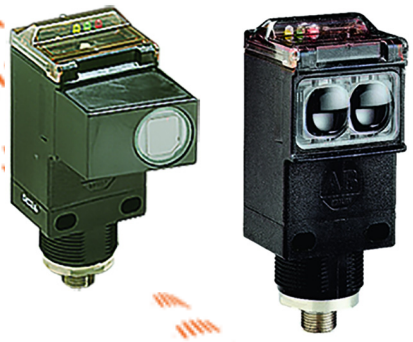
Technical Data

Original Instructions

Series 9000 Photoelectric Sensors Specifications

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



Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated Polarized Retroreflective light source in Table 7.	3

Product Overview

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

The following laser models are available:

- Polarized retroreflective
- Standard diffuse

Specifications

Table 1 - All Models

Attribute	Value
Certifications	cULus 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	
Material	• Housing: Valox® • Lens: Acrylic
Connection type	See Table 7 on page 3.

Table 2 - Standard Models

Attribute	Value
Environmental	
Operating temperature	-34…+70 °C (-29…+158 °F)
User Interface	
Status indicator	See Table 9 on page 5.
Electrical	
Current consumption	30 mA max
Protection type	• Short circuit • Reverse polarity • False pulse • Overload
Outputs	
Output type	See Table 7 on page 3.
Output function	Selectable light or dark operate
Load current	• 250 mA at 30V DC (all models except 42GLP and 42GSP) • 2 A at 132V AC and 1 A at 264V AC (SPDT relay models) • 300 mA at 264V AC (MOSFET models)

Table 3 - Laser Models

Attribute	Value
Environmental	
Operating temperature	-10…+50 °C (-14…+122 °F)
Electrical	
Current consumption	• DC models: 45 mA max • AC/DC models: 10 mA max • AC models: 70 mA max
Protection type	• Overload and short circuit (DC models) • Reverse polarity • False pulse
Outputs	
Output type	See Table 7 on page 3.
Output function	Selectable light or dark operate
Leakage current	10 µA max (DC models)

Table 4 - Diagnostic Models

Attribute	Value
Environmental	
Operating temperature	0…70 °C (32…158 °F)
User Interface	
Status indicator	See Table 9.
Electrical	
Protection type	• Short circuit • Reverse polarity • False pulse • Overload
Outputs	
Output type	See Table 7 on page 3.
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	

