

KEYENCE

Digital CMOS Laser Sensor
GV Series



Up to
1 m
Away



Stable detection of
metal targets



Innovative solution for
black targets

World's first **DATUM** Algorithm

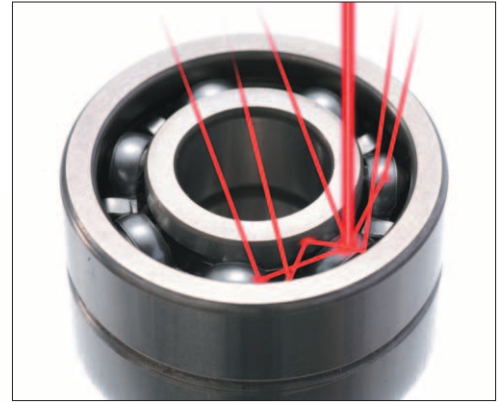
Conventional laser sensors have problems with...

Metals

Multiple reflection



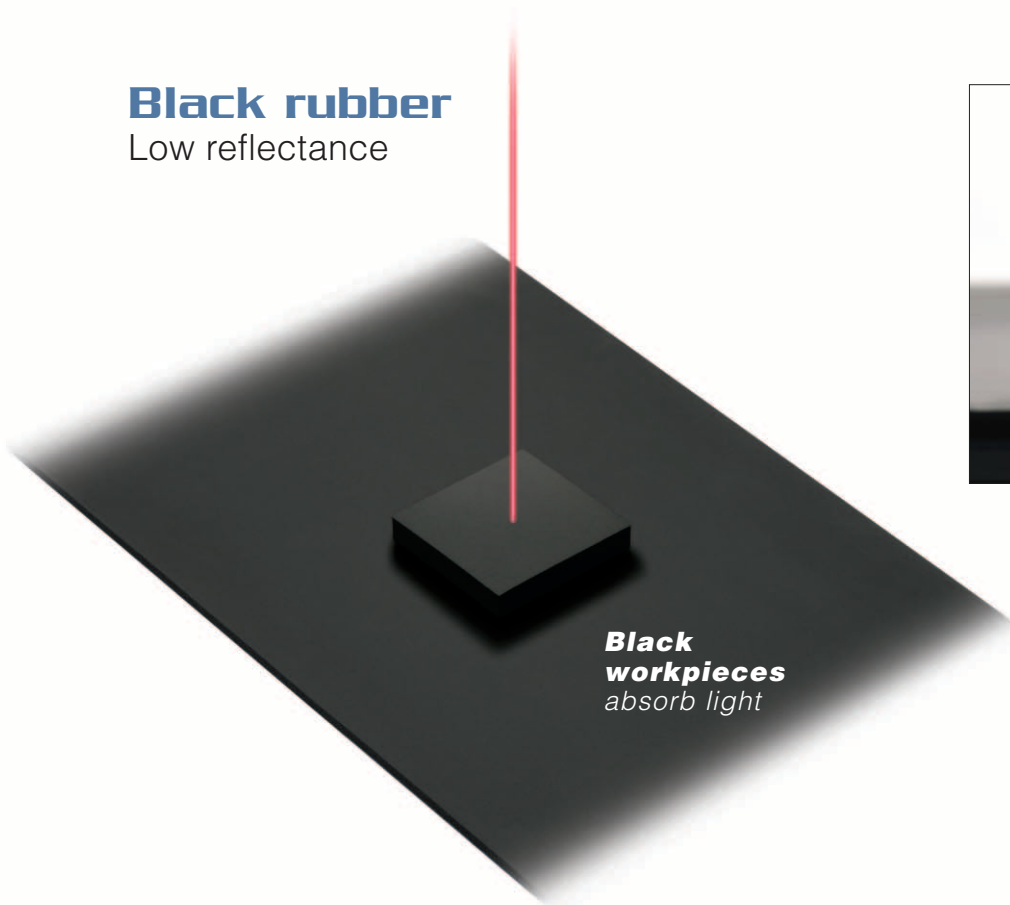
**Metal
workpieces**
*scatter the
laser light*



