

Sensors

Proximity, Photoelectric, and Ultrasonic Sensors, Limit Switches, Pressure Sensors, Machine Safety, Encoders, RFID, and Machine Cabling



4—OsiSense® SM, VM and XX Ultrasonic sensors

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OsiSense® SM, VM and XX Ultrasonic sensors

Applications
 Detection of any object without physical contact, irrespective of material (metal, plastic, wood, cardboard, etc.), nature (solid, liquid, powder, etc.), color, degree of transparency, etc.

Dimensions (mm)

Sensors with solid-state digital output Proximity Mode

Cylindrical type			
Ø 12	Ø 18	Ø 30	



4

Maximum Sensing distance S _n	102 mm (4.0 in.)	254 mm (10.0 in.)	508 mm (20.0 in.)	1 m (3.28 ft)
Operating zone mm (in.)	6.4–102 (0.25–4.0)	19–254 (0.75–10.0)	50.8–508 (2.0–20.0)	100–1000 (3.94–39.37)
Detection window adjustment	Fixed	Fixed, optional "AA" model for teachable	Adjustable using teach mode and pushbutton accessory (XXZPB100)	Adjustable using teach mode and pushbutton accessory (XXZPB100)
Type of output	PNP/NPN, PNP or NPN	PNP/NPN, PNP or NPN	PNP or NPN	PNP/NPN
Degree of protection	IP 67	IP 67	IP 67	IP 67
Function	NO or NC	NO or NC	NO or NC	NO or NC
Connection	Cable, M8, or M12	Cable or M12	Cable or M12	Cable or M12
Power supply <i>All models have protection against reverse polarity</i>	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc
Sensor type	SM3●0A●	SM6●0A● SM6●0A●S	VM18●	XX6V3A1●
Pages	16	16	16	16

	Flat format			
Ø 30	7.6 x 19 x 33	16 x 30 x 74	18 x 33 x 60 + Ø 18	80 x 80



1 m (3.28 ft)	2 m (6.56 ft)	8 m (26.25 ft)	100 mm (3.94 in.)	250 mm (9.84 in.)	508 mm (20.0 in.)	1 m (3.28 ft)
50.8–1000 (2.0–39.37)	120–2000 (4.7–78.74)	305–8000 (12.0–314.96)	6.4–102 (0.25–4.02)	19–254 (0.75–10)	50.8–508 (2.0–20.0)	100–1000 (3.94–39.37)
Adjustable using teach mode with built-in pushbutton		Adjustable using teach mode with built-in pushbutton	Fixed	Fixed, optional "AA" model for teachable	Adjustable using teach mode and pushbutton accessory (XXZPB100)	Adjustable using teach mode and pushbutton accessory (XXZPB100)
PNP/NPN or NPN or PNP	PNP/NPN or NPN or PNP	PNP/NPN or NPN or PNP	PNP/NPN or NPN or PNP	NPN/PNP	NPN or PNP	NPN or PNP
IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
NO, NC or NO + NC	NO, NC or NO + NC	NO, NC or NO + NC	NO or NC	NO or NC	NO or NC	NO or NC
Cable or M12	Cable or M12	Cable or M12	Cable, M8, or M12	Cable or M12	Cable or M12	M12
12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc
SM9•0A1• SM9•0A1•S	SM9•0A4• SM9•0A4•S	SM9•0A8•	SM3•0A•FP	SM6•0A•FP	VM1•	XX8D•
16		16	21	21	21	21

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OsiSense® SM, VM and XX Ultrasonic sensors

Applications
 Detection of any object without physical contact, irrespective of: material (metal, plastic, wood, cardboard, etc.), nature (solid, liquid, powder, etc.), color, degree of transparency, etc.

Dimensions (mm)

Sensors with solid-state analog output

Analog Mode

Cylindrical type

Ø 18

Ø 30



Maximum Sensing distance Sn

Operating zone, mm (in.)

Detection window adjustment

Type of output

Degree of protection

Connection

Power supply
all models have protection against reverse polarity

Sensor type

Pages

254 mm (10 in.)

508 mm (20.0 in.)

1 m (3.28 ft)

1 m (3.28 ft)

19–254 (0.75–10.0 in.)

50.8–508 (2.0–20.0)

100–1000 (3.94–39.37)

50.8–1000 (2.0–39.4)

Fixed, optional "AA" model for teachable

Adjustable using teach mode and pushbutton accessory (XXZPB100)

Adjustable using teach mode and pushbutton accessory (XXZPB100)

Adjustable using teach mode with built-in pushbutton

0–5V or 0–10 V

0–5 V, 0–10 V or 4–20 mA

0–5 V, 0–10 V, 0–20 mA, or 4–20 mA

0–5 V, 0–10 V, 0–20 mA, or 4–20 mA

IP 67

IP 67

IP 67

IP 67

Cable or M12

Cable or M12

M12

Cable or M12

15–24 Vdc

15–24 Vdc

15–24 Vdc

15–24 V

SM6●6A●
SM6●6A●S

VM18V●
or VM18C●

XX9V3A1●

SM9●6A1●
SM9●6A1●S

24

24

24

24

OsiSense® SM, VM and XX Ultrasonic sensors

Applications
 Detection of any object without physical contact, irrespective of material (metal, plastic, wood, cardboard, etc.), nature (solid, liquid, powder, etc.), color, degree of transparency, etc.

Dimensions (mm)

Sensors with solid-state digital output

Dual-Level Mode

Cylindrical type

Ø 12 Ø 18 Ø 30



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Maximum Sensing distance Sn	102 mm (4.0 in.)	254 mm (10.0 in.)	508 mm (20.0 in.)	1 m (3.28 ft)	1 m (3.28 ft)
Operating zone mm (in.)	6.4–102 (0.25–4.02)	19–254 (0.75–10)	50.8–508 (2.0–20.0)	100–1000 (3.94–39.37)	50.8–1000 (2.0–39.37)
Detection window adjustment	Fixed	Fixed, optional "AA" model for teachable	Adjustable using teach mode and pushbutton accessory (XXZPB100)	Adjustable using teach mode and pushbutton accessory (XXZPB100)	Adjustable using teach mode with built-in pushbutton
Type of output	PNP/NPN, PNP or NPN	PNP/NPN, PNP or NPN	PNP or NPN	PNP or NPN	PNP/NPN or NPN or PNP
Degree of protection	IP 67	IP 67	IP 67	IP 67	IP 67
Function	Pump-in latch or pump-out latch	Pump-in latch, pump-out latch, dual alarm NO, or dual alarm NC	Pump-in latch or pump-out latch	Pump-in latch or pump-out latch	Pump-in latch, pump-out latch, dual setpoint, dual alarm, pump-in latch with alarm, pump-out latch with alarm, pump-in latch with setpoint, or pumpout latch with setpoint Tri-setpoint , quad level
Connection	Cable, M8, or M12	Cable or M12	Cable or M12	Cable or M12	Cable or M12
Power supply <i>All models have protection against reverse polarity</i>	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc
Sensor type	SM3●2A●	SM6●2A● SM6●2A●S	VM18●	XX2V3A1●	SM9●2A1● SM9●2A1●S
Pages	28	28	28	28	28

	Flat format			
Ø 30	7.6 x 19 x 33	16 x 30 x 74	18 x 33 x 60 + Ø 18	80 x 80



2 m (6.56 ft)	8 m (26.25 ft)	100 mm (3.94 in.)	250 mm (9.84 in.)	508 mm (20.0 in.)	1 m (3.28 ft)
120–2000 (4.7–78.74)	305–8000 (12.0–314.96)	6.4–102 (0.25–4.02)	19–254 (0.75–10)	50.8–508 (2.0–20.0)	100–1000 (3.94–39.37)
Adjustable using teach mode with built-in pushbutton	Adjustable using teach mode with built-in pushbutton	Fixed	Fixed, optional "AA" model for teachable	Adjustable using teach mode and pushbutton accessory (XXZPB100)	Adjustable using teach mode and pushbutton accessory (XXZPB100)
PNP/NPN or NPN or PNP	PNP/NPN or NPN or PNP	PNP/NPN or NPN or PNP	NPN or PNP	NPN or PNP	NPN or PNP
IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
Pump-in latch, pump-out latch, dual setpoint, dual alarm, pump-in latch with alarm, pump-out latch with alarm, pump-in latch with setpoint, or pumpout latch with setpoint Tri-setpoint , quad level	Pump-in latch, pump-out latch, dual setpoint, dual alarm, pump-in latch with alarm, pump-out latch with alarm, pump-in latch with setpoint, or pumpout latch with setpoint Tri-setpoint , quad level	Pump-in latch or pump-out latch	Pump-in latch, pump-out latch, dual alarm NO, or dual alarm NC	Pump-in latch or pump-out latch	Pump-in latch or pump-out latch
Cable or M12	Cable or M12	Cable, M8, or M12	Cable, M8 or M12	Cable or M12	M12
12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc	12–24 Vdc
SM9●2A4● SM9●2A4●S	SM9●2A8●	SM3●2A●FP	SM6●2A●FP	VM1●	XX2D●
28	28	28	28	28	28

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OsiSense® SM, VM and XX Ultrasonic sensors

Applications
 Detection of any object without physical contact, irrespective of: material (metal, plastic, wood, cardboard, etc.), nature (solid, liquid, powder, etc.), color, degree of transparency, etc.

Dimensions (mm)

Sensors with solid-state digital output

Thru-Beam Mode

Cylindrical type

Ø 12	Ø 18	Ø 31.8 mm (1.25 in.)
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4

Maximum Sensing distance Sn	203 mm (8.0 in.)	1270 mm (50.0 in.)	1829 mm (72.0 in.)
Type of output	PNP and NPN	PNP and NPN	PNP or NPN
Degree of protection	IP 67	IP 67	IP 67
Function	NO or NC	NO or NC	NO or NC
Connection	Cable, M8, or M12	Cable or M12	Cable or mini
Power supply <i>All models have protection against reverse polarity</i>	12–24 Vdc	12–24 Vdc	12–24 Vdc
Sensor type	SM4●0A●	SM8●0A● SM8●0A●S	SM1●
Pages	33	33	See catalog 9006CT0703 or www.sesensors.com

Flat format		
7.6 x 19 x 33	16 x 30 x 74	



4

	203 mm (8.0 in.)	1270 mm (50.0 in.)
	NPN and PNP	NPN and PNP
	IP 67	IP 67
	NO or NC	NO or NC
	Cable, M8, or M12	Cable or M12
	12–24 Vdc	12–24 Vdc
	SM4•0A•FP	SM8•0A•FP
	33	33

OsiSense® SM, VM and XX Ultrasonic sensors

Quality, standards and certifications

Quality control

The OsiSense® SM, VM and XX ultrasonic sensors are subjected to special testing in order to ensure their reliability in the most arduous industrial environments.

■ Qualification

A **qualification procedure** on the specifications of OsiSense® SM, VM and XX ultrasonic sensors is carried out in our laboratories.

■ Production

The electrical specifications, sensing distances at the ambient temperature and operating temperatures are verified.

Sensors are randomly selected during the course of production and subjected to **monitoring tests** on all qualified specifications.

■ Customer returns

Products that are returned to us and claimed inoperative are subjected to systematic analysis and may result in corrective actions or continuous improvement

Conformity to standards

The OsiSense® SM, VM and XX ultrasonic sensors conform to IEC 60947-5-2.

Resistance to chemicals in the environment

End users should verify that the application does not subject sensors to chemicals that may damage them (refer to the specifications pages for the various sensors)

The materials selected (see product specifications) provide satisfactory compatibility in most industrial environments (for further information, consult the Sensor Competency Center)

Because of the materials used, OsiSense® SM, VM and XX ultrasonic sensors are very resistant to:

■ chemical agents:

salts, aliphatic and aromatic oils
petroleum, diluted bases and acids

Depending on their nature and concentration, tests should be carried out beforehand for the following chemical agents: alcohols, ketones and phenols

■ food industry products:

vegetable oils, animal fats
fruit juices, milk proteins, etc.

Resistance to the environment

■ IP 65: protection against water jets.

Tested in accordance with IEC 60529: the device is subjected to water sprayed from a Ø 6.3 mm nozzle, at a flow rate of 12.5 liters/min for 3 min at a distance of 3 m. No deterioration in either operating or insulation specifications is permitted.

■ IP 67: protection against the effects of immersion.

Tested in accordance with IEC 60529: the sensor is immersed for 30 minutes in 1 m of water. No deterioration in either operating or insulation specifications is permitted.

OsiSense® SM, VM and XX Ultrasonic sensors

Recommendations

The ultrasonic sensors are designed for use in standard industrial applications involving presence detection. Since these sensors do not incorporate a redundant electrical circuit, they are not suitable for use in safety applications. For safety applications, refer to our "Safety solutions using Preventa" the *Machine Safety Products* catalog.

Principle of ultrasonic detection



Presentation

Ultrasonic sensors enable detection, without contact, of any object irrespective of its:

- material (metal, plastic, wood, cardboard, etc.)
- nature (solid, liquid, powder, etc.)
- color
- degree of transparency

They are used in industrial applications for detecting, for example:

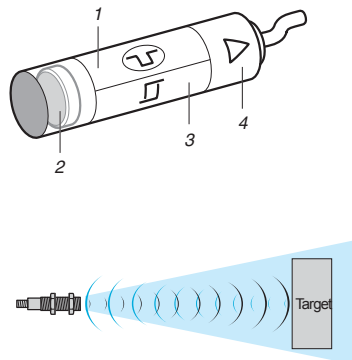
- the position of machine parts
- the presence of the windscreen during automobile assembly
- the flow of objects on a conveyor system: glass bottles, cardboard packages, cakes, etc.,
- the level
 - of different color paints in pots
 - of plastic pellets in injection moulding machine feeders

The ultrasonic sensors are simple to install due to their integral connector and availability of cabling and mounting accessories.

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Operating principle

The principle of ultrasonic detection is based on measuring the time taken between transmission of an ultrasonic wave (pressure wave) and reception of its echo (return of transmitted wave).



OsiSense® ultrasonic sensors comprise:

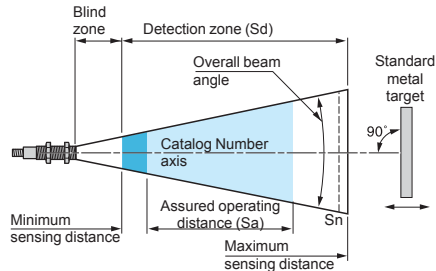
- 1 high voltage generator
- 2 piezoelectric transducer (transmitter and receiver)
- 3 signal processing stage
- 4 output stage

Excited by the high voltage generator **1**, the transducer (transmitter-receiver) **2** generates a pulsed ultrasonic wave (75 to 500 kHz depending on the product) which travels through the ambient air at the speed of sound. When the wave strikes an object, it reflects (echo) and travels back towards the transducer. A micro controller **3** analyzes the signal received and measures the time interval between the transmitted signal and the echo. By comparison with the preset or taught times, it determines and controls the output states **4**. The output stage **4** controls a solid-state switch (PNP or NPN transistor) corresponding to a NO contact (detection of object).

Advantages of ultrasonic detection

- No physical contact with the object to be detected, allowing detection of fragile or freshly painted objects, etc., with no wear or damage to the object
- Detection of any material, irrespective of color, at the same distance, without adjustment or correction factor.
- Teach mode function, by simply pressing a button, for defining the effective detection zone. Teaching of the minimum and maximum sensing distances (very precise foreground and background suppression, ± 6 mm).
- Very good resistance to industrial environments (robust products entirely encapsulated in resin).
- Solid-state units: no moving parts in the sensor, therefore, service life independent of the number of operating cycles.
- Various types of outputs to suit requirements:
 - digital output for level control or detection of any type of object
 - analog output for controlling systems that require a signal that is linear and proportional to the distance at which the object is detected.

Terminology



Definitions

The terms listed below are defined by the IEC 60947-5-2 standard:

- **Nominal sensing distance (Sn)**
Conventional value for indicating the sensing distance. It does not take into account manufacturing tolerances nor variations caused by external conditions such as voltage and temperature.
- **Detection zone (Sd)**
Zone in which the sensor is sensitive to objects.
- **Minimum sensing distance**
Lower limit of the specified detection zone.
- **Maximum sensing distance**
Upper limit of the specified detection zone.
- **Assured operating distance (Sa)**
This corresponds to the operating zone of the sensor (activation of outputs), and is included in the detection zone.
Its limits are fixed:
 - at the factory for fixed sensing distance sensors,
 - when setup within the application for sensors with teach mode.
- **Blind zone**
Zone between the sensing face of the sensor and the minimum sensing distance in which no object can be reliably detected.
Avoid any passing of objects in this blind zone during operation of the sensor. This could lead to instability of the output states.
- **Differential travel**
The differential travel (H) or hysteresis is the distance between the pick-up point as the standard metal target moves towards the sensor and the drop-out point as it moves away from the sensor.
- **Repeat accuracy**
The repeat accuracy (R) is the precision of reproduction between two successive measurements of the sensing distance, made in identical conditions.
- **Overall beam angle**
Fixed angle around the reference axis of an ultrasonic proximity sensor.
- **Standard metal target**
The IEC 60947-5-2 standard defines the standard target as a square metal plate, 1 mm (0.04 in.) thick with rolled finish, placed perpendicularly to the reference axis.
Its side dimension depends on the detection zone:

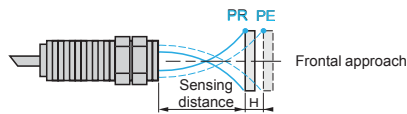
Detection zone (mm)	Size of target (mm)
< 300	10 x 10
300 < d < 800	20 x 20
> 800	100 x 100

- **Voltage drop (Ud)**
The voltage drop (Ud) corresponds to the voltage at the terminals of the sensor when in the closed state (value measured at the nominal current of the sensor).

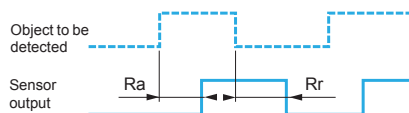
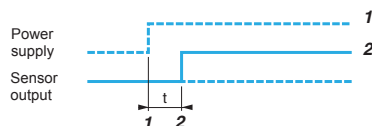
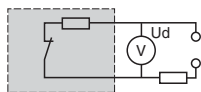
- **First-up delay**
Time required to ensure operation of the sensor's output signal following power-up.
 - 1 Power-up
 - 2 Output signal state (0 or 1)

- **Response time**
Response time (Ra): time taken between the instant the object to be detected enters the active zone and the changing of the output signal state. This time limits the passing speed of the target in relation to its dimensions.
Recovery time (Rr): time taken between the object being detected leaving the active zone and the changing of the output signal state. This time limits the interval between two objects.

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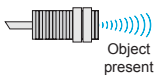




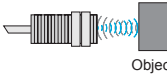






PR = drop-out point
PE = pick-up point



OsiSense[®] SM, VM and XX Ultrasonic sensors

Digital outputs

	NO output	NC output
 <p>Object present</p>	<p>LED </p> <p>Output state </p>	<p>LED </p> <p>Output state </p>
 <p>Object present</p>	<p>LED </p> <p>Output state </p>	<p>LED </p> <p>Output state </p>

LED indicators

The majority of OsiSense[®] ultrasonic sensors incorporate light-emitting diode output state indicators.

