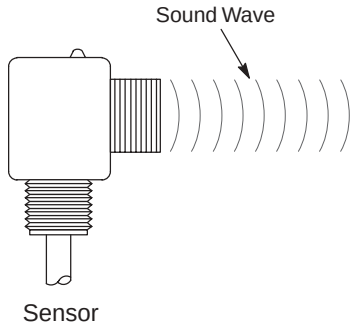
Contents

Quick Selection Guide

Specifications	 **873P** **Analog or Discrete Output**	 **873P** **Programmable**	 **873C** **Analog or Discrete Output**	 **873E** **RightSound ™ Opposed Mode Clear Object Sensing System**
Features	• Sensing ranges from 100mm to 2500mm • Analog output models (4–20mA, 0–10V DC) • Discrete output models (normally open, PNP) • Plastic barrel housing • Adjustable sensing distance (discrete models) • Short circuit, overload, false pulse, transient noise and reverse polarity protection • Hold/Synchronize function to reduce crosstalk • cULus listed and CE marked for all applicable directives	• Sensing ranges from 150mm to 3500mm • Programmable models include 2 discrete and 1 analog output • Discrete outputs can be programmed for normally open or normally closed operation • Programmable set point adjustment via pushbutton • Short circuit, overload, false pulse, transient noise and reverse polarity protection	• 3-wire operation • 3-conductor connection • 18–30V DC • Metal, nonmetal solid and liquid sensing capability • Short circuit, false pulse, reverse polarity, overload and transient noise protection • Adjustable sensing distance (discrete model) • Adjustable background suppression (analog model)	• Ideal solution for sensing clear objects or materials including glass and plastic bottles. • Popular right angle package allows through hole mounting as well as 18mm threaded mounting hubs on the sensor nose and base. • Highly visible 360° indicators conveniently mounted at the top of the sensor. • Designed to Rugged Food Industry Standards: enclosure rated for 1200psi washdown as well as NEMA 4X, 6P and IP67 water ingress standards. • Receivers come with both NPN (sinking) and PNP (sourcing) outputs. • Short circuit, overload, reverse polarity, false pulse and transient noise.
Housing	• Plastic Barrel; 18, 30mm	• Plastic Barrel; 30mm	• Plastic Face/Threaded Nickel-Plated Brass Barrel	• Plastic
Sensing Range	• 100 to 600mm (3.94 to 23.62in) • 200 to 1500mm (7.87 to 59.06in) • 300 to 2500mm (11.81 to 98.43in)	• 150 to 1500mm (5.98 to 59.10in) • 350 to 3500mm (13.78 to 137.80in)	• 300 to 1000mm (11.81 to 39.37in)	• 50 to 750mm (2 to 30in)
Operating Voltage	• 18 to 30V DC	• 19 to 30V DC	• 18–30V DC	• 10.8–30V DC
Outputs	• Discrete (Normally Open—PNP) • Analog Current (4 to 20mA) • Analog Voltage (0 to 10V DC)	• Programmable (2—PNP with Analog current or Analog voltage)	• Analog Voltage (1–10V DC) • Discrete (Normally Open—PNP)	• NPN/PNP
Enclosure	• IP67	• IP67	• NEMA 12 and IP65 (IEC 529)	• NEMA 4X, 6P, IP67 (IEC529); 1200psi (8270kPa) washdown
Connection	• Micro QD	• Micro QD	• Cable: 2m (6.5ft) length 3-conductor PVC	• Cable: #22 AWG PVC, 2m (6.5ft) QD: 4-pin DC micro style male receptacle on pigtail
Additional Info	• See page 3-5	• See page 3-8	• See page 3-11	• See page 3-13

Principles of Operation

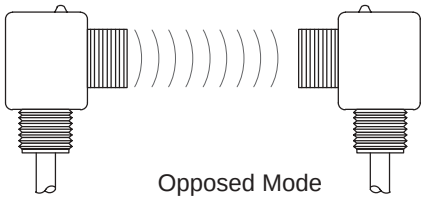


Ultrasonic sensors operate by emitting and receiving high-frequency sound waves. The frequency is usually in the order of 200kHz, which is too high for the human ear to hear.

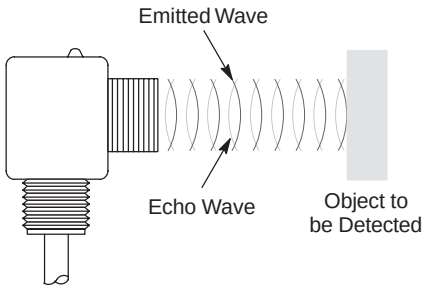
Modes of Operation

There are two basic modes of operation: opposed mode and diffuse (echo) mode.

In opposed mode, one sensor emits the sound wave and another, mounted opposite the emitter, receives the sound wave.

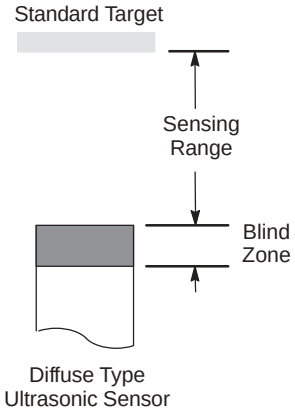


In diffuse mode, the same sensor emits the sound wave and then listens for the echo that bounces off an object.



