High resolution BGS sensor

FASTUS

BGS-HDL Series

BGS-HDL05T □

BGS-HDL25T □□

Instruction manual

● Thank you for purchasing BGS-HDL series. We hope you are satisfied with its performance.
● Please read this manual carefully and keep it for future reference.

Indicates a possible hazard that may result in death, serious injury, or serious property damage if the product is used without observing the stated instructions.

Indicates a possible hazard that may result in moderate or light injury or property damage if the product is used without observing the stated instructions.

Warning Mandatory Requirements

- The light source of this product applies the visible light semiconductor laser. Do not allow the laser beam to enter an eye, either directly or reflected from reflective object. If the laser beam enters an eye, it may cause blindness.
- This product is not an explosion proof construction. Do not use the product under flammable, explosive gas or liquid environment.
- Do not disassemble or modify the product since it is not designed to automatically stop the laser emission when open. Disassembling or modifying at customer's end may cause personal injury, fire or electric shock.
- Never use this product as a sensing device for personnel protection.
- It is dangerous to wire or attach/remove the connector while the power is on. Make sure to turn off the power before conducting such work. If not, an electric shock may result.

Warning Safety Precautions

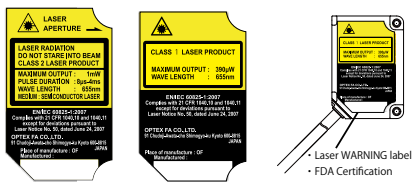
- Installing in the following places may result in malfunction:
  1. A dusty or steamy place
  2. A place generating corrosive gas
  3. A place directly receiving scattering water or oil
  4. A place suffered from heavy vibration or impact
- This product is not designed for outdoor use.
- Do not use the sensor in a transient state at power on (Approx. 2sec. for warm up period)
- Do not wire with the high voltage cable or the power lines. Failure to do so will cause malfunction by induction or damage.
- Detection characteristics may vary depending on the variation of individual product or state of detecting object.
- Do not use the product in water.
- Do not disassemble or modify the product. Disassembling or modifying may cause a failure or malfunction. OPTEX FA CO., LED. and its sales representatives do not take any responsibility for any damage caused by such a failure or malfunction.
- Operate within the rated range.

Precautions for using laser

This product emits visible light laser beam and is in the category of Class 1 or Class 2 in IEC 60825-1 Laser Safety standard. A label along the requirements of the standard is affixed or attached to the product.

● Regulations in the USA

When exporting laser devices to the USA, the USA laser control, FDA (Food and Drug Administration) is applied. This product has been already reported to CDRH (Center for Devices and Radiological Health). For details, contact our customer service.

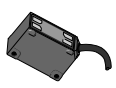


・Laser WARNING label
・FDA Certification

Included Items

Please confirm following goods bundled in the box.

・BGS-HDL □□



・This instruction manual

・Mounting screws
M3 × 15…2pcs
・Bracket
・Laser WARNING label

Specifications

●Part number legend

BGS-HDL__T__
- Laser Class ●(none) : Class 1 ● 2 : Class 2
- Connect type ●(none) : Cable ●M12 : M12 Connector*
- Max. working distance (cm)