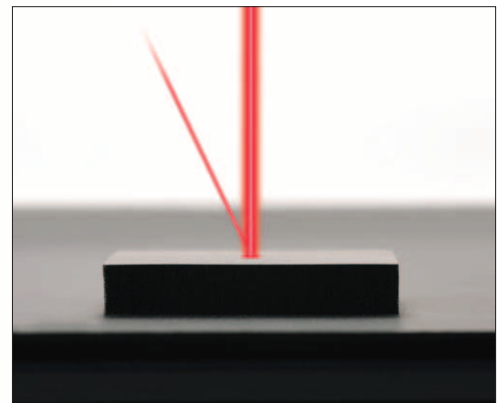
The correct valve
cannot be detected due to
multiple reflections

Black rubber

Low reflectance



**Black
workpieces**
absorb light

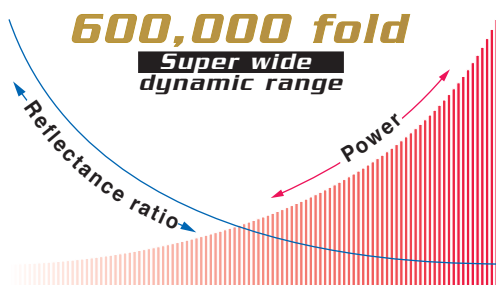
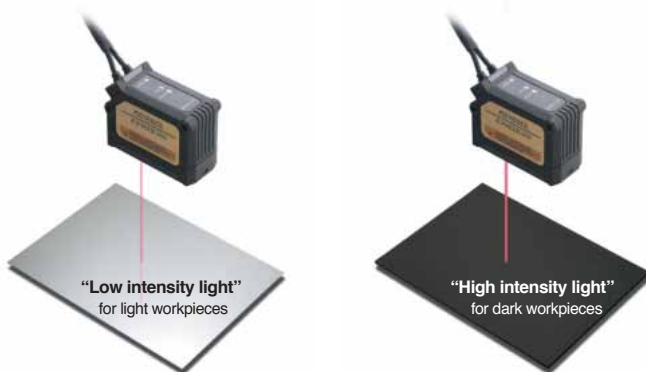


The detection is
unstable due
to the low reflectance

The latest light intensity control system reliably detects any colours.

Best in the class 600,000 fold Super wide dynamic range

The advanced technology that responds to the 600,000 fold light intensity variation of workpieces.



Dynamic range

Accommodates a wide variation of light intensity reflected from a workpiece without degrading the accuracy of distance detection.

The GV Series sets laser emitting time, power and gain optimally on a workpiece basis in real time. Targets with any colours can be reliably detected.

Adjustment range approximately 600,000 fold

Item	Lowest detection range	Highest detection range*
Laser power	1	Two fold
Light emitting time	1	3,926 fold
Gain	1	77 fold
Total	1	approximately 600,000 fold

*When the response time is set at 50 ms.

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



DATUM
function

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.

Measurement principle

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

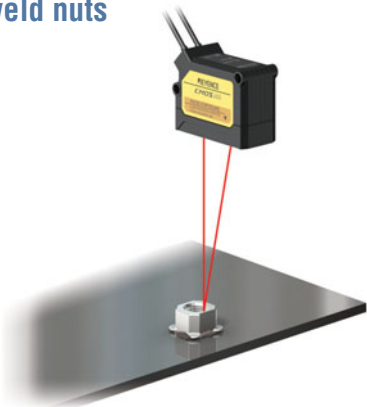
- Stable detection
- High-speed response

GV CMOS

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

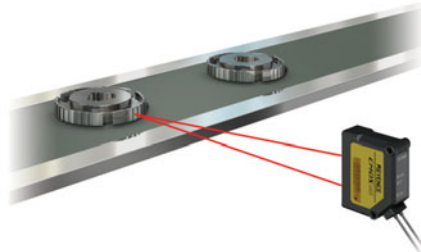
Applications

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



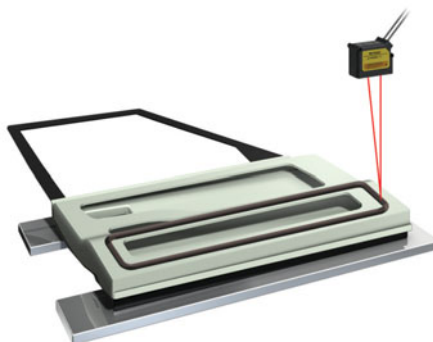
- Unaffected by polished, metallic surface