Sensing Range

The sensing range is the distance within which the ultrasonic sensor will detect a target under fluctuations of temperature and voltage.



Blind Zone

Ultrasonic sensors have an inherent blind zone located at the sensing face. The size of the blind zone depends on the frequency of the transducer. Objects located within the blind spot can not be reliably detected.

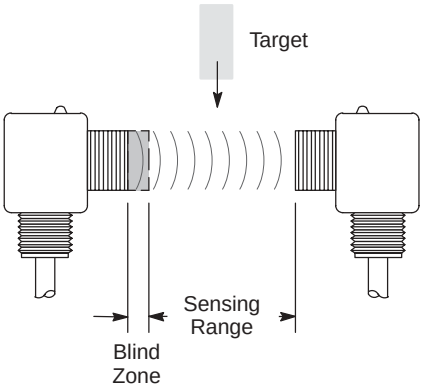
Target Considerations

Certain characteristic of targets must be considered when using ultrasonic sensors. These include target shape, material, temperature, size and positioning.

Soft materials such as fabric or foam rubber are difficult to detect by diffuse ultrasonic technology because they are not sound-reflective.

The standard target for a diffuse type ultrasonic sensor is established by the International Electrotechnical Commission standard IEC 60947–5–2. The standard target is a square shape, having a thickness of 1mm and made from metal with a rolled finish. The size of the target is dependent upon the sensing range.

For opposed mode ultrasonic sensors, there is no established standard.



Standard targets are used to establish the performance parameters of the sensors. The user must take into consideration differences in performance due to nonstandard targets.

Notes

Bulletin 873P Analog or Discrete Output

Plastic Barrel

873P Analog Output
18mm

873P Discrete Output
30mm

Specifications

	Discrete	Analog Current	Analog Voltage
Output Configuration	Normally Open, PNP	4 to 20mA	0 to 10V DC
Load Current	<500mA	—	
Leakage Current	<0.5mA	—	
Current Consumption	< 35mA		
Operating Voltage	18 to 30V DC		
Voltage Drop	< 3.5V DC	—	
Repeatability	0.2%		
Hysteresis	2.5% typical	—	
Linearity	—	± 0.3%	
Ultrasonic Frequency	130, 180, 300kHz		
Ultrasonic Beam Angle	8°		
Short Circuit Protection	Incorporated		
Overload Protection	Incorporated		
False Pulse Protection	Incorporated		
Transient Noise Protection	Incorporated		
Reverse Polarity Protection	Incorporated		
Approvals	cULus listed and CE marked for all applicable directives		
Housing Material	Plastic – PBT		
Enclosure Rating	IP67		
Connection	Micro quick-disconnect (18mm discrete models have 12 inch pigtail)		
Output LED	Yellow	—	
Adjustment	Potentiometer	—	
Operating Temperature	–15 to 70°C (5 to 158°F)		
Shock	30g, 11ms		
Vibration	55Hz, 1mm amplitude, 3 planes		

Description

Bulletin 873P Ultrasonic Sensors are self-contained solid-state devices designed for noncontact sensing of solid and liquid objects. They are available in 18mm and 30mm barrel diameters that are constructed from PBT plastic and meet IP67 enclosure standards. The electronic circuitry is potted to protect against shock, vibration, and contamination.

These sensors are available with either analog or discrete output types and three different sensing ranges. Analog model selection includes 4–20 mA or 0–10V DC outputs. Discrete models have a normally open PNP output and a potentiometer for adjusting the sensing range to ignore background targets. Bulletin 873P ultrasonic sensors have full electrical protections including short circuit, overload, false pulse, transient noise and reverse polarity.

Features

- Sensing ranges from 100mm to 2500mm
- Analog output models (4–20mA, 0–10V DC)
- Discrete output models (normally open, PNP)
- Plastic barrel housing
- Adjustable sensing distance (discrete models)
- Short circuit, overload, false pulse, transient noise and reverse polarity protection
- Hold/Synchronize function to reduce crosstalk
- cULus listed and CE marked for all applicable directives

QD Cordsets and Accessories

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873P Analog or Discrete Output, Micro QD

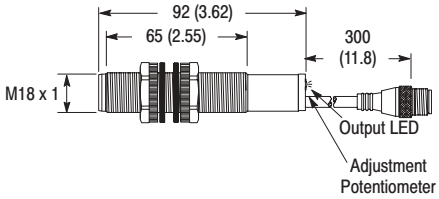
Plastic Barrel

Selection Guide

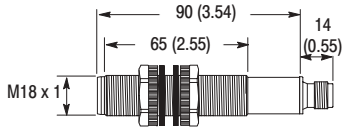
Barrel Diameter	Sensing Range—mm (inches)	Output Configuration	Switching Frequency (Hz)	Connection	Catalog Number
18	100 (3.94) to 600 (23.62)	Normally Open PNP	20	Micro QD Pigtail	873P-DBNP1-F4
	200 (7.87) to 1500 (59.06)		10		873P-DBNP2-F4
30	300 (11.81) to 2500 (98.43)		5	Micro QD	873P-DCNP1-D5
18	100 (3.94) to 600 (23.62)	4 to 20mA	—		873P-DBAC1-D4
	200 (7.87) to 1500 (59.06)				873P-DBAC2-D4
30	300 (11.81) to 2500 (98.43)				873P-DCAC1-D5
18	100 (3.94) to 600 (23.62)	0 to 10V DC			873P-DBAV1-D4
	200 (7.87) to 1500 (59.06)				873P-DBAV2-D4
30	300 (11.81) to 2500 (98.43)				873P-DCAV1-D5
Recommended standard QD cordset (-2 = 2m (6.5ft))					889D-F4AC-2

