



Cutler-Hammer

# Enhanced 50 Series Diffuse Photoelectric Sensors

**1351E-6547****1351E-6517**

- Fiberglass-reinforced plastic housing
- Field of view: 2.8°
- Cable wires or mini/micro connector termination
- NPN/PNP, Solid-State Relay, or SPDT EM Relay outputs
- IP67 rated

**1351E-6534**

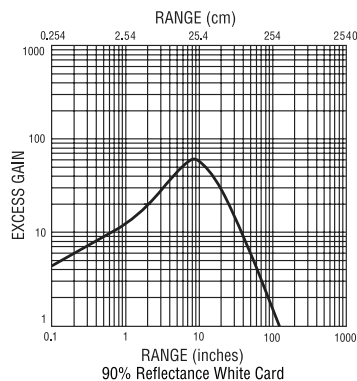
Note: Cutler-Hammer parts available for sale to North America locations only.

## Enhanced 50 Series Diffuse Photoelectric Sensors Selection Chart

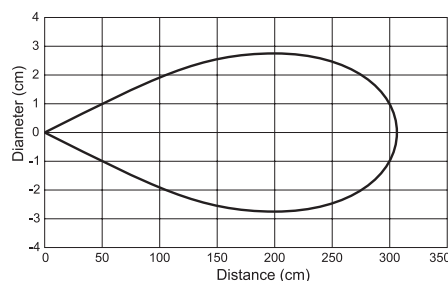
| Part Number                | Price    | Voltage Range                | Sensing Range* | Optimum Range*            | Sensing Beam | Output Type                          | Connection Type                         | Cable Part Number                                              |
|----------------------------|----------|------------------------------|----------------|---------------------------|--------------|--------------------------------------|-----------------------------------------|----------------------------------------------------------------|
| <a href="#">1351E-6517</a> | \$139.00 | 10 - 40 VDC                  | 10ft [3m]      | 1 to 60in [25 to 1520 mm] | Infrared     | NPN/PNP 250mA                        | 6-foot cable (300V)                     | Pre-wired 6ft [1.8 m]                                          |
| <a href="#">1351E-6547</a> | \$139.00 |                              |                |                           |              |                                      | 4-pin Euro (Micro) DC connector         | <a href="#">CSDS4A4CY2202</a><br><a href="#">CSDS4A4CY2205</a> |
| <a href="#">1351E-6507</a> | \$142.00 |                              |                |                           |              |                                      | 4-pin Mini connector                    | <a href="#">CSMS4A4CY1602</a><br><a href="#">CSMS4A4CY1606</a> |
| <a href="#">1351E-6513</a> | \$154.00 | 12 - 240 VDC<br>24 - 240 VAC |                |                           |              | Solid-state relay 300mA @ 240VAC/VDC | 6-foot cable (300V)                     | Pre-wired 6ft [1.8 m]                                          |
| <a href="#">1351E-6543</a> | \$154.00 |                              |                |                           |              |                                      | 4-pin Micro AC connector                | <a href="#">CSAS4F4CY2202</a><br><a href="#">CSAS4F4CY2205</a> |
| <a href="#">1351E-6503</a> | \$155.00 |                              |                |                           |              |                                      | 4-pin Mini connector                    | <a href="#">CSMS4A4CY1602</a><br><a href="#">CSMS4A4CY1606</a> |
| <a href="#">1351E-6514</a> | \$146.00 |                              |                |                           |              | SPDT EM relay 3A @ 120VAC            | 6-foot cable (300V)                     | Pre-wired 6ft [1.8 m]                                          |
| <a href="#">1351E-6534</a> | \$146.00 |                              |                |                           |              |                                      | 5-pin Micro AC connector [7.5" pigtail] | <a href="#">CSAS5A5CY2202</a><br><a href="#">CSAS5A5CY2205</a> |
| <a href="#">1351E-6504</a> | \$146.00 |                              |                |                           |              |                                      | 5-pin Mini connector                    | <a href="#">CSMS5A5CY1602</a><br><a href="#">CSMS5A5CY1606</a> |

\*Note: Ranges based on 90% reflectance white

### Characteristic curve chart



### Spot dimension chart



### Wiring Diagrams

(Pin numbers are for reference only. Rely on pin location when wiring.)

| Operating Voltage                                 | Models  | Cable Models | Mini-Connector Models (Face View Male Shown) | Micro and Euro (Micro) Connector Models (Face View Male Shown) |
|---------------------------------------------------|---------|--------------|----------------------------------------------|----------------------------------------------------------------|
| 10-40 VDC                                         | Diffuse |              |                                              |                                                                |
| 12 - 240 VDC or 24 - 240 VAC<br>Solid-State Relay | Diffuse |              |                                              |                                                                |
| 12 - 240 VDC or 24 - 240 VAC<br>SPDT EM Relay     | Diffuse |              |                                              |                                                                |

① Connect load to appropriate output for either sinking or sourcing operation.



