## Installation Instructions

### Ultrasonic Single & Dual Discrete Output Sensors

**IMPORTANT:** SAVE THESE INSTRUCTIONS FOR FUTURE USE.

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>873P-D180-400-D</th>
<th>873P-D180-900-D</th>
<th>873P-D180-2200-D</th>
<th>873P-D301-2500-D</th>
<th>873P-D301-3500-D</th>
<th>873P-D301-6000-D</th>
<th>873P-D301-6000-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifications</td>
<td>cULus Listed and CE Marked for all applicable directives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated Sensing Distance</td>
<td>50…400 mm (1.97…15.7 in.)</td>
<td>100…900 mm (3.94…35.4 in.)</td>
<td>200…2200 mm (7.87…86.6 in.)</td>
<td>200…2500 mm (7.87…98.4 in.)</td>
<td>250…3500 mm (9.84…137.8 in.)</td>
<td>350…6000 mm (13.8…236.2 in.)</td>
<td></td>
</tr>
<tr>
<td>Teachable Sensing Range</td>
<td>50…400 mm (1.97…15.7 in.)</td>
<td>100…900 mm (3.94…35.4 in.)</td>
<td>200…2200 mm (7.87…86.6 in.)</td>
<td>200…2500 mm (7.87…98.4 in.)</td>
<td>250…3500 mm (9.84…137.8 in.)</td>
<td>350…6000 mm (13.8…236.2 in.)</td>
<td></td>
</tr>
<tr>
<td>Blind Zone</td>
<td>0…50 mm (0…1.97 in.)</td>
<td>0…100 mm (0…3.94 in.)</td>
<td>0…200 mm (0…7.87 in.)</td>
<td>0…200 mm (0…7.87 in.)</td>
<td>0…250 mm (0…9.84 in.)</td>
<td>0…350 mm (0…13.78 in.)</td>
<td></td>
</tr>
<tr>
<td>Beam Angle</td>
<td>±8°</td>
<td>±7°</td>
<td>14° ±1°</td>
<td>15° ±2°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Adjustment</td>
<td>Push button</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.1% up to 3.5 m (11.5 ft) and 0.2% to 6 m (19.7 ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt;1% of the full scale value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>1 mm (0.04 in.)</td>
<td>2 mm (0.08 in.)</td>
<td>3 mm (0.12 in.)</td>
<td>2 mm (0.08 in.)</td>
<td>4 mm (0.16 in.)</td>
<td>6 mm (0.24 in.)</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.1% of sensing range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Consumption</td>
<td>≤50 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection Type</td>
<td>Short circuit, reverse polarity, transient noise, overload</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Current</td>
<td>100 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage Current</td>
<td>≤10 µA @ 30 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transducer Frequency</td>
<td>300 kHz</td>
<td>200 kHz</td>
<td>150 kHz</td>
<td>112 kHz</td>
<td>75 kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>2.2V max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Type</td>
<td>P1 or P2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>10 Hz</td>
<td>4 Hz</td>
<td>1 Hz</td>
<td>2 Hz</td>
<td>1 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>50 ms</td>
<td>125 ms</td>
<td>500 ms</td>
<td>250 ms</td>
<td>500 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Delay before Availability</td>
<td>≤500 ms (single discrete output); ≤900 ms (double discrete output)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-20…+60°C (-4…+140°F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Temperature Compensation</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Drift</td>
<td>±5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing Material</td>
<td>Plastic—PBT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Head Material</td>
<td>Epoxy—glass resin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingress Protection Rating</td>
<td>IP67 (EN 60529)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Operating Voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Catalog Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>12…30V DC</td>
<td>873P-D30P1-2500-D4, 873P-D30P2-2500-D5, 873P-D30P1-3500-D4, 873P-D30P2-3500-D5, 873P-D30P1-6000-D4, 873P-D30P2-6000-D5,</td>
</tr>
<tr>
<td>15…30V DC</td>
<td>873P-D18P1-400-D4, 873P-D18P2-400-D5, 873P-D18P1-900-D4, 873P-D18P2-900-D5, 873P-D18P1-2200-D4, 873P-D18P2-2200-D5</td>
</tr>
</tbody>
</table>

**IMPORTANT** The 873P sensor is set to a one-set point mode with maximum sensing range from the factory.
Single Discrete N.O./N.C. Output

Normally-open Logic: If near point is set first, far point is set second. The output is ON between the two points, and the output is OFF outside of these two points.

Normally-closed Logic: If far point is set first, near point is set second. The output is OFF between the two points, and the output is ON outside of these two points.

Window Function

In this sensing mode, you teach the sensor a near set point and a far set point within the defined sensing range of the sensor. With normally-open logic, if an object passes through the defined window, the discrete output turns ON or the opposite if the logic is normally-closed.

