



Fiber Optic Systems

Fiber System Overview..... page 170

- Fiber Systems Explained
- When to Use Fiber Systems
- Selection information for sensors and fibers
- Choosing Plastic or Glass Fibers



D10 page 172

- Advanced amplifier for use with plastic fibers
- High-performance, low-contrast sensing
- Easy-to-set TEACH programming
- Manual adjustment capability for fine tuning
- 4-digit display of signal strength and operating status
- Visible red or green sensing beam



FI22 page 186

- Low-profile design to mount directly on equipment
- 8-segment LED status bar for signal strength, sensing contrast, programming status and diagnostic warnings
- Completely sealed, IP67 point-of-use or inline fiber optic amplifier



D12 page 178

- Glass and plastic fiber optic models
- Models for standard applications, high-speed response and increased power
- AC-coupled for high-sensitivity applications



Plastic Fibers page 188

- Inexpensive and easily cut to length during installation
- Very bendable, for a precise fit
- Available coiled, for applications requiring articulated or reciprocating motion
- Diameters of 0.25, 0.5, 1.0 or 1.5 mm



R55F page 183

- Green, blue, white, red or infrared LED colors
- For mounting flat or to a 35 mm DIN rail
- Models for glass and plastic fiber optics



Glass Fibers page 204

- For hostile environments: high temperatures, corrosive materials, extreme moisture and high levels of shock and vibration
- Inherent immunity to extreme electrical noise
- Quickly custom designed and built for your unique applications

The broadest selection of fiber sensors in the world.

Fiber Systems

Two-part fiber systems include the sensor and the separately purchased application-specific fiber.

1. Sensors

The sensor contains all the electronics, the amplifier and the mechanical interface to the fiber. Some models are sealed and rated IP67 to mount directly on a machine; others are designed to be DIN-rail mounted in a centralized control enclosure.

2. Fibers

Sensing fibers are non-electronic, light-transmitting, optical-quality glass or plastic strands encased in cladding that reflects light to the core. Fibers transmit and/or receive light from the LED of a sensor. Glass fibers are arranged in bundles, and plastic fibers are typically packaged as monofilaments with a protective jacket of polyethylene, PVC, stainless-steel braid or other material. Fiber sensing tips have a wide variety of shapes and configurations.

When to Use Fiber Systems

- **Confined areas.** The small size and flexibility of fibers allows precise positioning where space is limited.
- **High temperatures.** Fiber optic assemblies can tolerate elevated temperatures—in some cases as high as 480° C.
- **High vibration and shock.** The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **Corrosive and wet environments.** Special purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **Explosive environments.** Fibers are passive and can safely pipe light to and from hazardous areas.
- **Noisy environments.** Fibers are non-electronic mechanical components and are completely immune to electrical noise.
- **Unique target shapes and requirements.** Fiber optic sensing heads can be custom designed and optimally shaped to the physical and optical requirements of a specific application.

Sensor Model	Models for Plastic Fibers	Page Number	Models for Glass Fibers	Page Number
WORLD-BEAM®		page 70		page 70
MINI-BEAM®		page 79		page 79
QM42		page 140		
Q45		page 146		page 146
OMNI-BEAM™		page 159		page 159
D10		page 172		
D12		page 178		page 178
R55F		page 183		page 183
FI22		page 186		
D11		page 34		
ECONO-BEAM®		page 34		page 34
MAXI-BEAM®		page 35		page 35
MULTI-BEAM®				page 35
PC44		See data sheet p/n 32910		
VALU-BEAM®		page 34		page 34
SM512				page 35

Typical Applications

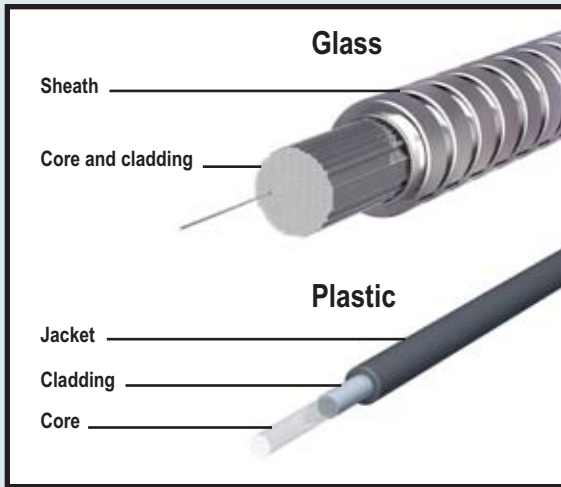
- Punch presses
- Vibratory feeders
- Conveyors
- Web control
- Tablet counting
- Ovens
- Semiconductor processing equipment
- Liquid level

Compare & select fiber optic sensors online:

www.bannerengineering.com/iselect



Fiber Construction



- Core** Thin glass or plastic center of the fiber through which light travels.
- Cladding** Outer optical material surrounding the core that reflects light back into the core.
- Jacket/Sheath** Protective layer to protect fiber from damage and moisture.

