	400 kHz	300 kHz	230 kHz	200 kHz	112 kHz
<b>Ultrasonic Beam Angle</b>	±8°	±7°	±8°	±7°	12° ±2°
<b>Max. Response Time (digital output)</b>	50 ms	125 ms	250 ms	500 ms	250 ms
<b>Sensitivity Adjustment</b>	Yes, via teach-in button				
<b>Input Voltage Transient Protection</b>	Yes				
<b>Operating Temperature</b>	-20° to 60°C (-4° to 140°F)				-20° to +70°C (-4° to +158°F)
<b>Temperature Compensation</b>	Yes				
<b>Protection Degree</b>	IEC IP67				
<b>Indication/Switch Status</b>	Multi-function LED indicator				
<b>Housing Material</b>	Polybutylene Terephthalate (PBT)				
<b>Shock/Vibration</b>	See Terminology Section				
<b>Tightening Torque</b>	1 Nm (0.737 lb-ft)				
<b>Weight</b>	35g (1.23 oz) (plug exit) 88g (3.10 oz) (cable exit)				90g (3.17 oz) (plug exit) 160g (5.64 oz) (cable exit)
<b>Connection</b>	M12 (12 mm) connector or 2m prewired output cable				
<b>Agency Approvals</b>	CE, cULus file E187310, RoHS				

## Wiring Diagrams

Diagram 1

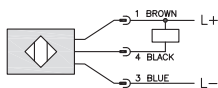


Diagram 2

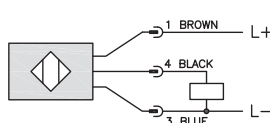


Diagram 3

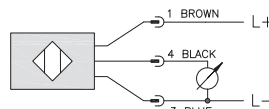


Diagram 4

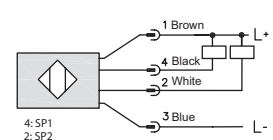


Diagram 5

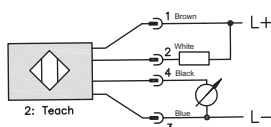


Diagram 6

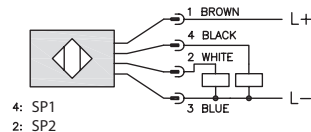
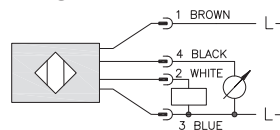
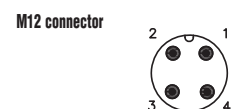


Diagram 7



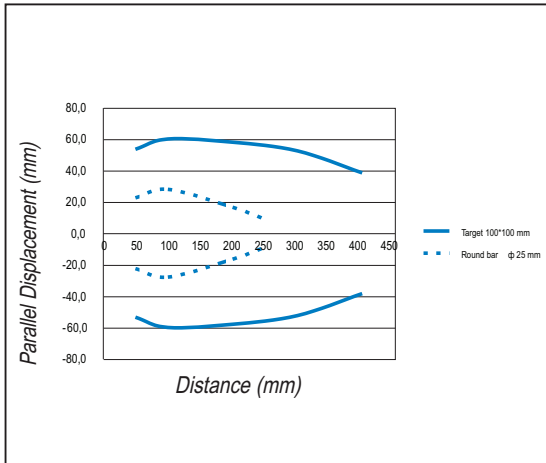
Connector



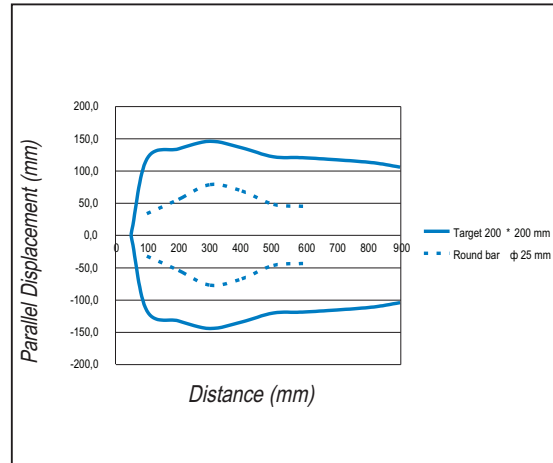
# UK1/UT1 Series Ultrasonic Sensors

## Characteristic Curves

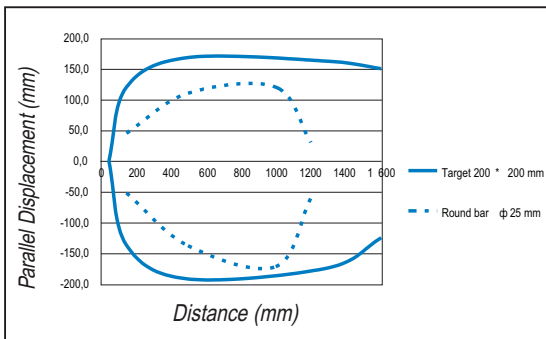
### UK1A models



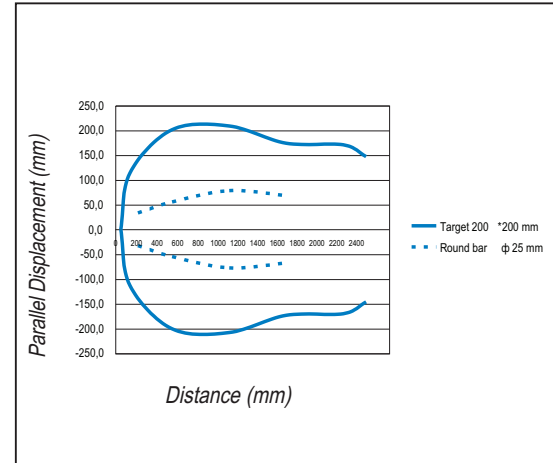
### UK1C models



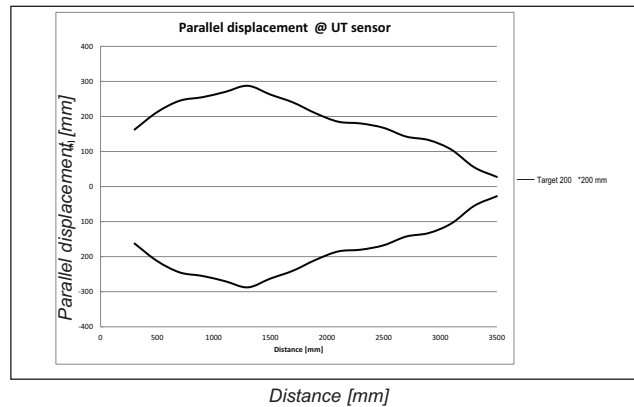
### UK1D models



### UK1F models



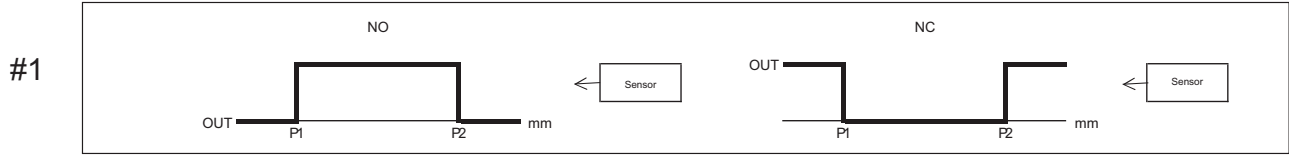
### UT1B models



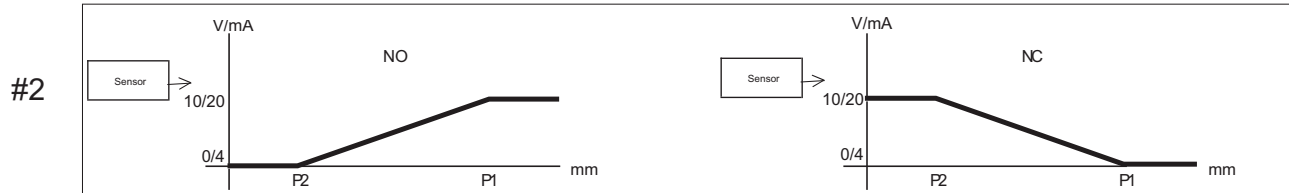
# UK1/UT1 Series Ultrasonic Sensors

## Functions

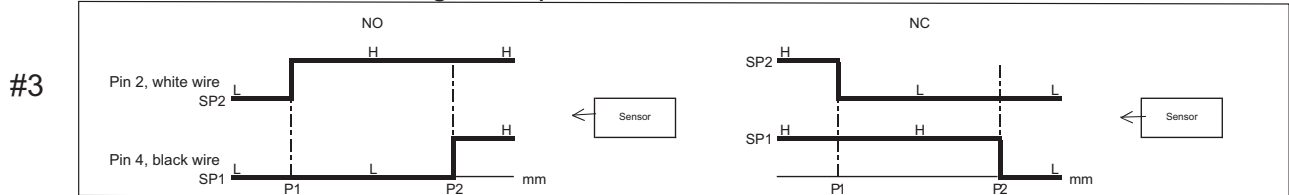
Function Models with single digital output



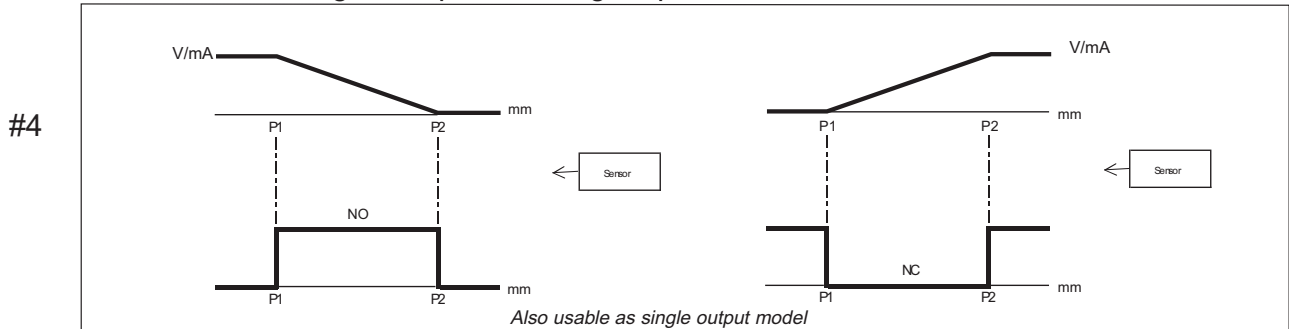
Models with single analog output



Models with double digital output

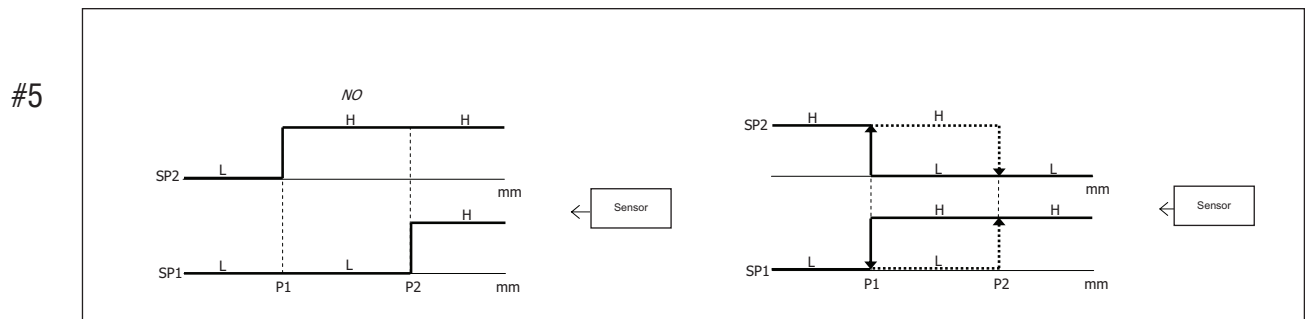


Models with digital output + analog output



**Note:** P1 maximum selected working distance and first point to select  
 P2 minimum selected working distance and second point to select

