VS8 Series Sensor Product Manual

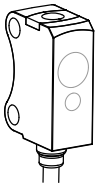
Original Instructions
p/n: 201958 Rev. F
31-Oct-24

Contents

Chapter Contents

Chapter 1 Product Description

- Miniature sensor for installation in the smallest of spaces
- Red laser models provide bright, precise laser light spot for optimum small part detection
- High switching frequency for detection in even the fastest processes
- User-friendly operation using electronic push button or remote input provides reliable and precise detection
- Red laser, Red LED, and Blue LED types available to match sensing beam to application
- Robust, glass-fiber-reinforced plastic housing
- PNP or NPN output, depending on model



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.

VS8 Opposed Mode Models

Model	Sensing Mode	Range	Output	Connection
VS8LEJ	Red Laser Emitter with Beam Inhibit	0 m to 3 m (0 in to 9.8 ft)	–	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8LEJQ			–	200 mm (7.8 in) PUR cable with a 4-pin M8/Pico-style male quick disconnect (QD)
VS8EAPR	Receiver		PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANR			NPN	
VS8EAPRQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8/Pico-style male quick disconnect (QD)
VS8EANRQ			NPN	

VS8 Retroreflective Models

Model	Sensing Mode	Range	Output	Connection
VS8EAPLP	Red LED Retro Reflective	0.1 m to 1.6 m (3.9 in to 62.9 in) with BRT-2X2	PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANLP			NPN	
VS8EAPLPQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8/Pico-style male quick disconnect (QD)
VS8EANLPQ			NPN	
VS8EAPLLP	Red Laser Retro Reflective	0.1 m to 2 m (3.9 in to 78.7 in) with BRT-51X51BM	PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANLLP			NPN	
VS8EAPLLPQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8/Pico-style male quick disconnect (QD)

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Continued from page 3

Model	Sensing Mode	Range	Output	Connection
VS8EANLLPQ			NPN	

VS8 Background Suppression Models

Model	Sensing Mode	Range	Output
VS8EAPAF70	Red LED, Adjustable Background Suppression	5 mm to 70 mm (0.2 in to 2.8 in)	PNP
VS8EANAF70			NPN
VS8EAPLAF70	Red Laser, Adjustable Background Suppression	6 mm to 70 mm (0.24 in to 2.8 in)	PNP
VS8EANLAF70			NPN
VS8APFF30B	Blue LED, Fixed 30 mm Background Suppression	2 mm to 30 mm (0.08 in to 1.18 in)	PNP
VS8ANFF30B			NPN
VS8APFF50B	Blue LED, Fixed 50 mm Background Suppression	2 mm to 50 mm (0.08 in to 1.97 in)	PNP
VS8ANFF50B			NPN

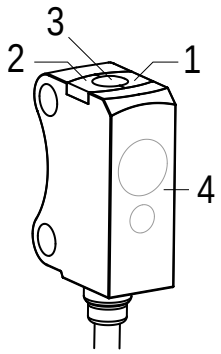
Model	Sensing Mode	Range	Output
VS8APFF15	Red LED, Fixed 15 mm Background Suppression	2 mm to 15 mm (0.08 in to 0.59 in)	PNP
VS8ANFF15			NPN
VS8APFF30	Red LED, Fixed 30 mm Background Suppression	2 mm to 30 mm (0.08 in to 1.18 in)	PNP
VS8ANFF30			NPN
VS8APFF50	Red LED, Fixed 50 mm Background Suppression	2 mm to 50 mm (0.08 in to 1.97 in)	PNP
VS8ANFF50			NPN

Integral 2 m (6.5 ft) unterminated PUR cable models are listed.

- To order the 200 mm (7.8 in) PUR cable model with a 4-pin M8 quick disconnect, add suffix "Q" to the model number. AF and LAF models only.
- To order the 200 mm (7.8 in) PUR cable model with a 3-pin M8 quick disconnect, add suffix "Q3" to the model number. FF models only.
- To order the 200 mm (7.8 in) PUR cable model with a 4-pin M12 quick disconnect, add suffix "Q5" to the model number. AF and LAF models only.

Overview

VS8 Sensor Features



Features

1. Green Indicator
2. Amber Indicator
3. TEACH Button - Laser Adjustable Field (LAF), Adjustable Field (AF), Polar Retro (LP), and Receiver (R) Models
4. Optical Window

Class 1 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 1 lasers are lasers that are safe 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.

For safe laser use:

- Do not stare at the laser.
- Do not point the laser at a person’s eye.
- Mount open laser beam paths either above or below eye level, where practical.
- Terminate the beam emitted by the laser product at the end of its useful path.

