

D12DAB6 Series DIN Rail AC-coupled Fiber Optic Sensors

Special-purpose glass and plastic fiber optic sensors for low-contrast applications



- **Highly sensitive to very small signal changes; fast response**
- **Automatic gain control circuit continually adjusts emitter output to maintain system gain**
- **Ideal for low contrast applications such as web flaw, thread break, and falling parts detection**
- **Sensors operate from 10-30V dc.**
- **One NPN (sinking) and one PNP (sourcing) output; 150 mA max. (continuous) load**
- **LED indicators for POWER ON, OUTPUT CONDUCTING, and AGC LOCK conditions**
- **Selectable light- or dark-operate; no false pulse on power-up**
- **D12DAB6FVs for glass fibers; D12DAB6FPs for plastic fibers**

Description

D12DAB6 Series sensors are compact, ac-coupled sensors designed for use with Banner glass or plastic fiber optics. They are intended for applications in which the light signal change is so small that sensitivity adjustment of ordinary dc-coupled sensors is difficult or impossible. D12DAB6 Series sensors can respond to even smaller signal changes than the standard D12 fiber optic sensors, and are less affected by gradual signal changes due to dirt buildup, etc. Typical applications include thread break detection, web flaw detection, and detection of small parts falling randomly from vibratory feeders or small presses.

Many low contrast photoelectric sensing applications present problems to dc-coupled sensors because of *switching hysteresis*. Switching hysteresis is a designed-in property of dc-coupled sensors that causes the "turn-on point" of the sensor's dc-coupled amplifier to be slightly different than the "turn-off point". This is to prevent indecision and erratic operation of the sensor's output circuit when the light signal is at or near the switching point of the dc-coupled amplifier.

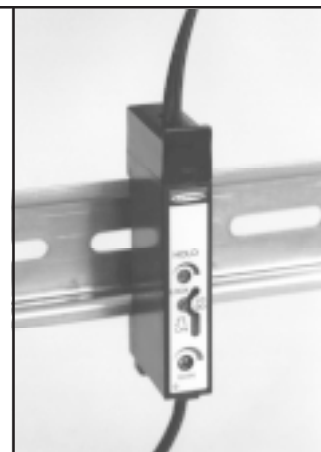
With their ac-coupled amplifier, D12DAB6 Series sensors reliably amplify the small signal changes found in many low contrast sensing applications. An automatic gain control (AGC) feedback system locks onto the light signal and continually adjusts the light intensity of the emitter so that the system is always maintained at the desired reference level regardless of the sensing range or the degree of environmental contamination. A multi-turn control enables setting of the amplifier sensitivity.

D12DAB6 Series sensors operate from +10 to 30V dc, and have two normally open outputs: one NPN (sinking) and one PNP (sourcing). Maximum switching capacity for each output is 150 mA (continuous). A hookup diagram is given on page 4.

Model D12DAB6FV models are for use with Banner glass fiber optic assemblies. The D12DAB6FP plastic fiber models may be used with either the small diameter (.020") or large diameter (.040") Banner cut-to-length plastic fiber optics.

D12DAB6 Series sensors have a POWER ON indicator, a LOCK indicator that lights when the AGC circuit has locked onto the signal, and a LOAD indicator that lights whenever the sensor's outputs are energized.

At right, a D12DAB6FP plastic fiber optic sensor, mounted on a DIN rail, with a bifurcated plastic fiber optic assembly attached.

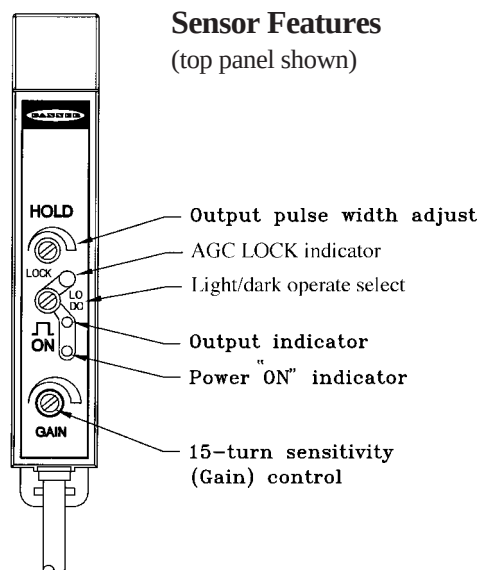


A switch on the sensor's top panel selects either light- or dark-operate. When light-operate is selected, output occurs on a dark-to-light transition. When dark-operate is selected, output occurs on a light-to-dark transition.