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# Enhanced 50 Series Photoelectric Sensors Selection Guide

## Overview

The Enhanced 50 family of high performance photoelectric sensors offers outstanding features, flexibility and durability at an incredible price. Choose from a wide selection of Through-beam, Polarized Reflex, Diffuse and even Clear Object models all designed in a rugged, industry standard, rectangular package. Each model comes with a variety of input options for maximum flexibility across many voltage ratings.

Cabling choices include built-in mini-connector, micro-connector, pigtail micro-connector or a 6 ft. integrated cable. Other convenient features included are Dark-on/Light-on selectability and Gain adjustment, available on all models. Use the Selection Guide below to find the sensor model that best suits your requirements.



### Enhanced 50 Photoelectric Sensors Specifications by Model Type

| Specifications       | Through-Beam                                                                             | Diffuse                                                                                  | Polarized Reflex                                                                         | Clear Object Detector                                                                    |
|----------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Voltage Range</b> | 10 - 40 VDC<br>12 - 240 VDC<br>24 - 240 VAC                                              | 10 - 40 VDC<br>12 - 240 VDC<br>24 - 240 VAC                                              | 10 - 40 VDC<br>12 - 240 VDC<br>24 - 240 VAC                                              | 10 - 40 VDC<br>12 - 240 VDC<br>24 - 240 VAC                                              |
| <b>Sensing Range</b> | 500ft [152m]                                                                             | 10ft [3m]                                                                                | 16ft [4.9 m]                                                                             | 45in [1.2 m]                                                                             |
| <b>Optimum Power</b> | 0.1 to 250ft [0.03 to 77m]                                                               | 1 to 60in [25 to 1520mm]                                                                 | 0.5 to 8ft [0.2 to 2.5 m]                                                                | 1 to 24in [25 to 610mm]                                                                  |
| <b>Sensing Beam</b>  | Infrared                                                                                 | Infrared                                                                                 | Visible Red                                                                              | Visible Red                                                                              |
| <b>Output Types</b>  | NPN/PNP 250mA,<br>Solid-state relay 300mA @<br>240 VAC/VDC,<br>SPDT EM relay 3A @ 120VAC | NPN/PNP 250mA,<br>Solid-state relay 300mA @<br>240 VAC/VDC,<br>SPDT EM relay 3A @ 120VAC | NPN/PNP 250mA,<br>Solid-state relay 300mA @<br>240 VAC/VDC,<br>SPDT EM relay 3A @ 120VAC | NPN/PNP 250mA,<br>Solid-state relay 300mA @<br>240 VAC/VDC,<br>SPDT EM relay 3A @ 120VAC |

