Q5Z Global Laser Measurement Sensor with IO-Link Quick Start Guide

Product Description

Laser sensor with dual outputs and IO-Link

This guide is designed to help you set up and install the Q5Z Global Laser Measurement Sensor. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Product Manual at www.bannerengineering.com. Search for part number 226330 to view the Product Manual. Use of this document assumes familiarity with pertinent industry standards and practices.

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Overview

The Q5Z Global Laser Measurement Sensor is a Class 2 laser sensor with IO-Link and a multifunction output.

The single teach button and no display mean the sensor must be configured at the factory. This is so that it is ready for installation out of the box. To customize the configuration for an application, contact Banner Engineering.

Features

The following shows the simplified user interface of the Q5Z.

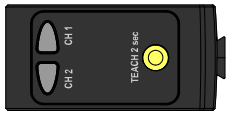
Q5Z Features



1. Chanel 1 output indicator (amber)
2. Chanel 2 output indicator (amber)
3. Button

Use the sensor button **(TEACH)** to program the sensor. Press and hold for longer than 2 seconds to start the pre-configured TEACH mode.

Top View



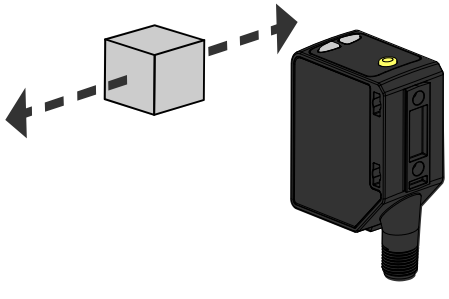
Installation

Sensor Orientation for the Triangulation Models

Optimize detection reliability and minimum object separation performance with correct sensor-to-target orientation.

To ensure reliable detection, orient the sensor as shown in relation to the target to be detected.

Optimal Orientation of Target to Sensor



Original Instructions
24-Jul-25

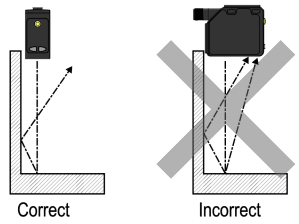
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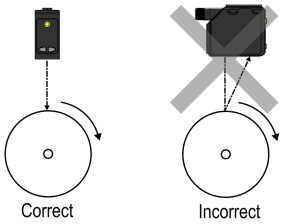
ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

See the following figures for examples of correct and incorrect sensor-to-target orientation as certain placements may pose problems for sensing some targets. The Q5Z can be used in the less preferred orientation and at steep angles of incidence and still provide reliable detection performance due to its high excess gain. For the minimum object separation distance required for each case, refer to "Performance Curves" on page 5.

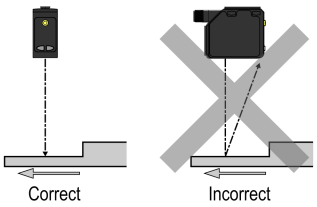
Orientation by a wall



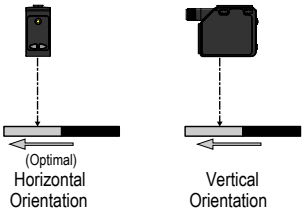
Orientation for a moving object



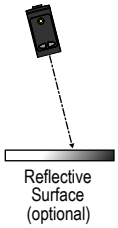
Orientation for a height difference



Orientation for a color or luster difference



Orientation for highly reflective target(1)

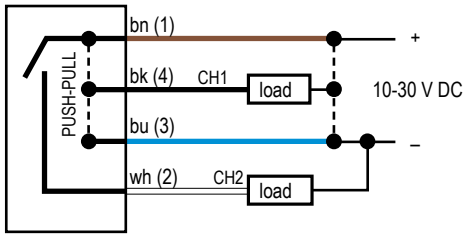


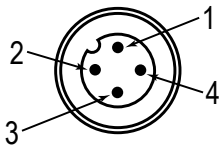
Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

Wiring Diagram

Channel 2 as PNP Discrete or PFM Output





NOTE: Open lead wires must be connected to a terminal block.

TEACH Procedure

Use the following instructions to perform a two-point TEACH (default TEACH mode) on the Q5Z sensor.

1. Press and hold **TEACH** for longer than 2 seconds to start the selected TEACH mode.
2. Present the target.
3. Press **TEACH** to teach the target.

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(1) Applying tilt to sensor may improve performance on reflective targets. The direction and magnitude of the tilt depends on the application, but a 15° tilt is often sufficient.

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The target is taught and the sensor waits for the second target.

4. Present the second target.
5. Press **TEACH** to teach the target.
   The target is taught and the sensor returns to Run mode.

