QC50 Series True Color Sensor

Compact, self-contained, three-output color-differentiating sensor

Features

- Two versions for application flexibility: QC50 models for most applications, and QCX50 models for more challenging applications

- Compact, self-contained design

- Analyzes and compares color to color, or varying intensities of one color

- QCX50 models excel in challenging applications, such as differentiating dark blue from black

- Fast sensing response time –

  QC50 models: 335 microseconds

  QCX50 models: 5 ms (reduced resolution setting – 1 ms)

- Easy-to-set programming options for 1, 2, or 3 colors

- Three programming parameters: channel, sensing mode, and tolerance level

- 10 tolerance levels to allow for product variation

- Output OFF-delay (6 options); selection applies to all three color channels

- Gate mode option (also called inhibiting, synchronization or windowing)

Models

Models	Sensing Range	Cable/Connector*	Sensing Response Time	Supply Voltage	Output Type
QC50A3P6XDWQ	20 mm (0.8") typical; varies according to sensor configuration	8-pin Euro-style (M12) swivel QD connector	335 µs	10 to 30V dc	PNP, 3 channels
QC50A3N6XDWQ					NPN, 3 channels
QCX50A3P6XDWQ			Selectable 5 ms or 1 ms		PNP, 3 channels
QCX50A3N6XDWQ					NPN, 3 channels

* Mating cable required; see page 7 for cable options

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Overview

The easy-to-use QC50 series true color sensor uses modulated white light with red, green, and blue (R, G, B) electronic filters to scan for the presence of one, two or three colors. Its compact size allows it to be mounted almost anywhere. Configuration options include Programming mode for color detection parameters and Setup mode for selecting an adjustable output OFF-delay or selecting between two response speeds (some models). Three solid-state outputs may be set individually for color differentiation or for color-plus-intensity differentiation (see Sensing Modes below).

The sensor has two push buttons, Set and Select, plus a 4-digit LED display, an Output LED, and three Output Status LEDs (one for each sensing output), for easy programming and status monitoring during operation. Push buttons can be locked out for security (see page 5).
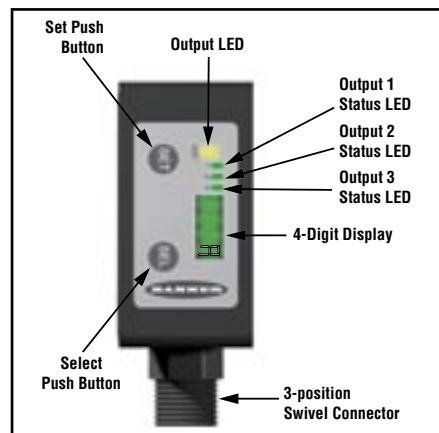

Figure 1. Sensor features

Sensor Configuration

Outputs
The QC50 can be programmed to sense one, two, or three colors. Three outputs are available for this purpose. When a programmed color is sensed, the yellow Output ("OUT") indicator LED and the associated green Output Status LED turn ON, and the respective output conducts.

Sensing Modes
The Sensor functions in one of two sensing modes: Color only (expressed "C" on the 4-digit display) or Color-Plus-Intensity (expressed "C_I"). In Color sensing mode, only colors are sensed. This is most useful for sorting obvious color differences (for example, red or black or green).

The Color-Plus-Intensity option refines the sensor's capabilities to include grayscale as well, broadening the spectrum of colors and shades which the sensor can be programmed to detect. This feature allows "batch" sorting or identifying within a color family (for example, light blue or medium blue or dark blue).

Tolerance Levels
The Sensor can be configured for one of 10 levels of tolerance (0 to 9). A higher number (for example 9, expressed "toL9" on the 4-digit display) permits the sensor to accept a wider range of target conditions, compared with lower tolerance levels. A tolerance level of 0 (expressed "toL0") causes much more precise discrimination and a narrower range of target conditions.

OFF-Delay
An output OFF-delay value up to 40 milliseconds may be set (see page 5). This value represents the time interval, following termination of sensing, during which the outputs remain active (see Figure 3). NOTE: The selected delay will apply to all three outputs.

