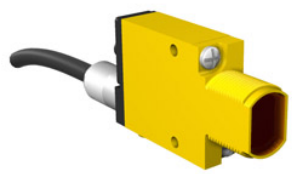
MINI-BEAM (Low Power Model)

more sensors, more solutions

Datasheet

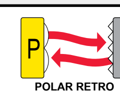
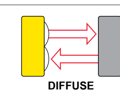
A self-contained dc-operated low-power sensor for use with the Sure Cross® devices



- Optimized for duty cycled battery-powered operation for the DX80 *Flex*Power® Nodes
- Compact, modulated, self-contained, low-power sensors for 5 V dc operation
- Available models include diffuse and extended-range polarized retroreflective
- Switch-selectable for light or dark operate

For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, *www.bannerengineering.com/wireless*.

Models

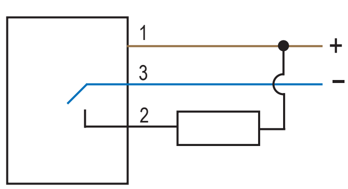
Model	Power	Range	Type
SM312LPQD-78447	5 V	3 m	
SM312DQD-78419		38 cm	

⚠ WARNING: Not To Be Used for Personnel **Protection**

Never use this device as a sensing device for personnel **protection.** Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

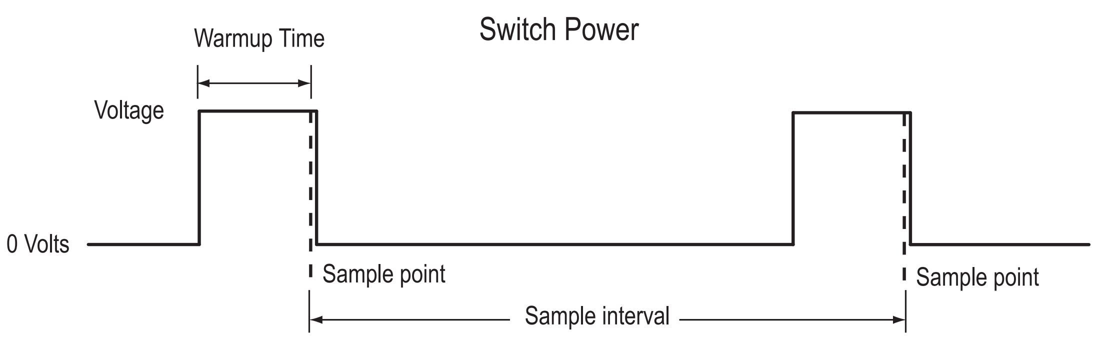
Installation

Wiring Diagrams



	Wire Color	**Description**
1	Brown	5 V dc
2	White	Load
3	Blue	Ground

Sensor **Operation** with the DX80 FlexPower System



Efficient power management technology enables the FlexPower battery system to briefly step up the switched power voltage to activate the low-power MINI-BEAM® sensor, which is optimized for low duty cycle pulse operation. Once activated, the input reads the sensor then the switched power shuts off to prolong battery life, operating the MINI-BEAM in short pulses rather than continuously.

Sensor **Mounting** and Alignment

MINI-BEAM sensors perform most reliably when they are properly aligned and securely mounted. For maximum mechanical stability, mount MINI-BEAM sensors through 18 mm diameter holes by their threaded barrel where available or use a mounting bracket.

Begin with line-of-sight positioning of the MINI-BEAM sensor to its target. When using a retroreflective sensor, the target is the retroreflector (retro target). For diffuse or convergent sensing modes, the target is the object to be detected.

Apply power to the sensor. Advance the 15-turn gain control to maximum (clockwise end of rotation), using a small flat-bladed screwdriver. The gain control is clutched at both ends to avoid damage and “free-wheels” when either endpoint is reached. Because the low-power MINI-BEAM operates in pulses instead of continuously, sensor alignment is more complicated. To simplify alignment, force the sensor to mimic continuous operation by hooking up the sensor to a fixed 5.0 voltage supply or by configuring the warm-up time to its maximum allowable value. After establishing the optimum position, configure the warm-up time back to the value listed in the specifications table.

When the MINI-BEAM sensor receives its light signal, the red LED alignment indictor turns ON and flashes at a rate proportional to the signal strength. Move the sensor to find the center of the movement zone within which the LED indicator remains ON. Reducing the gain setting reduces the size of the movement zone and permits more precise alignment.

