

SUPERPROX® Ultrasonic Dual-Level Sensors



Two styles of reliable ultrasonic sensors offer short range sensing solutions for dual-level control applications where mounting space is very limited

Functionality of the versatile, industry proven SUPERPROX® Model SM502 series is now part of the Model SM602 series of 18 mm or flat-profile, dual-level sensors. Utilizing the same world-leading, ultrasonic technology, these two styles of “smart” sensors can be selected for specific on/off latch or dual-alarm control functions. Other model selections include a variety of output types, response times, sensing ranges, and functionality to provide the sensing solution for a wide assortment of non contact, short-range, dual-level control applications.

Operation

Hyde Park's 18 mm barrel and flat-profile style of self-contained, dual-level sensors monitor and control most nonhazardous liquid or dry material levels within a sensing range of 25.4 mm (1") to 254 mm (10"). When selecting by model number from several factory-programmed, dual-limit parameters (near limit and far limit), the sensor can be set

up to perform either an on/off latch or a dual-alarm control function.

The 18 mm threaded barrel-style housing is available in either ULTEM® plastic or SS303 stainless steel while the flat-profile housing is available in ULTEM® plastic only. Both provide ease-of-installation convenience, particularly in applications with hard-to-mount or limited-space mounting areas. All models in this sensor series operate on 12 to 24 VDC regulated power.

For sensing applications requiring connection to a DeviceNet network, the flat-profile models in this series are available with this capability as an optional selection.

The Model SM602 sensor series offers dependable operation and compatible integration with most programmable logic controllers. Each sensor is epoxy sealed to withstand harsh, wet, messy, and dusty environments typically associated with level-control applications. With protection ratings of NEMA 4X (indoor use only) and IP67, both sensor styles are impervious to changing light conditions, colors, noise, non-condensing humidity, caustic chemicals, and other hostile environments. They are resistant to most acids and bases, including most food products. The SS303 stainless steel, 18 mm

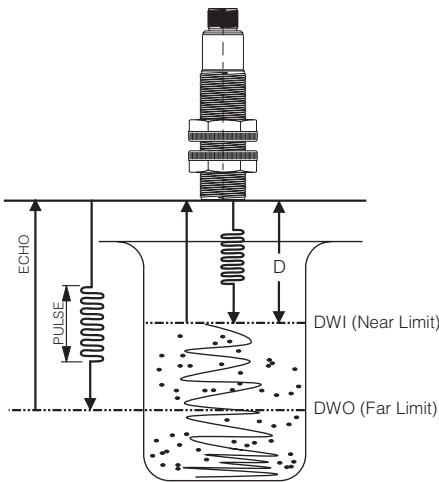
- **High resolution**
500 kHz ultrasonic frequency
- **Self-contained, 18 mm barrel or flat-profile housing styles**
- **Dual-level on/off latch**
- **Field programmable capability in 18 mm and flat-profile models**
- **DeviceNet capability available in flat-profile models**
- **CE certified**

housing allows application use where USDA-3A sanitary compliance is required. The sensing transducer is made of silicone rubber and the sensors carry the CE mark.

How does it work?

During setup and operation, these SM602 series sensors continually and accurately measure the elapsed time of every pulse echo reception between each pulse transmission. The transmitted pulse begins a time clock to register the elapsed times for the received pulse echoes. Given the elapsed time, the sensor software calculates the distance traveled out to the object or surface and back to the sensor, using the formula, $D = TV_s/2$, where: D = distance from the sensor to the object; T = elapsed time between the pulse transmission and its echo reception; V_s = the velocity of sound, approximately 1100 feet per second.

During operation, the calculated distance (D) between the sensor and the object (e.g., level) is compared to the distance between the sensor and the near and far span limits. These limits are shown in the illustration at right as DWI and DWO. When D is equal to one of the two span limits, according to the level-control functions, an output change takes place.



Level-Control Functions

The level-control output in the Model SM602 series can be configured for one of three different operating functions. Using the Model Reference Guide, the sensor can be selected to perform either a pump-in level-control function, pump-out level-control function or a dual alarm level-control function.

Pump-in Level Control

When the level moves beyond the far limit, the sensor level control output switches state and latches, starting a pump-in process. The sensor level control output does not change state until the level moves back beyond the near limit to stop the pumping or filling process.

Pump-out Level Control

When the level moves beyond the far limit, the level control output switches state and latches, stopping a pump-out process. The sensor level control output does not change state until the level moves back beyond the near limit to restart the pump-out process.