### Enhanced 50 Photoelectric Sensors Specifications by Input Type

| Enhanced 50 Photoelectric Sensors Specifications by Input Type |                                                                                                                  |                                |                |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|
| Specifications                                                 | AC/DC EM Relay Models                                                                                            | AC/DC Solid-State Relay Models | DC Only Models |
| Input Voltage                                                  | 12 – 240 VDC<br>24 – 240 VAC                                                                                     | 12 – 240 VDC<br>24 – 240 VAC   | 10 – 40 VDC    |
| Light/Dark Operation                                           | Switch selectable                                                                                                |                                |                |
| Operating Temperature                                          | -13 to 131°F [-25 to 55°C]                                                                                       |                                |                |
| Humidity                                                       | 95% relative humidity, non-condensing                                                                            |                                |                |
| Case Material                                                  | Fiberglass reinforced plastic                                                                                    |                                |                |
| Lens Material                                                  | Acrylic                                                                                                          |                                |                |
| Vibration                                                      | IEC 60947-5-2 part 7.4.2                                                                                         |                                |                |
| Shock                                                          | IEC 60947-5-2 part 7.4.1                                                                                         |                                |                |
| Protection                                                     | Output short circuit and overcurrent protection, reverse polarity protection                                     |                                |                |
| Enclosure Ratings                                              | IP67                                                                                                             |                                |                |
| Agency Approvals                                               | IEC IP67, cCSAus, UL508 (CSA File 224447)                                                                        |                                |                |
| Output Load                                                    | 3A @ 120VAC<br>3A @ 28VAC<br>3A @ 240VAC                                                                         | 300mA @ 240 VAC/VDC            | 250mA          |
| Response Time                                                  | 15ms                                                                                                             | 2ms                            |                |
| No Load Current Draw                                           | <30 mA                                                                                                           |                                |                |
| Leakage Current (max.)                                         | —                                                                                                                | 1mA @ 240VAC                   | <10µA          |
| Indicator LEDs                                                 | Through-Beam Source.....All Others:<br>Red: Power.....Green: Output<br>.....Yellow: Power<br>.....Red: Alignment |                                |                |



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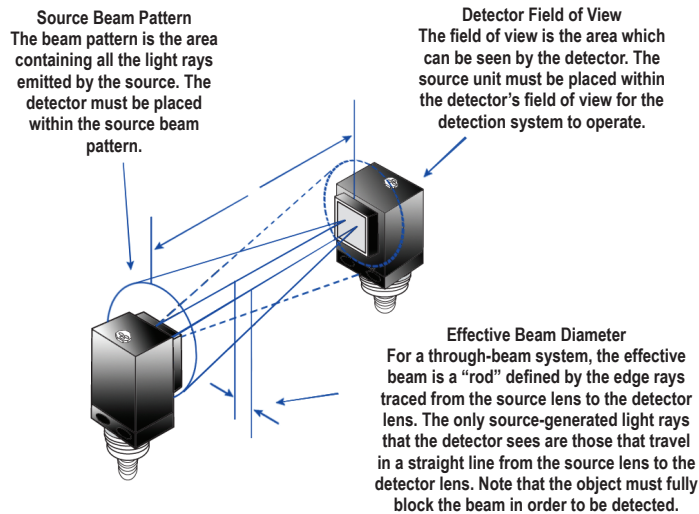
# Enhanced 50 Series Photoelectric Sensors

## Application Guide

The Enhanced 50 Series Photoelectric Sensors are a great fit for applications such as material handling, packaging, wrapping and sortation. This family of sensors, with its four basic models (Through-beam, Polarized Reflex, Diffuse and Clear Object), meets the needs for almost any sensing requirement, including harsh environments with excessive dust or high temperature. Follow the application guide below to choose the best sensor model for your application.

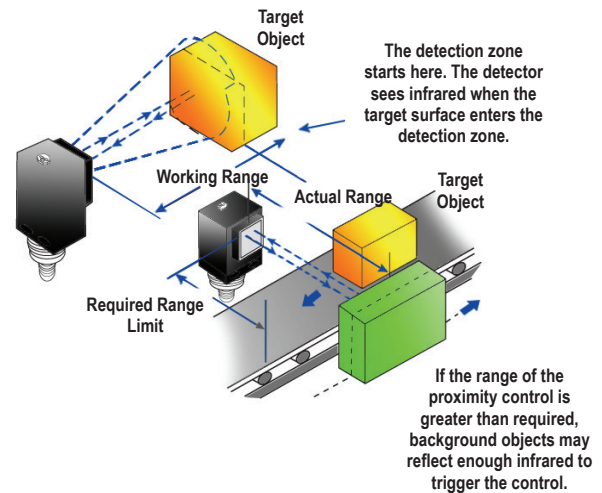
### Through-Beam

- Most accurate
- Longest sensing range
- Most reliable
- Must be installed in two points on system: emitter and receiver
- More costly



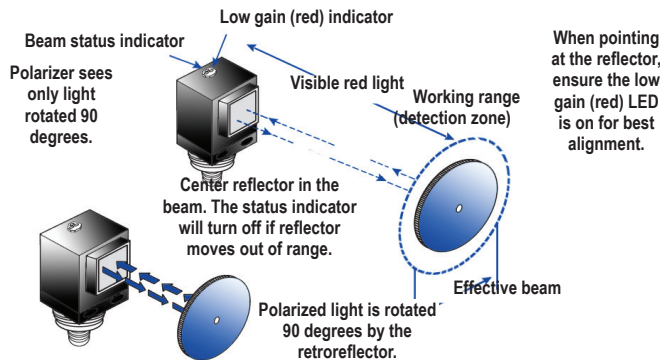
### Diffuse

- Lower cost
- Install at one point
- Less accurate than Through-Beam or Polarized Reflex
- More setup time involved