Dimensions—mm (inches)

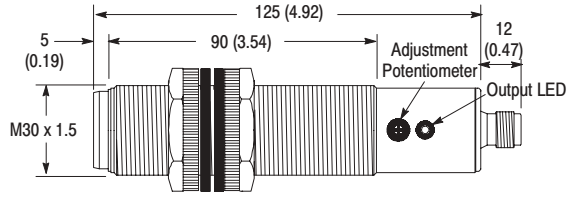
18mm Discrete



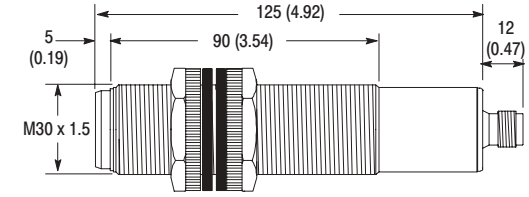
18mm Analog



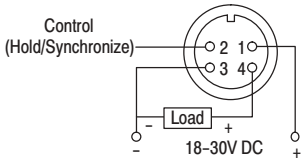
30mm Discrete

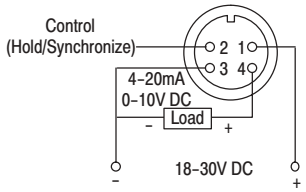


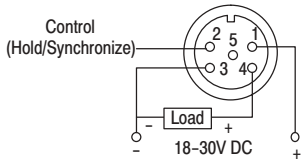
30mm Analog

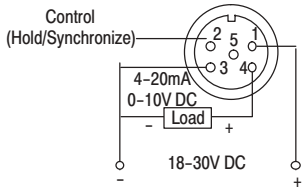


Wiring Diagrams









Control Pin

Normal Operation

For normal operation do not connect the control pin. Hold and synchronize features can be used for special applications.

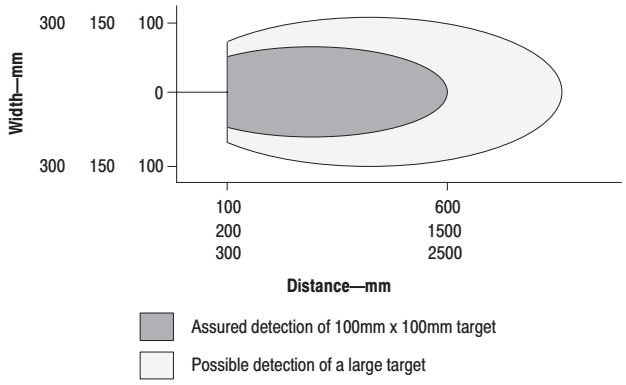
Hold

To inhibit sensor operation and hold the output to its present state connect the control pin (2) to 0V DC. The sensor will not transmit or receive ultrasonic pulses until this voltage is removed from the control pin. Switching output models will be latched and analog output models will hold their value during this period.

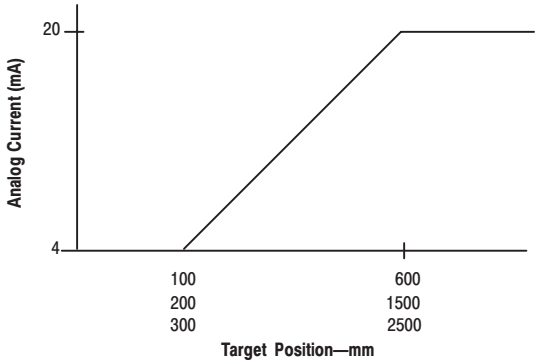
Synchronize

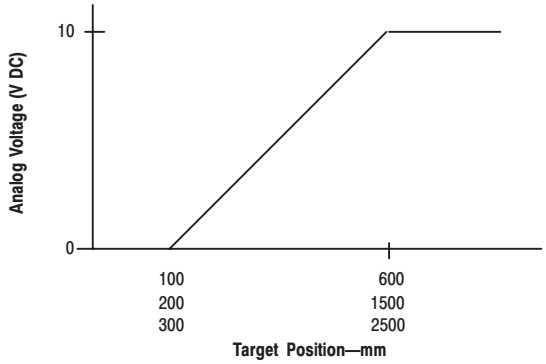
To synchronize the transmission of ultrasonic pulses between several sensors connect the control pins together. This feature reduces the potential for sensor crosstalk between models that are mounted in close proximity to one another.