Model Reference Guide - SM602 Series

Both the cable and connector style sensors are available in various models. Use the guide below to select or order the sensor to ensure the correct model number is specified for the application.

EXAMPLE

SUPERPROX® Product Series

Power/Connection Type

- 0...12 to 24 VDC / cable style
- 5...12 to 24 VDC / "micro" connector style

Sensing Type

- 2...Dual point

Design Level

- A...Applies to all models

Far Limit/Alarm

- 4...102 mm (4")
- 5...127 mm (5")
- 6...152 mm (6")
- B...254 mm (10"), maximum

Near Limit/Alarm

(Distance from Far Limit/Alarm to Near Limit/Alarm)**

- 04...6.4 mm (1/4")
- 06...9.5 mm (3/8")
- 16...25 mm (1")
- 32...51 mm (2")
- OB...203 mm (8")

Functionality

- 00...Pump-out latch
- 03...Pump-out latch with loss of echo
- 10...Pump-in latch
- 13...Pump-in latch with loss of echo
- 20...Dual alarm, normally open (N.O.)
- 23...Dual alarm, normally open (N.O.) with loss of echo
- 30...Dual alarm, normally closed (N.C.)
- 33...Dual alarm, normally closed (N.C.) with loss of echo

[Contact the factory for additional functionality options]

Options

Contact the factory for available options

Housing Types

...No letter indicates standard ULTEM® plastic - 18 mm barrel housing

FP...ULTEM® flat-profile housing

S...SS303 stainless steel - 18 mm barrel housing

NOTE: Contact the factory for DeviceNet communications capability in the flat-profile models

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

**Not allowed inside the 1.25" deadband, using standard gain sensor

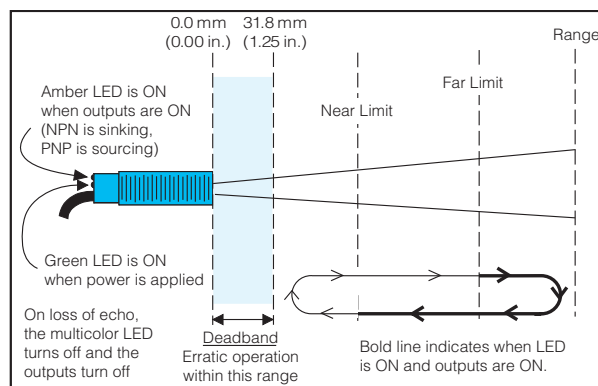
Dual-Alarm Level Control

The far alarm output switches when an object moves beyond the far alarm limit and changes state when an object returns closer than the far alarm limit. The near alarm output switches when an

object moves closer than the near alarm limit and changes state when an object returns beyond the near alarm limit.

