High-resolution C-MOS laser type

BGS-HL series
BGS-HDL series

High resolution BGS laser sensor

- **Minimum detectable height difference = 0.08 mm (BGS-HL05□□/-HDL05□□)**
- **Built-in controller and 4-digit display**
- **Stable detection regardless object color**

FASTUS

FASTUS is a product brand of Optex FA.

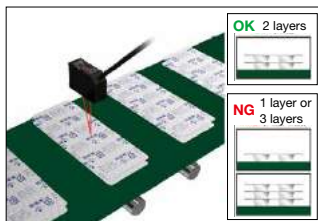| Related products	Displacement sensors **CD22** ● P.464	Low cost type **BGS-DL** ● P.318	Standard size **BGS-ZL** ● P.326

1-output type (BGS-HL series)

Detecting O-rings

Checking face of black rubber parts

2-output type (BGS-HDL series)

Detecting blister pack stacks
(Output 1: ON with 1 layer; Output 2: ON with 3 layers)

Detecting straws and float
(Output 1: ON with no straw; Output 2: ON when floating)

Selection table

Type	Sensing distance	Repeat accuracy	Laser class	No. of output	Model Aluminum housing	Model SUS housing
Cable type	20 to 50 mm	0.01 mm	(IEC/JIS/FDA*) Class 1	1	BGS-HL05T	BGS-HLM05T
				2	BGS-HDL05T	—
	50 to 250 mm	0.1 mm	(IEC/JIS/FDA*) Class 2	1	BGS-HL25T	BGS-HLM25T
				2	BGS-HDL25T2	—
				1	BGS-HL25T2	BGS-HLM25T2
M8 Connector type	20 to 50 mm	0.01 mm	(IEC/JIS/FDA*) Class 1	1	BGS-HL05TC	BGS-HLM05TC
	50 to 250 mm	0.1 mm			BGS-HL25TC	BGS-HLM25TC
			(IEC/JIS/FDA*) Class 2		BGS-HL25TC2	BGS-HLM25TC2
M12 Connector type	20 to 50 mm	0.01 mm	(IEC/JIS/FDA*) Class 1	2	BGS-HDL05TM12	—
	50 to 250 mm	0.1 mm	(IEC/JIS/FDA*) Class 2		BGS-HDL25TM122	—

*These products are Classified as CLASS 1 or CLASS 2 by IEC 60825-1 according to Laser Notice No.50, FDA Guidance Document.

Options/Accessories

Back-mounted bracket

● To be used if the sensor is mounted from the rear, instead of using floor mounting bracket BEF-OD1-B (included).

BEF-OD1-A

Connector cables

M8 connector cable

Straight
JCN-S Cable length: 2 m
JCN-5S Cable length: 5 m
JCN-10S Cable length: 10 m

L-shaped
JCN-L Cable length: 2 m
JCN-5L Cable length: 5 m
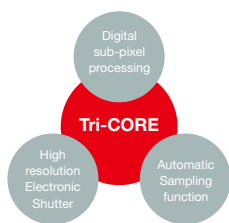**JCN-10L** Cable length: 10 m

M12 connector cable
DOL-1205-G02M-R Cable length: 2 m
DOL-1205-G05M-R Cable length: 5 m

OPTEX FA

Super precision BGS sensor detects 0.08 mm height difference (BGS-HL05☐☐ BGS-HDL05☐☐)

FASTUS BGS-HL/-HDL Series achieves precise height difference detection regardless of Object color and material.
This is accomplished by utilizing original "TRI-CORE" Technology found in our high-end displacement sensors.
This Technology enables the highest level of performance in the industry at an economical price.

| Features

High resolution electronic shutter

Thanks to an automatic shutter speed adjustment function, the BGS-HL/-HDL series has the advantage of accurately detecting Black non-reflective surfaces as well as shiny reflective surfaces.

The Automatic shutter speed adjustment function minimizes the error caused by differences in reflectivity of object color and material.

Black object
(small reflection)

Receiving light is small

Glossy object
(big reflection)

Receiving light is big

Saturation level

Adjust shutter speed so the waveform shows clear peak

Material response is improved incredibly

The error of BGS-HL25T2/BGS-HDL25T2 is improved to 1/13 (SUS object) and 1/58 (Black paper) compared with conventional BGS laser sensor.