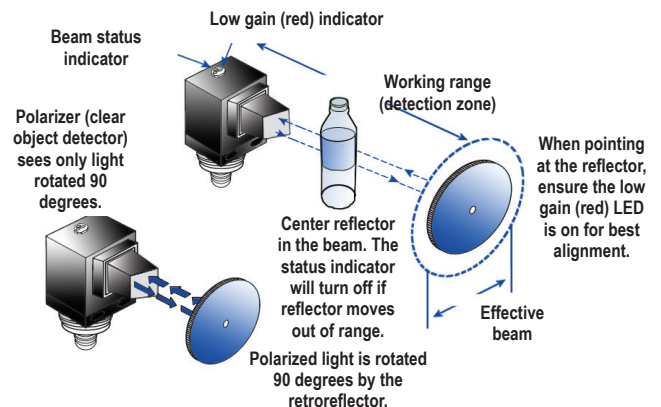
### Polarized Reflex

- Lower cost than Through-Beam
- Longer sensing range than Diffuse
- Very reliable
- Must be installed in two points on system: sensor and reflector



### Clear Object Detector

- Most reliable for sensing transparent objects
- Must be installed in two points on system: sensor and reflector.
- Short sensing distance: 45 inches max.





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# Enhanced 50 Series Photoelectric Sensors Connector Cables

Note: Cutler-Hammer parts available for sale to North America locations only.

| Enhanced 50 Series Cables Selection Chart |         |                                                                                                                                                              |       |                                                                                                                                         |
|-------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Part Number                               | Price   | Description                                                                                                                                                  | Gauge | Pin-Out Diagram                                                                                                                         |
| <a href="#"><u>CSDS4A4CY2202</u></a>      | \$32.00 | DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 6 feet (2 meter) length                   | 22    |  1-Brown<br>2-White<br>3-Blue<br>4-Black             |
| <a href="#"><u>CSDS4A4CY2205</u></a>      | \$33.00 | DC Euro (Micro) connector cable for quick-disconnect photoelectric sensors, straight female, DC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length                | 22    |  1-Brown<br>2-White<br>3-Blue<br>4-Black             |
| <a href="#"><u>CSAS4F4CY2202</u></a>      | \$36.00 | AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 6 feet (2 meter) length, 1/2" - 20 UNF thread    | 22    |  1-Red/Black<br>2-Red/White<br>3-Red<br>4-Green      |
| <a href="#"><u>CSAS4F4CY2205</u></a>      | \$37.00 | AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 4-pin/4-wire, PVC, 16.4 feet (5 meter) length, 1/2" - 20 UNF thread | 22    |  1-Red/Black<br>2-Red/White<br>3-Red<br>4-Green      |
| <a href="#"><u>CSAS5A5CY2202</u></a>      | \$45.50 | AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 5-pin/5-wire, PVC, 6 feet (2 meter) length, 1/2" - 20 UNF thread    | 22    |  1-Brown<br>2-Blue<br>3-Gray<br>4-Black<br>5-White   |
| <a href="#"><u>CSAS5A5CY2205</u></a>      | \$48.00 | AC Micro connector cable for quick-disconnect photoelectric sensors, straight female, AC 5-pin/5-wire, PVC, 16.4 feet (5 meter) length, 1/2" - 20 UNF thread | 22    |  1-Brown<br>2-Blue<br>3-Gray<br>4-Black<br>5-White   |
| <a href="#"><u>CSMS4A4CY1602</u></a>      | \$49.00 | Mini connector cable for quick-disconnect photoelectric sensors, straight female, 4-pin/4-wire, PVC, 6 feet (2 meter) length, 7/8" - 16 UN thread            | 16    |  1-Black<br>2-Blue<br>3-Brown<br>4-White             |
| <a href="#"><u>CSMS4A4CY1606</u></a>      | \$79.00 | Mini connector cable for quick-disconnect photoelectric sensors, straight female, 4-pin/4-wire, PVC, 19.69 feet (6 meter) length, 7/8" - 16 UN thread        | 16    |  1-Black<br>2-Blue<br>3-Brown<br>4-White             |
| <a href="#"><u>CSMS5A5CY1602</u></a>      | \$57.00 | Mini connector cable for quick-disconnect photoelectric sensors, straight female, 5-pin/5-wire, PVC, 6 feet (2 meter) length, 7/8" - 16 UN thread            | 16    |  1-Black<br>2-Blue<br>3-Orange<br>4-Brown<br>5-White |
| <a href="#"><u>CSMS5A5CY1606</u></a>      | \$91.00 | Mini connector cable for quick-disconnect photoelectric sensors, straight female, 5-pin/5-wire, PVC, 19.69 feet (6 meter) length, 7/8" - 16 UN thread        | 16    |  1-Black<br>2-Blue<br>3-Orange<br>4-Brown<br>5-White |