＊ : Make-to-Order

●Specifications

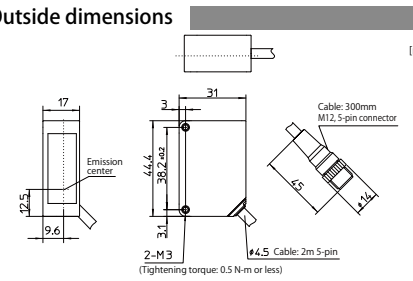
Type	2m cable	BGS-HDL05T	BGS-HDL25T2
	Connector type	BGS-HDL05TM12	BGS-HDL25TM122
Detection range		20 ～ 50mm	50 ～ 250mm
Repeat accuracy		0.01mm (Display: 0.01)	0.1mm (Display: 0.1) ※1
Min. detection step ※2		0.08mm	0.8mm
Temperature Drift(typ.)		± 0.04%/℃ of F.S	± 0.08%/℃ of F.S.
Light source	Type (Wavelength)	Red laser diode(Wave length: 655nm)	
	Pulse duration	Variable within 8 μ s – 4ms	
	Repetition	Variable within 250 Hz – 2kHz	
	Maximum output	390 μW	1mW
Laser class		CLASS 1(IEC/JIS/FDA ※3)	CLASS 2(IEC/JIS/FDA ※3)
Spot size ※4		φ 0.8 mm	φ 1 mm
Response time		Min.: 1.5ms ※ Default: 1.5-7ms	Min.: 1.5ms ※ Default:3-14ms
Hysteresis		0 -22.49 (Default: 0.15)	0 - 0149.9 (Default: 1.0)
Detection range adjustment		Selectable from two methods, Teaching type / Target mode and Background mode used with manual adjustment	
Indicator		Laser radiation emission indicator: Green Output1 Indicator, Output2 Indicator(Orange)	
Display		7 - segment 4 - digit LED display	
Control output		NPN/PNP Open Collector (Selectable Functions) 2 system × 50mA max./ 24VDC Residual voltage: 1.8V	
Output mode		Light ON / Dark ON / ZONE /FGS, Selectable by setting	
Timer function		OFF / On delay / Off delay / One shot, Selectable by setting (Unit: 1ms)	
Connection		Cable type: 2m cable, φ 4.5 Connector type: M12, 5-pin connector 300 mm	
External input mode (Input: Gray) ※5		Input (Gray) Laser OFF (N.O., N/C.)/ Teach / Sample hold / One shot, Selectable by setting	
External input mode (No.2 output/Teach input ※5		Teach input selectable by setting Alternative with No.2 output.	
Rating	Supply voltage	12-24 VDC including 10% ripple (p-p)	
	Current consumption ※6	40mA max. / 24VDC excluding the current of Control Output	
Environment resistance	Protection circuit	Reverse connection protection, Overcurrent protection	
	Protection Degree	IP67	
	Operating Temp./ Humid.	-10-45℃ /35-85% RH (without freezing or condensation)	
	Storage Temp./ Humid.	-20 ～ 60℃ / 35 ～ 85%/RH (without freezing or condensation)	
	Ambient illuminance	Incandescent lamp : 5,000 lx or less	
	Vibration resistance	10-55Hz, Double amplitude 1.5mm, 2 hours in each X,Y,Z direction	
	Shock resistance	500m / s² (Approx. 50G) 3 times in each X,Y,Z direction	
Material		Case : Aluminum die - cast, Front cover: PPSU, Display: PET, Cable: Oil proof PVC	
Applicable regulations	EMC	EMC Directive (2014/30/EU)	
	Environment	RoHS Directive (2011/ 65 / EU), China RoHS (MIIT Order No. 32)	
	Safety	21 CFR 1040.10, 1040.11 (excluding differences specified in Laser Notice No.50)	
Applicable standards		EN 60947-5-2:2007 / A1:2012、IEC 60825-1:2007	
Mass		Approx. 90g (Cable type) / Approx. 30g (M12 Connector type)	

The specifications are based on the following conditions unless otherwise designated:
mbient temperature: 23℃ (Normal temperature), Power voltage 24 VDC, Sampling interval: 500 μs, Averaging: 512 times, Measuring distance: Center of measurement range (BGS-HDL05T: 35mm, BGS-HDL25T2: 150mm), Measuring object: Our standard work (white ceramic plate)

※1 Sampling period:1000 μs
※2 Hysteresis setting: 0.02 BGS-HDL05T) , 0.2 (BGS-HDL25T2)
※3 In accordance with the FDA provisions of Laser Notice No. 50, the laser is classified as Class 1 or Class 2 per the IEC 60825-1 standard.
※4 Defined by light strength within 1/e² (13.5%) of spot center. There may be leak light at outside of the specified spot size. The sensor may be affected when there is a highly reflective object at that leak light area.
※5 Input Filter (Fixed) : 8ms
※6 No.1 output / No. 2 output load current are not included.

