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[ For information on these products, please visit our web site at  
[www.ab.com/catalogs](http://www.ab.com/catalogs)





Quick Selection Guide

Specifications	 <b>42EF</b> RightSight <sup>†</sup>	 <b>42KL</b> MiniSight <sup>†</sup>	 <b>44R</b> AccuSight <sup>†</sup>	 <b>42CA</b> 18 mm Cylindrical
<b>Features</b>	<ul style="list-style-type: none"> <li>Patented housing design with 1200 psi washdown rating</li> <li>Universal 18 mm and thru-hole mounting options</li> <li>360° visible status indicators</li> <li>DC only and universal supply models</li> <li>Variety of sensing modes</li> <li>Variety of output types</li> </ul>	<ul style="list-style-type: none"> <li>Industry standard housing design with 1200 psi washdown rating</li> <li>Universal 18 mm and thru-hole mounting options</li> <li>360° visible status indicators</li> <li>2- and 3-wire models</li> <li>Variety of sensing modes</li> <li>2 m cable and micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Patented status indicators</li> <li>Low profile housing design</li> <li>Universal 18 mm and thru-hole mounting options</li> <li>360° visible status indicators</li> <li>Low voltage DC operation</li> <li>Variety of sensing modes</li> <li>2 m cable and micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Industry standard 18 mm housing design</li> <li>Patented ASIC design offers linear sensitivity adjustment, stability indication, and excellent noise immunity</li> <li>Stability Indication for ease of alignment and forewarning against detection of background</li> <li>Complementary light/dark outputs</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Washdown applications</li> </ul>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Washdown applications</li> </ul>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Conveyors</li> </ul>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Embedded mounting</li> </ul>
<b>Sensing Modes and Max. Range</b>	<ul style="list-style-type: none"> <li>Polarized retroreflective 3 m (10 ft)</li> <li>Retroreflective 4.5 m (14.7 ft)</li> <li>Diffuse 500 mm (20 in.)</li> <li>Background suppression 50 mm (2 in.), 100 mm (4 in.)</li> <li>Transmitted beam 20 m (60 ft), 4 m (13 ft), 8 m (26 ft)</li> <li>Large aperture fiber optic</li> <li>Sharp cutoff diffuse 130 mm (5 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 5 m (16.4 ft) or 2.5 m (8.2 ft)</li> <li>Polarized retroreflective 2 m (6.6 ft) or 1 m (3.3 ft)</li> <li>Diffuse 380 mm (15 in.) or 190 mm (7.5 in.)</li> <li>Wide angle diffuse 180 mm (7 in.) or 90 mm (3.5 in.)</li> <li>Fixed focus diffuse 43 mm (1.7 in.) or 16 mm (0.63 in.)</li> <li>Transmitted beam 30 m (98 ft) or 10 m (33 ft)</li> <li>Large aperture fiber optic</li> <li>Small aperture fiber optic</li> </ul>	<ul style="list-style-type: none"> <li>Polarized retroreflective 3 m (10 ft)</li> <li>Diffuse 300 mm (12 in.)</li> <li>Wide angle diffuse 200 mm (7.8 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 4.8 m (15.7 ft) and 7 m (23 ft)</li> <li>Polarized retroreflective 3.8 m (12.5 ft)</li> <li>Diffuse 100, 400 and 1000 mm (3.94, 15.75, and 39.37 in.)</li> <li>Transmitted Beam 16 m (52.5 ft)</li> </ul>
<b>Operating Voltage</b>	<ul style="list-style-type: none"> <li>10.8...30V DC</li> <li>21.6...264V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>10.8...30V DC</li> <li>21.6...250V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>
<b>Output Type</b>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> <li>Dual NPN/PNP 100 mA</li> <li>MOSFET 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>Dual NPN/PNP 100 mA</li> <li>2-wire AC 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> <li>NPN and PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>
<b>Response Time</b>	<ul style="list-style-type: none"> <li>1...16 ms</li> </ul>	<ul style="list-style-type: none"> <li>DC = 1 ms</li> <li>DC high speed=300 μs</li> <li>AC = 8.3 ms</li> </ul>	<ul style="list-style-type: none"> <li>10 ms</li> </ul>	<ul style="list-style-type: none"> <li>1 ms</li> <li>0.5 ms (background suppression)</li> </ul>
<b>Connections</b>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Micro and pico QD</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Micro and pico QD</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Micro QD (6 in.) pigtail</li> </ul>	<ul style="list-style-type: none"> <li>2 m cable</li> <li>Micro QD</li> </ul>
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>Mindel, Acrylic</li> <li>NEMA 4X, 6P; IP67, IP69K</li> <li>1200 psi washdown</li> </ul>	<ul style="list-style-type: none"> <li>Noryl<sup>R</sup>, Acrylic</li> <li>NEMA 4X, 6P; IP67</li> <li>1200 psi washdown</li> </ul>	<ul style="list-style-type: none"> <li>Valox<sup>R</sup></li> <li>NEMA 12; IP51</li> </ul>	<ul style="list-style-type: none"> <li>PBT</li> <li>IP67</li> </ul>
<b>Additional Info</b>	<ul style="list-style-type: none"> <li>See page 1-31</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-40</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-48</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-52</li> </ul>





PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**Quick Selection Guide**

 <p><b>42CM</b> 18 mm Metal Cylindrical</p>	 <p><b>42CF</b> 12 mm Metal Cylindrical</p>	 <p><b>Series 9000</b> Standard and Timing</p>	 <p><b>44B</b> Adjustable Background and Foreground Suppression</p>	 <p><b>42BT</b> Long Range Background Suppression</p>
<ul style="list-style-type: none"> <li>• 18 mm industry standard package</li> <li>• Wide selection of sensing modes</li> <li>• 30V DC operation</li> <li>• NPN or PNP outputs</li> <li>• Fast response time</li> <li>• Variety of connection types</li> </ul>	<ul style="list-style-type: none"> <li>• Industry standard 12 mm housing design</li> <li>• Durable metal housing</li> <li>• Low voltage DC operation</li> <li>• Fast response time</li> <li>• Variety of sensing modes</li> <li>• 2 m cable and micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>• Industry standard housing design with 1200 psi washdown rating</li> <li>• Universal 30 mm and thru-hole mounting options</li> <li>• 360_ visible status indicators</li> <li>• DC and AC only models</li> <li>• Variety of sensing modes</li> <li>• Variety of output types</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustable background and Foreground suppression models</li> <li>• Power, output and stability status indication</li> <li>• Micro QD connection with 90° swivel</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustable long range background suppression sensing mode</li> <li>• Industry accepted housing design</li> <li>• 360_ visible status indicators</li> <li>• Low voltage DC operation</li> <li>• Dual NPN and PNP outputs</li> <li>• 2 m cable, pico and micro QD connections</li> </ul>
<ul style="list-style-type: none"> <li>• Short range, general purpose sensing</li> <li>• Embedded mounting</li> </ul>	<ul style="list-style-type: none"> <li>• Short range, general purpose sensing</li> <li>• Embedded mounting</li> </ul>	<ul style="list-style-type: none"> <li>• Long range, general purpose sensing</li> <li>• Washdown applications</li> </ul>	<ul style="list-style-type: none"> <li>• Medium range background suppression, foreground suppression</li> <li>• Material handling and packaging applications</li> </ul>	<ul style="list-style-type: none"> <li>• Long range, background suppression sensing</li> <li>• Light duty industrial environments</li> </ul>
<ul style="list-style-type: none"> <li>• Retroreflective 3 mm...4 m (0.12 in...13.2 ft)</li> <li>• Polarized retroreflective 3 mm...3 m (0.12 in...9.9 ft)</li> <li>• Standard diffuse 0...100 mm (3.9 in.) (Adjustable) and 0...400 mm (13.6 in.) (Adjustable)</li> <li>• Background Suppression 50 mm (1.97 in.) and 100 mm (3.9 in.)</li> <li>• Transmitted beam 3 mm...14 m (0.12 in...45.9 ft) (Adjustable)</li> </ul>	<ul style="list-style-type: none"> <li>• Polarized retroreflective 2 m (6.6 ft)</li> <li>• Standard diffuse 100 mm (3.9 in.) and 300 mm (11.8 in.)</li> <li>• Transmitted beam 4 m (13.1 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• Retroreflective 9.14 m (30 ft)</li> <li>• Polarized retroreflective 5 m (16 ft)</li> <li>• Standard diffuse 1.5 m (5 ft)</li> <li>• Long range diffuse 3 m (10 ft)</li> <li>• Transmitted beam 61 m (200 ft)</li> <li>• Long range transmitted beam 152 m (500 ft)</li> <li>• Large aperture fiber optic</li> <li>• Small aperture fiber optic</li> </ul>	<ul style="list-style-type: none"> <li>• Background suppression 300 mm (11.8 in.)</li> <li>• Foreground suppression 200 mm (7.87 in.)</li> </ul>	<ul style="list-style-type: none"> <li>• 1 m or 2 m (3.28 or 6.56 ft) mechanically adjusted background suppression</li> </ul>
<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 10...40V DC</li> <li>• 10...55V DC; 20...40V AC</li> <li>• 70...264V AC/DC</li> <li>• 45...264V AC; 40...264V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 20...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 12...24V DC</li> </ul>
<ul style="list-style-type: none"> <li>• NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN and PNP 250 mA</li> <li>• EM relay 2 A</li> <li>• Isolated NO solid state 300 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN and PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN or PNP 100 mA</li> </ul>
<ul style="list-style-type: none"> <li>• 2 ms (0.5 ms for background suppression)</li> </ul>	<ul style="list-style-type: none"> <li>• 1.25...2.0 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 2...15 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 1 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 2 ms</li> </ul>
<ul style="list-style-type: none"> <li>• 2 m cable</li> <li>• 4-pin DC micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• 300V PVC cable 2 m</li> <li>• Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• 300V PVC cable 2 m</li> <li>• Mini QD</li> <li>• Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• 300V PVC cable 2 m</li> <li>• Pico QD</li> <li>• Micro QD</li> </ul>
<ul style="list-style-type: none"> <li>• Nickel-plated brass</li> <li>• IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Nickel-plated brass</li> <li>• IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 3, 4X, 6P, 12 &amp; 13; IP67, IP69K</li> <li>• 1200 psi washdown</li> </ul>	<ul style="list-style-type: none"> <li>• Acrylic</li> <li>• NEMA 3, 4X, 6P, 12, 13, IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Polyarylate</li> <li>• IP65</li> </ul>
<ul style="list-style-type: none"> <li>• See page 1-57</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-62</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-65</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-72</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-76</li> </ul>





Quick Selection Guide

Specifications	 <p><b>42BC</b> Long Range Background Suppression</p>	 <p><b>42BA</b> Short-Range Background Suppression</p>	 <p><b>42JS</b> VisiSight<sup>†</sup></p>	 <p><b>42KA</b> Subminiature Flat Pack</p>
<b>Features</b>	<ul style="list-style-type: none"> <li>Adjustable long range background suppression sensing mode</li> <li>Industry accepted housing design</li> <li>360° visible status indicators</li> <li>DC and AC only models</li> <li>Transistor or EM-Relay output models</li> <li>Screw terminal connections</li> </ul>	<ul style="list-style-type: none"> <li>Adjustable short range background suppression sensing mode</li> <li>Industry accepted housing design</li> <li>360° visible status indicators</li> <li>Low voltage DC operation</li> <li>Fast response time</li> <li>Diagnostic output</li> <li>2 m cable connections</li> </ul>	<ul style="list-style-type: none"> <li>Visible light source offered on all models for ease of alignment</li> <li>Patented ASIC design offers linear sensitivity adjustment, stability indication and excellent noise immunity</li> <li>Compact sealed housing and cavity-free design to minimize collection of dust and debris while allowing for easy sensor cleanup</li> </ul>	<ul style="list-style-type: none"> <li>Subminiature form factor</li> <li>Side and end-view options</li> <li>High visibility LED status indicators</li> <li>Variety of sense modes</li> <li>Low voltage DC operation</li> <li>2 m cable connection</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>Long range, background suppression sensing</li> <li>Light duty industrial environments</li> </ul>	<ul style="list-style-type: none"> <li>Short range, background suppression sensing</li> <li>Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Material handling, packaging and assembly</li> </ul>	<ul style="list-style-type: none"> <li>Short range general purpose sensing</li> <li>Small parts assembly</li> </ul>
<b>Sensing Modes and Max. Range</b>	<ul style="list-style-type: none"> <li>Background Suppression 1 m (3.3 ft) and 2 m (6.6 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Sharp cutoff diffuse: small sensor 3...5 cm (1.18...1.97 in.); large sensor 10...20 cm (3.94...7.87 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Polarized retroreflective 3.5 m (11.5 ft)</li> <li>Diffuse 800 mm (31.5 in.)</li> <li>Transmitted Beam: Red LED source 10 m (32.8 ft) Infrared LED source 10 m (32.8 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Standard diffuse 3...5 cm (1.18...1.97 in.)</li> <li>Sharp cutoff diffuse 3 cm (1.18 in.)</li> <li>Transmitted beam 50 cm (19.7 in.)</li> </ul>
<b>Operating Voltage</b>	<ul style="list-style-type: none"> <li>12...24V DC ±10% 30 mA</li> <li>24...240V AC/DC ±10% 30 mA (DC) 15 mA (AC)</li> </ul>	<ul style="list-style-type: none"> <li>11...26V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>12...24V DC</li> <li>24V DC ±10% (transmitted beam)</li> </ul>
<b>Output Type</b>	<ul style="list-style-type: none"> <li>NPN/PNP Selectable 100 mA</li> <li>S.P.S.T. N.O. Relay 3A (250V AC, 750V A) 3A (30V DC, 90 W)</li> </ul>	<ul style="list-style-type: none"> <li>NPN: 100 mA stability - 50 mA</li> <li>PNP: 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 80 mA</li> </ul>
<b>Response Time</b>	<ul style="list-style-type: none"> <li>20 ms</li> <li>30 ms</li> </ul>	<ul style="list-style-type: none"> <li>0.35 ms</li> </ul>	<ul style="list-style-type: none"> <li>1 ms</li> </ul>	<ul style="list-style-type: none"> <li>0.5 ms</li> </ul>
<b>Connections</b>	<ul style="list-style-type: none"> <li>Screw terminals accepts up to two 16 AWG (1.3 mm sq.) conductors</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> </ul>	<ul style="list-style-type: none"> <li>2 m cable</li> <li>Micro QD</li> <li>Pico QD</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> </ul>
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>Polycarbonate</li> <li>NEMA 1, 12, 13 IP65 (IEC529)</li> </ul>	<ul style="list-style-type: none"> <li>Polyarylate/ABS</li> <li>NEMA 1, 4, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>ABS/PMMA</li> <li>IP67</li> </ul>	<ul style="list-style-type: none"> <li>Polyester</li> <li>NEMA 1 &amp; IP40</li> </ul>
<b>Additional Info</b>	<ul style="list-style-type: none"> <li>See page 1-78</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-81</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-84</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-88</li> </ul>






PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**Quick Selection Guide**

 <p><b>42KB</b> Micro Rectangular</p>	 <p><b>42KC</b> Miniature Rectangular</p>	 <p><b>Series 7000</b> Miniature Rectangular</p>	 <p><b>Series 7000</b> LTD Miniature Rectangular</p>	 <p><b>42EF</b> LaserSight† RightSight†</p>
<ul style="list-style-type: none"> <li>Industry standard form factor</li> <li>Diagnostic output</li> <li>High visibility LED status indicator</li> <li>Variety of sense modes</li> <li>Low voltage DC operation</li> <li>2 m cable or pico QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Industry standard form factor</li> <li>Diagnostic output</li> <li>High visibility LED status indicator</li> <li>Variety of sense modes</li> <li>Low voltage DC operation</li> <li>2 m cable or pico QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Industry standard form factor</li> <li>High visibility LED status indicator</li> <li>Variety of sense modes</li> <li>Complimentary light/dark outputs</li> <li>Low voltage DC operation</li> <li>2 m cable or micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Economy with performance</li> <li>Industry standard form factor</li> <li>High visibility LED status indicator</li> <li>Standard sense modes</li> <li>Low voltage DC operation</li> <li>2 m cable or micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>Universal 18 mm and thru-hole mounting options</li> <li>360° visible status indicators</li> <li>Class 1 eye-safe visible laser</li> </ul>
<ul style="list-style-type: none"> <li>Short range general purpose sensing</li> <li>Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>Short range general purpose sensing</li> <li>Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>Short range general purpose sensing</li> <li>Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>Short range general purpose sensing</li> <li>Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>Medium range, general purpose sensing</li> <li>Material handling, assembly and packaging</li> </ul>
<ul style="list-style-type: none"> <li>Retroreflective 2 m (6.56 ft)</li> <li>Standard diffuse 70/200/300/400 mm (2.75/7.87/11.81/15.75 in.)</li> <li>Transmitted beam 1/7/10 m (3.3/22.75/32.8 ft)</li> <li>Sharp cutoff diffuse 30/40 mm (0.18/1.57 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Polarized retroreflective 1.5 m (5 ft)</li> <li>Standard diffuse 50 cm (19.68 in.)</li> <li>Transmitted beam 7 m (22.96 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 3.66 m (12 ft)</li> <li>Polarized retroreflective 1.98 m (6.5 ft)</li> <li>Standard diffuse 0.30 m (12 in.)</li> <li>Wide angle diffuse 0.28 m (11 in.)</li> <li>Fixed focus diffuse 17.8 mm (0.60 in.)</li> <li>Transmitted beam 7.62/9.15 m (25/30 ft)</li> <li>Small aperture fiber optic</li> <li>Transparent object detection</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 0.76/2.13/3.65 m (2.5/7/12 ft)</li> <li>Standard diffuse 0.30 m (12 in.)</li> <li>Antiglare retroreflective 1/2 m (3.28/6.5 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Polarized retroreflective 15 m (49 ft)</li> <li>Diffuse 300 mm (11.8 in.)</li> <li>Transmitted Beam 40 m (131 ft)</li> </ul>
<ul style="list-style-type: none"> <li>11...26V DC</li> </ul>	<ul style="list-style-type: none"> <li>11...26V DC</li> </ul>	<ul style="list-style-type: none"> <li>11...28V DC</li> </ul>	<ul style="list-style-type: none"> <li>11...28V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>
<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN and PNP 100 mA</li> </ul>
<ul style="list-style-type: none"> <li>0.35 ms</li> </ul>	<ul style="list-style-type: none"> <li>0.5 ms</li> </ul>	<ul style="list-style-type: none"> <li>0.5...1 ms</li> </ul>	<ul style="list-style-type: none"> <li>1 ms</li> </ul>	<ul style="list-style-type: none"> <li>1 ms (4 ms for transmitted beam)</li> </ul>
<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Pico QD</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> </ul>	<ul style="list-style-type: none"> <li>PVC cable 3 m</li> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>PVC cable 3 m</li> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>2 m cable</li> <li>Micro QD</li> </ul>
<ul style="list-style-type: none"> <li>Polyarylate</li> <li>NEMA 1, 4, 6, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>Polyarylate</li> <li>NEMA 1, 4, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>Valox<sup>R</sup></li> <li>NEMA 3, 4X, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>Valox<sup>R</sup></li> <li>NEMA 12 &amp; 13; IP62</li> </ul>	<ul style="list-style-type: none"> <li>Mindel/Acrylic</li> <li>IP54</li> </ul>
<ul style="list-style-type: none"> <li>See page 1-92</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-98</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-102</li> </ul>	<ul style="list-style-type: none"> <li><a href="http://www.ab.com/catalogs">www.ab.com/catalogs</a></li> </ul>	<ul style="list-style-type: none"> <li>See page 1-108</li> </ul>





Quick Selection Guide

Specifications	 <b>Series 9000 LaserSight t</b>	 <b>42CM 18 mm Cylindrical LaserSight t</b>	 <b>45MLD Laser Background Suppression</b>	 <b>45CPD Analog and Discrete Output</b>
<b>Features</b>	<ul style="list-style-type: none"> <li>• Class 2 visible red laser source</li> <li>• Polarized retroreflective and transmitted beam sensing modes</li> <li>• Industry standard housing design with 1200 psi washdown rating</li> <li>• Universal 30 mm and thru-hole mounting options</li> <li>• 360° visible status indicators</li> <li>• DC and AC only models</li> </ul>	<ul style="list-style-type: none"> <li>• Industry standard 18 mm housing design</li> <li>• Metal housing for heavy duty industrial applications</li> <li>• Class 1 eye safe visible laser</li> <li>• Small spot size</li> </ul>	<ul style="list-style-type: none"> <li>• Short range laser background suppression sensing mode</li> <li>• Adjustable sensing range and beam focus (0.5 mm (0.02 in.))</li> <li>• Industry accepted housing design</li> <li>• Low voltage DC operation</li> <li>• Fast response time</li> <li>• Pico QD connections</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple programming modes (object detection, object position)</li> <li>• Easy set-up using teach-in buttons</li> <li>• Class 1 eye safe visible laser for operation</li> <li>• Class 2 visible red laser for set-up</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>• Long range, general purpose sensing</li> <li>• Small parts placement</li> </ul>	<ul style="list-style-type: none"> <li>• Medium range, general purpose sensing</li> <li>• Embedded mounting</li> </ul>	<ul style="list-style-type: none"> <li>• Short range, precise sensing</li> <li>• Small parts assembly</li> </ul>	<ul style="list-style-type: none"> <li>• Long range, general purpose analog sensing</li> <li>• Object positioning, analog measuring</li> </ul>
<b>Sensing Modes and Max. Range</b>	<ul style="list-style-type: none"> <li>• Polarized retroreflective 40 m (130 ft)</li> <li>• Transmitted beam 300 m (1000 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• Polarized retroreflective 30 m (98 ft)</li> <li>• Diffuse 300 mm (11.8 in.)</li> <li>• Transmitted Beam 50 m (164 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• Background suppression diffuse 50...300 mm (1.9...11.8 in.)</li> </ul>	<ul style="list-style-type: none"> <li>• Diffuse 6 m (20 ft)</li> </ul>
<b>Operating Voltage</b>	<ul style="list-style-type: none"> <li>• 10...40V DC</li> <li>• 70...264V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 18...30V DC</li> </ul>
<b>Output Type</b>	<ul style="list-style-type: none"> <li>• NPN and PNP 250 mA</li> <li>• Em-Relay 2 A</li> </ul>	<ul style="list-style-type: none"> <li>• NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• Analog output: 4...20 mA;</li> <li>• Discrete: two PNP outputs</li> </ul>
<b>Response Time</b>	<ul style="list-style-type: none"> <li>• 500 µsec...15 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 0.7 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 200 µsec</li> </ul>	<ul style="list-style-type: none"> <li>• Fast/slow: 13 ms/30 ms</li> </ul>
<b>Connections</b>	<ul style="list-style-type: none"> <li>• 300V PVC cable 2 m</li> <li>• Mini QD</li> <li>• Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• 2 m cable</li> <li>• Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>• 4-pin pico QD</li> </ul>	<ul style="list-style-type: none"> <li>• Micro QD</li> </ul>
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup>, Acrylic</li> <li>• NEMA 3, 4X, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Nickel-plated brass/glass</li> <li>• IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Polyamide</li> <li>• IP65</li> </ul>	<ul style="list-style-type: none"> <li>• ABS/PMMA</li> <li>• IP67</li> </ul>
<b>Additional Info</b>	<ul style="list-style-type: none"> <li>• See page 1-112</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-115</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-119</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-121</li> </ul>

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
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 <b>45BPD</b> Analog and Discrete Output	 <b>45BRD</b> Analog Output	 <b>42CRC</b> Color Registration	 <b>Series 9000</b> ColorSight <sup>™</sup>	 <b>45CLR</b> ColorSight <sup>™</sup>
<ul style="list-style-type: none"> <li>Industry accepted 50 mm (1.97 in.) compact enclosure</li> <li>Self-contained laser measurement solution</li> <li>Class 2 visible red laser</li> </ul>	<ul style="list-style-type: none"> <li>Industry accepted 50 mm (1.97 in.) compact enclosure</li> <li>20 μm resolution</li> <li>Class 2 visible red laser</li> <li>270° rotatable connector</li> </ul>	<ul style="list-style-type: none"> <li>Selectable red or green light sources</li> <li>Manual or teachable operation</li> <li>Diagnostic output</li> <li>Fast response time</li> <li>Selectable pulse stretcher output</li> <li>Durable IP66 housing design</li> </ul>	<ul style="list-style-type: none"> <li>Teachable true RGB color sensor</li> <li>Fiber optic sensing for application flexibility</li> <li>Industry standard housing design with 1200 psi washdown rating</li> <li>Universal 30 mm and thru-hole mounting options</li> <li>8 color match precision levels</li> <li>Low voltage DC operation</li> </ul>	<ul style="list-style-type: none"> <li>Three channel color matching (3 outputs)</li> <li>Wide sensing range tolerance (±6 mm (±0.24 in.))</li> <li>Adjustable tolerance for high precision general color matching</li> <li>External teach capability</li> <li>Compact size enclosure</li> <li>RS-485 communication models available</li> </ul>
<ul style="list-style-type: none"> <li>Medium range, general purpose analog sensing</li> <li>Object positioning, analog measuring</li> </ul>	<ul style="list-style-type: none"> <li>Short range, precision general purpose measurement</li> <li>Object positioning, analog measuring</li> </ul>	<ul style="list-style-type: none"> <li>High speed contrast sensing</li> <li>Color registration</li> </ul>	<ul style="list-style-type: none"> <li>Precise color match sensing</li> <li>Part inspection and sortation</li> </ul>	<ul style="list-style-type: none"> <li>Precise color match sensing</li> <li>Part inspection and sortation</li> </ul>
<ul style="list-style-type: none"> <li>Diffuse 300 mm (11.8 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Diffuse 85 mm (3.35 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Color registration mark control 12.7 mm (0.5 in.)</li> </ul>	<ul style="list-style-type: none"> <li>Large aperture fiber optic</li> </ul>	<ul style="list-style-type: none"> <li>Diffuse 12...32 mm (0.47...1.26 in.)</li> </ul>
<ul style="list-style-type: none"> <li>18...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>18...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>18...30V DC</li> </ul>
<ul style="list-style-type: none"> <li>Analog output: 4...20 mA; Discrete: PNP (100 mA)</li> </ul>	<ul style="list-style-type: none"> <li>Analog output: 0...10V DC</li> </ul>	<ul style="list-style-type: none"> <li>NPN and PNP 100 mA</li> <li>Diagnostic alarm NPN 30 mA</li> </ul>	<ul style="list-style-type: none"> <li>Bipolar output</li> </ul>	<ul style="list-style-type: none"> <li>3 PNP outputs (discrete models)</li> <li>RS485 models: 1 PNP or 1 NPN output by cat. no.</li> </ul>
<ul style="list-style-type: none"> <li>0.4 ms</li> </ul>	<ul style="list-style-type: none"> <li>30 ms</li> </ul>	<ul style="list-style-type: none"> <li>0.25 ms</li> </ul>	<ul style="list-style-type: none"> <li>Selectable 1.5...16 ms</li> </ul>	<ul style="list-style-type: none"> <li>1 ms</li> </ul>
<ul style="list-style-type: none"> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>Micro QD</li> </ul>
<ul style="list-style-type: none"> <li>ABS/PMMA</li> <li>IP67</li> </ul>	<ul style="list-style-type: none"> <li>ABS/PMMA</li> <li>IP67</li> </ul>	<ul style="list-style-type: none"> <li>Epoxy-coated aluminum</li> <li>NEMA 3, 4, 6, 12 &amp; 13; IP66</li> </ul>	<ul style="list-style-type: none"> <li>Valox<sup>®</sup>, Acrylic</li> <li>NEMA 4; IP54</li> </ul>	<ul style="list-style-type: none"> <li>ABS/PMMA</li> <li>IP67</li> </ul>
<ul style="list-style-type: none"> <li>See page 1-123</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-125</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-127</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-130</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-134</li> </ul>

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Specifications	 <b>45FVL</b> Digital Fiber Optic	 <b>45FSL</b> Slim DIN-Rail Fiber Optic	 <b>42FT</b> 42FT Visible Red or Green Plastic Fiber Optic	 <b>42FA</b> Slim Fiber Optic
<b>Features</b>	<ul style="list-style-type: none"> <li>Teachable contrast sensor</li> <li>Accepts all plastic fiber optic cables</li> <li>Automatic and manual configuration with LCD display</li> <li>Red, green, blue, and white light source models</li> <li>"Power bus" feature reduces wiring</li> <li>DIN Rail mountable housing design</li> </ul>	<ul style="list-style-type: none"> <li>Adjustable plastic fiber optic contrast sensor</li> <li>Fast response time</li> <li>Red or white light source models</li> <li>"Power bus" feature reduces wiring</li> <li>Crosstalk protection</li> <li>DIN Rail mountable housing design</li> </ul>	<ul style="list-style-type: none"> <li>Red or green light source</li> <li>Local and remote self-teach operation</li> <li>Supports 1.5 mm and 1.25 mm plastic fiber optic cables</li> <li>Selectable pulse-stretcher</li> <li>Selectable hysteresis</li> <li>Dual "RUN" modes to prevent crosstalk with other sensors</li> </ul>	<ul style="list-style-type: none"> <li>In-line fiber optic sensor</li> <li>Accepts all plastic fiber optic cables</li> <li>Fast response time</li> <li>Red light source models</li> <li>Low voltage DC operation</li> <li>DIN Rail mount option</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>General contrast sensing</li> <li>Color registration, part inspection and sortation</li> </ul>	<ul style="list-style-type: none"> <li>High speed contrast sensing</li> <li>Color registration, part inspection and sortation</li> </ul>	<ul style="list-style-type: none"> <li>General contrast sensing</li> <li>Color registration, part inspection and sortation</li> </ul>	<ul style="list-style-type: none"> <li>Short range sensing</li> <li>Small part assembly</li> </ul>
<b>Sensing Modes and Max. Range</b>	<ul style="list-style-type: none"> <li>Retroreflective (bifurcated fiber)</li> <li>Standard diffuse (bifurcated fiber)</li> <li>Transmitted beam (individual fiber)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective (bifurcated fiber)</li> <li>Standard diffuse (bifurcated fiber)</li> <li>Transmitted beam (individual fiber)</li> </ul>	<ul style="list-style-type: none"> <li>Small aperture fiber optic</li> </ul>	<ul style="list-style-type: none"> <li>Small aperture fiber optic</li> </ul>
<b>Operating Voltage</b>	<ul style="list-style-type: none"> <li>12...24V DC</li> </ul>	<ul style="list-style-type: none"> <li>12...24V DC</li> </ul>	<ul style="list-style-type: none"> <li>12...24V DC</li> </ul>	<ul style="list-style-type: none"> <li>12...24V DC ±10%</li> <li>12...24V DC ±10%</li> </ul>
<b>Output Type</b>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> <li>Stability 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP by model</li> </ul>	<ul style="list-style-type: none"> <li>NPN 100 mA</li> <li>PNP 100 mA</li> </ul>
<b>Response Time</b>	<ul style="list-style-type: none"> <li>600 μsec</li> </ul>	<ul style="list-style-type: none"> <li>30 μsec, 250 μsec</li> </ul>	<ul style="list-style-type: none"> <li>500 μsec</li> </ul>	<ul style="list-style-type: none"> <li>500 μsec</li> </ul>
<b>Connections</b>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>4 pin pico QD</li> <li>Power Bus</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>4 pin pico QD</li> <li>Power Bus</li> </ul>	<ul style="list-style-type: none"> <li>2 m 500V 5 conductor cable</li> </ul>	<ul style="list-style-type: none"> <li>3-pin pico QD</li> </ul>
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>ABS</li> <li>NEMA 1 &amp; IP40</li> </ul>	<ul style="list-style-type: none"> <li>ABS</li> <li>NEMA 1 &amp; IP40</li> </ul>	<ul style="list-style-type: none"> <li>ABS resin</li> <li>NEMA 1, 4X, 12, 13; IP66 (IEC 529)</li> </ul>	<ul style="list-style-type: none"> <li>Noryl<sup>®</sup></li> <li>NEMA 1, 12, 13; IP65 (IEC 529)</li> </ul>
<b>Additional Info</b>	<ul style="list-style-type: none"> <li>See page 1-137</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-139</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-141</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-144</li> </ul>







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 <b>ClearSightt Series<sup>k</sup></b>	 <b>45LPT</b> <b>Optical Label Sensor</b>	 <b>45LFM</b> <b>Capacitive Label Sensor</b>	 <b>45LSP</b> <b>Optical Fork Sensor</b>	 <b>45LST</b> <b>Optical Fork Sensor</b>
<ul style="list-style-type: none"> <li>Optimized for clear object detection</li> <li>Three types from high performance (Series 9000, <sup>k</sup> pictured), to economical (RightSight and Series 7000)</li> <li>Washdown rated models</li> <li>DC and AC only models</li> <li>Variety of output types</li> </ul>	<ul style="list-style-type: none"> <li>One-touch local and remote teach operation</li> <li>Industrial aluminum housing design</li> <li>Highly visible LED status indicators</li> <li>Low voltage DC operation</li> <li>Fast response time</li> <li>Pico QD connection</li> </ul>	<ul style="list-style-type: none"> <li>Senses wide variety of label colors and material</li> <li>Industrial aluminum housing design</li> <li>Highly visible LED status indicators</li> <li>Low voltage DC operation</li> <li>Fast response time</li> <li>Micro QD connection</li> </ul>	<ul style="list-style-type: none"> <li>Teach-in sensitivity adjustment</li> <li>Light or dark operate selectable</li> <li>Remote teach capability (4-pin models)</li> <li>Plastic housing</li> </ul>	<ul style="list-style-type: none"> <li>Ideal for small parts detection</li> <li>Manual adjustment with LED status indicators</li> <li>Rugged aluminum construction</li> <li>Seven fork widths to choose from</li> <li>Fast response time</li> <li>Pico QD connections</li> </ul>
<ul style="list-style-type: none"> <li>Clear object sensing</li> <li>Plastic and glass bottles, films</li> </ul>	<ul style="list-style-type: none"> <li>Optical label sensing</li> <li>Translucent labels</li> </ul>	<ul style="list-style-type: none"> <li>Capacitive label sensing</li> <li>Translucent, clear, metalized labels</li> </ul>	<ul style="list-style-type: none"> <li>Smart parts detection</li> <li>Beam breakage sensing</li> </ul>	<ul style="list-style-type: none"> <li>Beam breakage sensing</li> <li>Small parts assembly</li> </ul>
<ul style="list-style-type: none"> <li>Polarized retroreflective</li> </ul>	<ul style="list-style-type: none"> <li>Transmitted beam (3 mm (0.12 in.) gap)</li> </ul>	<ul style="list-style-type: none"> <li>Capacitive (0.76 mm (0.03 in.) gap)</li> </ul>	<ul style="list-style-type: none"> <li>Transmitted beam gap (30...120 mm (1.18...4.72 in.))</li> </ul>	<ul style="list-style-type: none"> <li>Transmitted beam (2...225 mm (0.08...8.86 in.) gap)</li> </ul>
<ul style="list-style-type: none"> <li>10...40V DC</li> <li>40...264V AC/DC</li> <li>70...264V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>11...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> </ul>
<ul style="list-style-type: none"> <li>NPN and PNP 250 mA</li> <li>SPDT EM relay 2 A</li> <li>Isolated NO solid state 300 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 150 mA</li> </ul>	<ul style="list-style-type: none"> <li>PNP or NPN 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>NPN or PNP 100 mA</li> </ul>
<ul style="list-style-type: none"> <li>1...10 ms</li> </ul>	<ul style="list-style-type: none"> <li>50 μsec</li> </ul>	<ul style="list-style-type: none"> <li>10 μsec</li> </ul>	<ul style="list-style-type: none"> <li>250 μs</li> </ul>	<ul style="list-style-type: none"> <li>30 μs...1 ms</li> </ul>
<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Mini QD</li> <li>Micro QD</li> </ul>	<ul style="list-style-type: none"> <li>4-pin pico QD</li> </ul>	<ul style="list-style-type: none"> <li>5-pin micro QD</li> </ul>	<ul style="list-style-type: none"> <li>Pico QD</li> </ul>	<ul style="list-style-type: none"> <li>4-pin pico QD</li> </ul>
<ul style="list-style-type: none"> <li>Valox<sup>®</sup>, Acrylic</li> <li>NEMA 3, 4X, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>Aluminum</li> <li>IP65</li> </ul>	<ul style="list-style-type: none"> <li>Anodized aluminum</li> <li>IP54</li> </ul>	<ul style="list-style-type: none"> <li>Polycarbonate</li> <li>IP67</li> </ul>	<ul style="list-style-type: none"> <li>Aluminum</li> <li>IP65</li> </ul>
<ul style="list-style-type: none"> <li>See page 1-147</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-151</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-153</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-155</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-157</li> </ul>





Quick Selection Guide

	 <b>45MLA</b> Measuring Arrays & Controllers	 <b>45DLA</b> Discrete Light Arrays	 <b>45AST</b> Area Arrays	 <b>45PVA</b> Verification Array
<b>Specifications</b>				
<b>Features</b>	<ul style="list-style-type: none"> <li>• Height measuring capability</li> <li>• Slim profile array housing</li> <li>• Long operating range</li> <li>• Fast reaction time and measurement speed</li> <li>• Controllers available in I/O and serial communications (RS485 and CAN) models</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated light array controller</li> <li>• Simple, flexible mounting</li> <li>• Optically synchronized</li> <li>• Wiring selectable range and output state (light/dark operate)</li> <li>• 30mm resolution</li> </ul>	<ul style="list-style-type: none"> <li>• Two-dimensional array scanning technology</li> <li>• 11...17 mm resolution</li> <li>• 50, 100, 150 mm scanning height models</li> <li>• Durable aluminum housing</li> <li>• Bracket-free mounting</li> <li>• Low voltage DC operation</li> </ul>	<ul style="list-style-type: none"> <li>• 35 mm object resolution</li> <li>• Robust aluminum enclosure</li> <li>• Four heights to choose from</li> <li>• Highly visible JOB and FAULT indicators</li> <li>• Crosstalk immunity</li> <li>• Low voltage DC operation</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>• Height based measurement and sorting</li> <li>• Overheight/overhang detection</li> </ul>	<ul style="list-style-type: none"> <li>• Error proofing</li> <li>• Part detection</li> </ul>	<ul style="list-style-type: none"> <li>• Small parts assembly</li> <li>• Parts ejection sensing</li> </ul>	<ul style="list-style-type: none"> <li>• Error proofing</li> <li>• Bin picking</li> </ul>
<b>Sensing Modes and Max. Range</b>	• Transmitted beam up to 4 m (13 ft)	• Transmitted beam upto 8 m (26.2 ft)	• Transmitted beam up to 2.5 m (8 ft)	• Transmitted Beam 2 m (6.5 ft)
<b>Operating Voltage</b>	• 12...24V DC	• 12...24V DC	• 12...24V DC	• 12...24V DC
<b>Output Type</b>	• NPN and PNP or serial communications (selectable by model)	• NPN and PNP (single push/pull)	• NPN or PNP 100 mA	• NPN or PNP 50 mA
<b>Response Time</b>	• See 45MLA Controller User Manual	• 25...165 ms by cat. no.	• 4...8 ms	• 25...98 ms
<b>Connections</b>	• PVC cable with 8 pin micro-QD, 500 mm (19.7 in) between array and controller	• PVC cable with 4-pin DC micro (M12), 150 mm (6 in.) cable pigtail	• 300V PVC cable 2 m	• 300V PVC cable with micro QD
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>• Arrays: Aluminum housing, polycarbonate lens, IP54</li> <li>• Controller: ABS housing IP54</li> <li>• Terminal strip: IP20</li> </ul>	<ul style="list-style-type: none"> <li>• Aluminum housing, polycarbonate lens</li> <li>• IP54</li> </ul>	<ul style="list-style-type: none"> <li>• Aluminum housing, acrylic window</li> <li>• IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Aluminum housing, acrylic window</li> <li>• IP62</li> </ul>
<b>Additional Info</b>	• See page 1-160	• See page 1-166	• See page 1-169	• See page 1-171

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 <b>44N</b> Zone Control Sensor	 <b>22ZC</b> Zone Controller	 <b>Series 9000</b> Intrinsically Safe	 <b>Series 5000</b> Intrinsically Safe
<ul style="list-style-type: none"> <li>• Integral zone control logic</li> <li>• Supports singulation and slug operation</li> <li>• Compatible with variety of valves</li> <li>• Polarized retroreflective sense mode</li> <li>• Durable housing and connections</li> <li>• Low voltage DC operation</li> </ul>	<ul style="list-style-type: none"> <li>• Selectable pneumatic or powered roller zone control logic</li> <li>• Selectable advanced zone logic functions</li> <li>• Selectable RUN/STOP delay timers</li> <li>• Accepts mechanical or photoelectric sensor inputs</li> <li>• Drives pneumatic valve or powered roller driver</li> <li>• Proven flat cable IDC technology</li> </ul>	<ul style="list-style-type: none"> <li>• FM approved intrinsically safe design</li> <li>• Transmitted beam sensing mode</li> <li>• Compatible with Series 897H IS barriers</li> <li>• Industry standard housing design with 1200 psi washdown rating</li> <li>• Universal 30 mm and thru-hole mounting options</li> <li>• 360° visible status indicators</li> </ul>	<ul style="list-style-type: none"> <li>• FM approved intrinsically safe design</li> <li>• Multiple sensing modes</li> <li>• Compatible with Series 897H IS barriers</li> <li>• Modular housing design</li> <li>• Screw terminal connections</li> </ul>
<ul style="list-style-type: none"> <li>• Zero pressure accumulation conveyors</li> <li>• Pneumatically driven systems</li> </ul>	<ul style="list-style-type: none"> <li>• Accumulation conveyors</li> <li>• Pneumatically and powered roller driven systems</li> </ul>	<ul style="list-style-type: none"> <li>• Intrinsically safe systems</li> <li>• Hazardous (Classified) locations</li> </ul>	<ul style="list-style-type: none"> <li>• Intrinsically safe systems</li> <li>• Hazardous (Classified) locations</li> </ul>
<ul style="list-style-type: none"> <li>• Polarized Retroreflective 50.8...4.87 m (2...16 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• Compatible with a wide variety of photoelectric and mechanical switches</li> </ul>	<ul style="list-style-type: none"> <li>• Transmitted Beam</li> <li>• 106 m (350 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• Retroreflective 10 m (33 ft)</li> <li>• Polarized retroreflective 6 m (20 ft)</li> <li>• Standard diffuse 2.1 m (7 ft)</li> <li>• Large aperture fiber optic/fixd focus/wide angle diffuse</li> </ul>
<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 24V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 13...30V DC</li> <li>• 25 mA</li> </ul>	<ul style="list-style-type: none"> <li>• 13...29.5V DC</li> </ul>
<ul style="list-style-type: none"> <li>• PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• Output signal for powered roller and drive for pneumatic valve</li> </ul>	<ul style="list-style-type: none"> <li>• PNP/8.5 mA</li> <li>• NPN/15 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN and PNP 20 mA at 29.5V DC</li> </ul>
<ul style="list-style-type: none"> <li>• Variable 200 ms...10 s</li> </ul>	<ul style="list-style-type: none"> <li>• 1 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 10 ms max.</li> </ul>	<ul style="list-style-type: none"> <li>• 1 ms</li> </ul>
<ul style="list-style-type: none"> <li>• 838 mm (33 in.) pigtail</li> <li>• 381 mm (15 in.) pigtail</li> <li>• Pico (M8) connector</li> </ul>	<ul style="list-style-type: none"> <li>• IDC flat cable</li> </ul>	<ul style="list-style-type: none"> <li>• 2 m 300V cable</li> <li>• 4-pin micro QD</li> <li>• 4-pin mini QD</li> </ul>	<ul style="list-style-type: none"> <li>• Screw terminals</li> </ul>
<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 4, 4X, 6, 12, IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 1, IP20 (IEC 529)</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 3, 4X, 6P, 12, 13, IP67, 1200 psi washdown</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 3, 4, 12, 13 (IP66)</li> </ul>
<ul style="list-style-type: none"> <li>• See page 1-177</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-180</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-184</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-187</li> </ul>

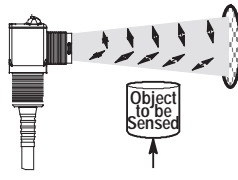
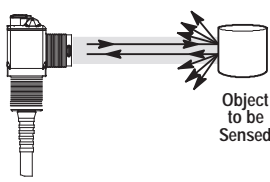
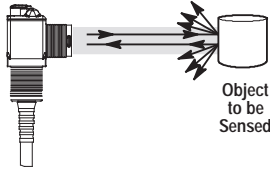
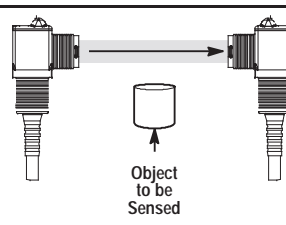
Quick Selection Guide

Specifications	 <b>48MS MultiSightt</b>	 <b>Series 9000 Gate Entry</b>	 <b>Series 9000 Diagnostic</b>	 <b>Series 9000 Darkroom</b>
<b>Features</b>	<ul style="list-style-type: none"> <li>Ten or 32 virtual detectors</li> <li>Standalone vision sensor</li> <li>Compact, sturdy industrial housing with IP67 rating</li> <li>Optional EtherNet/IP with RSLogix 5000 Add-On profile for I/O data</li> <li>Multiple evaluation methods: pattern matching, brightness, contrast and contour matching.</li> </ul>	<ul style="list-style-type: none"> <li>UL325 and UL508 approved</li> <li>Industry standard housing design with 1200 psi washdown rating</li> <li>Offered as kits or individual components</li> </ul>	<ul style="list-style-type: none"> <li>Selectable static or dynamic operation</li> <li>Industry standard housing design with 1200 psi washdown rating</li> <li>Universal 30 mm (1.18 in.) and thru-hole mounting options</li> <li>360° visible status indicators</li> <li>DC and AC only models</li> <li>Variety of sensing modes</li> </ul>	<ul style="list-style-type: none"> <li>880 nm wavelength for darkroom applications</li> <li>Fast response time</li> <li>Industry standard housing design</li> <li>DC and AC only models</li> <li>Variety of sensing modes</li> <li>Variety of output types</li> </ul>
<b>Applications</b>	<ul style="list-style-type: none"> <li>Error proofing applications</li> <li>Packaging, assembly</li> </ul>	<ul style="list-style-type: none"> <li>Automatic access control</li> <li>Vehicle access systems</li> </ul>	<ul style="list-style-type: none"> <li>Long range, general purpose sensing</li> <li>Requirement for diagnostic output</li> </ul>	<ul style="list-style-type: none"> <li>Darkroom, general purpose sensing</li> <li>Film processing</li> </ul>
<b>Sensing Modes and Max. Range</b>	<ul style="list-style-type: none"> <li>Vision sensor (infinite depending on lighting conditions)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 9 m (30 ft)</li> <li>Transmitted beam 61 m (200 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 9.14 m (30 ft)</li> <li>Polarized retroreflective 5 m (16 ft)</li> <li>Standard diffuse 1.5 m (5 ft)</li> <li>Transmitted beam 61 m (200 ft)</li> </ul>	<ul style="list-style-type: none"> <li>Retroreflective 9.14 m (30 ft)</li> <li>Standard diffuse 0.91 m (3 ft)</li> <li>Transmitted beam 30 m (100 ft)</li> </ul>
<b>Operating Voltage</b>	<ul style="list-style-type: none"> <li>24V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...55V DC/20...40V AC</li> <li>70...264V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>10...30V DC</li> <li>90...264V AC</li> <li>95...264V DC</li> </ul>	<ul style="list-style-type: none"> <li>10...40V DC</li> <li>70...264V AC/DC</li> </ul>
<b>Output Type</b>	<ul style="list-style-type: none"> <li>4 x PNP (200 mA per output)</li> </ul>	<ul style="list-style-type: none"> <li>SPDT EM Relay</li> </ul>	<ul style="list-style-type: none"> <li>Switch selectable NPN and PNP NO—NC 100 mA</li> <li>EM relay: sensor - 2 A diagnostic - 1 A</li> </ul>	<ul style="list-style-type: none"> <li>NPN and PNP 250 mA</li> <li>SPDT EM relay, 2 A</li> </ul>
<b>Response Time</b>	<ul style="list-style-type: none"> <li>50...250 ms</li> </ul>	<ul style="list-style-type: none"> <li>23 ms</li> </ul>	<ul style="list-style-type: none"> <li>2...15 ms</li> </ul>	<ul style="list-style-type: none"> <li>2...23 ms</li> </ul>
<b>Connections</b>	<ul style="list-style-type: none"> <li>Power I/O</li> <li>Ethernet</li> </ul>	<ul style="list-style-type: none"> <li>2 m cable</li> <li>AC mini QD</li> </ul>	<ul style="list-style-type: none"> <li>Mini quick-disconnect</li> <li>Micro quick-disconnect</li> </ul>	<ul style="list-style-type: none"> <li>300V PVC cable 2 m</li> <li>Mini quick-disconnect</li> <li>Micro quick-disconnect</li> </ul>
<b>Enclosure</b>	<ul style="list-style-type: none"> <li>Polycarbonate</li> <li>IP67</li> </ul>	<ul style="list-style-type: none"> <li>Valox/Acrylic</li> <li>NEMA 2, 4, 4X, 6P, IP67, 1200 psi (8270 kPa) washdown</li> </ul>	<ul style="list-style-type: none"> <li>Valox<sup>®</sup></li> <li>NEMA 3, 4X, 6P, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>NEMA 3,4X, 6P, 12 &amp; 13; IP67</li> </ul>
<b>Additional Info</b>	<ul style="list-style-type: none"> <li>See page 1-191</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-198</li> </ul>	<ul style="list-style-type: none"> <li>See page 1-201</li> </ul>	<ul style="list-style-type: none"> <li><a href="http://www.ab.com/catalogs">www.ab.com/catalogs</a></li> </ul>

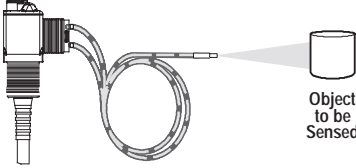

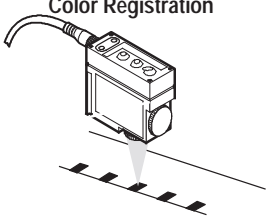
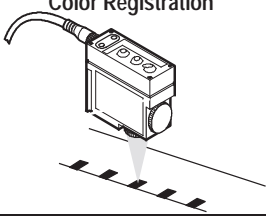
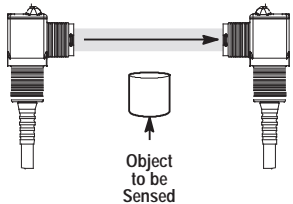

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 <p><b>Series 6000</b> Compact</p>	 <p><b>Series 5000</b> Modular</p>	 <p><b>Series 4000B</b> Long Range</p>	 <p><b>Series 10,000</b> Teachable</p>
<ul style="list-style-type: none"> <li>• Compact cylindrical housing design</li> <li>• Manual sensitivity adjustment</li> <li>• Dual NPN and PNP outputs</li> <li>• Variety of sense modes</li> <li>• DC and AC only models</li> <li>• 2 m cable and micro QD connections</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple connection base and photohead options</li> <li>• Multiple plug-in output modules</li> <li>• Multiple plug-in logic modules</li> <li>• DC and AC only models</li> </ul>	<ul style="list-style-type: none"> <li>• Durable housing design</li> <li>• DC and AC only models</li> <li>• Variety of sensing modes</li> <li>• Multiple plug-in output modules</li> <li>• Multiple plug-in logic modules</li> <li>• Screw terminal connections</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or teachable operation</li> <li>• LCD display for easy setup</li> <li>• Automatic sensitivity control with diagnostic output</li> <li>• Industry standard housing design with 1200 psi washdown rating</li> <li>• Low voltage DC operation</li> <li>• Variety of sensing modes</li> </ul>
<ul style="list-style-type: none"> <li>• Medium range, general purpose sensing</li> <li>• Cold temperature environments</li> </ul>	<ul style="list-style-type: none"> <li>• Long range, general purpose sensing</li> <li>• Modular approach for maximum flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Long range, general purpose sensing</li> <li>• Harsh duty installations</li> </ul>	<ul style="list-style-type: none"> <li>• Precise contrast sensing</li> <li>• Small parts assembly</li> </ul>
<ul style="list-style-type: none"> <li>• Retroreflective 8.5 m (28 ft)</li> <li>• Polarized retroreflective 3 m (10 ft)</li> <li>• Standard diffuse 0.76 m (30 in.)</li> <li>• Wide angle diffuse 0.46 m (18 in.)</li> <li>• Fixed focus diffuse 27.9 mm (1.1 in.)</li> <li>• Transmitted beam 36.5 m (120 ft)</li> <li>• Large aperture fiber optic</li> <li>• Small aperture fiber optic</li> <li>• Sharp cutoff diffuse 0.25...7.6 cm (0.1...3 in.)</li> </ul>	<ul style="list-style-type: none"> <li>• Retroreflective 6...10 m (20...33 ft)</li> <li>• Polarized retroreflective 6 m (20 ft)</li> <li>• Standard diffuse 1.5...3 m (5...10 ft)</li> <li>• Background suppression diffuse 6.3...30.5 cm (2.5...12 in.)</li> <li>• Wide angle diffuse 0.46 m (18 in.)</li> <li>• Fixed focus diffuse 50.8 mm (2.0 in.)</li> <li>• Large aperture fiber optic</li> </ul>	<ul style="list-style-type: none"> <li>• Retroreflective 10.6 m (35 ft)</li> <li>• Polarized retroreflective 7 m (23 ft)</li> <li>• Standard diffuse 3.6 m (12 ft)</li> <li>• Transmitted beam 274 m (900 ft)</li> </ul>	<ul style="list-style-type: none"> <li>• ClearSight 1.2 m (48 in.)</li> <li>• Retroreflective 9 m (30 ft)</li> <li>• Polarized retroreflective 4.6 m (15 ft)</li> <li>• Standard diffuse 2.7 m (8.9 ft)</li> <li>• Large aperture fiber optic</li> <li>• Small aperture fiber optic</li> <li>• Green fiber optic</li> </ul>
<ul style="list-style-type: none"> <li>• 10...30V DC</li> <li>• 20...132V AC/DC</li> <li>• 20...264V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>• 102...132V AC</li> <li>• 204...254V AC</li> <li>• 10...30V DC</li> <li>• 40...54V AC/DC</li> <li>• 20...30V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>• 102...132V AC</li> <li>• 195...253V AC</li> <li>• 40...58V AC</li> <li>• 18...28V AC/DC</li> </ul>	<ul style="list-style-type: none"> <li>• 10...30V DC</li> </ul>
<ul style="list-style-type: none"> <li>• NPN and PNP 220 mA</li> <li>• Power MOSFET 150...300 mA</li> </ul>	<ul style="list-style-type: none"> <li>• EM relay 2 A</li> <li>• Triac 750 mA</li> <li>• FET 30 mA</li> <li>• NPN and PNP 100 mA</li> </ul>	<ul style="list-style-type: none"> <li>• EM relay 5 A</li> <li>• Triac 1 A</li> <li>• FET 30 mA</li> <li>• NPN 250 mA</li> <li>• DCV 30 mA</li> </ul>	<ul style="list-style-type: none"> <li>• NPN and PNP</li> <li>• Diagnostic alarm, NPN or PNP</li> </ul>
<ul style="list-style-type: none"> <li>• 0.2...18 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 1...20 ms</li> </ul>	<ul style="list-style-type: none"> <li>• 5...20 ms</li> </ul>	<ul style="list-style-type: none"> <li>• Selectable 250 μsec...4 ms</li> </ul>
<ul style="list-style-type: none"> <li>• PVC cable 3 m</li> </ul>	<ul style="list-style-type: none"> <li>• Vinyl cable 3 m</li> <li>• Screw terminals</li> <li>• Mini QD</li> </ul>	<ul style="list-style-type: none"> <li>• Terminals</li> </ul>	<ul style="list-style-type: none"> <li>• 300V PVC cable 2 m</li> <li>• Mini QD</li> <li>• Micro QD</li> </ul>
<ul style="list-style-type: none"> <li>• Noryl<sup>®</sup></li> <li>• NEMA 3, 4X 6, 12 &amp; 13; IP67</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 3, 4, 12 &amp; 13; IP66</li> </ul>	<ul style="list-style-type: none"> <li>• Noryl<sup>®</sup></li> <li>• NEMA 3, 4, 12 &amp; 13; IP66</li> </ul>	<ul style="list-style-type: none"> <li>• Valox<sup>®</sup></li> <li>• NEMA 3, 4X, 6P, 12 &amp; 13; IP67</li> </ul>
<ul style="list-style-type: none"> <li>• See page 1-207</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-213</li> </ul>	<ul style="list-style-type: none"> <li>• See page 1-227</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="http://www.ab.com/catalogs">www.ab.com/catalogs</a></li> </ul>

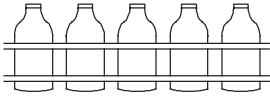

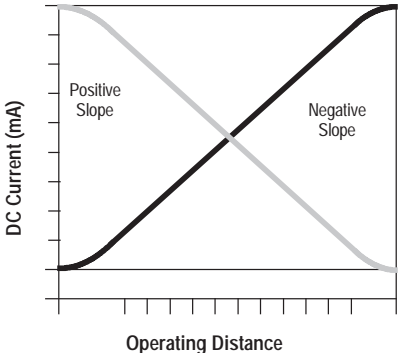
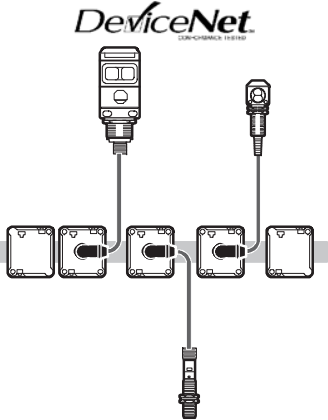
PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
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Standard Industrial Application	Sensing Modes	Maximum Sensing Range	Series	Page		
	Retroreflective	4.8 m (15.7 ft)	42CA	1-52		
		7.2 m (23.6 ft)	42CA	1-52		
	Retroreflective	4.5 m (14.7 ft)	RightSight	1-31		
		5 m (16.4 ft)	MiniSight	1-40		
		9 m (30 ft)	Series 9000	1-68		
	Polarized Retroreflective	3 m (9.8 ft)	AccuSight	1-48		
		3 m (9.8 ft)	RightSight	1-31		
		3 m (9.8 ft)	42CA	1-52		
		2 m (6.6 ft)	MiniSight	1-40		
		5 m (16 ft)	Series 9000	1-69		
	Standard Diffuse	500 mm (20 in.)	RightSight	1-31		
		380 mm (15 in.)	MiniSight	1-40		
		380 mm (15 in.)	AccuSight	1-48		
		1.5 m (5 ft)	Series 9000	1-69		
		400 mm (13.6 in.)	42CA	1-52		
		100 mm (4 in.)	42CA	1-52		
		1000 mm (39.4 in.)	42CA	1-52		
	Background Suppression	50 mm (2 in.)	RightSight	1-31		
		300 mm (11.8 in.)	44B	1-72		
		100 mm (4 in.)	RightSight	1-31		
		1 m (3.3 ft)	42BT	1-76		
		2 m (6.5 ft)	42BC	1-78		
		1 m (3.3 ft)	42BT	1-76		
		2 m (6.5 ft)	42BC	1-78		
		30 mm (1.2 in.)	42BA	1-81		
		50 mm (2 in.)	42CA	1-52		
		50 mm (2 in.)	42BA	1-81		
		100 mm (4 in.)	42CA	1-52		
		100 mm (4 in.)	42BA	1-81		
		200 mm (8 in.)	42BA	1-81		
	Sharp Cutoff Diffuse	100 mm (4 in.)	AccuSight	1-48		
		130 mm (5 in.)	RightSight	1-31		
		30 mm (1.2 in.)	42KA	1-88		
		30 mm (1.2 in.)	42KB	1-96		
		40 mm (1.6 in.)	42KB	1-96		
			Transmitted Beam	4 m (15 ft)	RightSight	1-31
				16 m (52.5 ft)	42CA	1-52
20 m (65 ft)	RightSight			1-31		
20 m (65 ft)	MiniSight			1-40		
61 m (200 ft)	Series 9000			1-65		
152 m (500 ft)	Series 9000			1-65		

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Standard Industrial Application	Sensing Modes	Maximum Sensing Range	Series	Page
	Fiber Optic, Infrared Glass	Varies with FO cable	MiniSight	1-40
		Varies with FO cable	RightSight	1-31
		Varies with FO cable	Series 9000	1-65
	Fiber Optic, Visible Red Plastic	Varies with FO cable	MiniSight	1-40
		Varies with FO cable	Series 9000	1-65
		Varies with FO cable	45FVL	1-137
		Varies with FO cable	42FA	1-144
	Fiber Optic, Visible Green Plastic	Varies with FO cable	45FSL	1-139
	Fiber Optic, Visible Blue Plastic	Varies with FO cable	45FVL	1-137
	Fiber Optic, Visible White Plastic	Varies with FO cable	45FSL	1-139
Varies with FO cable		45FVL	1-137	
<b>Clear Bottles, Films</b> 	Clear Object	1.4 m (4.5 ft)	ClearSight 9000	1-147
		1.5 m (5 ft)	ClearSight 10000	1-147
		1 m (3.28 ft)	ClearSight RightSight	1-150
<b>Color Registration</b> 	Color Recognition	Up to 25.5 mm (1 in.)	ColorSight	1-130
		12...32 mm (0.4...1.26 in.)	45CLR ColorSight	1-134
<b>Color Registration</b> 	Contrast	Up to 12 mm (0.5 in.)	45FVL	1-137
		12.7 mm (0.5 in.)	42CRC	1-127
<b>Long Range Sensing</b> 	Transmitted Beam	152 m (500 ft)	Series 9000	1-65
	Laser	300 m (1000 ft)	LaserSight	1-112
<b>High Temperature (70...480_C)</b> 	Fiber Optic	Varies with FO cable	45FVL	1-137
	Fiber Optic	Varies with FO cable	42FT	1-141
	Fiber Optic	Varies with FO cable	45FSL	1-139
	Fiber Optic	Varies with FO cable	RightSight	1-31
	Fiber Optic	Varies with FO cable	MiniSight	1-40
		Varies with FO cable	Series 9000	1-65

Product Application Selector

Standard Industrial Application	Sensing Modes	Maximum Sensing Range	Series	Page
<p>High Speed (250 ms or better)</p> 	Retroreflective	5 m (16.4 ft)	MiniSight	1-40
	Polarized Retroreflective	2 m (6.6 ft)	MiniSight	1-40
	Standard Diffuse	380 mm (15 in.)	MiniSight	1-40
	Wide Angle Diffuse	180 mm (7 in.)	MiniSight	1-40
	Transmitted Beam	30 m (98 ft)	MiniSight	1-40
	Glass (Infrared) Fiber Optic	Varies with FO cable	MiniSight	1-40
	Plastic (Visible) Fiber Optic	Varies with FO cable	MiniSight	1-40
		Varies with FO cable	45FSL	1-139
<p>Hazardous (Classified) Location</p> 	Retroreflective	10 m (33 ft)	Series 5000	1-213
	Polarized Retroreflective	6 m (20 ft)	Series 5000	1-213
	Standard Diffuse	2 m (7 ft)	Series 5000	1-213
	Fixed Focus Diffuse	50 mm (2 in.)	Series 5000	1-213
	Wide Angle Diffuse	500 mm (20 in.)	Series 5000	1-213
	Transmitted Beam	106 m (350 ft)	Series 9000	1-186
	Glass Fiber Optic	Varies with FO cable	Series 5000	1-213
<p>Analog Output</p> 	Retroreflective	4.6 m (15 ft)	Series 5000	1-213
	Standard Diffuse	1.5 m (5 ft)	Series 5000	1-213
	Fixed Focus Diffuse	50 mm (2 in.)	Series 5000	1-213
	Wide Angle Diffuse	500 mm (20 in.)	Series 5000	1-213
	Glass (Infrared) Fiber Optic	500 mm (20 in.)	Series 5000	1-213
	Retroreflective	9 m (30 ft)	SmartSight 9000	10-10
	Polarized Retroreflective	3 m (9.8 ft)	RightSight	10-4
		5 m (16 ft)	SmartSight 9000	10-10
	Standard Diffuse	500 mm (20 in.)	RightSight	10-6
		1.5 m (5 ft)	SmartSight 9000	10-11
	Transmitted Beam	4 m (15 ft)	RightSight	10-7
		20 m (65 ft)	RightSight	10-7
		61 m (200 ft)	SmartSight 9000	10-11
		130 m (425 ft)	SmartSight 9000	10-11
	Fiber Optic, Infrared Glass	Varies with FO cable	RightSight	10-7
Varies with FO cable		SmartSight 9000	10-11	



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Miniature - UltraMiniature Sensors	Sensing Modes	Maximum Sensing Range	Series	Page
	Retroreflective	2 m (6.5 ft)	42KB	1-95
		3.6 m (12 ft)	Series 7000	1-102
	Polarized Retroreflective	1.5 m (4.9 ft)	42KC	1-98
		2 m (6.5 ft)	Series 7000	1-102
		2 m (6.5 ft)	42CF	1-62
		3.5 m (11.5 ft)	42JS	1-84
		Standard Diffuse	30 mm (1.2 in.)	42KA
	50 mm (2 in.)		42KA	1-88
	70 mm (2.8 in.)		42KB	1-96
	200 mm (8 in.)		42KB	1-96
	300 mm (11.8 in.)		42KB	1-96
	400 mm (15.8 in.)		42KB	1-96
	500 mm (20 in.)		42KC	1-98
	100 mm (4 in.)		42CF	1-62
	300 mm (11.8 in.)		42CF	1-62
	300 mm (11.8 in.)		Series 7000	1-102
	800 mm (31.5 in.)		42JS	1-84
	Background Suppression		30 mm (1.2 in.)	42BA
		50 mm (2 in.)	42BA	1-81
		100 mm (4 in.)	42BA	1-81
		200 mm (8 in.)	42BA	1-81
	Sharp Cutoff Diffuse	30 mm (1.2 in.)	42KA	1-88
		30 mm (1.2 in.)	42KB	1-96
		40 mm (1.6 in.)	42KB	1-96
	Wide Angle Diffuse	280 mm (11 in.)	Series 7000	1-102
	Transmitted Beam	500 mm (20 in.)	42KA	1-88
		1 m (3.3 ft)	42KB	1-97
		7 m (23 ft)	42KB	1-97
10 m (33 ft)		42KB	1-97	
7 m (23 ft)		42KC	1-98	
7.6 m (25 ft)		Series 7000	1-102	
9.2 m (30 ft)		Series 7000	1-102	
533 mm (21 in.)		Series 7000	1-102	
4 m (13 ft)		42CF	1-62	
10 m (33 ft)	42JS	1-84		

## Technical Definitions and Terminology

**AC Coupled Amplifier:** An amplifier in which only pulsed (AC) signals are amplified and direct (DC) signals are ignored. (Direct signals generated by sunlight, heat sources and other.)

**Alignment:** Positioning of light source and receiver, reflector, or target in which a maximum signal strength is obtained.

**Ambient Light:** Illumination of a receiver not generated by its light source.

**Analog:** Electronic circuit with a current or voltage output signal that varies as a function of the light intensity received by the photodetector.

**Angstrom:** Unit of measurement used to determine the wavelength of light. 10 Angstrom (Å) is equal to 1 nanometer (nm)

**Attenuation:** The reduction of signal strength. An example is when light travels through a fiber optic cable. The degree of attenuation depends on the fiber material and on the total length of the fiber optic cable.

**Bifurcated:** A fiber optic bundle that divides in two legs, forming a Y.

**Complementary Output:** Output circuit with a dual output device such that when one output is energized the other output is de-energized (similar to SPDT contact).

**Dark Operate:** A dark operate sensor energizes an output when the light intensity on the photodetector has sufficiently decreased.

**Diagnostic:** Advanced warning of loss in signal strength due to misalignment, dust and more, prior to loss of control output signal.

**Differential Travel (Hysteresis):** The distance between the operating point and the release point (see hysteresis).

**Diffuse Reflection (Proximity):** A photoelectric sensing method in which the light emitted by the light source hits the target surface and is then diffused from the surface in all directions.

**Digital Output:** An output circuit with only two operating states that are either "On" or "Off." These operating states often are called "Hi" or "Low."

**Dwell-Time:** The adjustable or fixed time length of an output pulse, independent of input signal duration.

**Excess Gain:** See operating margin.

**False Pulse:** An undesired change in the state of the output of the proximity switch that lasts for more than two milliseconds.

**False Pulse Protection:** Circuitry designed to avoid false pulses during power on or power down action.

**Ferrule:** Tip or termination of a fiber optic cable.

**Field of View:** The region that is illuminated by the light source and that can be seen by the receiver. Field of view is expressed in degrees but is three dimensional.

**Gating:** The provision to apply an external signal to a sensor in order to prevent undesirable operation.

**Hysteresis:** The distance between the operating point and the release point.

**Infrared:** Invisible light radiation starting at a wavelength of 690 nanometer (or 6900 Angstrom) and longer.

**Intrinsic Safety:** A design technique applied to electrical equipment and wiring for hazardous locations. It is based on limiting electrical and thermal energy to a level below that required to ignite hazardous atmospheric mixtures.

**LED (Light Emitting Diode):** Semi-conductor that generates monochromatic light when current flows in the conductive direction. An LED is the standard light source for most photoelectric sensors.

**Leakage Current:** Small current flowing through a solid state output when in the off state.

**Light Operate:** A light operate sensor energizes an output when the light intensity on the photodetector has sufficiently increased.

**Nanometer (nm):** 1 Nanometer is equal to 10<sup>-9</sup> meter.

**Noise:** Presence of undesirable voltage, current, or light that may cause the sensor to malfunction.

**Normally Closed:** Output opens when an object is detected in the active switching area.

**Normally Open:** Output closes when an object is detected in the active switching area.

**Operating Margin:** The ratio of electrical signal available at a given sensing range to the minimum signal required to trigger the amplifier and output.

**Operating Mode:** See light and dark operate.

**Optical Crosstalk:** Optical crosstalk occurs when a photoelectric receiver responds to the signal from an adjacent emitter. Crosstalk can usually be resolved by repositioning the sensors.

**Photoelectric Sensor:** Electronic device recognizing changes in light intensity and converting these changes into a change in output state.

**Pulse:** A sudden fast change of a normally constant or relatively slow changing value such as voltage, current or light intensity.

**Response Time:** The sum of the time needed for a string of electronic circuits to translate a change in light into a change of output status.

**Reverse Polarity Protection:** A circuit that uses a diode to avoid damage to the control in case the polarity of the power supply is accidentally reversed.

**Ripple %:** The percentage of alternating component left on a DC signal after rectifying. Measured peak to peak of the alternating component and compared to the DC signal value.

**Rise Time (10% Levels):** The time required for an analog voltage or current output value to rise from 10% of its maximum value to 90% of its maximum value.

**Sink (Current):** Transistor output that requires the current to flow from positive (+) through the load and then through the output to negative (-). A current sink output uses an NPN transistor.

**Source (Current):** Transistor output that requires the current to flow from positive (+) through the output and then through the load to negative (-). A current source output uses a PNP transistor.

**Transmitted Beam:** A sensing mode where the light source and the receiver are opposite each other and where the target breaks the beam.

**Wavelength:** Distance traveled by light while completing one complete sine-wave. Is expressed in nanometers (nm). Each color has a specific wavelength.

**White Paper Response:** A calibration procedure performed on retroreflective sensors to eliminate all response to white paper with 90% reflectance.

**Basic Concepts and Components**

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Photoelectric sensors are used in many applications and industries to provide accurate detection of objects without physical contact.

In its most basic form, a photoelectric sensor can be thought of as a "limit switch-like" device, where the mechanical actuator or lever arm function is replaced by a beam of light.

Photoelectric sensors operate by sensing a change in the amount of light that is either reflected or blocked by an object to be detected (target). The change in light could be the result of the presence or absence of the target, or as the result in a change of the size, shape, reflectivity or color of a target.

A photoelectric sensor can be used in applications to sense targets at distances from less than 5 mm (0.2 in.) to over 250m (820 ft).

Successful sensing with a photoelectric sensor requires that the object to be detected (target) causes a sufficient change of light level detected by the sensor and that the user has a clear understanding of the sensing requirements.

The following must be clearly understood:

- The sensing requirements,
- The sensing environment, and
- The capabilities and limitations of the photoelectric sensor.

Be prepared to answer the following questions:

- What is the size, shape and/or opacity of the object to be detected?
- Does the object to be detected have any reflective properties?
- What response time is required of the sensor?
- What mounting configuration is required for the sensor? Are there position or physical restraints to consider?
- What is the frequency of operation and what requirement does the operating rate impose on the output device?
- What are the load requirements, such as voltage, current, load impedance?

- What voltage and current supply are available to operate the sensor?
- What is the ambient temperature surrounding the photoelectric sensor?
- Are there other environmental conditions such as dirt or high humidity that are unique to the area surrounding the photoelectric sensor?

There are a vast number of photoelectric sensors to choose from. Each offers a unique combination of sensing performance, output characteristics and mounting options. Many sensors also offer unique embedded logic or device networking capabilities.

This introduction will help you select the optimal photoelectric sensor for each application.

**Basic Concepts and Components**

There are four basic components to any photoelectric sensor:

- Light source
- Light detector
- Lenses
- Output switching device

**Light Source**

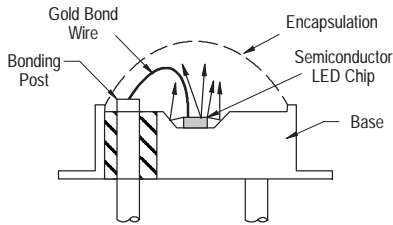
A light emitting diode (LED) is a solid-state semiconductor that emits light when current is applied. *Figure 1* (on page 1-20) shows the construction of an LED. LEDs are made to emit specific wavelengths or colors of light. Infrared, visible red, green, and blue LEDs are used as the light source (emitter) in most photoelectric sensors.

Different LED colors offer different desirable characteristics. Infrared LEDs are the most efficient, they generate the most light and the least heat of any LED color. Infrared LEDs are used in sensors where maximum light output is required for an extended sensing range.

In many applications, a visible beam of light is desirable to aid setup or confirm sensor operation. Visible red is most efficient for this requirement.

## Introduction

**Figure 1**  
LED Light-Emitting Diode



Visible red, blue, and yellow LEDs are also used in special applications where specific colors or color contrasts must be detected. These LEDs are also used as status indicators on photoelectric sensors.

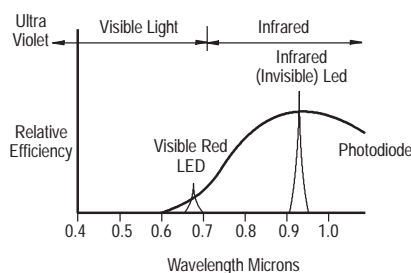
LEDs are rugged and reliable components, making them ideal for use in photoelectric sensors. They operate over a wide temperature range and are very resistant to damage from shock and vibration.

### Light Detector

A photodetector is the component used to detect the light source. A photodiode or phototransistor is a robust solid-state component that provides a change in conducted current depending on the amount of light detected.

Photodetectors are more sensitive to certain wavelengths of light. The spectral response of a photodetector determines its sensitivity to different wavelengths in the light spectrum. To improve sensing efficiency, the LED and photodetector are often spectrally matched. An example is shown in *Figure 2*.

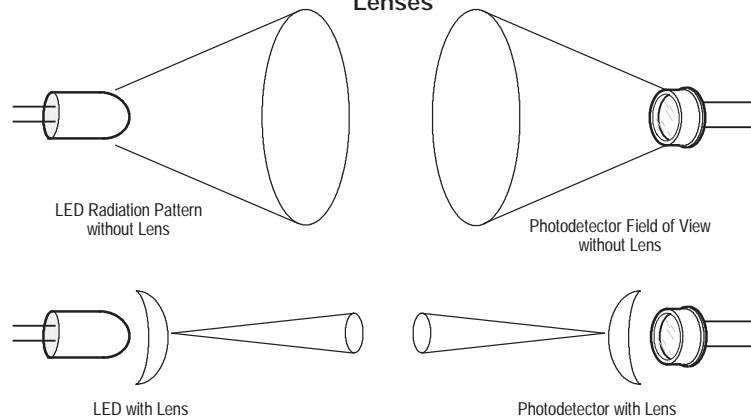
**Figure 2**  
Spectral Response



The invisible (infrared) LED is a spectral match for this silicon phototransistor, and has much greater efficiency than a visible (red) LED.

The photodetector and associated circuitry are referred to as the receiver.

**Figure 3**  
Lenses



### Lens

LEDs typically emit light and photodetectors are sensitive to light over a broad area. Lenses are used with LED light sources and photodetectors to narrow this area. As the area is narrowed, the range of the LED or photodetector increases. As a result, lenses also increase the sensing distance of photoelectric sensors (see *Figure 3*).

The light beam from an LED and lens combination is typically conical in shape. The area of the cone increases with distance.

Some photoelectric sensors are optimized for extra sensing distance. The light beam (or field of view) emitted by these sensors is fairly narrow. However, alignment can be difficult if the field of view is too narrow. Other photoelectric sensors are designed for detection of objects within a broad area. These sensors have a wider field of view, but a shorter overall range.

### Output Device

Once a sufficient change of light level is detected, the photoelectric sensor switches an output device to provide an interface to machine logic. Many types of discrete and variable (analog) outputs are available, each with particular strengths and weaknesses.

### Margin

Margin (operating margin, excess gain) is an important concept to understand when applying photoelectric sensors. The amount of maintenance required for a photoelectric sensing application can be minimized by obtaining the best margin levels for that application.

Margin is a measurement of the amount of light from the light source that is detected by the receiver. Margin is best explained by example:

- A margin of zero occurs when none of the light emitted by the light source can be detected by the light detector.
- A margin of one is obtained when just enough light is detected to switch the state of the output device (from OFF to ON or from ON to OFF).
- A margin of 20 is reached when 20 times the minimum light level required to switch the state of the output device is detected.

Margin is defined as:

$$\frac{\text{Actual amount of light detected}}{\text{Minimum amount required to change the output device state}}$$

and is usually expressed as a ratio or as a whole number followed by "X." A margin of 6 may be expressed as 6:1 or as 6X.

### LED Modulation

The amount of light generated by the LED in the light source is determined by the amount of current it is conducting. To increase the range of a photoelectric sensor, the amount of current must be increased. However, LEDs also generate heat—there is an upper limit of heat that can be generated before an LED is damaged or destroyed.

Photoelectric sensors rapidly switch on and off or modulate the current conducted by the LED. A low duty cycle (typically less than 5%) allows the amount of current, and therefore the amount of emitted light, to far exceed

what would be allowable under continuous operation, see *Figure 4*.

**Figure 4  
Modulation**



The modulation rate or frequency is often in excess of 5 kHz, much faster than can be detected by eye.

**Synchronous Detection**

The receiver is designed to detect a pulsed light source from a modulated light source. To further enhance sensing reliability, the receiver and light source are synchronized. The receiver watches for light pulses that are identical to the pulses generated by the light source.

Synchronous detection helps a photoelectric sensor to ignore light pulses from other photoelectric sensors nearby or from other pulsed light sources such as fluorescent lights.

Synchronous detection is only possible when the light source and receiver are in the same housing, which is true for all sensing modes except transmitted beam as explained below.

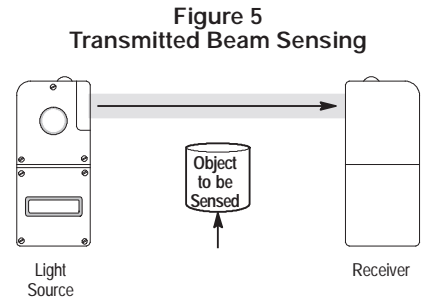
**Photoelectric Sensing Modes**

Different methods of sensing are referred to as sensing modes. There are three basic types:

- Transmitted beam (sometimes called through-beam or thru-beam)
- Retroreflective (sometimes referred to as reflex)
- Diffuse (also known as proximity)
- While many applications can be handled by any of these sensing modes, each offers specific strengths and weaknesses to consider. These strengths and weaknesses are summarized in *Table 1*.

**Transmitted Beam**

In this mode (*Figure 5*) the light source and receiver are contained in separate housings. These two units are positioned opposite each other so that the light from the light source shines directly on the receiver. Targets must break (block) the beam between light source and receiver.



**Figure 5  
Transmitted Beam Sensing**

**Table 1  
Photoelectric Sensing Modes Advantages and Cautions**

Sensing Mode	Applications	Advantages	Cautions
Transmitted Beam	General purpose sensing Parts counting	<ul style="list-style-type: none"> <li>§ High margin for contaminated environments</li> <li>§ Longest sensing distances</li> <li>§ Not affected by second surface reflections</li> <li>§ Probably most reliable when you have highly reflective objects</li> </ul>	<ul style="list-style-type: none"> <li>§ More expensive because of separate light source and receiver required, more costly wiring</li> <li>§ Alignment important</li> <li>§ Avoid detecting objects of clear material</li> </ul>
Retroreflective	General purpose sensing	<ul style="list-style-type: none"> <li>§ Moderate sensing distances</li> <li>§ Less expensive than transmitted beam because simpler wiring</li> <li>§ Ease of alignment</li> </ul>	<ul style="list-style-type: none"> <li>§ Shorter sensing distance than transmitted beam</li> <li>§ Less margin than transmitted beam</li> <li>§ May detect reflections from shiny objects (use polarized instead)</li> </ul>
Polarized Retroreflective	General purpose sensing of shiny objects	<ul style="list-style-type: none"> <li>§ Ignores first surface reflections</li> <li>§ Uses visible red beam for ease of alignment</li> </ul>	<ul style="list-style-type: none"> <li>§ Shorter sensing distance than standard retroreflective</li> <li>§ May see second surface reflections</li> </ul>
Standard Diffuse	Applications where both sides of the object cannot be accessed	<ul style="list-style-type: none"> <li>§ Access to both sides of the object not required</li> <li>§ No reflector needed</li> <li>§ Ease of alignment</li> </ul>	<ul style="list-style-type: none"> <li>§ Can be difficult to apply if the background behind the object is sufficiently reflective and close to the object</li> </ul>
Sharp Cutoff Diffuse	Short-range detection of objects with the need to ignore backgrounds that are close to the object.	<ul style="list-style-type: none"> <li>§ Access to both sides of the object not required</li> <li>§ Provides some protection against sensing of close backgrounds</li> <li>§ Detects objects regardless of color within specified distance</li> </ul>	<ul style="list-style-type: none"> <li>§ Only useful for very short distance sensing</li> <li>§ Not used with backgrounds close to object</li> </ul>
Background Suppression Diffuse	General purpose sensing Areas where you need to ignore backgrounds that are close to the object	<ul style="list-style-type: none"> <li>§ Access to both sides of the target not required</li> <li>§ Ignores backgrounds beyond rated sensing distance regardless of reflectivity</li> <li>§ Detect objects regardless of color at specified distance</li> </ul>	<ul style="list-style-type: none"> <li>§ More expensive than other types of diffuse sensors</li> <li>§ Limited maximum sensing distance</li> </ul>
Fixed Focus Diffuse	Detection of small targets Detects objects at a specific distance from sensor Detection of color marks	<ul style="list-style-type: none"> <li>§ Accurate detection of small objects in a specific location</li> </ul>	<ul style="list-style-type: none"> <li>§ Very short distance sensing</li> <li>§ Not suitable for general purpose sensing</li> <li>§ Object must be accurately positioned</li> </ul>
Wide Angle Diffuse	Detection of objects not accurately positioned Detection of very fine threads over a broad area	<ul style="list-style-type: none"> <li>§ Good at ignoring background reflections</li> <li>§ Detecting objects that are not accurately positioned</li> <li>§ No reflector needed</li> </ul>	<ul style="list-style-type: none"> <li>§ Short distance sensing</li> </ul>
Fiber Optics	Allows photoelectric sensing in areas where a sensor cannot be mounted because of size or environment considerations	<ul style="list-style-type: none"> <li>§ Glass fiber optic cables available for high ambient temperature applications</li> <li>§ Shock and vibration resistant</li> <li>§ Plastic fiber optic cables can be used in areas where continuous movement is required</li> <li>§ Insert in limited space</li> <li>§ Noise immunity</li> <li>§ Corrosive areas placement</li> </ul>	<ul style="list-style-type: none"> <li>§ More expensive than lensed sensors</li> <li>§ Short distance sensing</li> </ul>

## Introduction

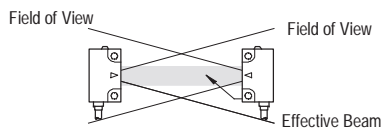
Transmitted beam sensors provide the longest sensing distances and the highest level of operating margin. For example, PHOTOSWITCH<sup>®</sup> Series 4000B Transmitted Beam sensors are capable of sensing distances of up to 274 m (900 ft).

Transmitted beam application margins at ranges of less than 10 m (3.1 ft) can exceed 10,000X. For this reason, transmitted beam is the best sensing mode when operating in very dusty or dirty industrial environments.

Another example: Series 9000 Transmitted Beam photoelectric sensors offer 300X margin at a sensing distance of 3 m (9.8 ft). At this distance, these sensors will continue to operate even if 99.67% of the combined lens area of the light source and receiver is covered with contamination.

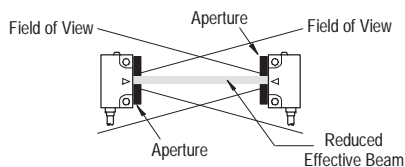
The "effective beam" of a transmitted beam sensor is equivalent to the diameter of the lens on the light source and receiver (Figure 6). Reliable detection occurs when the target is opaque and breaks at least 50% of the effective beam.

**Figure 6**  
Effective Beam



Detection of objects smaller than the effective beam can best be achieved by reducing the beam diameter through means of apertures placed in front of the light source and receiver (Figure 7). Apertures are available for most 42KL, 42KB and 42EF transmitted beam sensors. Some users have created their own apertures for other sensor families.

**Figure 7**  
Effective Beam with Apertures



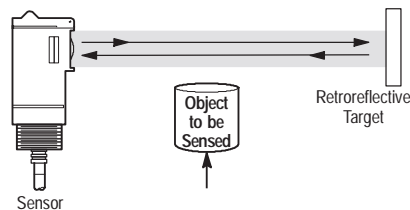
The most reliable transmitted beam applications have a very high margin when the target is absent, and a margin of zero (or close to zero) when the target is present.

Transmitted beam sensing may not be suitable for detection of translucent or transparent targets. The high margin levels allow the sensor to "see through" these targets. While it is often possible to reduce the sensitivity of the receiver, retroreflective or diffuse sensing may provide a better solution.

### Retroreflective

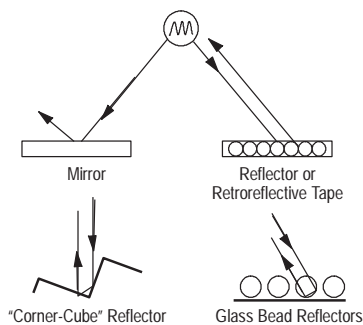
Retroreflective (reflex) is the most popular sensing mode. A retroreflective sensor contains both the light source and receiver in one housing. The light beam emitted by the light source is reflected by a special reflective object and detected by the receiver. The target is detected when it breaks this light beam (Figure 8).

**Figure 8**  
Retroreflective Sensing



Special reflectors or reflective tapes are used for retroreflective sensing. Unlike mirrors or other flat reflective surfaces, these reflective objects do not have to be aligned perfectly perpendicular to the sensor. Misalignment of a reflector or reflective tape of up to 15° will typically not significantly reduce the margin of the sensing system (see Figure 9).

**Figure 9**  
Retroreflective Materials



A wide selection of reflectors and reflective tapes are available.

The maximum available sensing distance of a sensor and reflector will depend in part upon the efficiency of the reflector or reflective tape. These reflective materials (page 1-306) are rated with a reflective index.

The PHOTOSWITCH standard 78 mm (3 in.) diameter round reflector (catalog number 92-39) is used to determine the maximum sensing distance of most PHOTOSWITCH sensors.

The 92-39 reflector has a reflective index of 100. The 92-99 reflective tape has a reflective index of 77 meaning that it will reflect only 77% as much light as a 92-39 reflector.

Retroreflective sensors are easier to install than transmitted beam sensors. Only one sensor housing must be installed and wired. However, margins when the target is absent are typically 10 to 1000 times lower than transmitted beam sensing, making retroreflective sensing less desirable in highly contaminated environments.

Caution must be used when applying standard retroreflective sensors in applications where shiny or highly reflective targets must be sensed. Reflections from the target itself may be detected. It may be possible to orient the sensor and reflector or reflective tape so that the shiny target reflects light away from the receiver. However, for most applications with shiny targets, *polarized retroreflective* sensing offers a better solution.

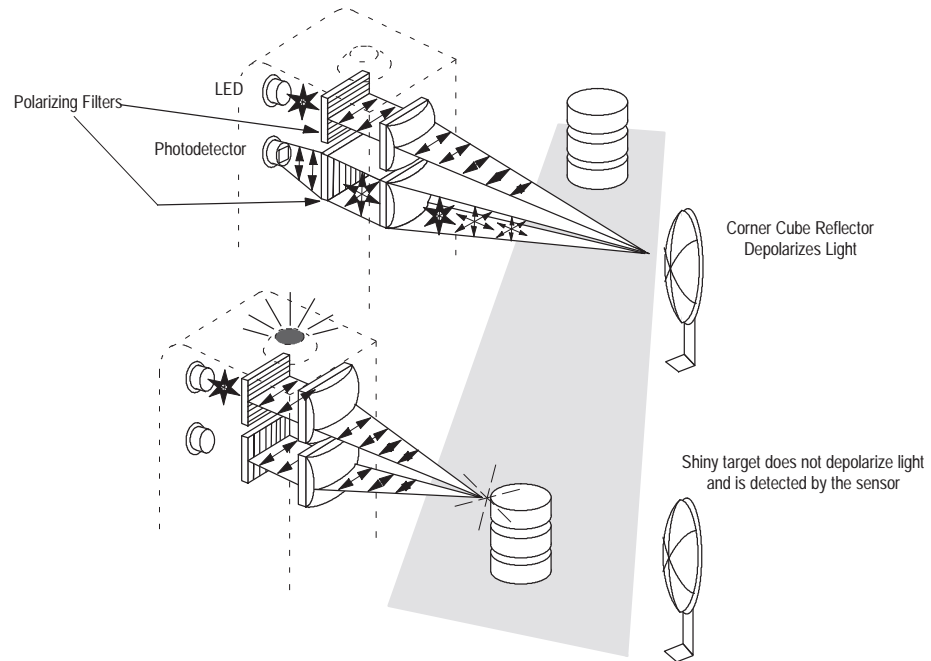
Polarized retroreflective sensors contain polarizing filters in front of the light source and receiver. These filters are perpendicular or 90° out of phase with each other (Figure 10, on page 1-23).

The sensor cannot see light reflected by most targets. The reflected polarized light cannot pass through the polarizing filter located in front of the receiver.

Reflectors depolarize reflected light. Some of the reflected depolarized light can pass through the polarizing filter in front to the receiver and can be detected by the sensor.

In summary, the sensor can "see" the reflection from a reflector, and it cannot "see" the reflection from most shiny targets.

Figure 10  
Polarized Retroreflective Sensing



Polarized retroreflective sensors offer 30...40% shorter range (and less margin) than standard retroreflective sensors. Instead of infrared LEDs, polarized retroreflective sensors must use a less efficient visible light source (typically a visible red LED). There are additional light losses caused by the polarizing filters.

Polarized sensors will only ignore “first surface” reflections from an exposed reflective surface. Polarized light is depolarized as it passes through most plastic film or stretch wrap. Therefore, a shiny object may create reflections that are detected by the receiver when it is wrapped in clear plastic film. In the latter case, the shiny object becomes the “second surface” behind the plastic wrap. Other sensing modes must be considered for these applications.

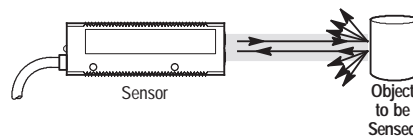
All standard reflectors depolarize light and are suitable for polarized retroreflective sensing. However, most reflective tapes do not depolarize light and are suitable only for use with standard retroreflective sensors. Specially constructed reflective tapes for polarized retroreflective sensing are available. Look for reflective tapes specifically identified as suitable for use with polarized retroreflective sensors.

#### Diffuse

Transmitted beam and standard or polarized retroreflective sensing creates a beam of light between light source and receiver or between sensor and reflector. Access to opposite sides of the target is required.

Sometimes it is difficult, or even impossible, to obtain access on both sides of a target. In these applications, it is necessary to point the light source directly at the target. Light is scattered by the surface at all angles and a small portion is reflected back to be detected by the receiver contained in the same housing. This mode of sensing is called diffuse or proximity (see Figure 11).

Figure 11  
Diffuse Sensing



A sensing mode in which light strikes an object surface, is diffused from the surface at all angles and detected by the sensor.

There are a number of different types of diffuse sensing. The simplest, *standard diffuse*, is discussed here. Other types, sharp cutoff diffuse, fixed focus

diffuse, wide angle diffuse, and background suppression diffuse, are explained in later sections.

The goal of standard diffuse sensing is to obtain a relatively high margin when sensing the target. When the target is absent, reflections from any background behind the target should provide a margin as close to zero as possible.

Target reflectivity can vary widely. Relatively shiny surfaces may reflect most of the light *away* from the receiver, making detection very difficult. The sensor face must be parallel with these types of target surfaces.

Very dark, matte objects may absorb most of the light and reflect very little for detection. These targets may be hard to detect unless the sensor is positioned very close.

The specified maximum sensing distance of a photoelectric sensor is determined using a calibrated diffuse target. Allen-Bradley uses a 216 x 292 mm (8.5 x 11 in.) sheet of white paper that has been specially formulated to be 90% reflective—meaning that 90% of the light energy from the light source will be reflected by the paper.

## Introduction

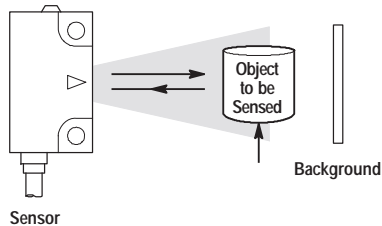
“Real world” diffuse targets are often considerably less reflective, as shown in *Table 2*.

**Table 2**

Target	Typical Relative Reflectivity
Polished aluminum	500
White paper (reference)	100
White typing paper	90
Cardboard	40
Cut lumber	20
Black paper	10
Neoprene	5
Tire rubber	4
Black felt	2

Detecting targets positioned close to reflective backgrounds can be particularly challenging. It may be impossible to adjust the sensor to obtain sufficient margin from the target without detecting, or coming close to detecting, the background (*Figure 12*). Other types of diffuse sensing may be more appropriate.

**Figure 12**



### Sharp Cutoff Diffuse

Sharp cutoff diffuse sensors are designed so that the light beam from the light source and the area of detection of the receiver are angled towards each other. This makes these sensors more sensitive at short range, and less sensitive than a longer range. This can provide more reliable sensing of targets that are positioned close to reflective backgrounds.

Note that this sensing mode provides some degree of improvement over standard diffuse sensing when a reflective background is present. However, a background that is very reflective may still be detected.

An even better solution is provided by background suppression diffuse sensors.

### Background Suppression Diffuse

Instead of attempting to ignore the background behind a target, background suppression sensors use sophisticated electronics to actively sense the presence of both the target and the background. The two signals are compared, and the output will change state upon active detection of the target, or active detection of the background.

In simple terms, background suppression sensing can allow the sensor to ignore the presence of a very reflective background almost directly behind a dark, less-reflective target. For many applications, it is the ideal diffuse sensing mode. However, background suppression sensors are more complex, and therefore more expensive than other diffuse sensors.

### Fixed Focus Diffuse

In a fixed focus (convergent beam) sensor, the light beam from the light source and the detection area of the receiver are focused to a very narrow point (focal point) at a fixed distance in front of the sensor. The sensor is very sensitive at this point, and much less sensitive before and beyond this focal point.

Fixed focus sensors have three primary applications:

- Reliable detection of small targets. Because the sensor is very sensitive at the focal point, a small target can be readily detected.
- Detection of objects at a fixed distance. As a fixed focus sensor is most sensitive at the focal point, it can be used in some applications to detect a target at the focal point, and ignore it when it is in front of or behind the focal point.
- Detection of color printing marks (color registration mark detection). In some applications, it is important to detect the presence of a printing mark on a continuous web of wrapping material. A fixed focus sensor with a specific visible light source color (typically red, green or blue) may be selected to provide the greatest sensitivity to the mark.

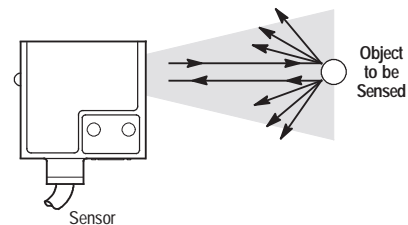
### Wide Angle Diffuse

Wide angle diffuse sensors project the light source and detection area of the receiver over a wide area (*Figure 13*).

These sensors are ideal for two applications:

- Thread detection—a wide angle diffuse sensor can detect the presence of extremely thin strands of thread or other material positioned close to the sensor. The presence or absence (thread break) of the thread can be reliably detected even when the thread moves from side to side in front of the sensor.
- Ignoring holes or imperfections in targets—because wide angle diffuse sensors can sense over a broad area, they can ignore small holes or imperfections in diffuse targets.

**Figure 13**  
Wide Angle Diffuse



### Fiber Optics

Fiber optic sensors permit the attachment of “light pipes” called fiber optic cables. Emitted light from the light source is transmitted through transparent fibers in the cables and emerges at the end of the fiber. The transmitted or reflected beam is then carried back to the receiver through different fibers.

Fiber optic cables can be mounted in locations that would otherwise be inaccessible to photoelectric sensors. They can be used where there is a high ambient temperature and in applications where extreme shock and vibration or continuous movement of the sensing point is required (as described below).

Both glass and plastic are used as transparent materials to create fiber optic cables.

#### Glass

Glass fiber optic cables contain multiple strands of very thin glass fiber that are bundled together in a flexible sheath.

Glass fiber optic cables are typically more durable than plastic fiber optic cables. Glass cables will withstand



much higher temperatures. Standard Allen-Bradley glass fiber optic cables with a stainless steel sheath rated up to 260\_C (500\_F). Special order cables can be obtained with temperature ratings of up to 480\_C (900\_F).

Most glass cables are available with a choice of PVC or flexible stainless steel sheath. PVC-sheathed cables are typically less expensive. Stainless steel sheathing adds even greater durability and allows the cables to operate at higher temperatures

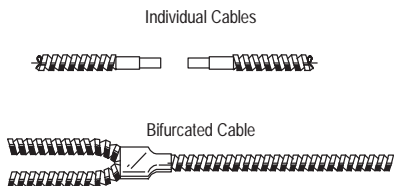
**Plastic**

Plastic fiber optic cables are typically constructed of a single acrylic monofilament. There is no protective sheathing, making plastic fiber optic cables less durable, but typically less expensive than glass cables.

Plastic cables can be used in applications where continuous flexing of the fiber optic cable is required. Coiled plastic cables are also available for these applications.

Fiber optic cables are available in *individual* or *bifurcated* configurations (Figure 14).

**Figure 14  
Fiber Optic Cables**



Two individual cables are used for transmitted beam sensing. Some individual cables are packaged separately, others are sold in packages of two. Order carefully to receive two cables.

**Comparison of Fiber Optic Cables**

	Glass	Plastic
Construction	Thin glass strands bundled in stainless steel or PVC sheath	Single acrylic monofilament
Temperature Range	-40...260_C (-40...500_F) with stainless steel sheath. Special order up to 480_C (900_F).	-30...70_C (-20...158_F)
Durability	Very durable	Adequate for many applications
Continuous Flexing	Will quickly break glass fibers	Will work very well, coiled versions available
Light Source	Visible or infrared OK	Must use visible light
Range	Can be longer range because of larger diameter	Adequate for many applications

Bifurcated cables are used for diffuse or retroreflective sensing modes. Standard diffuse sensing with fiber optic cables are similar to sensing with lensed photoelectric sensors.

Retroreflective sensing is possible with either reflectors or reflective tapes. Polarized retroreflective sensing is not possible. In some applications it will be necessary to reduce the sensitivity of the sensor to prevent diffuse detection of the target.

Glass fibers can be used with infrared or visible LEDs. Plastic fibers absorb infrared light and therefore are most efficient when used with visible red LEDs.

A wide selection of fiber optic cables is available and many special configurations can be obtained.

**Clear Object Detection**

Clear materials present a unique application challenge for photoelectric sensors. Most clear objects and films provide insufficient contrast to be reliably detected using general purpose retroreflective or polarized retroreflective sensors. Various forms of diffuse sensing do not offer a preferred solution because the exact location of the clear target cannot be detected.

Rockwell Automation/Allen-Bradley offers ClearSight<sup>™</sup> photoelectric sensors that are specifically designed for clear object and clear film sensing applications. These modified polarized retroreflective sensors contain special optical assemblies designed to optimize the amount of contrast generated by clear objects and films. Special electronics and software features further enhance sensing reliability.

For detailed information about solving the challenges of clear object detection, refer to the white paper "Clear Object Detection Using Photoelectric Sensors."

## Introduction

45FVL/FSL Light Source Selector Guide for Color Contrast Sensing

Target \ Background	White	Yellow	Orange	Red	Green	Blue	Black
White	❶	B	B	B	R	R	R
Yellow	B	❶	G	G	R	R	R
Orange	B	G	❶	G	G	G	R
Red	B	G	G	❶	R	B	R
Green	R	R	G	R	❶	B	G
Blue	R	R	G	B	B	❶	B
Black	R	R	R	R	G	B	❶

R = Red; B = Blue; G = Green

❶ 42QA ColorSight sensor suggested for shades of same color.

Note: White LED light source can be used selectively in place of red, blue and green.

### Photoelectric Sensor Specifications

#### Light/Dark Operate Output

The terms 'light operate' and 'dark operate' are used to describe the action of a sensor output when a target is present or absent.

A light operate output is ON (energized, logic level one) when the receiver can "see" sufficient light from the light source.

For transmitted beam and retroreflective sensing, a light operate output is ON when the target is absent and light can travel from the light source to the receiver. For diffuse sensing (all types), the output is ON when the target is present and reflecting light from the light source to the receiver.

A dark operate output is ON (energized, logic level one) when the receiver cannot "see" the light from the light source.

For transmitted beam and retroreflective sensing, a dark operate output is ON when the target is present and light from the light source is blocked and cannot reach the receiver. For diffuse sensing (all types), a dark operate output is ON when the target is absent.

#### Maximum Sensing Distance

This specification refers to the sensing distance from:

- Sensor to reflector in retroreflective and polarized retroreflective sensors,
- From sensor to specified target in all types of diffuse sensors, and,
- Light source to receiver in transmitted beam sensors.

This sensing distance is guaranteed by the manufacturer. PHOTOSWITCH photoelectric sensors are conservatively rated; the actual available sensing distance will typically exceed this specification.

Note that this distance is specified at a margin of 1X, meaning that just enough light from the light source will be detected by the receiver to change the state of the output.

Most industrial environments will create contamination on the sensor lenses and reflectors or targets. Sensors should be applied at shorter distances to increase the margin to an acceptable value and enhance application reliability.

#### Minimum Sensing Distance

Many retroreflective, polarized retroreflective, and diffuse (most types) sensors have a small "blind" area near the sensor (*Figure 15*). Reflectors, reflective tapes, or diffuse targets should be located further away from the sensor than this minimum sensing distance for reliable operation.

#### Typical Response Curve

The catalog pages for most PHOTOSWITCH photoelectric sensors contain a curve that shows what the typical margin will be depending on sensing distance.

A margin of at least 2X is generally recommended for industrial environments.

*Figure 16* shows an example curve for a diffuse sensor. The maximum sensing range (margin=1X) of this sensor is 1 m (39.4 in.) to a specified white paper target. A margin of 4X can be achieved at approximately half that distance, or 500 mm (19.7 in.).

Figure 15  
Blind Area

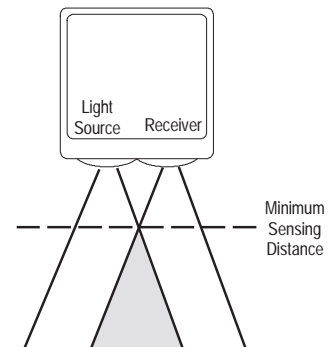
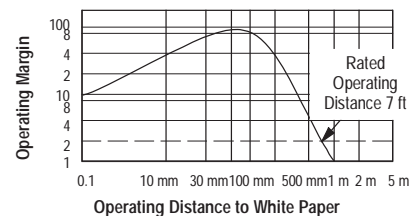


Figure 16  
Margin



#### Response Time

The response time of a sensor is the amount of time that elapses between the detection of a target and the change of state of the output device from ON to OFF or from OFF to ON. It is also the amount of time it takes for the output device to change state once the target is no longer detected by the sensor.

For most sensors, the response time is a single specification for both the ON time and OFF time. For other sensors, two different values may be given.

Response times are dependent on sensor design and choice of output device. Slower sensors usually offer longer sensing ranges. Very fast sensors typically have shorter sensing ranges. PHOTOSWITCH photoelectric sensors response times vary from 30  $\mu$ s to 30 ms.

#### Field of View

For most photoelectric sensors, the light beam from the light source and the area of detection in front of the receiver project away from the sensor in a conical shape. Field of view is a measurement (in degrees) of this conical area.

The Field of View is a useful specification to determine the available sensing area at a fixed distance away from a photoelectric sensor.

Refer to *Figure 17* for this example. The 42SRU-6002 retroreflective sensor has a 3° field of view. The figure shows that at a sensing distance of 3.0 m (10 ft) the detection area will be a circle that is approximately 168 mm (6.6 in.) diameter (56 mm (2.2 in.) per degree).

Sensors with a wide field of view typically have shorter sensing distances. However, a wider field of view can make alignment easier.

**Beam Patterns**

Beam patterns are included for several lines of Allen-Bradley photoelectric sensors to help predict the performance of these sensors in a variety of applications. A beam pattern is defined as the sensing area for a photoelectric sensor. It is the pattern generated by comparing the response of the receiver to the emitted signal over the operating distance of the sensor.

All beam patterns are drawn in two dimensions and are assumed to be symmetrical in all planes about the optical axis of the sensor. The maximum operating margin is located at the optical axis and decreases towards the outer boundary of the beam pattern.

All beam patterns are generated under clean sensing conditions with optimal sensor alignment. The beam pattern represents the largest typical sensing area, and should not be considered exact. Dust, contamination, fog, etc. will decrease the sensing area and operating range of the sensor.

**Transmitted Beam Patterns**

The beam pattern for a transmitted beam sensor represents the boundary where the receiver effectively receives the signal of the emitter, assuming there is no angular misalignment. Angular misalignment between the emitter and receiver will decrease the size of the sensing area. Beam patterns for transmitted beam sensors are useful for determining the minimum spacing required between adjacent transmitted beam sensor pairs to prevent optical crosstalk from one pair of sensors to the next.

**Retroreflective Beam Patterns**

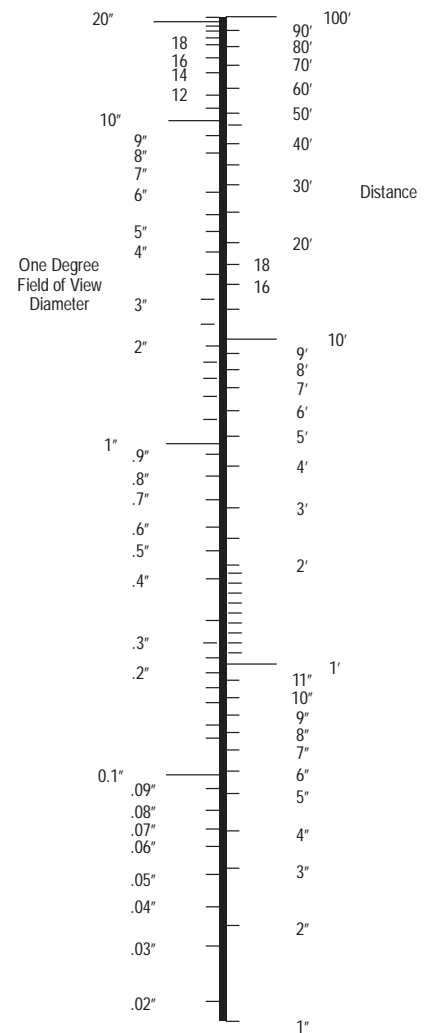
Beam patterns for retroreflective and polarized retroreflective sensors represent the boundary within which the sensor will respond to a retroreflective target as it passes by the sensors optics. The retroreflective target is held perpendicular to the sensor's optical axis while the beam diameter is plotted. The model 92-39 76 mm diameter retroreflective target is used to generate retroreflective beam patterns unless otherwise noted.

For reliable operation, the object to be sensed must be equal to or larger than the beam diameter indicated in the beam pattern. A smaller retroreflective target should be used for accurate detection of smaller objects.

**Diffuse, Sharp Cutoff, and Background Suppression Beam Patterns**

The beam pattern for a diffuse sensor represents the boundary within which the edge of a white reflective target that will be detected as it passes by the sensor. Diffuse beam patterns are generated using a 90% reflective sheet of 216 x 279 mm (8.5 x 11 in.) white paper held perpendicular to the sensor's optical axis. The sensing area will be smaller for materials that are less reflective, and larger for more reflective materials. Smaller objects may decrease the size of the beam pattern of some diffuse sensors at longer ranges. Diffuse targets with surfaces that are not perpendicular to the sensor's optical axis will also significantly decrease sensor response.

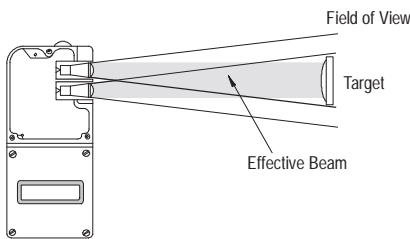
**Figure 17**  
Field of View Diameter vs. Distance



It is important to note that the effective size of the beam of the retroreflective control is equal to the size of the retroreflective target. Additional reflective targets in the field of view will increase the excess gain and operating distance, if the field of view is bigger than the initial target as depicted in (*Figure 18*, on page 1-28).

## Introduction

**Figure 18**  
Retroreflective Sensors



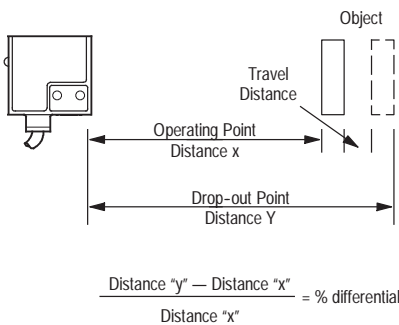
### Hysteresis

Photoelectric sensors exhibit hysteresis (or differential).

The hysteresis of a photoelectric sensor is the difference between the distance when a target can be detected as it moves towards the sensor, and the distance it has to move away from the sensor to no longer be detected.

An example is shown in *Figure 19*. As the target moves toward the sensor, it will be detected at distance X. As it then moves away from the sensor, it will still be detected until it gets to distance Y.

**Figure 19**  
Hysteresis



The high hysteresis in most photoelectric sensors is useful for detecting large opaque objects in retroreflective, polarized retroreflective and transmitted beam applications. In diffuse applications a large difference in reflected light from target and background also allows the use of high hysteresis sensors.

Low hysteresis requires smaller changes in light level. The Series 10,000 and 42FT allow selection of low hysteresis for these applications.

### Aligning a Photoelectric Sensor

Proper alignment of the sensor will create a more rugged sensing solution that requires less maintenance.

#### Retroreflective or Polarized Retroreflective

Aim the sensor at the reflector (or reflective tape). Slowly pan the sensor left until the reflector is no longer detected. Note this position, then slowly scan the sensor to the right and note when the reflector is no longer detected. Center the sensor between these two positions, then pan it up and down to center it in the vertical plane.

#### Diffuse (all types)

Aim the sensor at the target. Pan the sensor up and down, left and right to center the beam on the target.

Reduce the sensitivity just until the target is no longer detected and note the position of the sensitivity adjustment.

Remove the target and increase the sensitivity until the background is detected. Adjust the sensitivity to the mid point between detection of the target and detection of the background.

#### Transmitted Beam

Aim the receiver at the light source. Slowly pan the receiver left until the light source is no longer detected. Note this position, then slowly scan the receiver to the right and note when the reflector is no longer detected. Center the receiver between these two positions, then pan it up and down to center it in the vertical plane.

### Digital Output Devices

Once the sensor has detected the target, an output device switches the electrical power in the user's control circuit. The output is either ON or OFF, making the sensor a digital device.

There are many types of outputs available, each with different benefits and weaknesses. The types available with Allen-Bradley PHOTOSWITCH photoelectric sensors are described below, and summarized in *Table 3*.

#### Electromechanical Relay

An electromechanical relay (or simply "relay") offers a reliable, positive means of switching electrical energy. Its major advantages are high switching current and electrical isolation from the sensor power source.

Because of the electrical isolation from the power source of the sensor, and due to the absence of leakage current, relays from multiple sensors can readily be connected in series and/or parallel.

Contact ratings will vary from 1...5 A at 120/240V AC 50/60 Hz resistive, depending on the sensor selected.

There are a number of different contact arrangements available:

- SPST—Single pole, single throw
- SPDT—Single pole, double throw
- DPDT—Double pole, double throw

Relays have a finite life span, typically measured in millions of operations. Inductive loads can shorten the life span considerably. Solid-state outputs should be considered for applications that require frequent switching by the sensor.

**Table 3**

Output Type	Strengths	Weaknesses
Electromechanical Relay <i>AC or DC switching</i>	<ul style="list-style-type: none"> <li>S Output is electrically isolated from supply power</li> <li>S Easy series and/or parallel connection of sensor outputs</li> <li>S High switching current</li> </ul>	<ul style="list-style-type: none"> <li>S No short circuit protection possible</li> <li>S Finite relay life</li> </ul>
FET <i>AC or DC switching</i>	<ul style="list-style-type: none"> <li>S Very low leakage current</li> <li>S Fast switching speed</li> </ul>	<ul style="list-style-type: none"> <li>S Low output current</li> </ul>
Power MOSFET <i>AC or DC switching</i>	<ul style="list-style-type: none"> <li>S Very low leakage current</li> <li>S Fast switching speed</li> </ul>	<ul style="list-style-type: none"> <li>S Moderately high output current</li> </ul>
TRIAC <i>AC switching only</i>	<ul style="list-style-type: none"> <li>S High output current</li> </ul>	<ul style="list-style-type: none"> <li>S Relatively high leakage current</li> <li>S Slow output switching</li> </ul>
NPN or PNP Transistor <i>DC switching only</i>	<ul style="list-style-type: none"> <li>S Very low leakage current</li> <li>S Fast switching speed</li> </ul>	<ul style="list-style-type: none"> <li>S No AC switching</li> </ul>

Response times of relays are typically 15...25 ms, much slower than most solid-state outputs.

