SUPERPROX® Ultrasonic Proximity Sensors

Extended-range Proximity Sensing

- Extended 51mm (2.0") sensing range
- Short 6mm (0.25") deadband
- Easy to install, 12mm barrel-style housing
- All-material, proximity sensing capability
- CE certified

The world's first 12mm, long-range, multi-material, ultrasonic, proximity sensor...the efficient solution to close-up sensing

Use the highly versatile SUPERPROX® Model SM300 Series of proximity sensors as a replacement for inductive proximity sensors and fixed-field photoelectric sensors. Its long range, small size, fast response, performance, reliability and low cost, offers a simple, easy to use, once-and-for-all solution to many of the proximity sensing problems encountered daily in almost every industry.

The 12mm, SM300 proximity sensor provides reliable detection of objects 51mm (2") from the sensor face, performance unmatched by other proximity sensors of the same size or larger. At this distance, the sensor is safely out of harm's way, an especially important cost savings benefit. The only miniature proximity sensor on the market that offers this combination of extended sensing range and small size, the threaded, 12mm diameter housing allows embedment in machines where longer range proximity sensors may not fit.

The SM300 is inherently capable of automatically detecting all materials regardless of color, shape and composition (transparent or opaque, liquid or solid) including clear glass, mirrors, wood, powder, ink, ferrous and nonferrous metal, plastics, and objects that change colors. While some sensors require adjustment (through the use of a sensitivity potentiometer) to the material they are detecting, the SM300 detects most materials automatically. With protection ratings of NEMA 4X and IP67, the sensor resists most acids and bases and is compatible with many chemicals, cleaning solutions and chemical-based products. The SM300 sensor series is CE certified.

These are just a few of the benefits of this new, small, multi-material, extended-range proximity sensor from the world leader in ultrasonic sensing technology.

The applications suited to the SM300 proximity sensor are as broad as the benefits just mentioned. And because of the sensor's versatility, it is a solid candidate for almost every proximity sensing and noncontact switching need in the plant. The SM300 can detect positive stop and true home positions for servo-control systems and tool and parts presence in automated CNC centers and assembly equipment. It is an ideal solution for sensing part and pin presence along with punch-through verification in stamping dies. Other applications include die open and closed detection of stamping, plastic injection molding and die casting applications. Or, anywhere that traditional proximity sensing methods cannot reliably detect the large variety of materials running through the process or are limited by range.

Operation

The SUPERPROX® Model SM300 Series is a self-contained, pulse-echo, proximity sensing device that both transmits and receives sonic energy within an operating distance of 6mm (0.25") to 51mm (2"). The sensor combines the latest piezoelectric and microprocessor technology for the best possible performance in almost any sensing application.

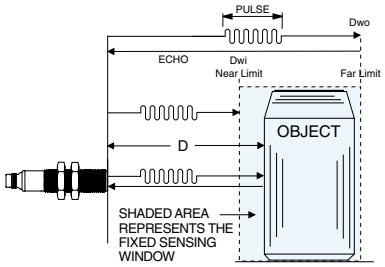
This 500 kHz proximity sensor operates on 12 to 24 VDC and is equipped with both sinking (NPN) and sourcing (PNP) outputs. The sensor has two LEDs, both of which use half of the same light ring on the back of the sensor. An amber LED indicates "power on" when no object is present. The orange LED indicates object presence, regardless of output state (N.O. or N.C.). Just one LED is illuminated at any given time.

During operation, the sensor transmits to and receives sonic pulses from objects in front of it without interruption. A discriminating microprocessor makes it possible for the sensor to accept only those pulse echoes received

from objects within the fixed sensing window limits and ignore all other objects. An object is detected when it is within the fixed sensing window.

How does it work?

During setup and operation, the SM300 Series sensor continually and accurately measures the elapsed time of every pulse echo reception after each pulse transmission. The transmitted pulse starts a time clock to register the elapsed time for the received pulse echoes. Given the elapsed time, the sensor software calculates the distance traveled to the



object or surface and back to the sensor, using the formula, D = TVs/2, where D = Distance from the sensor to the object; T = Elapsed time between the pulse transmission and its echo reception, Vs = the Velocity of sound, approximately 1100 feet per second.