Choosing Plastic or Glass

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.



Plastic fibers page 188

- Inexpensive and easily cut to length during installation
- Bend for a precise fit
- Available in high-flex models to withstand flexing
- Offered with special jackets that withstand corrosion, impact and abrasion
- Available in coiled versions for applications requiring articulated or reciprocating motion
- Available in diameters of 0.25, 0.5, 1.0 or 1.5 mm
- Can be quickly custom designed and built for your unique applications



Glass fibers page 204

- Solve numerous challenging sensing requirements
- Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
- Withstand high levels of shock and vibration
- Inherently immune to extreme electrical noise
- Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
- Can be quickly custom designed

Specialty fibers for specific sensing applications.



DURA-BEND™ for extremely tight radius bends



Fluoropolymer encapsulated fibers



Focused beam fibers



Convergent beam fibers



Linear array fibers



Liquid level detection fibers



High temperature fibers



STEELSKIN™ for impact, abrasion

SENSORS
PLASTIC FIBERS
GLASS FIBERS

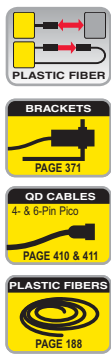
D10 Series

Redefining High-Performance Fiber Optic Sensing

- Features advanced fiber optic amplifier for use with plastic fibers
- Available with visible red or green beam
- Delivers high-performance, low-contrast sensing with automatic TEACH options or manual adjustment
- Available in bipolar, dual-discrete and analog/discrete output models

Expert™ Models:

- 4-digit TEACH and signal strength display or bargraph readout
- Operating status indicators
- Easy-to-set static, dynamic and single-point programming
- Manual fine tuning
- Remote configuration, using TEACH wire



Expert™ Advanced LED Display

- Configuration and performance indicator
- Quick and easy setup
- Constant status monitoring in RUN mode

Expert™ Dual-Discrete Outputs

- Two configurable individual setpoints
- Current sourcing (PNP) or current sinking (NPN)



Expert™ Analog & Discrete Outputs

- Two configurable individual setpoints: one for analog and one for discrete output
- Current sourcing (PNP) or current sinking (NPN)
- One 4-20 mA current analog output or 0-10V dc voltage analog output



D10 Expert™ with Numeric Display	page 173
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D10 Discrete Output	174

D10 Expert™ with Numeric Display

- Numeric display of signal strength and operating status
- Two output options: two discrete outputs in the same sensor; or discrete output and either a 4-20 mA current or a 0-10V dc voltage analog output in the same sensor



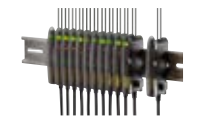
D10 Expert™ with Bargraph Display

- Easy-to-read 8-segment light bar display indicator for TEACH and signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)



D10 Expert™ with Bussable Power

- Connect up to 16 devices side-to-side
- Reduce wiring cost; connect power to one sensor and bus to the next
- Save making up to 30 power connections



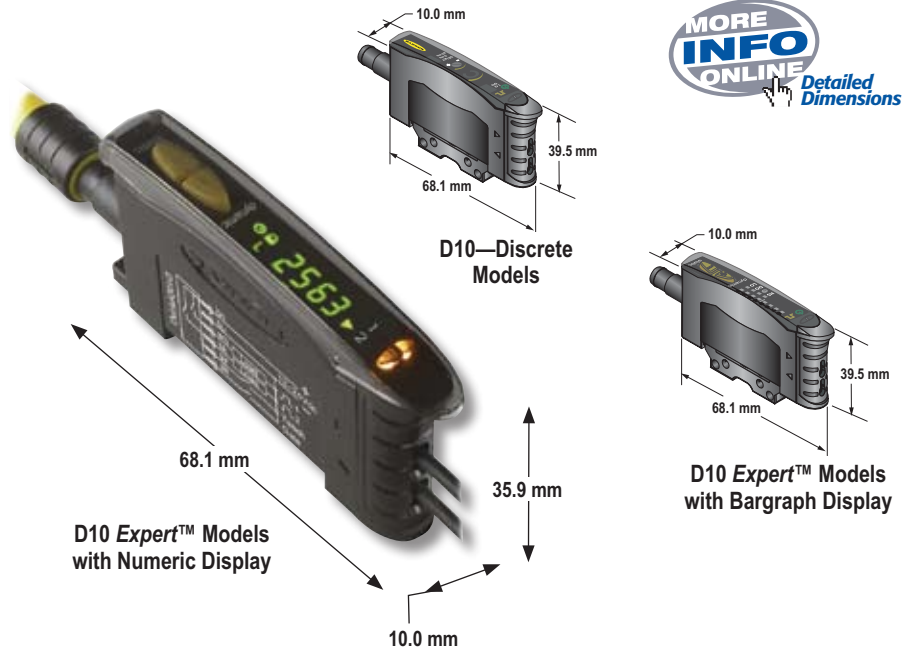
D10 Discrete Output

- 12-turn manual sensitivity adjustment
- Pulse rate LED indicator for signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)