Models with double digital output, hysteresis, + standard window



# SU Series Ultrasonic Sensors



## M18 (18 mm) plastic –PNP or analog output

- High resolution
- 2 PNP models with adjustable sensitivity
- 3 analog models available
- Complete overload protection
- IP67 rated
- LED status indicator on PNP models
- Purchase cable separately (for quick-disconnect model)
- Lifetime warranty



### SU Series Ultrasonic DC Output Sensor Selection Chart

Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring
SU1-B0-0A	<-->	100 to 600mm (3.94-23.62in)	N.O.	PNP	2m (6.5') axial cable	Diagram 1
SU2-A0-0A	<-->	200 to 1500mm (7.87-59.06in)		PNP	2m (6.5') axial cable	

### SU Series Ultrasonic Analog Output Sensor Selection Chart

Part Number	Price	Sensing Range	Output	Connection	Wiring
SU1-B1-0A	<-->	100 to 600mm (3.94-23.62in)	0-10VDC	2m (6.5') axial cable	Diagram 2
SU1-B1-0E	<-->			M12 (12mm) connector	
SU2-A1-0E	<-->	200 to 1500mm (7.87-59.06in)		M12 (12mm) connector	

Specifications				
Mounting Type	SU1-B0-0A	SU2-A0-0A	SU1-B1-0*	SU2-A1-0E
Nominal Sensing Distance	100 to 600mm (3.94-23.62in)	200 to 1500mm (7.87-59.06in)	100 to 600mm (3.94-23.62in)	200 to 1500mm (7.87-59.06in)
Operating Distance	N/A			
Output Type	PNP / N.O.		0-10VDC	
Operating Voltage	15-30VDC		18-30VDC	
No-load Supply Current	≤35mA			
Operating (Load) Current	≤500mA		≤5mA	
Off-state (Leakage) Current	≤10µA			
Voltage Drop	≤2.5 volts			
Switching Frequency	25Hz	8Hz	-	
Differential Travel	±2.5%	±2.0%		
Repeat Accuracy	0.2%		±2mm	
Time Delay Before Availability (tv)	≤200ms		≤500ms	
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Linearity Error	-		≤0.3%	
Ultrasonic Frequency	300kHz	180kHz	300kHz	180kHz
Ultrasonic Beam Angle	8°			
Max. Response Time	-		50ms	150ms
Control Input	Hold / Sync			
Sensitivity Adjustment	Yes		-	
Input Voltage Transient Protection	Yes, only if transient peak does not exceed 30VDC			
Operating Temperature	-25° to +70°C (-13° to 158°F)			
Temperature Compensation	Yes			
Protection Degree	IEC IP67			
Indication/Switch Status	Yellow (output energized)		-	
Housing Material	Polybutylene Terephthalate (PBT)			
Shock/Vibration	See Terminology Section			
Tightening Torque	3 Nm (2.21lb-ft)			
Weight (cable/connector)	54g (1.90oz) / 38g (1.34oz.)			
Connection	2m (6.5') axial cable		2m (6.5') axial cable or M12 (12mm) connector	
Agency Approvals	CE, UL listed file E187310			

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controllers

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Safety

Appendix

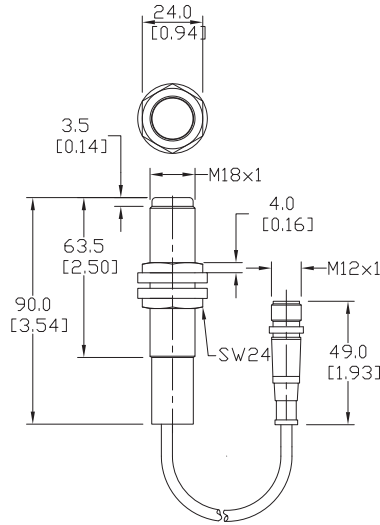
Product Index

Part # Index

# SU Series Ultrasonic Sensors

## Dimensions

mm [inches]



## Wiring Diagrams

Diagram 1\*

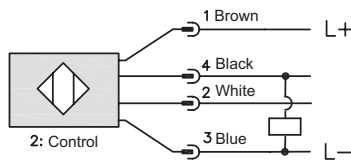
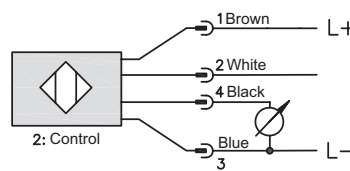


Diagram 2\*



\*Note: Control wire can be used to inhibit sensor or to synchronize with another sensor.

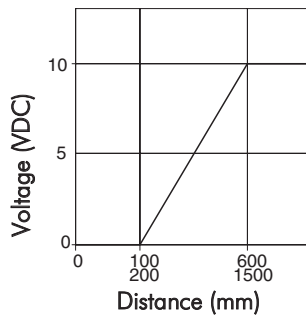
## Connector



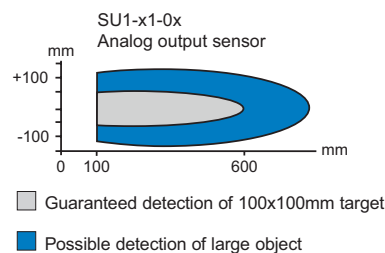
Must be used with 2M or 7M cable (4-wire)

## Characteristic Curves

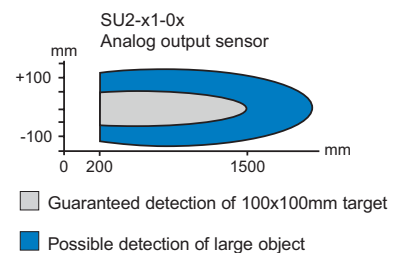
### Analog Output



### Detection Area SU1 Analog output



### Detection Area SU2 Analog output



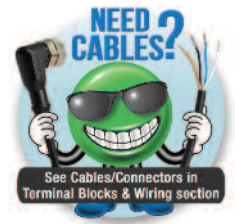


# TU Series Ultrasonic Sensors

M30 (30 mm) plastic – PNP or Analog Output



- High resolution
- PNP output model with adjustable sensitivity
- Complete overload protection
- IP67 rated
- LED status indicator on PNP models
- Purchase cable separately
- Lifetime warranty



## TU Series Ultrasonic PNP Output Sensor Selection Chart

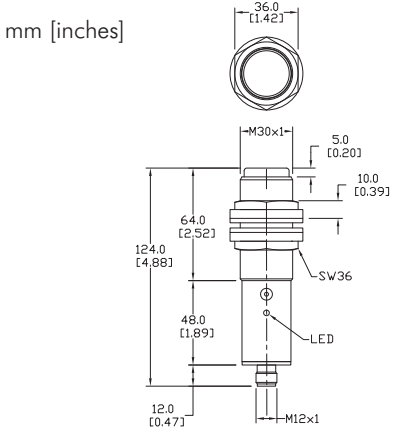
Part Number	Price	Sensing Range	Output State	Logic	Connection	Wiring
TU1-C0-0E	<--->	300 to 2500mm (11.81-98.43in)	N.O.	PNP	M12 (12mm) connector	Diagram 1

## TU Series Ultrasonic Analog Output Sensor Selection Chart

Part Number	Price	Sensing Range	Output	Connection	Wiring
TU1-C1-0E	<--->	300 to 2500mm (11.81-98.43in)	0 to 10 VDC	M12 (12mm) connector	Diagram 2

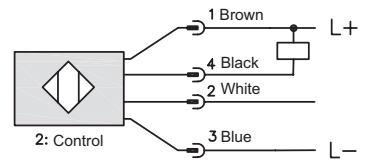
Specifications		
Mounting Type	TU1-C0-0E	TU1-C1-0E
Nominal Sensing Distance	300 to 2500mm (11.81-98.43in)	300 to 2500mm (11.81-98.43in)
Operating Distance	N/A	N/A
Output Type	PNP / N.O.	0 to 10 VDC
Operating Voltage	19 to 30 VDC	
No-load Supply Current	≤35mA	
Operating (Load) Current	≤500mA	≤5mA
Off-state (Leakage) Current	≤10µA	
Voltage Drop	≤2.5 volts	-
Switching Frequency	1Hz	-
Differential Travel	±2.0%	-
Repeat Accuracy	0.2%	±2mm
Linearity Error	-	≤0.3%
Ultrasonic Frequency	130kHz	
Ultrasonic Beam Angle	8°	
Max. Response Time	-	100ms
Time Delay Before Availability (tv)	≤200ms	≤1s
Control Input	Hold / Sync	
Sensitivity Adjustment	Yes	-
Reverse Polarity Protection	Yes	
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)	
Operating Temperature	-25° to +70°C (-13° to 158°F)	
Temperature Compensation	Yes	
Protection Degree	IEC IP67	
Indication/Switch Status	Yellow (output energized)	-
Housing Material	Polybutylene Terephthalate (PBT)	
Tightening Torque	3 Nm (2.21lb-ft)	
Weight (connector)	124g (4.37oz)	
Connection	M12 (12mm) connector	
Agency Approvals	CE, UL listed file E187310	

## Dimensions

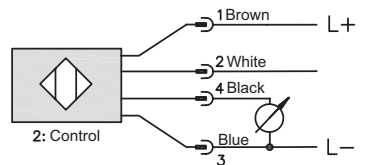


## Wiring Diagrams

### Diagram 1\*

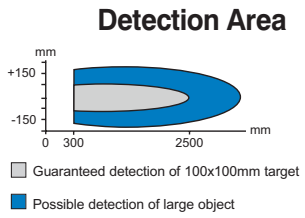
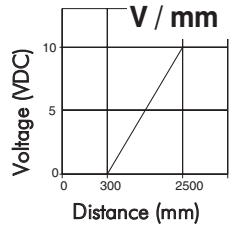


### Diagram 2\*

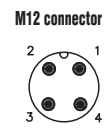


\*Note: Control wire can be used to inhibit sensor or to synchronize with another sensor.