While the sensor is in operation, the calculated distance (D) between the sensor and the object is compared to the distances associated with the fixed window limits. These limits are shown in the illustration above as Dwi and Dwo. If D is within these limits, an output is generated. The output remains On until the echo does not return or it returns from outside the window limits.

Mounting & Setting up the SM300 Proximity Sensor

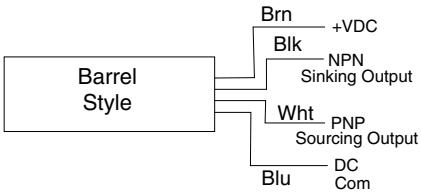
The SM300 Series proximity sensor should be mounted in a bracket that allows it to be adjusted for proper alignment with the object. Set up for optimum object sensing and sensitivity merely involves positioning the sensor so the sonic beam is aligned with and perpendicular to the surface of the object being detected and the object is at or near the center of the sensing window. Once the sensor is mounted, no other adjustments are required.

Note: Small objects are best detected at 38 mm (1.5").

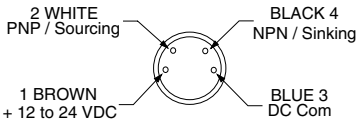
Electrical Wiring

The sensor cable must be run in conduit, free of any AC power or control wires.

Cable Style Wire Assignments

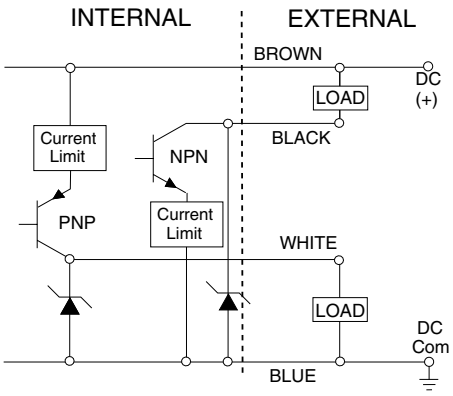


Connector Style Pin Assignments