[CSDS4A4CY2205](#)[CSAS4F4CY2205](#)[CSAS5A5CY2202](#)

| Connector Cables Specifications       |                                                                   |                                                                    |
|---------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------|
|                                       | Micro Style                                                       | Mini Style                                                         |
| Jacket Material                       | PVC                                                               | PVC                                                                |
| Contact Material                      | Gold-plated copper alloy                                          | Gold-plated brass                                                  |
| Coupling Nut Material                 | Zinc die-cast epoxy-coat                                          | Zinc die cast epoxy-coat                                           |
| O-ring                                | Nitrile rubber                                                    | None                                                               |
| Cable                                 | PVC insulation and jacket, stranded copper conductors             |                                                                    |
| Cable Strain Relief                   | 35 pounds minimum                                                 |                                                                    |
| Voltage Rating                        | 320 V (24 VDC for LED plugs)                                      | 600 V                                                              |
| Current Rating                        | 4A                                                                | 4-pin: 10A<br>5-pin: 8 A                                           |
| Contact Resistance                    | 5mΩ max                                                           | 5mΩ max                                                            |
| Isolation Resistance                  | 1000MΩ min                                                        | 100 MΩ min                                                         |
| Protection                            | IP67                                                              | NEMA 6P, IP68                                                      |
| Temperature Range                     | -25 to 90°C                                                       | -20 to 105°C                                                       |
| Cable Diameter<br>(3/C = 3 Conductor) | 22 AWG PVC:<br>4/C: 0.21 inch [5.3 mm]<br>5/C: 0.20 inch [5.1 mm] | 16AWG PVC:<br>4/C: 0.42 inch [10.7 mm]<br>5/C: 0.50 inch [12.7 mm] |
| Bend Radius                           | Minimum recommended bend radius is 12X cable diameter             |                                                                    |

[CSMS4A4CY1602](#)[CSMS5A5CY1602](#)



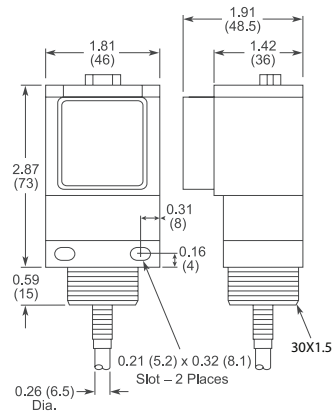
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# Enhanced 50 Series Photoelectric Sensors Dimensions

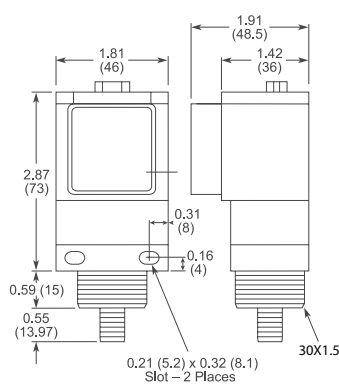
## Sensor Dimensions

inches (mm)