Channel 2 is configured to be light operate and can be taught. To change the active channel, press the **TEACH** five times. The LED indicator of the now activated channel flashes five times and can be taught normally. The TEACH method of both channels is the same.

Expected TEACH Behavior for Two-Point Static Background Suppression

Condition	TEACH Result	Display
Two valid distances that are greater than or equal to the horizontal minimum object separation	Sets a switch point between the two taught distances.	The indicator of the active channel flashes three times.
Two valid distances that are less than the horizontal minimum object separation	Sets a switch point in front of the furthest taught distance equal to the uniform reflectivity minimum object separation.	The indicator of the active channel flashes six times.
One valid distance with one invalid TEACH point	Sets a switch point between the one taught distance and the maximum range.	The indicator of the active channel flashes eight times.
Two invalid TEACH points	Sets a switch point at 174 cm.	The indicator of the active channel flashes ten times.

Specifications

Sensing Beam
Visible red Class 2 laser models (see "Class 2 Laser Description and Safety Information" on page 5)

Supply Voltage (Vcc)
10 to 30 V DC (Class 2 supply) (10% max ripple within limits)

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Power and Current Consumption, exclusive of load
< 1 W

Sensing Range
95 mm to 1800 mm (3.74 in to 70.86 in)

Output Configuration
Channel 1: IO-Link, Push/pull output, configurable PNP or NPN output

Channel 2: Multi-function remote input/output, configurable PNP or NPN, or pulse frequency modulated output

Temperature Effect (Typical)
< 0.5 mm/°C at < 500 mm

< 1.0 mm/°C at < 1000 mm

< 3.5 mm/°C at < 1800 mm

Remote Input
Allowable Input Voltage Range: 0 to Vsupply

Active High (internal weak pull-down): High state > (Vsupply – 2.25 V) at 2 mA maximum

Active Low (internal weak pull-up): Low state < 2.25 V at 2 mA maximum

IO-Link Interface
IO-Link Revision V1.1

Smart Sensor Profile: Yes

Baud Rate: 38400 bps

Process Data In Length: 32 bits

Process Data Out Length: 8 bits

Minimum Cycle Time: 3.6 ms

IODD files: Provides all programming options of the display, plus additional functionality.

Boresighting
± 43 mm at 1800 mm

Response Speed
User-selectable 3, 5, 15, 25, or 50 ms

Delay at Power-Up
< 2.5 s

Maximum Torque
Side mounting: 1 N·m (9 in·lbs)

Ambient Light Immunity
2000 lux at 1.8 m

Connector
Integral 4-pin M12 male quick-disconnect connector

Construction
Housing: ABS

Lens cover: PMMA acrylic

Lightpipe: polycarbonate

Application Note
For optimum performance, allow 10 minutes for the sensor to warm up

Environmental Rating
IP67 per IEC60529

Vibration
MIL-STD-202G, Method 201A (Vibration: 10 Hz to 55 Hz, 0.06 inch (1.52 mm) double amplitude, 2 hours each along X, Y and Z axes), with device operating

Shock
MIL-STD-202G, Method 213B, Condition I (100G 6x along X, Y, and Z axes, 18 shocks), with device operating

Operating Conditions
–10 °C to +50 °C (+14 °F to +122 °F)

35% to 95% relative humidity

Storage Temperature
–25 °C to +70 °C (–13 °F to +158 °F)

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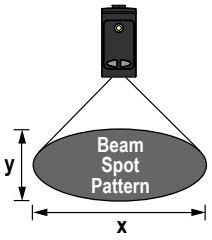
Output Rating

Current rating: 50 mA maximum

Black wire specifications per configuration		
IO-Link Push/Pull	Output High:	≥ Vsupply - 2.5 V
	Output Low:	≤ 2.5 V
PNP	Output High:	≥ Vsupply - 2.5 V
	Output Low:	≤ 1V (loads ≤ 1 MegΩ)
NPN	Output High:	≥ Vsupply - 2.5 V (loads ≤ 50 kΩ)
	Output Low:	≤ 2.5 V

White wire specifications per configuration		
PNP	Output High:	≥ Vsupply - 2.5 V
	Output Low:	≤ 2.5 V (loads ≤ 70 kΩ)
NPN	Output High:	≥ Vsupply - 2.5 V (loads ≤ 70 kΩ)
	Output Low:	≤ 2.5 V

Beam Spot Size



Distance (mm)	Size (x × y) (mm)
100	3.8 × 5.0
1000	5.2 × 6.5
1800	7.0 × 6.2

Beam spot size is calculated as 1.6 times the D4σ measured value

Discrete Output Distance Repeatability

Distance (mm)	Repeatability (1800 mm Models)
95 to 300	± 0.5 mm
300 to 1000	± 0.25%
1000 to 1800	± 0.52%