- Ø 12 sensor, sensitivity 50 mm and 100 mm (1.97 in. and 3.94 in.)
 - Green LED (power on)
 - Amber LED (object present)
- Ø 18 sensor, sensitivity 500 mm (19.68 in.)
 - Amber LED (object present) and green LED (object not present) + user assistance when adjusting the detection zone.
- Ø 30 sensor, sensitivity 1 to 8 m (3.28 to 26.25 ft)
 - Multicolor LED for assisting the user when adjusting the detection zone
 - Amber LED (state of the black wire control output)
- Ø 30 sensor, sensitivity 1 to 8 m (3.28 to 26.25 ft) with analog output
 - Multicolor LED for assisting the user when adjusting the detection distance
 - Amber LED (object present, with luminosity increasing as output signal increases).
- Flat profile format sensor
 - SM3●: Dual color amber (object present) or green (power on) LED
 - VM●: Dual color amber (object present) or green (power on) LED + user assistance when adjusting the detection zone.
 - SM6●: Amber LED (object present); green LED (power on)



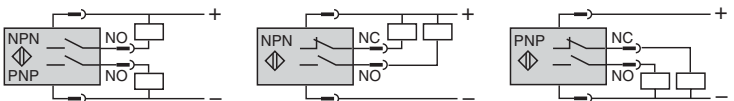
Sensors with digital switching

Contact logic output

- Normally open (NO)
 - Corresponds to a sensor whose output changes to the closed state when an object is present in the operating zone.
- Normally closed (NC)
 - Corresponds to a sensor whose output changes to the closed state when an object is present in the operating zone.

4-wire technique

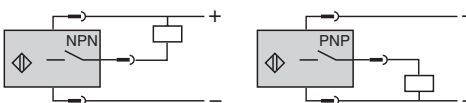
- NO output/PNP and NPN
- NO + NC output/NPN
- NO + NC output/PNP



These sensors comprise two wires for the supply and one wire for each output signal

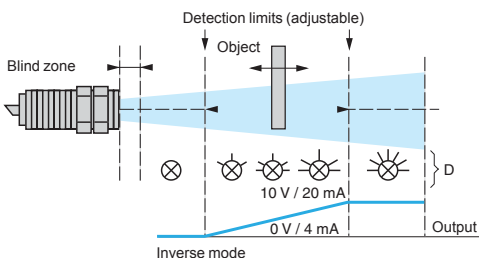
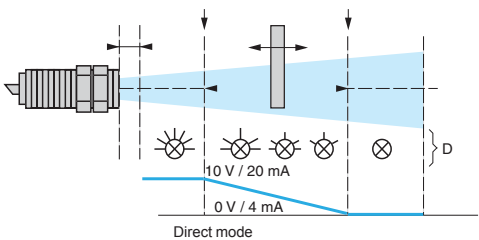
3-wire technique

- NO output/NPN
- NO output/PNP



These sensors comprise two wires for the supply and one wire for the output signal

- PNP type:** switching the positive side to the load
- NPN type:** switching the negative side to the load



Sensors with analog output

Operation

The specifications feature of these sensors is the output which delivers a signal (either current or voltage) that is linear and proportional to the distance to the object being detected. Within the detection limits, which are adjustable using teach mode, the value of the output signal increases (inverse slope) or decreases (direct slope) as the object moves away. When an object is detected, an LED indicator (D) illuminates and its luminosity increases in relation to the value of the output signal. The slope of the signal can simply be changed using teach button (auto slope).

Advantages

- Visual information available relating to the sensor/object distance
- Protection against reverse polarity
- Protection against overloads and short-circuits
- No residual current, low voltage drop

OsiSense® SM, VM and XX Ultrasonic sensors

Power supply

DC source

Check that the voltage limits of the sensor and the acceptable level of ripple, are compatible with the supply used.

AC source (comprising transformer, rectifier, smoothing capacitor)

The supply voltage must be within the operating limits specified for the sensor.

Where the voltage is derived from a single phase AC supply, the voltage must be rectified and smoothed to ensure that:

- the peak voltage of the DC supply is lower than the maximum voltage rating of the sensor.

$$\text{Peak voltage} = \text{nominal voltage} \times \sqrt{2}$$

- the minimum voltage of the DC supply is greater than the minimum voltage rating of the sensor, given that:

$$\Delta V = (I \times t) / C$$

$$\Delta V = \text{maximum ripple: } 10\% (V)$$

$$I = \text{anticipated load current (mA)}$$

$$t = \text{period of 1 cycle (10 ms full-wave rectified for a 50 Hz supply frequency)}$$

$$C = \text{capacitance } (\mu F)$$

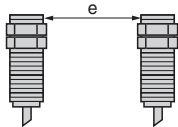
As a general rule, use a transformer with a lower secondary voltage (U_e) than the required DC voltage (U)

Example:

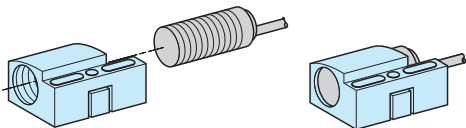
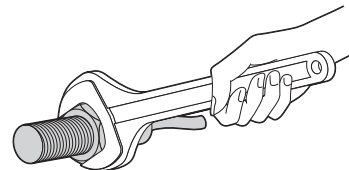
$\sim 18 V$ to obtain $\approx 24 V$

4

Setup precautions



Mounting side by side
 $e \geq 2x$ width of detection curve



Mounting

Mounting distance between ultrasonic sensors

If two standard sensors are mounted too close to each other, the wave transmitted by one sensor is likely to interfere with the other and result in erratic operation.

In order to avoid this, it is necessary to adhere to the minimum distances between sensors.

Maximum tightening torque, N•m (in.lb)

Cylindrical sensors	Diameter mm	Tightening torque	Flat sensors	Screw	Tightening torque
SM6●	Ø 12	0.7 (6.20)	SM3●	M3	0.7 (6.20)
VM18●	Ø 18	1 (8.85)	SM6●●	M4	1 (8.85)
SM9●0●	Ø 30	1.35 (11.95)	XX●V●	M3	0.7 (6.20)
XX●V3●	–	1.35 (11.95)	VM1●	Ø 18	1 (8.85)

Interchangeability

Using the indexed **mounting clamp**, the assembly is similar to a block type sensor.

Cabling

Electrical connection

- Connect the sensor before switching on the supply

- Length of cable (discrete sensors)

No limitation up to 200 m or up to a line capacitance of $< 0.1 \mu F$

It is, however, advisable to take into account the voltage drop on the line

- Separation of control and power cables

The sensors are immune to electrical interference encountered in normal industrial conditions.

Where extreme conditions of electrical noise could occur (large motors, spot welders, etc.), it is advisable to protect against transients in the normal way:

- suppress interference at source
- separate power and control wiring from each other
- smooth the supply
- limit the length of cable
- Voltage (analog) sensors require shielded cable

Setup precautions (continued)

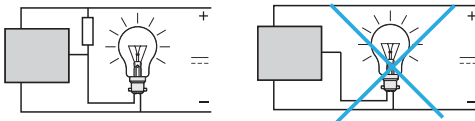
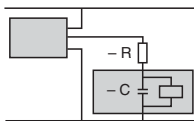
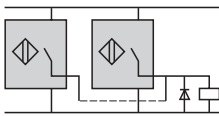
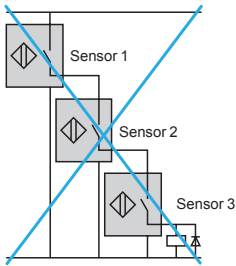


Figure 1

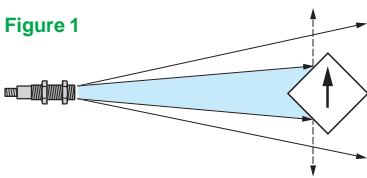


Figure 2

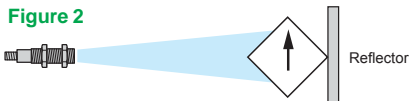


Figure 3

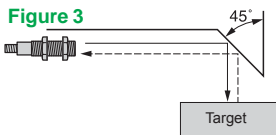
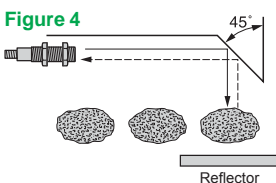


Figure 4



Connection in series

This connection method is not recommended.

- Correct operation of the sensors cannot be assured and, if this method is used, tests must be made before installation. The following points should be taken into account:
 - Sensor 1 carries the load current in addition to the no-load current consumption values of the other sensors connected in series. For certain models, this connection method is not possible unless a current limiting resistor is used.
 - When in the closed state, each sensor will produce a voltage drop and, therefore, the load voltage should be selected accordingly.
 - As sensor 1 closes, sensor 2 will not operate until a certain time "T" has elapsed (corresponding to the first-up delay) and likewise for the following sensors in the sequence.
 - "Flywheel" diodes should be used when the load being switched is inductive.

Sensors and units in series with an external mechanical contact

- The following points should be taken into account:
 - When the mechanical contact is open, the sensor is not supplied.
 - When the contact closes, the sensor will not operate until a certain time "T" has elapsed (corresponding to the first-up delay).

Connection in parallel

- No specific restrictions. The use of "flywheel" diodes is recommended when an inductive load (relay) is being switched.

Capacitive load (C > 0.1 mF)

- At switch-on, it is necessary to limit (by resistor) the charging current of the capacitive load C. The voltage drop in the sensor can also be taken into account by subtracting it from the supply voltage for calculation of R.

$$R = \frac{U \text{ (supply)}}{I \text{ max. (sensor)}}$$

Load containing an incandescent lamp

- If the load comprises an incandescent lamp, the cold state resistance can be one tenth that of the lower than the hot state resistance. This can cause very high current levels on switching. Fit a pre-heat resistance in parallel with the sensor.

$$R = \frac{U^2}{P} \times 10 \text{ where } U = \text{supply voltage and } P = \text{lamp power}$$

Detection

- Influencing factors
 - The ultrasonic sensors are particularly suited to the detection of a hard object with a flat surface perpendicular to the detection axis.
 - However, the correct operation of the ultrasonic sensor can be disrupted by:
 - Air currents, which can accelerate or divert the acoustic wave transmitted by the sensor (ejection of part by air jet), high temperature gradients within the detection zone:
 - An object emitting considerable heat can create zones of varying temperature that will modify the propagation time of the wave and thus prevent reliable operation,
 - Sound insulators: sound absorbing materials (cotton, fabrics, rubber, etc.), the angle between the face of the object to be detected and the reference axis of the sensor: when the angle is offset from 90°, the wave is no longer reflected back along the sensor axis and the operating distance is reduced. The greater the distance between the sensor and the target, the greater the effect. Detection is not possible when the angle exceeds ± 10°.
 - The shape of the object to be detected: similar to the example above, an excessively angular object can be difficult to detect (Figure 1).
- Detection system
 - Direct reflection mode
 - In this mode, it is the object itself that reflects the ultrasonic wave back to the sensor which, in turn, switches its output. It is the most widely used and the most simple mode.
 - Retroreflective or beam break mode
 - The sensor is in a permanently detecting state on a fixed background of the machine and when the object to be detected breaks the acoustic beam the output switches state (Figure 2).
 - This mode is particularly recommended in cases where the shape of the object changes (irregular, angular, non-perpendicular) and also for objects that absorb sound (see above).

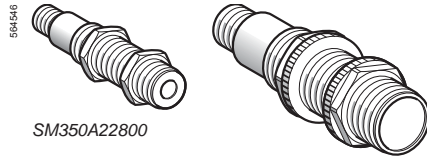
Caution: in retroreflective mode, the NO function opens when an object is present and the NC function closes when an object is present.

Using a "Bank Shot"

In cases where space is restricted or when the sensor needs to be isolated from excessive heat or extremely corrosive materials, a reflector (Figure 3 and 4), angled at 45°, can be used. This system can be used for both the direct reflection and retroreflective modes. This reflector can be a flat part of the machine or a separate element.

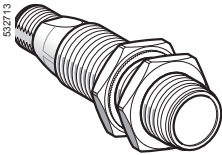
OsiSense® SM, VM and XX Ultrasonic sensors

Cylindrical plastic case,
M12 x 1, M18 x 1, M30 x 1.5
DC supply, solid-state output

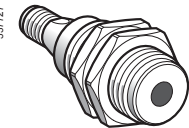


SM350A22800

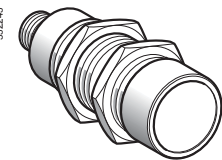
SM650A68000



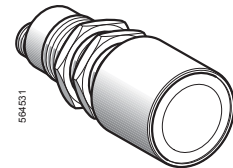
VM18PNOQ



XX6V3A1CM12



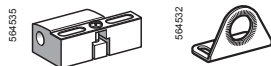
SM950A130000



SM950A820000

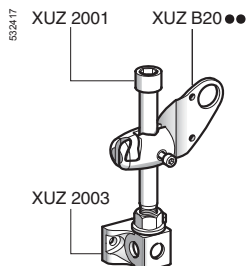


XXZPB100



XSZB11

XUZA118



XUZ 2003

3D mounting kit example

Fixed sensing distance sensors

Sensors	Sensing distance (Sn) mm (in.)	Function	Connection	Output	Catalog Number	Weight kg (lb)
Ø 12	50.8 (2.0)	NO (1)	Pre-cabled	PNP/NPN	SM300A22800	0.011 (0.02)
	50.8 (2.0)	NO (1)	M8 connector	PNP/NPN	SM350A22800	0.011 (0.02)
	101.6 (4.0)	NO (1)	M8 connector	PNP/NPN	SM350A46000	0.011 (0.02)
Ø 18	50.8 (2.0)	NO (1)	M12 connector	PNP/NPN	SM380A22800	0.011 (0.02)
	50.8 (2.0)	NO (1) (2)		PNP/NPN	SM60A21600 (4)	0.033 (0.07)
	101.6 (4.0)	NO (1) (2)		PNP/NPN	SM60A44800 (4)	0.033 (0.07)
	152.0 (6.0)	NO (1) (2)		PNP/NPN	SM60A64800 (4)	0.033 (0.4)

Adjustable sensing distance sensors

Ø 18	508.0 (20.0)	NO	Pre-cabled	PNP	VM18PNO	0.033 (0.07)
	508.0 (20.0)	NO	Pre-cabled	NPN	VM18NNO	0.033 (0.07)
	508.0 (20.0)	NO	M12 connector	PNP	VM18PNOQ	0.033 (0.07)
	508.0 (20.0)	NO	M12 connector	NPN	VM18NNOQ	0.033 (0.07)
	508.0 (20.0)	NC	Pre-cabled	PNP	VM18PNC	0.033 (0.07)
	508.0 (20.0)	NC	Pre-cabled	NPN	VM18NNC	0.033 (0.07)
	508.0 (20.0)	NC	M12 connector	PNP	VM18PNCQ	0.033 (0.07)
	508.0 (20.0)	NC	M12 connector	NPN	VM18NNCQ	0.033 (0.07)
Ø 30	1 m (39.4 in.)	NO	M12 connector	PNP	XX6V3A1PAM12	0.09 (0.2)
	1 m (39.4 in.)	NO	M12 connector	NPN	XX6V3A1NAM12	0.09 (0.2)
	1 m (39.4 in.)	NC	M12 connector	PNP	XX6V3A1PBM12	0.09 (0.2)
	1 m (39.4 in.)	NC	M12 connector	NPN	XX6V3A1NBM12	0.09 (0.2)
	1 m (39.4 in.)	NO (2)		PNP/NPN	SM90A100000 (4)	0.09 (0.2)
	1 m (39.4 in.)	NO + NC (2)		PNP	SM90A130000 (4)	0.09 (0.2)
	1 m (39.4 in.)	NO + NC (2)		NPN	SM90A120000 (4)	0.09 (0.2)
	2 m (78.74 in.)	NO (2)		PNP/NPN	SM90A400000 (4)	0.09 (0.2)
	2 m (78.74 in.)	NO + NC (2)		NPN	SM90A420000 (4)	0.09 (0.2)
	8 m (26.25 ft)	NO (2)		PNP/NPN	SM90A800000	0.09 (0.2)

Accessories

Teach pushbutton

Teach pushbutton	For use with sensors	Catalog Number	Weight kg (lb)
	VM1 and XX6V3A	XXZPB100	0.035 (0.08)

Selection of detection window
Input: M12 female connector
Output: M12 male connector

Cabling accessories

Pre-wired connectors	For use with sensor	Type	Length m	Catalog Number	Weight kg (lb)
M8, 4-pin	Ø 12	Straight	2	XZCP00941L2 (3)	0.080 (0.18)
		Elbowed	2	XZCP1041L2 (3)	0.080 (0.18)
M12	Ø 18, Ø 30	Straight	2	XZCP1141L2 (3)	0.090 (0.20)
		Elbowed	2	XZCP1241L2 (3)	0.090 (0.20)

Mounting accessories

Description	For use with sensor	Catalog Number	Weight kg (lb)	
Mounting clamps	Ø 12	XSZB112	0.006 (0.01)	
	Ø 18	XSZB118	0.010 (0.02)	
90° mounting bracket	Ø 12	XXZ12	0.025 (0.06)	
	Ø 18	XUZA118	0.038 (0.08)	
	Ø 30	XXZ30	0.115 (0.25)	
3D mounting kit (4)	M12 rod	Ø 12, Ø 18 and Ø 30	XUZ2001	0.050 (0.11)
	Support for M12 rod	Ø 12, Ø 18 and Ø 30	XUZ2003	0.160 (0.35)
	Ball-joint mounted	Ø 12	XUZB2012	0.175 (0.39)
	mounting bracket	Ø 18	XUZB2003	0.175 (0.39)
		Ø 30	XUZB2030	0.160 (0.35)

(1) For normally closed (NC) function, change last two digits of catalog number from "00" to "10".

(2) Replace "•" with "0" for pre-cabled version, or with "5" for M12 connector version.

(3) Replace "L2" with "L5" for 5 m "L10" for 10 m cable, or M12 for M12 connector.

(4) Add "S" to the end of the catalog number for stainless steel 303 case.

