

## Model SM503 Series

### SUPERPROX® Ultrasonic Proximity Sensors

### On/Off Delay Sensing



The versatile time-delay and sensing window setup features of the SUPERPROX® Model SM503 series of Hyde Park ultrasonic, proximity sensors are as easy as pressing a door bell.

Now available in either AC or DC power, the SM503 series is intended for applications requiring reliable detection of objects and a delay of the output signal. Applications include jam and gap detection of all types of containers, even clear glass and P.E.T.

A convenient push-button in the rear control compartment

gives the user the ability to quickly program when and how long the sensor output is delayed in switching to either the on or off state, or both. Once set, the sensor remains set with no periodic adjustments required.

Like other SUPERPROX® sensors, this series has a push-button for quickly setting the window limits within which the object is to be detected. These sensors are sealed for reliable sensing in harsh, wet, or dirty environments typically associated with many conveyor line, machine, and other automatic control sensing applications. The housing meets NEMA 4X (indoor use only) and IP67 industry standards. A Dairy 3A compliant housing is available **Control Compartment**

A unique feature available to the user of these sensors is the ability to quickly set up each sensor for a specific application. The sensor is configured through four slide switches and two push-buttons (See Figure 1) located inside a watertight control compartment on the sensor. To access the controls, remove the small square cover on the back of the sensor. Simply loosen the two flathead cover

- **Easy push-button setup for the specific application**
- **Programmable On/Off delay**
- **Non-contact sensing range up to 2 m (79")**
- **Sensing limits and time delay(s) stored in nonvolatile memory**
- **Epoxy sealed in tough ULTEM® housing**
- **Virtually impervious to the harshest environments**
- **CE certified**
- **AC-powered models ETL approved**

screws and insert a small-blade screwdriver in either the top or bottom slot to remove the cover. A short plastic tether prevents separation of the cover from the sensor. NOTE: The switch settings may require changing for the intended application.

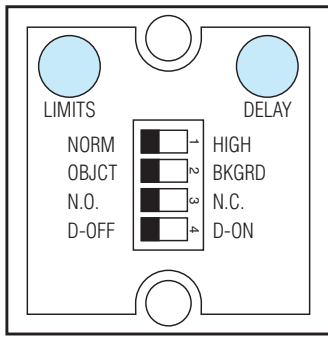


Figure 1

## Sensor Configuration Switches

**Switch 1** configures the sensor to operate in either a normal or high sensitivity mode. Place this switch in the NORM position for sensing liquid or solid materials. Place the switch in the HIGH position for sensing soft or porous materials that will absorb some of the ultrasonic energy.

**Switch 2** configures the sensor to operate in either an object or background sensing mode. Place this switch in the OBJCT position to perform a sensing function for receiving the reflected ultrasonic energy directly off an object. Place this switch in the BKGRD position to perform a break-beam sensing function for receiving the reflected ultrasonic energy directly off a fixed background target.

**Switch 3** selects the operating mode for the sensor output to be either normally open (N.O.) or normally closed (N.C.).

**Switch 4** selects the delay time program mode for setting the desired ON and OFF delay times through the DELAYS push-button. See Delay Time Setup for switch operation.

## Delay Time Functions

The ON delay time prevents the sensor output state from immediately switching active when the sensor starts sensing an object inside the set window limits. The output switches active only after the sensor has continued sensing the object inside the set window limits for the entire ON delay time period.

The OFF delay time prevents the sensor output state from immediately switching inactive when the sensor stops sensing an object inside the set window limits. The output switches inactive only after the sensor has discontinued sensing the object inside the set window limits for the entire OFF delay time period.

## Delay Time Setup

Place Switch 4 in the D-OFF position for setting the desired OFF delay time. Press the DELAYS push-button for the length of the desired delay time. The multicolored LED indicator on the sensor momentarily flashes green after release of the DELAYS push-button to acknowledge the delay time has been set into the nonvolatile memory of the sensor.

Place Switch 4 in the D-ON position

for setting the desired ON delay time. Press the DELAYS push-button for the length of the desired delay time. The multicolored LED indicator on the sensor momentarily flashes green after release of the DELAYS push-button to acknowledge the delay time has been set into the nonvolatile memory of the sensor.