## Characteristic Curves (analog)



## Connector



Must be used with 2M or 7M cable

- Company Information
- Systems Overview
- Programmable Controllers
- Field I/O
- Software
- C-more & other HMI
- Drives
- Soft Starters
- Motors & Gearbox
- Steppers/Servos
- Motor Controls
- Proximity Sensors
- Photo Sensors
- Limit Switches
- Encoders
- Current Sensors
- Pressure Sensors
- Temperature Sensors
- Pushbuttons/Lights
- Process
- Relays/Timers
- Comm.
- Terminal Blocks & Wiring
- Power
- Circuit Protection
- Enclosures
- Tools
- Pneumatics
- Safety
- Appendix
- Product Index
- Part # Index

# UHZ Series Ultrasonic Sensors



Measuring only 30 mm x 20 mm, these miniature sensors are specifically designed for applications with limited mounting space. Thru-beam pair sensors are often the most accurate and reliable sensor configurations, but can also be the most costly when compared to traditional diffuse or retro-reflective sensors. The low price of a UHZ series thru-beam pair allows it to be a competitive alternative to similarly priced but less accurate sensors.

Ultrasonic sensors (rectangular) are ideal for detecting objects in applications where the use of a normal photocell does not, such as:

- level measurement: for tanks containing solid or liquid
- diameter or loop detection: for materials such as paper, sheet iron, etc.
- transparent object detection: for plastic or glass bottles, plastic filters, etc.

## Overview

The principle of ultrasonic sensors is based on the emission of a sound impulse and the measurement of the time elapsing of the return echo signal reflected by the detected object. The ultrasonic beam is well reflected by almost all materials (metal, wood, plastic, glass, liquid, etc.) and is not affected by colored, transparent, or shiny objects.

This allows the user to standardize on one sensor for many materials without any extra setup or sensing concerns.



Ultrasonic Thru-Beam Sensors Specifications	
Specifications	UHZ
<b>Nominal Sensing Distance</b>	300 mm (11.81 in)
<b>Operating Distance</b>	N/A
<b>Output Type</b>	PNP/NPN, NO/ NC
<b>Operating Voltage</b>	18 - 30 VDC
<b>No Load Supply Current</b>	< 40 mA
<b>Operating (Load) Current</b>	500 mA
<b>Off-state (Leakage) Current</b>	<10 µA @ 30 VDC
<b>Voltage Drop</b>	N/A
<b>Switching Frequency</b>	150 Hz
<b>Sensing Beam</b>	Beam angle 15°
<b>Differential Travel (% of Nominal Distance)</b>	N/A
<b>Repeat Accuracy</b>	N/A
<b>Ripple</b>	N/A
<b>Time Delay Before Availability (tv)</b>	N/A
<b>Response Time</b>	1 ms
<b>Reverse Polarity Protection</b>	Yes
<b>Short-Circuit Protection</b>	Output short circuit and overcurrent protection, reverse polarity protection
<b>Operating Temperature</b>	5°F to 140°F (-15°C to +60°C)
<b>Protection Degree</b>	IEC-IP67
<b>Indication/Switch Status</b>	Yellow Output State
<b>Case Material</b>	PBTP
<b>Active Head Material</b>	Ceramic
<b>Shock/Vibration</b>	per IEC EN 60947-5-2
<b>Tightening Torque</b>	N/A
<b>Weight</b>	161 g (5.68 oz)
<b>Connection</b>	2m (6.5') axial cable
<b>Agency Approvals</b>	CE

# UHZ Series Ultrasonic Sensors

The UHZ series of miniature ultrasonic sensors includes four models of rectangular thru-beam units. These tiny 20 mm x 30 mm sensors have a maximum sensing distance of 300 mm, with no dead zone at close range. This enables object sensing at a variety of distances. All models have an LED indicator on the receiver and are IP67 protection rated.

With two pre-drilled mounting holes, the UHZ units can be surface mounted more easily than traditional 18 mm or 30 mm threaded tubular designs, which often require a separate mounting bracket or a large mounting hole and additional lock-nuts.

## Features

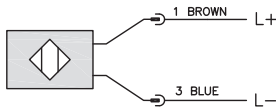
- 30x20x12 mm emitter/receiver rectangular ultrasonic sensor
- LED status indicator for all models
- Complete protection against electrical damage
- IP67 protection
- Strong plastic housing
- Switching frequency 150 Hz
- Sensing distance (sn): 300mm
- Beam angle: 15°
- Supply voltage: 18 - 30 VDC
- NPN or PNP, NO or NC models
- Lifetime warranty

Rectangular Ultrasonic Thru-Beam Sensors Selection Chart

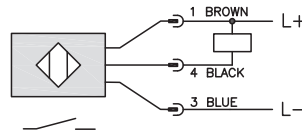
Part Number	Price	Voltage Range	Sensing Range	Switching Frequency	Sensing Beam	Thru-Beam Component	Output Type	Connection Type	Wiring
UHZ-AN-0A	<-->	18 - 30 VDC	11.81 in. (0.3 m)	150 Hz	ultrasonic	pair	NPN /N.O.	2 meter cable	Diagram 1
UHZ-AP-0A	<-->					pair	PNP/ N.O.		Diagram 2
UHZ-CN-0A	<-->					pair	NPN /N.C.		Diagram 3
UHZ-CP-0A	<-->					pair	PNP/ N.C.		Diagram 4

## Wiring Diagram

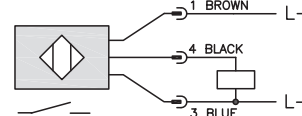
### Emitter



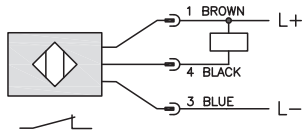
### Receiver (NPN) Diagram 1



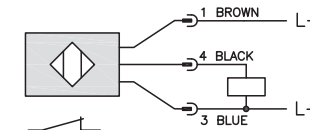
### Receiver (PNP) Diagram 2



### Receiver (NPN) Diagram 3

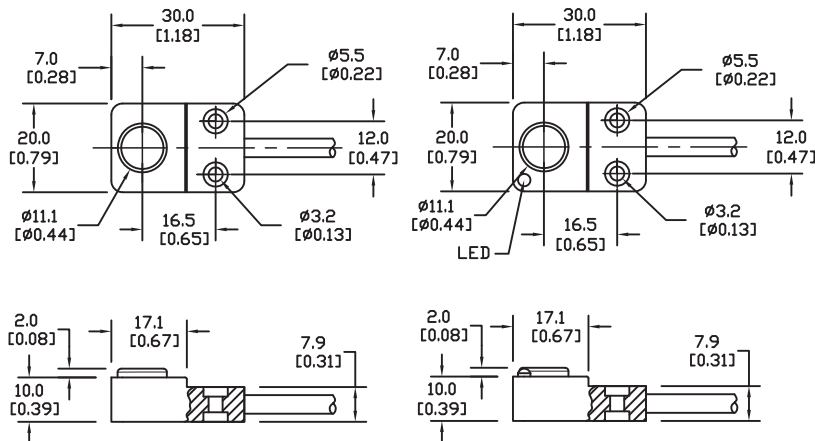


### Receiver (PNP) Diagram 4



## Dimensions

mm [inches]

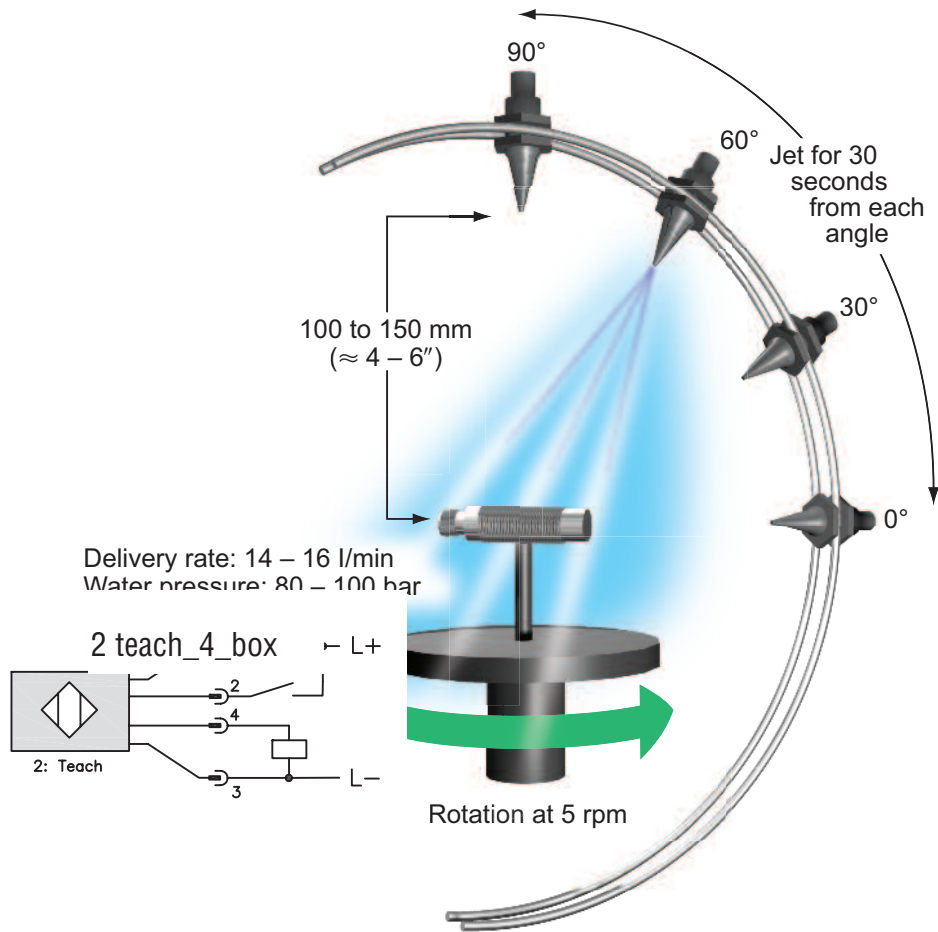


EMITTER

RECEIVER

**Warning: These products are not safety sensors and are not suitable for use in personal safety applications.**

# IP69K-rated Proximity Sensors



## Overview

### IP69K high-pressure cleaning test

The ADC Food and Beverage products were tested in accordance with the IP69K standard, according to DIN 40050 part 9. The goal of this test was to duplicate pressure cleaning conditions on a plant floor. In the test fixture, the sensors were exposed to a 1500 psi spray of water at a temperature of 176 °F. The duration of each cleaning cycle was 30 seconds. The test was performed at specified angles using a spray nozzle located at a distance of 4" from the switch. The sensors withstood test conditions and were still operable, providing 100% of sensing range.