D12s are constructed of rugged black ABS (Cyclocac® KJB). They are designed for mounting directly to a 35 mm DIN rail, or may be mounted via a convenient through-hole bracket (included, see page 2). The transparent housing cover is acrylic. All D12 sensors are rated NEMA 4 (IEC IP 66).

Sensors are available with either 6-1/2 foot (2 m) or 30 foot (9 m) attached PVC-jacketed cable, or a 6 inch pigtail with attached 4-pin pico-type QD connector. A model listing appears on page 4.

Sensor Features (top panel shown)



D12DAB6FV AC-coupled Glass Fiber Optic Sensor

Specifications, D12DAB6FV Sensor for use with glass fiber optics

Sensing modes and minimum guaranteed ranges (3-foot fibers):

Opposed	1/16" fibers, no lenses:	3 inches (75 mm)
Opposed	1/16" fibers, L9 lenses:	>60 inches (150 cm)*
Opposed	1/16" fibers, L16F lenses:	>60 inches (150 cm)*
Diffuse	1/16" fibers, no lenses:	1 inch (25 mm); distance to 90% reflectance white test card
Opposed	1/8" fibers, no lenses:	8 inches (20 cm)
Opposed	1/8" fibers, L9 lenses:	>60 inches (150 cm)*
Opposed	1/8" fibers, L16F lenses:	>60 inches (150 cm)*
Diffuse	1/8" fibers, no lenses:	2.5 inches (60 mm); distance to 90% reflectance white test card

*Exceeds maximum practical separation of sensing ends for a pair of 3-foot individual fibers.

Sensing beam: visible red, 680 nanometers.

Supply voltage: +10 to 30V dc at 60 mA max, exclusive of load. Protected against reverse polarity and inductive load transients.

Output configuration: One NPN (current sinking) and one PNP (current sourcing) open-collector transistor. See hookup diagram, page 4.

Output rating: 150 mA maximum each output. No false pulse on power-up. (False pulse protection circuit causes a 0.1 second delay on power-up.) Short-circuit protected.

Off-state leakage current <10 microamps at 30V dc.

On-state saturation voltage <1V at 10 mA dc; <1.5V at 150 mA dc.

The total load may not exceed 150 mA.

Output pulse time adjustable, 1 to 70 milliseconds

Response time: 50 microseconds "on".

Repeatability: 15 microseconds

Indicators: Three top-mounted LED indicators, one yellow, one green, and one red.

GREEN LED lights for DC POWER ON.

YELLOW LED lights for OUTPUT CONDUCTING.

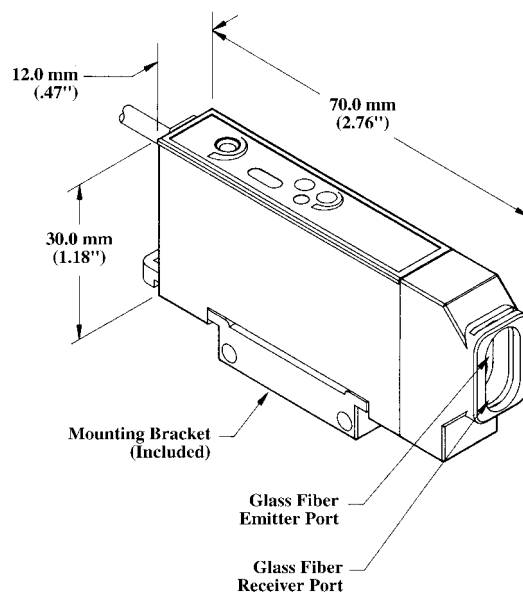
RED LED lights whenever the AGC system is locked onto the signal.

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).

Construction: Black ABS (Cyclocac® KJB) housing with acrylic cover. Rated NEMA 4; IEC IP66. The fiber clamping element is Delrin®. Stainless steel M3 x 0,5 hardware for use with mounting bracket (supplied).

