

Series 9000 Photoelectric Sensors

Bulletin Numbers 42GDF, 42GDR, 42GLP, 42GRC, 42GRF, 42GRL, 42GRP, 42GRR, 42GRU, 42GSP, 42GTC, 42GTF, 42GTP, 42GTR, 42GTU

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The following laser models are available:

- Polarized retroreflective
- Standard diffuse

Features

The Series 9000™ Photoelectric Sensors include the following features:

- Extended sensing range for maximum application flexibility
- Class 1 laser models ideal for the detection of small parts
- DC (PNP and NPN) and AC/DC (relay output, solid-state) models
- Time delay models
- Dual (NPN and PNP) output models
- IP69K, IP67 with 1200 psi, NEMA, and ECOLAB rated enclosures

Available Models

The following standard models are available:

- Retroreflective
- Polarized retroreflective
- Clear object detection
- Diffuse
- Transmitted beam
- Large aperture fiber-optic
- Small aperture fiber-optic

Table 1 - Specifications for All Models

Certifications	c-UL-us Listed, CSA Certified, and CE Marked for all applicable directives
Shock	30 g with 1 ms pulse duration, meets or exceeds IEC 60947-5-2
Vibration	10...55 Hz, 1 mm amplitude, meets or exceeds IEC 60947-5-2
Environmental	
Enclosure type rating	IP69K, IP67 with 1200 psi; NEMA 3, 4X, 6P, 12, 13; ECOLAB rated
Relative humidity	5...95%
Ambient light immunity	Incandescent light 5000 lux
Electrical	
Operating voltage	See Table 7 on page 3
Mechanical	
Housing material	Valox®
Lens material	Acrylic
Connection type	See Table 7 .



Table 2 - Specifications for Standard Models

Environmental	
Operating temperature	-34...+70 °C (-29...+158 °F)
User Interface	
Indicator LED	See Table 9 .
Electrical	
Current consumption	30 mA max
Protection type	Short circuit, reverse polarity, false pulse, overload
Outputs	
Output type	See Table 7 .
Output function	Selectable light or dark operate
Load current	250 mA @ 30V DC (all models except 42GLP and 42GSP); 2 A @ 132V AC and 1 A @ 264V AC (SPDT relay models); 300 mA @ 264V AC (MOSFET models)

Table 3 - Specifications for Laser Models

Environmental	
Operating temperature	-10...+50 °C (-14...+122 °F)
Electrical	
Current consumption	45 mA max. (DC models), 10 mA max. (AC/DC models), 70 mA max. (AC models)
Protection type	Overload and short circuit (DC models), reverse polarity, false pulse
Outputs	
Output type	See Table 7 .
Output function	Selectable light or dark operate
Leakage current	10 µA max (DC models)

Table 4 - Specifications for Diagnostic Models

Environmental	
Operating temperature	0...70 °C (32...158 °F)
User Interface	
Indicator LED	See Table 9 .
Electrical	
Protection type	Short circuit, reverse polarity, false pulse, overload
Outputs	
Output type	See Table 7 .
Output function	Selectable light or dark operate
Load current	100 mA max. at 30V DC, 2 A at 132V (AC/DC sensor and diagnostic), 11 A at 264V (AC/DC sensor and diagnostic)

Optical and Response Time Characteristics

Table 5 - Optical and Response Time Characteristics—Standard, Diagnostic, and Intrinsically Safe Transmitted Beam Models

Attribute	Sensing Mode					
	Retroreflective	Polarized Retroreflective	Diffuse	Transmitted Beam	Small Aperture Fiber-optic	Large Aperture Fiber-optic
Field of view	1.5°		3.5° for 1.5 m (4.92 ft) 6.5° for 3 m (9.8 ft) and 4 m (13 ft) range	1.5°	Depends on fiber-optic cable	
Light source	Visible red 660 nm					Infrared 880 nm
Response time	2 ms (DC), SPDT EM Relay (15 ms), 2 ms (MOSFET AC/DC)					

Table 6 - Optical and Response Time Characteristics—Laser Models

Attribute	Sensing Mode	
	Polarized Retroreflective	Diffuse
Spot size	20 x 25 mm (0.98 in.) at 40 m (131.23 ft)	2 x 3.5 mm (0.14 in.) at 800 nm
Response time	0.5 ms	