### Thermal endurance

In pressure cleaning environments, proximity and photo sensors can be exposed to extreme temperature conditions. A thermal shock test was performed on the proximity sensors by cycling the temperature to ensure their consistent high reliability. All proximity and FFRS photoeyes can withstand temperatures up to 100°C (212°F).

### FDA certified Materials

The ADC Food & Beverage sensors are manufactured from materials capable of withstanding solutions used during equipment cleaning. These materials are all approved by the FDA for use in food production environments:

- 316L (V4A) stainless steel
- PMMA (acrylic)
- PEEK (Polyether Ether Ketone)
- PPS (Techtron)

Third Party chemical testing companies such as ECOLAB and Johnson Diversey have tested these products with common cleaning agents, such as P3-clint KF and P3-topax 52, to assure continued operation.

# PFM Series IP69K-rated Proximity Sensors

## 12 mm stainless steel - DC



**PFM1-BN-1H**

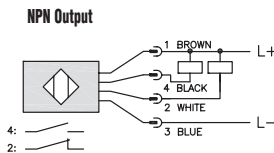
- 10 models available
- 12mm diameter
- 316L stainless steel housing
- M12 quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M12 mounting hex nuts included
- Lifetime warranty



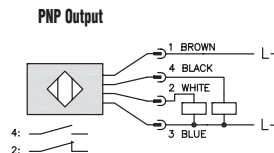
PFM Series Food and Beverage DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard</b>								
<b>PFM1-BN-1H</b>	<--->	0 to 2mm (0 to 0.079in)	Shielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 2
<b>PFM1-BP-1H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 2
<b>PFM1-BN-2H</b>	<--->	0 to 4mm (0 to 0.157in)	Unshielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 2
<b>PFM1-BP-2H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 2
<b>Extended</b>								
<b>PFM1-BN-3H</b>	<--->	0 to 4mm (0 to 0.157in)	Shielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 2
<b>PFM1-BP-3H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 2
<b>PFM1-AP-3H</b>	<--->				N.O.	M12 (12mm) connector	Diagram 3	Figure 1
<b>PFM1-BN-4H</b>	<--->	0 to 8 mm (0 to 0.315in)	Unshielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 2	Figure 2
<b>PFM1-BP-4H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 2
<b>PFM1-AP-4H</b>	<--->				N.O.	M12 (12mm) connector	Diagram 3	Figure 1

## Wiring diagrams

**Diagram 1**

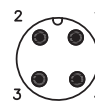


**Diagram 2**

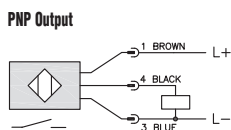


## Connector

**M12 connector**



**Diagram 3**



**NOTE: CLASS 2 POWER SUPPLY REQUIRED**

# PFM Series IP69K-rated Proximity Sensors

PFM Series Specifications	Standard		Extended			
	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	2mm (0.079in)	4mm (0.157in)	4mm (0.157in)	8mm (0.315in)	4mm (0.157in)	7mm (0.275in)
<b>Operating Distance</b>	N/A					
<b>Material Correction Factors</b>	See Material Influence table #2 later in this section.					
<b>Output Type</b>	NPN or PNP/4-wire, N.O./N.C.				PNP, N.O. only	
<b>Operating Voltage</b>	10 - 30 VDC				10 - 36 VDC	
<b>No-load Supply Current</b>	≤15 mA				≤10 mA	
<b>Operating (Load) Current</b>	≤200mA				≤100mA	
<b>Off-state (Leakage) Current</b>	≤10μA				-	
<b>Voltage Drop</b>	≤2.0 V				≤2.5 V	
<b>Switching Frequency</b>	2000 Hz				800 Hz	
<b>Differential Travel (% of Nominal Distance)</b>	1 - 20%				3 - 15%	
<b>Repeat Accuracy</b>	5%				10%	
<b>Ripple</b>	≤10%				-	
<b>Time Delay Before Availability (tv)</b>	50ms				30ms	
<b>Reverse Polarity Protection</b>	Yes					
<b>Short-Circuit Protection</b>	Yes (switch auto-resets after overload is removed)					
<b>Operating Temperature</b>	-40° to 80°C (-40° to 176°F), Short exposure (15 minutes) to 100°C (212°F) during cleaning processes				0° to 100°C (32° to 212°F)	
<b>Temperature Drift</b>	≤10% Sr					
<b>Protection Degree (DIN 40050)</b>	IEC IP67, IP68, IP69K				IEC IP68, IP69K	
<b>Indication/Switch Status</b>	Normally Open output energized - Yellow					
<b>Housing Material</b>	316L stainless steel					
<b>Sensing Face Material</b>	PPS (FDA certified)				PEEK (Polyether Ether Ketone)	
<b>Shock/Vibration</b>	See Terminology Section					
<b>Tightening Torque</b>	20 Nm (14.75 lb-ft)				20 Nm (14.75 lb-ft)	
<b>Weight</b>	35 g (1.23 oz)				25 g (0.88 oz)	
<b>Connection</b>	M12 plug with gold-plated pins					
<b>Agency Approvals</b>	UL file E187310, CE, ECOLAB, RoHS				UL file E328811, CE, ECOLAB, RoHS	

## Dimensions

mm [inches]

Figure 1

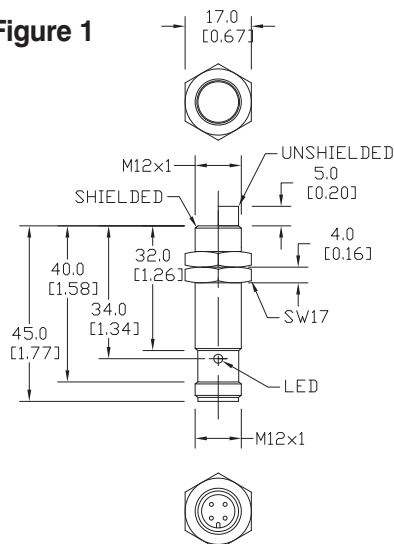
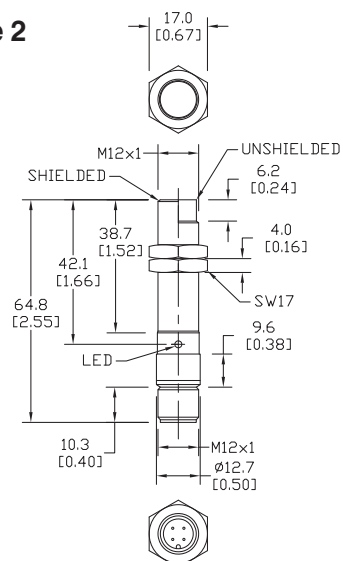


Figure 2



# PFK Series IP69K-rated Proximity Sensors

## 18mm stainless steel - DC



PFK1-BN-1H

- 10 models available
- 18mm diameter
- 316L stainless steel housing
- M12 quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M18 mounting hex nuts included
- Lifetime warranty



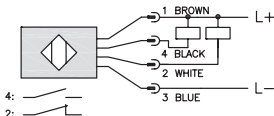
### PFK Series Food and Beverage DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>Standard</b>								
<b>PFK1-BN-1H</b>	<--->	0 to 5mm (0 to 0.197in)	Shielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 3
<b>PFK1-BP-1H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 3
<b>PFK1-BN-2H</b>	<--->	0 to 8mm (0 to 0.315in)	Unshielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 3
<b>PFK1-BP-2H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 3
<b>Extended</b>								
<b>PFK1-BN-3H</b>	<--->	0 to 8mm (0 to 0.315in)	Shielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 3
<b>PFK1-BP-3H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 3
<b>PFK1-AP-3H</b>	<--->			N.O.	PNP	M12 (12mm) connector	Diagram 3	Figure 1
<b>PFK1-BN-4H</b>	<--->	0 to 12mm (0 to 0.472in)	Unshielded	N.O./N.C.	NPN	M12 (12mm) connector	Diagram 1	Figure 3
<b>PFK1-BP-4H</b>	<--->				PNP	M12 (12mm) connector	Diagram 2	Figure 3
<b>PFK1-AP-4H</b>	<--->				N.O.	M12 (12mm) connector	Diagram 3	Figure 2

## Wiring diagrams

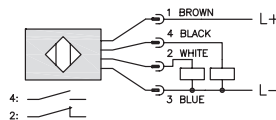
### Diagram 1

NPN Output



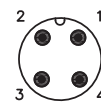
### Diagram 2

PNP Output



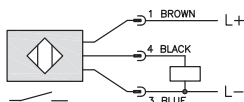
### Connector

M12 connector



### Diagram 3

PNP Output



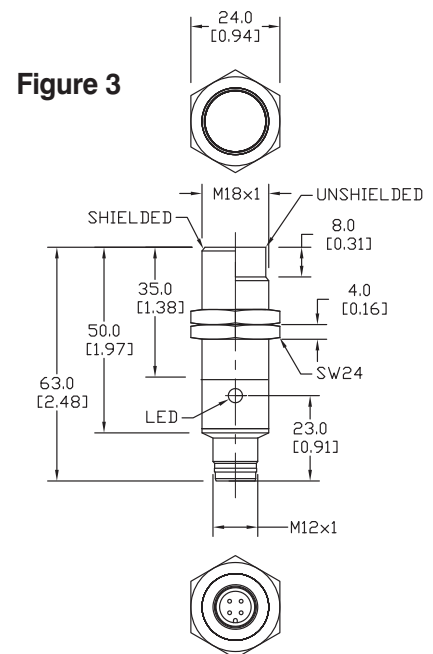
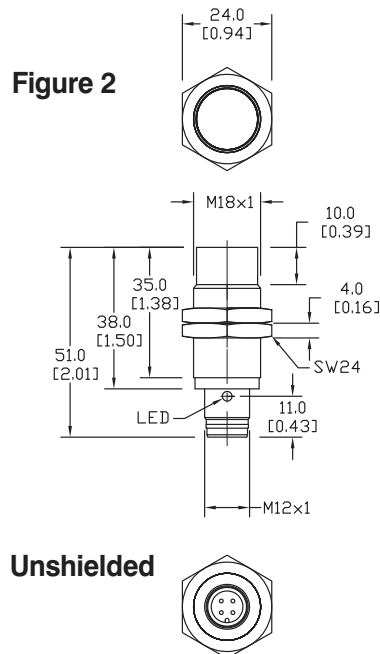
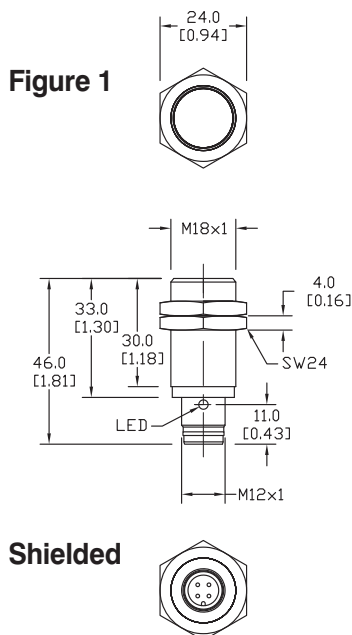
**NOTE: CLASS 2 POWER SUPPLY REQUIRED**