Beam Pattern



Analog Output





Bulletin 873P Programmable

Plastic Barrel

873P DC Programmable
30mm

Specifications

Output Configuration	Two discrete PNP (Programmable N.O./N.C.) Analog Current: 4–20mA Analog Voltage: 0–10V DC
Load Current	<100mA (Open collector)
Leakage Current	<0.5mA
Current Consumption	<45mA
Operating Voltage	19 to 30V DC
Voltage Drop	<5V DC
Repeatability	0.4%
Hysteresis	1% typical
Linearity	±0.5%
Ultrasonic Frequency	130, 200kHz
Ultrasonic Beam Angle	8°
Short Circuit Protection	Incorporated
Overload Protection	Incorporated
False Pulse Protection	Incorporated
Transient Noise Protection	Incorporated
Reverse Polarity Protection	Incorporated
Approvals	cULus listed and CE marked for all applicable directives
Housing Material	Plastic – PBT
Enclosure Rating	IP67
Connection	Micro quick-disconnect
LED	Yellow: (2) P1, P2 output; Green: Alignment/echo
Program	Via setup pushbutton
Operating Temperature	–15 to 70°C (5 to 158°F)
Shock	30g, 11ms
Vibration	55Hz, 1 amplitude, 3 planes

Description

Bulletin 873P Programmable Ultrasonic Sensors are self-contained solid-state devices designed for noncontact sensing of solid and liquid objects. They are available with a 30mm barrel diameter that is constructed from PBT plastic and meets IP67 enclosure standards. The electronic circuitry is potted to protect against shock, vibration, and contamination.

These sensors have two programmable setpoints with sourcing (PNP) outputs that can be configured for either normally open or normally closed operation. They also feature a 4–20mA or 0–10V DC analog output. The slope of the analog output is scaled between the limits of the setpoint values. Programming of the setpoints and the output configuration is done using the setup pushbutton on the rear of the housing.

In addition, these devices have full electrical protections including short circuit, overload, false pulse, transient noise and reverse polarity. Bulletin 873P programmable ultrasonic sensors are ideal for applications such as level control, diameter measurement, distance measurement, slope control, and presence detection.

Features

- Sensing ranges from 150mm to 3500mm
- Programmable models include 2 discrete and 1 analog output
- Discrete outputs can be programmed for normally open or normally closed operation
- Programmable set point adjustment via pushbutton
- Short circuit, overload, false pulse, transient noise and reverse polarity protection
- cULus listed and CE marked for all applicable directives

QD Cordsets and Accessories

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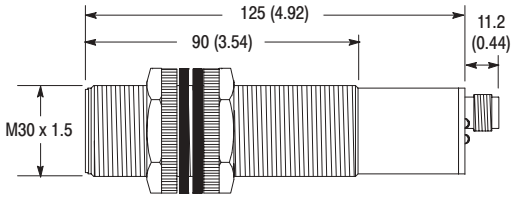
Selection Guide

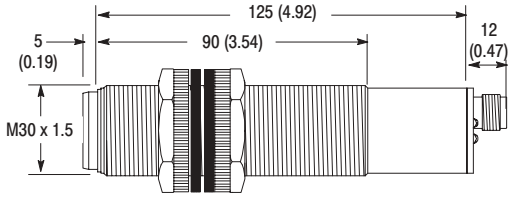
Barrel	Sensing Range—mm (inches)	Output Configuration	Switching Frequency	Connection	Catalog Number
30mm	150 to 1500 (5.91 to 59.10)	2 PNP (NO or NC) with 4–20mA	1 Hz	Micro QD	873P–DCAC1S–D5
	350 to 3500 (13.78 to137.80)				873P–DCAC2S–D5
	150 to 1500 (5.91 to 59.10)	2 PNP (NO or NC) with 0–10V DC			873P–DCAV1S–D5
	350 to 3500 (13.78 to 137.80)				873P–DCAV2S–D5
Recommended standard QD cordset (–2 = 2m (6.5ft))					889D–F5AC–2

Dimensions—mm (inches)