Class 1 Laser Characteristics

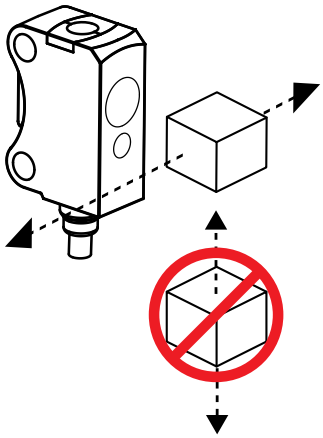
Output power: ≤ 2.3 mW
Laser wavelength: 655 nm
Pulse duration: 3.2 µs

Chapter Contents

Chapter 2 Sensor Installation

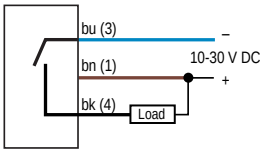
Install the sensor so the object to be detected moves horizontally to the sensor. Applies to adjustable and fixed field models only.

VS8 Sensor Installation

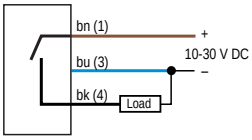


Wiring Diagrams

3-Pin NPN Models



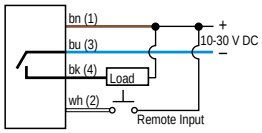
3-Pin PNP Models



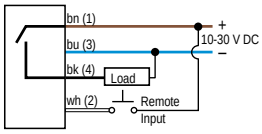
Key

1. Brown
2. White
3. Blue
4. Black

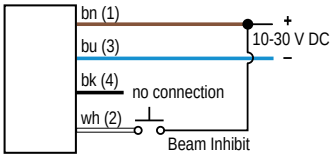
4-Pin NPN Models



4-Pin PNP Models



Opposed Mode Emitters



NOTE: All 4-pin and cabled models have a remote input on the white wire (pin-2).

Chapter Contents

Chapter 3 VS8 Sensor Configuration

- Expert™ 4-pin background suppression, retroreflective, and opposed mode receiver models are configurable using either the sealed push button or the remote input wire.
- 3-pin fixed field and opposed mode emitter models require no user adjustments.
- The remote input wire (pin-2/white wire) is used to select light or dark operate or perform the desired TEACH method. Pulse durations for the remote input wire correspond to the indicated press durations of the push button.

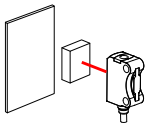
VS8 Remote Configuration – 4-Pin Models

The remote input wire (pin-2/white wire) is used to select light or dark operate, or perform the desired TEACH method. Closing and opening times for the remote input wire correspond to the indicated press/hold durations of the push button.

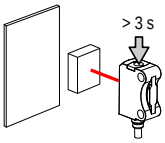
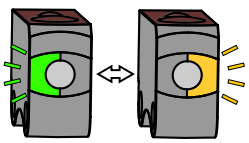
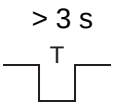
VS8 Two-Point Static Background Suppression

Two-point TEACH sets a single switch point. The sensor sets the switch point between two taught target distances, relative to the shifted origin location.

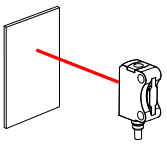
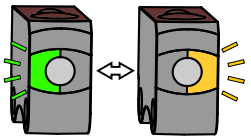
1. Present the target.

Method	Action		Result
Push Button **Remote Input**	Present the first target. The sensor-to-target distance must be within the sensor's range.		N/A

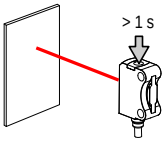
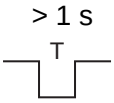
2. Start TEACH mode.

Method	Action		Result
Push Button	Press and hold push button > 3 seconds.		
Remote Input	Pulse remote input wire > 3 seconds.		Both LEDs flash (alternating)

3. Present the background or second target.

Method	Action		Result
Push Button	Present the background or second target. The sensor-to-target distance must be within the sensor's range.		 Both LEDs flash (alternating)
Remote Input			

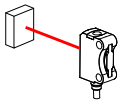
4. Configure the sensor.

Method	Action		Result
Push Button	Press push button > 1 second.		Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 second.		

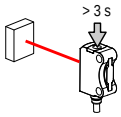
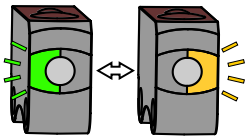
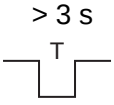
VS8 One-Point Static Background Suppression

One-point TEACH sets a single switch point. The sensor sets the switch point just behind the taught target distance.