SUS object   Error : 1/13

Error from preset distance (mm)

16.03 mm

1.2 mm

Conventional BGS laser sensor

BGS-HL25T2 BGS-HDL25T2

Black paper   Error : 1/58

Error from preset distance (mm)

11.53 mm

0.2 mm

Conventional BGS laser sensor

BGS-HL25T2 BGS-HDL25T2

* White ceramic base at 250 mm.

Photoelectric Sensors

Specialized Photoelectric Sensors

Laser Displacement Sensors

BGS Sensors

BGS-HL, BGS-HDL

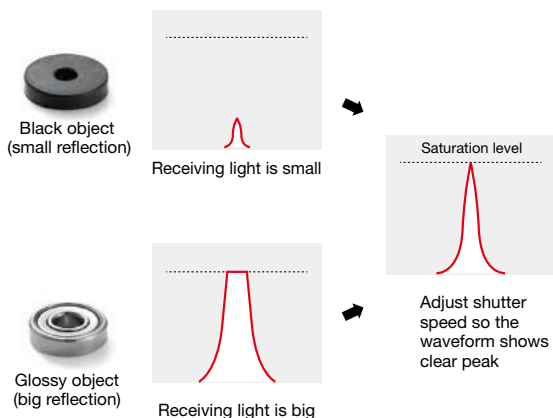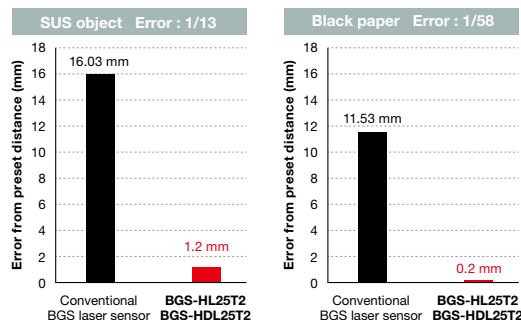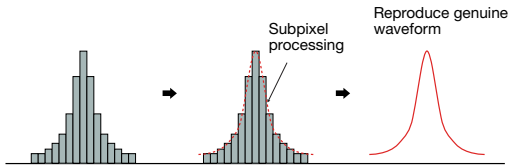BGS-DL

BGS-ZL, BGS-Z

BGS-ZM

BGS-S, BGS-2S

BGS

BGS-DL (potentiometer type)

High-resolution C-MOS laser type **BGS-HL, BGS-HDL** series

Digital subpixel processing

Subpixel processing divides one pixel into sub pixels and enables accurate detection of peak.


	BGS-HL05□□ BGS-HDL05□□	BGS-HL25□□ BGS-HDL25□□
Minimum detectable height difference	0.08 mm	0.8 mm

Condition : Hysteresis setting : 0.02 (BGS-HL05□□/BGS-HDL05□□), 0.2 (BGS-HL25□□/BGS-HDL25□□)
Other condition to be referred notes on the specifications sheet

Automatic sampling function

In addition to standard feedback, received light to laser power, BGS-HL/-HDL has Automatic Sampling function which enables stable detection of metal surface and also black material by adjusting sampling speed.
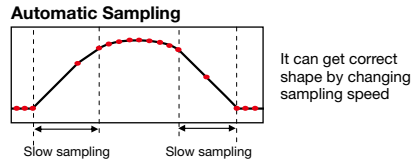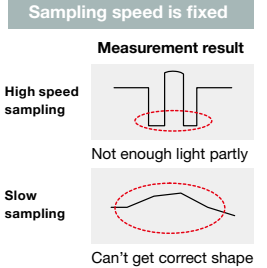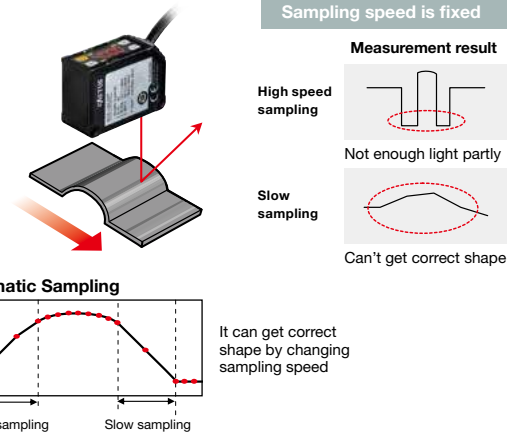
Easy to see digital panel