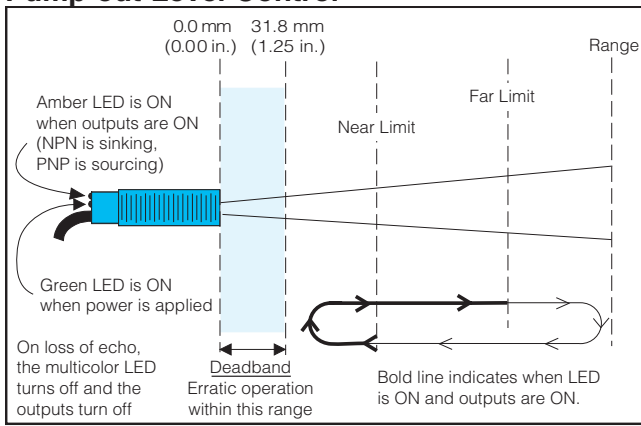
Sensor Operating Profiles

Pump-in Level Control

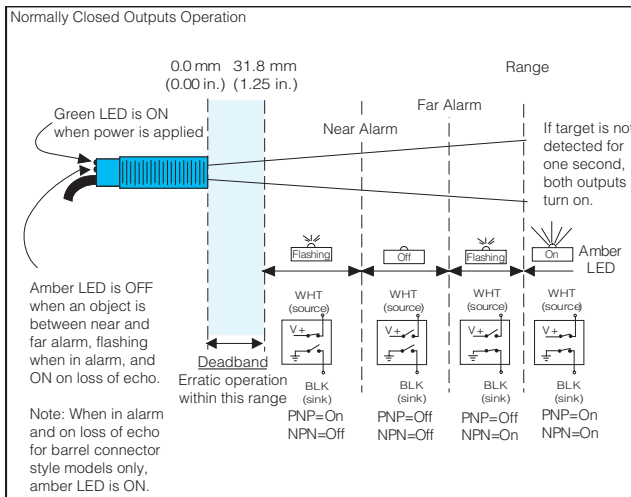
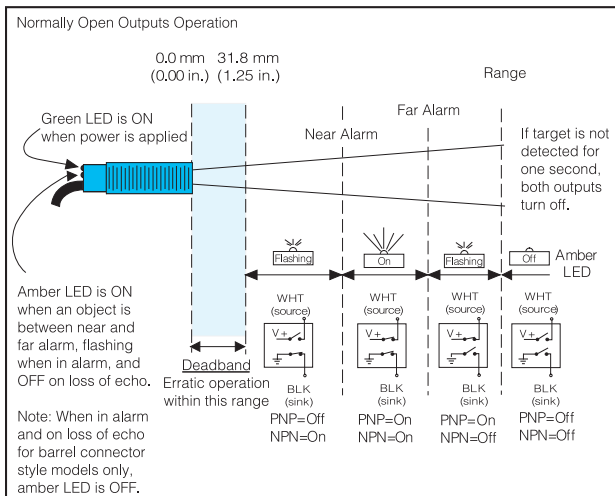


Sensor Operating Profiles (cont.)

Pump-out Level Control



Alarm Level Control



Loss of Echo Operation

Output Off on Loss of Echo

Loss of echo occurs when the sensor does not receive echoes from an object within its sensing range for more than one second. When this occurs, the sensor's output automatically switches OFF. When the sensor again receives echoes, the output assumes the state relative to the control limit setpoints.

The only exception applies to the alarm level control models with normally

closed outputs as shown and noted in the illustration.

Output Holds on Loss of Echo ("LE" Option)

The LE suffix indicates an available option for users who do not prefer the standard response to loss of echo. With the LE option, when loss of echo occurs, there is no change in the output state of the sensor. When the sensor again receives echoes, the output assumes the state relative to the control limit setpoints.

Mounting

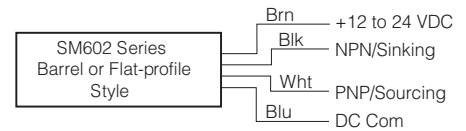
The Model SM602 series sensors should be mounted in brackets that allow them to be adjusted for proper alignment. Hyde Park offers the Model AC226 stainless and polyamide conveyor-rail clamp/bracket set, Model AC227 large, right-angle, stainless mounting bracket, Model AC228 small, right-angle, stainless, mounting bracket, Model AC231 straight, stainless, mounting bracket and Model AC232s-shaped, stainless, mounting bracket. All are illustrated with dimensions on Pages 4-87 and 4-88.

Electrical Wiring

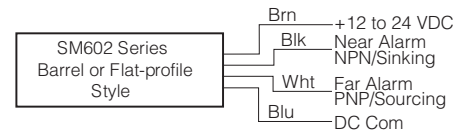
The sensor wires must be run in conduit free of any AC power or control wires.

