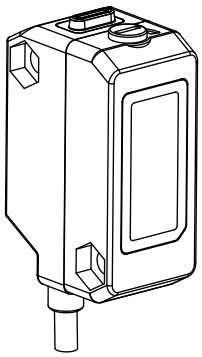
WORLD-BEAM® QS18 Adjustable-Field Sensors

Datasheet

Miniature sensors with visible red LED or visible red laser



- Exceptional optical performance, comparable to larger sensors
- Simple multi-turn screw adjustment of cutoff distance
- 10 V dc to 30 V dc operation, with complementary (SPDT) NPN or PNP outputs, depending on model
- Less than 1 millisecond output response for excellent sensing repeatability

Laser Models:

- Narrow effective beam (approx. 1 mm spot size) for small-object detection and precise position control
- Crosstalk rejection algorithm to avoid optical disturbance from adjacent sensors
- Class 2 models have reduced excess gain within 20 mm of sensor for decreased susceptibility to the effects of lens contamination and to allow use of external lens shield

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.

Models

Models	Sensing Beam	Range	Cordset[1]	Supply Voltage	Output Type
QS18VN6AF100	660 nm Visible Red LED	1 mm (0.04 in) to cutoff point; Adjustable cutoff point, 20-100 mm (0.8 in-4 in)	2 m (6.5 ft) 4-wire	10 to 30 V dc	NPN
QS18VP6AF100					PNP
QS18VN6LAF	650 nm Visible Red Class 1 Laser	1 mm (0.04 in) to cutoff point; Adjustable cutoff point, 30-150 mm (1.2 in-6 in)			NPN
QS18VP6LAF					PNP
QS18VN6LAF250	658 nm Visible Red Class 2 Laser	20 mm (0.08 in) to cutoff point; Adjustable cutoff point, 50-250 mm (2 in-10 in)			NPN
QS18VP6LAF250					PNP

[1] Only standard 2 m (6.5 ft) cable models are listed.

- For 9 m (30 **ft)** cables: add suffix "W/30" to the model number (for example, QS18VN6AF100 W/30).
- For 4-pin Pico-style pigtail QD: add suffix "Q" to the model number (for example, QS18VN6AF100Q); accessory mating cordset required.
- For 4-pin Euro-style pigtail QD: add suffix "Q5" to the model number (for example, QS18VN6AF100Q5); accessory mating cordset required.

Overview

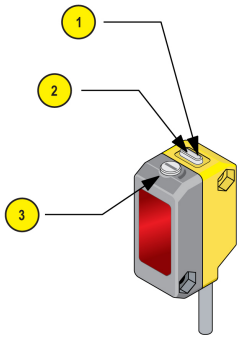


Figure 1. Sensor features

The QS18 Adjustable-Field Sensors are a full-featured sensor in a miniature package. It provides background suppression sensing capability for small or difficult-to-reach areas. Models are available with a visible red LED sensing beam, or one of two visible red lasers (see *Models* on page 1).

These adjustable-field sensors are able to detect objects of relatively low reflectivity, while ignoring other objects in the background (beyond the cutoff point). The cutoff distance is mechanically adjustable, using the 5-turn adjustment screw on the sensor top. Backgrounds and background objects must *always* be placed beyond the cutoff distance.

1. Green: Power Indicator (Flashes for Output Overload)
2. Amber: Light Sensed Indicator (Flashes for Low Gain Conditions)
3. Cutoff Point Adjustment Screw

Adjustable-Field Sensing — Theory of **Operation**

The sensor compares the reflections of its emitted light beam (E) from an object back to the sensor's two differently-aimed detectors R1 and R2 (see *Figure 2* on page 2). If the near detector (R1) light signal is stronger than the far detector (R2) light signal (see object A, closer than the cutoff distance), the sensor responds to the object. If the far detector (R2) light signal is stronger than the near detector (R1) light signal (see object B, object beyond the cutoff distance), the sensor ignores the object.

The cutoff distance for these sensors is adjustable. Objects lying beyond the cutoff distance are ignored, even if they are highly reflective. However, it is possible to falsely detect a background object, under certain conditions (see *Background Reflectivity and Placement* on page 4).

In this document, the letters E, R1, and R2 identify how the sensor's three optical elements (Emitter "E", Near Detector "R1", and Far Detector "R2") line up across the face of the sensor. The location of these elements defines the sensing axis (see *Figure 6* on page 4). The sensing axis becomes important in certain situations, such as those illustrated in *Figure 10* on page 5 and *Figure 11* on page 5.

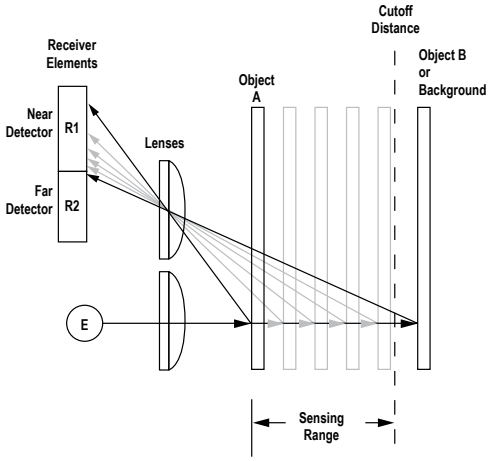


Figure 2. Adjustable field sensing concept

Color **Sensitivity**

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. It is expected that at any given cutoff setting, the actual cutoff distance for lower reflectance targets will be slightly shorter than for higher reflectance targets (see the cutoff point deviation graphs). This behavior is known as color sensitivity.

The excess gain curves were generated using a white test card of 90% reflectance. Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

In the cutoff point deviation graphs, the percentage of deviation indicates a change in the cutoff point for either 18% gray or 6% black targets, relative to the cutoff point set for a 90% reflectance white test card.

For example, in *Figure 3* on page 3, the cutoff point decreases 10% for a 6% reflectance black target when the cutoff point is adjusted for 100 mm (4 in) using a 90% reflectance white test card. In other words, the cutoff point for the black target is 90 mm (3.6 in) for this setting.