Outside dimensions

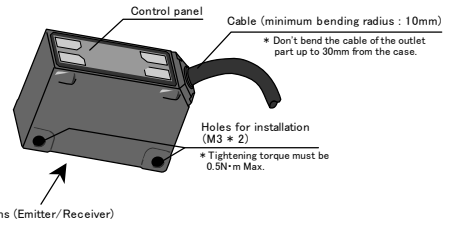
[mm]



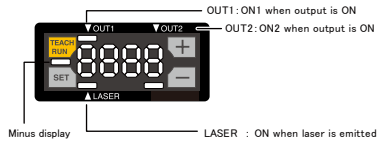
(Tightening torque: 0.5 N-m or less)

Functions of components

Component names of BGS-HDL series



● Control panel

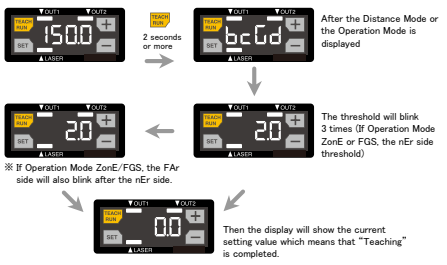


Basic operation

The following shows the basic operation and how to shift the screens of BGS-HDL series.
Pressing the TEACH/RUN button less than 2 seconds will restore the Normal screen even in the Setup screen. Press the TEACH/RUN button less than 2 seconds even after setting is complete.
When in Setup Mode or Threshold Adjustment Mode, if the button is not touched for 30 seconds the displayed/chosen parameter will be set, and the display will revert to Default Display.

1. Teaching Function

Press the "TEACH/RUN" button for 2 seconds or more, to go to "Teaching Mode".
Please refer to the Parameter Description about Teaching.



・Before setting the Teach function, please choose Distance Display Mode settings: bcGd/trGt, and for Output1/Output2 settings: L on/d on/ZonE/FGSat.
・Refer to Setup Mode/Extension Mode at the back of this instruction manual, please set necessary parameters.

2. Parameter Display and Setup

Press the "SET" button for 2 seconds or more to go to the Parameter Display.
Refer to the Parameter Description for each setting.

・In Teaching mode, you can't just set the threshold Output2. But you can edit the already set or the default threshold for Output2 along with Output1. Also, you can adjust it manually based on the values (distances) as described below.

3. "Threshold" Adjustment

Press the "+" or "−" buttons each for 2 seconds or more, then go to the "Threshold" adjustment display.
※The display will be changed by Output setting.

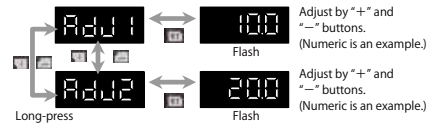
Functions of components

Component names of BGS-HDL series

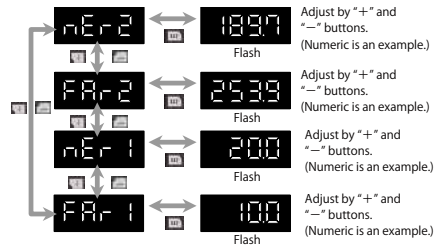
	1ch setting	2ch setting	1ch threshold name	1ch threshold name	2ch threshold name	2ch threshold name
①	L/D on	tch	None	—	—	—
②	Zone/FGS	tch	FAr	nEr	—	—
③	L/D on	L/D on	ADJ1	—	ADJ2	—
④	L/D on	Zone/FGS	ADJ1	—	FAr2	nEr2
⑤	Zone/FGS	L/D on	FAr1	nEr1	ADJ2	—
⑥	Zone/FGS	Zone/FGS	FAr1	nEr1	FAr2	nEr2

For ①, if "+" or "-" button is long-pressed, "Threshold name" will flash, and the value can be adjusted by pressing "+" or "-" button again. After adjusting the value, press the SET button. Then, the Threshold value is entered.