Set Point 1 (P1):
1. Place the target at the desired near/far set point.
   a. The near set point first yields normally-open.
   b. The far set point first yields normally-closed.
2. With target at the desired near/far location, press the teach button, then release.
3. 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 near/far set point location based upon set point 1 location.
2. While green and yellow LEDs are flashing, press the teach button, then release. The sensor is ready to operate.

One Set Point Function

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. When using the one set point mode it is only possible to configure the sensor for normally open logic. It is not possible to configure the sensor for N.C.

Set Point 1 (P1):
1. Place the target at the desired set point.
2. With the target still in place, press the teach button. While the yellow and green LEDs flash simultaneously, press the teach button, then release. The sensor is ready for use. The minimum sensing distance is indicated in the Specifications.

Set Point 2 (P2):
1. Place the target at the desired near/far set point.
   a. The near set point (i.e. nearest to sensor face) yields a normally-open logic.
   b. The far set point (i.e. furthest from the sensor face) yields a normally-closed logic.
2. With target in the desired near/far location, press the teach button, then release.
3. 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.

Window Function

Two set points are taught in the defined sensing range, thus creating a sensing window. When a target is detected between the taught set points, the sensor output triggers ON or OFF, depending on the type of logic used (N.O. or N.C.).

Set Point 1 (P1):
1. Place the target at the desired set point.
2. With the target still in place, press the teach button.
3. The yellow and green LEDs flash simultaneously, indicating that the first set point P1 is now set. The sensor is waiting for the sensor reference point.

Sensor Reference Point

Keep the target in the same position used to set P1.
**LED Indicators: Dual PNP Discrete Output**

<table>
<thead>
<tr>
<th>Operating Mode</th>
<th>Green LED (Alignment)</th>
<th>Yellow LED A (Output)</th>
<th>Yellow LED B (Teach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target Present</td>
<td>ON §</td>
<td>ON/OFF ‡</td>
<td>ON/OFF ‡</td>
</tr>
<tr>
<td>Target Absent</td>
<td>ON/OFF ‡</td>
<td>ON/OFF ‡</td>
<td>ON/OFF ‡</td>
</tr>
</tbody>
</table>

§ 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.

‡ For single discrete sensors, LED A will trigger ON/OFF depending on target position relative to the taught set point(s) and if Normally-open or Normally-closed logic is used. In the case of a dual discrete sensor, LEDs A and B will trigger ON/OFF depending on the target position relative to the taught set points and on the logic used (N.C. or N.O.).

**Other Functions**

**Hold Function**
Proceed as follows to inhibit sensor operation and hold the output to its present state.

PNP Logic: If the SYNC pin is connected to the NER, the ultrasonic wave emission is stopped and the digital output is frozen in the current state. If the SYNC pin is either connected to 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 PLC output. 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. Please note that sensor response times will increase proportionally to the number of synchronized sensors.

**How it Works**:
Connect Pin 2 (white) to all sensors to be synchronized. 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, and “Width” refers to the pulse width.

- **400 mm Sensing Range Sensors**
  - 500 µsec ≤ Width ≤ 1 msec
  - Minimum distance between sensors: 50…100 mm.

- **2500 mm Sensing Range Sensors**
  - T ≥ 25 msec
  - 500 µsec ≤ Width ≤ 5 msec
  - Minimum distance between sensors: 100 mm for working distances up to 1.5 m, and 50 mm for distances > 1.5 m.

- **900 mm Sensing Range Sensors**
  - T ≥ 7.5 msec
  - 500 µsec ≤ Width ≤ 1 msec
  - Minimum distance between sensors: 30…50 mm.

- **3500 mm Sensing Range Sensors**
  - T ≥ 35 msec
  - 500 µsec ≤ Width ≤ 5 msec
  - Minimum distance between sensors: 100 mm for working distances up to 1.5 m, and 50 mm for distances > 1.5 m.
ATTENTION

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

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.

Dimensions [mm (in.)]

**M18**

![M18 Dimensions](image)

**M30**

![M30 Dimensions](image)

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

![M30 M30 Dimensions](image)

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- **2200 mm Sensing Range**
  - Sensors: 30…40 mm
  - Minimum distance between sensors: 200 mm for working distances up to 1.5 m, and 50 mm for distances > 1.5 m.

- **6000 mm Sensing Range**
  - Sensors: 50…400 mm
  - Minimum distance between sensors: 200 mm for working distances up to 1.5 m, and 50 mm for distances > 1.5 m.

**Beam Diagrams**

- **50…400 mm Sensing Range**
- **100…900 mm Sensing Range**
- **200…2200 mm Sensing Range**
- **200…2500 mm Sensing Range**
- **250…3500 mm Sensing Range**
- **300…4000 mm Sensing Range**
- **350…6000 mm Sensing Range**

**Wiring Diagrams**

- Single PNP Discrete Models
- Dual PNP Discrete Models


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