## Model Reference Guide - SM503 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.

	SM	5	0	3	A	-	1	00	-	FS	-	R	2
<b>EXAMPLE MODEL:</b>													
<b>SUPERPROX<sup>®</sup> Product Series</b>	_____												
<b>Power/Connection Type</b>	_____												
0...12 to 24 VDC / cable style													
2...100 to 240 VAC / cable style													
5...12 to 24 VDC / connector style													
7...100 to 240 VAC / connector style													
<b>Sensing Function</b>	_____												
3...Proximity - on/off delay													
<b>Design Level</b>	_____												
A...Applies to all DC-powered models													
B...Applies to all AC-powered models													
<b>Sensing Range</b>	_____												
0...51 to 635 mm (2 to 25")													
1...51 to 1m (2 to 39")													
4...120 mm to 2 m (4.7 to 79")													
<b>Functionality</b>	_____												
00...Standard proximity													
15...Default window: ±1"													
17...Special delay: 250 ms increment													
25...Default window: +0.1"/-0.25"													
44...Default window: ±0.1"													
49...Special delay: 5 ms increment													
91...Default window: ±0.05"													
<b>Special Features</b>	_____												
... No letter indicates standard sensor with no special features													
FS...Fluorosilicone transducer face													
AA...Remote limit setup (Available on DC cable models only.)													
AB...RS232, 4-digit/2-decimal place output (Available on cable models only.)													
AD...Limits push-button disabled													
AE...RS232, 5-digit/3-decimal place output (Available on cable models only.)													
AF...No LEDs													
<b>Housing Types</b>	_____												
...No letter indicates standard ULTEM <sup>®</sup> plastic housing													
N...NORYL <sup>®</sup> Dairy 3A gray plastic housing													
<b>Remote Type</b>	_____												
...No letter indicates standard coupler													
R...Right-angle sensing head with armor cable													
S...Straight sensing head with armor cable													
<b>Remote Cable Length</b>	_____												
...No number indicates standard coupler													
1...254 mm (10")													
2...508 mm (20")													
3...762 mm (30")													
4...1016 mm (40")													
	} Armored (standard) or PVC cable (specify P after number)												
	} 5P...1270 mm (50") Available in PVC cable only												
	} 6P...1524 mm (60")												

\* ULTEM<sup>®</sup> and NORYL<sup>®</sup> are registered trademarks of The General Electric Company.

## Resetting Delay Times

Place Switch 4 in the D-OFF position and press the DELAYS push-button two successive times for resetting the OFF delay time to the minimum response time. Perform the same process with Switch 4 in the D-ON position for resetting the ON delay time to the minimum response time. The multicolored LED indicator on the sensor momentarily flashes amber after the second release of the DELAYS push-button to acknowledge the delay time has been reset to the minimum response time.

## Sensor Limits Setup Push-button

First, during installation, make sure the sensor face is as parallel as possible to the surface of the material being detected.

To set the limits, simply place an object at the desired distance from the sensor for one limit and press the LIMITS push-button once. This sets the first limit and switches the sensor output to an inactive state during the limit setup. While the LIMITS push-button is depressed, the multicolored LED, located on top of the sensor, is amber. Upon release of the push-button, the LED flashes amber indicating that the second limit needs to be set within 30 seconds. Place an object at the desired position for the second limit and press the LIMITS push-button once. Again, while the push-button is depressed, the LED is amber. Upon release of the push-button, the LED flashes amber momentarily and then turns green to indicate acceptance of both limits. If 30 seconds elapse before the second limit is set, the limits revert back to the previous settings.

At the same time, the sensor output switches from the inactive to the active state, placing the sensor into the operational mode, ready to use. When power is off or interrupted, the limits are retained in a nonvolatile memory.

If in setting either limit the echo from the object is too weak or distorted, the LED flashes RED for 10 seconds (or until the button is pressed again) indicating the limit setting was not accepted by the sensor. Attempt to set both limits again, being careful to keep the object surface parallel to the face of the sensor.