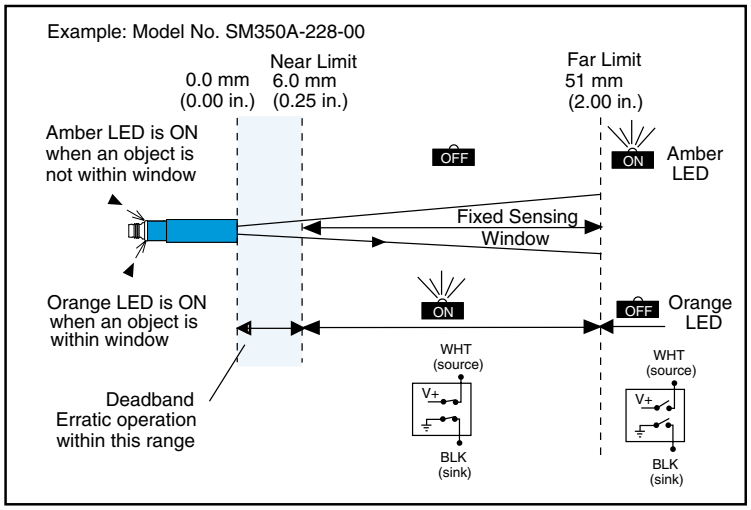
Outputs

NPN Sinking and PNP Sourcing



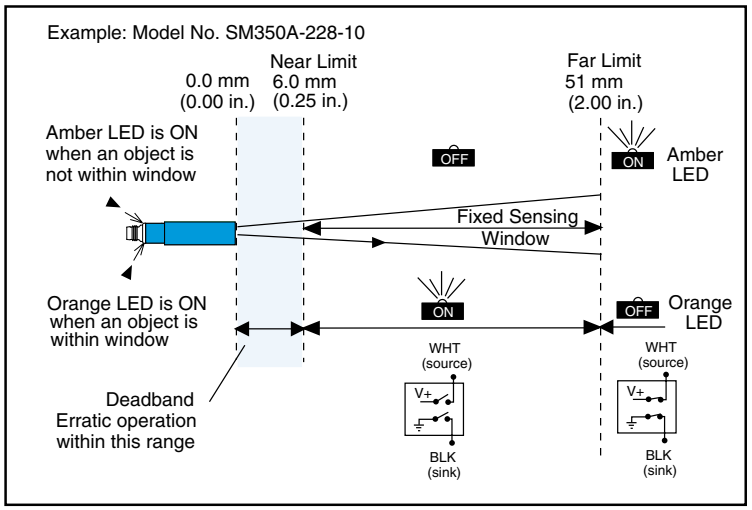
Normally Open Output

The sensor output is “On” with the object in the fixed sensing window.



Normally Closed Output

The sensor output is “Off” with the object in the fixed sensing window.



Model Reference Guide

Use the guide below to ensure the correct model number is specified for the application. Please note that not all sensor model combinations are available.

EXAMPLE MODEL: SM3 5 0 A - 2 28 - 00 n n

Extended Range Proximity Series

Power/Connection Type

0...12 to 24 VDC / Cable style
5...12 to 24 VDC / "Pico" connector style

Sensing Function

0...Proximity - No On/Off delay

Design Level

A...Applies to all models

Sensing Range (Far Limit)

2...51mm (2")

Sensing Window (Distance from Near Limit to Far Limit)

28...44mm (1.75")

Functionality

00...N.O. output, 2.0 ms response 1.0 ms cycle 2 on / 2 off
10...N.C. output, 2.0 ms response 1.0 ms cycle 2 on / 2 off

Options

...No designator indicates no options

Housing Types

...No letter indicates standard ULTEM® plastic -12 mm barrel housing

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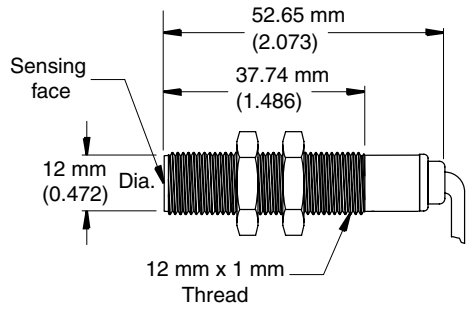
Dimensions