Table 7 - Product Selection

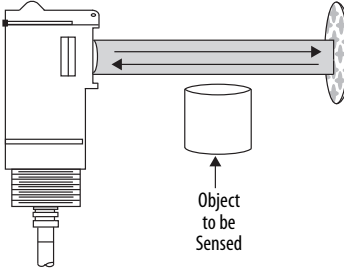
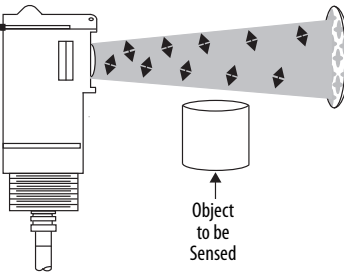
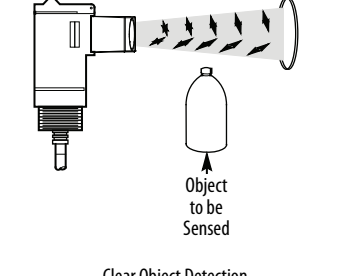
Sensing Mode	Operating Voltage	Light Source	Sensing Distance	Output Type	Sensor Type	Cat. No. ⁽²⁾
 <p>Retroreflective</p>	10...30V DC	Visible red 660 nm	0.050...9.1 m (0.16...30 ft)	PNP and NPN	Standard On/Off	42GRU-9000-QD
	10...55V DC; 20...40V AC			NPN and PNP	Timing	42GTU-9000-QD
				70...264V AC/DC	SPDT EM Relay	Standard On/Off
	Timing					42GTU-9001-QD
	N-MOSFET				Standard On/Off	42GRU-9002-QD
					Timing	42GTU-9002-QD
Standard On/Off	42GRU-9003-QD					
Timing	42GTU-9003-QD					
 <p>Polarized Retroreflective</p>	10...30V DC	Infrared 660 nm	0.050...4.9 m (0.16...16 ft)	NPN and PNP	Standard On/Off	42GRU-9200-QD
	10...55V DC; 20...40V AC			Timing	42GTU-9200-QD	
				70...264V AC/DC	SPDT EM Relay	Standard On/Off
	Timing					42GTU-9201-QD
	Standard On/Off	42GRU-9202-QD				
	Timing	42GTU-9202-QD				
	N-MOSFET	Standard On/Off	42GRU-9203-QD			
		Timing	42GTU-9203-QD			
	10...30V DC	Class 1 Laser	0.3...40 m (1...130 ft)	NPN and PNP (DC only), EM relay	Standard On/Off	42GRU-92L0-QD
	105...132V AC			SPDT EM Relay	Standard On/Off	42GRU-92L2-QD
 <p>Clear Object Detection</p>	10...30V DC	Visible red 660 nm	0.050...1.2 m (0.16...4 ft)	NPN and PNP	Standard On/Off	42GRC-9200-QD
	70...264V AC/DC			SPDT EM Relay	Timing	42GTC-9200-QD
					Standard On/Off	42GRC-9202-QD
	N-MOSFET			Timing	42GTC-9202-QD	
				Standard On/Off	42GRC-9203-QD	
	Timing			42GTC-9203-QD		