Product Selection

Table 7 - Product Selection

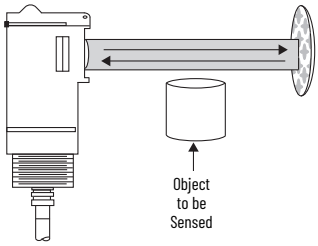
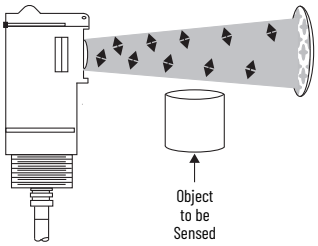
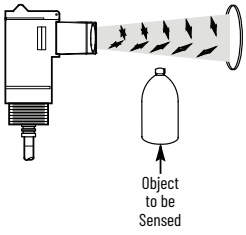
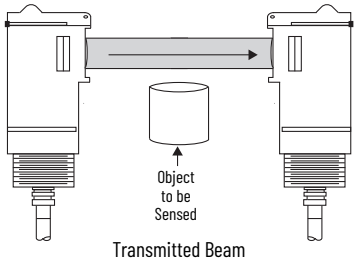
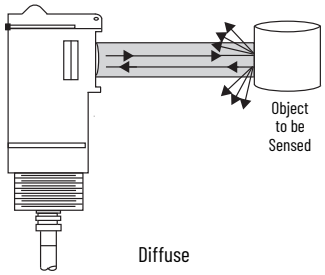
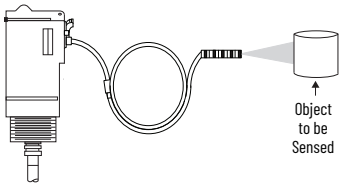
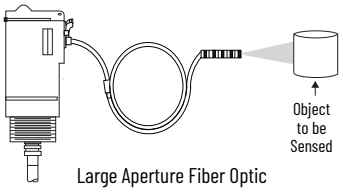
Sensing Mode	Operating Voltage	Light Source	Sensing Distance	Output Type	Sensor Type	Cat. No. [1]
 Retroreflective	10...30V DC	Visible red 660 nm	0.050...9.1 m (0.16...30 ft)	PNP and NPN	Standard ON/OFF	42GRU-9000-QD
				NPN and PNP	Timing	42GTU-9000-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRU-9001-QD
					Timing	42GTU-9001-QD
	70...264V AC/DC				Standard ON/OFF	42GRU-9002-QD
					Timing	42GTU-9002-QD
				N-MOSFET	Standard ON/OFF	42GRU-9003-QD
					Timing	42GTU-9003-QD
 Polarized Retroreflective	10...30V DC	Visible red 660 nm	0.050...4.9 m (0.16...16 ft)	NPN and PNP	Standard ON/OFF	42GRU-9200-QD
					Timing	42GTU-9200-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRU-9201-QD
					Timing	42GTU-9201-QD
	70...264V AC/DC				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
 Clear Object Detection	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
					Timing	42GTC-9200-QD
	70...264V AC/DC			SPDT EM Relay	Standard ON/OFF	42GRC-9202-QD
					Timing	42GTC-9202-QD
				N-MOSFET	Standard ON/OFF	42GRC-9203-QD
					Timing	42GTC-9203-QD
 Transmitted Beam	10...30V DC	Infrared 880 nm	0.025...61 m (0.83...200 ft)	– (Emitter) [2]	–	42GRL-9000-QD
			0.025...152 m (0.83...500 ft)			42GRL-9040-QD
			Depends on Transmitted Beam Emitter	NPN and PNP	Standard ON/OFF	42GRR-9000-QD
					Timing	42GTR-9000-QD
					Diagnostic	42GDR-9000-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRR-9001-QD
					Standard ON/OFF	42GRR-9002-QD
					Timing	42GTR-9002-QD
	70...264V AC/DC			N-MOSFET	Standard ON/OFF	42GRR-9003-QD
			0.050...4.9 m (0.16...16 ft)		Timing	42GTU-9203-QD

Table 7 - Product Selection (Continued)

Sensing Mode	Operating Voltage	Light Source	Sensing Distance	Output Type	Sensor Type	Cat. No. (1)
 Diffuse	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
					Standard ON/OFF Teach Push Button	42GSP-9000-QD
					Standard ON/OFF	42GRP-9000-QD
					Timing	42GTP-9000-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRP-9001-QD
					Timing	42GTP-9001-QD
	70...264V AC/DC				Standard ON/OFF	42GRP-9002-QD
					Timing	42GTP-9002-QD
				N-MOSFET	Standard ON/OFF	42GRP-9003-QD
					Timing	42GTP-9003-QD
	10...30V DC	Class 1 Laser	1...800 mm (0.03...31.5 in.)	NPN and PNP	Standard ON/OFF	42GRP-92L0-QD
	105...132V AC			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
 Small Aperture Fiber Optic	10...30V DC	Visible red 660 nm	Depends on fiber-optic cable	NPN and PNP	Standard ON/OFF	42GRF-9100-QD
					Timing	42GTF-9100-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRF-9101-QD
					Timing	42GTF-9101-QD
	70...264V AC/DC				Standard ON/OFF	42GRF-9102-QD
					Timing	42GTF-9102-QD
				N-MOSFET	Standard ON/OFF	42GRF-9103-QD
					Timing	42GTF-9103-QD
 Large Aperture Fiber Optic	10...30V DC	Infrared 880 nm	Depends on fiber-optic cable	NPN and PNP	Standard ON/OFF	42GRF-9000-QD
					Timing	42GTF-9000-QD
					Diagnostic	42GDF-9000-QD
	10...55V DC; 20...40V AC			SPDT EM Relay	Standard ON/OFF	42GRF-9001-QD
					Timing	42GTF-9001-QD
	70...264V AC/DC				Standard ON/OFF	42GRF-9002-QD
					Timing	42GTF-9002-QD
				N-MOSFET	Standard ON/OFF	42GRF-9003-QD
					Timing	42GTF-9003-QD
Recommended DC micro (M12) quick-disconnect cordset, straight, 4-pin, 2 m (6.6 ft)						889D-F4AC-2
Recommended DC pico (M8) quick-disconnect cordset, straight, 4-pin, 2 m (6.6 ft)						889D-F4AB-2

