SUPERPROX®
Ultrasonic
Dual-level
Sensors
Up to 8 Meter
Range Dual-
Level Sensing

CE **DeviceNet.**

Up to 8 meter (26 feet) level control, mounting convenience and broad functionality in this new 30 mm, dual-level sensor series

The world's leading ultrasonic technology now makes possible discrete level control in vessels, tanks, hoppers, bins, and reservoirs covering object distances a few inches from the sensor to as far away as 26 feet. Depending on the model selected and material being detected, the SUPERPROX® Model SM902 series of "smart" dual-level sensors offers sensing ranges of 1 m (39"), 2 m (79"), and a long-range 8 m (26'), with the shortest deadbands in the sensing industry of 51 mm (2"), 120 mm (4.7"), and 203 mm (8"), respectively. In addition to range selection,the sensors can be factory configured for a specific level-control function, output type, response time, and functionality. Using these selections, an ideal solution can be found for such operations as starting and stopping a pump and opening and closing a valve. Others include controlling either loop levels or tension on web processing lines relative to two set level control limit points. Packaged for mounting convenience in a threaded 30 mm housing up to 60% smaller than other level sensors with equal functionality, these dual-level sensors are easily installed, without positioning limitations, in covers and other hard-to-mount areas. All models

are equipped with a push-button to set the sensor's near and far limits of the sensing "window." When it is impractical to use the push- button for setting long-range limits, an optional, hand-held AC441A, setup/display accessory is available. All limits are stored in nonvolatile memory and thus are retained if power is removed from the sensor.

Unlike other sensing technologies, these sensors are capable of detecting all materials whether, liquid, granular, or solid, and regardless of color, shape, or composition, transparent or opaque, including powder, food products, grains, chemicals, pharmaceuticals, oils, plastics, and objects that change colors. The sensors are available in either ULTEM® plastic or SS303 stainless steel housings which are fully encapsulated to withstand shock and vibration. Both are sealed to withstand dusty, dirty, clean-in-place, noncondensing humidity, high-pressure washdown environments, and they are virtually unaffected by changing light conditions, colors, and noise. With housings that meet NEMA 4X (indoor use only) and IP67 industry standards, the sensors resist most acids, bases, and oils, including most food products. All the sensors in this model series are CE certified. Additionally, the Model SM902 series sensors offer dependable operation and compatible integration with most programmable logic controllers.

- *Sensing ranges of 1 m (39"), 2 m (79"), and 8 m (26')*

- *Easy push-button setup or optional hand-held setup/ display accessory available for all*

- *Dual-level on/off latch output*

- *Dual setpoint on/off outputs*

- *Epoxy sealed in tough ULTEM® plastic or stainless steel housing*

- *Resistant to caustic materials and harsh environments*

- *Field programmable capability*

- *DeviceNet capability*

- *CE certified*

SUPERPROX® PROXIMITY SENSORS

1 meter and 2 meter range models

In the Model Reference Guide, the standard 1 meter range models are identified as the Model SM902A-1 and SM952A-1 series sensors, and the 2 meter range models are identified as the Model SM902A-4 and SM952A-4 series sensors. Respectively, these models provide for dual-level sensing from 50.8 mm to 1 m (2" to 39") and 120 mm to 2 m (4.7" to 79"). The length of the connector model, excluding the connector/cable assembly, is just 96 mm (3.78"), thus adding to the mounting convenience. These sensors operate on a sonic frequency of 200 kHz and are available with response times as fast as 150 ms. The FDA approved silicone rubber transducer face, while used to couple the ultrasonic energy to the air, is also resistant to most acids, bases, oils, and food products.

For dual-level-control sensing applications that involve severe, corrosive-type environments, the Model SM902A-7STS and SM952A-7STS sensors have an SS303 stainless steel housing with an SS304 stainless steel-faced transducer. These models, with a sensing range of 120 mm to 1 m (4.7" to 39"), provide reliable operation in the detection of certain strong chemicals and corrosive materials, where caustic cleaning solutions are used in washdowns of machinery, and where equipment is in close proximity to the sensor. For out-of-doors, dual-level-control sensing applications where cold weather is a factor, these corrosion-resistant models provide reliable operation in temperatures as low as -20°C (-4°F).

Non-level control applications ideally suited for these sensors within the 1 and 2 meter ranges include container accumulation detection on mass conveyors and controlling either loop positions or tension on web processing lines relative to two set control limits.

8 meter, long-range models

No other discrete, level-control sensor on the market combines a short deadband, and a long sensing range, housed in as small a package as the Model SM902A-8 and Model SM952A-8 series of long-range, ultrasonic, dual-level sensors. As indicated in the Model Reference Guide, these 30 mm sensors detect objects over a sensing range of just 203 mm (8") to 8 m (26'). The 116.31 mm (4.579") length of the cable model, a fraction of the size of other long-range sensors, ensures easy installation. The

sensors operate on a sonic frequency of 75 kHz with a standard response time of 1 second, with other response times available. The transducer face of the fully encapsulated sensor is made of epoxy which, in addition to coupling the ultrasonic energy to the air, allows the sensor to perform in a wide range of harsh environments including those involving most acids, bases, and oils.

Applications for these long-range, dual-level sensors can be found in almost every industry or business when reliable detection within the range of 8 meters (26 feet) is required. By virtue of the 75 kHz sonic frequency, the sensor's wide, 20° beam is especially effective in sensing the levels of various types of liquids, solids, and granules as close as 203 mm (8") from the sensor's face. These applications include the processing of food and beverage products and pharmaceuticals, as well as the treatment of water and sewage. In the sensing of dry materials such as grains and powders, the long-range, dual-level sensors offer an efficient alternative to certain limit switch devices, which can be prone to frequent maintenance problems and unreliable operation.

In applications where high sound absorption conditions may exist in the material being detected, and either the one or two meter range model sensor becomes unreliable because of lost energy, the more powerful 8m range SM902 can provide the solution when used within the sensing ranges of either one or two meters.

Temperature compensation allows these long-range sensors to operate reliably in outdoor applications in temperatures ranging from -20° to 60°C (-4° to 140°F).

Operation

The Model SM902 series sensor, operating on 12 to 24 VDC regulated power, is a self-contained, pulse-echo, dual-level sensing device that monitors and controls most nonhazardous material levels within the specified sensing ranges. With extremely short deadbands, the sensors are capable of detecting levels of liquids, solids, and powders as close as 51 mm (2") from the sensor face.

Before operation, a push-button "teach" function is used to set the sensing window limits. The near and far limits of a desired sensing window can be set anywhere within the sensing range and may be set to encompass the full sensing range or be as small as de-

sired. A double press of the SETUP push-button makes possible the setting of a default window anywhere within the sensing range.

Functionality in the operation of the 30 mm, long-range sensors includes the capability to be configured for various NPN and PNP, normally open, normally closed or complementary output modes for: pump-in latch or pump-out, with and without alarm or setpoint, and dual alarm/dual setpoint operations. A loss-of-echo feature can be selected to hold the output in the event of a loss-of-echo condition.

During setup and operation, a multicolor LED indicates the limits setup and operational modes while an amber LED illuminates when the output is in an active (on) state.

How does it work?