Table 7 - Product Selection

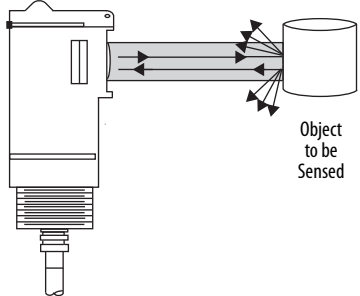
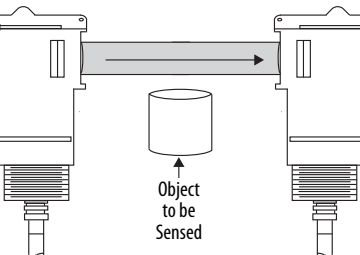
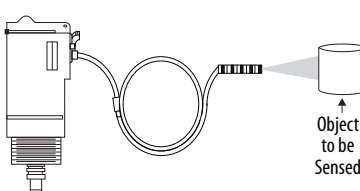
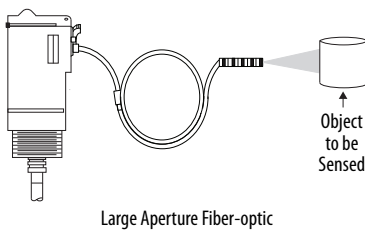
Sensing Mode	Operating Voltage	Light Source	Sensing Distance	Output Type	Sensor Type	Cat. No. ⁽²⁾
 <p>Diffuse</p>	10...30V DC	Visible red 660 nm	0.050...1.5 m (0.16...5 ft)	NPN and PNP	Standard On/Off Linear Adjustment	42GLP-9000-QD
	10...55V DC; 20...40V AC				Standard On/Off Teach Push Button	42GSP-9000-QD
					Standard On/Off	42GRP-9000-QD
				Timing	42GTP-9000-QD	
	70...264V AC/DC			SPDT EM Relay	Standard On/Off	42GRP-9001-QD
					Timing	42GTP-9001-QD
		Standard On/Off	42GRP-9002-QD			
	10...30V DC	Class 1 Laser	1...800 mm (0.03...31.5 in.)	NPN and PNP	Standard On/Off	42GRP-92L0-QD
					SPDT EM Relay	42GRP-92L2-QD
	10...30V DC	Infrared 880 nm	0.050...3.04 m (0.16...10 ft)	NPN and PNP	Standard On/Off	42GRP-9040-QD
					Timing	42GTP-9040-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard On/Off	42GRP-9041-QD
Timing					42GTP-9041-QD	
70...264V AC/DC	Standard On/Off			42GRP-9042-QD		
	Timing			42GTP-9042-QD		
70...264V DC; 40...264V AC	N-MOSFET	Standard On/Off	42GRP-9043-QD			
Timing	42GTP-9043-QD					
10...30V DC		0.050...4.2 m (0.16...14 ft)	NPN and PNP	Standard On/Off	42GRP-9070-QD	
70...264V AC/DC		50.8 mm...4.2 m (2 in...14 ft)	SPDT EM Relay	Standard On/Off	42GRP-9072-QD	
 <p>Transmitted Beam</p>	10...30V DC	Infrared 880 nm	0.025...61 m (0.83...200 ft)	— (Emitter) ⁽¹⁾	—	42GRL-9000-QD
	10...55V DC; 20...40V AC		0.025...152 m (0.83...500 ft)			42GRL-9040-QD
			70...264V AC/DC	Depends on Transmitted Beam Emitter	NPN and PNP	Standard On/Off
	Timing					42GTR-9000-QD
	Diagnostic					42GDR-9000-QD
	70...264V AC/DC		SPDT EM Relay	Standard On/Off	42GRR-9001-QD	
				Timing	42GTR-9002-QD	
	N-MOSFET	Standard On/Off	42GRR-9003-QD			
	Timing	42GTU-9203-QD				
 <p>Small Aperture Fiber-optic</p>	10...30V DC	Visible red 660 nm	Depends on fiber-optic cable	NPN and PNP	Standard On/Off	42GRF-9100-QD
	10...55V DC; 20...40V AC				Timing	42GTF-9100-QD
				70...264V AC/DC	SPDT EM Relay	Standard On/Off
	Timing					42GTF-9101-QD
				Standard On/Off	42GRF-9102-QD	
				Timing	42GTF-9102-QD	
	N-MOSFET	Standard On/Off	42GRF-9103-QD			
	Timing	42GTF-9103-QD				