(1) 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 (6.6 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).
- See ProposalWorks™ for available connection options in 600V 2 m (6.6 ft) cables.
- Diagnostic models are only available with QD options.

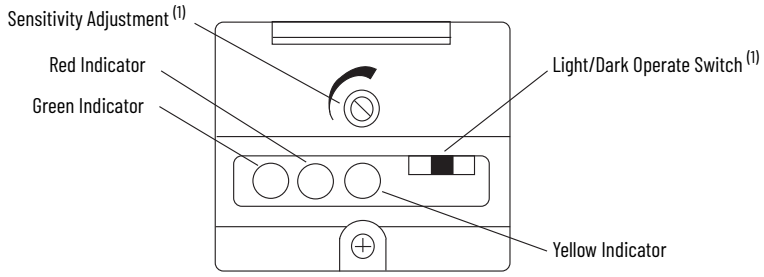
(2) SPDT EM Relay with N.O. and N.C. outputs for diagnostic models.

Cordsets and Accessories

Description		Cat. No.
Cordsets	AC micro QD, straight, 4-pin, 2 m (6.5 ft)	889D-F4AEA-2
	Mini QD, 1.8 m (6 ft) 5-pin	889N-F5AF-6F
	Mini QD, 2 m (6 ft) 4-pin	889N-F4AF-6F
Mounting bracket	30 mm (1.2 in.) swivel/tilt	60-2439
	Heavy-duty impact	60-2702
Spare reflector, corner cube	76 mm (3 in.) diameter with mounting hole	92-39
	32 mm (1.25 in.) diameter with mounting hole	92-47
Extended range lens assembly [260 °C (500 °F)]		60-1844
		60-2559
Fiber-optic cable lens extender		60-2738

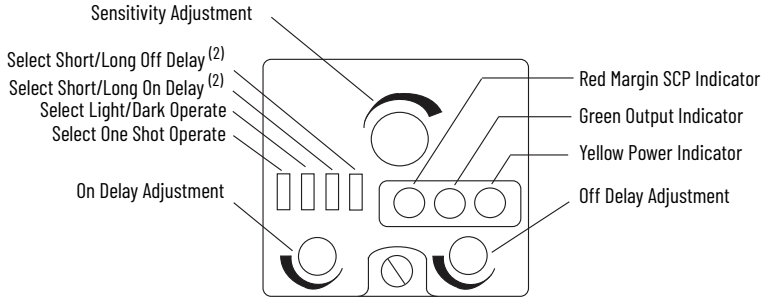
Sensor User Interface

Table 8 - Standard Sensors

42GRx Versions — Top View Detail	Status Indicator 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 - Time Delay Sensors

42GTx Versions — Top View Detail	Status Indicator 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

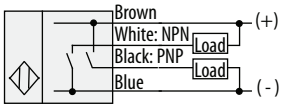
(2) The sensors timing can be set as short (0…1.5 s) or long (0…15 s).

Wiring Diagrams

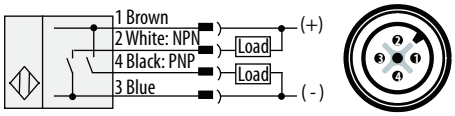
IMPORTANT Do not connect an NPN and PNP load simultaneously.

