SUPERPROX® Ultrasonic Analog Output Sensors

Up to 8 Meter Span Measurement & Level Control

- *Sensing spans 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*
- *Either 4 to 20 mA or 0 to 10VDC analog output; either direct or inverse proportional 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*

Control levels and measure distances over spans of up to 8 meters (26 feet) with broad functionality and 30 mm mounting convenience

In vast contrast to other self-contained analog sensors, this new and smaller 30 mm, SUPERPROX® Model SM906 sensor series offers mounting convenience, broad functionality, and a selection of three analog sensing spans encompassing a few inches from the sensor to as far away as 26 feet. Depending on the model selected and the distance or level of the material being measured or controlled, the sensors offer analog spans of 1 m (39"), 2 m (79"), and a long span of 8 m (26'). The capability is enhanced further with the shortest deadbands in the sensing industry of 51 mm (2"), 120 mm (4.7"), and 203 mm (8"), respectively.

As shown in the Model Reference Guide, the SM906 series of ultrasonic analog sensors gives the user a wide selection of factory-configurable functionality to maximize the sensor's efficiency in specific analog sensing applications. In addition to the analog sensing span, the user may select a 0 to 10 VDC or 4 to 20 mA output that is either directly or inversely proportional, output state for loss of echo and power up, and response time. Also, a broad selection of sensing functionality configurations, with foreground and/or background suppression, makes possible optimum sensing discrimination. This includes, for example, the capability of monitoring levels in a tank while ignoring the paddles on the tank agitator.

The 30 mm housing, 60% smaller than other analog sensors with equal functionality, provides a package for the SM906 that is easily installed, without positioning limitations, in covers and other hard-to-mount areas. The models in this series are equipped with a push-button to set the sensors' near and far span limits. When it is impractical to use the push-button for setting the long-range limits, an optional, hand-held, setup/display accessory is available. The two limits can be set for a span to either encompass the full range of the sensor or create a span as

Model Reference Guide - SM906 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 6 A - 1 0 0 0 00 -

SUPERPROX® Product Series

Power/Connection Type

0...15 to 24 VDC / cable style

5...15 to 24 VDC / connector style

Sensing Function

6...Analog

Design Level

A...Applies to all models

Analog Span

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')

Output Signal

0...Inverse 0 to 10 V

1...Direct 0 to 10 V

2...Inverse 4 to 20 mA

3...Direct 4 to 20 mA

4...Inverse 0 to 5 V

5...Direct 0-5 V

6...Inverse 0 to 20 mA

7...Direct 0 to 20 mA

8... Autoslope 0 to 10 V

9... Autoslope 4 to 20 mA

Output State for Loss of Echo and Power Up

0...Minimum

1...Maximum

2...Hold on loss of echo and minimum on power up

3...Hold on loss of echo and maximum on power up

Response Time

0...Standard: 25 ms (1 m) / 35 ms (2 m) / 250 ms (8 m)

1...Fast: 15 ms (1 m) / 20 ms (2 m) / 150 ms (8 m)

2...100 ms (1 m /2 m)

3...250 ms (1 m/2 m)

4...500 ms (1 m/2 m/8 m)

5...1.00 s (1 m/2 m/8 m)

6...2.50 s (1 m/2 m/8 m)

Functionality

00...Standard: No foreground or background suppression (background mode)

01...Foreground suppression only (object mode) ignore echoes before near limit

02...Foreground suppression only (background mode), process first echo, ignore if before near limit

03...Foreground and background suppression (background mode), process first echo, ignore if not within limits

Options

...No designator indicates no options

ST...Stainless transducer (available in stainless steel housing for 120 mm to 1 m models only)

FS...Fluorosilicone transducer face (1 m models only)

AD...Limits push-button disabled

Housing Types

...No designator indicates standard ULTEM®* plastic housing

S...SS303 stainless steel (1 and 2 m models only)

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

FOR ALL SM900 PRODUCTS
LED Color change has been implemented
Current LED
Red
New LED
Amber
Output

Field configurable and DeviceNet Model Reference Guides start on page 4-145.

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 Object-size Detection:
1.59 mm (0.0625") diameter rod up to 635 mm (26") 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
15 to 24 VDC @ 80 mA, excluding output load
Current Consumption: 80 mA max., excluding load
Peak Inrush Current: 0.75 Amp.
Power Consumption: 1.2 W max., excluding load

Outputs

Output Range:
0 to 10 VDC or 4 to 20 mA, depending on model selected
Output Configuration:
Inverse (0 to 10 VDC or 4 to 20 mA)
Direct (10 to 0 VDC or 20 to 4 mA)
Voltage Output Slope: 33 mV/mm (0.833 V/inch) using a 305 mm (12") span
Minimum Load Resistance: 1 K Ohms (5 K Ohms recommended for best accuracy)
Current Output Slope: 52 µA/mm (1.33 mA/inch) using a 305 mm (12") span
Maximum Load Resistance: 500 Ohms (250 Ohms recommended for best accuracy)