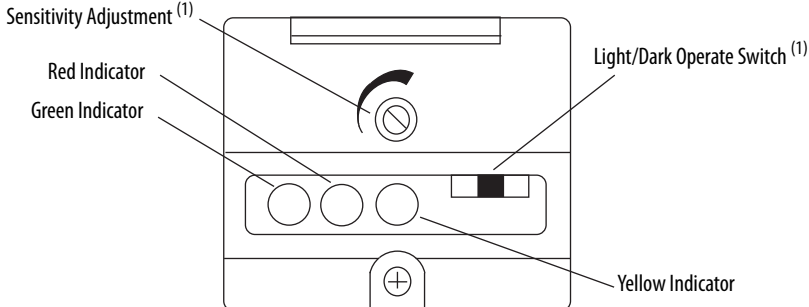
Table 7 - Product Selection

Sensing Mode	Operating Voltage	Light Source	Sensing Distance	Output Type	Sensor Type	Cat. No. ⁽²⁾
 <p>Large Aperture Fiber-optic</p>	10...30V DC	Infrared 880 nm	Depends on fiber-optic cable	NPN and PNP	Standard On/Off	42GRF-9000-QD
	10...55V DC; 20...40V AC				Timing	42GTF-9000-QD
					Diagnostic	42GDF-9000-QD
				70...264V AC/DC	Standard On/Off	42GRF-9001-QD
	Timing				42GTF-9001-QD	
	Standard On/Off				42GRF-9002-QD	
	N-MOSFET			Timing	42GTF-9002-QD	
				Standard On/Off	42GRF-9003-QD	
				Timing	42GTF-9003-QD	
Recommended DC micro (M12) quick-disconnect cordset, straight, 4-pin, 2 m (6.56 ft)						889D-F4AC-2
Recommended DC pico (M8) quick-disconnect cordset, straight, 4-pin, 2 m (6.56 ft)						889D-F4AB-2

- (1) SPDT EM Relay with N.O. and N.C. outputs for diagnostic models.
 (2) Connection Options: The -QD suffix describes a 4-pin DC micro (M12) integral QD for DC models, a 5-pin mini QD for SPDT EM Relay models and a 4-pin mini (M12) integral QD for N-MOSFET models. For additional connection options:
 - Remove the -QD suffix for a 2 m (6.56 ft) cable without QD (Example: 42GRU-9200).
 - For NPN and PNP models replace the -QD suffix with a -QD1 for a 4-pin mini-integral QD (for example, 42GRU-9200-QD1). For N-MOSFET models, replace the -QD suffix with a -QD1 for a 4-pin AC micro (M12) integral QD (for example, 42GRU-9203-QD1).
 - Refer to www.ab.com/e-tools for available connection options in 600V 2 m (6.56 ft) cables.
 - Diagnostic models are only available with QD options.

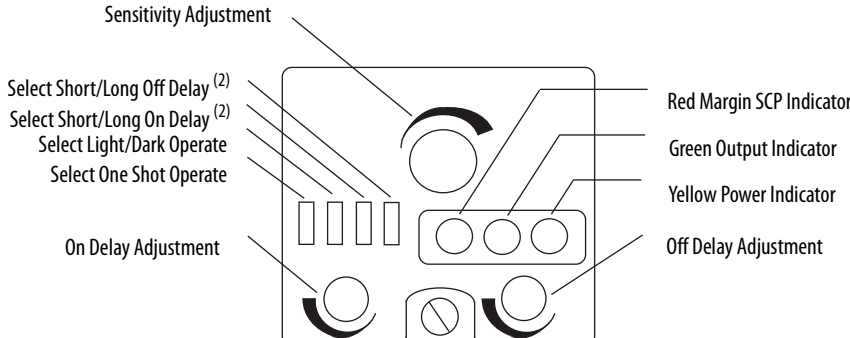
User Interface Panels

Table 8 - User Interface Panel—Standard Sensors

42GRx Versions — Top View Detail	LED Color	State	Status
	Red	Off	Margin < 2.5X
		On	Margin > 2.5X
	Green	Off	Output is de-energized
		On	Output is energized
	Yellow	Off	Power is off
		On	Power is on