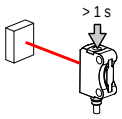
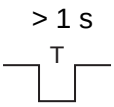
1. Present the target.

Method	Action		Result
Push Button	Present the target. The sensor-to-target distance must be within the sensor's range.		N/A
Remote Input			

2. Start TEACH mode.

Method	Action		Result
Push Button	Press and hold push button > 3 seconds.		 Both LEDs flash (alternating)
Remote Input	Pulse remote input wire > 3 seconds.		

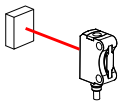
3. Configure the sensor.

Method	Action		Result
Push Button	Press push button > 1 second.		Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 second.		

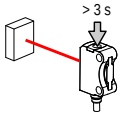
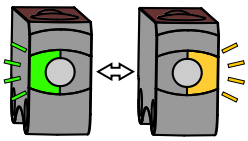
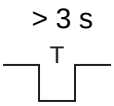
VS8 Dynamic Background Suppression

Dynamic TEACH sets a single switch point during machine run conditions. Dynamic TEACH is recommended for applications where a machine or process may not be stopped for teaching. The sensor takes multiple samples and the switch point is set just behind the farthest taught target distance, accounting for a static background.

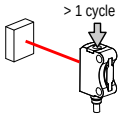
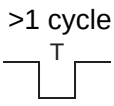
1. Present the target.

Method	Action		Result
Push Button	Present the first target. The sensor-to-target distance must be within the sensor's range.		N/A
Remote Input			

2. Start TEACH mode.

Method	Action		Result
Push Button	Press and hold push button > 3 seconds.		 Both LEDs flash (alternating)
Remote Input	Pulse remote input wire > 3 seconds.		

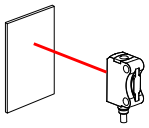
3. Configure the sensor.

Method	Action		Result
Push Button	Press and hold push button > 1 cycle of operation.		Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 cycle of operation.		

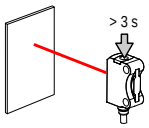
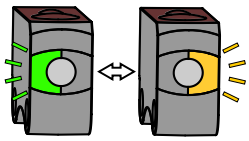
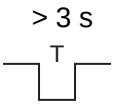
VS8 Two-Point Static Opposed and Retroreflective

Two-point TEACH for Opposed and Retroreflective modes sets a single switching level. The sensor sets the switching level between the blocked and unblocked conditions.

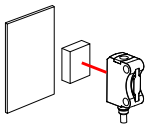
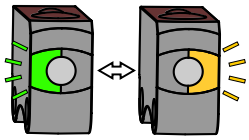
1. Align the sensor.

Method	Action		Result
Push Button	Align the emitter/receiver or sensor/retroreflector. The beam path should not be blocked.		N/A
Remote Input			

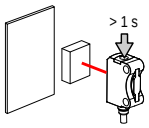
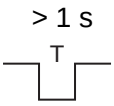
2. Start TEACH mode.

Method	Action		Result
Push Button	Press and hold push button > 3 seconds.		
Remote Input	Pulse remote input wire > 3 seconds.		Both LEDs flash (alternating)

3. Present the target.

Method	Action		Result
Push Button	Present the target. The beam path should be blocked by the target.		
Remote Input			Both LEDs flash (alternating)

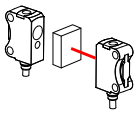
4. Configure the sensor.

Method	Action		Result
Push Button	Press and hold push button > 1 second.		Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 second.		

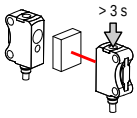
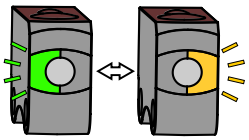
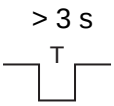
VS8 Dynamic Opposed and Retroreflective

Dynamic TEACH for Opposed and Retroreflective modes sets a single switching level during machine run conditions. Dynamic TEACH is recommended for applications where a machine or process may not be stopped for teaching. The sensor takes multiple samples and the switching level is set between the blocked and unblocked conditions.

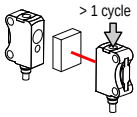
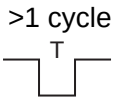
1. Present the target.

Method	Action		Result
Push Button	Present the target. The beam path should be blocked by the target.		N/A
Remote Input			

2. Start TEACH mode.

Method	Action		Result
Push Button	Press and hold push button > 3 seconds.		
Remote Input	Pulse remote input wire > 3 seconds.		Both LEDs flash (alternating)

3. Configure the sensor.

Method	Action		Result
Push Button	Press and hold push button > 1 cycle of operation.		Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 cycle of operation.		

VS8 Select Light Operate/Dark Operate – 4-Pin Models

Change the sensor operation to light operate or dark operate for the desired application. Use either the button or the remote input wire procedure to configure the sensor.