· 4-digit display in small case
· Easy setup by 4 buttons
· High-end functionality
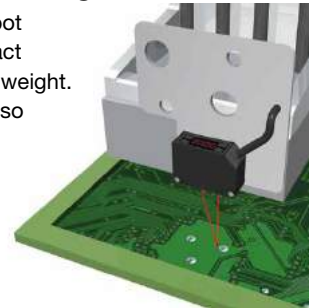
BGS-HL series

BGS-HDL series

Ideal for robot mounting

Ideal for mounting on robot cylinder thanks to compact dimensions and the light weight. IP67 water tightness is also secured.
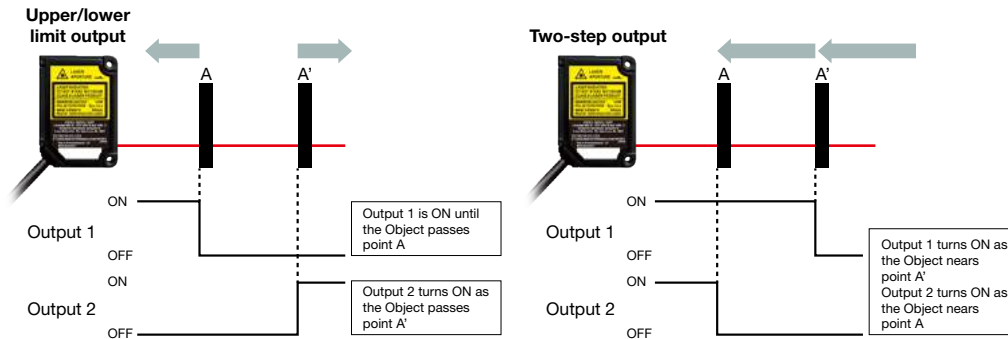

The minimum detectable height difference of 0.08 mm (BGS-HL05□□/BGS-HDL05□□)

Perfect for applications that require sensing the height difference of very thin parts, inclination, and overlap (seam) detection.
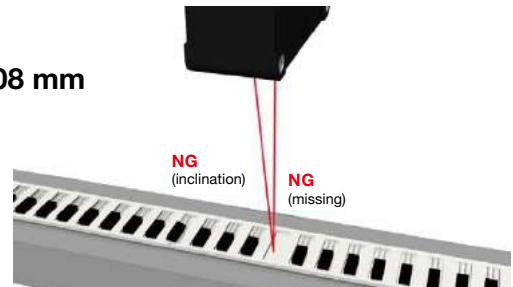
Introducing the dual-output BGS-HDL - the newest addition to Optex FA's best-in-class lineup of height difference sensors

The newly added BGS-HDL model is equipped with two control outputs.

With support for upper and lower limit output or two-step output,

applications that call for two sensors can now be covered with just a single sensor.

Upper/lower limit output

Two-step output

Output 1
ON
OFF

Output 2
ON
OFF

Output 1 is ON until the Object passes point A

Output 2 turns ON as the Object passes point A'

Output 1
ON
OFF

Output 2
ON
OFF

Output 1 turns ON as the Object nears point A'
Output 2 turns ON as the Object nears point A

Two selectable distance display patterns (BGS-HDL function)

The digital panel for displaying distance on the sensor can be set to either Background mode (bcGd) or Target mode (trGt). Select the display mode that makes seeing changes in distance easiest according to the application.

Background mode

Displays the distance to the background as zero and displays the displacement amount from zero as a reference.
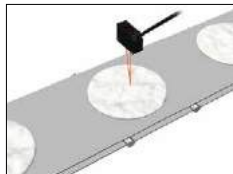
DISPLAY EXAMPLES

Reset the Distance to the background and displays as zero

With the 5 mm tall object

Used mainly for detection of the object on a conveyor.

*Device used: BGS-HDL05T

Target mode

Displays the distance to where the spot light hits.

DISPLAY EXAMPLES

With a distance of 100 mm to the object

With a distance of 250 mm to background

Used when there is no background or installed horizontally for the object detection.

*Device used: BGS-HDL25T2

Switchable between Output 2 and Teach Input (BGS-HDL function)

For BGS-HDL, it is possible to choose from Output 2 or Teach Input by changing the setting and wiring connection (White wire).

With this function, it enables dual input operations such as "Laser OFF" or "Sample & Hold", in addition to Teaching at the same time.