### FET

The FET (Field Effect Transistor) is a solid-state device that provides for fast switching of AC or DC power and very low leakage current. Its switching current is limited. The FET output on the Series 4000B switches only 30 mA of current.

FET outputs can be connected in parallel like electromechanical relay contacts.

### Power MOSFET

A Power MOSFET (Metal Oxide Semiconductor Field Effect Transistor) provides the very low leakage and fast response time benefits of an FET with high switching current capacity.

The Power MOSFET used in Series 6000 and Series 9000 sensors can switch up to 300 mA of current.

### TRIAC

A TRIAC is a solid-state output device designed for AC switching only. TRIACs offer high switching current, making them suitable for connection to large contactors and solenoids.

TRIACs exhibit much higher leakage current than FETs and Power MOSFETs. Leakage current from TRIACs can exceed 1 mA, making them unsuitable as input devices for programmable controllers and other solid-state inputs. A zero crossing of the 50/60 Hz AC power cycle is required to activate a TRIAC, meaning that the minimum response time is 8.3 ms.

For most applications, Power MOSFETs provide better output characteristics.

### NPN/PNP Transistor

Transistors are the typical solid-state output device for low voltage DC sensors.

A sensor with an NPN transistor output device has a sinking output. The load must be connected between the sensor output and the (+) power connection.

A sensor with a PNP transistor output device has a sourcing output. The load must be connected between the sensor output and the (-) power connection.

Transistors exhibit very low leakage current (measured in  $\mu\text{A}$ ) and relatively high switching current (typically 100 mA) for easy interface to most DC loads. Response times of sensors with transistor outputs can vary from 2 ms to as fast as 30  $\mu\text{s}$ .

### Analog Output

Analog sensors provide an output that is proportional, or inversely proportional, to the quantity of light seen by the receiver.

Series 5000 analog output sensors provide a selectable voltage or current output that is proportional or inversely proportional to the amount of light detected by the receiver.

### Timing and Logic

Photoelectric sensors are somewhat unique among presence sensors because many offer timing or logic functions. These functions may be available in special versions of the sensors, or in plug-in modules.

#### On Delay and Off Delay

On Delay and Off Delay are the most common timing modes.

An On Delay timer will delay the operation of an output after a target is detected.

An Off Delay timer will delay the operation of an output after the target is no longer detected.

The delay time of most sensors is adjustable from less than a second to 10 seconds or more.

Some high speed sensors (less than 1ms response time) such as the 42FB and 42FT contain a selectable 50 ms off delay time. This "pulse stretcher" is useful when it is necessary to slow down the OFF response time to allow a slower PLC or other machine logic to respond to the movement of materials in high speed applications.

#### One-Shot

One-shot logic provides a single pulse output regardless of the speed that a target moves past the sensor. The length of the pulse is adjustable.

One-shot operation can provide different application solutions:

- In high speed operations—provides a pulse each time a target moves past the sensor that is sufficiently long to allow other slower logic to respond.
- In slower speed operations—provides a brief pulse each time a target moves past the sensor to trigger a solenoid or other impulse device.
- Provides a leading edge signal regardless of target length.
- Provides a trailing edge signal regardless of target length.

#### Delayed One-Shot

Delayed one-shot logic adds an adjustable time delay before the one-shot output pulse occurs.

#### Motion Detector

Motion detection logic provides the unique capability to detect the continuous movement of targets. The sensor will provide an output if it does not detect the motion of successive targets within the adjustable delay time.

Motion detector logic is useful to detect a jam or void in material handling applications.

Notes

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RightSight DC model  
with short 18 mm base

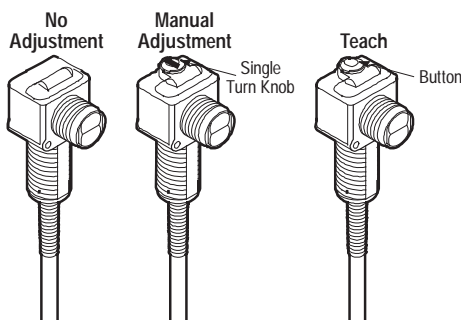
**Features**

- S Compact right angle housing
- S Flexible 18 mm mounting options
- S 1200 psi washdown rating
- S Non-adjustable, adjustable and teach versions
- S 360\_ visible LED indicators
- S Reverse polarity protection
- S Short-circuit protected outputs
- S Fast 1 ms response time (DC)
- S False pulse protection
- S Variety of output types
- S Laser models available (see page 1-108)

**Specifications**

<b>Environmental</b>	
Certifications	UL Listed, CSA Certified and CE Marked for all applicable directives
Operating Environment	NEMA 4X, 6P, IP67 (IEC 529); 1200 psi (8270 kPa) washdown, IP69K
Operating Temperature [C (F)]	-25...+70° (-13...+158°) ≤ 132V AC/DC -25...+55° (-13...+131°) ≥ 132V AC/DC
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60068-2-27
Relative Humidity	5...95% (noncondensing)
Ambient Light Immunity	Incandescent light 5000 lux
<b>Optical</b>	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, background suppression, sharp cutoff, fixed focus, fiber optic, transmitted beam
Sensing Range	See Product Selection table on page 1-34
Field of View	See Product Selection table on 1-34
Light Source	Visible red LED (660 nm) or infrared LED (880 nm)
LED Indicators	See User Interface below
Adjustments	Sensitivity potentiometer, teach button, or fixed by cat. no.
<b>Electrical</b>	
Voltage	10.8...30V DC, 21.6...264V AC
Current Consumption	35 mA max (DC), 25 mA max (AC)
Sensor Protection	False pulse, reverse polarity, overload, short circuit
<b>Outputs</b>	
Response Time	1 ms (4 ms for transmitted beam) DC models 8.3 ms (16.6 ms for transmitted beam) AC models
Output Type	PNP or NPN by cat. no., PNP and NPN, N-MOSFET
Output Mode	Complementary light or dark operate, light or dark operate by cat. no.
Output Current	100 mA
Output Leakage Current	0.1 mA max (DC); 0.4 mA max (AC)
<b>Mechanical</b>	
Housing Material	Mindel
Lens Material	Acrylic
Cover Material	Udel
Connection Types	2 m cable, 4-pin DC micro (M12) QD, 4-pin pico (M8) QD
Supplied Accessories	18 mm fastening nuts
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-39

**User Interface**



Color	State	Status—Nonteach Version	Status—Teach Version
Yellow	OFF	Output de-energized	Output de-energized
	ON	Output energized	Output energized
	Flashing	SCP active	NA
Orange	OFF	Margin < 2.5	Normal operation
	ON	Margin > 2.5	Teach mode active
	Flashing	Output SCP active (AC models only)	Teach mode active or output SCP active
Green	OFF	Sensor not powered, SCP active, output active	Sensor not powered
	ON	Sensor powered	Sensor powered
	Flashing	NA	Unstable margin condition or output SCP active

**Note:** For DC models output and margin LEDs alternate flashing when SCP active.

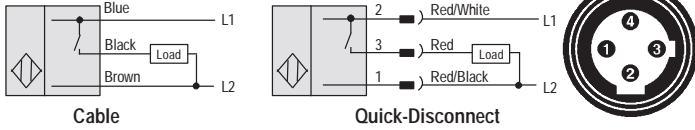
# 42EF RightSight<sup>t</sup>

18 mm Right Angle

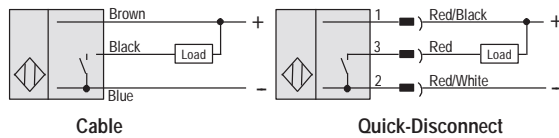
## Wiring Diagrams

### 21.6...264V AC/DC Sensors

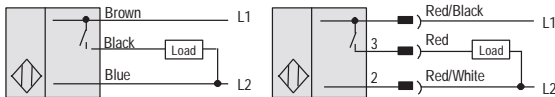
#### AC Wiring for 42EF-...C... Models



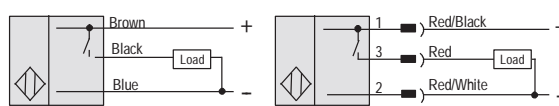
#### DC Wiring for 42EF-...C... Models



#### AC Wiring for 42EF-...F... Models



#### DC Wiring for 42EF-...F... Models



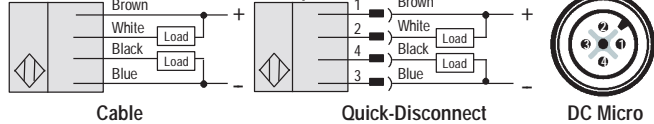
### Transmitted Beam Source

#### 21.6...264V AC/DC

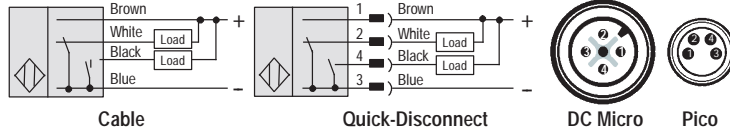


### 10.8...30V DC Sensors

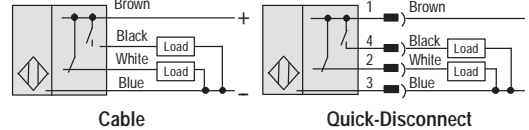
#### Models with Dual NPN and PNP Outputs





#### Models with Complementary NPN Outputs



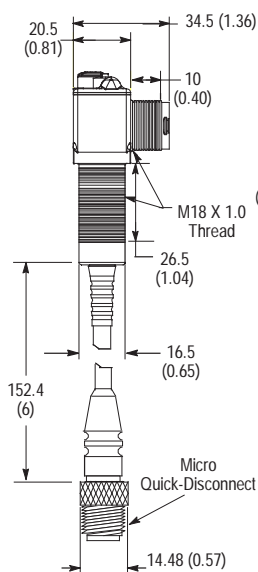
#### Models with Complementary PNP Outputs



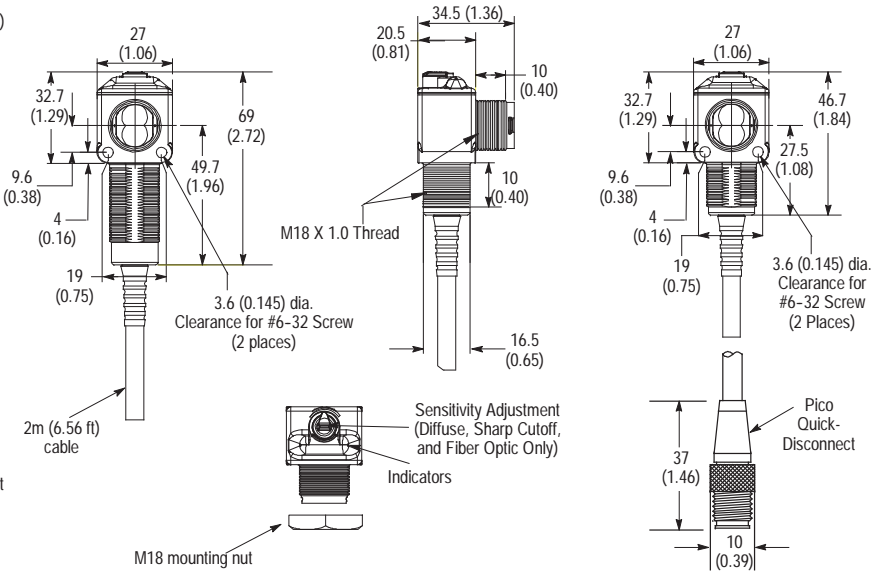
-  For Rockwell Automation programmable controller compatible interface, refer to publication 42-2.0.
-  All wire colors on quick-disconnect models refer to Rockwell Automation cordsets.

## Approximate Dimensions [mm (in.)]

### AC/DC and DeviceNet Models



### DC Models

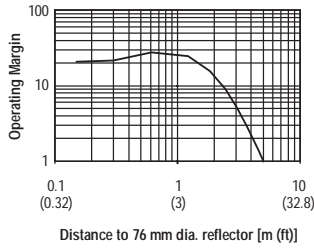


Note: All sensors supplied with one M18 mounting nut (Cat. No. 75012-097-01) except fiber optic models which come with two M18 mounting nuts (Cat. No. 75012-025-01).

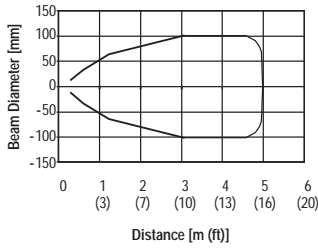


Typical Response Curve

Retroreflective

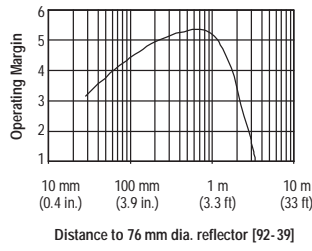


Beam Pattern

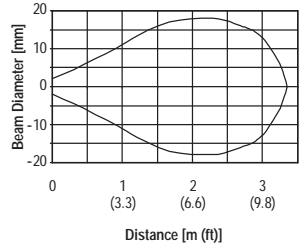


Typical Response Curve

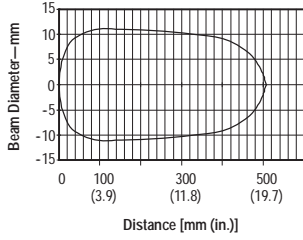
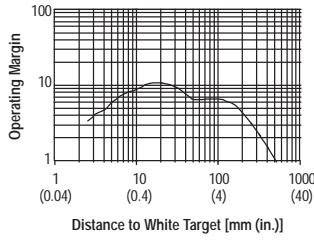
Polarized Retroreflective



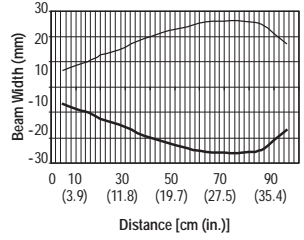
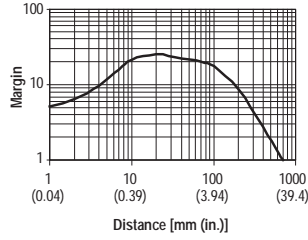
Beam Pattern



Standard Diffuse—Nonteach



Standard Diffuse—Teach

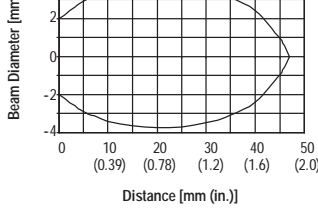


Background Suppression

50 mm

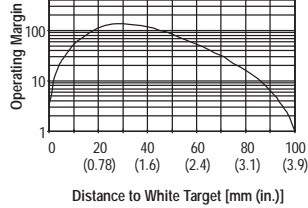


50 mm

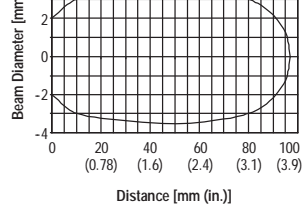


Background Suppression

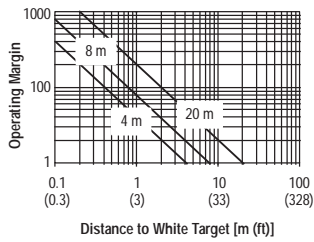
100 mm



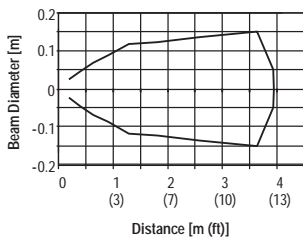
100 mm



Transmitted Beam

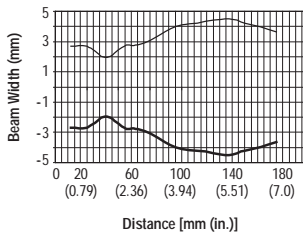
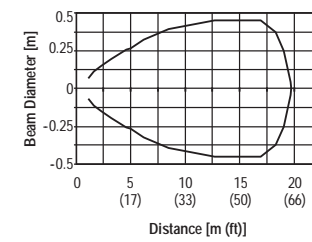


4 m Receiver Models

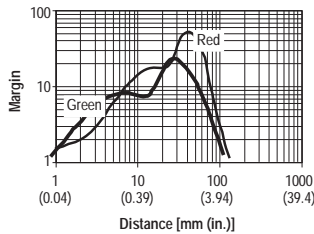


Transmitted Beam

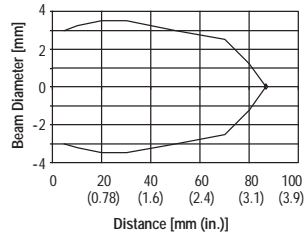
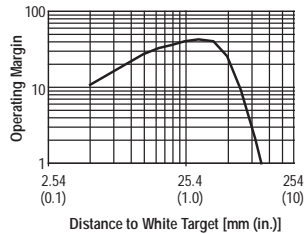
20 m Receiver Models



Fixed Focus



Sharp Cutoff Diffuse

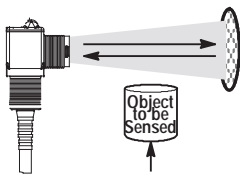
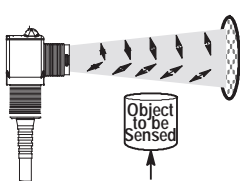


PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**42EF RightSight t**

18 mm Right Angle

Product Selection

Sensing Mode	Current @ Voltage	Sensing Distance	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.	
 <p>Retroreflective</p> <p>Field of View: 2.5_</p> <p>Emitter LED: Visible red 660 nm</p>	35 mA @ 10.8...30V DC	25 mm...4.5 m (1 in...14.7 ft)	No Adjustment	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-U2KBB-A2	
				Light Operate		4-pin DC micro	42EF-U2KBB-F4	
	15 mA @ 21.6...264V AC/DC	25 mm...3 m (1 in...9.8 ft)	No Adjustment	Dark Operate	N-MOSFET* 100 mA 8.3 ms	2 m 300V cable	42EF-U2SCB-A2	
				Light Operate		4-pin AC micro	42EF-U2SCB-G4	
				Dark Operate		2 m 300V cable	42EF-U2RCB-A2	
				Light Operate		4-pin AC micro	42EF-U2RCB-G4	
 <p>Polarized Retroreflective</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	35 mA @ 10.8...30V DC	25 mm...3 m (1 in...9.8 ft)	No Adjustment	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-P2KBB-A2	
				Light Operate		4-pin DC micro	42EF-P2KBB-F4	
				Complementary Light and Dark Operate		NPN 100 mA 1 ms	2 m 300V cable	42EF-P2MNB-A2
							4-pin DC micro	42EF-P2MNB-F4
	PNP 100 mA 1 ms	4-pin pico QD	42EF-P2MNB-Y4					
		2 m 300V cable	42EF-P2MPB-A2					
	15 mA @ 21.6...264V AC/DC	25 mm...3 m (1 in...9.8 ft)	No Adjustment	Dark Operate	N-MOSFET <sup>1</sup> 100 mA 8.3 ms	4-pin DC micro	42EF-P2MPB-F4	
				Light Operate		4-pin pico QD	42EF-P2MPB-Y4	
				Dark Operate		2 m 300V cable	42EF-P2SCB-A2	
				Light Operate		4-pin AC micro	42EF-P2SCB-G4	
							2 m 300V cable	42EF-P2RCB-A2
							4-pin AC micro	42EF-P2RCB-G4

<sup>1</sup> P-MOSFET models are available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors).

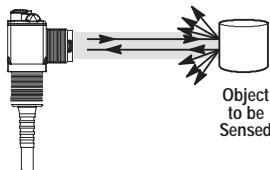
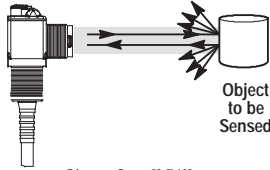
ATTENTION



P-MOSFET models have a lower in-rush current threshold for short-circuit protection than N-MOSFET. Therefore, they may be susceptible to false trigger of short-circuit protection due to induced noise.

Refer to page 1-39 for cordsets and accessories.

Product Selection (continued)

Sensing Mode	Current @ Voltage	Sensing Distance	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.		
 <p>Standard Diffuse Field of View: 5_° Emitter LED: Infrared 880 nm</p>	35 mA @ 10.8...30V DC	3...500 mm (0.12...20 in.)	Single-Turn Knob	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-D1KBAK-A2		
				Light Operate		4-pin DC micro	42EF-D1KBAK-F4		
						2 m 300V cable	42EF-D1JBAK-A2		
				4-pin DC micro		42EF-D1JBAK-F4			
	30 mA @ 10.8...30V DC	3...700 mm (0.12...27.6 in.)	Teach Button	Light Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-D1JBCK-A2		
				Dark Operate		4-pin DC micro	42EF-D1JBCK-F4		
						4-pin pico QD	42EF-D1JBCK-A2		
				2 m 300V cable		42EF-D1JBCK-F4			
	35 mA @ 10.8...30V DC	3...500 mm (0.12...20 in.)	Single-Turn Knob	Complementary Light and Dark Operate	NPN 100 mA 1 ms	2 m 300V cable	42EF-D1MNAK-A2		
						4-pin DC micro	42EF-D1MNAK-F4		
						4-pin pico QD	42EF-D1MNAK-Y4		
						2 m 300V cable	42EF-D1MPAK-A2		
15 mA @ 21.6...264V AC/DC	3...500 mm (0.12...20 in.)	Single-Turn Knob	Complementary Light and Dark Operate	PNP 100 mA 1 ms	4-pin DC micro	42EF-D1MPAK-F4			
					4-pin pico QD	42EF-D1MPAK-Y4			
					Light Operate	N-MOSFET* 100 mA 8.3 ms	2 m 300V cable	42EF-D1RCAK-A2	
					Dark Operate		4-pin AC micro	42EF-D1RCAK-G4	
 <p>Sharp Cutoff Diffuse Field of View: 7_° Emitter LED: Infrared 880 nm</p>	25 mA @ 10.8...30V DC	3...130 mm (0.12...5 in.)	Single-Turn Knob	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-S1KBA-A2		
				Light Operate		4-pin DC micro	42EF-S1KBA-F4		
						2 m 300V cable	42EF-S1JBA-A2		
				4-pin DC micro		42EF-S1JBA-F4			
	25 mA @ 10.8...30V DC	3...130 mm (0.12...5 in.)	Single-Turn Knob	Complementary Light and Dark Operate	PNP 100 mA 1 ms	2 m 300V cable	42EF-S1MPA-A2		
						4-pin DC micro	42EF-S1MPA-F4		
						4-pin pico QD	42EF-S1MPA-Y4		
						2 m 300V cable	42EF-S1MNA-A2		
	15 mA @ 21.6...264V AC/DC	3...130 mm (0.12...5 in.)	Single-Turn Knob	Complementary Light and Dark Operate	NPN 100 mA 1 ms	4-pin DC micro	42EF-S1MNA-F4		
						4-pin pico QD	42EF-S1MNA-Y4		
						Light Operate	N-MOSFET <sup>①</sup> 100 mA 8.3 ms	2 m 300V cable	42EF-S1RCA-A2
						Dark Operate		4-pin AC micro	42EF-S1RCA-G4
2 m 300V cable	42EF-S1SCA-A2								
4-pin AC micro	42EF-S1SCA-G4								

① P-MOSFET models are available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors).

ATTENTION



P-MOSFET models have a lower in-rush current threshold for short-circuit protection than N-MOSFET. Therefore, they may be susceptible to false trigger of short-circuit protection due to induced noise.

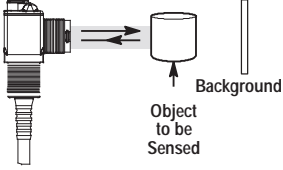
Refer to page 1-39 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

42EF RightSight<sup>t</sup>

18 mm Right Angle

Product Selection (continued)

Sensing Mode	Current @ Voltage	Sensing Distance	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
 <p>Background Suppression</p> <p>Field of View: 50 mm (2 in.): 20_ 100 mm (3.9 in.): 8_</p> <p>Emitter LED: Infrared 880 nm</p>	35 mA @ 10.8...30V DC	50 mm (1.97 in.)	No Adjustment	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-B1KBBC-A2
				Light Operate		4-pin DC micro	42EF-B1KBBC-F4
		100 mm (3.94 in.)		Dark Operate		2 m 300V cable	42EF-B1JBBC-A2
				Light Operate		4-pin DC micro	42EF-B1JBBC-F4
		3...50 mm (0.12...2 in.)		Dark Operate		2 m 300V cable	42EF-B1KBBC-A2
						4-pin DC micro	42EF-B1KBBC-F4
				Light Operate	2 m 300V cable	42EF-B1JBBC-A2	
					4-pin DC micro	42EF-B1JBBC-F4	
				Complementary Light and Dark Operate	NPN 100 mA 1 ms	2 m 300V cable	42EF-B1MNBC-A2
					4-pin DC micro	42EF-B1MNBC-F4	
		PNP 100 mA 1 ms		2 m 300V cable	42EF-B1MPBC-A2		
				4-pin DC micro	42EF-B1MPBC-F4		
	4-pin pico QD	42EF-B1MPBC-Y4	42EF-B1MPBC-Y4				
		NPN 100 mA 1 ms	2 m 300V cable	42EF-B1MNBE-A2			
	4-pin DC micro		42EF-B1MNBE-F4				
	PNP 100 mA 1 ms	2 m 300V cable	42EF-B1MPBE-A2				
		4-pin DC micro	42EF-B1MPBE-F4				
	4-pin pico QD	42EF-B1MPBE-Y4	42EF-B1MPBE-Y4				
		15 mA @ 21.6...132V AC/DC	3...50 mm (0.12...2 in.)	No Adjustment	Light Operate	PNP-FET 100 mA 8.3 ms	2 m 300V cable
	Dark Operate				4-pin AC micro		42EF-B1RFBC-G4
	3...100 mm (0.12...3.9 in.)		Light Operate		2 m 300V cable		42EF-B1SFBC-A2
			Dark Operate		4-pin AC micro		42EF-B1SFBC-G4
	Light Operate		2 m 300V cable		42EF-B1RFBE-A2		
			4-pin AC micro		42EF-B1RFBE-G4		
Dark Operate	2 m 300V cable		42EF-B1SFBE-A2				
	4-pin AC micro		42EF-B1SFBE-G4				
15 mA @ 21.6...264V AC/DC	3...50 mm (0.12...2 in.)	No Adjustment	Light Operate	N-MOSFET <sup>1</sup> 100 mA 8.3 ms	2 m 300V cable	42EF-B1RCBC-A2	
			Dark Operate		4-pin AC micro	42EF-B1RCBC-G4	
	3...100 mm (0.12...3.9 in.)		Light Operate		2 m 300V cable	42EF-B1SCBC-A2	
			Dark Operate		4-pin AC micro	42EF-B1SCBC-G4	
	Light Operate		2 m 300V cable		42EF-B1RCBE-A2		
			4-pin AC micro		42EF-B1RCBE-G4		
	Dark Operate		2 m 300V cable		42EF-B1SCBE-A2		
			4-pin AC micro		42EF-B1SCBE-G4		

<sup>1</sup> P-MOSFET models are available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors).

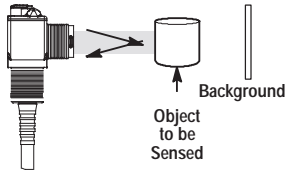
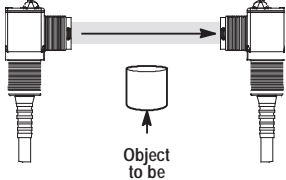
ATTENTION



P-MOSFET models have a lower in-rush current threshold for short-circuit protection than N-MOSFET. Therefore, they may be susceptible to false trigger of short-circuit protection due to induced noise.

Refer to page 1-39 for cordsets and accessories.

Product Selection (continued)

Sensing Mode	Current @ Voltage	Sensing Distance	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
 <p><i>Fixed Focus Diffuse</i> Spot Size: 4 mm Emitter LED: Visible red (660 nm)</p>	10.8...30V DC @ 30 mA max.	Red LED 43 mm (1.69 in.)	Teach Button	Light Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-F2JBC-A2
						4-pin DC micro	42EF-F2JBC-F4
				Dark Operate		2 m 300V cable	42EF-F2KBC-A2
						4-pin DC micro	42EF-F2KBC-F4
 <p><i>Transmitted Beam</i> Field of View: 7_° Emitter LED: Infrared 880nm</p>	10.8...30V DC 25 mA	Depends on Receiver	NA	NA	NA	2 m 300V cable	42EF-E1EZB-A2
	21.6...264V AC/DC 15 mA					4-pin DC micro	42EF-E1EZB-F4
						4-pin pico QD	42EF-E1EZB-Y4
						2 m 300V cable	42EF-E1QZB-A2
						4-pin AC micro	42EF-E1QZB-G4

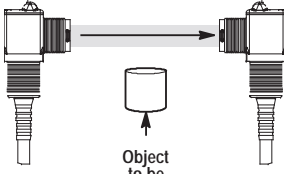
Refer to page 1-39 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

42EF RightSight<sup>t</sup>

18 mm Right Angle

Product Selection for Receivers

Sensing Mode	Current @ Voltage	Sensing Distance [m (ft)]	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
 <p>Field of View: 7° Emitter LED: Infrared 880nm (See Note 2.)</p>	25 mA @ 10.8...30V DC	20 m (65.6 ft)	No Adjustment	Dark Operate	NPN and PNP 100 mA 4 ms	2 m 300V cable	42EF-R9KBB-A2
				Light Operate		4-pin DC micro	42EF-R9KBB-F4
		Dark Operate		2 m 300V cable		42EF-R9JBB-A2	
		Light Operate		4-pin DC micro		42EF-R9JBB-F4	
		Dark Operate		2 m 300V cable		42EF-R9KBBV-A2	
		Light Operate		4-pin DC micro		42EF-R9KBBV-F4	
		Dark Operate		2 m 300V cable		42EF-R9JBBV-A2	
		Light Operate		4-pin DC micro		42EF-R9JBBV-F4	
		Dark Operate		2 m 300V cable		42EF-R9KBBT-A2	
		Light Operate		4-pin DC micro		42EF-R9KBBT-F4	
		Dark Operate		2 m 300V cable		42EF-R9JBBT-A2	
		Light Operate		4-pin DC micro		42EF-R9JBBT-F4	
	15 mA @ 21.6...264V AC/DC	4 m (13 ft)	Complementary Light and Dark Operate	NPN 100 mA 4 ms	2 m 300V cable	42EF-R9MNBV-A2	
				PNP 100 mA 4 ms	4-pin DC micro	42EF-R9MNBV-F4	
					4-pin DC pico	42EF-R9MNBV-Y4	
		NPN 100 mA 4 ms			2 m 300V cable	42EF-R9MPBV-A2	
				4-pin DC micro	42EF-R9MPBV-F4		
					4-pin DC pico	42EF-R9MPBV-Y4	
		8 m (26.25 ft)	Complementary Light and Dark Operate	NPN 100 mA 4 ms	2 m 300V cable	42EF-R9MNBT-A2	
				PNP 100 mA 4 ms	4-pin DC micro	42EF-R9MNBT-F4	
					4-pin DC pico	42EF-R9MNBT-Y4	
		NPN 100 mA 4 ms			2 m 300V cable	42EF-R9MPBT-A2	
				4-pin DC micro	42EF-R9MPBT-F4		
					4-pin DC pico	42EF-R9MPBT-Y4	
20 m (65.6 ft)	Complementary Light and Dark Operate	NPN 100 mA 4 ms	2 m 300V cable	42EF-R9MNB-A2			
		PNP 100 mA 4 ms	4-pin DC micro	42EF-R9MNB-F4			
			4-pin DC pico	42EF-R9MNB-Y4			
NPN 100 mA 4 ms			2 m 300V cable	42EF-R9MPB-A2			
		4-pin DC micro	42EF-R9MPB-F4				
			4-pin DC pico	42EF-R9MPB-Y4			
4 m (13 ft)	N-MOSFET <sup>1</sup> 100 mA 16.6 ms	Dark Operate	2 m 300V cable	42EF-R9SCBV-A2			
		Light Operate	4-pin AC micro	42EF-R9SCBV-G4			
			2 m 300V cable	42EF-R9RCBV-A2			
		4-pin AC micro	42EF-R9RCBV-G4				
			8 m (26.25 ft)	N-MOSFET <sup>1</sup> 100 mA 16.6 ms	Dark Operate	2 m 300V cable	42EF-R9SCBT-A2
		Light Operate			4-pin AC micro	42EF-R9SCBT-G4	
2 m 300V cable	42EF-R9RCBT-A2						
4-pin AC micro	42EF-R9RCBT-G4						
	20 m (65.6 ft)	N-MOSFET <sup>1</sup> 100 mA 16.6 ms	Dark Operate		2 m 300V cable	42EF-R9SCB-A2	
Light Operate			4-pin AC micro		42EF-R9SCB-G4		
	2 m 300V cable		42EF-R9RCB-A2				
4-pin AC micro	42EF-R9RCB-G4						

<sup>1</sup> P-MOSFET models are available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors).

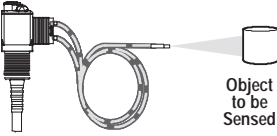
ATTENTION




P-MOSFET models have a lower in-rush current threshold for short-circuit protection than N-MOSFET. Therefore, they may be susceptible to false trigger of short-circuit protection due to induced noise.

Refer to page 1-39 for cordsets and accessories.

Product Selection (continued)

Sensing Mode	Current @ Voltage	Sensing Distance	Adjustment Type	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
 <p>Object to be Sensed</p> <p>Large Aperture Fiber Optic (See Note 3.)</p> <p>Field of View: Depends on Glass Fiber Optic cable selected</p> <p>Emitter LED: Infrared 880nm</p>	35 mA @ 10.8...30V DC	Depends on Glass Fiber Optic cable selected	Single-Turn Knob	Dark Operate	NPN and PNP 100 mA 1 ms	2 m 300V cable	42EF-G1KBA-A2
						4-pin DC micro	42EF-G1KBA-F4
				Light Operate		2 m 300V cable	42EF-G1JBA-A2
						4-pin DC micro	42EF-G1JBA-F4
				Complementary Light and Dark Operate	NPN 100 mA 1 ms	2 m 300V cable	42EF-G1MNA-A2
						4-pin DC micro	42EF-G1MNA-F4
		PNP 100 mA 1 ms	4-pin pico	42EF-G1MNA-Y4			
			2 m 300V cable	42EF-G1MPA-A2			
			4-pin DC micro	42EF-G1MPA-F4			
			4-pin pico	42EF-G1MPA-Y4			
	Light Operate	N-MOSFET <sup>①</sup> 100 mA 8.3 ms			2 m 300V cable	42EF-G1RCA-A2	
					4-pin AC micro	42EF-G1RCA-G4	
Dark Operate				2 m 300V cable	42EF-G1SCA-A2		
				4-pin AC micro	42EF-G1SCA-G4		

① P-MOSFET models are available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors).

<p><b>ATTENTION</b></p> 	<p>P-MOSFET models have a lower in-rush current threshold for short-circuit protection than N-MOSFET. Therefore, they may be susceptible to false trigger of short-circuit protection due to induced noise.</p>
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Note 1: For color registration mark applications, refer to light source selection guide at [www.ab.com/sensors](http://www.ab.com/sensors).

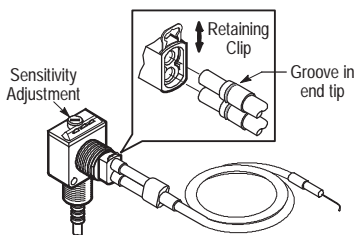
Note 2: For maximum performance, transmitted beam sources should be combined with matched operating voltage receivers, i.e., AC/DC source with AC/DC receiver or DC source with DC receiver. Reduced operating distance and margin will result from mixed operating voltage pairs.

Note 3: For use with glass fiber optic cables. See page 1-231 for more information.

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, Straight, 4-pin, 2 m	889D-F4AC-2	76 mm (3 in.) Diameter Reflector	<b>92-39</b>	Apertures, 1 mm Slot	60-2660
AC Micro QD Cordset, Straight, 4-pin, 2 m	889R-F4AEA-2	32 mm (1.25 in.) Diameter Reflector	<b>92-47</b>	Apertures, 2 mm Slot	60-2661
Pico QD Cordset, Straight, 4-pin, 2 m	889P-F4AB-2	Mounting Bracket Swivel/Tilt	60-2649	Apertures, 4 mm Slot	60-2662
				Aperture Set	60-2659
Bifurcated Fiber Optic Cable—38 mm (1.5 in.) typical range	<b>43GR-TBB25SL</b>	Individual Fiber Optic Cable—457 mm (18 in.) typical range	<b>43GT-FAS25SL</b>		
Bifurcated Fiber Optic Cable—21 mm (0.8 in.) typical range	43GR-TFS10ML	Individual Fiber Optic Cable—152 mm (6 in.) typical range	43GT-TFS10ML		

Glass Fiber Optic Cables





42JS

42JS Adaptor

42JT

### Description

The 42JS VisiSight™ family of photoelectric sensors features a full range of sensing modes in a miniature rectangular enclosure. The small housing combined with minimal adjustments; makes the 42JS VisiSight ideal for material handling applications where simplified installation and maintenance are required. A strong and visible light source is offered in all models for ease of alignment and a fast installation. The sensors can be mounted using the industry standard 25.4 mm hole spacing or using 18 mm hole mount when using the 60-AJS-18 snap-on adaptor.

The 42JT VisiSight models add flexibility by offering a tactile pushbutton that simplifies sensitivity and parameter setup. This makes the 42JT VisiSight a great solution for packaging and assembly applications that require some configuration in order to operate at optimal conditions. The 42JT offers unique "Auto PNP/NPN" output that continuously monitors how the load is connected and automatically configures the output for proper operation and output LED to indicate correct output status.

### Features

#### 42JS VisiSight

- Visible red LED for ease of alignment
- Complementary light and dark operate outputs
- Linear sensitivity adjustment knob or no adjustment models
- Optional snap-on adaptor enables 18 mm mount and makes sensor replacement a snap
- IP67 rated enclosure

#### 42JT VisiSight

- Class 1 "Eye Safe" red laser beam (for small object and contrast detection) and visible LED models
- Unique "Auto PNP/NPN" output reduces stocking cost and simplifies selection, installation, and maintenance
- Teach pushbutton for sensitivity and L.O./D.O. selection
- IP69K enclosure rating and ECOLAB certified to withstand food industry cleaning chemicals
- Laser etched markings for durability

### Available Models

#### 42JS VisiSight

Polarized Retroreflective  
 Standard Diffuse  
 Fixed Background Suppression  
 Transmitted Beam

#### 42JT VisiSight

Polarized Retroreflective  
 Standard Diffuse  
 Adjustable Background Suppression  
 Transmitted Beam  
 Clear Object  
 Color Mark

### General Specifications

Certifications	cULus Listed and CE Marked for all applicable directives
<b>Environmental</b>	
Vibration	10...55 Hz, 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	Incandescent light 5000 lux
<b>User Interface</b>	
Indicator LEDs	Green LED, Yellow LED
<b>Electrical</b>	
Operating Voltage	10...30V DC
Protection Type	False pulse, reverse polarity, overload, short circuit
<b>Outputs</b>	
Load Current	100 mA max.
<b>Mechanical</b>	
Housing Material	ABS
Lens Material	PMMA

### Specifications for 42JS VisiSight

<b>Environmental</b>	
Enclosure Type Rating	IP67
Operating Temperature [C (F)]	-20...+60° (-4...+140°)
<b>User Interface</b>	
Sensitivity Adjustment	Potentiometer or fixed by cat. no.
<b>Electrical</b>	
Current Consumption	25mA max.
<b>Outputs</b>	
Output Type	PNP or NPN by cat. no.
Output Function	Complementary light and dark operate
<b>Mechanical</b>	
Connection Type	2 m cable, 4-pin DC micro (M12) QD, 4-pin pico (M8) QD

### Specifications for 42JT VisiSight

<b>Environmental</b>	
Enclosure Type Rating	IP67 and IP69K
Operating Temperature [C (F)]	-20...+60° (-4...+140°)
<b>User Interface</b>	
Sensitivity Adjustment	Potentiometer or fixed by cat. no.
<b>Electrical</b>	
Current Consumption	30 mA max.
<b>Outputs</b>	
Output Type	PNP or NPN by cat. no.
Output Function	Teachable light or dark operate
<b>Mechanical</b>	
Connection Type	2 m cable, 4-pin DC micro (M12) QD on pigtail, 4-pin pico (M8) integral QD



PHOTOSWITCH® Photoelectric Sensors  
**42JS & 42JT VisiSight™**  
 20 mm Rectangular

Product Selection

Sensing Mode	Light Source	Sensing Distance	Sensitivity Adjustment	Output Function	Output Type	Cat. No.‡	
Polarized Retroreflective							
42JS		Visible red	No adjustment	Complementary light or dark operate	NPN	42JS-P2MNB1-F4	
					PNP	42JS-P2MPB1-F4	
			Adjustment knob		NPN	42JS-P2MNA2-F4	
					PNP	42JS-P2MPA2-F4	
42JT		Class 1 laser	Teach button	Teachable light or dark operate	Auto PNP or NPN	42JT-P2LAT1-P4	
					42JT-P8LAT1-P4		
Clear Object Detection							
42JT		Visible red	2 m (6.6 ft)Δ	Teach button	Teachable light or dark operate	Auto PNP or NPN	42JT-C2LAT1-P4
Diffuse							
42JS		Visible red	Adjustment knob	Complementary light or dark operate	NPN	42JS-D2MNA2-F4	
					PNP	42JS-D2MPA2-F4	
					NPN	42JS-D2MNA1-F4	
					PNP	42JS-D2MPA1-F4	
42JT		Class 1 laser	Teach button	Teachable light or dark operate	Auto PNP or NPN	42JT-D2LAT1-P4	
					42JT-D8LAT1-P4		
Background Suppression							
42JS		Visible red	No adjustment	Complementary light and dark operate	NPN	42JS-B2MNB1-F4	
					PNP	42JS-B2MPB1-F4	
					NPN	42JS-B2MNB2-F4	
					PNP	42JS-B2MPB2-F4	
42JT		Class 1 laser	Teach button	Teachable light or dark operate	Auto PNP or NPN	42JT-B2LAT1-P4	
					42JT-B2LAT2-P4		
					42JT-B8LAT1-P4		
					42JT-B8LAT1-P4		
Color Mark							
42JT		White LED	12 mm (0.47 in.) ±2.5 mm	Teach button	Teachable light or dark operate	PNP or NPN (push pull)	42JT-F5LET1-P4
Transmitted Beam (emitter and receiver sold separately)							
42JS		Visible red	No adjustment	NA (emitter)	NA	42JS-E2EZB1-F4	
			Adjustment knob	Complementary light or dark operate	NPN	42JS-R9MNA1-F4	
		Infrared	No adjustment	NA (emitter)	NA	42JS-E1EZB1-F4	
			Adjustment knob	Complementary light or dark operate	NPN	42JS-R9MNA2-F4	
42JT		Visible red	No adjustment	NA (emitter)	NA	42JT-E2EZB1-P4	
			Teach Button	Teachable light or dark operate	Auto PNP or NPN	42JT-R9LAT1-P4	
		Class 1 laser	No adjustment	NA (emitter)	NA	42JT-E8EZB1-P4	
			Teach button	Teachable light or dark operate	Auto PNP or NPN	42JT-R8LAT1-P4	
Recommended DC micro (M12) quick-disconnect cordset, straight, 4-pin, 2 m						889D-F4AC-2	
Recommended DC pico (M8) quick-disconnect cordset, straight, 4-pin, 2 m						889P-F4AB-2	

§ Sensing distance with 92-124 reflector.

♣ Sensing distance with 92-125 reflector.

Δ Sensing distance with 92-118 reflector.

‡ **42JS connection options:** The -F4 suffix describes a 4-pin DC micro (M12) QD connector on a 150 mm (6 in.) pigtail. For additional connection options, replace the -F4 suffix with:

-A2 for a 2 m cable without QD connection (for example, 42JS-P2MPB1-A2).

-Y4 for a 4-pin DC pico (M8) QD connection on a 150 mm (6 in.) pigtail (for example, 42JS-P2MPB1-Y4).

**42JT connection options:** The -P4 suffix describes a 4-pin DC pico (M8) integral QD connector. For additional connection options, replace the -P4 suffix with:

-A2 for a 2 m cable without QD connection (for example, 42JT-P2LAT1-A2).

-F4 for a 4-pin DC micro (M12) QD connection on a 150 mm (6 in.) pigtail (for example, 42JT-P2LAT1-F4).



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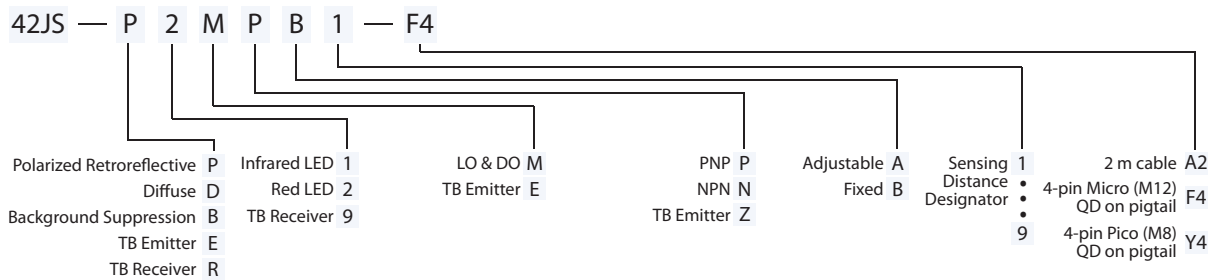
**Optical and Response Time Characteristics**

Sensing Mode	Polarized Retroreflective	Clear Object Detection	Diffuse	Background Suppression	Color Mark	Transmitted Beam
42JS VisiSight—Visible red 645 nm						
Field of View	2.8°	—	5.5° for 250 mm, 4° for 800 mm	14° for 55 mm, 17° for 130 mm	—	4°
Spot Size	175 mm @ 3.5 m	—	40 mm @ 250 mm, 60 mm @ 800 mm	7.6 mm @ 55 mm, 11.5 mm @ 130 mm	—	700 mm @ 10 m
Light Source	Visible red	—	Visible red	Visible red	—	Visible red and infrared
Response Time	1 ms	—	1 ms	1 ms	—	1 ms
42JT VisiSight—Visible red 660 nm (except for color mark models)						
Spot Size	500 mm @ 6 m	40 mm @ 1 m	70 mm @ 800 mm	15 mm @ 180 mm, 27 mm @ 400 mm	1 x 4 mm @ 12 mm (white LED)	1.1 m @ 13 m
Response Time	0.5 ms	0.5 ms	0.5 ms	0.5 ms	50 μs	0.5 ms
42JT VisiSight—Class 1 laser 650 nm						
Spot Size	14 mm @ 13 m	—	0.6 mm @ 250 mm	1.3 mm @ 120 mm	—	13 mm @ 18 m
Response Time	0.25 ms	—	0.333 ms	0.5 ms	—	0.25 ms

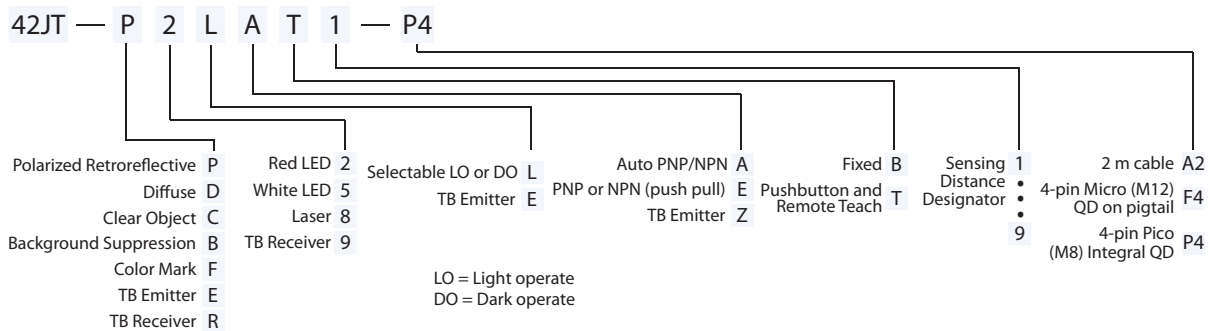
**Note:** For more information on spot size, refer to the typical response curves.

**Cat. No. Structure**

**Product Family**



**Product Family**



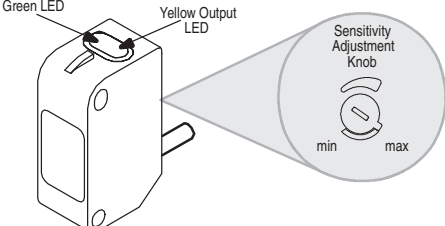
The cat. no. structure is for reference only. Please do not use this to create a cat. no. as the result may be unavailable.

2-Photoelectric Sensors



PHOTOSWITCH® Photoelectric Sensors  
**42JS & 42JT VisiSight™**  
 20 mm Rectangular

**42JS User Interface**

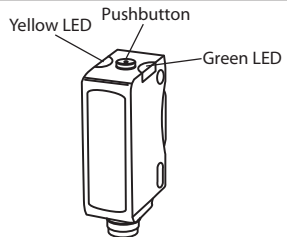


LED Color	State	Status
Green	OFF	Power is Off
	ON	Power is On
	Flashing (6 Hz)	Unstable ( $0.5 < \text{Margin} < 2$ )
	Flashing (1.5 hz)	Output short-circuit protection active
Yellow	OFF	Output de-energized‡
	ON	Output energized‡

‡ Black wire or pin 4 of connector.

**42JT User Interface**

The table below provides LED status in the RUN mode, i.e., during operation the sensor is always in RUN mode, except when being taught.



LED Color	State	Status
Green	OFF	Power is Off
	ON	Power is On
	Flashing (6 Hz)	Unstable ( $0.5 < \text{Margin} < 2$ )
	Flashing (1.5 hz)	Output short-circuit protection active
Yellow§	OFF	Output de-energized
	ON	Output energized

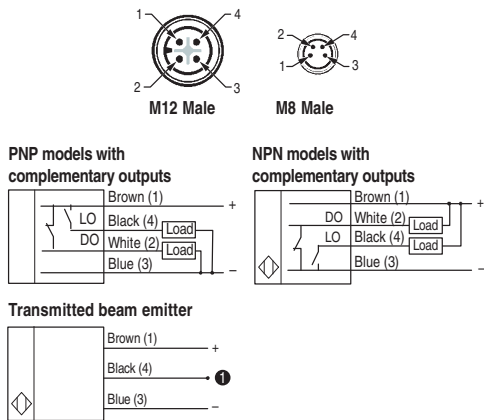
§ Except for color mark sensors: color mark sensors have PNP or NPN (push-pull) output. The above table shows LED status when output is connected as PNP. If connected as NPN, the yellow LED is ON when the output is de-energized and OFF when it is energized.

2-Photoelectric Sensors

**Wiring Diagrams**

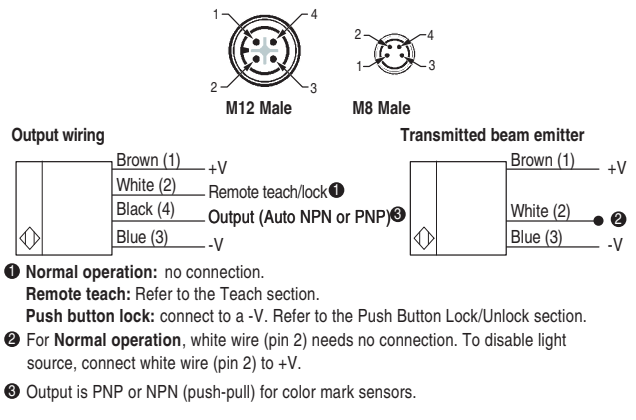
Cable connections are shown in the following diagrams. Pin numbers correspond to an M12 or M8 male connector on the sensor.

**42JS VisiSight**



❶ For normal operation, black wire (pin 4) needs no connection. To disable light source, connect black wire (pin 4) to +V.

**42JT VisiSight**



- ❶ **Normal operation:** no connection.
- Remote teach:** Refer to the Teach section.
- Push button lock:** connect to a -V. Refer to the Push Button Lock/Unlock section.
- ❷ For **Normal operation**, white wire (pin 2) needs no connection. To disable light source, connect white wire (pin 2) to +V.
- ❸ Output is PNP or NPN (push-pull) for color mark sensors.

**42JT Push Button Lock/Unlock**

The push button or remote teach (RT) can be used to prevent unauthorized users from changing teach settings.

To lock the push button: press and release the button three times within three seconds. Both LEDs flash synchronously for three seconds indicating that the push button is now locked.

To unlock the push button: press and release the button three times within three seconds. Both LEDs flash asynchronously for three seconds indicating that the push button is now unlocked.

Permanent lock: The push button may be permanently locked by connecting the white wire (pin 2) to -V.

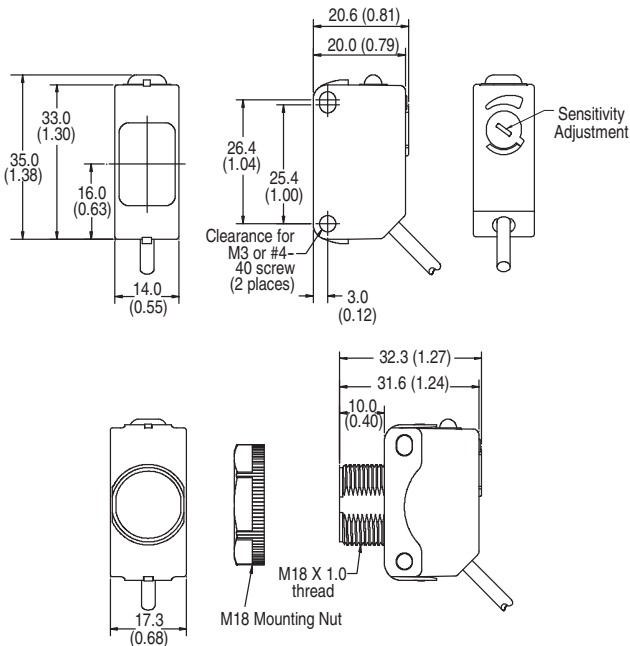
**42JT Remote Teach (RT)**

The sensor can be taught remotely via the white wire (pin 2). Connection to +V acts the same as the button being pressed and no connection is the same as the button not being pressed. The sensor can be taught by following the same teach/timing sequence as used in the push button teach (e.g., connect to the +V for more than three seconds to teach the "target," disconnect from the +V; remove the target and connect to the +V for less than one second to teach the "no target" condition. All push button functions can also be carried out via RT.

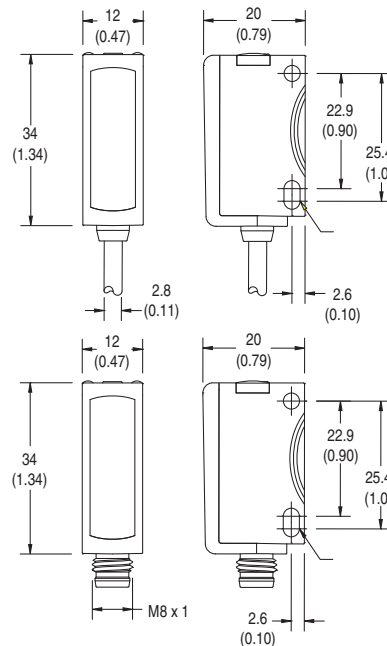


Approximate Dimensions [mm (in.)]

42JS VisiSight



42JT VisiSight



The 42JT mounting holes are located toward the rear end of the sensor while the 42JS mounting holes are located towards the front. Both sensors are compatible with the industry standard 25.4 mm mounting. The 42JT flexible mounting hole spacing ranges of 22.9...25.4 mm (0.9...1 in.), makes it compatible with the 24.1 mm (0.95 in.) hole spacing sensors.

Refer to [www.ab.com/e-tools](http://www.ab.com/e-tools) for 2D and 3D CAD drawings.

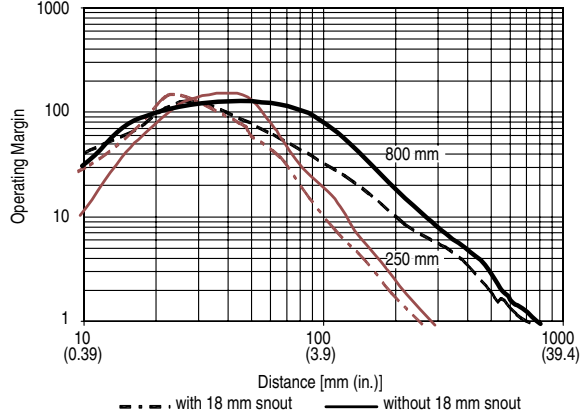
Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.
DC Micro (M12) QD Cordset, Straight, 4-pin, 2 m	889D-F4AC-2	Reflector, Corner Cube, 76 mm (3 in.) diameter	92-124
DC Pico (M8) QD Cordset, Straight, 4-pin, 2 m	889D-F4AB-2	Reflector, Corner Cube, 84 mm (3.3 in.) diameter	92-125
DC Pico (M8) QD Cordset, Right Angle, 4-pin, 2 m	889P-R4AB-2	Reflector, Corner Cube, 32 mm (1.5 in.) diameter	92-47
Mounting Bracket, Stainless Steel, L-Shaped for 42JT and 42JS	60-BJS-L1	Reflector, Corner Cube, 100 x 100 mm (4 x 4 in.)	92-108
Mounting Bracket, Stainless Steel, L-Shaped for 42JS VisiSight	60-BJS-L2	Reflector, Corner Cube, 51 x 61 mm (2 x 2.5 in.)	92-109
Mounting Bracket, Stainless Steel	60-BKTL-SS	Reflector, Micro Cube, 51 x 61 mm (2 x 2.5 in.) for laser and clear object models	92-118
Mounting Bracket, Stainless Steel, L-Shaped for 42JT and 42JS VisiSight	60-BJT-L2	Mounting Bracket, Plastic, swivel/tilt for 42JS VisiSight.	60-2619
Replacement Mounting Bracket, Stainless Steel, for replacing larger (50 x 50 mm) sensors.	60-BJT-RCS	Protective Mounting Bracket, Stainless Steel, U-Shaped for 42JT and 42JS	60-BJT-U1
Replacement Mounting Bracket, Stainless Steel, for compatible sensors using holes towards the front with 42JT VisiSight.	60-BJT-P2	Protective Mounting Bracket, Stainless Steel, Horizontal and Vertical for 42JT and 42JS VisiSight	60-BJT-H1

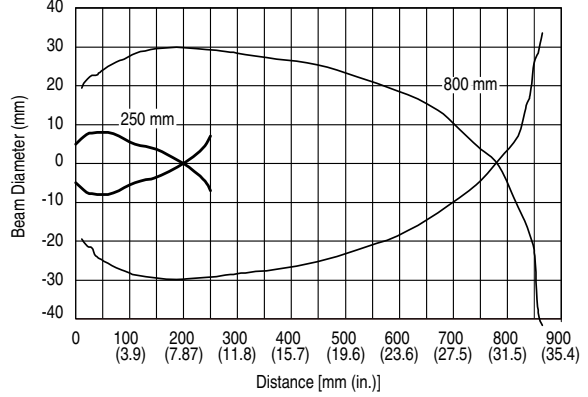
PHOTOSWITCH® Photoelectric Sensors  
**42JS & 42JT VisiSight™**  
 20 mm Rectangular

Typical Response Curves  
 42JS VisiSight

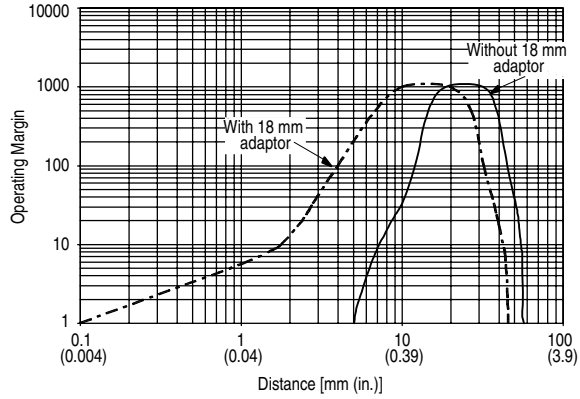
Standard Diffuse



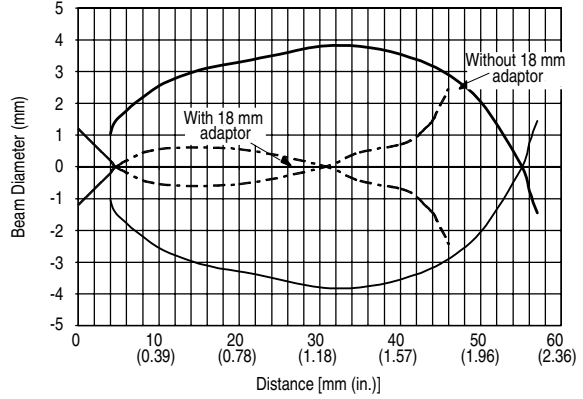
Standard Diffuse—Beam Pattern



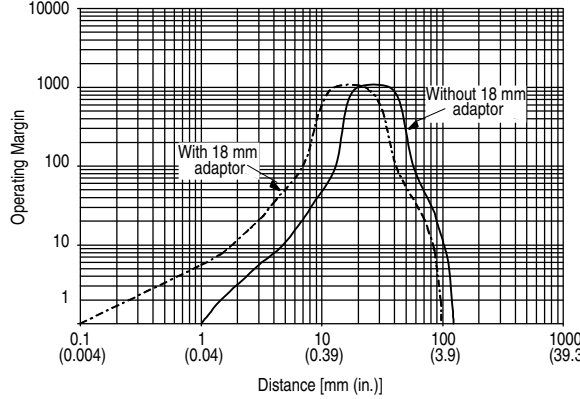
Background Suppression (55 mm)



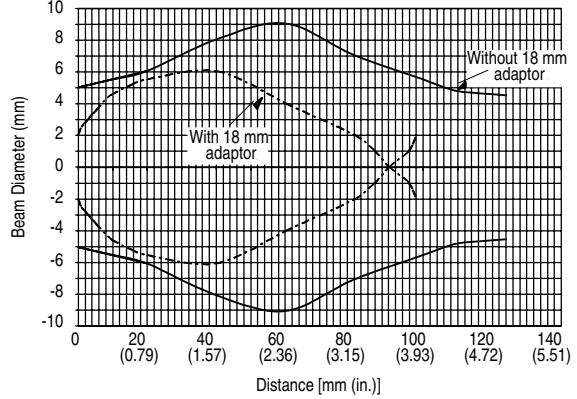
Background Suppression (55 mm)—Beam Pattern



Background Suppression (130 mm)



Background Suppression (130 mm)—Beam Pattern

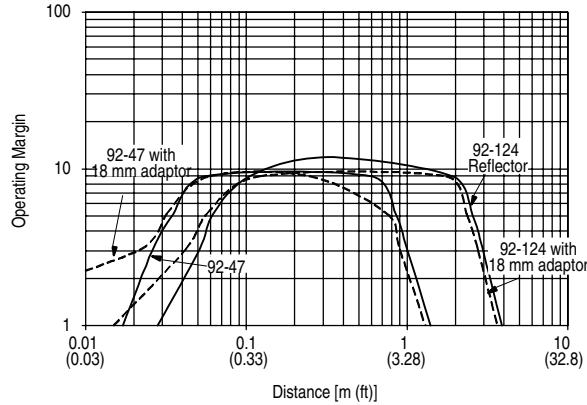


2-Photoelectric Sensors

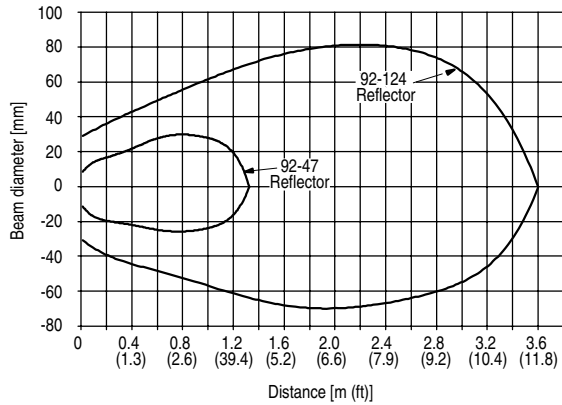


42JS VisiSight

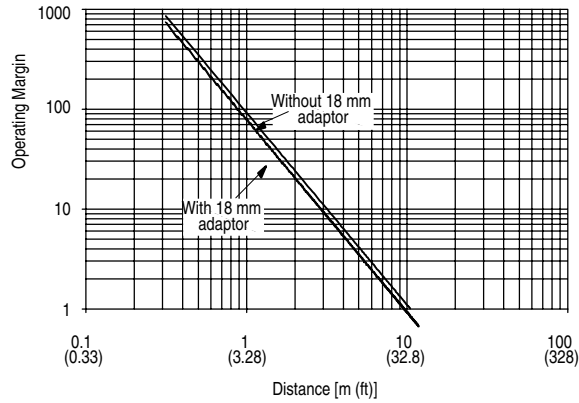
Polarized Retroreflective



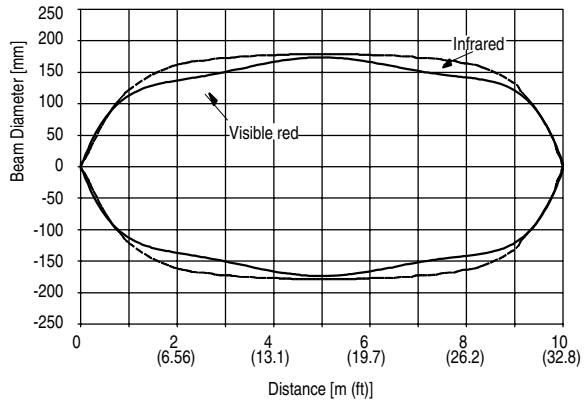
Polarized Retroreflective—Beam Pattern



Transmitted Beam—Visible Red and Infrared



Transmitted Beam—Beam Pattern

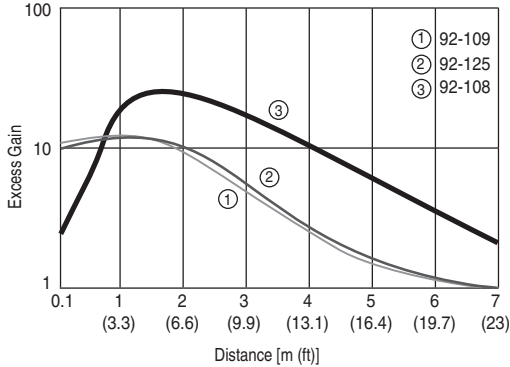


2-Photoelectric Sensors

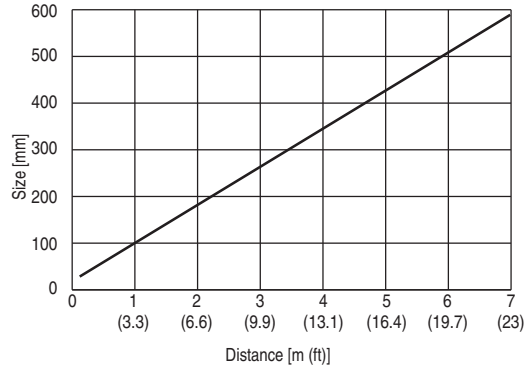
**PHOTOSWITCH® Photoelectric Sensors**  
**42JS & 42JT VisiSight™**  
 20 mm Rectangular

**42JT VisiSight**

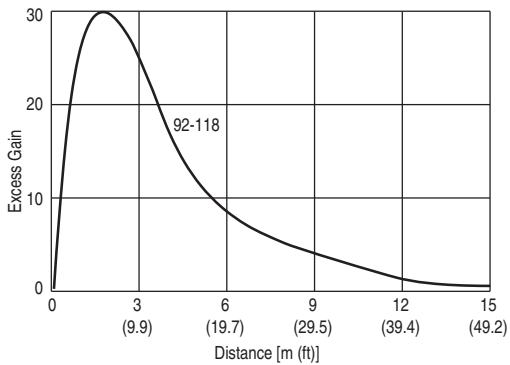
**Red Polarized Retroreflective (6 m)**



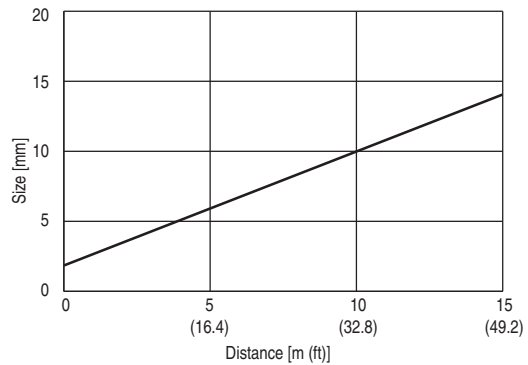
**Polarized Retroreflective Spot Size (6 m)**



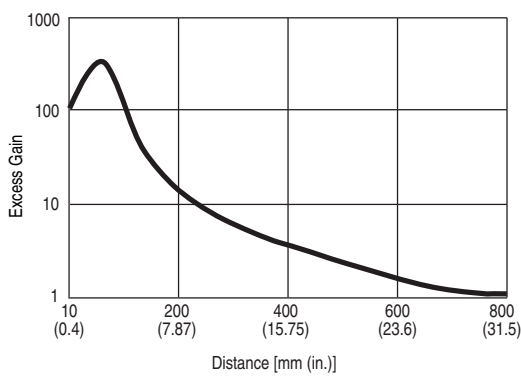
**Laser Polarized Retroreflective — Margin Curve (13 m)**



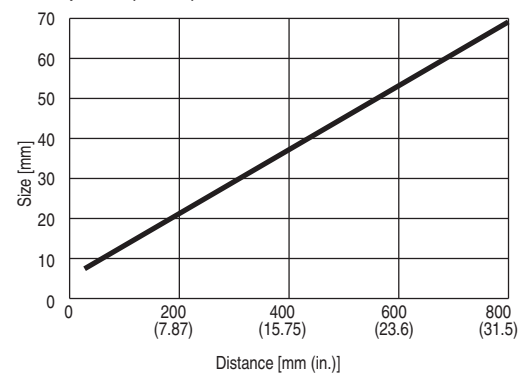
**Laser Polarized Retroreflective Spot Size (13 m)**



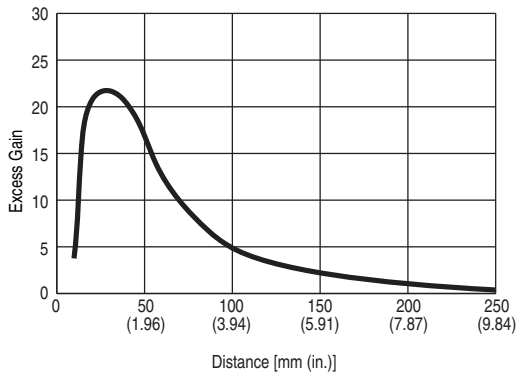
**Standard Diffuse (800 mm)**



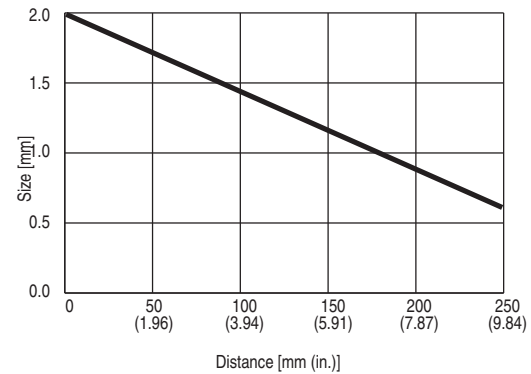
**Diffuse Spot Size (800 mm)**



**Laser Diffuse (250 mm)**



**Laser Diffuse Spot Size (250 mm)**



2-Photoelectric Sensors

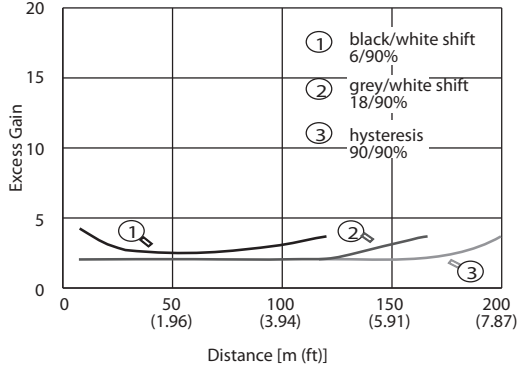


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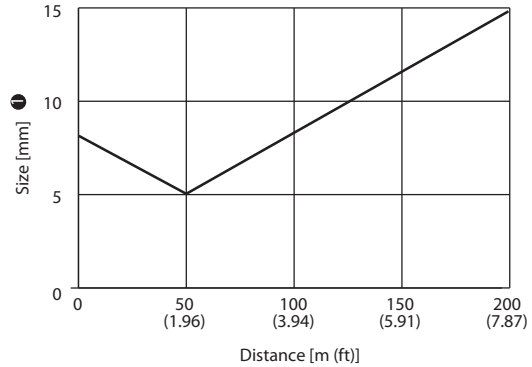


42JT VisiSight

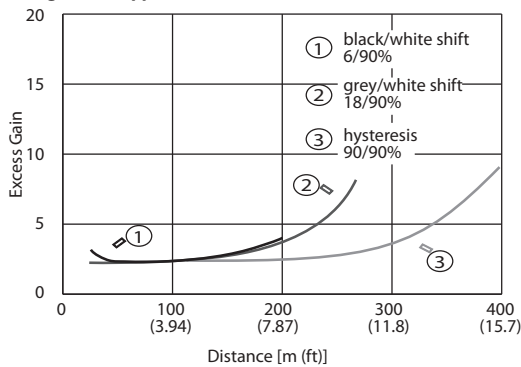
Background Suppression (180 mm)



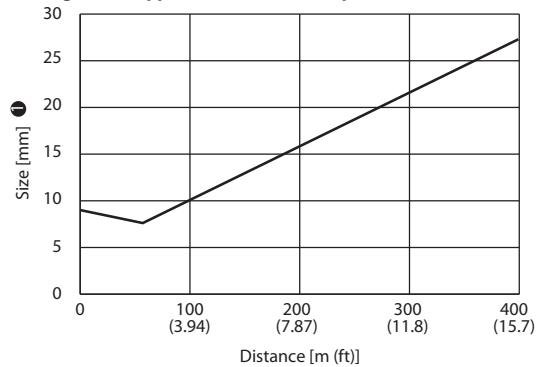
Background Suppression (180 mm) — Spot Size



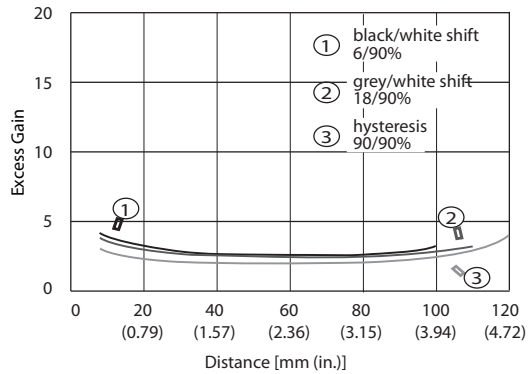
Background Suppression (400 mm)



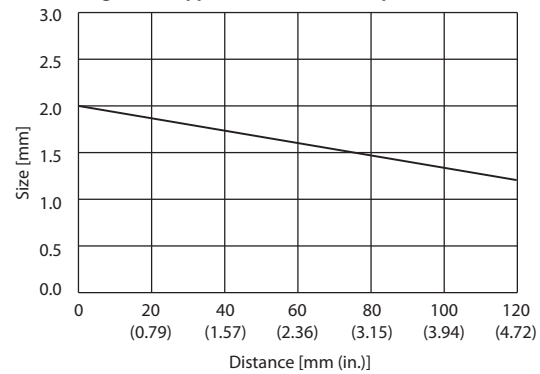
Background Suppression (400 mm) — Spot Size



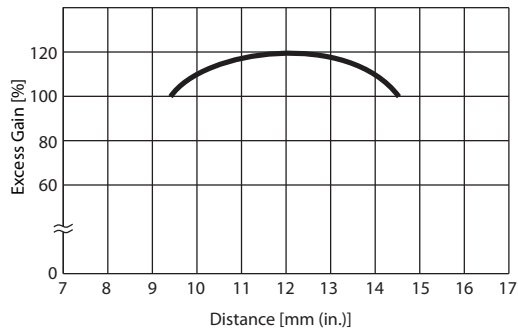
Laser Background Suppression (120 mm)



Laser Background Suppression (120 mm) — Spot Size



Color Mark



① The spot is square in shape with one side dimension per graph.

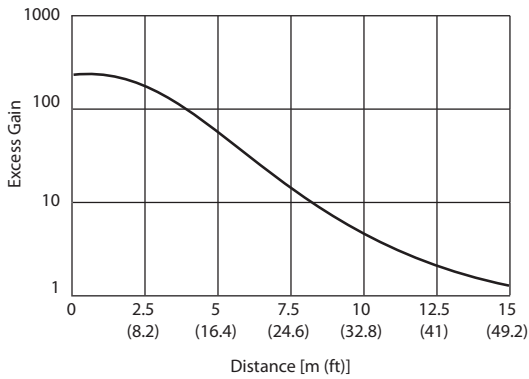
2-Photoelectric Sensors



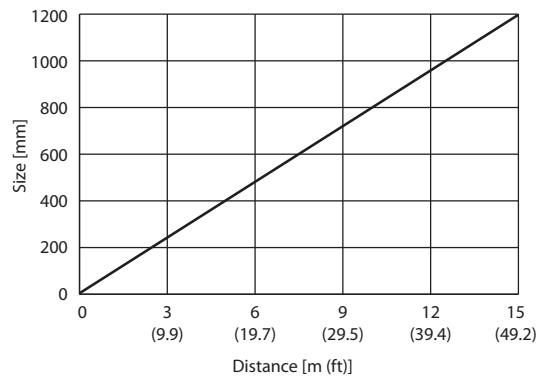
PHOTOSWITCH® Photoelectric Sensors  
**42JS & 42JT VisiSight™**  
 20 mm Rectangular

42JT VisiSight

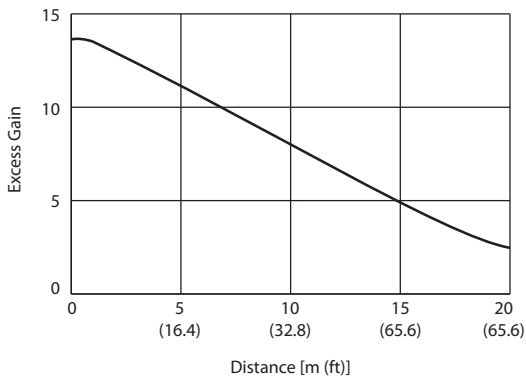
Red Transmitted Beam (13 m)



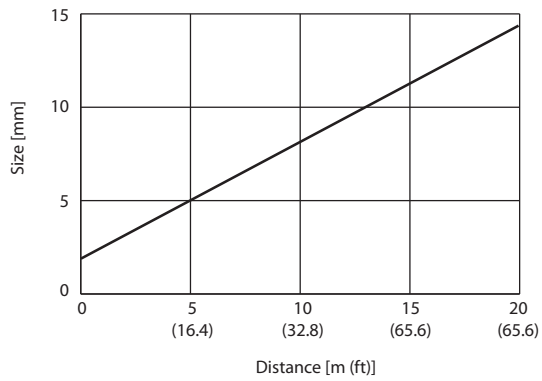
Red Transmitted Beam (13 m) — Spot Size



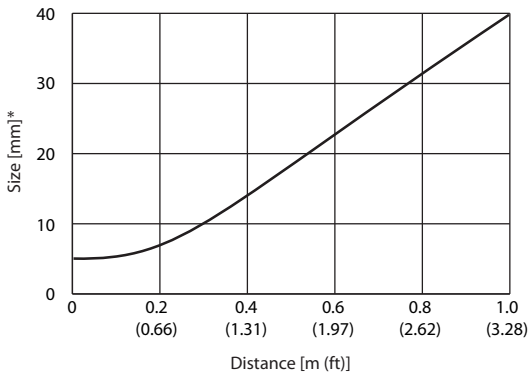
Laser Transmitted Beam (18 m)



Laser Transmitted Beam (18 m) — Spot Size



Clear Object Spot Size



2-Photoelectric Sensors



## 42KL MiniSight<sup>†</sup>

18 mm Compact Rectangular



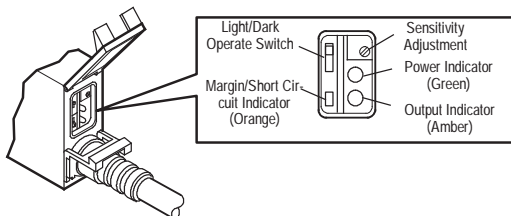
### Features

- S Compact rectangular size with standard 18 mm mounting nose
- S Visible indicators for power, output, and 2.5X margin/short circuit
- S Short circuit protection in all versions, including two-wire universal voltage versions
- S False pulse protection
- S Switch selectable light or dark operation
- S Access to sensor adjustments through captive cover that does not require tools for access
- S Eight sensing modes available
- S Rated to withstand high temperature 1200 psi washdowns
- S 300 μs high speed DC versions
- S No tools are required to attach fiber optic cables to either glass or plastic fiber optic sensors

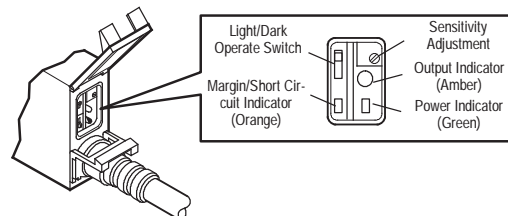
### Specifications

Environmental	
Certifications	UL, CSA and CE Marked for all applicable directives
Operating Environment	NEMA 4X, 6P, IP67, 1200 psi (8270 kPa) washdown
Operating Temperature [C (F)]	-20...+70° (-4...+158°)
Vibration	10...55 Hz, 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%
Optical	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, wide angle diffuse, fixed focus diffuse, transmitted beam, fiber optic
Sensing Range	See Product Selection table on page 1-45
Field of View	See Product Selection table on page 1-45
Light Source	Visible red LED (660 nm), infrared LED (880 nm)
LED Indicators	See User Interface below
Adjustments	Multi-turn potentiometer
Electrical	
Voltage	10.8...30V DC, 21.6...250V AC/DC
Current Consumption	30 mA max. (DC)
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	See Product Selection table on page 1-45
Output Type	PNP and NPN (DC), MOSFET (AC/DC)
Output Mode	Light operate or dark operate selectable
Output Current	100 mA @ 30V DC max
Output Leakage Current	0.1 mA max (DC), 1.7 mA (AC/DC)
Mechanical	
Housing Material	Noryl 190X
Lens Material	Acrylic
Connection Types	2 m cable (24 AWG), 4-pin DC micro (M12) QD, 3-pin AC micro (M12)
Supplied Accessories	75012-097-01 18 mm locknut
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-47

### User Interface



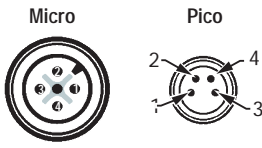
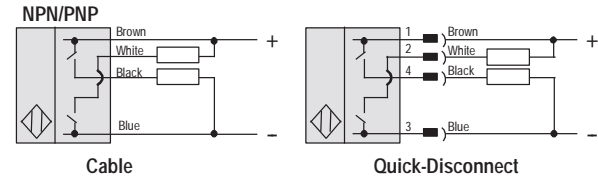
**NOTE:** The power indicator will turn off when the output indicator is on. The cat. no. for the Rear Snap Cover is 60-2679.



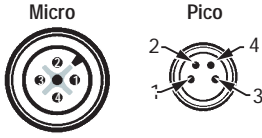
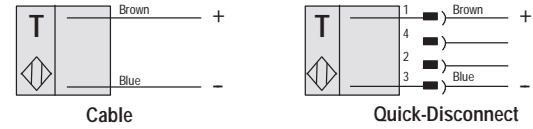
**NOTE:** The power indicator will turn off when the output indicator is on. The cat. no. for the Rear Snap Cover is 60-2679.

**Wiring Diagrams** ①②

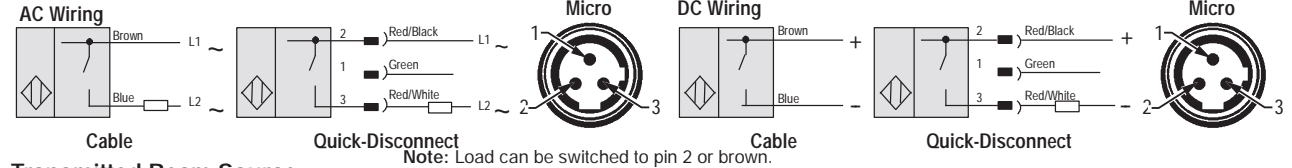
**11...30V DC Sensors**



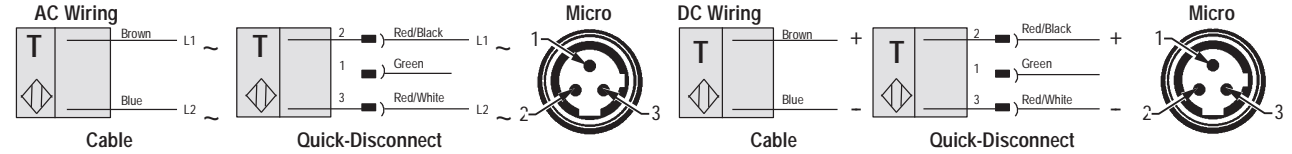
**Transmitted Beam Source**



**22...250V AC/DC Sensors**



**Transmitted Beam Source**



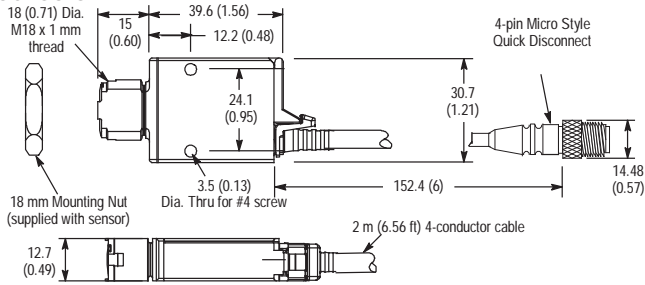
- ① For Rockwell Automation programmable controller compatible interface, refer to *PHOTOSWITCH<sup>®</sup> Photoelectric Sensors and Programmable Controller Interface Manual* at [www.ab.com/literature](http://www.ab.com/literature).
- ② Quick-disconnect wiring codes shown are valid for Rockwell Automation cables only.

## 42KL MiniSight<sup>†</sup>

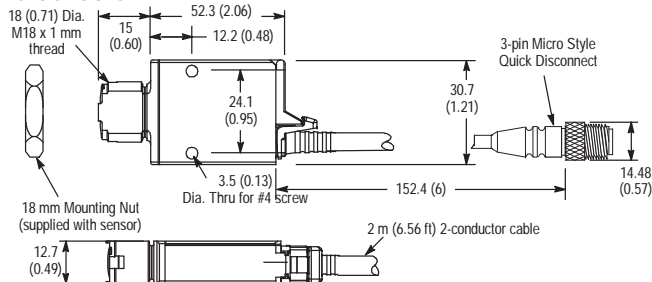
### 18 mm Compact Rectangular

#### Approximate Dimensions [mm (in.)]

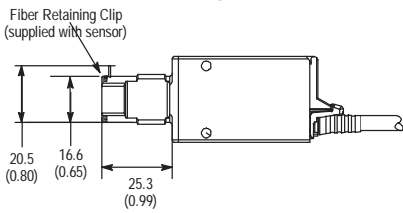
##### DC Sensors



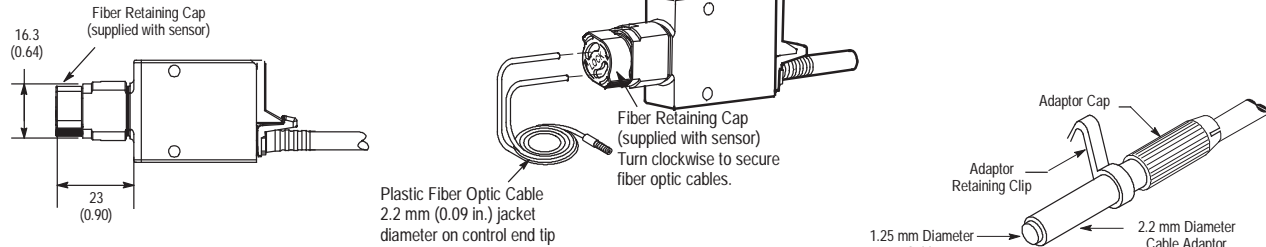
##### AC/DC Sensors



##### Infrared Glass Fiber Optic Sensors



##### Visible Red Plastic Fiber Optic Sensors

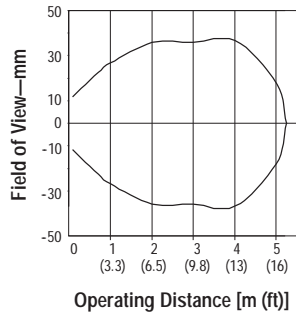
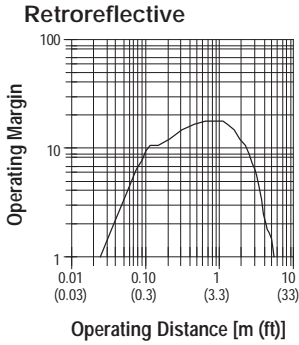


Special Glass Fiber Optic cables are also available with 2.2 mm (0.09 in.) diameter control end tips.

**NOTE:** Cat. No. 61-6731 adaptors are required for smaller fiber optic cables with jacket diameters of 1.25 mm (0.05 in.).

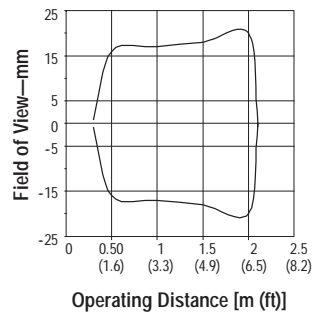
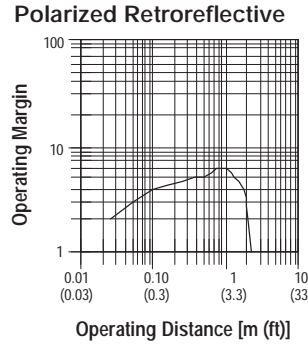
**Typical Response Curve**

**Beam Pattern**

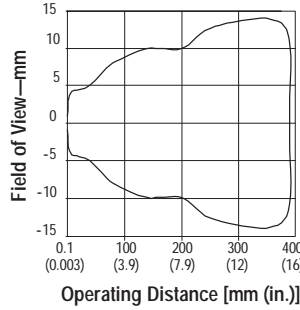
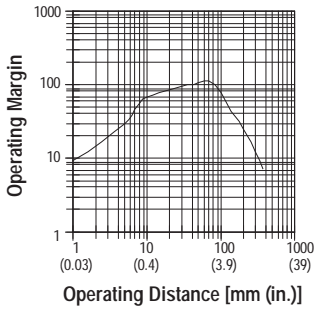


**Typical Response Curve**

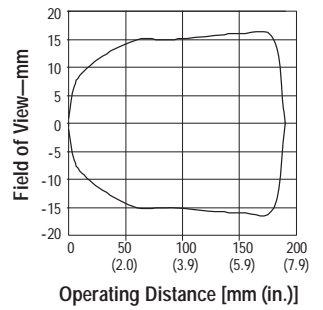
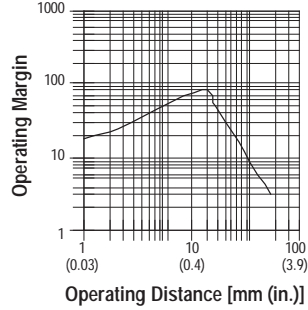
**Beam Pattern**



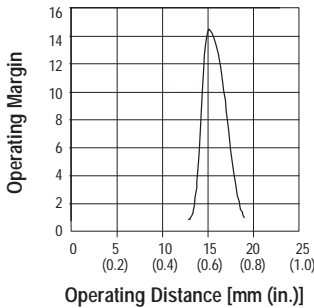
**Standard Diffuse**



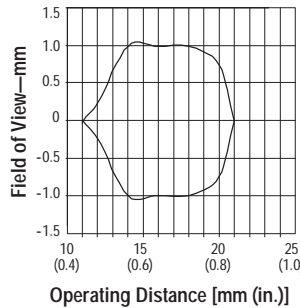
**Wide Angle Diffuse**



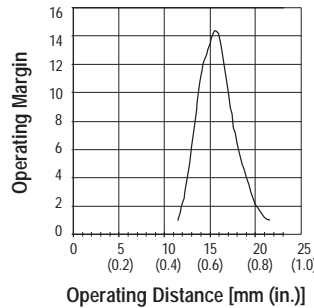
**Fixed Focus Diffuse**  
**16 mm Red LED**



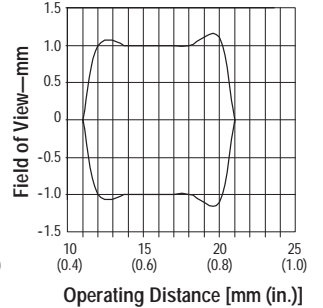
**16 mm Red LED**



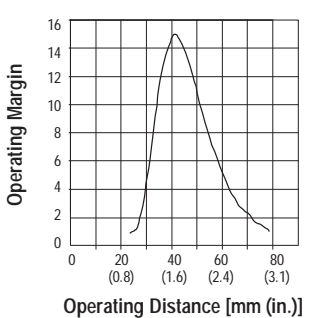
**Fixed Focus Diffuse**  
**16 mm Green LED**



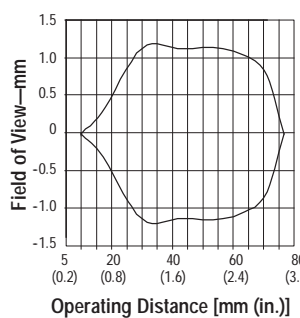
**16 mm Green LED**



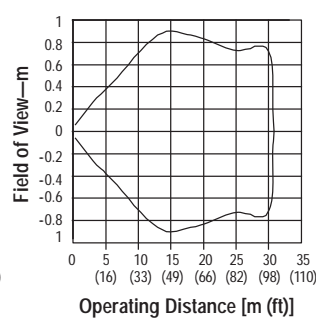
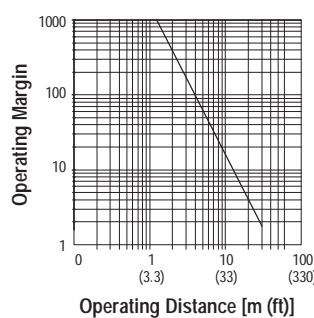
**Fixed Focus Diffuse**  
**43 mm Red LED**



**43 mm Red LED**



**Transmitted Beam**

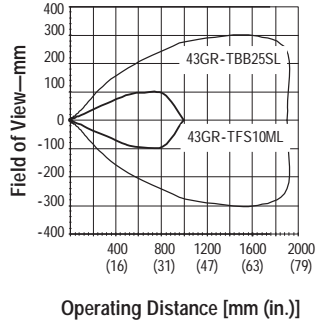
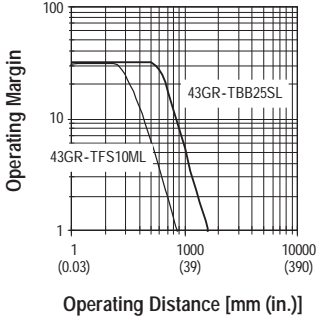


**42KL MiniSight<sup>†</sup>**

18 mm Compact Rectangular

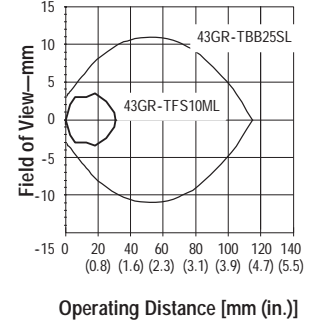
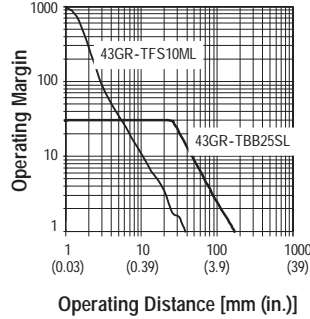
**Typical Response Curve Beam Pattern**

Large Aperture Fiber Optic Retroreflective (using 3 in. dia. reflector)

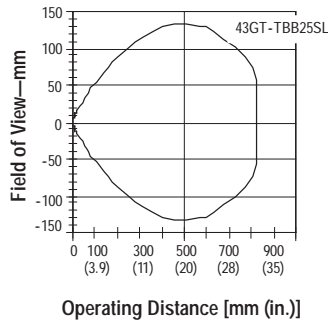
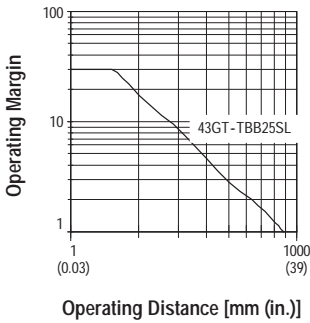


**Typical Response Curve Beam Pattern**

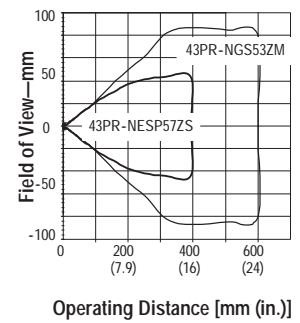
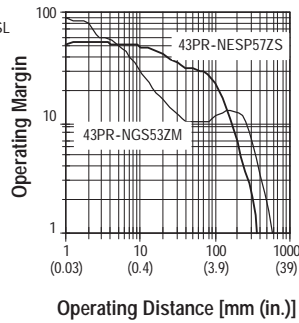
Large Aperture Fiber Optic Diffuse



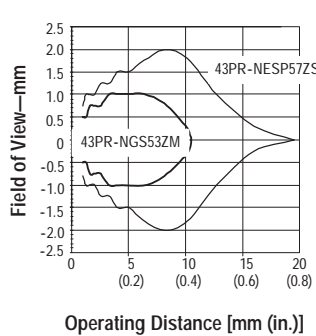
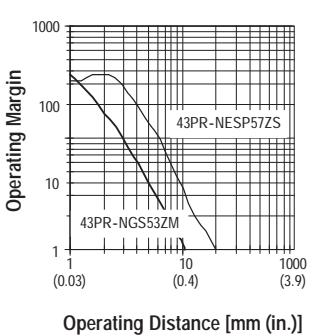
Large Aperture Fiber Optic Transmitted Beam



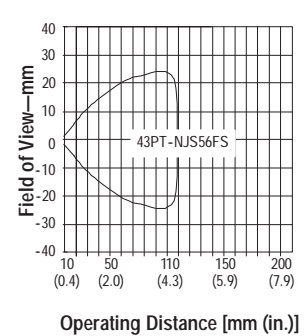
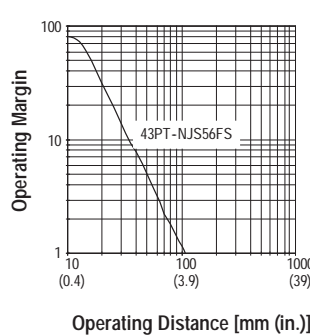
Small Aperture Fiber Optic Retroreflective (using 3 in. dia. reflector)



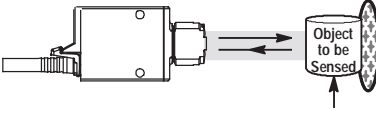
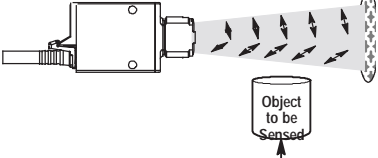
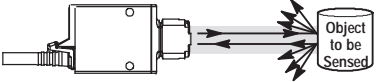
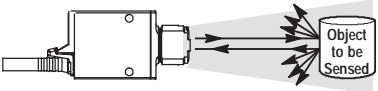
Small Aperture Fiber Optic Diffuse



Small Aperture Fiber Optic Transmitted Beam



**Product Selection**

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p><i>Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	10.8...30V DC 35 mA	25 mm...5 m (0.98 in...16.4 ft)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-U2LB-A2
		21.6...250V AC/DC			25 mm...5 m (0.98 in...16.4 ft)	4-pin DC micro
	4-pin pico QD					42KL-U2LB-Y4
	Power MOSFET 2-wire 100 mA 8.3 ms			2 m 300V cable		42KL-U2LBQ-A2
		4-pin DC micro		42KL-U2LBQ-F4		
		4-pin pico QD		42KL-U2LBQ-Y4		
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	10.8...30V DC 35 mA	25 mm...2 m (0.98 in...6.6 ft)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-P2LB-A2
		21.6...250V AC/DC			25 mm...1 m (0.98 in...3.3 ft)	4-pin DC micro
	4-pin pico QD					42KL-P2LB-Y4
	Power MOSFET 2 wire 100 mA 8.3 ms			2 m 300V cable		42KL-P2LBQ-A2
		4-pin DC micro		42KL-P2LBQ-F4		
		4-pin pico QD		42KL-P2LBQ-Y4		
 <p><i>Standard Diffuse</i></p> <p>Field of View: 5_</p> <p>Emitter LED: Infrared 880 nm</p>	10.8...30V DC 35 mA	1...380 mm (0.04...15 in.)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-D1LB-A2
		21.6...250V AC/DC			1...190 mm (0.04...7.5 in.)	4-pin DC micro
	4-pin pico QD					42KL-D1LB-Y4
	Power MOSFET 2 wire 100 mA 8.3 ms			2 m 300V cable		42KL-D1LBQ-A2
		4-pin DC micro		42KL-D1LBQ-F4		
		4-pin pico QD		42KL-D1LBQ-Y4		
 <p><i>Wide Angle Diffuse</i></p> <p>Field of View: 18_</p> <p>Emitter LED: Infrared 880 nm</p>	10.8...30V DC 35 mA	1...180 mm (0.04...7.0 in.)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-W1LB-A2
		21.6...250V AC/DC			1...90 mm (0.04...3.5 in.)	4-pin DC micro
	4-pin pico QD					42KL-W1LB-Y4
	Power MOSFET 2 wire 100 mA 8.3 ms			2 m 300V cable		42KL-W1LBQ-A2
		4-pin DC micro		42KL-W1LBQ-F4		
		4-pin pico QD		42KL-W1LBQ-Y4		

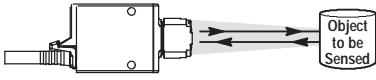
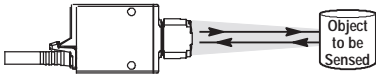
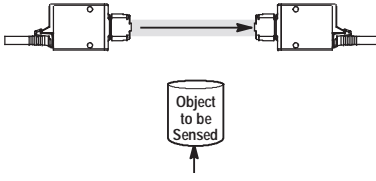
Refer to page 1-47 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**42KL MiniSight<sup>†</sup>**

18 mm Compact Rectangular

Product Selection (continued)


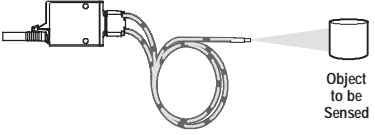

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.	
 <p><i>Fixed Focus Diffuse</i> Emitter LED: Visible red (660 nm) ①</p>	10.8...30V DC 35 mA	16 mm (0.63 in.)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-F2LBS-A2	
					4-pin DC micro	42KL-F2LBS-F4	
					4-pin pico QD	42KL-F2LBS-Y4	
	21.6...250V AC/DC			NPN/PNP 100 mA 300 μs	2 m 300V cable	42KL-F2LBSQ-A2	
					4-pin DC micro	42KL-F2LBSQ-F4	
					4-pin pico QD	42KL-F2LBSQ-Y4	
Power MOSFET 2 wire 100 mA 8.3 ms	2 m 300V cable	42KL-F2TCS-A2					
	3-pin AC micro	42KL-F2TCS-G3					
 <p><i>Fixed Focus Diffuse</i> Emitter LED: Visible green (525 nm) ①</p>	10.8...30V DC 35 mA	43 mm (1.7 in.)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-F3LBS-A2	
					4-pin DC micro	42KL-F3LBS-F4	
					4-pin pico QD	42KL-F3LBS-Y4	
	NPN/PNP 100 mA 300 μs			2 m 300V cable	42KL-F3LBSQ-A2		
				4-pin DC micro	42KL-F3LBSQ-F4		
				4-pin pico QD	42KL-F3LBSQ-Y4		
NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-F2LBL-A2					
	4-pin DC micro	42KL-F2LBL-F4					
	4-pin pico QD	42KL-F2LBL-Y4					
NPN/PNP 100 mA 300 μs	2 m 300V cable	42KL-F2LBLO-A2					
	4-pin DC micro	42KL-F2LBLO-F4					
	4-pin pico QD	42KL-F2LBLO-Y4					
Power MOSFET 2-wire 100 mA 8.3 ms	2 m 300V cable	42KL-F2TCL-A2					
	3-pin AC micro	42KL-F2TCL-G3					
 <p><i>Transmitted Beam</i> Light Source Field of View: 7_  Emitter LED: Infrared 880 nm</p>	10.8...30V DC 35 mA	1...30 m (98 ft)	—	—	2 m 300V cable	42KL-E1EZB-A2	
					4-pin DC micro	42KL-E1EZB-F4	
					4-pin pico QD	42KL-E1EZB-Y4	
	21.6...250V AC/DC 5 mA	—	—	—	2 m 300V cable	42KL-E1QZB-A2	
					3-pin AC micro	42KL-E1QZB-G3	
	10.8...30V DC 35 mA	1...10 m (33 ft)	—	—	—	2 m 300V cable	42KL-E1EZBQ-A2
						4-pin DC micro	42KL-E1EZBQ-F4
						4-pin pico QD	42KL-E1EZBQ-Y4

① For color registration mark applications, refer to light source selection guide at [www.ab.com/sensors](http://www.ab.com/sensors).

Refer to page 1-47 for cordsets and accessories.



Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.				
 <p>Object to be Sensed</p> <p>Transmitted Beam Receiver</p> <p>Field of View: 7_</p> <p>Emitter LED: Infrared 880 nm</p>	10.8...30V DC 25 mA	30 m (98 ft)	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-RLB-A2				
	21.6...250V AC/DC				4-pin DC micro	42KL-RLB-F4				
		10.8...30V DC 25 mA	10 m (33 ft)	Light/Dark Selectable	NPN/PNP 100 mA 900 μS	4-pin pico QD	42KL-RLB-Y4			
	2 m 300V cable					42KL-RTC-A2				
	3-pin AC micro	42KL-RTC-G3								
	 <p>Object to be Sensed</p> <p>Large Aperture Fiber Optic</p> <p>Field of View: Depends on Fiber Optic cable selected</p> <p>Emitter LED: Infrared 880 nm</p>	10.8...30V DC 35 mA	Depends on Fiber Optic cable selected <sup>②</sup>	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-G1LB-A2			
21.6...250V AC/DC		4-pin DC micro				42KL-G1LB-F4				
		4-pin pico QD				42KL-G1LB-Y4				
10.8...30V DC 35 mA		Depends on Fiber Optic cable selected <sup>②</sup>				Light/Dark Selectable	NPN/PNP 100 mA 300 μs	2 m 300V cable	42KL-G1LBQ-A2	
								4-pin DC micro	42KL-G1LBQ-F4	
4-pin pico QD		42KL-G1LBQ-Y4								
 <p>Object to be Sensed</p> <p>Small Aperture Plastic Fiber Optic</p> <p>Field of View: Depends on Fiber Optic cable selected</p> <p>Emitter LED: Visible red 660nm</p>		10.8...30V DC 35 mA	Depends on Fiber Optic cable selected <sup>②</sup>	Light/Dark Selectable	NPN/PNP 100 mA 1 ms	2 m 300V cable	42KL-L2LB-A2			
		21.6...250V AC/DC 15 mA				4-pin DC micro	42KL-L2LB-F4			
						4-pin pico QD	42KL-L2LB-Y4			
		10.8...30V DC 35 mA				Depends on Fiber Optic cable selected <sup>②</sup>	Light/Dark Selectable	NPN/PNP 100 mA 300 μs	2 m 300V cable	42KL-L2LBQ-A2
									4-pin DC micro	42KL-L2LBQ-F4
		4-pin pico QD				42KL-L2LBQ-Y4				
2 m 300V cable	42KL-L2TC-A2									
3-pin AC micro	42KL-L2TC-G3									

② For fiber optic selection guide, see pages 1-231.

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, Straight, 4-pin, 2 m	889D-F4AC-2	Pico QD Cordset, Straight, 4-pin, 2 m	889P-F4AB-2	32 mm (1.25 in.) Diameter Reflector	92-47
AC Micro QD Cordset, Straight, 3-pin, 2 m	889R-F3AEA-2	76 mm (3 in.) Diameter Reflector	92-39		

Transmitted Beam—Maximum Operating Distance with Apertures

Aperture Slot Size	Maximum Range		Cat. No.
	Standard Speed	High Speed	
1 mm	2.1 m (6.9 ft)	0.7 m (2.3 ft)	60-2673
2 mm	10.5 m (34.5 ft)	3.5 m (11.4 ft)	60-2674
4 mm	18.6 m (61.0 ft)	6.1 m (20.1 ft)	60-2675
1, 2, 4 mm kit	—	—	60-2676

## 44R AccuSight<sup>t</sup>

18 mm Right Angle



### Features

- S Narrow 27 mm deep housing
- S 18 mm nose and through-hole mounting options
- S LED indicators with 360° visibility
- S No user adjustments required
- S Multiple sensing modes
- S Low voltage 24V DC operation
- S Variety of connection types

### Specifications

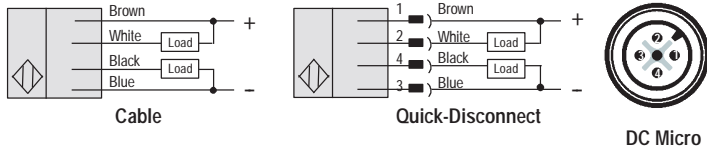
Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	NEMA 12, IP51
Operating Temperature [C (F)]	0...+50° (32...+122°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	5...95%
Optical	
Sensing Modes	Diffuse, polarized retroreflective, wide angle, sharp cutoff
Sensing Range	See Product Selection table on page 1-51
Field of View	See Product Selection table on page 1-51
Light Source	Visible red LED (660 nm), infrared LED (880 nm)
LED Indicators	See User Interface below
Adjustments	None
Electrical	
Voltage	10...30V DC
Current Consumption	35 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	10 ms
Output Type	PNP or NPN by cat. no., both PNP and NPN models
Output Mode	Light or dark operate by cat. no.
Output Current	100 mA @ 30V DC max
Output Leakage Current	0.1 mA max
Mechanical	
Housing Material	Valoxr
Lens Material	Acrylic
Connection Types	2 m cable ( 24 AWG), 4-pin DC micro (M12) QD
Supplied Accessories	75012-097-01 18 mm locknut
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-51

### User Interface

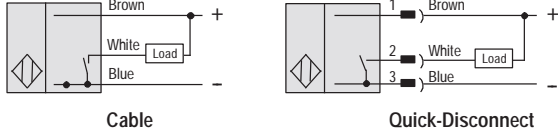
Label	Color	State	Status
Output	Yellow	OFF	Sensor output de-activated
		ON	Sensor output activated
Margin	Red	OFF	Margin < 1.2
		ON	Margin > 1.2
Power	Green	OFF	Sensor not powered
		ON	Sensor powered

Wiring Diagrams

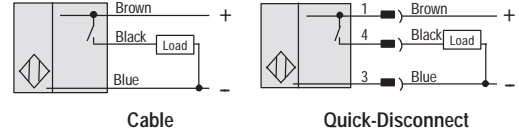
Models with Dual NPN and PNP Outputs



Models with NPN Outputs



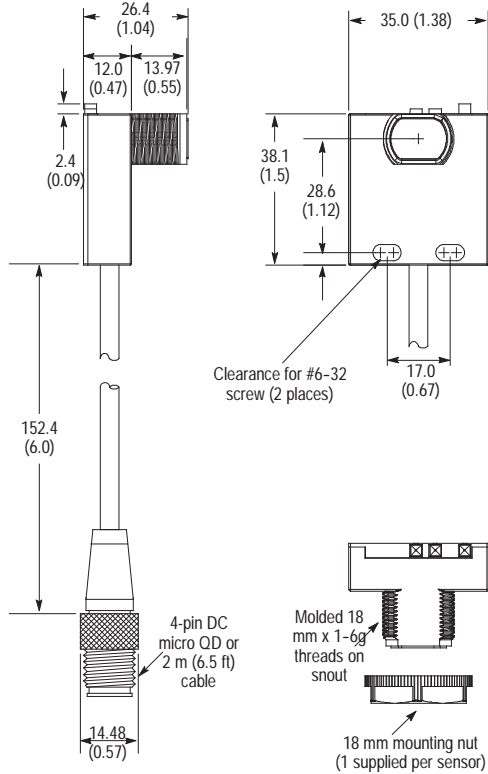
Models with PNP Outputs



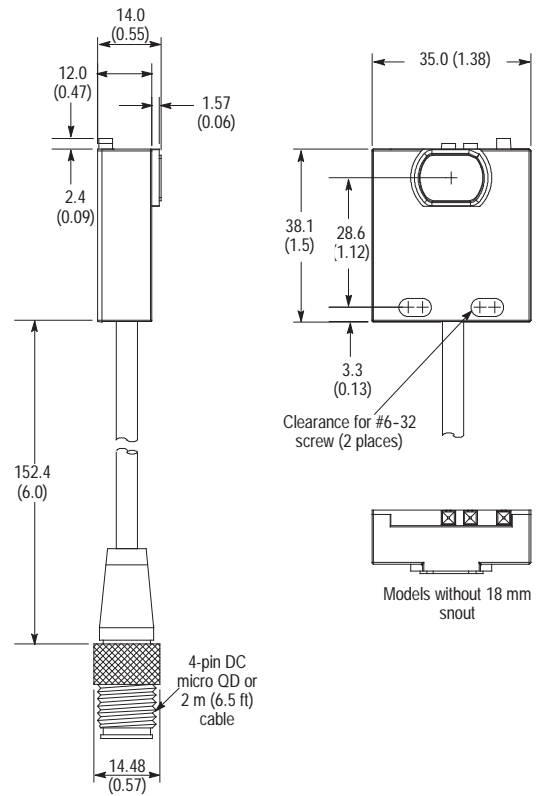
All wire colors on quick-disconnect models refer to Rockwell Automation 889D cordsets.