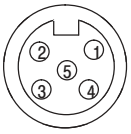
1500mm



3500mm

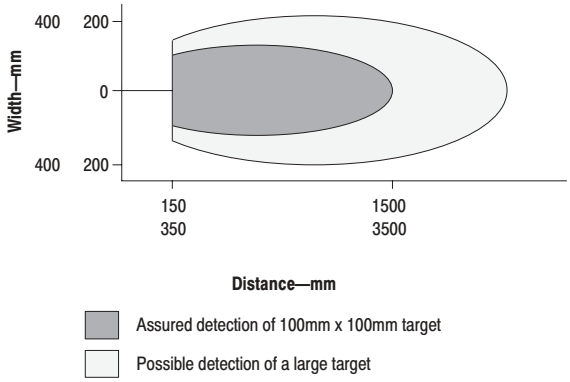


Wiring Diagram

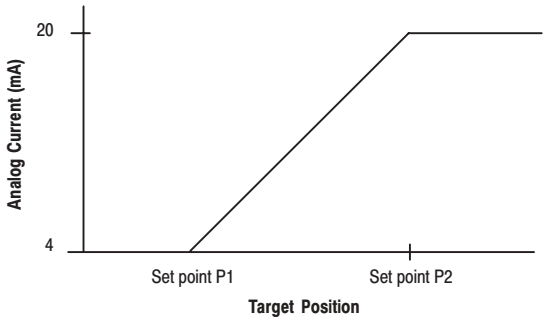


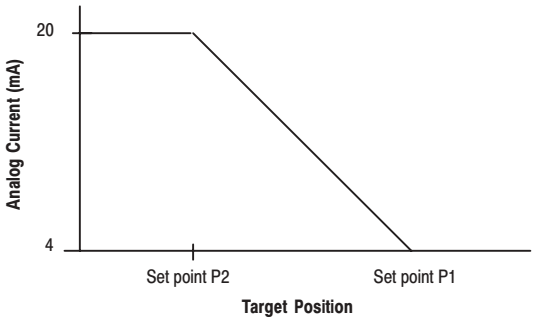
Pin	Function
1	19 to 30V DC Operating Voltage
2	Set point (P2)
3	0V DC
4	Set point (P1)
5	4–20mA or 0–10V DC (depending on model)

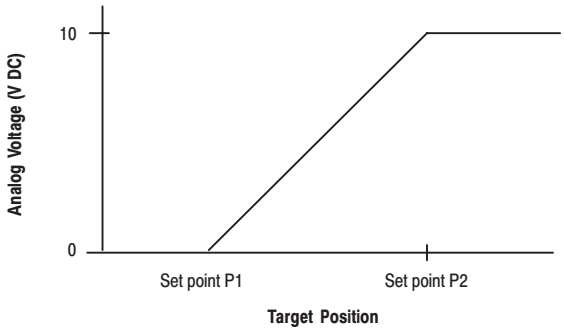
Beam Pattern

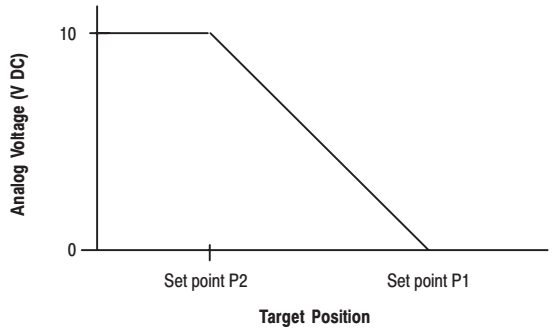


Analog Output







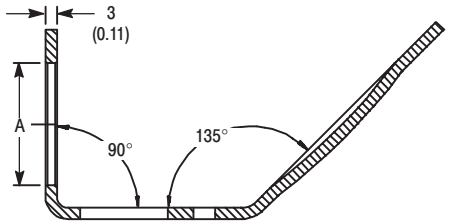


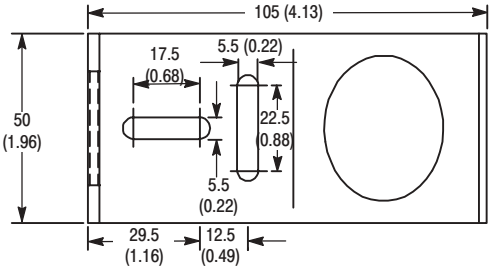
Accessories

Beam Deflectors

These plastic or stainless steel beam deflectors reduce the mounting profile for space critical applications by deflecting the ultrasonic beam 90°. In addition, stainless steel models provide mounting capability and focus the ultrasonic beam.

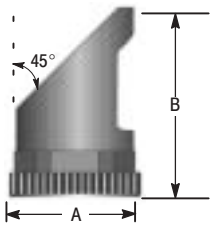
Ultrasonic Beam Deflector/Bracket—Stainless Steel—mm (inches)





Sensor Diameter	A —mm (inches)	Catalog Number
18mm	20 (0.79) Dia.	**60–2757**
30mm	32 (1.26) Dia.	**60–2758**

Ultrasonic Beam Deflector—Plastic—mm (inches)



Sensor Diameter	A —mm (inches)	B —mm (inches)	Catalog Number
18mm	23 (0.91)	35 (1.38)	**60–2759**
30mm	35.5 (1.40)	54 (2.13)	**60–2760**

873C DC Cable Style
30mm
page 3–12

Specifications

Load Current	Discrete output: ≤400mA Analog output: ≤5mA
Minimum Load Current	1mA
Leakage Current	≤10µA
Operating Voltage	18–30V DC
Voltage Drop	≤2.4V
Analog Output Voltage	1–10V DC
Repeatability	±5mm in axial direction
Hysteresis	≤15mm typical
Ultrasonic Frequency	200kHz
Ultrasonic Pulse Cone Angle	8° (full angle)
Protections	False Pulse, Transients, Reverse Polarity, Short Circuit, Overload
Approvals	CE marked for all applicable directives
Enclosure	NEMA 12 and IP65 (IEC 529) Nickel-plated brass barrel with plastic face
Connection	Cable: 2m (6.5ft) length 3-conductor PVC
LED	Discrete Model: Output Energized Analog Model: Echo Detected
Operating Temperature	–10°C to +60°C (+14°F to +140°F)
Shock and Vibration	30g, 10–55Hz

Description

The Bulletin 873C ultrasonic sensor has the ability to detect solid and liquid targets from a distance of up to 1m (3.3ft).