OsiSense® SM, VM and XX Ultrasonic sensors

Cylindrical plastic case,
M12 x 1, M18 x 1, M30 x 1.5
DC supply, solid-state output

Sensor type		SM3●0A●	SM6●0A●	SM6●0A●S	VM18●
Specifications					
Product certifications		CE, UL	CE, UL, CSA		CE, UL
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14			
Connection	Connector	Pre-cabled 4-pin M8 or M12	Pre-cabled, 4-pin M12		
Sensing range		mm (in.) 6.4–101.6 (0.25–4.0)	19–254 (0.75–10.0)		50.8–508 (2.0–20.0)
Nominal sensing distance (Sn)		mm (in.) 101.6 (4.0)	254 (10.0)		508 (20.0)
Detection distance		Fixed	Fixed, optional "AA" model for teachable		Remotely adjustable using external teach button
Blind zone (no object must pass through this zone while the sensor is operating)		mm (in.) 0–6.4 (0–0.25)	0–19 (0–0.75)		0–50.8 (0–2.0)
Differential travel		mm (in.) < 0.7 (0.03)	< 0.35 (0.01)		< 2.5 (0.10)
Transmission frequency		kHz 500			300
Repeat accuracy		mm (in.) ± 0.7 (0.03)			± 1.27 (0.05)
Overall beam angle (see detection lobe)		11°	8°		6°
Minimum size of object to be detected		mm (in.) Cylinder Ø 2.5 (0.10) or flat bar 1 (0.04) wide	Cylinder Ø 1.6 (0.06)		Cylinder Ø 2.5 (0.10) up to a sensing distance of 50 (2.0)
Degree of protection		Conforming to IEC 60529 and IEC 60947-5-2	IP 67		
Storage temperature		°C (°F) -40 to + 85 (-40 to +185)			
Operating temperature		°C (°F) -30 to + 65 (-22 to +149)	0 to + 50 (+32 to +122)		- 30 to + 70 (-22 to + 158)
Materials	Case	PEI Plastic		SS303 Stainless Steel	PBT Plastic
	Sensing face	Epoxy	Silicone		Epoxy
Vibration resistance		Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)		
Mechanical shock resistance		Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes		
Resistance to electromagnetic interference					
Electrostatic discharges		Conforming to IEC 61000-4-2	kV 8, level 4		
Radiated electromagnetic fields		Conforming to IEC 61000-4-3	V/m 10, level 3		
Fast transients		Conforming to IEC 61000-4-4	kV 1, level 3		
LED indicators	Output state		–		–
	Power on		–	Green	–
	Setup assistance		–	–	Dual color LED
	Target location		Dual color LED	Amber LED	Dual color LED
Rated supply voltage (with protection against reverse polarity)		Vdc --- 12–24 V			
Voltage limits (including ripple)		Vdc --- 10–28 V			
Current consumption, no-load		mA 25	60		40
Switching capacity		mA < 100 (PNP and NPN) with overload and short-circuit protection			
Voltage drop		V < 1 (NPN); < 1.5 (PNP)			
Maximum switching frequency		Hz 125	80		40
Delays	First-up	ms 20	350		100
	Response	ms 2	3		10
	Recovery	ms 2	3		10
Deviation angle from 90° of the object to be detected		± 10°	± 10°		± 7°

OsiSense® SM, VM and XX Ultrasonic sensors

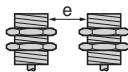
Cylindrical plastic case,
M12 x 1, M18 x 1, M30 x 1.5
DC supply, solid-state output

Sensor type		SM9•0A1•	SM9•0A1•S	SM9•0A4•	SM9•0A4•S	SM9•0A8•	XX6V3A•
Specifications							
Product certifications		CE, UL, CSA					
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14					
Connection		Pre-cabled, 4-pin M12					4-pin M12
Sensing range		mm (in.)	50.8–1000 (2.0–39.4)	120–2000 (4.72–78.74)	305–8000 (12.0–314.96)	100–1000 (4.0–39.4)	
Nominal sensing distance (Sn)		m (ft)	1 m (3.28 ft)	2 m (6.56 ft)	8 m (26.25 ft)	1 m (3.28 ft)	
Detection distance		Adjustable using teach button on sensor					Remotely adjustable using external teach button
Blind zone (no object must pass through this zone while the sensor is operating)		mm (in.)	0–50.8 (0–2.0)	0–120 (0–4.72)	0–305 (0–12.0)	0–100 (0–4.0)	
Differential travel		mm (in.)	< 2.5 (0.10)		< 12.7 (0.50)	< 2.5 (0.10)	
Transmission frequency		kHz	200		75	180	
Repeat accuracy		mm (in.)	± 0.9 (0.04)		± 2.54 (0.10)	± 1.6 (0.06)	
Overall beam angle (see detection lobe)			10°		16°	7°	
Minimum size of object to be detected		mm (in.)	Cylinder Ø 1.6 (0.06) up to a sensing distance of 635 (25.0)		Cylinder Ø 50.8 (2.0) up to a sensing distance of 4732 (186.30)	Cylinder Ø 50 (1.97) up to a sensing distance of 1000 (39.37)	
Degree of protection		Conforming to IEC 60529 and IEC 60947-5-2	IP 67				
Storage temperature		°C (°F)	-40 to + 85 (-40 to +185)				
Operating temperature		°C (°F)	0 to +50 (+32 to 122)			-20 to +60 (-4 to +140)	0 to +70 (+32 to 158)
Materials		Case	PEI Plastic	SS303 Stainless Steel	PEI Plastic	SS303 Stainless Steel	PEI Plastic
		Sensing face	Silicone			Epoxy	Epoxy
Vibration resistance		Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)				
Mechanical shock resistance		Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes				
Resistance to electromagnetic interference							
Electrostatic discharges		Conforming to IEC 61000-4-2	kV 8, level 4				
Radiated electromagnetic fields		Conforming to IEC 61000-4-3	V/m 10, level 3				
Fast transients		Conforming to IEC 61000-4-4	kV 1, level 3				
LED indicators		Output state	Amber LED				Dual color LED
		Target location	Multicolor LED				–
		Setup assistance	Multicolor LED				Dual color LED
Rated supply voltage (with protection against reverse polarity)		Vdc	∓ 12–24 V				
Voltage limits (including ripple)		Vdc	∓ 10–28 V				
Current consumption, no-load		mA	50			50	60
Switching capacity		mA	< 100 (PNP and NPN) with overload and short-circuit protection				
Voltage drop		V	< 1 (NPN); < 1.5 (PNP)				
Maximum switching frequency		Hz	10			2	70
Delays		First-up	ms 720			800	75
		Response	ms 20			200	15
		Recovery	ms 20			200	75
Deviation angle from 90° of the object to be detected			± 7°			± 5°	± 5°

Setup

Minimum mounting distances

Side by side



e: respect the distances indicated on the detection curves shown on page 24
e ≥ 2x detection curve width

OsiSense® SM, VM and XX Ultrasonic sensors

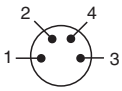
Cylindrical plastic case,
M12 x 1, M18 x 1, M30 x 1.5
DC supply, solid-state output

Wiring diagrams

M8 connector

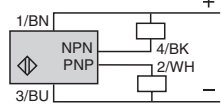
SM350A22800

4-wire type



1 (+) 2 PNP output
3 (-) 4 NPN output

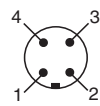
NO outputs, PNP and NPN



(-) BU (Blue) (+) BN (Brown)
WH (White) BK (Black)

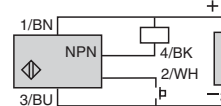
SM380A●

3-wire type



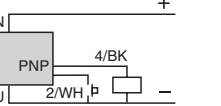
1 (+) 3 (-)
4 NPN or PNP output

NO outputs, NPN



(-) BU (Blue) (+) BN (Brown)
BK (Black)

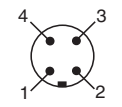
NO outputs, PNP



M12 connector

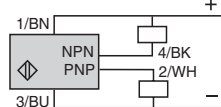
SM650A68000

4-wire type



1 (+) 2 PNP output
3 (-) 4 NPN output

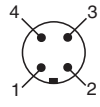
NO outputs, PNP and NPN



(-) BU (Blue) (+) BN (Brown)
WH (White) BK (Black)

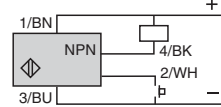
VM18●, XX6V3●

3-wire type



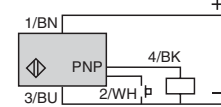
1 (+) 2 Teach input
3 (-) 4 NPN or PNP output

NO outputs, NPN



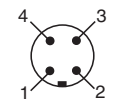
(-) BU (Blue) (+) BN (Brown)
BK (Black)
WH (White)

NO outputs, PNP



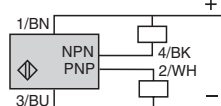
SM950A●00000

4-wire type



1 (+) 2 PNP output
3 (-) 4 NPN output

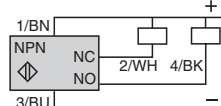
NO outputs, PNP and NPN



(-) BU (Blue) (+) BN (Brown)
WH (White) BK (Black)

SM950A●20000

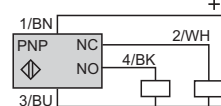
NO + NC outputs, NPN



(-) BU (Blue) (+) BN (Brown)
WH (White) BK (Black)

SM950A●30000

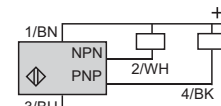
NO + NC outputs, PNP



(-) BU (Blue) (+) BN (Brown)
WH (White) BK (Black)

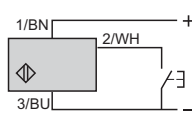
SM950A●10000

NC outputs, PNP and NPN

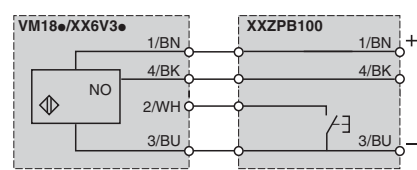
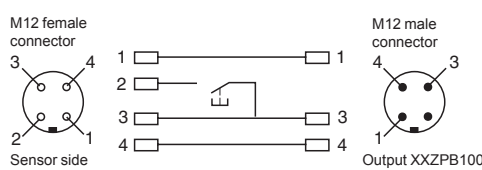


Wiring for teaching of detection window

Using external contact
VM18●/XX6V3●



Using XXZPB100

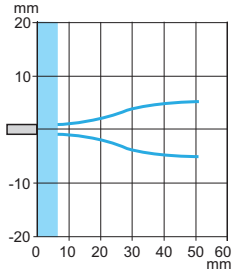


OsiSense® SM, VM and XX Ultrasonic sensors

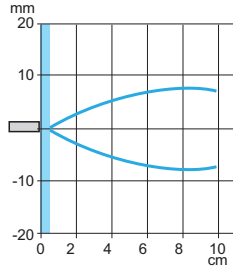
Cylindrical plastic case,
M12 x 1, M18 x 1, M30 x 1.5
DC supply, solid-state output

Operating curves

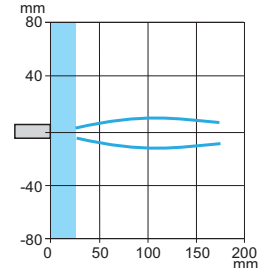
SM350A22800



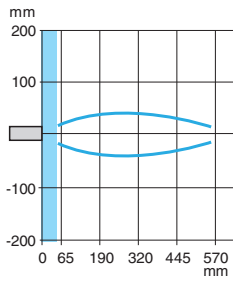
SM380A46000



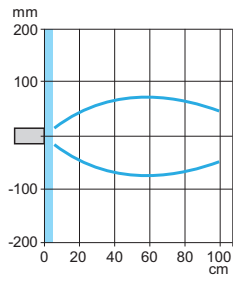
SM650A68000



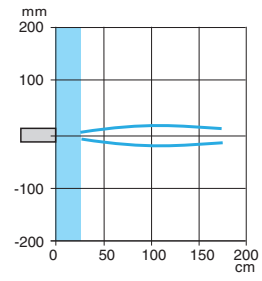
VM18●



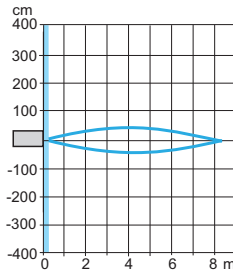
SM950A1●



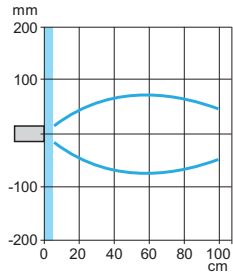
SM950A4●



SM950A8●



XX6V3A1



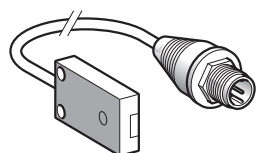
Blind zone

4

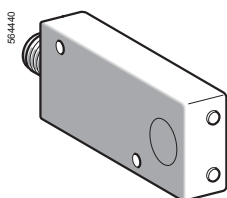
OsiSense® SM, VM and XX

Ultrasonic sensors

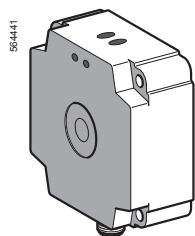
Optimum and Universal
Plastic case, flat form
d.c. supply, solid-state output



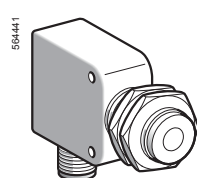
SM30A0FP



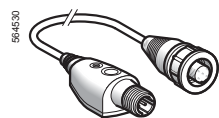
SM60A0FP



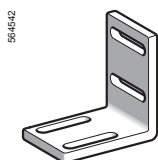
XX8D1A1●● M12



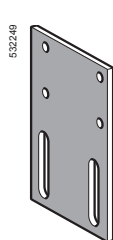
VM1●NOQ



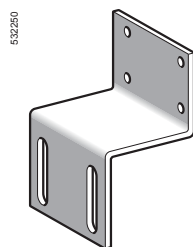
XXZPB100



XXZ1933



XXZ3074F



XXZ3074S

Fixed sensing distance sensors

Sensors	Sensing distance (Sn) mm (in.)	Function	Connection	Output	Catalog Number	Weight	
						kg	(lb)
7.6 x 19 x 33	50.8 (2.0)	NO (1)	Pre-cabled	PNP/NPN	SM300A22800FP	0.011	(0.02)
	50.8 (2.0)	NO (1)	M8 connector	PNP/NPN	SM350A22800FP	0.011	(0.02)
	101.6 (4.0)	NO (1)	M8 connector	PNP/NPN	SM350A46000FP	0.011	(0.02)
16 x 30 x 74	50.8 (2.0)	NO (1)	M12 connector	PNP/NPN	SM380A22800FP	0.011	(0.02)
	50.8 (2.0)	NO (1)	Pre-cabled	PNP/NPN	SM600A21600FP	0.033	(0.07)
	101.6 (4.0)	NO (1)	Pre-cabled	PNP/NPN	SM600A44800FP	0.033	(0.07)
	152.0 (6.0)	NO (1)	Pre-cabled	PNP/NPN	SM600A64800FP	0.033	(0.4)
	50.8 (2.0)	NO (1)	M12 connector	PNP/NPN	SM650A21600FP	0.033	(0.4)
	101.6 (4.0)	NO (1)	M12 connector	PNP/NPN	SM650A44800FP	0.033	(0.4)
80 x 80	152.0 (6.0)	NO (1)	M12 connector	PNP/NPN	SM650A64800FP	0.033	(0.4)

Adjustable sensing distance sensors

18 x 33 x 60 + Ø 18	508.0 (20.0)	NO	Pre-cabled	PNP	VM1PNO	0.033	(0.07)
	508.0 (20.0)	NO	Pre-cabled	NPN	VM1NNO	0.033	(0.07)
	508.0 (20.0)	NO	M12 connector	PNP	VM1PNOQ	0.033	(0.07)
	508.0 (20.0)	NO	M12 connector	NPN	VM1NNOQ	0.033	(0.07)
	508.0 (20.0)	NC	Pre-cabled	PNP	VM1PNC	0.033	(0.07)
	508.0 (20.0)	NC	Pre-cabled	NPN	VM1NNC	0.033	(0.07)
80 x 80	508.0 (20.0)	NC	M12 connector	PNP	VM1PNCQ	0.033	(0.07)
	508.0 (20.0)	NC	M12 connector	NPN	VM1NNCQ	0.033	(0.07)
	1 m (39.4)	NO	M12 connector	PNP	XX8D1A1PAM12	0.3	(0.66)
	1 m (39.4)	NO	M12 connector	NPN	XX8D1A1NAM12	0.3	(0.66)

Accessories

Teach pushbutton

Teach pushbutton	For use with sensors	Catalog Number	Weight kg (lb)
	VM1● and XX8D1●	XXZPB100	0.035 (0.08)

Selection of detection window

Input: M12 female connector

Output: M12 male connector

Cabling accessories

Pre-wired connectors	For use with sensor	Type	Length m	Catalog Number	Weight kg (lb)
M8, 4-pin	7.6 x 19 x 33	Straight	2	XZCP0941L2 (2)	0.080 (0.18)
		Elbowed	2	XZCP1041L2 (2)	0.080 (0.18)
M12	16 x 30 x 74, 18 x 33 x 60 + Ø 18, and 80 x 80	Straight	2	XZCP1141L2 (2)	0.090 (0.20)
		Elbowed	2	XZCP1241L2 (2)	0.090 (0.20)

Mounting accessories

Description	For use with sensor	Catalog Number	Weight kg (lb)
Mounting clamps	7.6 x 19 x 33		
	18 x 33 x 60 + Ø 18	XSZB118	0.010 (0.02)
	16 x 30 x 74	XXZ3074F	
90° mounting bracket	80 x 80	XSZBD10	
	7.6 x 19 x 33	XXZ1933	
	18 x 33 x 60 + Ø 18	XUZA118	0.038 (0.08)
	16 x 30 x 74	XXZ3074S	
	80 x 80		

(1) For normally closed (NC) function, change the last set of characters in the catalog number from "00FP" to "10FP".

(2) Replace "L2" with "L5" for 5 m "L10" for 10 m cable, or M12 for M12 connector.

OsiSense® SM, VM and XX Ultrasonic sensors

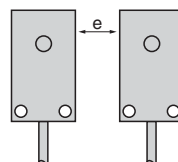
Optimum and Universal
Plastic case, flat form
d.c. supply, solid-state output

Sensor type		SM3●0A●FP	SM6●0A●FP	VM1●	XX8D1A1●M12
Specifications					
Product certifications		CE, UL		CE, UL, CSA	
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14			
Connection Connector		Pre-cabled, 4-pin M8 or M12	Pre-cabled, 4-pin M12		4-pin M12
Sensing range		mm (in.) 6.4–101.6 (0.25–4.0)	19–254 (0.75–10.0)	50.8–508 (2.0–20.0)	100–1000 (4.0–39.4)
Nominal sensing distance (Sn)		mm (in.) 101.6 (4.0)	254 (10.0)	508 (20.0)	1 m (3.28 ft)
Detection distance		Fixed		Remotely adjustable using external teach button	
Blind zone (no object must pass through this zone while the sensor is operating)		mm (in.) 0–6.4 (0–0.25)	0–19 (0–0.75)	0–50.8 (0–2.0)	0–100 (0.0–4.0)
Differential travel		mm (in.) < 0.7 (0.03)	< 0.35 (0.01)	< 2.5 (0.10)	< 2.5 (0.10)
Transmission frequency		kHz 500		300	180
Repeat accuracy		mm (in.) ± 0.7 (0.03)		± 1.27 (0.05)	± 1.6 (0.06)
Overall beam angle (see detection lobe)		11°	8°	6°	7°
Minimum size of object to be detected		mm (in.) Cylinder Ø 2.5 (0.10) or flat bar 1 (0.04) wide	Cylinder Ø 1.6 (0.06)	Cylinder Ø 2.5 (0.10) up to a sensing distance of 50 (2.0)	Cylinder Ø 50 up to a sensing distance of 1000 (39.37)
Degree of protection Conforming to IEC 60529 and IEC 60947-5-2		IP 67			
Storage temperature		°C (°F) -40 to + 85 (-40 to +185)			
Operating temperature		°C (°F) -30 to + 65 (-22 to +149)		0 to + 50 (+32 to 122)	-30 to + 70 (-22 to +158) 0 to + 70 (+32 to + 158)
Materials Case		PEI Plastic		PBT Plastic	
Sensing face		Epoxy	Silicone	Epoxy	
Vibration resistance Conforming to IEC 60068-2-6		Amplitude ± 1 mm (f = 10–55 Hz)			
Mechanical shock resistance Conforming to IEC 60068-2-27		30 gn, duration 11 ms, in all 3 axes			
Resistance to electromagnetic interference					
Electrostatic discharges Conforming to IEC 61000-4-2		kV 8, level 4			
Radiated electromagnetic fields Conforming to IEC 61000-4-3		V/m 10, level 3			
Fast transients Conforming to IEC 61000-4-4		kV 1, level 3			
LED indicators Target location		Dual color LED	–	Dual color LED	
Power on		–	Green LED	–	
Setup assistance		–	–	Dual color LED	
Rated supply voltage (with protection against reverse polarity)		Vdc ∓ 12–24 V			
Voltage limits (including ripple)		Vdc ∓ 10–28 V			
Current consumption, no-load		mA 25	60	40	60
Switching capacity		mA < 100 (PNP and NPN) with overload and short-circuit protection			
Voltage drop		V < 1 (NPN); < 1.5 (PNP)			
Maximum switching frequency		Hz 125	80	40	72
Delays First-up		ms 20	350	100	75
Response		ms 2	3	10	15
Recovery		ms 2	3	10	75
Deviation angle from 90° of the object to be detected		± 10°	± 10°	± 7°	± 5°

Setup

Minimum mounting distances

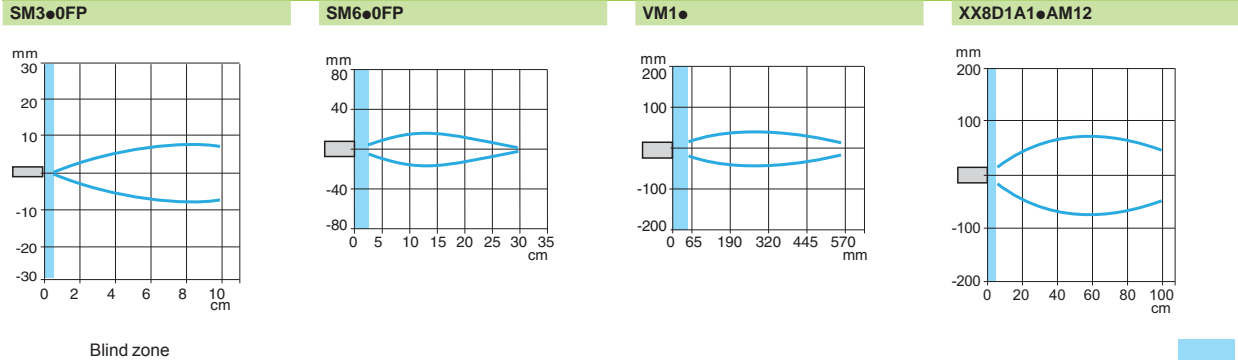
Side by side



e: respect the distances indicated on the detection curves shown on page 24
e ≥ 2x detection curve width

Optimum and Universal
Plastic case, flat form
d.c. supply, solid-state output

Operating curves



Wiring diagrams

M12 connector	SM3B0A● (1), VM1N●, XX8D1A1NAM12	SM3A0A (1), XX8D1A1PAM12
<p>3-wire type</p> <p>1 (+) 2 On sensors VM1●, terminal 2 is reserved for the teach pushbutton. 3 (-) 4 NPN or PNP output</p>	<p>NO output, NPN</p> <p>(-) BU (Blue) (+) BN (Brown) BK (Black)</p>	<p>NO output, PNP</p>
(1) Remote connector on flying lead approximately 15 cm long.		