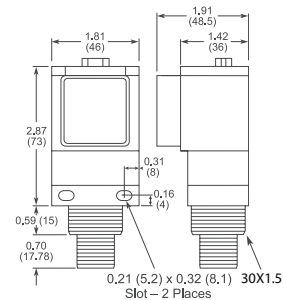
Cable and Pigtail Connector\* Version



AC/DC Micro or Euro (Micro) Connector Versions

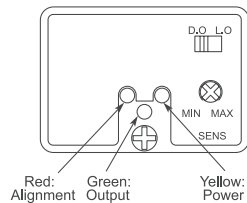


Mini Connector Versions

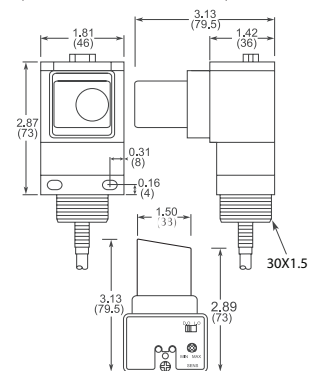


\* Pigtail length: 7.5" nominal

Top View



Clear Object Versions (Cable Version Shown)

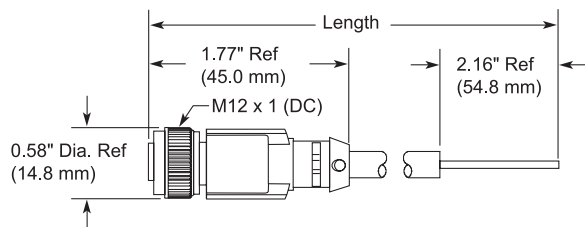


## Connector Cables Dimensions

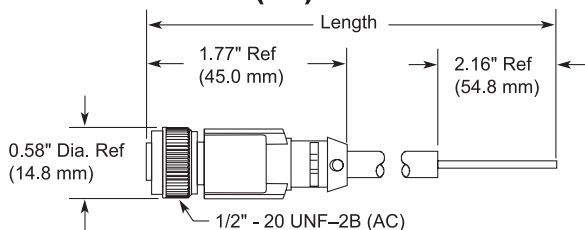
(in/mm)

### Micro Style Connector Cables

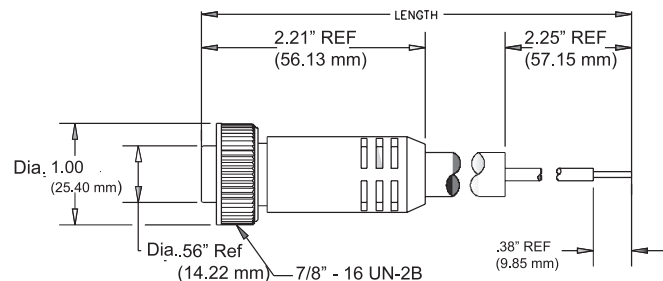
#### M12 x 1 (DC) connector cable



#### 1/2" - 20 UNF-2B (AC) connector cable



### Mini Style Connector Cables



# DFT Series Fiber Photoelectric Amplifiers



## Compact rectangular plastic DIN-rail mount with Teach function - DC

- DIN-rail mounting
- Bargraph signal-strength indicator
- NPN or PNP, Light-on/Dark-on selectable outputs
- Red LED with visible spot
- IP64 rated



### DFT Series Fiber Photoelectric Amplifier Selection Chart

| Part Number               | Price    | Sensing Range              | Output State            | Logic | Connection              | Wiring    | Dimensions |
|---------------------------|----------|----------------------------|-------------------------|-------|-------------------------|-----------|------------|
| <a href="#">DFT-AN-1A</a> | \$172.00 | Optical fiber<br>Dependent | N.O./N.C.<br>selectable | NPN   | 2m [6.5 ft] axial cable | Diagram 1 | Figure 1   |
| <a href="#">DFT-AN-1F</a> | \$172.00 |                            |                         |       | M8 [8mm] connector      | Diagram 1 | Figure 2   |
| <a href="#">DFT-AP-1A</a> | \$172.00 |                            |                         | PNP   | 2m [6.5 ft] axial cable | Diagram 2 | Figure 1   |
| <a href="#">DFT-AP-1F</a> | \$172.00 |                            |                         |       | M8 [8mm] connector      | Diagram 2 | Figure 2   |