# PFK Series IP69K-rated Proximity Sensors

PFK Series Specifications	Standard		Extended			
	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Mounting Type</b>	Shielded	Unshielded	Shielded	Unshielded	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	5mm (0.196in)	8mm (0.315in)	8mm (0.315in)	12mm (0.472in)	8mm (0.315in)	12mm (0.472in)
<b>Operating Distance</b>	N/A					
<b>Material Correction Factors</b>	See Material Influence table #2 later in this section.					
<b>Output Type</b>	NPN or PNP/4-wire, N.O./N.C.				PNP, N.O. only	
<b>Operating Voltage</b>	10 - 30 VDC				10 - 36 VDC	
<b>No-load Supply Current</b>	≤15 mA				≤10 mA	
<b>Operating (Load) Current</b>	≤200mA				≤100mA	
<b>Off-state (Leakage) Current</b>	≤10µA				-	
<b>Voltage Drop</b>	≤2.0 V				≤2.5 V	
<b>Switching Frequency</b>	1500 Hz				600 Hz	300 Hz
<b>Differential Travel (% of Nominal Distance)</b>	1 - 20%				3 - 15%	
<b>Repeat Accuracy</b>	5%				10%	
<b>Ripple</b>	≤10%				-	
<b>Time Delay Before Availability (tv)</b>	50ms				30ms	
<b>Reverse Polarity Protection</b>	Yes					
<b>Short-Circuit Protection</b>	Yes (switch auto-resets after overload is removed)					
<b>Operating Temperature</b>	-40° to 80°C (-40° to 176°F), Short exposure (15 minutes) to 100°C (212°F) during cleaning processes				0° to 100°C (32° to 212°F)	
<b>Protection Degree (DIN 40050)</b>	IEC IP67, IP68, IP69K				IEC IP68, IP69K	
<b>Indication/Switch Status</b>	Normally Open output energized - Yellow					
<b>Housing Material</b>	316L stainless steel					
<b>Sensing Face Material</b>	PPS (FDA certified)				PEEK (Polyether Ether Ketone)	
<b>Shock/Vibration</b>	See Terminology Section					
<b>Tightening Torque</b>	107 Nm (79 lb-ft)				50 Nm (37 lb-ft)	
<b>Weight</b>	35 g (1.23 oz)				45 g (1.587 oz)	
<b>Connection</b>	M12 plug with gold-plated pins					
<b>Agency Approvals</b>	UL file E187310, CE, ECOLAB, RoHS				UL file E328811, CE, ECOLAB, RoHS	

## Dimensions

mm [inches]





# PFT Series IP69K-rated Proximity Sensors



**PFT1-AP-3H**  
**PFT1-AP-4H**

## 30mm stainless steel - DC

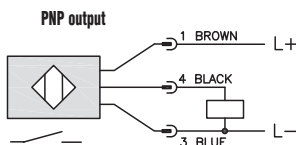
- 4 models available.  
PFT1 series – short-body length,  
PFT2 series – regular body length
- 30mm diameter
- 316L stainless steel housing
- M12 quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M30 mounting hex nuts included
- Lifetime warranty



PFT Series Food and Beverage DC Inductive Prox Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>PFT1-AP-3H</b>	<--->	0 to 14 mm (0 to 0.551 in)	Shielded	N.O.	PNP	M12 (12mm) connector	Diagram1	Figure 1
<b>PFT2-AP-3H</b>	<--->	0 to 15 mm (0 to 0.590 in)			PNP	M12 (12mm) connector	Diagram1	Figure 2
<b>PFT1-AP-4H</b>	<--->	0 to 22 mm (0 to 0.866 in)	Unshielded	N.O.	PNP	M12 (12mm) connector	Diagram1	Figure 1
<b>PFT2-AP-4H</b>	<--->				PNP	M12 (12mm) connector	Diagram1	Figure 2

## Wiring diagram

**Diagram 1**



## Connector

**M12 connector**



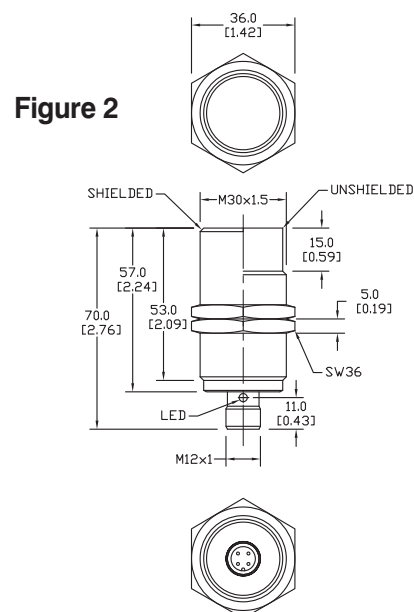
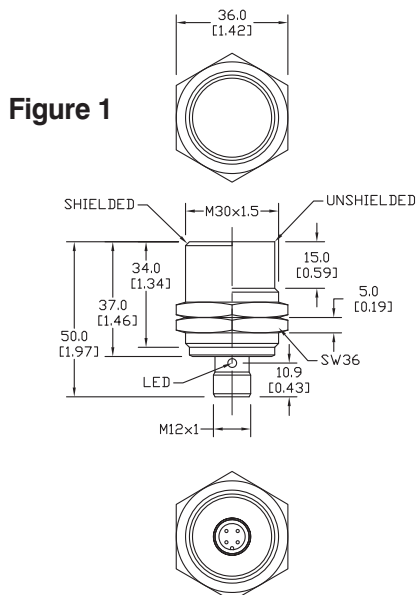
NOTE: CLASS 2 POWER SUPPLY REQUIRED

# PFT Series IP69K-rated Proximity Sensors

PFT Series Specifications				
Mounting Type	Shielded		Unshielded	
	PFT1	PFT2	PFT1	PFT2
Nominal Sensing Distance	14mm (0.551 in)	15mm (0.590 in)	22mm (0.866 in)	
Operating Distance	N/A			
Material Correction Factors	See Material Influence table #2 later in this section.			
Output Type	PNP, N.O. only			
Operating Voltage	10 - 36 VDC			
No-load Supply Current	≤10 mA			
Operating (Load) Current	≤100mA			
Off-state (Leakage) Current	—			
Voltage Drop	≤2.5 V			
Switching Frequency	50 Hz		100 Hz	
Differential Travel (% of Nominal Distance)	3 - 15%			
Repeat Accuracy	10%			
Ripple	N/A			
Time Delay Before Availability (tv)	30 ms			
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature	0° to 100°C (32° to 212°F)			
Protection Degree (DIN 40050)	IEC IP68, IP69K			
Indication/Switch Status	Normally Open output energized - Yellow			
Housing Material	316L stainless steel			
Sensing Face Material	PEEK (Polyether Ether Ketone)			
Shock/Vibration	See Terminology Section			
Tightening Torque	80 Nm (59 lb-ft)			
Weight	110g ( 3.88 oz)	130g ( 4.58 oz)	107g ( 3.77 oz)	124g ( 4.37 oz)
Connection	M12 plug with gold-plated pins			
Agency Approvals	UL file E328811, CE ECOLAB, RoHS			

## Dimensions

mm [inches]



# VFK Series IP69K-rated Proximity Sensors



VFK1-A0-1M  
VFK1-A0-2M

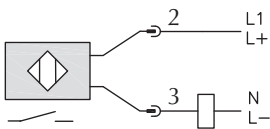
## 18mm stainless steel - AC

- 2 models available
- 18mm diameter
- 316L stainless steel housing
- 1/2" micro AC quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M18 mounting hex nuts included
- Lifetime warranty

VFK Series Food and Beverage AC Inductive Prox Selection Chart							
Part Number	Price	Sensing Range	Housing	Output State	Connection	Wiring	Dimensions
VFK1-A0-1M	<-->	0 to 5 mm (0 to 0.197 in)	Shielded	N.O.	1/2" micro AC quick-disconnect plug	Diagram 1	Figure 1
VFK1-A0-2M	<-->	0 to 12 mm (0 to 0.472 in)	Unshielded		1/2" micro AC quick-disconnect plug	Diagram 1	Figure 1

## Wiring diagram

Diagram 1



Connector



**NOTE: CLASS 2 POWER SUPPLY REQUIRED**

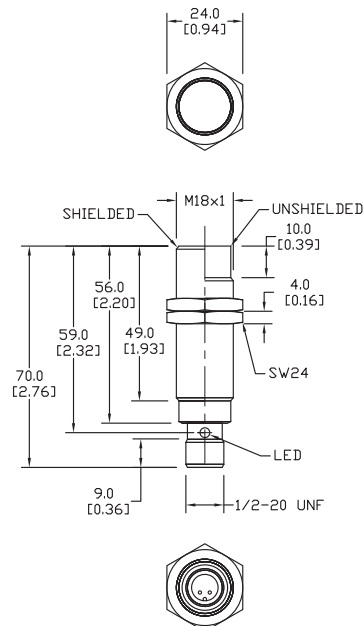
# VFK Series IP69K-rated Proximity Sensors