The Bulletin 873C comes in one of two versions: a background suppression unit with analog voltage output or a standard diffuse model with a digital output.

The analog model provides an output voltage that varies linearly with the target distance and an adjustable background suppression feature. For many applications, such as monitoring the level of water in a tank, ultrasonic technology allows a single device to do a job that would otherwise require multiple sensors.

The digital model has a normally open PNP output that can be adjusted between 300mm (11.8in) and 1m (3.3ft).

Features

- 3-wire operation
- 3-conductor connection
- 18–30V DC
- Analog or digital (discrete) output
- Metal, nonmetal solid and liquid sensing capability
- Short circuit, false pulse, reverse polarity, overload and transient noise protection
- Adjustable sensing distance (digital/discrete model)
- Adjustable background suppression (analog model)
- CE marked for all applicable directives

Target Considerations

Because ultrasonic sensors depend on a reflected sound wave for proper operation, the shape, material, temperature and positioning of the target are important. These must be selected to return the strongest possible echo.

The ideal target shape is a smooth, flat surface. Rounded or uneven objects can also be detected, but the sensing distances and/or analog output voltages will be reduced.

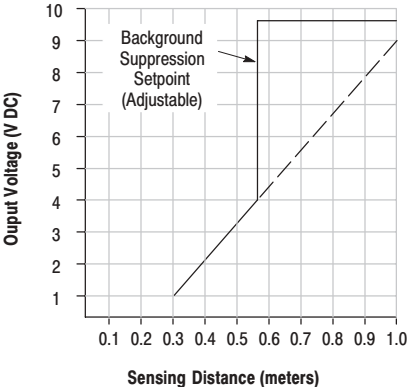
An object must be close to the sensor barrel axis to be detected because the 873C emits ultrasonic pulses in an 8° cone. Targets must be within this cone to reflect the pulses and activate the switch. The object's surface must also face directly toward the sensor to give a proper echo.

The sensor can be positioned accurately using the LED on its end, which glows with an intensity proportional to the strength of the echo. Simply place a target at the desired sensing point, then adjust the position and angle of the sensor to maximize the LEDs brightness.

Soft materials such as fabric or foam rubber are difficult to detect by ultrasonic technology because they are not adequately sound-reflective. This means that non-target objects in the sensing field can be hidden from the sensor by covering them with sound-absorbent material and/or by positioning them so that their echoes are not reflected to the detector.

Target temperatures must be at or below 100°C (212°F) for reliable sensing.

Output Voltage vs. Target Distance (Analog Model)



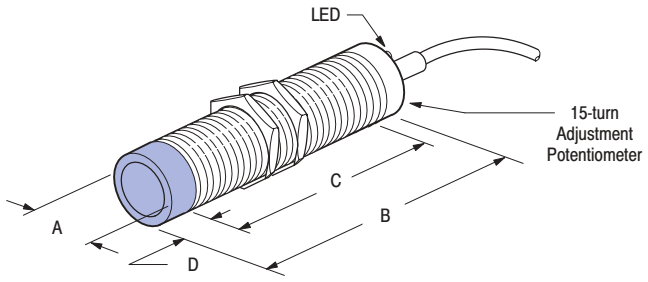
873C 3-Wire DC, Cable Style

Plastic Face/Threaded Nickel-Plated Brass Barrel

Selection Guide

Barrel Diameter	Nominal Sensing Distance mm (inches)	Output Configuration		Switching Frequency (Hz)	Catalog Number
30mm	300 (11.81) to 1000 (39.37)	Analog	PNP	5	873C–DDAV1000E2
		N.O.			873C–DDNP1000E2

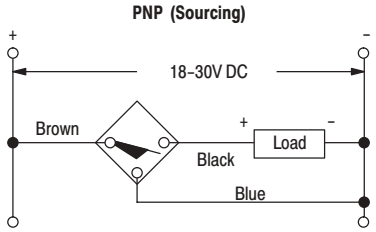
Dimensions—mm (inches)



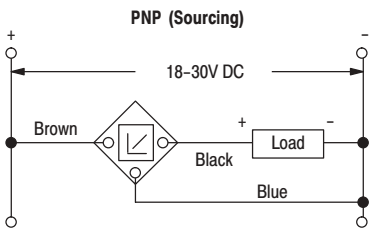
Thread Size	mm (inches)			
	A	B	C	D
M30 X 1.5	30.0 (1.18)	117.0 (4.61)	95.0 (3.74)	12.0 (0.47)

Wiring Diagrams

Normally Open Digital (Discrete)



Analog



Accessories

Description	Page Number
Mounting Brackets	2–186 – 2–190
Extra Mounting Nuts	2–197 – 2–198

