

KEYENCE

Digital CMOS Laser Sensor

GV Series



Up to
1m
[3.3']
Away



Stable detection of
metal targets



Innovative solution for
black targets



World's first **DATUM** Algorithm

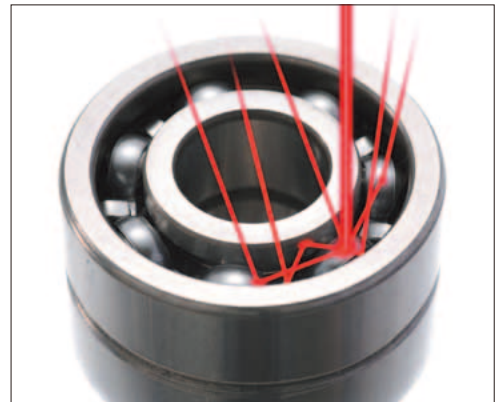
Conventional laser sensors have problems with...

Metals

Multiple reflection



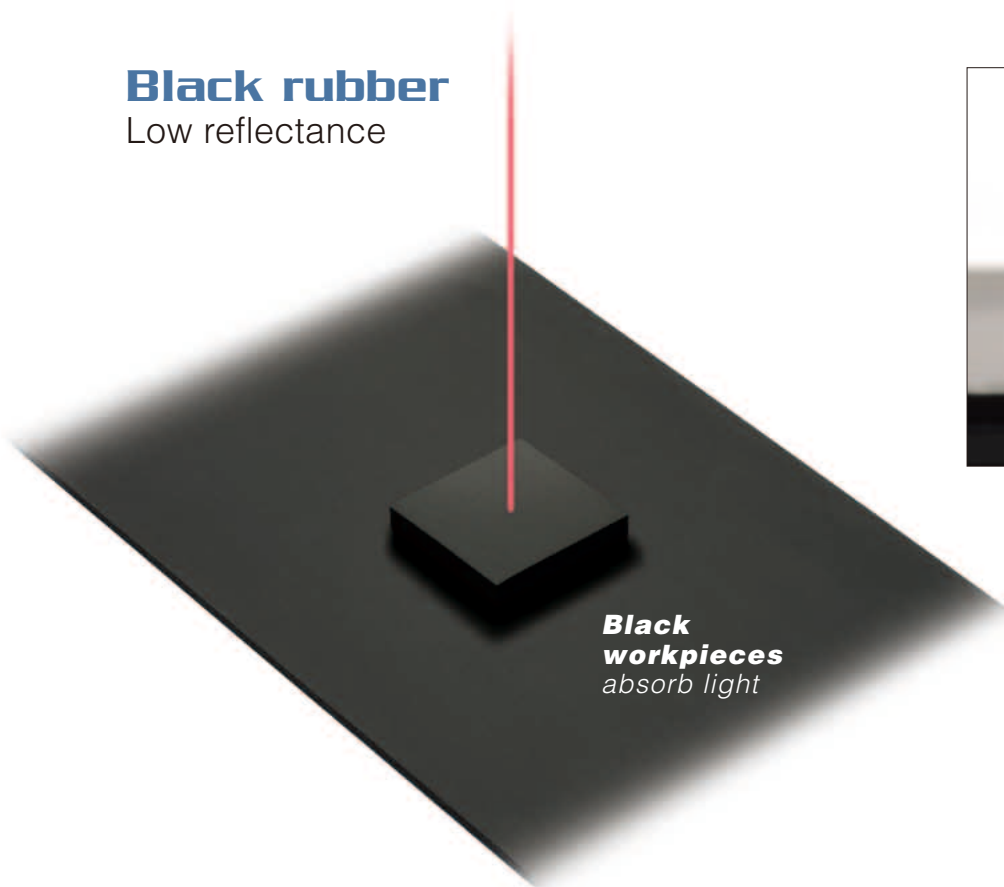
**Metal
workpieces**
scatter the
laser light



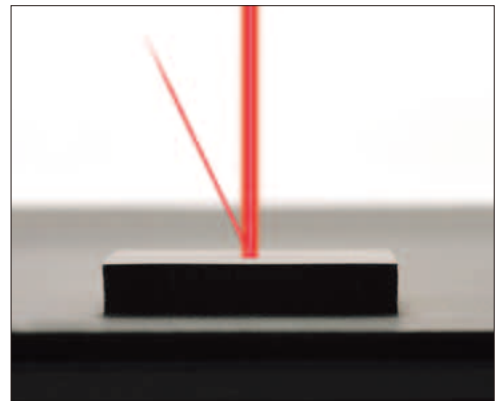
The correct valve
cannot be detected due to
multiple reflections

Black rubber

Low reflectance



**Black
workpieces**
absorb light



The detection is
unstable due
to the low reflectance

The DATUM function of the GV Series eliminates these problems!!



Sensor head
GV-H45/
GV-H45L

Sensor head
GV-H130/
GV-H130L

Sensor head
GV-H450/
GV-H450L

Sensor head
GV-H1000/
GV-H1000L



Amplifier unit
GV-21/21P
GV-22/22P

**Newly developed
GV CMOS**

Stable detection and high-speed response

The size per pixel of this CMOS is larger than that of the conventional one to receive a larger amount of light than before. This provides stable detection and high-speed response.