During setup and operation, these SM902 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, $D = TVs/2$, where D = distance from the sensor to the object; T = elapsed time between the pulse transmission and its echo receptions; V = 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 limits. These limits are shown in the illustration above as D_{wi} and D_{wo}. When D is equal to one of the two limits, according to the level-control functions, an output change takes place. A red LED illuminates when the output is in an active (on) state.

Level-Control Functions

The level control output in the Model SM902 series can be configured for many different operating functions. Through the Model Reference Guide, the sensor can be selected to perform a pump-in latch function, pump-out latch function, dual-setpoint function, dual alarm, or a combination of these functions.

Pump-in Latch

When the level moves farther than 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 closer than the near limit to stop the pumping process.
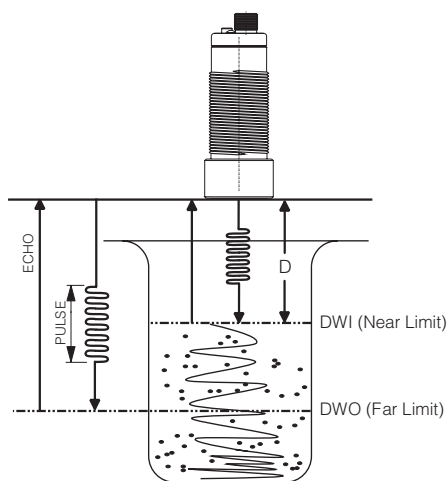
Pump-out Latch

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

Dual Set-point

Two sensor outputs are used to enable this control function. One output operates independently with the near set-point limit while the other operates independently with the far setpoint limit. The near set-point limit output switches state when the level moves closer than the near set-point limit and does not switch back until the level moves farther than the near set-point limit.

The far set-point limit output switches state when the level moves closer than the far set-point limit and does not switch back until the level moves farther than the far set-point limit.

Dual Alarm

Two sensor outputs are used to enable this control function. One output operates independently with the near alarm limit while the other operates independently with the far alarm limit. The near alarm limit output switches state when the level moves above (closer than) the near alarm limit and changes state when the level moves back below (farther than) the near alarm limit. The far setpoint limit output switches

Model Reference Guide - SM902 Series

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: **SM9 5 2 A - 1 0 0 0 0 0 -**

SUPERPROX® Product Series
Power/Connection Type
0...12 to 24 VDC / cable style
5...12 to 24 VDC / connector style
Sensing Function
2..Dual level
Design Level
A...Applies to all models
Sensing Range
1...51 mm to 1 m (2" to 39")
4...120 mm to 2 m (4.7" to 79")
7…120 mm to 1 m (4.7" to 39") - Required for ST option
8…203 mm to 8 m (8" to 26')
Level-Control Function
0...Pump-out latch
1...Pump-in latch
2...Dual setpoint
3...Dual alarm
4...Pump-in latch, with alarm
5...Pump-out latch, with alarm
6...Pump-in latch, with setpoint
7...Pump-out latch, with setpoint
Output Type
Level-control functions 0 and 1 (Pump in/out units without alarm or setpoint):
0...Normally open (N.O.) - NPN & PNP
1...Normally closed (N.C.) - NPN & PNP
2...Complementary NPN outputs
3...Complementary PNP outputs
Level-control functions 2 and 3 (Dual alarm/dual setpoint units):
4...Normally open (N.O.) - NPN outputs
5...Normally closed (N.C.) - NPN outputs
6...Normally open (N.O.) - PNP outputs
7...Normally closed (N.C.) - PNP outputs
Level-control functions 4 through 7 (Pump units with alarm or setpoint):
4...N.O. control and alarm/set-point - NPN outputs
5...N.C. control and alarm/set-point - NPN outputs
6...N.O. control and alarm/set-point - PNP outputs
7...N.C. control and alarm/set-point - PNP outputs
8...N.O. control, N.C. alarm/set-point - NPN outputs
9...N.C. control, N.O. alarm/set-point - NPN outputs
A...N.O. control, N.C. alarm/set-point - PNP outputs
B...N.C. control, N.O. alarm/set-point - PNP outputs
Response Time
0...Standard: 150 ms (1 m) / 200 ms (2 m) / 1 s (8 m)
1...300 ms (1 m) / 400 ms (2 m)
2...1.000 s (1 m) / 1.500 s (2 m)
4…500 ms (1 m and 2 m)
Functionality
00...Standard default window: $\pm$ 6.35 mm (0.25"), 1 m and 2 m; $\pm$ 63.5 mm (2.50"), 8 m
02...Default window, $\pm$ 6.35 mm (0.25"),1 m and 2 m; $\pm$ 63.5 mm (2.50"), 8 m; outputs on loss-of-echo
04...Default window, $\pm$ 9.52 mm (0.375"),1 m and 2 m; outputs off on loss-of-echo
Options
   ...No designator indicates no options
ST...Stainless transducer (available in stainless steel housing and 120 mm to 1 m models only)
LE...No change in output on loss of echo
FS...Fluorosilicone transducer face (1 m models only)
AD...Limits push-button disabled
Housing Types
   ...No designator indicates standard ULTEM®* plastic
S...SS303 stainless steel (1 and 2 m models only)

NOTE: Contact the factory for DeviceNet communications capability
* ULTEM® is a registered trademark of The General Electric Company.

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state when the level moves below (farther than) the far alarm limit and changes state when the level moves back above (closer than) the far alarm limit. As a fail-safe, the normally open (N.O.) dual alarm outputs are physically active when the level is between the alarm limits and physically inactive when in an alarm condition.

Pump Latch with Alarm/Setpoint

This control function uses a combination of the above level control functions.

Setting the Window Limits

Located on the backside of the sensor, the SETUP push-button is used to set the near and far window limits within which the level sensing is to take place. Before the limits are set, the sensor must be properly aligned with the object to be detected.

To set the window limits, depress the SETUP push-button (the multicolor LED rapidly flashes amber to indicate the push-button is being pressed) until the multicolor LED flashes green in about 3 seconds, and then release the SETUP push-button. The multicolor LED continues flashing green indicating the sensor is waiting for the first window limit. Align a flat object parallel to the sensor face at the desired distance for either the near or far window limit, and press the SETUP push-button once. Upon release of the SETUP push-button, the multicolor LED flashes amber indicating the first window limit is set and the sensor is waiting for the second window limit. Align a flat object parallel to the sensor face at the desired position for the second window limit and press the SETUP push-button once. Upon release of the SETUP push-button, the multicolor LED turns to the color that indicates where the object is located. The sensor has no time-out for setting limits.

For sensor models with a control output and either an alarm or setpoint output, the alarm or setpoint limit is set after the window limits are set. With these models, after the SETUP push-button is pressed for the second window limit and released, the multicolor LED flashes amber/green indicating the second window limit is set and the sensor is waiting for either the alarm or setpoint limit. Align a flat object parallel to the sensor face at the desired position for either the alarm or setpoint limit and press the SETUP pushbutton once. Upon release of the SETUP push-button, the multicolor LED turns to the color that indicates where the object is located.