VFK Series Specifications		
Mounting Type	Shielded	Unshielded
Nominal Sensing Distance	0 to 5 mm(0 to 0.197 in)	0 to 12 mm (0 to 0.472 in)
Operating Distance	N/A	
Material Correction Factors	See Material Influence table #2 later in this section.	
Output Type	N.O. only	
Operating Voltage	20 to 140 VAC/VDC	
No-load Supply Current	N/A	
Operating (Load)Current	5 - 200mA	
Off-state (Leakage) Current	<1mA	
Voltage Drop	<5.5 V	
Switching Frequency	25 Hz VAC/400 Hz VDC	25 Hz VAC/300 Hz VDC
Differential Travel (% of Nominal Distance)	1 - 20%	
Repeat Accuracy	10%	
Ripple	N/A	
Time Delay Before Availability (tv)	1 s	
Reverse Polarity Protection	yes	
Short-Circuit Protection	yes (non latching)	
Operating Temperature	0° to 100°C (32° to 212°F)	
Protection Degree (DIN 40050)	IEC IP68/IP69K, II	
Indication/Switch Status	Normally Open output energized - Yellow	
Housing Material	316L stainless steel	
Sensing Face Material	PEEK (Polyether Ether Ketone)	
Shock/Vibration	See Terminology Section	
Tightening Torque	50 Nm (37 lb-ft)	
Weight	68 g (2.39 oz)	59 g (2.08 oz)
Connection	1/2" micro AC connector	
Agency Approvals	UL E328811, CE, ECOLAB, RoHS	

## Dimensions

mm [inches]

Figure 1



# VFT Series IP69K-rated Proximity Sensors



VFT1-A0-1M  
VFT1-A0-2M

## 30mm stainless steel - AC

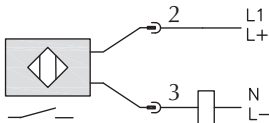
- 2 models available
- 30mm diameter
- 316L stainless steel housing
- 1/2" micro AC quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M30 mounting hex nuts included
- Lifetime warranty



VFT Series Food and Beverage AC Inductive Prox Selection Chart							
Part Number	Price	Sensing Range	Housing	Output State	Connection	Wiring	Dimensions
VFT1-A0-1M	<--->	0 to 14 mm (0 to 0.551 in)	Shielded	N.O.	1/2" micro AC quick-disconnect plug	Diagram 1	Figure 1
VFT1-A0-2M	<--->	0 to 22 mm (0 to 0.866 in)	Unshielded		1/2" micro AC quick-disconnect plug	Diagram 1	Figure 1

## Wiring diagram

Diagram 1



Connector



**NOTE: CLASS 2 POWER SUPPLY REQUIRED**

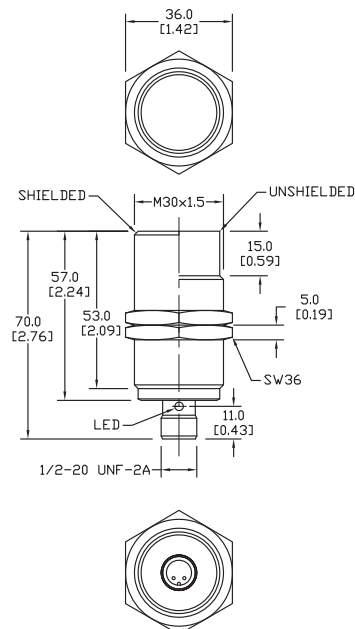
# VFT Series IP69K-rated Proximity Sensors

VFT Series Specifications		
<b>Mounting Type</b>	Shielded	Unshielded
<b>Nominal Sensing Distance</b>	0 to 14 mm (0 to 0.551 in)	0 to 22 mm (0 to 0.866 in)
<b>Operating Distance</b>	N/A	N/A
<b>Material Correction Factors</b>	See Material Influence Table 2 later in this section.	
<b>Output Type</b>	N.O. only	
<b>Operating Voltage</b>	20 to 140 VAC/VDC	
<b>No-load Supply Current</b>	N/A	
<b>Operating (Load) Current</b>	5 - 200mA	
<b>Off-state (Leakage) Current</b>	<1mA	
<b>Voltage Drop</b>	<5.5 V	
<b>Switching Frequency</b>	25 Hz VAC/100 Hz VDC	
<b>Differential Travel (% of Nominal Distance)</b>	2 - 15%	3 - 15%
<b>Repeat Accuracy</b>	10%	
<b>Ripple</b>	N/A	
<b>Time Delay Before Availability (tv)</b>	1 s	
<b>Reverse Polarity Protection</b>	yes	
<b>Short-Circuit Protection</b>	yes (non latching)	
<b>Operating Temperature</b>	0° to 100°C (32° to 212°F)	
<b>Protection Degree (DIN 40050)</b>	IEC IP68/IP69K, II	
<b>Indication/Switch Status</b>	Normally Open output energized - Yellow	
<b>Housing Material</b>	316L stainless steel	
<b>Sensing Face Material</b>	PEEK (Polyether Ether Ketone)	
<b>Shock/Vibration</b>	See Terminology Section	
<b>Tightening Torque</b>	80 Nm (59 lb-ft)	
<b>Weight</b>	149 g (5.25 oz)	142 g (5.01 oz)
<b>Connection</b>	1/2" micro AC connector	
<b>Agency Approvals</b>	UL E328811, CE, ECOLAB, RoHS	

## Dimensions

mm [inches]

Figure 1



# IP69K-rated Proximity Sensors - Magnetic



**MAFM1-A0-1H**  
**MAFK1-A0-1H**

## 12mm and 18mm stainless steel-DC

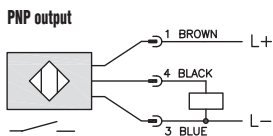
- 2 models available
- 12mm or 18mm diameter
- 316L stainless steel housing
- M12 quick-disconnect plug with gold-plated pins (purchase cable separately)
- Complete overload protection
- IP69K rated for food and beverage applications
- M12 or M18, as applicable, mounting hex nuts included
- Lifetime warranty



Magnetic DC Prox Food and Beverage Selection Chart								
Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
<b>12 mm Diameter</b>								
<b>MAFM1-A0-1H</b>	<--->	0 to 60 mm (0 to 2.362 in)	Shielded	N.O.	PNP	M12 (12mm) connector	Diagram 1	Figure 1
<b>18 mm Diameter</b>								
<b>MAFK1-A0-1H</b>	<--->	0 to 70 mm (0 to 2.756 in)	Shielded	N.O.	PNP	M12 (12mm) connector	Diagram 1	Figure 2

## Wiring diagram

**Diagram 1**



**Connector**



NOTE: CLASS 2 POWER SUPPLY REQUIRED

## Magnet

- Damping magnet for use with MAFM1 and MAFK1 series sensors
- Barium ferrite with stainless steel coating



### Damping Magnet

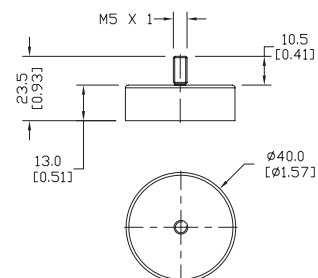
<b>AW-MAG</b>	<--->
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### AW-MAG Damping Magnet Specifications

<b>Ambient Temperature</b>	-13 to 266°F (-25 to 130°C)
<b>Housing Materials</b>	Barium ferrite, stainless steel coating (1.4571/316Ti)
<b>Approvals</b>	RoHS
<b>Weight</b>	82 g (2.89 oz)

## Dimensions

mm [inches]



# MAFM and MAFK Series IP69K-rated Magnetic Proximity Sensors

Magnetic Series Specifications		
Series	MAFM	MAFK
Mounting Type	Shielded	
Nominal Sensing Distance	0 to 60 mm (0 to 2.362 in)	0 to 70 mm (0 to 2.756 in)
Operating Distance	N/A	
Material Correction Factors	N/A	
Output Type	PNP, N.O. only	
Operating Voltage	10 to 30 VDC	
No-load Supply Current	<10 mA	
Operating (Load) Current	200mA	
Off-state (Leakage) Current	N/A	
Voltage Drop	<2.5 V	
Switching Frequency	5000 Hz VDC	
Differential Travel (% of Nominal Distance)	1 to 10%	
Repeat Accuracy	10%	
Ripple	N/A	
Time Delay Before Availability (tv)	1 s	
Reverse Polarity Protection	yes	
Short-Circuit Protection	yes (non latching)	
Operating Temperature	0° to 100°C (32° to 212°F)	
Protection Degree (DIN 40050)	IEC IP68/IP69K, II	
Indication/Switch Status	Normally Open output energized - Yellow	
Housing Material	316L stainless steel	
Sensing Face Material	PEEK (Polyether Ether Ketone)	
Shock/Vibration	See Terminology Section	
Tightening Torque	20 Nm (14.75 lb-ft)	50 Nm (37 lb-ft)
Weight	33 g (1.16 oz)	54 g (1.90 oz)
Connection	M12 connector	
Agency Approvals	UL E32881, CE, ECOLAB, RoHS	

## Dimensions

mm [inches]

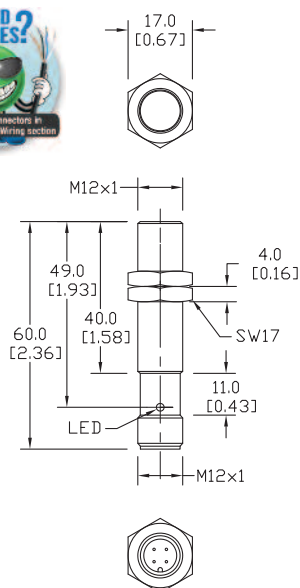
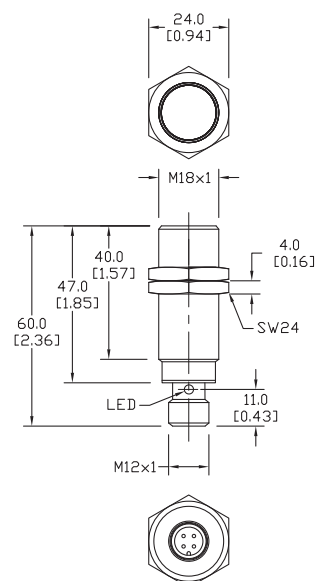


Figure 2





# Accessories: Adapter, Mounting Brackets

## ST12A axial bracket

For mounting M12 (12 mm) sensors. Has two mounting holes (use 3 mm screws) and allows the rotation of an optical axis for right-beam angle adapter sensors. Hexagonal nuts not included.



## ST12C right-angle bracket

Angular mounting bracket for use with M12 (12 mm) sensors. Has two mounting holes (use 3 mm screws) and allows the rotation of an optical axis for axial sensors. Hexagonal nuts not included.