Cable Model Wire Assignments

On/Off Latch Outputs

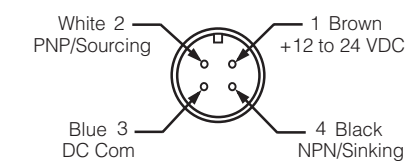


Dual Alarm Outputs

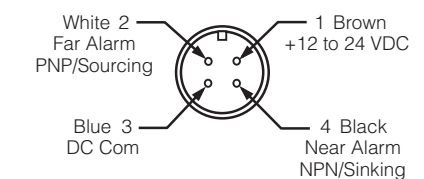


Connector Model Pin Assignments

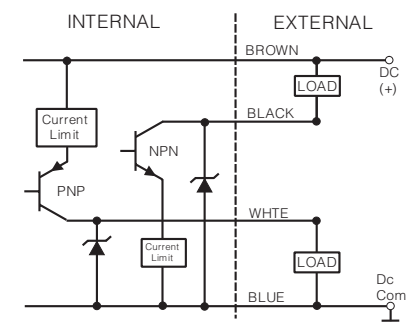
On/Off Latch Outputs



Dual Alarm Outputs



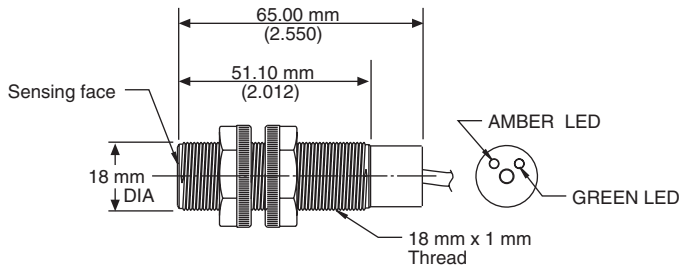
NPN/Sinking and PNP/Sourcing Outputs



Dimensions

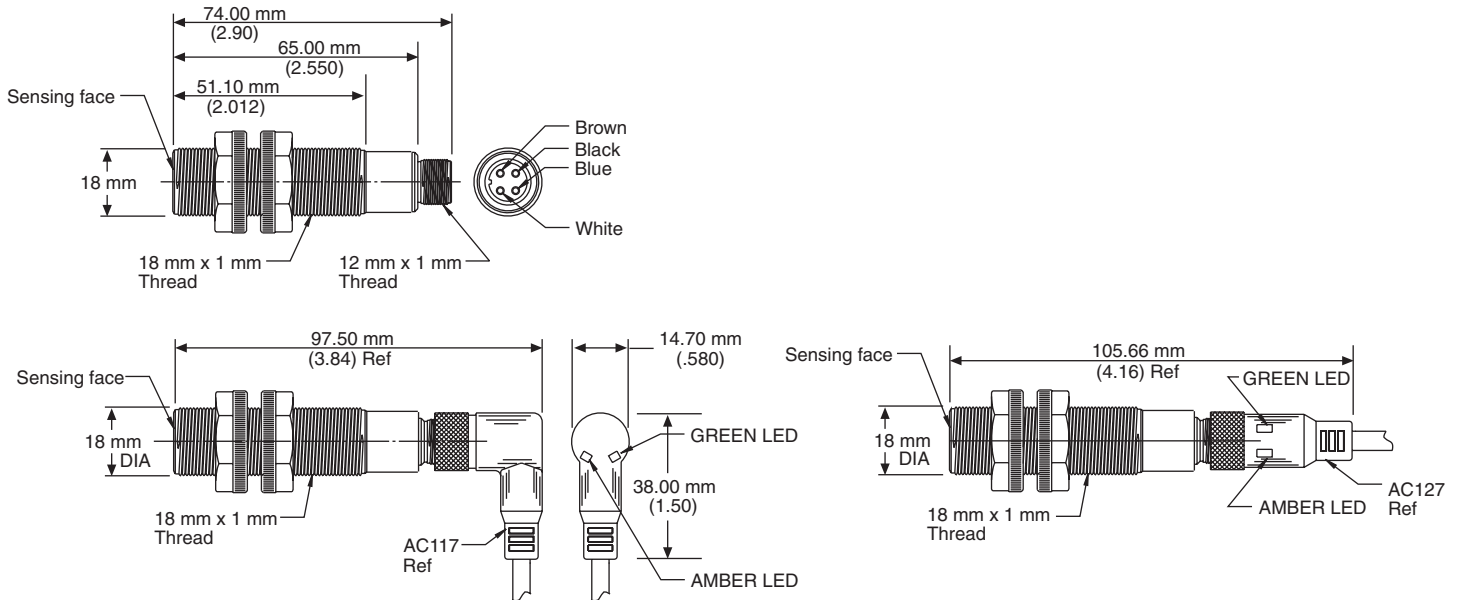
Barrel Cable Style

(ULTEM® plastic and stainless steel) SM602A-XXX-XX, SM602A-XXX-XXS



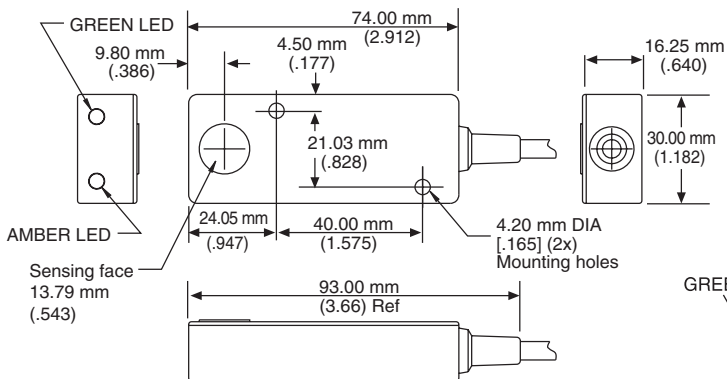