873E RightSound™ Opposed Mode Clear Object Sensing System

18mm Right Angle Plastic Housing

Opposed Mode
18mm

Specifications

Emitter	873E–EDZZ0750A2 (2m (6.5ft) 300V cable) 873E–EDZZ0750F4 (4-pin DC micro style QD pigtail)
Receiver	873E–RDTT0750A2 (2m (6.5ft) 300V cable) 873E–RDTT0750F4 (4-pin DC micro style QD pigtail)
Sensing Mode	Opposed
Sensing Range	50mm to 750mm (2in to 30in)
Unit Protection	False Pulse, Transient Noise, Short Circuit, Overload, Reverse Polarity
Operating Voltage	10.8–30V DC
Output Type	NPN/PNP
Output Mode	Normally Open/Normally Closed
Load Current	100mA max.
Leakage Current	0.1mA max.
Response Time	<2.5ms
Power-up Delay	<300ms
Max. Switching Frequency	125Hz
Ultrasonic Frequency	200–240kHz
Ultrasonic Pulse Cone Angle	(+/–) 5°
Housing Material	Noryl
Sensing Face Material	FDA compliant silicone rubber
Operating Environment	NEMA 4X, 6P, IP67 (IEC529); 1200psi (8270kPa) washdown
Connection	Cable: #22 AWG PVC, 2m (6.5ft) QD: 4-pin DC micro style male receptacle on pigtail
Vibration	20G, 10–55Hz (non-operational)
Operating Temperature	–25°C to +70°C (–13°F to +158°F)
Storage Temperature	–40°C to +85°C (–40°F to +185°F)
Operating Humidity	Not to exceed 95%, noncondensing
Approvals	UL, c–UL, and CE marked for all applicable directives
Standards	IEC 60947–5–2, EN60947–5–2

Description

RightSound Bulletin 873E sensors are opposed mode ultrasonic sensors consisting of an emitter and a receiver. The receiver is microprocessor based to provide advanced temperature stability and noise immunity. Precise tuning of the receiver to the emitter minimizes interference from ambient noise sources.

The emitter volume control allows the operator to correctly adjust the volume for the sensing distance (distance from the emitter to the receiver) and other variables of a given application (i.e., target speed and spacing, etc.).

The sensing of clear objects, which can be difficult to do reliably with photoelectric controls, is made highly reliable with RightSound ultrasonic sensors. RightSound sensors have been designed for demanding environments, especially those of the Food and Beverage Industry. The NORYL housings are extremely rugged and are rated for 1200psi washdown and NEMA 4X and 6P standards. The acoustic faces of the emitter and receiver are made of FDA compliant silicone rubber for maximum durability and water ingress protection.

Receivers come with both NPN current sinking and PNP current sourcing outputs rated to 100mA. The receiver has the ability to operate in either a normally open or normally closed mode. Modes are selected by the polarity of receiver supply voltage. When the receiver is in the normally open mode, the output conducts when the receiver hears a RightSound emitter.

When the receiver is in the normally closed mode, the output conducts when the sonic beam from the emitter is blocked or not present.

Features

- Continuously adjustable emitter amplitude with instability indicator allows for simple optimized adjustment over 2 inch to 30 inch sensing range.
- Ideal solution for sensing clear objects or materials including glass and plastic bottles.
- Highly immune to ambient sonic and electrical noise.
- Popular right angle package allows through hole mounting as well as 18mm threaded mounting hubs on the sensor nose and base.
- Highly visible 360° indicators conveniently mounted at the top of the sensor.
- Designed to Rugged Food Industry Standards: enclosure rated for 1200psi washdown as well as NEMA 4X, 6P and IP67 water ingress standards.
- Receivers come with both NPN (sinking) and PNP (sourcing) outputs; output logic switchable via polarity of receiver power wiring; simplified product selection… Select a 6.5 foot cable or a 6 inch pigtail quick-disconnect and cordset and you're ready to start sensing!
- 10.8–30V DC operation with protections for short circuit, overload, reverse polarity, false pulse and transient noise.