Minimum allowed distance between any two setup limits is 13 mm (1/2"). The multicolored LED flashes RED after the press and release of the LIMITS push-button for the second limit setting if the distance between the limit

settings is less than 13 mm. The multicolored LED continues flashing RED either until the LIMITS push-button is pressed and released once for the first limit setting or until 10 seconds have elapsed. Pressing and releasing the LIMITS push-button once reinitiates the limit setup sequence. If 30 seconds elapse before the LIMITS push-button is pressed and released for the second limit setup, the limits revert back to the previous settings.

A special feature provides an automatic 13 mm (1/2") window limits setup function. Simply place an object within the sensing range of the sensor and press the LIMITS push-button twice in succession without moving the object. A limit is set on a line 1/4" in front and back of the object surface nearest the sensor.

## Multicolored LED Indicator During Limit Setup

Prior to pressing LIMITS push-button

- Off - Sensing no object or object is outside the sensing range
- Red - Sensing an object outside the set limits
- Green - Sensing an object inside the set limits

LIMITS push-button depressed for first time

- Amber - Sensing a good object surface condition
- Red - Sensing no object or a poor object surface condition

LIMITS push-button released for first time

- Flashing Amber - First limit accepted, waiting for second limit
- Flashing Red - First limit not accepted; retry setting limit

LIMITS push-button depressed for second time

- Amber - Sensing a good object surface condition
- Red - Sensing no object or a poor object surface condition

LIMITS push-button released for second time

- Green or Red - Second limit accepted
- Green or Amber - Second limit accepted
- Flashing Red - Second limit not accepted; retry setting both limits

## Multicolored LED Indicator in Operational Mode

- Off - Sensing no object or object is outside the sensing range
- Red - Sensing an object outside the set limits
- Green - Sensing an object inside the set limits

## Red LED Indicator in Operational Mode

The red LED serves as a visual indicator for the sensor output. The LED is illuminated when the output is in an active (ON) state. Note: Indicator is not provided on all models.

## Electrical Wiring

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

## Sensor Wire Colors

DC Models	Cable Style	Connector Style
+12 to 24 VDC	RED	BROWN
NPN/Sinking Output	WHITE	BLACK
PNP/Sourcing Output	GREEN	WHITE
Common	BLACK	BLUE

## AC Models\*

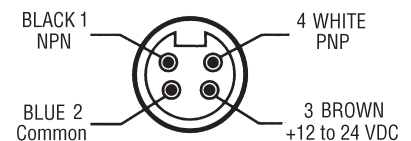
100 to 240 VAC	BROWN	BROWN
Switch Line Side	BLACK	BLACK
Switch Load Side	WHITE	WHITE
Neutral	RED	BLUE

## \*WARNING

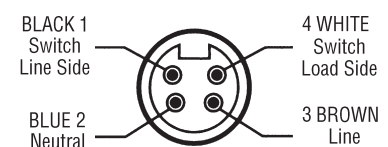
Not all cables are alike. Verify that connector pin outs and cable conductor colors match up with the wiring illustrations shown in the operating instructions.