Repeat the alignment motions after each gain reduction. When optimum alignment is achieved, mount the sensor and any applicable target (retroreflective) in that position. Increase the gain to maximum.

Test the sensor by placing the object to be detected in the sensing position, then removing it. The alignment indictor LED should come ON when the sensing beam is established (light condition), and go OFF when the beam is broken (dark condition). If the alignment indicator LED stays ON for both sensing conditions, consider the following tips for each sensing mode.

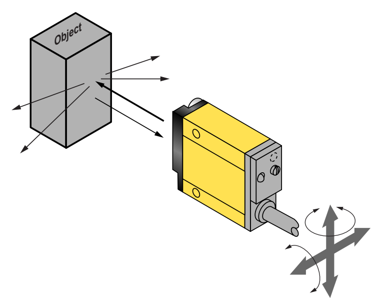
Diffuse-Mode Alignment

Light condition: object in beam

Dark condition: no object in beam

If the alignment LED does not go off when the object is removed from the beam, the sensor is probably detecting light reflected from a background object. To improve performance:

- Reduce the reflectivity of the background by painting the surface flat black, scuffing any shiny surface, or drilling a large hole directly opposite the diffuse sensor.
- Move the sensor closer to the object to be detected and reduce the gain adjustment. Rule of thumb for diffuse sensing: the distance to the nearest background object should be at least three times the sensing distance.



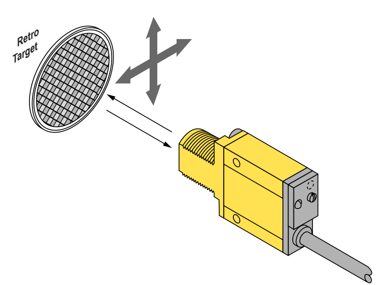
Retroreflective Mode Alignment

Light condition: no object in beam

Dark condition: object in beam

A highly reflective object may reflect enough light back to a retroreflective sensor to allow the object to cross the beam without being detected, a situation called proxing. Use the following methods to reduce this effect:

- Position the sensor and retro target until the beam does not strike a shiny surface perpendicular to the sensor lens.
- Reduce the gain adjustment.



Discrete **Configuration**

The battery life calculations, in years, for some discrete sensors are shown in the table below.