Approximate Dimensions [mm (in.)]

Polarized Retroreflective and Standard Diffuse Models



Wide Angle Diffuse Models



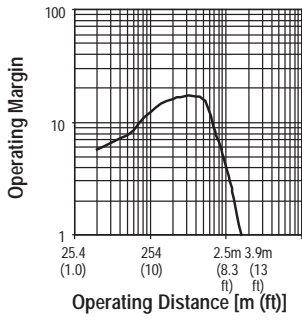
Note: All sensors except wide angle diffuse models are supplied with one M18 mounting nut (Cat. No. 75012-097-01).

# 44R AccuSight<sup>†</sup>

18 mm Right Angle

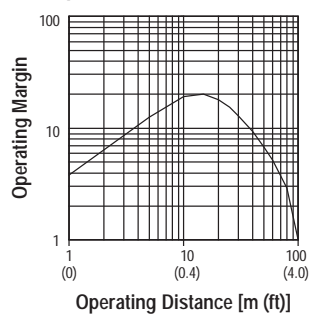
## Typical Response Curve

Polarized Retroreflective

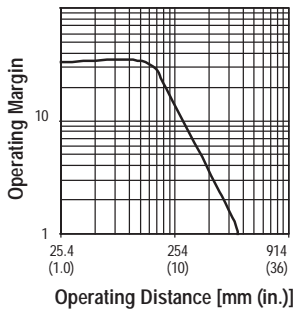


## Typical Response Curve

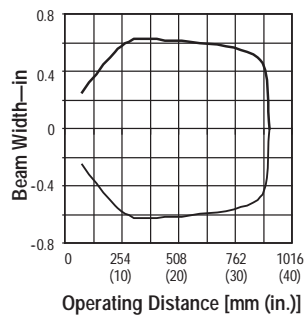
Sharp Cutoff Diffuse



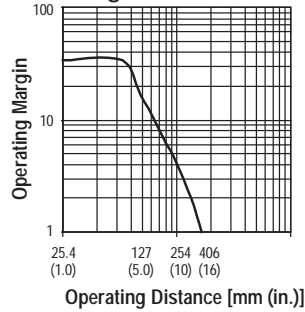
## Standard Diffuse



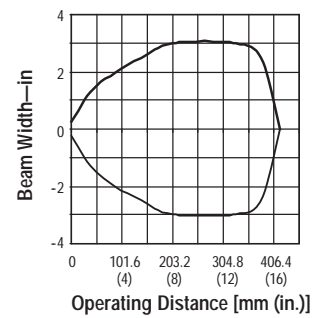
## Beam Pattern



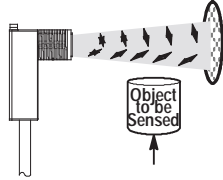
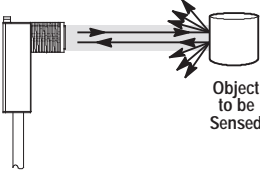
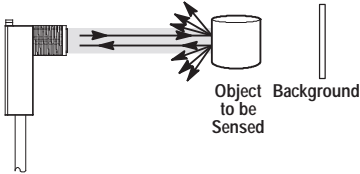
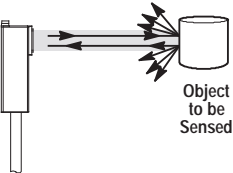
## Wide Angle Diffuse



## Beam Pattern



**Product Selection**

Sensing Mode	Operating Voltage/ Current	Sensing Distance	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.	
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 35 mA	25 mm...1.5 m (1 in...4.9 ft)	Dark Operate	NPN and PNP 100 mA 10 ms	2 m 300V cable	44RSP-2KBE1-A2	
			4-pin DC micro		44RSP-2KBE1-F4		
		Light Operate	2 m 300V cable		44RSP-2JBE3-A2		
		4-pin DC micro	44RSP-2JBE3-F4				
		Dark Operate	2 m 300V cable		44RSP-2KBE3-A2		
		4-pin DC micro	44RSP-2KBE3-F4				
		Light Operate	NPN/100 mA 10 ms	25 mm...3 m (1 in...9.8 ft)	2 m 300V cable	44RSP-2JNE3-A2	
					4-pin DC micro	44RSP-2JNE3-F4	
			PNP/100 mA 10 ms	3-pin Molex	44RSP-2JNE3-Z6		
				2 m 300V cable	44RSP-2JPE3-A2		
4-pin DC micro	44RSP-2JPE3-F4						
 <p><i>Standard Diffuse</i></p> <p>Field of View: 5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	3...380 mm (0.12...15 in.)	Light Operate	NPN/100 mA 10 ms	2 m 300V cable	44RSD-1JNC38-A2	
					4-pin DC micro	44RSD-1JNC38-F4	
					PNP/100 mA 10 ms	2 m 300V cable	44RSD-1JPC38-A2
						4-pin DC micro	44RSD-1JPC38-F4
 <p><i>Sharp Cutoff Diffuse</i></p> <p>Field of View: 5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	3...100 mm (0.12...4 in.)	Light Operate	NPN/100 mA 10 ms	2 m 300V cable	44RSS-1JNB1-A2	
					4-pin DC micro	44RSS-1JNB1-F4	
 <p><i>Wide Angle Diffuse</i></p> <p>Field of View: Approx. 60_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	3...200 mm (0.12...7.8 in.)	Light Operate	NPN/100 mA 10 ms	2 m 300V cable	44RSW-1JNC20-A2	
					4-pin DC micro	44RSW-1JNC20-F4	
					PNP/100 mA 10 ms	2 m 300V cable	44RSW-1JPC20-A2
						4-pin DC micro	44RSW-1JPC20-F4

**Cordsets and Accessories**

Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, Straight, 4-pin, 2 m	889D-F4AC-2	Right Angle Mounting Bracket	60-2657
76 mm (3 in.) Diameter Reflector	92-39	Mounting Screws (not supplied)	2 x #6-32
32 mm (1.25 in.) Diameter Reflector	92-47		

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 42CA

### 18 mm Cylindrical



### Description

The 42CA 18 mm cylindrical family of general purpose photoelectric sensors is intended for light to medium duty industrial applications.

The 42CA family provides an indication if the sensor operation is unstable. An indicator flashes if the signal level is too close to the detection threshold. This helps for easy alignment of the sensor and forewarns against detection of a background.

### Features

- S 18 mm industry standard enclosure
- S Extended range high-speed models
- S Patented ASIC design offers linear sensitivity adjustment, stability indication and excellent noise immunity
- S Two LED indicators provide status of power, output, unstable operation and short-circuit protection
- S Complementary light and dark

### Specifications

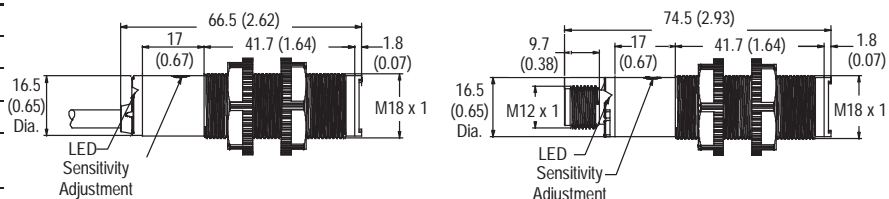
Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-25...+70° (-13...+158°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	5...95% (noncondensing)
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, background suppression, transmitted beam
Sensing Range	See Product Selection table on page 1-55
Light Source	Visible red LED (660 nm) or infrared LED (880 nm)
LED Indicators	Green and yellow, see User Interface below
Adjustments	Sensitivity potentiometer on select models
Electrical	
Voltage	10...30V DC
Current Consumption	30 mA max
Sensor Protection	Reverse polarity, overload, short circuit
Outputs	
Response Time	See Product Selection table on page 1-55
Output Type	PNP or NPN by cat. no.
Output Mode	Complementary light or dark operate, selectable light or dark operate for background suppression models
Output Current	100 mA
Output Leakage Current	10 µA max
Mechanical	
Housing Material	PBT
Lens Material	PMMA
Connection Types	2 m cable, 4-pin DC micro (M12) QD
Supplied Accessories	18 mm fastening nuts
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-56

### User Interface

LED Color	State	Status
Yellow	OFF	Output de-energized <sup>❶</sup>
	ON	Output energized <sup>❶</sup>
Green	OFF	Power is OFF
	ON	Power is ON
	Flashing (6 Hertz)	Unstable (0.5 < Margin < 2)
	Flashing (1.5 Hertz)	Output short-circuit protection active

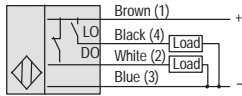
<sup>❶</sup> Black wire or pin 4 of connector.

### Approximate Dimensions [mm (in.)]



Wiring Diagrams

PNP Models with Complementary Outputs

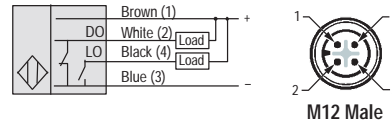


Transmitted Beam Emitter



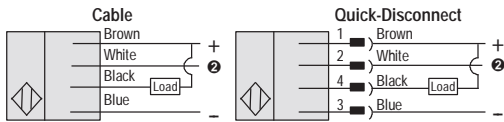
① For normal operation, black wire (pin 2) needs no connection. To disable light source, connect black wire (pin 2) to -V.

NPN Models with Complementary Outputs

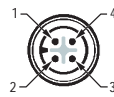


Additional Wiring Options for Background Suppression and Transmitted Beam

NPN Output

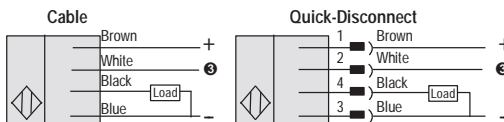


Face View Male Receptacle (Sensor) DC Micro

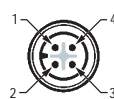


② Open circuit or tie white (2) and brown (1) conductors together for L.O. Tie white (2) and blue (3) conductors together for D.O.

PNP Output



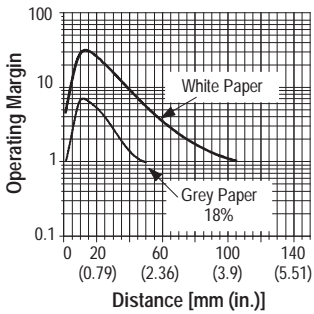
Face View Male Receptacle (Sensor) DC Micro



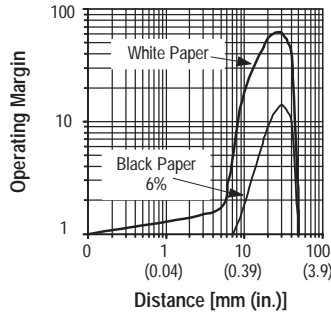
③ Tie white (2) and brown (1) conductors together for L.O. Open circuit or tie white (2) and blue (3) conductors together for D.O.

Typical Response Curves

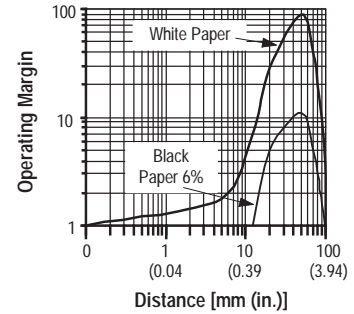
Standard Diffuse [100 mm]



Background Suppression [50 mm]



Background Suppression [100 mm]

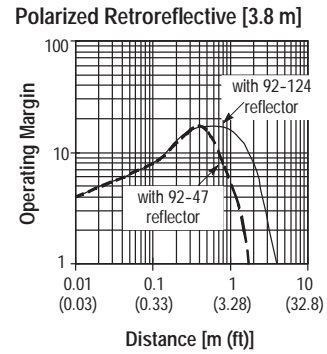
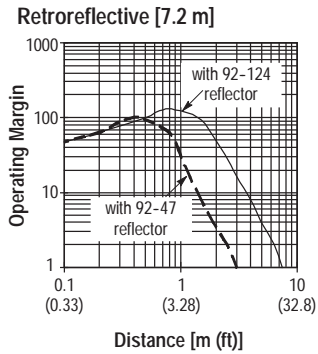
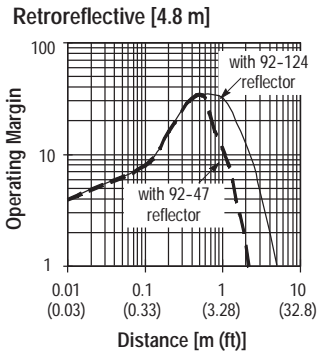


**42CA**

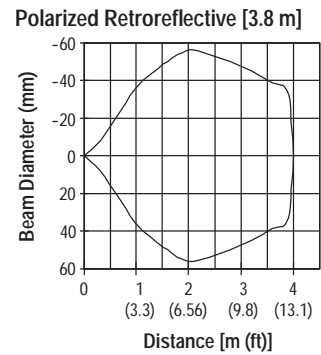
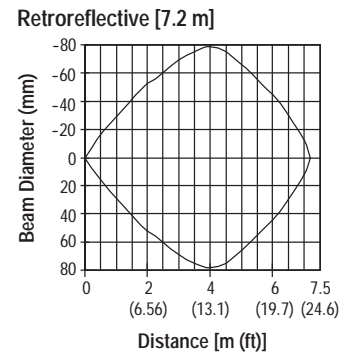
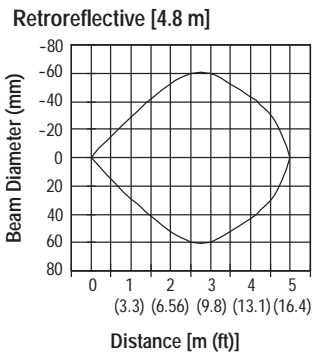
18 mm Cylindrical

Typical Response Curves (continued)

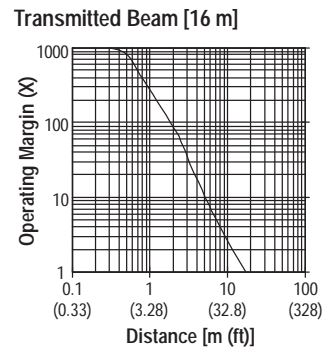
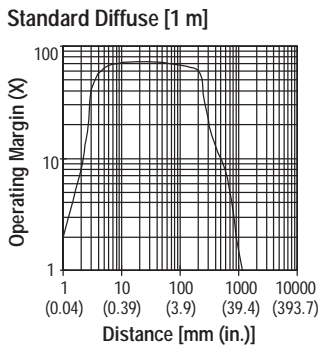
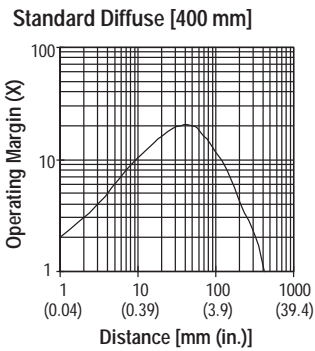
Operating Margin



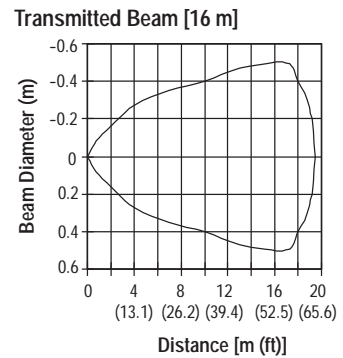
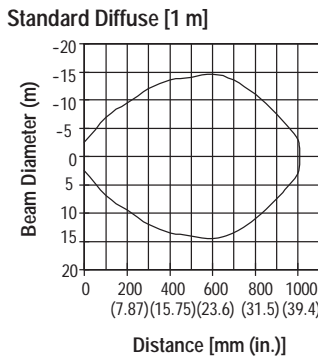
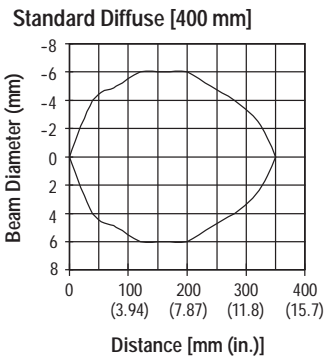
Beam Pattern



Operating Margin

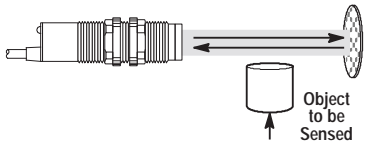
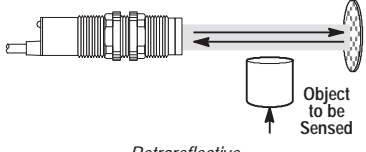
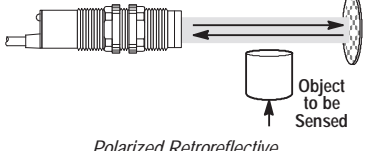
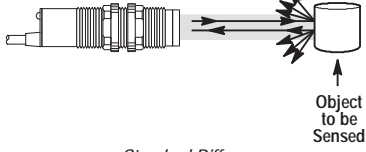
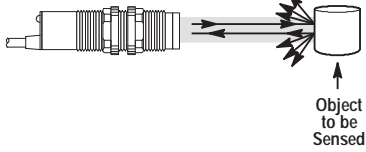
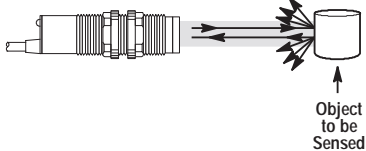


Beam Pattern





Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type/ Response Time	Sensitivity Adjust	Cat. No. ❶
 <p>Retroreflective</p> <p>Field of View: 1.2_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 25 mA max.	2 mm...4.8 m (0.08 in...15.7 ft)	Complementary light and dark operate	NPN 100 mA 1 ms	No adjustment	42CA-U2MNB-D4
				PNP 100 mA 1 ms	No adjustment	42CA-U2MPB-D4
 <p>Retroreflective</p> <p>Field of View: 1.2_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 25 mA max.	2 mm...7.2 m (0.08 in...23.6 ft)	Complementary light and dark operate	NPN 100 mA 0.5 ms	Single turn potentiometer	42CA-U2MNA-D4
				PNP 100 mA 0.5 ms	Single turn potentiometer	42CA-U2MPA-D4
 <p>Polarized Retroreflective</p> <p>Field of View: 1.3_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 25 mA max.	2 mm...3.8 m (0.08 in...12.5 ft)	Complementary light and dark operate	NPN 100 mA 1 ms	No adjustment	42CA-P2MNB-D4
				PNP 100 mA 1 ms	No adjustment	42CA-P2MPB-D4
 <p>Standard Diffuse</p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA max.	0...100 mm (0...3.94 in.)	Complementary light and dark operate	NPN 100 mA 1 ms	Single turn potentiometer	42CA-D1MNAE-D4❷
				PNP 100 mA 1 ms	Single turn potentiometer	42CA-D1MPAE-D4❷
 <p>Standard Diffuse</p> <p>Field of View: 7.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 25 mA max.	0...400 mm (0...15.7 in.)	Complementary light and dark operate	NPN 100 mA 1 ms	Single turn potentiometer	42CA-D1MNAJ-D4
				PNP 100 mA 1 ms	Single turn potentiometer	42CA-D1MPAJ-D4
 <p>Standard Diffuse</p> <p>Field of View: 5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA max.	0...1000 mm (0...39.4 in.)	Complementary light and dark operate	NPN 100 mA 0.5 ms	Single turn potentiometer	42CA-D1MNAL-D4
				PNP 100 mA 0.5 ms	Single turn potentiometer	42CA-D1MPAL-D4

❶ Suffix -D4 denotes 4-pin DC micro connection type. For 2 m cable without QD replace suffix -D4 with -A2 (e.g. 42CA-P2MPB-A2).

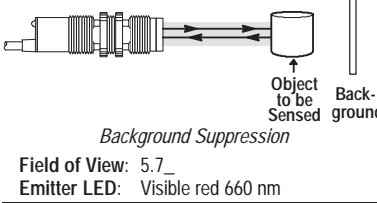
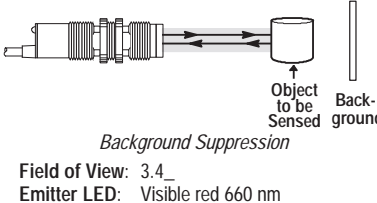
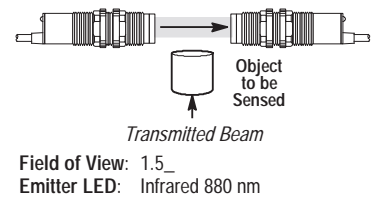
❷ Refer to [www.ab.com/sensors](http://www.ab.com/sensors) for updated information.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

42CA

18 mm Cylindrical

Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type/ Response Time	Sensitivity Adjust	Cat. No. ❶
 <p>Background Suppression</p> <p>Field of View: 5.7_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA max.	50 mm (1.97 in.)	Selectable light or dark operate	NPN 100 mA 0.5 ms	No adjustment	42CA-B2LNBC-D4❷
				PNP 100 mA 0.5 ms	No adjustment	42CA-B2LPBC-D4❷
 <p>Background Suppression</p> <p>Field of View: 3.4_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA max.	100 mm (3.94 in.)	Selectable light or dark operate	NPN 100 mA 0.5 ms	No adjustment	42CA-B2LNBE-D4❷
				PNP 100 mA 0.5 ms	No adjustment	42CA-B2LPBE-D4❷
 <p>Transmitted Beam</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA max.	3 mm...16 m (0.12 in...52.5 ft)	NA infrared light source	NA	No adjustment	42CA-E1EZB1-D4
	10...30V DC 25 mA max.		NPN 100 mA 1 ms	Single turn potentiometer	42CA-R1MNA1-D4	
			PNP 100 mA 1 ms	Single turn potentiometer	42CA-R1MPA1-D4	

❶ Suffix -D4 denotes 4-pin DC micro connection type. For 2 m cable without QD replace suffix -D4 with -A2 (e.g. 42CA-P2MPB-A2).

❷ Refer to [www.ab.com/sensors](http://www.ab.com/sensors) for updated information.

Cordsets and Accessories

Cordset		Accessories			
Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, 4-pin, 2 m	889D-F4AC-2	Mounting Bracket	60-2657	Reflector	92-124
Right Angle DC Micro QD Cordset, 4-pin, 2 m	889D-R4AC-2	Straight Mounting Bracket	60-2656	Reflector	92-47
		Snap-Clamp Mounting Bracket	871A-SCBP18		
		Right Angle Mounting Bracket	60-2654		

PHOTOSWITCH® Photoelectric Sensors  
**42CS Cylindrical**  
**Food and Beverage**



### Description

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

The innovative ferromagnetic teach feature makes the sensor easy to setup by simply placing a ferromagnetic metal object on a section of the sensor's housing to initiate the teach process. Its smooth and clean design minimizes the collection and accumulation of undesired particles allowing for a fast and easy clean up. There are also 18 mm threaded models available.

### Features

- Patented ferromagnetic teach for easy sensor programming
- Smooth barrel design minimizes the accumulation of undesired particles and allows for fast and easy clean up.
- Extended temperature operating range
- 18 mm stainless steel 316L enclosure with laser etched markings
- Background suppression models for improved detection of shiny objects
- Two teach modes: standard and precision
- Teach lockout feature prevents unauthorized users from changing the settings
- Input to disable light source on transmitted beam emitter
- IP69K, ECOLAB and Johnson Diversey rated

### Specifications

Certifications	cULus and CE marked for all applicable directives
<b>Environmental</b>	
Operating Environment	IP69K rated, ECOLAB and Johnson Diversey certified
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 11 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	Diffuse, background suppression, polarized retroreflective, clear object, and transmitted beam
Sensing Range	See product selection table
Light Source	Visible red (660 nm) or infrared (880 nm)
LED indicators	See user interface
Sensitivity Adjustments	Ferromagnetic teach
<b>Electrical</b>	
Voltage	10...30V DC
Current Consumption	35 mA max
Sensor Protection	Short circuit, transient noise, reverse polarity and overload
<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	PPS (grilamid)
Connection Types	4-pin DC micro (M12) QD
Supplied Accessories	Stainless steel teach rod, mounting nuts (threaded models only)
Optional Accessories	Mounting brackets, cordsets, reflectors

### User Interface

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



**PHOTOSWITCH® Photoelectric Sensors**

**42CS Cylindrical**

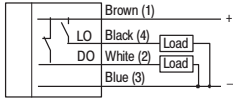
**Food and Beverage**

**Wiring Diagrams**

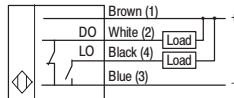
Pin numbers correspond to an M12 male connector on the sensor connected to an 889DS-F4AC-x cordset (featuring a stainless steel coupling nut).

**Diffuse and Background Suppression**

**PNP Models with Complementary Outputs**

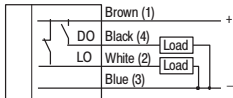


**NPN Models with Complementary Outputs**

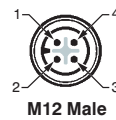
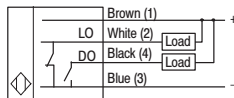


**Polarized Retroreflective, Clear Object and Transmitted Beam Receiver**

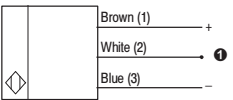
**PNP Models with Complementary Outputs**



**NPN Models with Complementary Outputs**



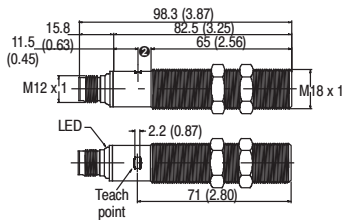
**Transmitted Beam Emitter**



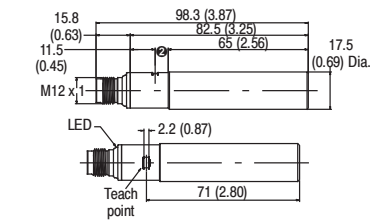
❶ For normal operation, white wire (pin 2) needs no connection. To disable light source, connect white wire (pin 2) to +V.

**Approximate Dimensions [mm (in.)]**

**Threaded Barrel Models**



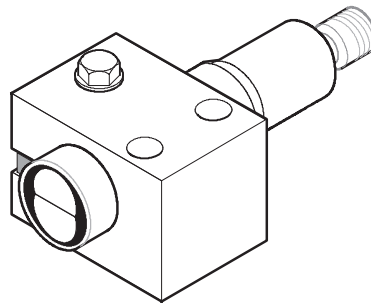
**Smooth Barrel Models**



⌀ 6 (0.24)

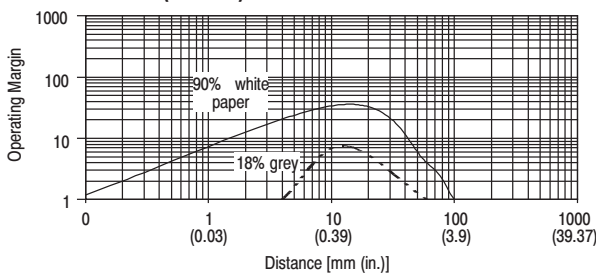
**Accessories**

**60-BCS-18B—Smooth Mounting Bracket**

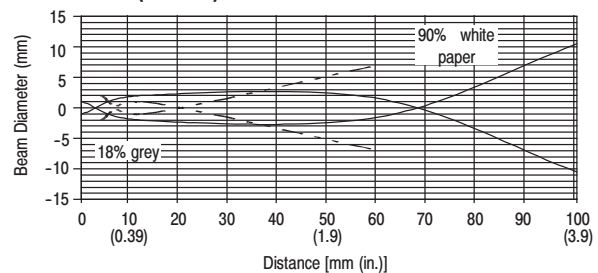


**Typical Response Curves**

**Standard Diffuse (100 mm)**



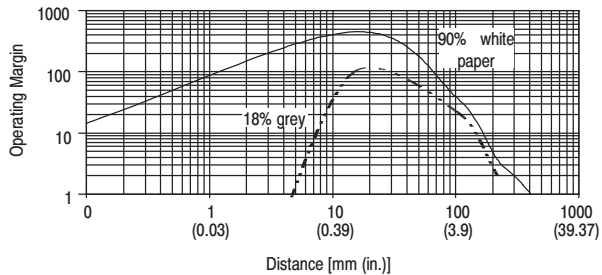
**Beam Pattern (100 mm)**



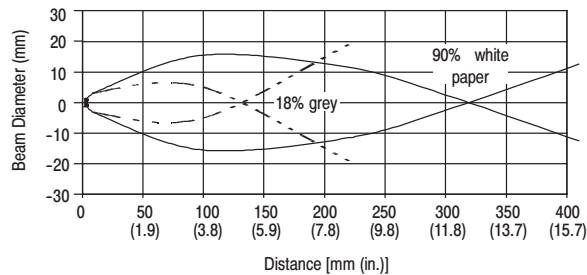
Visit our website: [www.ab.com/catalogs](http://www.ab.com/catalogs).  
Preferred availability cat. nos. are printed in **bold**.



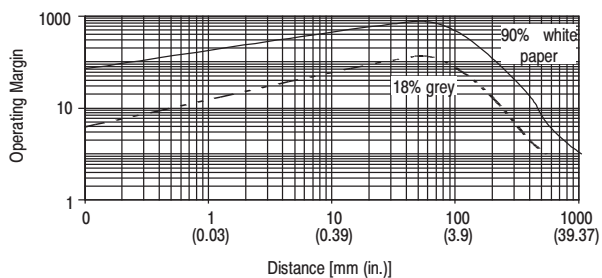
**Standard Diffuse (400 mm)**



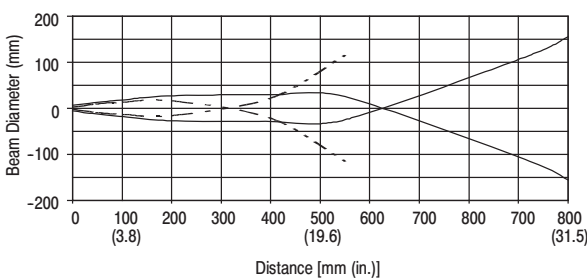
**Beam Pattern (400 mm)**



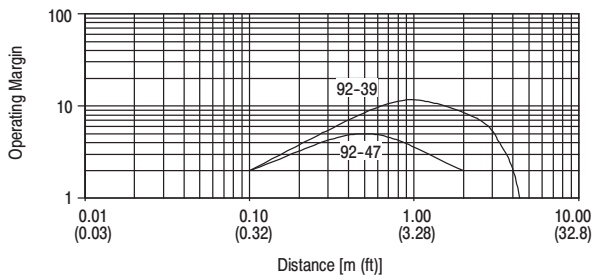
**Standard Diffuse (800 mm)**



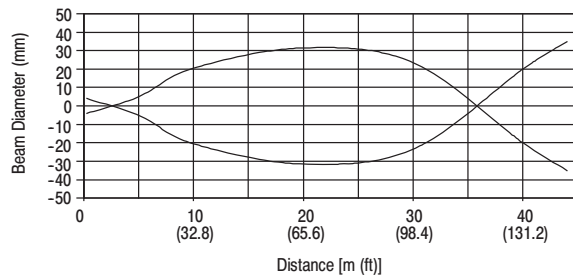
**Beam Pattern (800 mm)**



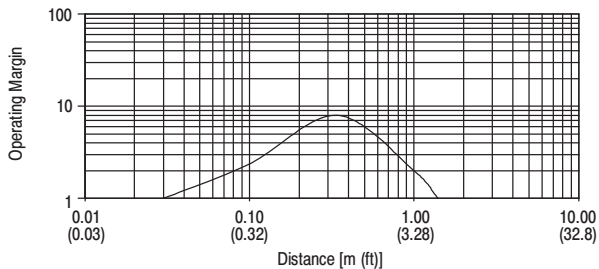
**Polarized Retroreflective (4 m)**



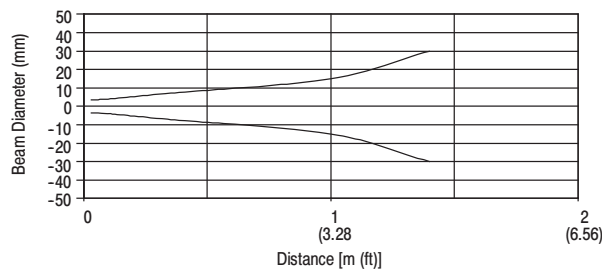
**Beam Pattern (4 m)**



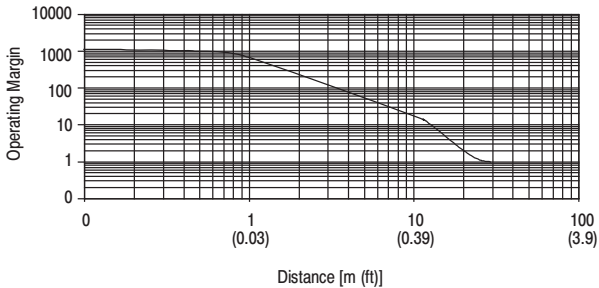
**Clear Object (1 m)**



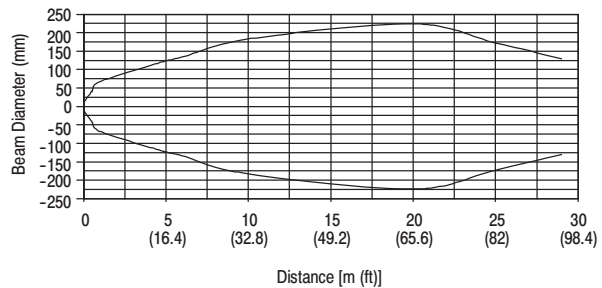
**Beam Pattern (1 m)**



**Transmitted Beam (20 m)**



**Beam Pattern (20 m)**

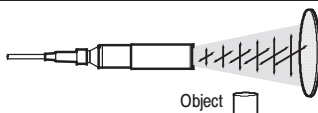
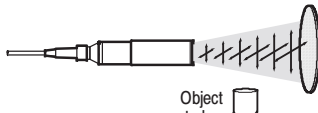
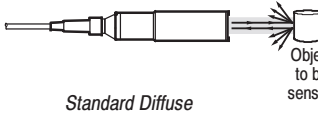
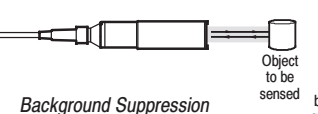
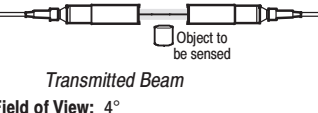


PHOTOSWITCH® Photoelectric Sensors

42CS Cylindrical

Food and Beverage

Product Selection

Sensing Mode (max. range)	Sensing Distance	Output Energized	Output Type Capacity	Sensitivity Adjustment	Cat. No. ❶
 Object to be sensed Polarized Retroreflective Field of View: 3° Emitter LED: Visible red 660 nm	4 m (13.1 ft)	Complementary light and dark operate	NPN	No adjustment	42CSS-P2MNB1-D4
			PNP		42CSS-P2MPB1-D4
 Object to be sensed Clear Object Detection Field of View: 3° Emitter LED: Visible red 660 nm	1 m (3.2 ft)	Complementary light and dark operate	NPN	Ferromagnetic Teach	42CSS-C2MNA1-D4
			PNP		42CSS-C2MPA1-D4
 Object to be sensed Standard Diffuse Field of View: 6° for 100 and 400 mm 8° for 800 mm Emitter LED: Visible red 660 nm	100 mm (3.9 in.)	Complementary light and dark operate	NPN	Ferromagnetic Teach	42CSS-D2MNA1-D4
	400 mm (15.8 in.)		PNP		42CSS-D2MPA1-D4
		NPN	Ferromagnetic Teach	42CSS-D1MNA2-D4	
		PNP		42CSS-D1MPA2-D4	
		800 mm (31.5 in.)	NPN	Ferromagnetic Teach	42CSS-D1MPNA3-D4
	PNP		42CSS-D1MPA3-D4		
 Object to be sensed Background Suppression Field of View: 9° Emitter LED: Visible red 660 nm	60...100 mm (2.4...3.9 in.)	Complementary light and dark operate	NPN	Ferromagnetic Teach	42CSS-B2MNA1-D4
			PNP		42CSS-B2MPA1-D4
 Object to be sensed Transmitted Beam Field of View: 4° Emitter LED: Infrared 880 nm	20 m (65.6 ft)	NA Light Source	NA	No adjustment	42CSS-E1EZB1-D4
		Complementary light and dark operate	NPN		42CSS-R9MNB1-D4
			PNP		42CSS-R9MPB1-D4

Note: All sensor models are rated for 10...30V DC and can drive loads requiring up to 100 mA.

❶ The prefix 42CSS denotes smooth enclosure. For threaded models replace the 42CSS with 42CST (e.g., 42CST-P2MPB1-D4).

Cordsets and Accessories

Cordset/Patchcords		Accessories					
Description	Cat. No.	Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro (M12) QD Cordset, 4-pin	889DS-F4AC-❷	Block Mounting Bracket for Smooth Barrel Housing	60-BCS-18B	Right Angle Mounting Bracket for Threaded Models	60-2657	Reflector, 76 mm (3 in.) dia. with center mount hole	92-39
DC Micro (M12) QD Patchcord, 4-pin	889D-F4ACDM-❸	Straight Mounting Bracket for Threaded Models	60-2656	Stainless Steel Right Angle Mounting Bracket	871A-BRS18	Reflector, 32 mm (1.5 in.) dia.	92-47
						Reflector, 76 mm (3 in.) dia. for clear object sensors	92-90

❷ Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

❸ Replace symbol with 0M3 (1 ft), 1 (1 m) 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.



Visit our website: [www.ab.com/catalogs](http://www.ab.com/catalogs). Preferred availability cat. nos. are printed in bold.





**Specifications**

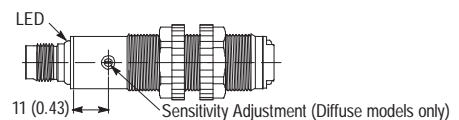
<b>Environmental</b>	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-25...+70° (-13...+158°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60068-2-27
Relative Humidity	5...95%
Ambient Light Immunity	Incandescent light 3000 lux
<b>Optical</b>	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, background suppression, transmitted beam
Sensing Range	See Product Selection table on page 1-60
Field of View	See Product Selection table on page 1-60
Light Source	Visible red LED (660 nm) or infrared LED (880 nm)
LED Indicators	Yellow LED for output indication
Adjustments	Sensitivity potentiometer (diffuse models only)
<b>Electrical</b>	
Voltage	10...30V DC
Current Consumption	30 mA max
Sensor Protection	Reverse polarity, overload, short circuit
<b>Outputs</b>	
Response Time	2 ms (0.5 ms for background suppression)
Output Type	PNP or NPN by cat. no.
Output Mode	Complementary light operate or dark operate, selectable light operate or dark operate for background suppression models
Output Current	100 mA
Output Leakage Current	10 µA max
<b>Mechanical</b>	
Housing Material	Nickel-plated brass
Lens Material	PMMA/PC
Connection Types	2 m cable, 4-pin DC micro (M12) QD
Supplied Accessories	18 mm fastening nuts
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-61

**Features**

- S 18 mm industry standard package
- S Wide selection of sensing modes
- S 30V DC operation
- S NPN or PNP outputs
- S Fast response time
- S Variety of connection types
- S Laser models available (see page 1-115)

**User Interface Panel**

Label	Color	State	Status
Output	Yellow	OFF	Sensor output de-activated
		ON	Sensor output activated



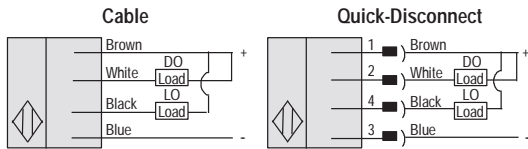
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 42CM

### 18 mm Metal Cylindrical

#### Wiring Diagrams

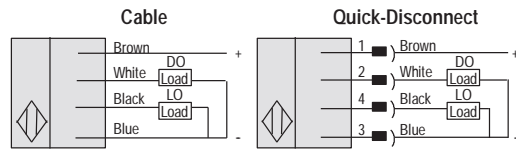
##### Diffuse NPN Output



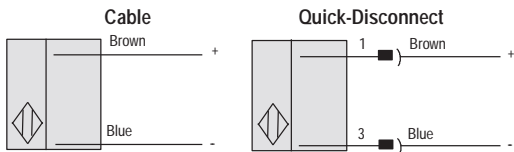
##### Face View Male Receptacle (Sensor) DC Micro



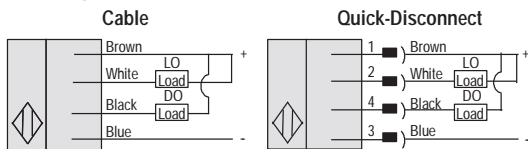
##### PNP Output



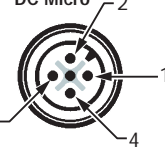
##### Transmitted Beam, Retroreflective, Polarized Retroreflective



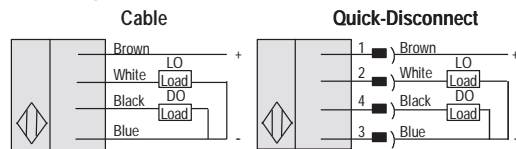
##### NPN Output



##### Face View Male Receptacle (Sensor) DC Micro

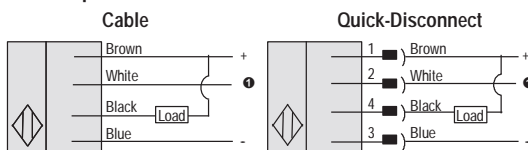


##### PNP Output

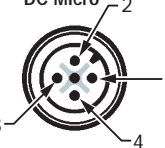


##### Background Suppression

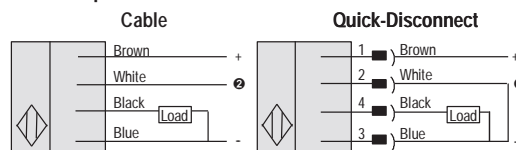
##### NPN Output



##### Face View Male Receptacle (Sensor) DC Micro

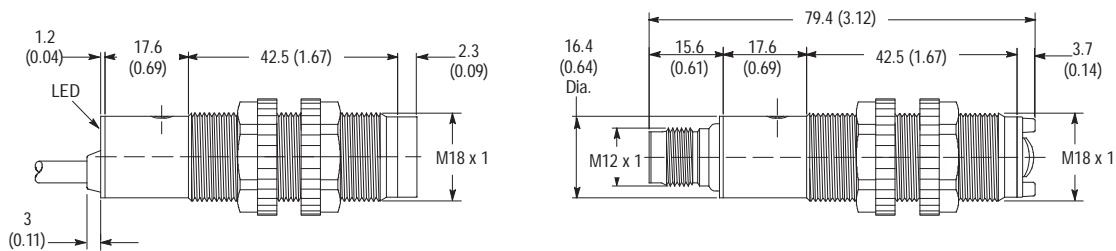


##### PNP Output



- ① Open circuit or tie white (2) and brown (1) conductors together for L.O. Tie white (2) and blue (3) conductors together for D.O.
- ② Tie white (2) and brown (1) conductors together for L.O. or tie white (2) and blue (3) conductors together for D.O.

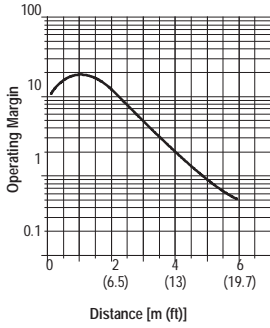
#### Approximate Dimensions [mm (in.)]



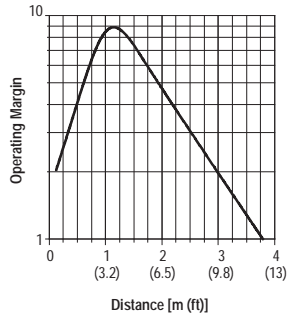


Typical Response Curve

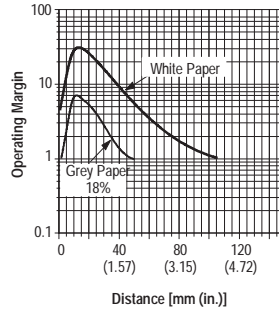
Retroreflective



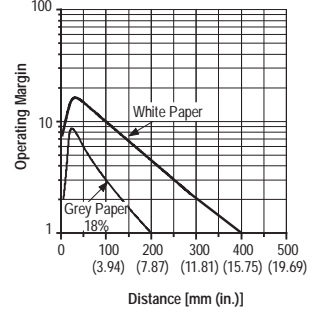
Polarized Retroreflective



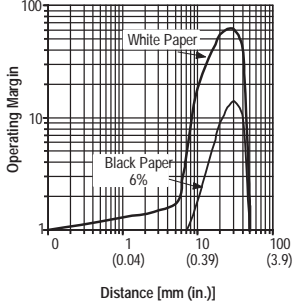
Standard Diffuse  
100 mm



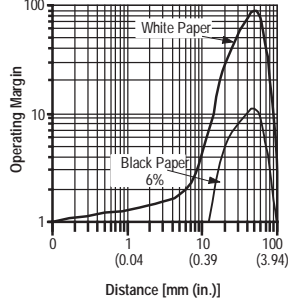
Standard Diffuse  
400 mm



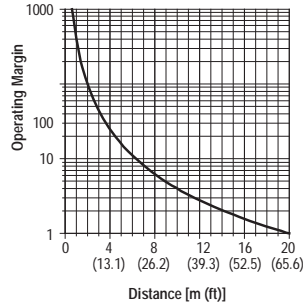
Background Suppression  
50 mm



Background Suppression  
100 mm



Transmitted Beam

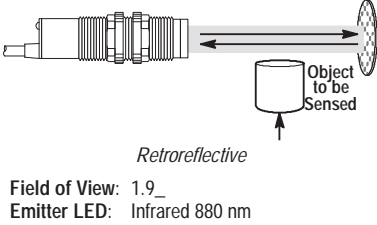
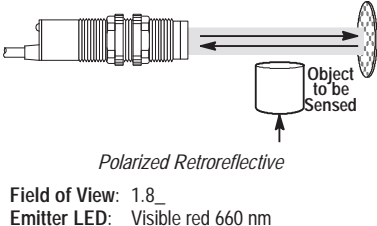
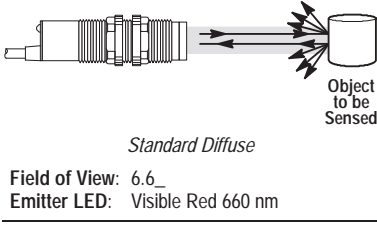
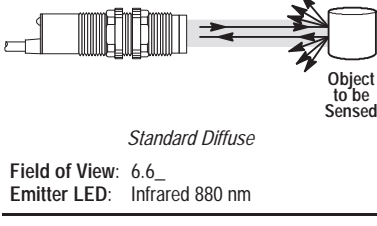
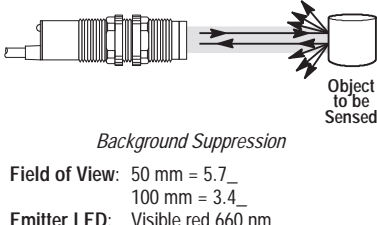


PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**42CM**

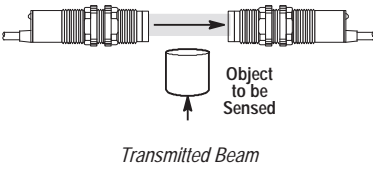
18 mm Metal Cylindrical

Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 1X Margin	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p><i>Retroreflective</i></p> <p>Field of View: 1.9_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	3 mm...4 m (0.12 in... 13.2 ft)	LO/DO Complementary	NPN 100 mA 4 ms	2 m 300V cable	42CM-U1MNB-A2
					4-pin DC micro	42CM-U1MNB-D4
				PNP 100 mA 4 ms	2 m 300V cable	42CM-U1MPB-A2
					4-pin DC micro	<b>42CM-U1MPB-D4</b>
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 1.8_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA	3 mm...3 m (0.12 in...9.9 ft)	LO/DO Complementary	NPN 100 mA 4 ms	2 m 300V cable	42CM-P2MNB-A2
					4-pin DC micro	42CM-P2MNB-D4
				PNP 100 mA 4 ms	2 m 300V cable	42CM-P2MPB-A2
					4-pin DC micro	<b>42CM-P2MPB-D4</b>
 <p><i>Standard Diffuse</i></p> <p>Field of View: 6.6_</p> <p>Emitter LED: Visible Red 660 nm</p>	10...30V DC 30 mA	100 mm (3.9 in.) (Adjustable)	LO/DO Complementary	NPN 100 mA 2 ms	2 m 300V cable	42CM-D2MNAE-A2
					4-pin DC micro	42CM-D2MNAE-D4
				PNP 100 mA 2 ms	2 m 300V cable	42CM-D2MPAE-A2
					4-pin DC micro	<b>42CM-D2MPAE-D4</b>
 <p><i>Standard Diffuse</i></p> <p>Field of View: 6.6_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	400 mm (13.6 in.) (Adjustable)	LO/DO Complementary	NPN 100 mA 2 ms	2 m 300V cable	42CM-D1MNAL-A2
					4-pin DC micro	42CM-D1MNAL-D4
				PNP 100 mA 2 ms	2 m 300V cable	42CM-D1MPAL-A2
					4-pin DC micro	<b>42CM-D1MPAL-D4</b>
 <p><i>Background Suppression</i></p> <p>Field of View: 50 mm = 5.7_ 100 mm = 3.4_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA	50 mm (1.97 in.)	L.O./D.O. Selectable	NPN 100 mA 0.5 ms	2 m 300V cable	42CM-B2LNBC-A2
					4-pin DC micro	42CM-B2LNBC-D4
		PNP 100 mA 0.5 ms		2 m 300V cable	42CM-B2LPBC-A2	
				4-pin DC micro	<b>42CM-B2LPBC-D4</b>	
		NPN 100 mA 0.5 ms		2 m 300V cable	42CM-B2LNBE-A2	
				4-pin DC micro	42CM-B2LNBE-D4	
PNP 100 mA 0.5 ms	2 m 300V cable	42CM-B2LPBE-A2				
	4-pin DC micro	<b>42CM-B2LPBE-D4</b>				

Refer to page 1-61 for cordsets and accessories.

Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p>Field of View: 1.6m Emitter LED: Infrared 880 nm</p>	10...30V DC 25 mA	3 mm...20 m (0.12 in... 65.6 ft)	NA Light Source		2 m 300V cable	42CM-E1EZB-A2
					4-pin DC micro	42CM-E1EZB-D4
			L.O./D.O. Complementary	NPN 100 mA 2 ms	2 m 300V cable	42CM-R1MNB-A2
					4-pin DC micro	42CM-R1MNB-D4
				PNP 100 mA 2 ms	2 m 300V cable	42CM-R1MPB-A2
					4-pin DC micro	42CM-R1MPB-D4

Cordsets and Accessories

Cordset		Accessories			
Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, 4-pin, 2 m	889D-F4AC-2	Mounting Brackets	60-2657	Reflectors	92-39
DC Micro QD Cordset, 4-pin, 2 m	889D-F4AC-2	Mounting Brackets	60-2649	Mounting Brackets	60-2664
		Snap-Clamp Mounting Brackets	871A-SCBP18		

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 42CF

### 12 mm Metal Cylindrical



#### Features

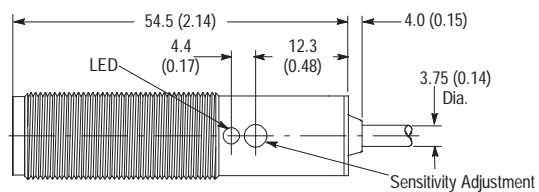
- § 12 mm industry standard package
- § Wide selection of sensing modes
- § 30V DC operation
- § NPN or PNP outputs
- § Fast response time
- § Variety of connection types
- § Local teach button
- § Accepts remote (diffuse and polarized retroreflective only) teach input

#### Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-25...+70° (-13...+158°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60068-2-27
Relative Humidity	5...95%
Ambient Light Immunity	Incandescent light 3000 lux
Optical	
Sensing Modes	Polarized retroreflective, standard diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-64
Field of View	See Product Selection table on page 1-64
Light Source	Visible red LED (660 nm) or infrared LED (880 nm)
LED Indicators	Yellow LED for output indication
Adjustments	Sensitivity potentiometer
Electrical	
Voltage	10...30V DC
Current Consumption	30 mA max
Sensor Protection	Reverse polarity, overload, short circuit
Outputs	
Response Time	2 ms (transmitted beam), 1.25 ms (diffuse and polarized retroreflective)
Output Type	PNP or NPN by cat. no.
Output Mode	Selectable light operate or dark operate
Output Current	100 mA
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Nickel plated brass
Lens Material	Acrylic
Connection Types	2 m cable, 4-pin DC micro (M12) QD
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-64

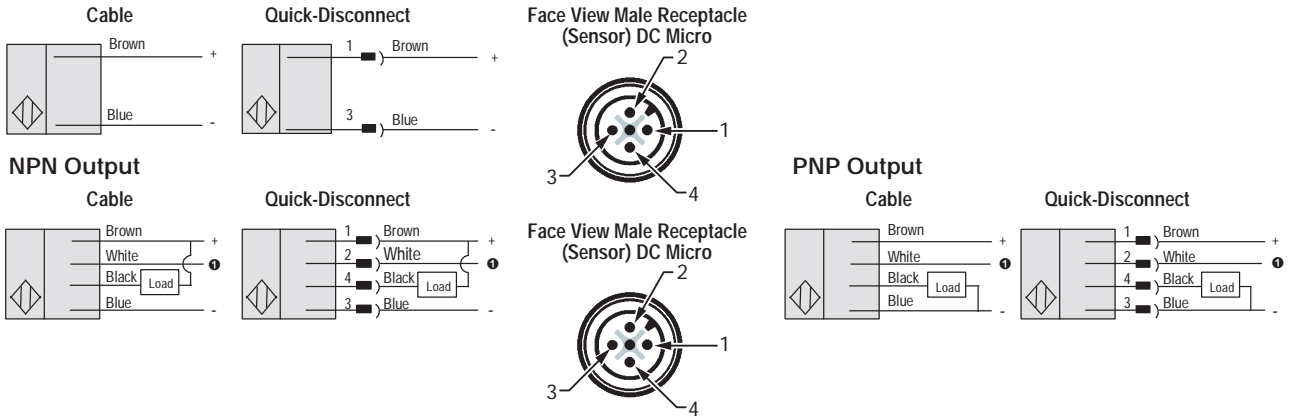
#### User Interface Panel

Label	Color	State	Status
Output	Yellow	OFF	Sensor output de-activated
		ON	Sensor output activated



Wiring Diagrams

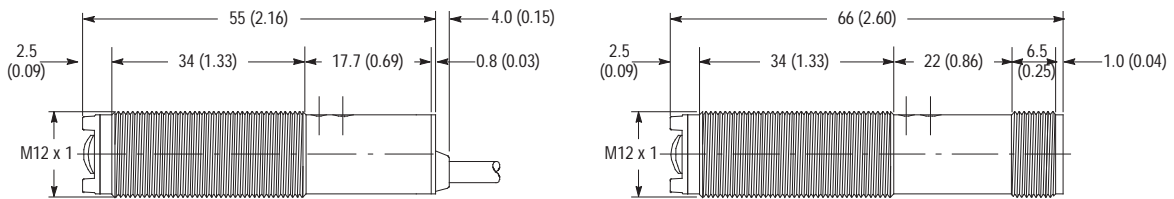
Diffuse, Polarized Retroreflective and Transmitted Beam



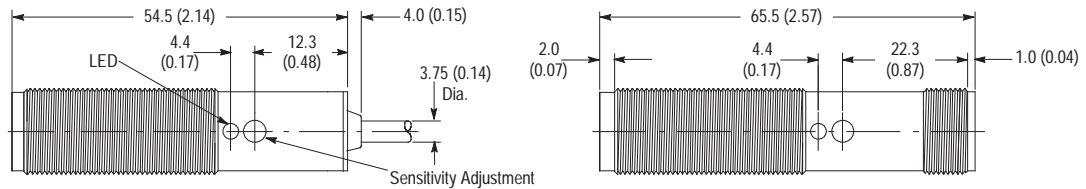
- Polarized retroreflective:** Open circuit for dark operate. Connect white (2) and brown (1) together for light operate. Connect white (2) and blue (3) together for remote teach.
- Diffuse:** Open circuit for light operate. Connect white (2) and brown (1) together for dark operate. Connect white (2) and blue (3) together for remote teach.
- Transmitted beam:** Open circuit for dark operate. Connect white (2) and brown (1) together for light operate. Connect white (2) and blue (3) together for dark operate. This model does not have remote teach.

Approximate Dimensions [mm (in.)]

Diffuse and Polarized Retroreflective

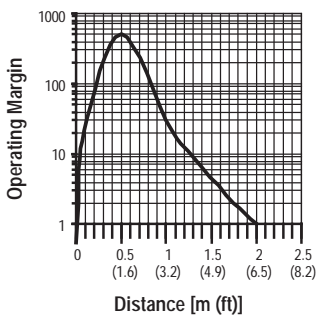


Transmitted Beam

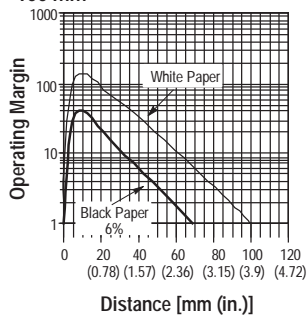


Typical Response Curve

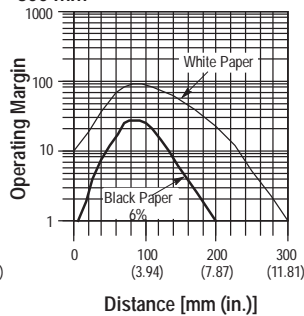
Polarized Retroreflective



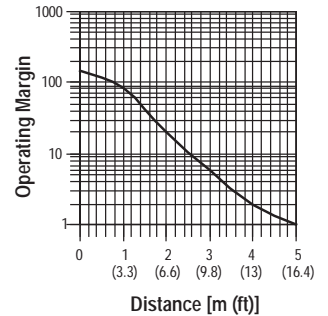
Standard Diffuse 100 mm



Standard Diffuse 300 mm



Transmitted Beam

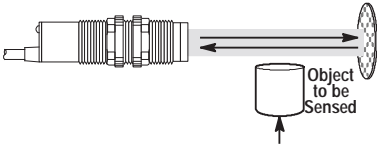
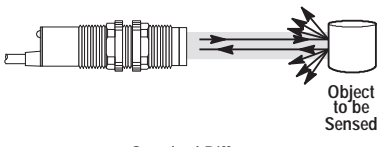
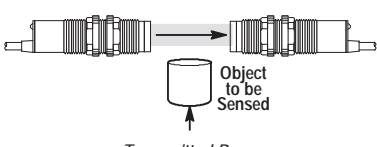


PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**42CF**

12 mm Metal Cylindrical

Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 1X Margin	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 2.3_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA	3 mm...2 m (0.12 in...6.5 ft)	L.O./D.O. Selectable	NPN 100 mA 1.25 ms	2 m 300V cable	42CF-P2LNA1-A2
				4-pin DC micro	42CF-P2LNA1-D4	
				PNP 100 mA 1.25 ms	2 m 300V cable	42CF-P2LPA1-A2
				4-pin DC micro	42CF-P2LPA1-D4	
 <p><i>Standard Diffuse</i></p> <p>Field of View: 11.4_ (100 mm) 5.3_ (300 mm)</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	0...100 mm (0...3.9 in.) (adjustable)	L.O./D.O. Selectable	NPN 100 mA 1.25 ms	2 m 300V cable	42CF-D1LNA1-A2
				4-pin DC micro	42CF-D1LNA1-D4	
				PNP 100 mA 1.25 ms	2 m 300V cable	42CF-D1LPA1-A2
				4-pin DC micro	42CF-D1LPA1-D4	
		0...300 mm (0...12.2 in.) (adjustable)		NPN 100 mA 1.25 ms	2 m 300V cable	42CF-D1LNA2-A2
				4-pin DC micro	42CF-D1LNA2-D4	
				PNP 100 mA 1.25 ms	2 m 300V cable	42CF-D1LPA2-A2
				4-pin DC micro	42CF-D1LPA2-D4	
 <p><i>Transmitted Beam</i></p> <p>Field of View: 1.4_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 25 mA	3 mm...4 m (0.12 in... 13.2 ft)	L.O./D.O. Selectable	—	2 m 300V cable	42CF-E1EZB-A2
	4-pin DC micro			42CF-E1EZB-D4		
	10...30V DC 20 mA	NPN 100 mA 2 ms		2 m 300V cable	42CF-R1LNB1-A2	
		4-pin DC micro		42CF-R1LNB1-D4		
		PNP 100 mA 2 ms		2 m 300V cable	42CF-R1LPB1-A2	
				4-pin DC micro	42CF-R1LPB1-D4	

Cordsets and Accessories

Cordset		Accessories			
Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, 4-pin, 2 m	889D-F4AC-2	Mounting Bracket	871A-BRNR	Reflectors	92-39
		Snap-Clamp Mounting Bracket	871A-SCBP12		



**Features**

- S Wide selection of sensing modes
- S Wide selection of operating modes
- S Both DC and AC/DC operation
- S Models with teach function
- S Standard ON/OFF and timing versions
- S Fast response time
- S Variety of connection types
- S Laser models available (see page 1-112)

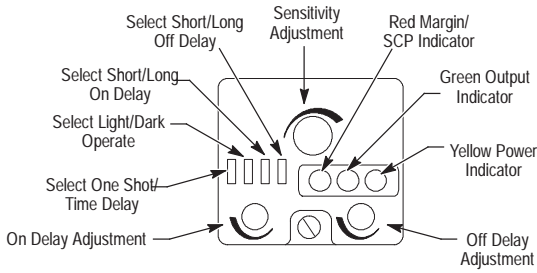
**Specifications**

<b>Environmental</b>	
Certifications	UL Listed, CSA Approved, CE Marked for all applicable directives
Operating Environment	NEMA 3, 4X, 6P, 12, 13, IP67 (IEC529) 1200 psi (8270 kPa) washdown, IP69K, ECOLAB certification on cable models
Operating Temperature [C (F)]	-34...+70° (-29...+158°)
Vibration	10...55 Hz, 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%
Ambient Light Immunity	Incandescent light 5000 lux
<b>Optical</b>	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, long range diffuse, fiber optic, extended range fiber optic, transmitted beam
Sensing Range	See Product Selection table on page 1-69
Field of View	See Product Selection table on page 1-69
Light Source	Visible red (660 nm), Infrared (880 nm)
LED Indicators	See User Interface table below
Adjustments	Single-turn potentiometer for sensitivity
<b>Electrical</b>	
Voltage	10...30V DC , 40...264V AC/DC models (see Product Selection table on page 1-69)
Current Consumption	30 mA max (DC models), 15 mA max (AC/DC models)
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
<b>Outputs</b>	
Response Time	2 ms (DC models), 15 ms (AC/DC models), 2 ms (MOSFET models)
Output Type	PNP and NPN (DC models), SPDT relay (AC/DC models), MOSFET (AC/DC models)
Output Mode	Light operate or dark operate selectable
Output Current	250 mA @ 30V DC (all models except 42GLP and 42GSP); 2 A @ 132 V AC (SPDT relay models), 1 A @ 264V AC (SPDT relay); 300 mA @ 264V AC (MOSFET models)
Output Leakage Current	10 µA max (DC) , 1 mA (AC)
<b>Mechanical</b>	
Housing Material	Valoxr
Lens Material	Acrylic
Cover Material	Neoprene
Connection Types	2 m (6.5 ft) cable, 4-pin DC micro QD, 4-pin DC mini QD, 5-pin DC micro QD
Supplied Accessories	129-130 mounting kit
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-71

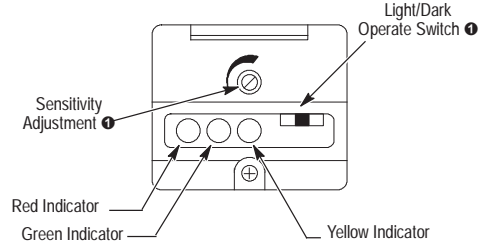
**User Interface—Standard Models (Refer to installation instructions for 42GLP and 42GSP versions)**

Label	Color	State	Status
Output	Green	OFF	Sensor output de-activated
		ON	Sensor output activated
Margin/SCP	Red	OFF	Margin < 2.5
		ON	Margin >2.5
		Flashing	Output SCP active
Power	Yellow	OFF	Sensor not powered
		ON	Sensor powered

42GTx Versions—Top View Detail



42GRx Versions—Top View Detail

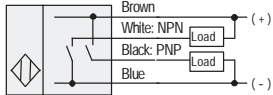


① Push button on 42GSP models.

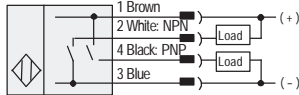
Wiring Diagrams<sup>①②</sup>

All Models Except Transmitted Beam Source

Cable Model: 9\_ \_0



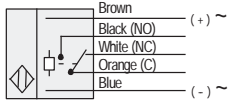
4-pin DC Micro QD Model: 9\_ \_0-QD



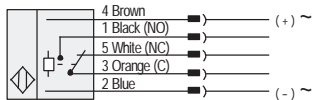
4-pin DC Mini QD Model: 9\_ \_0-QD1



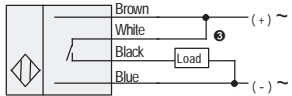
Cable Model: 9\_ \_1, 9\_ \_2



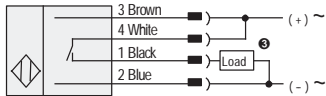
5-pin AC/DC Mini QD Model: 9\_ \_1-QD, 9\_ \_2-QD



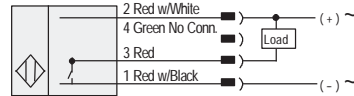
Cable Model: 9\_ \_3



AC/DC Mini QD Model: 9\_ \_3-QD

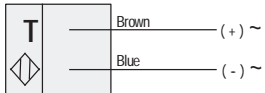


AC/DC Micro QD Model: 9\_ \_3-QD1

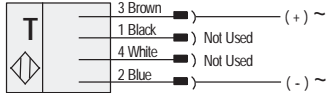


Transmitted Beam Source

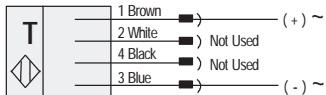
Cable Model: 42GRL- 90\_ \_



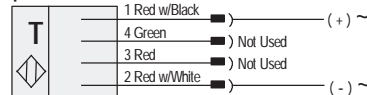
AC/DC Mini QD Model: 42GRL- 90\_ 2-QD



DC Micro QD Model: 42GRL- 90\_ 0-QD



4-pin DC Micro QD Model: 42GRL- 90\_ 3-QD1

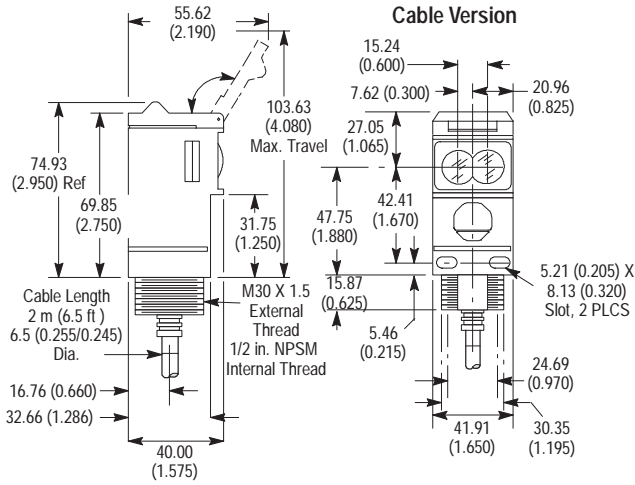


- ① For Allen-Bradley programmable controller compatible interface, refer to publication 42-2.0.
- ② Quick-disconnect wiring codes shown are valid for Allen-Bradley cables only.
- ③ Load can be placed on either black or white wire to create sourcing or sinking respectively.

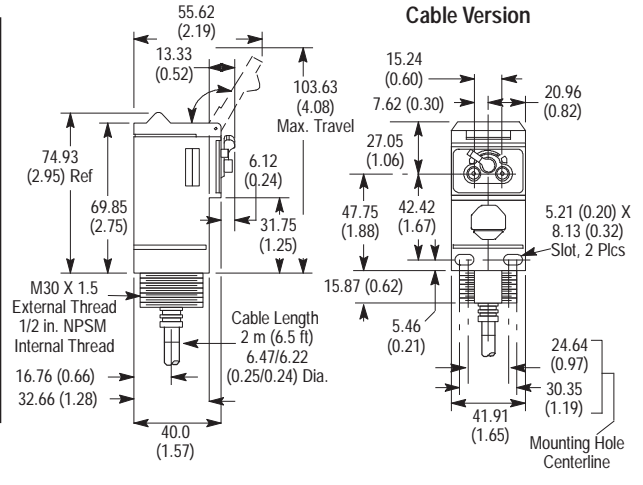


**Approximate Dimensions [mm (in.)]**

All Versions Except Fiber Optic

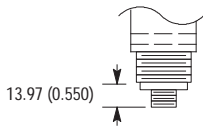


Fiber Optic

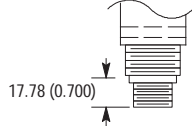


Connector Version

Micro Style



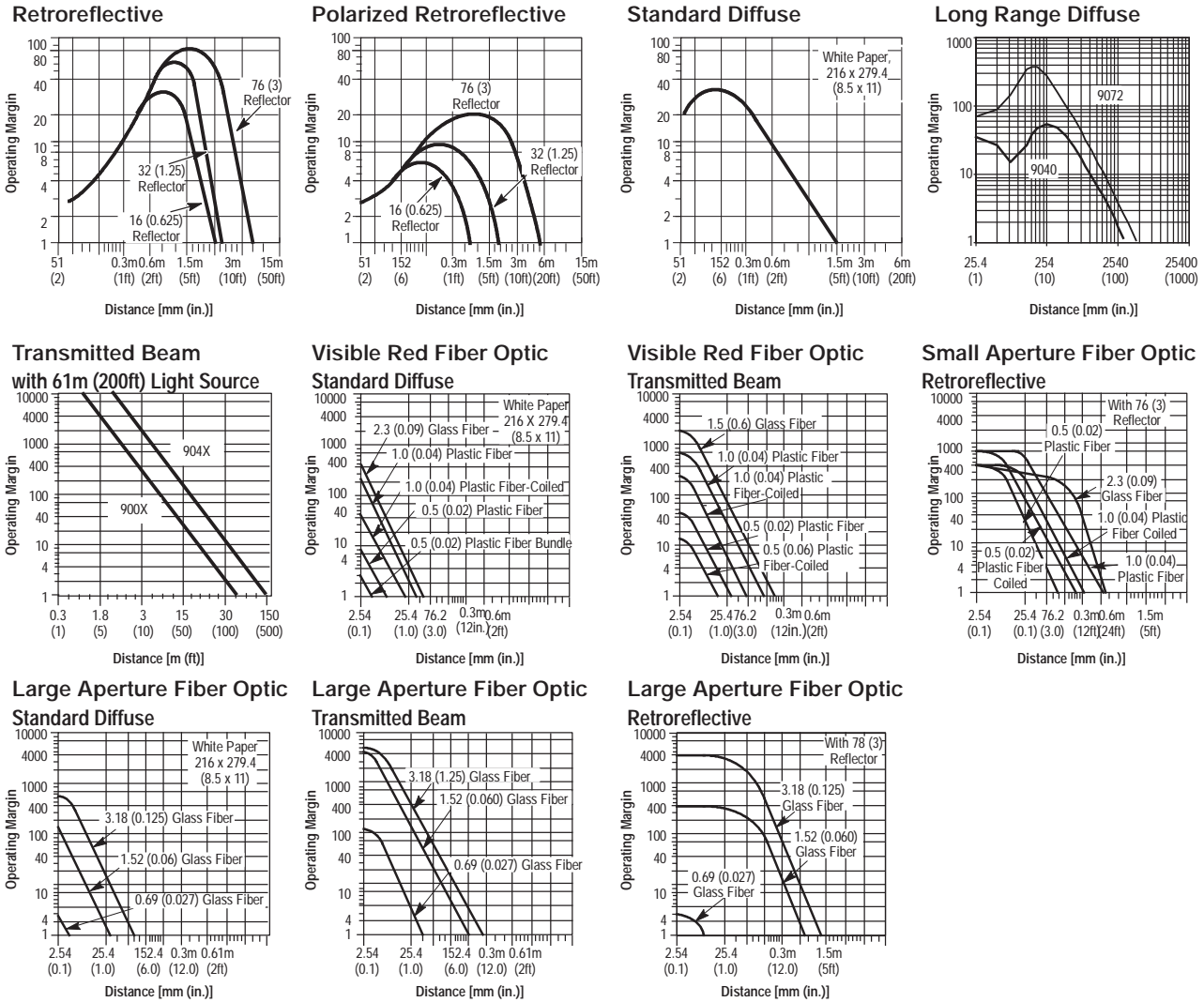
Mini Style



Thread Size

	AC	DC
Micro Style	1/2-20 UNF 2 Keyways	M12 x 1 1 Keyway
Mini Style	7/8-16 UN 1 Keyway	

Typical Response Curve

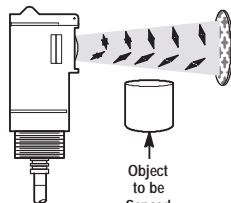
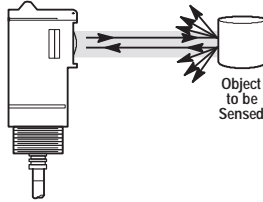
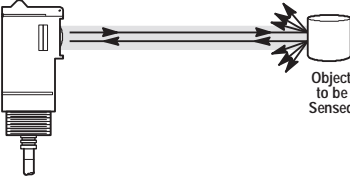


Product Selection for On/Off and Timing Sensors

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
<p>Retroreflective</p> <p>Field of View: 1.5° Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA	50.8 mm... 9.14 m (2 in...30 ft) with 76 mm (3 in.) Reflector	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42GⓈU-9000
	70...264V AC/DC 50/60 Hz 15 mA				4-pin DC micro	42GⓈU-9000-QD
					4-pin mini	42GⓈU-9000-QD1
	70...264V DC/ 40...264V AC 50/60 Hz 15 mA	SPDT EM Relay 2 A/132V AC 1 A/264V AC 1 A/150V DC 15 ms		2 m 300V cable	42GⓈU-9002	
				5-pin mini	42GⓈU-9002-QD	
		Solid State Isolated N.O. 300 mA 2 ms		2 m 300V cable	42GⓈU-9003	
				2 m 600V cable	42GⓈU-9003H	
				4-pin mini	42GⓈU-9003-QD	
				4-pin AC micro	42GⓈU-9003-QD1	

Ⓢ R for standard (i.e. 42GRU-9000); T for timing (i.e. 42GTU-9000)

Product Selection for On/Off and Timing Sensors

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 30 mA	50.8 mm... 4.87 m (2 in... 16 ft) with 76 mm (3 in.) Reflector	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42G⊗U-9200
	70...264V DC/ 60...264V AC 50/60 Hz 15 mA				4-pin DC micro	42G⊗U-9200-QD
					4-pin mini	42G⊗U-9200-QD1
	70...264V DC/ 40...264V AC 50/60 Hz 15 mA			2 m 300V cable	SPDT EM Relay 2 A/132V AC 1 A/264V AC 1 A/150V DC 15 ms	42G⊗U-9202
					5-pin mini	42G⊗U-9202-QD
				Solid State Isolated N.O. 300 mA 2 ms	2 m 300V cable	42G⊗U-9203
	2 m 600V cable				42G⊗U-9203H	
	4-pin mini				42G⊗U-9203-QD	
	 <p><i>Standard Diffuse</i></p> <p>Field of View: 3.5_</p> <p>Emitter LED: Infrared 880 nm</p>			10...30V DC 30 mA	50.8 mm... 1.52 m (2 in...5 ft) to White Paper	Light/Dark Selectable
70...264V DC/ 60...264V AC 50/60 Hz 15 mA		4-pin DC micro	42GLP-9000-QD			
		2 m 300V cable	42GSP-9000			
70...264V DC/ 40...264V AC 50/60 Hz 15 mA		4-pin DC micro	42GSP-9000-QD			
		4-pin mini	42G⊗P-9000			
Solid State Isolated N.O. 300 mA 2 ms		2 m 300V cable	42G⊗P-9000-QD1			
		2 m 600V cable	42G⊗P-9000			
		4-pin mini	42G⊗P-9002			
70...264V DC/ 40...264V AC 50/60 Hz 15 mA		2 m 300V cable	SPDT EM Relay 2 A/132V AC 1 A/264V AC 1 A/150V DC 15 ms	42G⊗P-9002-QD		
			5-pin mini	42G⊗P-9002-QD		
		2 m 300V cable	Solid State Isolated N.O. 300 mA 2 ms	42G⊗P-9003		
				2 m 600V cable		
	4-pin mini	42G⊗P-9003-QD				
	4-pin AC micro	42G⊗P-9003-QD1				
 <p><i>Long Range Diffuse</i></p> <p>Field of View: 6.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	50.8 mm... 3.04 m (2 in...10 ft)	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42GRP-9040
	70...264V AC/DC 50/60 Hz 15 mA				4-pin DC micro	42GRP-9040-QD
					4-pin mini	42GRP-9040-QD1
	70...264V DC/ 40...264V AC 50/60 Hz 15 mA			2 m 300V cable	SPDT EM Relay 2 A/132V AC 1 A/264V AC 1 A/150V DC 15 ms	42GRP-9042
					5-pin mini	42GRP-9042-QD
				Solid State Isolated N.O. 300 mA 2 ms	2 m 300V cable	42GRP-9043
	2 m 600V cable				42GRP-9043H	
	4-pin mini				42GRP-9043-QD	
	4-pin AC micro			42GRP-9043-QD1	NPN/PNP 250 mA 2 ms	42GRP-9070
						4-pin DC micro
	70...264V AC/DC 50/60 Hz 15 mA			2 m 300V cable	SPDT EM Relay 2 A/132V AC 1 A/264V AC 1 A/150V DC 15 ms	42GRP-9072
						3 m 300V cable
				5-pin mini	42GRP-9072-QD	

⊗ R for standard (i.e. 42GRU-9000); T for timing (i.e. 42GTU-9000)

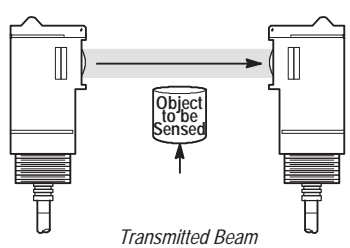
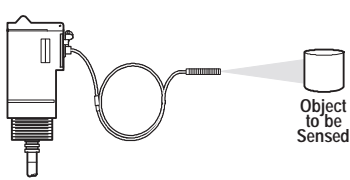
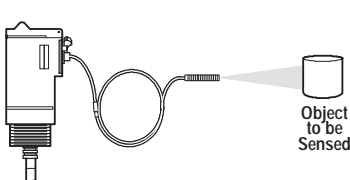
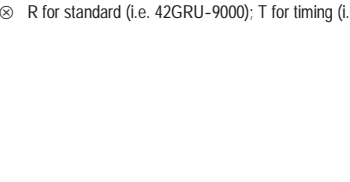
Refer to page 1-71 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

Series 9000

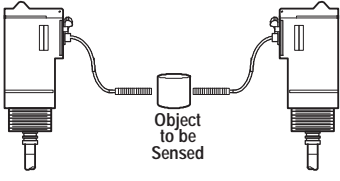
Standard and Timing

Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.			
 <p>Transmitted Beam</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...264V AC/DC 50/60 Hz 15 mA	25.4 mm...61 m (1 in...200 ft)	NA Light Source		2 m 300V cable	42GRL-9000			
		25.4 mm... 152 m (1 in...500 ft)			2 m 600V cable	42GRL-9000H			
					4-pin DC micro	42GRL-9000-QD			
					4-pin mini	42GRL-9002-QD			
					2 m 300V cable	42GRL-9040			
					4-pin DC micro	42GRL-9040-QD			
	4-pin mini		42GRL-9042-QD						
	4-pin AC micro	42GRL-9043-QD1							
	 <p>Small Aperture Red Fiber Optic</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 25 mA	Depends on Light Source	Receiver Light or Dark Output Selectable	NPN and PNP 250 mA 5 ms	2 m -300V cable	42G⊗R-9000		
		70...264V AC/DC, 50/60 Hz 10 mA				4-pin DC micro	42G⊗R-9000-QD		
4-pin mini						42G⊗R-9000-QD1			
70...264V DC, 40...264V AC 50/60 Hz 10 mA		Depends on Light Source				Receiver Light or Dark Output Selectable	SPDT EM Relay 2 A/132V AC, 1 A/264V AC 1 A/150V DC 23 ms	2 m 300V cable	42G⊗R-9002
								5-pin mini	42G⊗R-9002-QD
								2 m 300V cable	42GRR-9003
	2 m 600V cable		42GRR-9003H						
4-pin mini	42GRR-9003-QD								
4-pin AC micro	42GRR-9003-QD1								
 <p>Large Aperture Fiber Optic</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	Depends on Fiber Optic cable	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42G⊗F-9100			
	70...264V AC/DC 50/60 Hz 15 mA				4-pin DC micro	42G⊗F-9100-QD			
					70...264V DC/ 40...264V AC 50/60 Hz 15 mA	2 m 300V cable	42G⊗F-9102		
	5-pin mini						42G⊗F-9102-QD		
	2 m 300V cable					42G⊗F-9103			
	4-pin mini					42G⊗F-9103-QD			
4-pin AC micro	42G⊗F-9103-QD1								
 <p>Large Aperture Fiber Optic</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	Depends on Fiber Optic cable	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42G⊗F-9000			
	70...264V AC/DC, 50/60 Hz 15 mA				4-pin DC micro	42G⊗F-9000-QD			
					70...264V DC/ 40...264V AC 50/60 Hz 15 mA	2 m 300V cable	42G⊗F-9002		
	5-pin mini						42G⊗F-9002-QD		
	2 m 300V cable					42G⊗F-9003			
	2 m 600V cable					42G⊗F-9003H			
4-pin mini	42G⊗F-9003-QD								
4-pin AC micro	42G⊗F-9003-QD1								

⊗ R for standard (i.e. 42GRU-9000); T for timing (i.e. 42GTU-9000)

Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p>Extended Range Large Aperture Fiber Optic Emitter LED: Infrared 880 nm</p>	10...264V AC/DC, 56/60 Hz 15 mA	See table below.	NA Light Source		2 m 300V cable	42GRLF-9040
					4-pin DC micro	42GRLF-9040-QD
	10...40V DC 30 mA	See table below.	Light/Dark Selectable		2 m 300V cable	42GRRF-9000
					4-pin DC micro	42GRRF-9000-QD
	70...264V AC/DC, 50/60 Hz 15 mA				2 m 300V cable	42GRRF-9002
					5-pin mini	42GRRF-9002-QD

Typical Sensing Distance—Extended Range Infrared Fiber Optic

Sensing Mode	Sensor	Fiber Optic Cable	Range Extender	Sensing Distance (1X margin.)
Transmitted Beam	42GRLF-9040 with individual fiber optic cable	43GT-FAS25SL Individual Fiber Optic Cable, smooth tip	none	914 mm (36 in.)
		43GT-TBB25SL Individual Fiber Optic Cable, with 5/16 inch threaded tip		
		43GT-FAS25SL Individual Fiber Optic Cable, smooth tip	60-1844	6 m (20 ft)
			60-2559	12 m (40 ft)
		43GT-TBB25SL Individual Fiber Optic Cable, with 5/16 inch threaded tip	60-2323	6 m (20 ft)
		60-2738	12 m (40 ft)	
	42GRLF-9040 with bifurcated fiber optic cable	43GR-FAS25SL Bifurcated Fiber Optic Cable, smooth tip	none	1.2 m (48 in.)
		43GR-TBB25SL Bifurcated Fiber Optic Cable, with 5/16 inch threaded tip		
		43GR-FAS25SL Bifurcated Fiber Optic Cable, with smooth tip	60-1844	7.6 m (25 ft)
			60-2559	15.2 m (50 ft)
43GR-TBB25SL Bifurcated Fiber Optic Cable, with 5/16 inch threaded tip		60-2323	7.6 m (25 ft)	
	60-2738	15.2 m (50 ft)		

1. Sensing ranges are for fiber optic cables shown. Range will vary with other fiber optic cable types.
2. When using individual fiber optic cable, second port must be blocked with the provided plug (60-2744).
3. Receiver Sensor (42GRRF) requires only individual fiber optic cable.

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.
1.8 m (6 ft) 4-pin, Mini QD Cordset	889N-F4AF-6F	32 mm (1.25 in.) Diameter Reflector	92-47
1.8 m (6 ft) 5-pin, Mini QD Cordset	889N-F5AF-6F	Range Extender	60-1844
2 m (6.5 ft) 4-pin, DC Micro QD Cordset	889D-F4AC-2	Range Extender	60-2559
2 m (6.5 ft) 4-pin, AC Micro QD Cordset	889R-F4AEA-2	Range Extender	60-2738
76 mm (3 in.) Diameter Reflector	92-39	Replacement Plug	60-2744

## 44B Adjustable Background and Foreground Suppression

50 mm Rectangular



### Features

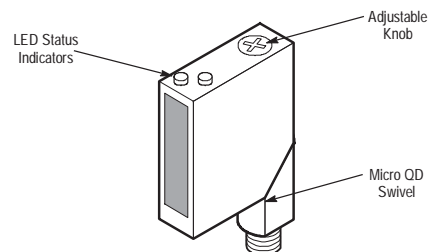
- S Adjustable background and foreground suppression models
- S Power, output, and stability status indicators
- S Micro QD connection with 90° swivel
- S Low voltage 24V DC operation
- S Protected from miswiring
- S Dual NPN and PNP outputs
- S Fast 1 ms response time

### Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	NEMA 3, 4X, 6P, 12, 13, IP67
Operating Temperature [C (F)]	0...+70° (32...+158°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 947-5-2
Relative Humidity	5...95%
Optical	
Sensing modes	Background suppression or foreground suppression
Sensing Range	20...300 mm (0.78...11.8 in.) adjustable for background suppression 20...200 mm (0.78...7.8 in.) adjustable for foreground suppression
Spot Size	See Product Selection table on page 1-74
Light Source	Infrared LED (880 nm)
LED Indicators	See User Interface Panel below
Adjustments	6-turn adjustment knob
Electrical	
Voltage	20...30V DC
Current Consumption	22 mA max
Sensor Protection	False pulse, reverse polarity, overload, output short circuit
Outputs	
Response Time	1 ms max
Output Type	PNP and NPN
Output Mode	Light or dark operate by cat. no.
Output Current	100 mA
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Acrylic
Lens Material	Acrylic
Connection Types	4-pin DC micro (M12) QD
Supplied Accessories	None
Optional Accessories	See mounting brackets and cordsets on page 1-73

### User Interface Panel

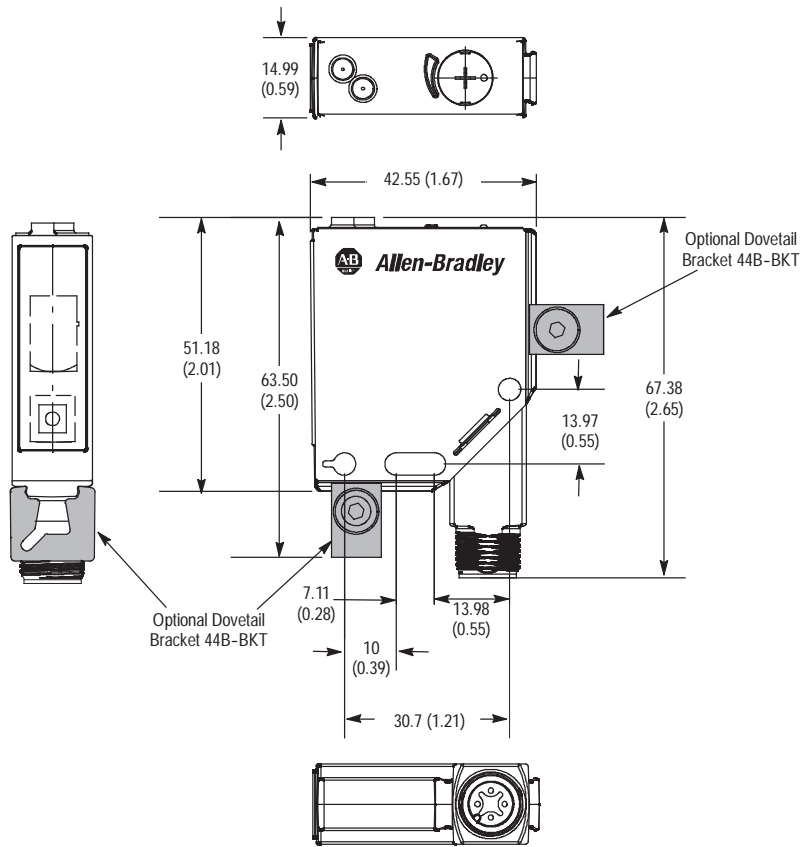
Color	State	Status
Green	OFF	Sensor not powered, SCP active
	ON	Sensor powered
	Flashing	Unstable margin
Orange	OFF	Output not activated
	ON	Output activated



# 44B Adjustable Background and Foreground Suppression

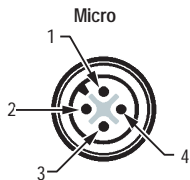
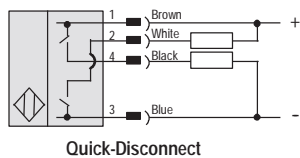
50 mm Rectangular

## Approximate Dimensions [mm (in.)]

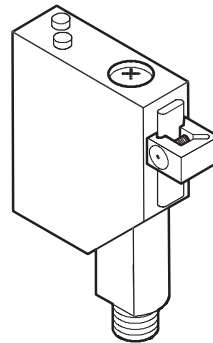


## Wiring Diagram

NPN/PNP



Dovetail Bracket  
(Optional)  
44B-BKT



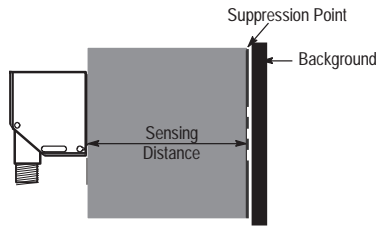
## Cordsets & Accessories

Description	Cat. No.
2 m (6.5 ft) 4-pin, DC Micro QD Cordset	889D-F4AC-2
Dovetail Bracket	44B-BKT
Mounting Bracket	60-BKTL-SS

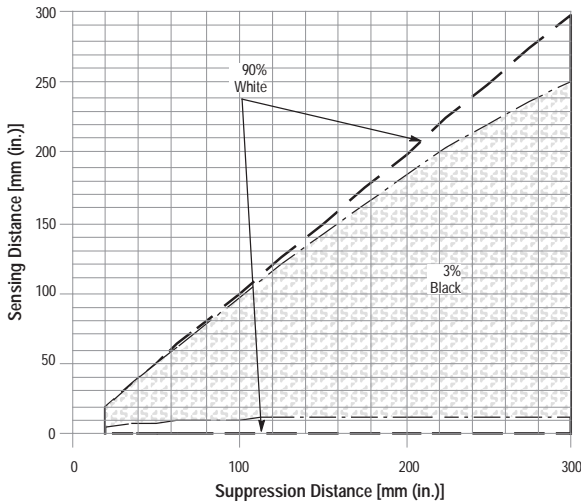
# 44B Adjustable Background and Foreground Suppression

50 mm Rectangular

## Typical Response Curve

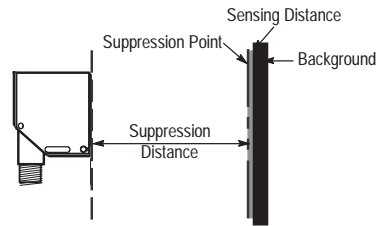


Background Suppression

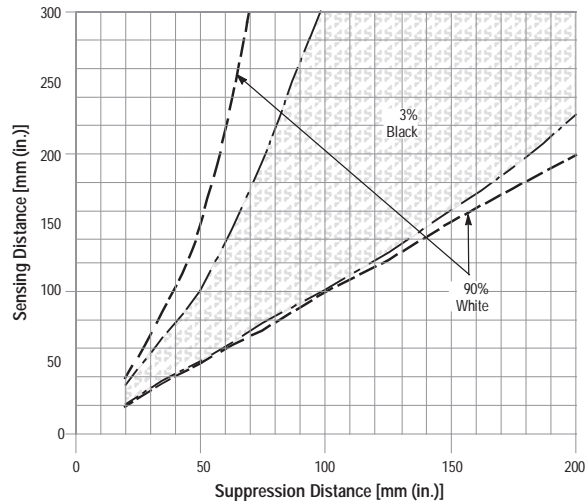


**Example:** With a suppression point set at 200 mm, the sensing distance will be between the sensor face and just under 200 mm for 90% white reflective targets and between 12 mm and 185mm for 3% black reflective targets.

## Typical Response Curve



Foreground Suppression



**Example:** With a suppression point set at 50 mm, the sensing distance will be between just over 50 mm and 150 mm for 90% white reflective targets and between just over 50 mm and 100 mm for 3% black reflective targets.

## Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance (Adjustable)	LED Source	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
<p><b>Background Suppression</b> ① 20 mm spot size @ 300 mm</p>	20...30V DC 22 mA	20...300 mm (0.78...11.8 in)	Infrared 880 nm	Light Operate	PNP and NPN 100 mA 1 ms	4-pin DC micro	<b>44BSB-1JBA1-D4</b>
				Dark Operate			<b>44BSB-1KBA1-D4</b>
<p><b>Foreground Suppression</b> ② 15 mm spot size @ 200 mm</p>		20...200 mm (0.78...7.9 in)		Dark Operate			<b>44BSN-1KBA1-D4</b>
				Light Operate			<b>44BSN-1JBA1-D4</b>

- ① Detection by presence of reflected light from the target.
- ② Detection by absence of reflected light from the background.

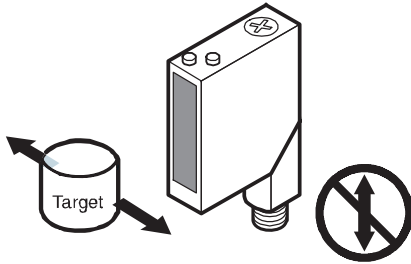


## 44B Adjustable Background and Foreground Suppression

50 mm Rectangular

### Application Notes

1. Due to the detection method used by these sensors, it is important that the sensor be mounted in such a way as to ensure that the target passes in an orientation perpendicular to the sensor's lenses.



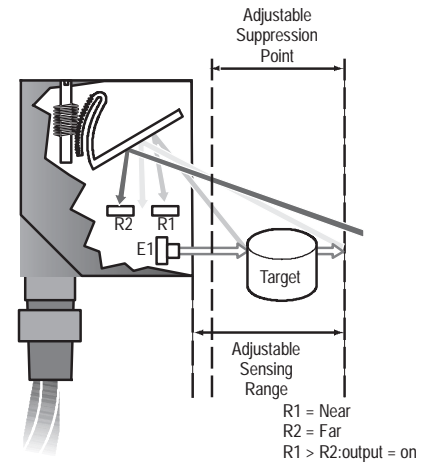
2. For installations with a fixed background up to 300 mm from the 44BSB sensor, set the suppression point to just before the background. If no background is present, set the suppression point to just beyond the target to be sensed so that adequate margin is achieved.
3. Avoid installing the 44BSB sensor directly perpendicular to a mirror-like background. This can cause a false output. If this occurs, use a nonreflective background or angle the sensor or background to minimize this condition.

4. The performance curves for the 44BSN and 44BSB are based on a 90% white and 3% black reflective paper. Use the table below to compare reflectivity levels of various industrial targets.

Target	Typical Relative Reflectivity
Polished aluminum	500
White paper (reference)	100
White typing paper	90
Cardboard	40
Cut lumber	20
Black paper	10
Neoprene	5
Tire rubber	4
Black felt	2

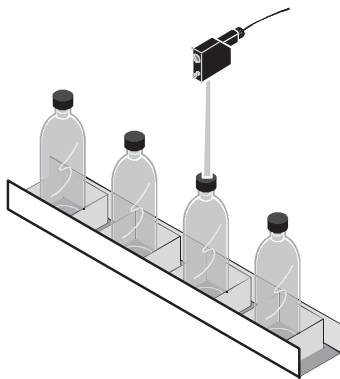
5. For foreground suppression dark operate model (44BSN-1KBA1-D4), the output turns on when a target is detected. For light operate model (44BSN-1JBA1-D4), the output turns off when a target is detected.
6. For background suppression light operate model (44BSB-1JBA1-D4), the output turns on when a target is detected. For dark operate model (44BSB-1KBA1-D4), the output turns off when the target is detected.

### Operation of Adjustable Background Suppression

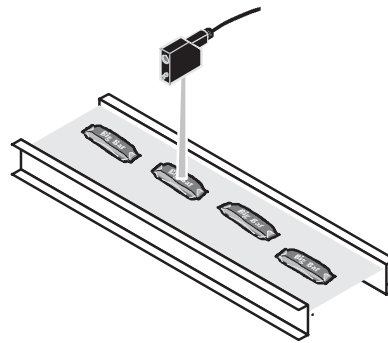


### Application Examples

#### Background Suppression



#### Foreground Suppression



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42BT Long Range Background Suppression**  
 Slim Flatpack



**Features**

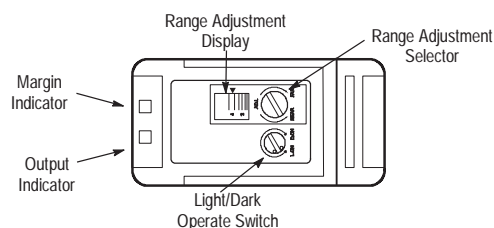
- § Long range background suppression diffuse sensing mode
- § Adjustable range settings
- § Slim flatpack housing design
- § Highly visible LED Indicators
- § Pico QD and 2 m cable versions
- § Both NPN and PNP outputs
- § Short-circuit protected outputs
- § Fast 2 ms response time

**Specifications**

<b>Environmental</b>	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	IP65
Operating Temperature [C (F)]	-5...+55° (+23...+131°)
Vibration	10...55 Hz, 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	35...85%
Ambient Light Immunity	Incandescent light: 3000 lux, sunlight immunity: 10000 lux
<b>Optical</b>	
Sensing Modes	Background suppression
Sensing Range	1 m or 2 m by cat. no.
Field of View	See Product Selection table on page 1-77
Light Source	Visible red LED (650 nm), infrared LED (880 nm)
LED Indicators	See User Interface Panel below
Adjustments	5-turn sensitivity potentiometer
<b>Electrical</b>	
Voltage	12...24V DC
Current Consumption	30 mA
Sensor Protection	Short circuit
<b>Outputs</b>	
Response Time	2 ms max
Output Type	PNP and NPN
Output Mode	Light operate or dark operate selectable
Output Current	100 mA @ 24V DC
Output Leakage Current	0.1 mA max
<b>Mechanical</b>	
Housing Material	Polyarilate
Lens Material	Polyarilate
Connection Types	2 m cable, 4-pin pico (M8) QD on 6-inch pigtail
Supplied Accessories	Screwdriver
Optional Accessories	See mounting brackets and cordsets on page 1-77

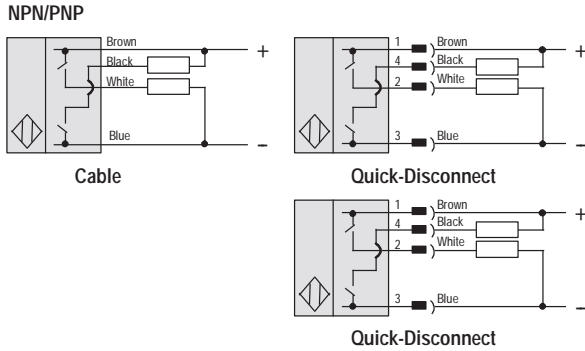
**User Interface Panel**

Label	Color	State	Status
Margin	Green	OFF	Margin < 2.5
		ON	Margin > 2.5
Status	Red	OFF	Output not activated
		ON	Output activated

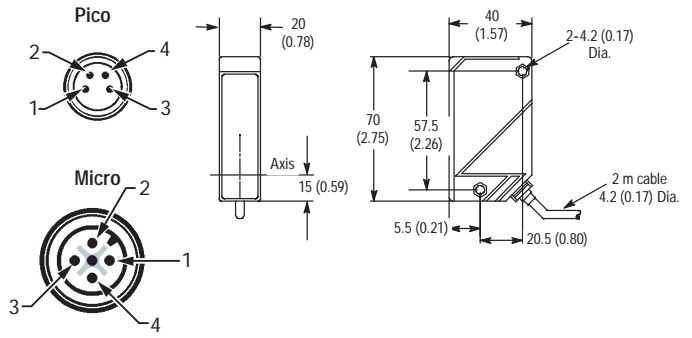


PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42BT Long Range Background Suppression**  
 Slim Flatpack

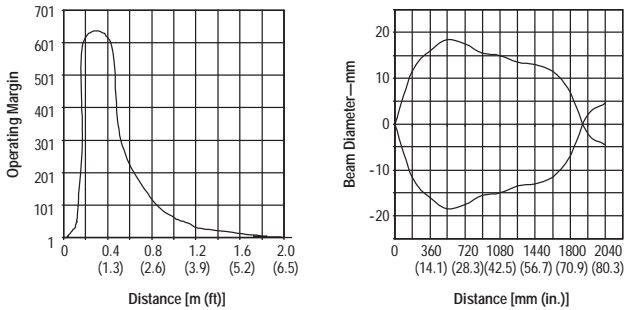
**Wiring Diagrams**



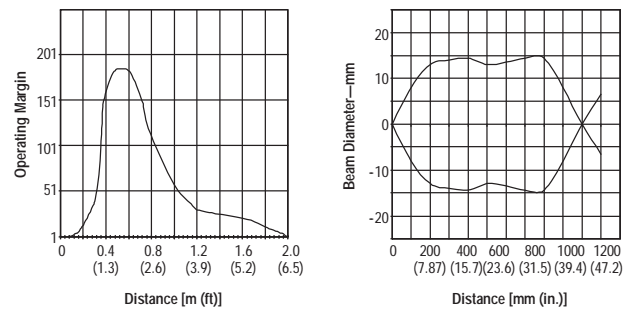
**Approximate Dimensions [mm (in.)]**



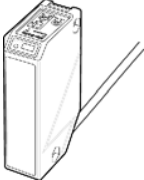
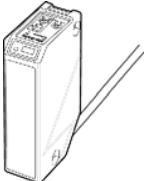
**Typical Response Curve** **Beam Pattern**  
**42BT-B1LBSN**



**Typical Response Curve** **Beam Pattern**  
**42BT-B2LBSL**



**Product Selection**

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	LED Source	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
 Background Suppression Field of View: 1.7_	12...24V DC ± 10% 30 mA	0.2...1 m (0.66...3.3 ft)	Visible Red 650 nm	L.O./D.O. selectable	PNP and NPN 2 ms (max)	2 m 300V cable	42BT-B2LBSL-A2
						4-pin DC micro	42BT-B2LBSL-F4
						4-pin DC pico	42BT-B2LBSL-Y4
 Background Suppression Field of View: 2.8_	12...24V DC ± 10% 30 mA	0.2...2 m (0.66...6.4 ft)	Infrared 880 nm	L.O./D.O. selectable	PNP and NPN 2 ms (max)	2 m 300V cable	42BT-B1LBSN-A2
						4-pin DC micro	42BT-B1LBSN-F4
						4-pin DC pico	42BT-B1LBSN-Y4

**Cordsets and Accessories**

Description	Cat. No.	Description	Cat. No.
2 m (6.5 ft) 4-pin, DC Micro QD Cordset	889D-F4AC-2	Vertical Mounting Bracket	61-6738
2 m (6.5 ft) 4-pin, Pico QD Cordset	889P-F4AB-2	Horizontal Mounting Bracket	61-6739

## 42BC Long Range Background Suppression

### Slim Housing



### Features

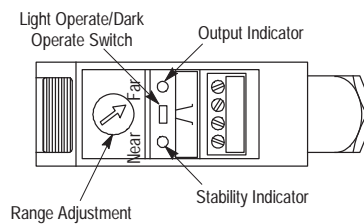
- § Long range background suppression diffuse sensing mode
- § Adjustable range settings
- § Slim housing style
- § Highly visible LED Indicators
- § Screw terminal connections
- § Both NPN and PNP outputs (DC)
- § SPST relay output (AC)
- § Short-circuit protected outputs

### Specifications

Environmental	
Certifications	UL Listed, CSA Certified and CE Marked for all applicable directives
Operating Environment	NEMA 1, 12, 13, IP65
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 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...85%
Ambient Light Immunity	Incandescent light: 3000 lux, sunlight immunity: 10000 lux
Optical	
Sensing Modes	Background suppression
Sensing Range	1 m or 2 m by cat. no.
Field of View	See Product Selection table on page 1-80
Light Source	Infrared LED (880 nm)
LED Indicators	See User Interface Panel below
Adjustments	Sensitivity potentiometer
Electrical	
Voltage	12...24V DC, 24...240V DC
Current Consumption	30 mA
Sensor Protection	Short circuit for DC models, reverse polarity, false pulse, transient
Outputs	
Response Time	20 ms max (DC models), 30 ms max (AC models)
Output Type	PNP and NPN, SPDT N.O. relay (AC models)
Output Mode	Light operate or dark operate selectable
Output Current	100 mA @ 24V DC, 3 A @ 240V AC
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	Polycarbonate
Lens Material	Polycarbonate
Cover Material	Acrylic
Connection Types	Screw terminal, 16 AWG (1.3 mm <sup>2</sup> )
Supplied Accessories	Right angle mounting bracket
Optional Accessories	See mounting brackets and cordsets on page 1-80

### User Interface Panel

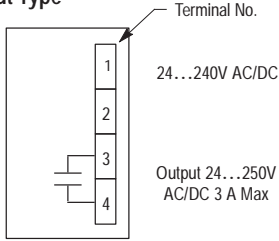
Label	Color	State	Status
Margin	Green	OFF	0.8 < margin < 1.2
		ON	0.8 < margin > 1.2
Output	Red	OFF	Output not activated
		ON	Output activated



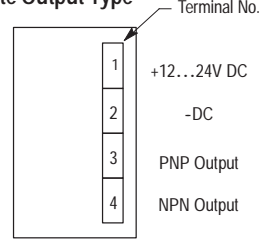
**Wiring Diagrams**

**Terminal Version**

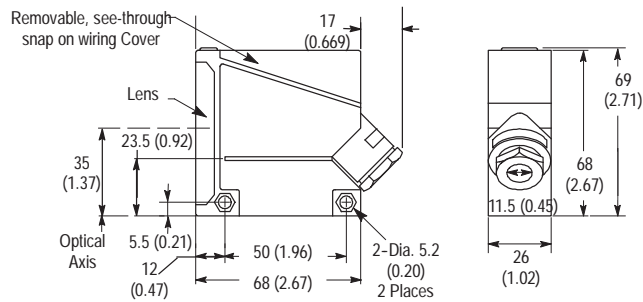
**Relay Output Type**



**Solid-State Output Type**

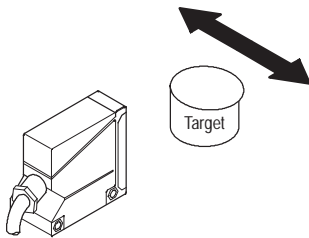


**Approximate Dimensions [mm (in.)]**



**Detection Direction**

Due to the detection method, the sensor must be positioned such that the target passes in the direction illustrated. Motion in up/down direction cannot be detected.



**Minimum Sensing Distances**

Near Setting

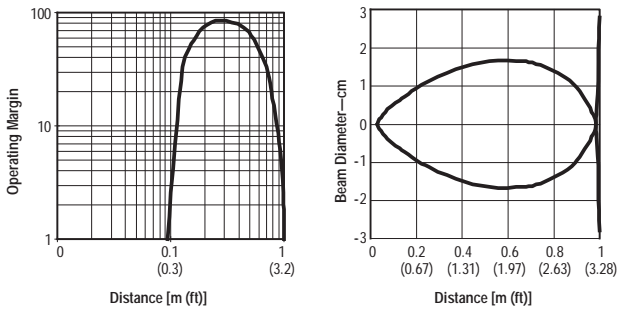
2.5% black 8 cm (3.15 in.) at 2X margin  
 100% white 3 cm (1.18 in.) at 2X margin

Far Setting

2.5% black 20 cm (7.9 in.) at 2X margin  
 100% white 4 cm (1.57 in.) at 2X margin

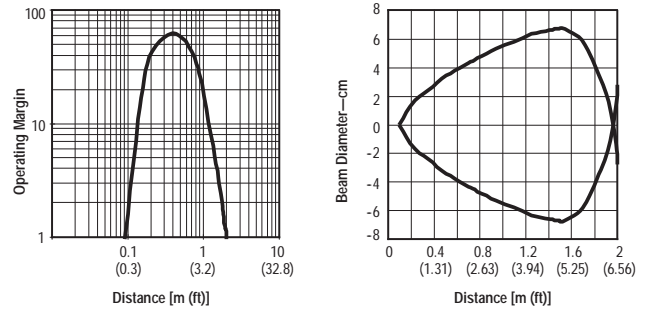
**Typical Response Curve Beam Pattern**

**1 m Background Suppression**



**Typical Response Curve Beam Pattern**

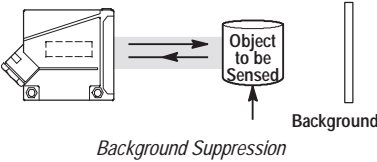
**2 m Background Suppression**



## 42BC Long Range Background Suppression

Slim Housing

### Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
 <p>Background Suppression</p> <p>Field of View: 3.5° Minimum Sensing Distance: 30 mm (1.2 in.) Emitter LED: Infrared 880 nm</p>	12...24V DC ±10% 30 mA	1 m (3.3 ft)	Light/Dark Selectable	NPN/PNP 100 mA 20 ms	Screw terminals accepts up to (2) 16 AWG (1.3 mm sq.) conductors	42BC-B1LBAL-T4
		2 m (6.6 ft)				42BC-B1LBAN-T4
	24...240V AC/DC ±10% 30 mA (DC) 15 mA (AC)	1 m (3.3 ft)		S.P.S.T. N.O. Relay 3 A (250V AC, 750V AC) 3 A (30V DC, 90 W) 30 ms		42BC-B1CRAL-T4
		2 m (6.6 ft)				42BC-B1CRAN-T4

### Cordsets and Accessories

Description	Cat. No.
DC Micro QD Cordset, Straight, 4-pin, 2 m	889D-F4AC-2
Receptacle, 4-pin DC Micro QD	888D-M4AC1-0M3
Mounting Bracket	60-2637
Replacement Cover	60-2669
Receptacle, 4-pin Mini QD	60-2668

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42BA Short Range Background Suppression**  
 Compact Housing



**Specifications**

Environmental	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	NEMA 1, 4, 6P, 12, 13, IP67 (IEC 529)
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 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...85%
Optical	
Sensing Mode	Background suppression
Sensing Range	See Product Selection table on page 1-83
Field of View	See Product Selection table on page 1-83
Light Source	Visible red LED (700 nm), infrared LED (880 nm)
LED Indicators	See User Interface Panel below
Adjustments	Sensitivity potentiometer
Electrical	
Voltage	10...30V DC
Current Consumption	33 mA max
Sensor Protection	Short circuit, reverse polarity, false pulse, transient noise
Outputs	
Response Time	350 μs
Output Type	PNP or NPN by cat. no.
Output Mode	Light operate or dark operate selectable
Output Current	100 mA max @ 24V DC
Output Leakage Current	1 μA max
Mechanical	
Housing Material	Polyarylate (30 mm and 50 mm models) ABS resin (100 mm and 200 mm models)
Lens Material	Polyarylate (30 mm and 50 mm models) Polysulfone (100 mm and 200 mm models)
Connection Types	2 m cable
Supplied Accessories	60-2636 mounting bracket

**Features**

- S Short-range background suppression diffuse sensing mode
- S Adjustable range settings
- S Compact housing style
- S Highly visible LED indicators
- S NPN or PNP output models
- S Diagnostic output
- S Short-circuit protected outputs
- S 2 m cable connection

**User Interface Panel**

Label	Color	State	Status
STB	Green	OFF	0.8 < margin < 1.2
		ON	0.8 < margin > 1.2
OUT	Red	OFF	Output not activated
		ON	Output activated

**Wiring Diagrams**

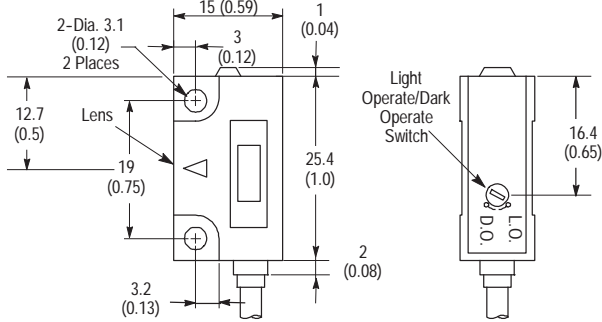


**Note:** Details regarding connection of Rockwell Automation 42BA photoelectric sensors to Rockwell Automation Programmable Controllers can be found in "PHOTOSWITCH<sup>®</sup> Photoelectric Sensors and Programmable Controller Interface Manual" on [www.ab.com/Literature](http://www.ab.com/Literature).

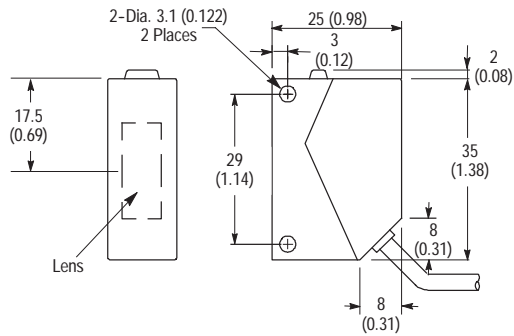
PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**42BA Short Range Background Suppression**  
 Compact Housing

Approximate Dimensions [mm (in.)]