For ③, if "+" or "-" button is long-pressed, "ch threshold name" will flash.
When "+" or "-" button is pressed with the "ch threshold name" displayed, a different "ch threshold name" is displayed. By pressing the SET button when an intended "Threshold name"is displayed, the value of the threshold name flashes. By pressing "+" or "-" button when the threshold value of a threshold name is flashing, the value can be adjusted. After adjusting the value, press the SET button. Then, the Threshold value is entered and the display will return to the "Threshold name".



Operations for the threshold items ④ - ⑥ are the same as for the item ③.
The following shows an example of screen transition for the item ⑥.

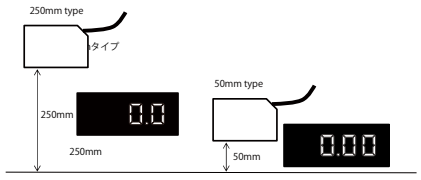


In any case, pressing the TEAC/RUN button after adjusting a threshold value will restore the Normal screen. Also, in all cases, if the TEAC/RUN button is pressed without pressing the SET button after the threshold value adjustment, the threshold value which is finally displayed is entered, and the screen returns to the normal screen.

Differences in display values depend on Distance Display Mode

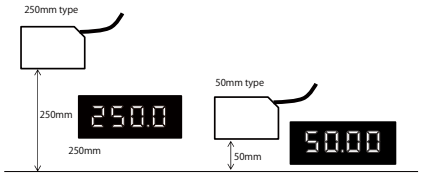
● When Distance Display Mode is "bcGd (Background)"

The position 250 mm off the sensor is "0.0" for the 250mm type while the position 50 mm off the sensor is "0.0" for the 50 mm type.
(The distance will be 0.0 or 0.00 after Teaching)
The Numeric display will be in millimeters, up to one digit (two digits for 50 mm type).
The value will become greater nearing the sensor.
This is a useful display for detecting workpieces on surfaces. (ex. on a conveyor belt)



●When Teaching method is "trGt (Target)"

In both 250mm and 50mm types, the distance from the sensor is displayed. Use this function to display the distance from the sensor to the detection target.



Setup Mode

The following shows the order to display the setting items when "-" button is pressed.
The order will reverse when "+" button is pressed.
(* shows the default of each setting item.)

■ 1: Distance Display Mode

bcGd	Background: Value increases when the distance closer to the sensor with the teaching position set as "0". *
trGt	Target: Displays the distance from the sensor to the position where laser strikes in the unit of "mm".

■ 2: Detail setting → To Explanation mode

■ 3: Input Setting

LSr	Laser OFF: Laser Emission OFF when input is ON *
oFF	External input terminal is not used.
onE	One shot: After input, holds measurement value until the next input.
Sh	Sample hold: Holds measurement value during input.
tch	Teach input: Sets an offset value as the threshold for the current value at input.
LSnc	Laser OFF N.C.: Laser Emission ON when input is ON (Laser Emission OFF when input is OFF) ※1

※2 ■ 4: Output2 Timer Time

0000	Output2 Timer: Set the value (unit: 0-9999ms) default is 0.

※3 ■ 5: Output2 Timer Setting

oFF	OFF: Disables output delay *
Shot	One shot
ondY	On delay
ofdY	Off delay

■ 6: Output2 Setting (Refer to "Teaching method" for the difference in the detection area per output mode.)

tch	Teach: Uses out2 as the teaching input instead of as an output. *
FGS	FGS: Sets upper/lower limits, turning OFF within the limits.
ZonE	Zone: Sets upper/lower limits, turning ON within the limits.
d on	Dark ON: Turns ON in the area further than the threshold value. (ON in dead zone)
L on	Light ON: Turns ON in the area closer to the sensor from the threshold value. (OFF in dead zone)

※4 ■ 7: Output2 Teach-ability

YES	No. 2 output threshold is set at the same time of No. 1 output threshold teaching. *
no	No 2 output threshold is not set by Teaching.

※5 ■ 8: 出力1タイマ時間

0000	No. 1 Output timer: Numeric input (Unit: ms)

■ 9: Output1 Timer Setting

oFF	OFF: Disables output delay *
Shot	One shot
ondY	On delay
ofdY	Off delay

■ 10: Output1 Setting ※ See Illustration for "The differences in detection area by Operation Mode".