XXZPB100 (teach pushbutton for VM1● and XX8D1●, XX6V3●)

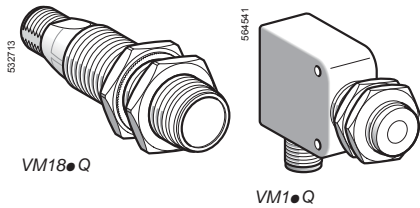
<p>M12 female connector</p> <p>Sensor side</p>	<p>M12 male connector</p> <p>Output XXZPB100</p>	<p>1 (+) BN (Brown) 2 WH (White) 3 (-) BU (Blue) 4 BK (Black)</p>
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XXZPB101 (teach pushbutton for "AA" versions)

<p>M12 female connector</p> <p>Sensor side</p>	<p>M12 male connectors</p> <p>Output XXZPB101</p>	<p>1 (+) BN (Brown) 2 WH (White) 3 (-) BU (Blue) 4 BK (Black)</p>
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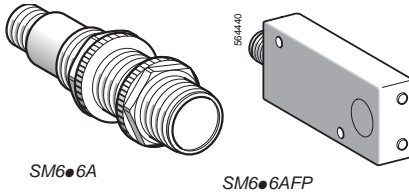
OsiSense® SM, VM and XX Ultrasonic sensors

Plastic case, cylindrical type and flat format
Sensors with analog output signal
0–10 V or 4–20 mA



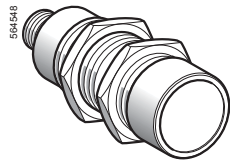
VM18•Q

VM1•Q

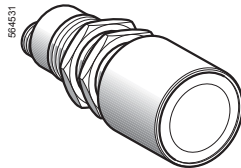


SM6•6A

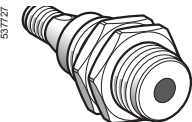
SM6•6AFP



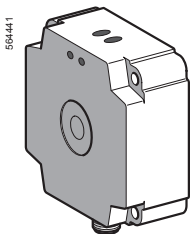
SM9•6A1•



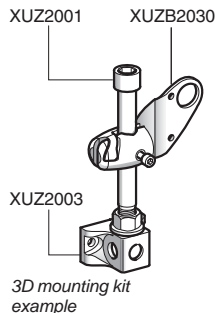
SM9•6A8



XX9V3A1••M12



XX9D1A1••M12



3D mounting kit example



XXZPB100

Fixed sensing distance sensors

Sensors	Sensing distance mm (in.)	Output Configuration	Catalog Number	Weight	
				kg	(lb)
Ø 18	101.6 (4.0)	0–10 V, Inverse slope	SM6•6A44400 (1) (2) (6)	0.033	(0.07)
	152.0 (6.0)	0–10 V, Inverse slope	SM6•6A67400 (1) (2) (6)	0.033	(0.07)
16 x 30 x 74	101.6 (4.0)	0–10 V, Inverse slope	SM6•6A44400FP (1) (6)	0.033	(0.07)
	152.0 (6.0)	0–10 V, Inverse slope	SM6•6A67400FP (1) (6)	0.033	(0.07)
	101.6 (4.0)	4–20 mA, Inverse slope	SM6•6A44410FP (1) (7)	0.033	(0.07)
	152.0 (6.0)	4–20 mA, Inverse slope	SM6•6A67410FP (1) (7)	0.033	(0.07)

Adjustable sensing distance sensors

Sensors	Sensing distance mm (in.)	Output Configuration	Catalog Number	Weight	
				kg	(lb)
Ø18	508 (20.0)	0–10 V, Autoslope	VM18VA• (3)	0.033	(0.07)
	508 (20.0)	4–20 mA, Autoslope	VM18CA• (3)	0.033	(0.07)
Ø 30	1 m (39.4)	0–10 V, Autoslope	SM9•6A180000 (1) (2)	0.09	(0.2)
	1 m (39.4)	4–20 mA, Inverse slope	SM9•6A120000 (1) (2)	0.09	(0.2)
	2 m (78.74)	0–10 V, Autoslope	SM9•6A480000 (1) (2)	0.09	(0.2)
	2 m (78.74)	4–20 mA, Inverse slope	SM9•6A420000 (1) (2)	0.09	(0.2)
	8 m (26.25 ft)	0–10 V, Autoslope	SM9•6A880000 (1)	0.09	(0.2)
	8 m (26.25 ft)	4–20 mA, Direct slope	SM9•6A830000 (1)	0.09	(0.2)
	1 m (39.4)	0–10 V, Autoslope	XX9V3A1F1M12	0.09	(0.2)
	1 m (39.4)	4–20 mA, Autoslope	XX9V3A1C2M12	0.09	(0.2)
18 x 33 x 60 + Ø18	508 (20.0)	0–10V, Autoslope	VM1VA• (3)	0.033	(0.07)
	508 (20.0)	4–20 mA, Autoslope	VM1CA• (3)	0.033	(0.07)
80 x 80	1 m (39.4)	0–10 V, Autoslope	XX9D1A1F1M12 (5)	0.3	(0.66)
	1 m (39.4)	4–20 mA, Autoslope	XX9D1A1C2M12 (5)	0.3	(0.66)

Accessories

Teach pushbuttons

Teach pushbuttons	For use with sensors	Catalog Number	Weight	
			kg	(lb)
Selection of detection window Input: M12 female connector Output: M12 male connector	VM18•, XX9V3A•	XXZPB100	0.035	(0.08)

Cabling accessories

Connectors	Type	Length (m)	Catalog Number	Weight	
				kg	(lb)
M12	Ø 18, Ø 30	Straight	2	XZCP1141L2 (4)	0.090 (0.20)
		Elbowed	2	XZCP1241L2 (4)	0.090 (0.20)

Mounting accessories

Description	For use with sensor	Catalog Number	Weight	
			kg	(lb)
90° mounting bracket	Ø 18	XUZA118	0.038	(0.08)
	Ø 30	XXZ30	0.115	(0.25)
Mounting clamp	Ø 80	XSZBD10	0.065	(0.14)
3D mounting kit M12 rod (2)	Support for M12 rod	XUZZ001	0.050	(0.11)
	Ball-joint mounted mounting	XUZZ003	0.160	(0.35)
	Bracket	XUZZB2030	0.160	(0.35)

- (1) Replace "•" with "0" for pre-cabled version, or with "5" for M12 connector version.
- (2) Add "S" to the end of the catalog number for stainless steel 303 case.
- (3) Replace "•" with a "Q" for a M12 connector version or leave blank for a pre-cabled version.
- (4) Replace "L2" with "L5" for 5 m "L10" for 10 m cable, or M12 for M12 connector.
- (5) XX9D1 is only offered in a M12 connector version.
- (6) Replace "00" with "01" for direct slope.
- (7) Replace "10" with "11" for direct slope.

OsiSense® SM, VM and XX Ultrasonic sensors

Plastic case, cylindrical type and flat format
Sensors with analog output signal
0–10 V or 4–20 mA

Sensor type		VM18●	VM1●	SM6●6A●	SM6●6A●S	SM9●6A1●	SM9●6A1●S
Specifications							
Product certifications		CE, UL	CE, UL, CSA				
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14					
Connection Connector		Pre-cabled, 4-pin M12					
Sensing range	mm (in.)	50.8–508 (2.0–20.0)	19–254 (0.75–10.0)			50.8–1000 (2.0–39.4)	
		Remotely adjustable using external teach button	Fixed			Adjustable using teach mode	
Nominal sensing distance (Sn)	mm (in.)	508 (20.0)	254 (10.0)			1 m (3.28 ft)	
Blind zone (no object must pass through this zone while the sensor is operating)	mm (in.)	0–50.8 (0–2.0)	0–19 (0–0.75)			0–50.8 (0–2.0)	
Transmission frequency	kHz	300	300			200	
Repeat accuracy	mm (in.)	1.27 (0.05)			± 0.9 (0.04)		
Overall beam angle (see detection lobe)		6°			10°		
Minimum size of object to be detected	mm (in.)	Cylinder Ø 2.5 (0.10) or flat bar 1 wide for a sensing distance of 150 (5.91)	Cylinder Ø 1.6 (0.06)			Cylinder Ø 1.6 (0.06) up to a sensing distance of 635 (25.0)	
Degree of protection	Conforming to IEC 60529 and IEC 60947-5-2	IP 67					
Storage temperature	°C (°F)	-40 to + 85 (-40 to +185)					
Operating temperature	°C (°F)	-30 to + 70 (-22 to + 158)		0 to +50 (+32 to 122)		0 to +50 (+32 to 122)	
Materials	Case	PBT Plastic	PEI Plastic	SS303 Stainless Steel	PEI Plastic	SS303 Stainless Steel	
	Sensing face	Epoxy	Silicone				
Vibration resistance	Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)					
Mechanical shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes					
Resistance to electromagnetic interference							
Electrostatic discharges	Conforming to IEC 61000-4-2	kV	8, level 4				
Radiated electromagnetic fields	Conforming to IEC 61000-4-3	V/m	10, level 3				
Fast transients	Conforming to IEC 61000-4-4	kV	1, level 3				
LED indicators	Output level	Orange LED	Amber LED				
	Power on	–	Green LED				
	Setup assistance	Dual color LED	–			Multicolor LED	
	Target location	Dual color LED	–			Multicolor LED	
Rated supply voltage (With protection against reverse polarity)	Vdc	∓ 12–24 V			∓ 15–24 V		
Voltage limits (including ripple)	Vdc	∓ 10–28 V					
Current consumption, no-load	mA	40	50			60	
Switching capacity		Analog output 4–20 mA: resistive load from 10 to 500 Ω max. (except for XX9V3A1● and XX9D1A1●: 350 Ω) Analog output 0-10 V: resistive load from 1 kΩ to unlimited (except for XX9V3A1● and XX9D1A1●: 2 kΩ) Overload and short-circuit protection Slope selection using teach button					
Delays	First-up	ms	100			75	
	Response	ms	15			30	
	Recovery	ms	10			30	
Deviation angle from 90° of the object to be detected		± 7°			± 5°		

OsiSense[®] SM, VM and XX Ultrasonic sensors

Plastic case, cylindrical type and flat format
Sensors with analog output signal
0–10 V or 4–20 mA

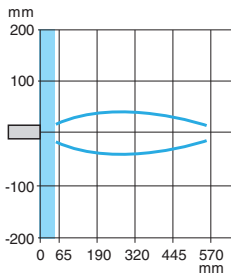
Sensor type		SM9●6A4●	SM9●6A4●S	SM9●6A8●	XX9V3A1●	XX9D1A1●	
Specifications							
Product certifications		CE, UL, CSA					
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14					
Connection	Connector	Pre-cabled, 4-pin M12			4-pin M12		
Sensing range	mm (in.)	120–2000 (4.72–78.74)	305–8000 (12.0–314.96)	100–1000 (4.0–39.4)			
		Adjustable using teach mode			Remotely adjustable using external teach button		
Nominal sensing distance (Sn)	mm (in.)	2 m (6.56 ft)	8 m (26.25 ft)	1 m (3.28 ft)			
Blind zone (no object must pass through this zone while the sensor is operating)	mm (in.)	0–120 (0–4.72)	0–305 (0–12.0)	0–100 (0–4.0)			
Transmission frequency	kHz	200	75	180			
Repeat accuracy	mm (in.)	± 0.9 (0.04)	± 2.54 (0.10)	± 0.9 (0.04)			
Overall beam angle (see detection lobe)		10°	16°	7°			
Minimum size of object to be detected	mm (in.)	Cylinder Ø 1.6 (0.06) up to a sensing distance of 635 (25.0)	Cylinder Ø 50.8 (2.0) up to a sensing distance of 4732 (186.30)	Cylinder Ø 50 (1.97) (1.97) up to a sensing distance of 1000 (39.37)			
Degree of protection	Conforming to IEC 60529 and IEC 60947-5-2	IP 67					
Storage temperature	°C (°F)	- 40 to + 85 (-40 to + 185)					
Operating temperature	°C (°F)	0 to + 50 (+ 32 to 122)	- 20 to + 60 (- 4 to + 140)	0 to + 70 (+ 32 to 158)			
Materials	Case	PEI Plastic	SS303 Stainless Steel	PEI Plastic	PBT Plastic		
	Sensing face	Silicon		Epoxy			
Vibration resistance	Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)					
Mechanical shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes					
Resistance to electromagnetic interference							
Electrostatic discharges	Conforming to IEC 61000-4-2	kV	8, level 4				
Radiated electromagnetic fields	Conforming to IEC 61000-4-3	V/m	10, level 3				
Fast transients	Conforming to IEC 61000-4-4	kV	1, level 3				
LED indicators	Output level	Amber LED			Orange LED		
	Power on	–					
	Setup assistance	Multicolor LED			Dual color LED		
	Target location	–			Dual color LED		
Rated supply voltage (With protection against reverse polarity)	Vdc	--- 15–24 V					
Voltage limits (including ripple)	Vdc	--- 10–28 V					
Current consumption, no-load	mA	80			100		
Switching capacity		Analog output 4–20 mA: resistive load from 10 to 500 Ω max. (except for XX9V3A1● and XX9D1A1●: 350 Ω) Analog output 0–10 V: resistive load from 1 kΩ to unlimited (except for XX9V3A1● and XX9D1A1●: 2 kΩ) Overload and short-circuit protection Slope selection using teach button					
Delays	First-up	ms	75	1200	75		
	Response	ms	30	250	30		
	Recovery	ms	30	250	30		
Deviation angle from 90° of the object to be detected			± 5°				

4

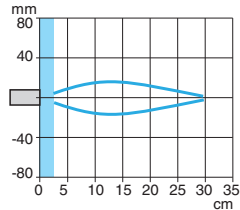
Plastic case, cylindrical type and flat format
Sensors with analog output signal
0–10 V or 4–20 mA

Operating Curves

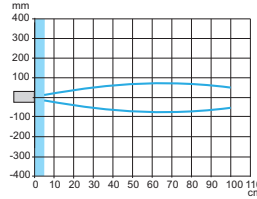
VM1●



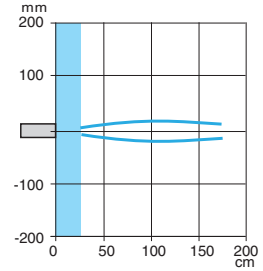
SM6●6A●



SM9●6A1●

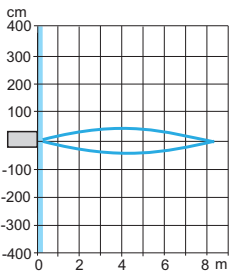


SM9●6A4●

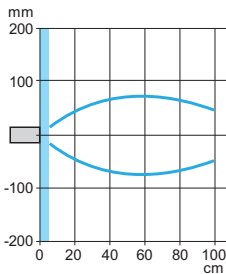


Blind zone

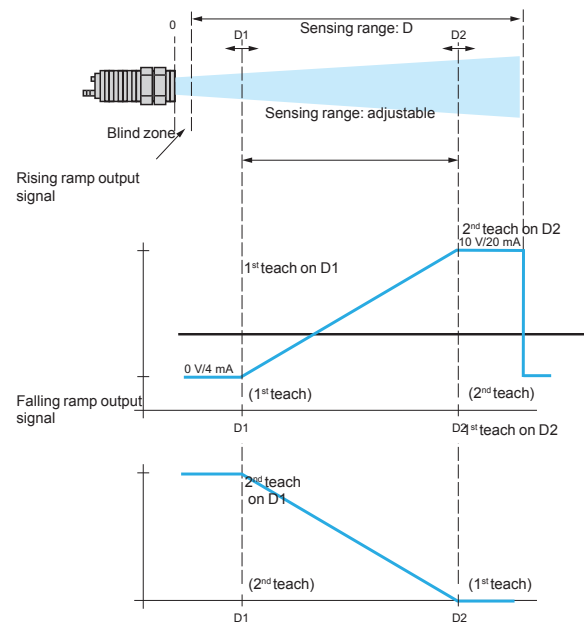
SM9●6A8●



XX9V3A1●●M12,
XX9DA1●●M12



Output signal curves



The direction of the slope of the signal is obtained by teaching the first limit:

- D1 for rising ramp
- D2 for falling ramp

Maximum deviation < 0.5%

4

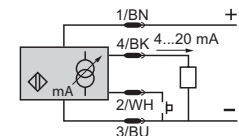
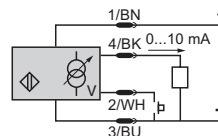
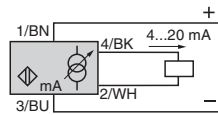
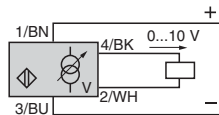
Wiring diagrams

M12 connector

SM956A●

VM1●/XX9D1A●/XX9V3A●

4-wire type



- 1 (+)
- 2 Signal return
- 3 (-)
- 4 Output signal

(-) BU (Blue)
(+) BN (Brown)
WH (White)
BK (Black)

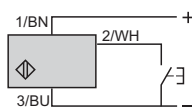
(-) BU (Blue)
(+) BN (Brown)
WH (White)
BK (Black)

(-) BU (Blue)
(+) BN (Brown)
WH (White)
BK (Black)

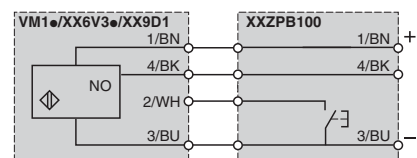
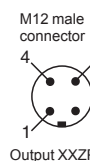
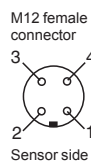
(-) BU (Blue)
(+) BN (Brown)
WH (White)
BK (Black)