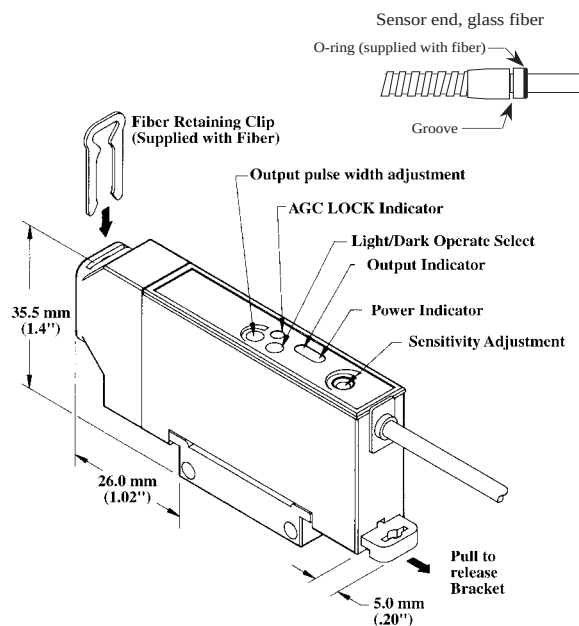
Cable: 6-1/2-foot (2 m) or 30-foot (9 m) attached PVC-covered cable, or 6-inch pigtail with pico-type 4-pin QD connector.

Mounting bracket: D12 Series 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. Bracket material is black VALOX®.



Glass fiber installation (refer to drawings):

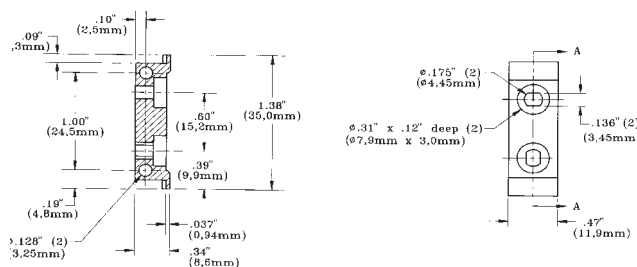
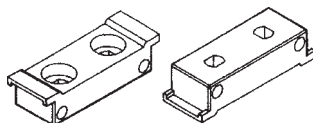
- 1) Gently seat an o-ring onto each sensor end of the fiber (above), and push the sensor ends into the D12's fiber ports as far as they will go.
- 2) While holding the sensor ends snugly in place, slip the fiber retaining clip into the slot, and press the clip in until it snaps into the groove.



Operating temperature range: -40° to +70°C (-40° to +158°F).
Maximum relative humidity 90% at 50°C (non-condensing).

D12 Bracket Dimensions

For through-hole mounting of all D12 models; stainless steel hardware included.



D12DAB6FP AC-coupled Plastic Fiber Optic Sensor

Specifications, D12DAB6FP Sensor for use with plastic fiber optics

Sensing modes and minimum guaranteed ranges (6-foot fibers):

Opposed	.020" fibers, no lenses:	0.5 inch (13 mm)
Diffuse	.020" fibers, no lenses:	0.2 inch (5 mm); distance to 90% reflectance white test card
Opposed	.040" fibers, no lenses:	3 inches (76 mm)
Opposed	.040" fibers, L2 lenses:	30 inches (76 cm)
Opposed	.040" fibers, L08 lenses:	>10 feet (3 m)*
Diffuse	.040" fibers, no lenses:	1 inch (25 mm); distance to 90% reflectance white test card

*Exceeds maximum practical separation of sensing ends for a pair of 6-foot individual fibers.

Sensing beam: visible red, 680 nanometers.

Supply voltage: +10 to 30V dc at 60 mA max, exclusive of load. Protected against reverse polarity and inductive load transients.

Output configuration:

One NPN (current sinking) and one PNP (current sourcing) open-collector transistor. See hookup diagram, page 4.

Output rating: 150 mA maximum each output. No false pulse on power-up. (False pulse protection circuit causes a 0.1 second delay on power-up.) Short-circuit protected.

Off-state leakage current <10 microamps at 30V dc.

On-state saturation voltage <1V at 10 mA dc; <1.5V at 150 mA dc.

The total load may not exceed 150 mA.