30 mm and 50 mm Sensing Distance Versions



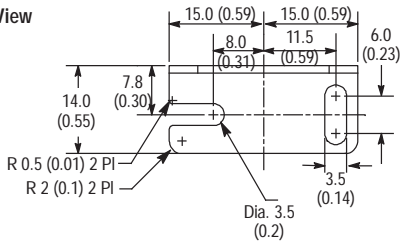
100 mm and 200 mm Sensing Distance Versions



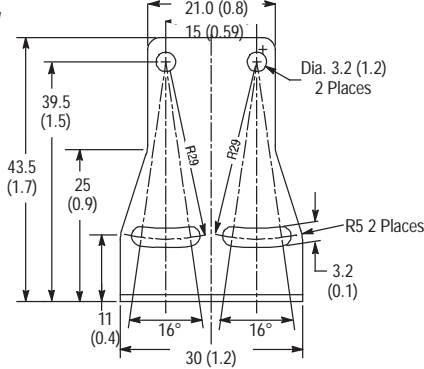
Stainless Steel Mounting Bracket—60-2636

Stainless steel mounting bracket and hardware supplied with all 42BA sensors.

Bottom View



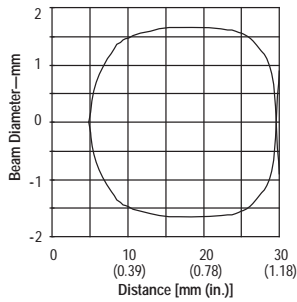
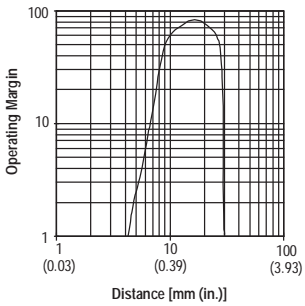
Side View



Note: Replacement mounting assemblies and reflectors available on page 1-293.

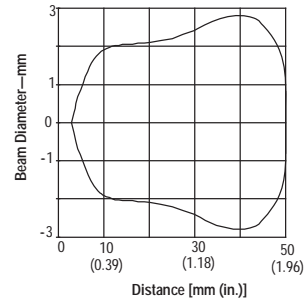
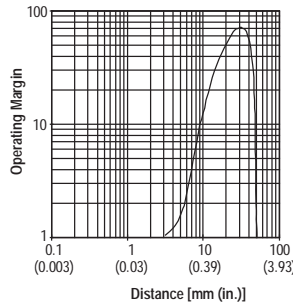
Typical Response Curve Beam Pattern

30 mm

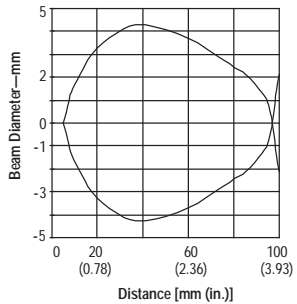
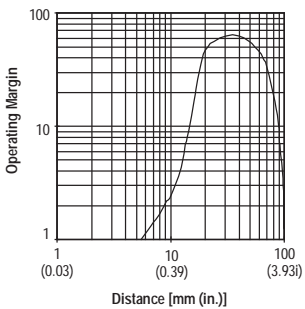


Typical Response Curve Beam Pattern

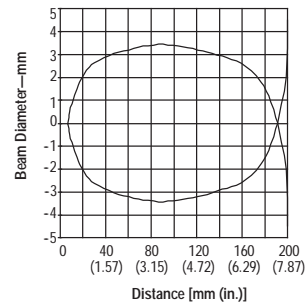
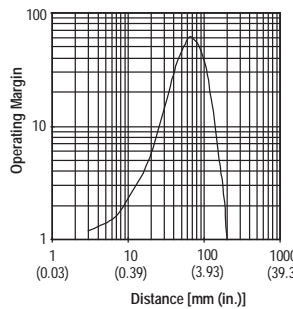
50 mm



100 mm



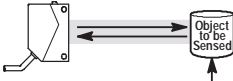
200 mm





PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42BA Short Range Background Suppression**  
 Compact Housing

**Product Selection**

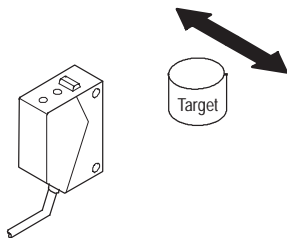
Sensing Mode	Operating Voltage Supply Current	Sensing Distance [mm (in.)]	Field of View	Output Energized	LED Source	Output Type Capacity Response Time	Connection Type	Cat. No.		
	12...24V DC ±10% 27 mA	10...30 (0.39...1.2)	9_	Light/Dark Selectable	Visible red 700 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	2 m 500V cable	42BA-S2LNAA-A2		
	12...24V DC ±10% 30 mA					PNP Output: 100 mA, 350 μs		42BA-S2LPAA-A2		
	12...24V DC ±10% 27 mA	10...50 (0.39...2.0)				NPN Output: 100 mA, Stability: 50 mA 350 μs		42BA-S2LNAC-A2		
	12...24V DC ±10% 30 mA					PNP Output: 100 mA, 350 μs		42BA-S2LPAC-A2		
	12...24V DC ±10% 33 mA	10...100 (0.39...3.9)				NPN Output: 100 mA Stability: 50 mA 350 μs		42BA-S2LNAE-A2		
	12...24V DC ±10% 33 mA					PNP Output: 100 mA 350 μs		42BA-S2LP AE-A2		
	12...24V DC ±10% 30 mA	10...200 (0.39...7.9)				5_		Infrared 880 nm	NPN Output: 100 mA Stability: 50 mA 350 μs	42BA-S1LNAG-A2
	12...24V DC ±10% 33 mA								PNP Output: 100 mA 350 μs	42BA-S1LPAG-A2

**Operating Distance with White Paper**

Min Sensitivity [mm (in.)]	Max Sensitivity [mm (in.)]	Cat. No.
12...25 (0.47...0.98)	2...30 (0.078...1.18)	42BA-S2LNAA-A2 42BA-S2LPAA-A2
9.5...39 (0.37...1.54)	2.7...50 (0.106...1.97)	42BA-S2LNAC-A2 42BA-S2LPAC-A2
17...75 (0.67...2.95)	6...100 (0.24...3.94)	42BA-S2LNAE-A2 42BA-S2LP AE-A2
25...160 (0.98...6.29)	1...200 (0.039...7.87)	42BA-S1LNAG-A2 42BA-S1LPAG-A2

**Detection Direction**

Due to the detection method, the sensor must be positioned such that the target passes in the horizontal direction illustrated.



Motion in the vertical direction cannot be reliably detected.

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 42KA

### Ultra-Miniature Flat Pack



### Features

- § Subminiature package style
- § Three sensing modes
- § Models with and without sensitivity adjustment
- § Highly visible LED Indicators
- § NPN or PNP output models
- § 2 m cable connection

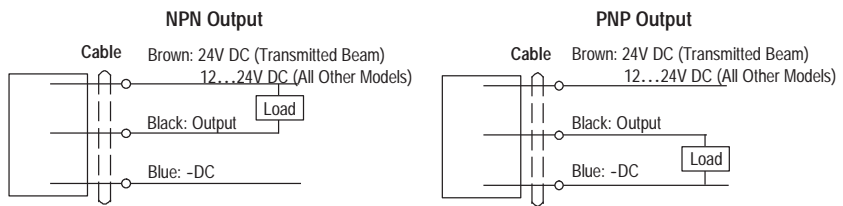
### Specifications

Environmental	
Certifications	UL Listed, CSA Approved, and CE Marked for all applicable directives
Operating Environment	NEMA 1, IP40
Operating Temperature [C(F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60068-2-27
Relative Humidity	5...85%
Optical	
Sensing Modes	Diffuse, sharp cutoff, transmitted beam
Sensing Range	See Product Selection table on page 1-91
Field of View	See Product Selection table on page 1-91
Light Source	Visible red LED (660 nm)
LED Indicators	See User Interface below
Adjustments	See Product Selection table on page 1-91
Electrical	
Voltage	12...24V DC
Current Consumption	30 mA max
Sensor Protection	Reverse polarity for standard diffuse without adjustment, transient noise
Outputs	
Response Time	500 μS
Output Type	PNP or NPN by cat. no.
Output Mode	See Product Selection table on page 1-91
Output Current	80 mA @ 24V DC
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	Polyester
Lens Material	Polycarbonate
Connection Types	2 m cable

### User Interface Panel

Label	Color	State	Status
STB	Green	OFF	0.8<math><1.2</math>
		ON	0.8>math>>1.2</math>
OUT	Red	OFF	Output not activated
		ON	Output activated

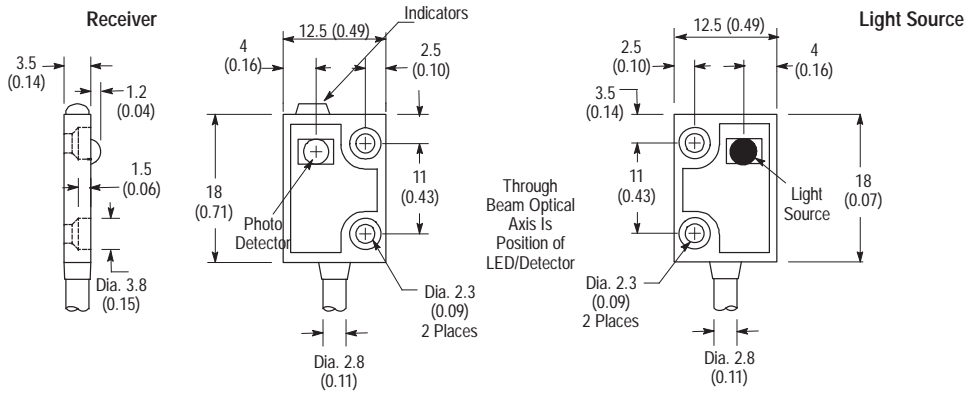
### Wiring Diagrams



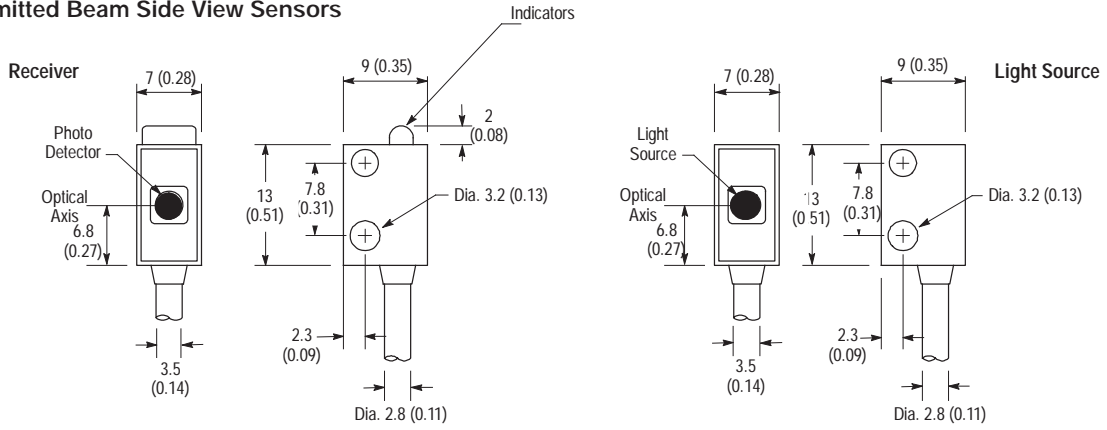
**Note:** Details regarding connection of Rockwell Automation Bulletin 42KA photoelectric sensors to Rockwell Automation Programmable Controllers can be found in publication 42-2.0.

Approximate Dimensions [mm (in.)]

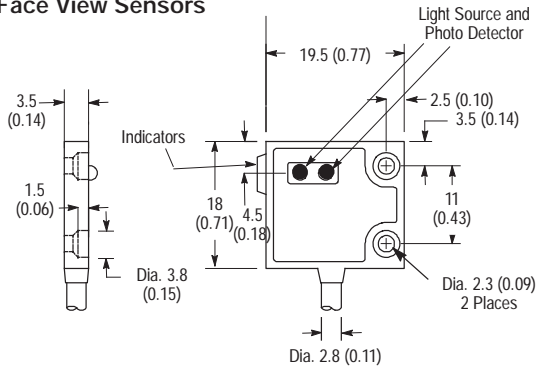
Transmitted Beam Face View Sensors



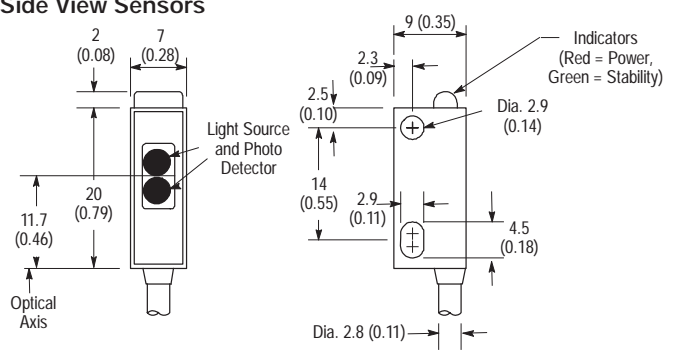
Transmitted Beam Side View Sensors



Face View Sensors

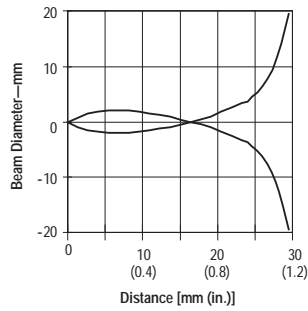
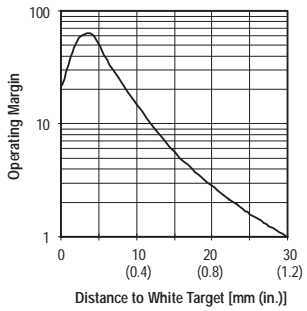


Side View Sensors



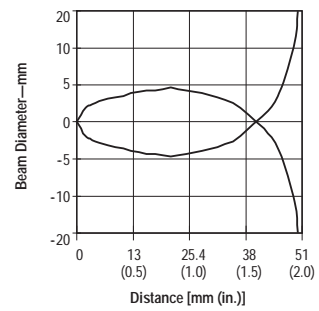
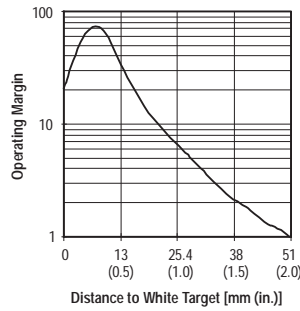
**Typical Response Curve Beam Pattern**

Standard Diffuse—30 mm

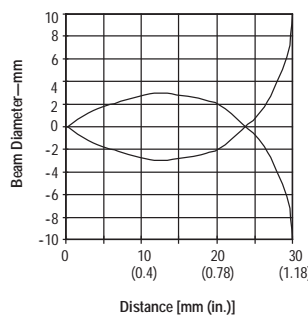
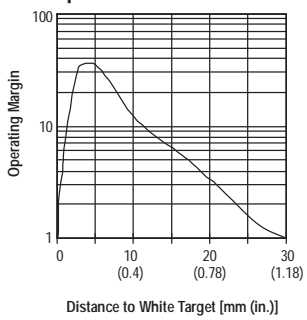


**Typical Response Curve Beam Pattern**

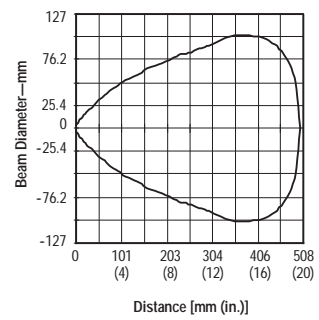
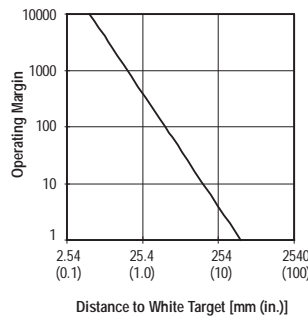
Standard Diffuse—50 mm



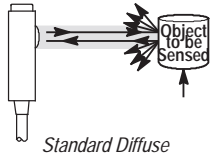
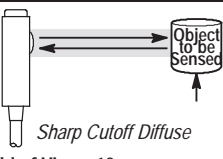
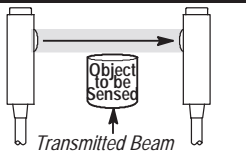
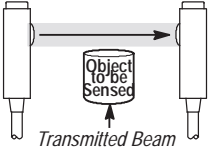
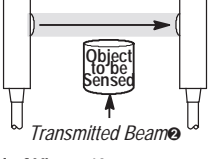
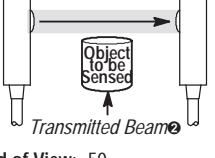
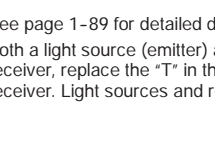
**Sharp Cutoff Diffuse**



**Transmitted Beam**



Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energy	Output Type Capacity Response Time	Face or Side View ❶	Sensitiv. Adjust.	Connection Type	Cat. No.
 Standard Diffuse Field of View: 18_° Emitter LED: Visible red 660 nm Face or Side View: Face View	12...24V DC ±10% 20 mA	3...50 mm (0.12... 2.0 in.)	Light	NPN 80 mA 0.5 ms	Face	No	2 m 500V cable	42KA-D2JNHC-A2
	12...24V DC ±10% 29 mA			PNP 80 mA 0.5 ms				42KA-D2JPHC-A2
	12...24V DC ±10% 27 mA			NPN 80 mA 0.5 ms	Face	Yes		42KA-D2JNFC-A2
	12...24V DC ±10% 29 mA			PNP 80 mA 0.5 ms				42KA-D2JPFC-A2
 Sharp Cutoff Diffuse Field of View: 18_° Emitter LED: Red 660 nm	12...24V DC ±10% 27 mA	3...30 mm (0.12... 1.2 in.)	Light Operate	NPN 80 mA 0.5 ms	Side	Yes	2 m 500V cable	42KA-S2JNSA-A2
	12...24V DC ±10% 29 mA			PNP 80 mA 0.5 ms				42KA-S2JPSA-A2
 Transmitted Beam Field of View: 40_° Emitter LED: Red 660 nm	24V DC ±10% Source: 15 mA Receiver: 15 mA	3...500 mm (0.12... 19.7 in.)	Dark	NPN 80 mA 0.5 ms	Face	No	2 m 500V cable	42KA-T2KNHK-A2
					Side			42KA-T2KNTK-A2
 Transmitted Beam Field of View: 50_° Emitter LED: Red 660 nm	24V DC ±10% Source: 15 mA Receiver: 22 mA			Face	Yes	42KA-T2KNFK-A2		
						42KA-T2KNFK-A2		
 Transmitted Beam Field of View: 40_° Emitter LED: Red 660 nm	24V DC ±10% Source: 15 mA Receiver: 17 mA	Face	No	42KA-T2KPHK-A2				
				42KA-T2KPHK-A2				
 Transmitted Beam Field of View: 50_° Emitter LED: Red 660 nm	24V DC ±10% Source: 15 mA Receiver: 24 mA	Side	Yes	42KA-T2KPTK-A2				
				42KA-T2KPTK-A2				
 Transmitted Beam Field of View: 50_° Emitter LED: Red 660 nm	24V DC ±10% Source: 15 mA Receiver: 24 mA	Face	Yes	42KA-T2KPFK-A2				
				42KA-T2KPFK-A2				

❶ See page 1-89 for detailed dimensions.

❷ Both a light source (emitter) and receiver are included in the package. To identify the light source, replace the "T" in the cat. no. with "E." To identify the receiver, replace the "T" in the cat. no. with "R." Example: 42KA-T2KNHK-A2 contains one 42KA-E2KNHK-A2 light source and one 42KA-R2KNHK-A2 receiver. Light sources and receivers are not available separately.

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 42KB

### Micro Rectangular



### Features

- § Compact rectangular package
- § Four sensing modes
- § Sensitivity adjustment
- § Selectable light/dark operate
- § Highly visible LED Indicators
- § NPN or PNP output models
- § 2 m cable or pico connections

### Specifications

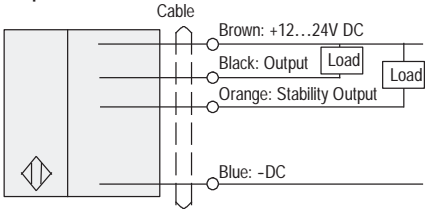
Environmental	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	NEMA 1, 4, 6, 12, 13; IP67 (IEC 60529)
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	5...85%
Optical	
Sensing Mode	Retroreflective, diffuse, sharp cutoff diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-95
Field of View	See Product Selection table on page 1-95
Light Source	Visible red LED (660 nm), infrared LED (880 nm)
LED Indicators	See User Interface Panel below
Adjustments	Sensitivity potentiometer
Electrical	
Voltage	12...24V DC
Current Consumption	30 mA max
Sensor Protection	Short circuit (NPN models only), reverse polarity, false pulse, transient noise
Outputs	
Response Time	350 μs
Output Type	PNP or NPN by cat. no., stability output for NPN models only
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 24V DC
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	Polyarylate
Lens Material	Acrylic, polycarbonate, polyarylate by cat. no.
Connection Types	2 m cable, 3-pin DC pico (M8) QD
Supplied Accessories	Mounting bracket, adhesive apertures (transmitted beam models), screwdriver, reflector (retroreflective models)
Optional Accessories	See mounting brackets and cordsets on page 1-97

### User Interface Panel

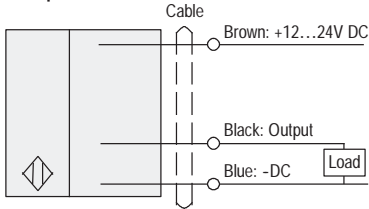
Label	Color	State	Status
STB	Green	OFF	0.8<math><1.2</math>
		ON	0.8>math>>1.2</math>
OUT	Red	OFF	Output not activated
		ON	Output activated

Wiring Diagrams

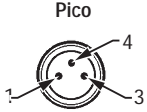
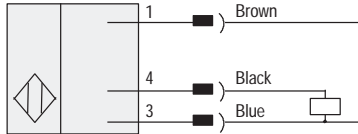
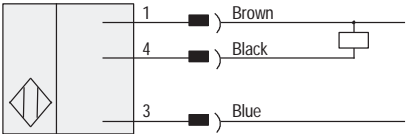
Cable NPN Output



Cable PNP Output



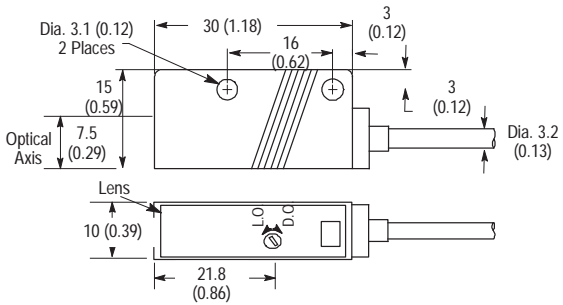
Quick-Disconnect



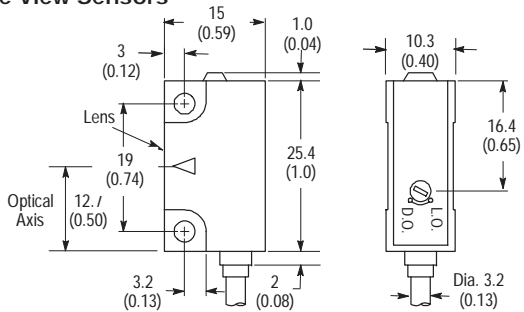
Note: Details regarding connection of Rockwell Automation Bulletin 42KB photoelectric sensors to Rockwell Automation Programmable Controllers can be found in "PHOTOSWITCH<sup>®</sup> Photoelectric Sensors and Programmable Controller Interface Manual" on www.ab.com/literature.

Approximate Dimensions [mm (in.)]

End View Sensors

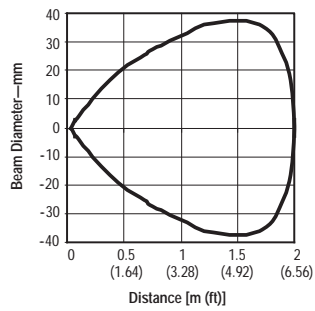
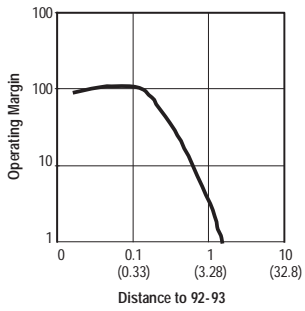


Side View Sensors



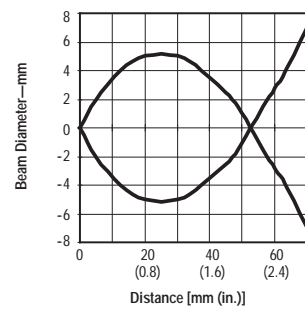
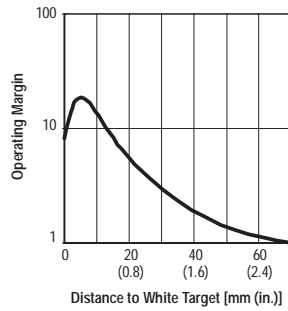
Typical Response Curve Beam Pattern

Retroreflective

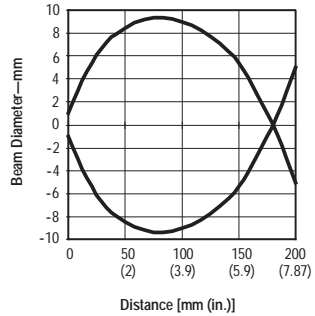
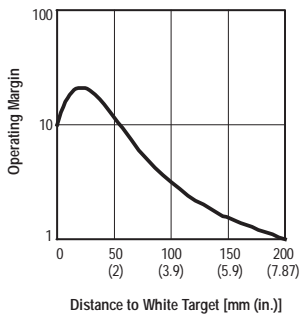


Typical Response Curve Beam Pattern

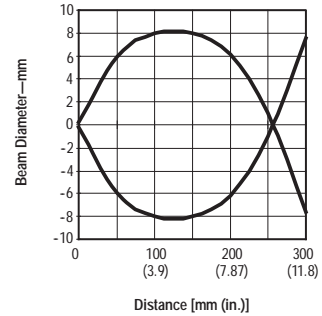
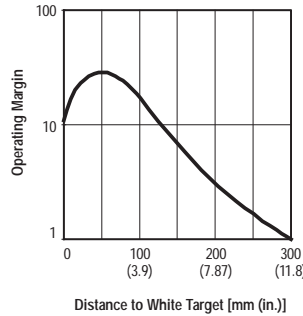
Standard Diffuse—70 mm



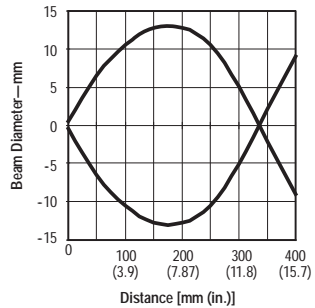
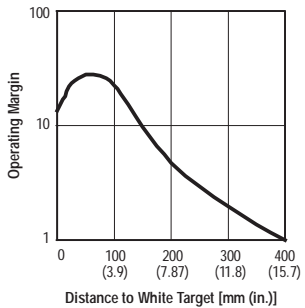
Standard Diffuse—200 mm



Standard Diffuse—300 mm



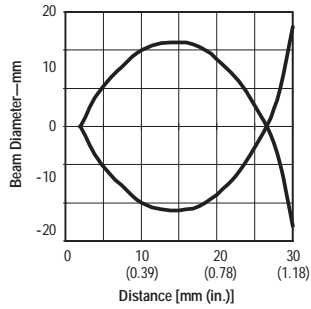
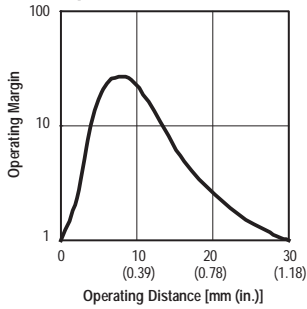
Standard Diffuse—400 mm





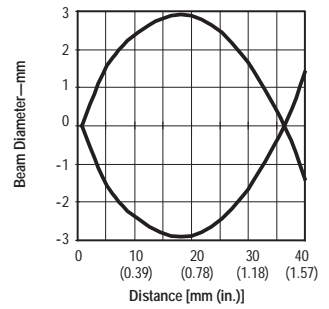
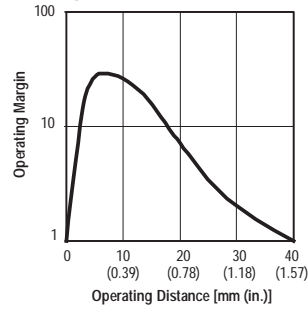
Typical Response Curve Beam Pattern

Sharp Cutoff Diffuse—30 mm

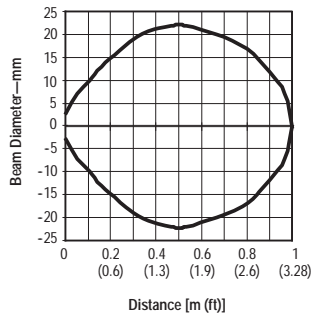
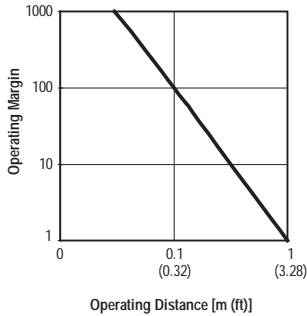


Typical Response Curve Beam Pattern

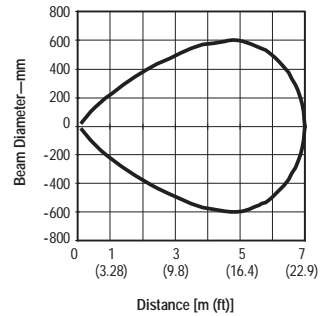
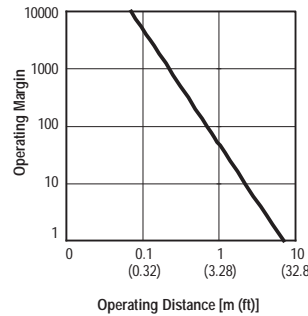
Sharp Cutoff Diffuse—40 mm



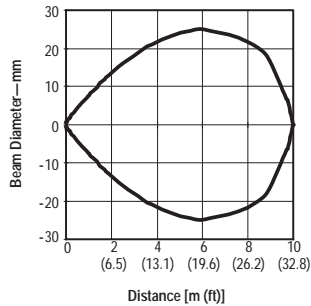
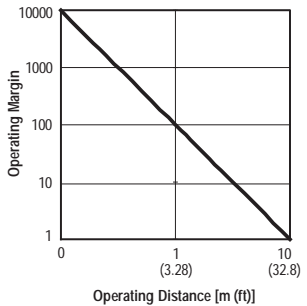
Transmitted Beam—1 m



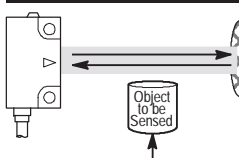
Transmitted Beam—7 m



Transmitted Beam—10 m



Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	LED Source	Output Type Capacity Response Time	End or Side View	Connection Type	Cat. No.
 <p>Retroreflective</p> <p>Field of View: 5°</p> <p>Emitter LED: Visible red 660 nm</p>	12...24V DC ±10% 20 mA	3 mm... 2 m (0.12 in... 6.6 ft)	Light/Dark Selectable	—	NPN Output: 100 mA Stability: 50 mA 350 μs	Side	2 m 500V cable	42KB-U2LNSN-A2
							3-pin pico	42KB-U2LNSN-Y3
	12...24V DC ±10% 25 mA						2 m 500V cable	42KB-U2LPSN-A2
							3-pin pico	42KB-U2LPSN-Y3


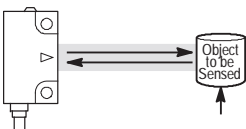
Refer to page 1-97 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

42KB

Micro Rectangular

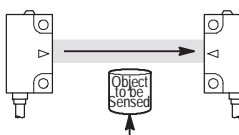
Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance [mm (in.)]	Output Energized	LED Source	Output Type Capacity Response Time	End or Side View <sup>①</sup>	Connection Type	Cat. No.	
 <p><i>Standard Diffuse</i></p> <p>Field of View: 50 mm Infrared sensors: 20_; All others: 12_ Emitter LED: See Product Selection</p>	12...24V DC ±10% 25 mA	3...70 (0.12...2.8)	Light/Dark Selectable	IR 950 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	End	2 m 500V cable	42KB-D1LNED-A2	
							3-pin pico	42KB-D1LNED-Y3	
	12...24V DC ±10% 28 mA	3...70 (0.12...2.8)	Light/Dark Selectable	IR 950 nm	PNP Output: 100 mA 350 μs	End	2 m 500V cable	42KB-D1LPED-A2	
							3-pin pico	42KB-D1LPED-Y3	
	12...24V DC ±10% 22 mA	3...200 (0.12...7.9)	Light/Dark Selectable	IR 900 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	End	2 m 500V cable	42KB-D1LNEG-A2	
							3-pin pico	42KB-D1LNEG-Y3	
	12...24V DC ±10% 25 mA	3...200 (0.12...7.9)	Light/Dark Selectable	IR 900 nm	PNP Output: 100 mA 350 μs	End	2 m 500V cable	42KB-D1LPEG-A2	
							3-pin pico	42KB-D1LPEG-Y3	
	12...24V DC ±10% 20 mA	3...300 (0.12...11.8)	Light/Dark Selectable	Red 700 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	End	2 m 500V cable	42KB-D2LNEH-A2	
							3-pin pico	42KB-D2LNEH-Y3	
	12...24V DC ±10% 25 mA	3...300 (0.12...11.8)	Light/Dark Selectable	Red 700 nm	PNP Output: 100 mA 350 μs	End	2 m 500V cable	42KB-D2LPEH-A2	
							3-pin pico	42KB-D2LPEH-Y3	
12...24V DC ±10% 22 mA	3...400 (0.12...15.8)	Light/Dark Selectable	IR 900 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	Side	2 m 500V cable	42KB-D1LNSH-A2		
						3-pin pico	42KB-D1LNSH-Y3		
12...24V DC ±10% 25 mA	3...400 (0.12...15.8)	Light/Dark Selectable	IR 900 nm	PNP Output: 100 mA 350 μs	Side	2 m 500V cable	42KB-D1LPSH-A2		
						3-pin pico	42KB-D1LPSH-Y3		
12...24V DC ±10% 20 mA	3...400 (0.12...15.8)	Light/Dark Selectable	Red 700 nm	NPN Output: 100 mA, Stability: 50 mA 350 μs	Side	2 m 500V cable	42KB-D2LNSG-A2		
						3-pin pico	42KB-D2LNSG-Y3		
12...24V DC ±10% 25 mA	3...400 (0.12...15.8)	Light/Dark Selectable	Red 700 nm	PNP Output: 100 mA 350 μs	Side	2 m 500V cable	42KB-D2LPSG-A2		
						3-pin pico	42KB-D2LPSG-Y3		
 <p><i>Sharp Cutoff Diffuse</i></p> <p>Field of View: Infrared sensors: 15_; Visible red sensors: 20_ Emitter LED: Infrared 900 nm or Visible red 660 nm (See Product Selection)</p>	12...24V DC ±10% 20 mA	3...30 (0.12...1.2)	Light/Dark Selectable	Red 660 nm	NPN Output: 100 mA Stability: 50 mA 350 μs	Side	2 m 500V cable	42KB-S2LNSA-A2	
							3-pin pico	42KB-S2LNSA-Y3	
	12...24V DC ±10% 22 mA	3...40 (0.12...1.6)	Light/Dark Selectable	IR 900 nm	Red 660 nm	NPN Output: 100 mA Stability: 50 mA 350 μs	Side	2 m 500V cable	42KB-S1LNSB-A2
								3-pin pico	42KB-S1LNSB-Y3
	12...24V DC ±10% 25 mA	3...30 (0.12...1.2)	Light/Dark Selectable	IR 900 nm	Red 660 nm	PNP Output: 100 mA 350 μs	Side	2 m 500V cable	42KB-S2LPSA-A2
								3-pin pico	42KB-S2LPSA-Y3
12...24V DC ±10% 25 mA	3...40 (0.12...1.6)	Light/Dark Selectable	IR 900 nm	Red 660 nm	PNP Output: 100 mA 350 μs	Side	2 m 500V cable	42KB-S1LPSB-A2	
							3-pin pico	42KB-S1LPSB-Y3	

① See page 1-93 for detailed dimensions.

Refer to page 1-97 for cordsets and accessories.

Product Selection (continued)

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	LED Source	Output Type Capacity Response Time	End or Side View <sup>①</sup>	Connection Type	Cat. No.			
 <p>Transmitted Beam<sup>②</sup></p> <p>Field of View: 1 m sensors: 50°; All others: 24° Emitter LED: Infrared 880 nm or Visible red 700 nm (See Product Selection)</p>	12...24V DC ±10% Source: 23 mA Receiver: 18 mA	3 mm...1 m (0.12 in... 3.2 ft)	Light/Dark Selectable	IR 880 nm	NPN Output: 100 mA, Stability: 50 mA 350 µs	End	2 m 500V cable	42KB-T1LNEL-A2 <sup>③</sup>			
							3-pin pico	42KB-T1LNEL-Y3			
		Side				2 m 500V cable	42KB-T1LNLSL-A2 <sup>③④</sup>				
						3-pin pico	42KB-T1LNLSL-Y3				
		End				2 m 500V cable	42KB-T1LNEQ-A2				
						3-pin pico	42KB-T1LNEQ-Y3				
	Side	12...24V DC ±10% Source: 20 mA Receiver: 18 mA		3 mm...7 m (0.12 in... 23 ft)	Red 700 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T1LNSQ-A2 <sup>③</sup>			
								3-pin pico	42KB-T1LNSQ-Y3		
				2 m 500V cable			42KB-T2LNSR-A2 <sup>③</sup>				
							3-pin pico	42KB-T2LNSR-Y3			
				End			3 mm...1 m (0.12 in... 3.2 ft)	IR 880 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T1LPEL-A2 <sup>③</sup>
											3-pin pico
Side	3 mm...7 m (0.12 in... 23 ft)	IR 880 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T1LPSL-A2 <sup>③④</sup>						
					3-pin pico	42KB-T1LPSL-Y3					
End	3 mm...7 m (0.12 in... 23 ft)	IR 880 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T1LPEQ-A2						
					3-pin pico	42KB-T1LPEQ-Y3					
Side	3 mm...10 m (0.12 in... 32.8 ft)	Red 700 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T1LPSQ-A2 <sup>③</sup>						
					3-pin pico	42KB-T1LPSQ-Y3					
Side	3 mm...10 m (0.12 in... 32.8 ft)	Red 700 nm	PNP Output: 100 mA 350 µs	2 m 500V cable	42KB-T2LPSR-A2 <sup>③</sup>						
					3-pin pico	42KB-T2LPSR-Y3					

- ① See page 1-93 for detailed dimensions.
- ② Adhesive 1 mm apertures are included with these sensors.
- ③ Optional metal apertures are available for these sensors under Accessories .
- ④ Both a light source (emitter) and receiver are included in the package. To identify the light source, replace the "T" in the cat. no. with "E." To identify the receiver, replace the "T" in the cat. no. with "R." Example: 42KB-T2KNHK-A2 contains one 42KB-E2KNHK-A2 light source and one 42KB-R2KNHK-A2 receiver. Light sources and receivers are not available separately.

Maximum Operating Distance with Apertures

Aperture Cat. No.				Sensor Cat. No.	
61-6726	61-6727	61-6728	61-6729		
100 mm (3.93 in.)	300 mm (11.8 in.)	400 mm (15.7 in.)	300 mm (11.8 in.)	42KB-T1LNLSL-A2	42KB-T1LPSL-A2
400 mm (1.57 in.)	1 m (39.3 in.)	3 m (9.8 ft)	2 m (6.56 ft)	42KB-T2LNSR-A2	42KB-T2LPSR-A2
300 mm (11.8 in.)	1 m (39.3 in.)	2.5 m (8.2 ft)	1.7 m (5.6 ft)	42KB-T1LNSQ-A2	42KB-T1LPSQ-A2

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.
Pico QD Cordset, 3-pin 2 m	889P-F3AB-2	Aperture, 2 mm (10 pcs)	61-6727
End View Bracket (included)	60-2632	Aperture, 3 mm (10 pcs)	61-6728
Side View Bracket (included)	60-2633	Aperture, 1 x 5 mm (10 pcs)	61-6729
Aperture, 1 mm (10 pcs)	61-6726	Reflectors (included)	92-93

# PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

## 42KC

### Miniature Rectangular



#### Features

- § Compact rectangular package
- § Three sensing modes
- § Diagnostic output
- § Sensitivity adjustment
- § Selectable light/dark operate
- § Highly visible LED indicators
- § NPN or PNP output models
- § 2 m cable or pico connections

#### Specifications

Environmental	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	NEMA 1, 4X, 6P, 12, 13; IP67
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 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...85%
Optical	
Sensing Mode	Polarized retroreflective, diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-101
Field of View	See Product Selection table on page 1-101
Light Source	Visible red LED (700 nm)
LED Indicators	See User Interface Panel below
Electrical	
Voltage	12...24V DC
Current Consumption	35 mA max
Sensor Protection	Short circuit (NPN models only), reverse polarity, false pulse, transient noise
Outputs	
Response Time	350 μS
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 24V DC
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	Polyarylate
Lens Material	Acrylic
Connection Types	2 m cable, 4-pin DC pico (M8) OD
Supplied Accessories	Mounting bracket, screwdriver, reflector (retroreflective models)
Optional Accessories	See mounting brackets and cordsets on page 1-101

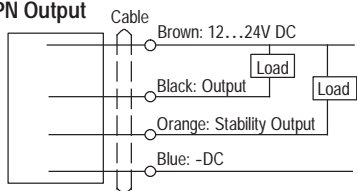
#### User Interface Panel

Label	Color	State	Status
STB	Green	OFF	0.8<math><1.2</math>
		ON	0.8>math>>1.2</math>
OUT	Red	OFF	Output not activated
		ON	Output activated

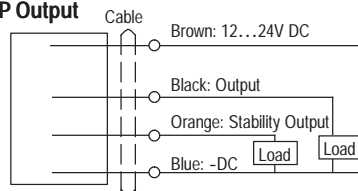
**Wiring Diagrams**

**Cable Version**

**NPN Output**



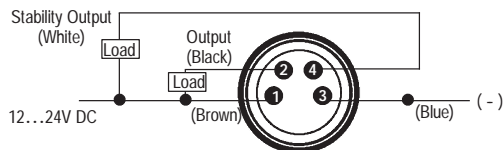
**PNP Output**



**Pico Quick-Disconnect Version**

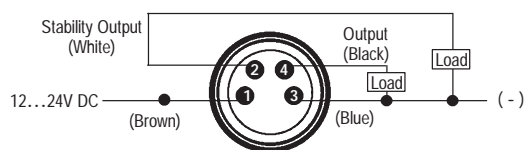
**NPN Output**

**Face View Male Receptacle (Sensor)**



**PNP Output**

**Face View Male Receptacle (Sensor)**

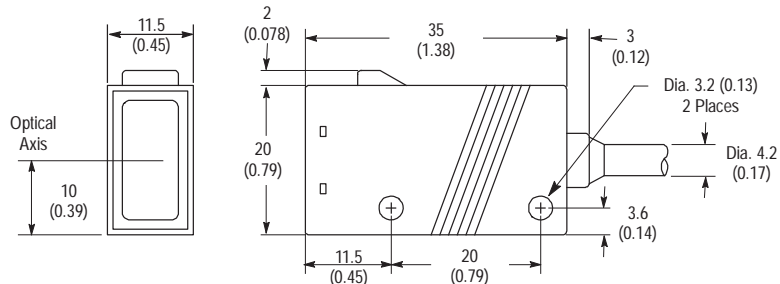


**Note:** Details regarding connection of Rockwell Automation Bulletin 42KC photoelectric sensors to Rockwell Automation Programmable Controllers can be found in publication 42-2.0.

**Approximate Dimensions [mm (in.)]**

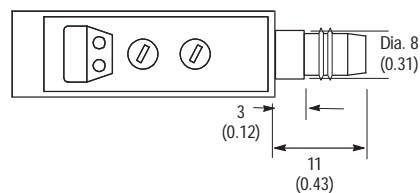
**End View Sensors**

**Cable Version**



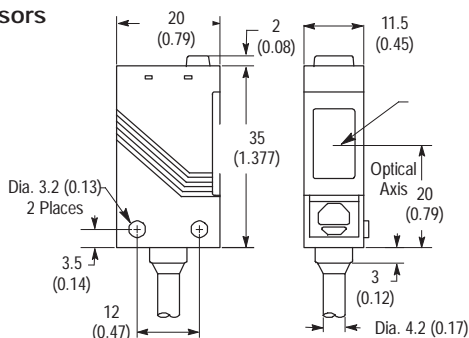
**End View Sensors**

**Pico Quick-Disconnect Version**



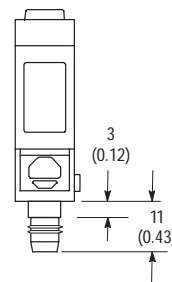
**Side View Sensors**

**Cable Version**



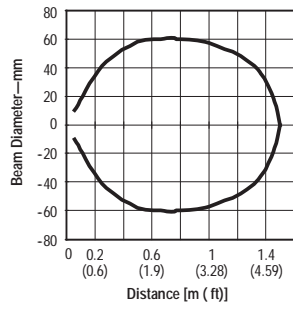
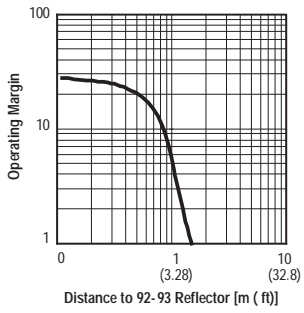
**Side View Sensors**

**Pico Quick-Disconnect Version**



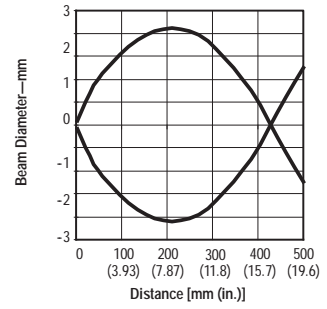
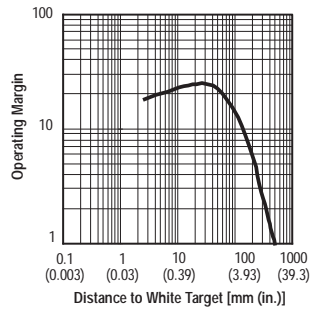
**Typical Response Curve**   **Beam Pattern**

**Polarized Retroreflective**

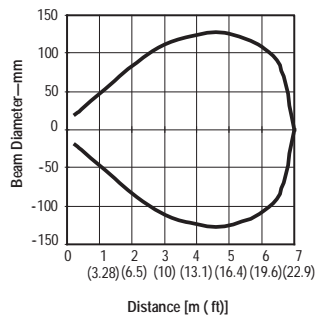
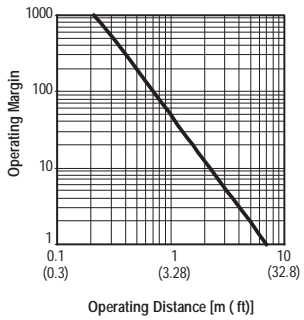


**Typical Response Curve**   **Beam Pattern**

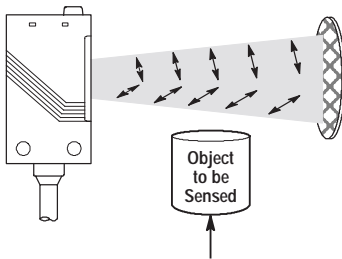
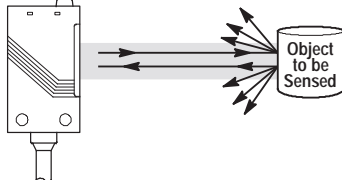
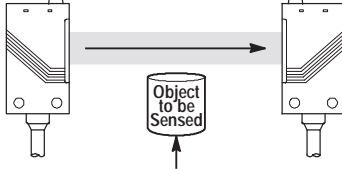
**Standard Diffuse**



**Transmitted Beam**



Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	End or Side View <sup>①</sup>	Connection Type	Cat. No.			
 <p><i>Polarized Retroreflective</i></p> <p>Field of View: 8_</p> <p>Emitter LED: Visible red 700 nm</p>	12...24V DC ±10% 30 mA	50 mm... 1.5 m (1.9 in... 4.9 ft)	Light/Dark Selectable	NPN Output: 100 mA Stability: 50 mA 0.5 ms	End	2 m 500V cable	42KC-P2LNEM-A2			
	Side					4-pin pico	42KC-P2LNEM-P4			
					End	2 m 500V cable	42KC-P2LPEM-A2			
	Side					4-pin pico	42KC-P2LPEM-P4			
	End				12...24V DC ±10% 35 mA	5V DC ± 10% 25 mA	NPN Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-P2YNSM-A2
					Side				4-pin pico	42KC-P2YNSM-P4
 <p><i>Standard Diffuse</i></p> <p>Field of View: 7_</p> <p>Emitter LED: Visible red 700 nm</p>	12...24V DC ±10% 30 mA	3...500 mm (0.12... 19.7 in.)	Light/Dark Selectable	NPN Output: 100 mA Stability: 50 mA 0.5 ms	End	2 m 500V cable	42KC-D2LNEK-A2			
	Side					4-pin pico	42KC-D2LNEK-P4			
					End	12...24V DC ±10% 35 mA	NPN Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-D2LNSK-A2
	Side					4-pin pico			42KC-D2LNSK-P4	
	End				12...24V DC ±10% 35 mA	PNP Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-D2LPEK-A2	
								Side	4-pin pico	42KC-D2LPEK-P4
 <p><i>Transmitted Beam<sup>②</sup></i></p> <p>Field of View: 10_</p> <p>Emitter LED: Visible red 700 nm</p>	12...24V DC ±10% Source: 20 mA Receiver: 20 mA	50 mm... 7 m (1.9 in... 23.0 ft)	Light/Dark Selectable	NPN Output: 100 mA Stability: 50 mA 0.5 ms	End	2 m 500V cable	42KC-T2LNGP-A2			
	Side					4-pin pico	42KC-T2LNGP-P4			
					End	12...24V DC ±10% Source: 20 mA Receiver: 25 mA	NPN Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-T2LNTP-A2
	Side					4-pin pico			42KC-T2LNTP-P4	
	End				12...24V DC ±10% Source: 20 mA Receiver: 25 mA	PNP Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-T2LPGP-A2	
								Side	4-pin pico	42KC-T2LPGP-P4
End	12...24V DC ±10% Source: 20 mA Receiver: 25 mA	PNP Output: 100 mA Stability: 50 mA 0.5 ms	Side	2 m 500V cable	42KC-T2LPTP-A2					
				Side	4-pin pico	42KC-T2LPTP-P4				

① See page 1-99 for detailed dimensions.

② Both a light source (emitter) and receiver are included in the package. To identify the light source, replace the "T" in the cat. no. with "E." To identify the receiver, replace the "T" in the cat. no. with "R." Example: 42KC-T2LNGP-A2 contains one 42KC-E2LNGP-A2 light source and one 42KC-R2LNGP-A2 receiver. Light sources and receivers are not available separately.

Cordsets and Accessories

Description	Cat. No.
Pico QD Cordset, 4-pin 2 m	889P-F4AB-2
End View Bracket	60-2634
Side View Bracket	60-2635
Reflectors (included)	92-93

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**Series 7000**

Miniature Rectangular

---

Obsolete



Obsolete

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**Series 7000**

Miniature Rectangular

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Obsolete

Obsolete

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**Series 7000**

Miniature Rectangular

---

Obsolete

Obsolete

**LaserSight<sup>†</sup> RightSight<sup>†</sup>**

18 mm Right Angle



**Features**

- S Class 1 eye safe visible laser
- S Models with teach function
- S Compact right angle housing
- S Flexible 18 mm mounting options
- S 360\_ visible LED indicators
- S Reverse polarity protection
- S Short-circuit protected outputs
- S 1 ms response time
- S False pulse protection
- S NPN and PNP outputs

**Specifications**

Environmental	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	IP54 (IEC 60529)
Operating Temperature [C (F)]	-10...+40° (14...+104°)
Vibration	10...55 Hz, 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)
Optical	
Sensing Modes	Polarized retroreflective, diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-111
Field of View	See Product Selection table on page 1-111
Light Source	Class 1 visible red laser (660 nm)
LED Indicators	See User Interface below
Electrical	
Voltage	24V DC ± 10%
Current Consumption	30 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	1 ms (4 ms for transmitted beam)
Output Type	PNP and NPN
Output Mode	Light or dark operate by cat. no.
Output Current	100 mA @ 24V DC max
Output Leakage Current	0.1 mA max
Mechanical	
Housing Material	Mindel
Lens Material	Acrylic
Connection Types	2 m cable (24 AWG), 4-pin DC micro (M12) QD
Supplied Accessories	18 mm mounting nut
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-111

**User Interface**

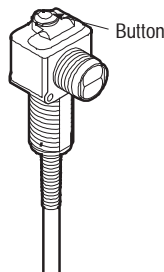
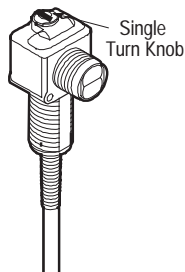
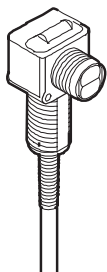
LED Color	State	Status—Teachable and Adjustable Versions	Status—Transmitted Beam Receiver
Yellow	OFF	Output de-energized	
	ON	Output energized	
	Flashing	NA	Output SCP active
Orange	OFF	Normal operation	Margin < 2.5x
	ON	Teach mode active	Margin > 2.5x
	Flashing	Output SCP active Teach mode active	NA
Green	OFF	Sensor not powered	Sensor not powered, output on, or SCP active
	ON	Sensor powered	
	Flashing	Unstable margin condition (0.7x...2.0x) or output SCP active	NA

**Note:** For laser models, output and margin LEDs flash simultaneously when SCP active.

No Adjustment

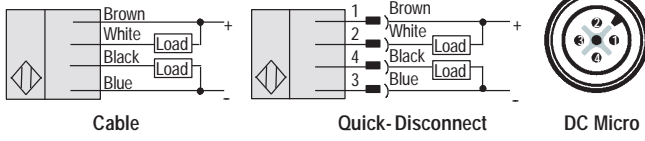
Manual Adjustment

Teach

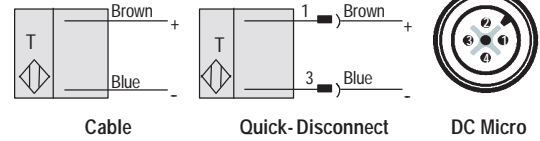


Wiring Diagrams ①②

Output Versions



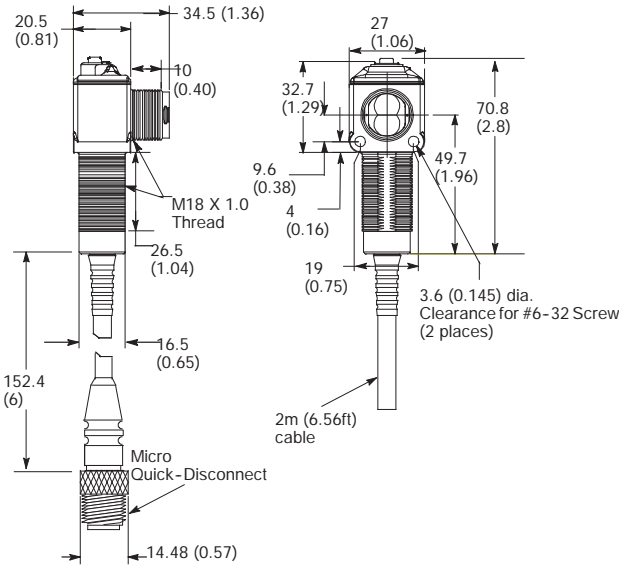
Transmitted Beam Source



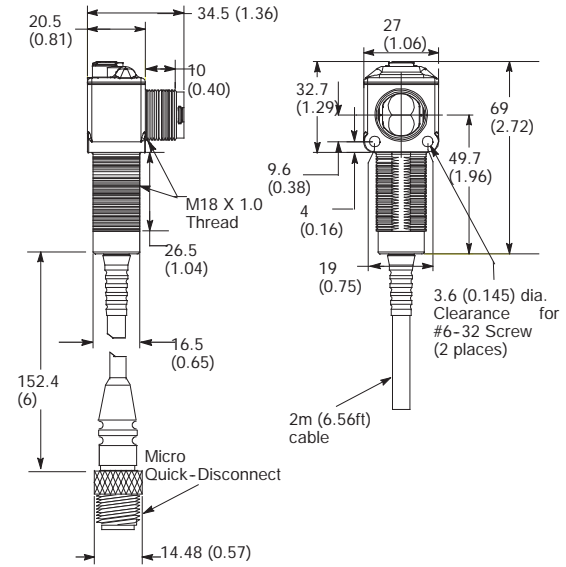
- ① For Rockwell Automation programmable controller compatible interface, refer to publication 42-2.0.
- ② All wire colors on quick-disconnect models refer to Rockwell Automation 889D cordsets.

Approximate Dimensions [mm (in.)]

Teach Function Models



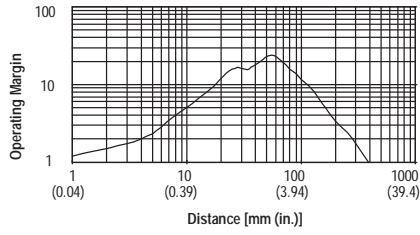
Adjustable Models



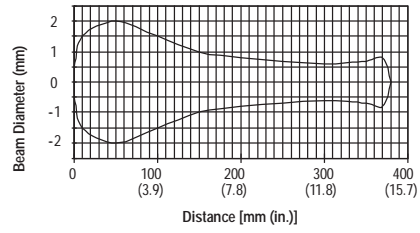
Note: All sensors supplied with one M18 mounting nut (Cat. No. 75012-097-01).

Typical Response Curve

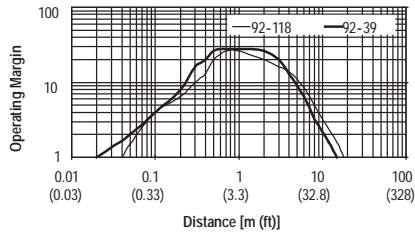
Standard Diffuse—Margin



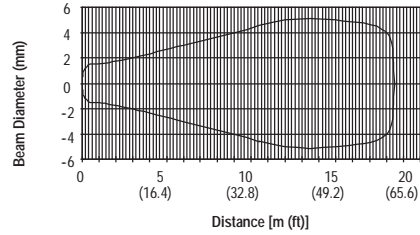
Standard Diffuse—Beam Pattern



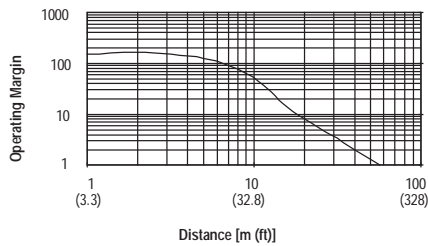
Polarized Retroreflective—Margin



Polarized Retroreflective—Beam Pattern



Transmitted Beam—Margin



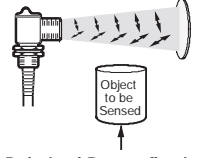
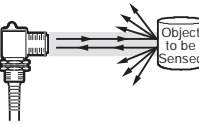
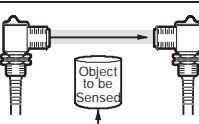
Typical Spot Size

Model	Distance	300 mm	15 m	40 m
Polarized Retroreflective ❶	Spot Size	2 x 3.5	16 x 20 mm	—
Diffuse		2 x 3.5	—	—
Transmitted Beam ❷		2 x 3.5	16 x 20 mm	50 mm x 70 m

❶ Actual spot size may be smaller.



**Product Selection**

Sensing Mode	Supply Voltage	Sensing Distance [mm (in.)]	Adjustment Type	Output Energized	Output Type/ Rating/ Response Time	Connection Type	Cat. No.
 Polarized Retroreflective	24V DC ±10%	0.05...15 m (0.16...49.2 ft)	Teach Button	Dark Operate	NPN and PNP/ 100 mA/ 1 ms max.	2 m 300V cable	42EF-P8KBC-A2
						4-pin DC micro QD	42EF-P8KBC-F4
 Standard Diffuse		300 (11.8)	Single-Turn Knob	Light Operate	NPN and PNP/ 100 mA/ 1 ms max.	2 m 300V cable	42EF-D8JBA-A2
		300 (11.8)	Teach Button	Light Operate	NPN and PNP/ 100 mA/ 1 ms max.	4-pin DC micro QD	42EF-D8JBA-F4
 Transmitted Beam		Light Source	NA	NA	NA	2 m 300V cable	42EF-D8JBC-A2
		4-pin DC micro QD	42EF-D8JBC-F4				
		0.015...40 m (0.05...131.2 ft)	No Adjustment	Dark Operate	NPN and PNP/ 100 mA/ 4 ms max.	2 m 300V cable	42EF-E8EZB-A2
						4-pin DC micro QD	42EF-E8EZB-F4
						2 m 300V cable	42EF-R7KBB-A2
						4-pin DC micro QD	42EF-R7KBB-F4

**Cordsets and Accessories**

Description	Cat. No.
2 m (6.5 ft) 4-pin, DC Micro QD Cordset	889D-F4AC-2
Microcube reflector for polarized retroreflective laser sensors	92-118
Swivel/Tilt bracket allows ±10° vertical and 360° rotation adjustment	60-2649
Right Angle Bracket	60-2677

## LaserSight<sup>†</sup> 9000

Class II Laser Sensor



### Features

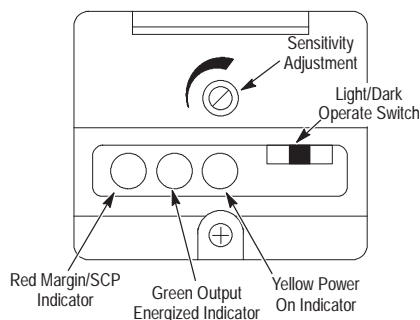
- S Class II laser light source
- S Long range polarized retroreflective and transmitted beam sensing modes
- S Visible red beam for easy alignment
- S Robust 30 mm housing
- S Both NPN and PNP outputs (DC)
- S SPDT relay output (AC)
- S Selectable light/dark operate
- S Micro, mini QD, 2 m cable connections

### Specifications

Environmental	
Certifications	UL Listed, CSA Approved, CE Marked for all applicable directives
Operating Environment	NEMA 3,4X,6P,12,13; IP67(IEC529) 1200 psi (8270 kPa) washdown, IP69K
Operating Temperature [C (F)]	-10...+40° (14...+104°)
Vibration	10...55 Hz, 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%
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Polarized retroreflective and transmitted beam
Sensing Range	See Product Selection table on page 1-114
Field of View	See Product Selection table on page 1-114
Light Source	Class 2 laser
LED Indicators	See User Interface Panel below
Adjustments	Single-turn potentiometer for sensitivity
Electrical	
Voltage	10...30V DC , 110...132V AC models, 10...264 V AC/DC models
Current Consumption	45 mA max (DC models), 10 mA max (AC/DC models), 70 mA max AC models
Sensor Protection	Overload (DC only), short circuit (DC only), reverse polarity, false pulse
Outputs	
Response Time	See Product Selection table on page 1-114
Output Type	PNP and NPN (DC only), EM relay
Output Mode	Light operate or dark operate selectable
Output Current	See Product Selection table on page 1-114
Output Leakage Current	10 µA max
Mechanical	
Housing Material	ValoxR
Lens Material	Acrylic
Cover Material	Neoprene
Connection Types	2 m 300V AC cable, 4-pin DC micro QD, 4-pin DC mini QD, 5-pin DC micro QD
Supplied Accessories	129-130 mounting kit
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-114

### User Interface Panel

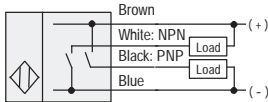
Label	Color	State	Status
Margin/SCP	Red	OFF	Margin < 2.5
		ON	Margin > 2.5
		Flashing	Output SCP active
Output	Green	OFF	Output not activated
		ON	Output activated
Power	Yellow	OFF	Sensor not powered
		ON	Sensor powered



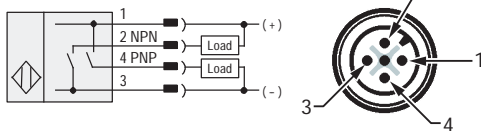
**Wiring Diagrams**

**DC Models**

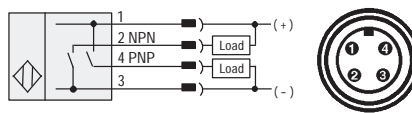
Cable Model: 42GR\_-9\_L0



4-pin DC Micro QD Model: 42GR\_-9\_L0-QD

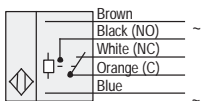


4-pin DC Mini QD Model: 42GR\_-9\_L0-QD1

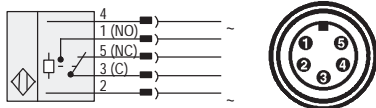


**AC Models**

Cable Model: 42GR\_-9\_L2

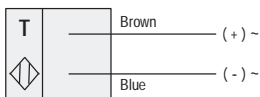


5-pin AC Mini QD Model: 42GR\_-9\_L2-QD

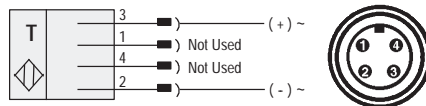


**Transmitted Beam Source**

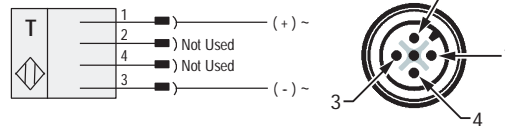
Cable Model: 42GRL-90L0



AC/DC Mini QD Model: 42GRL-90L2-QD

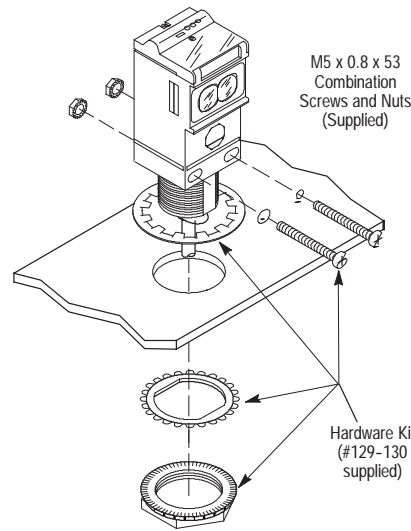
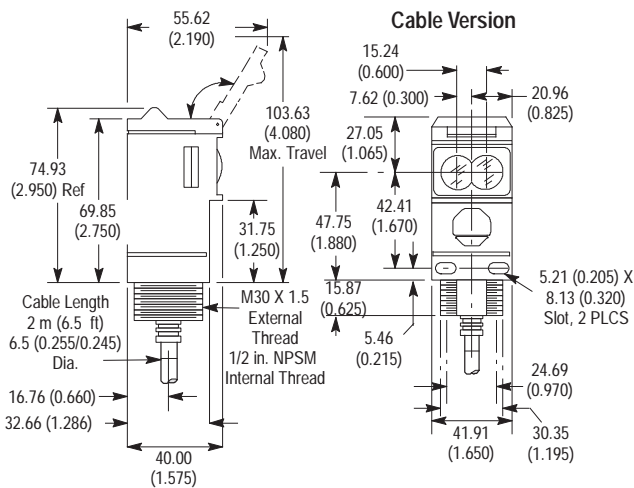


DC Micro QD Model: 42GRL-90L0-QD



**Approximate Dimensions [mm (in.)]**

**All Versions**



**Connector Version**



**Thread Size**

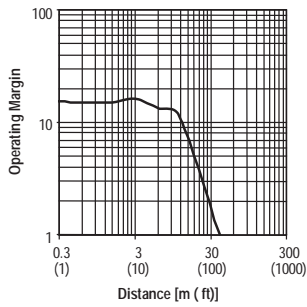
Micro Style	M12 x 1 1 Keyway
Mini Style	7/8-16 UN 1 Keyway

# LaserSight<sup>†</sup> 9000

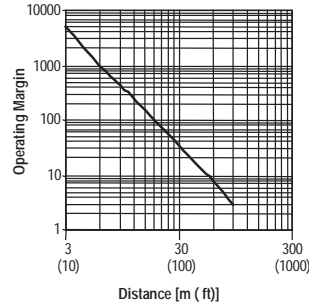
Class II Laser Sensor

## Typical Response Curve

Polarized Retroreflective



Transmitted Beam



## Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type/ Capacity Response Time	Connection Type	Cat. No.
<p><i>Polarized Retroreflective</i></p> <p>Spot Size: 19 mm (3/4 in.) @ 40 m (130 ft) Emitter LED: Visible Laser, 650 nm</p>	10...30V DC 45 mA	0.3...40 m (1...130 ft)	Selectable Light/Dark Operate	PNP/250 mA NPN/250 mA 500 ms	2 m 300V cable	42GRU-92L0
	110...132V AC 70 mA				4-pin DC micro	42GRU-92L0-QD
					4-pin DC mini	42GRU-92L0-QD1
	110...132V AC 70 mA			2 m 300V cable	42GRU-92L2	
				5-pin mini	42GRU-92L2-QD	
<p><i>Transmitted Beam</i></p> <p>Emitter LED: Visible Laser, 650 nm</p>	10...264V AC/DC 10 mA	300 m (1000 ft)	Selectable Light/Dark Operate	NA Light Source	2 m 300V cable	42GRL-90L0 ①
	10...40V DC 25 mA	4-pin micro			42GRL-90L0-QD ①	
		4-pin mini			42GRL-90L2-QD ①	
		2 m 300V cable			42GRR-90L0	
	70...264V AC/DC 10 mA	4-pin micro			42GRR-90L0-QD	
		4-pin mini			42GRR-90L0-QD1	
2 m 300V cable		42GRR-90L2				
5-pin mini	42GRR-90L2-QD					

① Temperature rating -10...+40\_C for 24V DC operation. Reduce by 5\_C for 120V AC and 10\_C for 220V AC operation.

## Cordsets and Accessories

Description	Cat. No.
1.8 m (6 ft) 4-pin mini QD cordset	889N-F4AF-6F
1.8 m (6 ft) 5-pin mini QD cordset	889N-F5AF-6F
2 m (6.5 ft) 4-pin DC micro QD cordset	889D-F4AC-2
Tilt/Swivel Bracket	60-2439
Microcube reflector	92-118

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42CM LaserSight<sup>†</sup>**  
 18 mm Metal Cylindrical, Class 1 Laser Sensor



**Features**

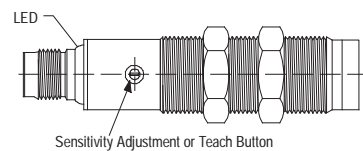
- S Class 1 laser
- S Small spot size—0.1 mm @ 100 mm sensing distance
- S Metal housing for heavy duty industrial applications
- S 18 mm industry standard package
- S Three sensing modes
- S 30V DC operation
- S NPN or PNP outputs
- S Fast response time—less than 0.7 ms
- S 2 m cable or micro QD connector

**Specifications**

<b>Environmental</b>	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-10...+55° (+14...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60068-2-27
Relative Humidity	15...95%
Ambient Light Immunity	Incandescent light 5000 lux
<b>Optical</b>	
Sensing Modes	Polarized retroreflective, diffuse, and transmitted beam
Sensing Range	See Product Selection table on page 1-118
Light Source	Class 1 laser 650 nm
LED Indicators	See User Interface Panel below
Adjustments	Sensitivity potentiometer or teach button
<b>Electrical</b>	
Voltage	10...30V DC
Current Consumption	25 mA max
Sensor Protection	Reverse polarity, overload, short circuit
<b>Outputs</b>	
Response Time	0.5 ms (transmitted beam), 0.7 ms (diffuse, polarized retroreflective)
Output Type	PNP or NPN by cat. no.
Output Mode	Complementary light or dark operate
Output Current	100 mA
Output Leakage Current	10 µA max
<b>Mechanical</b>	
Housing Material	Nickel-plated brass
Lens Material	Glass
Connection Types	2 m cable, 4-pin DC micro (M12) QD
Supplied Accessories	18 mm fastening nuts (871C-N3)
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-118

**User Interface Panel**

LED Color	State	Status	LO Output	DO Output
Yellow	OFF	Dark condition	OFF	ON
	Flashing <b>ⓘ</b>	Light condition (excess gain < 2)	ON	OFF
	ON	Light condition (excess gain > 2)	ON	OFF
Green	ON	Power On	—	—



**ⓘ** Transmitted beam receivers do not have a "Flashing" (low margin) state.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**42CM LaserSight<sup>†</sup>**  
 18 mm Metal Cylindrical, Class 1 Laser Sensor

**Wiring Diagrams**

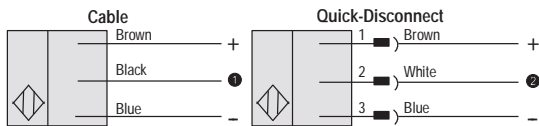
Diffuse



Transmitted Beam, Polarized Retroreflective



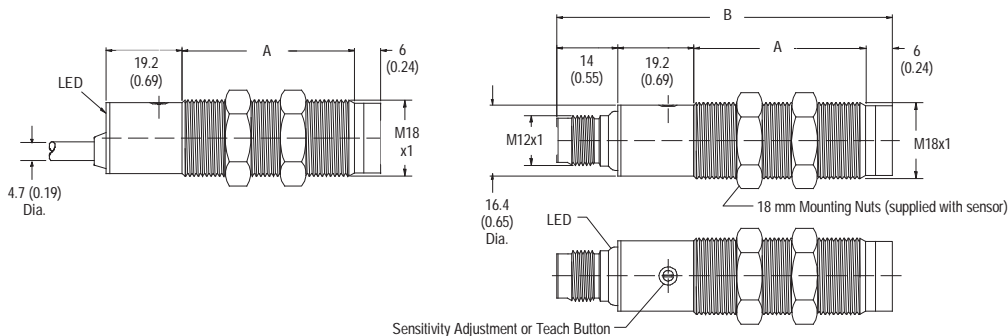
Laser Transmitted Beam Emitter (Standard LED)



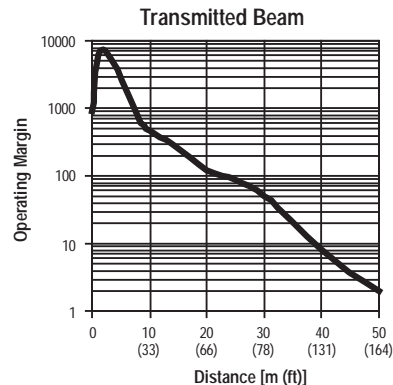
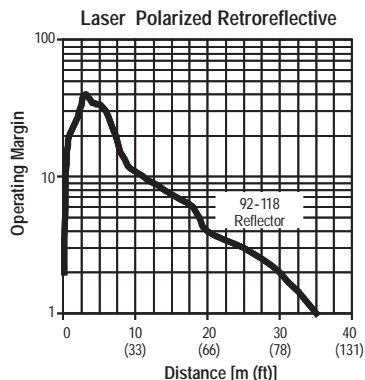
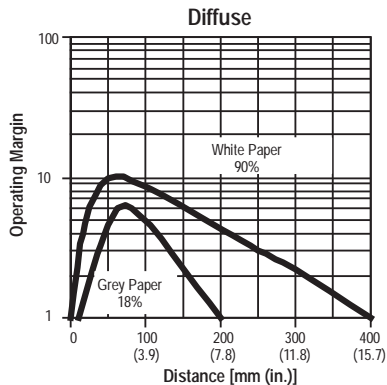
- Black open circuit to enable laser. Tie black to blue/V- to disable laser.
- Pin 2/white open circuit to enable laser. Tie pin 2/white to blue/V- to disable laser.

**Approximate Dimensions [mm (in.)]**

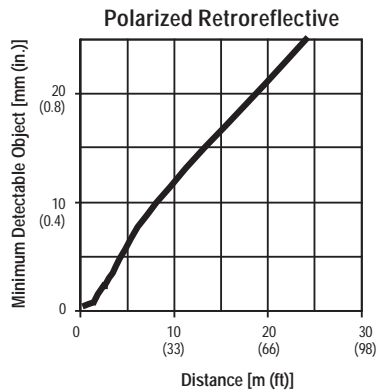
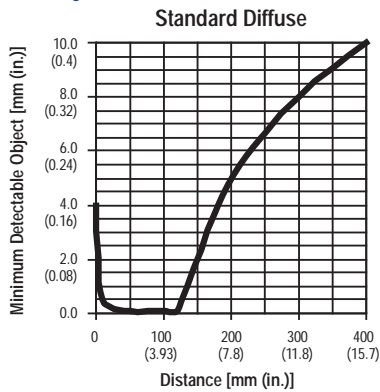
Dimension	Laser Receiver [mm (in.)]	Other Laser Models [mm (in.)]
A	42.7 (1.68)	57.5 (2.26)
B	82.8 (3.26)	97.7 (3.85)



**Typical Response Curve**



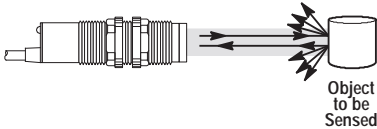
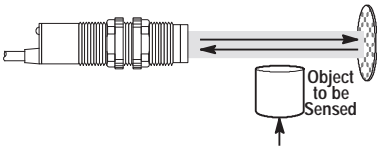
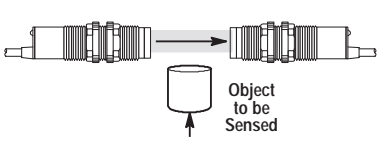
**Minimum Detectable Object**



## 42CM LaserSight<sup>†</sup>

18 mm Metal Cylindrical, Class 1 Laser Sensor

### Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 2X Margin	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.	
 <p><i>Standard Diffuse</i> Emitter: Class 1—Visible laser 650 nm</p>	10...30V DC 25 mA	3...300 mm (0.12...11.8 in.) (Teachable)	L.O./D.O. Complementary	NPN 100 mA 0.7 ms	2 m 300V cable	42CM-D8MNA-A2	
					4-pin DC micro	42CM-D8MNA-D4	
				PNP 100 mA 0.7 ms	2 m 300V cable	42CM-D8MPA-A2	
					4-pin DC micro	<b>42CM-D8MPA-D4</b>	
 <p><i>Polarized Retroreflective</i> Emitter: Class 1—Visible laser 650 nm</p>	10...30V DC 25 mA	3 mm...30 m (0.12 in...78 ft) (Teachable)	L.O./D.O. Complementary	NPN 100 mA 0.7 ms	2 m 300V cable	42CM-P8MNB-A2	
					4-pin DC micro	42CM-P8MNB-D4	
				PNP 100 mA 0.7 ms	2 m 300V cable	42CM-P8MPB-A2	
					4-pin DC micro	<b>42CM-P8MPB-D4</b>	
 <p><i>Transmitted Beam</i> Emitter: Class 1—Visible laser 650 nm</p>	10...30V DC 25 mA	3 mm...50 m (0.12 in...164 ft) (Adjustable)	L.O./D.O. Complementary	NA Light Source	2 m 300V cable	42CM-E8EZB-A2	
					4-pin DC micro	42CM-E8EZB-D4	
					NPN 100 mA 0.5 ms	2 m 300V cable	42CM-R8MNB-A2
						4-pin DC micro	42CM-R8MNB-D4
					PNP 100 mA 0.5 ms	2 m 300V cable	42CM-R8MPB-A2
						4-pin DC micro	<b>42CM-R8MPB-D4</b>

### Cordsets and Accessories

Cordset		Accessories			
Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
DC micro QD cordset, 4-pin, 2 m	889D-F4AC-2	Mounting bracket	60-2657	Micro cube reflector	92-118
18 mm fastening nuts	871C-N3	Swivel/tilt bracket	60-2649		





## Description

The 45MLD is a Class 2 laser sensor designed for packaging, material handling and semiconductor industries. Offering a 300 mm (11.8 in.) adjustable sensing range, the 45MLD provides background suppression by triangulation, establishing a fixed focal point and suppressing anything beyond the focal point. The rotatable lens also allows the user to adjust the laser beam spot size at the focal point down to 0.5 mm (0.02 in.) for accurate sensing of small targets such as gap, chip and crack detection in semiconductor and packaging applications. Target presence status is provided through a discrete NPN or PNP output.

## Features

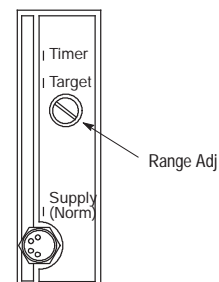
- S Class 2 laser
- S Fast response time
- S Rotatable focus lens allows adjustment of laser spot to 0.5 mm (0.01 in.)
- S 50...300 mm (1.96...11.8 in.) sensing distance
- S Background suppression
- S IP65

## Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP65
Operating Temperature [C (F)]	0...+50° (32...+122°)
Vibration	10...55 Hz, 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
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Laser background suppression
Sensing Range	50...300 mm (1.96...11.8 in.)
Light Source	Class 2 laser
LED Indicators	See User Interface Panel below
Adjustments	Optical spot size adjustment knob, 30-turn range adjustment screw
Electrical	
Voltage	10...30V DC
Current Consumption	35 mA max
Sensor Protection	Overload, short circuit
Outputs	
Response Time	200 μs
Output Type	PNP or NPN selectable
Output Mode	Light or dark operate selectable
Output Current	100 mA @ 30V DC max
Mechanical	
Housing Material	Polyamide
Lens Material	PMMA
Connection Types	4-pin pico (M8) QD
Optional Accessories	See mounting brackets and cordsets on page 1-120

## User Interface Panel

Label	Color	State	Status
Target	Green	OFF	No target present
		ON	Target present
Timer	Red	OFF	40 ms pulse OFF
		ON	40 ms pulse ON
Supply (Norm)	Red	ON	Normal wiring Brn = (+), Blu = (-)
		OFF	Reverse wiring Brn = (-), Blue = (+)



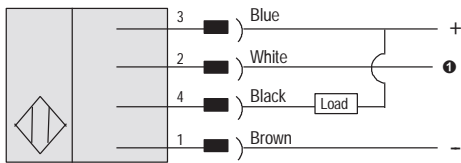
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45MLD

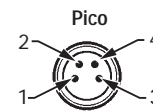
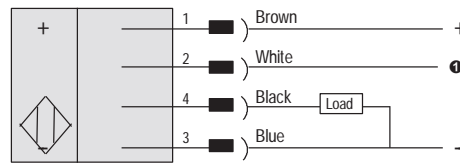
### Laser Diffuse Sensor

#### Wiring Diagrams

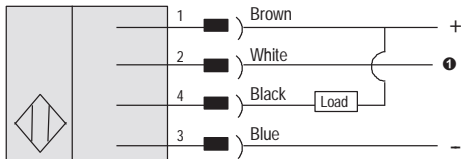
##### NPN (Light Operate)



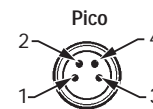
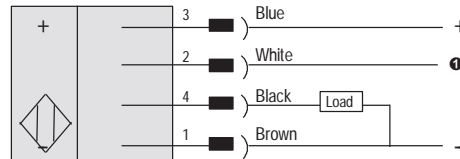
##### PNP (Light Operate)



##### NPN (Dark Operate)

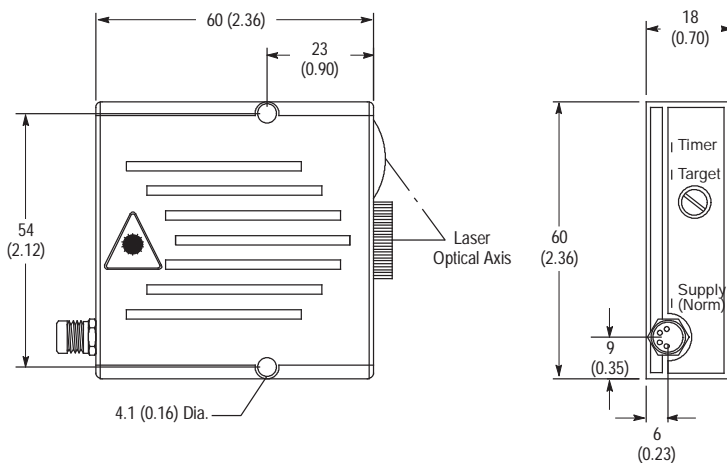


##### PNP (Dark Operate)



- 40 ms pulse stretcher ON = Connect **white wire** to (+) positive terminal.
- 40 ms pulse stretcher OFF = Open circuit or connect **white wire** to (-) negative terminal.

#### Approximate Dimensions [mm (in.)]



#### Product Selection

Operating Voltage Supply Current	Sensing Distance [mm (in.)]	Output Energized	Output Type Response Time	Connection Type	Cat. No.
10...30V DC 35 mA	50...300 (1.9...11.8)	L.O./D.O. Selectable	NPN or PNP 200 $\mu$ s	4-pin DC Pico QD	<b>45MLD-8LEA1-P4</b>

#### Cordsets and Accessories

Description	Cat. No.
2 m (6.5 ft) 4-pin, DC Pico QD Cordset	889P-F4AB-2
Mounting Bracket	60-2677

# PHOTOSWITCH® Photoelectric Sensors

## 45LMS Laser Measurement



### Description

The 45LMS family of long distance laser sensors is available in a variety of measuring ranges. The 8 m diffuse and 50 m retroreflective models use a Class 1 visible red laser and the 15 m diffuse models use a Class 2 visible red laser. The discrete and analog outputs can be easily set using the five-step rotary switch and the push button. Potential applications include object position (analog output) and object detection (background suppression with discrete output).

This sensor utilizes the Time of Flight (ToF) principle and has a relatively small beam spot even at 50 m away. The sensor is completely self-contained and does not require any external control devices which add cost and require additional mounting space.

The 45LMS is easily set up by mounting the sensor such that the target is within the operating range of the sensor and teaching in the appropriate set-points required for the application. All sensors in this family have one discrete output with one analog output. The discrete output can be wired for either light operate (L.O.) or dark operate (D.O.) and the analog output is automatically scaled between the selected set-points with either a positive or negative slope.

The 45LMS is an excellent solution for long range detection and measurement applications including: distance measurement, verifying material position, stack level, thickness measurement, roll diameter, positioning fixtures, error proofing inspection, long standoff distance, level monitoring, crane crash protection and other difficult applications that exceed the capabilities of standard diffuse or background suppression photosensors.

### Features

- Eye Safe Class 1 or Class 2 laser (by model)
- Sensing ranges of 8 m (26 ft), 15 m (49 ft) or 50 m (164 ft), dependent on model
- One discrete output (1 x NPN/PNP) and one analog output (1 x 4...20 mA)
- Easy setup of switch points or analog scaling using programming buttons
- IP65 enclosure
- Self-contained sensor

### Available Models

Diffuse

Retroreflective

### General Specifications

Environmental	
Certifications	UL, cULus, and CE Marked for all applicable directives
Enclosure Type Rating	IP65
Operating Temperature [C (F)]	-30...50° (-22...122°)
Storage Temperature [C (F)]	-30...70° (-22...158°)
Vibration	10...55 Hz, 0.5 mm amplitude, meets or exceeds IEC 60068-2-6
Shock	30 g with 11 ms pulse duration, meets or exceeds IEC 60068-2-27
Optical	
Absolute Accuracy	± 25 mm (± 0.98 in.)
Repeatability	< 5 mm (0.20 in.)
Angle Deviation	± 2° max.
Temperature Drift	? 0.25 mm/K
Indicator LEDs	Green: Power Yellow: Output switching states Green/Yellow Flashing 2.5 Hz: Teach indication Green/Yellow Flashing 8.0 Hz: Teach error
Electrical	
Operating Voltage	10...30V DC (18...30V DC when operating in IO-Link mode)
Current Consumption	?70 mA @ 24V DC
Protection Type	Short circuit, reverse polarity (for NPN/PNP output); Short circuit, overload protected (for 4...20 mA analog output)
Communication Interface	
Interface	IO-Link V1.0
Typical Cycle Time	2.3 ms
Baud Rate	COM 2 (38.4 kBaud)
Serial Data Size	16 bit
Outputs	
Response Time	10 ms
Output Type	1 PNP/NPN (Push-Pull) output; 1 analog output 4...20 mA
Output Function	Light or dark operation for discrete output
Output Current	30V DC max./100 mA max.
Mechanical	
Housing Material	Plastic ABS
Lens Material	Plastic pane
Connection Type	4-pin DC micro (M12) QD, 90° rotateable

# PHOTOSWITCH® Photoelectric Sensors

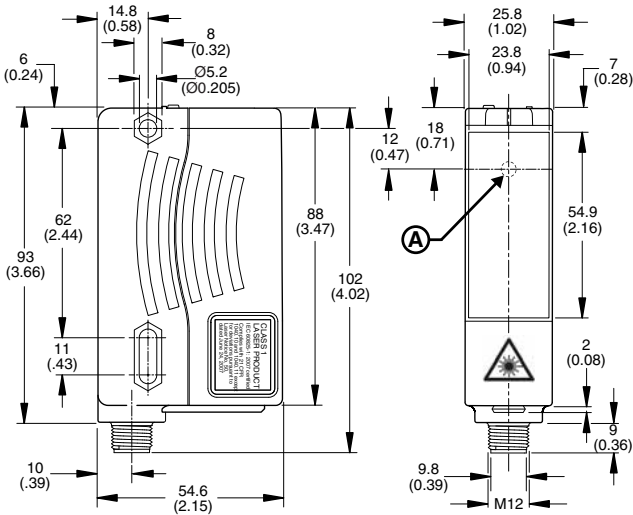
## 45LMS Laser Measurement

1-Photoelectric Sensors

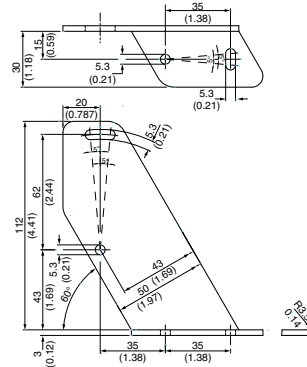
### Product Selection

Sensing Mode	Light Source	Sensing Distance	Measuring Rate	Spot Size	Cat. No.
Diffuse	Class 1 laser, visible red 660 nm	0.2...8 m (0.66...26.25 ft)	7.8 m (25.59 ft)	< 10 mm (0.39 in.) at a distance of 8 m (26 ft) at 20°C (68°F)	45LMS-D8LGC1-D4
Diffuse	Class 2 laser, visible red 660 nm	0.2...15 m (0.66...49.21 ft)	14.8 m (48.55 ft)	< 15 mm (0.59 in.) at a distance of 15 m (49 ft) at 20°C (68°F)	45LMS-D8LGC2-D4
Retroreflective	Class 1 laser, visible red 660 nm	0.2...50 m (0.66...164.04 ft)	49.8 m (163.38 ft)	< 50 mm (2 in.) at a distance of 50 m (164 ft) at 20°C (68°F)	45LMS-U8LGC3-D4

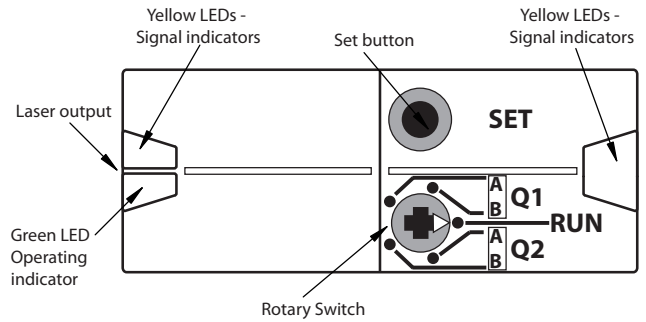
### Approximate Dimensions [mm (in.)]



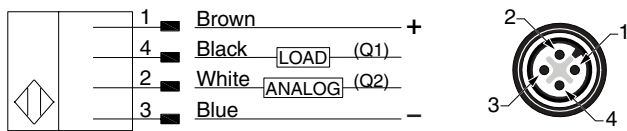
### Mounting Bracket 45LMS-BKT1



### Controls and Indicators



### Wiring Diagrams



### Cordsets and Accessories

Description	Cat. No.
2 m (6.5 ft) 4-pin, DC Micro QD Cordset, Straight	889D-F4AC-2
2 m (6.5 ft) 4-pin, DC Micro QD Cordset, Right Angle	889D-R4AC-2
Mounting Bracket	45LMS-BKT1



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## Description

The 45CPD sensor is a Class 1 infrared laser sensor that provides long distance sensing with both analog and discrete outputs. It is set up using the Teach-In buttons on the top of the sensor and can be programmed for several modes depending on the application: object detection (single or dual output), object position (analog output), object detection (background suppression), or object detection (reflector mode).

This sensor utilizes the time of flight principle and has a relatively small beam spot for applications typical for this sensing range (up to 6 m). The sensor is completely self contained in an IP67 enclosure and does not require any external control devices which add cost and require additional mounting space.

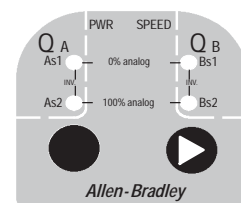
For convenience purposes, the 45CPD utilizes a visible red Class 2 laser for alignment purposes during the set up of the sensor in an application. The Class 2 laser is automatically shut down when the sensor is placed in normal operation and the Class 1 "eye safe" laser is used.

The 45CPD can be easily set up by mounting the sensor such that the target is within the operating range of the sensor, and teaching in the appropriate set points required for the application. The sensor can be set with any combination of one or two discrete PNP outputs and 4...20 mA analog output. The discrete outputs can be set for Light Operate (L.O.) or Dark Operate (D.O.) and the analog output is automatically scaled between the taught set points with either a positive or negative slope.

## Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-20...+50° (-4...+122°)
Vibration	10...55 Hz, 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
Optical	
Sensing Range	0.2...6 m (0.7...19.7 ft)
Spot Size	4 x 7 mm @ 2 m (0.16 x 0.28 in. @ 6.5 ft) 4x 12 mm @ 6 m (0.16 x 0.47 in. @19.7 ft)
Linearity Tolerance	±40 mm (1.57 in.)
Repeatability	Fast/slow: ±15/±10 mm (±0.6/±0.4 in.)
Hysteresis	30 mm (1.2 in.) fixed
Temperature Drift	1.3mm/°C
Light Source	Sensing beam: Class 1 laser (905 nm) Alignment beam: Class 2 visible red laser (650 nm)
LED Indicators	See Features on page 1-122
Electrical	
Voltage	18...30V DC
Current Consumption	125 mA max @ 24V DC
Sensor Protection	Overload, short circuit, reverse polarity, false pulse, transient noise
Outputs	
Response Time	Fast/slow: 13 ms/30 ms
Output Type	Discrete: Two PNP outputs, analog output: 4...20 mA current
Output Mode	Light or dark operate for discrete outputs
Output Current	100 mA max for discrete output, 500W max impedance for analog
Mechanical	
Housing Material	Plastic—ABS
Lens Material	PMMA
Connection Types	5-pin DC micro (M12) QD
Supplied Accessories	None
Optional Accessories	See mounting brackets and cordsets on page 1-122

The 45CPD is an excellent solution for long range detection and measurement applications including: distance measurement, verifying material position, stack level, thickness measurement, roll diameter, web winding/unwinding, positioning fixtures, error proofing, inspection, long standoff distance (hot or limited space), level monitoring, and box width measurement.



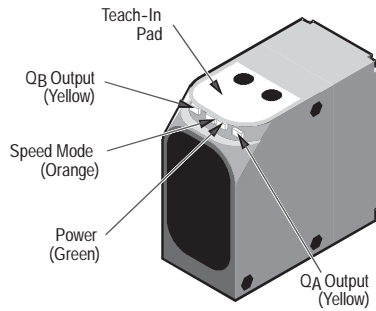
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45CPD

### Analog and Discrete Output

#### Features

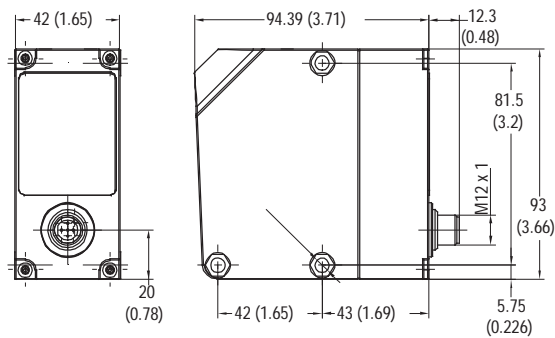
- S Eye Safe Class 1 laser for operation
- S Visible red Class 2 laser for set-up
- S Six meter sensing range
- S Two discrete outputs (PNP) and analog output (4...20 mA)
- S Easy set-up using teach-in buttons
- S IP67 enclosure
- S Self-contained sensor



#### Product Selection

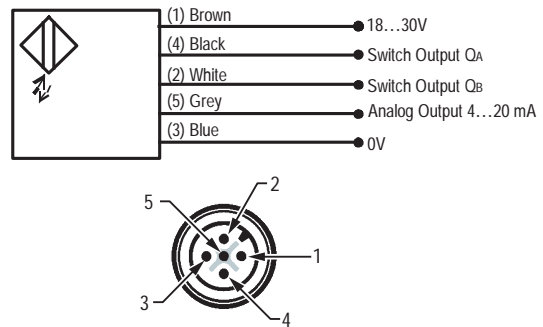
Sensing Range [mm (in.)]	Measuring Range [mm (in.)]	Spot Size	Cat. No.
200...6000 (7.87...236.22)	5800 (228.35)	4 x 7 mm @ 2 m (0.16 x 0.28 in. @ 6.5 ft)	45CPD-8LTB1-D5

#### Approximate Dimensions [mm (in.)]



#### Wiring Diagrams

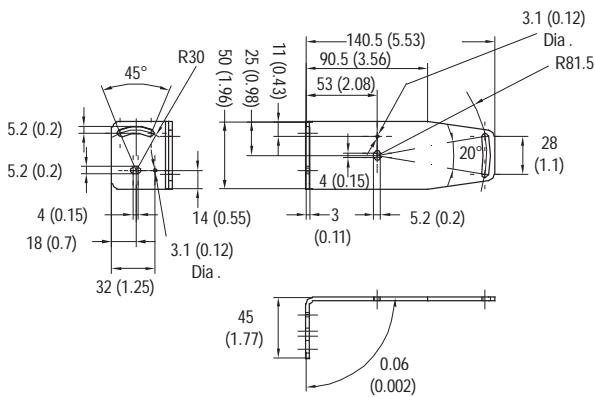
##### 45CPD-8LTB1-D5



#### Cordsets and Accessories

Description	Cat. No.
2 m (6.5 ft) 5-pin, DC Micro QD Cordset	889D-F5AC-2
Mounting Bracket	45CPD-BKT1

#### Mounting Bracket 45CPD-BKT1





## Description

The 45BPD analog output sensor is a Class 2 visible red laser sensor that provides sensing with both an analog and discrete output. It is set up using the Teach-In buttons and LED indicators on the top of the sensor.

This sensor utilizes the triangulation principle for precise measurement and the visible red beam spot is useful for alignment in small part detection and measurement applications. The sensor is completely self contained in an IP67 enclosure and does not require any external control devices which add cost and require additional mounting space.

The 45BPD can be easily set up by mounting the sensor such that the target is within the operating range of the sensor and teaching in the appropriate set points required for the application. The sensor can be set with both a discrete PNP output and a 4...20 mA analog output. The discrete output can be set for normally open (N.O.) or normally closed (N.C.) operation and the analog output is automatically scaled between the taught set points with either a positive or negative slope.

The 45BPD is an excellent solution for several noncontact measurement applications including: distance measurement, part profiling, thickness measurement, error proofing, inspection, verifying material position, hole depth, warpage, and positioning.

## Features

- § Noncontact measurement
- § Visible red Class 2 laser
- § Analog and discrete outputs
- § Scalable analog output (4...20 mA)

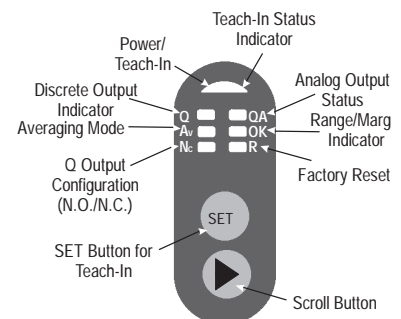
## Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-10...+45° (14...+140°)
Vibration	10...55 Hz, 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
Optical	
Sensing Range	See Product Selection table on page 1-124
Linearity	< 0.25 % of measuring range
Resolution	< 0.1% of measuring range
Temperature Drift	< 0.02%/°C
Light Source	Class 2 visible red laser (650 nm)
LED Indicators	See User Interface below
Electrical	
Voltage	18...28V DC
Current Consumption	40 mA max @ 24V DC
Sensor Protection	Overload, short circuit, reverse polarity, false pulse, transient noise
Outputs	
Response Time	Speed mode: 0.4 ms (applicable with synchronously switched laser and target)
Output Type	Discrete: PNP, analog output: 4...20 mA current
Output Mode	Normally open or normally close for discrete output
Output Current	100 mA max for discrete output, 500Ω max impedance for analog
Mechanical	
Housing Material	Plastic — ABS
Lens Material	PMMA
Connection Types	4-pin DC micro (M12) QD, 270° rotatable connector
Supplied Accessories	None
Optional Accessories	See mounting brackets and cordsets on page 1-124

## Features (cont.)

- § Configurable discrete output (N.O./N.C.)
- § IP67 enclosure
- § 270° rotatable connector
- § Set point adjustment via push buttons
- § Self-contained sensor
- § Laser-disable control
- § Teach-in lock out
- § Averaging and speed mode

## User Interface



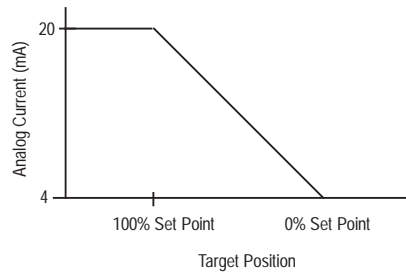
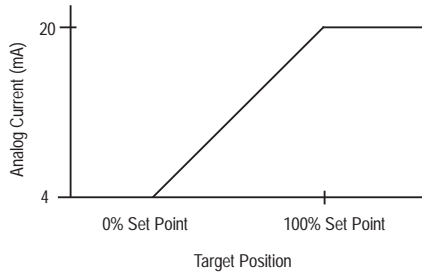
## 45BPD Laser Sensor

Analog and Discrete Output

### Product Selection

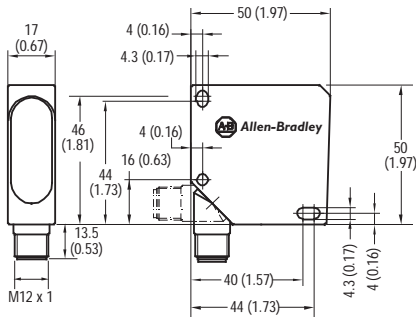
Sensing Range [mm (in.)]	Measuring Range [mm (in.)]	Spot Size	Cat. No.
30...100 (1.18...3.93)	70 (2.75)	1.5 x 3 mm/1.5 x 3.25 mm (0.06 x 0.12 in./0.06 x 0.13)	45BPD-8LTB1-D5
80...300 (3.14...11.8)	220 (8.66)	1.5 x .53 mm/2.0 x 4.5 mm (0.06 x 0.14 in./0.08 x 0.18)	45BPD-8LTB2-D5

### Analog Output

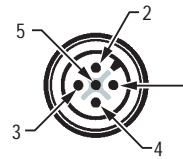


### Approximate Dimensions [mm (in.)]

Dimensions are not intended to be used for installation purposes.



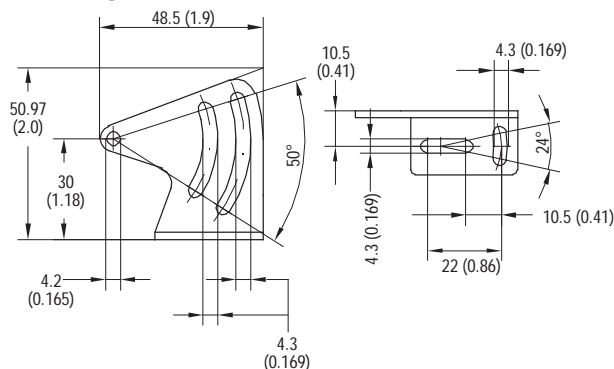
### Wiring Diagrams



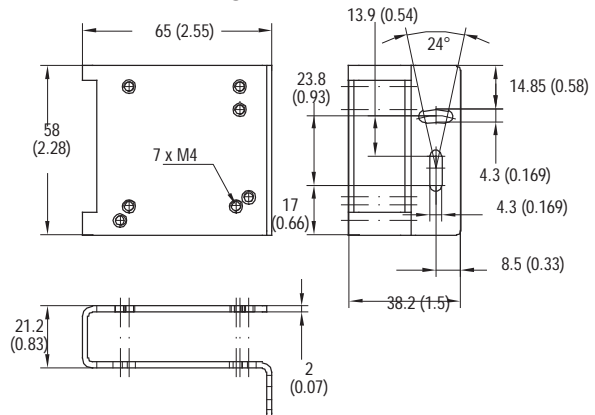
### Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
2 m (6.5 ft) micro QD cordset	889D-F5AC-2	Mounting brackets	45BPD-BKT1	Protective mounting bracket	45BPD-BKT2

#### Mounting Bracket 45BPD-BKT1



#### Protective Mounting Bracket 45BPD-BKT2







## Description

The 45BRD analog output sensor is a Class 2 visible red laser sensor that provides exceptional resolution at an economical cost. This sensor utilizes the triangulation principle for precise measurement and has a small beam spot for small part detection and measurement. The sensor is completely self-contained in an IP67 enclosure and does not require any external control devices which add cost and require additional mounting space.

The 45BRD can be easily set up by mounting the sensor such that the target is within the operating range of the sensor. There are no additional adjustments for the sensor and the 0...10V output is scaled linearly over the range of the sensor [45...85 mm (1.77...3.35 in.)].

The 45BRD is an excellent solution for precision noncontact measurement applications including: distance measurement, part profiling, thickness measurement, hole depth, warpage, and positioning.

## Features

- § Visible red Class 2 laser
- § 20 µm resolution
- § 40 mm measuring range
- § 0...10V DC analog output
- § IP67 enclosure
- § 270° rotatable connector
- § No user adjustments
- § Contamination indicator
- § Self-contained sensor

## Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	0...+45° (32...+113°)
Vibration	10...55 Hz, 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
Optical	
Sensing Range	45...85 mm (1.77...3.35 in.)
Spot Size	< 0.8 mm (0.03 in.) beam spot @ 65 mm (2.56 in.)
Measuring Range	40 mm (1.57 in.)
Linearity	< 1 %
Resolution	20 µm
Temperature Drift	18 µm/°C
Light Source	Class 2 visible red laser (670 nm)
LED Indicators	Green: power, red : lens contamination
Electrical	
Voltage	18...28V DC
Current Consumption	35 mA max @ 24V DC
Sensor Protection	Overload, short circuit, reverse polarity, false pulse, transient noise
Outputs	
Response Time	30 ms
Output Type	Analog output 0...10V DC
Output Current	3 mA max
Mechanical	
Housing Material	Plastic — ABS
Lens Material	PMMA
Connection Types	4-pin DC micro (M12) QD, 270° rotatable connector
Supplied Accessories	None
Optional Accessories	See mounting brackets and cordsets on page 1-126

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

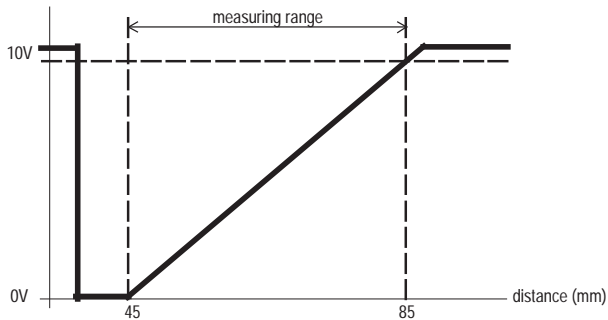
**45BRD Laser Sensor**

Analog Output

Product Selection

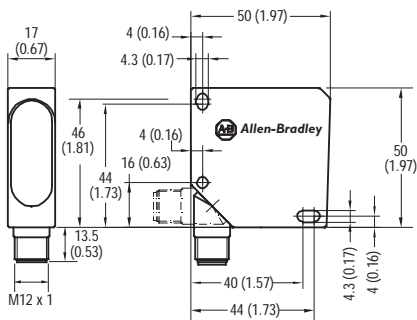
Sensing Range [mm (in.)]	Measuring Range [mm (in.)]	Spot Size	Cat. No.
45...85 (1.77...3.35)	40 (1.57)	<0.8 mm @ 65 mm	45BRD-8JKB1-D4

Analog Output

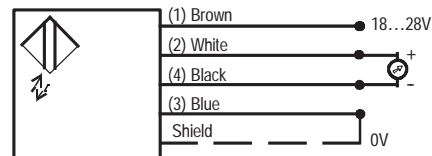


Approximate Dimensions [mm (in.)]

Dimensions are not intended to be used for installation purposes.



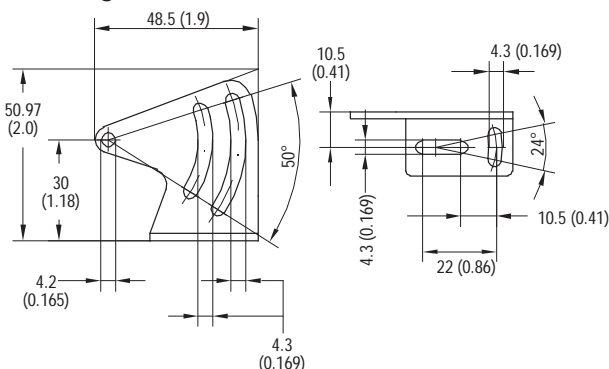
Wiring Diagrams



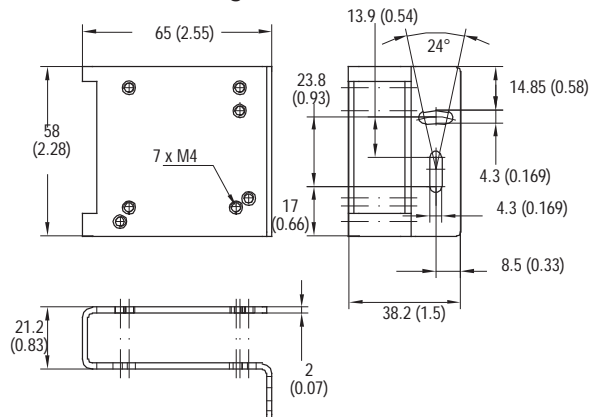
Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
2 m (6.5 ft) Micro QD Cordset	<b>889D-F4EC-2</b>	Mounting brackets	45BPD-BKT1	Protective mounting bracket	45BPD-BKT2

Mounting Bracket 45BPD-BKT1



Protective Mounting Bracket 45BPD-BKT2





**Specifications**

Environmental	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	NEMA 3,4,12,13; IP66 (IEC 529)
Operating Temperature [C(F)]	0...+70° (32...+158°)
Vibration	10...55 Hz, 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%

Optical	
Sensing Modes	Fixed focus color registration
Sensing Range	12.7 mm
Field Depth	± 2 mm
Light Source	Visible red LED (630 nm) or visible green (570 nm) selectable
LED Indicators	See User Interface Panel below

Electrical	
Voltage	10...30V DC
Current Consumption	70 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse

Outputs	
Response Time	250 µs
Output Type	PNP or NPN by cat. no.
Output Mode	Leading edge or trailing edge of a light or dark mark
Output Current	100 mA @ 30V DC
Output Leakage Current	1 µA max

Mechanical	
Housing Material	Anodized and epoxy coated aluminum
Lens Material	Glass
Connection Types	5-pin DC micro (M12) QD
Optional Accessories	See mounting brackets and cordsets on page 1-129

**Description**

The 42CRC Color Registration Control is a specialized photoelectric sensor designed to detect registration marks by sensing the difference in greyscale response between the mark and background.

The sensor automatically adjusts the sensitivity, compensating for variations in background colors and lens contamination.

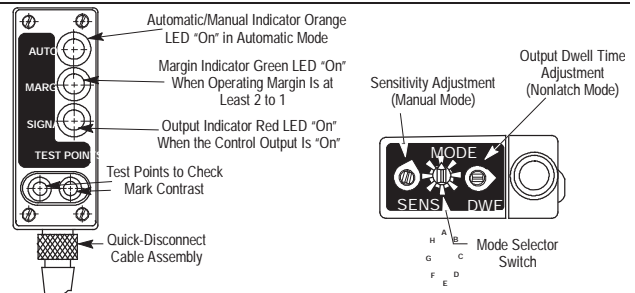
Switch selectable red or green light sources provide capability to sense a wide range of marks and background colors, including difficult pastels.

