

Installation Instructions

Ultrasonic Single Analog Output Sensors

IMPORTANT: SAVE THESE INSTRUCTIONS FOR FUTURE USE.

Specifications

Model	873P-D18 ^① -400-D4	873P-D18 ^① -900-D4	873P-D18 ^① -2200-D4	873P-D30 ^① -2500-D4	873P-D30 ^① -3500-D4	873P-D30 ^① -6000-D4
Certifications	cULus Listed and CE Marked for all applicable directives					
Rated Sensing Distance	50...400 mm ^② (1.97...15.7 in.)	100...900 mm ^③ (3.94...35.4 in.)	200...2200 mm ^③ (7.87...88.6 in.)	200...2500 mm ^③ (7.87...98.4 in.)	250...3500 mm ^③ (9.87...137.8 in.)	350...6000 mm ^④ (13.8...236.2 in.)
Teachable Sensing Range	50...400 mm ^② (1.97...15.7 in.)	100...900 mm ^③	200...2200 mm ^③	200...2500 mm ^③	250...3500 mm ^③	350...6000 mm ^④
Blind Zone	0...50 mm (0...1.97 in.)	0...100 mm (0...3.94 in.)	0...200 mm	0...200 mm	0...250 mm	0...350mm
Beam Angle	±8°	±7°		14° ±1°	15° ±2°	
Sensitivity Adjustment	Push button					
Linearity	<1% of full scale value					
Resolution	1 mm (0.04 in.)	2 mm (0.08 in.)	3 mm (0.12 in.)	2 mm (0.08 in.)	4 mm (0.16 in.)	6 mm (0.24 in.)
Accuracy	0.1% of sensing range					
Hysteresis	<1% of full scale value					
Ripple	5%					
Current Consumption	≤50 mA					
Output Type ^①	AV or AI					
Transducer Frequency	300 kHz		200 kHz	150 kHz	112 kHz	75 kHz
Response Time	500 ms			600 ms		
Time Delay before Availability	≤900 ms			≤1400 ms		
Electrical Protection	Polarity reversal, transient noise, short circuit, overload					
Minimum Load (analog voltage)	3 kΩ					
Maximum Current (analog voltage output)	40 mA					
Temperature Range	-20...+60° C (-4...+140° F)			-20...+70° C (-4...+158° F)		
Temperature Compensation	Yes					
Temperature Drift	±5%					
Housing Material	Plastic—PBT					
Active Head Material	Epoxy—glass resin					
Ingress Protection Rating	IP67 (EN 60529)					

- ① **AV**—Analog voltage (0...10V DC) or **AI**—Analog current (4...20 mA)
- ② Metallic target 100 x 100 mm (3.94 x 3.94 in.)
- ③ Metallic target 200 x 200 mm (7.87 x 7.87 in.)
- ④ Metallic target 400 x 400 mm (15.75 x 15.75 in.)

Operating Voltage	Catalog Numbers
12...30V DC	873P-D30AI-2500-D4, 873P-D30AI-3500-D4, 873P-D30AI-6000-D4
15...30V DC	873P-D18AV-400-D4, 873P-D18AI-400-D4, 873P-D18AV-900-D4, 873P-D18AI-900-D4, 873P-D18AV-2200-D4, 873P-D18AI-2200-D4, 873P-D30AV-2500-D4, 873P-D30AV-3500-D4, 873P-D30AV-6000-D4

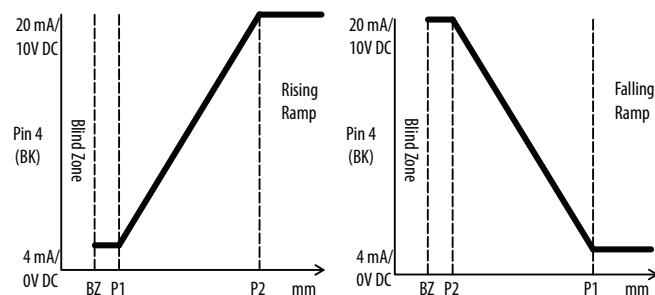
IMPORTANT

The 873P sensor is a one set point mode with a maximum sensing range from the factory.