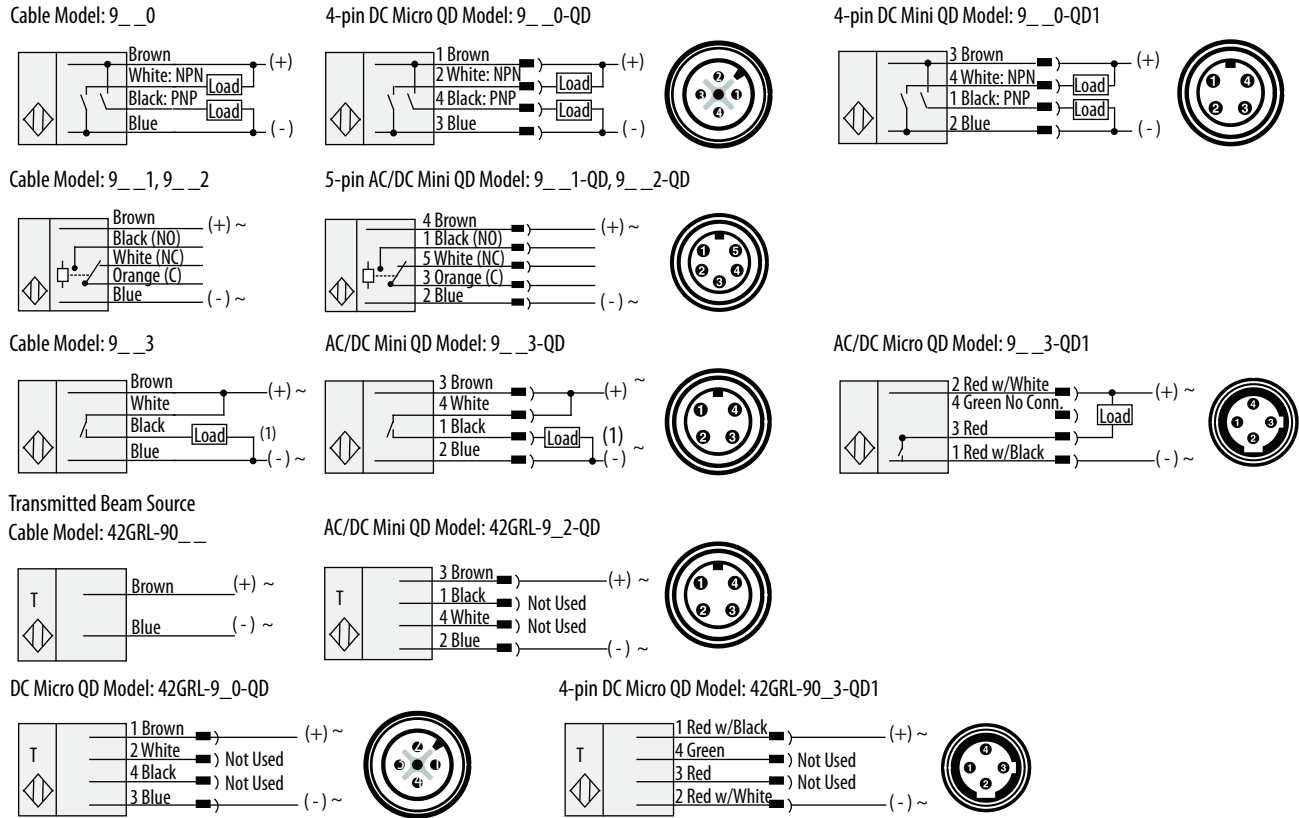
(1) Transmitted beam receivers do not have a flashing (low margin) state.

Table 9 - User Interface Panel—Time Delay Sensors

42GTx Versions — Top View Detail	LED Color	State	Status
	Red	Off	Margin < 2.5X
		On	Margin > 2.5X
	Green	Off	Output is de-energized
		On	Output is energized
	Yellow	Off	Power is off
		On	Power is on

(2) The sensors timing can be set as short (0...1.5 s) or long (0...15 s).

Figure 1 - Wiring Diagrams—Standard and Laser Models



(1) Load can be placed on either black wire to create sourcing or on white wire to create sinking.

IMPORTANT Do not connect an NPN and PNP load simultaneously.

Approximate Dimensions

Figure 2 - All Versions except Fiber-optic [mm (in.)]

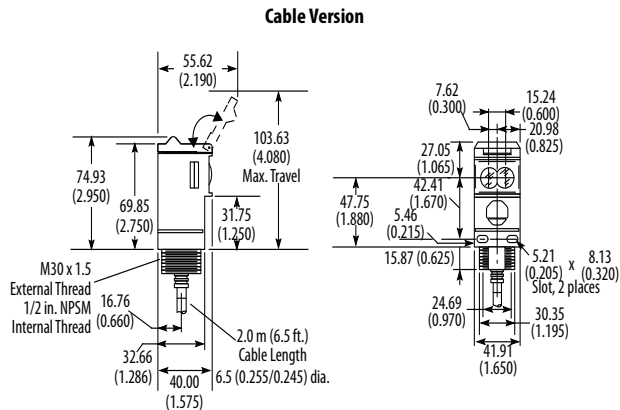


Figure 3 - Fiber-optic Versions [mm (in.)]