Output pulse time adjustable, 1 to 70 milliseconds

Response time: 50 microseconds "on".

Repeatability: 15 microseconds.

Indicators: Three top-mounted LED indicators, one yellow, one green, and one red.

GREEN LED lights for DC POWER ON.

YELLOW LED lights for OUTPUT CONDUCTING.

RED LED lights whenever the AGC system is locked onto the signal.

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).

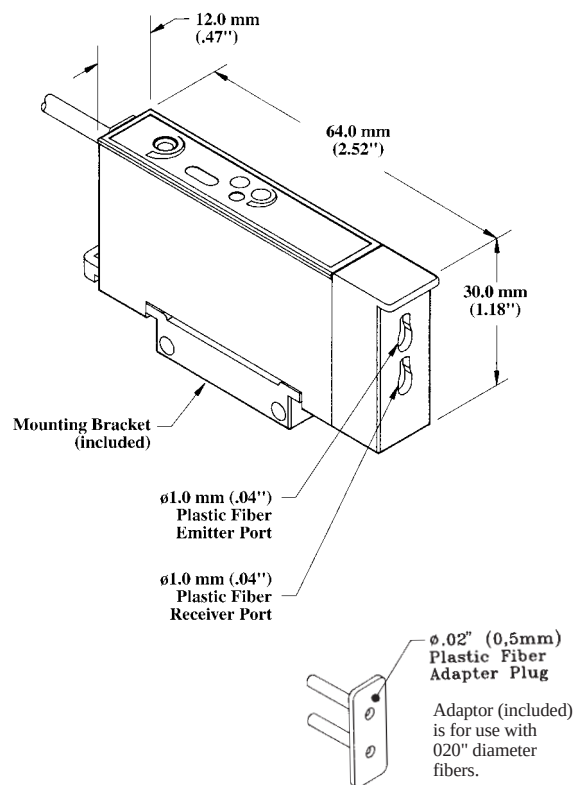
Construction: Black ABS (Cyclac® KJB) housing with acrylic cover. Rated NEMA 4; IEC IP66. The fiber clamping element is Delrin®. Stainless steel M3 x 0,5 hardware for use with mounting bracket (supplied).

Cable: 6-1/2-foot (2 m) or 30-foot (9 m) attached PVC-covered cable, or 6-inch pigtail with pico-type 4-pin QD connector.

Mounting bracket: D12 Series 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. Bracket material is black VALOX®.

Operating temperature range: -40° to +70°C (-40° to +158°F).

Maximum relative humidity 90% at 50°C (non-condensing).



Plastic fiber installation:

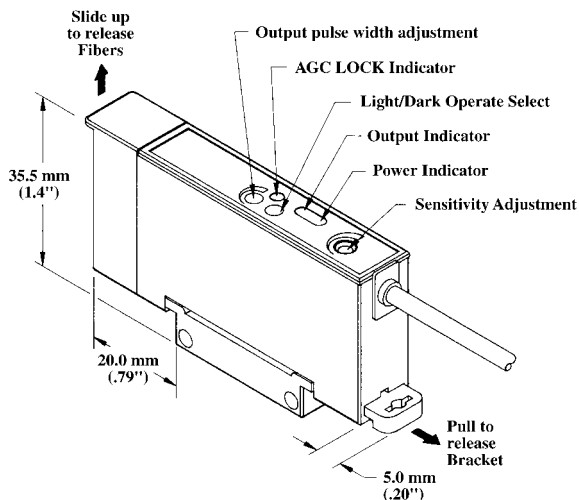
1) Cut fiber ends per instructions included with the fibers.

Slide the fiber gripper up (open).

If .020" dia. fibers are used, insert the adaptor (drawing above) into the ports as far as it will go.

2) All fibers: Insert the prepared plastic fiber sensor ends gently into the ports as far as they will go.

Slide the fiber gripper back down to lock.



D12DAB6 Series AC-coupled Fiber Optic Sensors

Alignment

1) Attach two individual fiber optic assemblies (or one bifurcated fiber optic assembly) to the D12DAB6 Series sensor, using the instructions packed with the fiber. Mount and align the sensing end(s) of the fiber(s) at the sensing location in a position that will optimize the differential between the "light" and "dark" conditions.