DATUM
function

Measurement principle

The wider pixel size of the GV CMOS can receive more light than conventional CMOS imagers. The end result is:

- Stable detection
- High-speed response

GV CMOS

* A CMOS is a device with multiple light receiving elements aligned.

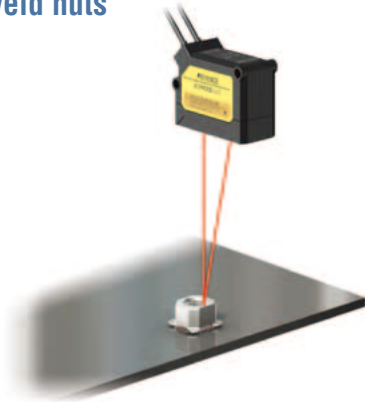


**Washable Sensor head
<IP67>**

Rugged, IP67 rated sensor heads can be put to the test in harsh environments.

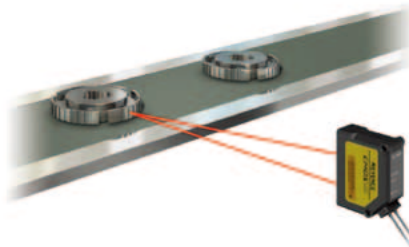
Applications

Detecting presence/absence of weld nuts



- Long distance
- Detects irregular shape and surface finishes

Detecting quenched parts



- Long distance allows mounting away from heat
- Detects parts with irregular shape
- Detects oil soaked parts

Detecting displacement of blank material



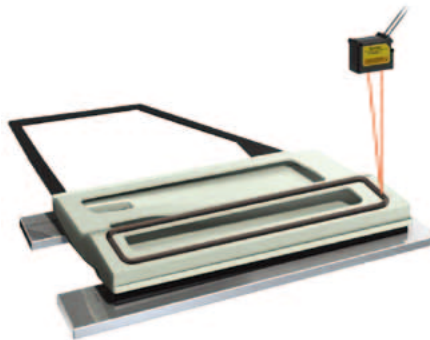
- Unaffected by polished, metallic surface

Checking processed grooves of pipe material



- Ignores scattered light and focuses only on the groove

Checking application of adhesive



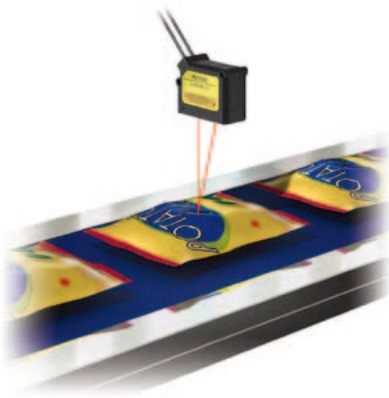
- Long distance detection of dark, glossy surfaces

Detecting presence/absence of brake pads



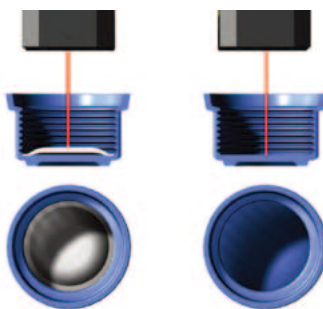
- Long distance detection of dark and irregular shaped targets

Detecting snack packages



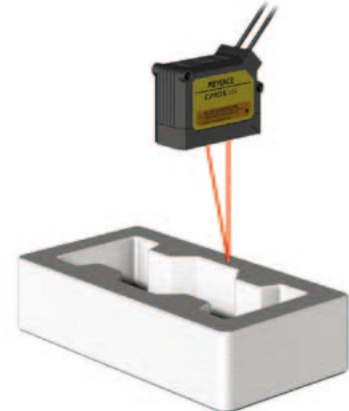
- Stable detection of shiny, wrinkled plastic or foil

Detecting presence/absence of cap seals



- Targets are detected by height
- Perfect for applications where color changes frequently.





Detecting foam targets



- Reliable detection when light is dispersed by a target such as foam

Sensor Head

Four variations ranging from long-distance to high-accuracy detection.

45mm 1.77"		Short-range type GV-H45/GV-H45L	 Rugged, IP67 rated sensor heads can be put to the test in harsh environments.
130mm 5.12"		Middle-range type GV-H130/GV-H130L	
450mm 17.72"		Long-range type GV-H450/GV-H450L	
1000mm 39.37"		Ultra Long-range type GV-H1000/GV-H1000L	

Amplifier unit

Wire-saving structure! Up to four units can be connected

The power is supplied through the side connector when connecting expansion units. This saves two wires per unit (power +, -).



- The GV Series' amplifiers should not be connected with those of other models.

Interference suppression function

When expansion units are connected, up to two adjacent units can operate in close proximity to each other with no interference.

- Those two units should be set for the same response time..
- This Interference suppression function is invalid for response times of 20ms or 50ms.

Bar LED


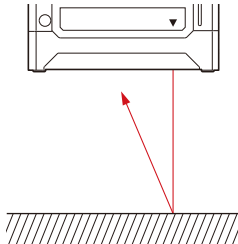
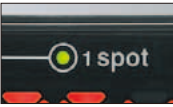
This bar LED shows you the detection state at a glance.