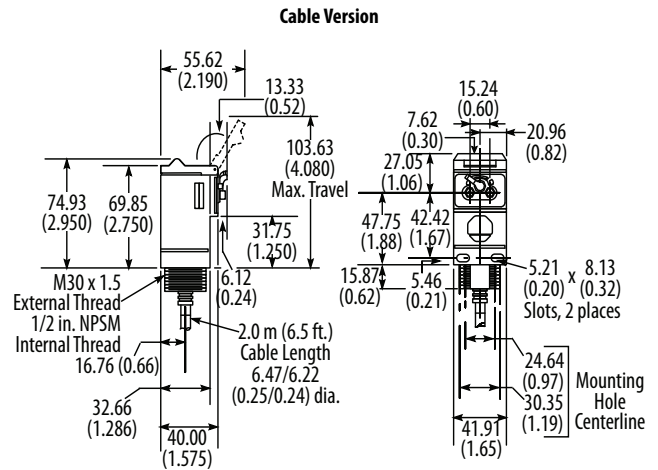


Figure 4 - ClearSight™ 9000 [mm (in.)]

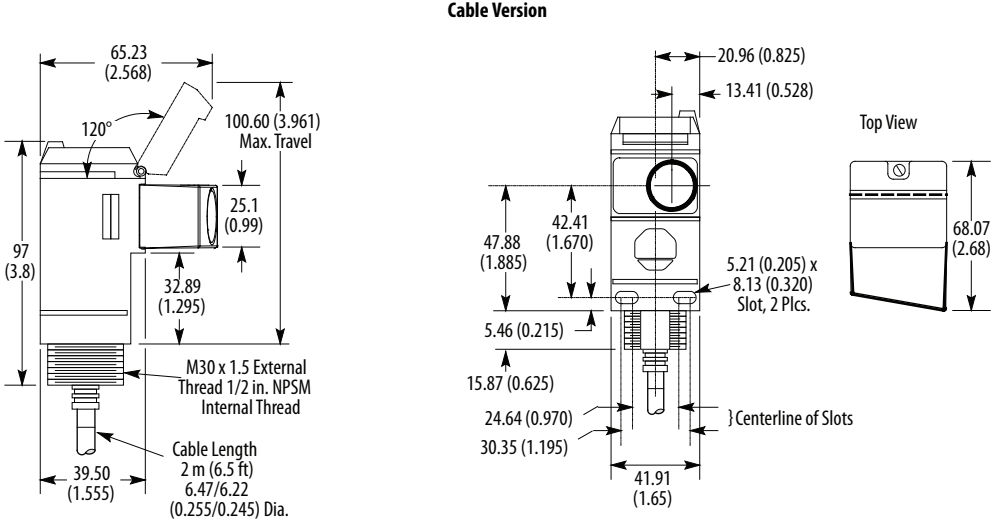


Figure 5 - Approximate Dimensions—Connector Version

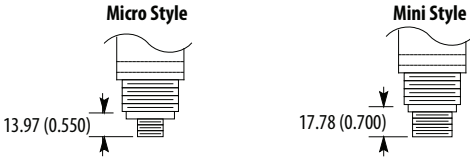
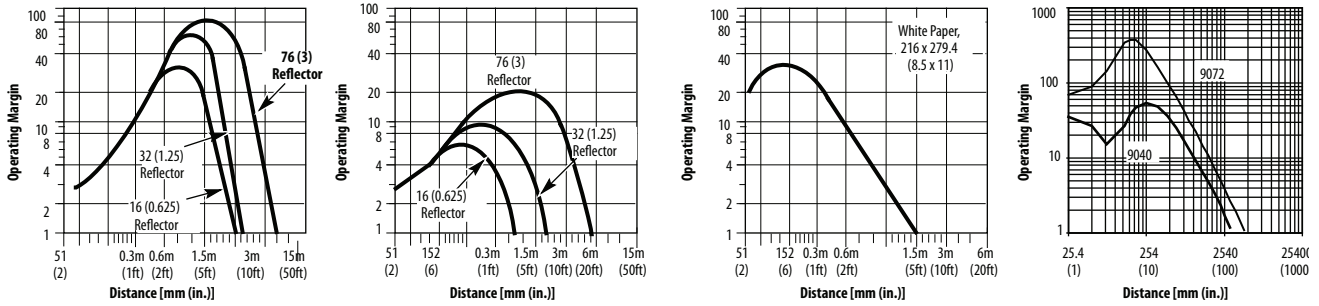