L on	Light ON: Turns ON in the area closer to the sensor from the threshold value. (OFF in dead zone) *
FGS	FGS: Sets upper/lower limits, turning OFF within the limits.
ZonE	Zone: Sets upper/lower limits, turning ON within the limits.
d on	Dark ON: Turns ON in the area further than the threshold value. (ON in dead zone)

■ 1: Display setting (Loop)

＊1 The light receiving part operates even if the laser is OFF, therefore the Output Function (of the sensor) may operate due to incoming light such as ambient light. (test function) Please take countermeasures on the control side if you do not want the sensor to operate Output Function when the laser is OFF.
＊2 In case Output2 Timer is "OFF", no display.
＊3 In case Output2 setting is on "Teach", no display.
＊4 In case Output2 setting is on "Teach", no display.
＊5 n case the Output1 Timer setting is "OFF", no display.

Extension Mode

Select "Menu" in the Setup mode to enter the Explanation mode (* shows the default of each setting item.)

■ 1: Display setting

on	Activates the display. *
turn	Displays upside down (Cannot display Decimal.)
oFF	Disables the display while in "Key lock".

■ 2: Rest (Initializing)

YES	Initialize the parameters to default setting (when it returned to detection mode)
no	Do nothing

■ 3: Averaging

1	Once *
512	512 times
64	64 times
8	8 times

■ 4: Threshold

bASE	Base : Sets threshold to lowest level. *
P400	P400 : Sets threshold to upper level.
P200	P200 : Sets threshold to middle level.
P100	P100 : Sets threshold to lower level.

※ Set threshold level to detect rising part and falling part of light strength wave.You can change the threshold level to get stable detection especially when the sensor receives external light as noise. Basically, you do not need to change the threshold.

■ 5: Sensitivity

Auto	**Auto** :Adjusts sensitivity automatically. *
AutF	**Auto**ᶠ: Adjusts sensitivity automatically. (※)
n_6	6: Maximum sensitivity
≀	
n_1	1: Minimum sensitivity

※ Compatibility specification.

■ 6: Sampling period

1000	1000μs (1kHz) *
500	500μs (2kHz) *
Auto	**AUTO** (※)
4000	4000μs (250Hz)
2000	2000μs (500Hz)

※1 Default: 500μs (BGS-HDL05) 1000μs (BGS-HDL25)
※2 Auto: The sensor optimizes sampling period automatically.

■ 7: Hysteresis

0.123	BGS-HDL05T□□ (0～22.49mm) Default:0.15
	BGS-HDL25T□□ (0～149.9mm) Default:1.0

■ 8: Electrical output

nPn	Input and output operate by NPN. *
PnP	Input and output operate by PNP.

※ The "Reset" operation will not change this setting.

■ 1: Display setting (Loop)

Other function

The following other function is provided.

■ Keylock function

●Activating keylock

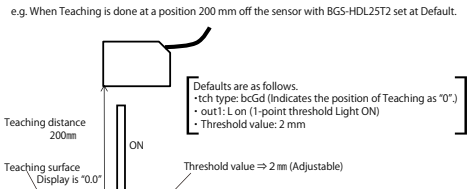
While it's RUN mode, press + − at a time for 1 second or more.
Then, LOC will be shown.
While Key lock is activated, any access except "Release Key lock" will be neglected.
※ In the Setup mode, press TEACH/RUN to enter the Run mode.

●Resetting keylock

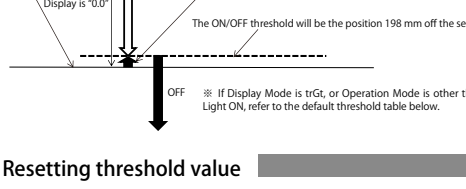
While Key lock is activated, it will be released by pressing + −
at a time for 3 seconds or more. Then, ULOC will be shown.
After this process, keylock is released and every access will be accepted.