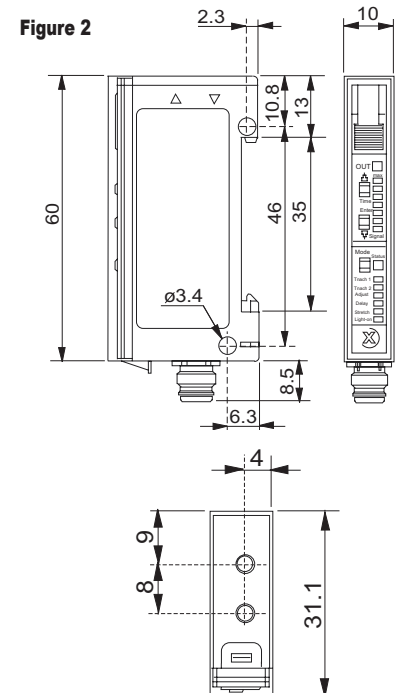
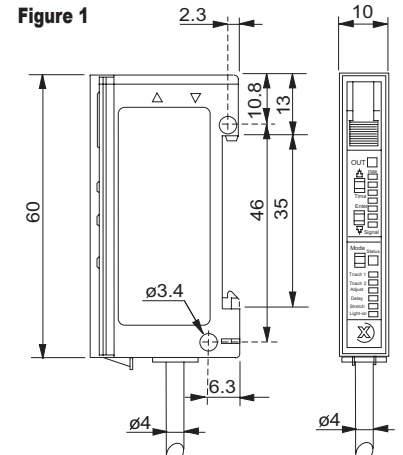
### Specifications

| Type                                       | DFT-AN-1*                                                                  | DFT-AP-1*                                                                  |
|--------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Sensing Distance</b>                    | See Optical Fibers Table                                                   |                                                                            |
| <b>Light Spot Diameter</b>                 | N/A                                                                        |                                                                            |
| <b>Emission</b>                            | red (680nm)                                                                |                                                                            |
| <b>Sensitivity</b>                         | Dual Teach function                                                        |                                                                            |
| <b>Output Type</b>                         | NPN Light-on or Dark-on Selectable<br>Output delay or stretch programmable | PNP Light-on or Dark-on Selectable<br>Output delay or stretch programmable |
| <b>Operating Voltage</b>                   | 10-30VDC                                                                   |                                                                            |
| <b>No-Load Supply Current</b>              | ≤ 25mA                                                                     |                                                                            |
| <b>Operating (Load) Current</b>            | ≤ 200mA                                                                    |                                                                            |
| <b>Off-state (Leakage) Current</b>         | ≤ 0.1mA                                                                    |                                                                            |
| <b>Voltage Drop</b>                        | 2V maximum at 200mA                                                        |                                                                            |
| <b>Switching Frequency</b>                 | 1.5 kHz                                                                    |                                                                            |
| <b>Ripple</b>                              | m20%                                                                       |                                                                            |
| <b>Time Delay Before Availability (tv)</b> | 80ms                                                                       |                                                                            |
| <b>Short-Circuit Protection</b>            | Yes (switch auto-resets after overload is removed)                         |                                                                            |
| <b>Operating Temperature</b>               | -25 to 55°C [-13 to 131°F]                                                 |                                                                            |
| <b>Protection Degree</b>                   | IEC IP64                                                                   |                                                                            |
| <b>LED Indicators -Switching Status</b>    | Yellow (output energized)                                                  |                                                                            |
| <b>Housing Material</b>                    | PBT                                                                        |                                                                            |
| <b>Lens Material</b>                       | Acrylic                                                                    |                                                                            |
| <b>Shock/Vibration</b>                     | <a href="#">See terminology section</a>                                    |                                                                            |
| <b>Tightening Torque</b>                   | N/A                                                                        |                                                                            |
| <b>Weight (cable/connector)</b>            | 68g [2.39oz] / 17g [0.60oz]                                                |                                                                            |
| <b>Connectors</b>                          | 2m [6.5 ft] axial cable; M8 [8mm] connector                                |                                                                            |
| <b>Agency Approvals</b>                    | UL file E328811                                                            |                                                                            |

To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

### Dimensions

(mm)



### Wiring Diagrams

Diagram 1

NPN Output

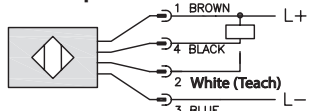
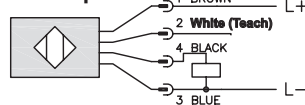


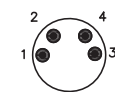
Diagram 2

PNP Output



Connector

M8 Connector



### Switching Element Function

|                 | Through-beam and Reflective Models | Diffuse Reflective Models |
|-----------------|------------------------------------|---------------------------|
| <b>Light-on</b> | N.C.                               | N.O.                      |
| <b>Dark-on</b>  | N.O.                               | N.C.                      |