## View of Plug on Connector Style Sensor

### DC Power Models

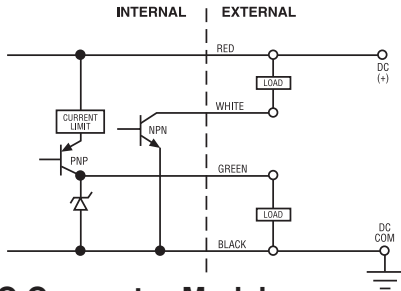


### AC Power Models

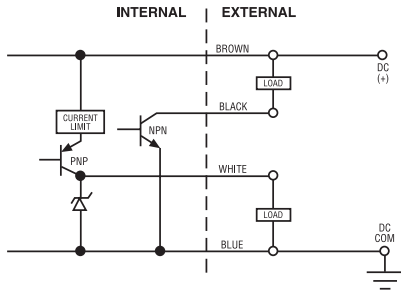


## Outputs

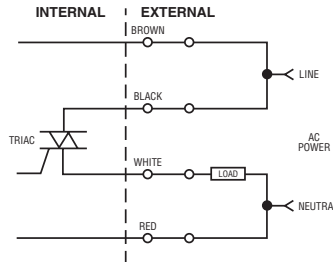
### DC Cable Models



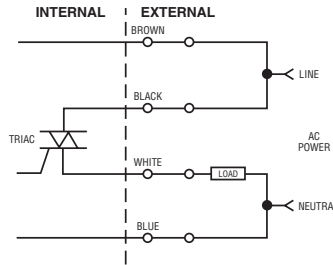
### DC Connector Models



### AC Cable Models

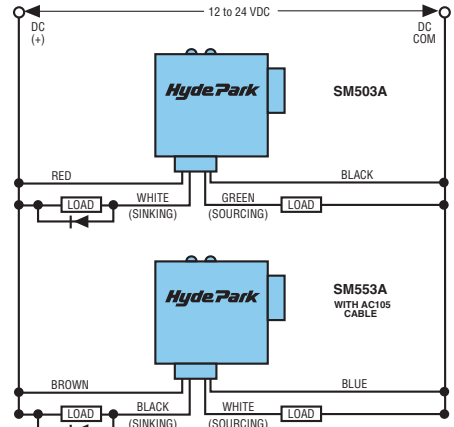


### AC Connector Models

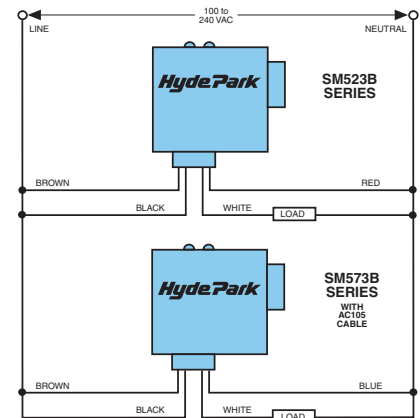


## Sensor Wire Connections

### DC Models

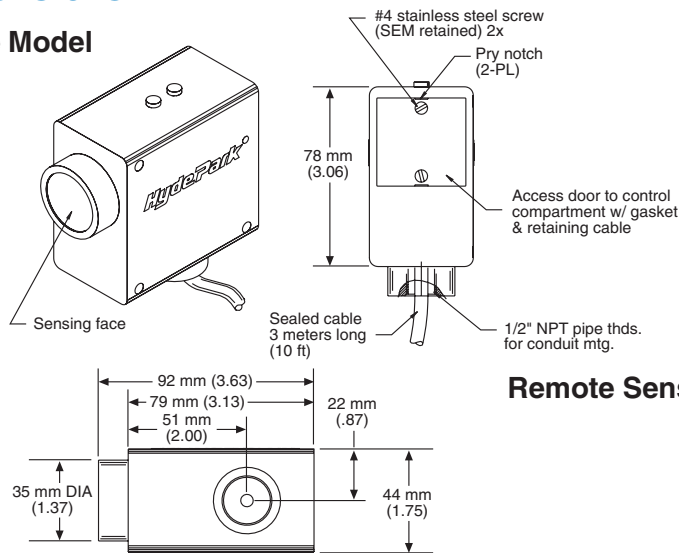


### AC Models

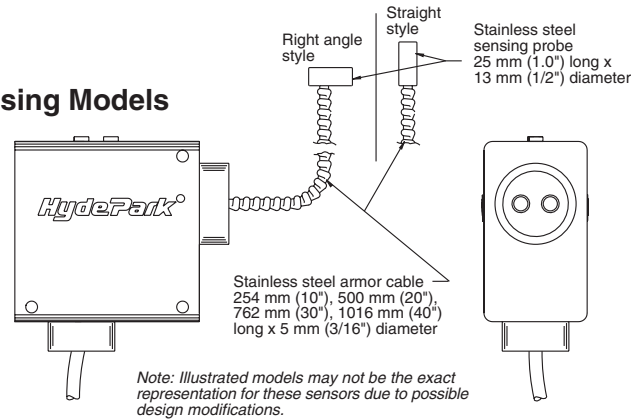