Wiring for teaching of detection window

Using external contact
VM1●/XX9V3A●/XX9D1●



Using XXZPB100

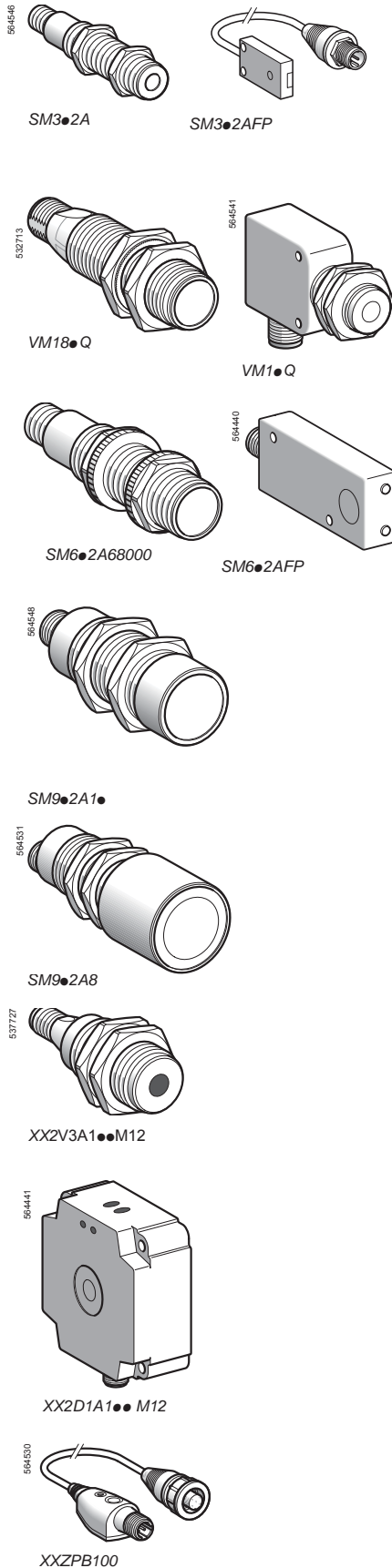


OsiSense® SM, VM and XX Ultrasonic sensors

Application

Sensors for monitoring 2 levels

Plastic case, cylindrical type and flat format
d.c. supply, solid-state output



Fixed sensing distance sensors

Sensors	Sensing distance (Sn) mm (in.)	Function	Output	Catalog Number (4) (5)	Weight kg (lb)
ø 12	50.8 (2.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A21200 (4)	0.011 (0.02)
	76.0 (3.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A31600 (4)	0.011 (0.02)
	101.6 (4.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A41600 (4)	0.011 (0.02)
7.6 x 19 x 33	50.8 (2.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A21200FP (4)	0.011 (0.02)
	76.0 (3.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A31600FP (4)	0.011 (0.02)
	101.6 (4.0)	NO, pump-out latch (1)	PNP/NPN	SM3•2A41600FP (4)	0.011 (0.02)
ø 18	101.6 (4.0)	NO, pump-out latch (1)	PNP/NPN	SM6•2A41600 (5) (6)	0.033 (0.07)
	127.0 (5.0)	NO, pump-out latch (1)	PNP/NPN	SM6•2A51600 (5) (6)	0.033 (0.07)
	152.0 (6.0)	NO, Dual Alarm	PNP/NPN	SM6•2A63220 (5) (6)	0.033 (0.07)
16 x 30 x 74	101.6 (4.0)	NO, pump-out latch (1)	PNP/NPN	SM6•2A41600FP (5)	0.033 (0.07)
	127.0 (5.0)	NO, pump-out latch (1)	PNP/NPN	SM6•2A51600FP (5)	0.033 (0.07)
	152.0 (6.0)	NO, Dual Alarm	PNP/NPN	SM6•2A63220FP (5)	0.033 (0.07)

Adjustable sensing distance sensors

ø 18	508 (20.0)	NO, pump-out latch (2)	PNP	VM18PPO0000• (7)	0.033 (0.07)
	508 (20.0)	NO, pump-out latch (2)	NPN	VM18NPO0000• (7)	0.033 (0.07)
18 x 33 x 60	508 (20.0)	NO, pump-out latch (2)	PNP	VM1PPO0000• (7)	0.033 (0.07)
+ ø 18	508 (20.0)	NO, pump-out latch (2)	NPN	VM1NPO0000• (7)	0.033 (0.07)
ø 30	1 m (39.4)	NO, pump-out latch (3)	PNP/NPN	SM9•2A100000 (5) (6)	0.09 (0.2)
	2 m (78.74)	NO, pump-out latch (3)	PNP/NPN	SM9•2A400000 (5) (6)	0.09 (0.2)
	8 m (26.25 ft)	NO, pump-out latch (3)	PNP/NPN	SM9•2A800000	0.09 (0.2)
	1 m (39.4)	NO, pump-out latch	PNP	XX2V3A1PHM12	0.09 (0.2)
80 x 80	1 m (39.4)	NO, pump-out latch	NPN	XX2V3A1NHM12	0.06 (0.13)
	1 m (39.4)	NO, pump-out latch	PNP	XX2D1A1PHM12 (8)	0.3 (0.66)
	1 m (39.4)	NO, pump-out latch	NPN	XX2D1A1NHM12 (8)	0.3 (0.66)

Accessories

Teach pushbutton

Teach pushbutton	For use with sensors	Catalog Number	Weight kg (lb)
Selection of detection window	VM1•, XX9V3• and XX9D1•	XXZPB100	0.035 (0.08)

Input: M12 female connector
Output: M12 male connector

Cabling accessories (4-wire output)

Connectors Type	Length (m)	Catalog Number	Weight kg (lb)
M8, 4-pin	Ø 12	Straight XZCP0941L2 (9)	0.080 (0.18)
		Elbowed XZCP1041L2 (9)	0.080 (0.18)
M12	Ø 18, Ø 30	Straight XZCP1141L2 (9)	0.090 (0.20)
		Elbowed XZCP1241L2 (9)	0.090 (0.20)

Mounting accessories

Description	For use with sensor	Catalog Number	Weight kg (lb)
Mounting clamp	Ø 18	XSZB118	0.010 (0.02)
90° mounting bracket	Ø 18	XUZA118	0.038 (0.08)
	Ø 30	XXZ30	0.115 (0.25)
3D mounting kit	M12 rod	XUZ2001	0.050 (0.11)
	Support for M12 rod	Ø 18 and Ø 30 XUZ2003	0.160 (0.35)
	Ball-joint mounted mounting bracket	Ø 18 XUZB2003	0.175 (0.39)
	Ø 30 XUZB2030	0.160 (0.35)	

(1) For Normally Open, pump-in latch function, change the last two digits from "00" to "10".

(2) For Normally Open, pump-in latch function, change the last two digits from "PO" to "PI".

(3) For Normally Open, pump-in latch function, change the 8th digit in the part number from "0" to "1".
Example: SM902A100000 becomes SM902A110000

(4) Connection types for the SM3 series; replace "•" with "0" for a pre-cabled version, "5" for M8 connector or "8" for M12 connector.

(5) Connection types for the SM6 and SM9 series; replace "•" with "0" for a pre-cabled version or with "5" for M12 connector.

(6) Add "S" to the end of the catalog number for stainless steel 303 case.

(7) Replace "•" with "Q" for an M12 connector version or leave blank for a pre-cabled version.

(8) XX2D1 is only offered in an M12 connector version.

(9) Replace "L2" with "L5" for 5 m "L10" for 10 m cable, or M12 for M12 connector.

OsiSense® SM, VM and XX Ultrasonic sensors

Application

Sensors for monitoring 2 levels

Plastic case, cylindrical type and flat format

d.c. supply, solid-state output

Sensor type		VM1●	VM18●	SM3●	SM6●	SM6●S	SM9●2A1●	SM9●2A1●S	
Specifications									
Product certifications		CE, UL, CSA	CE, UL, CSA	CE, UL, CSA					
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14							
Connection	Connector	Pre-cabled, 4-pin M12	Pre-cabled, 4-pin M8 or M12	Pre-cabled, 4-pin M12					
Sensing range	mm (in.)	50.8–508 (2.0–20.0)	6.4–101.6 (0.25–4.0)	19–254 (0.75–10.0)		50.8–1000 (2.0–39.4)			
		Remotely adjustable using external teach button	Fixed	Fixed		Adjustable using teach mode			
Nominal sensing distance (Sn)	mm (in.)	508 (20.0)	101.6 (4.0)	254 (10.0)		1 m (3.28 ft)			
Differential travel	mm (in.)	< 2.5 (0.10)	< 0.7 (0.03)	0.35 (0.01)		< 2.5 (0.10)			
Blind zone (no object must pass through this zone while the sensor is operating)	mm (in.)	0–50.8 (0–2.0)	0–6.4 (0–101.6)	0–19 (0–0.75)		0–50.8 (2.0)			
Transmission frequency	kHz	300	500	500		200			
Repeat accuracy	mm (in.)	± 1.27 (0.05)	± 0.69 (0.03)		± 0.9 (0.04)				
Overall beam angle (see detection lobe)		6°	8°	7°		10°			
Minimum size of object to be detected	mm (in.)	Cylinder Ø 2.5 (0.10) up to a sensing distance of 150 (5.91)	Cylinder Ø 2.5 (0.10) up to a sensing distance of 1 (0.04)	Cylinder Ø 1.59 (0.06) up to a sensing distance of 63.5 (2.5)		Cylinder Ø 1.6 (0.06) up to a sensing distance of 305 (12.01)			
Degree of protection	Conforming to IEC 60529 and IEC 60947-5-2	IP 67							
Storage temperature	°C (°F)	-40 to +85 (-40 to +185)					-10 to +80 (+14 to 176)		
Operating temperature	°C (°F)	-30 to +70 (-22 to +158)	-30 to +65 (-22 to 149)	0 to +50 (+32 to +122)		0 to +50 (+32 to 122)			
Materials	Case	PBT Plastic	PEI Plastic	PEI Plastic	SS303 Stainless Steel	PEI Plastic	SS303 Stainless Steel		
	Sensing face	Epoxy		Silicone					
Vibration resistance	Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)							
Mechanical shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes							
Resistance to electromagnetic interference									
Electrostatic discharges	Conforming to IEC 61000-4-2	kV	8, level 4						
Radiated electromagnetic fields	Conforming to IEC 61000-4-3	V/m	10, level 3						
Fast transients	Conforming to IEC 61000-4-4	kV	1, level 3						
LED indicators									
	Output state	Dual color LED					Amber LED		
	Power on	–	Dual color LED	Amber LED		–			
	Setup assistance	Dual color LED	–	Green LED		Multicolor LED			
	Distance indication	–						Multicolor LED	
Rated supply voltage (With protection against reverse polarity)	V	≍ 12–24 V							
Voltage limits (including ripple)	V	≍ 10–28 V							
Current consumption, no-load	mA	40	25	50		80			
Switching capacity	mA	< 100 (PNP and NPN) with overload and short-circuit protection							
Voltage drop	V	< 1 (PNP and NPN)							
Delays	First-up	ms	100	3		1000			
	Response	ms	15	3		150			
	Recovery	ms	1000	3		1000			
Deviation angle from 90° of the object to be detected		± 7°		± 7°		± 10° on 305 x 305 mm			



OsiSense® SM, VM and XX Ultrasonic sensors

Application

Sensors for monitoring 2 levels

Plastic case, cylindrical type and flat format

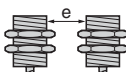
d.c. supply, solid-state output

Sensor type		SM9•2A4	SM9•2A4•S	SM9•2A8•	XX2V3•	XX2D1•		
Specifications								
Product certifications		CE, UL, CSA			CE			
Conformity to standards		IEC 60947-5-2, UL508 and CSA C22-2 n° 14						
Connection Connector		Pre-cabled, 4-pin M12			4-pin M12			
Sensing range		mm (in.)		120–2000 (4.72–78.74)	305–8000 (12.0–314.96)	100–1000 (4.0–39.97)		
				Adjustable using teach mode		Remotely adjustable using external teach button		
Nominal sensing distance (Sn)		mm (in.)		2 m (6.56 ft)	8 m (26.25 ft)	1 m (3.28 ft)		
Differential travel		mm (in.)		< 2.5 (0.10)	12.7 (0.50)	< 2.5 (0.10)		
Blind zone (no object must pass through this zone while the sensor is operating)		mm (in.)		0–120 (0–4.72)	0–305 (0–12.0)	0–100 (0–4.0)		
Transmission frequency		kHz		200	75	300		
Repeat accuracy		mm (in.)		± 0.9 (0.04)	2.54 (0.10)	±1.6 (0.06)		
Overall beam angle (see detection lobe)				10°	10°	7°		
Minimum size of object to be detected		mm (in.)		Cylinder Ø 1.6 (0.06) up to a sensing distance of 305 (12.0)	50.8 mm (2.0) diameter rod up to 4572 mm (15 ft) distance from the sensor	Cylinder Ø 50.8 (2.0) up to a sensing distance of 1000 (39.37)		
Degree of protection Conforming to IEC 60529 and IEC 60947-5-2		IP 67						
Storage temperature		°C (°F) -40 to + 85 (-40 to +185)						
Operating temperature		°C (°F) 0 to + 50 (+32 to 122)						
Materials Case		PEI Plastic		SS303 Stainless Steel	PEI Plastic	PBT Plastic		
		Sensing face		Silicon		Epoxy		
Vibration resistance Conforming to IEC 60068-2-6		Amplitude ± 1 mm (f = 10–55 Hz)						
Mechanical shock resistance Conforming to IEC 60068-2-27		30 gn, duration 11 ms, in all 3 axes						
Resistance to electromagnetic interference								
Electrostatic discharges Conforming to IEC 61000-4-2		kV		8, level 4				
Radiated electromagnetic fields Conforming to IEC 61000-4-3		V/m		10, level 3				
Fast transients Conforming to IEC 61000-4-4		kV		1, level 3				
LED indicators		Output state		Amber LED		Dual color LED		
		Power on		–		–		
		Setup assistance		Multicolor LED		Dual color LED		
		Distance indication		Multicolor LED		–		
Rated supply voltage (With protection against reverse polarity)		Vdc		--- 12–24 V				
Voltage limits (including ripple)		Vdc		--- 10–28 V				
Current consumption, no-load		mA		100		60		
Switching capacity		mA		<100				
Voltage drop		V		<1	2	<1		
Delays		First-up		ms		1000	1200	75
		Response		ms		150	250	30
		Recovery		ms		1000	250	30
Deviation angle from 90° of the object to be detected				± 10° on 305 x 305 mm		± 5°		

Setup

Minimum mounting distances

Side by side



e: respect the distances indicated on the detection curves shown on page 32.
e ≥ 2x detection curve width

Application

Sensors for monitoring 2 levels

Plastic case, cylindrical type and flat format

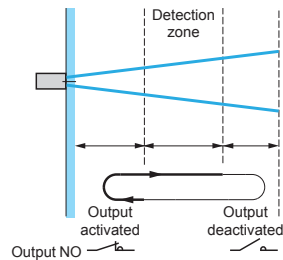
d.c. supply, solid-state output

Operating Curves

Operating curves

VM1•PO

Emptying (pump-out)

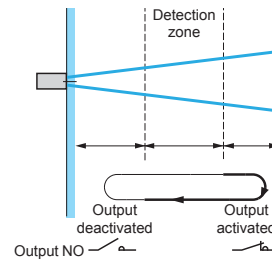


Output NO

Bold line indicates output is active and amber LED is "on".

VM1•PI

Filling (pump-in)

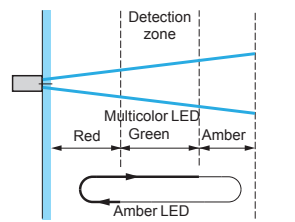


Output NO

(1) LED indicator.

SM9•2A•03000

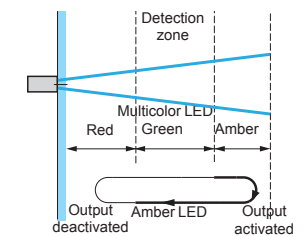
Emptying (pump-out)



Output NO
Output NC

SM9•2A•13000

Filling (pump-in)

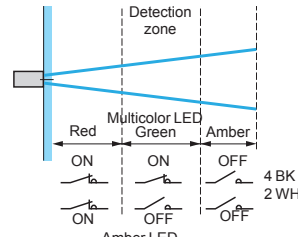


Output NO
Output NC

Bold line indicates pin 4/BK is closed and amber LED is "on".

SM9•2A•24000

3 levels, 2 independent outputs

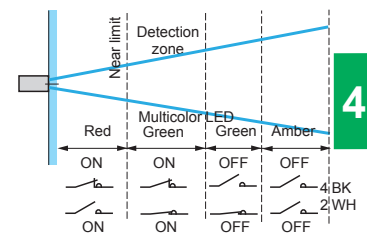


4 BK
2 WH

Amber LED is "on" when pin 4/BK is closed.

SM9•2A•84000

4 levels, 2 independent outputs

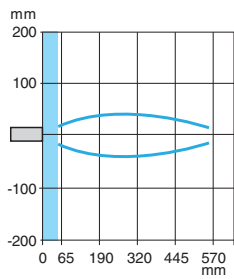


4 BK
2 WH

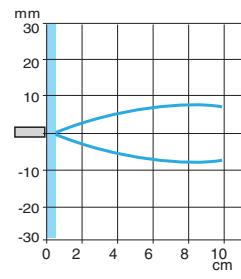
4

Detection curves

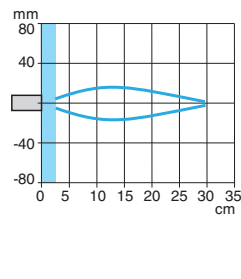
VM1•



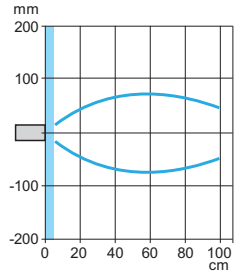
SM3•2A•



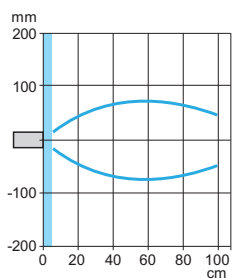
SM6•2A•



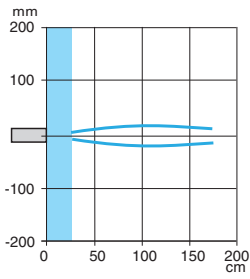
XX2V3A•



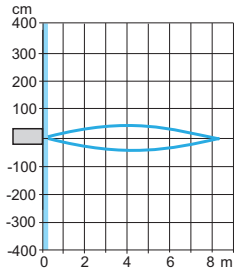
SM9•2A•



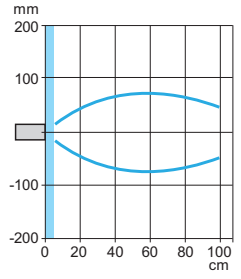
SM9•2A4•



SM9•2A8•



XX2D1•



Blind zone

OsiSense® SM, VM and XX Ultrasonic sensors

Application

Sensors for monitoring 2 levels

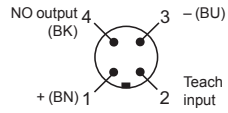
Plastic case, cylindrical type and flat format

d.c. supply, solid-state output

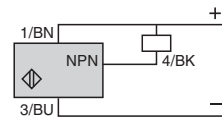
Wiring diagrams

M12 connector

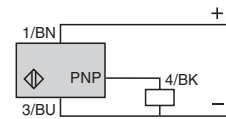
VM1●●



NO output, NPN

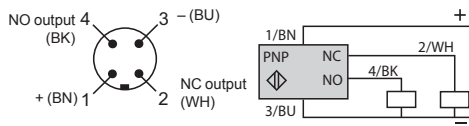


NO output, PNP

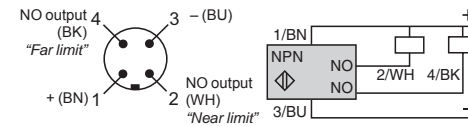


SM952A●

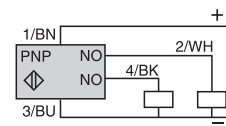
NO + NC outputs, PNP



NO + NO outputs, NPN



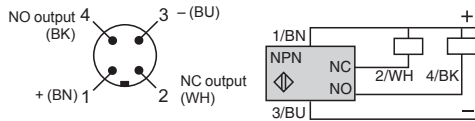
NO + NO outputs, PNP



BN (Brown) WH (White) BU (Blue) BK (Black)