Operation Mode

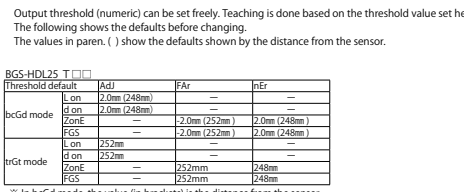
① **bcGd mode default**



② **trGt mode default**



③ **ZONE Default Setting**



④ **FGS mode default**

Teaching distance and Default

e.g. When Teaching is done at a position 200 mm off the sensor with BGS-HDL25T2 set at Default.

Resetting threshold value

Output threshold (numeric) can be set freely. Teaching is done based on the threshold value set here.
The following shows the defaults before changing.
The values in paren. ( ) show the defaults shown by the distance from the sensor.

BGS-HDL25 T□□

Threshold default		AdJ	FAr	nEr
bcGd mode	L on	2.0mm (248mm)	—	—
	d on	2.0mm (248mm)	—	—
	ZonE	—	-2.0mm (252mm)	2.0mm (248mm)
	FGS	—	-2.0mm (252mm)	2.0mm (248mm)
trGt mode	L on	252mm	—	—
	d on	252mm	—	—
	ZonE	—	252mm	248mm
	FGS	—	252mm	248mm

※ In bcGd mode, the value (in brackets) is the distance from the sensor.

BGS-HDL05 T□□

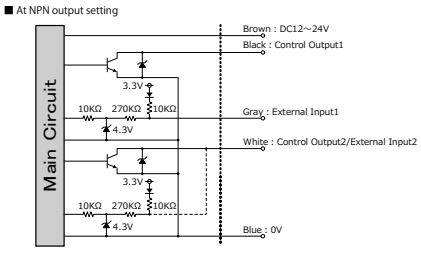
Threshold default		AdJ	FAr	nEr
bcGd mode	L on	0.5mm (49.5mm)	—	—
	d on	0.5mm (49.5mm)	—	—
	ZonE	—	-0.5mm (50.5mm)	0.5mm (49.5mm)
	FGS	—	-0.5mm (50.5mm)	0.5mm (49.5mm)
trGt mode	L on	50.5mm	—	—
	d on	50.5mm	—	—
	ZonE	—	50.5mm	49.5mm
	FGS	—	50.5mm	49.5mm

※ In bcGd mode, the value (in brackets) is the distance from the sensor.

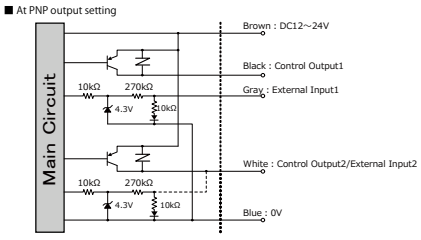
Connection diagram

Circuit diagram of signal lines is as follows.
NPN/PNP output can be switched over by the setting of main body.

■ At NPN output setting

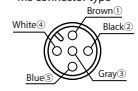


■ At PNP output setting



■ Pins configuration
(sensor side)

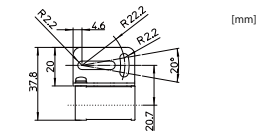
M8 connector type

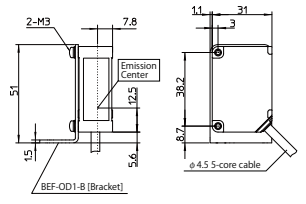


Brown① DC12 ～ 24V
Black② Control Output1
Gray③ External Input1 (Laser Emission OFF)
White④ Control Output2/External Input2
(Output and input are switched by the setting.)
(External input 2 is teach input.)
Blue⑤ 0V

Dimensions with bracket

[mm]





● Specifications and equipment are subject to change without any obligations on the part of manufacture.
● For more information, questions and comments regarding products, please contact us below.

■ Our correspondence to China RoHS

Please see website below for our correspondence to China RoHS (Management Methods for Controlling Pollution by Electronic Information Products).

http://www.optex-fa.com/rohs_cn/

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OPTEX FA CO.,LTD.

91 Chudoji-Awata-cho Shimogyo-ku Kyoto 600-8815 JAPAN
TEL : +81-(0)75-325-2920
FAX: +81-(0)75-325-2921
Website : http://www.optex-fa.com