Barrel Connector Style

(ULTEM® plastic and stainless steel) SM652A-XXX-XX, SM652A-XXX-XXS



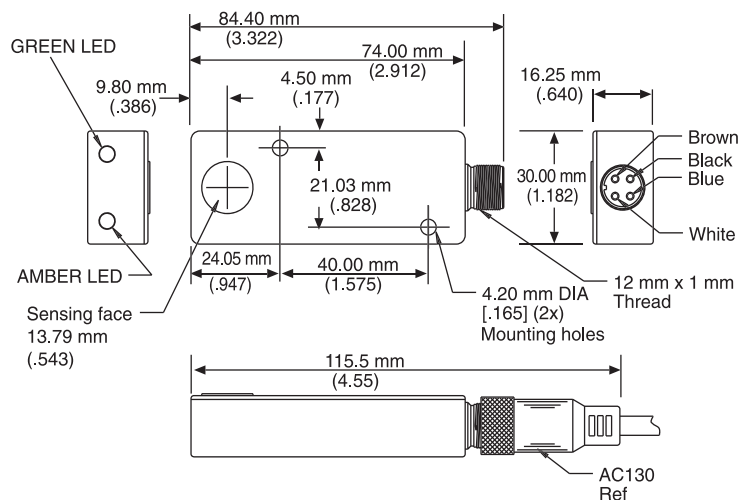
“Flat-profile” Cable Style

(ULTEM® plastic) SM602A-XXX-XXFP



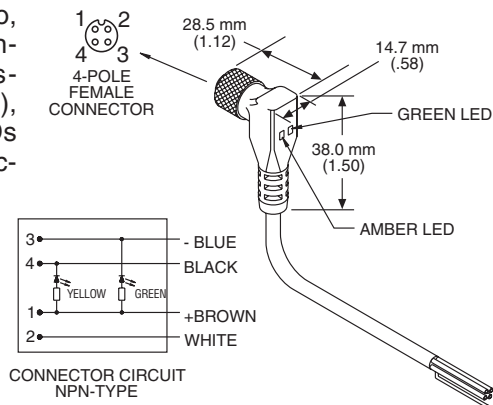
“Flat-profile” Connector Style

(ULTEM® plastic) SM652A-XXX-XXFP

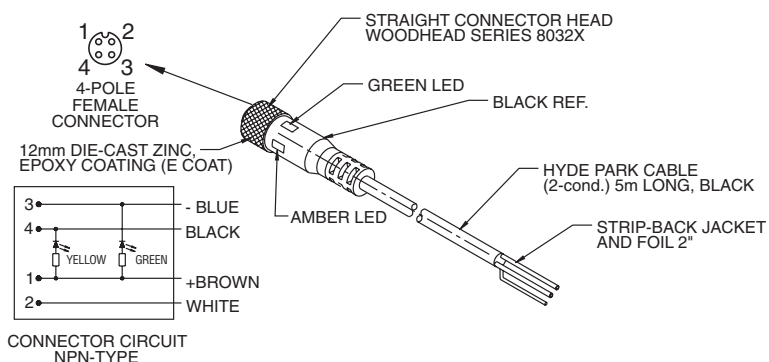


Mounting Accessories

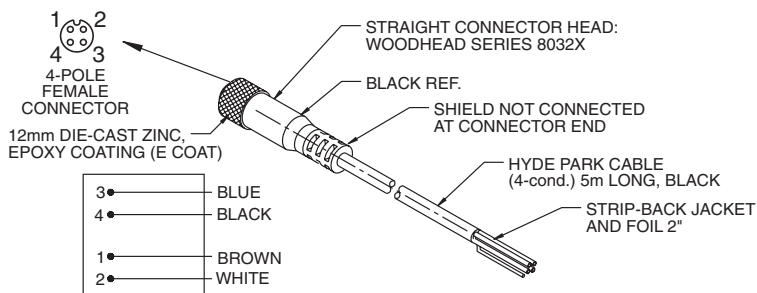
AC117 Right-angle, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), with built-in LEDs (for barrel connector-style sensors)