D10 Sensors

- Static and dynamic programming push buttons or manual gain potentiometer
- Informative signal-strength readout with LED display, bargraph display or mechanical indicator
- Output indicators
- 2 m or 9 m integral cable, or Pico-style quick-disconnect



SENSORS
PLASTIC FIBERS
GLASS FIBERS

D10 Expert™ with Numeric Display—Dual Discrete, 12-24V dc



Models	Sensing Mode/LED*	Range	Cable**	Outputs	Data Sheet		
D10DNFP	 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet part number 64154 for range information.	2 m	Dual NPN	64154		
D10DNFPQ			6-pin Pico QD				
D10DPFP			 PLASTIC FIBER	2 m		Dual PNP	
D10DPFPQ				6-pin Pico QD			
D10DNFPG	 PLASTIC FIBER			2 m		Dual NPN	
D10DNFPGQ				6-pin Pico QD			
D10DPFPG				 PLASTIC FIBER		2 m	Dual PNP
D10DPFPGQ						6-pin Pico QD	

D10 Expert™ with Numeric Display—Analog/Discrete, 12-24V dc



Models	Sensing Mode/LED*	Range	Cable**	Discrete Output	Analog Output	Data Sheet	
D10INFP	 PLASTIC FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet part number 65448 for range information.	2 m	NPN	4-20 mA	65448	
D10INFPQ			6-pin Pico QD				
D10IPFP			 PLASTIC FIBER	2 m			PNP
D10IPFPQ				6-pin Pico QD			
D10INFPG	 PLASTIC FIBER			2 m	NPN		
D10INFPGQ				6-pin Pico QD			
D10IPFPG				 PLASTIC FIBER	2 m		PNP
D10IPFPGQ					6-pin Pico QD		

* Visible Red LED Visible Green LED

** For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D10DNFP W/30**). A model with a QD requires a mating cable (see page 411).

SENSORS
PLASTIC FIBERS
GLASS FIBERS



D10 Expert™ with Numeric Display—Analog/Discrete, 15-24V dc

Models	Sensing Mode/LED*	Range	Cable**	Output Type	Analog Output	Data Sheet
D10UNFP		Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 188 or reference data sheet part number 65448 for range information.	2 m	NPN	0-10V	65448
D10UNFPQ			6-pin Pico QD			
D10UPFP			2 m	PNP		
D10UPFPQ			6-pin Pico QD			
D10UNFPG			2 m	NPN	0-10V	
D10UNFPGQ			6-pin Pico QD			
D10UPFPG			2 m	PNP		
D10UPFPGQ			6-pin Pico QD			



D10 Expert™ with Bargraph Display—Discrete, 10-30V dc

Models	Sensing Mode/LED*	Range	Cable**	Output Type	Excess Gain	Beam Pattern	Data Sheet	
D10BFP		Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 188 or reference data sheet part number 117830 for range information.	2 m	Bipolar NPN/PNP	EGCP-26 to EGCP-29 (p. 489)	BPP-26 to BPP-29 (p. 508)	117830	
D10BFPQ			6-pin Pico QD					
D10BFPG			2 m		6-pin Pico QD	EGCP-30 to EGCP-33 (pp. 489-490)		BPP-30 to BPP-33 (pp. 508-509)
D10BFPGQ			6-pin Pico QD					




D10—Discrete, 10-30V dc

Models	Sensing Mode/LED*	Range	Cable**	Output Type	Data Sheet	
D10AFP		Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 188 or reference data sheet part number 118431 for range information.	2 m	Bipolar NPN/PNP	118431	
D10AFPQ			4-pin Pico QD			
D10AFPG			2 m			4-pin Pico QD
D10AFPGQ			4-pin Pico QD			
D10AFPY		Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 188 or reference data sheet part number 118431 for range information.	2 m	Bipolar NPN/PNP	118431	
D10AFPYQ			4-pin Pico QD			
D10AFPGY			2 m			4-pin Pico QD
D10AFPGYQ			4-pin Pico QD			

* Visible Red LED Visible Green LED



** For 9 m cable, add suffix W/30 to the 2 m model number (example, **D10UNFP W/30**). A model with a QD requires a mating cable (see pages 410 and 411).