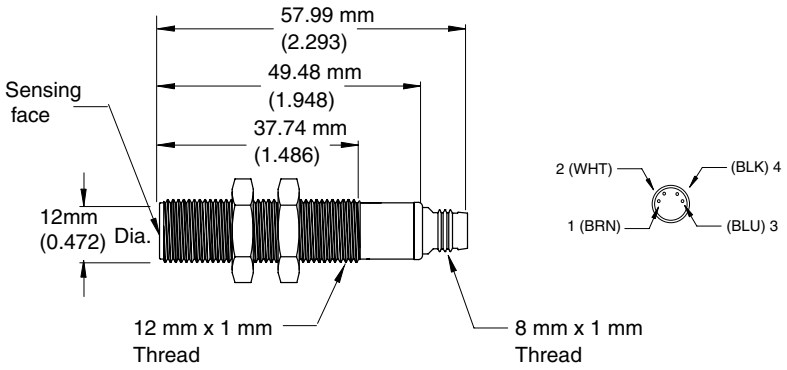
Barrel Cable Style

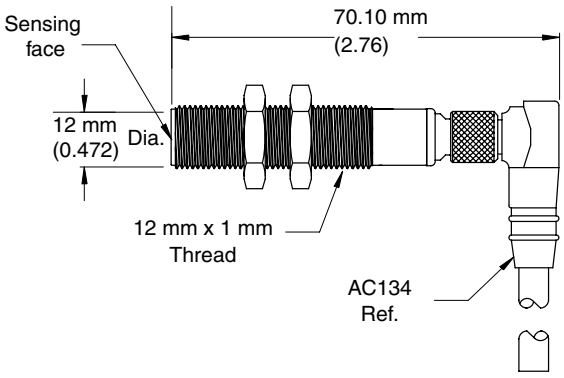
(ULTEM® Plastic) SM300A-XXX-XX

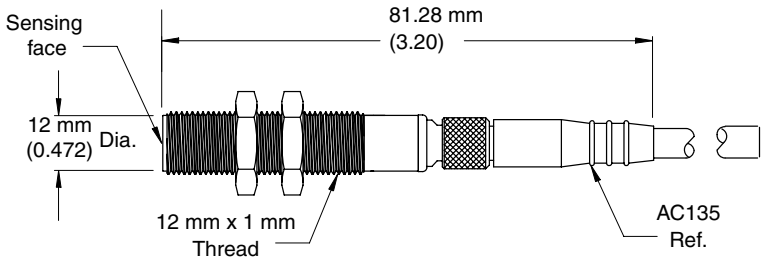


Barrel Connector Style

(ULTEM® Plastic) SM350A-XXX-XX







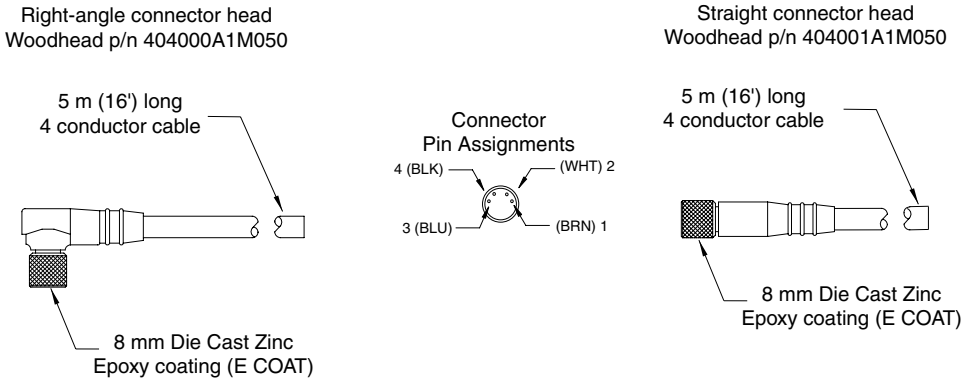
Accessories

AC134

Right-angle 4 conductor cable/connector assembly, 5m (16').

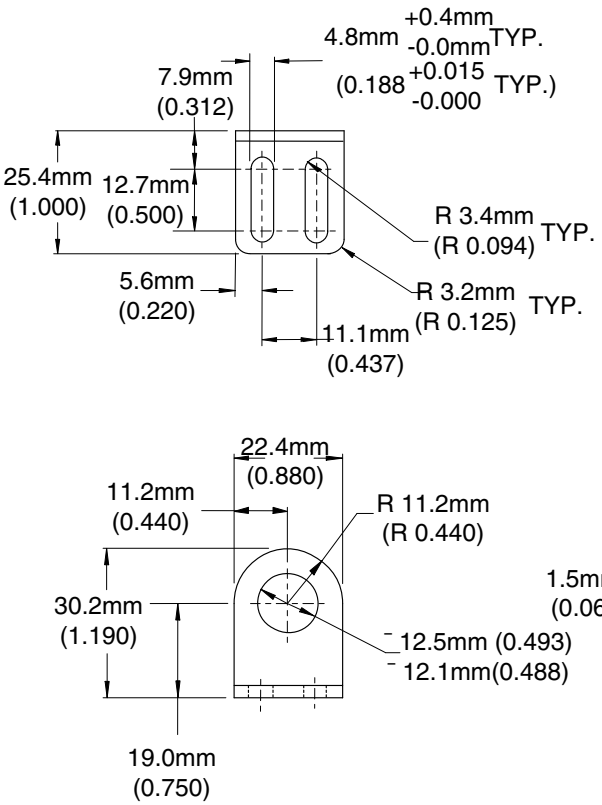
AC135

Straight 4 conductor cable/connector assembly, 5m (16').