< Output 2 : Connection diagram >

+V
Load
Control Output 2
External Input
0 V
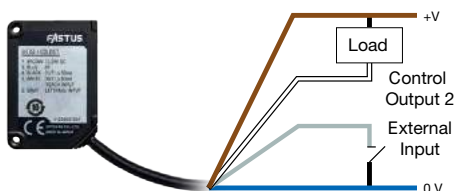
< Teach Input : Connection diagram >

+V
Teach Input
External Input
0 V
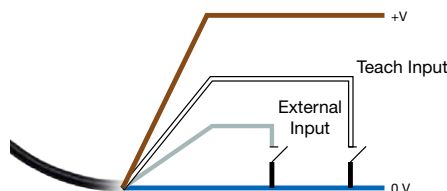
* The factory setting is Teach Input.
* The gray-External Input can be assigned to one of the following functions: Laser OFF, Laser ON, Teaching, Sample & Hold, or One-shot.
* The above wiring example is for output set to NPN.

High-resolution C-MOS laser type BGS-HL, BGS-HDL series

Specifications

Type	Case	1-output type		2-output type	
Sensing distance		20 to 50 mm (display: 0.00 to 30.00[*1])	50 to 250 mm (display: 0.0 to 200.0[*1])	20 to 50 mm (display: 20.00 to 50.00)	50 to 250 mm (display: 50.0 to 250.0)
Cable type	Aluminum	BGS-HL05T	BGS-HL25T BGS-HL25T2	BGS-HDL05T	BGS-HDL25T2
	SUS	BGS-HLM05T	BGS-HLM25T BGS-HLM25T2	–	–
M8 Connector type	Aluminum	BGS-HL05TC	BGS-HL25TC BGS-HL25TC2	–	–
	SUS	BGS-HLM05TC	BGS-HLM25TC BGS-HLM25TC2	–	–
M12 Connector type	Aluminum	–	–	BGS-HDL05TM12	BGS-HDL25TM122
Repeat accuracy		0.01 mm (display: 0.01)	0.1 mm (display: 0.1[*2])	0.01 mm (display: 0.01)	0.1 mm (display: 0.1[*2])
Minimum detectable height difference[*3]		0.08 mm	0.8 mm	0.08 mm	0.8 mm
Temperature drift (typical value)		±0.04% / °C F.S.	±0.08% / °C F.S.	±0.04% / °C F.S.	±0.08% / °C F.S.
Light source		Red laser Diode (wave length 655 nm)			
		Output: 390 µW Max.	Output: 1 mW Max.	Output: 390 µW Max.	Output: 1 mW Max.
Spot size[*4]		ø0.8 mm	ø1 mm	ø0.8 mm	ø1 mm
Response time[*5]		1.5 ms Min.			
Hysteresis[*6]		0 to 22.49 mm Adjustable	0 to 149.9 mm Adjustable	0 to 22.49 mm Adjustable	0 to 149.9 mm Adjustable
Distance adjustment		Teaching / Manual (Selectable from: 1-point / 2-point / Zone)		Teaching / Manual	
Indicator		Laser emission indicator: Green / Output indicator: Orange / Mode indicator: Red		Laser emission indicator: Green / Output 1, 2 indicator: Orange	
Digital display		7-segment 4-digit LED display			
External input		Selectable from: Laser OFF, Teaching, Sample & Hold, One-shot		Selectable from: Laser OFF, Laser ON, Teaching, Sample & Hold, One-shot	
Control output		Open collector (NPN / PNP selectable), 100 mA Max. / 24 VDC (Residual voltage 1.8 V Max.)		Open collector (NPN / PNP selectable), 50 mA Max. / 24 VDC (Residual voltage 1.8 V Max.)	
Operating mode		Selectable by setting from: Light ON / Dark ON		Selectable by setting from: Light ON / Dark ON/Zone/FGS	
Timer		Selectable from: OFF/On delay / Off delay / One-shot (0 to 9999 ms, 1 ms step)			
Power supply		12 to 24 VDC including 10% ripple (p-p)			
Current consumption[*7]		40 mA Max.			
Connection type		Cable type: 2 m, ø4.5 mm, M8 Connector type: 4pin		Cable type: 2 m, ø4.5 mm M12 Connector type: 5pin with 300 mm cable	
Applicable regulations	EMC	2014 / 30 / EU			
	RoHS	2011 / 65 / EU,MIIT Order No.32			
	Safety	21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice No.50			
Applicable standards		EN 60947-5-2:2007 / A1:2012 IEC 60825-1:2007			
Ambient Temp./Humid.		-10 to +50°C / 35 to 85% RH (no condensation)		-10 to +45°C / 35 to 85% RH (no condensation)	
Storage Temp./Humid.		-20 to +60°C / 35 to 85% RH			
Ambient illuminance		Incandescent lamp: 5,000 lx max.			
Vibration resistance		10 to 55 Hz, Double amplitude 1.5 mm, X,Y,Z for 2 Hours			
Shock resistance		500m/s² (approx. 50G) X,Y,Z 3 times each			
Protection circuit		Reverse connection protection, Over current protection			
Degree of protection		IP67			
Material		Case : <Alminum type> Aluminum / <SUS type> SUS, Front lens: PPSU, Display: PET, Cable: Oil resistant PVC			
Weight		Cable type: Approx. 90g, M8 Connector type: Approx. 30g		Cable type: Approx. 100g, M12 Connector type: Approx. 60g	
Included accessories		Mounting bracket: BEF-OD1-B (for cable type) / BEF-OD1-A (for connector type), M3 screw * 2pieces			