SENSORS
PLASTIC FIBERS
GLASS FIBERS

D10 Expert™ with Numeric Display—Dual-Discrete Specifications			
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 188)		
Supply Voltage and Current	12 to 24V dc (10% max. ripple) at less than 65 mA, exclusive of load		
Supply Protection Circuitry	Protected against reverse polarity and transient voltage.		
Output Configuration	Two independently configured current sourcing (PNP) or current sinking (NPN) solid-state transistors, depending on model.		
Output Rating	150 mA max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: less than 1.5V at 150 mA load PNP: less than 2.5V at 150 mA load		
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit		
Output Response Time	Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds NOTE: less than 1 second delay on power-up; outputs do not conduct during this time.		
Adjustments	Two push buttons or remote programming of (TEACH) switching threshold response time, OFF-delay, light/dark operate, and display		
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection; two yellow LEDs serve as output indicators and active channel indicator.		
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover.		
Environmental Rating	IEC IP50; NEMA 1		
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 411.		
Operating Conditions	Temperature: -20° to +55° C Storage Temperature: -20° to +80° C Relative humidity: 90% @ 50° C		
	Number of Devices Stacked	Ambient Temperature Rating	Load Specification
	3	55° C	150 mA
	7	50° C	50 mA
10	45° C	50 mA	
Installation	35 mm DIN rail or included mounting bracket		
Certifications			
Hookup Diagrams	DC14: (p. 523)		

D10 Expert™ with Numeric Display—Analog/Discrete Specifications			
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 188)		
Supply Voltage and Current	4-20 mA Analog Models: 12-24V dc (10% max. ripple) at less than 65 mA exclusive of load 0-10V dc Analog Models: 15-24V dc (10% max. ripple) at less than 70 mA exclusive of load		
Supply Protection Circuitry	Protected against reverse polarity and transient voltage.		
Output Configuration	Two independently configurable outputs, depending on model: NPN w/analog (4-20 mA or 0-10V) or PNP w/analog (4-20 mA or 0-10V)		
Output Rating	Discrete Output: 150 mA, max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: < 1.5V @ 150 mA PNP: < 2.5V @ 150 mA	Analog Output: 4-20 mA or 0-10V dc Load: 4-20 mA Models: 100Ω max. impedance 0-10V dc Models: 1 MΩ min. impedance	
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit		
Output Response Time	Discrete Output: Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds Analog Output: 1 millisecond NOTE: less than 1 second delay on power-up; outputs do not conduct during this time.		
Adjustments	Push-button or remote programming of (TEACH) switching threshold response time, OFF-delay, light/dark operate, and display		
Indicators	Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection; two yellow output indicators.		



D10 Expert™ with Numeric Display—Analog/Discrete (cont'd)			
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover.		
Environmental Rating	IEC IP50; NEMA 1		
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cables are ordered separately. See page 411.		
Operating Conditions	Temperature: -20° to +55° C Storage Temperature: -20° to +80° C Relative humidity: 90% @ 50° C		
	Number of Devices Stacked	Ambient Temperature Rating	Load Specification
	3	55° C	150 mA
	7	50° C	50 mA
	10	45° C	50 mA
Installation	35 mm DIN rail or included mounting bracket		
Certifications	 		
Hookup Diagrams	NPN Models: DC15 (p. 523) PNP Models: DC16 (p. 523)		

D10 Expert™ with Bargraph Display—Discrete Specifications	
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 188)
Supply Voltage and Current	10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity, over voltage and transient voltage.
Delay at Power Up	200 milliseconds max.; outputs do not conduct during this time
Output Configuration	Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN)
Output Rating	150 mA max. load @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 5 µA at 30V dc ON-state saturation voltage: NPN: less than 200 mV at 10 mA and 1V at 150 mA load PNP: less than 1V at 10 mA and 1.5V at 150 mA load
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up
Output Response Time	500 microseconds (normal mode) or 200 microseconds (high-speed mode)
Repeatability	100 microseconds (normal mode) or 66 microseconds (high-speed mode)
Adjustments	Two push buttons and remote wire <ul style="list-style-type: none"> • Expert -style configuration (Static and Dynamic TEACH, and Windows SET) • Manually Adjust (+/-) sensitivity (from buttons only) • LO/DO, OFF-Delay, and response speed configurable (from buttons or remote wire) • Push-button lockout (from remote wire only) Factory Default Settings: Light Operate, Normal Speed, No Delay
Indicators	8-segment red bargraph: Light-to-dark signal difference relative to taught condition (window SET) Sensing contrast (Static or Dynamic TEACH) Green Status Indicators: LO, DO, High Speed (HS) and OFF-Delay Green LED: Power ON Yellow LED: Output conducting
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover.
Environmental Rating	IEC IP50, NEMA 1
Connections	PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cables are ordered separately. See page 411.
Operating Conditions	Temperature: -10° to +55° C Storage Temperature: -20° to +85° C Relative humidity: 90% @ 55° C
Installation	35 mm DIN rail or included mounting bracket
Certifications	
Hookup Diagrams	DC08 (p. 521)