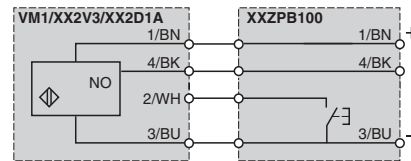
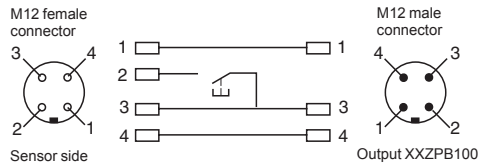
SM952A●

NO + NC outputs, NPN



BN (Brown) WH (White) BU (Blue) BK (Black)

XXZPB100 (teach pushbutton for VM1●, XX2V3●, XX2D1A●)



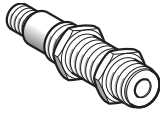
OsiSense® SM, VM and XX Ultrasonic sensors

Application

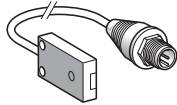
Sensors for thru-beam

Plastic case, cylindrical type and flat format

d.c. supply, solid-state output



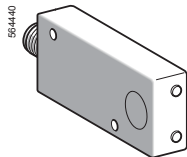
SM4•0A



SM4•0AFP



SM8•0A



SM8•0AFP

Fixed sensing distance—Cylindrical thru-beam sensors

Sensors	Sensing distance (Sn) mm (in.)	Model	Function	Connection	Output	Catalog Number	Weight	
							kg	(lb)
ø 12	101.6 (4.0)	Emitter		(2)	PNP/NPN	SM4•0A0400	0.011	(0.02)
	101.6 (4.0)	Receiver	NO (1)	(2)	PNP/NPN	SM4•1A0400	0.011	(0.02)
	203 (8.0)	Emitter		(2)	PNP/NPN	SM4•0A0800	0.011	(0.02)
	203 (8.0)	Receiver	NO (1)	(2)	PNP/NPN	SM4•1A0800	0.011	(0.02)
ø 18	101.6 (4.0)	Emitter		(3)	PNP/NPN	SM8•0A0400 (4)	0.011	(0.02)
	101.6 (4.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A0400 (4)	0.011	(0.02)
	305 (12.0)	Emitter		(3)	PNP/NPN	SM8•0A1200 (4)	0.033	(0.07)
	305 (12.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A1200 (4)	0.033	(0.07)
	610 (24.0)	Emitter		(3)	PNP/NPN	SM8•0A2400 (4)	0.033	(0.07)
	610 (24.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A2400 (4)	0.033	(0.07)
	1 m (39.4)	Emitter		(3)	PNP/NPN	SM8•0A4000 (4)	0.033	(0.07)
	1 m (39.4)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A4000 (4)	0.033	(0.07)

Fixed sensing distance—Flat-profile thru-beam sensors

7.6 x 19 x 33	101.6 (4.0)	Emitter		(2)	PNP/NPN	SM4•0A0400FP	0.011	(0.02)
	101.6 (4.0)	Receiver	NO (1)	(2)	PNP/NPN	SM4•1A0400FP	0.011	(0.02)
	203 (8.0)	Emitter		(2)	PNP/NPN	SM4•0A0800FP	0.011	(0.02)
	203 (8.0)	Receiver	NO (1)	(2)	PNP/NPN	SM4•1A0800FP	0.011	(0.02)
16 x 30 x 74	101.6 (4.0)	Emitter		(3)	PNP/NPN	SM8•0A0400FP	0.011	(0.02)
	101.6 (4.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A0400FP	0.011	(0.02)
	305 (12.0)	Emitter		(3)	PNP/NPN	SM8•0A1200FP	0.033	(0.07)
	305 (12.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A1200FP	0.033	(0.07)
	610 (24.0)	Emitter		(3)	PNP/NPN	SM8•0A2400FP	0.033	(0.07)
	610 (24.0)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A2400FP	0.033	(0.07)
	1 m (39.4)	Emitter		(3)	PNP/NPN	SM8•0A4000FP	0.033	(0.07)
	1 m (39.4)	Receiver	NO (1)	(3)	PNP/NPN	SM8•1A4000FP	0.033	(0.07)

Accessories

Cabling accessories (4-wire output) (1)

Connectors	Type		Length (m)	Catalog Number	Weight kg (lb)
M8, 4-pin	ø 12	Straight	2	XZCP0941L2 (5)	0.080 (0.18)
		Elbowed	2	XZCP1041L2 (5)	0.080 (0.18)
M12	ø 18, ø 30	Straight	2	XZCP1141L2 (5)	0.090 (0.20)
		Elbowed	2	XZCP1241L2 (5)	0.090 (0.20)

Mounting accessories

Description	For use with sensor	Catalog Number	Weight kg (lb)	
Mounting clamp	ø 18	XSZB118	0.010 (0.02)	
90° mounting bracket	ø 18	XUZA118	0.038 (0.08)	
3D mounting kit	M12 rod	ø 18 and ø 30	XUZ2001	0.050 (0.11)
	Support for M12 rod	ø 18 and ø 30	XUZ2003	0.160 (0.35)
	Ball-joint mounted mounting bracket	ø 18	XUZB2003	0.175 (0.39)

(1) For normally closed (NC) function, change the last two digits from "00" to "10".

(2) Replace • with "0" for pre-cabled version, "5" for M8 connector or "8" for M12 connector.

(3) Replace • with "0" for pre-cabled version or "5" for M12 connector.

(4) Add "S" to the end of the catalog number for stainless steel 303 case.

(5) Replace "L2" with "L5" for 5 m "L10" for 10 m cable, or M12 for M12 connector.

4

OsiSense[®] SM, VM and XX Ultrasonic sensors

Application

Sensors for thru-beam

Plastic case, cylindrical type and flat format

d.c. supply, solid-state output

Sensor type		SM4●0●●	SM4●1●●	SM8●0●●	SM8●0●●S	SM8●1●●	SM8●1●●S
Specifications							
Product certifications		CE, UL					
Conformity to standards		IEC 60947-5-2					
Connection		Connector		Pre-cabled, 4-pin M8 or M12		Pre-cabled, 4-pin M12	
Sensing range		mm (in.)	102–204 (4.02–8.0), fixed varies by model	102–1270 (4.02–50.0), fixed varies by model			
Nominal sensing distance (Sn)		mm (in.)	250 (9.84)	1270 (50.0)			
Differential travel		mm (in.)	< 2.5 (0.10)	< 2.5 (0.10)			
Blind zone (no object must pass through this zone while the sensor is operating)		mm (in.)	0.0 (0.0)	0.0 (0.0)			
Transmission frequency		kHz	500	200/500			
Repeat accuracy		mm (in.)	± 0.79 (0.03)	± 0.79 (0.03)			
Overall beam angle (see detection lobe)			10°	20° varies by model			
Minimum size of object to be detected		mm (in.)	Cylinder Ø 12.2 (0.48) up to a sensing distance of 200 (7.87)	Cylinder Ø 38 (1.50) up to a sensing distance of 600 (23.62) for SM8●A04●● Cylinder Ø 114 (4.49) up to a sensing distance of 1 m (39.37) for SM8●A08●●			
Degree of protection		Conforming to IEC 60529 and IEC 60947-5-2	IP 67				
Storage temperature		°C (°F)	-40 to +80 (-40 to +176)		0 to +60 (+32 to +140)		
Operating temperature		°C (°F)	-30 to +65 (-22 to +149)				
Materials		Case	PEI Plastic		SS303 Stainless Steel	PEI Plastic	SS303 Stainless Steel
		Sensing face	Epoxy		Silicone		
Vibration resistance		Conforming to IEC 60068-2-6	Amplitude ± 1 mm (f = 10–55 Hz)				
Mechanical shock resistance		Conforming to IEC 60068-2-27	30 gn, duration 11 ms, in all 3 axes				
Resistance to electromagnetic interference			Conforms to IEC 60947-5-2				
LED indicators		Output state	–	Dual color LED	–	Amber LED	
		Power on	Green LED	–	–	–	
		Setup Assistance	Amber LED	–	Amber LED	–	
Rated supply voltage		Vdc	12–24 V with protection against reverse polarity				
Voltage limits (including ripple)		Vdc	10–28 V				
Current consumption, no-load		mA	40				
Switching capacity		mA	<100, NO or NC				
Voltage drop		V	<1.1		<1		
Delays		First-up	ms	20	200		
		Response	ms	4	5		
		Recovery	ms	4	6		

Setup

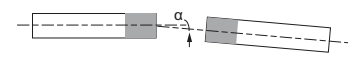
Minimum mounting distances

Alignment offset



$e \leq$ sensor body diameter

Face to face



5–25° depending upon sensor crystal frequency

OsiSense® SM, VM and XX Ultrasonic sensors

Application

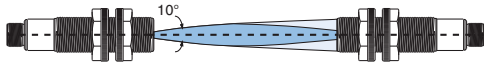
Sensors for thru-beam

Plastic case, cylindrical type and flat format
d.c. supply, solid-state output

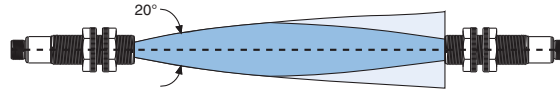
Operating Curves

Operating curves

SM4



SM8



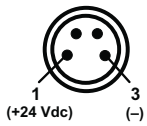
Transmitted Beam

Effective Received Beam

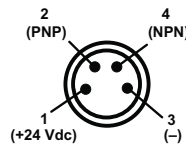
Wiring diagrams

M8 connector

SM450 Transmitter

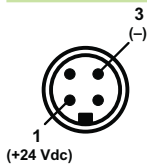


SM451 Receiver

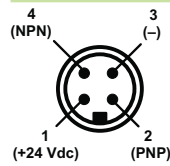


M12 connector

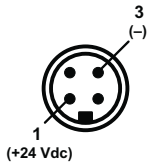
SM480 Transmitter



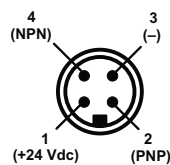
SM481 Receiver



SM850 Transmitter

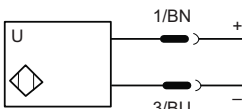


SM851 Receiver



Cable

SM400/SM800 Transmitter

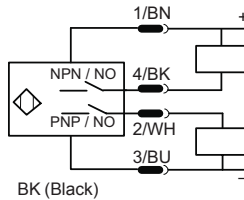


BN (Brown)

WH (White)

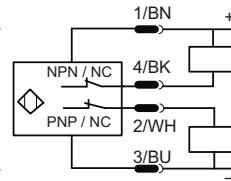
BU (Blue)

SM401/SM801 Receiver Normally Open (NO)



BK (Black)

SM401/SM801 Receiver Normally Closed (NC)



4

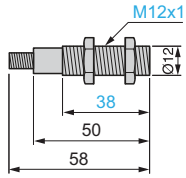
OsiSense® SM, VM and XX

Ultrasonic sensors

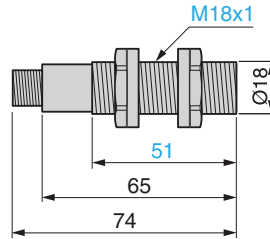
Cylindrical, M12 x 1, M18 x 1, M30 x 1.5

Dimensions (mm)

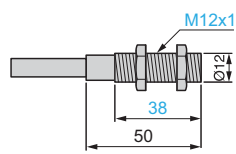
SM35 or 8●0A●/SM45 or 8●0A●



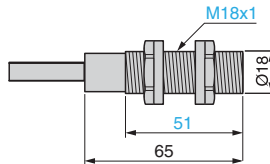
SM65●A●/SM85●A●



SM30●A●/SM40●A●

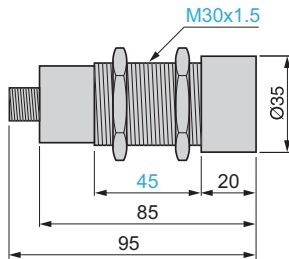


SM60●A●/SM80●A●

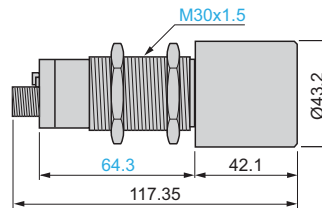


4

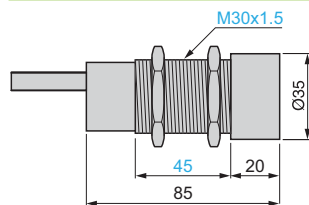
SM95●A1/SM9●●A4●



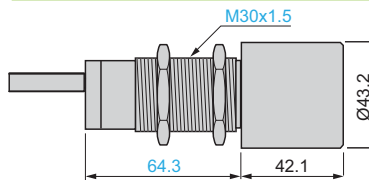
SM9●●A8●



SM90●A1●/SM90●A4●



SM90●A8●

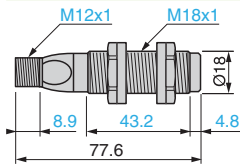


OsiSense® SM, VM and XX Ultrasonic sensors

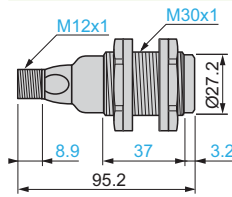
Cylindrical M12 x 1, M18 x 1, M30 x 1.5

Dimensions (mm)

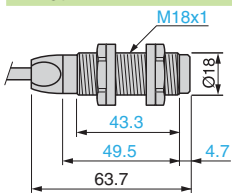
VM18●Q



XX●V3●●●●M12



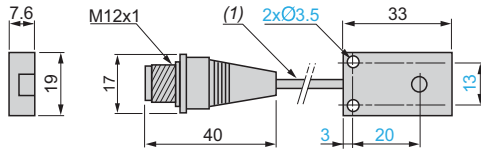
VM18●



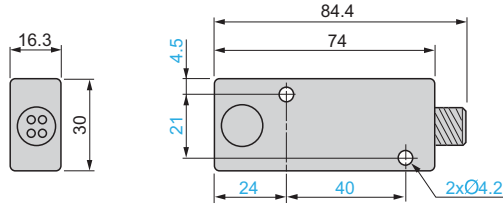
4

Dimensions (mm)

SM350A●FP/SM400A●FP

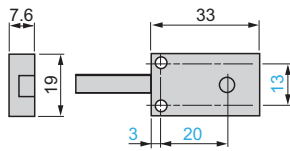


SM65●A●FP/SM85●A●FP

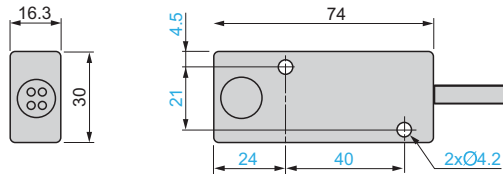


(1) Cable, length: 152 mm.

SM30●A●FP/SM40●A●FP

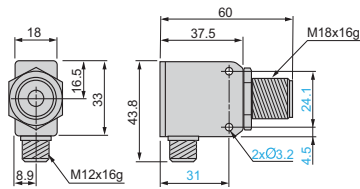


SM60●A●FP/SM80●A●FP●

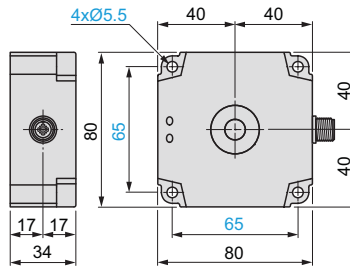


4

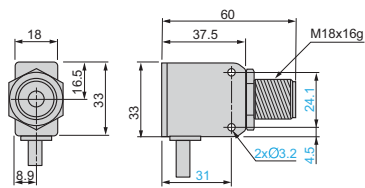
VM1●Q



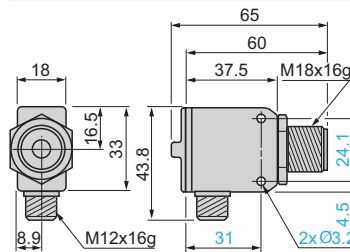
XX●D1●●●●M12



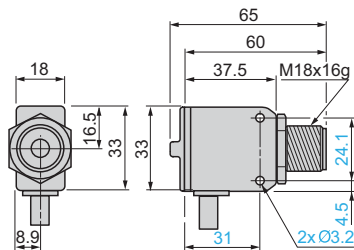
VM1●

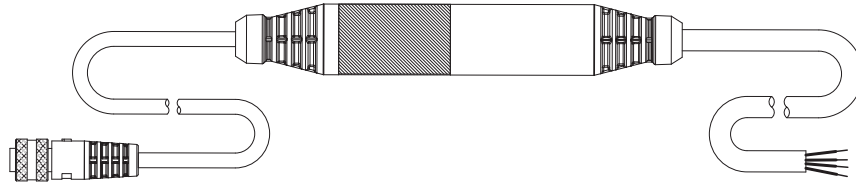


VM1●Q (analog models only)



VM1● (analog models only)





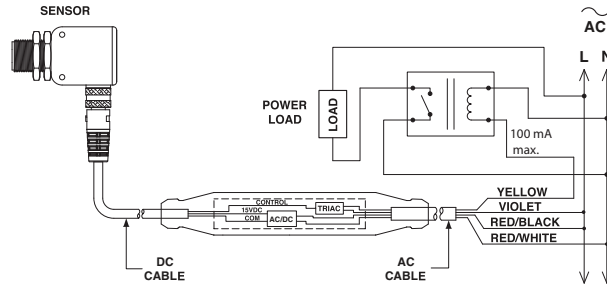
Catalog Number		
Sensor Type		PM100-01
Connection Type		4-pin, M8
Weight, kg (lb)		0.31 kg (0.70 lbs)
		PM100-02
Connection Type		4-pin, M12
Specifications		
Product certifications		CE, UL
Protection Ratings		IP67
Materials	Case	PVC Plastic
	Cable	AC: c.s.a 2 m x 0.7 mm ² (18 AWG) DC: 1 m x 0.3 mm ² (22 AWG)
Storage temperature		-40 to +85 °C (-40 to +185 °F)
Operating temperature		-25 to +60 °C (-13 to +140 °F)
AC power requirements	Supply Voltage	~ 100–240 Vac
	Current Consumption	38 mA max
	Power Consumption	4 VA max
DC output ratings (to sensor)	Minimum at rated current	~ 15 Vdc
	Maximum at no load	~ 20 Vdc
	Current max	100 mA
	Current fault	200 mA max
TRIAC switch ratings (1)	Switch voltage	~ 230 Vac
	Switch current	50 mA @ 230 Vac, 100 mA @ 120 Vac
	Peak repetitive surge current	1A (100 μS, 120 pps)
	On-state voltage	3 V max @ 100 mA
	Off-state leakage	500 nA max
	Holdling current	250 μA typical
	Critical rate of rise of off-state voltage	600 v/us min.
	Isolation surge voltage	~7500 Vac min, 60 Hz, 1 s
	Turn-on time, full load max voltage	15 ms max (zero-crossing)
	Turn-off time, full load max voltage	15 ms max (zero-crossing)
	Over-current protection	Internal fuse (non-replaceable)
Delays	On	10 ms
	Off	1 s

(1) Check relay or PLC input specifications before connection. Relay or PLC input load must be a minimum of 1200 ohms at 120 Vac/2400 ohms at 250 Vac to prevent irreversible damage to the Python™.

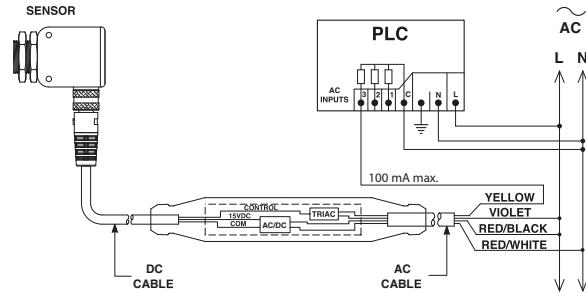
Operation

PM100-02

Driving Power Relay



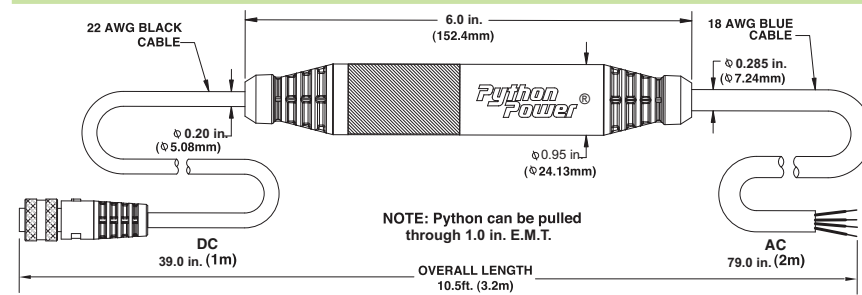
Typical PLC Connection



Applied AC load must limit the Python's TRIAC switch to rated current.