Method	Action		Result
Push Button	Press and hold the button for longer than 10 seconds. Press the button until the desired operation is selected, then release the button and wait 10 seconds.	> 10 s 	The green LED flashes to show that the sensor is in LO/DO select mode. The amber LED indicates the selected operation mode.
Remote Input Wire	Pulse the remote input wire to + V DC for longer than 10 seconds. Pulse the remote input wire to + V DC for 4 to 1000 ms until the desired operation is selected and wait 10 seconds.	4-1000 ms T 	For light operate: The green LED flashes and the amber LED is off. For dark operation: The green LED flashes and the amber LED is on. The sensor is configured and returns to normal operation.

Chapter Contents

Chapter 4 VS8 Specifications

Laser Classifications

All Models: Class 1; wavelength: 655 nm; frequency: 5 kHz; pulse duration: 3.2 µs; limit value pulse: ≤ 2.3 mW. Complies with IEC 60825-1:2014 and EN 60825-1:2014+A11:2021.

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

Blue LED Models: Risk Group 2; possibly hazardous optical radiation emitted from this product. Do not stare at the operating lamp. May be harmful to the eyes. (EN62471)

Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

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

Supply Voltage and Current

LED models: 10 V DC to 30 V DC (10% max. ripple) at less than 20 mA, exclusive of load

Laser models: 10 V DC to 30 V DC (10% max. ripple) at less than 12 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and short-circuit

Output Protection Circuitry

Protected against output short-circuit, continuous overload, and false pulse on power-up

Output Configuration

Retroreflective and Background Suppression Models: Single PNP or NPN on pin 4 (black wire) with remote input on pin 2 (white wire)

Opposed Mode Receivers only: Single PNP or NPN on pin 4 (black wire) with remote input on pin 2 (white wire)

Output Response Time

500 µs

Output Rating

50 mA

Switching Frequency

≤ 1000 Hz

Delay Before Power-Up

< 300 ms

Indicators

2 LED indicators on top of the sensor

Green on: Power on

Amber on: Output conducting

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	1.0	30	0.5

Emitter LED Wavelength

Red LED models: 650 nm

Blue LED models: 450 nm

Laser models: 655 nm

Effective Beam

5.5 mm

This can be adjusted without an aperture by teaching the sensor

Connections

2 m (6.5 ft) unterminated 4-wire PUR cable or 200 mm (7.8 in) PUR cable with a 3- or 4-pin M8 or 4-pin M12 male quick disconnect, depending on model

Models ending in suffix "Q", "Q3", or "Q5" must be used with a UL-recognized cordset R/C (CYJV2)

Search p/n 201958 at www.bannerengineering.com to view the Instruction Manual for more information on cordsets

Opposed Mode Model Adjustments

Push button TEACH input (Receivers)

Remote wire TEACH input (Receivers)

Remote wire beam inhibit (Emitters)

Construction

Housing, cable: PUR

Front screen: PMMA

Operating Conditions

LED models: –20 °C to +60 °C (–4 °F to +140 °F)

Laser models: –20 °C to +50 °C (–4 °F to +122 °F)

Storage Temperature: –20 °C to +80 °C (–4 °F to +176 °F)

UL Operating Temperature: –20 °C to +30 °C (–4 °F to +86 °F)

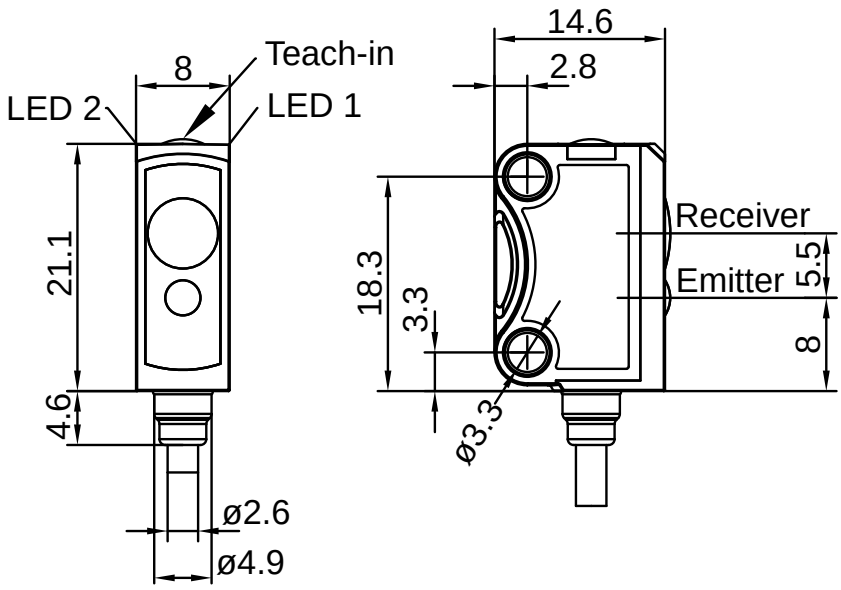
Chemical Compatibility
ECOLAB® certified (2 m cabled models only)

