

# Installation Instructions

## Bulletin 42CS Stainless Steel Photoelectric Sensors

**SAVE THESE INSTRUCTIONS FOR FUTURE USE.**  
**Refer to the product catalog pages for additional information.**

### Description

The 42CS family of sensors offers a wide range of sensing modes in a smooth 316L stainless steel housing, designed for food, beverage and pharmaceutical applications.

The ferromagnetic teach feature makes the sensor easy to program by simply placing a ferromagnetic metal object on a section of the sensors housing to initiate the teach process. The smooth and clean design minimizes the collection and accumulation of undesired particles and allows for a fast cleanup.

### Features

- Patented ferromagnetic teach for easy sensor programming
- Extended temperature operating range
- Clean design minimizes the accumulation of undesired particles allowing for a fast and easy cleanup
- 18 mm stainless steel 316L enclosure with laser etched markings
- Two teach modes: standard and precision
- Complementary light and dark operate outputs
- Teach lockout feature prevents unauthorized users from changing the settings
- Clear object detection models available
- Input to disable light source on transmitted beam emitter
- IP69K, ECOLAB and Johnson Diversey rated

### Sensor Indicators

LED Status		
Green	OFF	Teach function is locked
	ON	Teach function is enabled
	Flashing (8 Hz)	Short Circuit
Yellow	OFF	Output de-energized ❶
	ON	Output energized ❶
	Flashing (3 Hz)	Output energized (Margin < 2) ❶

❶ Pin 4 of Micro (M12) QD. L.O for diffuse, background suppression. D.O for polarized retroreflective and transmitted beam

### Specifications

Certifications	cULus and CE marked for all applicable directives
<b>Environmental</b>	
Operating Environment	IP69K, ECOLAB and Johnson Diversey rated
Operating Temperature [C (F)]	-25...+85° (-13...185°)
Vibration	10...55Hz, 1 mm amplitude; meets or exceeds IEC 60947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	5...95% (noncondensing)
Ambient Light Immunity	5000 Lux (Incandescent light) and 100000 Lux (Sunlight)

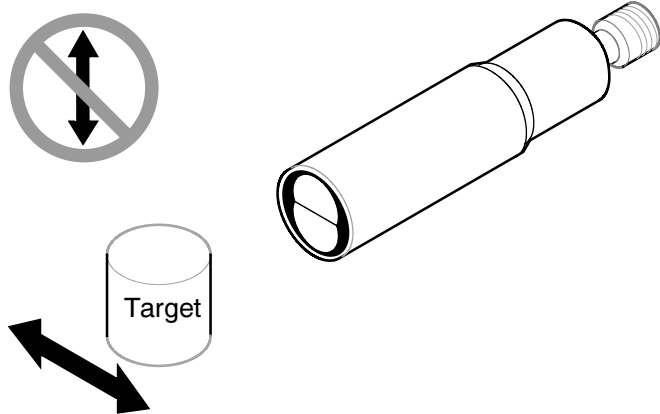
<b>Optical</b>			
Sensing Modes	Sensing Range	Light Source	Spot Size @ max. distance
Standard Diffuse	100 mm (3.94 in.)	Visible Red (660 nm)	10 mm @ 100 mm
	400 mm (15.75 in.)	Infrared (880 nm)	50 mm @ 400 mm
	800 mm (31.5 in.)	Infrared (880 nm)	120 mm @ 1 m
Background Suppression	60...100 mm (2.36...3.94 in.)	Visible Red (660 nm)	12 mm @ 120 mm
Polarized Retroreflective	4 m (13.12 ft)	Visible Red (660 nm)	100 mm @ 3 mm
Clear Object Detection	1 m (3.2 ft)	Visible red (660 nm)	50 mm @ 1 m
Transmitted Beam	20 m (65.62 ft)	Infrared (880 nm)	600 mm @ 20 m

<b>Electrical</b>	
Voltage	10...30V DC
Current Consumption	35 mA max
Sensor Protection	Short circuit, transient noise, reverse polarity

<b>Outputs</b>	
Response Time	1 ms (diffuse, polarized retroreflective, clear object), 1.25 ms (background suppression), 2 ms (transmitted beam)
Output Type	PNP or NPN by cat. no.
Output Mode	Complementary light and dark operate
Output Current	100 mA
Output Leakage Current	10 µA max.