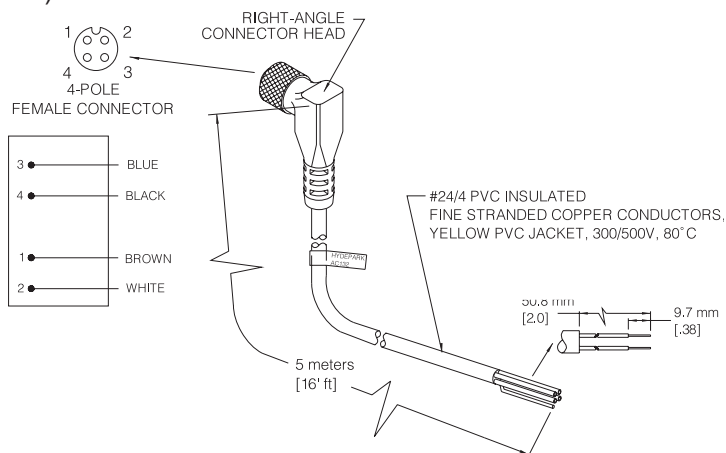
AC127 Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), with built-in LEDs (for barrel connector-style sensors)



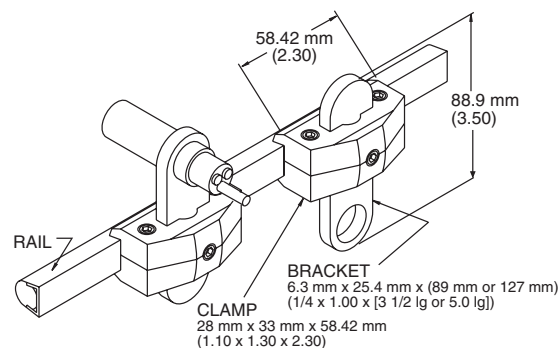
AC130 Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16') (for flat-profile connector-style sensors)



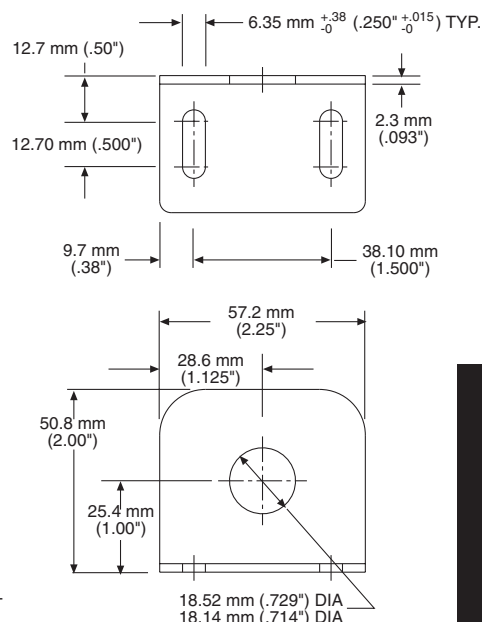
AC132 Right-angle, M12 micro, 4-conductor, connector/cable assembly, 5 m (16') (for flat-profile connector-style sensors)



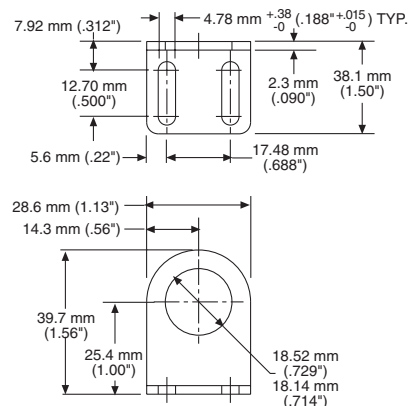
AC226 Stainless and polyamide conveyor-rail clamp/bracket set (for 18 mm barrel sensors)



AC227 Large, right-angle, stainless, mounting bracket (for 18 mm barrel sensors)

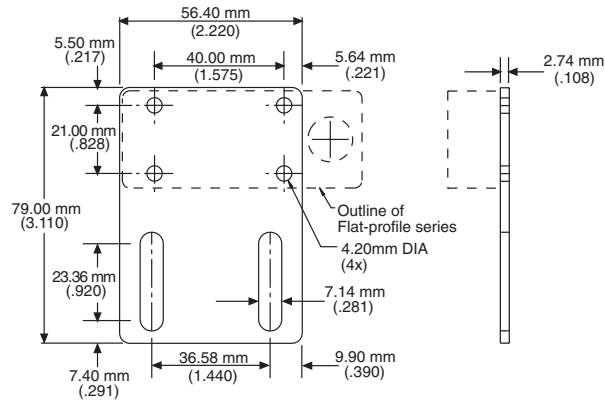


AC228 Small, right-angle, stainless, mounting bracket (for 18 mm barrel sensors)