2) Do not connect the load at this time: the LOAD (yellow) LED will simulate the action of the load. Connect the brown and blue wires from the sensor to a +10 to 30V dc source (see hookup diagram, right). Apply dc power and verify that the POWER ON LED (green) is "on".

3) Set the LO/DO switch to DO (dark operate). Present the "light" condition to the sensor. Make sure that the LOCK LED (red) stays "on". If necessary, adjust the fiber ends so that the red LOCK LED stays "on" reliably.

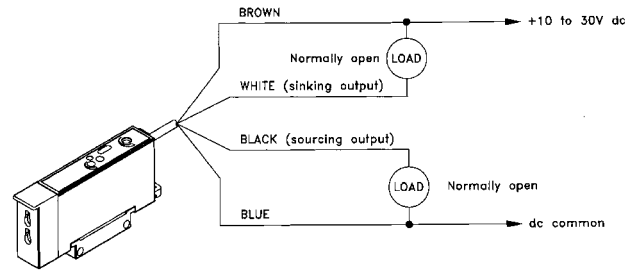
NOTE: If the "light" condition is a quick transition that cannot be simulated as a static condition and the "dark" condition is the normal condition, set the LO/DO switch to LO (light operate). Adjust the fiber ends so that, when the "light" condition occurs, the yellow LOAD indicator LED comes "on" reliably.

4) Simulate the sensing event to the sensor while observing the amber LOAD LED. If necessary, adjust the GAIN control (clockwise to increase) so that the LOAD LED changes state positively and reliably to all desired variations of the sensing event. Note that too much gain may result in unwanted response to conditions such as vibration of the sensing ends, etc.

5) While observing the LOAD LED, adjust the output pulse length using the sensor's 3/4-turn HOLD control. Minimum "on" time is 1 millisecond; maximum "on" time is 70 milliseconds.

6) Connect the load to the sensor and check the system.

D12DAB6 Series Hookup (model D12DAB6FP shown)



NOTE: These sensors will operate normally if the supply voltage polarity is reversed; however, the white and black wires must always be wired as shown above.

D12DAB6 Series Model Summary

Plastic Fiber Optic Models:

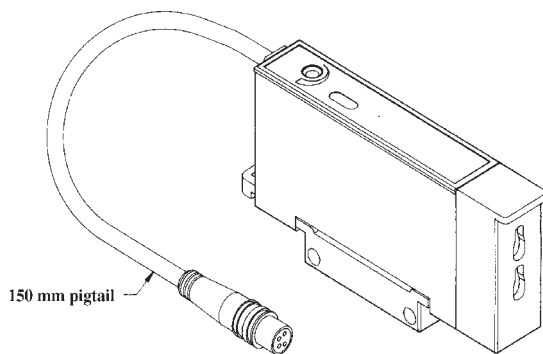
Model	Part No.	Description
D12DAB6FP	38382	6-1/2 foot attached cable
D12DAB6FP W/30	39544	30-foot attached cable
D12DAB6FPQ	39543	6-inch pigtail w/pico-type QD

Glass Fiber Optic Models:

Model	Part No.	Description
D12DAB6FV	39545	6-1/2 foot attached cable
D12DAB6FV W/30	39547	30-foot attached cable
D12DAB6FVQ	39546	6-inch pigtail w/pico-type QD

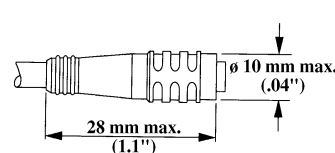
QD (Quick Disconnect) Information

D12 models with "Q" model suffix; use cable at right.



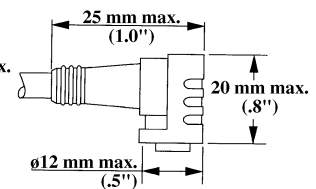
Model PKG4-2 cable (straight connector)

4-wire cable p/n 32438
length 6-1/2 feet (2 meters)



Model PKW4-2 cable (right-angle connector)

4-wire cable p/n 34462
length 6-1/2 feet (2 meters)



WARNING These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as a safety device may create an unsafe condition which could lead to serious injury or death.

Only MINI-SCREEN®, MULTI-SCREEN®, MICRO-SCREEN™, MACHINE-GUARD™ and PERIMETER-GUARD™ Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.