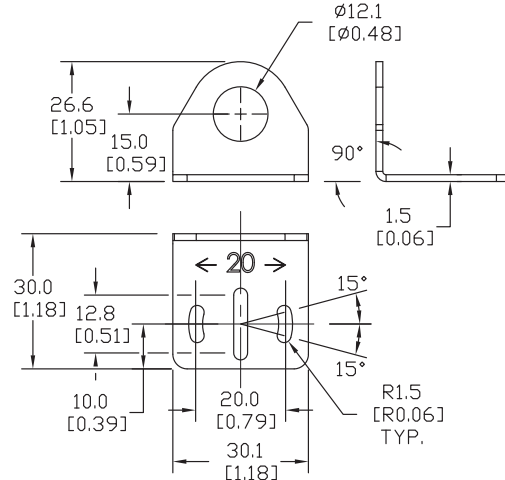
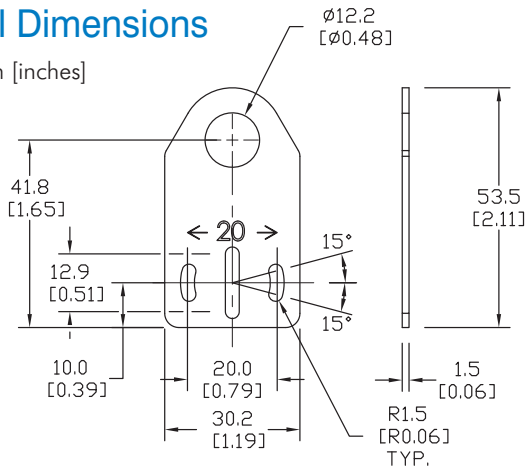


Brackets		
Part Number	Price	Description
ST12A	<--->	Zinc plated iron axial bracket for 12 mm sensors, 1/pk
ST12A7W	<--->	316L stainless steel axial bracket for 12 mm sensors, 1/pk

Brackets		
Part Number	Price	Description
ST12C	<--->	Zinc plated iron right angle bracket for 12 mm sensors, 1/pk
ST12C7W	<--->	316L stainless steel right angle bracket for 12 mm sensors, 1/pk

### All Dimensions

mm [inches]



## ST18A axial bracket

Mounting bracket for M18 (18 mm) sensors. Has two mounting holes (use 4 mm screws) and allows the rotation of an optical axis for right-beam-angle-adaptor sensors. Hexagonal nuts not included.



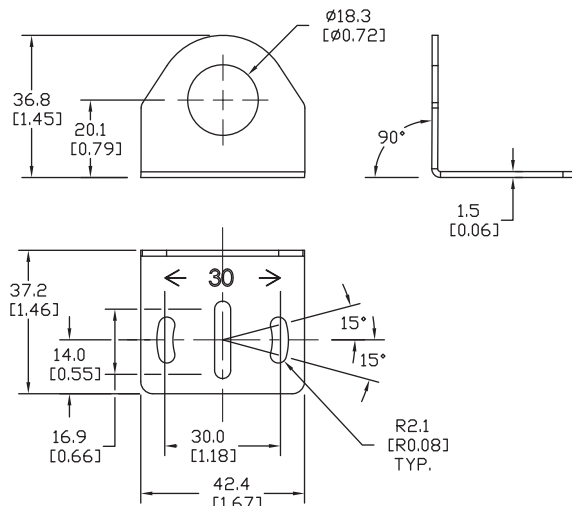
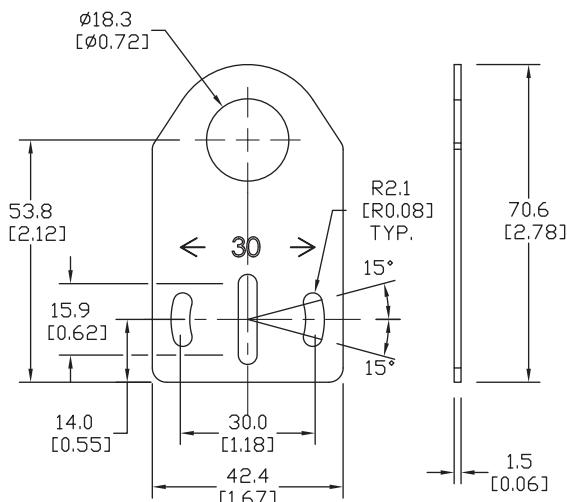
## ST18C right-angle bracket

Angular mounting bracket for M18 (18 mm) sensors. Has two mounting holes (use 4 mm screws) and allows the rotation of an optical axis for axial sensors. Hexagonal nuts not included.



Brackets		
Part Number	Price	Description
ST18A	<--->	Zinc plated iron axial bracket for 18 mm sensors, 1/pk
ST18A7W	<--->	316L stainless steel axial bracket for 18 mm sensors, 1/pk

Brackets		
Part Number	Price	Description
ST18C	<--->	Zinc plated iron right angle bracket for 18 mm sensors, 1/pk
ST18C7W	<--->	316L stainless steel right angle bracket for 18 mm sensors, 1/pk



# Accessories: Mounting Brackets

## ST30A axial bracket

Mounting M30 (30 mm) sensors. Has two mounting holes (use 5 mm screws) and allows the rotation of an optical axis for right-beam-angle-adaptor sensors. Hexagonal nuts not included.



## ST30C right-angle bracket

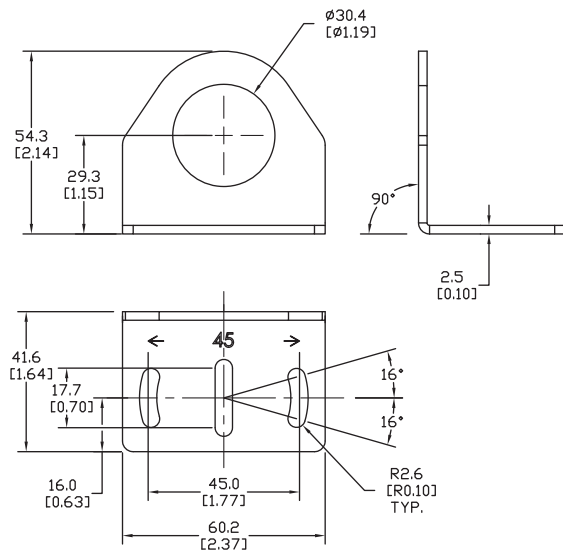
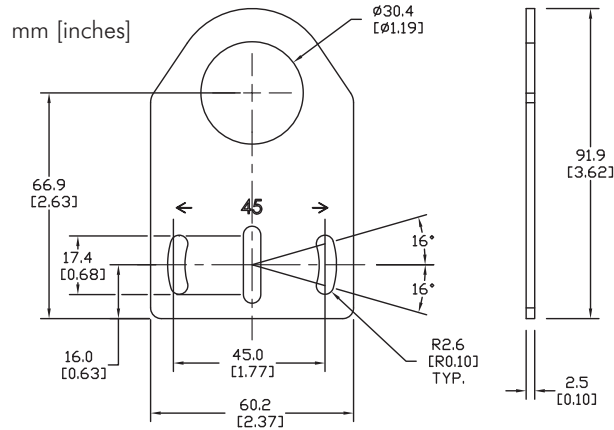
Angular mounting bracket for M30 (30 mm) sensors. Has two mounting holes (use 5 mm screws) and allows the rotation of an optical axis for axial sensors. Hexagonal nuts not included.



Brackets		
Part Number	Price	Description
ST30A	<--->	Zinc plated iron axial bracket for 30 mm sensors, 1/pk

Brackets		
Part Number	Price	Description
ST30C	<--->	Zinc plated iron right angle bracket for 30 mm sensors, 1/pk

## All Dimensions



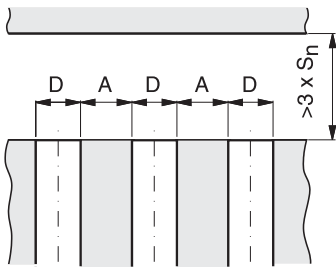
# Proximity Sensor Terminology

The following descriptions refer to the European standard EN 60947-5-2. of 2007.

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

## Alignment

Proximity switches must not be mutually influenced. For this reason, a minimum distance between them (referred to as alignment) must be provided.



Size D	Embeddable A (mm)	Non-Embeddable A (mm)
Ø3	0	--
M4	0	--
Ø4	0	--
M5	0	--
5X5	0	--
M8	2/3*	8
8X8	2/3*	--
M12	6/10*	12
M18	12/20*	30
M30	30	60

\*Extended distance models

## Break function (N.C., normally closed)

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

## Protection degree

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

## Differential travel (Hysteresis)

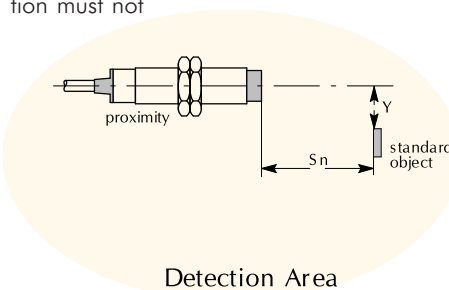
The differential travel is given as a percentage of the nominal sensing distance ( $S_n$ ) and is the maximum difference between the switching distances. The differential is intentionally introduced to guarantee the stability of the output state in case the target is positioned near the switching points.

## Electrical connections

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

The power supply voltage must not exceed the specified limits  $U_b$ .

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



exceed  $U_b$  limits.

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

## Installation notes

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

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

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

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

Metallic chips or dust must not accumulate on the sensing face. The distance between the sensor and the object to detect must not exceed the assured operating distance  $S_a$ ; the best sensing range is  $S_n/2$ .

Check the effect of vibrations.

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

# Proximity Sensor Terminology

## Indication/switch status

Proximity switches may incorporate one or more color indicators. The meaning of the colors vary by part. Please see part specifications for meaning.

## Make function (N.O., normally open)

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

## Material influence

The nominal sensing distance ( $S_n$ ) is defined using precisely defined measuring conditions (See **Operating Distance**.) Other conditions may result in a reduction of the operating distance. The tables in the next column show the influence different target materials have on the operating distances of the sensors.