Close Output ON	
Near the setting value Output ON	
Distant Output OFF	


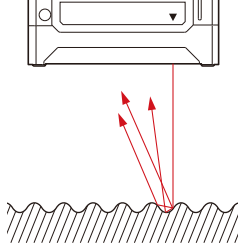
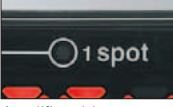
1 spot indicator

This indicator tells you from the reflection whether the target is on the optimal condition for detection. Make sure that the 1 spot indicator is lit when you perform the DATUM tuning.

No multiple reflection

	
Head side	
	Amplifier side

There is a multiple reflection

	
Head side	
	Amplifier side

External input (selectable)

External shift input----- the current value can be shifted to any value.
Bank switching input----- the bank switches two setting values with each other.
Timing input----- This input enables the output.

Timer function (selectable)

Off-delay, On-delay, One-shot
On-delay/Off-delay, On-delay/One-shot

World's first **DATUM** Algorithm

When the **DATUM** (background, reference surface) tuning is performed, workpieces can be correctly detected.

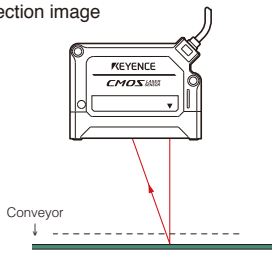
DATUM ALGORITHM

- Based on:
- Distance
 - Received light pattern

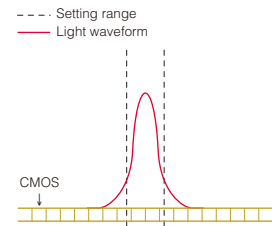
<<< DATUM tuning >>>

Easy tuning just by pressing the [SET] button with a target on a conveyor

Detection image

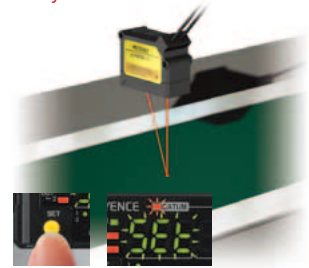


CMOS light received image



When performing the DATUM tuning (reference surface calibration) with a target on a conveyor (background), the values are set slightly above and slightly below the conveyor position. With no workpiece in place, the light waveform falls within this range.

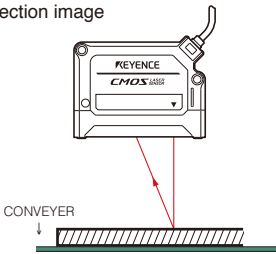
“Output OFF”



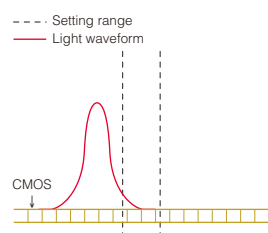
<<< Detection example 1 >>>

Flat workpiece

Detection image

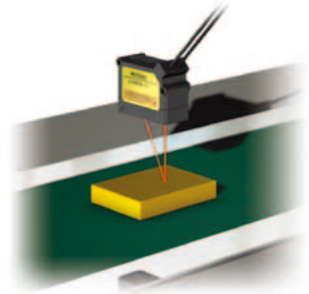


CMOS light received image



The CMOS light receiving position changes
↓
The distance changes
↓
The workpiece is judged as present

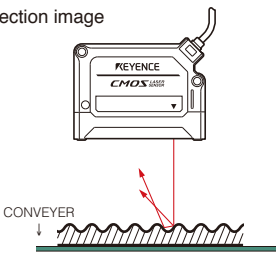
“Output ON”



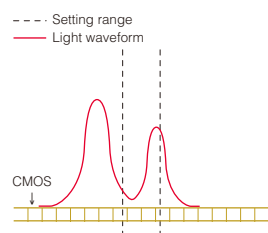
<<< Detection example 2 >>>

Rough workpiece

Detection image

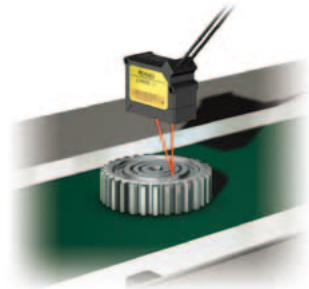


CMOS light received image



2 peaks appear on the waveform
↓
The light receiving pattern changes
↓
The workpiece is judged as present

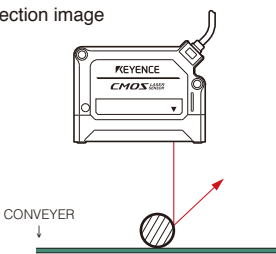
“Output ON”



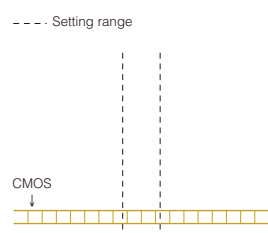
<<< Detection example 3 >>>

Round workpiece

Detection image

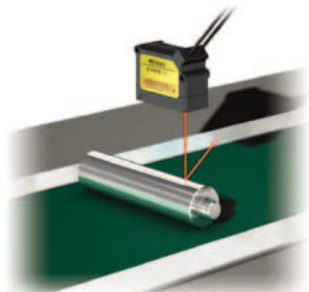


CMOS light received image



The light is not reflected properly
↓
The distance changes
↓
The workpiece is judged as present

“Output ON”





Other convenient sensing algorithms

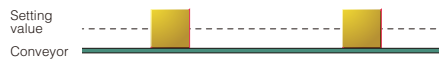
<<< Edge hold mode >>>

With an unstable background

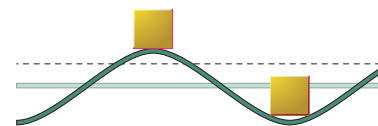
Edge Hold
Detection of a workpiece on a conveyor

This operation mode ignores slow distance changes and detects only sudden changes in height (workpieces). The GV Series detects the change of the distance so the detection is not affected by the traveling speed of the workpieces.