While the SETUP push-button is depressed, the multicolor LED turns amber to indicate the sensor detects the object. If the sensor does not detect the object, the multicolor LED is red while the SETUP push-button is depressed, and flashes 2 seconds when the SETUP push-button is released. After flashing red 2 seconds, the sensor requests that window limit again by flashing green for the first window limit or flashing amber for the second window limit.

A special feature of these sensors allows the user to set an automatic default window of fixed size anywhere within the sensing range. For the 1 and 2 meter range models, the standard default window is 12.7 mm (0.50"). It is 127 mm (5.0") for the 8 meter range models. Other default window sizes are available for all the models upon request. To easily set the default window, while the multicolor LED is flashing green, align a flat object parallel to the sensor face at the center of the desired window and press the SETUP push-button twice in succession without moving the object. An automatic default window limit will be set at a distance equal to half the default window in front of and behind the flat-object surface nearest the sensor. If, for example, the functionality of the 1 or 2 meter range sensor calls for the standard default window, the sensing window is set with limits 6.35 mm (0.25") in front of and behind the object's front surface.

For long distances or tall-tank applications, when use of the sensor's push-button is not practical an optional Model AC441A handheld configurator can be used to set or change the near and far window limits and display the object distance when the sensor is located up to 200 feet from the user. The Model AC441A cannot, however, be used to set the default window.

Once set, the window limits are saved in nonvolatile memory and thus are retained when power is removed from the sensor.

Loss of Echo Operation

Output Off, On Loss of Echo

Loss of echo occurs when the sensor does not receive echoes from an object or surface level 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 dual-level control or dual-setpoint limits.

Output Holds, On Loss of Echo ("LE" Option)

The LE suffix in the Model Reference Guide 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 dual-level control or dual-setpoint limits.

Sensor Operating Profiles

Pump-in Latch

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Far Limit
Near Limit
Range

Amber Status LED
Setup Pushbutton
Multicolor LED
Connector

Multicolor LED
Red   Green   Amber

On loss of echo, the multicolor LED turns off and the outputs turn off

Bold line indicates when LED is ON and outputs are ON.

Pump-out Latch

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Far Limit
Near Limit
Range

Amber Status LED
Setup Pushbutton
Multicolor LED
Connector

Multicolor LED
Red   Green   Amber

On loss of echo, the multicolor LED turns off and the outputs turn off

Bold line indicates when LED is ON and outputs are ON.

Dual Set-point

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Near Setpoint
Far Setpoint
Range

Amber LED
Setup Pushbutton
Multicolor LED
Connector

Multicolor LED
Red   Green   Amber   Off

Normally Open Outputs Operation *

Red LED On / BLK Far Output / WHT Near Output
Red LED Flashing / BLK Far Output / WHT Near Output
Red LED Off / BLK Far Output / WHT Near Output
Red LED Off / BLK Far Output / WHT Near Output
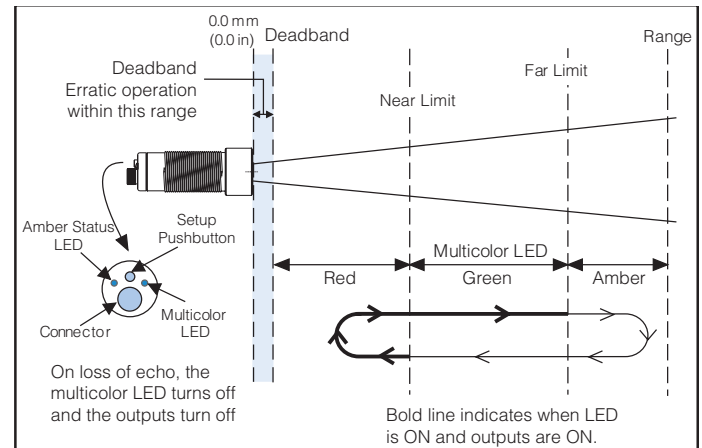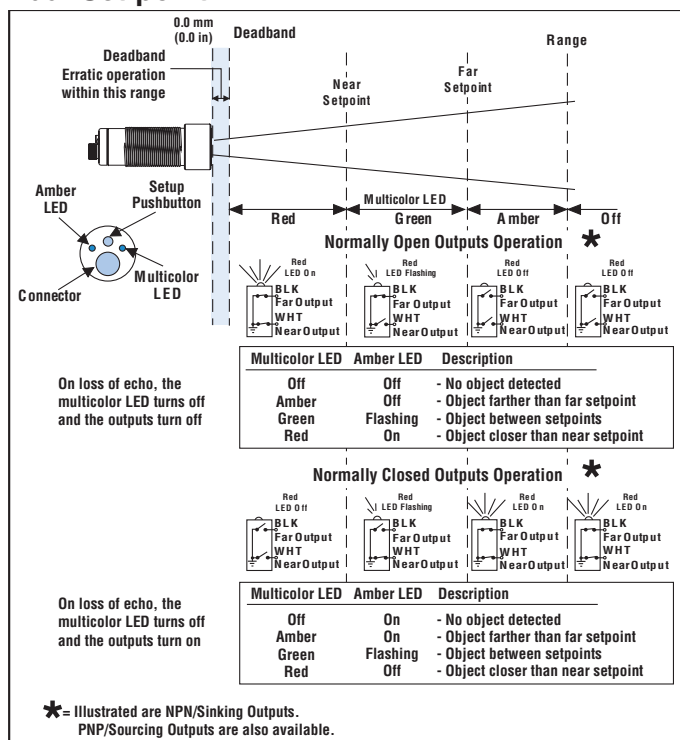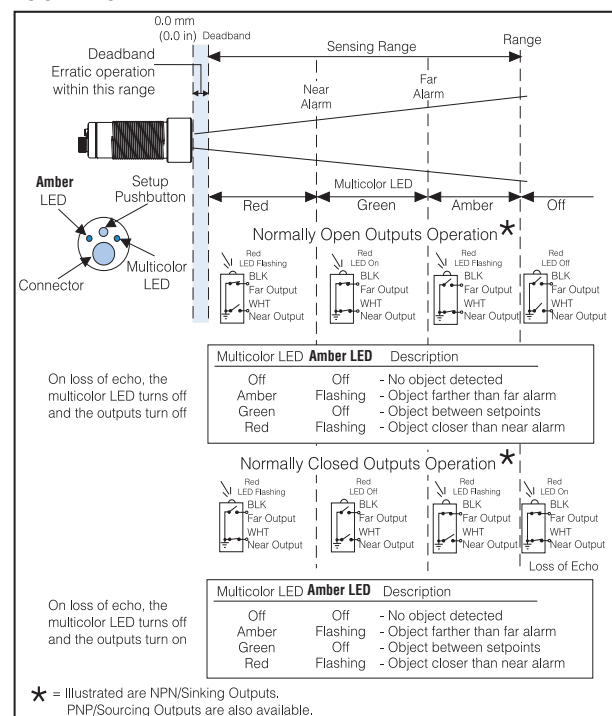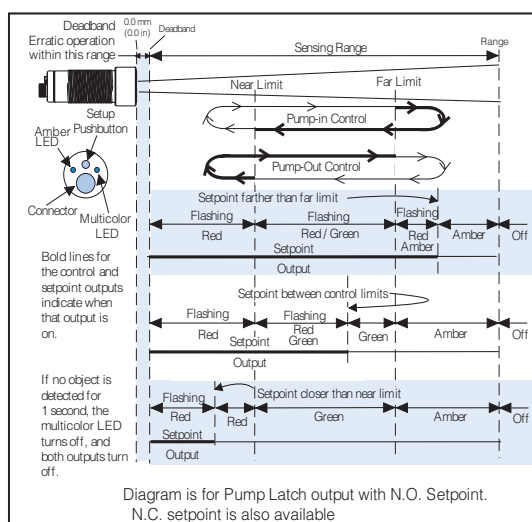
Multicolor LED	Amber LED	Description
Off	Off	- No object detected
Amber	Off	- Object farther than far setpoint
Green	Flashing	- Object between setpoints
Red	On	- Object closer than near setpoint