Environmental Rating
IP67

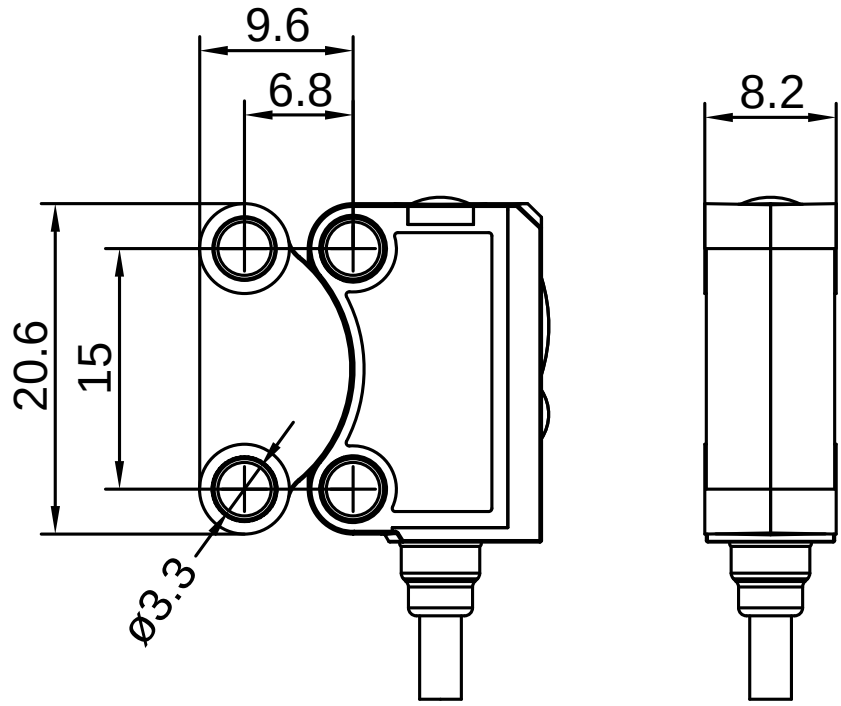
VS8 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise. The measurements provided are subject to change.