Window Mode

In this sensing mode, you teach the sensor a near set point and far set point within the defined sensing range of the sensor. P1 and P2 define the analog output slope. P1 determines the 4 mA/0V DC position and P2 determines the 20 mA/10V DC position. The analog output is scaled between the two taught set points.



Rising ramp: current or voltage values increase as the target distance increases from the sensor.

Falling ramp: current or voltage values decrease as the target distance increases from the sensor.

Set Point 1 (P1)

1. Place target at the desired near/far set point.
 - a. The near set point first yields a rising ramp.
 - b. The far set point first yields a falling ramp.

2. With the target still in place, press the teach button, then release.

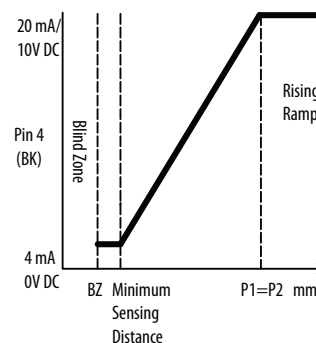
The yellow and green LEDs flash simultaneously, indicating that the first set point P1 is now set. The sensor is waiting for the last set point.

Set Point 2 (P2)

1. Place the target at the desired far/near set point.
2. Press the teach button and release. The sensor is ready to operate.

One Set Point Mode

In this sensing mode, a set point is taught in the defined sensing range. The working range of the sensor becomes the minimum sensing distance to a user-taught set point. Depending on where the set point is taught, the output will turn ON when the target passes between the minimum sensing distance of the sensor and the taught set point. The analog output is scaled between those two set points. **When using the One Set Point mode, it is only possible to configure the sensor for rising ramp analog output. It is not possible to configure the sensor for a falling ramp.**



1. Place the target at the desired set point.
2. Press and release the teach button. The yellow and green LEDs flash simultaneously, indicating that the sensor has learned the set point.
3. Keeping the target in the same position, press and release the teach button. The yellow LED blinks twice to indicate that the **sensor is ready for use**. The minimum sensing distance is indicated in the Specifications table.

IMPORTANT

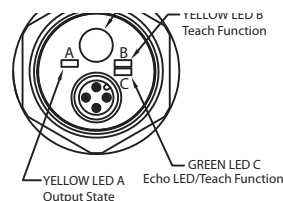
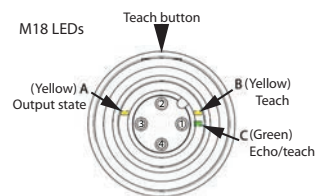
When configuring the sensor for One Set Point mode, it is very important that the target is at the **exact** same distance for both the first and second push of the teach button. If the target (or sensor) has moved even slightly, the detected ranges will be different for the two pushes of the teach button, and the sensor will be configured for Window Mode.

IMPORTANT

The green and yellow LEDs flash asynchronously for about two seconds indicating there is no target present within the sensing range of the sensor and therefore no set point to teach. When this happens, the 873P ignores this teach attempt and restores its previous settings. By comparison, when an object is detected during the teach, the yellow and green LEDs flash synchronously and continue flashing until the second push of the teach button.

Single Analog Output Indicator LED Functions

LED	Color	Function
A	Yellow	Output state
B	Yellow	Teach function
C	Green	ECHO LED/ Teach function



Single Analog Output			
Operating Mode	Green LED (Alignment)	Yellow LED A (Output)	Yellow LED B (Teach)
Standard Operation			
Target present	ON ❶	ON ❷ or OFF ❸	OFF
Target absent	ON/OFF ❶	ON ❷ or OFF ❸	OFF

- ❶ Green LED indicates that an echo is reflected back to the sensor by an object, not necessarily the target. Its primary use is for alignment.
- ❷ If rising ramp
- ❸ If falling ramp

Other Functions

Hold Function

The Hold function inhibits sensor operation and holds the output to its present state.

Analog Output: If the HOLD pin is connected to the NEG, the ultrasonic wave emission is stopped and the analog output is frozen in the present state. If the SYNC pin is connected to the POS or not connected, the sensor operates normally.