Figure 1 - Standard and Laser Models

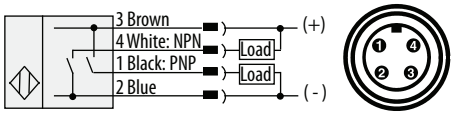
Cable Model: 9_ _0



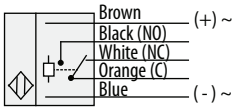
4-pin DC Micro QD Model: 9_ _0-QD



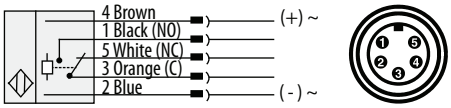
4-pin DC Mini QD Model: 9_ _0-QD1



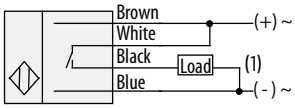
Cable Model: 9_ _1, 9_ _2



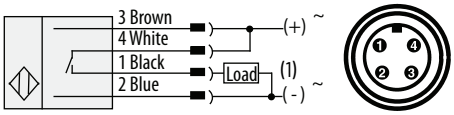
5-pin AC/DC Mini QD Model: 9_ _1-QD, 9_ _2-QD



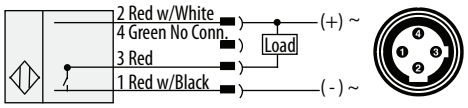
Cable Model: 9_ _3



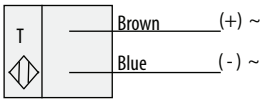
AC/DC Mini QD Model: 9_ _3-QD



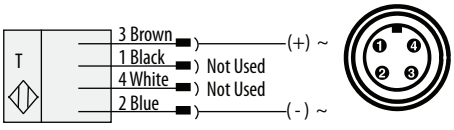
AC/DC Micro QD Model: 9_ _3-QD1



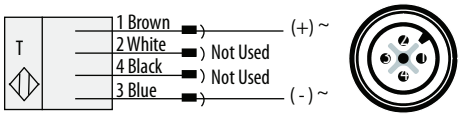
Transmitted Beam Source
Cable Model: 42GRL-90_ _



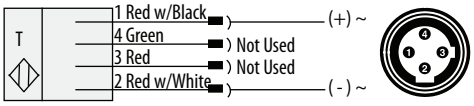
AC/DC Mini QD Model: 42GRL-9_2-QD



DC Micro QD Model: 42GRL-9_0-QD



4-pin DC Micro QD Model: 42GRL-90_3-QD1



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

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.