## Dimensions

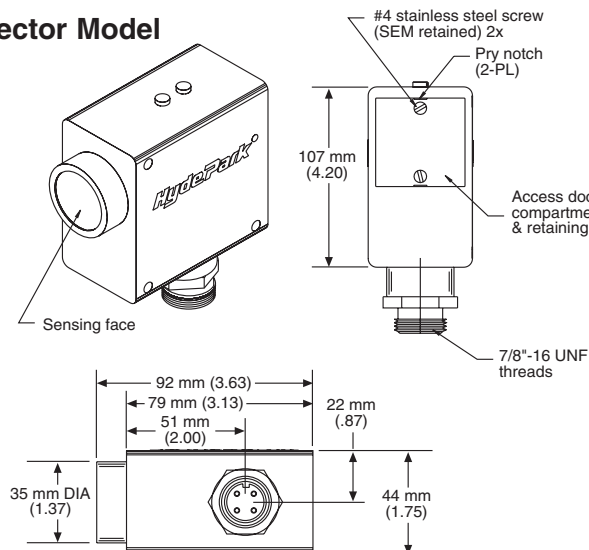
### Cable Model



### Remote Sensing Models

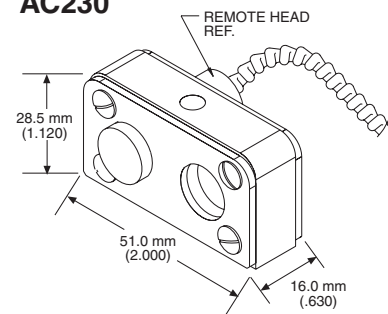


### Connector Model



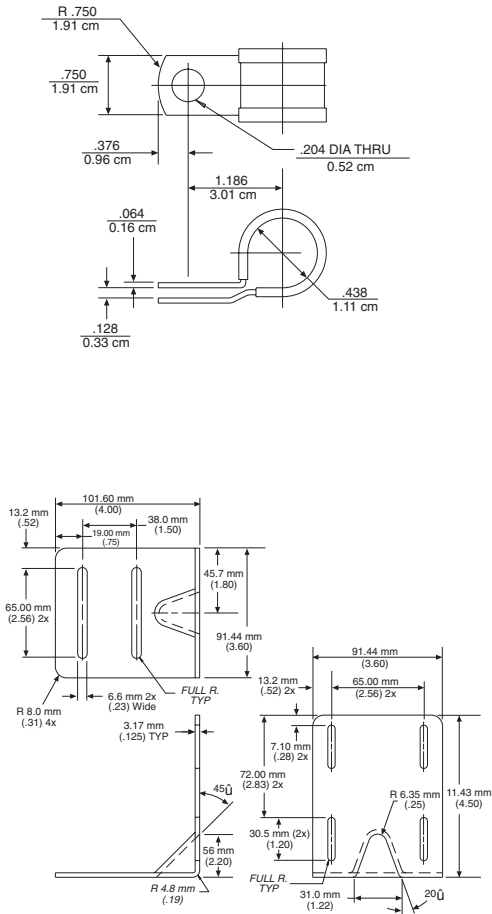
## Mounting Accessories

### AC230



## Mounting Accessories

### AC213



## General Specifications

### Sensing

#### Ranges:

- 51 to 1 m (2 to 39")
- 120 mm to 2 m (4.7 to 79") - DC Models only
- Sonic Frequency: 200 kHz

### Power Requirements

#### DC Models:

- 12 to 24 VDC  $\pm$  10% @ 80 mA, 2 W max., excluding output load (regulated supply)