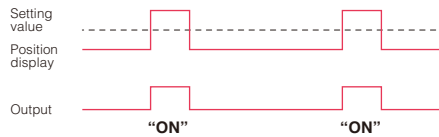
Normal state



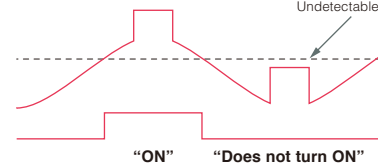
With an unstable background



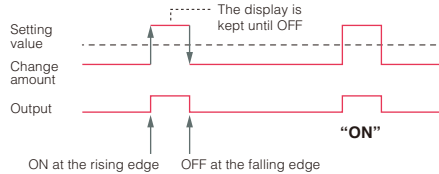
(a) Distance detection mode



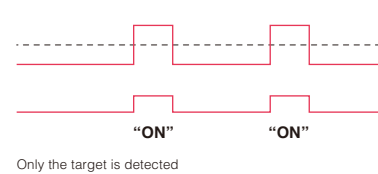
(a) Distance detection mode



(b) Edge hold mode

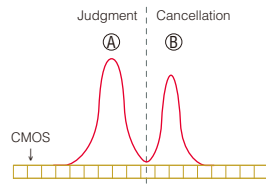
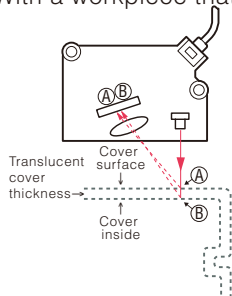


(b) Edge hold mode

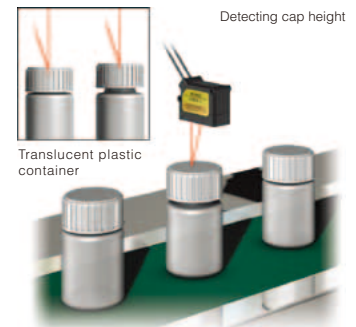


<<< Surface detection mode >>>

With a workpiece that has a dual reflection

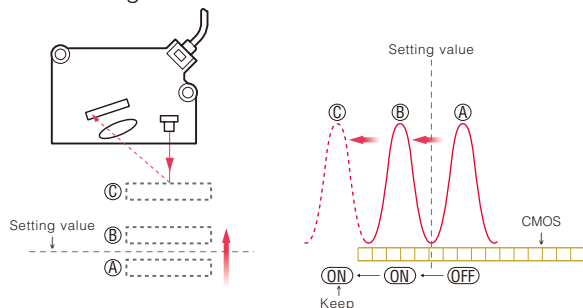


Some workpieces reflect the light from both top and bottom surfaces, making detection difficult. The surface detection mode ignores all other reflections and detects only the nearest surface.

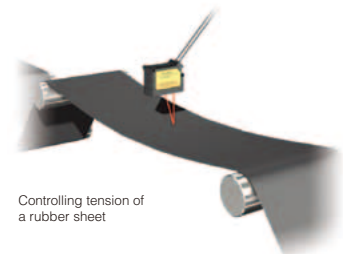


<<< Clamp function >>>

When the target comes too close to the sensor head



Even when the target comes too close to the sensor head and does not enter the detecting area, this function keeps the previous ON/OFF state.



Lineup

SENSOR HEAD

Model	Type	Configuration	Detection distance	Display	Display resolution	Detectable step change
GV-H45/ GV-H45L	Short-range		20 to 45 mm 0.79" to 1.77"	250 to 0	1 digit (Approx. 0.1 mm 0.004")	0.5 mm 0.02"
GV-H130/ GV-H130L	Middle-range		55 to 130 mm 2.17" to 5.12"	750 to 0	2 digits (Approx. 0.2 mm 0.008")	1 mm 0.04"
GV-H450/ GV-H450L	Long-range		160 to 450 mm 6.30" to 17.72"	290 to 0	1 digit (Approx. 1 mm 0.04")	3 mm 0.12"
GV-H1000/ GV-H1000L	Ultra long-range type		200 to 1000mm 7.87" to 39.37"	800 to 0	5 digit (Approx. 5 mm 0.2")	20mm 0.79" (Detection distance 200 to 800 mm 7.87" to 31.5") 30 mm 1.18" (Detection distance 800 to 1000 mm 31.5" to 39.37")

SENSOR AMPLIFIER

Model	Type	Configuration	Main/ expansion unit	Output mode
GV-21	DIN mounting		Main unit	NPN
GV-22			Expansion unit	
GV-21P			Main unit	PNP
GV-22P			Expansion unit	

OPTIONAL (sold separately)