Figure 2 - All Versions (Except Fiber Optic) — Cable Version

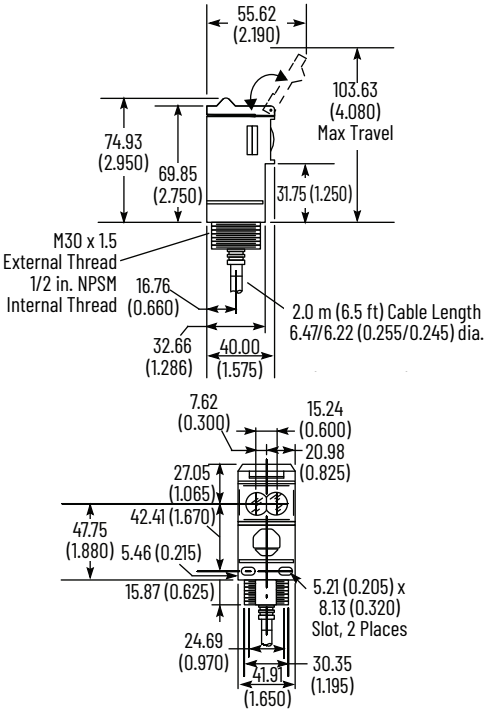


Figure 3 - Fiber-optic Versions — Cable Version

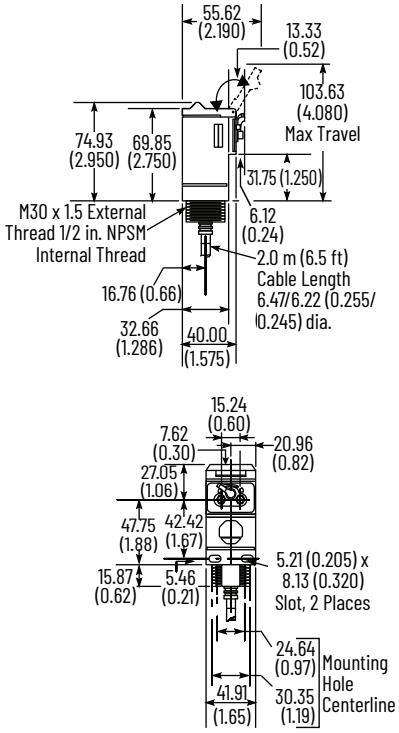


Figure 4 - ClearSight™ 9000 Sensor — Cable Version

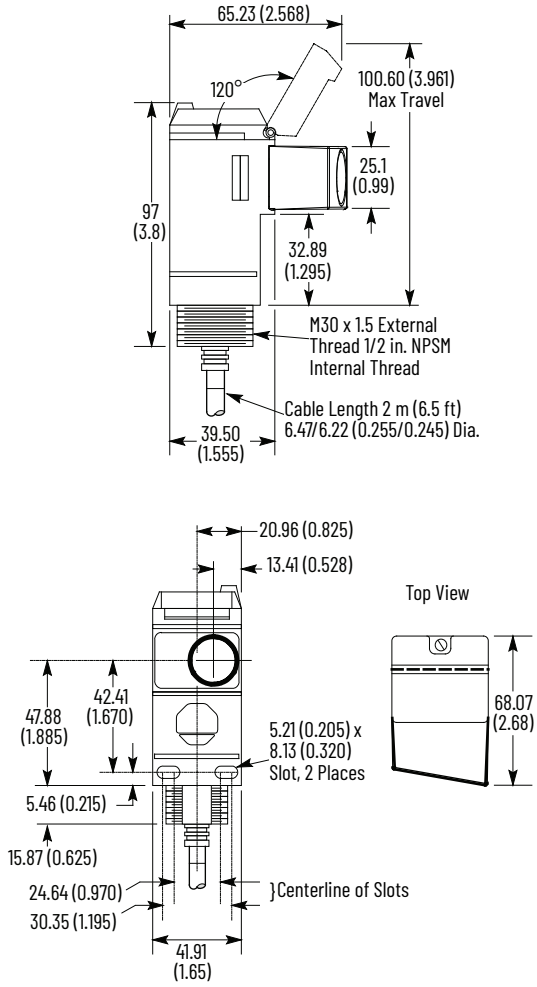


Figure 5 - Connector Version

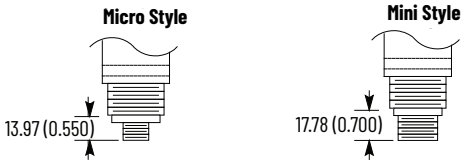


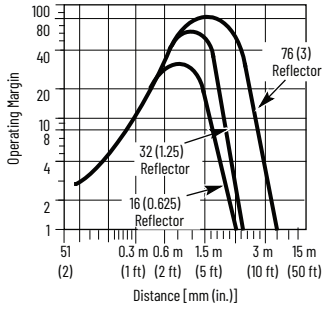
Table 10 - Thread Sizes

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

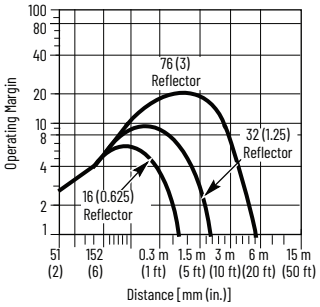
Typical Response Curves

Table 11 - Non-clear Object Detection Versions

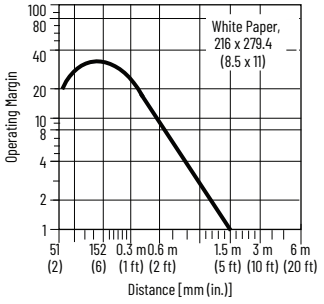
Retroreflective



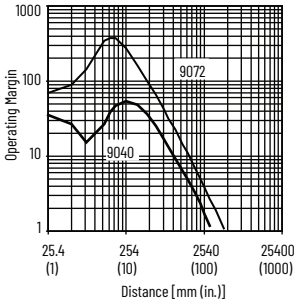
Polarized Retroreflective



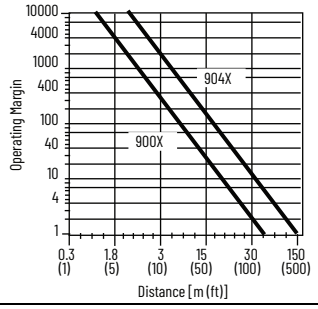
Standard Diffuse



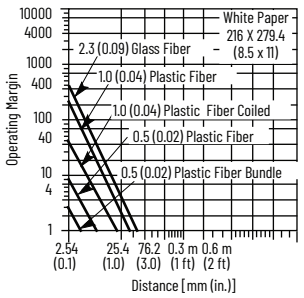
Long Range Diffuse