# Accessories for 50 Series Photoelectric Sensors

## Mounting Brackets

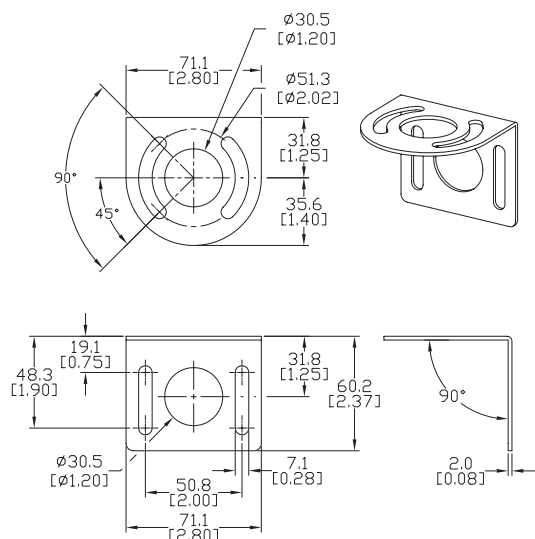
Short, tall or ball-swivel style of mounting brackets are available. All styles allow 360° rotation of the sensor.

*Note: Cutler-Hammer parts available for sale to North America locations only.*

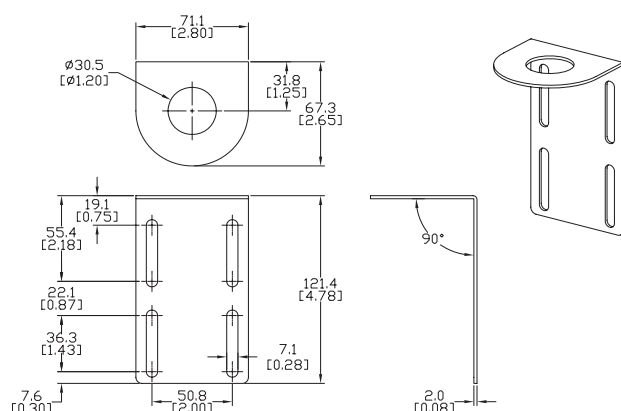
## Dimensions

mm [inches]

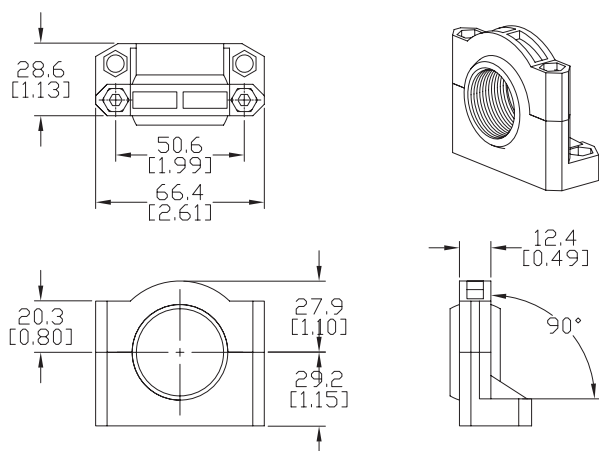
| Accessories for Enhanced 50 Series Sensors |         |                                                                                                                                                                                           |             |
|--------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Part Number                                | Price   | Description                                                                                                                                                                               | Weight [lb] |
| <a href="#"><u>6150E-6501</u></a>          | \$7.75  | Mounting bracket, right-angle, 1.5in vertical adjustment, nickel plated steel. For use with CH Enhanced 50 Series sensor.                                                                 | 0.20        |
| <a href="#"><u>6150E-6502</u></a>          | \$10.00 | Mounting bracket, right-angle, 3.5in vertical adjustment, nickel plated steel. For use with CH Enhanced 50 Series sensor.                                                                 | 0.39        |
| <a href="#"><u>6150E-6503</u></a>          | \$10.00 | Mounting bracket, right-angle ball swivel, 60 degree vertical and horizontal adjustment, plastic. For use with CH Enhanced 50 Series sensor. Ball swivel allows for $\pm 30^\circ$ angle. | 0.11        |



[6150E-6501](#)



[6150E-6502](#)



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