873E RightSound™ Opposed Mode Clear Object Sensing System

18mm Right Angle Plastic Housing

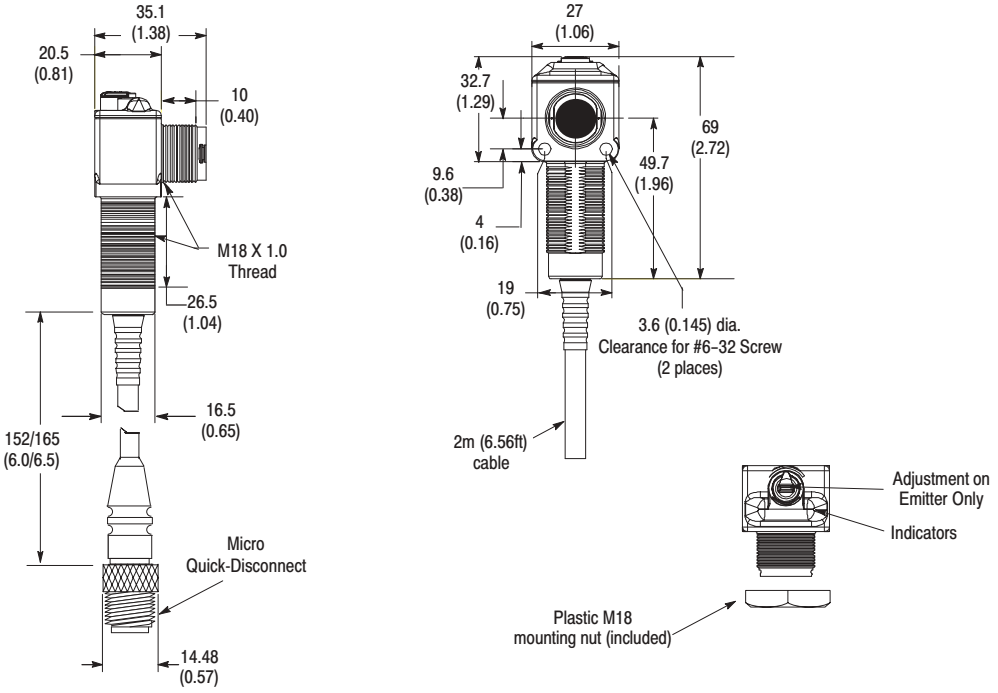
Selection Guide

Catalog Number	Sensor Type	Termination	Operating Voltage Supply Current
873E-EDZZ0750A2	Emitter	2m (6.5ft) Cable 300V	10.8-30V DC 20mA @ 20°C 100mA @ -25°C
873E-EDZZ0750F4	Emitter	Micro Style QD	
873E-RDTT0750A2	Receiver	2m (6.5ft) Cable 300V	10.8-30V DC 10mA
873E-RDTT0750F4	Receiver	Micro Style QD	
889D-F4AC-2	DC Micro QD	Recommended Standard QD Cordset (-2 = 2m (6.5ft)	

LED Indicator Lights

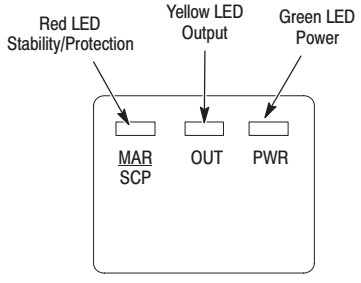
Sensor Type	Label	Color	Status
Emitter	—	Green	Sensor powered
Receiver	PWR		Sensor powered
	OUT	Yellow	Output is conducting
	MAR/SCP	Red	Unreliable sensing condition (On)
			Output in overload or short circuit (Flashing)

Dimensions—mm (inches)

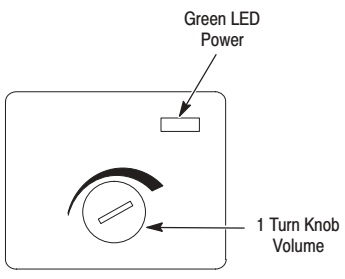


LED and Adjustment Locations

RightSound Ultrasonic Receiver



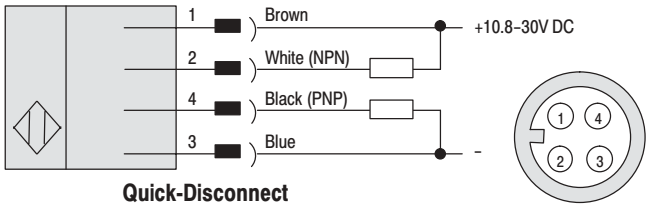
RightSound Ultrasonic Emitter



Wiring Diagrams

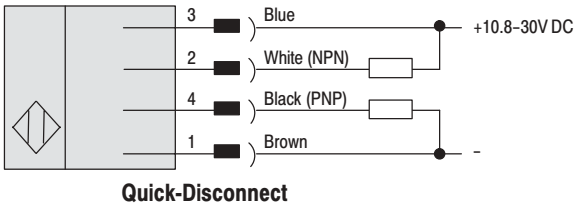
Receivers with Quick-Disconnect

Normally Open Configuration



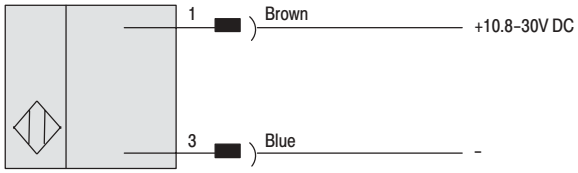
Quick-Disconnect

Normally Closed Configuration



Quick-Disconnect

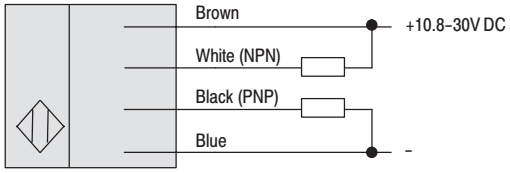
Emitter with Quick-Disconnect



Quick-Disconnect

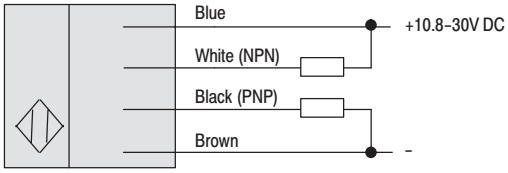
Receivers with Cable

Normally Open Configuration



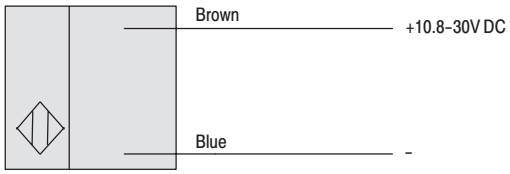
Cable

Normally Closed Configuration



Cable

Emitter with Cable



Cable

Accessories

Description	Page Number
Terminal Chambers	7–63
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Mounting Nuts	2–197 – 2–198