**Features**

- S Automatic or manual sensitivity adjustment
- S Selectable red or green light source
- S Selectable lens position
- S Fast 250 µs response time
- S Separate diagnostic output
- S Adjustable pulse-stretcher
- S Selectable latching output with reset
- S Selectable gated input operation
- S Selectable NPN or PNP output
- S 5-pin micro QD connection

**User Interface Panel**

Label	Color	State	Status
Margin	Green	OFF	Margin < 2X
		ON	Margin > 2X
Auto	Orange	OFF	Sensor in manual configuration mode
		ON	Sensor in automatic configuration mode
Signal	Red	OFF	Sensor output activated
		ON	Sensor output de-activated

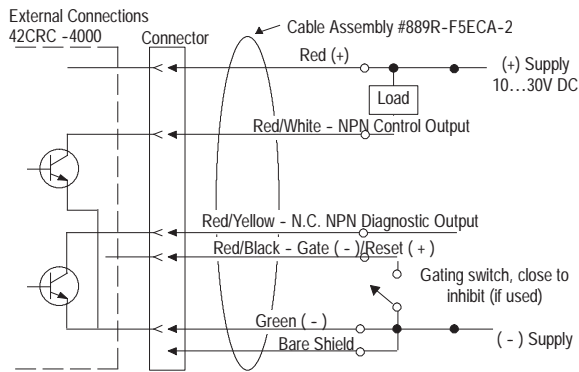


## 42CRC

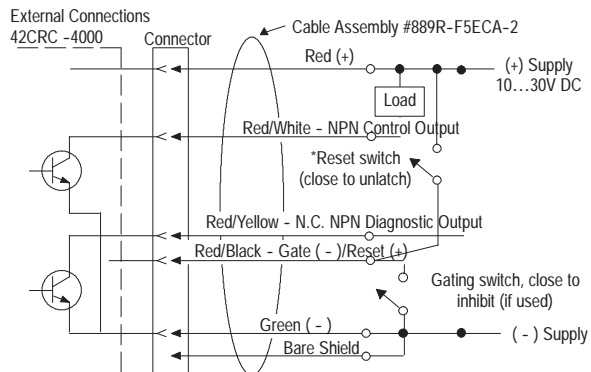
### Color Registration Control

#### Wiring Diagrams

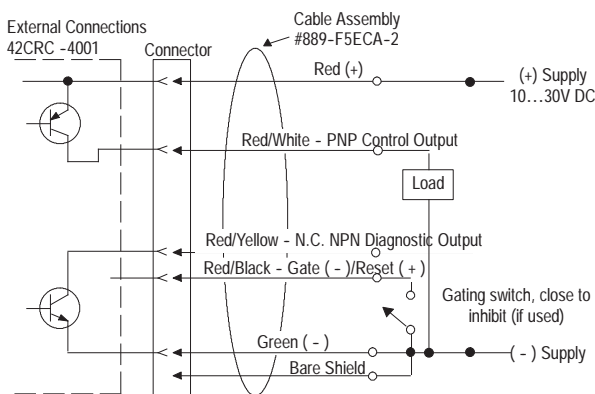
**NPN Output 42CRC-4000**  
**Non-Latched Output—Function Switch Positions**  
**“E” Through “H” with or without External Gating**



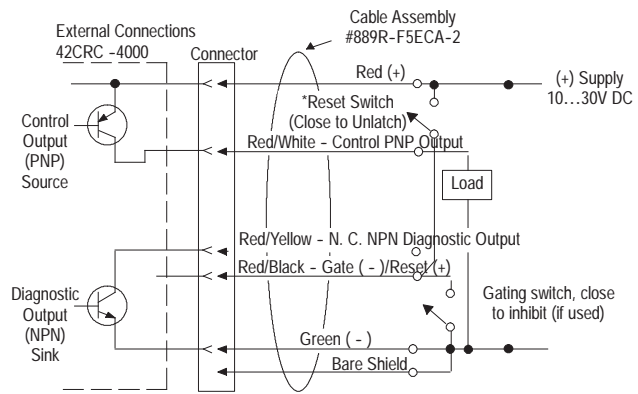
**NPN Output 42CRC-4000**  
**Latched Output—Function Switch Positions**  
**“A” Through “D” with or without External Gating**



**PNP Output 42CRC-4001**  
**Non-Latched Output—Function Switch Positions**  
**“E” Through “H” with or without External Gating**



**PNP Output 42CRC-4001**  
**Latched Output—Function Switch Positions**  
**“A” Through “D” with or without External Gating**

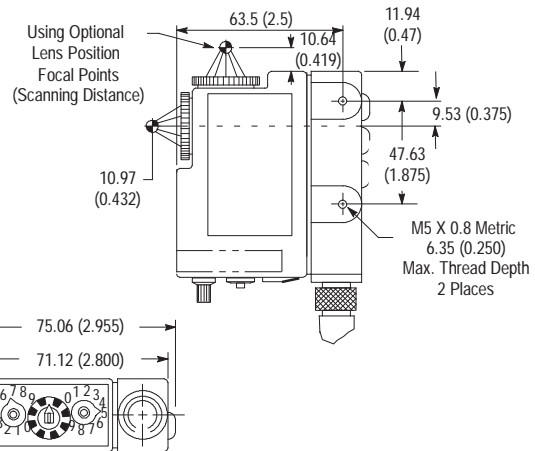
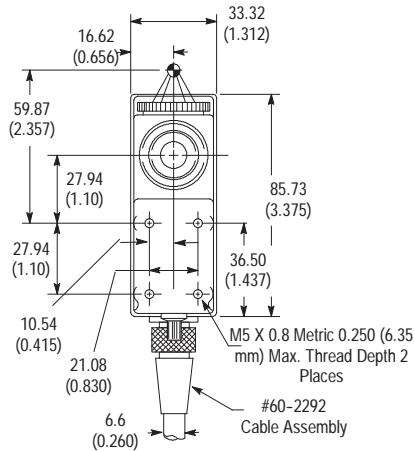


#### ATTENTION

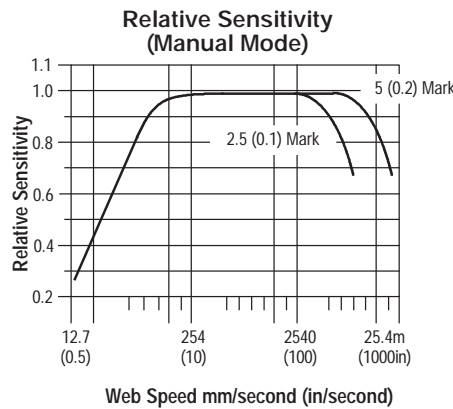
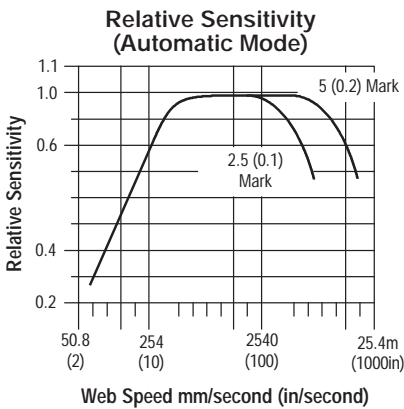


Do not close the reset and gating switches simultaneously.

**Approximate Dimensions [mm (in.)]**



**Typical Response Curve**



**Product Selection**

Sensing Mode	Operating Voltage Supply Current	Output Energized	Output Type Capacity Response Time	Diagnostic Output	Focal Point	Depth of Field	Min Web Velocity	Cat. No.
<p>Emitter LED: Visible red 630 nm or visible green 570 nm (selectable)</p>	10...30V DC 70 mA max	Leading Edge or Trailing Edge of a Light or Dark Mark	NPN 100 mA at 30V DC 250 μs	NPN 30 mA at 30V DC	12.7 mm (0.5 in.)	±2 mm (0.08 in.)	51 mm/sec (2 in./sec)	42CRC-4000
			PNP 100 mA at 30V DC 250 μs					42CRC-4001

**Cordsets and Accessories**

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
5-pin AC Micro QD Cordset	889R-F5ECA-2	Lens	61-6312	Cover	61-6333

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**ColorSight<sup>†</sup> 9000**

Self-Teach Color Recognition

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Obsolete

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PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**ColorSight<sup>†</sup> 9000**

Self-Teach Color Recognition

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Obsolete



Obsolete

## 45CLR ColorSight<sup>t</sup>

### Color Sensor



### Description

The 45CLR ColorSight is a self-contained color detection sensor with three output channels, allowing for the concurrent sensing of three different colors. The colors to be sensed are taught quickly and easily with the touch of a button on the sensor or through remote teach.

Models are also available with RS-485 communications with the capability of matching up to five colors and communicate true RGB values for remote processing of additional colors.

The 45CLR ColorSight can be set up to detect:

- S A single color per channel with adjustable tolerance
- S Scan an area of various colors on the same surface
- S Detect multiple individual colors per channel

This sensor offers a wide sensing range tolerance for reliable sensing when target distance varies from the taught settings.

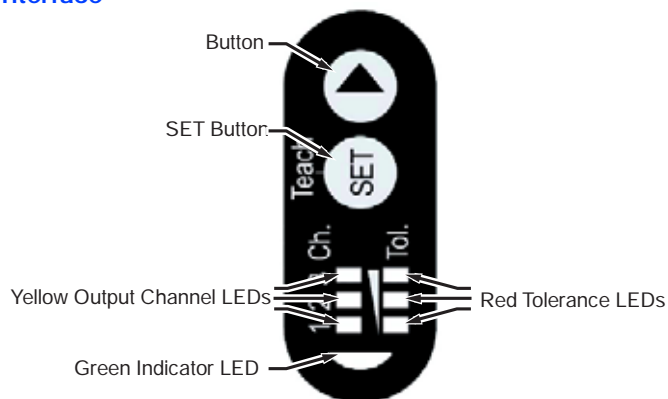
### Features

- S Wide sensing range tolerance
- S Three channel color matching (3 outputs)
- S Gating input (also known as inhibiting input)
- S Adjustable tolerance for high precision to general color matching
- S Pulse stretching capability (50 ms off delay)
- S Teach colors via push buttons
- S External teach capability (1 output)
- S Teach button lockout
- S 270° rotatable connector
- S Compact size IP67 enclosure

### Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C(F)]	-10...+55° (14...+131°)
Vibration	10...55 Hz, 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
Optical	
Sensing Mode	True color (diffuse)
Sensing Range	See Product Selection table on page 1-135
Light Source	White LED
LED Indicators	See User Interface below
Adjustments	Push buttons
Electrical	
Voltage	18...28V DC
Current Consumption	40 mA max @ 24V DC
Sensor Protection	Overload, short circuit, reverse polarity, false pulse, transient noise
Outputs	
Response Time	1 ms on each channel, 2 ms for channel 3 in remote teach
Output Type	Discrete: 3 PNP outputs RS485 models: 1 PNP or 1 NPN output by cat. no.
Output Mode	Light operate
Output Current	100 mA @ 30V DC max
Output Leakage Current	0.1 mA max
Mechanical	
Housing Material	ABS
Lens Material	PMMA
Connection Types	8-pin DC micro (M12) QD
Supplied Accessories	None
Optional Accessories	See mounting brackets and cordsets on page 1-136

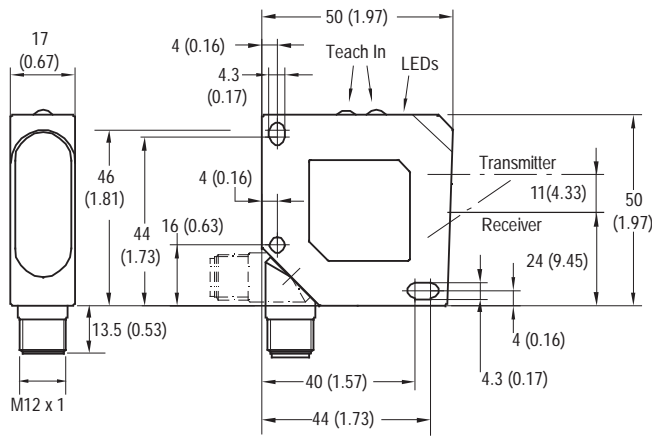
### User Interface



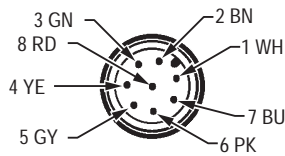
**Product Selection**

Sensing Range [mm (in.)]	Sensing Range Tolerance	Spot Size [mm (in.)]	Output Type	Cat. No.
12...32 (0.47...1.26)	±6 mm (0.24 in.)	4 (0.16) @ 22 (0.86)	3 PNP	45CLR-5JPC1-D8
15...30 (0.59...1.18)	±5 mm (0.20 in.)	2 x 2 (0.07 x 0.07) @ 22 (0.86)	3 PNP	45CLR-5JPC2-D8
18...22 (0.70...0.86)	±2 mm (0.08 in.)	5 x 1 (0.19) @ 22 (0.86)	3 PNP	45CLR-5JPC3-D8
12...32 (0.47...1.26)	±6 mm (0.24 in.)	4 (0.16) @ 22 (0.86)	RS-485, 1 PNP	45CLR-5LPS1-D8
12...32 (0.47...1.26)	±6 mm (0.24 in.)	4 (0.16) @ 22 (0.86)	RS-485, 1 NPN	45CLR-5LNS1-D8
15...30 (0.59...1.18)	±5 mm (0.20 in.)	2 x 2 (0.07 x 0.07) @ 22 (0.86)	RS-485, 1 PNP	45CLR-5LPS2-D8
15...30 (0.59...1.18)	±5 mm (0.20 in.)	2 x 2 (0.07 x 0.07) @ 22 (0.86)	RS-485, 1 NPN	45CLR-5LNS2-D8
18...22 (0.70...0.86)	±2 mm (0.08 in.)	5 x 1 (0.19) @ 22 (0.86)	RS-485, 1 PNP	45CLR-5LPS3-D8
18...22 (0.70...0.86)	±2 mm (0.08 in.)	5 x 1 (0.19) @ 22 (0.86)	RS-485, 1 NPN	45CLR-5LNS3-D8

**Approximate Dimensions [mm (in.)]**



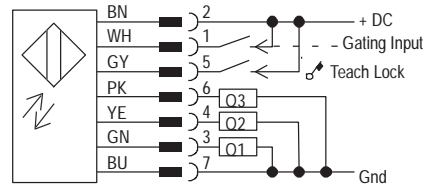
**Pinout and Color Codes**



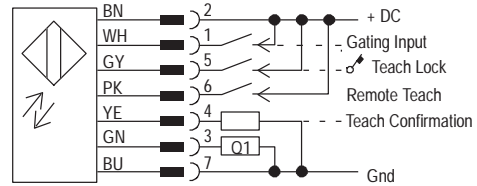
M12 Male

Pin	Color	Connection
1	White	Gate Input
2	Brown	V+ 12...28V DC
3	Green	OUT 1
4	Yellow	OUT 2/Teach Confirmation
5	Grey	Teach Button Lock
6	Pink	OUT 3/Remote Teach
7	Blue	V- 0V DC
8	Red	Not Connected

**Wiring Diagrams**

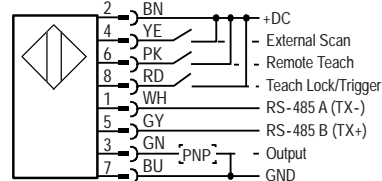


**Remote Teach**



The control input (pin 5) can be used to lock the ColorSight push buttons by connecting it to the +DC (18...28V DC). When working with the sensor in remote teach, we recommend the use of push button lockout to prevent accidental tampering of the configuration.

**RS-485 Models**



**Note:** For NPN output models one terminal of the load should be connected to Pin 3 (output) and the other terminal of the load should be connected to +DC.

**ATTENTION**



Pin 1 and pin 5 are the RS 485 interface connections and must not be connected to the power supply. This can permanently damage the sensor.

## 45CLR ColorSight<sup>†</sup>

### Color Sensor

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#### Cordsets and Accessories

Description	Cat. No.
DC Micro Style QD Cordset, 8-Pin	889D-F8AB-2
Mounting Bracket	45BPD-BKT1
Mounting Bracket	45BPD-BKT2
Communications Cable (RS-485) for MicroLogix	1763-NC01

# PHOTOSWITCH® Photoelectric Sensors

## 45CRM Contrast Sensor



### Description

The 45CRM is a photoelectric contrast sensor that reliably detects registration marks on a web. This sensor features red, green, and blue (RGB) emitter LEDs. During the teach process the sensor determines which of the emitter LEDs maximizes the contrast between the registration mark and the web (background). The teach process is completed using a simple rotary switch.

The extremely fast response time enables the control system to precisely align web material within the machine, for example, lining up labels on a web with the cutting blade of the equipment prior to the label being placed on a bottle.

### Features

- Three emitter LEDs (red, green, and blue)
- A 40  $\mu$ s response time
- Three simple setup methods: dynamic teach, static teach, or IO-Link configurable
- Adjustable-position micro (M12) quick-disconnect (QD) for mounting flexibility

### General Specifications

Environmental	
Certifications	UL, cULus, and CE Marked for all applicable directives
Enclosure Type Rating	IP67
Operating Temperature [C (F)]	-20...60° (-4...140°)
Storage Temperature [C (F)]	-40...75° (-40...167°)
Vibration	10...55 Hz, 0.5 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30 g with 11 ms pulse duration, meets or exceeds IEC 60947-5-2
Optical	
Sensing Distance	11 mm $\pm$ 2 mm
Angle Deviation	$\pm$ 3° max.
Light Source	3 LEDs (red, green, blue)
Electrical	
Operating Voltage	10...30 V DC (18...30V DC when operating in IO-Link® mode)
Current Consumption	$\leq$ 60 mA @ 24V DC
Protection Type	Short circuit, reverse polarity
Communication Interface	
Interface	IO-Link V1.0
Baud Rate	COM 2 (38.4 kBaud)
Outputs	
Response Time	40 $\mu$ s
Sensitivity Adjustment	Rotary switch
Output Type	2 x PNP/NPN (Push-Pull) complementary outputs
Output Mode	Light or dark operation
Output Leakage Current, Max.	$\leq$ 100 $\mu$ A per output
Discrete Output Rating	30V DC max./100 mA max.
Mechanical	
Housing Material	Die-cast zinc, nickel-plated
Lens Material	PMMA plastic, clear
Connection Type	M12, 4-pin , 90° rotateable

# PHOTOSWITCH® Photoelectric Sensors

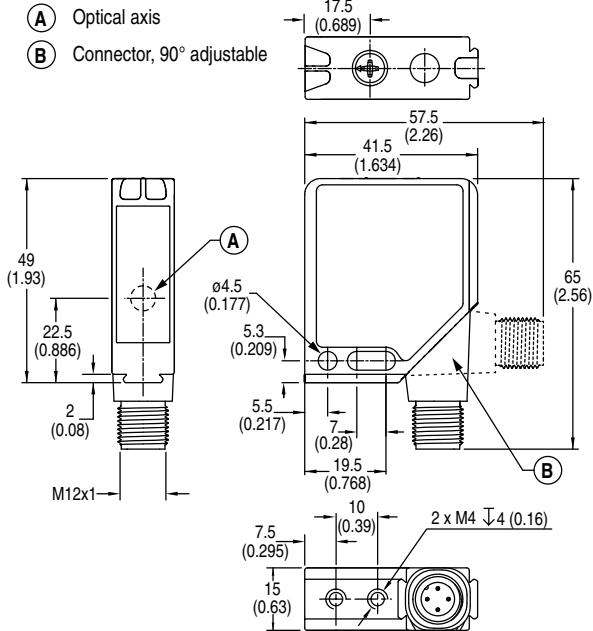
## 45CRM Contrast Sensor

1-Photoelectric Sensors

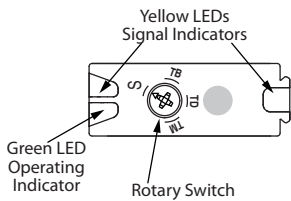
### Product Selection

Description	Spot Size [mm (in.)]	Cat. No.
Parallel beam	1 x 3 (0.04 x 0.12)	45CRM-4LHT1-D4
Perpendicular beam	3 x 1 (0.12 x 0.04)	45CRM-4LHT2-D4

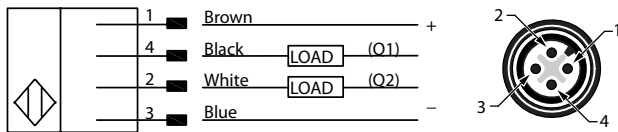
### Approximate Dimensions [mm (in.)]



### Controls and Indicators



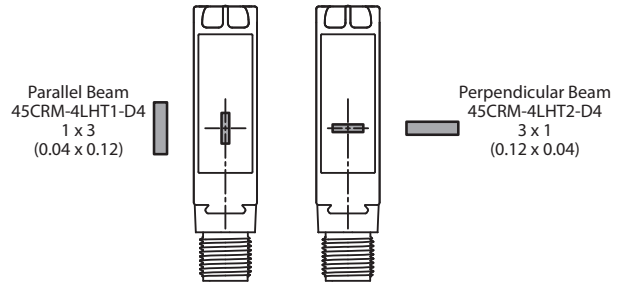
### Wiring Diagrams



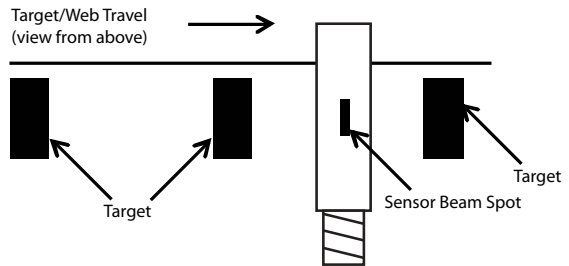
### Cordsets and Accessories

Description	Cat. No.
DC micro QD cordset, straight, 4-pin, 2 m (6.5 ft)	889D-F4AC-2
Mounting Bracket	45CRM-BRK1-ADAPT

### Light Spot Orientation [mm (in.)]

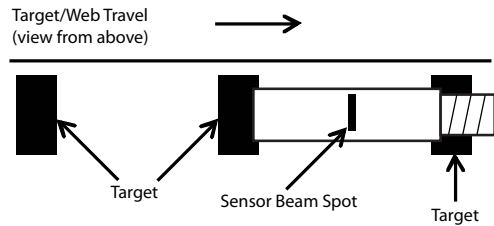


### Parallel Orientation



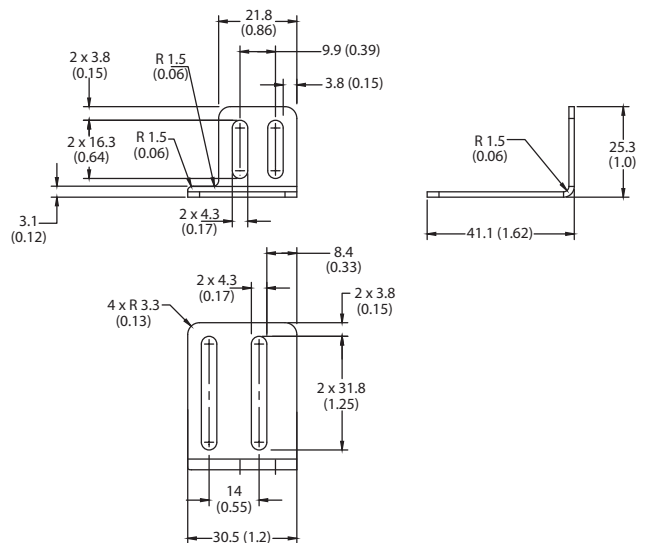
Select the 45CRM-4LHT1-D4 (parallel beam) when the sensor will be mounted perpendicular to the web travel.

### Perpendicular Orientation



Select the 45CRM-4LHT2-D4 (perpendicular beam) when the sensor will be mounted parallel to the web travel.

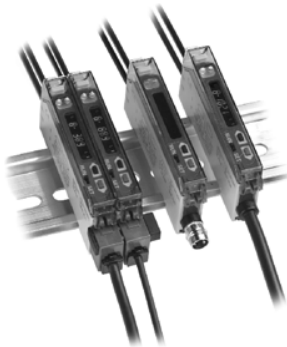
### Mounting Bracket 45CRM-BRK1-ADAPT [mm (in.)]



Visit our website: [www.ab.com/catalogs](http://www.ab.com/catalogs)



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**45FVL Visible Red, Blue, Green or White Plastic Fiber Optic**  
 Self-Teach with Digital Display



### Specifications

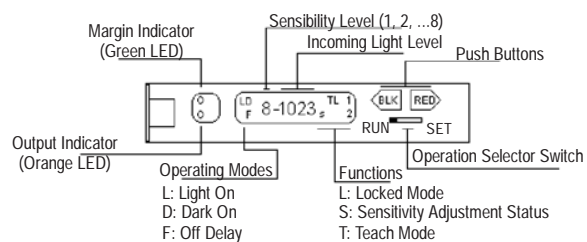
Environmental	
Certifications	CE Marked for all applicable directives
Operating Environment	NEMA 1; IP40
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	50 g , 3 directions, 3 times
Relative Humidity	35...85%
Ambient Light Immunity	Incandescent light 10,000 lux max
Optical	
Sensing Mode	Diffuse or transmitted beam depends on fiber optic cable selected
Light Source	Red LED (660 nm), green LED (525 nm), blue LED (470 nm), white LED
LED Indicators	See User Interface Panel below
Adjustments	Push buttons
Electrical	
Voltage	12...24V DC
Current Consumption	50 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	Channel 1 = 600 μs, channel 2 = 700 μs
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 30V DC max
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	ABS resin
Connection Types	4-pin DC pico (M8) QD, power bus cables
Supplied Accessories	60-2638 mounting assembly
Optional Accessories	See mounting bracket and cordsets on page 1-138

### Features

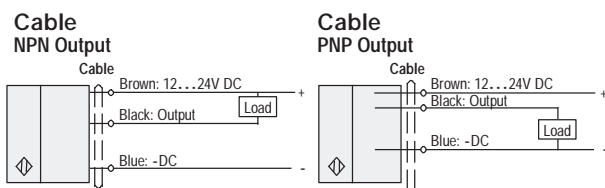
- S Choose from, red, green, blue, white light source
- S Self-teach capability
- S Manual or automatic sensitivity adjustment
- S Back-lit LCD display
- S Selectable 40 ms off delay output timer
- S DIN Rail mountable
- S "Power-Bus" option
- S Dual channel interference protection
- S Reverse polarity, false pulse and transient noise protection (500V)

### User Interface Panel

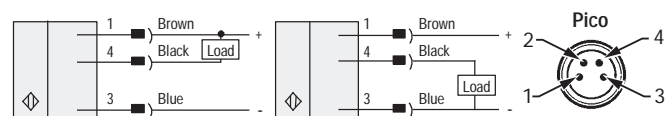
LED	State	Condition
Green	OFF ON	Unstable light signal Stable light signal
Orange	OFF ON	Output OFF Output ON



### Wiring Diagrams



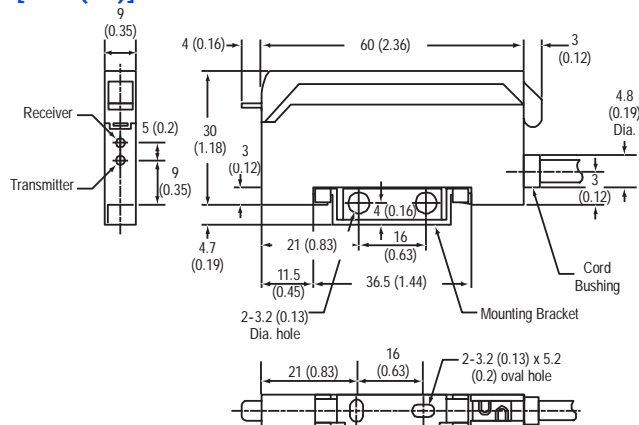
### Quick-Disconnect



## 45FVL Visible Red, Blue, Green or White Plastic Fiber Optic

Self-Teach with Digital Display

### Approximate Dimensions [mm (in.)]



### Typical Plastic Fiber Optic Cable Selection

LED	Sensing Mode	Plastic Fiber Diameter [mm (in.)]	Typical Fiber Model	Typical Range
Red	Diffuse (Bifurcated Fiber)	1 (0.040)	43PR-NES57ZS	Refer to the Fiber Optic section on page 1-231.
		0.5 (0.020)	43PR-NJS53ZM	
	Transmitted Beam (Individual Fiber)	1 (0.040)	43PT-NJS56FS	
		0.5 (0.020)	43PT-NBS52FM	
Green	Diffuse (Bifurcated Fiber)	1 (0.040)	43PR-NES57ZS	
	Transmitted Beam (Individual Fiber)		43PT-NJS56FS	
Blue	Diffuse (Bifurcated Fiber)		43PR-NES57ZS	
	Transmitted Beam (Individual Fiber)		43PT-NJS56FS	
White	Diffuse (Bifurcated Fiber)		43PR-NES57ZS	
	Transmitted Beam (Individual Fiber)		43PT-NJS56FS	

### Product Selection

Sensing Mode	Operating Voltage	Response Time	Output Characteristics		LED	Cat. No.		
			Type	Max Load Current		Cable	Pico	Power Bus (QD required)
<p>Field of View: Refer to Plastic Fiber Optic section page 1-270</p> <p>Emitter LED: Visible red 660 nm, Visible green 565 nm, Visible blue 470 nm, Visible white</p> <p>Indicators: Orange: Output, Green: Stability</p>	12...24V DC ±10%	600 μs	PNP	Output: 100 ma	Red	45FVL-2LHE-A2	45FVL-2LHE-P4	45FVL-2LHE-C4 ①
					Green	45FVL-3LHE-A2	45FVL-3LHE-P4	45FVL-3LHE-C4 ①
					Blue	45FVL-6LHE-A2	45FVL-6LHE-P4	45FVL-6LHE-C4 ①
					White	45FVL-5LHE-A2	45FVL-5LHE-P4	45FVL-5LHE-C4 ①
					Red	45FVL-2LGE-A2	45FVL-2LGE-P4	45FVL-2LGE-C4 ①
			Green		45FVL-3LGE-A2	45FVL-3LGE-P4	45FVL-3LGE-C4 ①	
			Blue		45FVL-6LGE-A2	45FVL-6LGE-P4	45FVL-6LGE-C4 ①	
			White		45FVL-5LGE-A2	45FVL-5LGE-P4	45FVL-5LGE-C4 ①	

① PowerBus master/3 conductor QD = 45F-A3C-A2. PowerBus slave/1 conductor QD = 45F-A1C-A2

### Cordsets and Accessories

Description	Cat./Page No.	Description	Cat./Page No.
Pico QD Cordset, Straight, 4-pin, 2 m	889P-F4AB-2	PowerBus master/3 conductor QD	45F-A3C-A2
Fiber Optic Cables	1-231	PowerBus slave/1 conductor QD	45F-A1C-A2
Fiber Optic Adaptor Replacements	61-6731 1.25...2.2 mm O.D. 61-6742 1.00...2.2 mm O.D.	PowerBus caps	45F-AMC 45F-AFC
Mounting Assembly	60-2638		



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**45FSL Visible Red or White Plastic Fiber Optic**  
 General Purpose DIN Style



**Features**

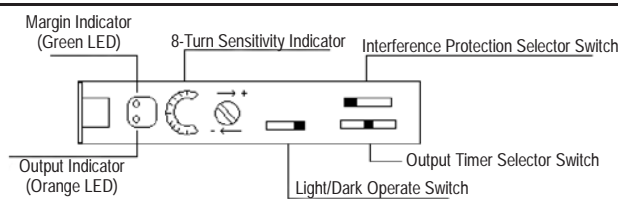
- S Choose from red or white light source
- S Dual LED indicators
- S Manual sensitivity adjustment
- S Selectable 40 ms on/off delay output timer
- S DIN Rail mountable
- S "Power-Bus" option
- S A 4/8 sensor cross-talk protection
- S Reverse polarity, false pulse and transient noise protection (500V)

**Specifications**

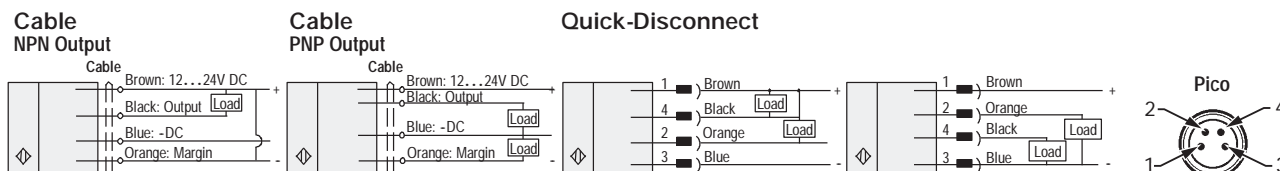
Environmental	
Certifications	CE Marked for all applicable directives
Operating Environment	NEMA 1; IP40
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	10 g , 3 directions, 3 times
Relative Humidity	35...85%
Ambient Light Immunity	Incandescent light 10,000 lux max
Optical	
Sensing Mode	Diffuse or transmitted beam depends on fiber optic cable selected
Light Source	Visible red LED (660 nm), visible white LED
LED Indicators	See User Interface Panel below
Adjustments	8-turn sensitivity potentiometer
Electrical	
Voltage	12...24V DC
Current Consumption	40 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	30 μs, 250 μs, 500 μs
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 30V DC max 50 mA stability output @ 30V DC max
Output Leakage Current	0.5 mA max
Mechanical	
Housing Material	ABS resin
Connection Types	2 m conductor cable (24 AWG), 4-pin DC pico OD, power bus cables
Supplied Accessories	60-2638 mounting assembly
Optional Accessories	See mounting bracket and cordsets on page 1-140

**User Interface Panel**

LED	State	Condition
Green	OFF	Unstable light signal Stable light signal
	ON	
Orange	OFF	Output OFF Output ON
	ON	



**Wiring Diagrams**



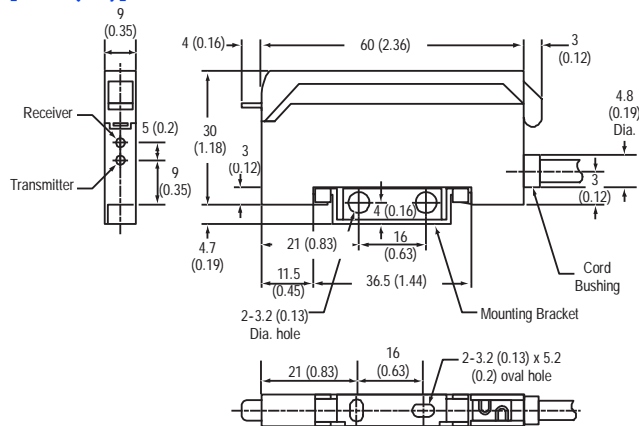
**Note:** Details regarding connection of Rockwell Automation 45FSL photoelectric sensors to Rockwell Automation Programmable Controllers can be found in "PHOTOSWITCH<sup>®</sup> Photoelectric Sensors and Programmable Controller Interface Manual" on [www.ab.com/literature](http://www.ab.com/literature).

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**45FSL Visible Red or White Plastic Fiber Optic**

General Purpose DIN Style

Approximate Dimensions [mm (in.)]



Typical Plastic Fiber Optic Cable Selection

LED	Sensing Mode	Plastic Fiber Diameter [mm (in.)]	Typical Fiber Model	Typical Range
Red	Diffuse (Bifurcated Fiber)	1 (0.040)	43PR-NES57ZS	Refer to the Fiber Optic section on page 1-231.
		0.5 (0.020)	43PR-NJS53ZM	
	Transmitted Beam (Individual Fiber)	1 (0.040)	43PT-NJS56FS	
		0.5 (0.020)	43PT-NBS52FM	
White	Diffuse (Bifurcated Fiber)	1 (0.040)	43PR-NES57ZS	
	Transmitted Beam (Individual Fiber)		43PT-NJS56FS	

Product Selection

Sensing Mode	Operating Voltage	Response Time	Output Characteristics		LED	Cat. No.			
			Type	Max Load Current		Cable	Pico	Power Bus (QD required)	
<p>Field of View: Refer to Plastic Fiber Optic section page 1-270</p> <p>Emitter LED: Visible red 660 nm, Visible white</p> <p>Indicators: Orange: Output, Green: Stability</p>	12...24V DC ±10%	Selectable 250 μs or 500 μs	PNP	Output: 100 ma Stability: 50 ma	Red	45FSL-2LHE-A2	45FSL-2LHE-P4	45FSL-2LHE-C4 ①	
					White	45FSL-5LHE-A2	45FSL-5LHE-P4	45FSL-5LHE-C4 ①	
			NPN		Red	45FSL-2LGE-A2	45FSL-2LGE-P4	45FSL-2LGE-C4 ①	
					White	45FSL-5LGE-A2	45FSL-5LGE-P4	45FSL-5LGE-C4 ①	
			30 μs		PNP	Red	45FSL-2LWE-A2	45FSL-2LWE-P4	45FSL-2LWE-C4 ①
						White	45FSL-5LWE-A2	45FSL-5LWE-P4	45FSL-5LWE-C4 ①
		NPN		Red	45FSL-2LVE-A2	45FSL-2LVE-P4	45FSL-2LVE-C4 ①		
				White	45FSL-5LVE-A2	45FSL-5LVE-P4	45FSL-5LVE-C4 ①		

① PowerBus master/4 conductor QD = 45F-A4C-A2  
PowerBus slave/2 conductor QD = 45F-A2C-A2

Cordsets and Accessories

Description	Cat./Page No.	Description	Cat./Page No.
Pico QD Cordset, Straight, 4-pin, 2 m	889P-F4AB-2	PowerBus master/4 conductor QD	45F-A4C-A2
Fiber Optic Cables	1-231	PowerBus slave/2 conductor QD	45F-A2C-A2
Fiber Optic Adaptor Replacements 1.25...2.2 mm O.D. 1.00...2.2 mm O.D.	61-6731 61-6742	PowerBus caps Male Female	45F-AMC 45F-AFC
Mounting Assembly	60-2638		

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42FT Visible Red or Green Plastic Fiber Optic**  
 Self-Teach



### Description

The 42FT is a compact, DIN Rail mount fiber optic photoelectric sensor with sophisticated part detection, diagnostic, and self-teach capabilities.

Five LED indicators provide diagnostic and alignment information. A dynamic diagnostic output signals when margin levels are below a predetermined threshold for seven successive detections.

The self-teach capability allows the Bulletin 42FT to determine an optimum sensitivity and hysteresis setting for a specific application. The remote lockout feature can be used to help prevent unauthorized changes to these adjustments. A switch selectable 50 ms off-delay ("pulse stretcher") is useful in high speed applications where the output pulse must be lengthened to allow time for the machine logic to respond.

### Features

- S Choose from red or green light source
- S Local and remote self-teach operation
- S Supports 1.5 mm and 1.25 mm plastic fiber optic cables
- S Fast 500  $\mu$ s response time
- S Selectable pulse-stretcher
- S Selectable hysteresis
- S Selectable light/dark operate
- S Dual "RUN" modes to prevent crosstalk with other sensors
- S Both NPN and PNP outputs

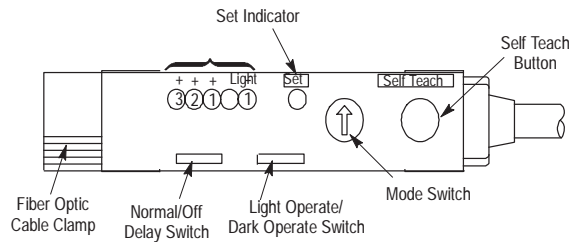
### Specifications

Environmental	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	NEMA 1, 4X, 12, 13; IP66 (IEC 529)
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 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...85%
Optical	
Sensing Mode	Fiber optic
Light Source	Red or green
LED Indicators	See User Interface Panel on page 1-142
Adjustments	Local teach and remote self teach
Electrical	
Voltage	12...24V DC
Current Consumption	60 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	500 $\mu$ s
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 24V DC max
Mechanical	
Housing Material	ABS resin
Connection Types	2 m conductor cable
Supplied Accessories	60-2638 mounting assembly, fiber optic adaptor
Optional Accessories	See mounting bracket and cordsets on page 1-143

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**42FT Visible Red or Green Plastic Fiber Optic**  
 Self-Teach

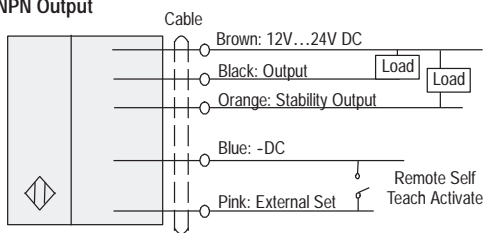
User Interface Panel

Label	Color	State	Status
Set	Green	OFF	Sensor not powered
		ON	Sensor powered, configuration verified
		Flashing	Self-teach mode active
-1... +3		ON	0.8X...1.6X margin
Light	Red	OFF	1X margin, output not activated
		ON	1X margin, output activated

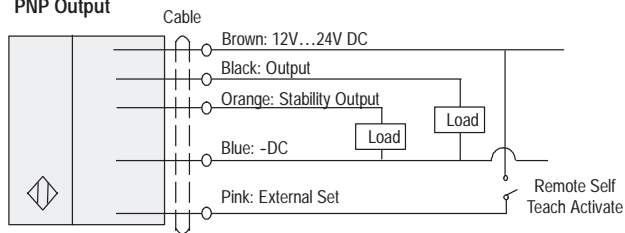


Wiring Diagrams

Cable NPN Output



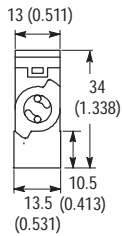
PNP Output



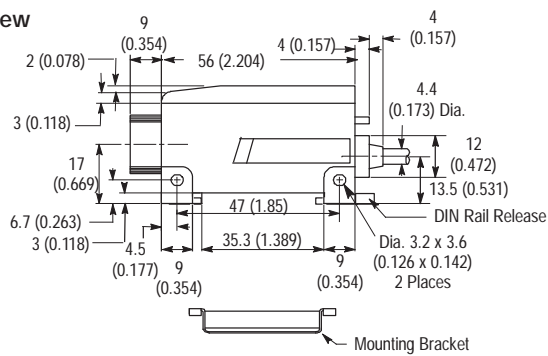
**Note:** Details regarding connection of Allen-Bradley Bulletin 42FT photoelectric sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0. Refer to [www.ab.com/literature](http://www.ab.com/literature) for more information.

Approximate Dimensions [mm (in.)]

End View



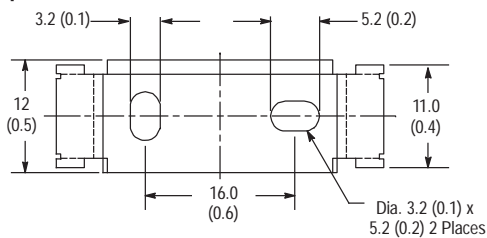
Side View



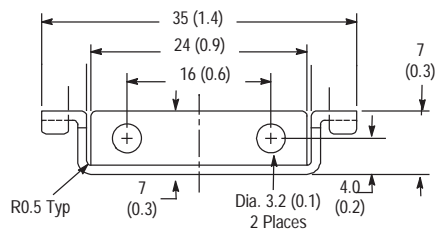
Mounting Assembly—60-2638

Stainless steel mounting bracket for installing the 42FT without a DIN Rail.

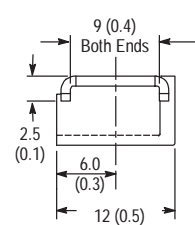
Top View



Side View

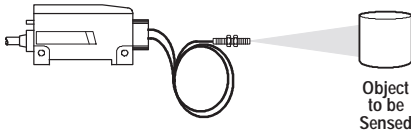


End View



## 42FT Visible Red or Green Plastic Fiber Optic

Self-Teach

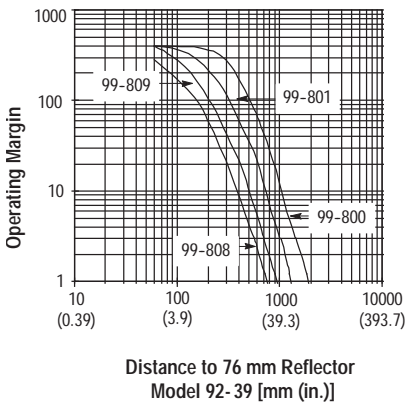


### QD Cordsets and Accessories

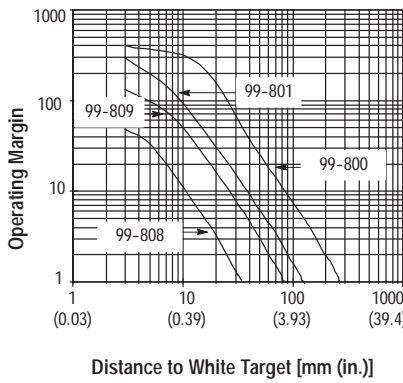
Description	Cat./Page No.
Fiber Optic Cables	1-231
Mounting Assemblies	1-293
Fiber Optic Cable Adaptors	61-6731
76 mm (3 in.) Diameter with Center Mount Hole	92-39
32 mm (1.25 in.) Diameter with Center Mount Hole	92-47

### Typical Response Curves for Visible Red LED

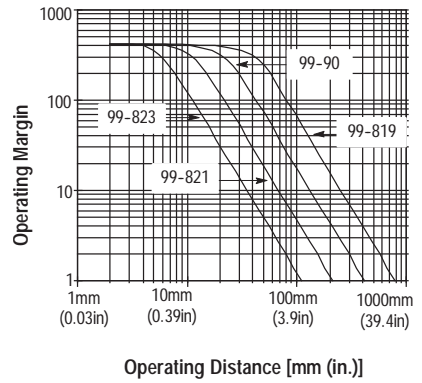
Retroreflective



Diffuse



Transmitted Beam



### Product Selection

Operating Voltage Supply Current	Max Sensing Distance @ 1X Margin	Output Energized	Emitter LED	Output Type Capacity Response Time	Max Leakage Current	Connection Type	Cat. No.
12...24V DC $\pm 10\%$ 60 mA	Depends on Fiber Optic Cable Selected	Light/Dark Selectable	Red 660 nm	PNP Output: 100 mA Stability: 50 mA 500 $\mu$ s	0.5 mA	2 m 500V cable	<b>42FT-F2LPA-A2</b>
			Green 565 nm			2 m 500V cable	<b>42FT-F3LPA-A2</b>
12...24V DC $\pm 10\%$ 50 mA			Red 660 nm	NPN Output: 100 mA Stability: 50 mA 500 $\mu$ s		2 m 500V cable	<b>42FT-F2LNA-A2</b>
			Green 565 nm			2 m 500V cable	<b>42FT-F3LNA-A2</b>

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**42FA Visible Red Plastic Fiber Optic**  
 Slim Housing



**Features**

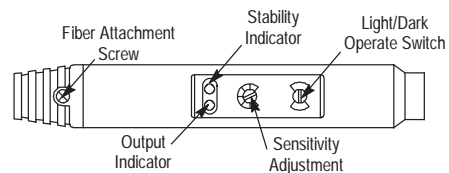
- S Compact 8 x 10 mm size
- S Dual LED indicators: output (red), stability (green)
- S Fast 500 μs response time
- S Visible red light source
- S Selectable light or dark operate
- S Can be DIN Rail mounted or mounted separately

**Specifications**

<b>Environmental</b>	
Certifications	UL Listed, CSA Certified, and CE Marked for all applicable directives
Operating Environment	NEMA 1, 12, 13; IP65 (IEC 529)
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 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...85%
<b>Optical</b>	
Sensing Mode	Fiber optic
Sensing Range	Depends on fiber optic selected
Field of View	Depends on fiber optic selected
Light Source	Visible red LED (660 nm)
LED Indicators	See User Interface Panel below
Adjustments	Sensitivity potentiometer
<b>Electrical</b>	
Voltage	12...24V DC
Current Consumption	30 mA max
Sensor Protection	Reverse polarity, false pulse, transient noise
<b>Outputs</b>	
Response Time	500 μs
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 24V DC
<b>Mechanical</b>	
Housing Material	NorylR
Lens Material	Not applicable
Connection Types	3-pin DC pico (M8) QD
Supplied Accessories	Mounting bracket, adhesive apertures (transmitted beam models), screwdriver, reflector (retroreflective models)
Optional Accessories	See cordsets and 35 mm DIN Rail on page 1-146

**User Interface Panel**

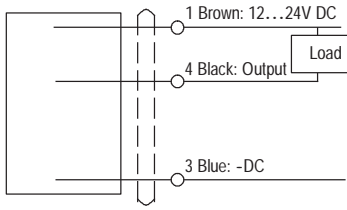
Label	Color	State	Status
STB	Green	OFF	0.8X < Margin < 1X
		ON	0.8X > Margin > 1X
OUT	Red	OFF	Output not activated
		ON	Output activated



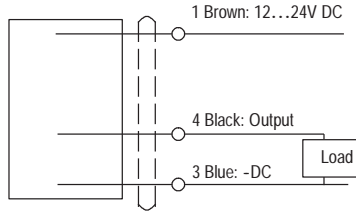
PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**42FA Visible Red Plastic Fiber Optic**  
 Slim Housing

**Wiring Diagrams**

**NPN Output**



**PNP Output**



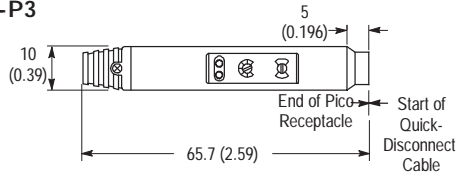
**Face View Male Receptacle (Sensor)**



**Note:** Details regarding connection of Rockwell Automation Bulletin 42FA photoelectric sensors to Rockwell Automation Programmable Controllers can be found in the *PHOTOSWITCH<sup>®</sup> Interface Manual*. Refer to [www.ab.com/literature](http://www.ab.com/literature) for more information.

**Approximate Dimensions [mm (in.)]**

**Pico Quick-Disconnect Versions**  
 42FA-F2LPA-P3  
 42FA-F2LNA-P3

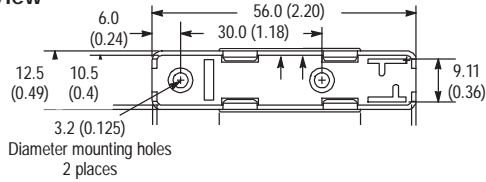


**DIN Rail Mounting Assembly—60-2639 (included with sensor)**

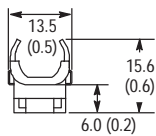
Mounting bracket and hardware for DIN rail mounting.

**Approximate Dimensions [mm (in.)]**

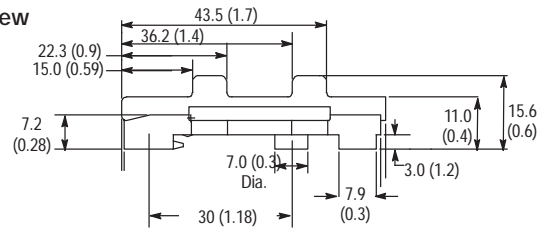
**Top View**



**End View**



**Side View**

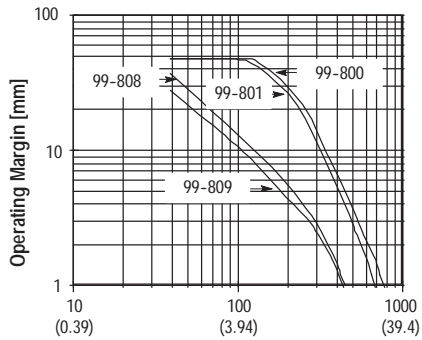


**Note:** Replacement mounting assembly and fiber optic cable adaptors are available on page 1-293.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**42FA Visible Red Plastic Fiber Optic**  
 Slim Housing

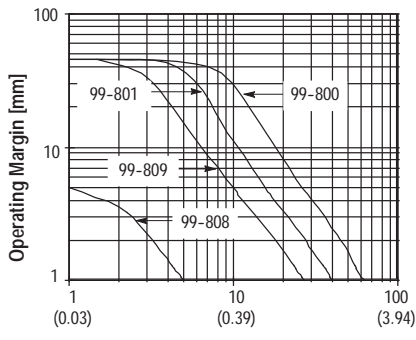
**Typical Response Curves**

**Retroreflective**



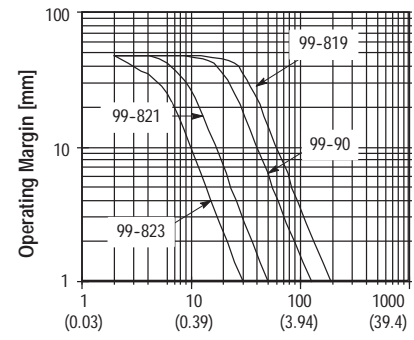
Distance to 76 mm Reflector Model 92-39 [mm (in.)]

**Diffuse**




Distance to White Target [mm (in.)]

**Transmitted Beam**



Operating Distance [mm (in.)]

**Product Selection**

 <p>Object to be Sensed</p> <p>Field of View: Refer to Fiber Optic section          Emitter LED: Visible red 660 nm</p>	<p><b>Operating Voltage</b>  <b>Supply Current</b></p> <p>12...24V DC ±10%          25 mA</p>	<p><b>Output Type</b>  <b>Capacity</b>  <b>Response Time</b></p> <p>NPN          100 mA          500 μs</p>	<p><b>Max Leakage Current</b></p> <p>0.5 mA</p>	<p><b>Connection Type</b></p> <p>3-pin pico</p>	<p><b>Cat. No.</b></p> <p>42FA-F2LNA-P3</p>
	<p>12...24V DC ±10%          30 mA</p>	<p>PNP          100 mA          500 μs</p>			

**Cordsets and Accessories**

Description	Cat./Page No.
2 m (6.5 ft) 3-pin Pico QD Cordset	<b>889P-S3AB-2</b>
Plastic Fiber Optic Cables	1-270
Adaptor for 1.25 mm Fiber Optic Cables	61-6731
DIN Rail Mounting Bracket	60-2639



## 45FPL Visible Red Small Aperture Teachable Fiber Optic

Extended Range with Digital Display



### Description

DIN rail mountable fiber optic sensors with easy to read LED display and teach-in functionality.

The 45FPL photoelectric sensors are designed for use with fiber optic cables up to 2.2 mm in diameter. An adaptor is supplied for use with either 1.0 or 1.25 mm fiber optic cables. No tools are required to attach or remove the fiber optic cables.

### Features

- S Two step static or dynamic teach functionality: allows the 45FPL photoelectric sensor to determine an optimum sensitivity setting for applications.
- S Large, easy to read back lit display: clearly indicates detected light levels, operating modes, functions and diagnostic information.
- S High speed and long range modes: allows for maximum application flexibility.
- S Selectable 45 ms OFF delay output timer: useful for interfacing to slower systems.
- S DIN rail mountable: for installation convenience, a steel bracket is supplied for applications requiring side mounting.
- S Reverse polarity, false pulse and transient noise protection.
- S Selectable L.O. or D.O. operating mode.
- S Manual override of switching threshold.

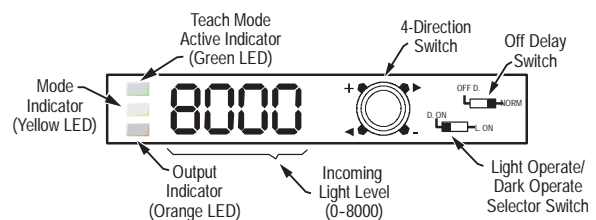
### Specifications

Environmental	
Certifications	UL and CE Marked for all applicable directives
Operating Environment	IP40
Operating Temperature [C (F)]	-25...+55° (-13...+131°)
Vibration	10...55 Hz, 1.5 mm double amplitude, 2 hrs. each in X, Y and Z directions
Shock	500 m/s <sup>2</sup> three times each in X, Y and Z directions
Relative Humidity	35...85% relative humidity (without condensation)
Ambient Light Immunity	Incandescent lamp: 3,500 lux max.
Optical	
Sensing Modes	Diffuse or transmitted beam, depends on fiber optic cable selected
Light Source	Visible red LED (660 nm)
LED Indicators	See User Interface Panel below
Adjustments	Full auto-teaching and manual adjustment
Electrical	
Voltage	12...24V DC ±10%
Current Consumption	PNP type 32 mA, NPN type 25 mA
Sensor Protection	Reverse polarity, short circuit, surge absorption (overload)
Outputs	
Response Time	High speed mode: 190 μs, Long range mode: 1.8 ms
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable
Output Current	100 mA @ 30V DC max
Mechanical	
Housing Material	Polycarbonate
Connection Types	2 m (6.5 ft) cable or 3-pin pico on 300 mm (11.8 in.) pigtail
Supplied Accessories	#61-6731 fiber optic cable adaptor (Qty 2), #60-2638 Steel mounting bracket (Qty 1)
Optional Accessories	Cordsets, ArmorBlock I/O, distribution boxes, fiber optic cables

### User Interface Panel

The user interface contains a large, easy to read back lit LCD display, a four position thumb switch, two operation mode selection switches, and LED indicators for configuring and viewing the sensor's operation and status.

Color	State	Status
Green	Flashing	Teach mode active
Yellow	ON	Long range mode
	OFF	High speed mode
Orange	ON	Output ON
	OFF	Output OFF



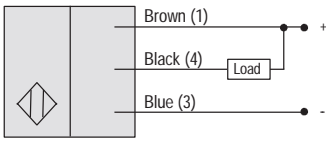
PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**45FPL Visible Red Small Aperture Teachable Fiber Optic**

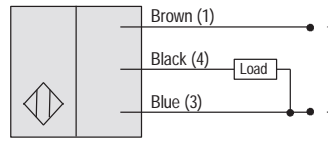
Extended Range with Digital Display

**Wiring Diagrams**

**PNP Output**



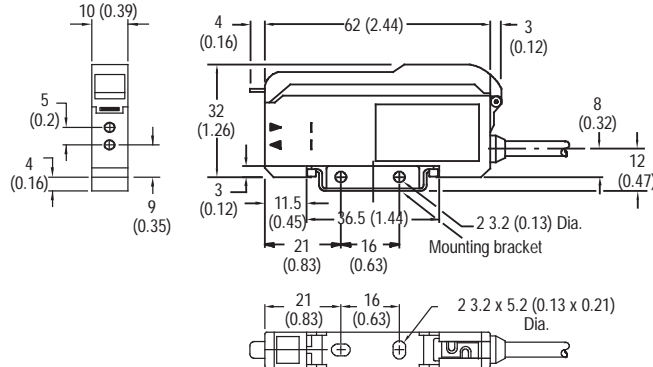
**NPN Output**



**Pico QD (M8)**



**Approximate Dimensions [mm (in.)]**



**Product Selection**

Sensing Characteristics	Operating Voltage	Output Type	Connection Type	Cat. No.
<p>Emitter LED: Visible red 660 nm Sensing Range: Refer to fiber optic selection below</p>	12...24V DC ±10%	PNP	2 m cable	45FPL-2LHE-A2
			3-pin pico QD (M8) on 300 mm pigtail	45FPL-2LHE-Y3
		NPN	2 m cable	45FPL-2LGE-A2
			3-pin pico QD (M8) on 300 mm pigtail	45FPL-2LGE-Y3

**Cordsets and Accessories**

Description	Cat. No.	Description	Cat. No.
Pico cordset	889P-F3AB-2	8-port, 3-pin pico distribution box	898P-P38PT-B5
3-pin pico patchcord, 2 m, straight	889P-F3ABPM-2	Fiber optic cables	Refer to <i>Sensors</i> catalog
ArmorBlock DeviceNet 8-port sinking input module (for use with PNP sensors only)	1732D-1B8M8	Fiber optic adaptor (included) 1.0...2.2 mm OD	60-6731
		Mounting assembly (included)	60-2638
4-port, 3-pin pico distribution box	898P-P34PT-B5		



Visit our website: [www.ab.com/catalogs](http://www.ab.com/catalogs). Preferred availability cat. nos. are printed in bold.





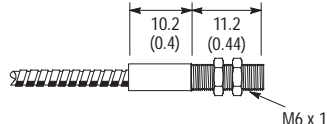
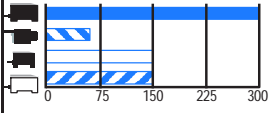


## 45FPL Visible Red Small Aperture Teachable Fiber Optic

Extended Range with Digital Display

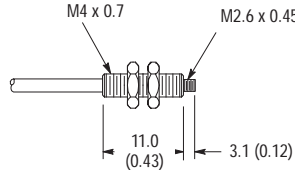
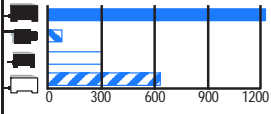
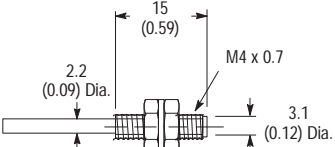
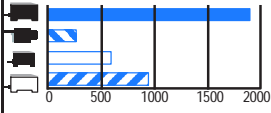
### 43GR Glass Fiber Optic Cable Selection

Threaded Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

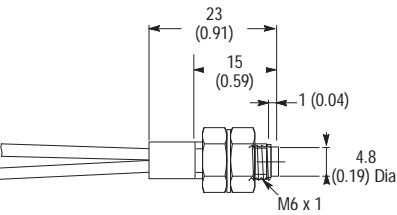
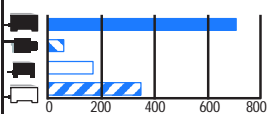
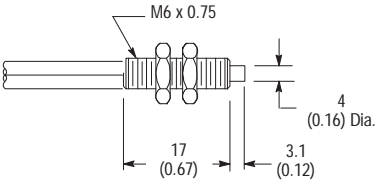
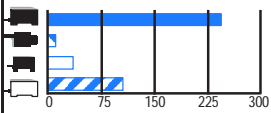
		Approximate Metric / Standard Distances							
		0	50	100	150	200	250	300	mm
		0	2	4	6	8	10	12	in.
	<b>45FPL-xxxx</b>		<b>42KL-L2xxx</b>		<b>45FSL-xxxx</b>		<b>45FVL-xxxx</b>		
Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm] ①	Cat. No.				
	Brass	2.2 (0.09)	Stainless Steel		<b>43GR-TAB20SS</b>				

### 43PT Plastic Fiber Optic Cable Selection

Threaded Transmitted Beam Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm] ①	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		<b>43PT-NJS56FS</b>
	40 (1.6)	1.5 (0.06)	Polyethylene		<b>43PT-NAS58FS</b>

Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm] ①	Cat. No.
	40 (1.6)	2 x 1.5 (0.06)	Polyethylene		<b>43PR-NDS59FS</b>
	25 (1.0)	2 x 1 (0.04)	Polyethylene		<b>43PR-NES57ZS</b>

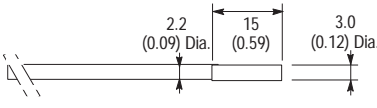
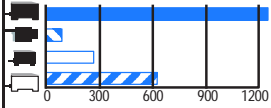
① The sensing distance for the 45FPL is two times the sensing distance for the 45FVL when used in long range mode.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

**45FPL Visible Red Small Aperture Teachable Fiber Optic**

Extended Range with Digital Display

Ferrule Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]❶	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		43PT-CBS56FS

**Notes:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.  
Two cables per one plastic transmitted beam cat. no.

❶ The sensing distance for the 45FPL is two times the sensing distance for the 45FVL when used in long range mode.



Visit our website: [www.ab.com/catalogs](http://www.ab.com/catalogs).  
Preferred availability cat. nos. are printed in bold.





ClearSight 9000



ClearSight RightSight



ClearSight 7000

**Features**

Three product families for application flexibility

- S Configurable ClearSight 9000 for harsh duty glass and PET bottle detection
- S ClearSight RightSight and 7000 for general purpose plastic film and stretch-wrap detection

**Specifications**

	9000	RightSight	7000
<b>Environmental</b>			
Certifications	cULus Listed and CE Marked for all applicable directives		
Operating Environment	NEMA 3, 4X, 6P, 12, 13, IP67 (IEC529); 1200 psi (8270 kpa) washdown for RightSight and Series 9000 models		
Operating Temperature [C (F)]	-34...+70° (-29...+158°)	-25...+55° (-13...+131°)	-40...+65° (+13...+150°)
Vibration	10...55 Hz, 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	35...85%		
Ambient Light Immunity	Incandescent light: 5000 lux		
<b>Optical</b>			
Sensing Modes	Clear object		
Sensing Range	1.2 m max	1 m max	1.5 m max
Field of View	See Product Selection table on page 1-149		
Light Source	Visible red LED (660 nm)		
<b>Electrical</b>			
Voltage	10...40V DC; 70...264V AC/DC	10.8...30V DC	11.8...28V DC
Current Consumption	30 mA max	35 mA max	46 mA max
Sensor Protection	Short circuit, false pulse, reverse polarity, overload		
<b>Outputs</b>			
Response Time	See Product Selection table on page 1-149		
Output Type	PNP and NPN, SDPT, SS relay, diagnostic output, see Product Selection table on page 1-149		
Output Mode	Light or dark operate selectable, light or dark operate by cat. no. (see Product Selection table on page 1-149)		
Output Current	Refer to Product Selection table on page 1-149		
<b>Mechanical</b>			
Housing Material	Valox <sup>®</sup>	Mindel <sup>®</sup>	Valox
Lens Material	Acrylic		
Connection Types	See Product Selection table on page 1-149		
Supplied Accessories	92-90 Reflector		
Optional Accessories	See mounting brackets and cordsets on page 1-150		

**Wiring Diagrams**

For Wiring Diagrams, please refer to base product specifications:

ClearSight RightSight see page 1-32

ClearSight 9000 see page 1-66

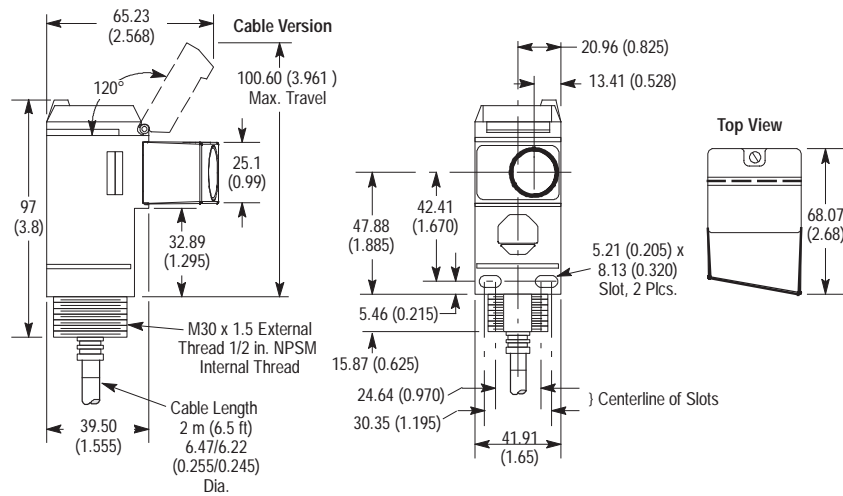
ClearSight 7000 see page 1-103

# ClearSight<sup>†</sup>

Clear Object Sensors

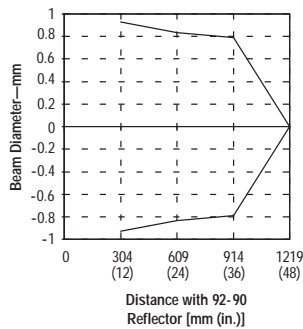
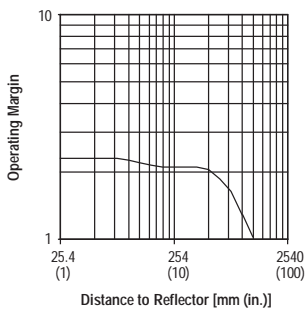
## Approximate Dimensions [mm (in.)]

### ClearSight 9000

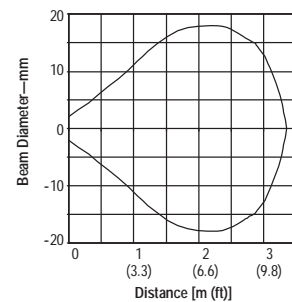
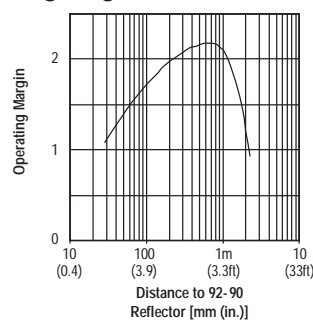


Dimensions for ClearSight RightSight and ClearSight 7000 are located on page 1-32 and 1-103, respectively.

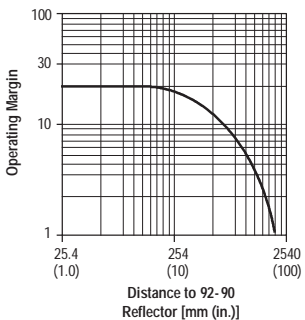
### Typical Response Curve Beam Pattern 9000



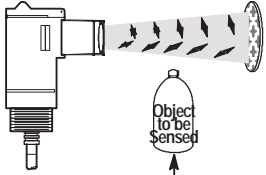
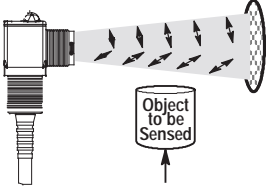
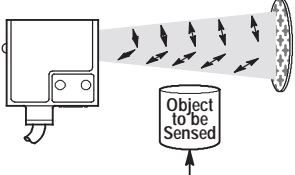
### Typical Response Curve Beam Pattern RightSight



### 7000



Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
<b>On/Off Sensors and Timing</b>						
 <p>9000 Field of View: 1.5_ Emitter LED: Visible red 660 nm</p>	10...40V DC 30 mA	0.025...1.2 m (0.08...4 ft)	Light/Dark Selectable	NPN/PNP 250 mA 2 ms	2 m 300V cable	42G⊗C-9200
	70...264V AC/DC 50/60 Hz 15 mA				4-pin DC micro	<b>42G⊗C-9200-QD</b>
					4-pin mini	42G⊗C-9200-QD1
70...264V AC/DC 50/60 Hz 15 mA	2 m 300V cable	SPDT EM Relay 2 A/132V AC/ 1 A/264V AC 1 A/150V DC 15 ms	42G⊗C-9202			
		5-pin mini	<b>42G⊗C-9202-QD</b>			
	45...264V DC/ 40...264V AC 50/60 Hz 15 mA	2 m 300V cable	Solid State Isolated N.O. 300 mA 2 ms	42G⊗C-9203		
4-pin mini		42G⊗C-9203-QD				
 <p>RightSight Field of View: 1.5_ Emitter LED: Visible red 660 nm</p>	21.6...264V AC/DC 15 mA	25 mm...1.5 m (1 in...3.28 ft)	Dark Operate	N-MOSFET/100 mA 8.3 ms	2 m 300V cable	42EF-C2SCA-A2
					4-pin AC micro	42EF-C2SCA-G4
	10.8...30V DC 35 mA			2 m 300V cable	NPN/PNP 100 mA 1 ms	42EF-C2KBA-A2
				4-pin DC micro	<b>42EF-C2KBA-F4</b>	
<b>Linear Polarized Sensors for Detection of Clear Films</b>						
 <p>7000 Field of View: 3_ Emitter LED: Visible red 660 nm</p>	11...28V DC 46 mA	50 mm...1.5 m (2 in...4.9 ft)	Comple- mentary L.O./D.O.	NPN 100 mA 1 ms	3 m cable	42SMU-7250
					4-pin DC micro	42SMU-7250-QD
				PNP 100 mA 1 ms	3 m cable	42SMU-7251
					4-pin DC micro	<b>42SMU-7251-QD</b>

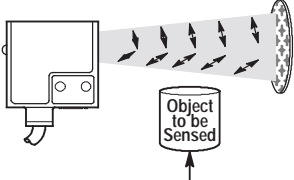
⊗ R for standard (i.e. 42GRC-9200)  
T for timing (i.e. 42GTC-9200)

Refer to page 1-150 for cordsets and accessories.

**ClearSight<sup>†</sup>**

Clear Object Sensors

**Product Selection (continued)**

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Connection Type	Cat. No.
<b>Circular Polarized Sensors for Detection of Clear Objects (Bottles, Clear Packages)</b>						
 <p>Field of View: 3_7000 Emitter LED: Visible red 660 nm</p>	11...28V DC 46 mA	50 mm...1.5 m (2 in...4.9 ft)	Comple- mentary L.O./D.O.	NPN 100 mA 1 ms	3 m cable	42SMU-7260
					4-pin DC micro	42SMU-7260-QD
				PNP 100 mA 1 ms	3 m cable	42SMU-7261
					4-pin DC micro	42SMU-7261-QD

**Cordsets and Accessories**

Description	Cat. No.	Description	Cat. No.
2 m (6.5 ft), 4-pin DC Micro QD Cordset	889D-F4AC-2	Mounting Bracket Swivel/Tilt for ClearSight 7000	60-2619
2 m (6.5 ft) 5-pin DC Micro QD Cordset	889D-F5AC-2	Mounting Bracket Swivel/Tilt for ClearSight RightSight	60-2649
2 m (6.5 ft), 4-pin AC Micro QD Cordset, Straight	889R-F4AEA-2	Mounting Bracket Swivel/Tilt for ClearSight 9000 and 10,000	60-2681
1.8 m (6 ft) 4-pin, Mini QD Cordset	889N-F4AF-6F	Reflector	92-90 (included)
1.8 m (6 ft) 5-pin Mini QD Cordset	889N-F5AF-6F		





**Specifications**

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP65
Operating Temperature [C (F)]	-20...+60° (-4...+140°)
Vibration/Shock	10...55 Hz, 1.5 mm amplitude; meets or exceeds IEC 60947-5-2
Relative Humidity	5...95% (noncondensing)
Ambient Light Immunity	Incandescent light 3000 lux

Optical	
Sensing Mode	Transmitted beam
Sensing Gap	3 mm (0.12 in.)
Light Source	Nonpulsed infrared
Adjustments	Push button for sensitivity adjustment, local and remote teach

Electrical	
Voltage	10...30V DC
Current Consumption	40 mA max
Sensor Protection	Short circuit, overload, transient noise, reverse polarity
Power ON Delay	350 ms

Outputs	
Response Time	50 µs
Output Type	PNP or NPN selectable
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 30 V DC
Output Leakage Current	12V Supply: 0.78 mA @ 10 mA load, 6.9 mA @100 mA load 24V Supply: 0.30 mA @ 10 mA load, 3 mA @ 100 mA load

Mechanical	
Housing Material	Aluminum
Connection Types	4-pin pico (M8) QD
Supplied Accessories	None
Optional Accessories	Cordsets

**Description**

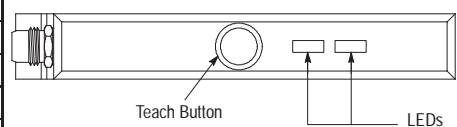
The 45LPT is an optical label sensor designed exclusively for the detection of standard or opaque labels on a high speed web. The 45LPT provides a solution for packaging industry applications such as label counting and web, "double sheet" and mark detection on a translucent film.

**Features**

- S "One Touch" local and remote teach capability
- S 10...30V DC operation
- S Fast 50 µsec response time
- S User interface lockout feature
- S IP65 housing
- S Industrial anodized aluminum housing

**User Interface**

Label	Color	State	Condition
—	Green ①	OFF	Sensor power not present
		Steady	Sensor power present
		Flash	Fine teach—translucent label teach
—	Red ①	OFF	Output inactive
		Steady	Interface lockout
		Flash	Standard label teach



① Red and green LED flash: SCP active or label too translucent or web to opaque.

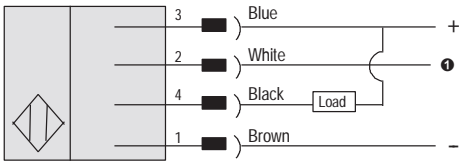
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45LPT

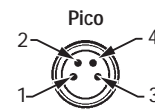
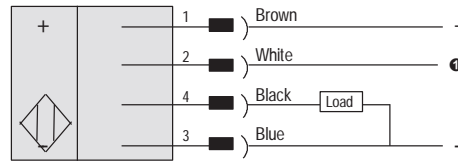
### Optical Label Sensor

#### Wiring Diagrams

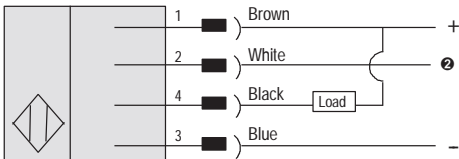
##### NPN (Light Operate)



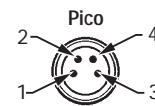
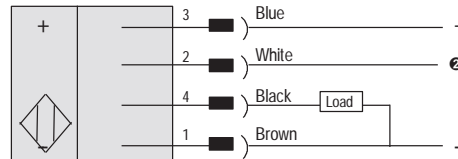
##### PNP (Light Operate)



##### NPN (Dark Operate)



##### PNP (Dark Operate)



① Remote teach = Connect **white** wire to (+) positive terminal.

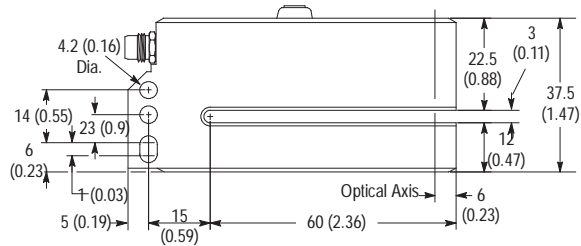
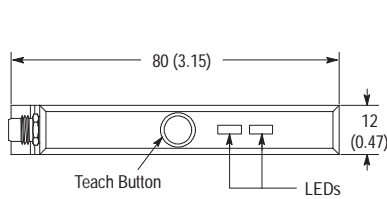
② Remote teach = Connect **white** wire to (-) negative terminal.

**Note:** If remote teach (white wire) is not used, connect it to (-) negative terminal.

**Note:** In the event of power failure, the sensor remembers the last threshold taught-in.

**IMPORTANT** For Label detection use Dark operate. For Web detection use Light operate.

#### Approximate Dimensions [mm (in.)]



#### Product Selection

Operating Voltage	Sensing Gap [mm (in.)]	Output Energized	Output Type	Response Time	Connection Type	Cat. No.
10...30V DC	3 (0.12)	L.O./D.O. Selectable	NPN or PNP Selectable	50 μsec	4-pin Pico	45LPT-1LEB1-P4
2 m (6.5 ft) pico QD Cordset						889P-F4AB-2



**Description**

The Allen-Bradley 45LFM capacitive label sensor uses an innovative electronic design to sense and/or count labels. Its unique technology enables it to sense the leading or trailing edges of labels that are not detectable by other similar sensors. The 45LFM provides an auto-teach function and a display to aid in initial setup and operational efficiency.

**Features**

- S Consistently senses the presence of most labels on a web
  - Clear labels on clear backing
  - Clear labels on opaque backing
  - Metallic labels on clear backing
  - Opaque labels on clear backing
  - Metallic labels on opaque backing
  - Opaque labels on opaque backing
- S Count 50,000 labels per minute with registration error less than 0.01 inch
- S Heavy-duty metal housing
- S Ideal for label counting and label registering applications

**Specifications**

Environmental	
Certifications	45LFM-CMBA1-D5 meets CE Marked for all applicable directives
Operating Environment	IP54
Operating Temperature [C (F)]	4...+50° (40...+120°)
Target Detection	
Sensing Modes	Capacitive
Registration Accuracy	0.025 mm (0.01 in.)
Minimum Sensing Gap	0.76 mm (0.03 in.)
LED Indicators	Edge, zero
Adjustments	Multi-turn potentiometer, selectable output polarity by wire
Electrical	
Voltage	11...28V DC
Current Consumption	50 mA
Sensor Protection	Short circuit, overload,reverse polarity
Power On delay	10 μs
Outputs	
Response Time	10 μS
Output Type	PNP and NPN
Output Mode	Selectable output polarity by wire
Output Current	150 mA max
Output Leakage Current	5 μA max
Mechanical	
Housing Material	Anodized aluminum
Connection Types	5-pin DC micro (M12) QD

**User Interface—45LFM-CMBA1-D5**

Label	Function
Gain	Sensitivity Adjustment
Zero	Gap Adjustment

**User Interface—45LFM-CMBA2-D5**

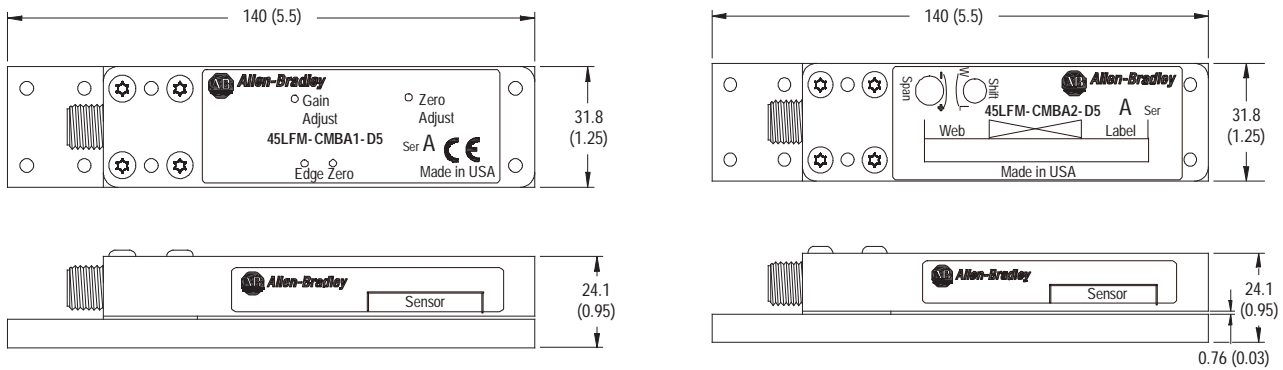
Label	Function
Shift	Adjusts position of illuminated LED on display
Span	Sensitivity Adjustment

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**45LFM**

Capacitive Label Sensor

Approximate Dimensions [mm (in.)]



Wiring

Designation	Lead Color (Cordset)	5-Pin Micro QD Pin Assignment
Termination		
V+	Brown	1
-V	Blue	2
PNP Output	Black	3
NPN Output	White	4
Output Polarity	Grey	5

Product Selection

Operating Voltage	Labels Sensed	Output Type	Response Time	Connection Type	Cat. No.
11...28V DC	Opaque Clear	NPN and PNP	10 μs	5-pin DC micro	45LFM-CMBA1-D5
	Opaque Clear Metallic				45LFM-CMBA2-D5
2 m (6.5 ft) Micro QD Cordset					889D-F5AC-2

**Note:** Pin 5 must be connected to +V or ground for reliable detection.



**Description**

The 45LSP is family of optical fork sensors housed in a plastic enclosure. Fork sensors offer self-contained transmitted beam sensing, ideal for applications that require reliable parts detection. The simple push button teach-in sensitivity adjustment, several connection options and multiple mounting features (via side thru-holes, rear threaded inserts, or optional dovetail brackets) make the 45LSP an economical, easy to use solution for typical applications such as small parts detection, edge detection, parts counting, gear tooth detection, dimension verifications, etc.

**Specifications**

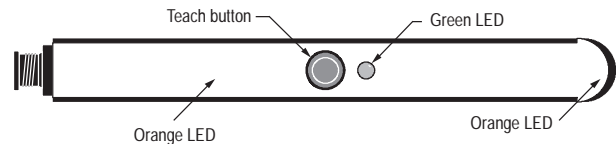
Environmental	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-20...+60° (-4...+140°)
Optical	
Sensing Modes	Transmitted beam
Sensing Gap	30, 50, 80, and 120 mm
Light Source	Visible red LED (640 nm)
LED Indicators	See User Interface below
Adjustments	Teach button
Electrical	
Voltage	10...30V DC
Current Consumption	30 mA max
Sensor Protection	Short circuit, reverse polarity
Outputs	
Response Time	250 μS
Output Type	PNP or NPN by cat. no.
Output Mode	Light or dark operate selectable (via teach button or remote)
Output Current	100 mA max
Mechanical	
Housing Material	Polycarbonate
Connection Types	4-pin DC pico (M8) QD connector, 3-pin DC pico (M8) QD connector
Optional Accessories	Cordsets and dovetail mounting brackets

**Features**

- § Detection of objects as small as 0.2 mm (0.008 in.)
- § Highly visible power and output LED indicators with output indication along both sides of the fork
- § Remote teach and teach button lock on 4-pin models
- § Light or dark operate selectable
- § Multiple mounting options: thru-holes, threaded holes and dovetail
- § Easy installation with no alignment required
- § 3- and 4-pin pico (M8) QD models

**User Interface**

LED Color	State	Status
Orange	OFF	Output de-energized
	ON	Output energized
	Flashing	Teach mode or short circuit protection active
Green	OFF	Power is OFF
	ON	Power is ON
	Flashing	Teach mode



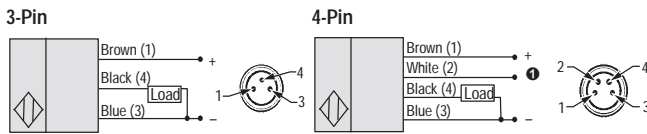
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45LSP

### Optical Fork Sensor

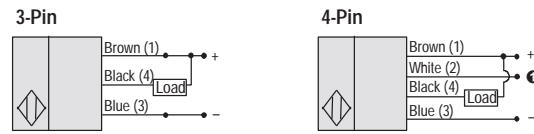
#### Wiring Diagrams

##### PNP Models

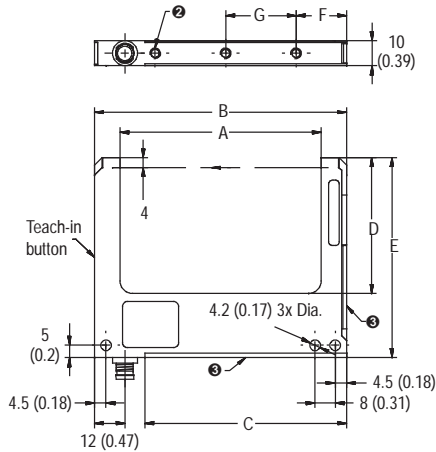


① Remote teach.

##### NPN Models



#### Approximate Dimensions [mm (in.)]



#### Cordsets and Accessories

Description	Cat. No.
2 m (6.5 ft) 3-pin DC pico QD	889P-F3AB-2
2 m (6.5 ft) 4-pin DC pico QD	889P-F4AB-2
Dovetail mounting bracket	44B-BKT

- ② M4 threaded inserts, 6 mm maximum depth.
- ③ Dovetail mounting

Gap Size	A	B	C	D	E	F	G
30 mm	30 (1.18)	50 (1.97)	30 (1.18)	34 (1.34)	59.5 (2.34)	20 (0.79)	—
50 mm	50 (1.97)	70 (2.76)	50 (1.97)	54 (2.13)	79.5 (3.13)	20 (0.79)	28 (1.10)
80 mm	80 (3.15)	100 (3.93)	80 (3.15)	54 (2.13)	79.5 (3.13)	20 (0.79)	2 x 28
120 mm	120 (4.72)	140 (5.51)	120 (4.72)	54 (2.13)	79.5 (3.13)	20 (0.79)	3 x 28

#### Product Selection

Sensing Gap	Resolution [mm (in.)] <sup>④</sup>	Operating Voltage	Output Mode	Connection Type	Output Type	Cat. No.
30 mm	0.2 (0.008) <sup>⑤</sup>	10...30 V DC	Light or dark operate selectable	3-pin pico	PNP	<b>45LSP-2LPA1-P3</b>
					NPN	45LSP-2LNA1-P3
4-pin pico	PNP			45LSP-2LPA1-P4		
	NPN			45LSP-2LNA1-P4		
50 mm	0.2 (0.008)			3-pin pico	PNP	<b>45LSP-2LPA2-P3</b>
					NPN	45LSP-2LNA2-P3
4-pin pico	PNP			45LSP-2LPA2-P4		
	NPN			45LSP-2LNA2-P4		
80 mm	0.2 (0.008)	3-pin pico	PNP	<b>45LSP-2LPA3-P3</b>		
			NPN	45LSP-2LNA3-P3		
4-pin pico	PNP	45LSP-2LPA3-P4				
	NPN	45LSP-2LNA3-P4				
120 mm	0.4 (0.016)	3-pin pico	PNP	<b>45LSP-2LPA4-P3</b>		
			NPN	45LSP-2LNA4-P3		
4-pin pico	PNP	45LSP-2LPA4-P4				
	NPN	45LSP-2LNA4-P4				

- ④ Not over the entire temperature range. For maximum precision, allow for a heating period of approximately 15 minutes.
- ⑤ For detection of objects less than 0.9 mm (0.035 in.), the object should be placed  $\geq 10$  mm away from the LED light source.



**Description**

The 45LST optical fork sensor is designed for small part detection on machines and conveyors. With available slot widths from 2...225 mm (0.08...8.86 in.), these sensors feature adjustable sensitivity and selectable NPN/PNP with L.O./D.O. energized output in a heavy-duty IP65 aluminum housing. Applications include label detection on clear substrates, cap detection on bottles, and part sensing on conveyors for the packaging and material handling industries. The 45LST sensors are also ideal for the automotive, paper, and food industries.

**Features**

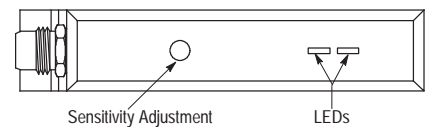
- S 10...30V DC operation
- S Fast 30 μsec response time for selected models
- S NPN/PNP output
- S IP65 housing
- S Industrial aluminum housing
- S cULus Listed and CE Marked for all applicable directives

**Specifications**

Environmental	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	IP65
Operating Temperature [C (F)]	-20...+60° (-4...+10°)
Ambient Light Immunity	Incandescent light 3000 lux
Optical	
Sensing Modes	Transmitted beam
Sensing Gap	2...225 mm (0.08...8.86 in.)
Light Source	Nonmodulated infrared, infrared LED (880 nm)
LED Indicators	See User Interface below
Adjustments	25 turn potentiometer
Electrical	
Voltage	10...30V DC
Current Consumption	40 mA max
Sensor Protection	Short circuit, reverse polarity, transient, overload
Power On Delay	129 ms
Outputs	
Response Time	1 ms , 30 μS (45LST-1LEA1-P4 only)
Output Type	PNP or NPN selectable
Output Mode	Light or dark operate selectable
Output Current	100 mA max
Output Leakage Current	12V DC supply : 0.78 mA @ 10 mA load, 6.9 mA @ 100 mA load 24V DC supply : 0.30 mA @ 10 mA load, 3.0 mA @ 100 mA load
Mechanical	
Housing Material	Anodized aluminum
Connection Types	4-pin DC pico (M8) QD connector
Optional Accessories	Cordsets

**User Interface**

Label	Color	State	Condition
—	Green <b>1</b>	OFF	Sensor power not present
		Steady	Sensor power present
—	Red <b>1</b>	OFF	Output inactive
		Steady	Output active



**1** Red and green LED flash: SCP active

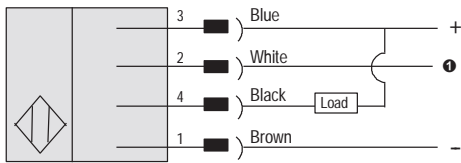
# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45LST

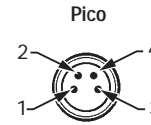
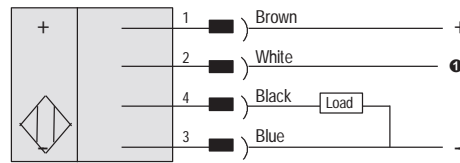
### Optical Fork Sensor

#### Wiring Diagrams

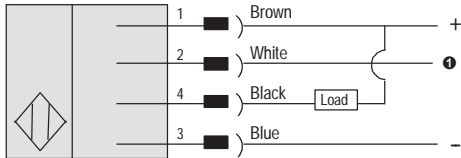
##### NPN (Light Operate)



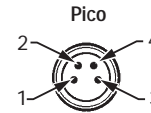
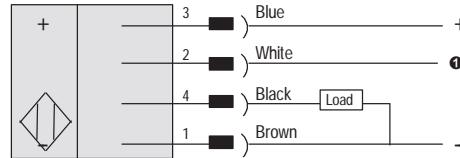
##### PNP (Light Operate)



##### NPN (Dark Operate)

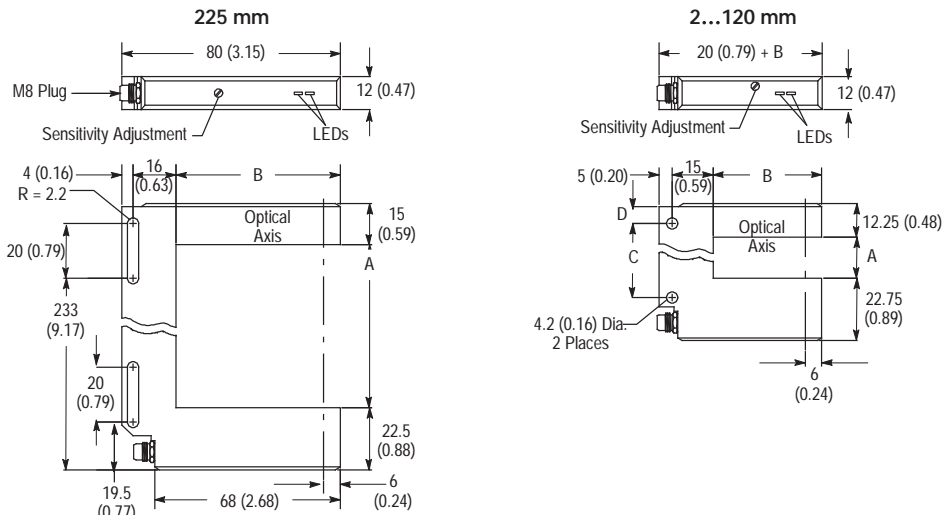


##### PNP (Dark Operate)



① White wire not used.

#### Approximate Dimensions [mm (in.)]



Dimensions [mm (in.)]

Fork Size	A	B	C	D
2...120 (0.08...4.72)	2 (0.08)	40 (1.57)	14 (0.55)	6.25 (0.25)
	15 (0.59)	40 (1.57)	27 (1.06)	6.25 (0.25)
	30 (1.18)	40 (1.57)	42 (1.65)	6.25 (0.25)
	50 (1.97)	57 (2.24)	40 (1.57)	17.25 (0.68)
	80 (3.15)	57 (2.24)	70 (2.75)	17.25 (0.68)
	120 (4.72)	57 (2.24)	110 (4.33)	17.25 (0.68)
225 (8.86)	225 (8.86)	60 (2.36)	—	—



**Product Selection**

Operating Voltage	Sensing Gap [mm (in.)]	Output Energized	Output Type	Light Source Emission	Response Time	Connection Type	Cat. No.
10...30V DC	2 (0.08)	LO/DO Selectable	NPN or PNP Selectable	Continuous	30 $\mu$ sec	4-pin pico	45LST-1LEA1-P4
	15 (0.59)			Modulated	1 ms		45LST-1LEA2-P4
	30 (1.18)						45LST-1LEA3-P4
	50 (1.96)						45LST-1LEA4-P4
	80 (3.15)						45LST-1LEA5-P4
	120 (4.72)						45LST-1LEA6-P4
	225 (8.86)						45LST-1LEA7-P4
2 m (6.5 ft) pico QD Cordset							889P-F4AB-2

## 45MLA

### Measuring Arrays and Controllers



#### Description

The Allen-Bradley 45MLA is a measurement sensor that utilizes an array of transmitted beam photoelectric sensor pairs to detect and measure objects. The array housing is extremely compact, allowing for easy installation in a range of applications.

The 45MLA are packaged as transmitted beam pairs—the emitter and receiver arrays are both included. The system requires an Allen-Bradley 45MLA controller, which must be ordered separately. Three versions of the controller (I/O, RS485, CAN) are available, each offering a different communications platform that can be selected to function with a range of PLCs.

The controller drives the photoelectric elements in the emitter and reads out the receiver beam information. Use of this external controller allows the flexibility to configure up to four separate sensing zones with independent outputs or the communication of individual beam status via serial protocols. Additionally, the 45MLA can also be customized for application specific overhang and over-height detection.

#### Features

- § Height measuring capability
- § Slim profile array housing
- § Long operating range—4 m (13 ft)
- § Fast reaction time and measurement speed
- § Individual beam status available via controller (serial communication models only)

#### Specifications

Environmental	45MLA Arrays	45MLA Controller
Certifications	CE Marked for all applicable directives	
Operating Environment	IP54	Housing IP54, terminal strip IP20
Operating Temperature [C (F)]	0...55° (32...131°)	
Storage Temperature [C (F)]	-20...70° (-4...158°)	-25...70° (-13...158°)
Vibration	10...55 Hz; amplitude 0.35 mm (0.01 in.); meets or exceeds IEC 60068-2-6	
Shock	Acceleration 10 g, pulse duration 16 ms, 10...55 Hz; amplitude 0.35 mm (0.01 in.); meets or exceeds IEC 60068-2-29	
Relative Humidity	15...95%	15...95%
<b>Optical</b>		
Sensing modes	Transmitted beam pair	—
Sensing Range	0...4 m (0...13 ft)	—
Field of View	3.2°	—
Light Source	940 nm	—
Beam Spacing	10 mm (0.4 in.) or 25 mm (1.0 in.)	—
Resolution	18 mm (0.7 in.) or 33 mm (1.3 in.)	—
LED Indicators	Red: Status Green: Alignment	Alignment, target present, outputs, inputs, power
<b>Electrical</b>		
Voltage	Provided by controller	20.4...27.6V DC ±5% max. ripple
Current Consumption	—	<300 mA with max. no. of beams to controller, outputs not connected
Sensor Protection	EN61000-4-2, EN 61000-4-4 and EN 61000-4-5; short circuit (SCP), reverse polarity, and overload	
<b>Outputs</b>		
Response Time	See <i>45MLA Controller User Manual</i>	
Output Type	—	NPN and PNP (push/pull output)
Output Mode	—	Dark operate (when connected as PNP)
Output Current	—	150 mA max. each
<b>Mechanical</b>		
Housing Material	Aluminum	ABS(FR) UL94-V0
Lens Material	Polycarbonate	—
Cover Material	Aluminum	Polycarbonate
Connection Types	8-pin DC micro (M12) female QD on 500 mm (20 in.) cable pigtail—controller connection only	Spring loaded terminal connections
Supplied Accessories	Adjustable mounting kit (445L-AF6143)	
Required Accessories	Controller 45MLA controller I/O model Cat. No. 45MLA-CTRL 45MLA controller RS45 Cat. No.: 45MLA-CTRL-485 45MLA controller CAN Cat. No. 45MLA-CTRL-CAN Light array to controller connecting cable 3 m (9.8 ft) M12—RJ45 Cat. No. 445L-AC8RJ3 5 m (16.4 ft) M12—RJ45 Cat. No. 445L-AC8RJ5 8 m (26.2 ft) M12—RJ45 Cat. No. 445L-AC8RJ8 Max. system length cannot exceed 10 m (32.8 ft)	
Optional Accessories	Flat mounting kit Cat. No. 445L-AF6145	

### User Interface

The following table indicates LED status and descriptions for LEDs on the emitter and receiver light arrays.

Location	LED	Description	Status	Meaning
Emitter and Receiver Arrays	Green	Light array alignment	Off	Arrays not aligned (or target present)
			On	Arrays aligned (and target not present)
			Flashing	Low margin/light intensity inadequate
	Red	Light array status	Off	Target not present (and arrays aligned)
			On	Target present (or arrays not aligned)

The following table indicates the status and description for each LED on the controller's main PCB.

LED	Description	Color	Meaning
D1	Light Array OK	Off	Target present or light arrays not aligned
		Green	Target not present and light arrays aligned
		Green flashing	Low margin/light intensity inadequate
D2	Light array status	Off	Target not present
		Red	Target present
		Red Flashing	Height Measurement Error
D3	Out1	Off	Output 1 inactive
		Green	Output 1 active
D4	Out2	Off	Output 2 inactive
		Green	Output 2 active
D5	In1	Off	Input 1 inactive
		Green	Input 1 active
D6	In2	Off	Input 2 inactive
		Green	Input 2 active
D7	Power	Off	Power off
		Green	Power on

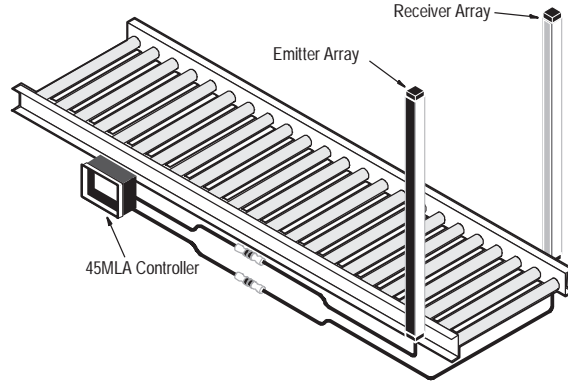
# PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

## 45MLA

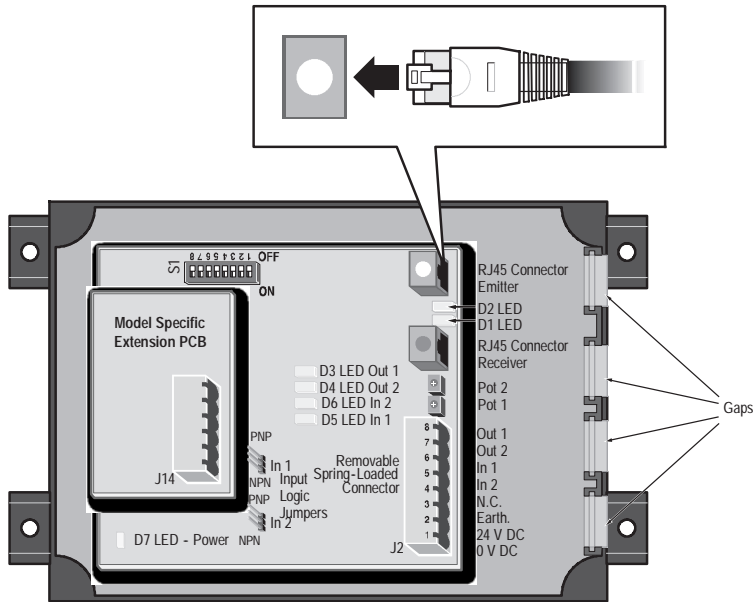
### Measuring Arrays and Controllers

#### Wiring Diagrams

The 45MLA is a "Three Box System." Every setup consists of an emitter array, a receiver array, and an external controller.



Each controller has the same base PCB and a pre-installed extension PCB with model-specific functionality and additional connections.



Connector J2 on the base PCB has the following pinout for all controller models.

Pin	Signal	Description
1	0V DC	Power
2	+24V DC	Power
3	Ground	Ground
4	Not connected	Not connected
5...8	Model specific functions (see below)	

Pins 5...8 on connector J2 (on the base PCB) have different functionality with each controller model. The following tables show the pin connections for each specific model.

**I/O Model**

Pin	Signal	Description	Remarks
5	In 2	Trigger and hold	DIP switch S1 (7) = 0
		Overhang back sensor	DIP switch S1 (7) = 1
6	In 1	Not used	DIP switch S1 (7) = 0
		Overhang front sensor	DIP switch S1 (7) = 1
7	Out 2	Light array interrupted❶	0 V DC = interrupted 24 V DC = not interrupted
8	Out 1	Overhang	0 V DC = overhang 24 V DC = no overhang

**RS485 and CAN models**

Pin	Signal	Description	Remarks
5	In 2	Trigger and hold	Special function
6	In 1	Not used	Not used
7	Out 2	Light interrupted❶	0V = interrupted
8	Out 1	Overhang	0V = overhang

❶ Or over-height (special function)

The extension PCB has connections specific to the functionality of each individual model. Here are the pin connections for each model. The connectors are labeled on the PCB.

**I/O Model  
Connector J14**

Pin	Signal	0V DC	+24V DC
1	Out 3	Zone Z1 interrupted	Zone Z1 not interrupted
2	Out 4	Zone Z2 interrupted	Zone Z2 not interrupted
3	Out 5	Zone Z3 interrupted	Zone Z3 not interrupted
4	Out 6	Zone Z4 interrupted	Zone Z4 not interrupted

**RS485 Model  
Connector J16**

Pin	2 Wire	4 Wire
1	0V DC	0V DC
2	—	Rx+
3	Shielding	Shielding
4	—	Rx-
5	B	Tx+
6	A	Tx-

**CAN Model  
Connectors J12 and J13 (RJ45)**

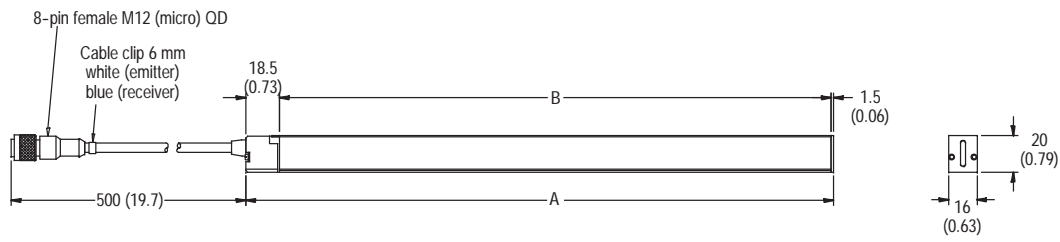
Pin	Signal
1	CAN H
2	CAN L
3	0V DC
4	Not connected
5	Not connected
6	Shield
7	0V DC
8	CAN V+

**45MLA**

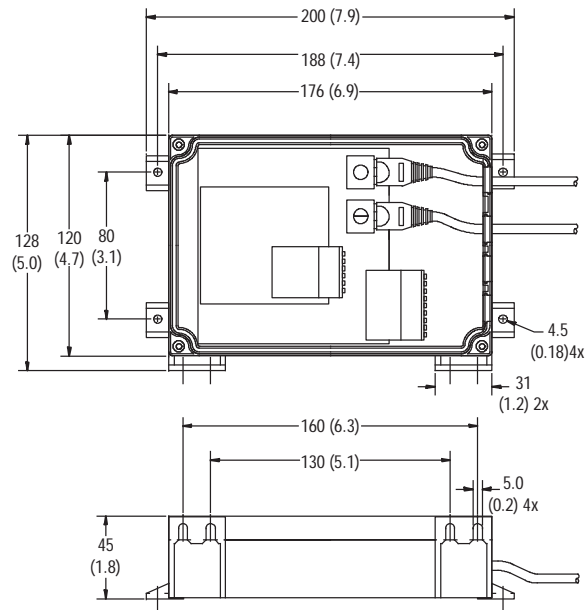
Measuring Arrays and Controllers

Approximate Dimensions [mm (in.)]

Arrays



Controller



**Note:** The controller can be mounted either on a DIN Rail using the mounting brackets on the back or with four screws through the holes on the tabs extending from the corners of the housing.

## Product Selection

## Arrays

No. of Beams	A Housing Height [mm (in.)]	B Sensing Height [mm (in.)]	Beam Spacing [mm (in.)]	Length x Width [mm (in.)]	Cat. No.
30	320 (12.6)	300 (11.8)	10 (0.39)	20 x 16 (0.79 x 0.62)	45MLA-AT0300P10
60	630 (24.4)	600 (23.6)	10 (0.39)	20 x 16 (0.79 x 0.62)	45MLA-AT0600P10
90	920 (36.2)	900 (35.4)	10 (0.39)	20 x 16 (0.79 x 0.62)	45MLA-AT0900P10
120	1220 (48.0)	1200 (47.2)	10 (0.39)	20 x 16 (0.79 x 0.62)	45MLA-AT1200P10
36	920 (36.2)	900 (35.4)	25 (0.98)	20 x 16 (0.79 x 0.62)	45MLA-AT0900P25
48	1220 (48.0)	1200 (47.2)	25 (0.98)	20 x 16 (0.79 x 0.62)	45MLA-AT1200P25

## Controllers

Description	Cat. No.
I/O Model	45MLA-CTRL
RS485	45MLA-CTRL-485
CAN	45MLA-CTRL-CAN

## Accessories

Description	Cat. No.
Flat mounting kit (four pieces/set)	445L-AF6145
180° adjustable mounting kit (four pieces/set, included with arrays)	445L-AF6143
Cable—Light array to controller	
3 m M12—RJ45	445L-AC8RJ3
5 m M12—RJ45	445L-AC8RJ5
8 m M12—RJ45	445L-AC8RJ8

## 45DLA

### Discrete Light Arrays



#### Description

The Allen-Bradley 45DLA discrete light array is an ON/OFF sensor that utilizes an array of transmitted beam photoelectric sensor pairs to detect objects over a much wider span than traditional sensors. The 45DLA are packaged as transmitted beam pairs (the emitter and receiver arrays are both included). The controls are integrated into the array housing and no separate controller is required. The emitter and receiver are optically synchronized and therefore do not need to be wired together.

#### Features

- § Integrated light array controller
- § IP54
- § Simple, flexible mounting
- § Optically synchronized (no electrical connection between emitter and receiver required)
- § Push/pull (PNP/NPN) outputs (connect to sinking or sourcing inputs)
- § Wiring selectable range and output state (light/dark operate)
- § 30 mm resolution
- § Sensing height of 118...734 mm (4.6...28.9 in.)

#### Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP54
Operating Temperature [C (F)]	-20°...+55° (-4°...+131°)
Vibration	2 g, 10...200 Hz; 20 sweeps each axis; meets or exceeds EN 60068-2-6
Shock	15 g, 11 ms, 3 x each axis; 10 g, 16 ms, 100 x each axis; meets or exceeds EN 60068-2-27 and EN 60068-2-29
Relative Humidity	5...95% (noncondensing)
Ambient Light Immunity	75,000 Lux
Optical	
Sensing Modes	Transmitted beam pair
Sensing Range	200...1500 mm (7.9...59 in.) or 1.0...8.0 m (3.3...26.2 ft)
Field of View	Emitter (long range selected): 15° @ 3.0 m (9.8 ft) Receiver (when emitter has long range selected): 35° @ 3.0 m (9.8 ft)
Light Source	Infrared LED (880 nm)
LED Indicators	Green (transmitter only) = power, orange (receiver only) = target present
Adjustments	Selectable range (by wiring input)
Resolution	30 mm (1.2 in.)
Beam Pitch	22 mm (0.87 in.)
Number of Beams	4...32 by Cat. No.
Sensing Height	118...734 mm (4.65...28.9 in.) by cat. no.
Electrical	
Voltage	14...30V DC
Current Consumption	50 mA @ 24V DC without load connected
Sensor Protection	Short circuit (SCP), reverse polarity
Outputs	
Response Time	25...165 ms by cat. no.
Power-On Time	100 ms + response time
Output Type	PNP/NPN (single push/pull output)
Output Mode	Dark or light operate selectable (by wiring)
Output Current	120 mA max.
Mechanical	
Housing Material	Aluminum
Housing Height	266...882 mm (10.5...34.7 in.) by cat. no.
Lens Material	Polycarbonate
Cable Material	PVC
Connection Type	4-pin DC micro (M12) on 150 mm (6 in.) cable pigtail



**User Interface Panel**

LED	Description	Status	Meaning
Emitter Array	Emitter Status	Off	No Power
		Green	Power OK
Receiver Array	Receiver Status	Off	No power OR target not present
		Orange	Power OK and target present (or arrays not aligned)

**Wiring Diagrams**

**Emitter**



① Pin 2 (white wire): Connect to 0V or not connected for 1.0...8.0 m (3.3...26.2 ft) range; connect to V+ (24V) for 0.2...1.5 m (0.6...4.9 ft) range.

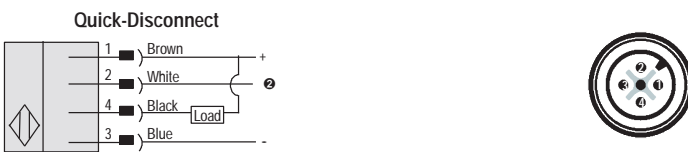
**Note:** In applications with multiple 45DLA pairs in one area, it is recommended to use the shorter range option (by connecting Pin 2/white wire to 24V) to reduce the potential for interference between separate pairs.

**Note:** For applications with a range of less than 1 m (3.3 ft) it is recommended to use the shorter range option to improve the response time.

**Receiver:**

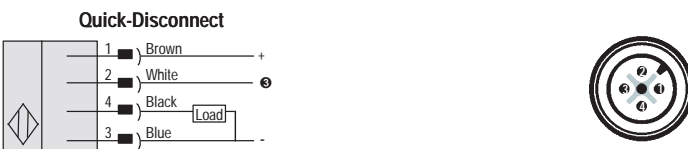
The 45DLA uses a push/pull transistor output that can be wired as either a PNP or NPN style output.

**Wired as NPN output:**



② Pin 2 (white wire): Connect to V+ (24V) or not connected for D.O.; connect to 0V for L.O.

**Wired as PNP output:**



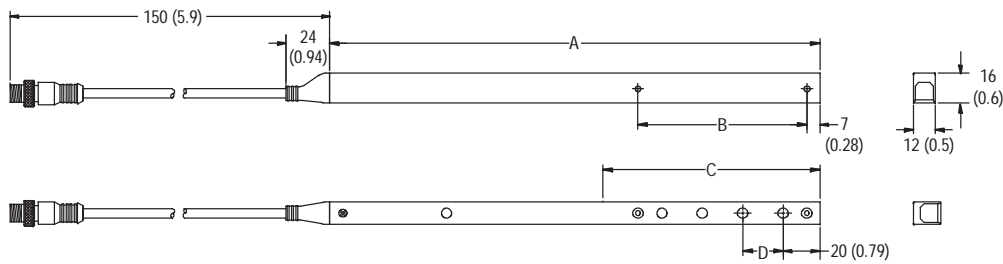
③ Pin 2 (white wire): Connect to V+ (24V) or not connected for L.O.; connect to 0V for D.O.

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 45DLA

### Discrete Light Arrays

#### Approximate Dimensions [mm (in.)]



**Note:** Mounting from the front of the array (lens side) requires M4 flat head (countersunk) screws (included). Mounting from the side of the array requires M4 pan head screws (not included).

No. of Beams	Approximate Dimensions [mm (in.)]				Cat. No.
	A: Housing Height	B: Mounting Holes	C: Sensing Height	D: Pitch	
4	266 (10.5)	92 (3.6)	118 (4.65)	22 (0.87)	45DLA-1LEB1T-F4
8	354 (13.9)	180 (7.1)	206 (8.11)	22 (0.87)	45DLA-1LEB2T-F4
16	530 (20.9)	356 (14.0)	382 (15.04)	22 (0.87)	45DLA-1LEB4T-F4
24	706 (27.8)	532 (20.9)	558 (21.97)	22 (0.87)	45DLA-1LEB6T-F4
32	882 (34.7)	708 (27.9)	734 (28.9)	22 (0.87)	45DLA-1LEB8T-F4

#### Product Selection

Sensing Height [mm (in.)]	Response Time	Cat. No.
118 (4.65)	25 ms	45DLA-1LEB1T-F4
206 (8.11)	45 ms	45DLA-1LEB2T-F4
382 (15.04)	85 ms	45DLA-1LEB4T-F4
558 (21.97)	125 ms	45DLA-1LEB6T-F4
734 (28.9)	165 ms	45DLA-1LEB8T-F4

**Note:** Both emitter (light source) and receiver arrays are included in the package. To identify the emitter, replace the "T" in the cat. no. with "E." To identify the receiver, replace the "T" in the cat. no. with "R." Example: 45DLA-1LEB2T-F4 contains one 45DLA-1LEB2E-F4 emitter array and one 45DLA-1LEB2R-F4 receiver array. Emitter and receiver arrays are not sold separately.