D10—Discrete Specifications	
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 188)
Supply Voltage	10 to 30V dc (10% max. ripple) @ less than 25 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN)
Output Rating	100 mA per output with short circuit protection OFF-state leakage current: less than 10 μ A sourcing; 200 μ A sinking ON-state saturation voltage: NPN: 1.6V @ 100 mA PNP: 2.0V @ 100 mA
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up (max. 100 milliseconds delay on power up; outputs do not conduct during this time).
Output Response Time	Standard models (with crosstalk avoidance circuitry): 500 microseconds High-speed models: 200 microseconds
Repeatability	Standard models: 95 microseconds High-speed models: 50 microseconds
Adjustments	12-turn Sensitivity potentiometer with relative position indicator; LO/DO Selection switch; 0 or 40 milliseconds OFF-delay switch NOTE: Use proper ESD techniques while making adjustments under cover.
Indicators	Two LEDs: Green and Yellow Green ON steady: Power ON Yellow flashing: Light Sensed Signal strength indicator (Banner's AID Alignment Indicator Device - the faster the flash, the more light is received).
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover.
Environmental Rating	IEC IP50; NEMA 1
Connections	PVC-jacketed 2 m or 9 m attached cable, or 4-pin Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 410.
Operating Conditions	Temperature: -10° to +55° C Storage: -20° to +85° C Relative humidity: 90% @ 55° C (non-condensing)
Certifications	Approvals in process.
Hookup Diagrams	DC04 (p. 520)

SENSORS
PLASTIC FIBERS
GLASS FIBERS

D12

Complete Family of Plastic and Glass Fiber Optic Sensors

- Features LED bargraph that indicates signal strength, sensing contrast, programming status and diagnostic warnings, when not in high-speed mode
- Available in glass and plastic fiber optic models
- Includes marginal gain indicator with alarm output
- Solves routine applications with economical standard models
- Features high-speed sensing response and higher sensing power in some models
- Excels in low-contrast applications with ac-coupled models
- Features easy push-button TEACH-mode setup on D12E *Expert*™ models



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4-Pin Pico
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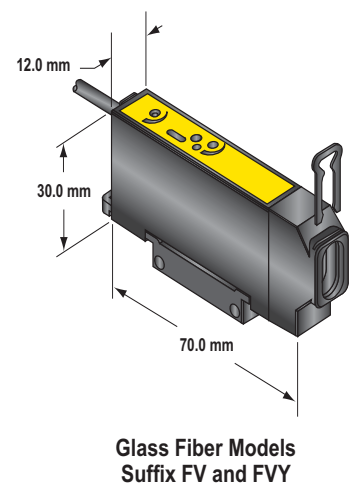
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D12 Sensors

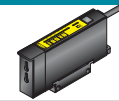
- 7-LED bargraph signal strength indicators
- Dual-LED multi-function status indicators
- Sensitivity adjustment
- 2 m or 9 m attached cable, or Pico-style quick-disconnect
- 35 mm DIN-rail mountable



MORE INFO ONLINE
Detailed Dimensions



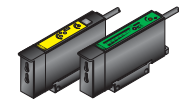
D12 Expert™, 10-30V dc



Models	Sensing Mode/LED*	Maximum Range	Switching Threshold Setting	Cable**	Output Type	Data Sheet
D12EN6FV	 GLASS FIBER	Range varies by sensing mode and fiber optics used. See data sheet part number 41974 for maximum range specifications.	Just above the "dark" condition	2 m	NPN	41974
D12EP6FV					PNP	
D12E2N6FV			Midway between "dark" and "light" conditions		NPN	
D12E2P6FV					PNP	
D12EN6FP	 PLASTIC FIBER		Just above the "dark" condition		NPN	
D12EP6FP					PNP	
D12E2N6FP			Midway between "dark" and "light" conditions		NPN	
D12E2P6FP					PNP	