On loss of echo, the multicolor LED turns off and the outputs turn off

Normally Closed Outputs Operation *

Red LED Off / BLK Far Output / WHT Near Output
Red LED Flashing / BLK Far Output / WHT Near Output
Red LED On / BLK Far Output / WHT Near Output
Red LED On / BLK Far Output / WHT Near Output

Multicolor LED	Amber LED	Description
Off	On	- No object detected
Amber	On	- Object farther than far setpoint
Green	Flashing	- Object between setpoints
Red	Off	- Object closer than near setpoint

On loss of echo, the multicolor LED turns off and the outputs turn on

* = Illustrated are NPN/Sinking Outputs. PNP/Sourcing Outputs are also available.

Dual Alarm

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Sensing Range
Near Alarm
Far Alarm
Range

Amber LED
Setup Pushbutton
Multicolor LED
Connector

Multicolor LED
Red   Green   Amber   Off

Normally Open Outputs Operation *

Red LED Flashing / BLK Far Output / WHT Near Output
Red LED On / BLK Far Output / WHT Near Output
Red LED Flashing / BLK Far Output / WHT Near Output
Red LED Off / BLK Far Output / WHT Near Output

Multicolor LED	Amber LED	Description
Off	Off	- No object detected
Amber	Flashing	- Object farther than far alarm
Green	Off	- Object between setpoints
Red	Flashing	- Object closer than near alarm

On loss of echo, the multicolor LED turns off and the outputs turn off

Normally Closed Outputs Operation *

Red LED Flashing / BLK Far Output / WHT Near Output
Red LED Off / BLK Far Output / WHT Near Output
Red LED Flashing / BLK Far Output / WHT Near Output
Red LED On / BLK Far Output / WHT Near Output

Loss of Echo

Multicolor LED	Amber LED	Description
Off	Off	- No object detected
Amber	Flashing	- Object farther than far alarm
Green	Off	- Object between setpoints
Red	Flashing	- Object closer than near alarm

On loss of echo, the multicolor LED turns off and the outputs turn on

* = Illustrated are NPN/Sinking Outputs. PNP/Sourcing Outputs are also available.

NPNs Pump Latch with N.O. Set-point

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Sensing Range
Near Limit
Far Limit
Range

Setup Pushbutton
Amber LED
Connector
Multicolor LED

Pump-in Control
Pump-Out Control

Setpoint farther than far limit
Flashing Red / Flashing Red/Green / Flashing Red Amber / Amber / Off
Setpoint
Output

Setpoint between control limits
Flashing Red / Flashing Red Green / Green / Amber / Off
Setpoint
Output

Setpoint closer than near limit
Flashing Red / Red / Green / Amber / Off
Setpoint
Output

Bold lines for the control and setpoint outputs indicate when that output is on.

If no object is detected for 1 second, the multicolor LED turns off, and both outputs turn off.

Diagram is for Pump Latch output with N.O. Setpoint. N.C. setpoint is also available

NPNs Pump Latch with N.O. Alarm

0.0 mm (0.0 in)
Deadband
Deadband Erratic operation within this range
Sensing Range
Near Limit
Far Limit
Range

Setup Pushbutton
Amber LED
Connector
Multicolor LED
Control Output

Pump-In Control
Pump-Out Control

Alarm limit farther than far limit
Red / Green / Amber / Flashing Amber / Off
Alarm
Output

Alarm limit between midpoint of control limits and far limit
Red / Green / Flashing Amber Green / Flashing Amber / Off
Alarm
Output

Alarm limit between midpoint of control limits and near limit
Flashing Red / Flashing Red Green / Green / Amber / Off
Alarm
Output

Alarm limit closer than near limit
Flashing Red / Red / Green / Amber / Off
Alarm
Output

Bold lines for the control and alarm outputs indicate when that output is on.

If no object is detected for 1 second, the multicolor LED turns off, and both outputs turn off.

Diagram is for Pump Latch output with N.O. Alarm
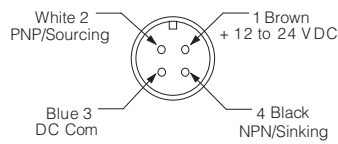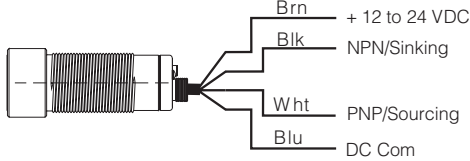
SUPERPROX® PROXIMITY SENSORS
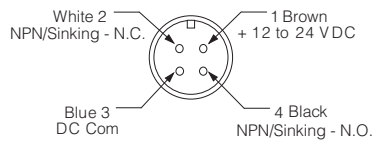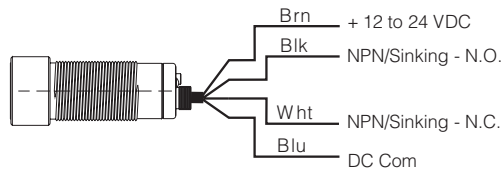
Electrical Wiring

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

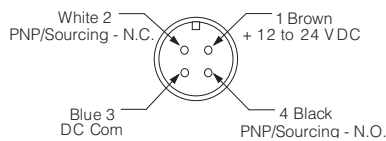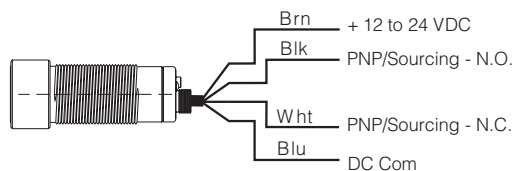**Cable Model Wire Assignments**   **Connector Model Pin Assignments**
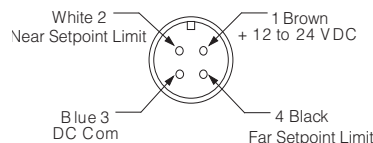
Latch Outputs
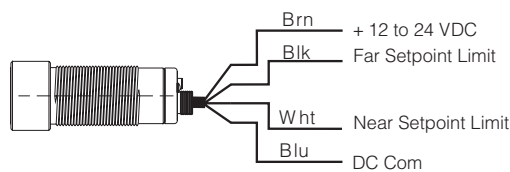### Sinking/Sourcing - N.O./N.C. outputs

Brn — + 12 to 24 VDC
Blk — NPN/Sinking
Wht — PNP/Sourcing
Blu — DC Com

White 2 PNP/Sourcing
1 Brown + 12 to 24 VDC
Blue 3 DC Com
4 Black NPN/Sinking

Complementary Sinking outputs

Brn — + 12 to 24 VDC
Blk — NPN/Sinking - N.O.
Wht — NPN/Sinking - N.C.
Blu — DC Com

White 2 NPN/Sinking - N.C.
1 Brown + 12 to 24 VDC
Blue 3 DC Com
4 Black NPN/Sinking - N.O.