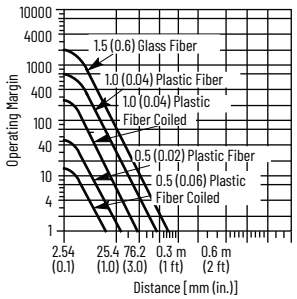
Transmitted Beam with 61 m (200 ft) Light Source



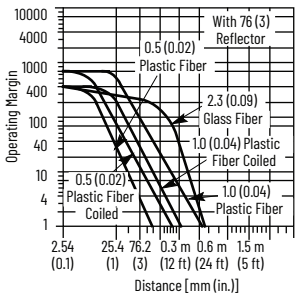
Visible Red Fiber Optic Standard Diffuse



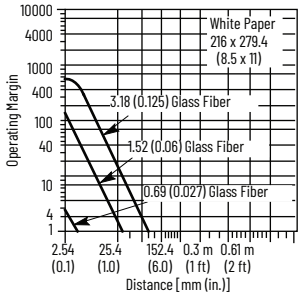
Visible Red Fiber Optic Transmitted Beam



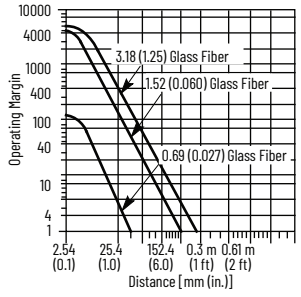
Small Aperture Fiber Optic Retroreflective



Large Aperture Fiber Optic Standard Diffuse



Large Aperture Fiber Optic Transmitted Beam



Large Aperture Fiber Optic Retroreflective

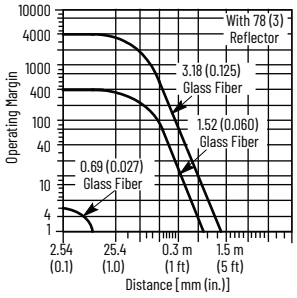
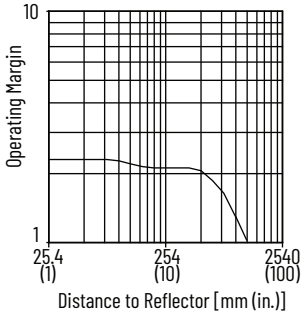
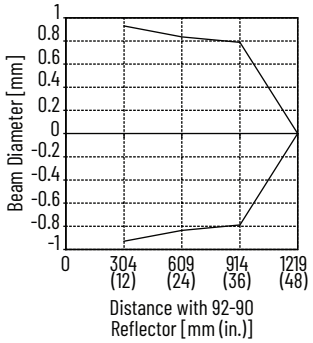


Table 12 - Clear Object Detection Versions

Response Curve



Beam Pattern



Notes:

Rockwell Automation Support

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Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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