SENSORS
PLASTIC FIBERS
GLASS FIBERS

D12 and D12 High-Speed, 10-30V dc



Models	Sensing Mode/LED*	Range	Cable**	Output Type	Output Response	Excess Gain	Data Sheet	
D12SN6FV	 GLASS FIBER	Range varies by sensing mode and fiber optics used	2 m	NPN	500 μs	EGCG-40 & EGCG-41 (p. 487)	32822	
D12SN6FVQ			4-Pin Pico Pigtail QD					
D12SP6FV			2 m	PNP				
D12SP6FVQ			4-Pin Pico Pigtail QD					
D12SN6FVY	 GLASS FIBER		Range varies by sensing mode and fiber optics used	2 m	NPN	Selectable 50 μs or 500 μs***		EGCG-42 & EGCG-43 (p. 487)
D12SN6FVYQ				4-Pin Pico Pigtail QD				
D12SN6FVY1†				2 m				
D12SN6FVY1Q†				4-Pin Pico Pigtail QD				
D12SP6FVY		2 m		PNP				
D12SP6FVYQ		4-Pin Pico Pigtail QD						
D12SP6FVY1†		2 m						
D12SP6FVY1Q†		4-Pin Pico Pigtail QD						
D12SN6FP	 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	NPN	500 μs	EGCP-34 & EGCP-35 (p. 490)		
D12SN6FPQ			4-Pin Pico Pigtail QD					
D12SP6FP			2 m	PNP				
D12SP6FPQ			4-Pin Pico Pigtail QD					
D12SN6FPY	 PLASTIC FIBER		Range varies by sensing mode and fiber optics used	2 m	NPN	Selectable 50 μs or 500 μs***	EGCP-36 & EGCP-37 (p. 490)	
D12SN6FPYQ				4-Pin Pico Pigtail QD				
D12SN6FPY1†				2 m				
D12SN6FPY1Q†				4-Pin Pico Pigtail QD				
D12SP6FPY		2 m		PNP				
D12SP6FPYQ		4-Pin Pico Pigtail QD						
D12SP6FPY1†		2 m						
D12SP6FPY1Q†		4-Pin Pico Pigtail QD						

† Y1 models have 20 milliseconds output pulse stretcher.

* Visible Red LED

** For 9 m cable, add suffix **W/30** to the 2 m model number (example, **D12EN6FV W/30**). A model with a QD requires a mating cable (see page 410).

*** When 50 microseconds is selected, bargraph is disabled.

D12 High-Power, 10-30V dc



Models	Sensing Mode/LED*	Range	Cable**	Output Type	Output Response	Excess Gain	Data Sheet
D12SN6FPH	 PLASTIC FIBER	Range varies by sensing mode and fiber optics used	2 m	NPN	500 μs	EGCP- 38 & EGCP-39 (p. 490)	34970
D12SN6FPHQ			4-Pin Pico Pigtail QD				
D12SP6FPH			2 m	PNP			
D12SP6FPHQ			4-Pin Pico Pigtail QD				

D12 AC-Coupled, 10-30V dc




Models	Sensing Mode/LED*	Range	Cable**	Output Type	Output Response	Data Sheet
D12DAB6FV	 GLASS FIBER	Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet part number 38384 for range information.	2 m	Bipolar NPN/PNP	50 μs	38384
D12DAB6FVQ			4-Pin Pico Pigtail QD			
D12DAB6FP	 PLASTIC FIBER		2 m		50 μs	
D12DAB6FPQ			4-Pin Pico Pigtail QD			


* Visible Red LED

** For 9 m cable, add suffix W/30 to the 2 m model number (example, D12SN6FPH W/30). A model with a QD requires a mating cable (see page 410).

D12 Expert™ Specifications	
Supply Voltage and Current	10 to 30V dc at 45 mA max. (exclusive of load); 10% max. ripple
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	NPN open collector (both outputs) or PNP open collector (both outputs), depending on model Load output: NO and programmable Light or Dark-Operate; Alarm output: NO
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 μA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs (trips at 175 mA)
Output Response Time	200 microseconds ON/OFF (40 milliseconds OFF when OFF-delay selected) (NOTE: False pulse protection circuit causes a 0.1 second delay on power-up)
Output Operation Mode	Light operate or dark operate: selected by push button
Output Timing Functions	ON/OFF (no delay) or fixed 40 millisecond OFF-delay; selected by push button
Repeatability	66 microseconds
Adjustments	Push-button TEACH-mode sensitivity setting; Remote teaching input is provided
Indicators	Green LED lights for DC power ON and flashes when ready for TEACH mode; 1 Hz when ready to learn first condition; 2 Hz for second condition Yellow LED lights for load output ON (conducting) 7-segment moving dot red LED display indicates relative received light signal strength, output program settings, relative contrast level and alarm
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware



D12 Expert™ Specifications (cont'd)	
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is Acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cables are ordered separately. See page 410.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications (except D10E2)	
Hookup Diagrams	DC17 (p. 524)