<b>Mechanical</b>	
Housing Material	Stainless steel 316L
Lens Material	PMMA
Connector Material	Grilamid
Connection Types	4-pin DC micro (M12) QD
Supplied Accessories	Stainless steel teach rod, mounting nuts (threaded models only)

## Background Suppression Sensors



### Application Note

Due to the detection method, targets traveling horizontal to the sensor's optics are detected. Targets traveling vertically may not be accurately detected. For reliable background suppression, a minimum separation distance of 6 mm is recommended between the target and the background.

### Sensor Alignment

1. Pan the sensor left, right, up, and down to center the beam on the sensed object (for diffuse), reflector (for polarized retroreflective) or transmitter (for transmitted beam).
2. Fix the sensor position when the green LED is ON (flashing) and the yellow output LED is ON (light sensed and L.O. output energized). This set up assures a good margin and that the signal received is greater than twice the signal required to energize the L.O. output. The yellow LED is on when the L.O. output is conducting.

### Mounting the Sensor

<b>IMPORTANT</b>	Installing sensors on equipment running above the indicated vibration and shock specification may cause intermittent operation.
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Securely mount the sensor on a firm, stable surface or support. A mounting which is subject to excessive vibration or shock may cause intermittent operation. Mounting brackets are available for a various installations. See accessories section for an example.

### Sensitivity Adjustment Modes

Two types of sensitivity adjustment modes are possible on the 42CS diffuse and polarized retroreflective: Standard Teach and Precision Teach.

The Standard Teach is recommended for general purpose detection of opaque targets, large objects or the absence of a background that could interfere with the teach process. For this teach process, the threshold levels are set at 50% of the detected signal.

The Precision Teach is suited for the detection of small targets or semi transparent objects, where a smaller variation in gain needs to be sensed. For this teach process, the threshold levels are set at below the hysteresis levels of the detected signal.

## Diffuse, Polarized Retroreflective and Clear Object

To teach the 42CS using the Standard Teach mode:

1. Place the target within the sensing range.
2. Enter teach mode by placing a ferromagnetic metal object in the notch until the green LED flashes once. Note that the green LED flashes while the teach process is active.
3. When the teach process is complete the green LED turns solid ON. The yellow LED also turns solid ON when the target is detected with at least twice the minimum amount of light needed ( $\text{Margin} \geq 2$ ) for standard operation. A flashing yellow LED indicates that the sensor operates with a margin below the recommended 2X ( $1 < \text{Margin} < 2$ ).
4. The sensor is now ready to operate (yellow LED is on when the target is present)

To teach the 42CS using the Precision Teach mode:

1. Place the target within the sensing range.
2. Enter teach mode by placing a ferromagnetic metal object in the notch until the green starts flashing. Note that the green LED blinks multiple times while the teach process is active.
3. When the teach process is complete the green LED turns solid ON. The yellow LED also turns solid ON when the target is detected with at least twice the minimum amount of light needed ( $\text{Margin} \geq 2$ ) for standard operation. A flashing yellow LED indicates that the sensor operates with a margin below the recommended 2X ( $1 < \text{Margin} < 2$ ).
4. The sensor is now ready to operate (yellow LED is on when the target is present).

### Background Suppression

To teach the 42CS background suppression:

- 1 Place the target within the sensing range.
- 2 Enter teach mode by placing a ferromagnetic object in the notch until the green LED starts flashing. Note that the green LED blinks multiple times while the teach process is active.
- 3 When the teach process is complete the green LED turns solid ON. The yellow LED also turns solid ON when the target is detected.
- 4 The sensor is now ready to operate (yellow LED is on when the target is present).

### Teach Lock/Unlock

The 42CS teach is used to prevent unauthorized users from changing teach settings and avoid interference from any metal objects that could be in proximity of the teach notch while in operation.

#### To lock the sensor:

Place a ferromagnetic metal object in the notch until the green LED turns OFF. The sensor is now locked.

#### To unlock the sensor:

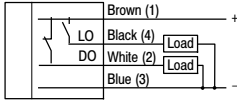
Place a ferromagnetic metal object in the notch until the green LED turns ON. The sensor is now unlocked.