Sensing Response Speed
The QCX50 models feature two selectable sensing response speeds: Normal and Fast. At either speed, sensing resolution is improved over that of the QC50 models. The faster the speed, the lower the resolution. Normal speed is the recommended mode for most applications and provides the best resolution. Normal speed enables such high-resolution sensing as differentiating between similar shades of beige.
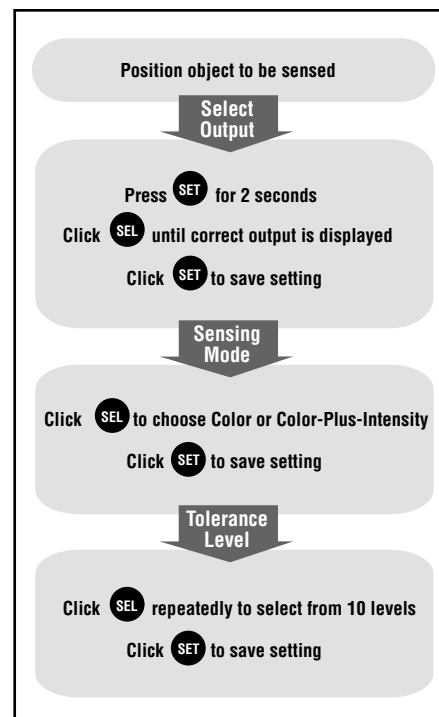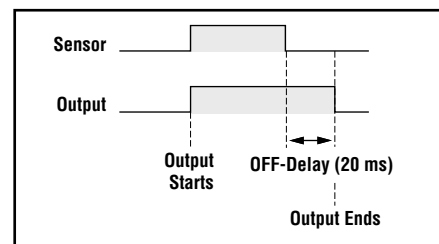

Figure 2. A quick sensor programming guide

Figure 3. 20 ms OFF-delay (d_20): output continues for an interval after sensing stops (applies to all outputs)

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Installing the Color Sensor

NOTE: When sensing glossy surfaces, install the sensor at approximately a 15° angle with respect to the target. See Figure 5.

1. Determine the best position for the swivel connector (back, side, or bottom of the sensor).

2. Measure the appropriate operating distance from the front surface of the sensor optics to the point where the sensor is to be fastened. Typically, the ideal distance is 20 mm (0.8").

3. Fasten the sensor to its intended location using two screws (M4x35 or longer). Any two of three holes in the housing may be used for this purpose.

4. Attach the power cable to the sensor's connector; see hookups on page 7.

NOTE: When the sensor is ON, the white emitter beam is ON and a message ("run" or "rund") appears on the 4-digit status display.
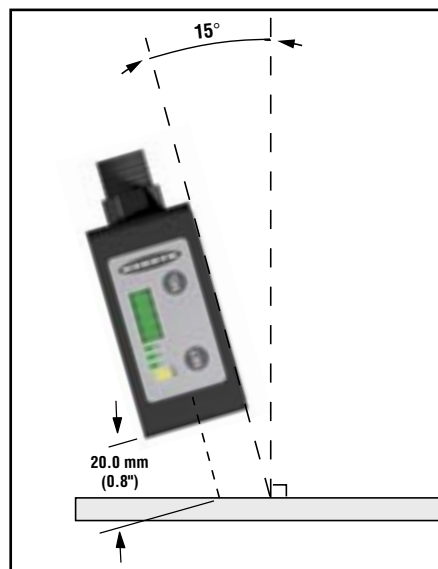

Figure 5. Mount sensor 15° from perpendicular when sensing a glossy surface
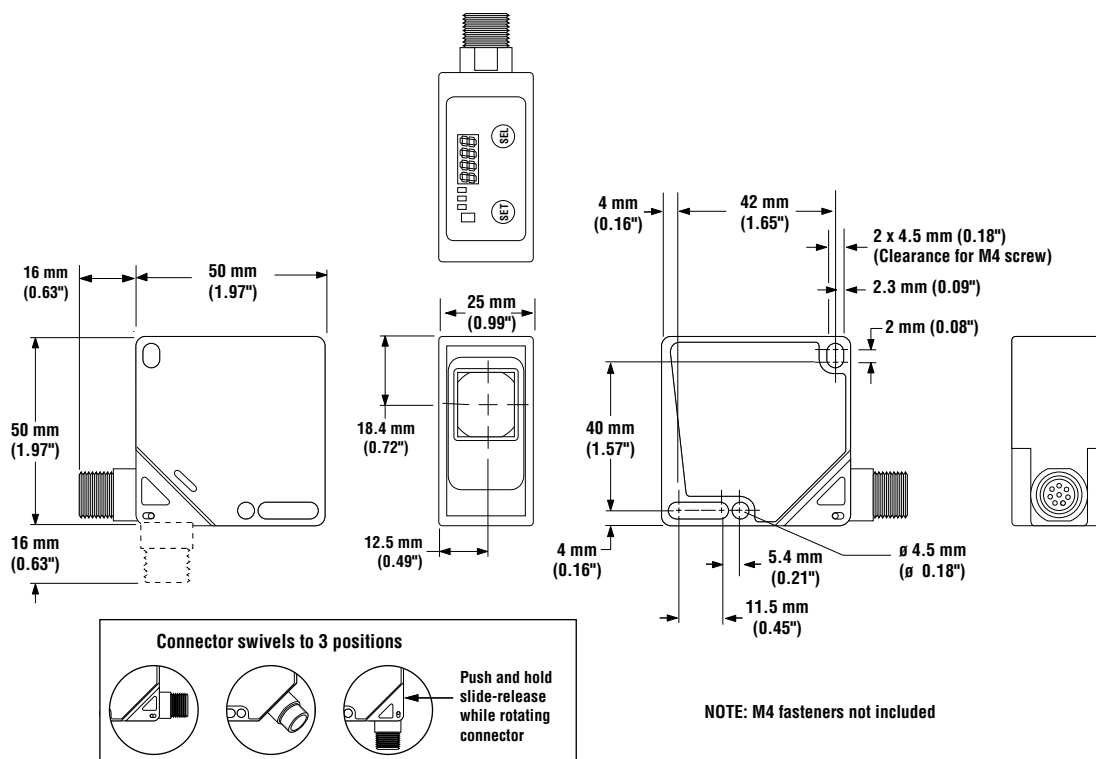
Specifications