Lockout Feature for Teach Button

The lockout feature locks the push button to prevent unwanted teaching of the sensor.

Lock Teach Button: Press the teach button for eight seconds, until the yellow LEDs A and B flash alternately with the green LED C. Release the teach button. The push button is now locked.

Unlock Teach Button: Press the teach button for eight seconds, until the yellow LEDs A and B flash alternately with the green LED C. Release the teach button. It is once again possible to teach the sensor.

Synchronization of Ultrasonic Sensors

In this mode, all sensors are connected to a same output on the PLC. A SYNC pulse simultaneously drives all sensors connected to the output on the PLC. When mounting the sensors, attention must be paid to a minimum distance between the sensors; said distance varies depending on the type(s) of sensors used (see below). The target must be positioned at the same distance from each synchronized sensor; the target position should overall be flat. When mounted correctly, the synchronized sensors perform like a single sensor with an extended detection angle.

How it Works:

Connect Pin 2 (white) to all the sensors you want to synchronize. All sensors will trigger at the same time. Any eventual crosstalk signal related to a longer sensing distance will be ignored. An external synchronization pulse controls the sensors.

All minimum distances depend on target distance and material. "T" is the pulse time period applied on the SYNC wire; "Width" refers to the pulse width.

- **400 mm Sensing Range Sensors**
 $T \geq 4 \text{ msec}$
 $500 \mu\text{sec} \leq \text{Width} \leq 1 \text{ msec}$
 Minimum distance between sensors: 50...100 mm.
- **900 mm Sensing Range Sensors**
 $T \geq 7.5 \text{ msec}$
 $500 \mu\text{sec} \leq \text{Width} \leq 1 \text{ msec}$
 Minimum distance between sensors: 30...50 mm.

- **2200 mm Sensing Range Sensors**

$T \geq 17.5 \text{ msec}$
 $500 \mu\text{sec} \leq \text{Width} \leq 1 \text{ msec}$
 Minimum distance between sensors: 30...40 mm.

- **2500 mm Sensing Range Sensors**

$T \geq 25 \text{ msec}$
 $500 \mu\text{sec} \leq \text{Width} \leq 5 \text{ msec}$
 Minimum distance between sensors: 100 mm for working distances up to 1.5 m, and 50 mm for distances greater than 1.5 m. Target material also affects these distances.

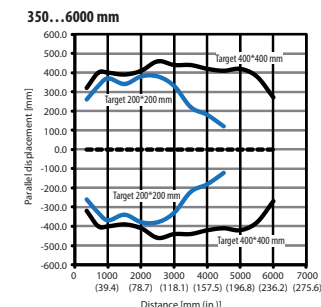
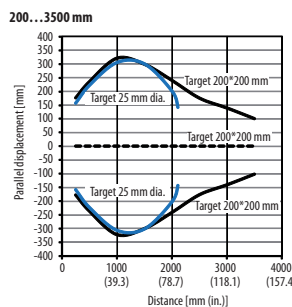
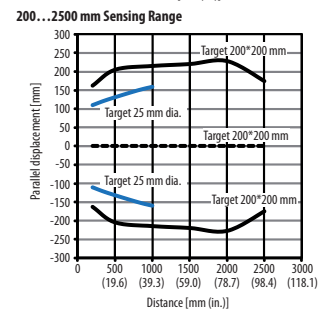
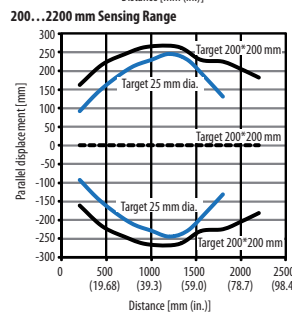
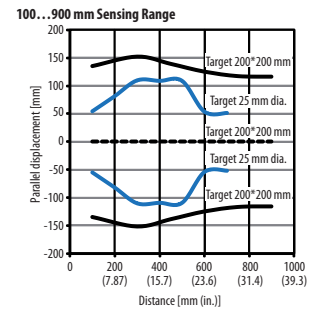
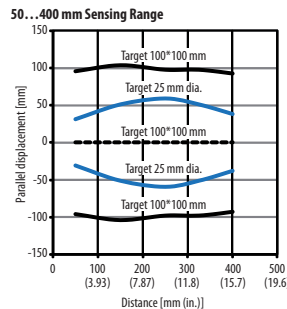
- **3500 mm Sensing Range Sensors**

$T \geq 35 \text{ msec}$
 $500 \mu\text{sec} \leq \text{Width} \leq 5 \text{ msec}$
 Minimum distance between sensors: 100 mm for working distances up to 1.5 m, and 50 mm for distances greater than 1.5 m. Target material also affects these distances.