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

Typical Excess Gain

	High Excess Gain (Standard Excess Gain) Using a 90% White Card [2]			
Response Speed (ms)	at 100 mm	at 500 mm	at 1000 mm	at 1800 mm
3	100	40	12	3
5	100	40	12	3
15	460 (140)	220 (65)	55 (20)	10 (5)
25	800 (520)	400 (220)	100 (55)	25 (12)
50	1600 (800)	800 (400)	200 (100)	50 (25)

Certifications

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1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

c UL us LISTED Industrial Control Equipment 3TJJ

Class 2 power; UL Environmental Rating: Type 1

IO-Link®

Advanced Capabilities

PULSE® PRO I/O

[2] Standard excess gain is available in 15, 25, and 50 ms response speeds; standard excess gain provides increased noise immunity.

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Class 2 Laser Description and Safety Information



Laser light. Do not stare into the beam.

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 56, dated May 8, 2019.





CAUTION:

- **Never stare directly into the sensor lens.**
- Laser light can damage your eyes.
- Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.



CAUTION:

- **Return defective units to the manufacturer.**
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer.

Class 2 lasers are lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

Class 2 Laser Safety Notes. Low-power lasers are, by definition, incapable of causing eye injury within the duration of a blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 nm to 700 nm). Therefore, an ocular hazard may exist only if individuals overcome their natural aversion to bright light and stare directly into the laser beam.

IMPORTANT: This laser device is not bore-sighted.

Models with maximum range of < 5 m

Class 2 Laser Characteristics

Output power: < 1.0 mW
Laser wavelength: 650 nm
Pulse duration: 20 µs to 2 ms

Models with maximum range ≥ 5 m

Class 2 Laser Characteristics

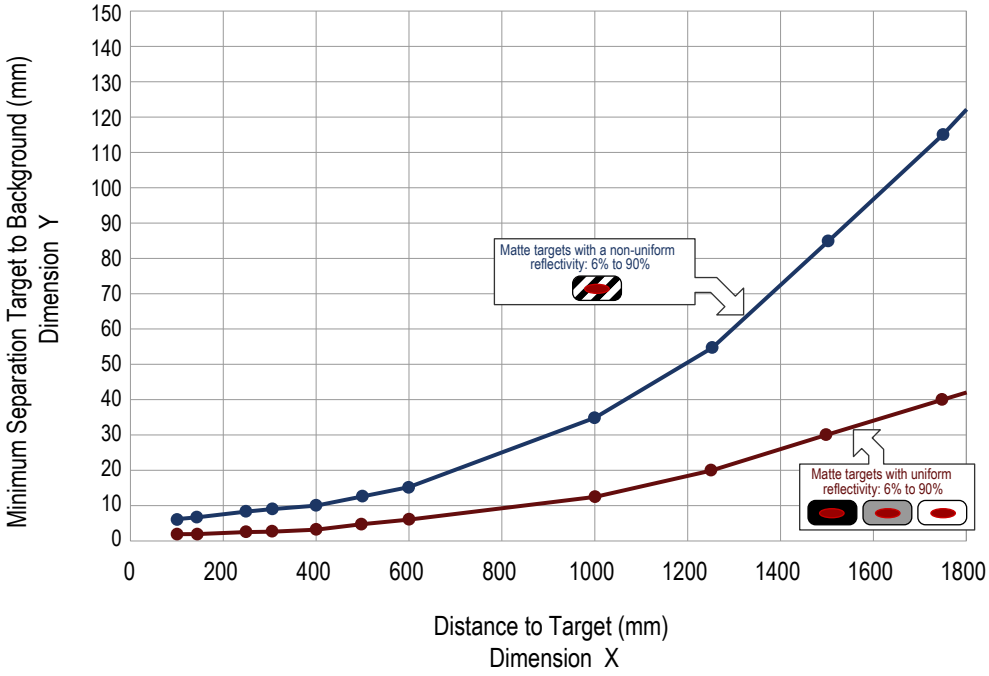
Output Power: < 1.0 mW
Laser wavelength: 650 nm
Pulse Duration: 3 µs

Performance Curves

Typical data for the sensor is shown.

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Minimum Object Separation (MOS) Specifications



Product Support

Clean Sensor with Compressed Air and Water

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. create stray light that may degrade the peak performance of the sensor.

Blow the window clear using filtered, compressed air, then clean as necessary using only water and a lint-free cloth. Do not use any other chemicals for cleaning.

Repairs

Contact Banner Engineering for troubleshooting of this device. **Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components.** If the device, device part, or device component is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.

> **IMPORTANT:** If instructed to return the device, pack it with care. Damage that occurs in return shipping is not covered by warranty.

Contact Us

Banner Engineering Corp. headquarters is located at: 9714 Tenth Avenue North | Plymouth, MN 55441, USA | Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

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