High-resolution C-MOS laser type BGS-HL, BGS-HDL series

The specifications are based on the condition unless otherwise designated:
Ambient temperature: 24°C , Supply voltage: 24 VDC, Sampling period: 500 μs,
Averaging: 512, Measuring distance: Center of the range,
Testing object: White ceramic

*1. When "shift function" is ON, display shows 0 at the teaching position.
The number on the display can be as follows.
-7.50 to 37.5 (BGS-HL05**), -50.0 to 250.0 (BGS-HL25**)

*2 Sampling period: 1000 μs

*3 Hysteresis setting: 0.02 mm (BGS-H(D)L05**), 0.2 mm (BGS-H(D)L25**)

*4 Defined with center strength $1/e^2$ (13.5%) at the center. There may be leak light
other than the specified spot size. The sensor may be affected when there is a
highly reflective object close to the detection area.

*5 Default value: 1.5 to 7 ms (BGS-H(D)L05**), 3 to 14 ms (BGS-H(D)L25**)

*6 Default value: 0.15 mm (BGS-H(D)L05**), 1 mm (BGS-H(D)L25**)

*7 Except output current of control output

Laser class (IEC/JIS/FDA*)

CLASS 1	CLASS 2
BGS-HL05T	BGS-HL25T2
BGS-HLM05T	BGS-HLM25T2
BGS-HL05TC	BGS-HL25TC2
BGS-HLM05TC	BGS-HLM25TC2
BGS-HL25T	BGS-HDL25T2
BGS-HLM25T	BGS-HDL25TM122
BGS-HL25TC	
BGS-HLM25TC	
BGS-HDL05T	
BGS-HDL05TM12	

* These products are Classified as CLASS 1 or
CLASS 2 by IEC 60825-1 according to Laser
Notice No.50, FDA Guidance Document.