VS8 Series Sensor

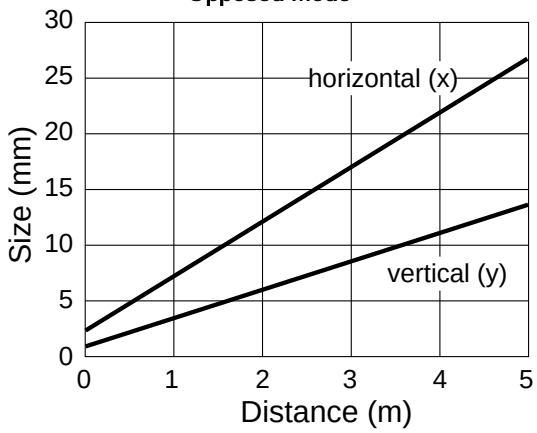


VS8 Series Sensor with SMBVS8DT Bracket

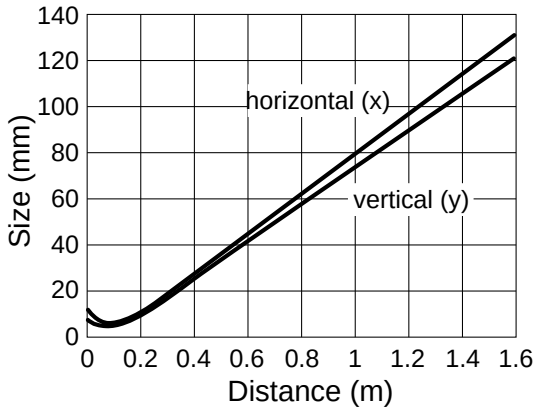


VS8 Series Beam Spot Sizes

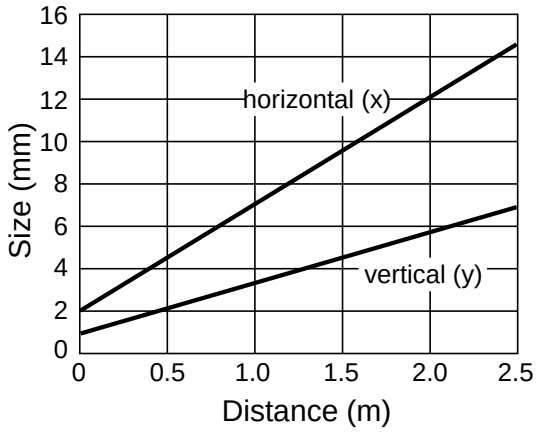
Opposed Mode



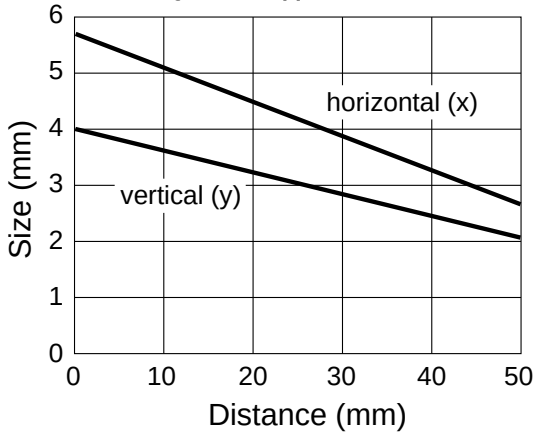
Retroreflective



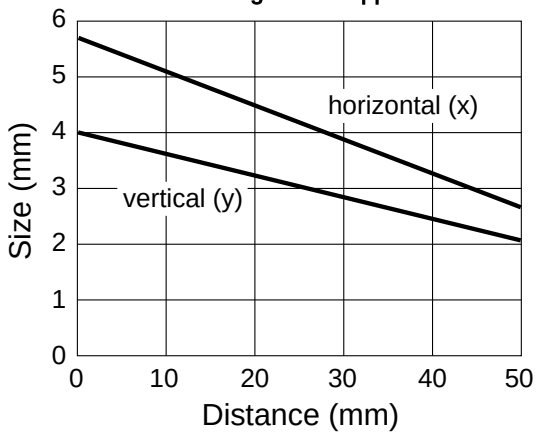
Laser Retroreflective



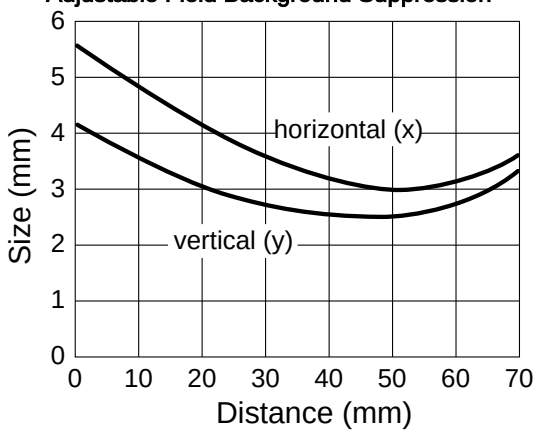
Fixed Field Background Suppression with Blue LED



Fixed Field Background Suppression



Adjustable Field Background Suppression



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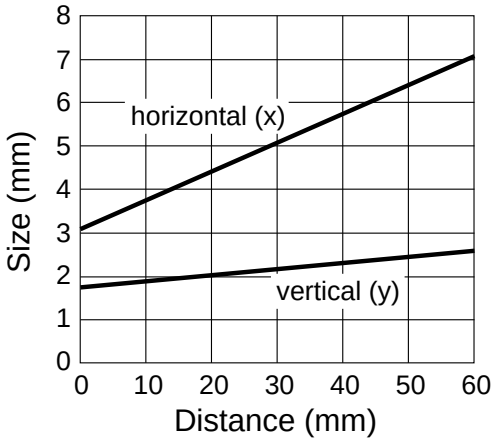
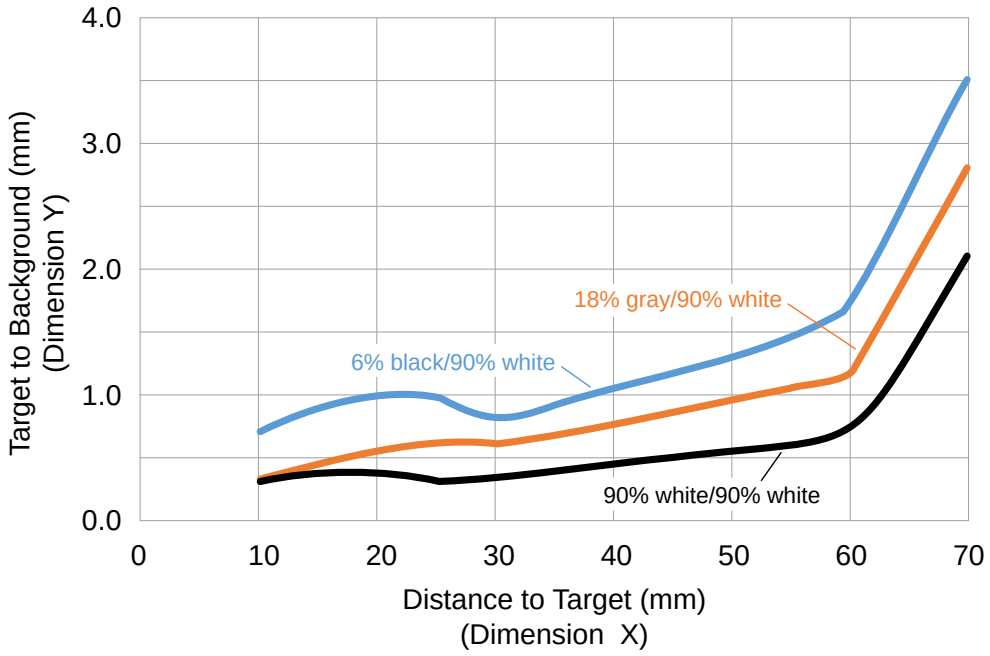
Continued from page 15