Sensing Beam	Pulsed white LED (400 to 700 nm)
Sensing Receiver	Solid-state photodiode device with R, G, B filters
Sensing Range	20 mm (0.8") typical; varies depending on sensor configuration
Supply Voltage	10 to 30V dc, 2 V pp max ripple 40 mA max @ 24V dc (excluding output current)
Supply Protection Circuitry	Protected against reverse polarity, over-voltage, and transient voltage
Output Configuration	3 PNP or 3 NPN outputs, depending on model 30V dc max **Saturation Voltage:** < 2V
Output Rating	100 mA maximum load per output channel
Output Protection	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	**QC50 models:** 335 microseconds **QCX50 models:** Selectable 5 ms (normal) or 1 ms NOTE: 500 ms delay at power-up; outputs do not conduct during this time. 　　　　　　　　　　**QC50 models**　　　　　**QCX50 models** **Gate ON-time:** 335 microseconds　　700 microseconds **Gate OFF-time:** 170 microseconds　　400 microseconds
Adjustments	2 push buttons (Set and Select) • Color scanning, color mode, delay and tolerance • Manual adjustment of color channels, sensing mode and tolerance level
Indicators	**4-Digit LCD Display:** indicates sensing mode, display information, tolerance level, channel status **Yellow Output LED:** ON when any output is conducting **3 Green Channel Output Status LEDs:** ON when its corresponding channel output is conducting
Construction	ABS shock-resistant housing; glass window and lens
Environmental Rating	IEC IP62

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Specifications, continued

Connections	8-pin Euro-style (M12) swivel quick-disconnect fitting; 2 m (6.5'), 5 m (15') or 9 m (30') cable available separately. See page 7.
Operating Conditions	**Temperature:** -10° to +55°C (+14° to 131°F) **Max. Relative Humidity:** 90% at 50°C (non-condensing)
Data Retention	EEPROM nonvolatile memory
Minimum Spot Diameter	4 mm (0.2")
Ambient Light Rejection	According to EN 609475-2
Shock Resistance	Approx. 30 G; 3 shocks per axis; 11 ms duration
Vibration	0.5 mm (0.02") amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis
Certifications	C E

Dimensions

16 mm (0.63")
50 mm (1.97")
50 mm (1.97")
16 mm (0.63")

25 mm (0.99")
18.4 mm (0.72")
12.5 mm (0.49")

4 mm (0.16")
42 mm (1.65")
2 x 4.5 mm (0.18") (Clearance for M4 screw)
2.3 mm (0.09")
2 mm (0.08")
40 mm (1.57")
4 mm (0.16")
5.4 mm (0.21")
ø 4.5 mm (ø 0.18")
11.5 mm (0.45")

Connector swivels to 3 positions

Push and hold slide-release while rotating connector

NOTE: M4 fasteners not included

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Hookups

PNP Hookup

bn
bu
gn   Output 1
ye   Output 2
gy   Output 3
rd
wh
pk

+ 10 to 30V dc −

Gate

} Not Used

NPN Hookup

bn
bu
gn   Output 1
ye   Output 2
gy   Output 3
rd
wh
pk

+ 10 - 30V dc −

Gate

} Not Used