GV-B01	GV-B02	GV-B03	OP-76877	OP-26751

Specifications

SENSOR HEAD



Sensor type	Short-range type		Middle-range type		Long-range type		Ultra long-range type		
	GV-H45	GV-H45L	GV-H130	GV-H130L	GV-H450	GV-H450L	GV-H1000	GV-H1000L	
Light source	Visible semiconductor laser Wavelength: 655 nm								
Laser class	FDA laser class Class II (Max. 560 μW)	Class 1 (Max. 220 μW)	Class II (Max. 560 μW)	Class 1 (Max. 220 μW)	Class II (Max. 560 μW)	Class 1 (Max. 220 μW)	Class II (Max. 560 μW)	Class 1 (Max. 220 μW)	
	IEC class Class 2 (Max. 560 μW)	Class 1 (Max. 220 μW)	Class 2 (Max. 560 μW)	Class 1 (Max. 220 μW)	Class 2 (Max. 560 μW)	Class 1 (Max. 220 μW)	Class 2 (Max. 560 μW)	Class 1 (Max. 220 μW)	
Detection distance	20 to 45 mm 0.79" to 1.77"		55 to 130 mm 2.17" to 5.12"		160 to 450 mm 6.30" to 17.72"		200 to 1000 mm 7.87" to 39.37"		
Displayable range	259 to -34		768 to -98		295 to -50		810 to -175		
Standard detection deviation	0.5 mm 0.02"		1 mm 0.04"		3mm 0.12"		20 mm 0.79" (Detection distance 200 to 800 mm 7.87" to 31.5") 30 mm 1.18" (Detection distance 800 to 1,000 mm 31.5" to 39.37")		
Spot diameter	Approx. ø0.1 mm ø0.004" (Detection distance 45 mm 1.77")		Approx. ø0.3 mm ø0.01" (Detection distance 130 mm 5.12")		Approx. ø0.8 mm ø0.03" (Detection distance 450 mm 17.72")		Approx. ø1.8 mm ø0.07" (Detection distance 1000 mm 39.37")		
Operation status indicators	Control output: Red LED / Laser radiation emission indicator: Green LED / Other: Green LED								
Environmental resistance	Enclosure rating	IP67							
	Ambient temperature	-10 to +50°C 14 to 122°F, No freezing							
	Relative humidity	35 to 85% (No condensation)							
	Ambient light	Incandescent lamp: 10000 lux / Sunlight: 20000 lux	Incandescent lamp: 5000 lux / Sunlight: 10000 lux	Incandescent lamp: 10000 lux / Sunlight: 20000 lux	Incandescent lamp: 5000 lux / Sunlight: 10000 lux	Incandescent lamp: 5000 lux / Sunlight: 10000 lux	Incandescent lamp: 2500 lux / Sunlight: 5000 lux	Incandescent lamp: 5000 lux / Sunlight: 10000 lux ¹	Incandescent lamp: 2500 lux / Sunlight: 5000 lux ²
	Vibration	10 to 55 Hz, 1.5 mm 0.06" double amplitude in the X, Y, and Z directions, 2 hours respectively							
Material	Housing material: PBT Display: Polyarylate Metal: SUS304 Lens cover: Glass Cable: PVC								
Weight ³	Approx. 120 g		Approx. 130 g		Approx. 190 g		Approx. 210 g		

1. Incandescent lamp: 5000 lux, Sunlight: 3000 lux for GV-H1000 (When the response time is set to 10 ms or faster)

2. Incandescent lamp: 2500 lux, Sunlight: 1500 lux for GV-H1000L (When the response time is set to 10 ms or faster)

3. Including 2 m 6.6' connector cable (3 m 9.8' cable for GV-H1000)

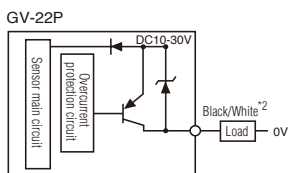
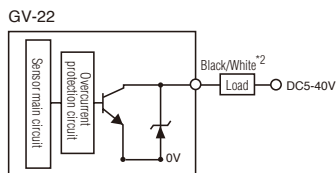
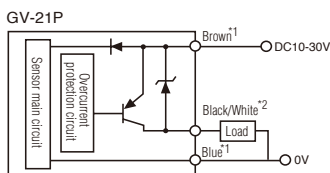
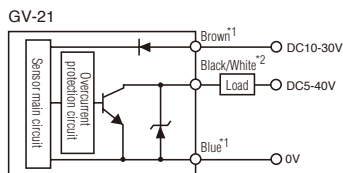
AMPLIFIER UNIT

Model	Amplifier Type		Main unit		Expansion unit	
	NPN output	PNP output	GV-21	GV-21P	GV-22	GV-22P
Power voltage	10-30 VDC, Ripple (P-P): 10% max, Class 2					
Power consumption	Normal	2200 mW max. (at 30 V: 73.3 mA max.)				
	Eco-bar	1700 mW max. (at 30 V: 56.7 mA max.)				
	Eco-all	1600 mW max. (at 30 V: 53.3 mA max.)				
Display indicator	Dual 7-segment display (Current Value: 3-digit red LED indicator, Preset Value: 3-digit green LED indicator) + 2-color 13-level Bar LED (Red, Green)					
Operation status indicators	Control output: Red LED x 2 Channel display: Green LED x 2 Laser radiation emission indicator Green LED Other: Green LED x 2/Red LED x 3					
Control output	NPN (PNP) open collector x 2ch, 40 V (30 V) DC max. / Max. 100 mA, residual voltage 1 V max.					
Control input	Purple: Laser emission stop Pink(selectable from menu):Bank switch, shift, timing					
Response time	1.5/3/10/20/50 ms					
Environmental resistance	Ambient temperature	-10 to +55°C 14 to 131°F, No freezing				
	Relative humidity	35 to 85% RH (No condensation)				
	Vibration	10 to 55 Hz, 1.5 mm 0.06" double amplitude in the X, Y, and Z directions, 2 hours respectively				
Material	Housing material, display cover: Polycarbonate Key Top: Polyacetal Cable: PVC					
Weight*1	Approx. 110 g					

*1. Including the cable (2 m 6.6').