Checking processed grooves of pipe material



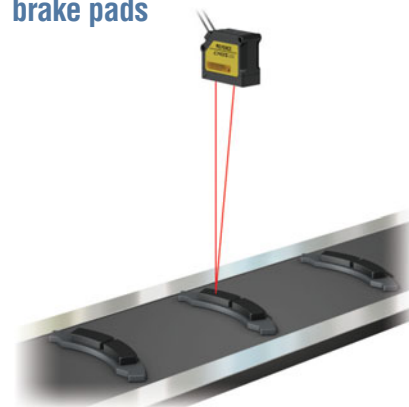
- Ignores scattered light and focuses only on the groove

Checking application of adhesive



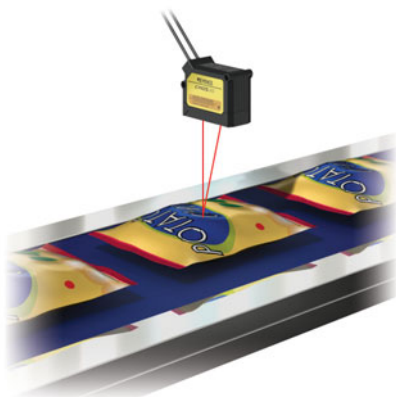
- Long distance detection of dark, glossy surfaces

Detecting presence/absence of brake pads



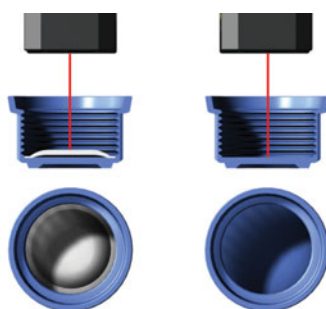
- Long distance detection of dark and irregular shaped targets

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 colour changes frequently.

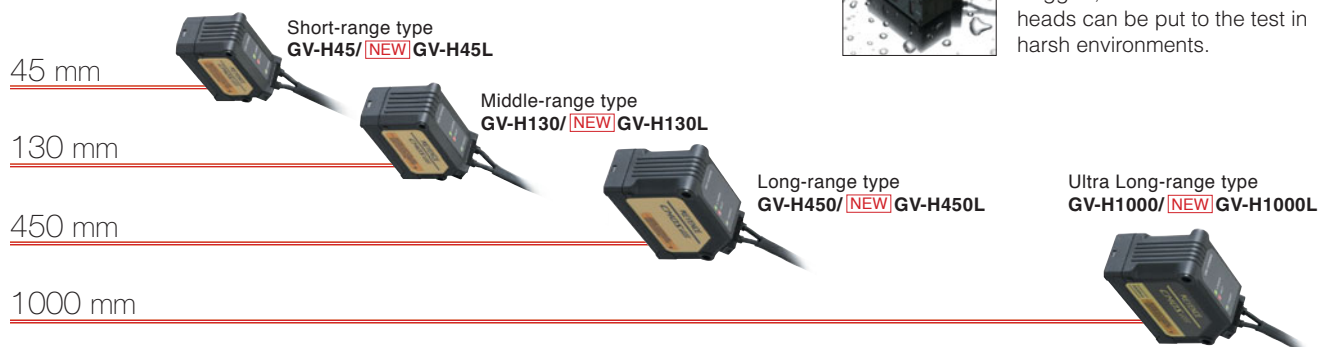
Detecting foam targets



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

Sensor Head

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



Washable sensor head (head only) <IP67>

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

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 20 or 50 ms.

Bar LED

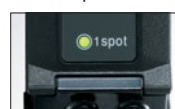
This bar LED shows you the detection state at a glance.