Complementary Sourcing outputs

Brn — + 12 to 24 VDC
Blk — PNP/Sourcing - N.O.
Wht — PNP/Sourcing - N.C.
Blu — DC Com

White 2 PNP/Sourcing - N.C.
1 Brown + 12 to 24 VDC
Blue 3 DC Com
4 Black PNP/Sourcing - N.O.

Dual Alarm Set-point Outputs
NPN/Sinking - N.O./N.C., PNP/Sourcing - N.O./N.C.

Brn — + 12 to 24 VDC
Blk — Far Setpoint Limit
Wht — Near Setpoint Limit
Blu — DC Com

White 2 Near Setpoint Limit
1 Brown + 12 to 24 VDC
Blue 3 DC Com
4 Black Far Setpoint Limit
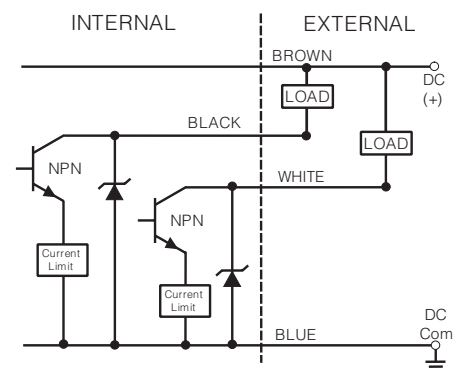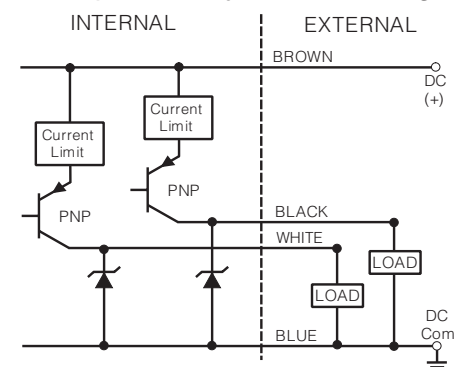
Outputs

Latch
NPN/Sinking and PNP/Sourcing
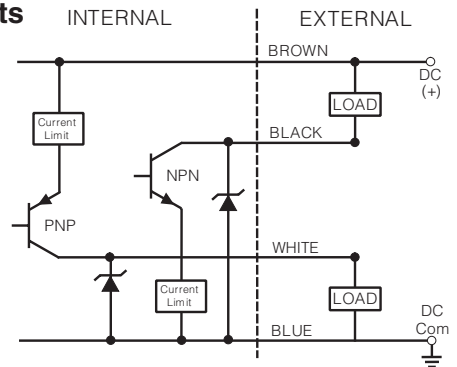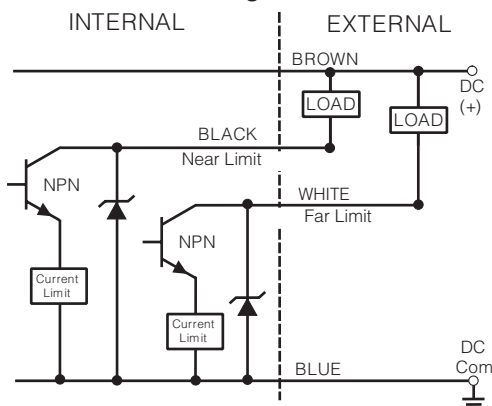

Complementary NPN/Sinking

Complementary PNP/Sourcing
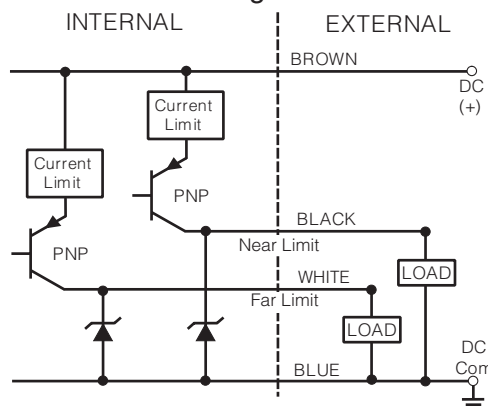

Outputs

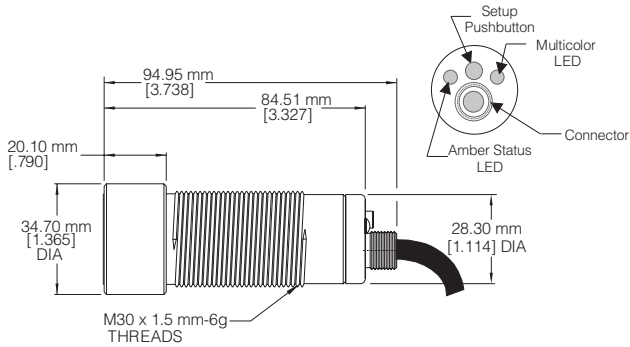### Dual Alarm/Set-point
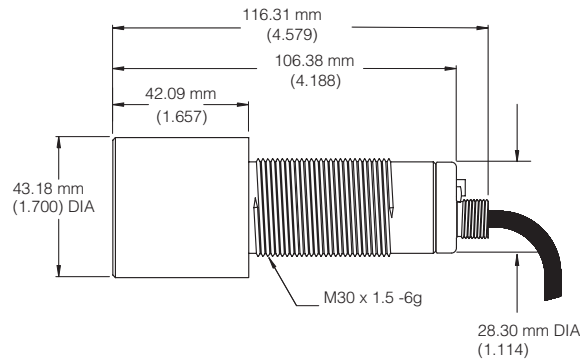
Dual NPN/Sinking

Dual PNP/Sourcing

Dimensions

Cable Style

(ULTEM® plastic and SS303 stainless steel)
SM902A-1, SM902A-4, SM902A-7STS

94.95 mm [3.738]
84.51 mm [3.327]
20.10 mm [.790]
34.70 mm [1.365] DIA
28.30 mm [1.114] DIA
M30 x 1.5 mm-6g THREADS

Setup Pushbutton
Multicolor LED
Connector
Amber Status LED

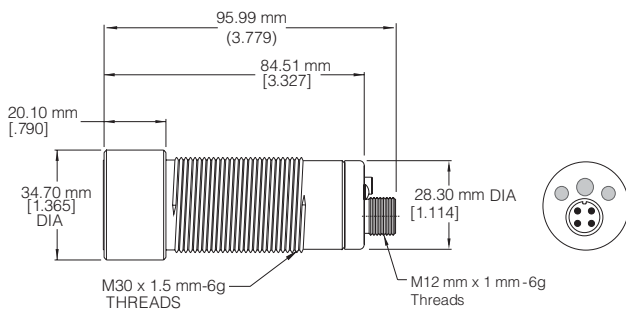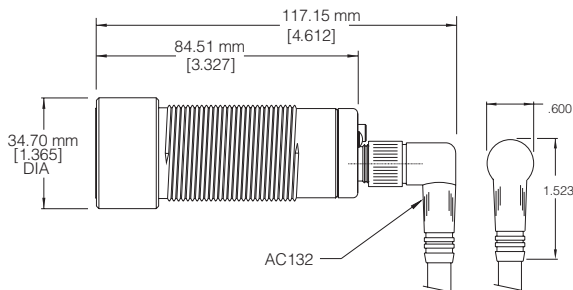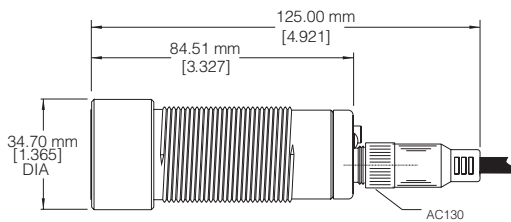### Cable Style