D12 Standard, High-Speed and High-Power Specifications	
Supply Voltage and Current	10 to 30V dc at 45 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Outputs are NPN (sinking) or PNP (sourcing), depending on model Complementary: one normally open (NO) and the other normally closed (NC); NC output may be wired as diagnostic alarm output by reversing power supply connections except high speed "Y" and "Y1" suffix models (see hookups)
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	Standard and High-Power Models: 500 microseconds ON/OFF High-Speed Models: selectable 50 or 500 microseconds ON/OFF (NOTE: False pulse protection circuit causes a 0.1 second delay on power-up)
Output Timing Functions	"Y1" models have fixed 20 milliseconds pulse stretcher (OFF-delay) when 50 microseconds mode is used
Repeatability	130 microseconds; "Y" and "Y1" models have selectable 50 microseconds/500 microseconds response; repeatability in 50 microseconds mode is 15 microseconds
Adjustments	All models have a SENSITIVITY control on top of sensor (15-turn slotted brass screw, clutched at both ends of adjustment); "Y" and "Y1" (high speed models) also have a top-mounted response mode selector switch
Indicators	Two top-mounted LED indicators, one yellow and one green, and one 7-segment red LED moving dot bargraph; Note that the 7-segment bargraph and marginal excess gain indication (bargraph segment #7) are inoperative in the 50 µs response mode of "Y" and "Y1" models Green LED lights for DC Power ON Yellow LED lights for NORMALLY OPEN OUTPUT CONDUCTING On all models in 500 microseconds response mode, the 7-segment moving dot red LED bargraph lights to indicate relative received light signal strength; On all models in 50 and 500 microseconds response mode, segment #1 flashes to indicate OUTPUT OVERLOAD; On all models in the 500 microseconds response mode, segment #7 flashes to indicate MARGINAL EXCESS GAIN; On standard and high power models, a flashing LED corresponds to the "ON" state of the alarm output; (Alarm output not available on Y & Y1 models)
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is Acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cables are ordered separately. See page 410.
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Certifications	
Hookup Diagrams	NPN Models: DC05 (p. 521) PNP Models: DC06 (p. 521)

D12 AC-Coupled Specifications	
Supply Voltage and Current	10 to 30V dc at 60 mA max. (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor
Output Rating	150 mA max. each output OFF-state leakage current: less than 10 μ A at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	50 microseconds ON/OFF (NOTE: False pulse protection circuit causes a 0.1 second delay on power-up)
Output Operation Mode	Light operate or dark operate: selected by switch
Output Timing Functions	Pulse output; adjustable from 1 to 70 milliseconds
Repeatability	15 microseconds ON
Adjustments	Three top-panel controls: SENSITIVITY control (15-turn slotted brass screw, clutched at both ends of adjustment), a light- or dark-operate select switch, and an OUTPUT PULSE adjustment (3/4-turn potentiometer)
Indicators	Three top-mounted LED indicators: Green LED: lights to indicate dc Power ON Yellow LED: lights for Output Conducting Red LED: lights whenever AGC system is locked onto the signal
Mounting Bracket	D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is Acetal
Environmental Rating	IEC IP11; NEMA 2
Connections	PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cables are ordered separately. See page 410.
Operating Conditions	Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing)
Application Note	D12 AC-coupled sensors should not be used in areas of known electrical "noise" or RF fields.
Hookup Diagrams	DC04 (p. 520)



R55F

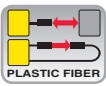
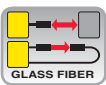
Glass or Plastic Fiber Optic Sensors

- Delivers outstanding color contrast sensitivity
- Features innovative TEACH function with two options for setting the sensing threshold
- Reliably detects 16 levels of gray scale at up to 10,000 actuations per second
- Available in two fiber types: economical plastic for repeated flexing and glass for harsh conditions
- Easily mounts in confined areas, either flat or to 35 mm DIN rail
- Provides bipolar (NPN/PNP) outputs with delay settings of 0, 20 and 40 milliseconds.