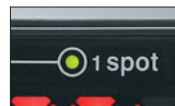
1 spot indicator

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

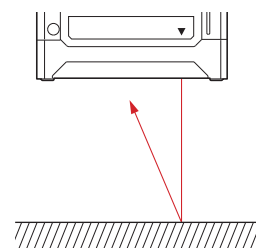
No multiple reflection



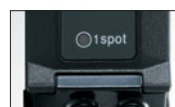
Head side



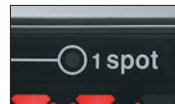
Amplifier side



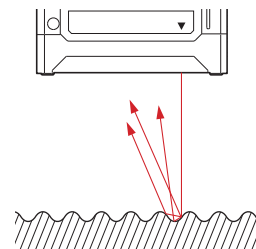
There is a multiple reflection



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 <Patent pending>

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

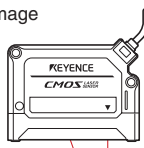
DATUM ALGORITHM

- Based on:
- Distance
 - Received light pattern

<<< DATUM tuning >>>

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

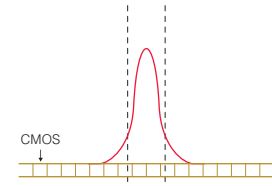
Detection image



CONVEYOR

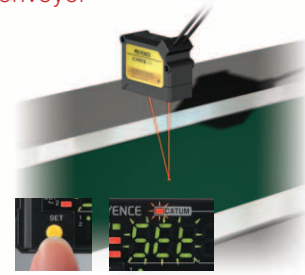
CMOS light received image

--- Setting range
— Light waveform



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.

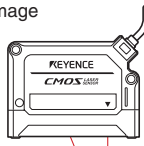
“Output OFF”



<<< Detection example 1 >>>

Flat workpiece

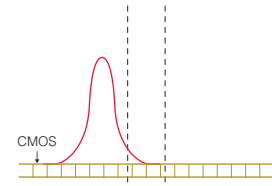
Detection image



CONVEYOR

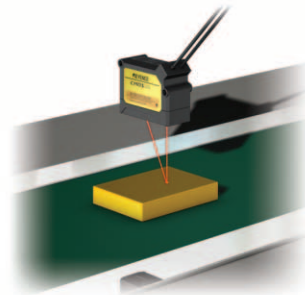
CMOS light received image

--- Setting range
— Light waveform



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

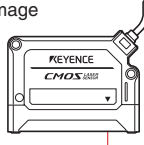
“Output ON”



<<< Detection example 2 >>>

Rough workpiece

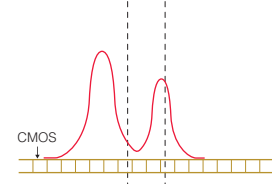
Detection image



CONVEYOR

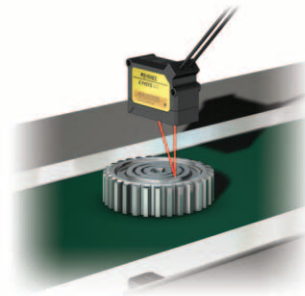
CMOS light received image

--- Setting range
— Light waveform



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

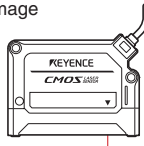
“Output ON”



<<< Detection example 3 >>>

Round workpiece

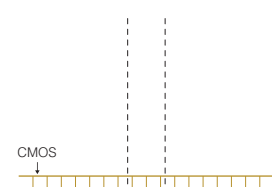
Detection image



CONVEYOR

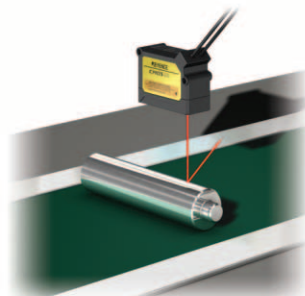
CMOS light received image

--- Setting range



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

“Output ON”





Other convenient sensing algorithms

<<< Edge hold mode >>> <Patent pending>
With an unstable background

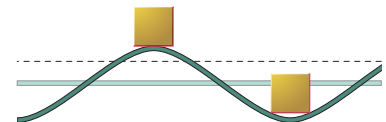
Edge Hold
Detection of a workpiece on a conveyor

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.

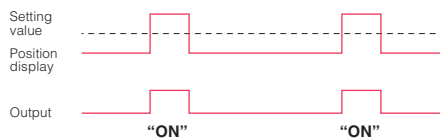
Normal state



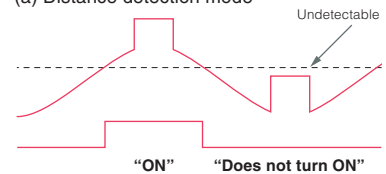
With an unstable background



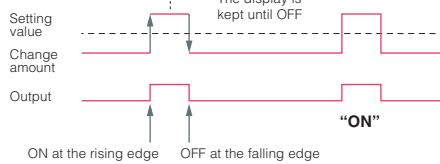
(a) Distance detection mode



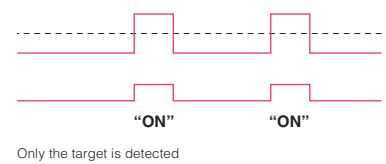
(a) Distance detection mode



(b) Edge hold mode

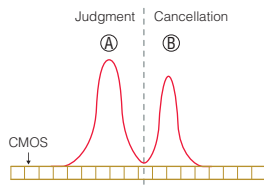
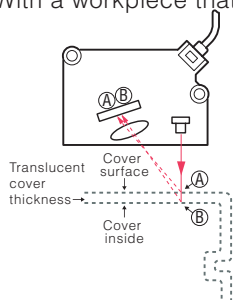