Photoelectric
Sensors

**Specialized
Photoelectric
Sensors**

Laser
Displacement
Sensors

BGS Sensors
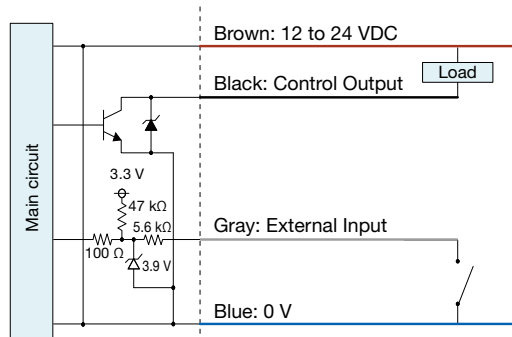
**BGS-HL,
BGS-HDL**

BGS-DL

BGS-ZL,
BGS-Z

BGS-ZM

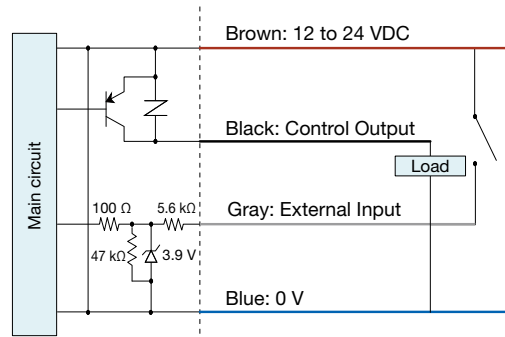BGS-S,
BGS-2S

BGS

BGS-DL
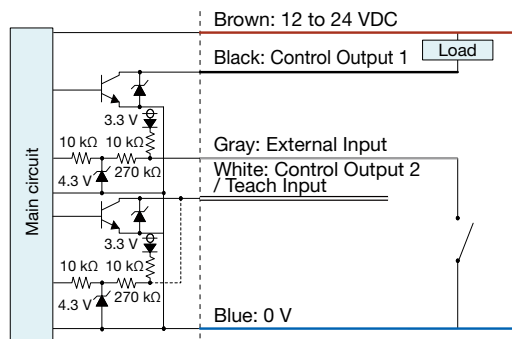(potentiometer type)

I/O circuit diagram

BGS-HL series

■ NPN mode

Brown: 12 to 24 VDC
Black: Control Output — Load
Main circuit
3.3 V
47 kΩ
5.6 kΩ
100 Ω
3.9 V
Gray: External Input
Blue: 0 V

■ PNP mode

Brown: 12 to 24 VDC
Black: Control Output — Load
Main circuit
100 Ω   5.6 kΩ
47 kΩ   3.9 V
Gray: External Input
Blue: 0 V

BGS-HDL series

■ NPN mode

Brown: 12 to 24 VDC
Black: Control Output 1 — Load
Main circuit
3.3 V
10 kΩ 10 kΩ
4.3 V   270 kΩ
3.3 V
10 kΩ 10 kΩ
4.3 V   270 kΩ
Gray: External Input
White: Control Output 2 / Teach Input
Blue: 0 V

■ PNP mode

Brown: 12 to 24 VDC
Black: Control Output 1
Main circuit
10 kΩ 270 kΩ
10 kΩ
4.3 V
10 kΩ 270 kΩ
10 kΩ
4.3 V
Gray: External Input
White: Control Output 2 / Teach Input
Load
Blue: 0 V

■ Connector pin configuration (sensor side)

M8 connector type (BGS-HL series)
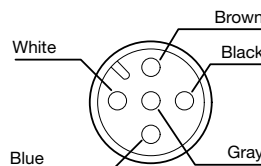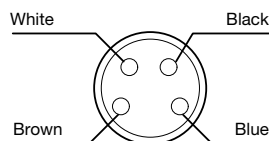
White   Black
Brown   Blue

M12 connector type (BGS-HDL series)

Brown
White   Black
Blue   Gray

OPTEX FA

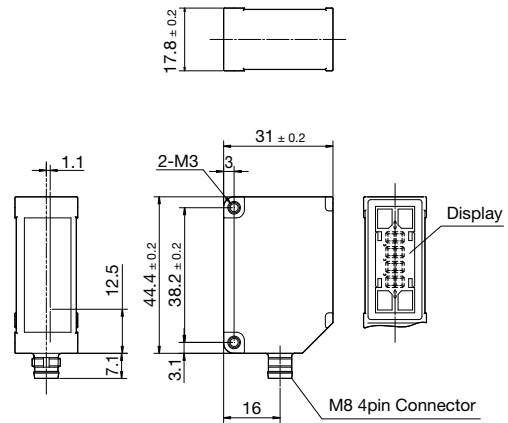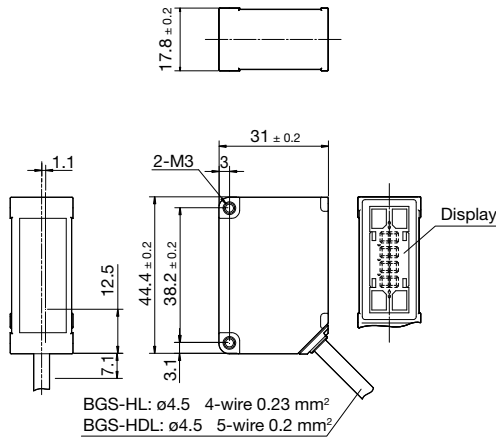# High-resolution C-MOS laser type BGS-HL, BGS-HDL series

Dimensions

Sensor

■ Cable type (BGS-HL/-HDL series)　　　　　■ M8 connector type (BGS-HL series)　　　(Unit: mm)