Laser Adjustable Field Background Suppression

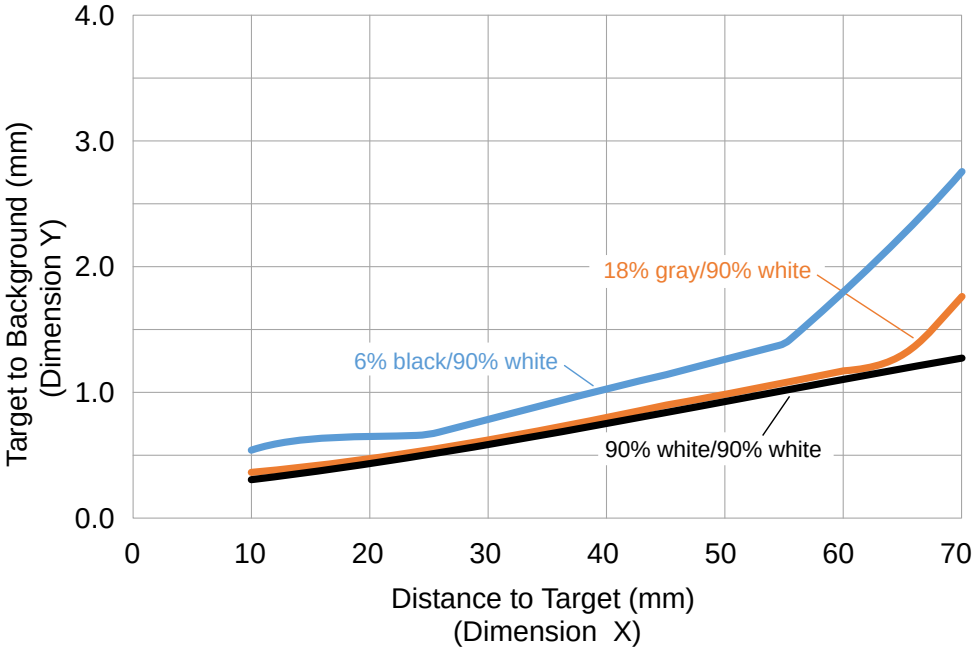


VS8 Minimum Object Separation (Background Suppression Models)

Minimum object separation for laser sensor models with background suppression



Minimum object separation for LED sensor models with background suppression

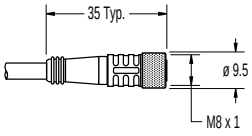
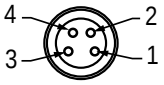
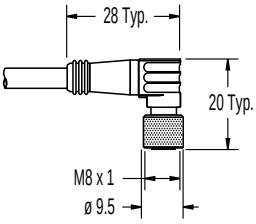
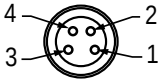


Chapter Contents

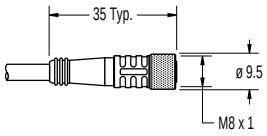
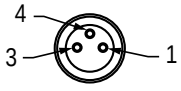
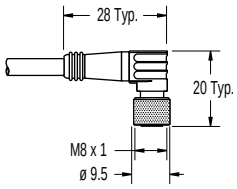
Chapter 5 Accessories