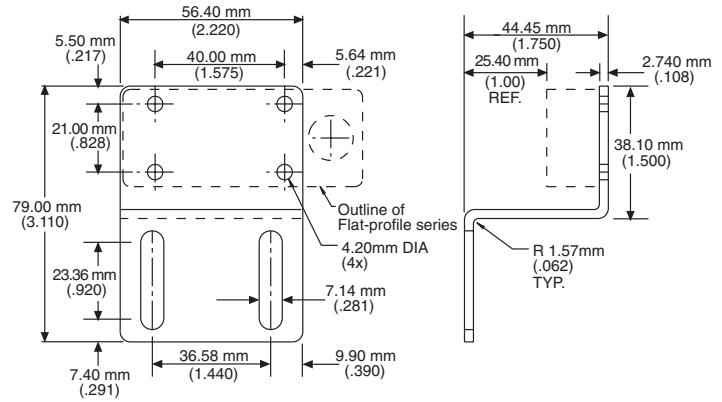


SUPERPROX® PROXIMITY SENSORS

AC231 Straight, stainless mounting bracket (for flat-profile sensors)



AC232 S-shaped, stainless mounting bracket (for flat-profile sensors)



General Specifications

Sensing

Ranges:

Up to 254 mm (10")

Spans:

From 3.18 mm (1/8") to 228.6 mm (9")

Window Position, Initial Accuracy:

± 1.59 mm (0.062") max.

Window Position Repeatability:

± 0.69 mm (0.027") max.

Detection Benchmarks:

Models with Ranges to 177.8 mm (7"):

1.59 mm (1/16") diameter rod at a distance of 63.5 mm (2.5")

Max. ± 10° tilt of large flat object at a distance of 127 mm (5")

Models with Ranges from over 177.8 mm (7") to 254 mm (10"):

1.59 mm (1/16") diameter rod at a distance of 76.2 mm (3")

Max. ± 10° tilt of large flat object at a distance of 203.2 mm (8")

Sonic Frequency: 500 kHz

Sonic Cone Angle: 7° (see beam plot, page 4-72)

Power Requirements

Supply Voltage:

12 to 24 VDC ± 10%, regulated supply

Current Consumption:

Cable Model: 50 mA max. (excluding load)

Connector Model: 60 mA max. (excluding load)

Power Consumption:

1.0 W max. (excluding load)

Output

NPN Sinking: 0 to 30 V

Maximum on-state voltage at 100 mA: 0.2 volts

PNP Sourcing: 100 mA @ 24 VDC, max.

Response Time

"On" 3 ms, "Off" 3 ms (standard)

"On" 2.0 ms, "Off" 2.0 ms (optional)

Indicators

Green LED: Power "On"

Amber LED:

Cable model: "On" if object is detected within the window, regardless of output polarity (N.O./N.C.) style.

Connector model with built-in cable LEDs: "On" if NPN output is sinking

Connections

Cable Style Models:

24 AWG, foil shield, lead-free, PVC jacket

4-conductor, 3 meters (10') long

Connector Style Models:

4-conductor, straight and right-angle "micro" style

Protection

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

Outputs: current-limited over-voltage, ESD, over-current

Environmental

Operating Temperature Range:

0° to 60°C @ 12 VDC supply

0° to 50°C @ 24 VDC supply

Storage Temperature Range: -40° to 100°C (-40° to 212°F)

Operating Humidity: 100%

Protection Ratings: NEMA 4X (indoor use only), 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:

Barrel

Cable Model: 18 mm dia. x 1 mm threaded housing x 65 mm (2.55") long

Connector Model: 18 mm dia. x 1 mm threaded housing x 102 mm (4") long, including connector/cable assembly

Flat-profile

Cable Model: 30 mm (1.182") H x 16.25 mm (0.640") W x 93 mm (3.66") L

Connector Model: 30 mm (1.182") H x 16.25 mm (0.640") W x 84.40 mm (3.322") L

Housing:

Shock and vibration resistant

Case: ULTEM® plastic (FDA Approved) (SS303 stainless steel available only in 18 mm barrel-style)

Transducer Face: Silicone rubber - gray

Sensor Cables: Lead-free PVC jacket, black (Model AC117)