BGS-HL: ø4.5　4-wire 0.23 mm²
BGS-HDL: ø4.5　5-wire 0.2 mm²

Display

2-M3

M8 4pin Connector

■ M12 connector type (BGS-HDL series)

M12 5-pin Connector
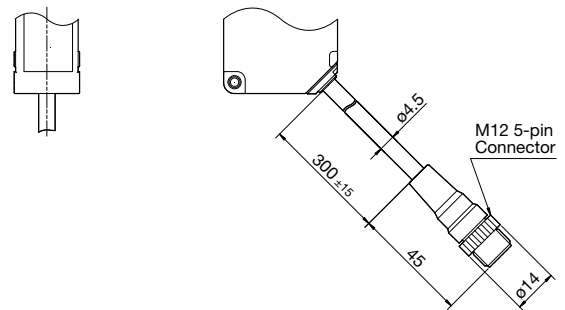
Bracket

■ BEF-OD1-A (for M8 connector type)　　　■ BEF-OD1-B (for cable type, M12 connector type)
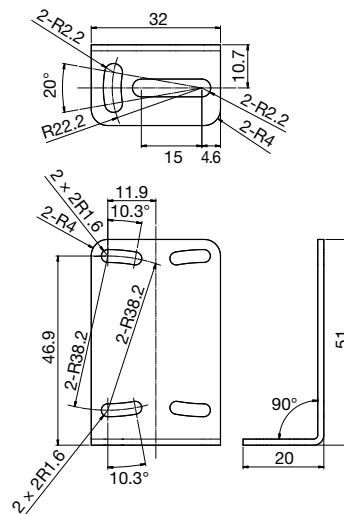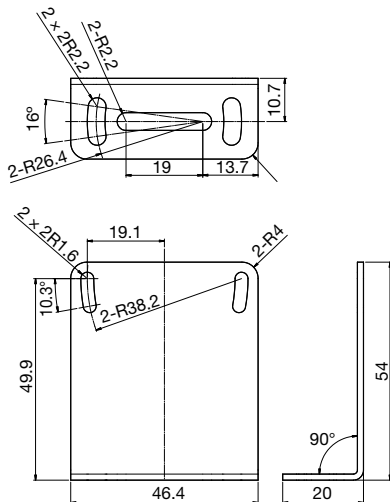
Typical characteristic data

BGS-HL05T□□ / -HDL05T□□

Spot size

1.2 mm   1 mm   ø0.8 mm

◀ Optical plane ▲

0   20   35   50
◀ Sensing distance (mm) ▶

Error between materials

▲ Deviation (mm) ▼

0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5

Teaching with white ceramic as standard
■ SUS board
■ Black paper

50 mm setting   150 mm setting   250 mm setting

BGS-HL25T□□ / -HDL25T□□

Spot size

1.7 mm   1.5 mm   1.3 mm   1.1 mm   ø1 mm

◀ Optical plane ▲

0   50   100   150   200   250
◀ Sensing distance (mm) ▶

Error between materials

▲ Deviation (mm) ▼

3.0
2.5
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0

Teaching with white ceramic as standard
■ SUS board
■ Black paper

50 mm setting   150 mm setting   250 mm setting

Precautions for laser light use

This product emits a Class 1 or Class 2 visible laser beam that is compliant with JIS C6802/IEC/FDA laser safety standards. Labels for applicable standards are affixed or attached to the sides of the sensor.

Type of laser used in this product

Type	Red semiconductor laser
Wavelength	655 nm
Output	390 µW/1 mW

● Export to the United States
If you install this product in a piece of machinery that will then be exported to the United States, it is necessary to follow laser standards as stipulated by the American Food and Drug Administration (FDA). This product has already been submitted to the CDRH (Center for Devices and Radiological Health). If exporting to the United States, apply the attached seal to the product or replace the seal.

BGS-HL25T2

LASER APERTURE
LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
MAXIMUM OUTPUT : 1mW
WAVE LENGTH : 655nm
MEDIUM : SEMICONDUCTOR LASER
CLASS 2 LASER PRODUCT

BGS-HDL25T2

LASER APERTURE
LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
MAXIMUM OUTPUT : 1mW
PULSE DURATION : 8µs-4ms
WAVE LENGTH : 655nm
MEDIUM : SEMICONDUCTOR LASER