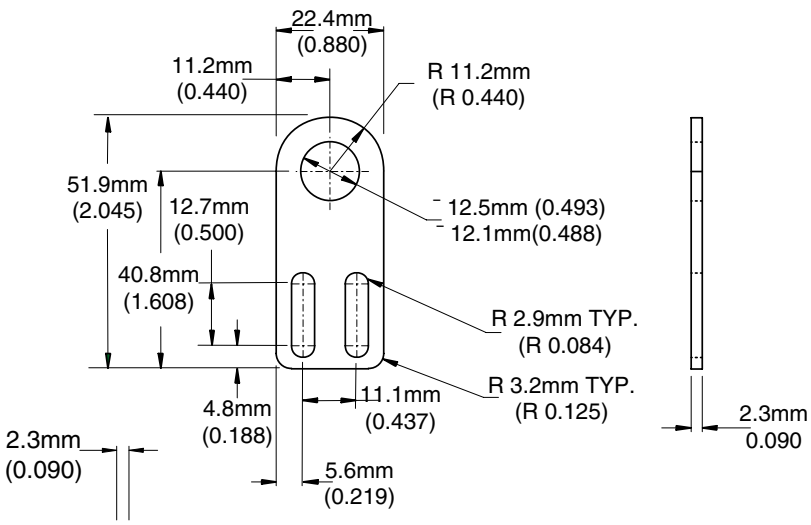
AC235

Right-angle, stainless, mounting bracket



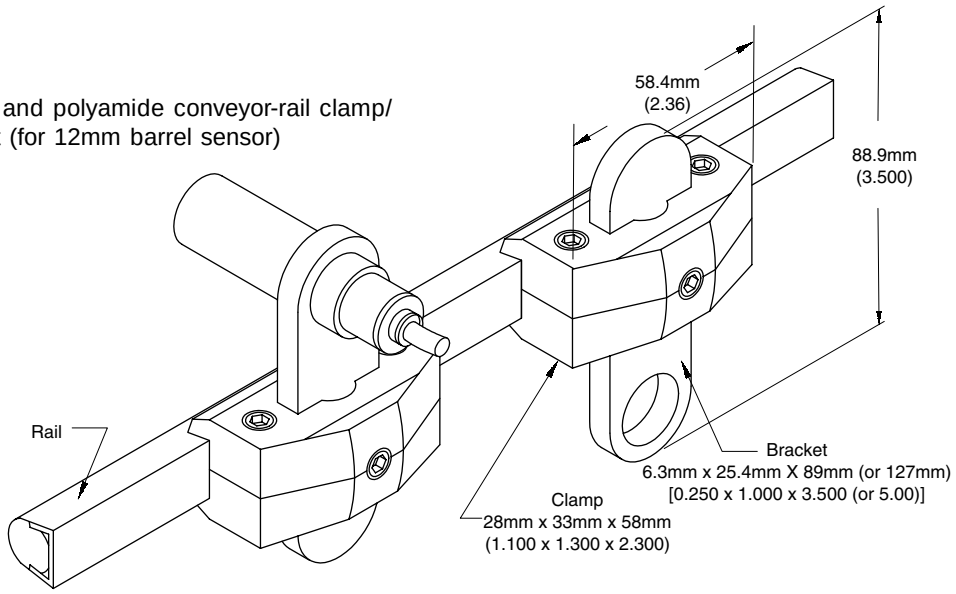
AC237

Straight, stainless, mounting bracket



AC236

Stainless and polyamide conveyor-rail clamp/ bracket set (for 12mm barrel sensor)



General Specifications

Sensing [T_A = 20° C (68° F)]

Sensing Range:
6 mm (0.25") to 51 mm (2.0") (large flat objects)
Highest sensitivity over the range 19 mm (0.75") to 51 mm (2.0")
Sonic Frequency: 500 kHz
Minimum-size Detection:
2.5 mm (0.098") diameter rod or 1.0 mm (0.039") wide flat bar at a distance of 38 mm (1.5")
Maximum Angular Deviation:
± 10° on a 100 mm x 100 mm (4" x 4") flat target at a distance of 38 mm (1.5")
Sonic Cone Profile:
see beam plot on page 3-2
Limit Position Accuracy:
± 1.6 mm (0.062") max.
Repeatability:
± 0.7mm (0.027") or greater