Material Influence: Table 1	
Target Material	Operating Distance
Steel Type FE 360	$(S_n) \times 1.00$
Brass	$(S_n) \times 0.64$
Aluminum	$(S_n) \times 0.55$
Copper	$(S_n) \times 0.51$
Stainless Steel (V2A)	$(S_n) \times 0.85$

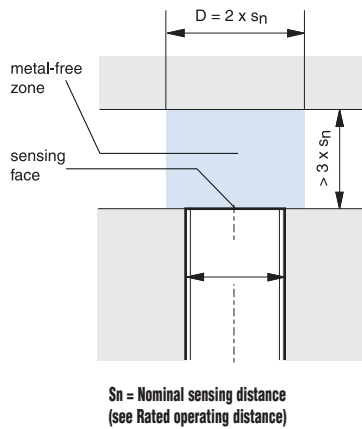
Material Influence: Table 2	
Target Material	Operating Distance
Steel Type FE 360	$(S_n) \times 1.00$
Brass	$(S_n) \times 0.44$
Aluminum	$(S_n) \times 0.36$
Copper	$(S_n) \times 0.32$
Stainless Steel (V2A)	$(S_n) \times 0.69$

Material Influence: Table 3	
Target Material	Operating Distance
Steel Type FE 360	$(S_n) \times 1.00$
Brass	$(S_n) \times 1.00$
Aluminum	$(S_n) \times 1.30$
Copper	$(S_n) \times 0.89$
SS (1mm thick)	$(S_n) \times 0.57$
SS (2mm thick)	$(S_n) \times 0.90$

## Mounting type

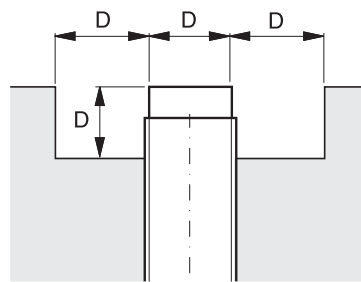
### Shielded (embeddable) on flush proximity switches

These proximity switches may be flush mounted regardless of the metal being used. For reliable operation, it is necessary to observe the minimum distances from adjacent metal targets.



### Unshielded (non-embeddable) on non-flush proximity switches

When mounting non-embeddable mounting proximity switches in conducting materials (metals), it is necessary to observe the minimum distances from adjacent metal targets. Flush mounting in non-conducting materials is permitted.



## Off-state (leakage) current

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

## Open collector

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

## Operating distance (assured sensing range) (Sa)

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

## Output type and load connections – 3-wire NPN

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

## Output type and load connections – 3-wire PNP

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

## Overvoltage protection

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

## Polarity reversing protection

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

# Proximity Sensor Terminology

## Protection against inductive loads

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

## Unshielded proximity switches

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

## Rated insulation voltage (Ui)

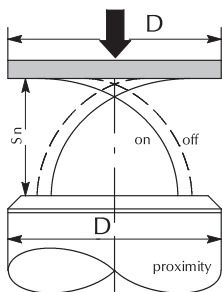
Unless specified differently, all of the sensors with a supply voltage of up to 50 VAC and 75 VDC are tested at 500 VAC.

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

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

## Nominal sensing distance — (Rated operating distance) (Sn)

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



Nominal Sensing Distance

## Repeat accuracy (R)

The repeat accuracy of the effective operating distance ( $S_r$ ) is measured over an eight hour period at an ambient temperature of  $73^\circ\text{F}$  ( $\pm 9^\circ$ ) [ $23^\circ\text{C}$  ( $\pm 5^\circ$ )] at a specified humidity and with a specified supply voltage. The difference between the measurements shall not exceed the specified value, or if not specified, 10% of  $S_n$ .

## Ripple

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

## Shocks

In accordance with IEC 608 68-2-27

Pulse shape: half-sine

Peak acceleration: 30g

Pulse duration: 11 ms

## Shielded proximity switches

A metal housing surrounds the coil, and only the front of the active face is sensitive. The device allows flush installation on metal plates without any performance change. Refer to Alignment when installing shielded sensors side-by-side.

## Short-circuit protection

All DC sensors have integrated short-circuit protection. AC sensors should be protected externally by such devices as fuses.

## No load supply (current consumption)

Amount of current consumed by sensor when output is not energized.

## Standard target

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

## Switching frequency (f)

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

- For DC sensors, the minimum output pulse width must not fall below  $50 \mu\text{s}$ .
- For AC sensors, the minimum output pulse must not fall below half a sine period (ie. for 60 Hz,  $1/60 \div 2 = 8.33 \text{ ms}$ .)

## Temperature range

Unless otherwise specified, the minimum temperature range is  $-13$  to  $+158^\circ\text{F}$  ( $-25$  to  $+70^\circ\text{C}$ ).

## Turn-on time

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

## Turn-off time

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

## Operating voltage (Ub)

Supply voltage range for safe and correct sensor operation.

## Operating (load) Current

Maximum current the sensor output is capable of switching.

# Proximity Sensor Terminology

## Voltage drop (Ud)

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

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

## Vibration

In accordance with IEC 608 68-2-6

Frequency range: 10-55 Hz

Amplitude: 1 mm

Sweep cycle duration: 5 min.

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

## 4-wire NPN or PNP (programmable output state)

There are two power wires: one N.O./N.C. selection input wire and one output wire. The output state is programmable by connecting the input wire to one of the power supply lines.

## 4-wire NPN or PNP (complementary outputs)

There are two power wires: one normally open output wire and one normally closed output wire.

## 4-wire NPN and PNP

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

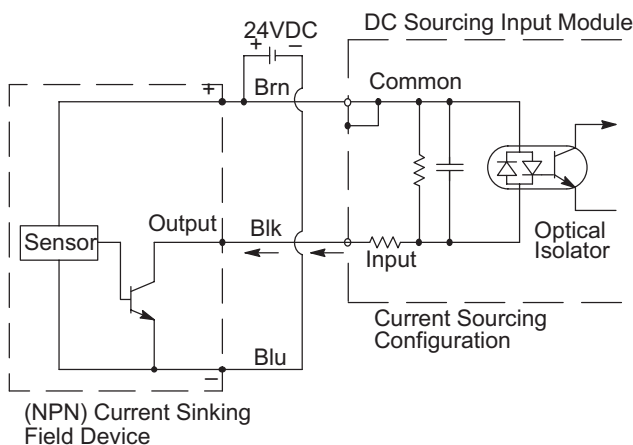
## Time delay before availability ( $t_v$ )

The time delay before availability is the time between the switching on of the supply voltage and the instant at which the sensor becomes ready to operate correctly.

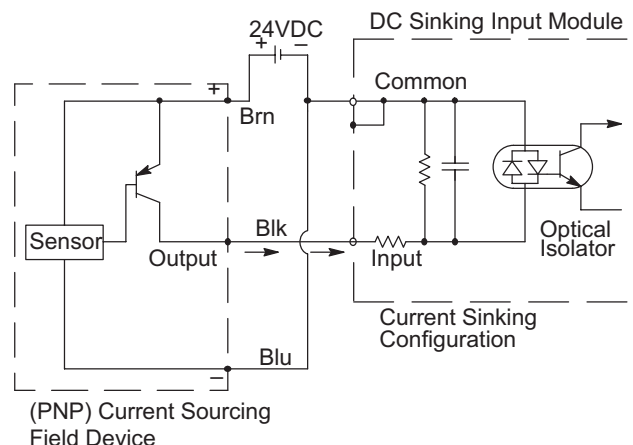
During the reset the output circuit is in OFF-state; false signal may be present but the duration shall not exceed 2 ms. If not specified otherwise, the reset duration doesn't exceed 300 ms.

# Field Device Examples – 3-Wire Connections

NPN (Sinking)  
Field Device Example



PNP (Sourcing)  
Field Device Example



# Frequently Asked Questions

## **How do inductive proximity switches work?**

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

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

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

## **What is the difference between inductive and capacitive sensors?**

The primary difference is sensing material. Inductive sensors only detect metallic objects while capacitive sensors will detect materials such as wood, paper, liquids, cardboard, etc.

## **How do I know what size proximity sensor I need?**

It depends on two factors: mounting space and sensing distance. Each application has a specific space available for the sensor and each application has a requirement for how close the sensor can be mounted to the sensed object.

## **What is the difference between shielded and unshielded?**

With a shielded proximity sensor, the face of the sensor may be mounted flush with metal, whereas an unshielded sensor may NOT be mounted flush with metal (otherwise the sensor will always be ON). In many applications, flush mounting is a requirement. Also, unshielded proximity sensors allow for greater sensing distances.

## **What output do I need? NPN or PNP?**

This is determined by the device you are connecting the sensor to. Most DirectLOGIC PLC modules (except 305 series) allow NPN or PNP sensors to be connected. This is determined by how the sensor is wired to the PLC.

## **How do I choose between normally open (N.O.) and normally closed (N.C.)?**

N.O. sensors do not pass power to the PLC until an object is detected. N.C. sensors always pass power to the PLC until an object is detected. The majority of Centsable sensors are N.O.; however, some sensors offer the option of N.C., such as PKW, PMW and CT1 series.

## **When do I want quick disconnects (Q/D) versus embedded cable output?**

There is a slight cost increase to purchase a sensor and a Q/D cable compared to only purchasing a sensor with a pre-attached cable. However, the Q/D output allows easy replacement of a failed sensor. This is important in minimizing machine or operation downtime.

## **What is the difference between 2-wire, 3-wire, and 4-wire sensors?**

2-wire sensors: allows either NPN or PNP outputs (don't have to select).

3-wire sensors: standard sensors. When ordering, you must choose between NPN and PNP output.

4-wire sensors: Allow either N.O. or N.C. outputs (don't have to select). Must still select NPN or PNP output.

## **Do AutomationDirect supplied sensors operate on AC or DC voltage?**

The majority of AutomationDirect supplied sensors operate on 10-30 VDC. However, we do offer the VT1, VK1, VM1, VFT and VFK series that operate on 20-253VAC.

## **Can my sensor be installed in a washdown area?**

Yes. Although most AutomationDirect sensors carry an IP67 protective rating which is suitable for submersion, we do offer units designed for harsh high-pressure cleaning environments. These units include the PFM, PFK, PFT, VFK and VFT series.

## **What does switching frequency mean to my application?**

This is how fast your sensor can sense an object, reset, and sense another object. For example, if a sensor has a switching frequency of 100 Hz or 100 cycles per second, the sensor can sense a maximum of 100 objects per second. This is very critical in many applications such as gear rotation measurement.

## **Can the sensor be put into a vibrating environment?**

Yes. Frequency range of 10-55 Hz, maximum amplitude of 1mm. Duration in any axis a maximum of 30 minutes.

## **What is the temperature range of the sensors?**

Most sensors operate between -25°F and 70°F. However, check the specifications for exact ranges.

## **If I wire my proximity sensor wrong, will it damage it?**

Possibly. All sensors contain polarity reversal, short-circuit and transient noise protection. However, the transient protection is only effective under 30 VDC.