(ULTEM® plastic and SS303 stainless steel)
SM902A-8 long-range

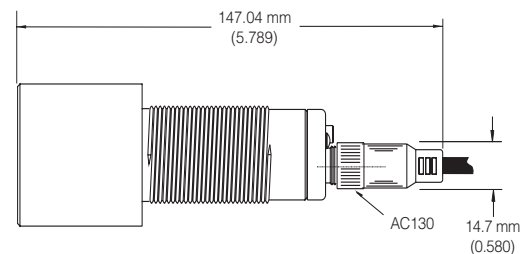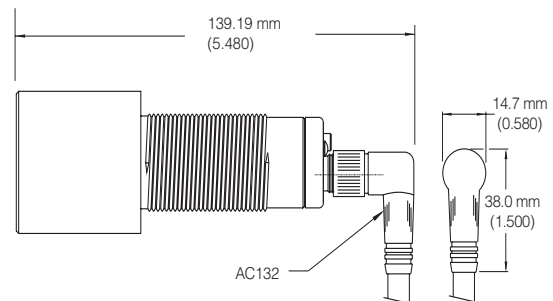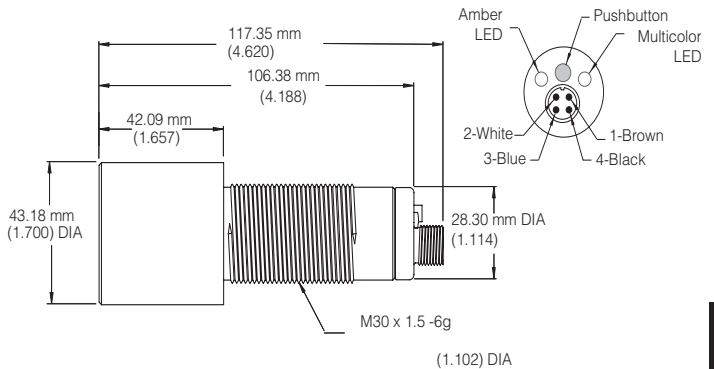116.31 mm (4.579)
106.38 mm (4.188)
42.09 mm (1.657)
43.18 mm (1.700) DIA
M30 x 1.5 -6g
28.30 mm DIA (1.114)

Connector Style

(ULTEM® plastic and SS303 stainless steel)
SM952A-1, SM952A-4, SM952A-7STS

125.00 mm [4.921]
84.51 mm [3.327]
34.70 mm [1.365] DIA
AC130

117.15 mm [4.612]
84.51 mm [3.327]
34.70 mm [1.365] DIA
AC132
.600
1.523

95.99 mm (3.779)
84.51 mm [3.327]
20.10 mm [.790]
34.70 mm [1.365] DIA
28.30 mm DIA [1.114]
M30 x 1.5 mm-6g THREADS
M12 mm x 1 mm-6g Threads

Connector Style

(ULTEM® plastic and SS303 stainless steel)
SM952A-8 long-range

117.35 mm (4.620)
106.38 mm (4.188)
42.09 mm (1.657)
43.18 mm (1.700) DIA
M30 x 1.5 -6g
28.30 mm DIA (1.114)
(1.102) DIA

Amber LED
Pushbutton
Multicolor LED
2-White
3-Blue
1-Brown
4-Black

139.19 mm (5.480)
14.7 mm (0.580)
AC132
38.0 mm (1.500)

147.04 mm (5.789)
AC130
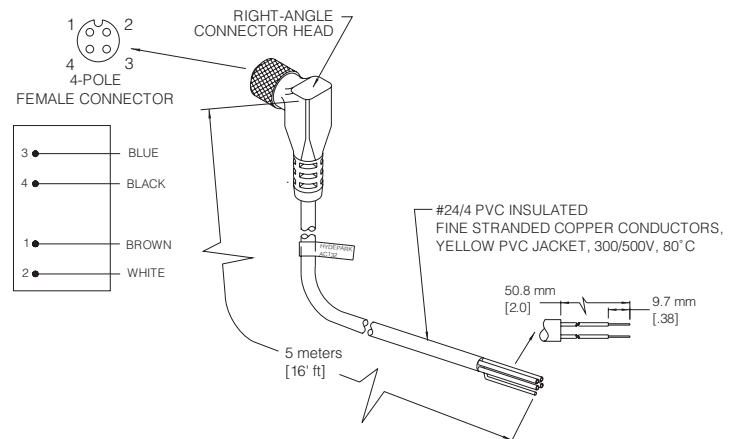14.7 mm (0.580)

SUPERPROX® PROXIMITY SENSORS

Accessories

AC130 Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), for 30 mm, barrel-style sensors
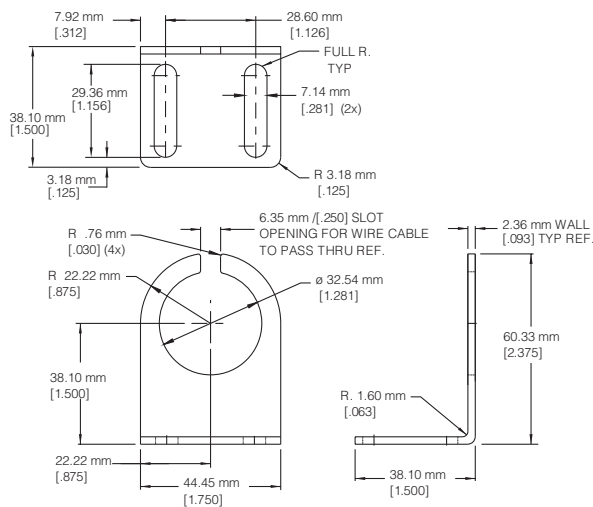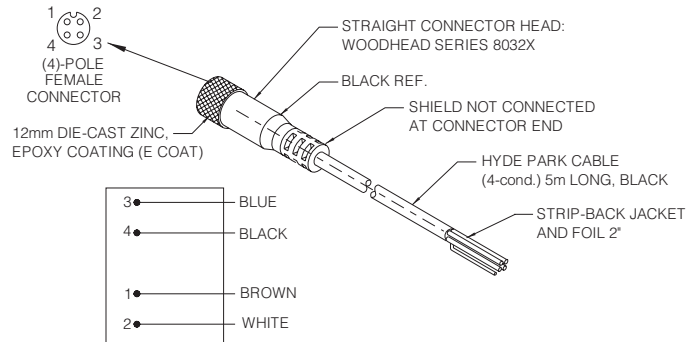
AC132 Right-angle, M12 micro, 4-conductor, connector/cable assembly, 5 m (16'), for 30 mm, barrel-style sensors

AC233 Small, right-angle, stainless, mounting bracket for 30 mm, barrel-style sensors.