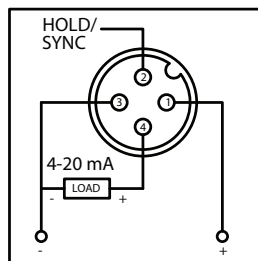
- **6000 mm Sensing Range Sensors**

$T \geq 60 \text{ ms}$
 $500 \mu\text{sec} \leq \text{Width} \leq 1 \text{ msec}$
 Minimum distance between sensors is 200 mm. Target material also affects these distances.

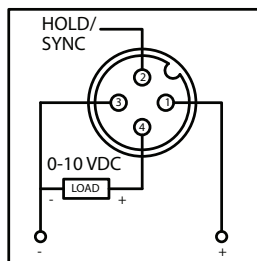
Beam Diagrams



Wiring Diagrams



Analog Current



Analog Voltage

IMPORTANT

Solid-state devices can be susceptible to radio frequency (RF) interference depending on the power and the frequency of the transmitting source. If RF transmitting equipment is to be used in the vicinity of the solid-state devices, thorough testing should be performed to assure that transmitter operation is restricted to a safe operating distance from the sensor equipment and its wiring.

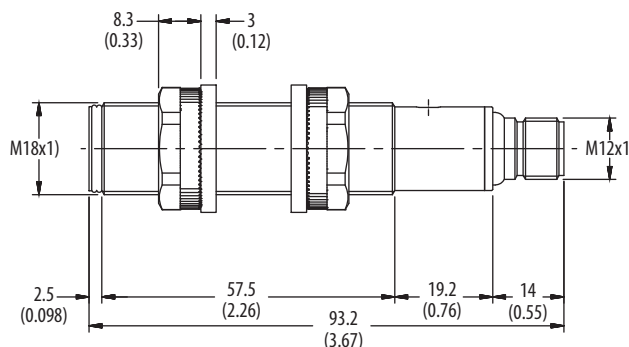
ATTENTION



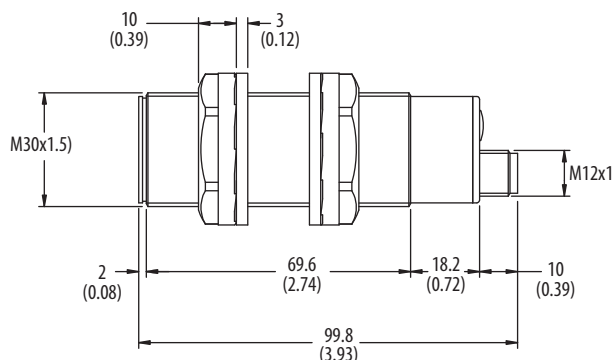
If a hazardous condition can result from unintended operation of this device, access to the sensing area should be guarded.

Dimensions [mm (in.)]

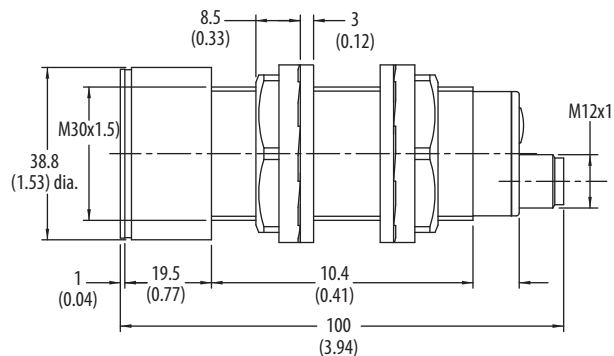
M18



M30



M30 (maximum diameter 38.8 mm (1.53 in.))



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Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846