I/O Circuit Diagram

Output circuit



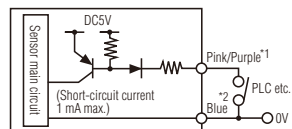
*1 The power lines (brown and blue) of the expansion unit are common inside through the connector.
*2 Black: Control output 1/White: Control output 2

*1 The power lines (brown and blue) of the main unit and those of the expansion unit are common inside through the connector.
*2 Black: Control output 1/White: Control output 2

Input circuit

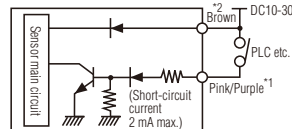
Emission stop input, Bank switching input, Shift input, Timing input

GV-21/22



*1 Pink: Bank switching input/Shift input/Timing input, Purple: Emission stop input
*2 The power line (blue) of the main unit and that of the expansion unit are common inside through the connector.

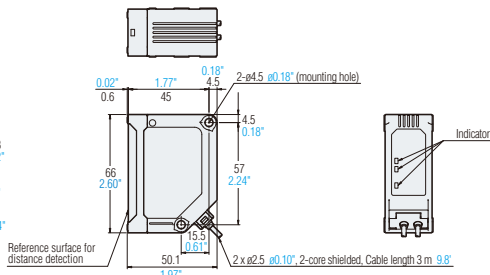
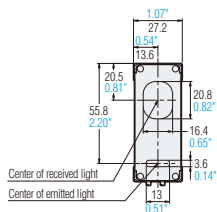
GV-21P/22P



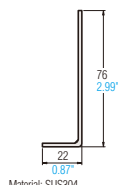
*1 Pink: Bank switching input/Shift input/Timing input, Purple: Emission stop input
*2 The power line (brown) of the main unit and that of the expansion unit are common inside through the connector.

Dimensions

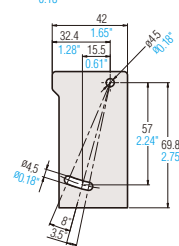
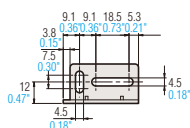
SENSOR HEAD GV-H1000/GV-H1000L



Mounting bracket (accessory)



Material: SUS304
t=2.0 0.08"
Supplied screw (2 pcs) M4, P=0.7, L=35 1.38", Material: SUS

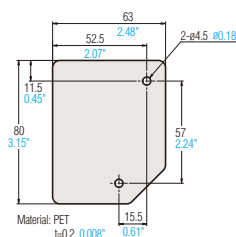


Material: SUS304
t=2.0 0.08"

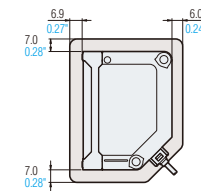
Unit:mm inch

Insulation sheet (accessory)

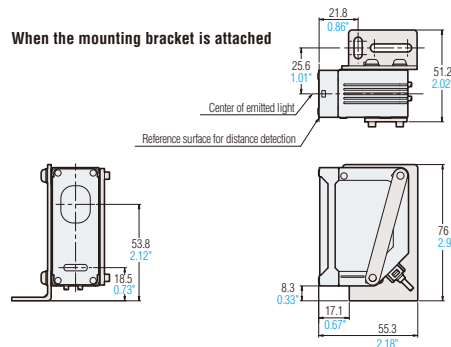
When the insulation sheet is attached



Material: PET
t=0.2 0.008"

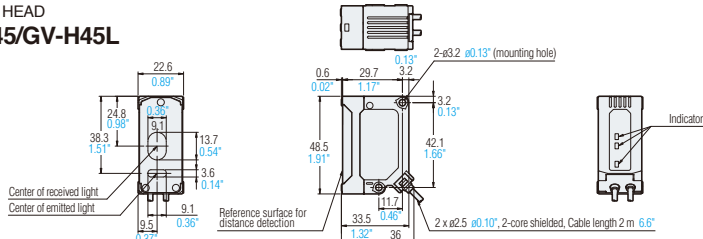


When the mounting bracket is attached

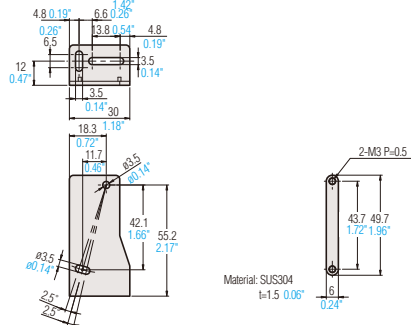
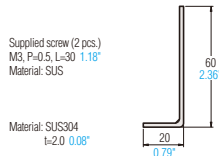


Dimensions

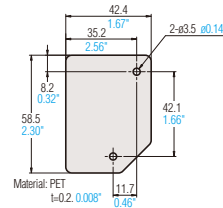
SENSOR HEAD GV-H45/GV-H45L



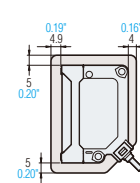
Mounting bracket (accessory)