General Specifications

Sensing [TA = 20° C (68° F)]

1 and 2 meter ranges

Model Sensing Ranges:
- 51 mm to 1 m (2.0" to 39")
- 120 mm to 1 m (4.7" to 39")**
- 120 mm to 2 m (4.7" to 79")

Sonic Frequency: 200 kHz

Minimum-size Detection
(Model SM902A-1):1.59 mm (0.0625")
diameter rod up to 635 mm (25") distance from sensor

Maximum Angular Deviation:
± 10° on 305 mm x 305 mm (12" x 12") flat target at a distance of 305 mm (12")

Sonic Cone Profile: See Beam Plots, Page 4-109

Limit Adjustment Resolution: 0.08 mm (0.003")

Repeatability: ± 0.8716 mm (0.03431") max.
Temperature Compensated

Power Requirements

Supply Voltage:
12 to 24 VDC ± 10% excluding output load (regulated supply)

Current Consumption: 100 mA max., excluding load

Peak Inrush Current: 0.50 Amp.

Power Consumption: 1.2 W max., excluding load

Outputs

Sinking Output (NPN):
- Maximum on-state voltage @ 100 mA: 0.37 volt
- Maximum load current: 100 mA
- Maximum applied voltage: 35 VDC

Sourcing Output (PNP):
- Maximum on-state voltage drop @ 100 mA: 0.50 volt
- Maximum load current: 100 mA

Response Time - Standard

150 ms on/off (1 m range models)

200 ms on/off (2 m range models)

Other response times are available.

Indicators

Multicolored (Amber, Red, Green) LED:
Indicates limits setup and operational modes.

Amber LED: Visual indicator for sensor output: illuminated when output is in an active (on) state.

Connection Options

Cable Style:
24 AWG, foil shield, lead-free PVC jacketed, 4-conductor, 3 meters (10') long, standard

Connector Style:
12 mm, 4 pole, male

Protection

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

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

NOTE: This sensor is NOT RATED EXPLOSION PROOF.

Environmental

Operating Temperature Range:
- 0° to 50°C (32° to 122°F) for silicone-faced models
- - 20° to 50°C (-4° to 122°F) for stainless steel-faced models

Storage Temperature Range:
- -20° to 80°C (14° to 176°F) for silicone-faced models
- -50° to 80°C (-58° to 176°F) for stainless steel-faced models

Operating Humidity: 100%

Protection Ratings: NEMA 4X (indoor use only), IP67

Chemical Resistance: Unaffected by most acids, bases, and oils. Fluorosilicone and stainless steel-faced transducers available for severe, corrosive-type environments.

Construction

Dimensions:

Cable Model: 30 mm (1.181") dia. x 1.5 mm-6g threaded housing x 94.95 mm (3.738") long, including 34.70 mm (1.365") dia. x 20.10 mm (0.790") long sensing head

Connector Model: 30 mm (1.181") dia x 1.5 mm-6g threaded housing x 95.99 mm (3.779") long; 117.15 mm (4.612") long, including AC132 right-angle, M12 micro, connector/cable assembly; 125 mm (4.921") long, including AC130 straight, M12 micro, connector/cable assembly; sensing head dimension same as cable model.

Housing: Epoxy encapsulated to resist shock and vibration

Case: ULTEM®* plastic (FDA Approved) or SS303 stainless steel

Transducer Face: Silicone rubber - gray SS304 stainless steel, 0.051 mm (0.002") thick**

Sensor Cables: Lead-free, black PVC jacketed

8 meter, long range

Model Sensing Range:
203 mm to 8 m (8.0" to 26')

Sonic Frequency: 75 KHz

Minimum-size Detection (Model SM902A-8):
50.8 mm (2.0") diameter rod up to 4572 mm (15') distance from the sensor

Maximum Angular Deviation:
$\pm$ 10° on a large flat surface at a distance of 6.096 m (20')
$\pm$ 5° on a large flat surface at a distance of 8 m (26')

Sonic Cone Profile: See Beam Plots, Page 4-109

Limit Adjustment Resolution:
0.254 mm (0.01")

Repeatability: $\pm$ 2.54 mm (0.10") max.

Temperature Compensated

Power Requirements

Supply Voltage:
12 to 24 VDC $\pm$ 10% excluding output load (regulated supply)

Current Consumption: 100 mA max., excluding load

Peak Inrush Current: 0.50 Amp.

Power Consumption: 1.2 W max., excluding load

Outputs

Sinking Output (NPN):
Maximum on-state voltage @ 100 mA: 0.37 volt
Maximum load current: 100 mA
Maximum applied voltage: 35 VDC

Sourcing Output (PNP):
Maximum on-state voltage drop @ 100 mA: 0.50 volt
Maximum load current: 100 mA

Response Time - Standard

1 s on/off
Other response times are available.

Indicators

Multicolored (Amber, Red, Green) LED:
Indicates limits setup and operational modes.

Amber LED:
Visual indicator for sensor output; illuminated when output is in an active (on) state.

Connection Options

Cable Style: 24 AWG, foil shield, lead-free PVC jacketed, 4-conductor, 3 meters (10') long, standard Connector Style: 12 mm, 4 pole, male

Protection

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

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

NOTE: This sensor is NOT RATED EXPLOSION PROOF.

Environmental

Operating Temperature Range: - 20° to 60°C (-4° to 140°F)

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

Operating Humidity: 100%

Protection Ratings: NEMA 4X (indoor use only), IP67   Chemical Resistance: Unaffected by most acids, bases, and oils.

Construction

Dimensions:

Cable Model: 30 mm (1.181") dia. x 1.5 mm-6g threaded housing x 116.31 mm (4.579") mm long, including 43.18 mm (1.70") dia. x 42.09 mm (1.657") long sensing head

Connector Model: 30 mm (1.181") dia x 1.5 mm-6g threaded housing x 117.35 mm (4.62") long; 139.19 mm (5.48") long, including AC132 right-angle, connector/cable assembly; 147.04 mm (5.789") long, including AC130 straight, connector/cable assembly; sensing head dimension same as cable model.

Housing: Epoxy encapsulated to resist shock and vibration

Case: ULTEM®* plastic (FDA Approved)

Transducer Face: Epoxy - white

Sensor Cables: Lead-free, black PVC jacketed

Agency Approvals

CE Mark: CE conformity is declared to:
EN63126: 1997 (annex A, industrial) including amendment A1:1998. EN55011 group 1 Class A.
Declaration of Conformity available upon request.

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

** Available only in the stainless steel-faced, 1 m range models

Accessories

Model AC130, Straight, M12 micro, 4-conductor, connector/cable assembly, 5 m (16')

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

Model AC233, Small, right-angle, stainless, mounting bracket

Model AC250-n, Tank sensor mounting reducer, available with four different outside diameters; used with all SUPERPROX® SM900 family sensors. n = 1 (1 1/4" NPT); 2 (2" NPT); 3 (3" NPT); 4 (4" NPT)

Model AC251-n, Tank sensor mounting flange, available with three different pipe thread diameters, furnished with matching AC250 Tank sensor mounting reducer; used with all SUPERPROX® SM900 family sensors. n = 2 (2"NPT); 3 (3"NPT); 4 (4"NPT)

Model AC441A, Handheld configurator

See Page 7-1 for accessory photos.