## Wiring Diagrams

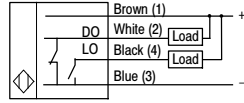
Quick disconnect connection is shown in the following diagrams. Pin numbers correspond to an M12 male connector connected to an 889DS-F4AC-2 cordset

## Diffuse and Background Suppression

### PNP Models with Complementary Outputs

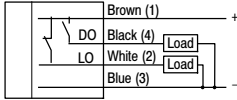


### NPN Models with Complementary Outputs

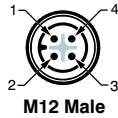
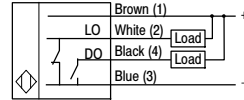


## Polarized Retroreflective, Clear Object and Transmitted Beam Receiver

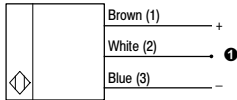
### PNP Models with Complementary Outputs



### NPN Models with Complementary Outputs

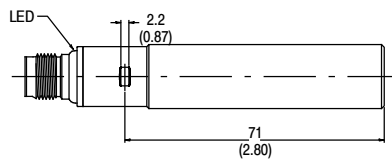
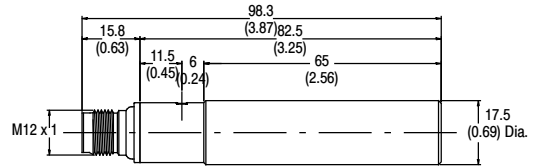
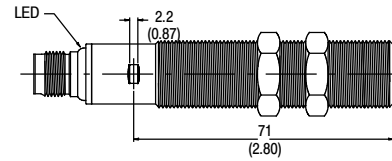
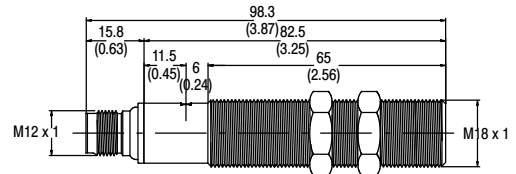


## Transmitted Beam Emitter



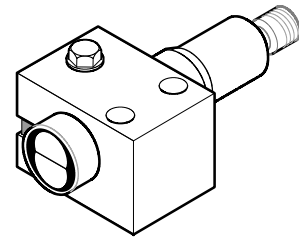
① For normal operation, white wire (pin 2) needs no connection. To disable light source, connect white wire (pin 2) to -V.

## Approximate Dimensions [mm (in.)]



## Accessories

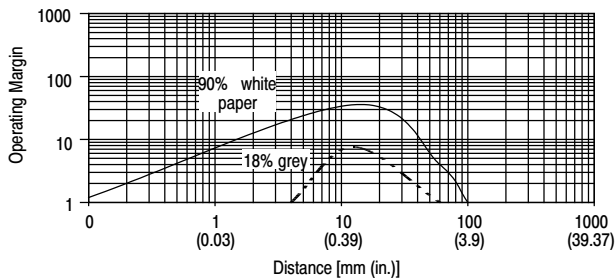
### 60-BCS-18B—Mounting bracket for smooth barrel



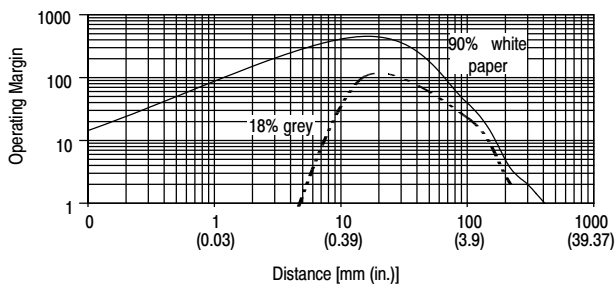
### 60-2656—Straight mounting bracket for threaded models 60-2657—Right angle mounting bracket for threaded models

## Typical Response Curves

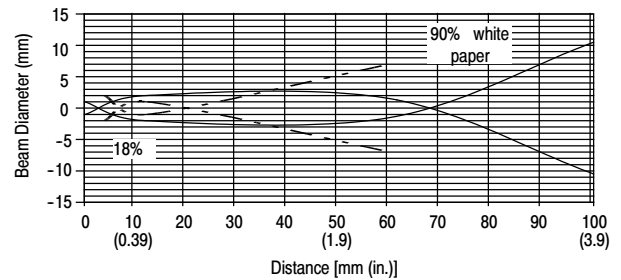
### Standard Diffuse (100 mm)



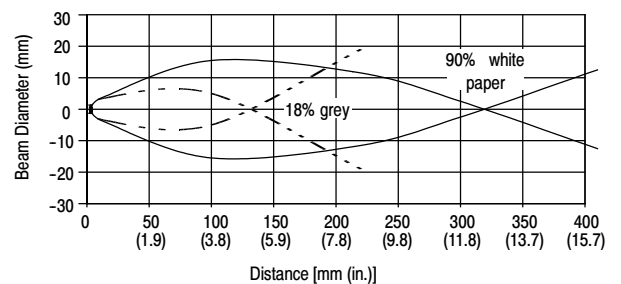
### Standard Diffuse (400 mm)