(b) Edge hold mode

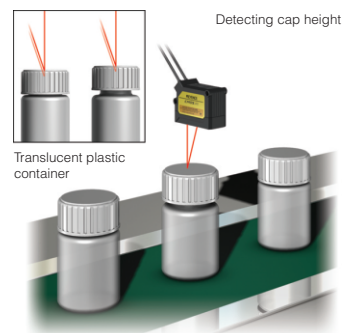


<<< Surface detection mode >>>

With a workpiece that has a dual reflection

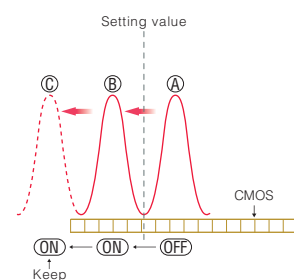
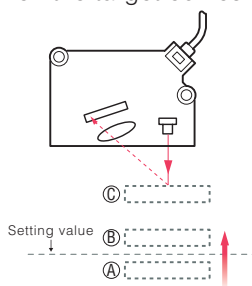


Some workpieces reflect the light from both top and bottom surfaces, making detection difficult. The surface detection mode ignores all other reflections and detects only the nearest surface.

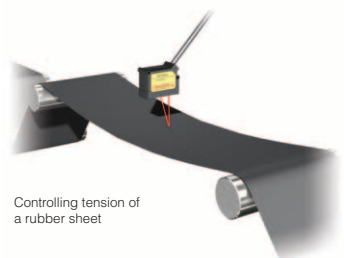


<<< Clamp function >>>

When the target comes too close to the sensor head

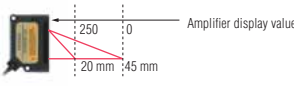
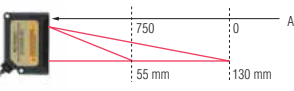

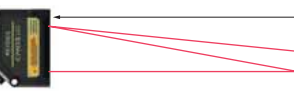


Even when the target comes too close to the sensor head and does not enter the detecting area, this function keeps the previous ON/OFF state.




Lineup






SENSOR HEAD

Model	Type	Configuration	Detection distance	Display	Display resolution	Detectable step change
GV-H45/ [NEW] GV-H45L	Short-range		20 to 45 mm	250 to 0	1 digit (Approx. 0.1 mm)	0.5 mm
GV-H130/ [NEW] GV-H130L	Middle-range		55 to 130 mm	750 to 0	2 digits (Approx. 0.2 mm)	1 mm
GV-H450/ [NEW] GV-H450L	Long-range		160 to 450 mm	290 to 0	1 digit (Approx. 1 mm)	3 mm
GV-H1000/ [NEW] GV-H1000L	Ultra long-range type		200 to 1000 mm	800 to 0	5 digit (Approx. 5 mm)	20 mm (Detection distance 200 to 800 mm) 30 mm (Detection distance 800 to 1000 mm)

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)