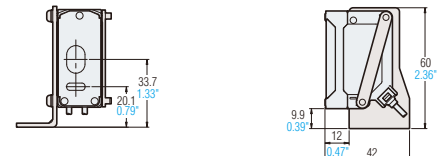
Insulation sheet (accessory)



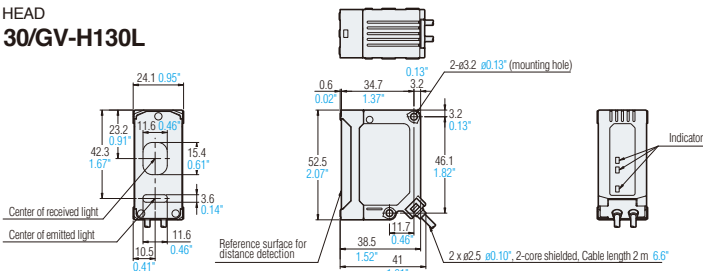
When the insulation sheet is attached



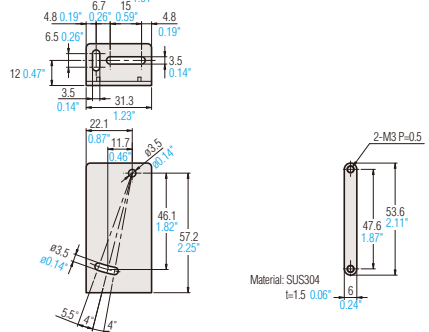
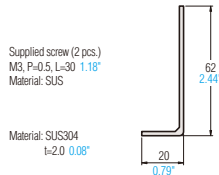
When the mounting bracket is attached



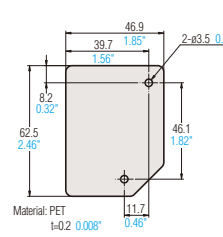
SENSOR HEAD GV-H130/GV-H130L



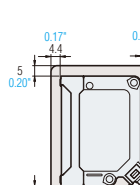
Mounting bracket (accessory)



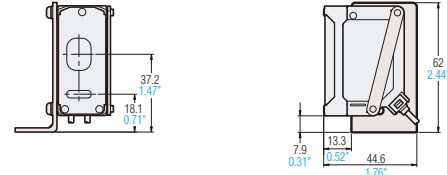
Insulation sheet (accessory)



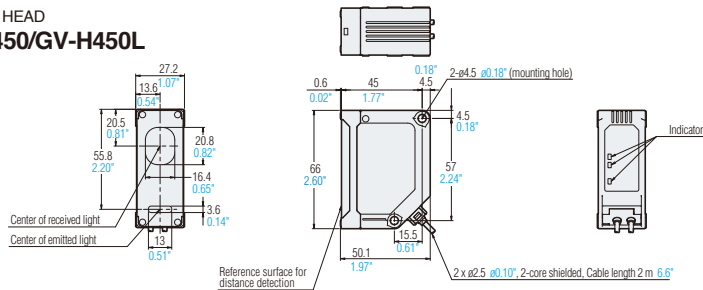
When the insulation sheet is attached



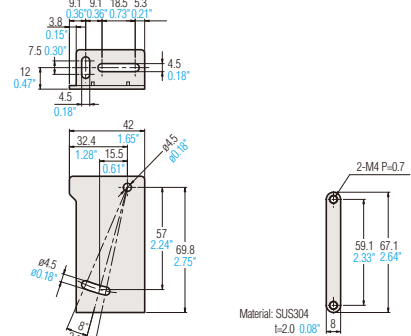
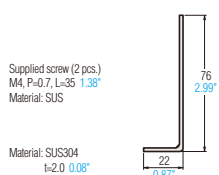
When the mounting bracket is attached



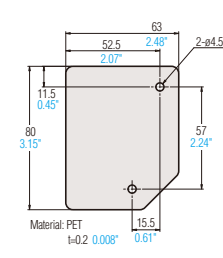
SENSOR HEAD GV-H450/GV-H450L



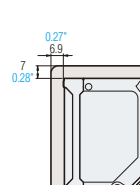
Mounting bracket (accessory)



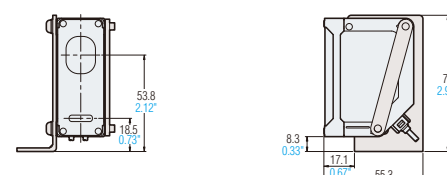
Insulation sheet (accessory)