#### Cordsets and Accessories

Cordset		Accessories	
Description	Cat. No.	Description	Cat. No.
DC Micro QD Cordset, 4-pin, 2 m (6.5 ft)	889D-F4AC-2	DC Micro Splitter	879D-F4DM
DC Micro QD Patchcord, 4-pin, 2 m (6.5 ft)	889D-F4ACDM-2		



### Features

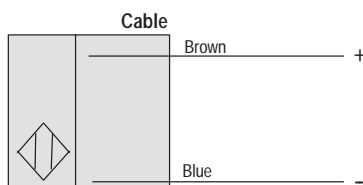
- S Introduces Two-Dimensional Array Scanning Technology
- S PNP or NPN Output
- S Minimum object resolution from 11...17 mm (0.43...0.66 in.)
- S Sensing ranges up to 2.5 m (8.2 ft)
- S IP67 rated housing
- S CE Marked for all applicable directives
- S Easy bracket-free mounting
- S Highly visible alignment LEDs

### Specifications

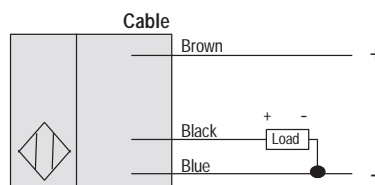
Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	IP67
Operating Temperature [C (F)]	-5...+55° (23...+131°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	35...85%
Ambient Light Immunity	500 lux max.
Optical	
Sensing Modes	Transmitted beam
Sensing Range	See Product Selection table on page 1-170
Number of Optical Axis	See Product Selection table on page 1-170
Light Source	Infrared LED (860 nm)
LED Indicators	Green LED for transmitted, green LED for alignment on receiver, and three orange LEDs for output
Electrical	
Voltage	12...24V DC ±10% ripple
Current Consumption	See Product Selection table on page 1-170
Sensor Protection	Reverse polarity, short circuit protection
Outputs	
Response Time	4 ms or 8 ms max by cat. no.
Output Type	PNP or NPN by cat. no.
Output Mode	Light operate
Output Current	100 mA @ 24V DC
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Aluminum
Lens Material	Acrylic
Connection Types	2 m cable, 4-pin DC micro (M12) pigtail
Supplied Accessories	None
Optional Accessories	Mounting brackets, reflectors, cordsets

### Wiring Diagrams

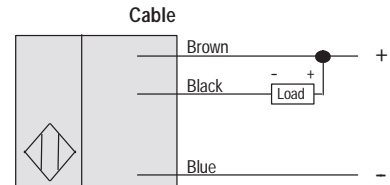
#### Emitter



#### PNP Output

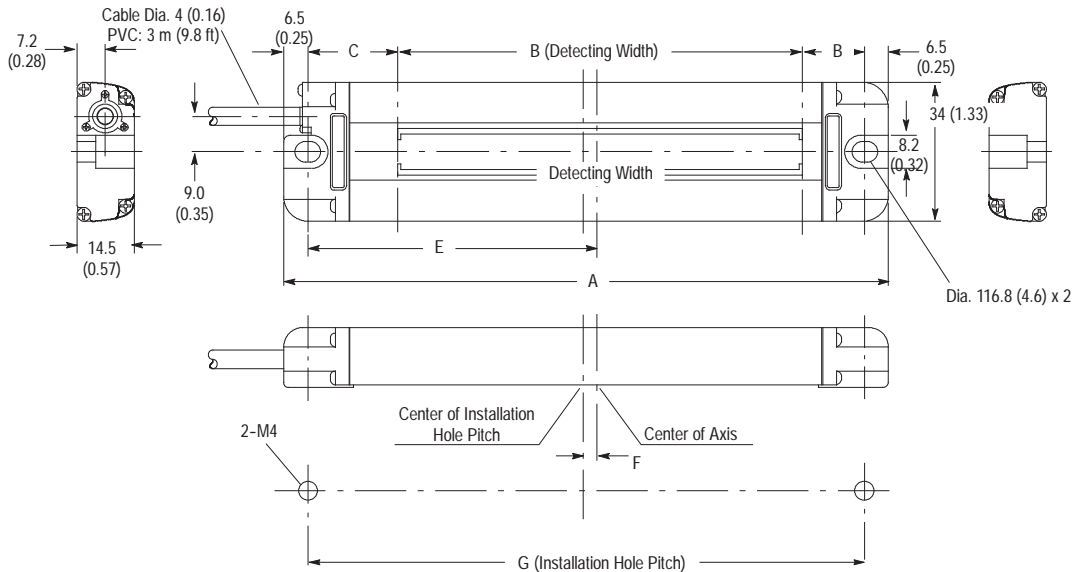


#### NPN Output



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**45AST Area Array**

Approximate Dimensions [mm (in.)]



Model	[mm (in.)]						
	A	B	C	D	E	F	G
45AST-1J <sup>①</sup> B1-A2	100 (3.93)	50 (1.96)	22.5 (0.88)	14.5 (0.57)	47.5 (1.87)	4 (0.15)	87 (3.42)
45AST-1J <sup>①</sup> B2-A2	150 (5.9)	100 (3.93)	22 (0.86)	15 (0.59)	72 (2.83)	3.5 (0.13)	137 (5.39)
45AST-1J <sup>①</sup> B3-A2							137 (5.39)
45AST-1J <sup>①</sup> B4-A2	200 (7.87)	150 (5.9)	22 (0.86)	15 (0.59)	97 (3.81)	3.5 (0.13)	187 (7.36)

① N = NPN and P = PNP.

Product Selection

Current Consumption (max.)		Range	Number of Optical Axis	Response Time (max)	Resolution Diameter [mm (in.)]	Sensing Height [mm (in.)]	Output Type	Cat. No. <sup>②</sup>
Transmitter	Receiver							
70 mA	65 mA	0.5...2 m (1.6...6.5 ft)	5	4 ms	15 (0.59)	50 (1.96)	PNP	45AST-1JPB1-A2
							NPN	45AST-1JNB1-A2 <sup>②</sup>
80 mA	110 mA	0.15...0.8 m (0.49...2.62 ft)	10	8 ms	11 (0.43)	100 (3.93)	PNP	<b>45AST-1JPB2-A2</b>
							NPN	45AST-1JNB2-A2 <sup>②</sup>
80 mA	110 mA	0.5...2.5 m (1.6...8.2 ft)	10	8 ms	13 (0.51)	100 (3.93)	PNP	45AST-1JPB3-A2
							NPN	45AST-1JNB3-A2 <sup>②</sup>
80 mA	110 mA	0.15...0.8 m (0.49...2.62 ft)	10	8 ms	17 (0.66)	150 (5.9)	PNP	<b>45AST-1JPB4-A2</b>
							NPN	45AST-1JNB4-A2 <sup>②</sup>

② NPN versions available with longer lead times.

③ Micro QD (M12) connector on pigtail models available. Refer to [www.ab.com/sensors](http://www.ab.com/sensors) for more information.



## Description

The Allen-Bradley 45PVA is a photoelectric Parts Verification Array designed for bin picking applications and object detection in the parts assembly industry. When used as part of a suitably configured bin-picking system, the 45PVA effectively prevents mispicks to enhance efficiency and minimize down time. It is also the ideal solution to address the “error proofing” initiatives prevalent in the automotive industry.

The 45PVA uses an array of LEDs to create a light screen that can be spanned across bins at an assembly station. By mounting the sensors on parts bins and wiring them into a controller programmed with the necessary logic, a virtually error-free bin-picking process can be achieved. “Job lights” on the 45PVA will not only show the assembler the bins required to complete the current process, but will also indicate the correct picking sequence. In the event the assembler attempts to pick an incorrect part, a selectable warning light on the 45PVA will illuminate to indicate the error; additional fault enunciation can be achieved via controller logic in conjunction with a tower light or

In addition to increasing efficiency and quality control by preventing faults in the bin-picking process, the 45PVA is instrumental in personnel stress reduction and the simplification of personnel training—especially in multi-lingual facilities.

## Specifications

Environmental	
Certifications	cULus and CE Marked for all applicable directives
Operating Environment	NEMA 12; IP62
Operating Temperature [C (F)]	Transmitted beam: 0...+50° (32...+122°) Retroreflective/diffuse: -10...+50° (14...+122°)
Vibration	10...55 Hz, 1.5 mm amplitude, 2 hours, X, Y, and Z direction
Shock	500 m/s, 3 times X, Y, and Z direction
Ambient Light Immunity	10,000 lux max
Optical	
Sensing Modes	Transmitted beam or retroreflective/diffuse selectable
Sensing Range	Transmitted beam or retroreflective: 2 m (6.5 ft), Diffuse: 400 mm (15.7 in.)
Field of View	
Light Source	Infrared LED (880 nm) or visible red (640 nm)
LED Indicators	See Approximate Dimensions on page 1-173
Adjustments	DIP switches
Electrical	
Voltage	12...264V DC
Current Consumption	46 mA max
Sensor Protection	Short circuit protection
Outputs	
Response Time	See Product Selection table on page 1-174
Output Type	PNP or NPN output selectable
Output Mode	Light or dark operate selectable
Output Current	50 mA @ 30V DC max
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Aluminum
Lens Material	Polycarbonate
End Plate Material	Resin
Connection Types	4-pin DC micro (M12) QD on 2 m pigtail
Supplied Accessories	Basic mounting brackets, reflective tape (retro/diffuse models)
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-174

## Features

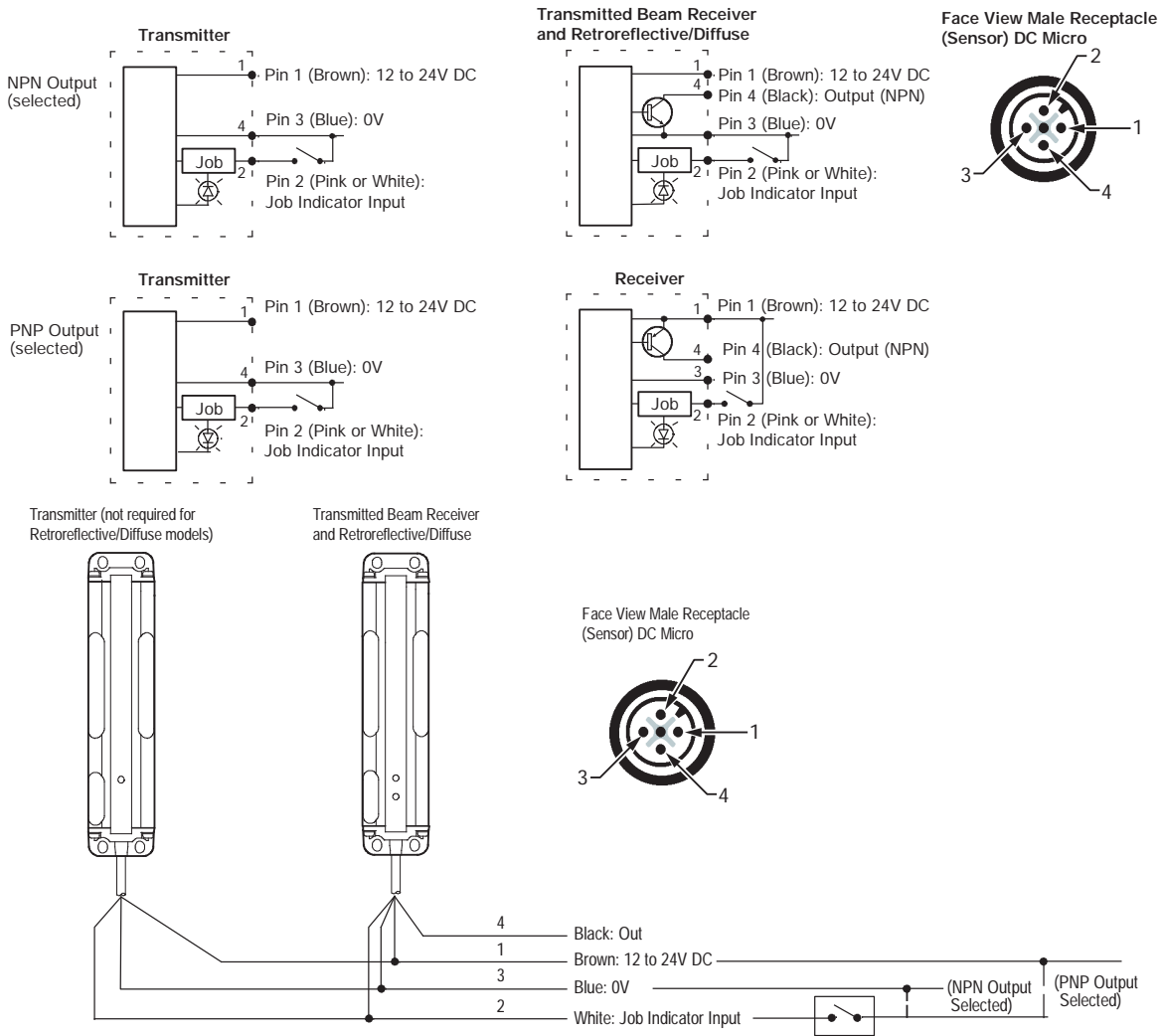
- S Robust metal enclosure with super slim 13 mm profile
- S Large highly-visible job indicator lights
- S Optional red fault light indicator to notify operator of incorrect component selection
- S Dip switch selectable lighting operation for job lights
- S NPN or PNP dip switch selectable output reduces inventory
- S Two frequency dip switch selectable crosstalk protection
- S Different sizes are available for different component racks. Transmitted beam models are available in four sizes (100 mm (4 in.), 225 mm (9 in.), 300 mm (12 in.), and 375 mm (15 in.)). Retroreflective/diffuse models are available in two sizes (100 mm (4 in.) and 225 mm (9 in.)).

## 45PVA Verification Array

### Slim Type Picking Sensor

#### Input/Output Circuit and Wiring Diagrams

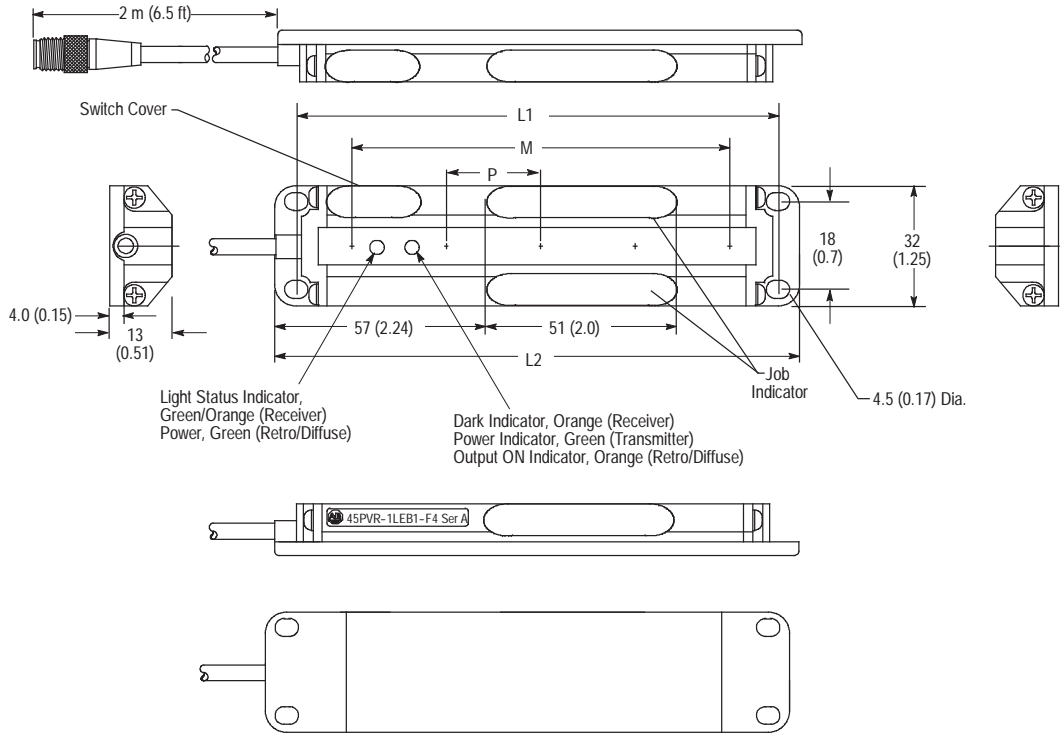
The NPN/PNP input of the job indicator and the NPN/PNP output are selected by mode switch.



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**45PVA Verification Array**  
 Slim Type Picking Sensor

**Approximate Dimensions [mm (in.)]**

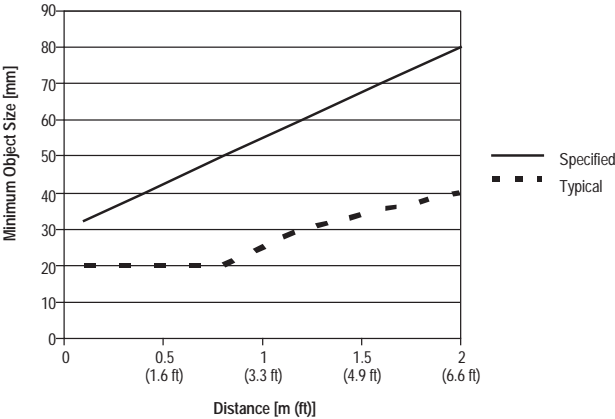
Dimensions are not intended to be used for installation purposes.



Approximate Dimensions [mm (in.)]					Cat. No.
N	M	L1	L2	P	
5	100 (3.9)	130 (5.1)	140 (5.5)	25 (1.0)	45PVA-1LEB1-F4
10	225 (8.9)	255 (10.0)	265 (10.4)	25 (1.0)	45PVA-1LEB2-F4
13	300 (11.8)	330 (13.0)	340 (13.4)	25 (1.0)	45PVA-1LEB3-F4
16	375 (14.8)	405 (16.0)	415 (16.3)	25 (1.0)	45PVA-1LEB4-F4
4	87 (3.4)	130 (5.1)	140 (5.5)	29 (1.1)	45PVA-2LEA1-F4
8	203 (8.0)	255 (10.0)	265 (10.4)	29 (1.1)	45PVA-2LEA2-F4

**Minimum Detectable Object Size**

Retroreflective Mode



## 45PVA Verification Array

### Slim Type Picking Sensor

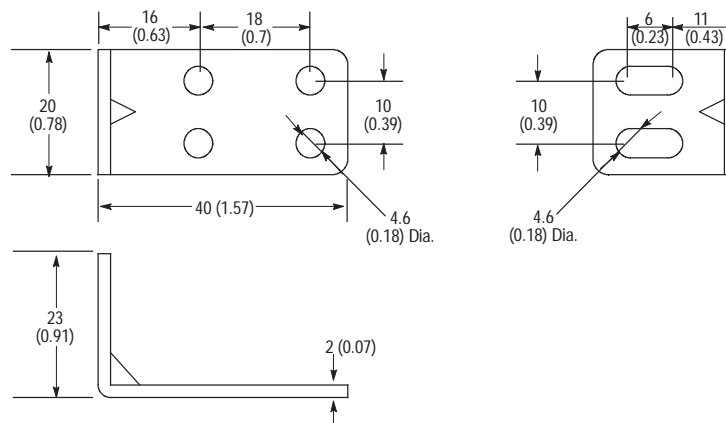
#### Product Selection

Sensing Mode	Light Source	Number of Optical Axis [mm (in.)]	Detection Width [mm (in.)]	Current Consumption	Response Time	Cat. No.
Transmitted Beam	Infrared LED, Wave-length 880 nm	5	100 (3.93)	130 mA	Standard: Standard: Light on: 35 ms/Dark on: 25 ms Interference Protection: Light on: 45 ms/Dark on: 28 ms	45PVA-1LEB1-F4
		10	225 (8.85)	140 mA	Standard: Light on: 68 ms/Dark on: 42 ms Interference Protection: Light on: 84 ms/Dark on: 52 ms	45PVA-1LEB2-F4
		13	300 (11.8)	150 mA	Standard: Light on: 70 ms/Dark on: 42 ms Interference Protection: Light on: 88 ms/Dark on: 54 ms	45PVA-1LEB3-F4
		16	375 (14.7)	155 mA	Standard: Light on: 94 ms/Dark on: 58 ms Interference Protection: Light on: 116 ms/Dark on: 72 ms	45PVA-1LEB4-F4
Retroreflective/ Diffuse	Visible Red LED, 640 nm	4	100 (3.93)	68 mA	120 ms	45PVA-2LEA1-F4
		8	225 (8.85)	78 mA		45PVA-2LEA2-F4

#### Accessories

##### Mounting Brackets

#60-2773 (2 brackets)  
(included)

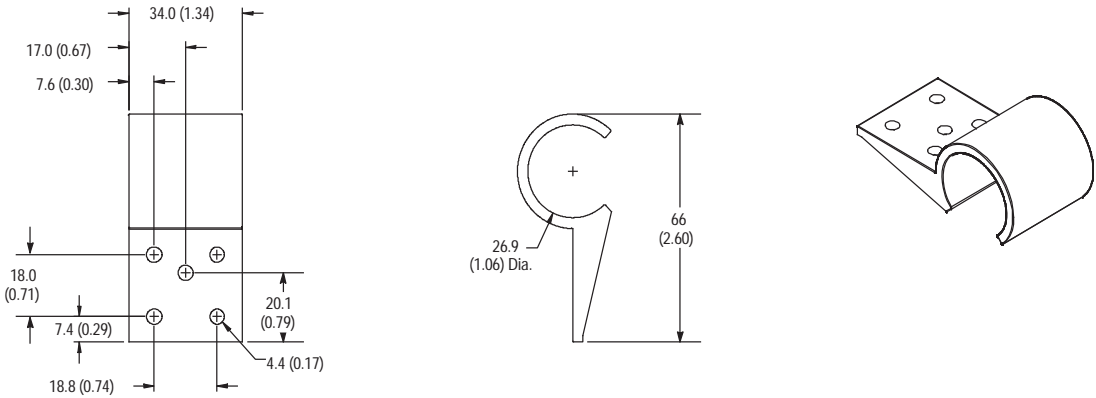




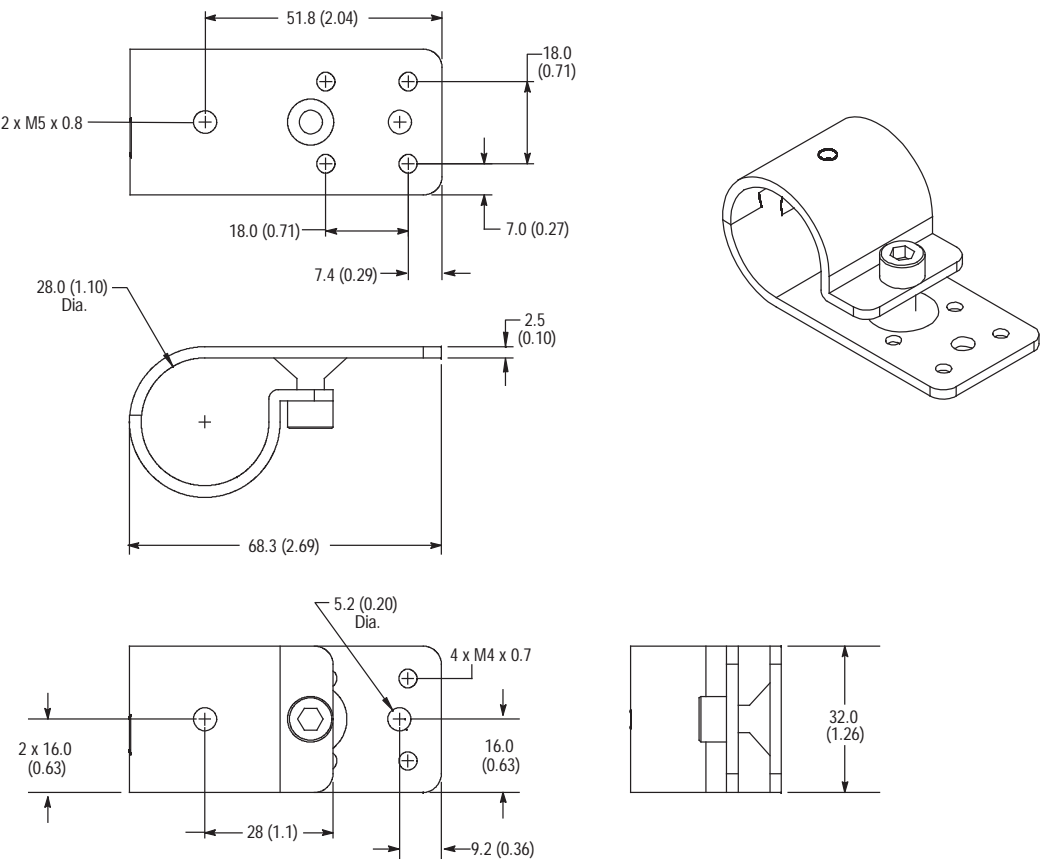
**Optional Mounting Brackets**

Mounting brackets available as an option (not included with sensor).

**Plastic Bracket**  
 #60-2779 (2 brackets)



**Metal Bracket**  
 #60-2772 (2 brackets)



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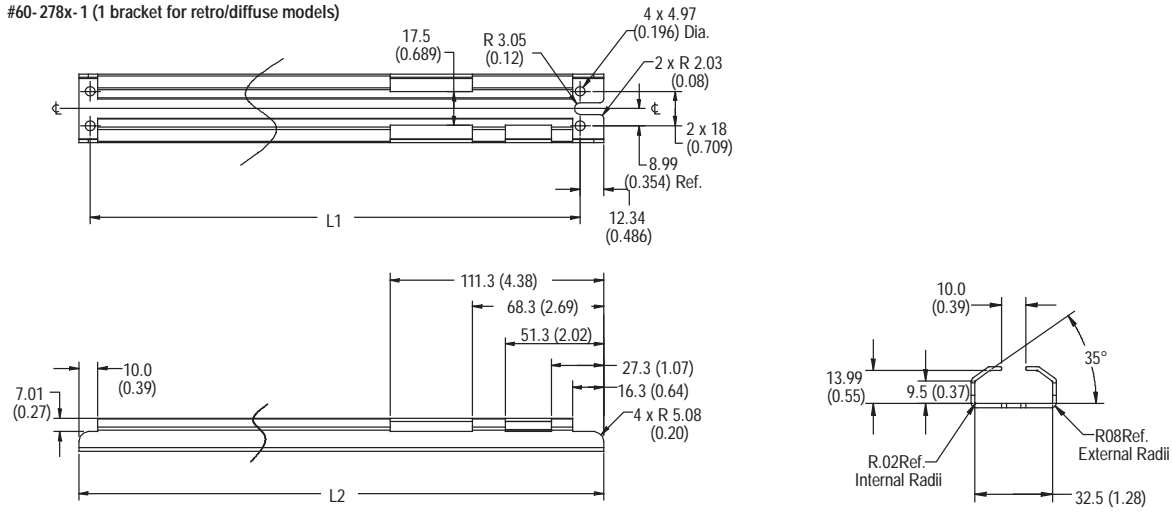
**45PVA Verification Array**

**Slim Type Picking Sensor**

Protective Metal Bracket

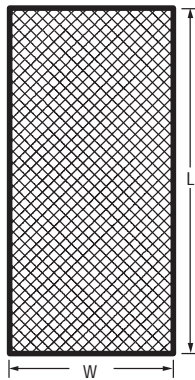
#60-277x-1 (2 brackets for transmitted beam models)

#60-278x-1 (1 bracket for retro/diffuse models)



L1 [mm (in.)]	L2 [mm (in.)]	Material	Cat. No. (1 Bracket)	Cat. No. (2 Brackets)
130 (5.11)	148.36 (5.84)	Galvanized Steel	60-2785-1	60-2775-1
254 (10.03)	273.35 (10.76)		60-2786-1	60-2776-1
330 (12.99)	348.36 (13.71)		NA	60-2777-1
405 (15.94)	423.34 (196.6)		NA	60-2778-1

Reflective Tape (included with retroreflective/diffuse models)



Dimensions		Reflective Tape Cat. No.	Included with Cat. No.
Width [mm (in.)]	Length [mm (in.)]		
50 (2)	120 (4.7)	—	45PVA-2LEA1-F4
50 (2)	245 (9.6)	—	45PVA-2LEA2-F4
25 (1)	2540 (100)	92-100	—



### Description

The 44N provides an economical, noncontact, solution to zero pressure accumulation conveyor systems by combining built-in zone control with a photoelectric sensor. This simple approach replaces the conventional mechanical switch sensing device, central PLC, and large quantities of interconnecting wiring.

The use of a photoelectric sensor eliminates the need for minimum weight restrictions required by mechanically actuated switches. The polarized retroreflective sensing mode ensures reliable detection of even shiny packages over a 4.8 m (16 ft) range.

The 44N comes complete with micro QD connections to both an upstream and downstream 44N along with a variety of connection options for common pneumatic valves. Power for the 44N and the valve is distributed through these connections.

The zone logic of the 44N ensures that product being loaded on the conveyor will be separated into zone length gaps thus providing zero pressure accumulation throughout the conveyor system. Once product has accumulated, it may be released individually (singulate) or simultaneously as a train (slug). This release is activated through an external contact closure.

### Features

- S Singulation release
- S Slug release
- S Adjustable 200 ms...10 secs ON (run) delay
- S NEMA 4X rated

### Specifications

Environmental	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	NEMA 4, 4X, 6, 12; IP67
Operating Temperature [C(F)]	-20...+70° (-4...+158°)
Vibration	10...55 Hz, 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)
Optical	
Sensing Modes	Polarized retroreflective
Sensing Range	50.8 mm...4.8 m (50.8 in...16 ft) with 92-39 reflector
Field of View	1.5°
Light Source	Visible red (660 nm)
Adjustments	On delay (200 ms...10 s), DIP switch
LED Indicators	Green output LED indicator
Electrical	
Voltage	10...30V DC
Current Consumption	20 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	2 ms
Output Type	PNP
Output Mode	Light or dark operate selectable by dip switch (1 L.O., 0 D.O.)
Output Current	100 mA @ 30V DC max
Mechanical	
Housing Material	Valox <sup>®</sup>
Lens Material	Acrylic
Connection Types	838 mm (33 in.) pigtail with 4-pin DC male micro QD (downstream) 838 mm (33 in.) pigtail with 4-pin DC female micro QD (upstream) Cable connector for load (see Product Selection table)
Supplied Accessories	129-130 mounting nut
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-179

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**44N Zone Control Sensor**

**System Overview, Installation, and Operation**

Install one 44N at the downstream side of each zone and make both upstream and downstream connections using the micro QD connectors. Connect the actuator lead of the 44N to the valve within its zone. Using an 889D-F4BC-2 cordset, connect 24V DC to a suitable power supply. A 4A supply will provide power for up to 25 zones when using a 1W pneumatic valve. Connect the black lead to the singulation release push button and the white lead to the slug release push button. Both push buttons should be normally open and maintained.

**Loading Product Onto the Conveyor**

With power applied to the system, all zones will immediately drive feeding product onto the conveyor. As product passes the 44N mounted at the infeed zone, a gap will be formed equal to the zone length. This will ensure zero pressure throughout the system. Once the first product reaches the discharge zone (1), it will stop and await release from the conveyor.

**Release of Product from the Conveyor:**

Once product has been transported and accumulated at the discharge end of the conveyor (Zone 1), it may be released in one of two manners.

**Singulation Release**

With the singulation release signal active, only product in the discharge zone (1) will release. As the product clears the sensor, the adjacent upstream zones will advance into the discharge zone. Product will continue to discharge as long as the zone release push button remains closed.

**Slug Release**

With the slug release push button closed and maintained, all accumulated product on the conveyor will release simultaneously. When the slug release push button is released, the remaining product will resume normal accumulation. This function overrides the 44N logic and can be used to load and unload product as a slug.

Figure 1. System Overview

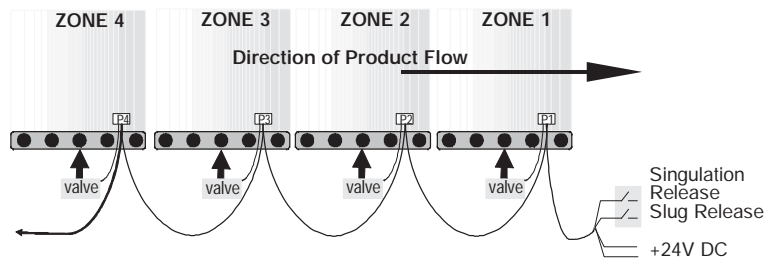


Figure 2. Loading the Conveyor

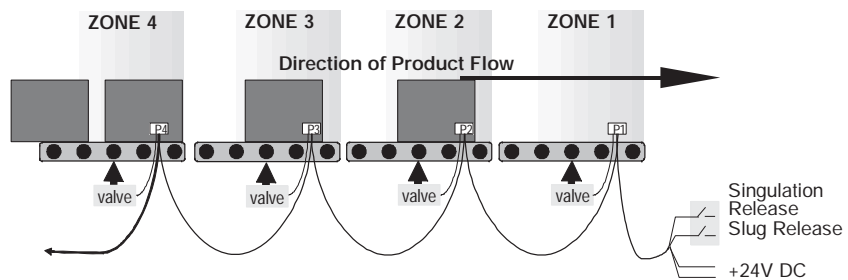


Figure 3. Singulation Release of Accumulated Product

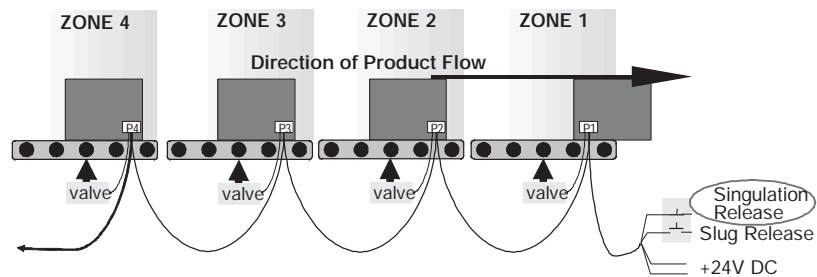
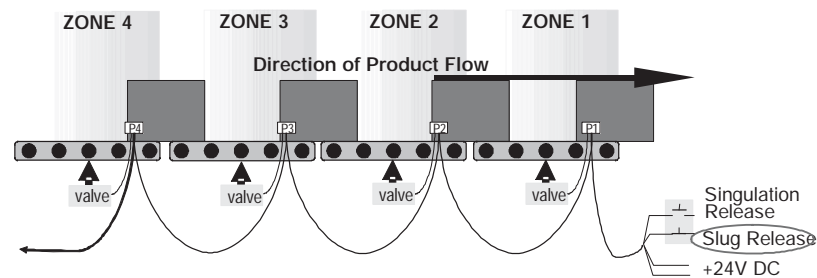


Figure 4. Slug Release of Accumulated Product

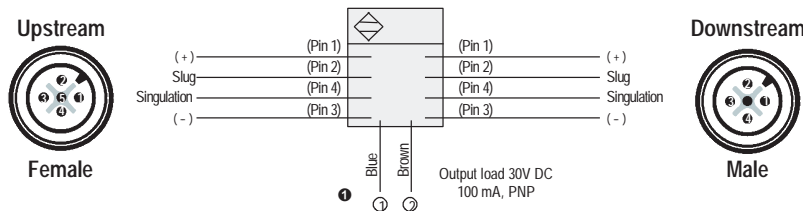


Refer to [www.ab.com/sensors](http://www.ab.com/sensors) for more information.

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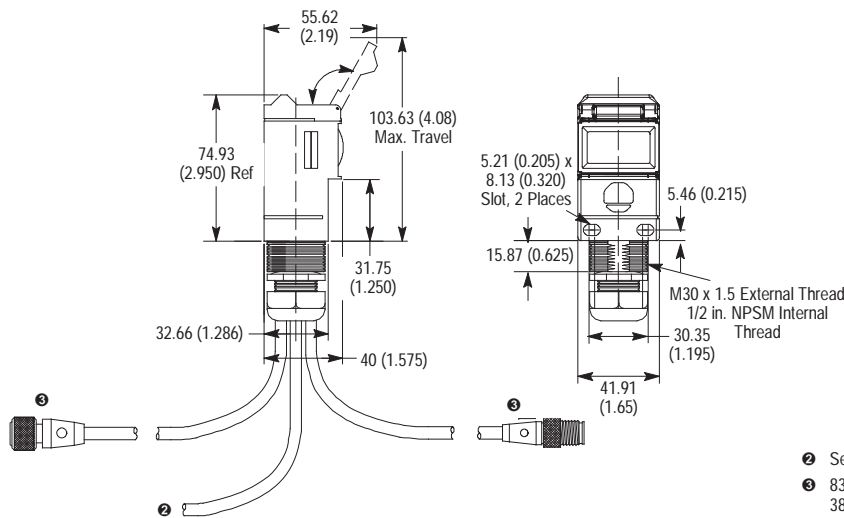
## 44N Zone Control Sensor

### Wiring Diagrams

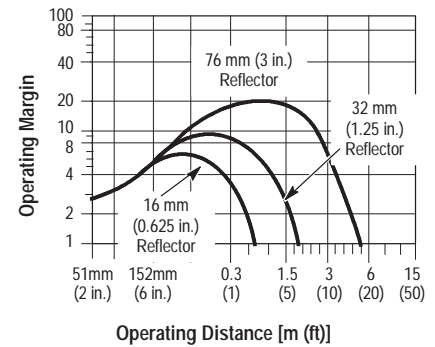


① Product comes with 22 AWG cable. Contact Rockwell Automation for DIN valve connection options.

### Approximate Dimensions [mm (in.)]



### Typical Response Curve



- ② See Product Selection table below for connection information.
- ③ 838 (33) pigtail for 44NSP-2JPBD5-Z01 and 44NSP-2JPBD5-Z02.  
381 (15) pigtail for 44NSP-2JPBD5-Z03.

### Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Capacity Response Time	Load Connection Type	Cat. No. ④
<p>Polarized Retroreflective</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible red 660 nm</p>	10...30V DC 40 mA	50.8 mm... 4.87 m (2 in...16 ft)	Light Operate	PNP 100 mA Variable 200 ms to 10 seconds	304.8 mm (12 in.) cable	44NSP-2JPBD5-Z01
					533.4 mm (21 in.) right angle pico (M8) female QD	44NSP-2JPBD5-Z02
						44NSP-2JPBD5-Z03

④ See Approximate Dimensions.

### Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
Male cordset, 2 m cable	889D-M4BC-2	Patchcord, 3.3 ft	889F-F4BCDM-1	Torx screw	129-135
Reflector, 3 in. diameter	92-39	Cordset, for external release	889D-F4BC-2	Torx screwdriver	57-144
Mounting Bracket, for 44N	60-2439	Power Supply (24V DC/4 A)	1606-XLP100E		

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**22ZC Zone Controller**



**Description**

The 22ZC Zone Controller bridges the gap between the 44N Zone Control Sensor and the 1799 embedded I/O module solutions. It offers the simplicity of a smart sensor, yet provides many of the advanced zone logic functions found in a networked, programmable device.

By placing the zone logic in a single zone controller, the user is given the flexibility to choose from a variety of both sensor input types (mechanical, optical) and actuator types (pneumatic, powered roller, DC motor).

The 22ZC uses a proven, industrial, IDC displacement flat media scheme for a high power transfer to maximize the number of zones connected to a single power supply.

The 22ZC offers two basic, switch selectable operating modes. First, is the single zone operation which is a run-on-demand system ideally suited for powered roller and DC motor applications. The second is a basic mode which provides a constant drive for both zero and low pressure accumulation.

Other advanced logic functions include selectable ON (RUN) and OFF (STOP) time delays, power conservation, jam detection, along with air-to-drive and air-to-brake operation.

**Specifications**

<b>Environmental</b>	
Certifications	cULus Listed and CE Marked for all applicable directives
Operating Environment	NEMA 1; IP50
Operating Temperature [C (F)]	0...+50° (32...+122°)
Vibration	10...55 Hz, 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...85% (noncondensing)
<b>Zone Control</b>	
Zone Logic	Switch selectable single or basic operating modes for zero and low pressure accumulation with singulation and slug release
Advanced Zone Logic	JAM respond function, sleep function, air-to-drive or air-to-brake operation, ON/OFF time delays
Adjustments	Rotary switches, DIP switches
LED Indicators	Orange (zone status, fault)
<b>Electrical</b>	
Voltage	24V DC
Current Consumption	16 mA max
Sensor Protection	Over-voltage, reverse polarity, short-circuit (SCP)
<b>Outputs/Inputs</b>	
Response Time	1 ms
Sensor Input	NPN
Actuator Output	NPN
Output Mode	Light or dark operate selectable by dip switch (1 L.O., 0 D.O.)
Actuator Output Current	100 mA @ 24V DC max
<b>Mechanical</b>	
Housing Material	Valoxr
Lens Material	Acrylic
Connection Types	Input: 3-pin MOLEX; Output: 4-pin MOLEX; Power/Signal: IDC Cable
Required Accessories	Sensing device, actuating device, flat media
Optional Accessories	Mounting brackets, reflectors, cordsets

### System Overview for Pneumatically Driven Conveyor Systems

Install one 22ZC in each zone of the conveyor and attach a suitable sensing and actuating device. Note that the infeed module (22ZC-343) must be installed at the beginning of your zone control system (zone 4 on Figure 1 on page 1-182) and the master module (22ZC-413) at the discharge end of your system (zone 1 on Figure 1). Size, cut and install the flat media between each controller. Connect a suitable 24V DC power supply to any controller within the system. It is recommended to make this connection to the center controller for balanced power distribution. A 4 A power supply will provide power for up to 25 zones when using a 1 W pneumatic valve. Wire the infeed and discharge zone external connection as required using the wiring diagram shown on Figure 1.

### Loading Product Onto the Conveyor (Figure 2 on page 1-182)

With power applied to the system, all zones will immediately drive feeding product onto the conveyor. As product passes the sensor mounted at the infeed zone, a gap will be formed equal to the zone length. This will ensure zero pressure throughout the whole system. Once the first product reaches the discharge zone (zone 1), it will stop and await release from the conveyor.

### Release of Product

Once the product has been transported and accumulated at the discharge end of the conveyor (zone 1) it may be release in one of two manners:

### Singulation Release (Figure 3 on page 1-182)

With the singulation release signal activate, only product in the discharge end of the conveyor (zone 1) will release. As the product clears the sensors, the adjacent upstream zones

will advance into the discharge zone. Product will continue to discharge as long as the singulation release signal remains active.

### Slug Release (Figure 4 on page 1-182)

With the slug release signal active, all accumulated product on the conveyor will release simultaneously. When the slug release signal is deactivated, the remaining product will resume normal accumulation. Predetermined slug lengths can be configured through the use of the slug respond switch on each controller.

For more information on these and other features refer to the 22ZC installation instructions or visit our website at [www.ab.com/sensors](http://www.ab.com/sensors).

### System Overview for Powered Roller Driven Conveyor Systems

Install one 22ZC in each zone of the conveyor and attach a suitable sensing and actuating device. Note that the infeed module (22ZC-343) must be installed at the beginning of your zone control system (zone 4 on Figure 1) and the master module (22ZC-413) at the discharge end of your system (zone 1 on Figure 1). Size, cut and install the flat media between each controller. Connect a suitable 24V DC power supply to any controller within the system. It is recommended to make this connection to the center controller for balanced power distribution. Note that the power for the powered roller and amplifier are not provided by the 22ZC, only the RUN signal. Wire the infeed and discharge zone external connection as required using the wiring diagram shown on Figure 1.

### Loading Product onto the Conveyor (Figure 2 on page 1-182)

With power applied to the system, all zones will be OFF until either the infeed

sensor is blocked or the zone feed input is closed and maintained. As product passes the sensor mounted at the infeed zone, a gap will be formed equal to the zone length. This will ensure zero pressure throughout the whole system. Once the first product reaches the discharge zone (zone 1), it will stop and await release from the conveyor. If a low pressure accumulation is desired, a system wide OFF time delay can be configured to minimize product spacing on the conveyor.

### Release of Product

Once the product has been transported and accumulated at the discharge end of the conveyor (zone 1) it may be release in one of two manners:

### Singulation Release (Figure 3 on page 1-182)

With the singulation release signal activate, only product in the discharge end of the conveyor (zone 1) will release. As the product clears the sensors, the adjacent upstream zones will advance into the discharge zone. Product will continue to discharge as long as the singulation release signal remains active.

### Slug Release (Figure 4 on page 1-182)

With the slug release signal active, all accumulated product on the conveyor will release simultaneously. When the slug release signal is deactivated, the remaining product will resume normal accumulation. Predetermined slug lengths can be configured through the use of the slug respond switch on each controller.

For more information on these and other features refer to the 22ZC installation instructions or visit our website at [www.ab.com/sensors](http://www.ab.com/sensors).

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**22ZC Zone Controller**

Figure 1. System Overview

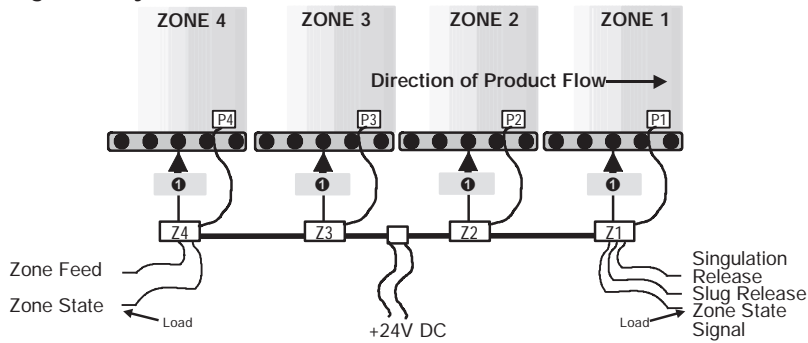


Figure 2. Loading the Conveyor

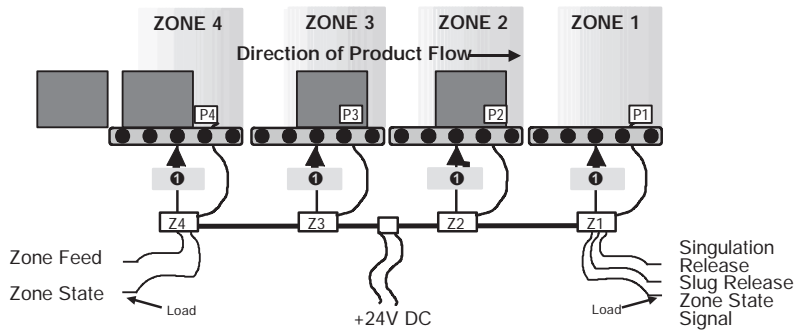


Figure 3. Singulation Release of Accumulated Product

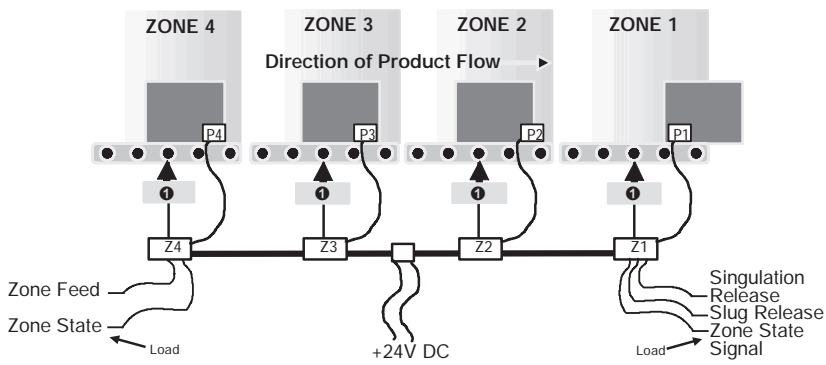
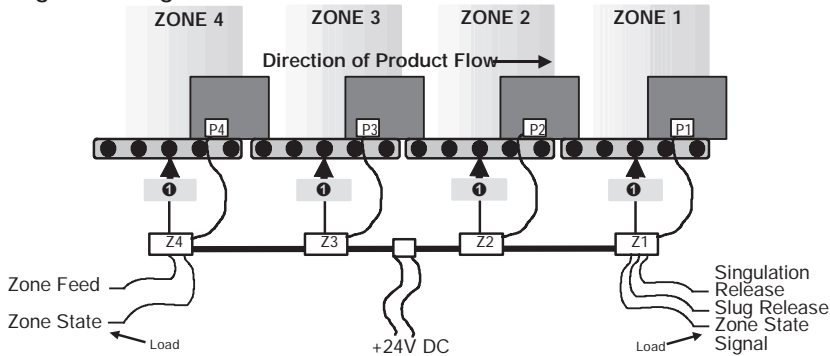


Figure 4. Slug Release of Accumulated Product



ⓘ Amplifier or Valve



**System Overview for Powered Roller Driven Conveyor Systems**

Install one 22ZC in each zone of the conveyor and attach a suitable sensing and actuating device. Size, cut and install the flat media between each controller. Using a 22ZC-PWR cordset, connect to a suitable 24V DC power supply to any controller within the system. It is recommended to make this connection to the center controller for maximum power distribution. A 4A supply will provide power for up to 50 zones. Note that the power for the powered roller and amplifier are not provided by the 22ZC, only the RUN signal. Wire the infeed and discharge zone external connections as required using the wiring diagram to the right. Note that the zone and slug release,

and the zone feed push buttons should be normally open and maintained.

**Loading Product onto the Conveyor**

With power applied to the system, all zones will be OFF until either the infeed sensor is blocked or the zone feed contact is closed and maintained. As product passes the sensor mounted at the infeed zone, a gap will be formed equal to the zone length. This will ensure zero pressure throughout the system. Once the first product reaches the discharge zone (1), it will stop and await release from the conveyor. If a low pressure accumulation is desired, a system-wide, 1 second OFF time delay can be configured to minimize product spacing on the conveyor.

**Release of Product**

Once product has been transported and accumulated at the discharge end of

the conveyor (Zone 1), it may be released in one of two manners.

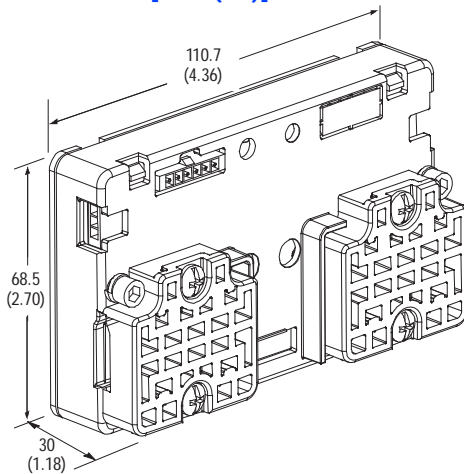
**Singulation Release**

With the zone release push button closed and maintained, only product in the discharge zone (1) will release. As the product clears the sensor, the adjacent upstream zones will advance into the discharge zone. Product will continue to discharge as long as the zone release push button remains closed.

**Slug Release**

With the slug release push button closed and maintained, all accumulated product on the conveyor will release simultaneously. When the slug release push button is released, the remaining product will resume normal accumulation. Predetermined slug lengths can be configured through the use of the SLUG RESPOND switch on each controller.

**Approximate Dimensions [mm (in.)]**



Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
Zone Controllers	22ZC-413 (master)	Flat Media, 75 m spool	1485C-P1L75	Reflector, 3 in. diameter	92-39
	22ZC-223 (basic)	Power Supply, 24V DC/4 A	1606-XLP100E	Mounting Bracket, sensor	60-2657
	22ZC-343 (infeed)	Power Tap	22ZC-PWR		
Photoelectric Sensor	44RSP-2JNE3-Z6	Power Tap, IDC	1485T-P1H4-R5		

Refer to [www.ab.com/sensors](http://www.ab.com/sensors) for more information.

Series 9000

Intrinsically Safe



Description

The Series 9000 transmitted beam photoelectric sensors are designed and approved as an intrinsically safe device under the FM and CSA entity concept. It may be installed into a Class I, II, III; Division 1 hazardous location when connected to an appropriate safety barrier. The sensor is also approved as non-incendive for installation into Class I; Division 2 hazardous locations without the need for a safety barrier.

Typical applications

- S Automotive
- S Petrochemical
- S Grain processing

Information on the Series 897H intrinsic safety barriers may be found on page 12-2.

Features

- S Intrinsically safe to North American standards
- S Transmitted beam sensing mode
- S Compatible with Series 897H intrinsic safety barriers
- S 30 mm harsh duty package
- S Fast response time
- S Variety of connection types

Specifications

Environmental	
Certifications	UL Listed, FM Approved, and CE Marked for all applicable directives
Operating Environment	NEMA 3, 4X, 6P, 12, 13; IP67, 1200 psi washdown, IP69K
Operating Temperature [C (F)]	-40...+65° (-40...+150°)
Vibration	10...55 Hz, 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% max
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Transmitted Beam
Light Source	Infrared LED (880 nm)
LED Indicators	Red LED for output indication
Adjustments	Sensitivity potentiometer
Electrical	
Voltage	13...30V DC
Current Consumption	25 mA max
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	10 ms max
Output Type	PNP and NPN
Output Mode	Light operate and dark operate selectable
Output Current	8.5 mA for PNP, 15 mA for NPN
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Valox <sup>R</sup>
Lens Material	Acrylic
Connection Types	2 m cable, 4-pin DC micro (M12) QD, 4-pin DC mini QD
Supplied Accessories	129-130 mounting kit
Optional Accessories	Series 897H intrinsic safety barriers, cordsets, mounting brackets

Selection Guide for Intrinsic Safety Barriers

The 42GRx-95x0 is approved as an intrinsically safe apparatus under the entity concept by FM and CSA. Therefore, any safety barrier which meets both the stated operational and safety requirements (see Table 1) of the

sensor may be used. Note that the sensor is also approved as non-incendive (FM) for installation into Class I; Division 2 hazardous locations without the need for a safety barrier.

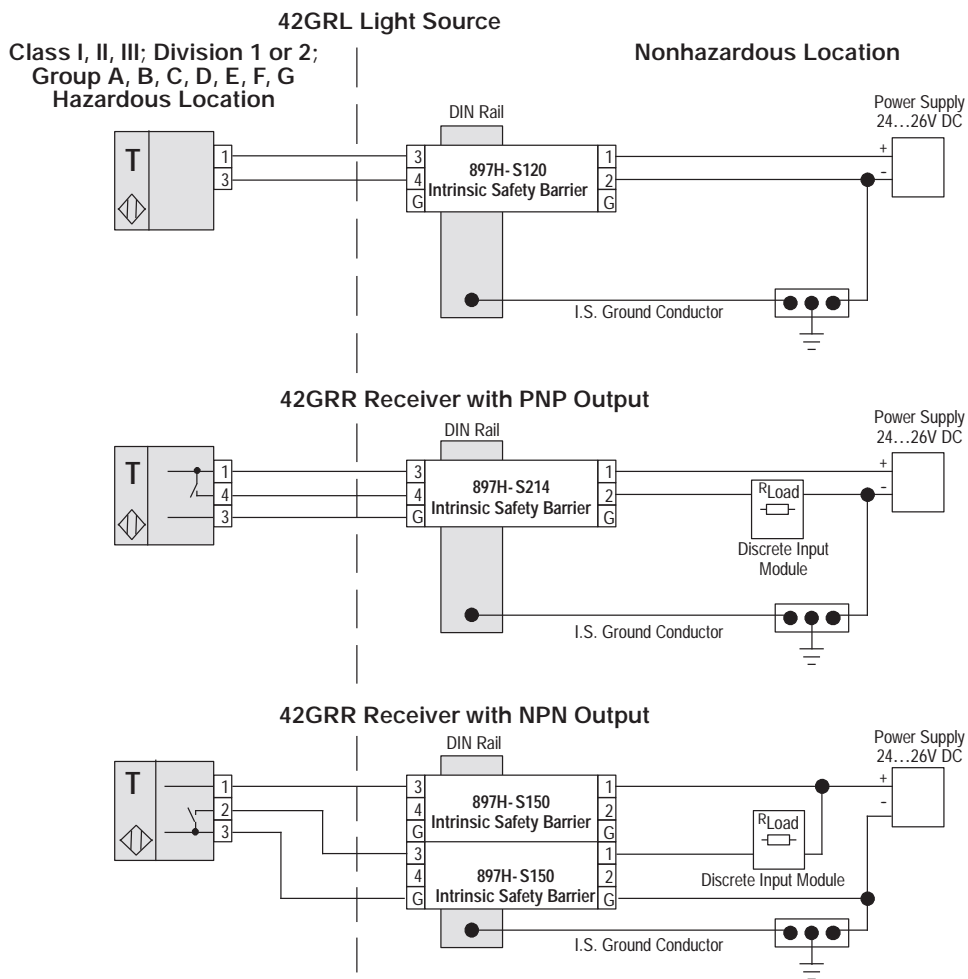
Table 1 Entity Parameters

	Sensor		Barrier
V <sub>max</sub>	31.5V	≥	V <sub>t</sub>
I <sub>max</sub>	150 mA	≥	I <sub>t</sub>
P <sub>max</sub>	0.95 W	≥	P <sub>t</sub>
C <sub>i</sub> + C <sub>leads</sub>	0 µF	≤	C <sub>a</sub>
L <sub>i</sub> + L <sub>leads</sub>	0 mH	≤	L <sub>a</sub>

User Interface

Label	Color	State	Status
Output	Green	OFF	Sensor output de-activated
		ON	Sensor output activated
Margin/SCP	Red	OFF	Margin <2.5
		ON	Margin >2.5
		Flashing	Output SCP active
Power	Yellow	OFF	Sensor not powered
		ON	Sensor powered

Wiring Diagrams



**IMPORTANT** See Control Drawing #75002-200.





**Description**

The Series 5000 intrinsically safe sensors are designed for the installation in hazardous locations. They can be used in Class I, II, III; Division 1, 2; groups A, B, C, D, E, F, and G locations with intrinsic Safety Zener Diode Barriers. They can also be used in Class I, II, II; Division 2 only without intrinsic safety zener diode barriers.

**Features**

- S Intrinsically Safe to North American standards
- S Nonincendive for Division 2 hazardous (classified) locations
- S Modular package for increased flexibility
- S Wide variety of sensing modes
- S Selectable light/dark operation
- S Both NPN and PNP outputs
- S Screw terminal connections

**Specifications**

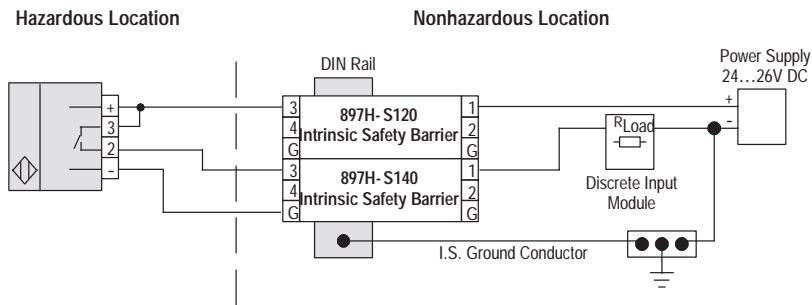
<b>Environmental</b>	
Certifications	UL Listed, FM Approved, and CE Marked for all applicable directives
Operating Environment	NEMA 3, 4, 12, 13; IP66
Operating Temperature [C (F)]	-40...+65° (-40...+150°)
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Relative Humidity	90% max
Ambient Light Immunity	Incandescent light 5000 lux
<b>Optical</b>	
Sensing Modes	Retroreflective, diffuse, polarized retroreflective, fiber optic
Sensing Range	See Product Selection table on page 1-189
Field of View	See Product Selection table on page 1-189
Light Source	Infrared LED (880 nm)
LED Indicators	Red LED for output indication
Adjustments	Sensitivity potentiometer
<b>Electrical</b>	
Voltage	24V DC with suitable intrinsically safe barrier
Current Consumption	30 mA max
Sensor Protection	False pulse
<b>Outputs</b>	
Response Time	1 ms
Output Type	PNP and NPN
Output Mode	Light and dark operate selectable
Output Current	20 mA @ 28V DC
Output Leakage Current	1 µA
<b>Mechanical</b>	
Housing Material	Valox <sup>®</sup>
Lens Material	Acrylic (glass on polarized lens)
Connection Types	2 m (6.5 ft) cable, screw terminal
Supplied Accessories	None
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-190

**User Interface**

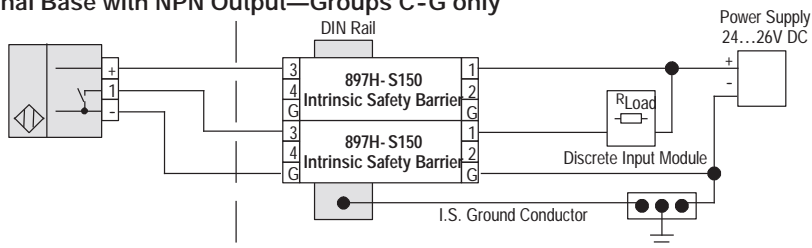
Label	Color	State	Status
Output	Red	OFF	Sensor output de-activated
		ON	Sensor output activated

Wiring Diagrams

Photohead and Terminal Base with PNP Output



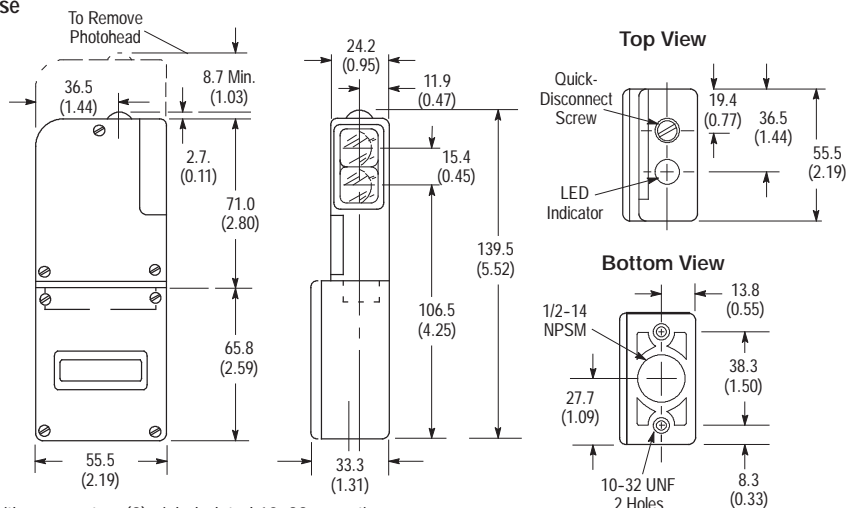
Photohead and Terminal Base with NPN Output—Groups C-G only



**IMPORTANT** See Control Drawing #133-451.

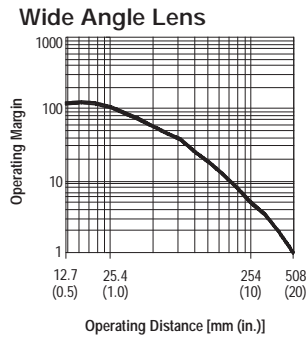
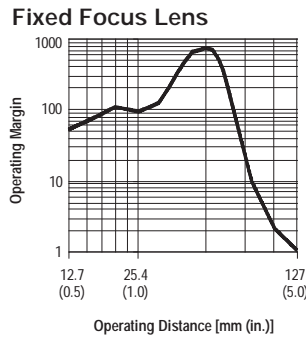
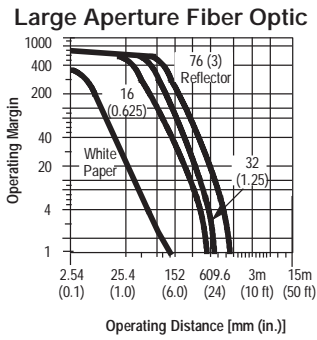
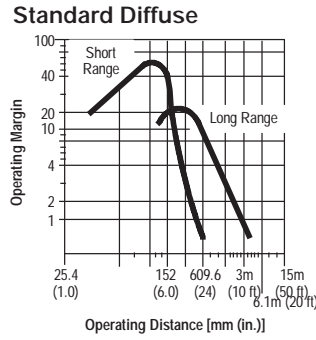
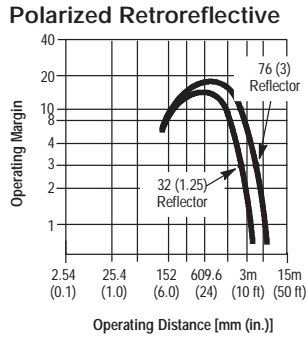
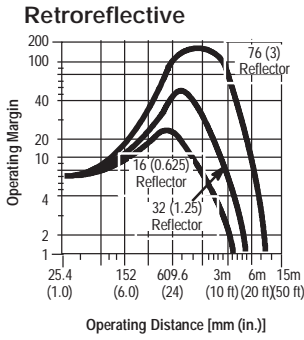
Approximate Dimensions (Applies to all versions) [mm (in.)]

Terminal Style Power Base



Note: Hardware included with sensor: two (2) nickel-plated 10-32 mounting screws.

Typical Response Curve



Fibers #43GR-FAS25SL through #43GR-BAA72ML  
See Fiber Optic section in this catalog for additional information.

Product Selection

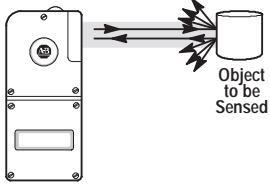
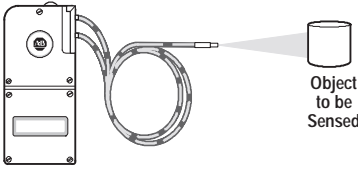
Photohead

Sensing Mode	Sensing Distance	Output Energized	Output Type Capacity	Response Time	Cat. No.
<p>Retroreflective Field of View: 2.5° Emitter LED: Infrared 880 nm</p>	50.8 mm... 10 m (2 in...33 ft) with 76 mm (3 in.) Reflector	Light/Dark Selectable	NPN and PNP 20 mA at 29.5V DC	1 ms	42DRU-5500
<p>Polarized Retroreflective Field of View: 2.5° Emitter LED: Visible 660 nm</p>	50.8 mm... 6 m (2 in...20 ft) with 76 mm (3 in.) Reflector	Light/Dark Selectable	NPN and PNP 20 mA at 29.5V DC	1 ms	42DRU-5700

Refer to page 1-190 for cordsets and accessories.

Product Selection (continued)

Photohead

Sensing Mode	Sensing Distance	Output Energized	Output Type Capacity	Response Time	Cat. No.
 <p>Standard Diffuse</p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	50.8 mm (2 in.)...Short Range: 0.4 m (16 in.) Long Range: 2.1 m (7 ft) with White Paper	Light/Dark Selectable	NPN and PNP 20 mA at 29.5V DC	1 ms	42DRP-5500
 <p>Large Aperture Fiber Optic</p> <p>Field of View: Depends on the glass fiber optics and lens type</p> <p>Emitter LED: Infrared 880 nm</p>	—	Light/Dark Selectable	NPN & PNP 20 mA at 29.5V DC	1 ms	42DRA-5500 <b>1</b>

**1** Lens assembly required, see below.

Power Base

Style	Operating Voltage	Supply Current	Cat. No.
Terminal	13...29.5V DC	26 mA max at 13V DC 30 mA max at 29.5V DC	42DTB-5500

Lens Assembly

Lens Type	Cat. No.
Fiber Optic	61-5550
Fixed Focus	61-5551
Wide Angle	61-5611

Cordsets and Accessories

Description	Page No.
Mounting Assemblies	1-293
Intrinsic Safety Barriers	12-2
76 mm (3 in.) Diameter Reflector	92-39
32 mm (1.25 in.) Diameter Reflector	92-47





## Description

The MultiSight is an optical multi-pixel sensor with a pass/fail PNP output. The MultiSight uses several different methods of evaluation (pattern matching, contrast, brightness, and contour matching) to detect or differentiate objects by means of previously defined optical characteristics, e.g. for separating "good" and "bad" parts. The main applications are in the field of industrial automation for quality assurance purposes. The MultiSight is an easy-to-use economical alternative to conventional vision systems for detecting presence or absence, completeness, position, markings, labeling, packaging, and components.

## Features

- S Standalone vision sensor
- S Easy handling and setup
- S Compact, sturdy industrial housing with IP67 rating
- S Integrated lighting
- S Optional EtherNet/IP<sup>†</sup> connection with RSLogix<sup>†</sup> 5000 Add-On Profile for I/O data
- S Adjustable focus from 20 mm to infinity
- S Short evaluation time (50...250 ms)
- S Multiple evaluation methods: pattern matching, brightness, contrast, and contour matching
- S Ten or 32 virtual detectors
- S Individual virtual detectors can be logically linked or grouped for evaluation of different objects with several characteristics for inspection
- S Ethernet connection for setup

## Specifications

	Standard Models	EtherNet/IP Models
Certifications	cULus Certified and CE Marked for all applicable directives	
<b>Lighting and Optics</b>		
Imager	640 x 480 pixels, CCD-monochrome; 256 level (8-bit) greyscale	
Lighting	Integrated LEDs; 6 x white, 2 x red	
Lens Type	6 mm or 12 mm integrated lens, adjustable focus	
Field of View	12 mm Lens: @ 200 mm; X = 60 mm, Y = 40 mm 6 mm Lens: @ 200 mm; X = 150 mm Y = 100 mm (see Field of View table for details)	
Sensing Range	Min. range: 20 mm; max. range: infinite but dependent on illumination	
Depth of Field	±5% of focusing distance	
<b>Electrical</b>		
Operating Voltage	24V DC ±10%	
Current Consumption	≤200 mA	
Open Circuit Protection	Short circuit, overload, false pulse, transient noise, reverse polarity	
Outputs	OUT1 (pass/fail), OUT2 (position), OUT3 (illumination), OUT4 (ready)	
Output Type	4 x PNP type (sourcing MOSFET)	
Output Rating	200 mA per output; max. 9.6 W	
Input Type	IN1 (trigger) and IN2 (control); high 10...30V DC, low 0...3V DC	
Ethernet Interface	Configuration only	Configuration (TCP/IP) and I/O (EtherNet/IP)
<b>Mechanical</b>		
Housing Material	Aluminum and ABS Plastic	
Lens Material	Plastic (PMMA)	
LED Indicators	Green: Power; Red: Error; Yellow (2): Q1, Q2 output	
Connection Type	Power-I/O: 8-pin micro QD (M12); Ethernet: 8-pin micro QD (M12)	Power-I/O: 8-pin micro QD (M12); Ethernet: 4-pin d-code micro QD (M12)
Enclosure Type Rating	IP67	
Vibration	10...55 Hz, 1.5 mm amplitude; 3 planes; meets or exceeds IEC 60947-5-2	
Shock	30 g; 11 ms; meets or exceeds IEC 60947-5-2	
Operating Temperature [C (F)]	0...50° (32...122°)	
<b>Accessories</b>		
Supplied Accessory	Dovetail bracket (48MS-BKTD), focus adjustment screwdriver, 3 mounting screws, Allen-wrench, software CD	
Additional Required Accessory	PWR and I/O cordset, ethernet cable	
Optional Accessory	Mounting brackets, cordsets, external lighting, trigger sensors	
<b>Detectors</b>		
Detector Types	Pattern matching, brightness, contrast	Pattern matching, brightness, contrast, contour matching
Number of Detectors	Up to 10 detectors	Up to 32 detectors
Angular Displacement	±5° (for pattern matching); 360° (for contour matching)	
Typical Cycle Time	Pattern 50...100 ms; brightness 40...50 ms; contrast 40...50 ms; contour 120...500 ms	
Number of Job Selects	Combination of 10 detectors and job selections	Combination of 32 detectors and job selections

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## 48MS MultiSight<sup>t</sup>

### Vision Sensor

#### Benefits

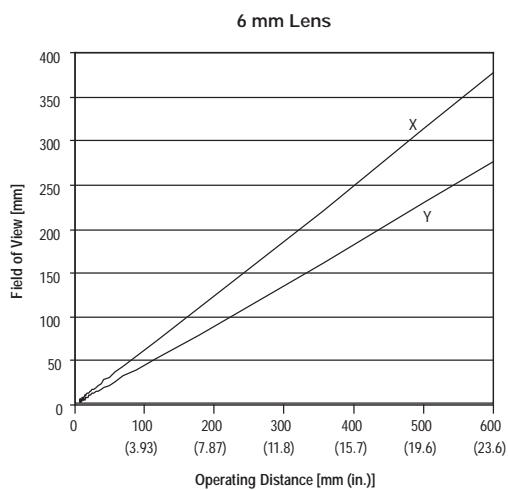
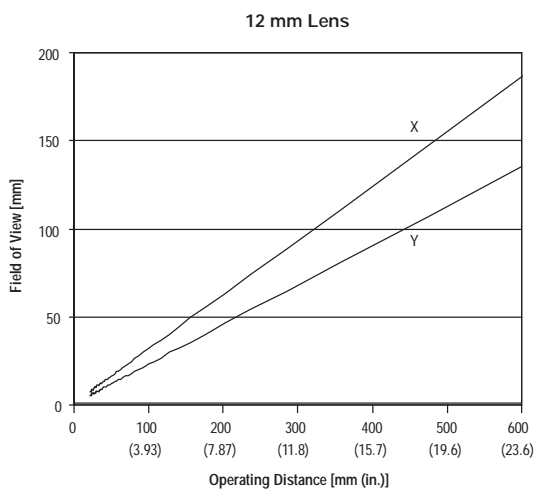
- S Perform multiple inspections with one sensor
- S Simple setup using PC and configuration software
- S Multiple job storage to facilitate flexible product changeovers
- S Simple inspection tools for detecting presence or absence, completeness, position, markings, labeling, packaging, and components
- S Economical alternative to conventional vision system

#### Product Selection

Focal Length of Lens	Field of View	EtherNet/IP	Cat. No.
12 mm	12 mm @ 200 mm; X = 60 mm, Y = 40 mm	No	48MS-SE1PF2-M2
6 mm	6 mm @ 200 mm; X = 150 mm, Y = 100 mm	No	48MS-SE1PF1-M2 <b>❶</b>
12 mm	12 mm @ 200 mm; X = 60 mm, Y = 40 mm	Yes	48MS-SN1PF2-M2
6 mm	6 mm @ 200 mm; X = 150 mm, Y = 100 mm	Yes	48MS-SN1PF1-M2 <b>❶</b>

❶ The 6 mm lens models typically require external lighting because the integrated lighting does not illuminate the entire field of view, i.e., the edges of the image are dark.

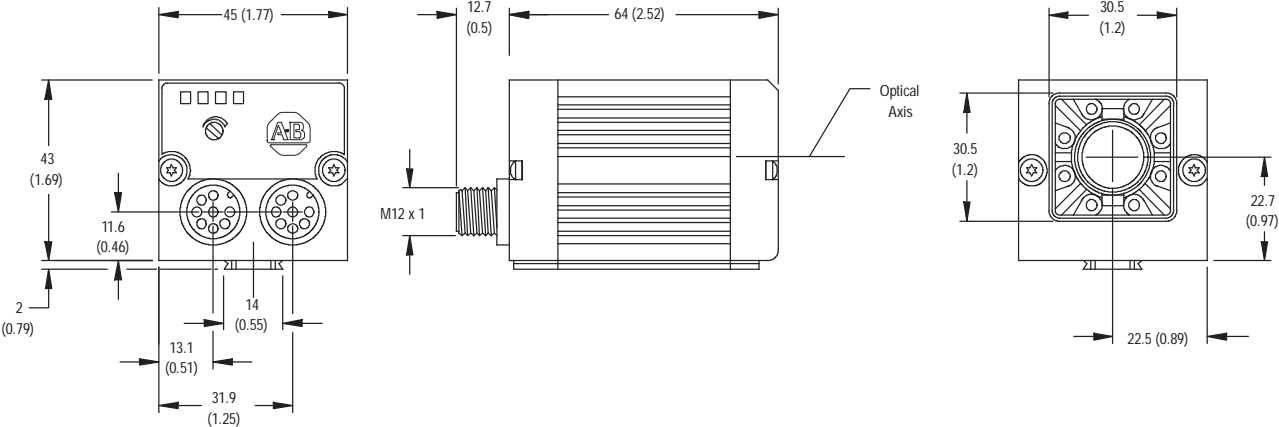
#### Field of View



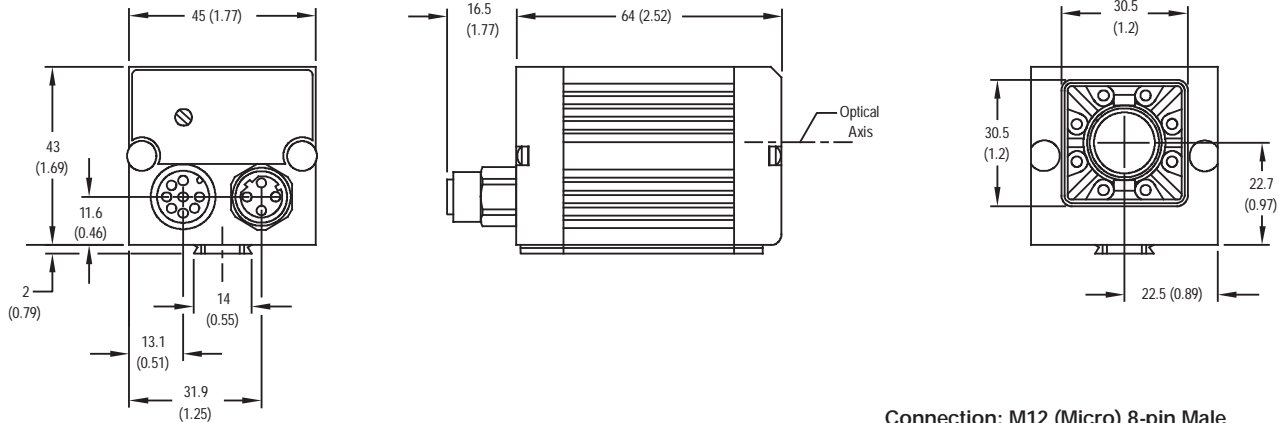
**Approximate Dimensions [mm (in.)]**

Dimensions are not intended to be used for installation purposes.

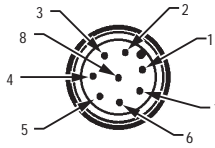
**Standard Models**



**EtherNet/IP Models**



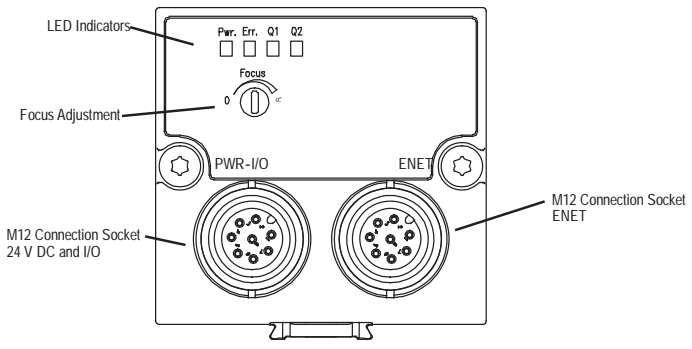
Connection: M12 (Micro) 8-pin Male QD (PWR and I/O; Ethernet on standard models)



Connection: 4-pin D Code Female QD (Ethernet connection for EtherNet/IP models)



**Rear View of the MultiSight**



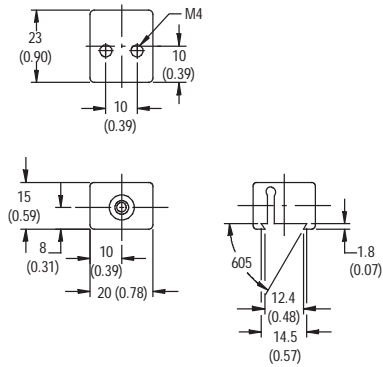
# 48MS MultiSight<sup>t</sup>

Vision Sensor

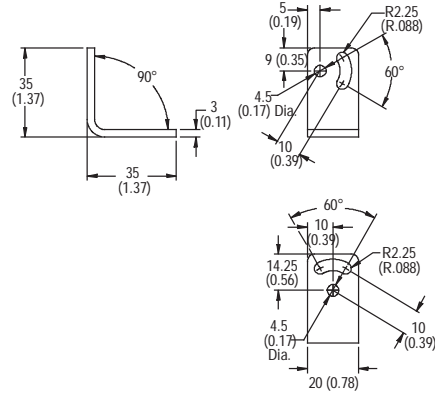
## Approximate Dimensions [mm (in.)] (continued)

Dimensions are not intended to be used for installation purposes.

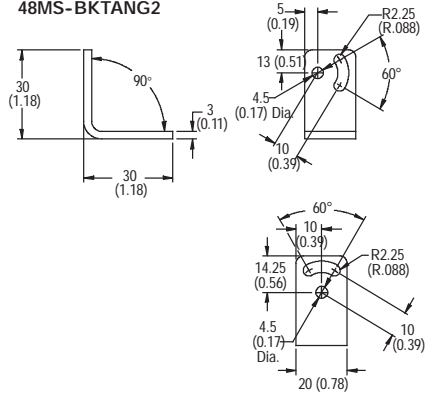
**Dovetail Bracket—48MS-BKTD**  
(included with MultiSight)



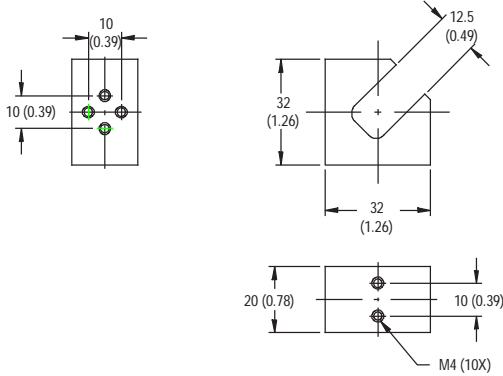
**Angle Bracket—48MS-BKTANG**



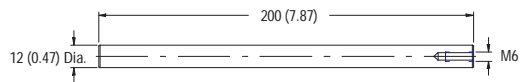
**Angle Bracket for Ring Light—48MS-BKTANG2**



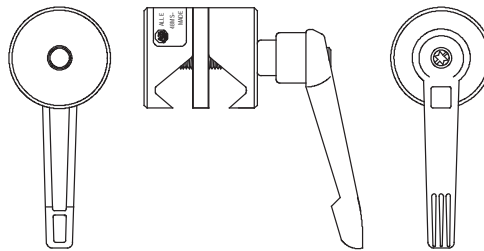
**Rod Bracket—48MS-BKTROD**



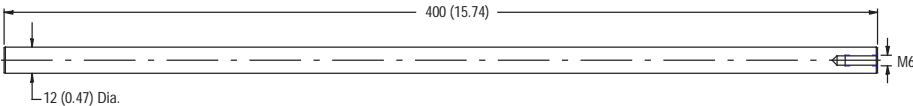
**Mounting Rod 200—48MS-ROD200**



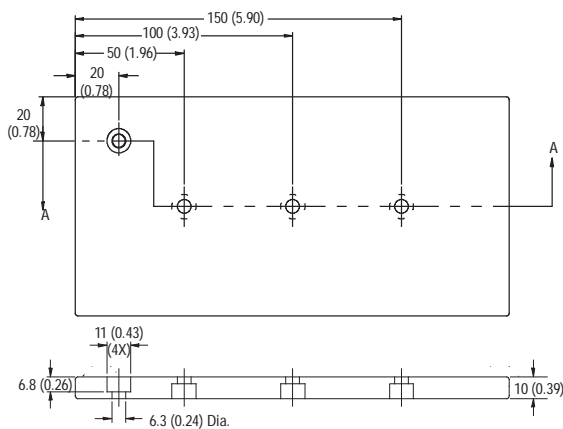
**Rod Clamp—48MS-CLAMP**



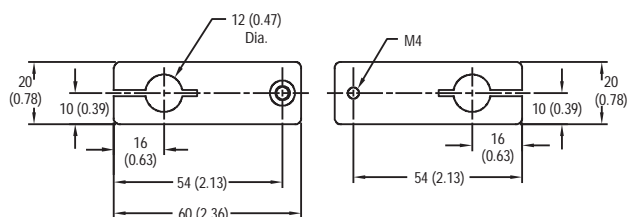
**Mounting Rod 400—48MS-ROD400**



**Mounting Plate—48MS-MTPLATE**



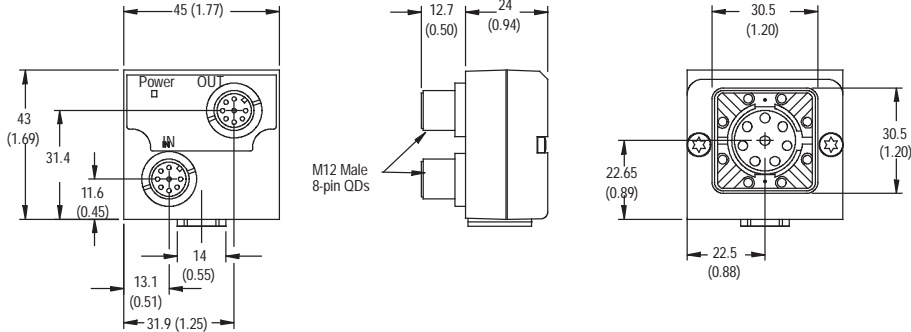
**Rod Link—48MS-RODLINK**



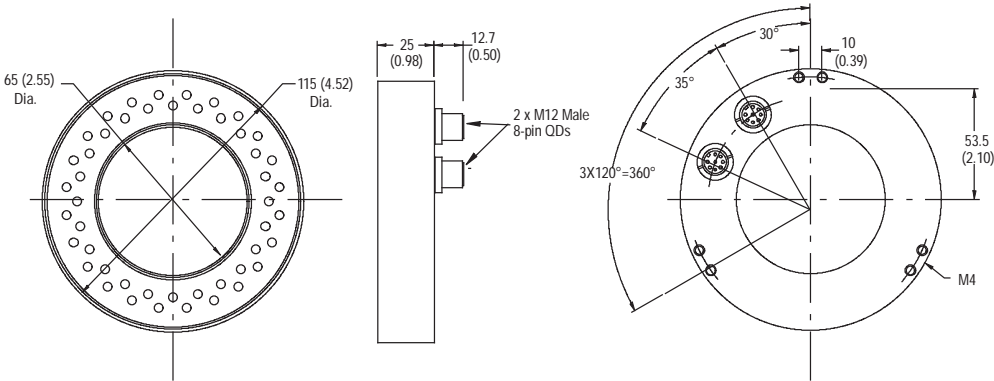
**Approximate Dimensions [mm (in.)] (continued)**

Dimensions are not intended to be used for installation purposes.

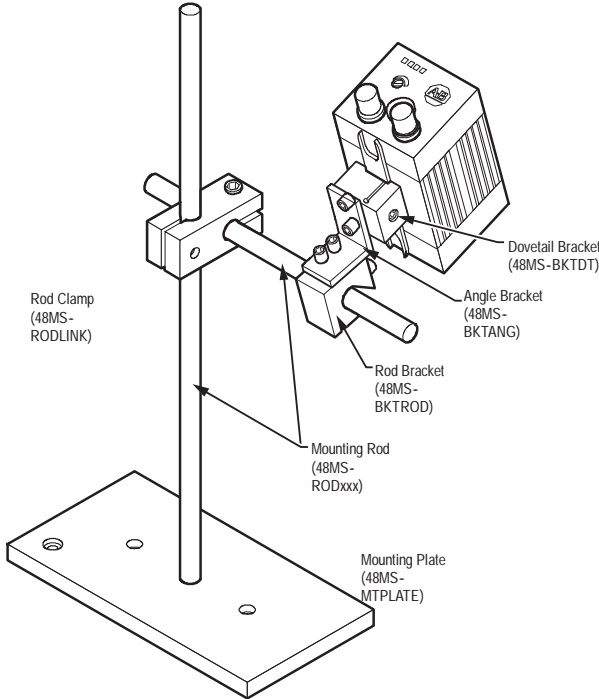
Area Light (White Light)—48MS-ALWH



Ring Light (White Light)—48MS-RLWH



Mounting Setup



# 48MS MultiSight<sup>t</sup>

## Vision Sensor

### Wiring

#### Power I/O Connection

Pin (M12)	Color	Use
1	White	IN1 (external trigger)
2	Brown	24V DC (V+)
3	Green	OUT1 (pass/fail); display LED = Q1
4	Yellow	OUT4 (ready) ❶
5	Grey	IN2 (control input)
6	Pink	OUT3 (external illuminated trigger)
7	Blue	GND (V+)
8	Red	OUT2 (position); display LED = Q2

❶ Indicates sensor evaluation is valid for OUT1 and OUT2, except in special cases as noted in the *MultiSight User Manual*.

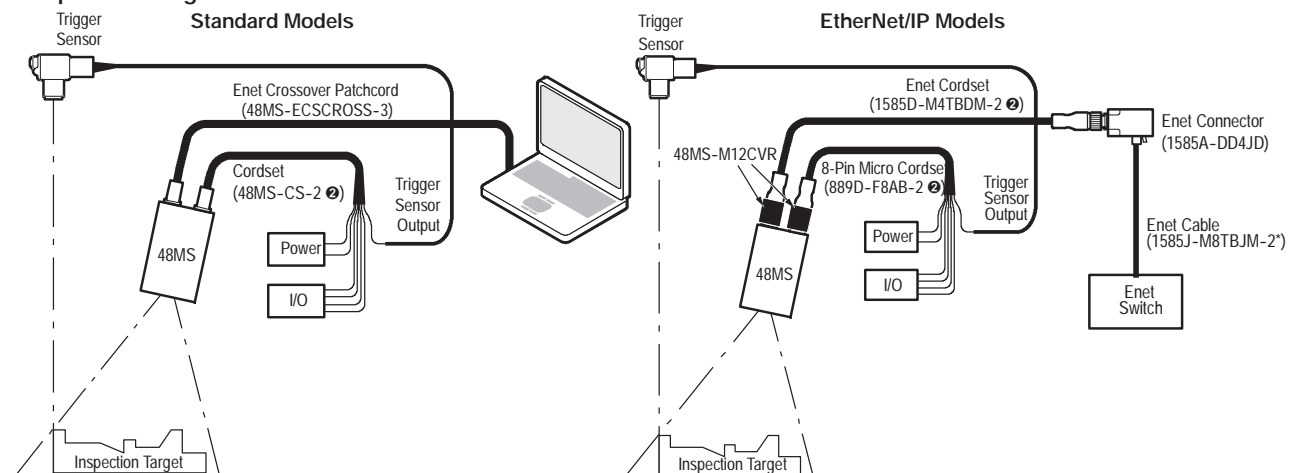
#### Ethernet (Standard Models)

Pin (M12)	Use
1	—
2	—
3	—
4	TxD-
5	RxD+
6	TxD+
7	RxD-
8	—

#### Ethernet (EtherNet/IP Models)

Pin (M12 D-Code)	Use
1	Tx+
2	Rx+
3	Tx-
4	Rx-

### Setup and Wiring



❷ Other lengths available: replace 2 with length in meters (5 m and 10 m are standard lengths).

## Accessories

Product Descriptor	Cat. No.
Dovetail Bracket	48MS-BKTD <sup>①</sup>
Angle Bracket	48MS-BKTANG
Rod Bracket	48MS-BKTROD
Mounting Rod 200 mm	48MS-ROD200
Mounting Rod 400 mm	48MS-ROD400
Rod Link	48MS-RODLINK
Rod Clamp	48MS-CLAMP
Mount Plate	48MS-MTPLATE
RJ45 Connector	48MS-RJ45CONN
Ethernet Crossover Cable, RJ45 to RJ45	48MS-ECROSS
Area Light—White Light	48MS-ALWH
Ring Light—White Light	48MS-RLWH
Angle Bracket for Ring Light	48MS-BKTANG2
Lighting Cable	48MS-LCS
Lighting Cable Right Angle	48MS-LCRT
MultiSight Test Box	48MS-TESTBOX

## Standard Model

Product Descriptor	Cat. No.
Cordset 2 m	48MS-CS-2
Cordset 5 m	48MS-CS-5
Cordset 10 m	48MS-CS-10
Cordset Right Angle 2 m	48MS-CSRT-2
Cordset Right Angle 5 m	48MS-CSRT-5
ENET Cordset Crossover 3 m	48MS-ECSCROSS-3
ENET Cordset 3 m	48MS-ECS-3
Sealing Cap—M12 Male Connector	889A-DCAP

## EtherNet/IP Model

Product Descriptor	Cat. No.
Power and I/O cordset—M12 8-pin female, 2 m	889D-F8AB-2 <sup>②</sup>
Cable Connector Cover (nonconducting)—M12	48MS-M12CVR <sup>①</sup>
Sealing Cap—M12 Female Connector	1485A-M12
Ethernet Patchcord M12 D-code to RJ45—2 m	1585D-M4TBJM-2 <sup>②</sup>
Ethernet Patchcord M12 D-code to M12 D-code—2 m	1585D-M4TBDM-2 <sup>②</sup>
Ethernet M12 D-code to RJ45 converter	1585A-DD4JD
Ethernet Cable RJ45 to RJ45—2 m	1585J-M8PBJM-2 <sup>②</sup>
Ethernet Patchcord Crossover M12 D-code to RJ45—3 m	48MS-EPC-3

<sup>①</sup> Included with MultiSight Sensor.

<sup>②</sup> Other lengths available: replace 2 with length in meters (5 m and 10 m are standard lengths).

**Note:** Additional accessories (longer cordsets and additional LED colors for external lighting) available with longer lead times. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for additional information.

Series 9000

Gate Entry



**Description**

These UL 325 Recognized and UL 508 Listed photoelectric sensing solutions are based on the industry proven Series 9000 and are specifically designed for noncontact detection of vehicles in automatic access control (gate entry) applications. These sensors are available individually or as bundled kits.

**Features**

- S Complete sensing solutions based on the industry proven Series 9000 photoelectric sensors
- S SPDT electro-mechanical relay output
- S 24V AC/DC and 120/220V AC/DC models
- S -34...+70°C (-29...+158°F) operating temperature range
- S NEMA 3, 4X, 6P, 12, 14 (IP 67) environmental rating
- S 1200 psi washdown rating
- S Offered as kits or individual components

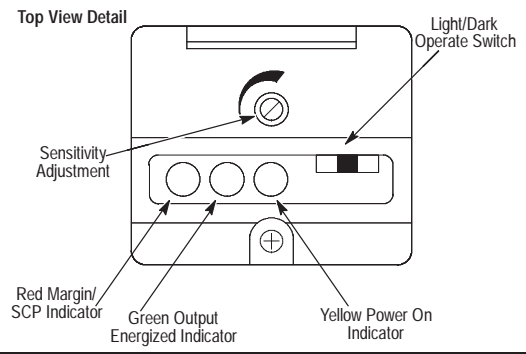
**Specifications**

<b>Environmental</b>	
Operating Temperature [C (F)]	-34...+70° (-29...+158°)
Relative Humidity	5...95% noncondensing
Operating Environment	NEMA 2, 4, 4X, 6P, 13; IP67 (IEC 602529), 1200 psi (8270 kPa) washdown
Certifications	UL 325 Recognized component for US and Canada and CE Marked for all applicable directives
Vibration	10...55 Hz, 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
<b>Optical</b>	
Sensing Mode	Retroreflective, transmitted beam
Sensing Distance	25.4 mm...9.15 m (1 in...30 ft) with AB #92-39 reflector, 25.4 mm...6 m (1 in...20 ft) transmitted beam
Transmitting LED	Visible red 660 nm, infrared (880 nm)
Field of View	1.5°
Operating Mode	Light or dark operate selectable
Sensitivity Adjustment	See User Interface on page 1-199
<b>Electrical</b>	
Supply Current	40 mA
Power Consumption	2.2 W/1.6V A
Protection	False pulse, reverse polarity, overload, short circuit
Output Type	SPDT EM Relay
Output Load Current/Voltage	1 A @ 264V AC, 2 A @ 132V AC, 1 A @ 150V DC
Response Time	23 ms max.
Leakage Current	Not applicable
<b>Mechanical</b>	
Housing Material	Valoxr
Lens Material	Acrylic
Mounting Bracket	#12 steel impact bracket
Connection Type	2 m 300V cable, 5-pin, AC mini QD



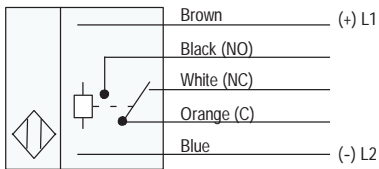
User Interface

Label	Color	State	Status
Output	Green	OFF	Sensor output de-activated
		ON	Sensor output activated
Margin/SCP	Red	OFF	Margin < 2.5
		ON	Margin > 2.5
		Flashing	Output SCP active
Power	Yellow	OFF	Sensor not powered
		ON	Sensor powered

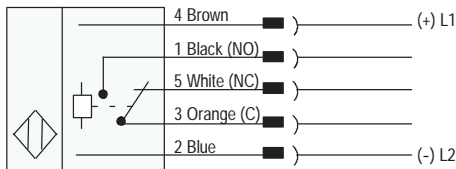


Wiring Diagrams

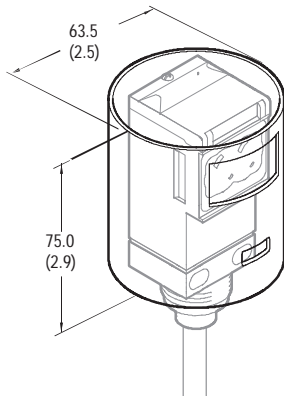
Cable Models



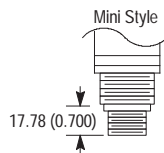
5-Pin AC/DC Mini OD Models



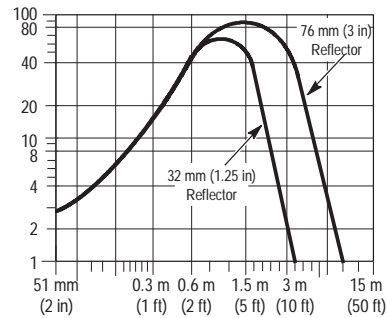
Approximate Dimensions [mm (in.)]



Mini Connector



Typical Response Curve



# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

## Series 9000

### Gate Entry

#### Product Selection—UL 325 Rated Retroreflective Sensor Kits

Description	Contents	Sensor Operating Voltage	Cat. No.
24V UL 325 Kit	Sensor: 60-2728 Mounting Bracket: 60-2421 Reflector: 92-39 Impact Bracket: 60-2725	10...55V DC/20...40V AC	60-GR1-24UL325
120/220V UL 325 Kit	Sensor: 60-2730 Mounting Bracket: 60-2421 Reflector: 92-39 Impact Bracket: 60-2725	70...264V AC/DC	60-GR1-120UL325

#### Product Selection—UL 508 Rated Sensor Kits (General Purpose)

Description	Contents of Kit	Cat. No.
24V AC/DC Retroreflective Kit	42GRU-9001, 60-2421 Bracket, 92-39 Reflector	60-GR1-24
120/220V AC/DC Retroreflective Kit	42GRU-9002, 60-2421 Bracket, 92-39 Reflector	60-GR1-120
24V AC/DC Transmitted Beam Kit	42GRL-9000, 42GRR-9001, 60-2421 Bracket (2 pcs.)	60-GRR1-24
120/220V AC/DC Transmitted Beam Kit	42GRL-9000, 42GRR-9002, 60-2421 Bracket (2 pcs.)	60-GRR1-120

Refer to Series 9000 in the *Sensors* catalog for detailed specifications for sensor models included in above kits.

#### Replacement Sensors Product Selection

Description	Details	Cat. No.
24V UL 325 Retroreflective	Retroreflective with 2 m Cable	60-2728
	Retroreflective with 5-pin Mini QD	60-2729
120/220V UL 325 Retroreflective	Retroreflective with 2 m Cable	60-2730
	Retroreflective with 5-pin Mini QD	60-2731

#### Cordsets and Accessories

Description	Cat. No.
Spare impact bracket for Series 9000 photoelectric sensor	60-2725
Spare mounting bracket for Series 9000 photoelectric sensor	60-2421
Spare reflector, 76 mm (3 in.) diameter with mounting hole	92-39
Spare reflector, 32 mm (1.25 in.) diameter with mounting hole	92-47
1.8 m (6 ft) 5-pin, mini QD cordset	889N-F5AF-6F



## Description

The Series 9000 photoelectric sensors with diagnostic output are designed to provide both a visual and electrical indication of a “dirty lens” condition. This is useful in applications where dirt and dust build-up on the optic lens are expected. This action will reduce the return light signal to the sensor thereby reducing its capability to reliably detect passing targets.

## Features

- S Both visual and electrical indication of “dirty lens” condition
- S Supports both static and diagnostic modes of operation
- S Harsh duty 30 mm package
- S Wide selection of sensing modes
- S Both DC and AC/DC operation
- S Fast response time
- S Variety of connection types

## Specifications

Environmental	
Certifications	UL Listed, CSA Approved, CE Marked for all applicable directives
Operating Environment	NEMA 3, 4X, 6P, 12, 13; IP67 (IEC 529) 1200 psi (8270 kPa) washdown, IP69K
Operating Temperature [C (F)]	0...+70° (32...+158°)
Vibration	10...55 Hz, 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%
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-205
Field of View	See Product Selection table on page 1-205
Light Source	Visible red (660 nm), Infrared (880 nm)
LED Indicators	See User Interface on page 1-202
Adjustments	Single-turn potentiometer for sensitivity
Electrical	
Voltage	10...30V DC, 95...264V AC/DC models
Current Consumption	30 mA max (DC models), 15 mA max (AC/DC models)
Sensor Protection	Overload, short circuit, reverse polarity, false pulse
Outputs	
Response Time	2 ms (DC models), 15 ms (AC/DC models)
Output Type	PNP and NPN both sensor and diagnostic output (DC models) SPST relay (sensor) with SPDT relay for diagnostic (AC/DC models)
Output Mode	Light or dark operate selectable
Output Current	100 mA max @ 30V DC, 2 A @ 132V (AC/DC sensor and diagnostic), 11 A @ 264V (AC/DC sensor and diagnostic)
Output Leakage Current	10 µA max
Mechanical	
Housing Material	Valox <sup>®</sup>
Lens Material	Acrylic
Cover Material	Neoprene
Connection Types	4-pin DC micro QD, 4-pin DC mini QD, 5-pin DC micro QD
Supplied Accessories	129-130 mounting kit
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-206

User Interface

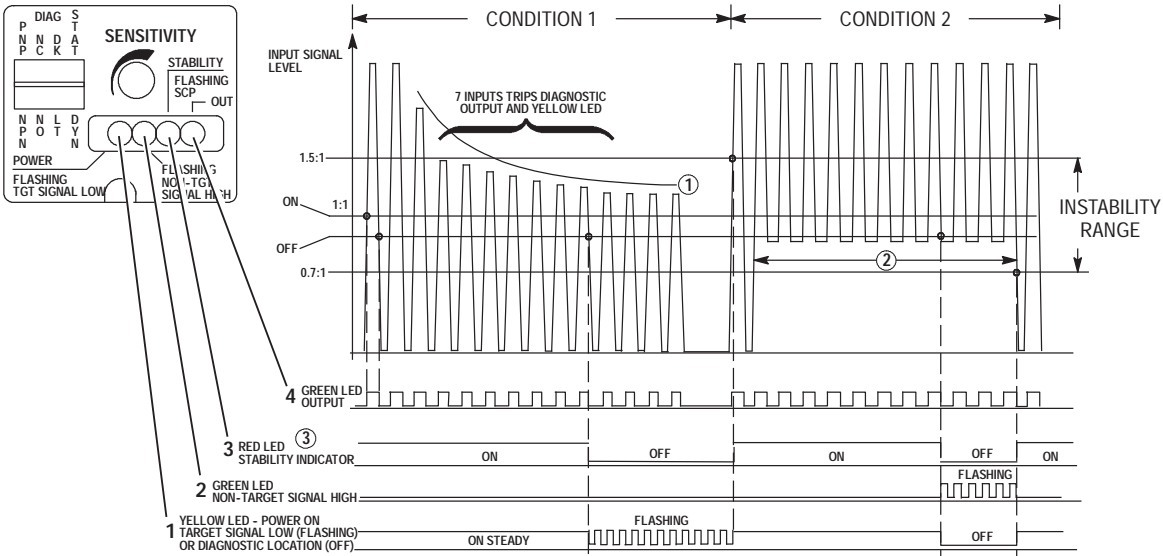
Label	Color	State	Diagnostic Operating Mode	
			Static	Dynamic
POWER FLASHING TGT SIGNAL LOW	Yellow	On Steady	Sensor Power On	
		Flashing	Unstable operation (0.7 < Margin < 1.5)	1.0 < Margin > 1.5 for seven successive operations Diffuse: Target margin too low Retro/Polarized Retro: Reflector margin too low Transmitted Beam unbroken beam margin too low
FLASHING NON-TGT SIGNAL HIGH	Green	Flashing	Unstable operation (0.7 < Margin < 1.5)	0.7 < Margin > 1.0 for seven successive operations Diffuse: Background margin too high Retro / Polarized Retro: Target margin too high Transmitted Beam broken beam margin to high
STABILITY <b>1</b> FLASHING SCP	Red	On Steady	Stable operation (Margin < 0.7 or Margin > 1.5)	
		Off	Unstable operation (0.7 < Margin < 1.5)	
		Flashing <b>2</b>	Overload or short circuit at sensor output	
OUTPUT	Green	On	Output energized	

**1** To prevent potentially confusing indications during rapid signal transitions, the red STABILITY indicator has a typical delay of 100 ms before it turns off. As a result, the indicator will not turn off for quick, brief events. (The Diagnostic Output has no delay.)

**2** 10...30V DC sensors only.

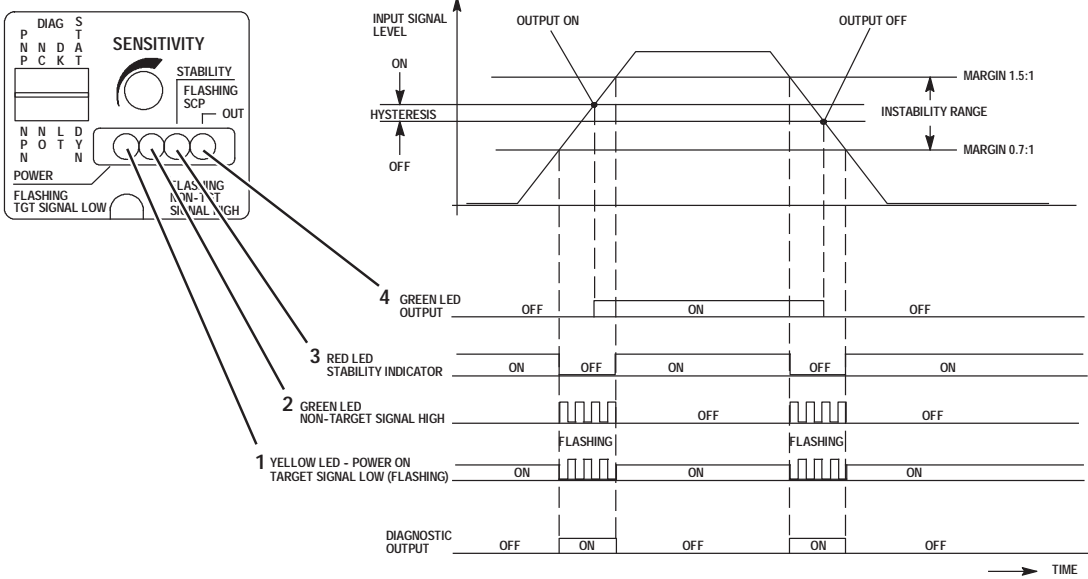
User Interface Panel—DC model shown

DYNAMIC Operating Mode



User Interface Panel—DC model shown (continued)

STATIC Operating Mode

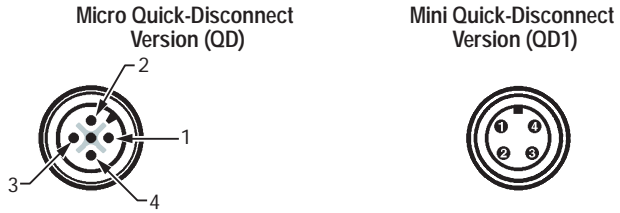
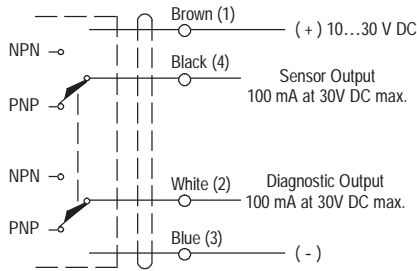


Series 9000

Diagnostic

Wiring Diagrams

DC Sensors



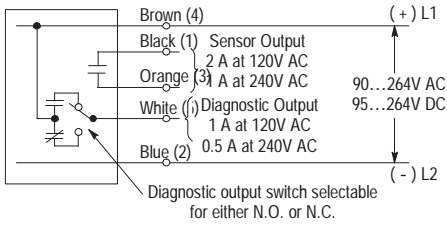
ATTENTION



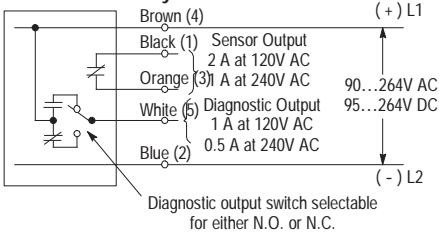
DO NOT connect both an NPN and PNP load at the same time!

AC Sensors

Normally Open



Normally Closed

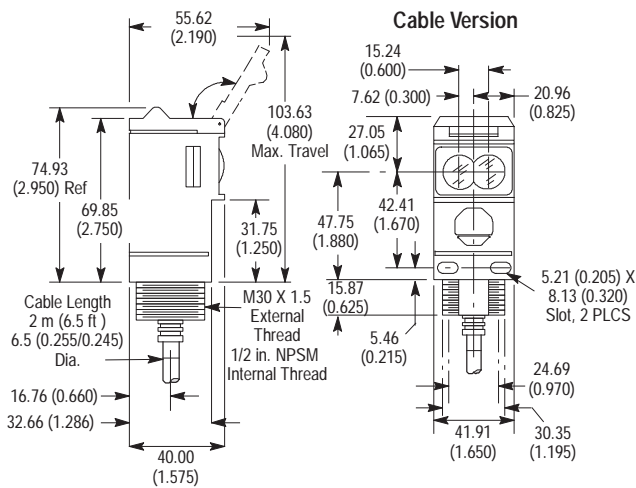


Mini Quick-Disconnect Version (QD)

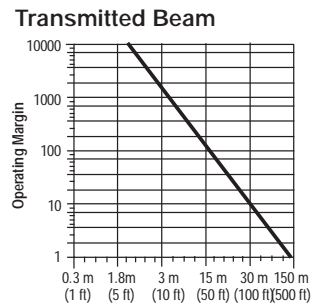
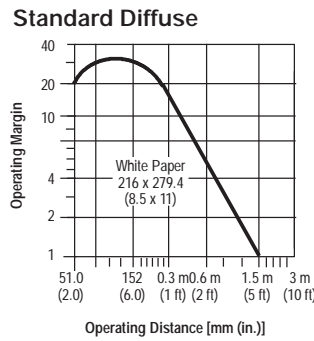
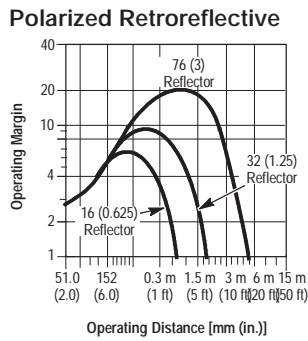
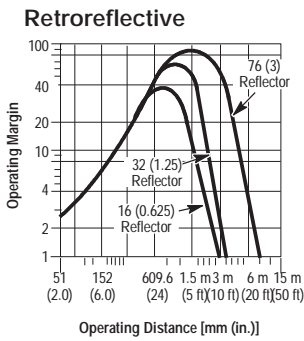


Approximate Dimensions [mm (in.)]