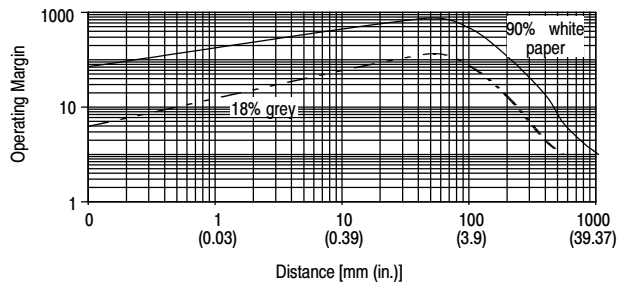
### Beam Pattern (100 mm)



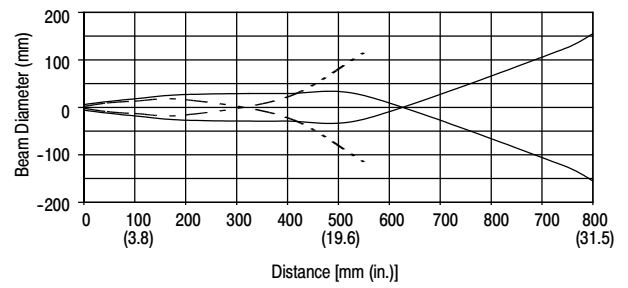
### Beam Pattern (400 mm)



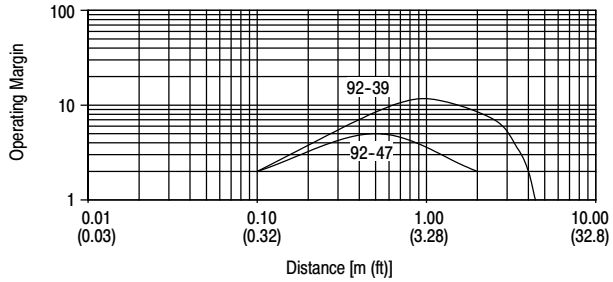
**Standard Diffuse (800 mm)**



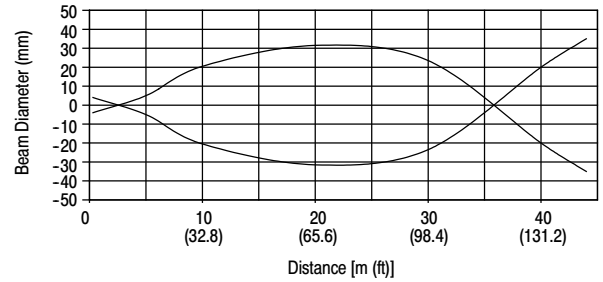
**Beam Pattern (800 mm)**



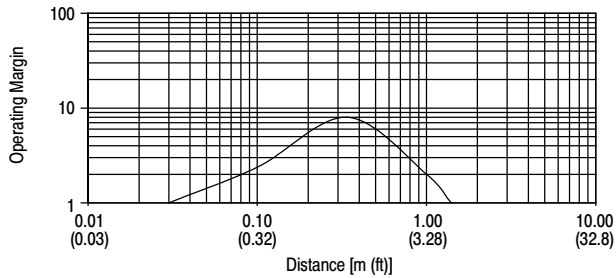
**Polarized Retroreflective (4 m)**



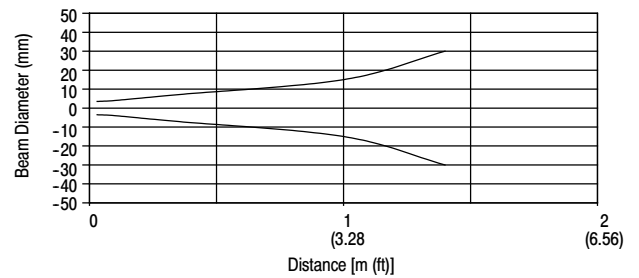
**Beam Pattern (4 m)**



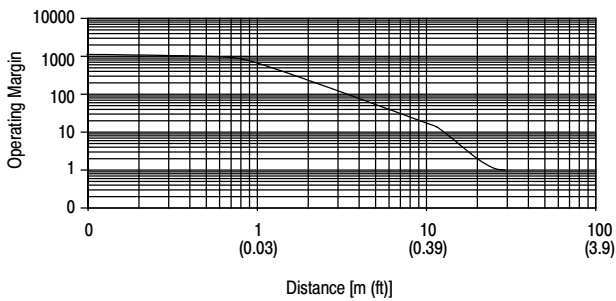
**Clear Object (1 m)**



**Beam Pattern (1 m)**



**Transmitted Beam (20 m)**



**Beam Pattern (20 m)**