When the insulation sheet is attached

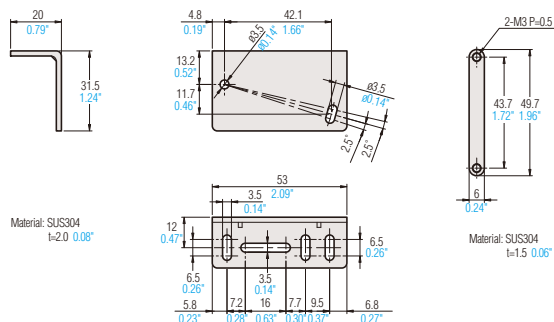


When the mounting bracket is attached



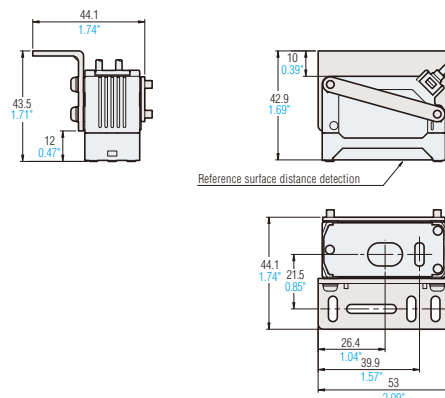
Unit:mm inch

Rear mounting bracket for GV-H45/GV-H45L (optional) **GV-B01**

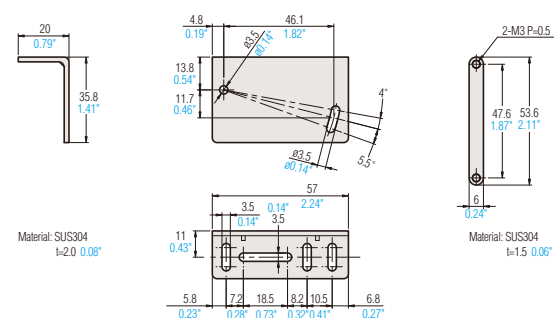


Supplied screw (2 pcs.) M3, P=0.5, L=30 1.18", Material: SUS

When the mounting bracket is attached

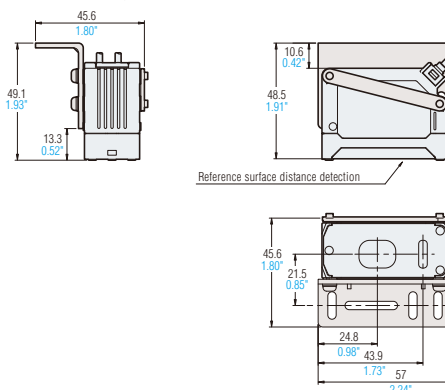


Rear mounting bracket for GV-H130/GV-H130L (optional) **GV-B02**

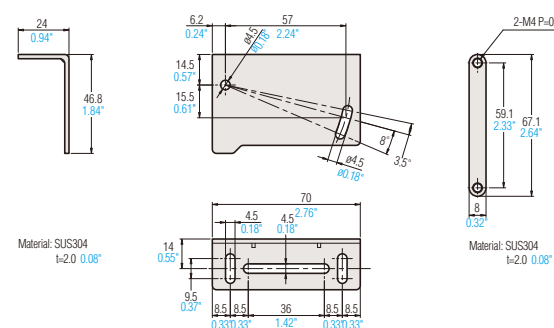


Supplied screw (2 pcs.) M3, P=0.5, L=30 1.18", Material: SUS

When the mounting bracket is attached

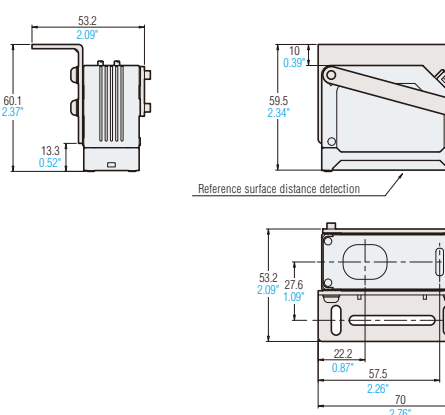


Rear mounting bracket for GV-H450/GV-H450L GV-H1000/GV-H1000L (optional) **GV-B03**

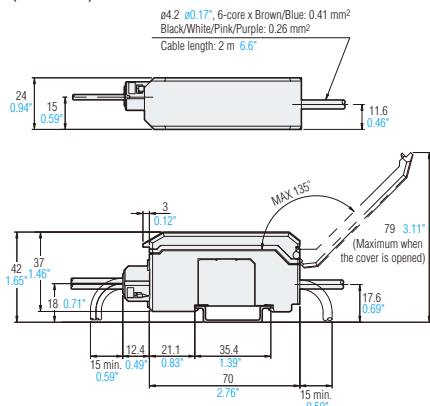


Supplied screw (2 pcs.) M3, P=0.5, L=30 1.18", Material: SUS

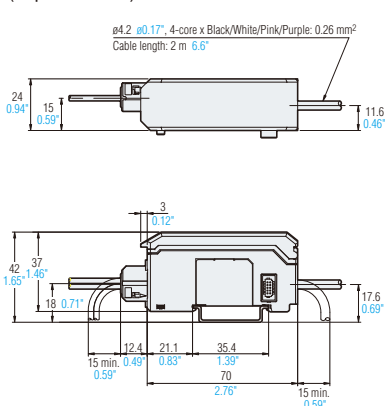
When the mounting bracket is attached



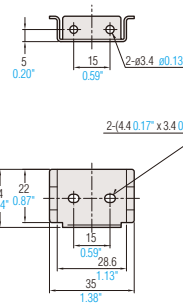
SENSOR AMPLIFIER **GV-21/21P** (Main unit)



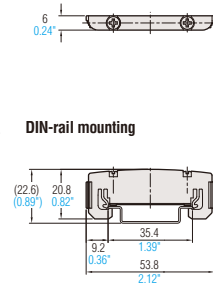
GV-22/22P (Expansion unit)



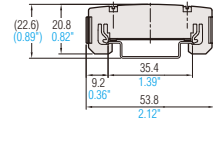
Fixture for fastening the DIN amplifier **OP-76877** (optional)



End unit **OP-26751** (optional)



DIN-rail mounting



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