All Versions



Typical Response Curve



Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type Response Time	Connection Type	Cat. No.
<p><i>Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible Red 660 nm</p>	10...30V DC 30 mA	50.8 mm ...9.14 m (2 in...30 ft) with 76 mm (3 in.) Reflector	Light/Dark Selectable	NPN and PNP (Sensor and Diagnostic) 100 mA @ 30V DC 2 ms	4-pin DC micro	42GDU-9000-QD
	90...264V AC 95...264V DC 15 mA			SPST Relay N.O. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic) 15 ms	4-pin mini	42GDU-9000-QD1
				SPST Relay N.C. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic) 15 ms	5-pin mini	42GDU-9004-QD
<p><i>Polarized Retroreflective</i></p> <p>Field of View: 1.5_</p> <p>Emitter LED: Visible Red 660 nm</p>	10...30V DC 30 mA	50.8 mm... 4.87 m (2 in...16 ft) with 76 mm (3 ft) Reflector	Light/Dark Selectable	NPN and PNP (Sensor and Diagnostic) 100 mA @ 30V DC 2 ms	4-pin DC micro	42GDU-9200-QD
	90...264V AC 95...264V DC 15 mA			SPST Relay N.O. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic) 15 ms	4-pin mini	42GDU-9200-QD1
				SPST Relay N.C. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic) 15 ms	5-pin mini	42GDU-9204-QD
					5-pin mini	42GDU-9205-QD

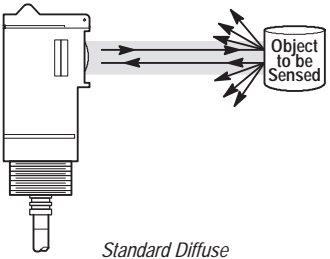
Refer to page 1-206 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

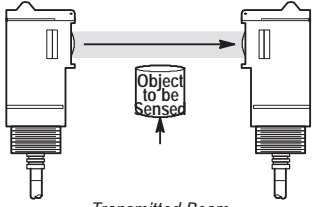
Series 9000

Diagnostic

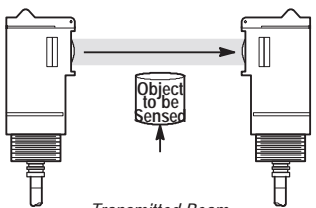
Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance	Output Energized	Output Type/ Response Time	Connection Type	Cat. No.
 <p>Standard Diffuse</p> <p>Field of View: 3.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	50.8 mm... 1.52 m (2 in...5 ft) to White Paper	Light/Dark Selectable	NPN and PNP (Sensor and Diagnostic) 100 mA @ 30V DC/2 ms	4-pin DC micro	42GDP-9000-QD
	90...264V AC 95...264V DC 15 mA			SPST Relay N.O. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic)/15 ms	5-pin mini	42GDP-9004-QD
				SPST Relay N.C. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic)/15 ms	5-pin mini	42GDP-9005-QD

For Light Sources

 <p>Transmitted Beam</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...264V AC/DC 15 mA	25.4 mm... 61 m (1 in...200 ft)	—	—	4-pin DC micro	42GRL-9000-QD
					4-pin mini	42GRL-9002-QD
	10...264V AC/DC 15 mA	25.4 mm... 152 m (1 in...500 ft)	—	—	4-pin DC micro	42GRL-9040-QD
					4-pin mini	42GRL-9042-QD

For Receivers

 <p>Transmitted Beam</p> <p>Field of View: 1.5_</p> <p>Emitter LED: Infrared 880 nm</p>	10...30V DC 30 mA	—	Receiver Light/Dark Selectable	NPN and PNP (Sensor and Diagnostic) 100 mA @ 30V DC/2 ms	4-pin DC micro	42GDR-9000-QD
			4-pin mini	42GDR-9000-QD1		
	90...264V AC 95...264V DC 15 mA	—	Light/Dark Selectable	SPST Relay N.O. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic)/15 ms	5-pin mini	42GDR-9004-QD
				SPST Relay N.C. (Sensor) 15 ms SPDT Relay, N.O. and N.C. (Diagnostic)/15 ms	5-pin mini	42GDR-9005-QD

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
1.8 m (6 ft) 4-pin, Mini QD Cordset	889N-F4AF-6F	2 m (6.5 ft) 4-pin, DC Micro QD Cordset	889D-F4AC-2	76 mm (3 in.) Diameter with Center Mount Hole	92-39
1.8 m (6 ft) 5-pin, Mini QD Cordset	889N-F5AF-6F	Mounting Bracket	60-2439	32 mm (1.25 in.) Diameter	92-47





## Specifications

Environmental	
Certifications	UL Listed, CSA Approved, and CE Marked for all applicable directives
Operating Environment	NEMA 3, 4X, 6, 12, 13; IP67
Operating Temperature [C (F)]	-40...+56° (-40...+150°)
Vibration	10...55 Hz, 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%
Ambient Light Immunity	Incandescent light 5000 lux
Optical	
Sensing Modes	Retroreflective, polarized retro, diffuse, fixed focus, sharp cutoff, wide angle, transmitted beam
Sensing Range	See Product Selection table on page 1-210
Field of View	See Product Selection table on page 1-210
Light Source	Visible red LED (660 nm), infrared LED (880 nm)
LED Indicators	Red LED for output indication
Adjustments	4-turn sensitivity potentiometer
Electrical	
Voltage	10...30V DC, 20...264V AC/DC
Current Consumption	35 mA max
Sensor Protection	Reverse polarity, false pulse
Outputs	
Response Time	See Product Selection table on page 1-210
Output Type	PNP and NPN (DC models); MOSFET (AC/DC models)
Output Mode	Light or dark operate by cat. no.
Output Current	See Product Selection table on page 1-210
Output Leakage Current	1 μA max
Mechanical	
Housing Material	Noryl
Lens Material	Acrylic
Cover Material	Neoprene
Connection Types	3 m (9.8 ft) cable, 4-pin DC micro (M12) QD, 4-pin AC micro (M12) QD
Supplied Accessories	Mounting kit # 129-106-1 and 129-106-2
Optional Accessories	See mounting brackets on page 1-212

## Features

- S Compact cylindrical package
- S Wide selection of sensing modes
- S Universal supply voltage models
- S Both NPN or PNP outputs (DC)
- S Fast response time
- S Variety of connection types

## User Interface Panel

Label	Color	State	Status
Output	Red	OFF	Sensor output de-activated
		ON	Sensor output activated

Series 6000

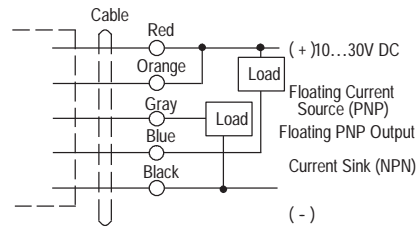
Compact

Wiring Diagrams

DC All Models Except Transmitted Beam Source and High Speed Diffuse

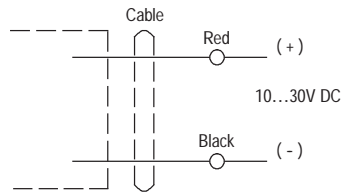
Cable Version

Models: 42SR\_-6\_\_2 and 6\_\_3



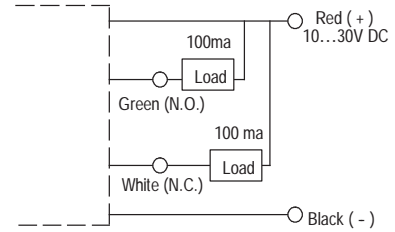
Transmitted Beam Source (42SRL-6000)

Cable Version



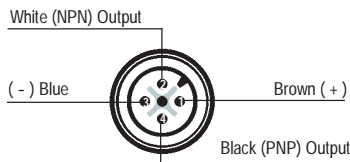
High Speed Diffuse (42SRP-6302)

Cable Version—NPN Outputs

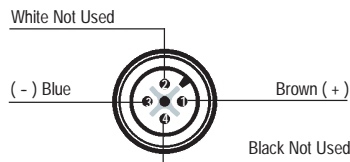


Quick-Disconnect Versions

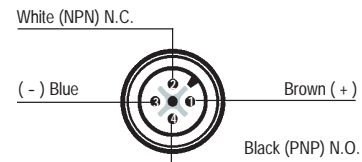
Models: 42SR\_-6\_\_2-QD and 6\_\_3-QD



Quick-Disconnect Version



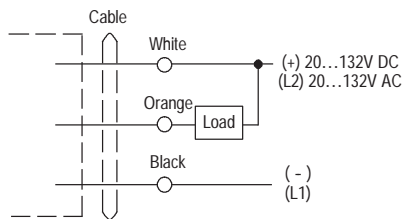
Quick-Disconnect Version



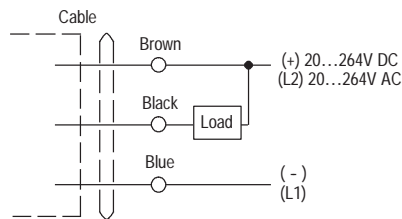
AC/DC All Models Except Transmitted Beam Source

Cable Versions

Models: 42SR\_-6\_\_4 and 6\_\_5

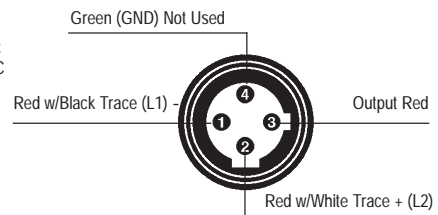


Models: 42SR\_-6\_\_6 and 6\_\_7



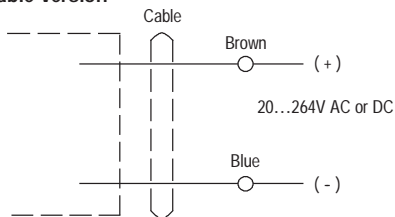
Quick-Disconnect Versions

Models: 42SR\_-6\_\_4-QD thru 6\_\_7-QD

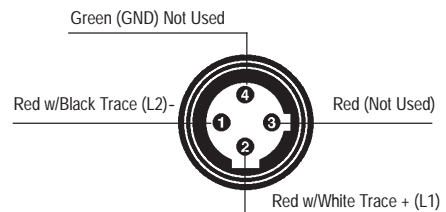


Transmitted Beam Source (42SRL-6006)

Cable Version



Quick-Disconnect Version

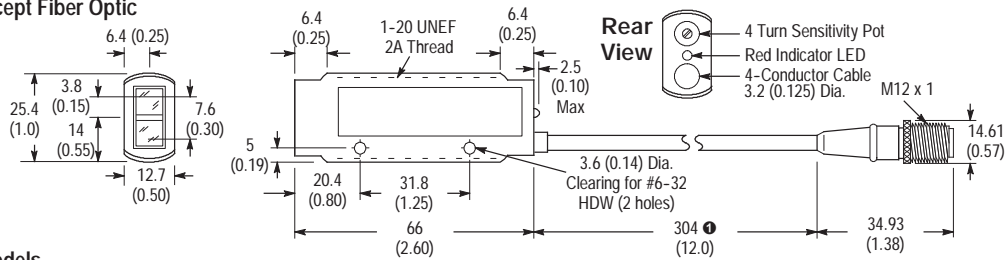


**Note:** Details regarding connection of Allen-Bradley Series 6000 photoelectric sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0.  
All wire colors shown refer to Allen-Bradley quick-disconnect cables.

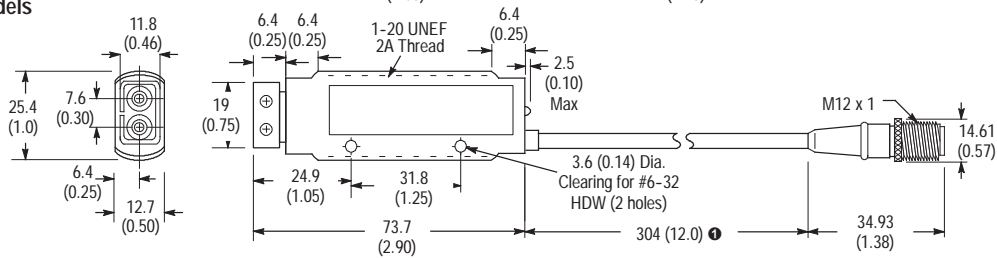
Approximate Dimensions [mm (in.)]

DC Models

All Models Except Fiber Optic



Fiber Optic Models

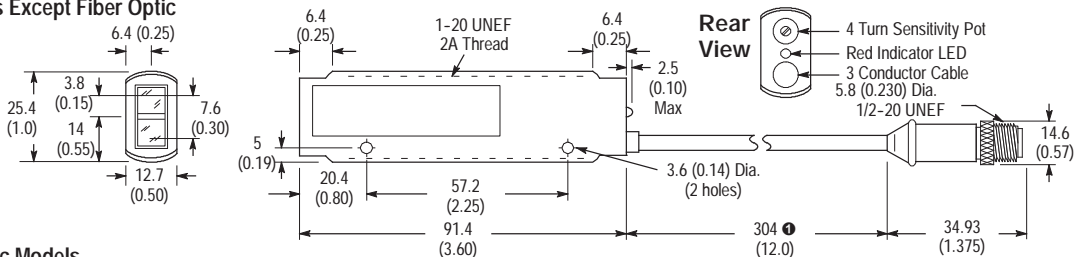


● Quick-disconnect cable length shown. Cable versions length is 3 m (10 ft).

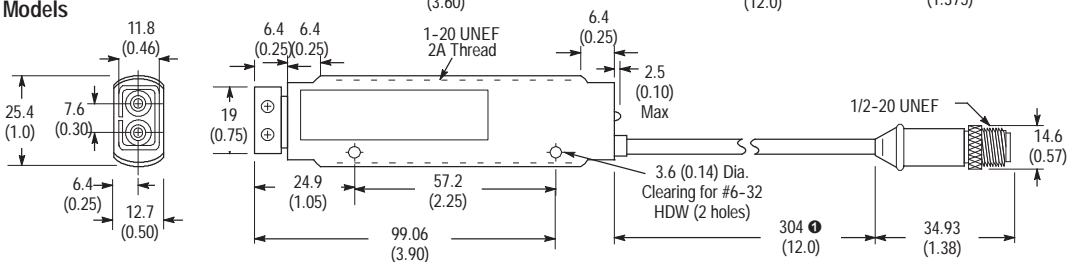
Connector Version

Micro Style	Thread Size	
	AC	DC
13.97 (0.55)	1/2-20 UNF 2 Keyways	M12 x 1 1 Keyway

All Models Except Fiber Optic



Fiber Optic Models

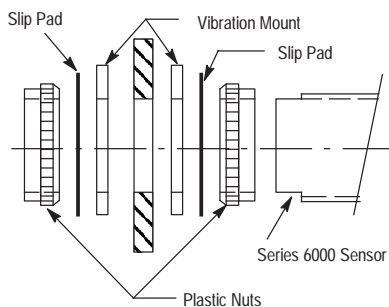


● Quick-disconnect cable length shown. Cable versions length is 3 m (10 ft).

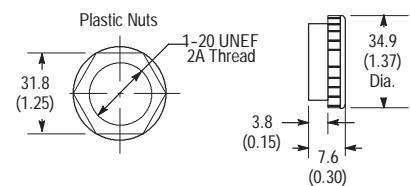
Supplied Accessories

Mounting Kit #129-106-1 contains two plastic nuts, anti-vibration mount, and slip pads.

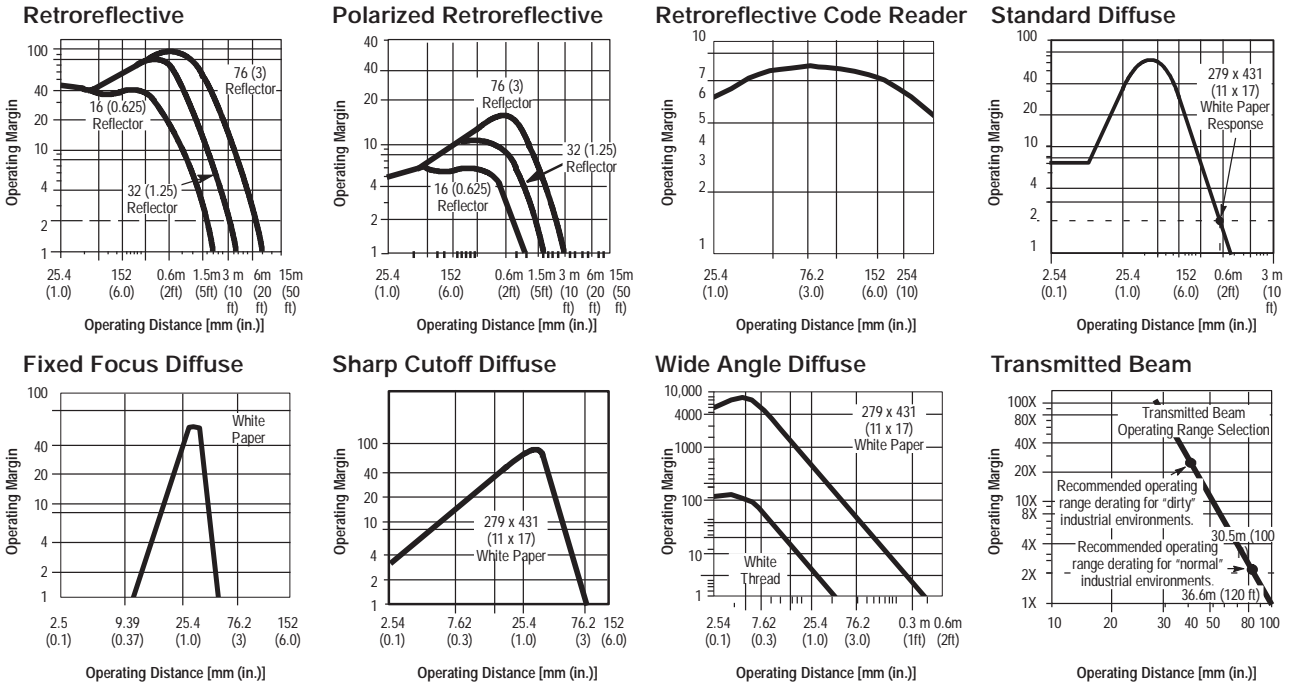
Mounting Kit #129-106-2 contains two plastic nuts, anti-vibration mount, slip pads, and fiber optic mounting hardware.



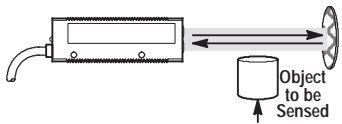
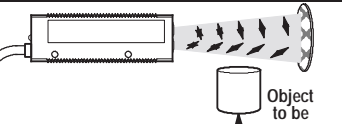
Plastic Nuts



Typical Response Curve

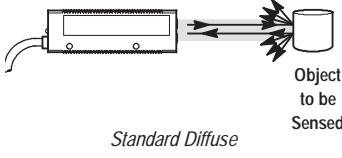
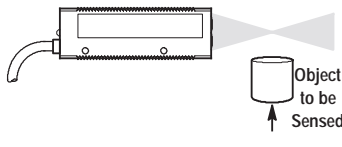
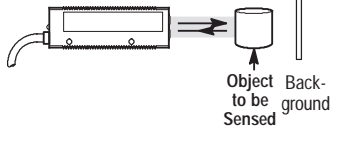
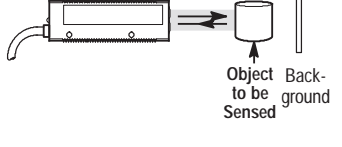
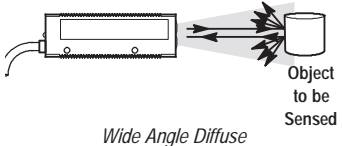


Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 1X Margin	Output Energized	Output Type Response Time	Connection Type	Cat. No.
 <p>Retroreflective</p> <p>Field of View: 3° Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	25.4 mm... 9 m (1 in...30 ft) with 76 mm (3 in.) Reflector	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRU-6002
			Dark		4-pin DC micro	42SRU-6002-QD
	20...132V AC/DC 50...60 Hz 1.2V A	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRU-6003	
				4-pin DC micro	42SRU-6003-QD	
				3 m cable	42SRU-6004	
				4-pin AC micro	42SRU-6004-QD	
 <p>Polarized Retroreflective</p> <p>Field of View: 3° Minimum Sensing Distance: 50.8 mm (2 in.) Emitter LED: Visible Red 660 nm Indicator LED: Red: Output</p>	10...30V DC 35 mA	50.8 mm... 3 m (2 in...10 ft) with 76 mm (3 in.) Reflector	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRU-6202
			Dark		4-pin DC micro	42SRU-6202-QD
	20...132V AC/DC 50...60 Hz 1.2V A	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRU-6203	
				4-pin DC micro	42SRU-6203-QD	
				3 m cable	42SRU-6204	
				4-pin AC micro	42SRU-6204-QD	
3 m cable	42SRU-6205					
4-pin AC micro	42SRU-6205-QD					

Refer to page 1-212 for cordsets and accessories.

Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 1X Margin	Output Energized	Output Type Response Time	Connection Type	Cat. No.
 <p><i>Standard Diffuse</i> Field of View: 7.5_ Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	2.54...760 mm (0.1...30 in.) to White Paper	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRP-6002
			Dark		4-pin DC micro	<b>42SRP-6002-QD</b>
	20...132V AC/DC 50...60 Hz 1.2V A		Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRP-6003
			Dark		4-pin DC micro	42SRP-6003-QD
			Light	3 m cable	<b>42SRP-6004</b>	
			Dark	4-pin AC micro	42SRP-6004-QD	
 <p><i>Fixed Focus Diffuse</i> Field of View: 1.52 mm (0.06 in.) square Emitter LED: Visible Red 660 nm</p>	10...30V DC 35 mA	27.9...28 mm (1.098...1.10 in.) to White Paper	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRP-6022
			Dark		4-pin DC micro	<b>42SRP-6022-QD</b>
	20...132V AC/DC 50...60 Hz 1.2V A		Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRP-6023
			Dark		4-pin DC micro	42SRP-6023-QD
			Light	3 m cable	42SRP-6024	
			Dark	4-pin AC micro	42SRP-6024-QD	
 <p><i>Sharp Cutoff Diffuse</i> Field of View: 7.5_ Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	5...76 mm (0.2...3 in.) to White Paper	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRP-6032
			Dark		4-pin DC micro	<b>42SRP-6032-QD</b>
	20...132V AC/DC 50...60 Hz 1.2V A		Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRP-6033
			Dark		4-pin DC micro	42SRP-6033-QD
			Light	3 m cable	42SRP-6034	
			Dark	4-pin AC micro	42SRP-6034-QD	
 <p><i>Sharp Cutoff Diffuse</i> Field of View: 7.5_ Emitter LED: Infrared 880 nm</p>	20...264V AC/DC 50...60 Hz 1.2V A	5...76 mm (0.2...3 in.) to White Paper	Dark	Power MOSFET 150 mA AC/DC 18 ms AC, 10 ms DC	4-pin AC micro	42SRP-6037-QD
			Light		4-pin AC micro	42SRP-6037-QD
 <p><i>Wide Angle Diffuse</i> Field of View: 62_ Emitter LED: Infrared 660 nm</p>	10...30V DC 35 mA	2.54...380 mm (0.1...15 in.) to White Paper	Light	NPN and PNP 200 mA 1 ms	3 m cable	42SRP-6012
			Dark		4-pin DC micro	<b>42SRP-6012-QD</b>
	20...132V AC/DC 50...60 Hz 1.2V A		Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRP-6013
			Dark		4-pin DC micro	42SRP-6013-QD
			Light	3 m cable	42SRP-6014	
			Dark	4-pin AC micro	42SRP-6014-QD	
Light	3 m cable	42SRP-6015				
Dark	4-pin AC micro	42SRP-6015-QD				

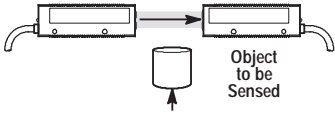
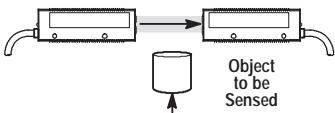
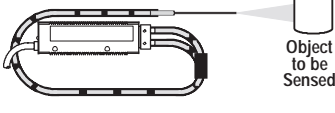
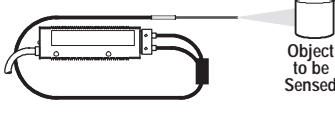
Refer to page 1-212 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

Series 6000

Compact

Product Selection

Sensing Mode	Operating Voltage Supply Current	Sensing Distance @ 1X Margin	Output Energized	Output Type Response Time	Connection Type	Cat. No.			
<b>For Light Source</b>									
 <p><i>Transmitted Beam</i></p> <p>Field of View: 7.5° Emitter LED: Infrared 880 nm</p>	10...30V DC 15 mA	2.54 mm...36.6 m (0.1 in...120 ft)	—	—	3 m cable	42SRL-6000			
	10...30V DC 15 mA	2.54 mm...36.6 m (0.1 in...120 ft)	—	—	4-pin DC micro	42SRL-6000-QD			
	20...264V AC/DC 50...60 Hz 1V A		—		3 m cable	42SRL-6006			
			—		4-pin AC micro	42SRL-6006-QD			
<b>For Receiver</b>									
 <p><i>Transmitted Beam</i></p> <p>Field of View: 7.5° Emitter LED: Infrared 880 nm</p>	10...30V DC 15 mA	—	Light	NPN and PNP 200 mA 5 ms	3 m cable	42SRR-6002			
			Dark		4-pin DC micro	42SRR-6002-QD			
			20...264V AC/DC 50...60 Hz 1V A		—	Light	Power MOSFET 300 mA AC/DC 18 ms AC, 10 ms DC	3 m cable	42SRR-6003
						Dark		4-pin DC micro	42SRR-6003-QD
	20...264V AC/DC 50...60 Hz 1V A	—	Light	Power MOSFET 300 mA AC/DC 18 ms AC, 10 ms DC	3 m cable	42SRR-6006			
			Dark		4-pin AC micro	42SRR-6006-QD			
	20...264V AC/DC 50...60 Hz 1V A	—	Light		Power MOSFET 300 mA AC/DC 18 ms AC, 10 ms DC	3 m cable	42SRR-6007		
			Dark			4-pin AC micro	42SRR-6007-QD		
 <p><i>Large Aperture Fiber Optic</i></p> <p>Field of View: Depends on Glass Fiber Optics selected. See Glass Fiber Optic section, page 1-234. Emitter LED: Infrared 880 nm</p>	10...30V DC 35 mA	Depends on Fiber Optic cable selected	Light	NPN and PNP 200 mA 1 ms		4-pin DC micro	42SRF-6002-QD		
			Dark			3 m cable	42SRF-6003		
			20...132V AC/DC 50...60 Hz 1.2V A		Depends on Fiber Optic cable selected	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRF-6004
						Dark		4-pin DC micro	42SRF-6003-QD
	20...132V AC/DC 50...60 Hz 1.2V A	Depends on Fiber Optic cable selected	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	4-pin AC micro	42SRF-6004-QD			
			Dark		3 m cable	42SRF-6005			
	20...132V AC/DC 50...60 Hz 1.2V A	Depends on Fiber Optic cable selected	Light		Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	4-pin AC micro	42SRF-6005-QD		
			Dark			3 m cable	42SRF-6005		
 <p><i>Small Aperture Fiber Optic</i></p> <p>Field of View: Depends on Plastic or Glass Fiber Optics selected. See Plastic Fiber optic section, page 1-270 and Glass Fiber Optic section, page 1-234. Emitter LED: Visible 660 nm</p>	10...30V DC 35 mA	Depends on Glass or Plastic Fiber Optics selected	Light	NPN and PNP 200 mA 1 ms		3 m cable	42SRF-6102		
			Dark			4-pin DC micro	42SRF-6102-QD		
			20...132V AC/DC 50...60 Hz 1.2V A		Depends on Glass or Plastic Fiber Optics selected	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRF-6103
						Dark		4-pin DC micro	42SRF-6103-QD
	20...132V AC/DC 50...60 Hz 1.2V A	Depends on Glass or Plastic Fiber Optics selected	Light	Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRF-6104			
			Dark		4-pin AC micro	42SRF-6104-QD			
	20...132V AC/DC 50...60 Hz 1.2V A	Depends on Glass or Plastic Fiber Optics selected	Light		Power MOSFET 300 mA AC/DC 12 ms AC, 5 ms DC	3 m cable	42SRF-6105		
			Dark			4-pin AC micro	42SRF-6105-QD		

See below for cordsets and accessories.

Cordsets and Accessories

Description	Cat. No.	Description	Cat. No.	Description	Cat. No.
2 m (6.5 ft) 4-pin DC Micro QD Cordset	889D-F4AC-2	Mounting Brackets	60-2618	76 mm (3 in.) Diameter Reflector	92-39
2 m (6.5 ft) 4-pin AC Micro QD Cordset	889R-F4AEA-2	Right Angle Reflector	60-2052	32 mm (1.25 in.) Diameter Reflector	92-47



**Features**

- S Wide selection for increased application flexibility
- S Quick-disconnect design reduces down time
  - No disruption of alignment or wiring
- S Three power base styles:
  - Terminal base can eliminate need for separate junction box
  - 3 m (10 ft) cable base for lower profile (red and blue line only)
  - Pre-wired mini-style quick-disconnect (green line only)
- S False turn-on pulse protection
- S Switch selectable light or dark operating mode
- S Adjustable sensitivity
- S Choice of relay or solid-state outputs
- S Highly visible LED output indicator

**Specifications**

	Red Line	Blue Line	Green Line	Analog Output
<b>Environmental</b>				
Certifications	UL Listed, CSA Approved, and CE Marked for all applicable directives			
Operating Environment	NEMA 3, 4, 12, 13; IP66			
Operating Temperature [C (F)]	-40...+52° (-40...+125°) for TRIAC output -40...+65° (-40...+150°) for all others	-40...+65° (-40...+150°)	-40...+65° (-40...+150°) for EM relay -40...+52° (-40...+125°) for solid state	-40...+65° (-40...+150°)
Vibration	10...55 Hz, 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	90% max			
Ambient Light Immunity	Incandescent light: 5000 lux			
<b>Optical</b>				
Sensing Modes	Retroreflective, diffuse, long range diffuse, fiber optic, background suppression, transmitted beam (see Product Selection table on page 1-220)			
Sensing Range	See Product Selection table on page 1-220			
Field of View	See Product Selection table on page 1-220			
Light Source	Visible red LED (660 nm), infrared LED (880 nm)			
<b>Electrical</b>				
Voltage	12...30V DC, 120V AC (see Product Selection table on page 1-220)			
Current Consumption	Depends on power base (see Product Selection table on page 1-220)			
Sensor Protection	False pulse	Reverse polarity and false pulse	False pulse	False pulse, short circuit
<b>Outputs</b>				
Response Time	1...8 ms	1 ms	Determined by plug-in module	100 ms
Output Type	PNP and NPN, FET,SPDT relay,TRIAC, analog output (see Product Selection table on page 1-220)			
Output Mode	Light or dark operate selectable, selectable positive or negative slope for analog models (see Product Selection table on page 1-220)			
Output Current	30 mA...2A max	100 mA	Determined by plug-in module	See Product Selection table
Output Leakage Current	1mA max	1 µA	—	10 µA
<b>Mechanical</b>				
Housing Material	Valoxr			
Lens Material	Acrylic (glass on polarized models)			
Connection Types	See Product Selection table on page 1-220			
Supplied Accessories	None			
Optional Accessories	See mounting brackets, reflectors, and cordsets on page 1-226			

**User Interface Panel**

Label	Color	State	Status
Output	Red	OFF	Sensor output de-activated
		ON	Sensor output activated

## Series 5000

### Modular

#### Plug-In Output Module (required for green line only)

Output Type Capacity	Max Leakage Current	Output Response Time <sup>①</sup>	Cat. No.
SPDT EM-Relay 2 A, 120V AC/1 A, 240V AC	—	10 ms On	8-590
		15 ms Off	8-594 <sup>②</sup>
SP-N.O. FET SS Relay 30 mA Cont./0...120V AC/DC	10 mA	1 ms	8-591
SP-N.O. AC Power TRIAC SS Relay 0.75 A Cont. 10 A Inrush/24...240V AC	1 mA	8 ms	8-592
NPN and PNP 100 mA 30V DC	1 $\mu$ A	1 ms	8-593 <sup>②</sup>

#### Plug-In Control Function Module (optional for green line only)

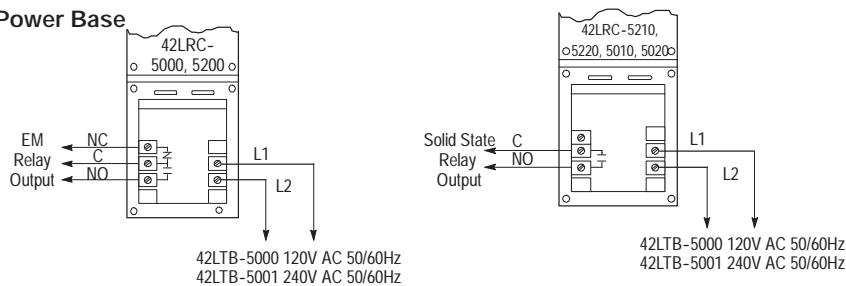
Function	Adjustable Time Delay (s)		Adjustable Dwell (s)	Cat. No.
	On	Off		
On and/or Off Delay	0.05...1.0	0.05...1.5	—	60-1790
	0.5...10	0.5...15		60-1791
	2...4.0	2...6.0		60-1798
One-Shot	—	—	0.005...0.5	60-1792
	—	—	0.5...15	60-1793
Motion Detector	—	0.05...1.5	—	60-1796
	—	0.5...15	—	60-1797

① Add sensor and output response time for total response time.

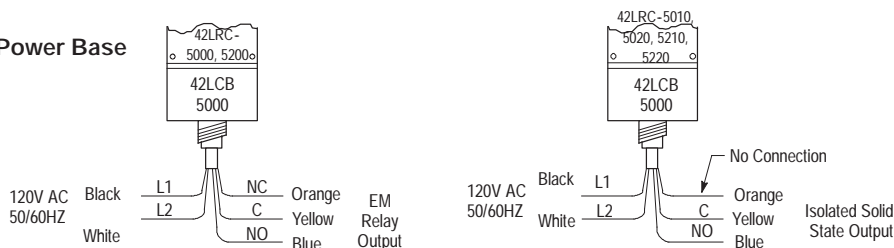
② Use with 42MTB-5004 base ONLY. Other output modules will not function with 5004 base.

#### Red Line Wiring Diagrams

##### With Terminal Style Power Base



##### With Cable Style Power Base

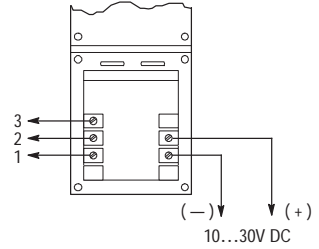


**Note:** Details of connection of Allen-Bradley Series 5000 photoelectric sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0. Refer to [www.ab.com/literature](http://www.ab.com/literature) for more information.

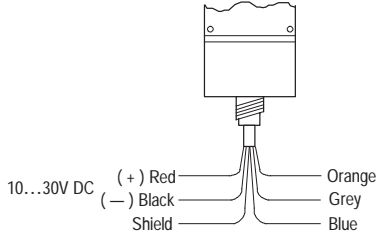


Blue Line Wiring Diagrams

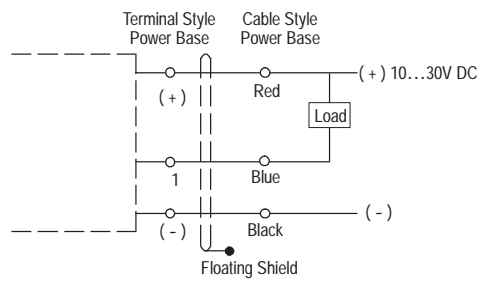
Terminal Style Power Base. DTB-5000



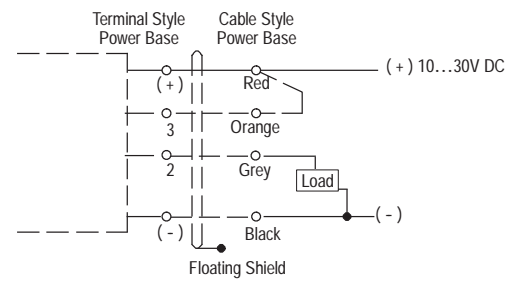
Cable Style Power Base, DCB-5000



NPN Output Connection (Sinking)

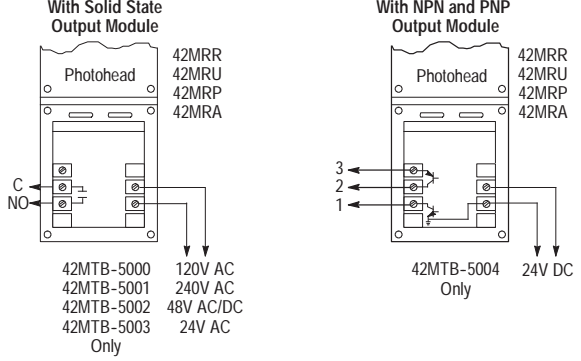
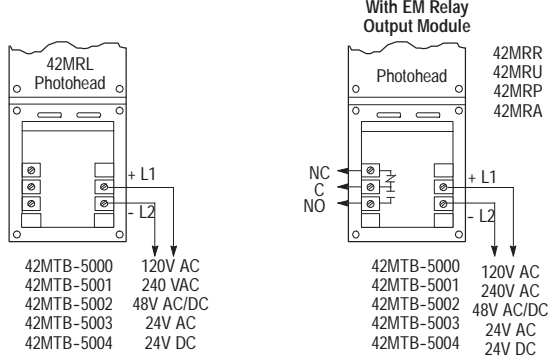


PNP Output Connection (Sourcing)

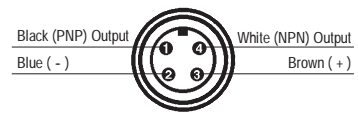


Green Line Wiring Diagrams

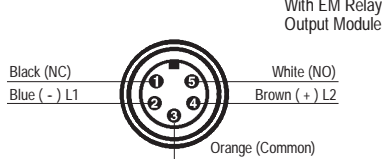
With Terminal Style Power Base



With Mini Quick-Disconnect Style Power Base  
42MTB-5004QD4-1



42MTB-5000QD5-1



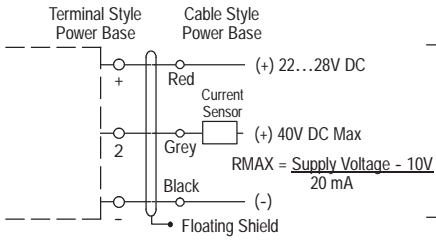
**Note:** Details of connection of Allen-Bradley Series 5000 photoelectric sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0. Wire colors shown refer to Allen-Bradley quick-disconnect cables.

Series 5000

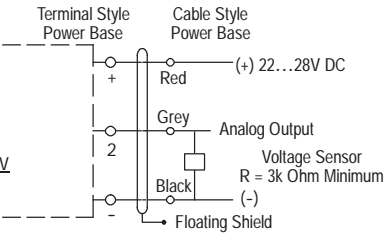
Modular

Analog Output Wiring Diagrams

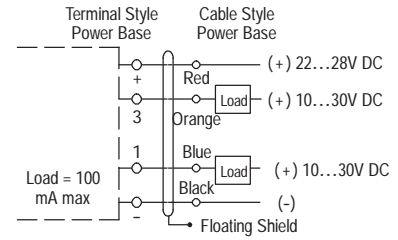
Current Output Connections



Voltage Output Connections



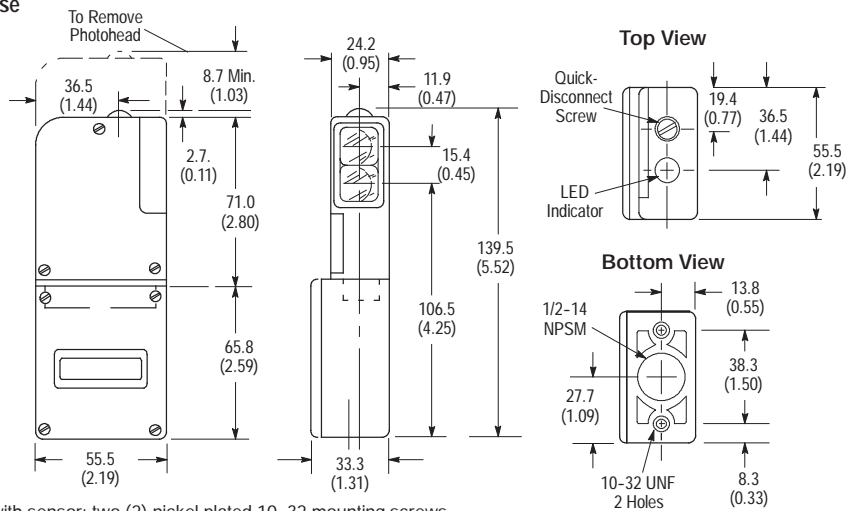
NPN Set Point Output Connections



Note: Details of connection of Allen-Bradley Series 5000 Photoelectric sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0.

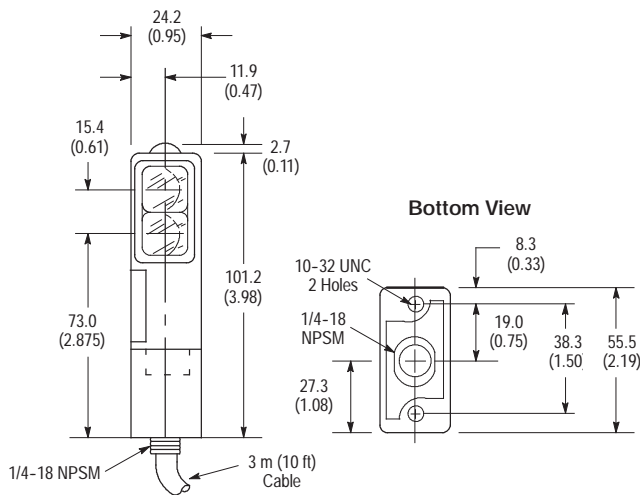
Approximate Dimensions (Applies to all versions) [mm (in.)]

Terminal Style Power Base



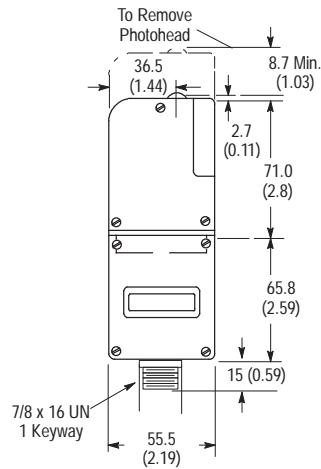
Note: Hardware included with sensor: two (2) nickel plated 10-32 mounting screws.

Cable Style Power Base



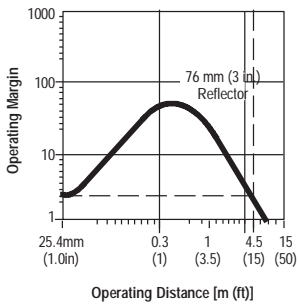
Approximate Dimensions (Applies to all versions) [mm (in.)] (continued)

Quick-Disconnect Style Power Base

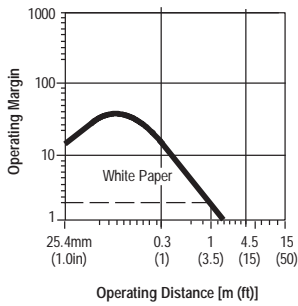


Red Line Typical Response Curve

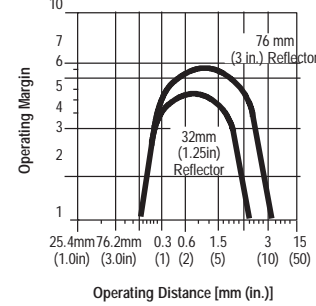
Retroreflective



Standard Diffuse

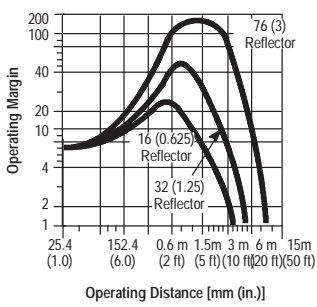


Polarized Retroreflective

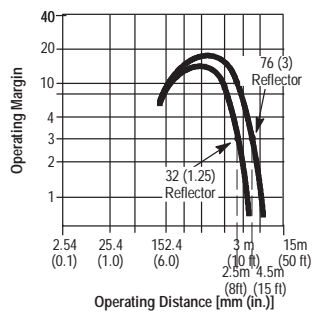


Blue Line Typical Response Curve

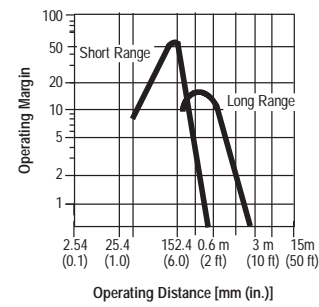
Retroreflective



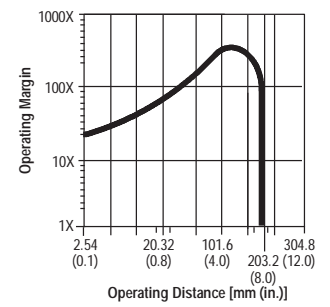
Polarized Retroreflective



Standard Diffuse



Background Suppression<sup>①</sup>

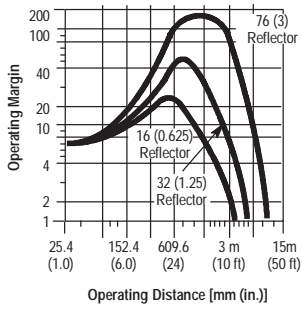


Series 5000

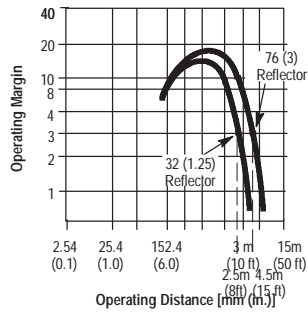
Modular

Green Line Typical Response Curve

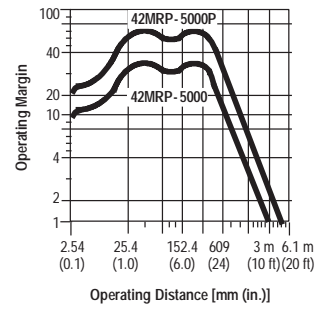
Retroreflective



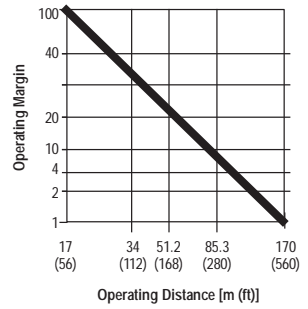
Polarized Retroreflective



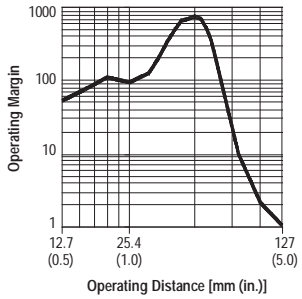
Standard Diffuse



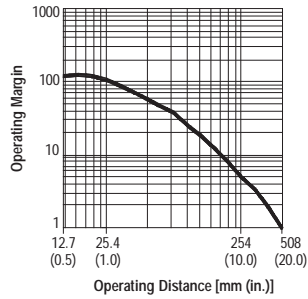
Transmitted Beam



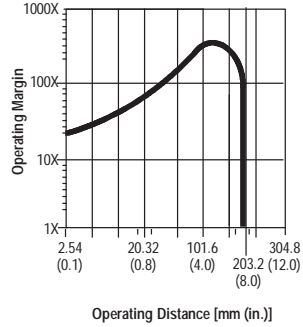
Fixed Focus Lens



Wide Angle Lens



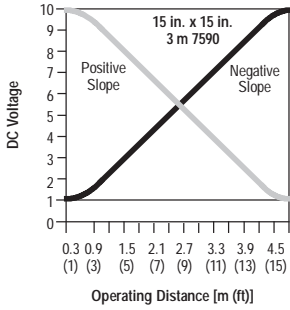
Background Suppression<sup>①</sup>



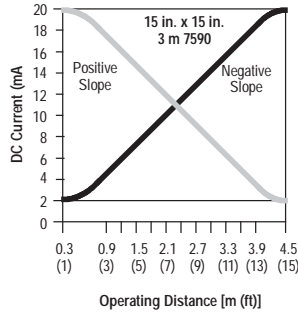
① Example: Operating distance set at 203.2 mm (8 in.).

Analog Output Typical Response Curve

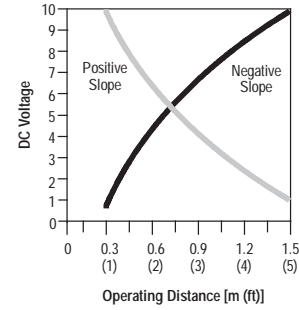
Retroreflective  
Voltage Output Slope



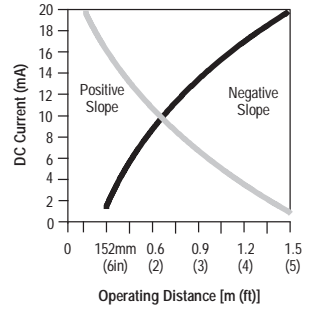
Current Output Slope



Standard Diffuse  
Voltage Output

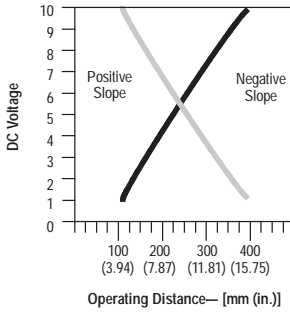


Current Output

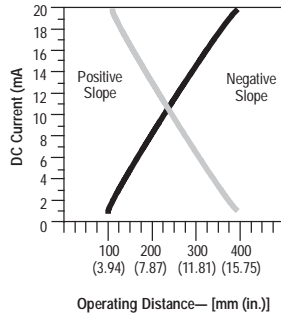


Infrared Glass FO/Fixed Focus/Wide Angle Diffuse

Voltage Output



Current Output



Product Selection Guidelines

1. Select photohead (see pages 1-220 to 1-225).
2. Select power base (see page 1-226).
3. Select output module for green line models only (see page 1-226).
4. Select plug-in control function optional module on page 1-226 (green models only).

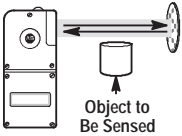
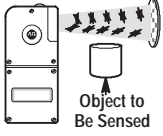
PHOTOSWITCH<sup>®</sup> Photoelectric Sensors

Series 5000

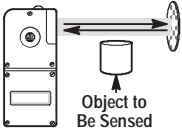
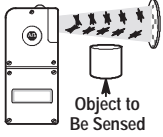

Red Line/Blue Line

Red Line Product Selection [mm (in.)]

1. Select Photohead.

Sensing Mode	Sensing Distance [mm (in.)]	Output Energized	Output Type Capacity	Response Time <sup>①</sup>		Cat. No.
				Sensor	Output	
 <p>Red Line—Retroreflective/Standard Diffuse</p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	50.8 mm...6 m (2 in...20 ft) with 76 (3) Reflector  50.8 mm...1.5 m (2 in...5 ft) with White Paper	Light/Dark Selectable	EM Relay (SPDT) 2.0 A-120V AC 1.0 A-240V AC	5 ms	On 10 ms Off 15 ms	42LRC-5000
			AC/DC Solid State FET (SP-N.O.) 30 mA 0...120V AC/DC		1 ms	42LRC-5010
			AC Solid State TRIAC (SP-N.O.) 0.75 A 240V AC cont.		8 ms	42LRC-5020
 <p>Red Line—Polarized Retroreflective</p> <p>Field of View: 3_</p> <p>Emitter LED: Visible Red 660 nm</p>	50.8 mm...6 m (2 in...20 ft) with 76 (3) Reflector	Light/Dark Selectable	EM-Relay (SPDT) 2.0 A-120V AC 1.0 A-240V AC	5 ms	On 10 ms Off 15 ms	42LRC-5200
			AC/DC Solid State FET (SP-N.O.) 30 mA 0...120V AC/DC		1 ms	42LRC-5210
			AC Solid State TRIAC (SP-N.O.) 0.75 A 240V AC cont.		8 ms	42LRC-5220

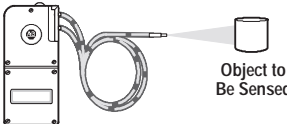
Blue Line Product Selection [mm (in.)]

 <p>Blue Line—Retroreflective</p> <p>Field of View: 2.5_</p> <p>Emitter LED: Infrared 880 nm</p>	50.8 mm...10 m (2 in...33 ft) with 76 (3) Reflector	Light/Dark Selectable	NPN and PNP 100 mA	1 ms	42DRU-5000
 <p>Blue Line—Polarized Retroreflective</p> <p>Field of View: 2.5_</p> <p>Emitter LED: Visible Red 660 nm</p>	50.8 mm...6 m (2 in...20 ft) with 76 (3) Reflector	Light/Dark Selectable	NPN and PNP 100 mA	1 ms	42DRU-5200
 <p>Blue Line—Standard Diffuse</p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	Long Range: 50.8 mm...2.1 m (2 in...7 ft) with White Paper	Light/Dark Selectable	NPN and PNP 100 mA	1 ms	42DRP-5000

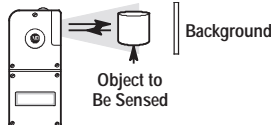
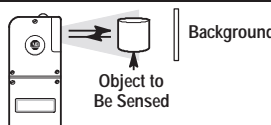
① Add Sensor and Output for total response time.

Refer to page 1-226 for cordsets and accessories.

Blue Line Product Selection [mm (in.)] (continued)

Sensing Mode	Sensing Distance	Output Energized	Output Type Capacity	Response Time	Cat. No.
 <p>Blue Line—Large Aperture Fiber Optic Field of View: Depends on fiber optics or lens selected or lens type Emitter LED: Infrared 880 nm</p>	Depends on Fiber Optic selected.	Light/Dark Selectable	NPN and PNP 100 mA	1 ms	42DRA-5000FO

Blue Line Product Selection [mm (in.)] (continued)

Sensing Mode	Sensing Distance [mm (in.)]	Output Energized	Output	Timing		Response Time	Cat. No.
				Function	Range		
 <p>Blue Line—Background Suppression without Timing Field of View: 3_  Emitter LED: Infrared 880 nm</p>	Suppression Point Adjustment Range 50.8 (2) to 63.5...304.8 (2.5...12)	Light/Dark Selectable	NPN & PNP	—	—	5 ms	42DBS-5000
 <p>Blue Line—Background Suppression with Timing Field of View: 3_  Emitter LED: Infrared 880 nm</p>	Suppression Point Adjustment Range 50.8 (2) to 63.5...304.8 (2.5...12)	Light/Dark Selectable	NPN & PNP	Selectable On Delay Off Delay On & Off Delay Delayed One-shot One-shot	0...1.5 s 0...15 s Selectable		42DBS-5100

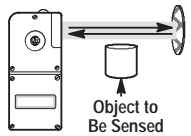
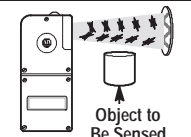
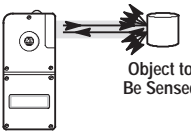
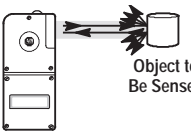
Refer to page 1-226 for cordsets and accessories.

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

Series 5000

Green Line

Green Line Product Selection [mm (in.)]

Sensing Mode	Sensing Distance [mm (in.)]	Output Energized	Sensor Response Time <sup>①</sup>	Cat. No.
 <p><i>Green Line—Retroreflective</i> Field of View: 2.5_° Emitter LED: Infrared 880 nm</p>	50.8 mm...10 m (2 in...33 ft) with 76 (3) Reflector	Light/Dark Selectable	1 ms	42MRU-5000
 <p><i>Green Line—Polarized Retroreflective</i> Field of View: 2.5_° Emitter LED: Visible Red 660 nm</p>	50.8 mm...6 m (2 in...20 ft) with 76 (3) Reflector	Light/Dark Selectable	2.5 ms	42MRU-5200
 <p><i>Green Line—Standard Diffuse</i> Field of View: 3_° Emitter LED: Infrared 880 nm</p>	Short Range: 50.8 mm... 3 m (2 in...10 ft) with White Paper	Light/Dark Selectable	2.5 ms	42MRP-5000
 <p><i>Green Line—Long Range Diffuse</i> Field of View: 3_° Emitter LED: Infrared 880 nm</p>	Long Range: 50.8 mm... 4.8 m (2 in...16 ft) with White Paper	Light/Dark Selectable	2.5 ms	42MRP-5000P

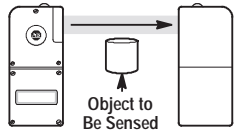
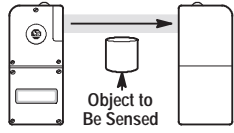
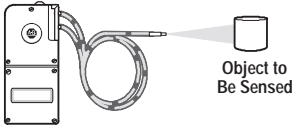
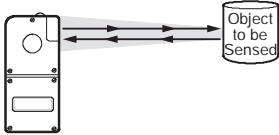
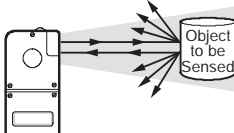
① Add Sensor and Output for total response time.

Refer to page 1-226 for cordsets and accessories.



**Green Line Product Selection [mm (in.)] (continued)**

**1. Select Photohead (continued).**

Sensing Mode	Sensing Distance [mm (in.)]	Output Energized	Sensor Response Time <sup>①</sup>	Cat. No.
 <p><i>Green Line—Transmitted Beam Receiver</i> Field of View: 3_  Emitter LED: Infrared 880 nm</p>	25.4 mm...171 m (1 in...560 ft)	Light/Dark Selectable	5 ms	<b>42MRR-5000</b> Order one receiver and one light source
 <p><i>Green Line—Transmitted Beam Light Source</i> Field of View: 3_  Emitter LED: Infrared 880 nm</p>	25.4 mm...171 m (1 in...560 ft)	—	N/A	<b>42MRL-5000</b> Order one receiver and one light source
 <p><i>Green Line—Large Aperture Fiber Optic</i> Field of View: Determined by fiber optics or lens type Emitter LED: Infrared 880 nm</p>	Depends on Fiber Optic selected.	Light/Dark Selectable	2.5 ms	<b>42MRA-5000FO</b>
 <p><i>Green Line—Fixed Focus</i> Emitter LED: Infrared 880 nm</p>	5.08 mm...172 m (0.2 in...564 ft)	Light/Dark Selectable	2.5 ms	<b>42MRA-5000FF</b>
 <p><i>Green Line—Wide Angle Diffuse</i> Emitter LED: Infrared 880 nm</p>	5.08 (0.2)...508 (20)	Light/Dark Selectable	2.5 ms	<b>42MRA-5000WA</b>

<sup>①</sup> Prewired for use with output 8-593 only.

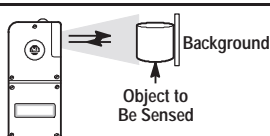
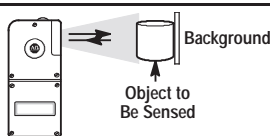
Refer to page 1-226 for cordsets and accessories.

## Series 5000

### Green Line/Analog Output

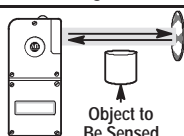
#### Green Line Product Selection [mm (in.)] (continued)

##### 1. Select Photohead (continued).

Sensing Mode	Sensing Distance [mm (in.)]	Output Energized	Timing		Sensor Response Time <sup>①</sup>	Cat. No.
			Function	Range		
 <p><i>Green Line—Background Suppression without Timing</i></p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	Suppression Point Adjustment Range 50.8 (2) to 63.5...304.8 (2.5...12)	Light/Dark Selectable	—	—	5 ms	42MBS-5000
 <p><i>Green Line—Background Suppression with Timing</i></p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	Suppression Point Adjustment Range 50.8 (2) to 63.5...304.8 (2.5...12)	Light/Dark Selectable	Selectable On Delay Off Delay On & Off Delay One-shot Delayed One-shot	0...1.5 s 0...15 s Selectable	5 ms	42MBS-5100

#### Analog Output Product Selection [mm (in.)]

##### 1. Select Photohead.

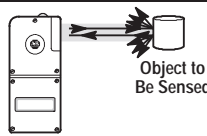
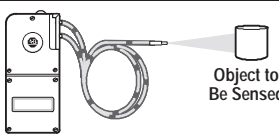
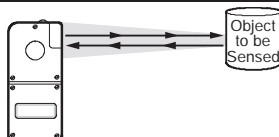
Sensing Mode	Supply Current	Sensing Distance	Analog Output	Output Type Capacity	Response Time <sup>②</sup>	Slope	Cat. No.
 <p><i>Analog Output—Retroreflective</i></p> <p>Field of View: 3_</p> <p>Emitter LED: Infrared 880 nm</p>	70 mA	600 mm (2 ft)... Total: 4.6 m (15 ft) Linear 4.0 m (13 ft)	Voltage 1...10V DC  Current 1...20 mA	Two Adjustable Set Points NPN 100 mA (30V Max)	100 ms	Selectable Positive or Negative	42DRU-5400

① Prewired for use with output 8-593 only.

② Time needed for full analog swing.

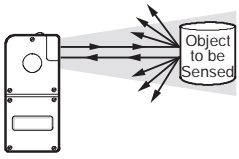
Refer to page 1-226 for cordsets and accessories.

Analog Output Product Selection [mm (in.)] (continued)

Sensing Mode	Sensing Distance [mm (in.)]	Analog Output	Output Type Capacity	Response Time <sup>Ⓢ</sup>	Slope	Cat. No.
 <p><i>Analog Output—Standard Diffuse</i> Field of View: 3_° Emitter LED: Infrared 880 nm</p>	150 (6)... Total: 1.5 m (5 ft) Linear: 1.2 m (4 ft)	Voltage 1...10V DC Current 1...20 mA	Two Adjustable Set Points NPN 100 mA (30V max)	100 ms	Selectable Positive or Negative	42DRP-5400
 <p><i>Analog Output—Large Aperture Fiber Optic</i> Field of View: Depends on fiber optics (refer to fiber optic section) or lens type Emitter LED: Infrared 880 nm</p>	Depends on Fiber Optic selected.	Voltage 1...10V DC Current 1...20 mA	Two Adjustable Set Points NPN 100 mA (30V max)	100 ms	Selectable Positive or Negative	42DRA-5400FO
 <p><i>Analog Output—Fixed Focus</i> Emitter LED: Infrared 880 nm</p>	5.08...101 (0.2...4)	Voltage 1...10V DC Current 1...20 mA	Two Adjustable Set Points NPN 100 mA (30V max)	100 ms	Selectable Positive or Negative	42DRA-5400FF

Analog Output Product Selection [mm (in.)] (continued)

1. Select Photohead.

Sensing Mode	Sensing Distance	Analog Output	Output Type Capacity	Response Time	Slope	Cat. No.
 <p><i>Analog Output—Wide Angle Diffuse</i> Emitter LED: Infrared 880 nm</p>	5.08 (0.2 in.)... 152 mm (6 in.)	Voltage 1...10V DC Current 1...20 mA	Two Adjustable Set Points NPN 100 mA (30V max)	100 ms	Selectable Positive or Negative	42DRA-5400WA

Ⓢ Time needed for full analog swing.

Refer to page 1-226 for cordsets and accessories.

## Series 5000

### Power Base

#### Power Base Product Selection [mm (in.)]

##### 2. Select Power Base.

Style	Operating Voltage	Supply Current	Cat. No.
<b>Red Line</b>			
Terminal	120V AC, 50/60 Hz	2V A	42LTB-5000
	240V AC, 50/60 Hz	4V A	42LTB-5001
Cable	120V AC, 50/60 Hz	2V A	42LCB-5000
<b>Blue Line</b>			
Terminal	10...30V DC	35 mA	42DTB-5000
Cable			42DCB-5000

Operating Voltage	Supply Current	Cat. No.	
		Terminal Style	Mini QD Style
<b>Green Line</b>			
102...132V AC, 50/60 Hz	2V A	42MTB-5000	42MTB-5000QD5-1
204...254V AC, 50/60 Hz	4V A	42MTB-5001	—
40...54V AC/DC, 50/60 Hz	1V A	42MTB-5002	—
20...30V AC, 50/60 Hz		42MTB-5003	—
20...30V DC		42MTB-5004	42MTB-5004QD4-1 <b>❶</b>

	Operating Voltage	Supply Current	Connection Type	Cat. No.
<b>Analog Output Line</b>				
All sensing modes	22...28V DC	70 mA maximum	Screw Terminal	42DTB-5000
		70 mA maximum	3 m 300V Cable	42DCB-5000

##### 3. Select Output module (green line models only) (required).

##### 4. Select plug-in control function optional module (green line models only).

#### Cordsets and Accessories

Description	Cat./Page No.	Description	Cat. No.	Description	Cat. No.
Terminal Chambers	8-1	Right Angle Bracket	60-1785	76 mm (3 in.) Diameter Reflector	92-39
Screw Terminal	42MTB-5000	Conduit Adaptor 1/2 inch NPT	60-2213	32 mm (1.25 in.) Diameter Reflector	92-47
5-pin DC Mini QD	42MTB-5000-QD5-1	Armored Cable Adaptor	60-1577	Heavy Duty Protective Guard	60-2083
Flexi-mount Mounting Assembly	60-2014	Limit Switch Type Mounting Assembly	60-2230	Heavy Duty Mounting Assembly	60-1748

❶ Prewired for use with output 8-593 only.



### Specifications

<b>Environmental</b>	
Certifications	UL Listed, CSA Approved
Operating Environment	NEMA 3, 4, 12, 13; IP66
Operating Temperature [C (F)]	-40...+57° (-40...+135°)
Vibration	10...55 Hz, 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...90%
<b>Optical</b>	
Sensing Modes	Retroreflective, polarized retroreflective, diffuse, transmitted beam
Sensing Range	See Product Selection table on page 1-230
Field of View	See Product Selection table on page 1-230
Light Source	Visible red LED (660 nm), infrared LED (880 nm)
LED Indicators	See User Interface below
Adjustments	Sensitivity adjustment potentiometer
<b>Electrical</b>	
Voltage	See Product Selection table on page 1-230
Current Consumption	See Product Selection table on page 1-230
Sensor Protection	False pulse
<b>Outputs</b>	
Response Time	5 ms plus plug-in module delay
Output Type	EM relay, TRIAC, FET, PNP/NPN
Output Mode	Light or dark operate selectable
Output Current	Determined by plug-in module, see Product Selection table on page 1-230
Output Leakage Current	1 µA max
<b>Mechanical</b>	
Housing Material	Noryl <sup>®</sup>
Lens Material	Acrylic, glass for polarized sensor
Connection Types	Nickel-plated screw terminal
Supplied Accessories	8-670 DPDT relay module
Optional Accessories	Mounting brackets, reflectors, cordsets

### Features

- S Harsh duty package
- S Screw terminal connections
- S Long-range sensing modes
- S Plug-in logic and output modules
- S Both DC and AC/DC operation
- S Selectable light/dark operation

### User Interface Panel

Label	Color	State	Status
Power	Yellow	OFF	Sensor not powered
		ON	Sensor powered

# PHOTOSWITCH<sup>R</sup> Photoelectric Sensors Series 4000B

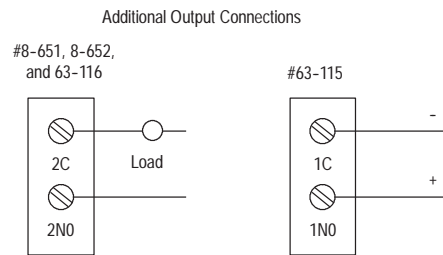
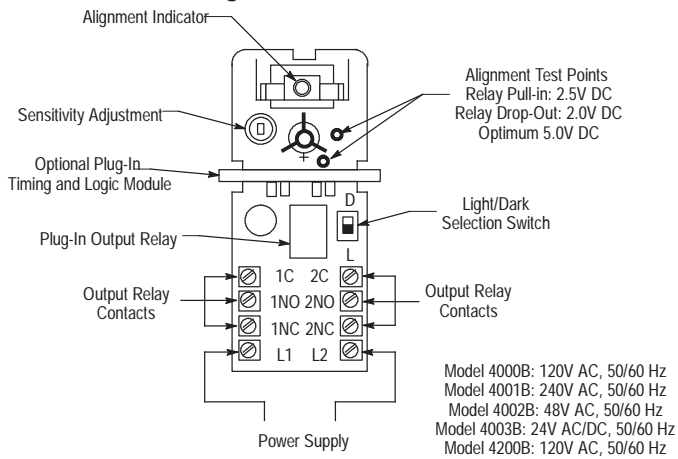
## Optional Timing and Logic Modules

These plug-in modules can be added to any series 4000B Photoelectric sensor.

Function	Adjustable Time Delay(s)		Adjustable Dwell (s)	Cat. No.
	On	Off		
One-shot	—	—	0.040...0.250	60-1612-1
	—	—	0.5...15	60-1612-2
On and/or Off Delay	0.05...1.0	0.05...1.5	—	60-1613
	0.5...10	0.5...15		60-1614
Delayed One-shot	0.10...1.5	—	0.040...0.250	60-1625
	1.0...15		0.040...0.250	60-1626
Motion Detector	—	0.05...1.5	—	60-1660
		0.5...15		60-1661
Preset Counter	2...999 Counts		0.040...0.250	60-1716

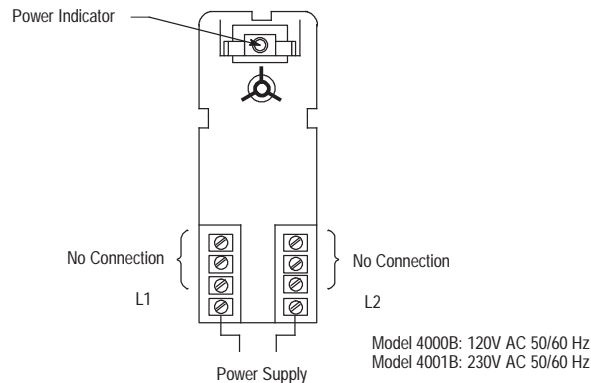
## Wiring Diagrams

### All Sensing Modes Except Transmitted Beam Light Source

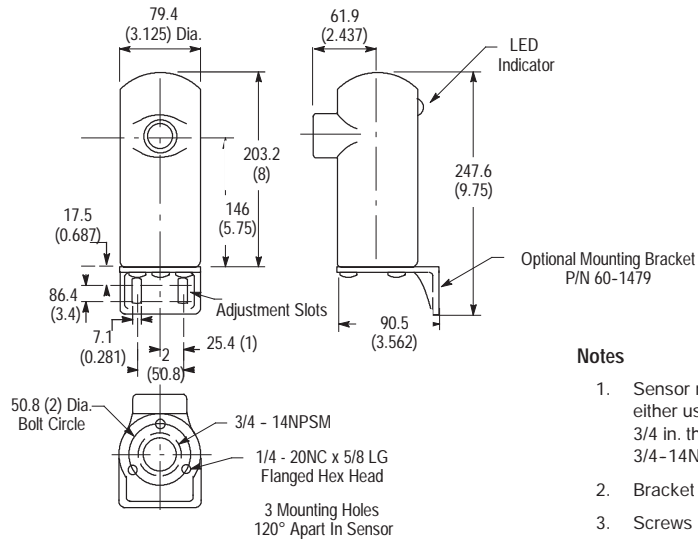


**Note:** Details regarding connection of Allen-Bradley Series 4000B sensors to Allen-Bradley Programmable Controllers can be found in publication 42-2.0.

### Transmitted Beam Light Source



**Approximate Dimensions [mm (in.)]**



**Notes**

1. Sensor may be mounted without bracket, either using 3, 1/4-20NC mtg. holes or on a 3/4 in. threaded pipe, thread pitch 3/4-14NPSM.
2. Bracket allows 360° adjustment.
3. Screws included with mounting bracket.

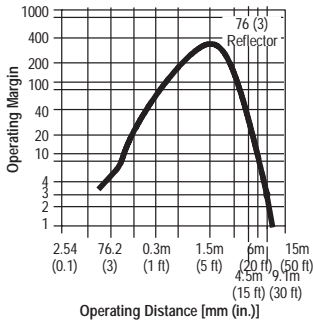
**ATTENTION**



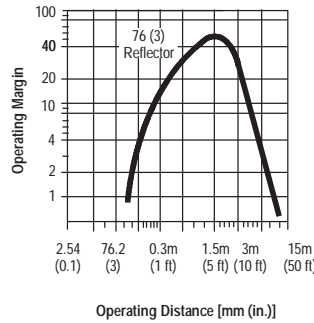
DO NOT use lockwashers with supplied whiz-lock mounting screws.

**Typical Response Curve**

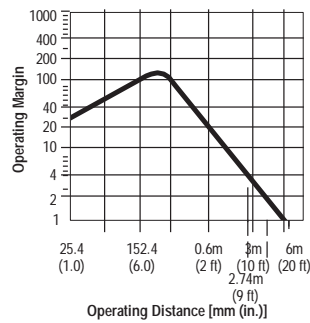
**Retroreflective**



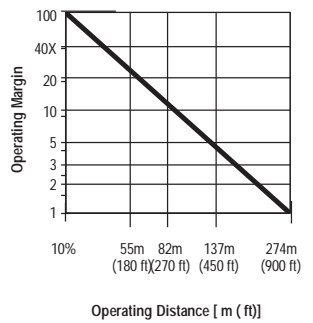
**Polarized Retroreflective**



**Standard Diffuse**



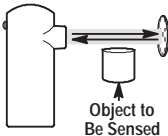
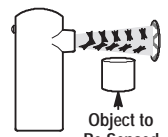
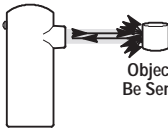
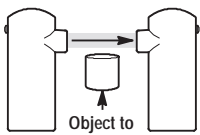
**Transmitted Beam**



PHOTOSWITCH<sup>R</sup> Photoelectric Sensors  
**Series 4000B**

**Product Selection**

**1. Select sensor.**

Sensing Mode	Operating Voltage/ Power Consumption	Sensing Range [mm (in.)]	Output Energized	Sensor Response Time ❶	Cat. No.
 Retroreflective Field of View: 1.5_ Emitter LED: Infrared 940 nm	102...132V AC/ 2V A	50.8 mm...10.6 m (2 in...35 ft)	Light/Dark Selectable	5 ms	42RLU-4000B
	195...253V AC/ 2V A				42RLU-4001B
	40...58V AC/ 2V A				42RLU-4002B
	18...28V AC/DC/2V A 20...32V DC				42RLU-4003B
 Series 4000B Polarized Retroreflective Field of View: 2_ Emitter LED: Visible Red 660 nm	102...132V AC/ 2 A	50.8 mm...7 m (2 in...23 ft)	Light/Dark Selectable	5 ms	42RLU-4200B
 Standard Diffuse Field of View: 4_ Emitter LED: Infrared 940 nm	102...132V AC/ 2V A	50.8 mm...3.6 m (2 in...12 ft)	Light/Dark Selectable	5 ms	42RLP-4000B
 Transmitted Beam Field of View: 3_ Emitter LED: Infrared 940 nm Light sources and receivers must be ordered separately. Any light source is compatible with any receiver.	102...132V AC, 50/60 Hz/ 2V A	50.8 mm...274 m (2 in...900 ft)	Light/Dark Selectable	5 ms	42RLR-4000B

**2. Select optional plug-in timing and logic module, page 1-227.**

**3. Select optional plug-in output module.**

Sensing Mode	Type	Max Load Current	Output Response Time❶	Cat. No.
All sensing modes	DPDT EM-Relay (included)	5 A, 120V AC 2.5 A, 240V AC	10 ms On 15 ms Off	8-670❷
	SP-N.O. AC TRIAC	1 A, 265V AC, 20 mA min	8 ms	8-651
	SP-N.O. AC/DC FET	30 mA, 0...120V AC/DC	1 ms	8-652
	Open Collector NPN	250 mA, 30V DC	1 ms	63-115
	DC Voltage Output Adaptor	30 mA, 17V DC		63-116

❶ Add sensor response time and output response time for total response time.

❷ 8-670 relay output module supplied with sensor.





Fiber optic sensors permit the attachment of “light pipes” called fiber optic cables. Light emitted from the source is sent through transparent fibers in the cables and emerges at the end of the fiber. The transmitted or reflected beam is then carried back to the receiver through different fibers. Ideal for sensing small objects, fiber optic cables can be mounted in locations that would otherwise be inaccessible to photoelectric sensors. Other characteristics/advantages of fiber optic sensors include:

- S Some glass fiber optic tips have the ability to withstand high temperatures (up to 482°C (900°F))
- S Withstand extreme shock and vibration
- S Often have the fastest response times
- S Immunity to electrical interference (EMI, RFI).

### Fiber Optic Cables—Types

Fiber optic cables can be made of glass or plastic and categorized as either individual (transmitted beam) or bifurcated (diffuse).

Glass fiber optic cables contain multiple strands of very thin glass fiber that are bundled together in a flexible sheath. Typically more durable than their plastic counterparts, glass fiber optic cables will withstand much higher

temperatures; glass fiber optic cables with a stainless steel sheath are rated up to 260°C (500°F). Special glass cables can be obtained with temperature ratings of up to 482°C (900°F). Most glass cables are available with a choice of PVC or flexible stainless steel sheath. While PVC-sheathed cables are typically less expensive, stainless steel sheathing offers greater durability and allows the cables to operate in higher temperatures. Glass fibers can be used with infrared or visible LED light sources.

Light transmission is maximized with a thicker bundle diameter. It is also important to note that attenuation increases as fiber optic cable length increases. For further details, see the Application Recommendations section on page 1-234 .

Plastic fiber optic cables are constructed of a single acrylic monofilament and, since plastic fibers absorb infrared light, they are most efficient when used with visible red LED sources. It is recommended that plastic fiber optic cables are used with visible light sources. Considered less durable than glass cables, plastic fibers are generally less expensive and can be used in applications where continuous flexing of the cable is required. For that reason, coiled plastic cables are also available for such applications.

### General Information

Sensor and Sensing Tip Selection . . . . . page 1-232 and 1-233

### Glass Fiber Optic Cables

Application Recommendations . . . . . page 1-234  
 Large Aperture Fibers . . . . . page 1-235  
 Small Aperture Fibers . . . . . page 1-251  
 Custom Fiber Configurator . . . . . page 1-258  
 Sensing Tip Drawings . . . . . page 1-260  
 Standard Bundle Sizes . . . . . page 1-268  
 Accessories . . . . . page 1-269

### Plastic Fiber Optic Cables

Application Recommendations . . . . . page 1-270  
 Small Aperture Fibers . . . . . page 1-271  
 Miniature Aperture Fibers . . . . . page 1-277  
 Special Purpose Fibers . . . . . page 1-280  
 Custom Fiber Configurator . . . . . page 1-281  
 Sensing Tip Drawings . . . . . page 1-283  
 Standard Bundle Sizes . . . . . page 1-286  
 Accessories . . . . . page 1-287  
 Cross Reference . . . . . page 1-292

## Fiber Optic Cables

### Introduction

#### Selection Process

##### 1. Determine the sensing mode

- S Transmitted beam (two separate cables required)
  - G Greater distance from sensing tip to the object
  - G Reflectivity of the object is low
  - G Generally darker colors reflect less light.
- S Diffuse (one bifurcated cable)
  - G Distance from sensing tip to the object is small
  - G Reflectivity of the object is high
  - G Generally lighter colors reflect more light.

##### 2. Choose between glass or plastic fiber optic cables

- S Glass
  - G Higher temperature rating (up to 482°C (900°F) possible)
  - G Used with infrared or visible red light sources
  - G More expensive.
- S Plastic
  - G Typically used for visible light sources
  - G Lower temperature applications (lower than 70°C (158°F))

- G Less expensive.
- 3. **Mechanical considerations**
  - S Glass has a more restrictive bending radius.
  - S Select sensing tip configuration based on mounting space availability
    - G Threaded tip versus ferruled
    - G Straight tip versus 45° or 90° bend
    - G Straight tip with light exiting at 90°.

##### 4. Select fiber bundle size for the application.

- S The smaller the bundle size, the smaller the light spot size for seeing smaller objects.
- S The larger the bundle size, the greater the sensing distance

##### 5. Cable length

- S Determine distance from sensor to object including required bending radii
- S Longer (custom length) cables have shorter sensing distances due to light loss

- G Light loss is approximately 6% per foot for glass and 3% for plastic

- S Use of extended range lens assemblies significantly increases sensing distance.

#### Custom Fiber Optic Cables

Rockwell Automation/Allen-Bradley can provide custom glass fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

- S Custom lengths up to 15.2 m (50 ft)
- S Custom temperature ratings up to 482\_C (900\_F) applies to glass fiber optic cables
- S Custom configurations including multiple sensing tips
- S Custom sensing end tips— nearly any modification is possible
- S Reference pages 1-258...1-259 for glass and 1-281...1-282 for plastic.

**Note:** For more information contact product support at 1.440.646.5800.

#### ATTENTION



Fiber optic cables are not recommended for explosion-proof applications in hazardous environments. The fiber optic cable can provide a path for explosive fumes to travel from the hazardous area to the safe area.

#### Sensing Modes

The standard photoelectric sensors, fiber optic sensors are offered in two sensing modes: transmitted beam and diffuse. Reflective sensing can be accomplished in a diffuse mode or retroreflective mode.

Standard *diffuse* sensing with fiber optic cables is similar to sensing with lensed photoelectrics. When adjusted to maximum sensitivity these sensors, using bifurcated fiber optic cables, can detect extremely small targets.

Individual fiber optic cables may be used for more specialized diffuse mode applications. For instance, aiming the two separate sensing tips of the cables at the target can create sharp cutoff, fixed focus and mechanically convergent sensing modes.

#### Bifurcated Cable (Diffuse/Retroreflective)



Standard *retroreflective* sensing is possible with fiber optics, but polarized retroreflective sensing is not. In some applications, it will be necessary to

reduce the sensitivity of the sensor to prevent diffuse detection of the target. Transmitted beam sensing, the most reliable sensing mode, requires two

individual fiber optic cables. Targets are detected when they break the light path established between the emitter and receiver cables.

Individual Cable (Transmitted Beam)



Sensing End Tip Selection

One of the most important decisions to be made when selecting fiber optic cables is the sensing end tip configuration. Among the many considerations:

- S Size of the object to be sensed
- S Rate of travel of the target object

- S Distance to the object
  - S Mounting options
  - S Environmental conditions
  - S Moving parts surrounding the object
  - S Sensing mode
- Based on these factors, there are many sensing tips to select from offering

various fiber diameters and arrays, bending radii, threaded and smooth body configurations, etc. The following pages are designed to assist in the selection of the proper sensing end tip for the application. Once a selection has been made, proceed to the fiber optic cables section to select the appropriate fiber optic cable part number.

45FVL/45FSL Light Source Selector Guide for Color Contrast Sensing

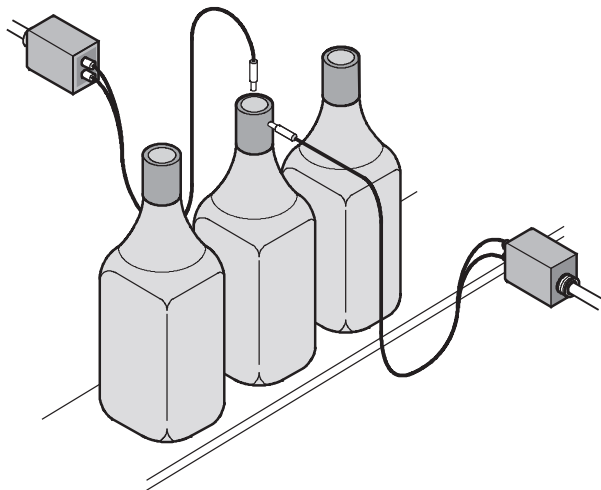
Background	Target						
	White	Yellow	Orange	Red	Green	Blue	Black
White	<b>1</b>	B	B	B	R	R	R
Yellow	B	<b>1</b>	G	G	R	R	R
Orange	B	G	<b>1</b>	G	G	G	R
Red	B	G	G	<b>1</b>	R	B	R
Green	R	R	G	R	<b>1</b>	B	G
Blue	R	R	G	B	B	<b>1</b>	B
Black	R	R	R	R	G	B	<b>1</b>

R = Red; B = Blue; G = Green

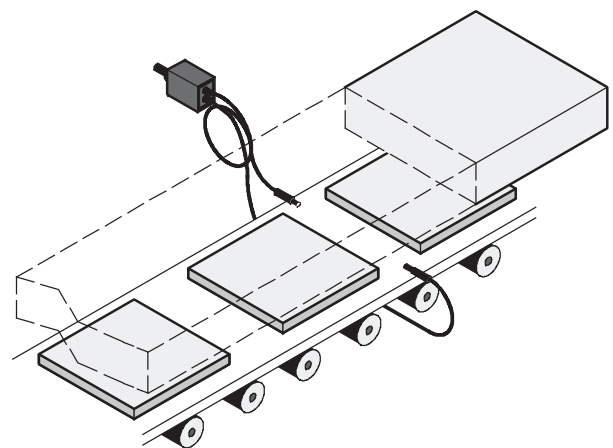
**1** 45CLR ColorSight sensor suggested for shades of same color.

Note: White LED light source can be used selectively in place of red, blue and green.

Cork Detection with Bifurcated Fiber Optic Cables



Work Piece Detection with Individual Fiber Optic Cables



## Glass Fiber Optic Cables

### Introduction



#### Application Recommendations

1. Many glass fiber optic cables are available with different glass fiber bundle diameters.  
Larger diameter bundles contain more fibers to carry light between the sensor and application. These cables will generally offer **longer sensing ranges**.  
Smaller diameter bundles provide greater resolution and the ability to detect smaller targets.
2. Glass fiber optic cables can be applied in high shock and vibration applications, but secure the cables to prevent excess flexing. Do not use glass cables in applications where they are constantly flexing. **They will break.** Plastic fiber optic cables provide better performance in these applications.
3. Avoid sharp bends. The individual glass fibers in the cable can be broken. Don't exceed the following bend tolerances with PVC sheathed cables:

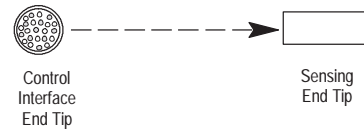
#### Minimum Cable Bend Radius

Bundle Diameter [mm (in.)]	Minimum Bend Radius [mm (in.)]
0.68 (0.027)	12.7 (0.50)
1.16 (0.046)	12.7 (0.50)
1.6 (0.063)	15.8 (0.625)
2.28 (0.090)	15.8 (0.625)
3.17 (0.125)	19.0 (0.75)
3.96 (0.156)	25.4 (1.0)
4.57 (0.180)	31.7 (1.25)

4. Glass fiber optic cables cannot be cut, spliced or repaired.
5. Glass fiber optic cables tip cannot be bent. Only special plastic fiber optic cable sensing end tips can be bent as specified in the Selection Guide. When using bendable end tips, bend should not be attempted closer than 19 mm (0.75 in.) to the sensing end of the cable.
6. Some applications call for glass fiber optic cables to be used to isolate the sensor from **high voltage**. Custom cables with special nonconductive components must be ordered for these applications.
7. X-RAY or GAMMA radiation will cause glass fibers to eventually become opaque. Custom cables constructed with special optical quartz fibers must be ordered for use in areas with **high radiation**.
8. Use Transmitted Beam sensing in **submerged applications** when possible. Spiral-wound stainless steel sheathing is generally not suitable for wet applications. Fiber optic cables with PVC sheathing should be used for these applications.
9. A glass fiber optic sensor with a **bifurcated** cable can provide **retroreflective** or **diffuse sensing** depending upon the distance to the target and the sensitivity adjustment on the sensor. If the sensor and

cable are to be used for retroreflective sensing, the sensitivity of the sensor must be adjusted low enough to avoid unwanted diffuse response from the targets to be sensed.

10. Glass fiber optic cables have a wide **field of view**, typically 82°. A smaller field of view can be achieved by attaching an Extended Range Lens Assembly to the sensing end of the fiber. These lens assemblies will also increase the available sensing distance. Refer to the Accessories section for more information.
11. Most glass fiber optic cables have round sensing tips with the glass fibers arranged in a circular configuration. Other cables such as 43GT-FIS40SL offer sensing tips with a **rectangular shaped opening** for the glass fibers, referred to as "slotted" cables (see illustration below).



Use these equivalent diameters to determine the approximate performance of slotted cables.

Slot Dimensions [mm (in.)]	Round Sensing Tip Equivalent Diameter [mm (in.)]
2.5 x 0.5 (0.1 x 0.02)	1.2 (0.046)
0.5 x 2.5 (0.02 x 0.1)	1.2 (0.046)
5.1 x 0.25 (2.0 x 0.01)	1.2 (0.046)
9.7 x 0.8 (0.382 x 0.032)	3.1 (0.125)

Formula:  
Approximate diameter = 1.128 x  $\sqrt{\text{Length} \times \text{Width}}$

#### ATTENTION



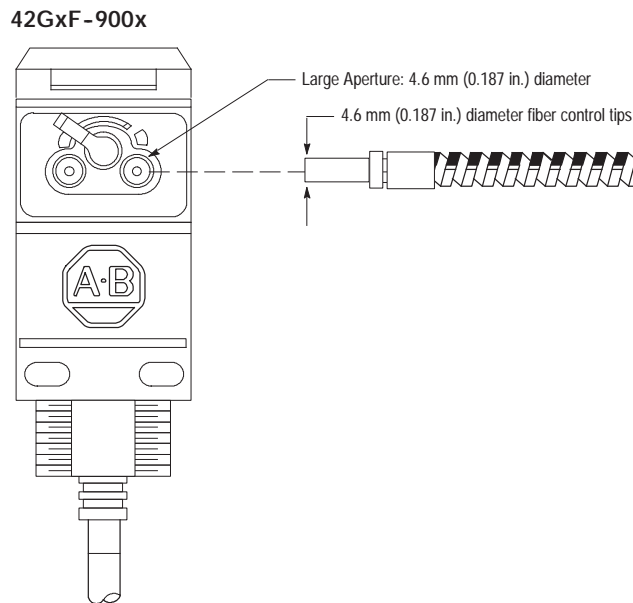
Fiber optic cables are not recommended for explosion-proof applications in hazardous environments. The fiber optic cable can provide a path for explosive fumes to travel from the hazardous area to the safe area.

**Glass Fiber Optic Cables**

Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

**Glass Fiber Optic Cables for use with Large Aperture Sensors**

The fiber optic cables on pages 1-236...1-250 are for use with the large aperture sensors shown below.

**Large Aperture Sensors:**

Note: Nominal Sensing Distance

- Due to the variation between fiber optic cables, sensing distance can vary widely
- The sensing distance of bifurcated cables is measured with white paper (90% reflectivity). Other surfaces may be less reflective and therefore would have shorter sensing distances.
- The published numbers are based on extensive testing and are conservative
- The sensing distance of transmitted beam cables is measured from tip to tip
- Application considerations that effect distance
  - Sensor selected
  - Reflectivity of target
  - Environment
  - Accessories such as range extending lenses
  - Length of the cable
- Consult with product support for additional information.

**All dimensions indicated are typical. The fiber optic cables on pages 1-236...1-250 are for use with large aperture sensors as seen on the following pages:**

## 43GR Glass Fiber Optic Cables

Threaded Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]



Approximate Metric / Standard Distances

0	50	100	150	200	250	300	mm
0	2	4	6	8	10	12	in.

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass	3.2 (0.125)	Stainless Steel		43GR-TBB25SL
			PVC		43GR-TBB25ML
		1.6 (0.062)	Stainless Steel		43GR-TBB15SL
			PVC		43GR-TBB15ML
		4.0 (0.156)	Stainless Steel		43GR-TBB30SL
			PVC		43GR-TBB30ML
		2.5 x 0.5 (0.1 x 0.02) E-W Slot	Stainless Steel		43GR-TBB40SL
			PVC		43GR-TBB40ML
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GR-TBS15SL
			PVC		43GR-TBS15ML
		3.2 (0.125)	Stainless Steel		43GR-TBS25SL
			PVC		43GR-TBS25ML
	Stainless Steel	2.3 (0.09)	Stainless Steel		43GR-TAS20SL
			PVC		43GR-TAS20ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-TFS10SL
			PVC		43GR-TFS10ML
	Brass	4.6 (0.180)	Stainless Steel		43GR-TGB33SL
			PVC		43GR-TGB33ML
	Brass	3.2 (0.125)	Stainless Steel		43GR-XDB25SL
			PVC		43GR-XDB25ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-TCS10SL
			PVC		43GR-TCS10ML

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GR Glass Fiber Optic Cables**

**Threaded Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass/ Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TMC25SL
			PVC		43GR-TMC25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TMC15SL
			PVC		43GR-TMC15ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TMS25SL
			PVC		43GR-TMS25ML
	Brass/ Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TQC25SL
			PVC		43GR-TQC25ML
	Stainless Steel	2.5 x 0.5 (0.1 x 0.02) E-W Slot	Stainless Steel		43GR-TQC40SL
			PVC		43GR-TQC40ML
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GR-TRC30SL
			PVC		43GR-TRC30ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TXC25SL
			PVC		43GR-TXC25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-THC25SL
			PVC		43GR-THC25ML

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GR Glass Fiber Optic Cables

Threaded Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass/ Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-TKC25SL
			PVC		43GR-TKC25ML
	Stainless Steel	2.3 (0.09)	Stainless Steel		43GR-TTS20SL
			PVC		43GR-TTS20ML
		1.2 (0.046)	Stainless Steel		43GR-TTS10SL
			PVC		43GR-TTS10ML
	Stainless Steel	51 x 0.25 (2.0 x 0.01) (N-S)	Stainless Steel	Characterization not available at time of publication	43GR-TUS46SL
			PVC		43GR-TUS46ML

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GR Glass Fiber Optic Cables**

Ferrule Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FAS25SL
			PVC		43GR-FAS25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FBS25SL
			PVC		43GR-FBS25ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MAS00SL
			PVC		43GR-MAS00ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MDS10SL
			PVC		43GR-MDS10ML
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GR-MHS15SL
			PVC		43GR-MHS15ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MVS00SL
			PVC		43GR-MVS00ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FIS25SL
			PVC		43GR-FIS25ML
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GR-FJS30SL
			PVC		43GR-FJS30ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MOS10SL
			PVC		43GR-MOS10ML

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GR Glass Fiber Optic Cables

Ferrule Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GR-MQS15SL
			PVC		43GR-MQS15ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MKS00SL
			PVC		43GR-MKS00ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FGS25SL
			PVC		43GR-FGS25ML
	Stainless Steel	2.3 (0.09)	Stainless Steel		43GR-FOS20SL
			PVC		43GR-FOS20ML
	Stainless Steel	2.3 (0.09)	Stainless Steel		43GR-FPS20SL
			PVC		43GR-FPS20ML
	Stainless Steel	2.5 x 0.5 (0.1 x 0.02) (E-W)	Stainless Steel		43GR-FRS40SL
			PVC		43GR-FRS40ML

**Note:** Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GR Glass Fiber Optic Cables**

**Block Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheath Material	Sensing Distance [mm]	Cat. No.
	Aluminum	9.7 x 0.8 (0.382 x 0.032) (E-W)	Stainless Steel	120 mm Nominal	43GR-BAA72SL
			PVC		43GR-BAA72ML
	Aluminum	38.1 x 0.3 (1.5 x 0.01)	Stainless Steel	Characterization not available at time of publication	43GR-BCA73SL
			PVC		43GR-BCA73ML
	Aluminum	25.4 x 0.4 (1.0 x 0.015)	Stainless Steel	Characterization not available at time of publication	43GR-BRA79SL
			PVC		43GR-BRA79ML
	Aluminum	3.9 x 0.5 (0.154 x 0.02)	Stainless Steel	Characterization not available at time of publication	43GR-BTA70SL
			PVC		43GR-BTA70ML

**Note:** Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GT Glass Fiber Optic Cables

Threaded Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass	3.2 (0.125)	Stainless Steel		43GT-TBB25SL
			PVC		43GT-TBB25ML
		1.6 (0.062)	Stainless Steel		43GT-TBB15SL
			PVC		43GT-TBB15ML
	4.0 (0.156)	Stainless Steel		43GT-TBB30SL	
		PVC		43GT-TBB30ML	
	2.5 x 0.5 (0.1 x 0.02) E-W Slot	Stainless Steel		43GT-TBB40SL	
		PVC		43GT-TBB40ML	
Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TBS25SL	
		PVC		43GT-TBS25ML	
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GT-TFS00SL
			PVC		43GT-TFS00ML
	1.2 (0.046)	Stainless Steel		43GT-TFS10SL	
		PVC		43GT-TFS10ML	
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TYS25SL
			PVC		43GT-TYS25ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GT-MRS00SL
			PVC		43GT-MRS00ML
	1.2 (0.046)	Stainless Steel		43GT-MRS10SL	
		PVC		43GT-MRS10ML	
	Brass/ Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-TMC15SL
			PVC		43GT-TMC15ML
	3.2 (0.125)	Stainless Steel		43GT-TMC25SL	
		PVC		43GT-TMC25ML	

**Note:** Two transmitted beam fiber cables required for each sensor.  
Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GT Glass Fiber Optic Cables**

**Threaded Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TMS25SL
	Stainless Steel		PVC		43GT-TMS25ML
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GT-TOC30SL
	Stainless Steel		PVC		43GT-TOC30ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TQC25SL
			PVC		43GT-TQC25ML
		1.6 (0.062)	Stainless Steel		43GT-TQC15SL
			PVC		43GT-TQC15ML
		2.5 x 0.5 (0.1 x 0.02) E-W Slot	Stainless Steel		43GT-TQC40SL
			PVC		43GT-TQC40ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TQS25SL
			PVC		43GT-TQS25ML
	Brass/ Stainless Steel	4.0 (0.156)	Stainless Steel		43GT-TRC30SL
			PVC		43GT-TRC30ML

**Note:** Two transmitted beam fiber cables required for each sensor.  
 Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GT Glass Fiber Optic Cables

Threaded Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GT-TRS30SL
			PVC		43GT-TRS30ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TWC25SL
			PVC		43GT-TWC25ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MUS10SL
			PVC		43GT-MUS10ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TXC25SL
			PVC		43GT-TXC25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-THC25SL
			PVC		43GT-THC25ML
	Brass/ Stainless Steel	4.0 (0.156)	Stainless Steel		43GT-TJC30SL
			PVC		43GT-TJC30ML
	Brass/ Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-TKC25SL
			PVC		43GT-TKC25ML

**Note:** Two transmitted beam fiber cables required for each sensor.  
Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GT Glass Fiber Optic Cables**

**Threaded Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GT-TLC30SL
			PVC		43GT-TLC30ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MSS10SL
			PVC		43GT-MSS10ML
	Stainless Steel	2.3 (0.090)	Stainless Steel		43GT-TTC20SL
			PVC		43GT-TTC20ML
	Stainless Steel/ Brass	2.5 x 0.5 (0.1 x 0.02) (E-W)	Stainless Steel		43GT-TZC40SL
			PVC		43GT-TZC40ML
	Stainless Steel	51 x 0.25 (2.0 x 0.01) (N-S)	Stainless Steel	130 mm Nominal	43GT-TUS46SL
			PVC		43GT-TUS46ML

**Note:** Two transmitted beam fiber cables required for each sensor.  
 Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GT Glass Fiber Optic Cables

Ferrule Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-FAS25SL
			PVC		43GT-FAS25ML
		4.0 (0.156)	Stainless Steel		43GT-FAS30SL
			PVC		43GT-FAS30ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GT-MBS00SL
			PVC		43GT-MBS00ML
		1.2 (0.046)	Stainless Steel		43GT-MBS10SL
			PVC		43GT-MBS10ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MCS10SL
			PVC		43GT-MCS10ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MDS10SL
			PVC		43GT-MDS10ML
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-MHS15SL
			PVC		43GT-MHS15ML
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-MIS15SL
			PVC		43GT-MIS15ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-FIS25SL
			PVC		43GT-FIS25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GT-FSS25SL
			PVC		43GT-FSS25ML

**Note:** Two transmitted beam fiber cables required for each sensor.  
Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GT Glass Fiber Optic Cables**

Ferrule Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.		
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MMS10SL		
			PVC		43GT-MMS10ML		
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MOS10SL		
			PVC		43GT-MOS10ML		
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GT-MKS00SL		
			PVC		43GT-MKS00ML		
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-FOS10SL		
			PVC		43GT-FOS10ML		
			2.3 (0.09)		Stainless Steel		43GT-FOS20SL
					PVC		43GT-FOS20ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-FPS10SL		
			PVC		43GT-FPS10ML		
			2.3 (0.09)		Stainless Steel		43GT-FPS20SL
					PVC		43GT-FPS20ML
	Stainless Steel	51 x 0.25 (2.0 x 0.01) (N-S)	Stainless Steel	130 mm Nominal	43GT-FQS46SL		
			PVC		43GT-FQS46ML		
	Stainless Steel	2.5 x 0.5 (0.1 x 0.02)	Stainless Steel		43GT-FRS40SL		
			PVC		43GT-FRS40ML		

## 43GT Glass Fiber Optic Cables

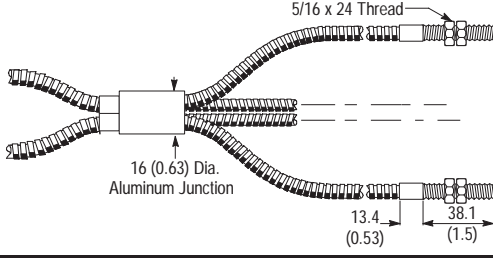
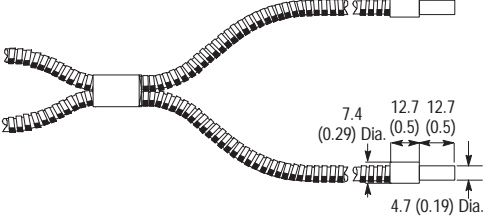
### Block Transmitted Beam Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Aluminum	9.7 x 0.8 (0.382 x 0.032) (E-W)	Stainless Steel	500 mm Nominal	43GT-BAA72SL
			PVC		43GT-BAA72ML
	Aluminum	38 x 0.25 (1.5 x 0.01) (E-W)	Stainless Steel	Characterization not available at time of publication	43GT-BCA73SL
			PVC		43GT-BCA73ML
	Aluminum	9.7 x 0.8 (0.382 x 0.032) (E-W)	Stainless Steel	Characterization not available at time of publication	43GT-BEA72SL
			PVC		43GT-BEA72ML

**Note:** Two transmitted beam fiber cables required for each sensor.  
Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GR Glass Fiber Optic Cables**

**Bifurcated Specialty Cable for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass	2.8 (0.11)	Stainless Steel	Characterization not available at time of publication	43GR-4TBB22SL
	Stainless Steel	3.2 (0.125)	Stainless Steel	Characterization not available at time of publication	43GR-2FAS25SL

**Note:** Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GT Glass Fiber Optic Cables

Transmitted Beam Specialty for Large Aperture Sensors [4.6 mm (0.187 in.)]

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheath. Material	Sensing Distance [mm]	Cat. No.
	Brass	1.6 (0.062) (x6)	Stainless Steel	Characterization not available at time of publication	43GT-6TBB15SL
	Stainless Steel	2.3 (0.090) (x2)	Stainless Steel	200 mm Nominal	43GT-2FAS20SL

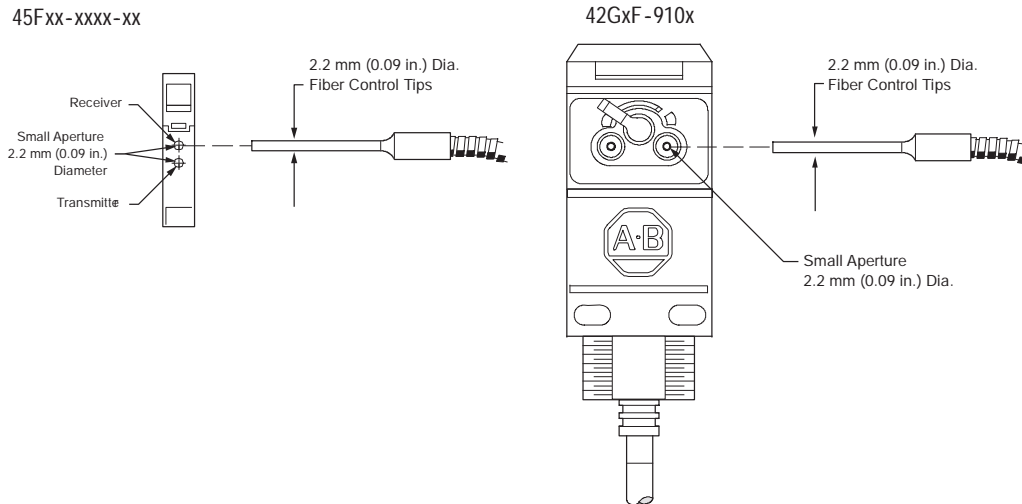
Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## Glass Fiber Optic Cables

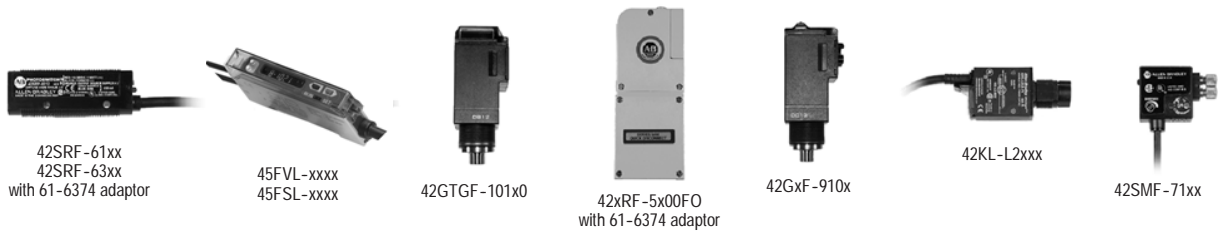
Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

### Glass Fiber Optic Cables for use with Small Aperture Sensors

The glass fiber optic cables cables on pages 1-252...1-257 are for use with small aperture sensors.



### Small Aperture Sensors:



#### Note: Nominal Sensing Distance

- Due to the variation between fiber optic cables, sensing distance can vary widely
- The published numbers are based on extensive testing and are conservative
- The sensing distance of bifurcated cables is measured with white paper (90% reflectivity). Other surfaces may be less reflective and therefore would have shorter sensing distances.
- The sensing distance of transmitted beam cables is measured from tip to tip
- Application considerations that effect distance
  - Sensor selected
  - Reflectivity of target
  - Environment
  - Accessories such as range extending lenses
- Consult with product support for additional information.

**All dimensions indicated are typical.**

## 43GR Glass Fiber Optic Cables

Threaded Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

The fiber optic cables on pages 1-252...1-257 are for use with small aperture sensors including the following:



Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass	2.2 (0.09)	Stainless Steel		43GR-TAB20SS
			PVC		43GR-TAB20MS
	Stainless Steel	2.2 (0.09)	Stainless Steel		43GR-TAS20SS
			PVC		43GR-TAS20MS
	Stainless Steel	2.2 (0.09)	Stainless Steel		43GR-TBS20SS
			PVC		43GR-TBS20MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-XAS10SS
			PVC		43GR-XAS10MS
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MRS00SS
			PVC		43GR-MRS00MS
	Stainless Steel	2.2 (0.09)	Stainless Steel		43GR-TMS20SS
			PVC		43GR-TMS20MS

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GR Glass Fiber Optic Cables**

**Threaded Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]**

Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-TIS10SS
			PVC		43GR-TIS10MS
	Stainless Steel	2.2 (0.09)	Stainless Steel		43GR-TQS20SS
			PVC		43GR-TQS20MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-TDS10SS
			PVC		43GR-TDS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MUS10SS
			PVC		43GR-MUS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MSS10SS
			PVC		43GR-MSS10MS

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GR Glass Fiber Optic Cables

Ferrule Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MAS00SS
			PVC		43GR-MAS00MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MDS10SS
			PVC		43GR-MDS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-FTS10SS
			PVC		43GR-FTS10MS
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MKS00SS
			PVC		43GR-MKS00MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MOS10SS
			PVC		43GR-MOS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MYS10SS
			PVC		43GR-MYS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MJS10SS
			PVC		43GR-MJS10MS

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.



PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GT Glass Fiber Optic Cables**

**Threaded Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]**

Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Brass	1.6 (0.062)	Stainless Steel		43GT-TAB15SS
			PVC		43GT-TAB15MS
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-TAS15SS
			PVC		43GT-TAS15MS
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-TBS15SS
			PVC		43GT-TBS15MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-XAS10SS
			PVC		43GT-XAS10MS
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GT-MRS00SS
			PVC		43GT-MRS00MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-TIS10SS
			PVC		43GT-TIS10MS
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-TMS15SS
			PVC		43GT-TMS15MS
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GT-TQS15SS
			PVC		43GT-TQS15MS

**Note:** Two transmitted beam fiber cables required for each sensor.  
 Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## 43GT Glass Fiber Optic Cables

### Threaded Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]

Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-TDS10SS
			PVC		43GT-TDS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MUS10SS
			PVC		43GT-MUS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MSS10SS
			PVC		43GT-MSS10MS

Note: Two transmitted beam fiber cables required for each sensor.  
 Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43GT Glass Fiber Optic Cables**

Ferrule Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]

Dimensions—[mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MAS10SS
			PVC		43GT-MAS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MDS10SS
			PVC		43GT-MDS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-FTS10SS
			PVC		43GT-FTS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MJS10SS
			PVC		43GT-MJS10MS
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GT-MYS10SS
			PVC		43GT-MYS10MS
	Aluminum	6.35 x 0.3 (0.25 x 0.012)	Stainless Steel	215 mm Nominal	43GT-BSA80SS
			PVC		43GT-BSA80MS

Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

## Glass Fiber Optic Cables

### Additional Cables for Large Aperture Sensors [4.6 mm (0.187 in.) OD Sensor End Tip]

#### Custom Fiber Optic Cables

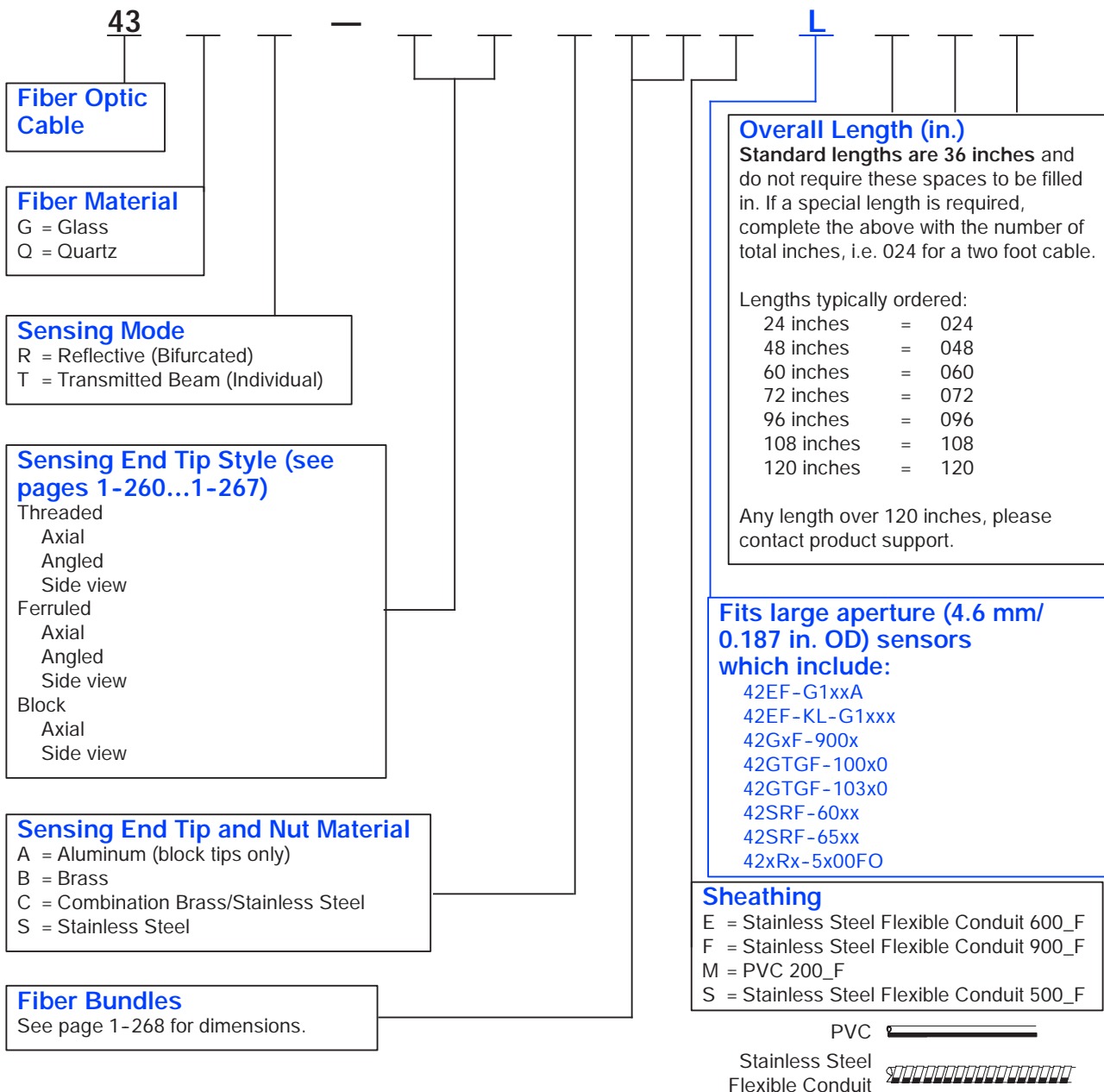
Rockwell Automation/Allen-Bradley can provide custom glass fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

- S Custom lengths up to 15.2 m (50 ft)
- S Custom temperature ratings up to 482\_C (900\_F)
- S Custom configurations including multiple sensing tips
- S Custom sensing end tips—nearly any modification is possible

For more information contact your local Rockwell Automation sales office or Allen-Bradley distributor.

#### To Build a Custom Fiber Optic for a Large Aperture Sensor:



## Glass Fiber Optic Cables

### Additional Cables for Small Aperture Sensors [2.2 mm (0.09 in.) OD Sensor End Tip]

#### Custom Fiber Optic Cables

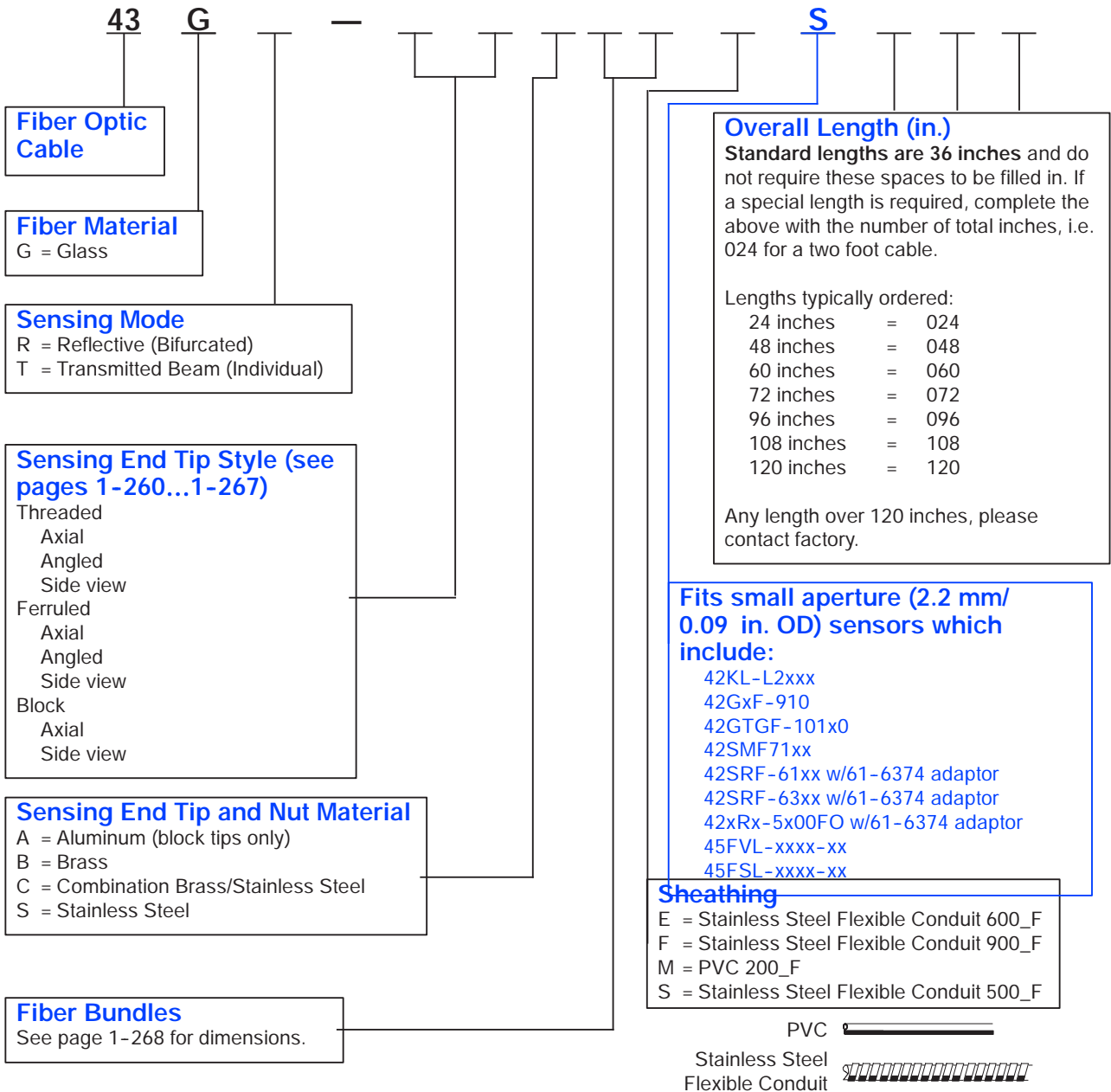
Rockwell Automation/Allen-Bradley can provide custom glass fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

- S Custom lengths up to 15.2 m (50 ft)
- S Custom temperature ratings up to 482\_C (900\_F)
- S Custom configurations including multiple sensing tips
- S Custom sensing end tips—nearly any modification is possible

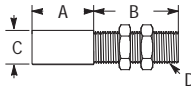
For more information contact your local Rockwell Automation sales office or Allen-Bradley distributor.