#### AC Models:

- 100 to 240 VAC, 50/60 Hz, @ 30 mA, 7.5 VA max., excluding load

### Outputs

#### DC Models:

#### NPN Sinking: Switch selectable N.O./N.C.

- Sinking on-state voltage drop: Maximum 0.25 volts @ 60 mA

#### Sinking load current:

- Maximum 100 mA

#### Sinking output voltage:

- Maximum applied 30 VDC

#### PNP Sourcing: Switch selectable N.O./N.C.

#### Sourcing output current:

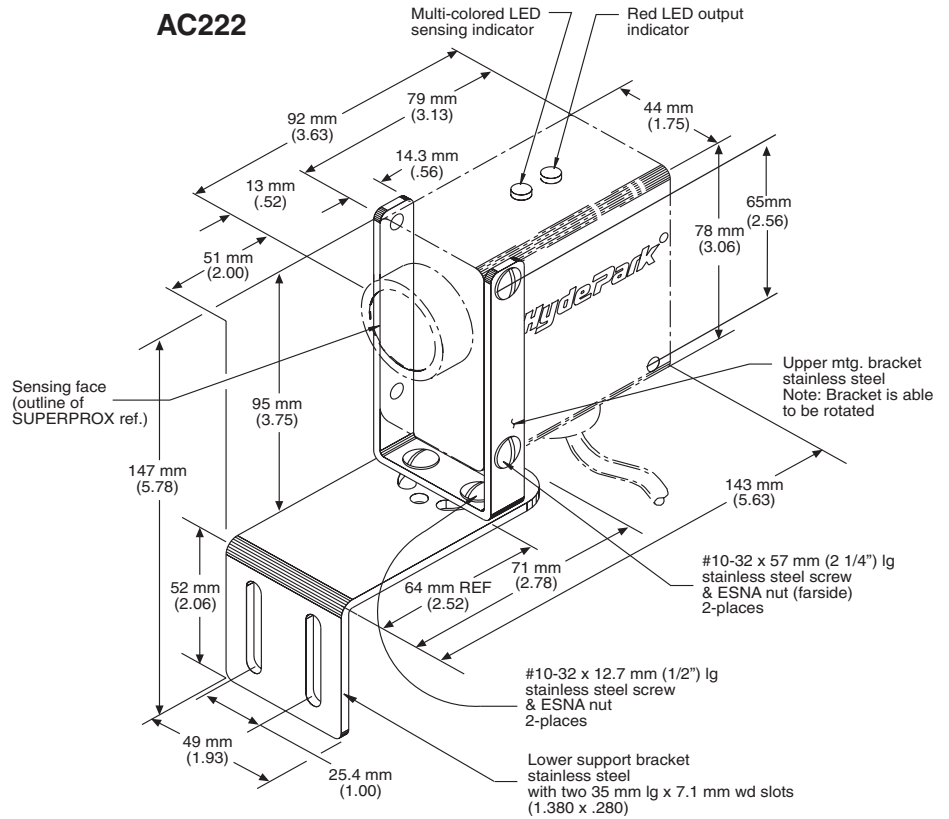
- Maximum 100 mA
- Current limit protected to less than 160 mA

#### AC Models:

#### TRIAC, switch selectable N.O./N.C.

- Maximum continuous load current: 1 Amp
- Maximum applied output voltage: 260 VAC
- Maximum off-state leakage current: less than 50  $\mu$ A (100% PLC/AC input interface compatibility)

### AC222



### Response Time

- "On" 10 ms, "Off" 10 ms to
- "On" 30 ms, "Off" 30 ms, depending upon model

### Indicators

- Multicolored (Amber, Red, Green) LED: Indicates limits setup and operational modes
- Red LED: Visual indicator for sensor output; Illuminated when output is in an active (on) state

### Connections

#### Cable Style Models:

- DC: 24 AWG, PVC jacket, 4-conductor, 3 meters (10') long, standard
- AC: 20 AWG, PVC jacket, 4-conductor, 3 meters (10') long, standard

#### Connector Style Models:

- DC: 4-pin "mini" style
- AC: 4-pin "mini" style

### Protection

- Power Supply: current-limited over-voltage, ESD, reverse polarity, fused on AC model
- Outputs: current-limited over voltage, ESD, over-current, fused TRIAC on AC model

### Environmental

- Operating Temperature Range: 0° to 50°C (32°F to 122°F)
- Storage Temperature Range: -40°C 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. Fluorosilicone transducer face is available to provide resistance to aromatic and petroleum-based hydrocarbons.

### Agency Approvals

- CE Mark: CE conformity is declared to: EN61010-1: 1990 including amend. No.1:1992 EN55011 Group 1 Class A, EN50082-1.

### Declaration of conformity available upon request

AC Models SM520/570 carry the ETL safety label.