Dimensions, in. (mm)

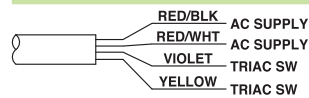
PM100-02



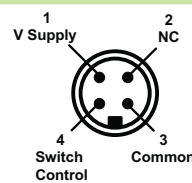
4

Wiring

AC Cable



4-pin M12 connector

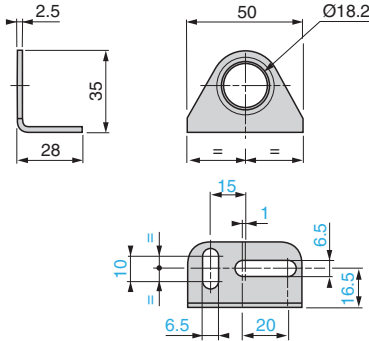


Dimensions (mm)

Accessories

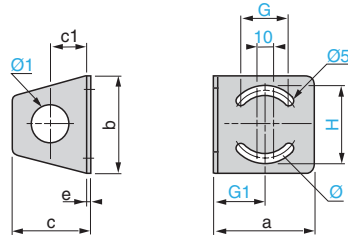
XUZA118

90° mounting bracket (Ø 18)



XXZ12, XXZ30

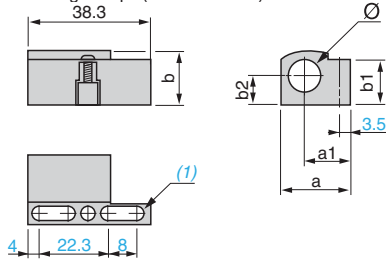
90° mounting bracket (Ø 12 and Ø 30)



XXZ	a	b	c	c1	e	H	G	G1	Ø	Ø1
12	35	40	33	18	2	31	18	18	25	13
30	67	65	52	25	3	51	35	33	50	31

XSZB112, XSZB118

Mounting clamps (Ø 12 and Ø 18)

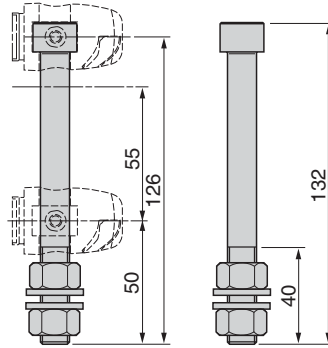


XSZ	a	a1	b	b1	b2	Ø
B112	21.9	14.5	16	15.5	8.5	12
B118	26	15.7	22.3	20.1	11.5	18

(1) 2 elongated holes Ø 4 x 8.

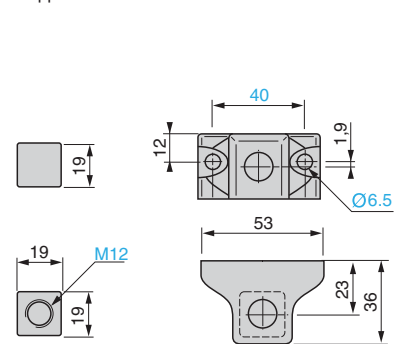
XUZ2001

M12 rod



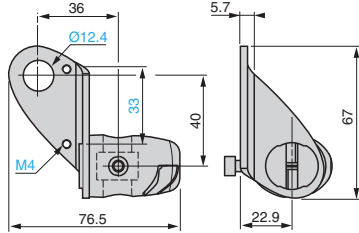
XUZ2003

Support for M12 rod



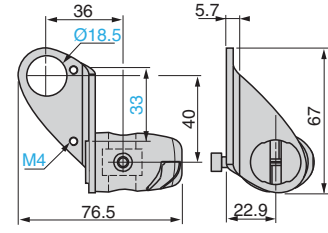
XUZB2012

Ball-joint mounted mounting bracket (Ø 12)



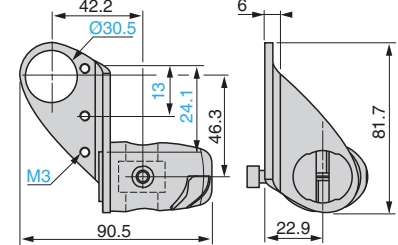
XUZB2003

Ball-joint mounted mounting bracket (Ø 18)



XUZ2030

Ball-joint mounted mounting bracket (Ø 30)

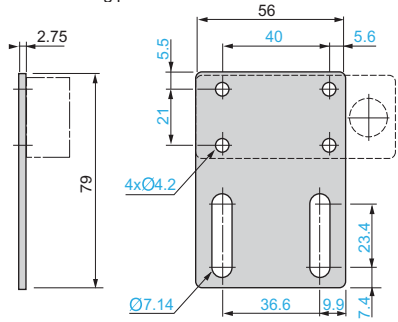


Dimensions (mm)

Accessories

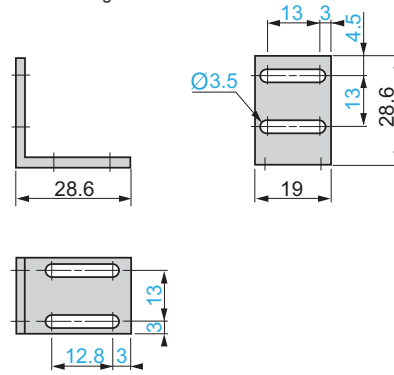
XXZ3074S

Flat mounting plate

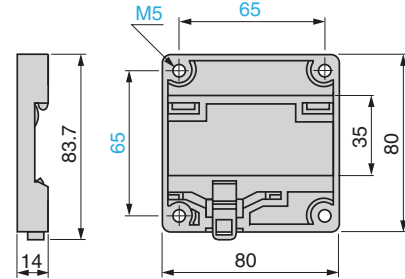


XXZ1933

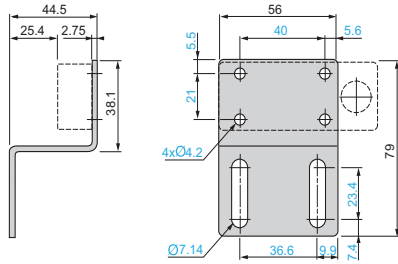
90° mounting bracket



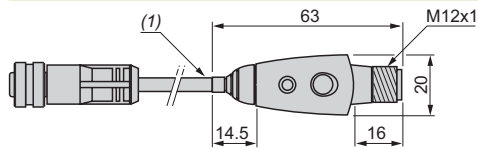
XSZBD10



XXZ3074F



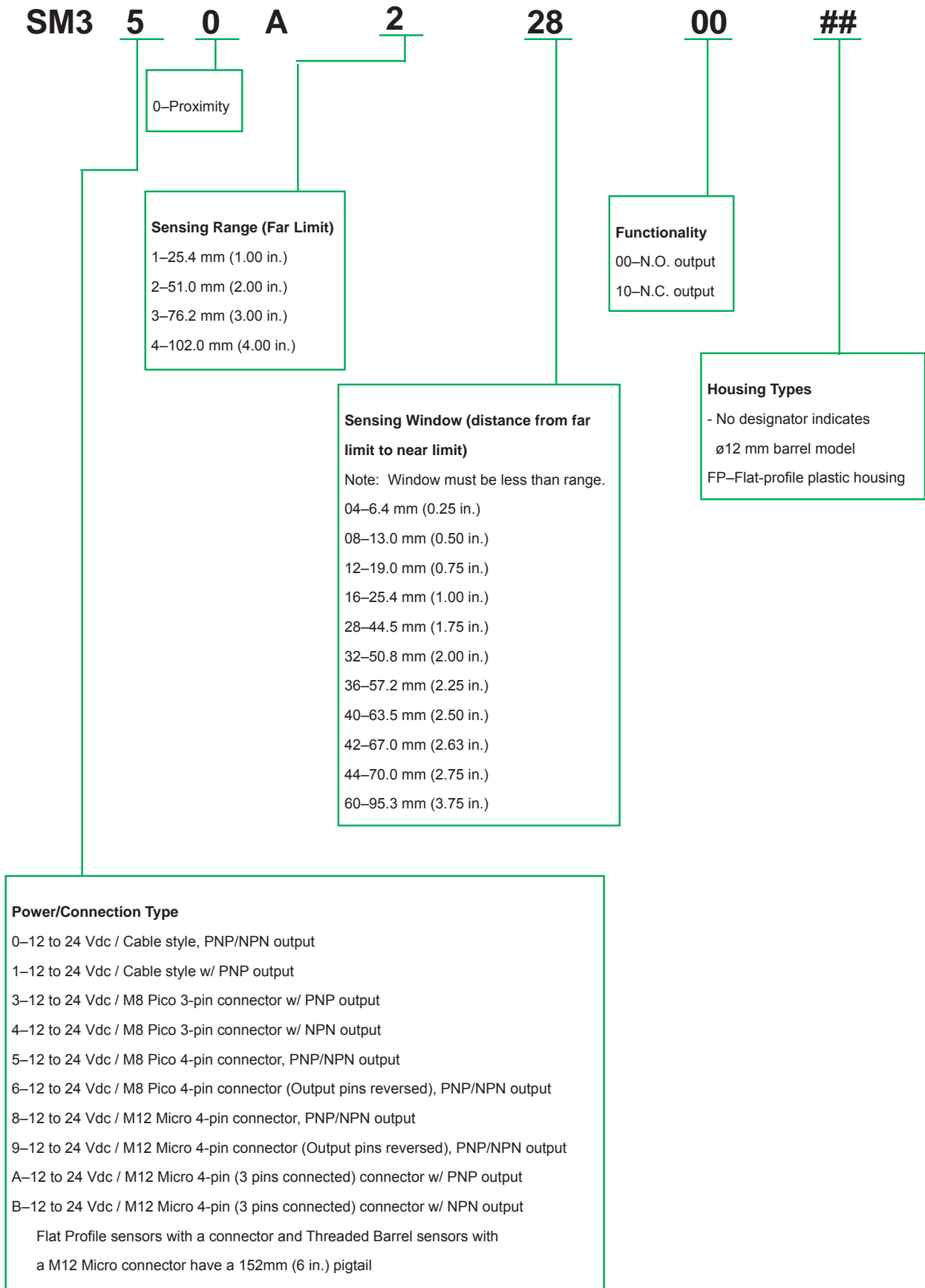
XXZPB100/XXZPB101



4

OsiSense® SM, VM and XX Ultrasonic sensors

Superprox® Ultrasonic Proximity Sensors
Model SM300 Series—Proximity



OsiSense[®] SM, VM and XX Ultrasonic sensors

Superprox[®] Ultrasonic Proximity Sensors
Model SM600 Series—Proximity

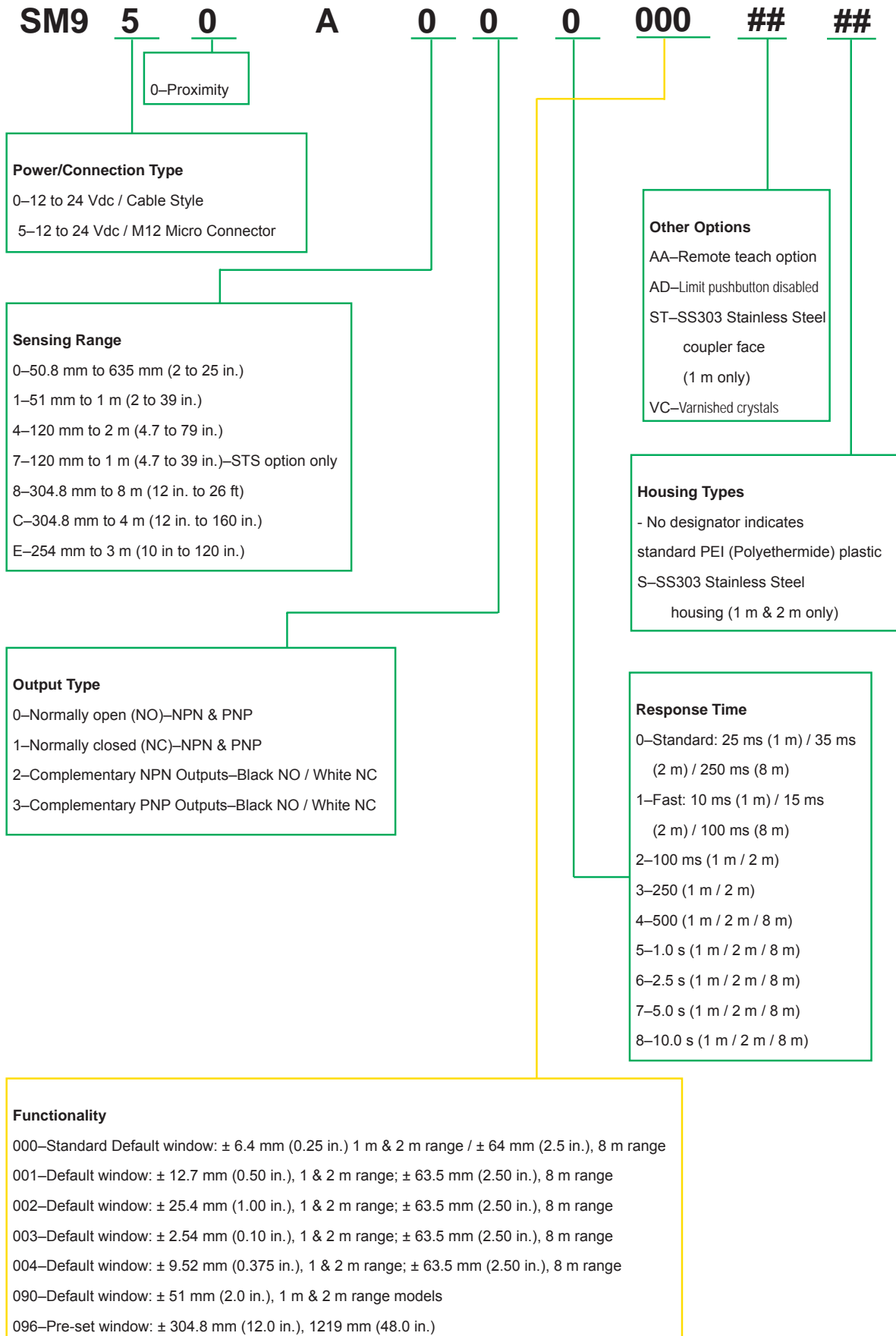


4

Some possible sensor options are not listed here

OsiSense® SM, VM and XX Ultrasonic sensors

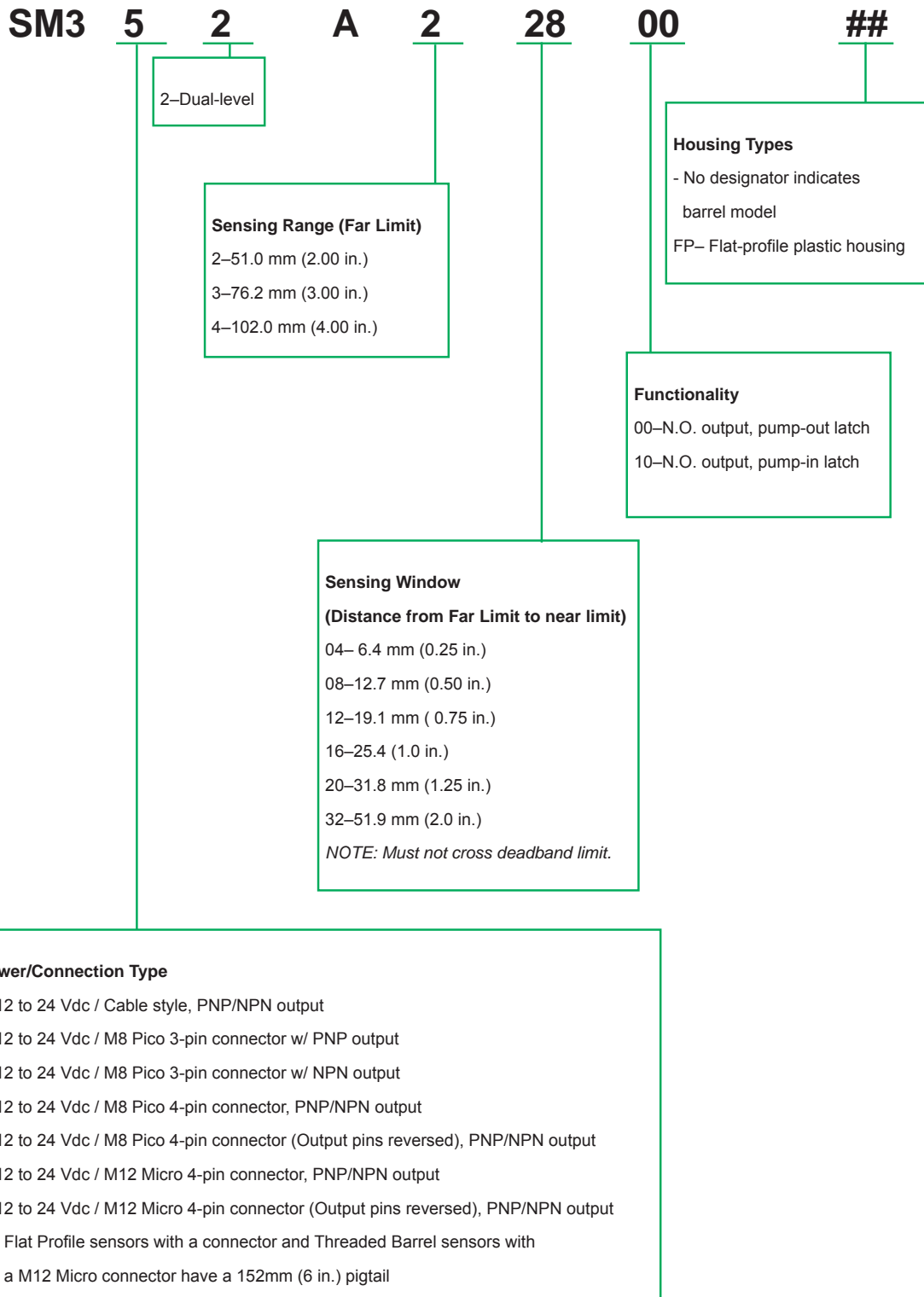
Superprox® Ultrasonic Proximity Sensors
Model SM900 Series—Proximity