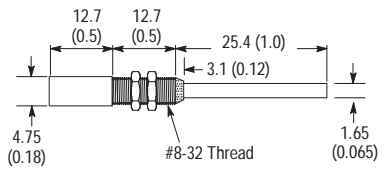
#### To Build a Custom Fiber Optic for Small Aperture Sensor:

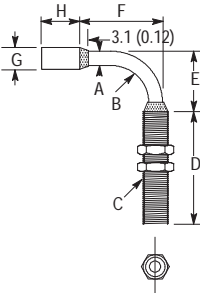


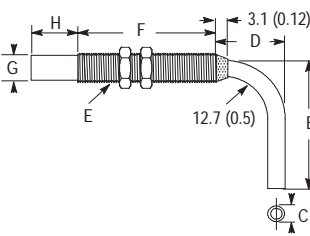
## Glass Fiber Optic Cable Tips

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	[mm (in.)]	Approximate Dimensions [mm (in.)]			
			A	B	C	D
	TA	2.29 (0.09)	10.16 (0.40)	11.18 (0.44)	5.84 (0.23)	M6 x 1 class 6g
	TB	3.2 (0.125)	13.46 (0.53)	38.1 (1.5)	7.92 (0.312)	5/16 x 24 UNF
	TF	3.2 (0.125)	13.46 (0.53)	12.7 (0.5)	4.45 (0.175)	#8-32
	TG	1.2 (0.046)	13.46 (0.53)	38.1 (1.5)	9.53 (0.375)	3/8 x 24 UNF
	TV	4.0 (0.156)	13.46 (0.53)	139.7 (5.5)	7.92 (0.312)	5/16 x 24 UNF
	TY	3.2 (0.125)	13.46 (0.53)	101.6 (4.0)	7.62 (0.3)	5/16 x 24 UNF
	XA	1.2 (0.046)	10.16 (0.40)	12.7 (0.5)	4.75 (0.187)	M4 x 0.7
	XB	1.2 (0.046)	10.16 (0.40)	12.7 (0.5)	4.75 (0.187)	M6 x 0.75
	XD	3.2 (0.125)	13.46 (0.53)	15.24 (0.6)	7.92 (0.312)	5/16 x 24 UNF

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	MR	1.2 (0.046)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Approximate Dimensions [mm (in.)]							
			A	B	C	D	E	F	G	H
	TM	3.2 (0.125)	4.75 (0.187)	12.7 (0.5)	5/16 x 24	38.1 (1.5)	20.3 (0.8)	27.9 (1.1)	7.49 (0.295)	15.8 (0.625)
	TO	4.0 (0.156)	5.54 (0.218)	12.7 (0.5)	5/16 x 24	38.1 (1.5)	20.3 (0.8)	27.9 (1.1)	7.49 (0.295)	15.8 (0.625)
	TC	1.2 (0.046)	2.36 (0.093)	6.35 (0.25)	8 - 32	12.7 (0.5)	9.65 (0.38)	15.2 (0.6)	4.45 (0.175)	15.8 (0.625)
	TI	1.2 (0.046)	2.36 (0.093)	3.81 (0.15)	M6 x 0.75	15.2 (0.6)	8.89 (0.35)	12.7 (0.5)	4.75 (0.187)	10.1 (0.40)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Approximate Dimensions [mm (in.)]						
			B	C	D	E	F	G	H
	TQ	3.2 (0.125)	27.9 (1.1)	4.75 (0.187)	15.75 (0.62)	5/16 x 24	38.1 (1.5)	7.92 (0.312)	13.97 (0.55)
	TR	3.98 (0.156)	27.9 (1.1)	5.54 (0.218)	18.29 (0.72)	5/16 x 24	38.1 (1.5)	7.92 (0.312)	13.97 (0.55)
	TW	3.2 (0.125)	40.6 (1.6)	4.75 (0.187)	15.75 (0.62)	5/16 x 24	38.1 (1.5)	7.92 (0.312)	13.97 (0.55)
	TX	3.2 (0.125)	20.6 (0.81)	4.75 (0.187)	26.9 (1.06)	5/16 x 24	38.1 (1.5)	7.92 (0.312)	13.97 (0.55)
	TD	1.2 (0.046)	12.7 (0.5)	2.36 (0.093)	8.89 (0.35)	M4 x 0.7	12.7 (0.5)	4.75 (0.187)	10.16 (0.40)

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**Glass Fiber Optic Cable Tips**  
 Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]		
			A	B	C
	MT	0.70 (0.027)	1.09 (0.043)	2.29 (0.09)	4.83 (0.19)
	MU	1.2 (0.046)	1.65 (0.065)	3.05 (0.12)	6.35 (0.25)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle—[mm (in.)]	Dimension A [mm (in.)]
	TH	3.2 (0.125)	4.75 (0.187)
	TJ	4.0 (0.156)	5.54 (0.218)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimension A [mm (in.)]
	TK	3.2 (0.125)	4.75 (0.187)
	TL	4.0 (0.156)	5.54 (0.218)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	MS	1.2 (0.046)

## Glass Fiber Optic Cable Tips

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimension A [mm (in.)]
	TT	2.29 (0.09)	3.2 (0.125)
	TZ	2.5 x 0.5 (0.1 x 0.02)	3.94 (0.155)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	TU	51 x 0.3 (2.0 x 0.01)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]	
			A	B
	FA	3.2 (0.125)	12.7 (0.5)	12.7 (0.5)
	FB		12.7 (0.5)	26.9 (1.06)
	FC		12.7 (0.5)	31.7 (1.25)
	FD		12.7 (0.5)	50.8 (2.0)
	FE		35.5 (1.4)	76.2 (3.0)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimension A [mm (in.)]
	MA	0.70 (0.027)	1.09 (0.043)
	MC	1.2 (0.046)	1.65 (0.065)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]			
			A	B	C	D
	MD	1.2 (0.046)	1.65 (0.065)	12.7 (0.5)	4.06 (0.16)	25.4 (1.0)
	MG	1.2 (0.046)		35.5 (1.4)	7.87 (0.31)	
	MH	1.6 (0.062)	2.36 (0.093)	35.5 (1.4)	7.87 (0.31)	76.2 (3.0)
	MI	1.6 (0.062)		12.7 (0.5)	7.87 (0.31)	25.4 (1.0)



**Glass Fiber Optic Cable Tips**

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	[mm (in.)]	Dimensions [mm (in.)]	
			A	B
	MB	1.2 (0.046)	1.65 (0.065)	25.4 (1.0)
	MF	1.2 (0.046)	1.65 (0.065)	50.8 (2.0)
	MV	0.70 (0.027)	1.09 (0.043)	12.7 (0.5)

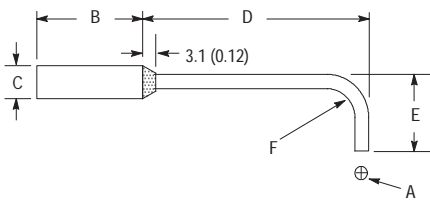
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]				
			A	B	C	D	E
	FI	3.2 (0.125)	27.9 (1.1)	20.3 (0.8)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FJ	4.0 (0.156)	27.9 (1.1)	25.4 (1.0)	5.54 (0.218)	7.49 (0.295)	15.8 (0.625)
	FK	3.2 (0.125)	27.9 (1.1)	27.9 (1.1)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FL	3.2 (0.125)	27.9 (1.1)	35.0 (1.38)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FM	3.2 (0.125)	47.7 (1.88)	47.7 (1.88)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FT	2.2 (0.09)	12.7 (0.5)	10.16 (0.40)	2.36 (0.093)	4.75 (0.187)	10.4(0.4)

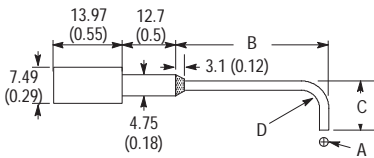
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]		
			A	B	C
	FS	3.2 (0.125)	27.9 (1.1)	20.3 (0.8)	4.75 (0.187)

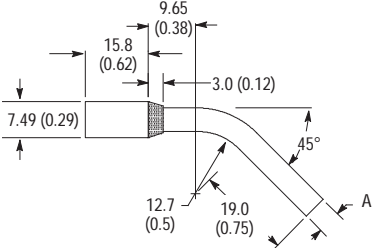
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	ML	1.2 (0.046)

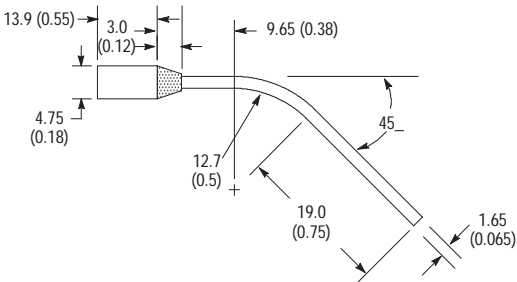
## Glass Fiber Optic Cable Tips

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]					
			A	B	C	D	E	F
	MM	1.2 (0.046)	1.65 (0.065)	12.7 (0.5)	4.06 (0.16)	25.4 (1.0)	6.35 (0.25)	3.05 (0.12)
	MO	1.2 (0.046)	1.65 (0.065)	35.5 (1.4)	7.87 (0.31)	25.4 (1.0)	6.35 (0.25)	3.05 (0.12)
	MQ	1.6 (0.062)	2.36 (0.083)	35.5 (1.4)	7.87 (0.31)	25.4 (1.0)	6.35 (0.25)	3.05 (0.12)
	MY	1.2 (0.046)	1.57 (0.062)	10.16 (0.40)	4.83 (0.19)	12.7 (0.5)	4.83 (0.19)	3.05 (0.12)

Approximate Dimensions [mm (in.)]	Code	[mm (in.)]	Dimensions [mm (in.)]			
			A	B	C	D
	MK	0.70 (0.027)	1.09 (0.043)	25.4 (1.0)	4.83 (0.19)	2.29 (0.09)
	MN	1.2 (0.046)	1.65 (0.065)	12.7 (0.5)	31.7 (1.25)	19 (0.75)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimension A [mm (in.)]
	FG	3.2 (0.125)	4.75 (0.187)
	FH	4.0 (0.156)	5.54 (0.218)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	MJ	1.2 (0.046)

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**Glass Fiber Optic Cable Tips**  
 Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	FO	2.29 (0.09)

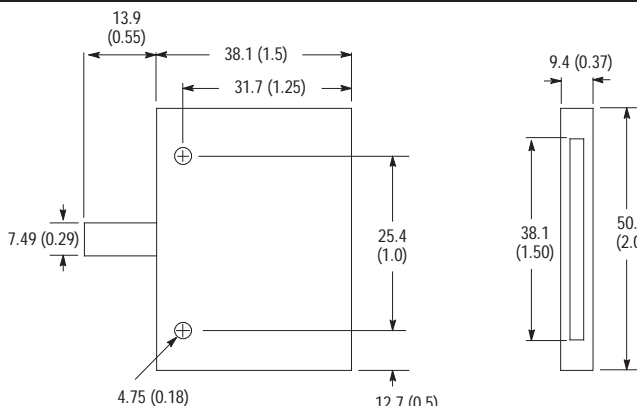
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimension A [mm (in.)]
	FP	2.29 (0.09)	3.2 (0.125)
	FR	0.5 x 2.5 (0.2 x 0.01) N-S slot	3.94 (0.155)

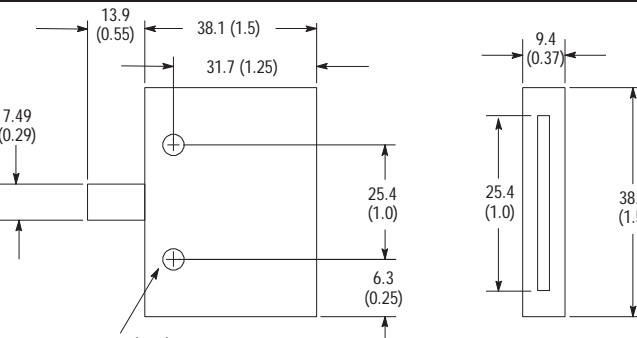
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	FQ	51 x 0.3 (2.0 x 0.01) N-S slot

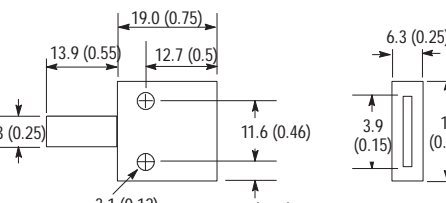
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	BA	9.7 x 0.8 (0.382 x 0.032) (E-W)

**Glass Fiber Optic Cable Tips**

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	<b>BC</b>	38.1 x 0.3 (1.5 x 0.01)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	<b>BR</b>	25.4 x 0.4 (1.0 x 0.015)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	<b>BT</b>	3.9 x 0.5 (0.154 x 0.02)

**Glass Fiber Optic Cable Tips**

Use with Configurators on page 1-258 and 1-259.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	BE	9.7 x 0.8 (0.382 x 0.032) (E-W)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	BP	2.79 x 2.79 (0.11 x 0.11)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	BS	0.3 x 6.35 (0.012 x 0.25) N-S slot

## Glass Fiber Optic Cable Tips

### Bundle Sizes

These bundle size codes are used with the configurators on page 1-258 and 1-259.

#### Glass Fiber Bundle with Cylindrical Sensing End Tips

Code	Diameter		Arrangement	2.2 mm Control End Tip		4.6 mm Control End Tip	
	mm	inches		Transmitted Beam	Bifurcated	Transmitted Beam	Bifurcated
00	0.70	0.027	Randomized	X	X	X	X
05	0.81	0.032	Randomized	X	X	X	X
10	1.2	0.046	Randomized	X	X	X	X
15	1.57	0.062	Randomized	X	X	X	X
20	2.29	0.090	Randomized		X	X	X
22	2.79	0.110	Randomized			X	X
25	3.2	0.125	Randomized			X	X
30	4.0	0.156	Randomized			X	X
33	4.57	0.180	Randomized				X
35	5.59	0.220	Randomized				X
40	2.5 x 0.5	0.10 x 0.02	E-W Slot	X	X	X	X
41	0.5 x 2.5	0.02 x 0.10	N-S Slot	X	X	X	X
45	22 x 0.5	0.875 x 0.02	Randomized			X	X
46	51 x 0.3	2.0 x 0.01	N-S Slot			X	X

X = Suitable for use with glass fiber bundle.

#### Glass Fiber Bundle with Block Sensing End Tips

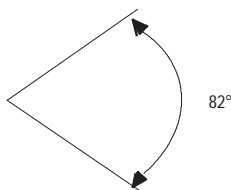
Code	Diameter	
	mm	inches
70	3.9 x 0.5	0.154 x 0.020
72	9.7 x 0.8	0.382 x 0.320
73	38 x 0.25	1.50 x 0.010
74	51 x 0.25	2.00 x 0.010
77	0.4 x 0.25	0.154 x 0.010
78	0.3 x 0.25	0.110 x 0.110
79	25.4 x 0.4	1.00 x 0.015
80	6.4 x 0.3	0.25 x 0.012

**Note:** Typical fiber optic cable construction is normally randomized. Other options, such as half or shimmed half moon, are available. Please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

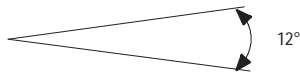
**Extended Range Lens Assemblies**

Extended range assemblies provide greater sensing range and reduce the field of view for detecting smaller objects at a greater distance. Without the extended range lens assembly the field of view is a divergent beam of 82°, leaving the end of the fiber optic cable tip. With the extended range lens the beam is reduced to 12°, thus permitting the sensing of smaller objects.

**Fiber Optic Field of View Standard Fibers (Without Extended Range Lens Assembly)**



**Fiber Optic Field of View Standard Fibers (With Extended Range Lens Assembly)**



**Adjustable Fixed Focus Sensing Lens**

Consult your local Rockwell Automation sales office or Allen-Bradley distributor for special applications. All the lens assemblies shown can provide fixed focus sensing with glass fiber optic cables. The distance between the lens and sensing tip can be adjusted, thus varying the focal point and spot size. An example of this using the Cat. No. 60-1844 lens is shown as follows:

[mm (in.)]	Spot Size (Diameter [mm (in.)])	Focus Range [mm (in.)]
0	31.8 (1.25)	127 (5)
2.54 (0.1)	12.7 (0.5)	51...89 (2...3.5)
5.08 (0.2)	7.62 (0.3)	38...51 (1.5...2)
7.62 (0.3)	5.08 (0.2)	33...38 (1.3...1.5)
10.16 (0.4)	3.81 (0.1)	28...33 (1.1...1.3)

It is necessary to reduce the sensitivity of the sensor when using lens assemblies with bifurcated cables to avoid detecting the rear surface of the adaptor lens.

Description	Approximate Dimensions [mm (in.)]	Cat. No.
<p>Extended Range Lens Assembly—260_C (500_F)</p>		<p>60-1844</p> <p>(One Cat. No. = One Lens Assembly)</p> <p>Sensing end tips with a 4.74 mm (0.187 in.) diameter</p>
<p>Extended Range Lens Assembly—260_C (500_F)</p>		<p>60-2559</p> <p>(One Cat. No. = One Lens Assembly)</p> <p>Sensing tips with 4.74 mm (0.187 in.) diameter</p>
<p>Extended Range Lens Assembly—260_C (500_F) (Thread mount 5/16 x 24)</p>		<p>60-2323</p> <p>(One Cat. No. = One Lens Assembly)</p> <p>Sensing end tips with 5/16 x 24 threads</p>
<p>Adaptor Kit for Series 5000 Green Line Sensors</p>		<p>61-5550</p> <p>(One Cat. No. = One Lens Assembly)</p>
<p>Glass Fiber Optic Cable Bracket</p>		<p>60-2696</p>
<p>ColorSight Lens Extender</p>		<p>60-2738</p>

## Plastic Fiber Optic Cables

### Introduction



### Application Recommendations

1. Many plastic fiber optic cables are available in different core diameters. Larger core diameter cables can carry more light between the sensor and application. These cables will generally offer longer sensing ranges.

Smaller core diameter cables provide greater resolution and the ability to detect smaller targets.

2. Note that different sensing distances can be achieved depending upon the cable core diameter. These sensing distances must be de-rated for adverse environments.

**Longer custom cables will attenuate the light and reduce the operating range.** Light loss is approximately 3% per foot for Plastic Fiber Optic cables. Contact your local Rockwell Automation sales office or Allen-Bradley distributor for application assistance.

3. Avoid sharp bends that can permanently deform the cable. Minimum radius bend is listed for each part.
4. Some plastic fiber optic cables can be cut to length. A very sharp right angle cut is essential to provide good performance. The supplied cable cutter Cat. No. 57-127, must be used. Each opening in the cutter can be used only once.
5. Some sensing tips cannot be bent. **Only special sensing tips can be bent as specified.** Bends should only be attempted in the areas shown in the illustrations. Do not exceed the minimum bend radius for the cable.
6. Plastic fiber optic cables are suitable for applications where the sensor must be isolated from high voltage.
7. X-RAY or GAMMA radiation will cause plastic fibers to eventually become opaque. Custom cables constructed with special optical quartz fibers must be ordered for use in areas with high radiation.
8. Use Transmitted Beam sensing in submerged applications when possible.
9. A plastic fiber optic sensor with a duplex cable can provide Retroreflective or Diffuse sensing depending upon the distance to the target and the sensitivity adjustment on the sensor. If the sensor and cable are to be used for Retroreflective sensing, the sensitivity of the sensor must be adjusted low enough to avoid unwanted diffuse response from the targets to be sensed.
10. **Plastic fiber optic cables have a wide field of view.** A smaller field of view can be achieved by attaching an Extended Range Lens Assembly such as the Cat. No. 63-118 (see page 1-288) to the sensing end of the fiber. These lens assemblies will also increase the available sensing distance.
11. Plastic fiber optics cables can be used in applications where constant motion or flexing of the cable is required. Coiled cables (such as 43PR-NES57VS) are particularly well suited for these applications.
12. Plastic fiber optic cables can be successfully applied in most industrial environments. However, where abrasion or occasional impact to the cable is a concern, glass fiber optic cables may provide more durability.
13. Chemical Resistance: Acid and alkali solvents could damage the Polyethylene Fiber Core. The jacket will offer some washdown protection but long term use in chemical environments could destroy the core material.
14. The maximum temperature rating of standard plastic fiber optic cables is 70\_C (158\_F) . Custom cables with temperature ratings of 115\_C (239\_F) are available.

### ATTENTION



Fiber optic cables are not recommended for explosion-proof applications in hazardous environments. The fiber optic cable can provide a path for explosive fumes to travel from the hazardous area to the safe area.

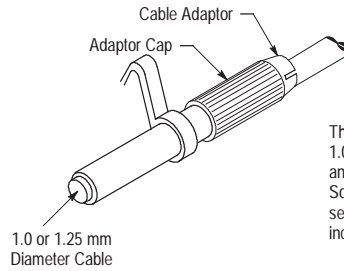


## Plastic Fiber Optic Cables

Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

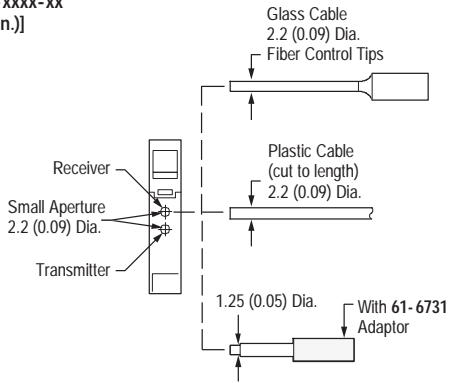
### Plastic Fiber Optic Cables for use with Small Aperture Sensors

The plastic fiber optic cables on pages 1-272...1-280 are for use with small aperture sensors. The cables shown on pages 1-277...1-279 require an adaptor (included with the cable).

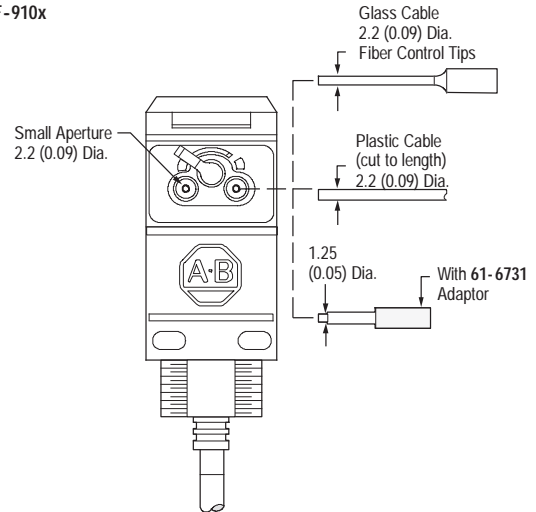


The drawing of the Cat. No. 61-6731 adaptor shows how 1.0/1.25 mm (0.04/0.05 in.) OD fibers (shown on pages 1-277 and 1-279) can be used with most small aperture sensors. Some sensors have adaptors for this purpose included. Product selection pages for each sensor will indicate if an adaptor is included as standard.

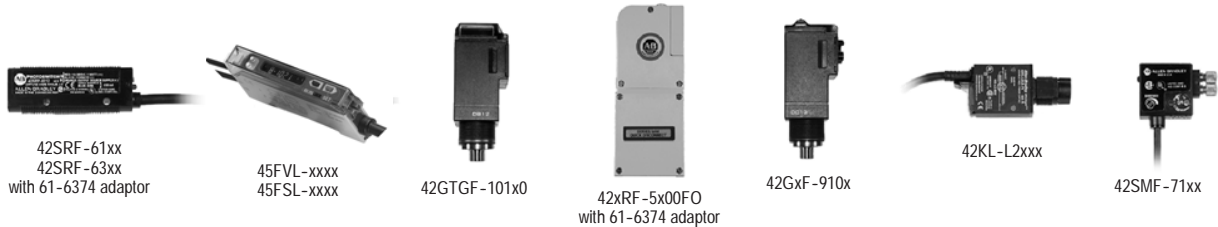
45Fxx-xxxx-xx  
[mm (in.)]



42GxF-910x



### Small Aperture Sensors:



### Note: Sensing Distance

- Due to the variation between fiber optic cables, sensing distance can vary widely
- The sensing distance of bifurcated cables is measured with white paper (90% reflectivity). Other surfaces may be less reflective and therefore would have shorter sensing distances.
- The published numbers are based on extensive testing and are conservative
- The sensing distance of transmitted beam cables is measured from tip to tip
- Application considerations that effect distance
  - Sensor selected
  - Reflectivity of target
  - Environment
  - Accessories such as focusing lens
  - Length of the cable
- The cut of the plastic. Re-cutting the cable with the proper tool (Cat. No. 57-127) will typically give a better surface for the sensor to interface with, allowing a longer sensing distance.
- Bending a bendable tip beyond the minimum bend radius of the cable will reduce sensing distance.
- Consult product support for additional information.

**All dimensions indicated are typical. Contact your local Rockwell Automation sales office or Allen-Bradley distributor for exact dimensions.**

PHOTOSWITCH<sup>R</sup> Photoelectric Sensors

**43PR Plastic Fiber Optic Cables**

**Threaded Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]**

The fiber optic cables on pages 1-272...1-279 are for use with small aperture sensors such as follows:



Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Core Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	40 (1.6)	2 x 1.5 (0.06)	Polyethylene		43PR-NDS59FS
	25 (1.0)	2 x 1 (0.04)			43PR-NDS57ZS
	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-NES57ZS
	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-NES57VS
<p>43PR-NKS61FS has coaxial optics for more precise sensing</p>	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-NKS57FS
	20 (0.8)	1 x 0.75 (0.03) 4 x 0.5 (0.02)		Characterization not available at time of publication	43PR-NKS61FS
	2 (0.08)	2 x 0.5 (0.02)	1 R Polyflex	Characterization not available at time of publication	43PR-NKS65YS
	2 (0.08)	2 x 1.0 (0.04)	1 R Polyflex	Characterization not available at time of publication	43PR-NLS65YS

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43PR Plastic Fiber Optic Cables**

**Threaded Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-PES53FS
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-PFS53FS
	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-PIS57ZS
	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-PIS57VS
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-PJS53ZS
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-PJS53VS

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.

## 43PR Plastic Fiber Optic Cables

Ferrule Bifurcated Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance	Cat. No.
	25 (1.0)	2 x 1 (0.04)	Polyethylene	Characterization not available at time of publication	43PR-RAS57ZS

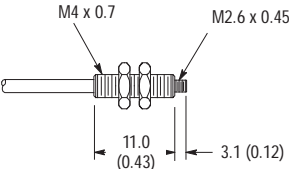
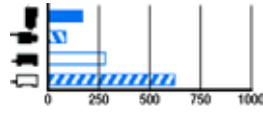
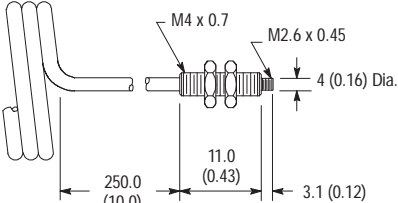
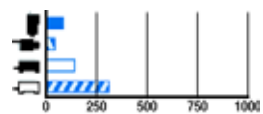
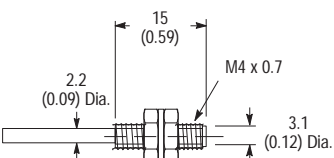
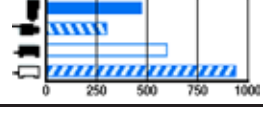
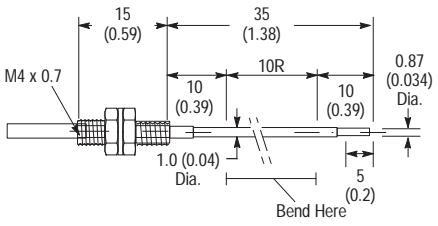
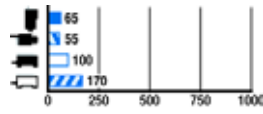
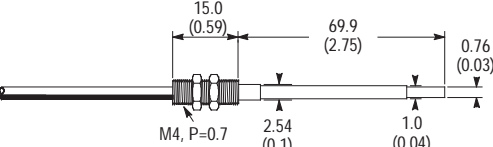
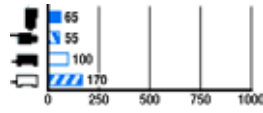
### Specialty Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

	25 (1.0)	2 x 1 (0.04)	Polyethylene	Characterization not available at time of publication	43PR-SBS57ZS
	25 (1.0)	2 x 1 (0.04)	Polyethylene	Characterization not available at time of publication	43PR-SCS57ZS
	25 (1.0)	1 (0.04)	Polyethylene	The sensing distance is the width of the gap (11.9 mm). The target must cross the optical axis between the two prongs of the fork	43PR-UAA56MS

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43PT Plastic Fiber Optic Cables**

**Threaded Transmitted Beam Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		43PT-NJS56FS
	25 (1.0)	1 (0.04)	Polyethylene		43PT-NJS56GS
	40 (1.6)	1.5 (0.06)	Polyethylene		43PT-NAS58FS
	2 (0.08)	1.0 (0.04)	1 R Polyflex	Characterization not available at time of publication	43PT-NAS66RS
	15 (0.6)	0.5 (0.02)	Polyethylene		43PT-PAS52FS
	15 (0.6)	0.5 (0.02)	Polyethylene		43PT-PBS52FS

**Notes:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.  
 Two cables per one plastic transmitted beam cat. no.

## 43PT Plastic Fiber Optic Cables

### Threaded Transmitted Beam Cables for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		43PT-PKS56FS
	25 (1.0)	1 (0.04)	Polyethylene		43PT-PKS56GS
	15 (0.6)	0.5 (0.02)	Polyethylene		43PT-PLS52FS
	15 (0.6)	0.5 (0.02)	Polyethylene		43PT-PLS52GS

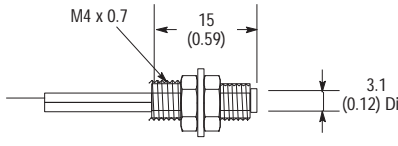
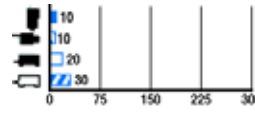
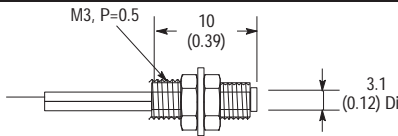
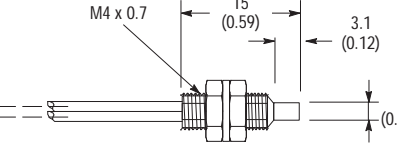
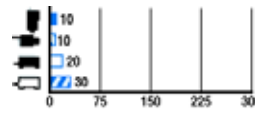
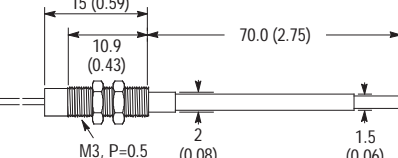
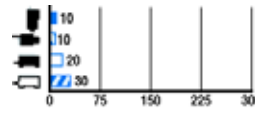
### Ferrule Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		43PT-CBS56FS
	25 (1.0)	1 (0.04)	Polyethylene	Characterization not available at time of publication	43PT-SAS56FS

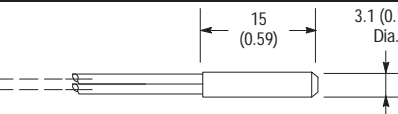
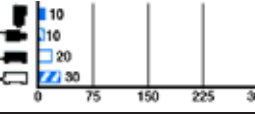
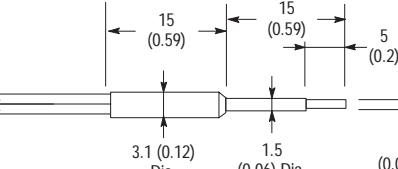

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.  
Two cables per one plastic transmitted beam Cat. No.

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43PR Plastic Fiber Optic Cables**

**Threaded Bifurcated Miniature Cables for Small Aperture Sensors (adaptor required)**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
 <p>43PR-NAS60FM has coaxial optics for more precise sensing</p>	25 (1.0)	2 x 1 (0.04)	Polyethylene		43PR-NAS57ZM
	15 (0.6)	1 x 0.5 (0.02) 4 x 0.25 (0.01)		Characterization not available at time of publication	43PR-NAS60FM
	2 (0.08)	2 x 0.25 (0.01)	1 R Polyflex	Characterization not available at time of publication	43PR-NBS63YM
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-NFS53FM
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-PHS53ZM

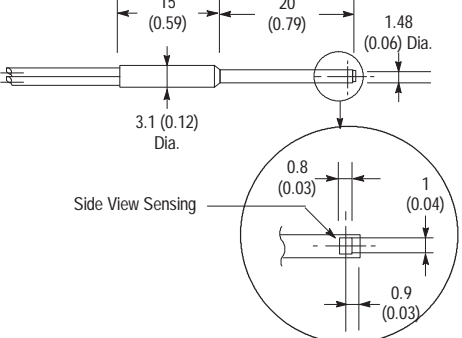
**Ferrule Bifurcated Miniature Cables for Small Aperture Sensors (adaptor required) [2.2 mm (0.09 in.)]**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.5
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-CBS53ZM
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene		43PR-AAS53ZM

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.

## 43PR Plastic Fiber Optic Cables

Ferrule Bifurcated Miniature Cables for Small Aperture Sensors (adaptor required)

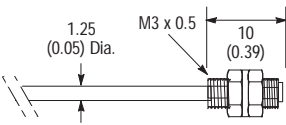
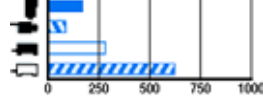
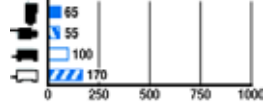
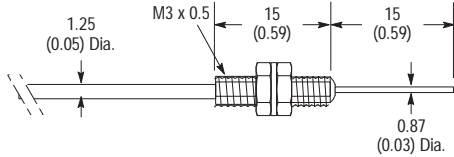
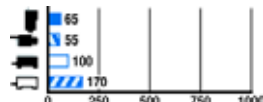
Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	15 (0.6)	2 x 0.5 (0.02)	Polyethylene	Characterization not available at time of publication	43PR-VBS53ZM

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.

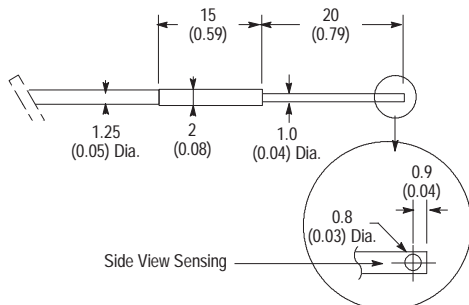


PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**43PT Plastic Fiber Optic Cables**

**Threaded Transmitted Beam Miniature Cables for Small Aperture Sensors (adaptor required)**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	25 (1.0)	1 (0.04)	Polyethylene		43PT-NBS56FM
	15 (0.6)	0.5 (0.02)			43PT-NBS52FM
	2 (0.08)		1R Polyflex	Characterization not available at time of publication	43PT-NBS64RM
	15 (0.6)	0.5 (0.02)	Polyethylene		43PT-PCS52FM

**Ferrule Transmitted Beam Miniature Cables for Small Aperture Sensors (adaptor required [2.2 mm (0.09 in.)])**

Approximate Dimensions [mm (in.)]	Bend Radius [mm (in.)]	Fiber Bundle Diameter	Sheathing Material	Sensing Distance [mm]	Cat. No.
	15 (0.6)	0.5 (0.02)	Polyethylene	Characterization not available at time of publication	43PT-VCS52FM

**Note:** Standard length for plastic fiber optic cables is 2 m (78 in.) tip to tip.  
 Two cables per one plastic transmitted beam Cat. No.

## Plastic Fiber Optic Cables

### Special Purpose

#### Approximate Dimensions [mm (in.)]

Sensing Tip Material	Fiber Diameter	Sheathing Material	Nominal Sensing Ref.	Cat. No.
PTFE	1.25 (0.049) x 2	PTFE	NA	99-193-1

PTFE	2.2 (0.090) x 2	PTFE	NA	99-197-1

## Plastic Fiber Optic Cables

### Additional Cables for Small Aperture Sensors [2.2 mm (0.09 in.) OD Sensor End Tip]

#### Custom Fiber Optic Cables

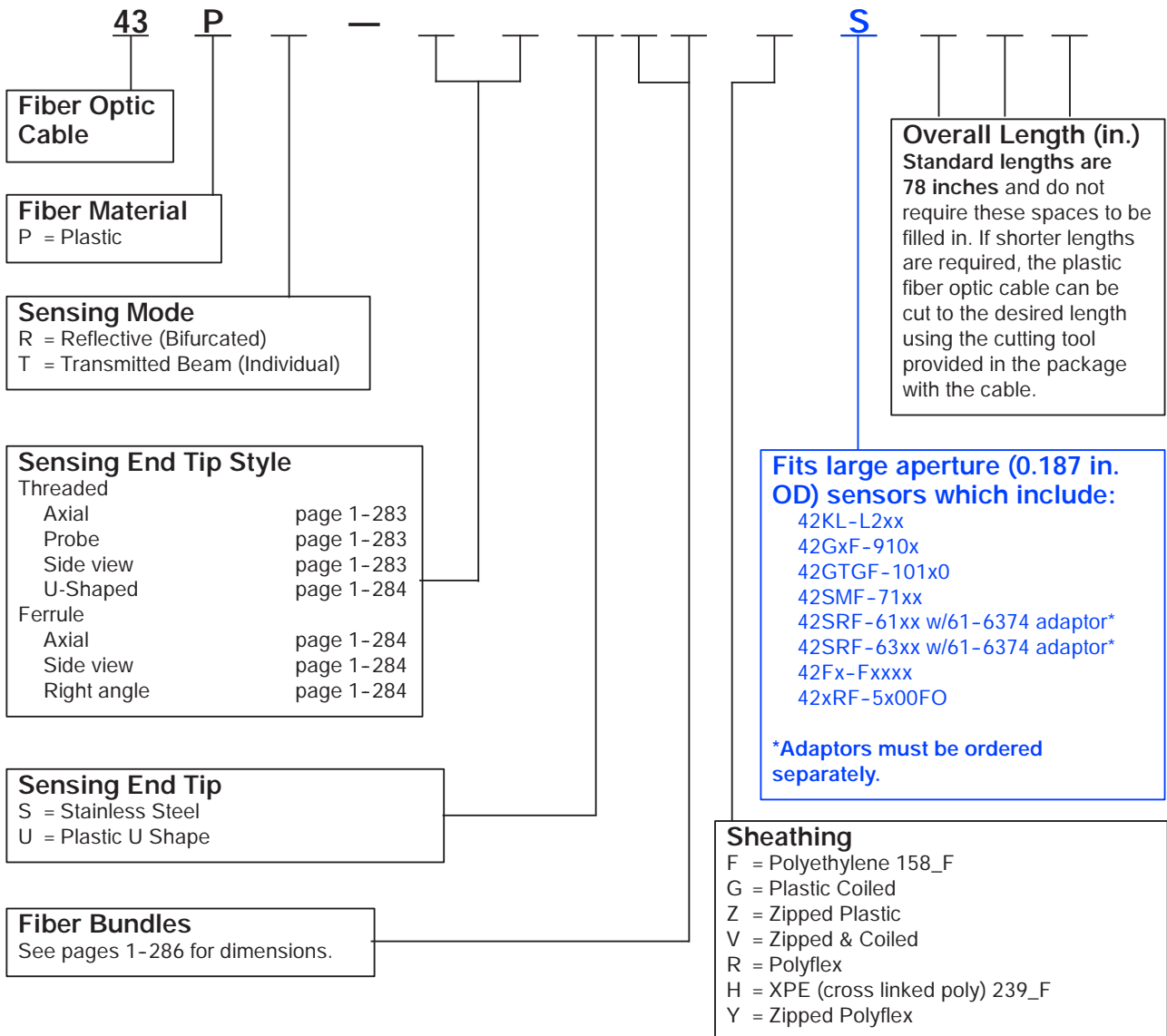
Rockwell Automation/Allen-Bradley can provide custom plastic fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

- S Custom lengths are available
- S Custom temperature ratings up to 115\_C (239\_F)
- S Custom configurations including multiple sensing tips
- S Custom sensing end tips—nearly any modification is possible

For more information contact your local Rockwell Automation sales office or Allen-Bradley distributor.

#### To Build a Custom Fiber Optic



## Plastic Fiber Optic Cables

**Additional Cables for Small Aperture Sensors [1.0/1.25 mm (0.04/0.05 in.) OD Sensor End Tip]**

### Custom Fiber Optic Cables

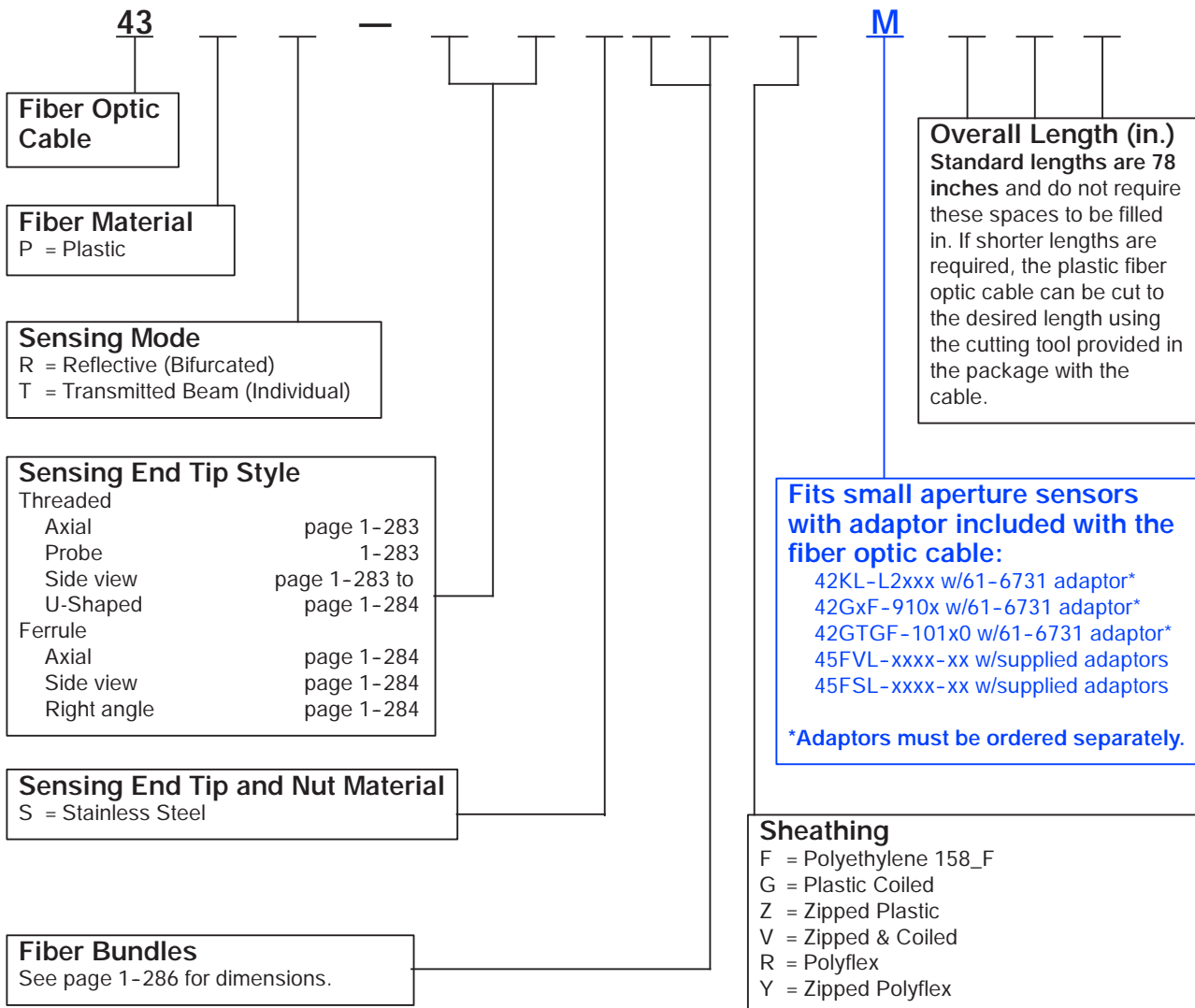
Rockwell Automation/Allen-Bradley can provide custom plastic fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

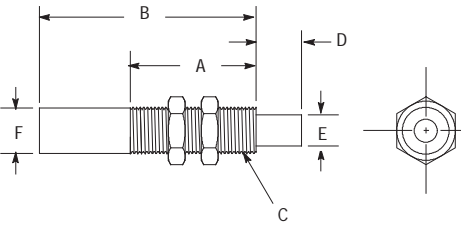
- S Custom lengths are available
- S Custom temperature ratings up to 70\_C (158\_F)
- S Custom configurations including multiple sensing tips
- S Custom sensing end tips—nearly any modification is possible

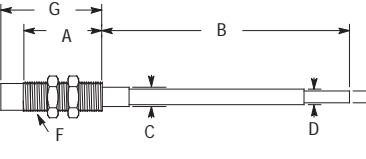
For more information contact your local Rockwell Automation sales office or Allen-Bradley distributor.

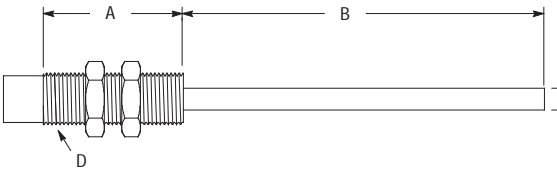
### To Build a Custom Fiber Optic

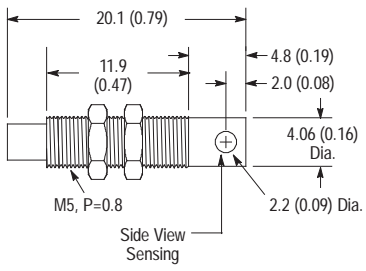


PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**Plastic Fiber Optic Cable Sensing Tips**  
 Use with Configurators on page 1-281 and 1-282.

Approximate Dimensions	Code	Standard Bundle [mm]	Approximate Dimensions [mm (in.)]					
			A	B	C	D	E	F
	NA	0.5	14.9 (0.59)	—	M4, P=0.7	0.51 (0.02)	3.0 (0.12)	—
	NB	0.5	9.9 (0.39)	—	M3, P=0.5	NA	—	—
	NC	0.25	11.9 (0.47)	—	M4, P=0.7	3.05 (0.12)	1.02 (0.04)	—
	ND	1.5	13.9 (0.55)	23.1 (0.91)	M6, P=1	1.02 (0.04)	4.8 (0.19)	—
	NE	1.0	17.0 (0.67)	—	M6, P=0.75	3.05 (0.12)	4.06 (0.16)	—
	NF	0.5	11.9 (0.47)	—	M4, P=0.7	3.05 (0.12)	2.54 (0.10)	—
	NG	0.75	10.9 (0.43)	14.9 (0.59)	M3, P=0.5	NA	—	3.05 (0.12)
	NJ	1.0	11.9 (0.47)	—	M4, P=0.7	3.05 (0.12)	—	—
	NK	0.5	11.9 (0.47)	—	M6, P=0.75	3.05 (0.12)	2.54 (0.10)	—
	NL	0.5	14.9 (0.59)	23.1 (0.91)	M6, P=1	4.8 (0.19)	6.1 (0.24)	6.1 (0.24)

Approximate Dimensions	Code	Standard Bundle [mm]	Approximate Dimensions [mm (in.)]						
			A	B	C	D	E	F	G
	PA	0.5	14.9 (0.59)	35.0 (1.38)	2.54 (0.1)	1.02 (0.04)	0.76 (0.03)	M4, P=0.7	—
	PB	0.5	14.9 (0.59)	69.8 (2.75)	2.54 (0.1)	1.02 (0.04)	0.76 (0.03)	M4, P=0.7	—
	PD	0.5	9.9 (0.39)	69.8 (2.75)	2.03 (0.08)	1.02 (0.04)	0.76 (0.03)	M3, P=0.5	—
	PE	0.5	14.9 (0.59)	35.0 (1.38)	2.54 (0.1)	1.52 (0.06)	1.27 (0.05)	M6, P=1	23.1 (0.91)
	PF	0.5	14.9 (0.59)	69.8 (2.75)	2.54 (0.1)	1.52 (0.06)	1.27 (0.05)	M6, P=1	23.1 (0.91)
	PG	0.5	14.9 (0.59)	69.8 (2.75)	2.54 (0.1)	1.52 (0.06)	1.27 (0.05)	M4, P=0.7	—
	PH	0.5	10.9 (0.43)	69.8 (2.75)	2.03 (0.08)	1.52 (0.06)	1.27 (0.05)	M3, P=0.5	14.9 (0.59)

Approximate Dimensions	Code	Standard Bundle [mm]	Approximate Dimensions [mm (in.)]			
			A	B	C	D
	PC	0.5	14.9 (0.59)	14.9 (0.59)	0.76 (0.03)	M3, P=0.5
	PI	1.0	17.0 (0.67)	88.9 (3.5)	2.54 (0.1)	M6, P=0.75
	PJ	0.5	11.4 (0.45)	88.9 (3.5)	1.27 (0.05)	M3, P=0.5
	PK	1.0	17.0 (0.67)	88.9 (3.5)	1.27 (0.05)	M6, P=0.75
	PL	0.5	10.9 (0.43)	88.9 (3.5)	0.86 (0.034)	M3, P=0.5

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
	SA	1.0

## Plastic Fiber Optic Cable Sensing Tips

Use with Configurators on page 1-281 and 1-282.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
<p>Side View Sensing</p> <p>Dimensions: 14.9 (0.59), 14.9 (0.59), 1.52 (0.06), 0.81 (0.032), 2.29 (0.09), 2.49 (0.098)</p>	VC	0.5

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
<p>Side View Sensing</p> <p>Dimensions: 28.1 (1.11), 11.9 (0.47), 4.7 (0.18), 2.03 (0.08), 3.81 (0.15), 5.54 (0.21) dia. collar, M5, P=0.8, 1.63 (0.064) x 2.5 (0.098) 1mm pair</p>	SB	1.0

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
<p>Side View Sensing</p> <p>Dimensions: 17.0 (0.67), 55.8 (2.2), 3.0 (0.12), 2.54 (0.1), 2.54 (0.1), M6 x 0.75 thread</p>	SC	1.0

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
<p>Dimensions: 5.08 (0.2), 13.97 (0.55), 15.24 (0.6), 3.05 (0.12), 12.7 (0.5), 44.45 (1.75), 3.18 (0.125)</p>	RA	1.0

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**Plastic Fiber Optic Cable Sensing Tips**  
 Use with Configurators on page 1-281 and 1-282.

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
	VA	0.5
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
	AA	0.5
Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm]
	CA	1.0


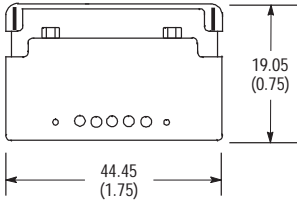

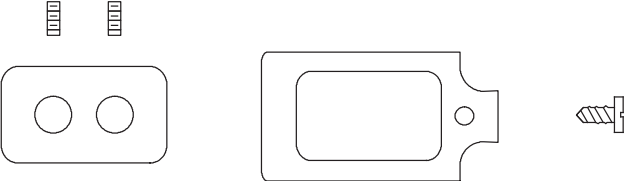

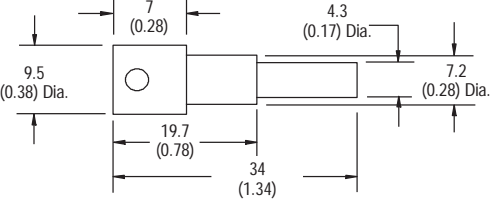
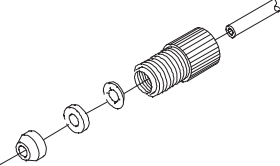
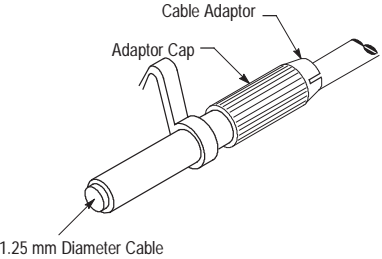
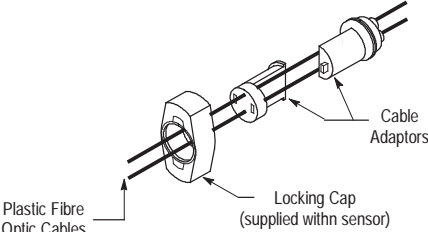
## Plastic Fiber Optic Cable Sensing Tips

Use with Configurators on page 1-281 and 1-282.

The bundle size codes are used with the configurators on page 1-281 and 1-282.

Code	Diameter [mm]	Bend Radius [mm (in.)]	Arrangement
52	0.50	15 (0.6)	Single
53	0.50	15 (0.6)	Pair Zipped
56	1.0	25 (1.0)	Single
57	1.0	25 (1.0)	Pair Zipped
58	1.5	40 (1.6)	Single
59	1.5	40 (1.6)	Pair
60	0.50 x 1 0.25 x 4	15 (0.6)	Coaxial
61	0.75 x 1 0.50 x 4	20 (0.8)	Coaxial
64	0.50	2 (0.08)	Single Flexible
65	0.50	2 (0.08)	Pair Flexible
66	1.0	2 (0.08)	Single Flexible
67	1.0	2 (0.08)	Pair Flexible


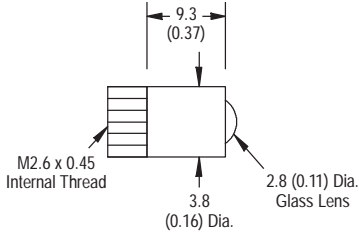
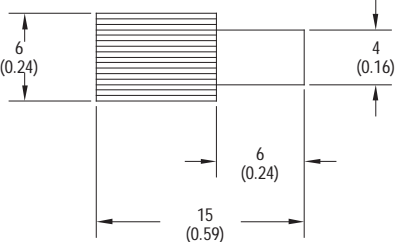
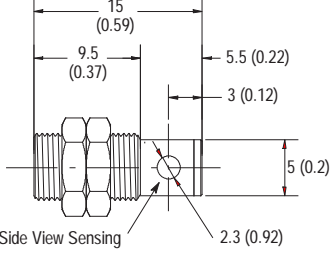
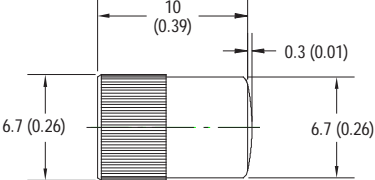


Description	Approximate Dimensions [mm (in.)]	Cat. No.
 <p>Cutting Tool for plastic Fiber Optic cable. For use with all cutable cables. One cutter tool is packaged with each fiber optic cable.</p>		57-127
 <p>Molded Fiber Optic Adaptor Kit to be used with Type 42DRF and Type 42MRF Series 5000.</p>		61-6310
 <p>Control End Adaptor Kit for 2.3 mm (0.09 in.) OD Plastic Fiber Optic cable. Use with Series 9000, 10,000, 5000 and 6000.</p>		61-6374 2/package
<p>Control End Adaptor Kit for Series 7000.</p>		129-125-5 2/package
<p>1.25 mm outer jacket adaptor for the 42FA and 42FT (included with sensor) and MiniSight, Series 9100 and 10,000 (adaptor not included)</p>		61-6731
<p>1.0 mm outer jacket adaptor for 45FVL/45FSL</p>		61-6742
<p>2.2 mm outer jacket adaptor for the 42FB (included with sensor)</p>		61-6733

Plastic Fiber Optic Cables

Accessories

Lenses (One per package)

Description	Approximate Dimensions [mm (in.)]	Cat. No.
 <p>Range extender lens adaptor for 1 mm (0.04 in.) dia. transmitted beam plastic cable.</p>	 <p>M2.6 x 0.45 Internal Thread 9.3 (0.37) 3.8 (0.16) Dia. 2.8 (0.11) Dia. Glass Lens</p>	63-118
<p>Fixed focus lens adaptor used with reflective cables with 4 mm (0.16 in.) x 0.7 pitch threaded sensing tips. Plastic housing One Cat. No. = one adaptor</p>	 <p>6 (0.24) 4 (0.16) 6 (0.24) 15 (0.59)</p>	60-2646
<p>Right angle lens adaptor used with transmitted beam cables with 4 mm (0.16 in.) x 0.7 pitch threaded sensing tips. Metal housing One Cat. No. = one adaptor</p>	 <p>15 (0.59) 9.5 (0.37) 5.5 (0.22) 3 (0.12) 5 (0.2) 2.3 (0.92) Side View Sensing</p>	60-2648
<p>Range extender lens adaptor used with transmitted beam cables with 4 mm (0.16 in.) x 0.7 pitch threaded sensing tips. Metal housing One Cat. No. = one adaptor</p>	 <p>10 (0.39) 0.3 (0.01) 6.7 (0.26) 6.7 (0.26)</p>	60-2652

PHOTOSWITCH<sup>®</sup> Photoelectric Sensors  
**Plastic Fiber Optic Cables**  
 Fiber Optic Lens Assemblies (Field Attachable)

**General Specifications**

Housing Material	Nickel-plated brass
Operating Temperature [C (F)]	-25...+60_ (-13...+140_)
Acceptable Fiber	2.2 mm (0.08 in.) outer diameter
Fiber Optic Cable	Bifurcated = 99-854 Individual = 99-850

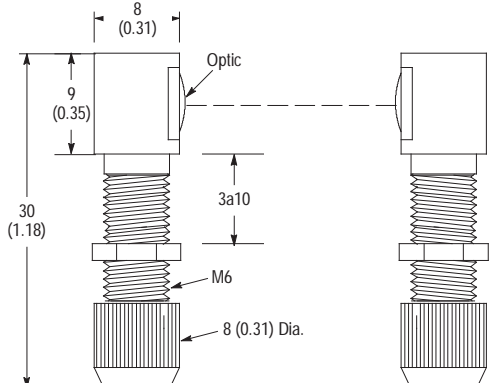
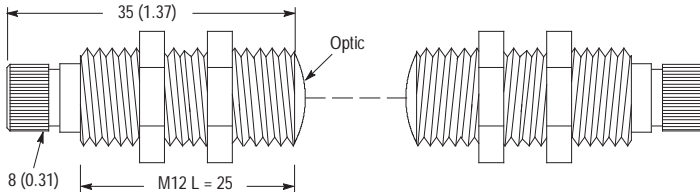
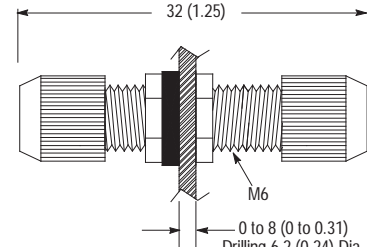
**Approximate Dimensions [mm (in.)]**

Description	Approximate Dimensions [mm (in.)]	Nominal Sensing Distance [mm (in.)]	Cat. No.
Range extending lens for ColorSight 9000		114 (4.5)	60-2738
Lens for diffuse sensing. Accepts 2.2 mm plastic bifurcated fiber optic cable. One Cat. No. = one lens assembly		70 (2.75)	60-2745
Range extending lens for transmitted beam sensing. Accepts 2.2 mm plastic individual fiber optic cable. One Cat. No. = two lens assemblies		200 (7.87)	60-2746
Range extending lens for transmitted beam sensing. Accepts 2.2 mm plastic individual fiber optic cable. One Cat. No. = two lens assemblies		800 (31.49)	60-2747
Range extending lens for transmitted beam sensing. Accepts 2.2 mm plastic individual fiber optic cable. One Cat. No. = two lens assemblies		1200 (47.24)	60-2748

## Plastic Fiber Optic Cables

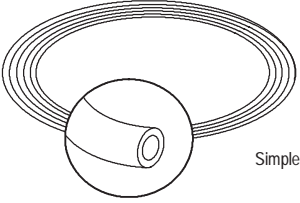
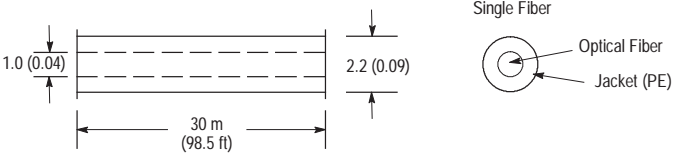
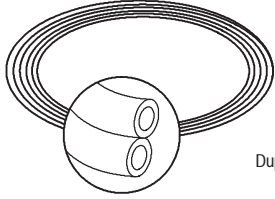
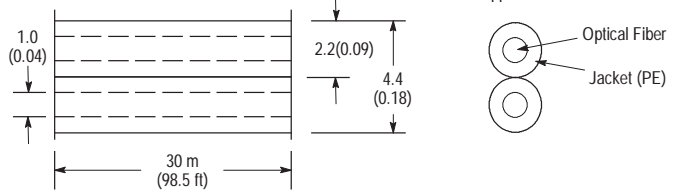
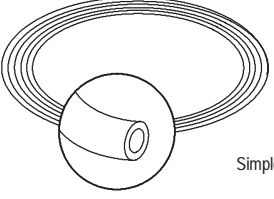
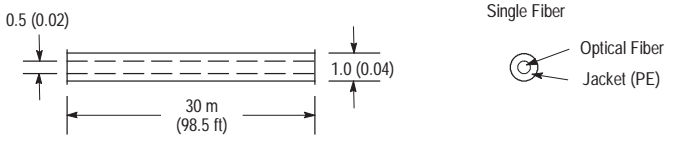
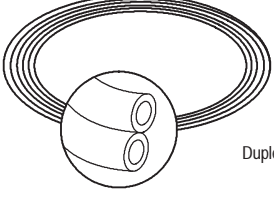
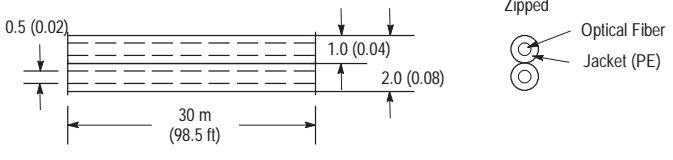
### Fiber Optic Lens Assemblies (Field Attachable)

#### Approximate Dimensions [mm (in.)]

Description	Approximate Dimensions [mm (in.)]	Nominal Sensing Distance [mm (in.)]	Cat. No.
<p>Range extending lens for transmitted beam sensing. Accepts 2.2 mm plastic individual fiber optic cable.</p> <p>One Cat. No. = two lens assemblies</p>		<p>1200 (47.24)</p>	<p>60-2749</p>
<p>Range extending lens for transmitted beam sensing. Accepts 2.2 mm plastic individual fiber optic cable.</p> <p>One Cat. No. = two lens assemblies</p>		<p>4000 (157.48)</p>	<p>60-2750</p>
<p>Splicer for single 2.2 mm plastic fiber optic cable</p> <p>One Cat. No. = two splicers</p> <p>25% Attenuation</p>		<p>—</p>	<p>60-2751</p>

**Note:** Nominal sensing reference is included to aid in the selection of fiber optic lens assemblies.

**Unterminated Plastic Fiber Optic Cables**

Description	Approximate Dimensions [mm (in.)]	Cat. No.
 <p>Simplex</p>	 <p>Single Fiber</p> <p>Optical Fiber Jacket (PE)</p>	<p><b>99-850</b></p>
 <p>Duplex</p>	 <p>Zipped</p> <p>Optical Fiber Jacket (PE)</p>	<p><b>99-854</b></p>
 <p>Simplex</p>	 <p>Single Fiber</p> <p>Optical Fiber Jacket (PE)</p>	<p><b>99-852</b></p>
 <p>Duplex</p>	 <p>Zipped</p> <p>Optical Fiber Jacket (PE)</p>	<p><b>99-853</b></p>

The above cat. nos. are unterminated simplex (individual) and duplex (dual) plastic fibers.

These plastic fiber optic cables can be used with plastic fiber optic sensors and require no control end tip to interface to the sensor.

A cutting tool for these unterminated plastic fiber optic cables is packaged with the fiber cable.

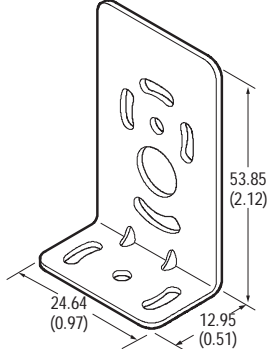
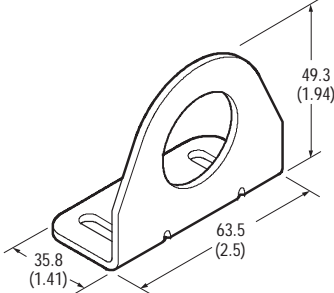
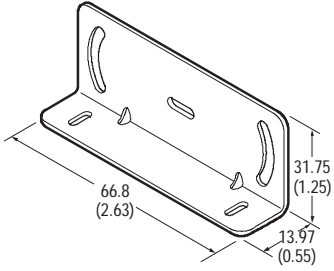
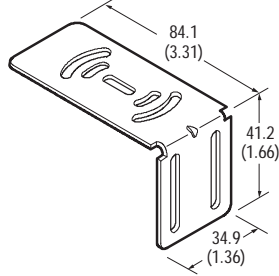
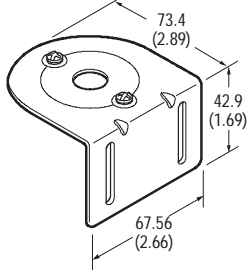
## Fiber Optic Cable Cross Reference

Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
99-1000-1	43GR-TAS20ML	99-461-1	43GT-MMS10ML	99-721-1	43GT-MIS15ML
99-1003-1	43GR-XDB25SL	99-477-1	43GT-TFS00ML	99-722-1	43GT-TMS25ML
99-108	43PT-PLS52FS	99-479-1	43GT-MUS10ML	99-723-1	43GT-TMS15MS
99-109	43PT-PLS52GS	99-487-1	43GT-MRS10ML	99-751-1	43GR-XAS10SS
99-110	43PR-PJS53ZS	99-490-1	43GT-MHS15SL	99-752-1	43GR-TIS10SS
99-116-1	43GT-MIS15SL	99-491-1	43GT-MHS15ML	99-753-1	43GR-FTS10SS
99-161-1	43GR-TAB20SS	99-494-1	43GT-BCA73SL	99-755-1	43GR-TDS10SS
99-181-1	43GT-TWC25SL	99-495-1	43GT-BCA73ML	99-794-1	43GR-BRA79SL
99-184-1	43GT-2FAS20SL	99-500-1	43GT-TBS25SL	99-800	43PR-NDS59FS
99-201-1	43GR-FOS20ML	99-50-1	43GT-FAS25SL	99-801	43PR-NDS57ZS
99-206-1	43GR-FPS20SL	99-501-1	43GT-TBS25ML	99-802	43PR-NAS57ZM
99-214-1	43GR-FJS30SL	99-502-1	43GT-TBB30SL	99-803	43PR-NAS60FM
99-222-1	43GR-TMC25SL	99-504-1	43GT-TQC25SL	99-804	43PR-NKS57ZS
99-224-1	43GR-TMC15SL	99-505-1	43GT-TQC25ML	99-805	43PR-NKS61FS
99-238-1	43GR-FGS25SL	99-508-1	43GT-TRC30SL	99-806	43PR-NFS53FM
99-275-1	43GR-TFS10ML	99-51-1	43GT-FAS25ML	99-808Z	43PR-NGS53ZM
99-279-1	43GR-MUS10ML	99-52-1	43GT-TBB25SL	99-809Z	43PR-NGS55ZM
99-283-1	43GR-MS10ML	99-530-1	43GT-TTC20SL	99-810	43PR-PES53FS
99-290-1	43GR-MHS15SL	99-53-1	43GT-TBB25ML	99-811	43PR-PFS53FS
99-291-1	43GR-MHS15ML	99-54-1	43GT-FIS25SL	99-814	43PR-CBS53ZM
99-294-1	43GR-BCA73SL	99-55-1	43GT-FIS25ML	99-816	43PR-AAS53ZM
99-300-1	43GR-TBS25SL	99-56-1	43GT-BAA72SL	99-818	43PR-VBS53ZM
99-30-1	43GR-FAS25SL	99-57-1	43GT-BAA72ML	99-819	43PT-NAS58FS
99-301-1	43GR-TBS25ML	99-58-1	43GT-MKS00SL	99-820	43PT-NBS56FM
99-302-1	43GR-TBB30SL	99-59-1	43GT-MKS00ML	99-821	43PT-NBS54FM
99-304-1	43GR-TQC25SL	99-614-1	43GR-MQS15SL	99-822	43PT-NBS52FM
99-308-1	43GR-TRC30SL	99-623-1	43GR-2FAS25SL	99-823	43PT-PAS52FS
99-31-1	43GR-FAS25ML	99-626-1	43GT-6TBB15SL	99-825	43PT-PCS52FM
99-315-1	43GR-TKC25ML	99-643-1	43GR-4TBB22SL	99-827	43PT-CBS56FS
99-32-1	43GR-TBB25SL	99-68-1	43GR-MVS00ML	99-828	43PT-SAS56FS
99-330-1	43GR-TTS20SL	99-69-1	43GT-TMC25SL	99-833	43PR-SCS57ZS
99-33-1	43GR-TBB25ML	99-700-1	43GR-TBS20MS	99-838	43PR-SBS57ZS
99-34-1	43GR-FIS25SL	99-701-1	43GR-TBS15ML	99-85-1	43GR-TGB33SL
99-350-1	43GR-FRS40SL	99-702-1	43GR-TAS20MS	99-90	43PT-NJS56FS
99-35-1	43GR-FIS25ML	99-704-1	43GR-TAS20SS	99-900	43PR-RAS57ZS
99-36-1	43GR-BAA72SL	99-705-1	43GR-TMS25ML	99-91	43PT-NJS56GS
99-37-1	43GR-BAA72ML	99-706-1	43GR-TMS20MS	99-92	43PT-PKS56FS
99-39-1	43GR-MKS00ML	99-708-1	43GR-TQS20MS	99-93	43PT-PKS56GS
99-400-1	43GT-FOS20SL	99-710-1	43GT-TBS15MS	99-94	43PR-NES57ZS
99-408-1	43GT-FPS10SL	99-714-1	43GT-TAS15SS	99-95	43PR-NES57VS
99-424-1	43GT-TMC15SL	99-714-1	43GT-TAS15SS	99-951-1	43GT-XAS10SS
99-426-1	43GT-TOC30SL	99-715-1	43GT-TFS10ML	99-952-1	43GT-TIS10SS
99-436-1	43GT-FAS30SL	99-716-1	43GT-TOS30ML	99-953-1	43GT-FTS10SS
99-453-1	43GT-TJC30ML	99-717-1	43GT-TQS25ML	99-955-1	43GT-TDS10SS
99-458-1	43GT-MBS10SL	99-718-1	43GT-TQS15MS	99-96	43PR-PIS57ZS
99-46-1	43GR-TXC25SL	99-720-1	43GT-TRS30ML	99-97	43PR-PIS57VS

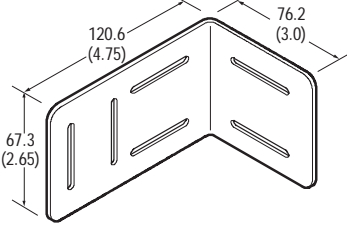
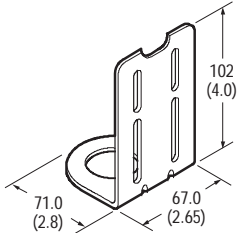
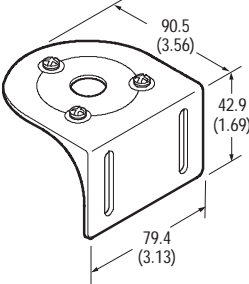
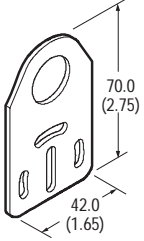
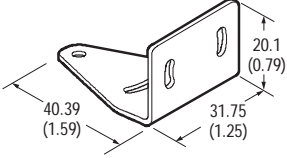
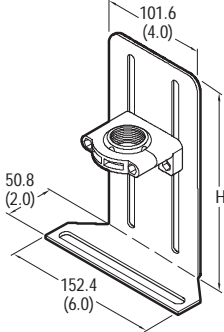
Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Swivel/Tilt bracket allows ±10_ vertical and 360_ rotation adjustment.	60-2649	RightSight	
	60-2439	Series 9000 ColorSight LaserSight	
	60-2681	ClearSight 9000	
	60-2619	Series 7000	
	60-2618	Series 6000	
Right angle mounting bracket allows 30_ horizontal adjustment.	60-2664	MiniSight 42CA, 42CB	
	60-2657	RightSight MiniSight 42CA, 42CB	
Right angle mounting bracket permits a 360_ rotation adjustment. The Cat. No. 60-2513 bracket has mounting hole patterns compatible with the Cat. No. 60-1785.	60-2421 60-2513	Series 9000 ClearSight 9000 ColorSight LaserSight	

Accessories

Mounting Brackets

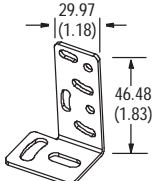
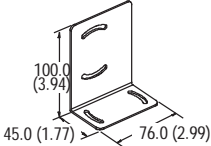
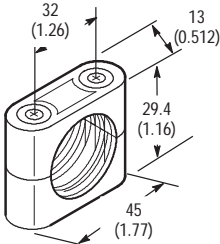
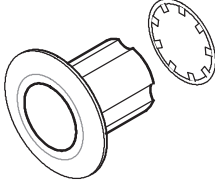
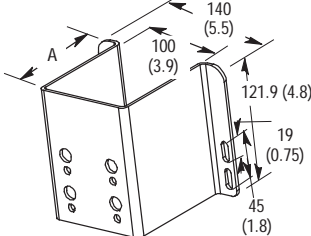
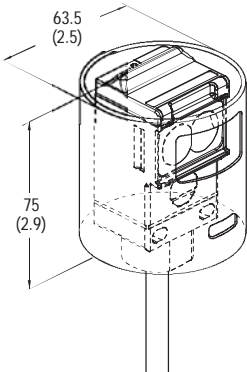
Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
<p>Right angle mounting bracket allows 40_ horizontal rotation. The Cat. No. 60-2152 permits a 30_ horizontal rotation.</p>	<p><b>60-2151</b> <b>60-2152</b></p>	<p>Series 7000</p>	
<p>Right angle mounting bracket with 25.4 mm (1 in.) knockout for Series 6000 sensor.</p>	<p><b>60-2006</b></p>	<p>Series 6000</p>	
<p>Tilt mounting bracket provides 30_ vertical height adjustment.</p>	<p><b>60-2007</b></p>	<p>Series 6000</p>	
<p>Right angle mounting bracket allows for both horizontal and vertical adjustment.</p>	<p><b>60-2008</b></p>	<p>Series 6000</p>	
<p>Right angle mounting bracket provides vertical height and 360_ rotation.</p>	<p><b>60-1785</b></p>	<p>Series 5000</p>	


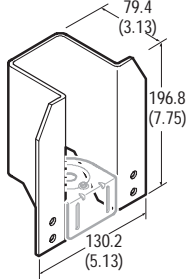

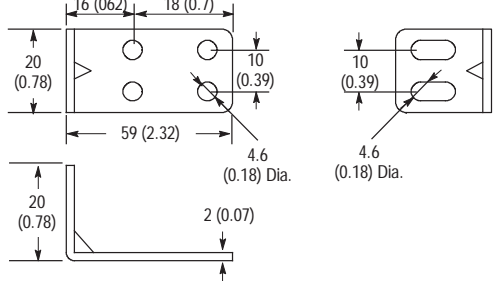
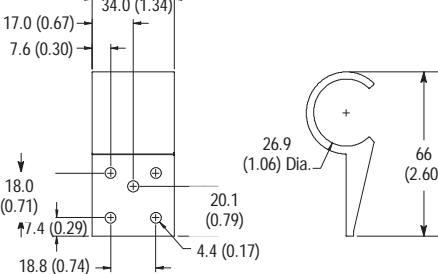
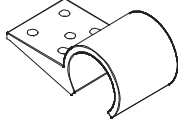


Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Right angle mounting bracket intended for use with Unistrut channel provides many vertical and horizontal adjustments.	<b>60-2014</b>	Series 5000	
Right angle mounting bracket allows 360° rotation and has hole patterns to match standard NEMA style limit switches.	<b>60-2230</b>	Series 5000	
Right angle mounting bracket provides 360° rotation.	<b>60-1479</b>	Series 4000	
Straight mounting bracket provides 30° horizontal rotation.	<b>60-2656</b>	RightSight MiniSight 42CA, 42CB	
Side mounting bracket provides 30° of vertical and 20° of horizontal rotation.	<b>60-2663</b>	MiniSight	
Photoelectric sensor vertical height adjustment bracket slotted for any swivel/tilt bracket.	<b>60-2721</b> (2 x 4 in.) <b>60-2722</b> (2 x 6 in.) <b>60-2723</b> (2 x 8 in.) <b>60-2724</b> (2 x 10 in.)	RightSight MiniSight Series 9000 ClearSight 9000 ColorSight LaserSight	

Accessories

Mounting Brackets

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Stainless steel mounting bracket	<b>60-BKTL-SS</b>	44B 42JS VisiSight	
Mounting bracket	<b>60-2677</b>	45MLD	
Clamp style bracket fits any 18 mm sensor.	<b>871A-BP18</b>	RightSight MiniSight 42CA, 42CB	
Flush mount adaptor allows any 18 mm sensor to be mounted flush against panel surface.	<b>60-2590</b>	RightSight MiniSight 42CA, 42CB	
Heavy duty impact bracket of #12 steel can be used with swivel/tilt bracket.	<b>60-2695</b> A = 76 mm (3 in.)	RightSight MiniSight Series 9000 ColorSight LaserSight	
	<b>60-2702</b> A = 117 mm (4.6 in.)	ClearSight 9000	
Heavy duty impact bracket of #12 steel can be used with swivel/tilt bracket.	<b>60-2725</b>	Series 9000	

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Heavy duty mounting bracket designed for use in high vibration applications provides both horizontal and vertical height adjustment.	60-1748	Series 5000	
Heavy duty impact bracket of #12 steel can be used with the Cat. No. 60-1785 mounting bracket.	60-2083	Series 5000	
Heavy duty impact bracket protects sensor and provides 60° horizontal adjustment.	60-1665	Series 4000	
Mounting bracket (included with sensor)	60-2773	45PVA	
Plastic bracket (2 brackets)	60-2779	45PVA	 

Accessories

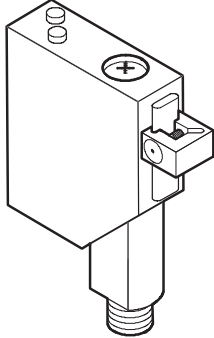
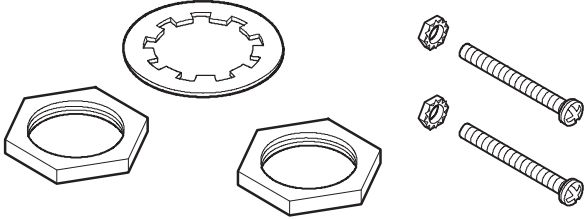
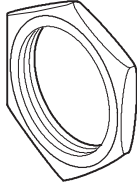
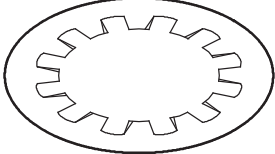
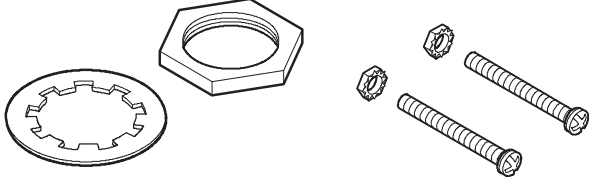
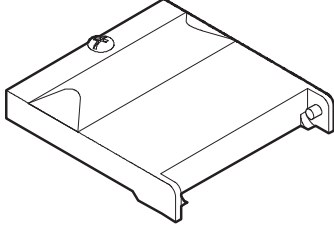
Mounting Brackets

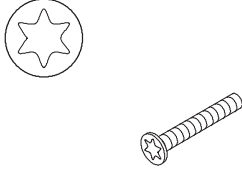
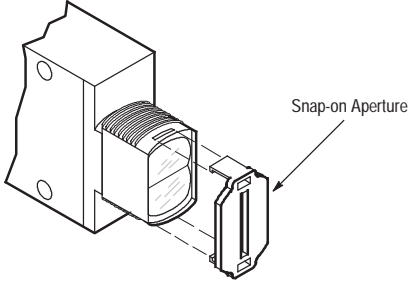
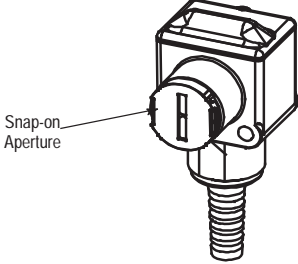
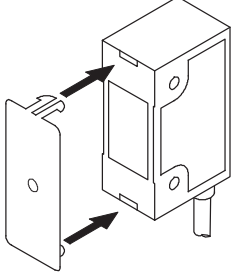
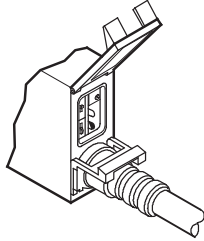
Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Metal brackets (2 brackets)	60-2772	45PVA	
Galvanized steel	60-2775-1	45PVA - 1LEB1-F4	
Galvanized steel	60-2776-1	45PVA - 1LEB2-F4	
Galvanized steel	60-2777-1	45PVA - 1LEB3-F4	
Galvanized steel	60-2778-1	45PVA - 1LEB4-F4	

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Mounting bracket	60-BJS-L1	42JS VisiSight	
Mounting bracket	60-BJS-L2	42JS VisiSight	
18 mm snap-on adaptor	60-AJS-18	42JS VisiSight	

Accessories

Protective Brackets and Apertures

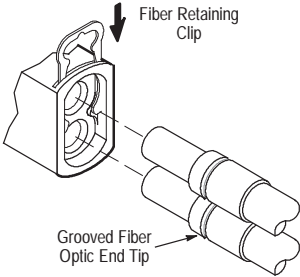
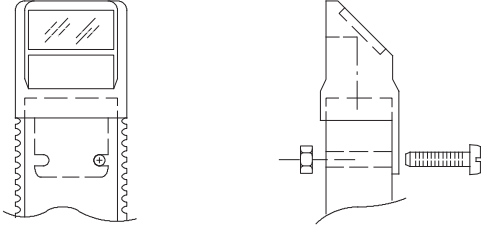
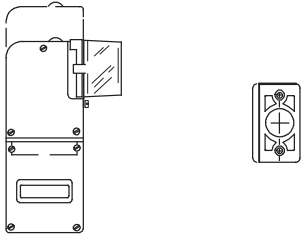
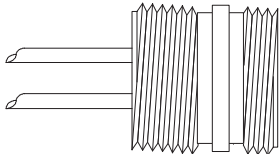
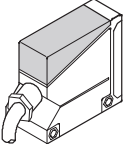
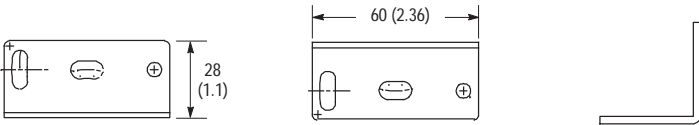
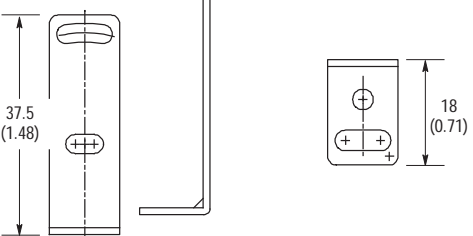
Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Dovetail mounting bracket	44B-BKT	44B 45LSP	
18 mm mounting kit contains lockwasher, nuts, and screws for both body or thru-hole mounting.	60-2716	RightSight	
18 mm mounting nut, plastic (2 each).	871T-N3	RightSight MiniSight 42CA, 42CB	
18 mm mounting nut, stainless steel (2 each).	871T-N4	RightSight MiniSight 42CA, 42CB	
18 mm lockwasher, metal	871A-LWN18	RightSight MiniSight 42CA, 42CB	
30 mm mounting kit contains lockwasher, nuts, and screws for both body or thru-hole mounting.	129-130	Series 9000 ColorSight LaserSight ClearSight 9000	
Replacement user interface cover.	60-2620	Series 9000 ColorSight LaserSight ClearSight 9000	

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Torx screw set to prevent tampering of sensor settings (set contains 25 pieces). Requires Torx screwdriver 57-144.	129-135	Series 9000 ColorSight LaserSight ClearSight 9000	
Torx screwdriver	57-144	Series 9000 ColorSight LaserSight ClearSight 9000	
<p>Apertures are used on transmitted beam sensing models to decrease the field of view. This is helpful in applications where small targets must be detected with precision. Note that the sensing range will be reduced by as much as 90% when using apertures. Apertures should be fitted to both the source and receiver models for proper operation. Each kit comes with 20 apertures except as noted.</p>	<b>60-2673 (1 mm)</b> <b>60-2674 (2 mm)</b> <b>60-2675 (4 mm)</b> <b>60-2676 (1, 2, 4 mm)</b> ❶	MiniSight	
	<b>60-2660 (1 mm)</b> <b>60-2661 (2 mm)</b> <b>60-2662 (4 mm)</b> <b>60-2659 (1, 2, 4 mm)</b> ❶	RightSight	
	<b>61-6726 (1 mm)</b> <b>61-6727 (2 mm)</b> <b>61-6728 (3 mm)</b> <b>61-6729 (1x5 mm)</b> ❷	42KB	
Replacement cover and locking clip.	60-2679	MiniSight	

❶ 4 each per kit  
 ❷ 10 pieces per kit

Accessories

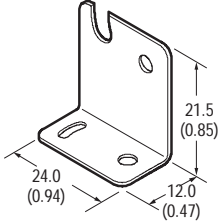
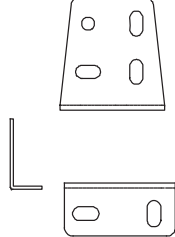
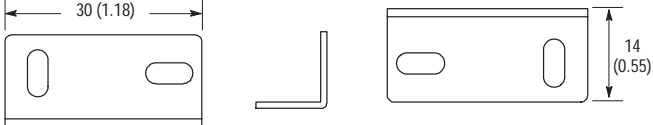
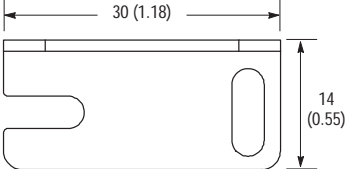
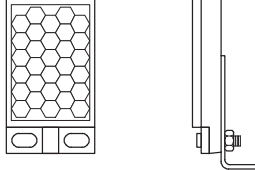
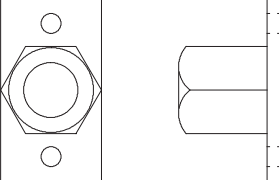
Protective Brackets and Apertures

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Replacement fiber optic retaining clip (set of 5 pieces).	60-2680	MiniSight	 <p>Fiber Retaining Clip</p> <p>Grooved Fiber Optic End Tip</p>
Snap on mirror permits side viewing of targets. Only for retroreflective and transmitted beam sensing models and will reduce sensing range by 30%.	60-2052	Series 6000	
Snap on mirror permits side viewing of targets. Only for retroreflective, diffuse, and transmitted beam sensing models and will reduce sensing range by 30%.	60-1840	Series 5000	
4-pin mini QD receptacle simplifies installation.	60-2668	42BC	
Replacement cover for user interface panel.	60-2669	42BC	
Replacement right angle mounting bracket.	60-2637	42BC	
Replacement mounting bracket side view.	60-2633	42KB	



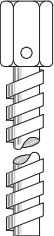
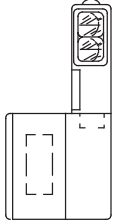
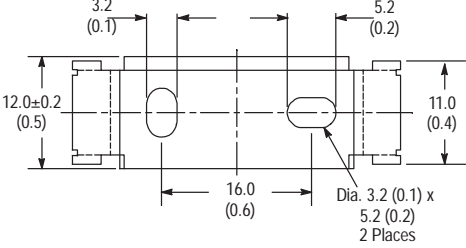
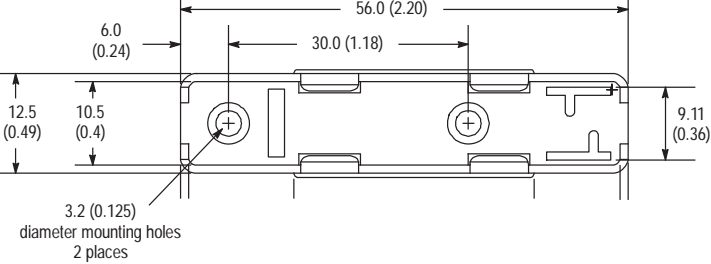
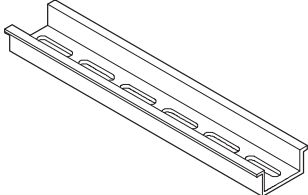
**Accessories**

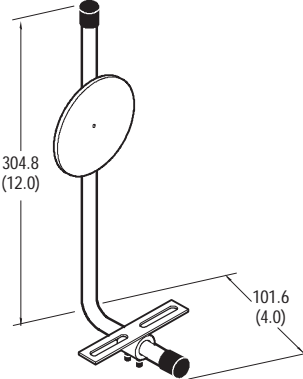
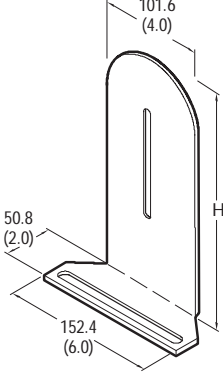
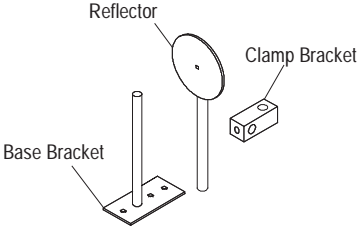
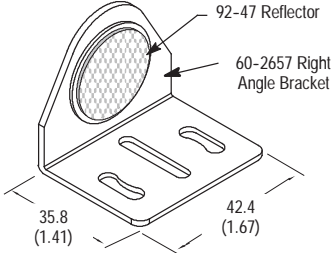
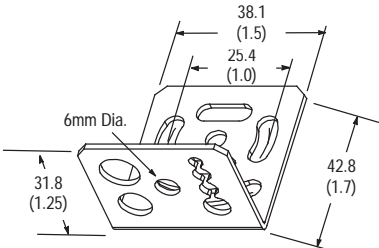
**Protective Brackets and Apertures**

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Replacement mounting bracket end view.	<b>60-2632</b>	42KB	
Replacement mounting bracket.	<b>60-2635</b>	42KC	
Replacement mounting bracket end view.	<b>60-2634</b>	42KC	
Replacement right angle mounting bracket.	<b>60-2636</b>	42BA	
Replacement reflector.	<b>92-93</b>	42KB 42KC	
Conduit mounting adaptor permits connection of sensor to 1/2 in. NPT conduit. Gasketed to maintain NEMA 4 rating.	<b>60-2213</b>	Series 5000	

Accessories

Protective Brackets and Apertures

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
<p>Adaptor contains 3 m (10 ft) or armoured cable to protect PVC cable found on Series 5000 cable style bases.</p>	<p><b>60-1577</b></p>	<p>Series 5000</p>	
<p>Counter/Totalizer module provides reliable high-speed counting capability and six digit, 5 mm high, LCD display. Battery powered for minimum 5 year life.</p>	<p><b>60-2072</b></p>	<p>Series 5000 Green Line</p>	
<p>Replacement adaptor permits mounting of sensor to 35 mm DIN rail.</p>	<p><b>60-2638</b></p>	<p>42FT 45FVL 45FSL</p>	
<p>Replacement adaptor permits mounting of sensor to 35 mm DIN rail.</p>	<p><b>60-2639</b></p>	<p>42FA</p>	
<p>35 mm DIN rail (1 m) for mounting sensor and other control equipment.</p>	<p><b>64-134</b></p>	<p>42FT 45FVL 45FSL</p>	

Description	Cat. No.	Used for	Approximate Dimensions [mm (in.)]
Right angle reflector bracket set for mounting up to 3 in. diameter reflectors.	<b>60-2717</b>	92-39 92-89 92-46 92-47 92-105 92-106	
Reflector vertical height adjustment bracket for mounting up to 3 in. diameter reflectors.	<b>60-2718</b> (2 x 8 in.) <b>60-2719</b> (2 x 10 in.) <b>60-2720</b> (2 x 12 in.)	92-39 92-89 92-46 92-47 92-105 92-106	
Reflector bracket provides both vertical and horizontal height adjustment. Bracket comes with 3 in. reflector Cat. No. 92-39.	<b>60-2685</b>	92-39 92-89 92-46 92-47 92-105 92-106	
Mounting bracket with Cat. No. 92-47 reflector mounted at right angle	<b>60-2692</b>	92-47	
Right angle mounting bracket for both reflectors and fiber optic cables	<b>60-2696</b>	92-105 92-106 92-47 92-46	

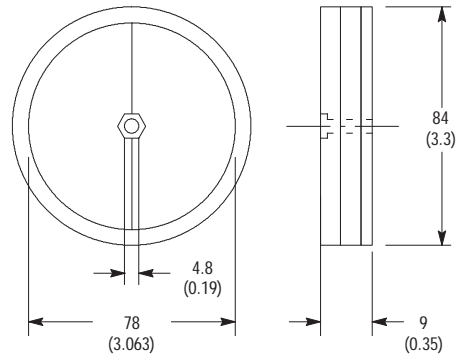
Accessories

Reflectors, Reflective Tape

Specifications

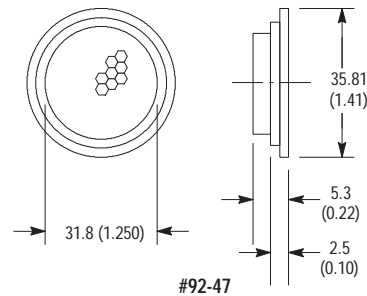
Approximate Dimensions [mm (in.)]

Cat. No.	92-39	92-124
Description	Reflector, 76 mm (3 in.) dia. with center mount hole. (Plastic back) (ABS)	
Suitable for Polarized Sensor	Yes	
Cube Style	Corner cube	
Optimum Range <sup>❶</sup>	150 mm (6 in.)...2 m (80 in.)	
Recommended Application	Suitable for general purpose applications up to 65°C (150°F).	

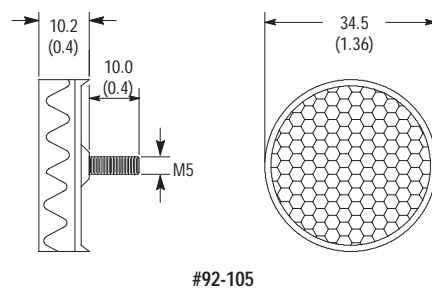


Cat. No.	92-89
Description	Reflector, 76 mm (3 in.) dia. with center mount hole. (Aluminum back)
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>❶</sup>	150 mm (6 in.)...2 m (80 in.)
Recommended Application	Suitable for general purpose applications up to 65°C (150°F).

Cat. No.	92-47
Description	Reflector, 32 mm (1.25 in.) dia. Requires adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>❶</sup>	150 mm (6 in.)...1.5 m (5 ft)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



Cat. No.	92-105
Description	Reflector, 32 mm (1.25 in.) dia. with M5 screw
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>❶</sup>	150 mm (6 in.)...1.5 m (5 ft)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).

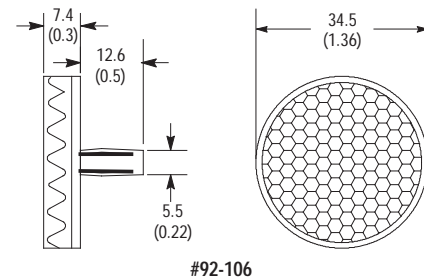


❶ Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.

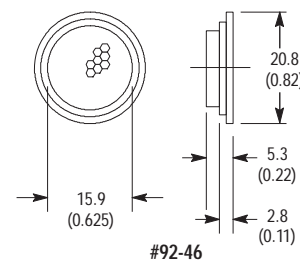
Specifications

Approximate Dimensions [mm (in.)]

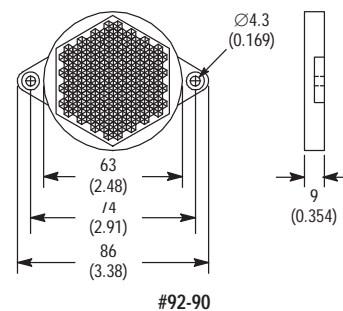
Cat. No.	<b>92-106</b>
Description	Reflector, 32 mm (1.25 in.) dia. with snap fit post
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	150 mm (6 in.)...1.5 m (5 ft)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



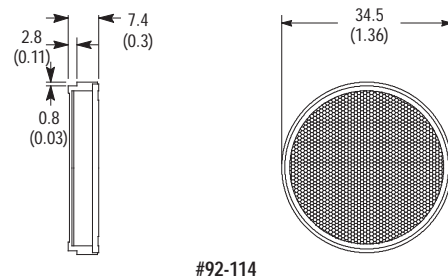
Cat. No.	<b>92-46</b>
Description	Reflector, 16 mm (0.625 in.) dia. Requires adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	51 mm (2 in.)...150 mm (6 in.)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



Cat. No.	<b>92-90</b>
Description	Reflector, 86 mm (3 in.) dia. with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	51 mm (2 in.)...1.5 m (5 ft)
Recommended Application	Suitable for ClearSight photoelectric sensors and general purpose applications up to 65_C (150_F).



Cat. No.	<b>92-114</b>
Description	Reflector, 34 mm (1.35 in.) dia. Requires adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Micro cube
Optimum Range <sup>①</sup>	
Recommended Application	Ideal for laser-based photoelectric sensors such as LaserSight as well as general purpose applications up to 65_C (150_F).



① Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.  
 ② Cat. Nos. 92-47 and 92-46 can be mounted with adhesive tape (not included).

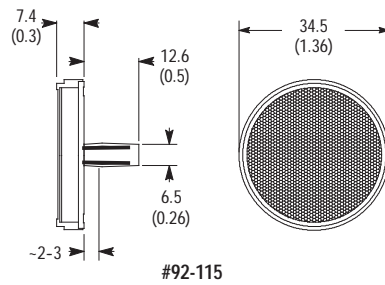
Accessories

Reflectors, Reflective Tape

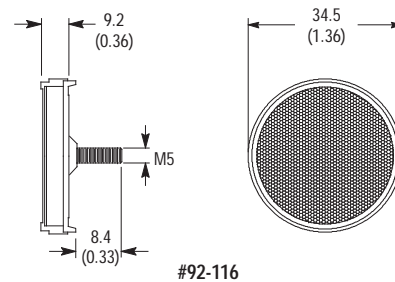
Specifications

Approximate Dimensions [mm (in.)]

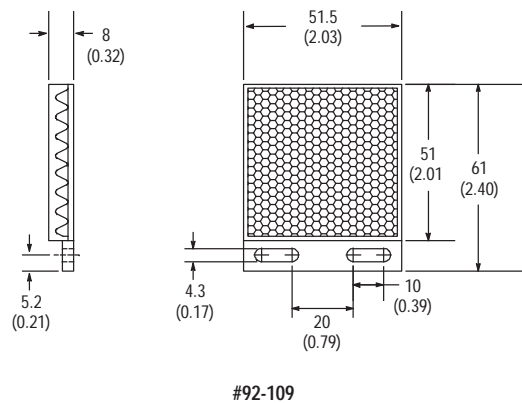
Cat. No.	92-115
Description	Reflector, 34 mm (1.35 in.) dia. with snap fit post.
Suitable for Polarized Sensor	Yes
Cube Style	Micro cube
Optimum Range <sup>❶</sup>	
Recommended Application	Ideal for laser-based photoelectric sensors such as LaserSight as well as general purpose applications up to 65_C (150_F).



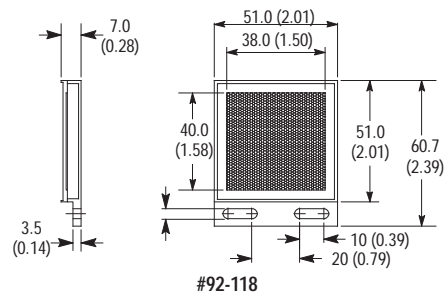
Cat. No.	92-116
Description	Reflector, 34 mm (1.35 in.) dia. with threaded post.
Suitable for Polarized Sensor	Yes
Cube Style	Micro cube
Optimum Range <sup>❶</sup>	
Recommended Application	Ideal for laser-based photoelectric sensors such as LaserSight as well as general purpose applications up to 65_C (150_F).



Cat. No.	92-109
Description	Reflector, 51 x 61 mm (2 x 2.5 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>❶</sup>	51 mm (2 in.)...3.0 m (10 ft)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



Cat. No.	92-118
Description	Reflector, 51 x 61 mm (2 x 2.5 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Micro cube
Optimum Range <sup>❶</sup>	
Recommended Application	Suitable for general purpose applications up to 65_C (150_F). The Cat. No. 92-118 is also suitable for laser-based photoelectric sensors such as LaserSight.



❶ Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.



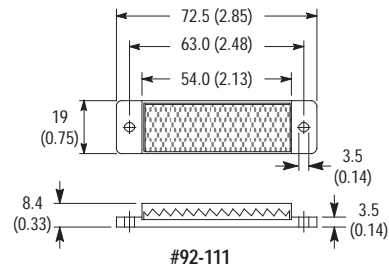
Accessories

Reflectors, Reflective Tape

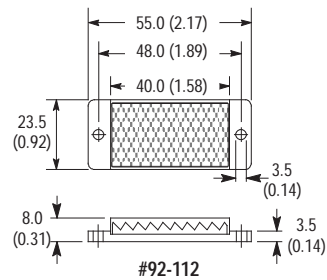
Specifications

Approximate Dimensions [mm (in.)]

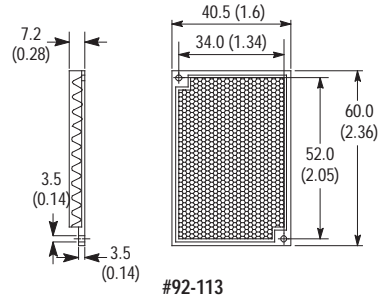
Cat. No.	92-111
Description	Reflector, 19 x 72.5 mm (0.75 x 2.85 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	
Recommended Application	Suitable for general purpose applications up to 55_C (130_F).



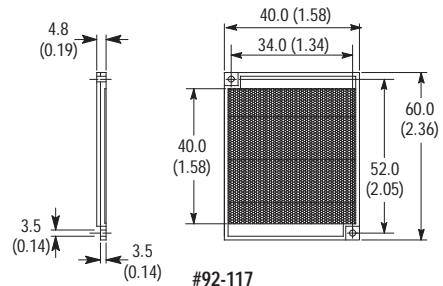
Cat. No.	92-112
Description	Reflector, 23.5 x 55 mm (0.924 x 2.17 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	
Recommended Application	Suitable for general purpose applications up to 55_C (130_F).



Cat. No.	92-113
Description	Reflector, 40.5 x 60 mm (1.6 x 2.36 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	
Recommended Application	Suitable for general purpose applications up to 55_C (130_F).



Cat. No.	92-117
Description	Reflector, 40.5 x 60 mm (1.6 x 2.36 in.) rectangular with mounting tabs.
Suitable for Polarized Sensor	Yes
Cube Style	Micro cube
Optimum Range <sup>①</sup>	
Recommended Application	Suitable for general purpose applications up to 55_C (130_F). The 92-117 is also suited for laser-based photoelectric sensors such as LaserSight.



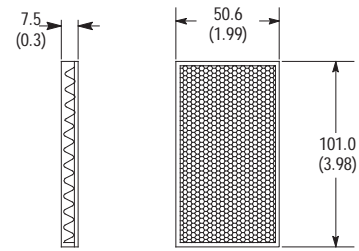
① Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.



Specifications

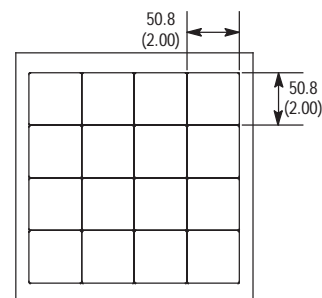
Approximate Dimensions [mm (in.)]

Cat. No.	<b>92-119</b>
Description	Reflector, 51 x 101 mm (2 x 4 in.) rectangular with adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Corner cube
Optimum Range <sup>①</sup>	
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



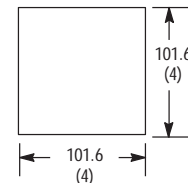
#92-119

Cat. No.	<b>92-97</b>
Description	Reflective tape, 51 mm (2 in.) square, sheet of 16 pieces with adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Glass bead
Optimum Range <sup>①</sup>	150 mm (6 in.)...1.5 m (5 ft)
Recommended Application	Suitable for general purpose applications up to 121_C (250_F). Also suitable for polarized retroreflective sensors.



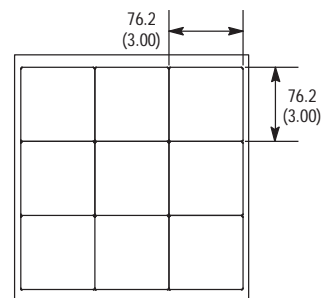
#92-97

Cat. No.	<b>92-91</b>
Description	Reflective metal, 100 x 100 mm (4 x 4 in.) square.
Suitable for Polarized Sensor	No
Cube Style	Glass bead
Optimum Range <sup>①</sup>	150 mm (6 in.)...1.5 m (5 ft)
Recommended Application	The Cat. No. 92-91 is intended for use in high temperature applications up to 480_C (900_F) but not with polarized retroreflective sensors.



#92-91

Cat. No.	<b>92-98</b>
Description	Reflective tape, 76 mm (2.75 in.) square, sheet of 9 pieces with adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Glass bead
Optimum Range <sup>①</sup>	150 mm (6 in.)...1.5 m (5 ft)



#92-98

① Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.

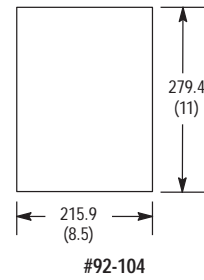
Accessories

Reflectors, Reflective Tape

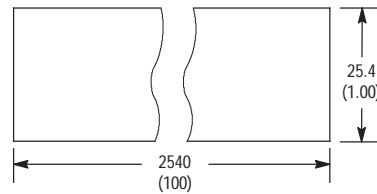
Specifications

Approximate Dimensions [mm (in.)]

Cat. No.	<b>92-104</b>
Description	Reflective tape, 215.9 x 279.4 mm (8.5 x 11 in.) sheet with adhesive backing.
Suitable for Polarized Sensor	Yes
Cube Style	Glass bead
Optimum Range❶	200 mm (8 in.)...1.5 m (5 ft)
Recommended Application	Suitable for general purpose applications up to 60_C (140_F) with polarized retroreflective sensors.



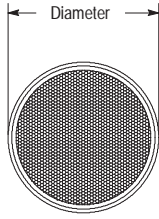
Cat. No.	<b>92-99</b>
Description	Reflective tape, roll of 25 x 2540 mm (1 x 100 in.).
Suitable for Polarized Sensor	Yes
Cube Style	Glass bead
Optimum Range❶	150 mm (6 in.)...1.0 m (40 in.)
Recommended Application	Suitable for general purpose applications up to 65_C (150_F).



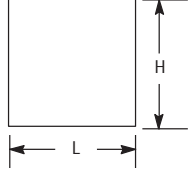
Cat. No.	<b>92-100</b>
Description	Reflective tape, 25 x 2540 mm (1 x 100 in.).
Suitable for Polarized Sensor	No
Cube Style	Glass bead
Optimum Range❶	150 mm (6 in.)...1.0 m (40 in.)
Recommended Application	Suitable for general purpose applications up to 79_C (175_F).

❶ Optimum range varies with sensor optics. See table on page 1-315 for reflectivity performance.

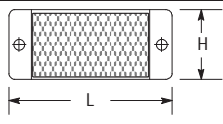
Round Reflectors

Diameter [mm (in.)]	Cube Style	Mounting	Temperature	Approximate Dimensions [mm (in.)]	Cat. No.
76.2 (3)	Corner Cube	Thru-Hole	≤ 65_C (150_F)		92-39
76.2 (3)					92-89
31.75 (1.25)		Adhesive			92-47
31.75 (1.25)		M5 Screw			92-105
31.75 (1.25)		Snap-Fit			92-106
31.75 (1.25)	Micro Cube	Adhesive			92-114
31.75 (1.25)		Snap-Fit			92-115
31.75 (1.25)		M5 Screw			92-116
19.05 (0.75)	Corner Cube	Adhesive			92-46
57.15 (2.25)		Thru-Hole x 2			92-90

Reflective Tape

Length x Height [mm (in.)]	Cube Style	Mounting	Temperature	Approximate Dimensions [mm (in.)]	Cat. No.
50 x 50 (2 x 2) (16 per sheet)	Glass Bead	Adhesive	<121_C (250_F)		92-97
76 x 76 (3 x 3) (9 per sheet)			<60_C (140_F)		92-98
100 x 100 (3.94 x 3.94)			<480_C (900_F)		92-104
2510 x 25 (98.8 x 0.98) (1 roll)			≤ 65_C (150_F)		92-91
			<79_C (175_F)		92-99
				92-100	

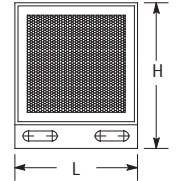
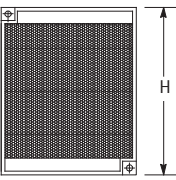
Rectangular Reflectors

Length x Height [mm (in.)]	Cube Style	Mounting	Temperature	Approximate Dimensions [mm (in.)]	Cat. No.	
40.5 x 60 (1.59 x 2.36)	Corner Cube	Thru-Hole x 2	<55_C (130_F)		92-113	
50.6 x 101 (1.99 x 3.98)		Adhesive	<65_C (150_F)		92-119	
18.5 x 120 (0.73 x 4.72)		Thru-Hole x 2		<55_C (130_F)	92-112, 92-111, 92-107	92-107
55 x 23.5 (2.17 x 0.93)					92-112	
72.5 x 19 (2.85 x 0.75)					92-111	
42 x 22 (1.65 x 0.87)					92-93	
				92-113, 92-117, 92-119		

**Accessories**

Reflectors, Reflective Tape

**Square Reflectors**

Length x Height [mm (in.)]	Cube Style	Mounting	Temperature	Approximate Dimensions [mm (in.)]	Cat. No.
100 x 100 (3.94 x 3.94)	Corner Cube	Thru-Hole x 2	≤ 65_C (150_F)	 <p>92-108, 92-117</p>	92-108
51.5 x 61 (2.08 x 2.40)					92-109
40 x 60 (1.57 x 2.36)				Micro Cube	 <p>92-109, 92-118</p>
51 x 60.7 (2.01 x 2.39)	92-118				

For more detailed dimensions, please refer to [www.ab.com/e-tools](http://www.ab.com/e-tools).

**Relative Reflectivity**

Reflectivity varies with distance and with sensor optics. The table below is designed to be used as a comparison between reflectors. The numbers represent a reflectivity at a given range

by a class of sensors relative to the standard 92-39 3 in. round reflector.

The two classes of sensors shown represent optic styles. The standard size optic includes the Series 9000,

10,000, 5000, and 4000.

The miniature optics are used in the smaller sensor families: RightSight<sup>™</sup>, MiniSight<sup>™</sup>, 5000, 6000, and 7000 Series.

Reflector		Standard Polarized Sensors			Miniature Polarized Sensors			Laser-Based Sensors	
		Series 10,000, 9000, 5000, and 4000			RightSight, MiniSight, Series 6000, 7000, and 42xx			LaserSight	
Cat. No.	Description	3.0 m (10 ft)	1.5 m (5 ft)	0.61 m (2 ft)	450 mm (18 in.)	200 mm (8 in.)	100 mm (4 in.)	15.2 m (50 ft)	3.05 m (10 ft)
<b>92-39, 92-89</b>	Reflector, 3 in. round	100	100	100	100	100	100	100	100
<b>92-46</b>	Reflector, 3/4 in. round	—	—	50	50	40	25	—	100
<b>92-47</b>	Reflector, 1 1/4 in. round	—	40	100	100	80	30	—	90
<b>92-90</b>	Reflector, 2 in. hexagon	70	150	150	350	150	200	130	100
<b>92-91</b>	Reflective tape, high temperature	—	—	—	—	—	—	—	—
<b>92-93</b>	Reflector, 3/4 x 1.5 in. rectangular	—	—	50	50	50	25	—	100
<b>92-97</b>	Reflector, 2 in. <sup>2</sup>	—	90	150	200	80	50	—	80
<b>92-98</b>	Reflector, 2 3/4 in. <sup>2</sup>	—	100	150	200	80	50	—	70
<b>92-99</b>	Reflective tape, polarized	—	40	70	100	50	30	—	—
<b>92-100</b>	Reflective tape, nonpolarized	—	—	—	—	—	—	—	—
<b>92-104</b>	Reflective tape, 8.5 x 11 in.	25	50	50	70	30	40	—	70
<b>92-105</b>	Reflector, 1 1/4 in. round	—	40	75	100	120	200	70	90
<b>92-106</b>	Reflector, 1 1/4 in. round	—	40	75	100	120	200	70	90
<b>92-107</b>	Reflector, 3/4 x 4 3/4 in. rectangular	—	50	100	100	60	60	—	110
<b>92-108</b>	Reflector, 4 in. <sup>2</sup> square	250	150	100	120	90	150	—	100
<b>92-109</b>	Reflector, 2 in. <sup>2</sup> square	100	150	100	100	90	150	150	110
<b>92-111</b>	Reflector, 2 x 1, rectangular	20	50	90	100	60	100	—	—
<b>92-112</b>	Reflector, 2.8 x 3/4 in. rectangular	20	60	100	100	60	110	—	100
<b>92-113</b>	Reflector, 1.6 x 2 1/4 in. rectangular	90	115	50	90	50	170	210	110
<b>92-114</b>	Reflector, 1 1/4 in. round	20	70	70	90	20	—	110	110
<b>92-115</b>	Reflector, 1 1/4 in. round	20	70	70	90	20	—	110	110
<b>92-116</b>	Reflector, 1 1/4 in. round	20	70	70	90	20	—	110	110
<b>92-117</b>	Reflector, 1 1/2 x 2 1/4 in. rectangular	30	130	140	200	60	50	30	100
<b>92-118</b>	Reflector, 2 x 2 rectangular	80	70	50	50	30	—	260	90

For more information on the theory of retroreflective sensing, see page 1-22. Some variation may be seen across the reflector. Data was measured with reflector rotating to normalize reflectance.