Analog Output Electrical Specifications

(Test conditions: 24 VDC, TA = 20° C, large flat target, still air, @ minimum span size of 304.8 mm or 12")

	current output[1]	voltage output[2]
Output Range	4-20 mA	0-10 V
Load Resistance (Ohms)	10 to 500	1 K to ∞
Resolution[3]	4.88 µA	2.44 mVDC
Accuracy (% of span)[4]	± 0.50	± 0.40
Linearity (% of span)	± 0.10	± 0.10
Temperature Dependence (% of span/°C)	± 0.006	± 0.004

[1]tested with 250 Ohm load
[2]tested with 1000 Ohm load; a low value is recommended to minimize noise pickup
[3]resolution = span/4096; Maximum: 0.23 mm (0.009") for 1 meter model, max. span 0.459 mm (0.018") for 2 meter model, max. span
[4]best accuracy may be limited to 0.794 mm (0.03125") due to wave-skip phenomena

Response Times - Minimum, standard

15 ms on/off, 25 ms on/off (1 m range models)
20 ms on/off, 35 ms on/off (2 m range models)
Other response times are available.

Indicators

Multicolored (Amber, Red, Green) LED:
Indicates object position relative to the span limits
Red LED:
Intensity increases as output signal increases.

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:
-40° to 100°C (-40° to 212°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, 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") mm 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 1.5mm-6g threaded housing x 95.99 mm (3.779") long; 117.15 mm (4.612") long, including AC 132 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 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 Object-size Detection:
50.8 mm (2.0") diameter rod up to 4572 mm (15') distance from the sensor
Maximum Angular Deviation:
± 10° on a large flat surface at a distance of 6.096 m (20')
± 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: ± 2.54 mm (0.10") max.
Temperature Compensated

Power Requirements

Supply Voltage
15 to 24 VDC ± 10%, excluding output load, regulated supply
Current Consumption: 80 mA max., excluding load
Peak Inrush Current: 0.75 Amp.
Power Consumption: 1.2 W max., excluding load

Outputs

Output Range:
0 to 10 VDC or 4 to 20 mA, depending on model selected
Output Configuration: Inverse (0 to 10 VDC or 4 to 20 mA) Direct (10 to 0 VDC or 20 to 4 mA)
Voltage Output Slope:
3.28 mV/mm (83.3 mV/inch) using a 3.048 mm (10') span
1.64 mV/mm (41.7 mV/inch) using a 6.096 mm (20') span
Minimum Load Resistance: 1 K Ohms (5 K Ohms recommended for best accuracy)
Current Output Slope:
5.2 µA/mm (0.133 mA/inch) using a 3.48 mm (10') span
2.6 µA/mm (0.066 mA/inch) using a 6.096 mm (20') span
Maximum Load Resistance: 500 Ohms

Analog Output Electrical Specifications

(Test conditions: 24 VDC, TA = 20° C, large flat target, still air, @ minimum span size of 3.048 m or 10')

	current output[1]	voltage output[2]
Output Range	4-20 mA	0-10 V
Load Resistance (Ohms)	10 to 500	1 K to ∞
Resolution[3]	4.88 µA	2.44 mVDC
Accuracy (% of span)[4]	± 0.50	± 0.40
Linearity (% of span)	± 0.15	± 0.15
Temperature Dependence (% of span/°C)	± 0.006	± 0.004

[1]tested with 250 Ohm load
[2]tested with 1000 Ohm load; a low value is recommended to minimize noise pickup
[3]resolution = span/4096; Maximum: 1.90 mm (0.071") for 8 meter, long-range model, max. span
[4]best accuracy may be limited to 2.117 mm (0.083") due to wave-skip phenomena

FOR ALL SM300 PRODUCTS
LED color change has been implemented
Current LED Output
Red
New LED
Amber

Response Times - Minimum, Standard

150 ms on/off, 250 ms on/off
Other response times are available.

Indicators

Multicolored (Amber, Red, Green) LED:
Indicates object position relative to the span limits.
Red LED:
Intensity increases as output signal increases.

Connection Options

Cable Style Models:
24 AWG, foil shield, lead-free PVC jacketed, 4-conductor, 3 meters (10') long, standard
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
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, 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 94.95 mm (3.738") mm 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, connector/ cable assembly; 125.00 mm (4.921") 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.