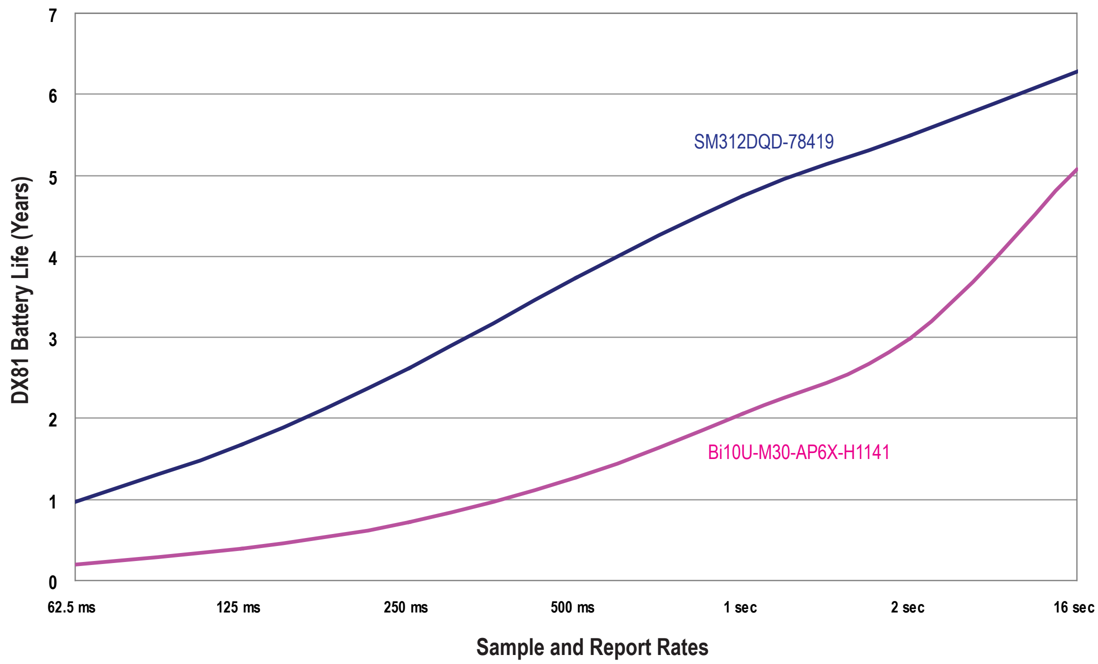
Table 1: Battery Life in Years

	Manufacturer	Device	Model	Boost Voltage	Warmup Time
1	Banner	Optical	SM312DQD-78419	5 V	4 ms

	Manufacturer	Device	Model	Boost Voltage	Warmup Time
2	Turck	Inductive Proximity	Bi10U-M30-AP6X-H1141	10 V	10 ms

	Sample and Report Rates						
	62.5 ms	125 ms	250 ms	500 ms	1 second	2 seconds	16 seconds
1	0.97	1.67	2.62	3.74	4.75	5.49	6.28
2	0.20	0.40	0.72	1.27	2.05	2.99	5.07

Note, battery life calculations are based on the sensor operating 24 hours a day, 365 days a year.



For each sensor characterized, a boost voltage and warmup time was specified. The sample and reports rates were varied to calculate the estimated battery life. For example, a Banner Optical sensor, model SM312DQD-78419, set to a boost voltage of 5 volts, a warm-up time of 4 milliseconds, and a sample and report rate of 16 seconds, should have a battery life of just over 6 years.

The curves for discrete devices represent a "worst case" as far as battery use because we are assuming for each sample of the sensor's output a change in state has occurred (e.g., target present to target absent or vice versa), sending a radio message from Node to Gateway. No messaging occurs unless there is a change to report. Actual battery life depends on how many state changes actually occur.

All battery life calculations are approximations based on a strong radio signal. Weaker radio connections and missed packets will decrease the battery life.

Low-Power MINI-BEAM **Specifications**

Supply Voltage
: 5 V dc

Supply Current
: Depends on the pulse duty cycle system of the *Flex*Power® device. For example, at 5 Volts and a 62.5 millisecond sample rate, the maximum sensor current is 1.1 mA.

Warm-up Time
: 4 milliseconds

Output **Configuration**
: One current sinking (NPN) open collector transistor

Adjustments
: LIGHT/DARK OPERATE select switch, and 15-turn slotted brass screw GAIN (sensitivity) adjustment potentiometer (clutched at both ends of travel). Both controls are located on the rear panel of the sensor and protected by a gasketed, clear acrylic cover.

Indicators
: Alignment Indicating Device system (AID) lights a rear-panel mounted red LED indicator when the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate).

Construction
: Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws.

Environmental **Rating**
NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67

Operating Conditions
Temperature: −20 to +70° C
Humidity: 90% max. relative (non-condensing) at 50° C

Certifications

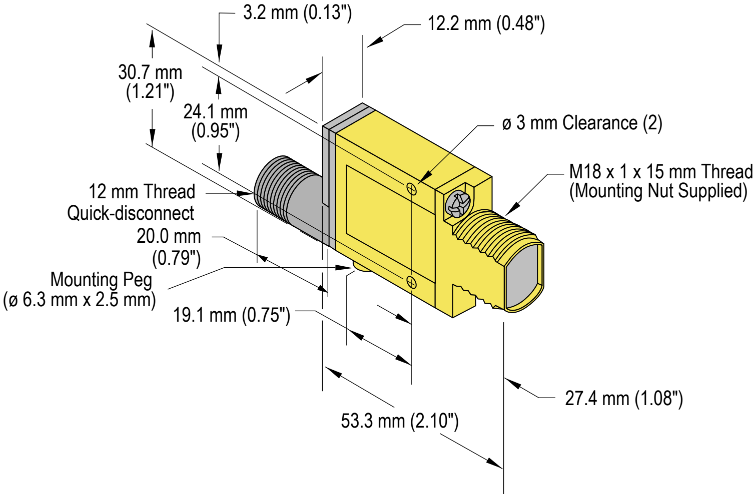
Required Overcurrent **Protection**

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *www.bannerengineering.com*.

Supply Wiring (AWG)	Required Overcurrent **Protection** (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions



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