LED: Polycarbonate

Accessories

18 mm Barrel Mounting Hardware and Cables

Model AC117, Right-angle, M12 micro, 4-conductor, connector/cable assembly, 5 m (16') with built-in LEDs for barrel connector-style prox sensors

Model AC127, Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16') with built-in LEDs for barrel connector-style prox sensors

Model AC226, Stainless and polyamide conveyor-rail clamp/bracket set

Model AC227, Large, right-angle, stainless mounting bracket

Model AC228, Small, right-angle, stainless mounting bracket

Flat-profile Mounting Hardware and Cables

Model AC130, Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), for flat-profile, connector-style sensors

Model AC132, Right-angle, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), for flat-profile, connector-style sensors

Model AC231, Straight, stainless, mounting bracket

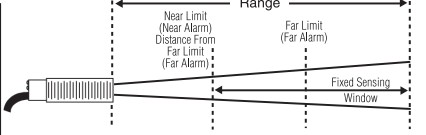
Model AC232, S-shaped, stainless, mounting bracket

See page 7-1 for accessory photos.

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

Selection Chart

SM602 Series Dual Level



Model No.	Power		Connection Style		Near Limit (Near Alarm) Distance from Far Limit (Far Alarm)	Far Limit (Far Alarm)	Transducer	Materials			Special Features
	12-24 VDC		Cable	Connector				Silicone*	18mm ULTEM®	18mm Stainless	
SM602A-404-00	■	■			6.4 mm (1/4")	102 mm (4")	■	■	■	■	Pump-out Latch
SM602A-416-00	■	■			25 mm (1")	102 mm (4")	■	■			Pump-out Latch
SM602A-432-00S	■	■			51 mm (2")	102 mm (4")	■	■			Pump-out Latch
SM602A-404-10	■	■			6.4 mm (1/4")	102 mm (4")	■	■			Pump-in Latch
SM602A-416-10	■	■			25 mm (1")	102 mm (4")	■	■			Pump-in Latch
SM602A-432-10	■	■			51 mm (2")	102 mm (4")	■	■			Pump-in Latch
SM602A-504-00	■	■			6.4 mm (1/4")	127 mm (5")	■	■			Pump-out Latch
SM602A-516-00S	■	■			25 mm (1")	127 mm (5")	■		■		Pump-out Latch
SM602A-532-00FP	■	■			51 mm (2")	127 mm (5")	■			■	Pump-out Latch
SM602A-504-10	■	■			6.4 mm (1/4")	127 mm (5")	■	■			Pump-in Latch
SM602A-516-10S	■	■			25 mm (1")	127 mm (5")	■		■		Pump-in Latch
SM602A-532-10FP	■	■			51 mm (2")	127 mm (5")	■			■	Pump-in Latch
SM602A-632-20	■	■			51 mm (2")	152 mm (6")	■	■			Dual-Alarm, Normally Open (N.O.)
SM652A-404-00	■	■	■		6.4 mm (1/4")	102 mm (4")	■	■			Pump-out Latch
SM652A-416-00	■	■	■		25 mm (1")	102 mm (4")	■	■			Pump-out Latch
SM652A-432-00	■	■	■		51 mm (2")	102 mm (4")	■	■			Pump-out Latch
SM652A-404-10	■	■	■		6.4 mm (1/4")	102 mm (4")	■	■			Pump-in Latch
SM652A-416-10	■	■	■		25 mm (1")	102 mm (4")	■	■			Pump-in Latch
SM652A-432-10	■	■	■		51 mm (2")	102 mm (4")	■	■			Pump-in Latch
SM652A-504-00	■	■	■		6.4 mm (1/4")	127 mm (5")	■		■		Pump-out Latch
SM652A-516-00S	■	■	■		25 mm (1")	127 mm (5")	■			■	Pump-out Latch
SM652A-532-00FP	■	■	■		51 mm (2")	127 mm (5")	■	■			Pump-out Latch
SM652A-504-10	■	■	■		6.4 mm (1/4")	127 mm (5")	■	■			Pump-in Latch
SM652A-516-10S	■	■	■		25 mm (1")	127 mm (5")	■		■		Pump-in Latch
SM652A-532-00FP	■	■	■		51 mm (2")	127 mm (5")	■			■	Pump-in Latch
SM652A-632-20	■	■	■		51 mm (2")	152 mm (6")	■	■			Dual-Alarm, Normally Open (N.O.)

* = See definition in Sensing Terms
All possible sensor configurations are not listed here.