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

**Available only in the stainless steel-faced, 1 m-span 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.

LED Color change has been implemented on ALL SM900 PRODUCTS
Current LED Output
Red
New LED
Amber

Selection Chart

SM906 Series
Level/Distance with Analog Output

Model No.	12/24 VDC Power Version	Connection Style: Cable	Connection Style: Connector	Analog Span: 51 mm - 1 m, 2" - 39"	Analog Span: 120 mm - 2 m, 4.7" - 79"	Analog Span: 120 mm - 1 m, 4.7" - 39"	Analog Span: 203 mm - 8 m, 8" - 26"	Output Signal: Inv. 0-10V	Output Signal: Dir. 0-10V	Output Signal: Inv. 4-20 mA	Output Signal: Dir. 4-20 mA	Output state on loss of Echo: Minimum	Output state on loss of Echo: Maximum	Power Up: Hold on loss of echo min. on power up	Power Up: Hold on loss of echo max. on power up	Transducer: Silicone	Transducer: Stainless	Transducer: Fluorosilicone	Materials: Epoxy	Housing: 30 mm ULTEM®	Housing: 30 mm stainless	Response Time	Functionality: No Foreground or Background Suppr.	Functionality: Foreground Suppr. (Object Mode)	Functionality: Foreground Suppr. (Background Mode)	Functionality: Fg & Bg Suppr. (Background Mode)
SM906A-100000	■	■		■				■				■				■				■		25 ms	■			
SM906A-102000	■	■		■				■						■		■				■		25 ms	■			
SM906A-103100S	■	■		■				■							■	■					■	15 ms	■			
SM906A-111000	■	■		■					■				■			■				■		25 ms	■			
SM906A-120000	■	■		■						■		■				■				■		25 ms	■			
SM906A-122000	■	■		■						■				■		■				■		25 ms	■			
SM906A-122203	■	■		■						■				■		■				■		100 ms				■
SM906A-122600S	■	■		■						■				■		■					■	2.50 s	■			
SM906A-132000	■	■		■							■			■		■				■		25 ms	■			
SM906A-133000FS	■	■		■							■				■			■		■		25 ms	■			
SM906A-400000	■	■			■			■				■				■				■		35 ms	■			
SM906A-400000S	■	■			■			■				■				■					■	35 ms	■			
SM906A-410000	■	■			■				■			■				■				■		35 ms	■			
SM906A-411000	■	■			■				■				■			■				■		35 ms	■			
SM906A-430000	■	■			■						■	■				■				■		35 ms	■			
SM906A-431000	■	■			■						■		■			■				■		35 ms	■			
SM906A-432000	■	■			■						■			■		■				■		35 ms	■			
SM906A-721000STS	■	■				■				■			■				■				■	25 ms	■			
SM906A-800000	■	■					■	■				■							■	■		250 ms	■			
SM906A-832000	■	■					■				■			■					■	■		250 ms	■			
SM956A-100000	■		■	■				■				■				■				■		25 ms	■			
SM956A-102000	■		■	■				■						■		■				■		25 ms	■			
SM956A-110000	■		■	■					■			■				■				■		25 ms	■			
SM956A-110000S	■		■	■					■			■				■					■	25 ms	■			
SM956A-111000	■		■	■					■				■			■				■		25 ms	■			
SM956A-120000	■		■	■						■		■				■				■		25 ms	■			
SM956A-122000	■		■	■						■				■		■				■		25 ms	■			
SM956A-123600S	■		■	■						■					■	■					■	2.50 s	■			
SM956A-130000	■		■	■							■	■				■				■		25 ms	■			
SM956A-130003S	■		■	■							■	■				■					■	25 ms				■
SM956A-131000	■		■	■							■		■			■				■		25 ms	■			
SM956A-131101S	■		■	■							■		■			■					■	15 ms		■		
SM956A-132000	■		■	■							■			■		■				■		25 ms	■			
SM956A-132400S	■		■	■							■			■		■					■	500 ms	■			
SM956A-133000	■		■	■							■				■	■				■		25 ms	■			
SM956A-133003	■		■	■							■				■	■				■		25 ms				■
SM956A-133600	■		■	■							■				■	■				■		2.50 s	■			
SM956A-400000	■		■		■			■				■				■				■		35 ms	■			
SM956A-402000	■		■		■			■						■		■				■		35 ms	■			
SM956A-410000	■		■		■				■			■				■				■		35 ms	■			
SM956A-412000	■		■		■				■					■		■				■		35 ms	■			
SM956A-420000	■		■		■					■		■				■				■		35 ms	■			
SM956A-420200	■		■		■					■		■				■				■		100 ms	■			
SM956A-430000	■		■		■						■	■				■				■		35 ms	■			
SM956A-432000	■		■		■						■			■		■				■		35 ms	■			
SM956A-432303	■		■		■						■			■		■				■		250 ms				■
SM956A-733003STS	■		■			■					■				■		■				■	25 ms				■
SM956A-800000	■		■				■	■				■							■	■		250 ms	■			
SM956A-820000	■		■				■			■		■							■	■		250 ms	■			

All possible sensor configurations are not listed here.