Table 10 - Thread Sizes

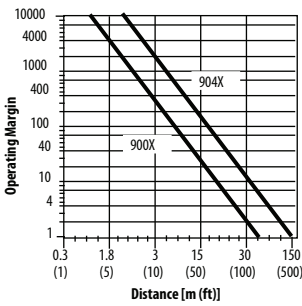
	AC	DC
Micro Style	1/2-20 UNF 2 Keyways	M12 x 1 1 Keyway
Mini Style	7/8-16 UN 1 Keyway	

Typical Response Curves

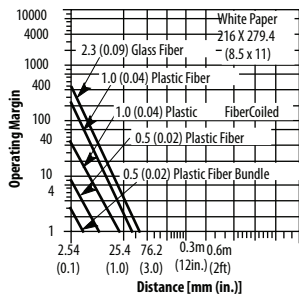
Figure 6 - Typical Response Curves—Non Clear Object Detection Versions



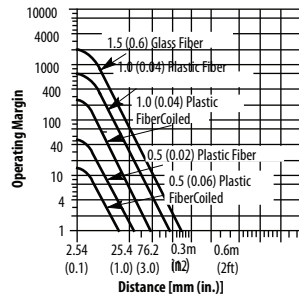
Transmitted Beam with 61m (200ft) Light Source



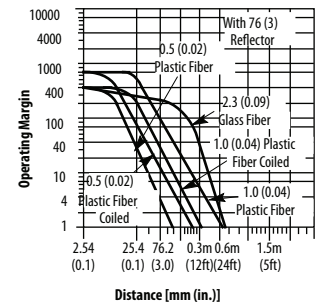
Visible Red Fiber Optic Standard Diffuse



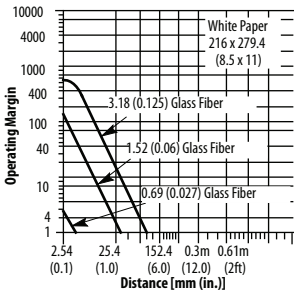
Visible Red Fiber Optic Transmitted Beam



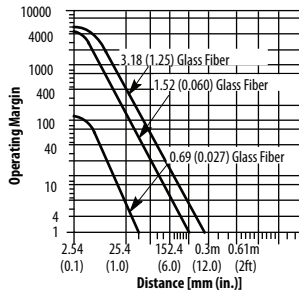
Small Aperture Fiber Optic Retroreflective



Large Aperture Fiber Optic Standard Diffuse



Large Aperture Fiber Optic Transmitted Beam



Large Aperture Fiber Optic Retroreflective

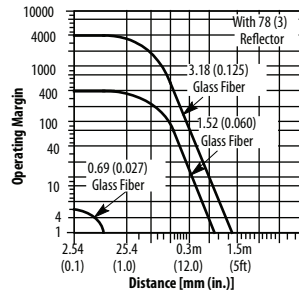


Figure 7 - Typical Response Curves—Clear Object Detection Versions

Clear Object

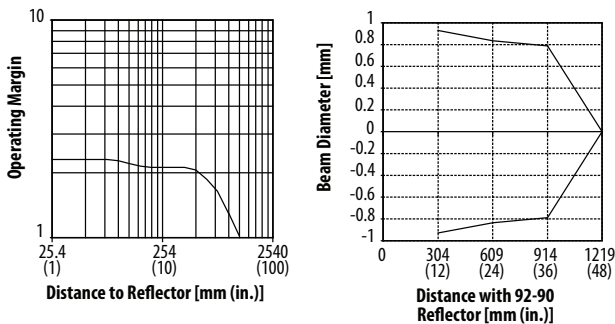


Table 11 - Cordsets and Accessories

Description	Cat. No.
AC micro QD cordset, straight, 4-pin, 2 m (6.5 ft)	889D-F4AEA-2
1.8 m (6 ft) 5-pin, mini QD cordset	889N-F5AF-6F
2 m (6 ft) 4-pin, mini QD cordset	889N-F4AF-6F
30 mm swivel/tilt Mounting Bracket	60-2439
Mounting Bracket, Heavy-Duty Impact	60-2702
Spare reflector, corner cube, 76 mm (3 in.) diameter with mounting hole	92-39
Spare reflector, corner cube, 32 mm (1.25 in.) diameter with mounting hole	92-47
Extended range lens assembly-260 °C (500 °F)	60-1844
Extended range lens assembly-260 °C (500 °F)	60-2559
Fiber-optic cable lens extender	60-2738

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

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