Power Requirements

Supply Voltage:
12VDC to 24VDC ± 10%, regulated supply
Current Consumption:
20 mA max. (excluding load)
Power Consumption:
0.5 W max. (excluding load)

Output

Sinking Output (NPN):
Maximum on-state voltage: 0.48 V @ 100 mA
Maximum load current: 100 mA
Maximum applied voltage: 30 VDC
Sourcing Output (PNP):
Maximum on-state voltage drop: 0.95V @ 100mA
Maximum load current: 100mA
Output voltage: V_{Supply} - 0.95V @ 100mA

Response Time

2.0 ms On/Off

Indicators

Amber LED: Illuminated if power applied and no object detected
Orange LED: Illuminated if object is detected within the window,regardless of output polarity (N.O./N.C.) style.
Note: Amber and orange LEDs are never illuminated simultaneously

Connections

Cable Style Models:
28 AWG, foil shield, lead-free, PVC jacket 4-conductor, 3M (10') long
Connector Style Models:
8 mm, circular 4-pole, male

Protection

Power Supply: Current-limited over-voltage, ESD, reverse polarity
Outputs: Current-limited over-voltage, ESD, reverse polarity, over-current

Environmental

Operating Temperature Range:
-20° to 65° C (-4° to 149° F), 12V supply / 24V supply
Storage Temperature Range:
-30° to 100° C (-22° to 212° F)
Operating Humidity: 100%
Protection Ratings: NEMA 4X, IP67
Chemical Resistance: Resists most acids and bases including most food products.

Agency Approvals

CE Mark: CE conformity is declared to:
EN61326:1997 (annex A, industrial) including amendment A1:1998. EN55011 Group 1 Class A
Declaration of Conformity available upon request.

Construction

Dimensions:
Cable Model: 12 mm (0.472") dia. x 1 mm-6g threaded housing x 53.3 mm (2.10") long
Connector Model: 12 mm (0.472") dia. x 1 mm-6g threaded housing x 55 mm (2.17") long;
Overall length,including right angle, connector/cable assembly: 67.6 mm (2.66")
Housing:
Shock and vibration resistant
Case: ULTEM® plastic
Transducer Face: Epoxy
Sensor Cable: Lead-free, PVC jacketed, black
LED light ring: Polycarbonate

* ULTEM® is a registered trademark of The General Electric Co.

Accessories

12mm Barrel Mounting Hardware and Cables

Model AC134, Right-angle, 4-conductor, connector/ cable assembly, 5m (16')

Model AC135, Straight, 4-conductor, connector/cable assembly, 5m (16')

Model AC137, Nano-to-micro pigtail adapter cable

Model AC138, Nano-to-micro pigtail adapter cable, output pins reversed

Model AC235, Right-angle, stainless, mounting bracket

Model AC236, Stainless and polyamide conveyor-rail clamp/bracket set

Model AC237, Straight, stainless, mounting bracket

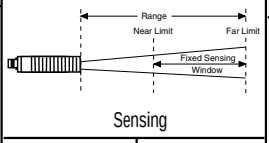
Model AC242, 18 mm to 12 mm hex mounting adapter

Model AC243, 30 mm to 12 mm hex mounting adapter

Selection Chart

SM300 Series
Proximity

Model No.	Power Version 12/24 VDC	Conn. Style: Cable	Conn. Style: Connector	Sensing: Range	Sensing: Window	Materials: Transducer: Epoxy	Materials: Housing: 12 mm ULTEM®	Functionally: N.O. output	Functionally: N.C output	Notes
SM300A-228-00	■	■		51 mm (2.0”)	44 mm (1.75”)	■	■	■		
SM300A-228-10	■	■		51 mm (2.0”)	44 mm (1.75”)	■	■		■	
SM350A-228-00	■		■	51 mm (2.0”)	44 mm (1.75”)	■	■	■		
SM350A-228-10	■		■	51 mm (2.0”)	44 mm (1.75”)	■	■		■	



All possible sensor configurations are not listed here.