SENSORS

PLASTIC FIBERS

GLASS FIBERS



R55 Fiber Optic Sensors

- 10-element signal strength indicator bargraph
- 2 m or 9 m attached cable, or Euro-style quick-disconnect
- Simple push-button programming and status indicators
- Models for use with glass or plastic fiber optics
 - Glass fiber models function well in harsh environments typically associated with printing processes.
 - Plastic fiber models function well in applications that require repeated flexing of the fibers.
- Quick fiber installation without tools





R55 Fiber Optic, 10-30V dc

- SENSORS
- PLASTIC FIBERS
- GLASS FIBERS

Models	Sensing Mode/LED*	Range	Cable**	Output Type	Data Sheet
R55F		Range varies by sensing mode and fiber optics used.	2 m	Bipolar NPN/PNP	57945
R55FQ	 GLASS FIBER		5-pin Euro QD		
R55FV			2 m		
R55FVQ	 GLASS FIBER		5-pin Euro QD		
R55FVG			2 m		
R55FVGQ	 GLASS FIBER		5-pin Euro QD		
R55FVB			2 m		
R55FVBQ	 GLASS FIBER		5-pin Euro QD		
R55FVW			2 m		
R55FVWQ	 GLASS FIBER		5-pin Euro QD		
R55FP			2 m		
R55FPQ	 PLASTIC FIBER		5-pin Euro QD		
R55FPG			2 m		
R55FPGQ	 PLASTIC FIBER		5-pin Euro QD		
R55FPB			2 m		
R55FPBQ	 PLASTIC FIBER		5-pin Euro QD		
R55FPW			2 m		
R55FPWQ	 PLASTIC FIBER		5-pin Euro QD		

* Infrared LED Visible Red LED Visible Green LED Visible Blue LED Visible White LED
 ** For 9 m cable, add suffix W30 to the 2 m model number (example, R55F W30). A model with a QD requires a mating cable (see page 414).

- SENSORS
- PLASTIC FIBERS
- GLASS FIBERS
- OD CABLES
6-Pin Pico
PAGE 411
- PLASTIC FIBERS
PAGE 188

FI22 Expert™

Low-Profile Inline Fiber Optic Sensors

- Features a low profile for inconspicuous surface mounting
- Includes 8-segment LED light bar that indicates relative received signal strength, sensing contrast, programming status and diagnostic warnings
- Offers TEACH-mode programming for static, dynamic and single-point configuration, and manual adjustment for fine tuning
- Features easy-to-read TEACH and signal strength readout, as well as a continuous readout of operating status
- Can be programmed for either light- or dark-operate output



FI22 Expert™ Sensors

- Push-button TEACH-mode programming
- 2 m or 9 m integral cable, or 6-pin Pico-style quick-disconnect
- Easy-to-read 8-segment bargraph status indicator
- Custom bracket for quick snap-in mounting



Plastic Fiber Models
Suffix FP



FI22 Expert™, 10-30V dc

Models	Sensing Mode/LED*	Range	Cable**	Output Type	Excess Gain	Beam Pattern	Data Sheet
FI22FP		Range varies by sensing mode and fiber optics used. See data sheet part number 108899 for maximum range specifications.	2 m	Bipolar NPN/PNP	Opposed mode: EGCP-40, EGCP-41 & EGCP-42 (p. 490)	Opposed mode: BPP-34, BPP-35 & BPP-36 (p. 509)	108899
FI22FPQ			6-pin Pico QD		Diffuse mode: EGCP-43, EGCP-44 & EGCP-45 (p. 490)	Diffuse mode: BPP-37, BPP-38 & BPP-39 (p. 509)	

* Visible Red LED

** For 9 m cable, add suffix **W/30** to the 2 m model number (example, **FI22FP W/30**). A model with a QD requires a mating cable (see page 411).

SENSORS
PLASTIC FIBERS
GLASS FIBERS

FI22 Expert™ Specifications	
Supply Voltage	10 to 30V dc (10% max. ripple) @ less than 32 mA exclusive of load
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Delay at Power Up	250 milliseconds max.; outputs do not conduct during this time
Output Configuration	Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN)
Output Rating	100 mA max. load @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 50 µA at 30V dc ON-state saturation voltage: NPN: less than 200 mV @ 10 mA and 1V @ 100 mA load PNP: less than 1.5V @ 10 mA and 2.0V @ 100 mA load
Output Protection	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	500 microseconds
Repeatability	100 microseconds
Adjustments	2 push buttons and remote wire <ul style="list-style-type: none"> • Expert™ TEACH programming (two-point static, dynamic and single-point static) • Manually adjust (+/-) thresholds (from buttons only – not available from remote wire) • LO/DO and OFF-Delay configurable (from buttons or remote wire) • Push-button lockout (from remote wire only)
Indicators	8-segment red bargraph: Light-to-dark signal difference relative to taught condition (single-point TEACH) or Sensing contrast (two-point TEACH) Green LED: Power ON Yellow LED: Output conducting
Construction	PC/ABS blend plastic housing; polycarbonate cover
Environmental Rating	IP67; NEMA 6
Connections	5-conductor 2 m PVC cable, 9 m PVC cable, or 6-pin integral Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 411.
Operating Conditions	Temperature: -10° to +55° C Relative humidity: 90% @ 50° C (non-condensing)
Certifications	
Hookup Diagrams	DC08 (p. 521)