### Construction

#### Dimensions (overall)

- 92 mm (3.625") L x 44 mm (1.75") W x 91 mm (3.58") H

#### Housing:

- Case: ULTEM®\* (FDA approved)
- Optional: NORLY® (USDA-Dairy 3A Sanitary Standards compliant)
- Transducer Face: Silicone rubber (FDA approved)
- Optional: Fluorosilicone rubber
- Sensor Cable: PVC jacket
- LED: Polycarbonate

\* ULTEM® and NORLY® are registered trademarks of The General Electric Co.

## Accessories

- Model AC105**, Straight, 7/8-16 mini, 4-conductor, mating connector cable, 4 m (12'), for connector style sensors
- Model AC105-50**, Straight, 7/8-16 mini, 4-conductor, mating connector cable, 15 m (50'), for connector style sensors
- Model AC213**, Stainless and Teflon, remote sensing probe mounting bracket
- Model AC222**, Standard, stainless mounting bracket assembly, slotted for vertical adjustment
- Model AC229**, Stainless, plate-style, right-angle, mounting bracket, with base slotted for forward reverse adjustment and side slotted for sensor adjustment
- Model AC230**, Three-piece, stainless, mounting bracket assembly with O-ring mount for sensor models with remote heads.

See page 7-1 for accessory photos.

# Selection Chart

## SM503 Series Proximity with Delay On/Off Control

Model No.	Power		Connection		Sensing Range			Transducer Style		Materials			Default Window	Special Delay	Special Features	Notes
	100-240 VAC	12-24 VDC	Cable	Connector	2 m (79")	1 m (39")	635mm (25")	Standard	Rt. Angle	Remote Straight	Silicone*	ULTEM®*				
SM503A-000•		■	■				■	■			■	■				
SM503A-000 AA		■	■				■	■			■	■				Remote limit setup
SM503A-025 AA		■	■								■	■		+0.1"/-0.25"		Remote limit setup
SM503A-025 R2		■	■						■(20")		■	■		+0.1"/-0.25"		
SM503A-100•		■	■				■	■			■	■				
SM503A-100 AA		■	■				■	■			■	■				Remote limit setup
SM503A-100 R2		■	■						■(20")		■	■				
SM503A-100 S4		■	■							■(40")	■	■				
SM503A-400		■	■				■	■			■	■				
SM503A-415		■	■				■	■			■	■		±1"		
SM523B-000•	■		■				■	■			■	■				
SM523B-000 R2	■		■						■(20")		■	■				
SM523B-000 R4	■		■						■(40")		■	■				
SM523B-017	■		■				■	■			■	■				250ms incr.
SM523B-049	■		■				■	■			■	■				5ms incr.
SM523B-100•	■		■				■	■			■	■				
SM523B-100 R2	■		■						■(20")		■	■				
SM523B-100 R4	■		■						■(40")		■	■				
SM523B-100 S2	■		■				■	■		■(20")	■	■				
SM523B-100 S3	■		■				■	■		■(30")	■	■				
SM523B-100 S4	■		■				■	■		■(40")	■	■				
SM523B-117	■		■				■	■			■	■				250ms incr.
SM553A-000•		■	■				■	■			■	■				
SM553A-044		■	■				■	■			■	■		±0.1"		
SM553A-091		■	■				■	■			■	■		±0.05"		
SM553A-100•		■	■				■	■			■	■				
SM553A-117		■	■				■	■			■	■				250ms incr.
SM553A-144		■	■				■	■			■	■		±0.1"		
SM553A-400		■	■	■			■	■			■	■				
SM573B-000•	■		■				■	■			■	■				
SM573B-000 R2	■		■						■(20")		■	■				
SM573B-000 S3	■		■				■	■		■(30")	■	■				
SM573B-000 S4	■		■				■	■		■(40")	■	■				
SM573B-017	■		■				■	■			■	■				250ms incr.
SM573B-044	■		■				■	■			■	■		±0.1"		
SM573B-091	■		■				■	■			■	■				5 ms incr.
SM573B-100•	■		■				■	■			■	■				
SM573B-115	■		■				■	■			■	■		±1"		
SM573B-144	■		■				■	■			■	■		±0.1"		

• = Most commonly stocked sensors

\* = See definition in *Sensing Terms*.

Fluorsilicone available at additional cost.

All possible sensor configurations are not listed here.