Some possible sensor options are not listed here

OsiSense[®] SM, VM and XX Ultrasonic sensors

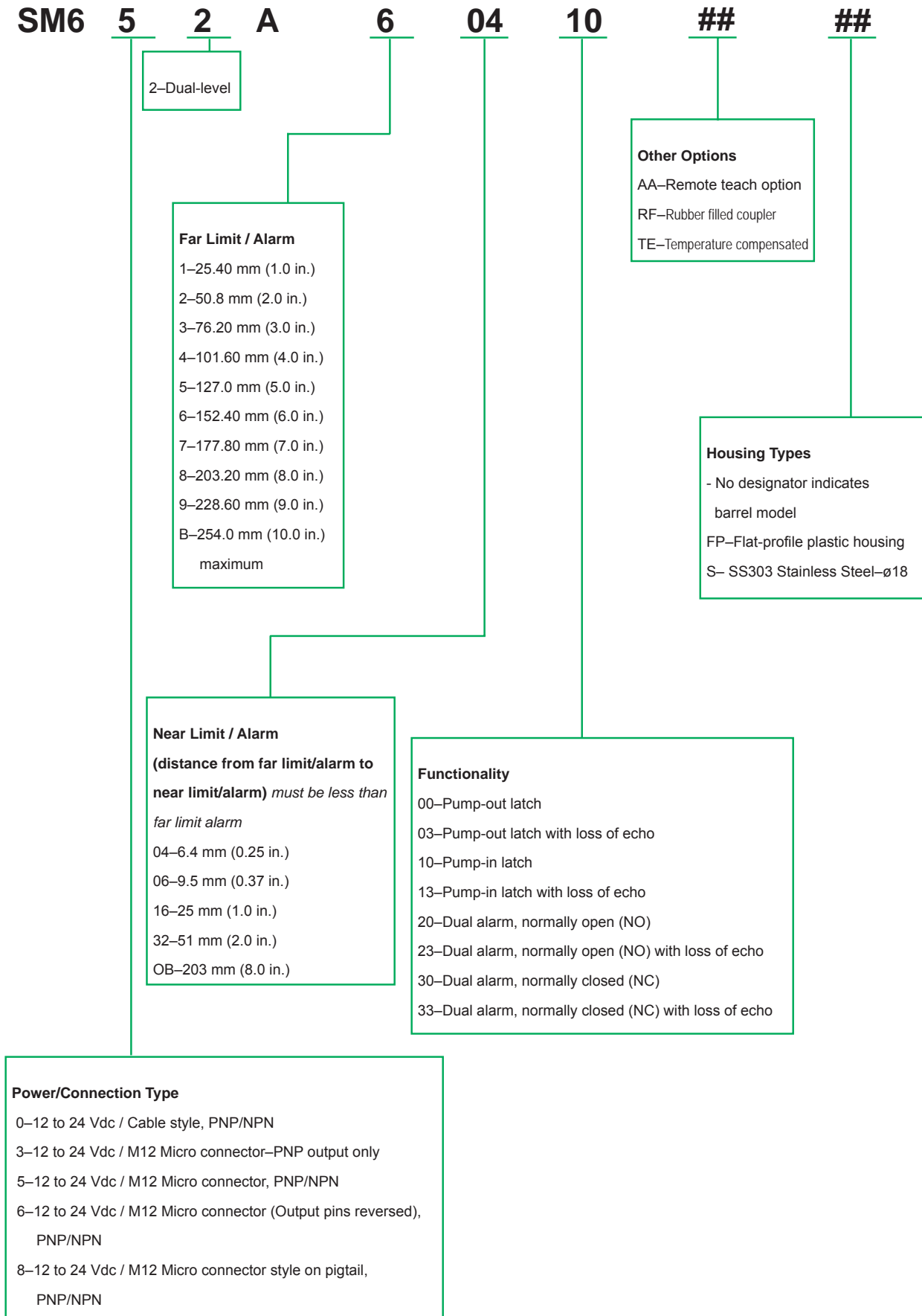
Superprox[®] Ultrasonic Proximity Sensors
Model SM302 Series—Dual-level



4

OsiSense[®] SM, VM and XX Ultrasonic sensors

Superprox[®] Ultrasonic Proximity Sensors
Model SM602 Series–Dual-level



Some possible sensor options are not listed here

OsiSense[®] SM, VM and XX Ultrasonic sensors

Superprox[®] Ultrasonic Proximity Sensors
Model SM902 Series—Dual-level

SM9 5 2 A 1 0 0 0 00 ## ##

0—Dual-level

Power/Connection Type

0—12 to 24 Vdc / Cable Style
5—12 to 24 Vdc / M12 Micro Connector

Sensing Range

1—51 mm to 1 m (2 to 39 in.)
4—120 mm to 2 m (4.7 to 79 in.)
7—120 mm to 1 m (4.7 to 39 in.)—STS option only
8—305 mm to 8 m (12 in. to 26 ft)
C—304.8 mm to 4 m (12 in. to 160 in.)
E—254 mm to 3 m (10 in to 120 in.)

Level Control Function

0—Pump-out latch 4—Pump-in latch, with alarm
1—Pump-in latch 5—Pump-out latch, with alarm
2—Dual setpoint 6—Pump-in latch, with setpoint
3—Dual alarm 7—Pump-out latch, with setpoint
8—Tri-setpoint; Quad level

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—1.0 s (1 m) / 1.5 s (2 m)
4—500 ms (1 m and 2 m)

Other Options

AA—Remote teach option
AD—Limit pushbutton disabled
ST—Stainless Coupler Face
(1 m only)

Functionality

00—Standard default window: ± 6.35 mm (0.25 in.),
1 m and 2 m; ± 63.5 mm (2.50 in.), 8 m
02—Default window, ± 6.35 mm (0.25 in.), 1 m and
2 m; ±63.5 mm (2.50 in.), 8 m; outputs "ON" on
loss of echo
04—Default window, ± 9.52 mm (0.375 in.), 1 m and
2 m; outputs off on loss of echo

Output Type

Level control functions 0 and 1

(pump in/out units without alarm or setpoint)

0—Normally open (NO), PNP & NPN
1—Normally closed (NC), PNP & NPN
2—Complementary NPN outputs
3—Complementary PNP outputs

Level control functions 2 and 3

(dual alarm/dual setpoint units)

4—Normally open (NO), NPN
5—Normally closed (NC), NPN
6—Normally open (NO), PNP
7—Normally closed (NC), PNP

Level control functions 4 through 7

(pump units with alarm or setpoint)

4—NO control and alarm/setpoint, NPN
5—NC control and alarm/setpoint, NPN
6—NO control and alarm/setpoint, PNP
7—NC control and alarm/setpoint, PNP
8—NO control, NC alarm/setpoint, NPN
9—NC control, NO alarm/setpoint, NPN
A—NO control, NC alarm/setpoint, PNP
B—NC control, NO alarm/setpoint, PNP

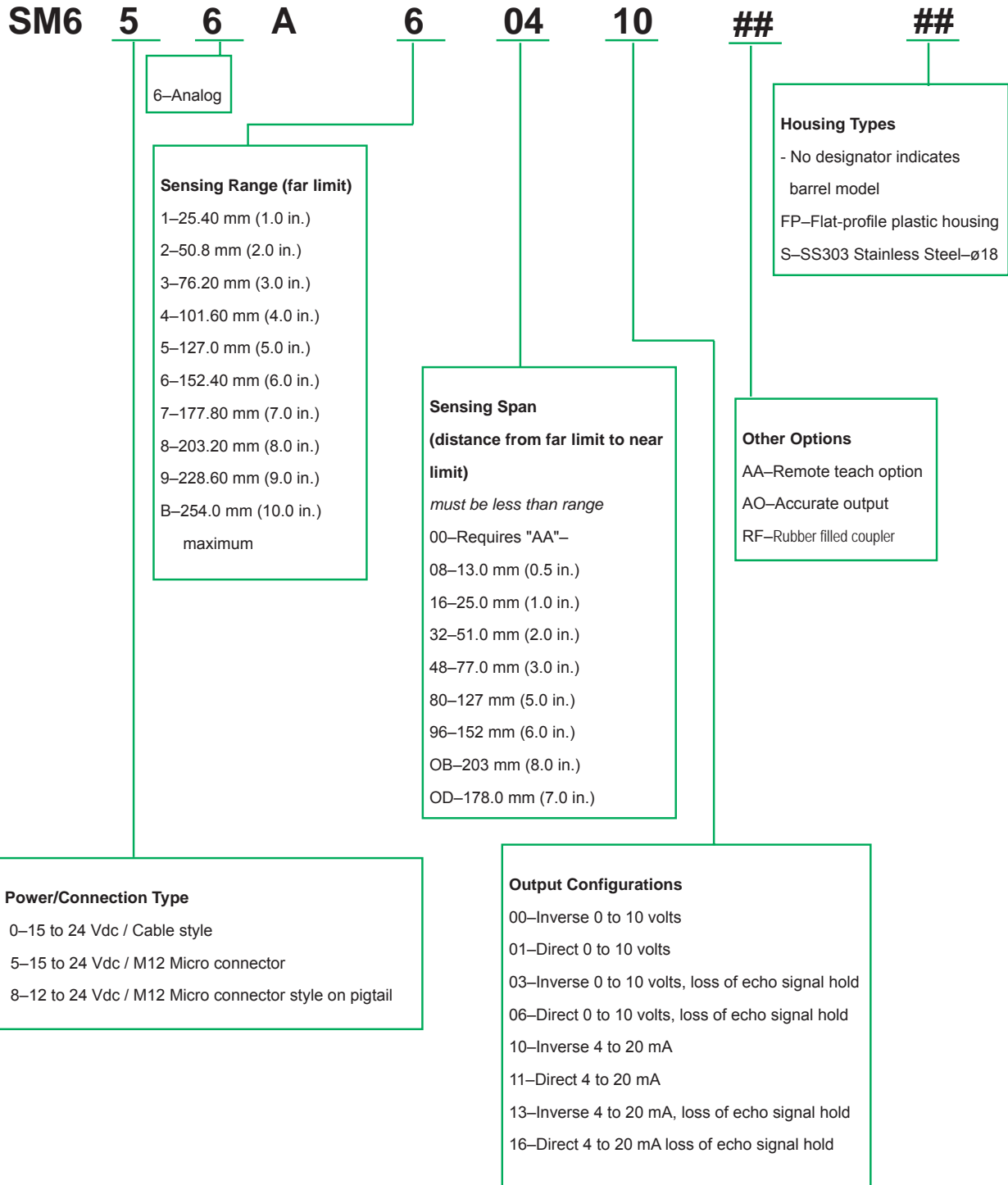
Housing Types

- No designator indicates
standard PEI (Polyetherimide) plastic
S—SS303 Stainless Steel
housing (1 m & 2 m only)

4

OsiSense® SM, VM and XX Ultrasonic sensors

Superprox® Ultrasonic Proximity Sensors
Model SM606 Series—Analog



OsiSense[®] SM, VM and XX Ultrasonic sensors

Superprox[®] Ultrasonic Proximity Sensors
Model SM906 Series—Analog

SM9 5 6 A 1 0 0 0 00 ## ##

0—Analog

Power/Connection Type
0—12 to 24 Vdc / Cable Style
5—12 to 24 Vdc / M12 Micro Connector

Sensing Range
1—51 mm to 1 m (2 to 39 in.)
4—120 mm to 2 m (4.7 to 79 in.)
7—120 mm to 1 m (4.7 to 39 in.)—STS option only
8—304.8 mm to 8 m (12 in. to 26 ft)
C—304.8 mm to 4 m (12 in. to 160 in.)
E—254 mm to 3 m (10 in to 120 in.)

Output Signal

0—Inverse 0 to 10 V	6—Inverse 0 to 20 mA
1—Direct 0 to 10 V	7—Direct 0 to 20 mA
2—Inverse 4 to 20 mA	8—Autoslope 0 to 10 V
3—Direct 4 to 20 mA	9—Autoslope 4 to 20 mA
4—Inverse 0 to 5 V	
5—Direct 0 to 5 V	

Output State for Loss of Echo on 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

Other Options
AA—Remote teach option
AD—Limit pushbutton disabled
ST—Stainless steel coupler face (1 m only)
TF—Low temp -40° C (-40° F) operation
VC—Varnished crystals

Response Time

- 0—Standard: 25 ms (1 m) / 35 ms (2 m) / 250 ms (8m)
- 1—Fast: 15 ms (1 m) / 20 ms (2 m) / 150 ms (8m)
- 2—100 ms (1 m and 2 m)
- 3—250 ms (1 m and 2 m)
- 4—500 ms (1 m, 2 m and 8 m)
- 5—1.0 s (1 m, 2 m and 8 m)
- 6—2.5 s (1 m, 2 m and 8 m)
- 7—5.0 s (1 m, 2 m and 8 m)
- 8—10.0 s (1 m, 2 m and 8 m)
- P—User programmable response

11 selectable ranges

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
- 58—Preset window: 12.19 mm (48.0 in.), 1753 mm (69.0 in.)

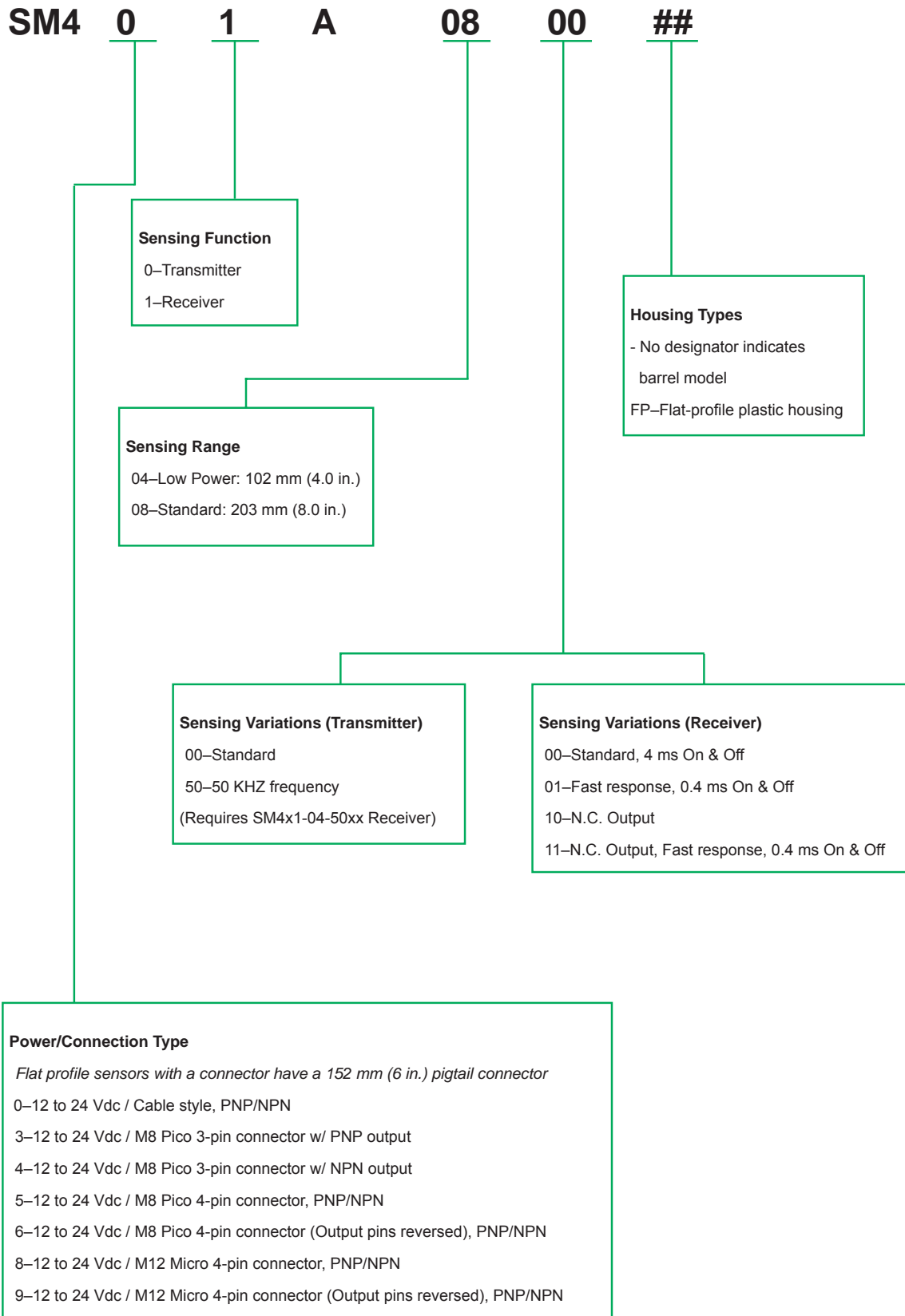
Housing Types

- No designator indicates standard PEI (Polyetherimide) plastic
- S—SS303 Stainless Steel housing (1 m & 2 m only)

4

OsiSense® SM, VM and XX Ultrasonic sensors

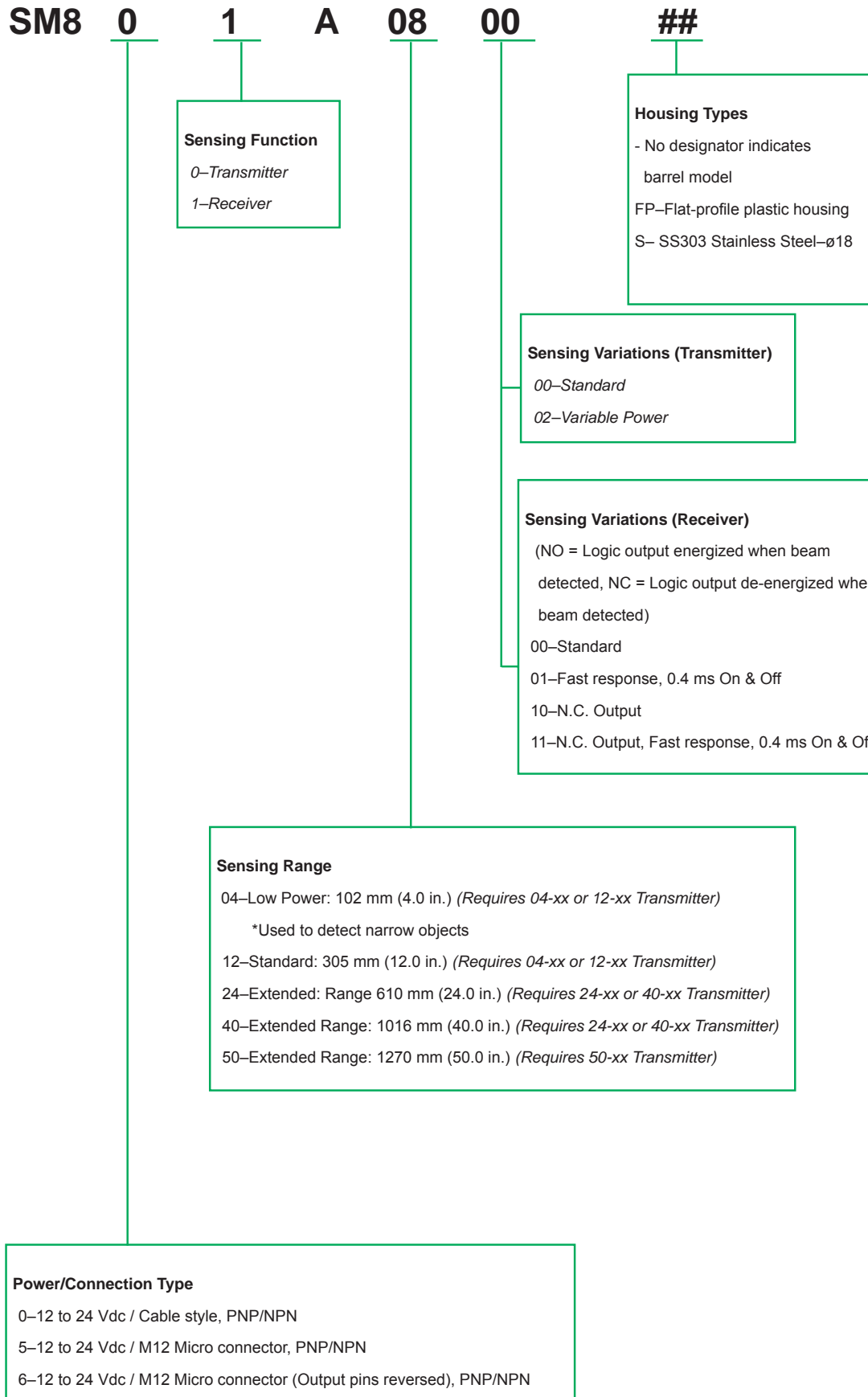
Superprox® Ultrasonic Proximity Sensors
Model SM400 Series–Thru-beam



4

OsiSense[®] SM, VM and XX Ultrasonic sensors

Superprox[®] Ultrasonic Proximity Sensors
Model SM800 Series—Thru-beam



4