Cordsets for VS8 Models with Suffix Q

All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

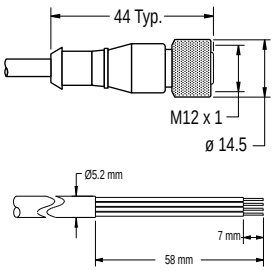
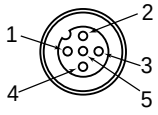
4-Pin Single-Ended M8 Female Cordsets					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
PKG4M-2	2 m (6.56 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black
PKG4M-5	5 m (16.4 ft)				
PKG4M-9	9 m (29.52 ft)				
PKW4M-2	2 m (6.56 ft)	Right Angle			
PKW4M-5	5 m (16.4 ft)				
PKW4M-9	9 m (29.5 ft)				

Cordsets for VS8 Models with Suffix Q3

3-pin Single-Ended Threaded M8 Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
PKG3M-2	2.035 m (6.68 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
PKG3M-5	5.035 m (16.51 ft)			
PKG3M-7	7.035 m (23.08 ft)			
PKG3M-9	9.035 m (29.64 ft)			
PKG3M-10	10.035 m (32.92 ft)			
PKW3M-2	2 m (6.56 ft)	Right-Angle		
PKW3M-5	5 m (16.40 ft)			
PKW3M-9	9 m (29.53 ft)			

Cordsets for VS8 Models with Suffix Q5

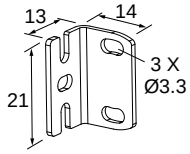
All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

4-Pin Single-Ended M12 Female Cordsets					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
MQDC-403	1 m (3.28 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Not used
MQDC-406	2 m (6.56 ft)				
MQDC-410	3 m (9.8 ft)				
MQDC-415	5 m (16.4 ft)				
MQDC-430	9 m (29.5 ft)				
MQDC-450	15 m (49.2 ft)				
MQDC-460	18.3 m (60 ft)				
MQDC-470	21 m (68.9 ft)				
MQDC-4100	30 m (98.43 ft)				

VS8 Brackets

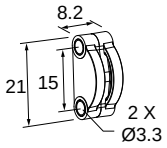
SMBVS8RA

- Right-angle bracket
- 3.1 mm stainless steel



SMBVS8DT

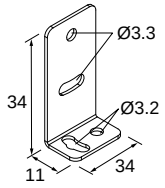
- Dovetail clamp bracket
- Adjustable ± 10°
- Material: PBT



SMBQ12A

- Adjustable right-angle bracket
- 20-ga. 300 series stainless steel

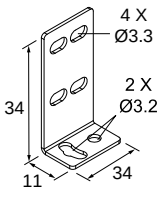
Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2



SMBQ12T

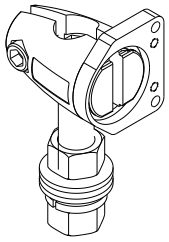
- Right-angle bracket
- 20-ga. 300 series stainless steel

Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2



SMBQ20FA

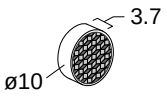
- Includes 3/8-16 × 2 in socket head cap screw (SHCS)
- 304 stainless steel



VS8 Retroreflectors

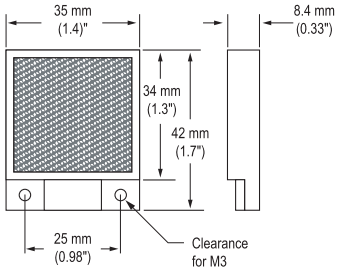
BRT-10BM

- Round, acrylic target
- Reflectivity Factor: 1.0
- Temperature:
- Micro-prism geometry
- Size: 10 mm diameter
- Reflective area: ø10 mm



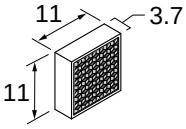
BRT-35X35BM

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature:
  –20 °C to +60 °C
  (–4 °F to +140 °F)
- Micro-prism geometry
- Approximate size:
  35 mm × 35 mm



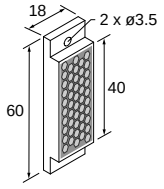
BRT-11X11M

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature:
- Micro-prism geometry
- Approximate size: 11 mm × 11 mm



BRT-40X18A

- Rectangular, acrylic target
- Reflectivity Factor: 1.0
- Temperature:
- Approximate size: 18 mm × 50 mm



NOTE: For maximum adhesion of all tape products, surfaces must be clean.

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-2-100	0.7	+60 °C (+140 °F)	50 mm (2 in) wide, 2.5 m (100 in) long

Chapter Contents

Chapter 6 Banner Engineering Corp Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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For patent information, see www.bannerengineering.com/patents.

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