Selection Chart

SM902 Series
Dual Level Output

Model No.	12/24 VDC Power Version	Cable	Connector	51 mm – 1 m, 2"–39"	120 mm – 2 m, 4.7"–79"	120 mm – 1 m, 4.7"–39"	203 mm – 8 m, 8"–26'	Pump-out latch	Pump-in latch	Dual Setpoint	Dual alarm	Pump-in latch, with alarm	Pump-out latch, with alarm	Pump-in latch, with set point	Pump-out latch, with set point	Silicone	Stainless	Fluorosilicone	Epoxy	30 mm ULTEM®	30 mm stainless	Output Type	Response Time	Default window	Loss of Echo Hold
SM902A-100000	■	■		■				■								■				■		N.O. NPN&PNP	150 ms	±0.25"	
SM902A-100000LES	■	■		■				■								■					■	N.O. NPN&PNP	150 ms	±0.25"	■
SM902A-110000LE	■	■		■					■							■				■		N.O. NPN&PNP	150 ms	±0.25"	■
SM902A-112000	■	■		■					■							■				■		Complementary NPN Outputs	150 ms	±0.25"	
SM902A-124000	■	■		■							■					■				■		N.O. NPN Outputs	150 ms	±0.25"	
SM902A-126000	■	■		■							■					■				■		N.O. PNP Outputs	150 ms	±0.25"	
SM902A-144100LE	■	■		■										■		■				■		N.O. Control & Alarm - NPN Outputs	300 ms	±0.25"	■
SM902A-168000	■	■		■											■	■				■		N.O. Control & N.C. Setpoint-NPN Outputs	150 ms	±0.25"	
SM902A-400000	■	■			■			■								■				■		N.O. NPN&PNP	200 ms	±0.25"	
SM902A-424000	■	■			■						■					■				■		N.O. NPN Outputs	200 ms	±0.25"	
SM902A-424000LES	■	■			■						■					■					■	N.O. NPN Outputs	200 ms	±0.25"	■
SM902A-435001	■	■			■							■				■				■		N.C. NPN Outputs	200 ms	±0.25"	
SM902A-444000LE	■	■			■									■		■				■		N.O. Control & Alarm - NPN Outputs	200 ms	±0.25"	■
SM902A-700000STS	■	■				■		■									■				■	N.O. NPN&PNP	150 ms	±0.25"	
SM902A-735000LESTS	■	■			■							■				■				■		N.C. NPN Outputs	150 ms	±0.25"	
SM902A-824000	■	■					■				■								■	■		N.O. NPN Outputs	1.000 s	±2.50"	
SM952A-100000	■		■	■				■								■				■		N.O. NPN&PNP	150 ms	±0.25"	
SM952A-100000S	■		■	■				■								■					■	N.O. NPN&PNP	150 ms	±0.25"	
SM952A-100100LE	■		■	■				■								■				■		N.O. NPN&PNP	300 ms	±0.25"	■
SM952A-110000	■		■	■					■							■				■		N.O. NPN&PNP	150 ms	±0.25"	
SM952A-110000LE	■		■	■					■							■				■		N.O. NPN&PNP	150 ms	±0.25"	■
SM952A-110000LES	■		■	■					■							■					■	N.O. NPN&PNP	150 ms	±0.25"	■
SM952A-110000S	■		■	■					■							■					■	N.O. NPN&PNP	150 ms	±0.25"	
SM952A-110002	■		■	■					■							■				■		N.O. NPN&PNP	150 ms	±0.25"	
SM952A-110200	■		■	■					■							■				■		N.O. NPN&PNP	1.000 s	±0.25"	
SM952A-110200FS	■		■	■					■									■		■		N.O. NPN&PNP	1.000 s	±0.25"	
SM952A-110200LES	■		■	■					■							■					■	N.O. NPN&PNP	1.000 s	±0.25"	■
SM952A-112200	■		■	■					■							■				■		Complementary NPN Outputs	1.000 s	±0.25"	
SM952A-113100S	■		■	■					■							■					■	Complementary NPN Outputs	300 ms	±0.25"	
SM952A-124000	■		■	■							■					■				■		N.O. NPN Outputs	150 ms	±0.25"	
SM952A-124000LE	■		■	■							■					■				■		N.O. NPN Outputs	150 ms	±0.25"	■
SM952A-124000S	■		■	■							■					■					■	N.O. NPN Outputs	150 ms	±0.25"	
SM952A-124100LE	■		■	■							■					■				■		N.O. NPN Outputs	300 ms	±0.25"	■
SM952A-125000	■		■	■							■					■				■		N.C. NPN Outputs	150 ms	±0.25"	
SM952A-126000	■		■	■							■					■				■		N.O. PNP Outputs	150 ms	±0.25"	
SM952A-126000LES	■		■	■							■					■					■	N.O. PNP Outputs	150 ms	±0.25"	■
SM952A-127000	■		■	■							■					■				■		N.C. PNP Outputs	150 ms	±0.25"	
SM952A-134000	■		■	■								■				■				■		N.O. NPN Outputs	150 ms	±0.25"	
SM952A-136100LES	■		■	■								■				■					■	N.O. PNP Outputs	300 ms	±0.25"	■
SM952A-164000	■		■	■											■	■				■		N.O. Control & N.C. Setpoint-NPN Outputs	150 ms	±0.25"	
SM952A-400000	■		■		■			■								■				■		N.O. NPN&PNP	200 ms	±0.25"	
SM952A-410000	■		■		■				■							■				■		N.O. NPN&PNP	200 ms	±0.25"	
SM952A-410100LES	■		■		■				■							■					■	N.O. NPN&PNP	400 ms	±0.25"	■
SM952A-413000	■		■		■				■							■				■		Complementary NPN Outputs	200 ms	±0.25"	
SM952A-424000	■		■		■						■					■				■		N.O. NPN Outputs	200 ms	±0.25"	
SM952A-426000	■		■		■						■					■				■		N.O. PNP Outputs	200 ms	±0.25"	
SM952A-426000S	■		■		■						■					■					■	N.O. PNP Outputs	200 ms	±0.25"	
SM952A-426100	■		■		■						■					■				■		N.O. PNP Outputs	400 ms	±0.25"	
SM952A-434000	■		■		■							■				■				■		N.O. NPN Outputs	200 ms	±0.25"	
SM952A-437000LE	■		■		■							■				■				■		N.C. PNP Outputs	200 ms	±0.25"	■
SM952A-456000	■		■		■									■		■				■		N.O. Control & Alarm - PNP Outputs	200 ms	±0.25"	
SM952A-710000STS	■		■			■			■								■				■	N.O. NPN&PNP	150 ms	±0.25"	
SM952A-810000	■		■				■		■										■	■	■	N.O. NPN&PNP	1.000 s	±2.50"	

All possible sensor configurations are not listed here.