				
Rear mounting bracket for GV-H45(L)	Rear mounting bracket for GV-H130(L)	Rear mounting bracket for GV-H450(L)/GV-H1000(L)	Fixture for fastening the DIN amplifier	End unit (2 units in a set)
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	
Model		GV-H45	[NEW] GV-H45L	GV-H130	[NEW] GV-H130L	GV-H450	[NEW] GV-H450L	GV-H1000	[NEW] GV-H1000L
Light source		Visible semiconductor laser Wavelength: 655 nm							
Laser class	FDA laser class	Class II (Max. 0.56 mW)	Class I (Max. 0.22 mW)	Class II (Max. 0.56 mW)	Class I (Max. 0.22 mW)	Class II (Max. 0.56 mW)	Class I (Max. 0.22 mW)	Class II (Max. 0.56 mW)	Class I (Max. 0.22 mW)
	IEC class	Class 2 (Max. 0.56 mW)	Class 1 (Max. 0.22 mW)	Class 2 (Max. 0.56 mW)	Class 1 (Max. 0.22 mW)	Class 2 (Max. 0.56 mW)	Class 1 (Max. 0.22 mW)	Class 1M (Max. 0.56 mW)	Class 1 (Max. 0.22 mW)
Detection distance		20 to 45 mm		55 to 130 mm		160 to 450 mm		200 to 1000 mm	
Standard detection deviation		0.5 mm		1 mm		3 mm		20 mm (Detection distance 200 to 800 mm) 30 mm (Detection distance 800 to 1000 mm)	
Spot diameter		Approx. ø0.1 mm (Detection distance 45 mm)		Approx. ø0.3 mm (Detection distance 130 mm)		Approx. ø0.8 mm (Detection distance 450 mm)		Approx. ø1.8 mm (Detection distance 1000 mm)	
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 (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 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 connector cable (3 m cable for GV-H1000)

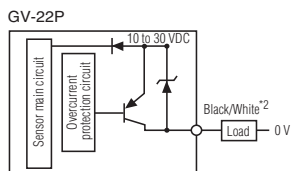
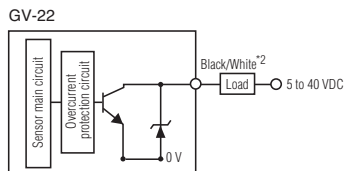
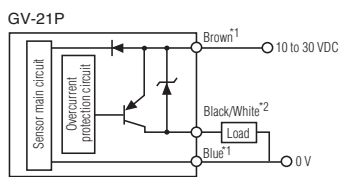
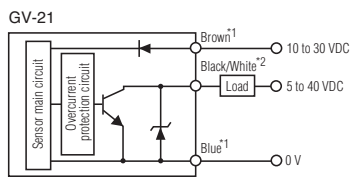
AMPLIFIER UNIT

Amplifier Type		Main unit	Expansion unit
Model	NPN output	GV-21	GV-22
	PNP output	GV-21P	GV-22P
Power voltage		10 to 30 VDC, Ripple (P-P): 10% max, Class 2	
Power consumption	Normal	2200 mW max. (at 30 V: 73.3 mA max.)	
	Eco-Half	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-colour 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 (No freezing)	
	Relative humidity	35 to 85% (No condensation)	
	Vibration	10 to 55 Hz, 1.5 mm 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).

I/O Circuit Diagram

Output circuit



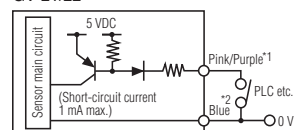
*1 The power lines (brown and blue) of the expansion unit are common inside through the connector.
 *2 Black: Control output 1/White: Control output 2

*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

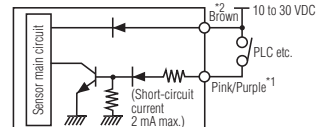
Emission stop input, Bank switching input, Shift input, Timing input

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

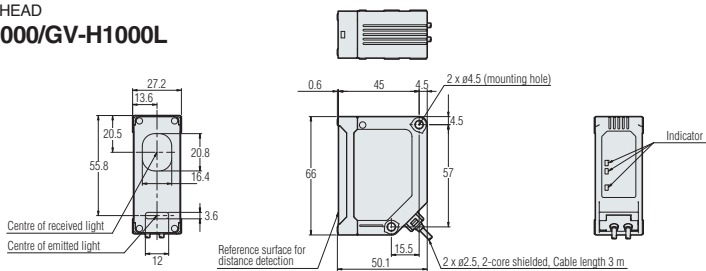


*1 Pink: Bank switching input/Shift input/Timing input, Purple: Emission stop input
 *2 The power line (brown) of the main unit and that of the expansion unit are common inside through the connector.

Dimensions

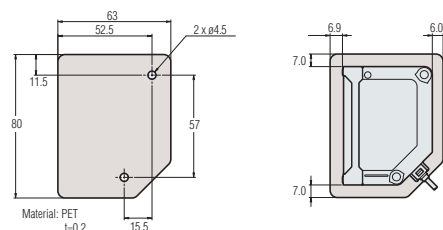
Unit:mm

SENSOR HEAD GV-H1000/GV-H1000L

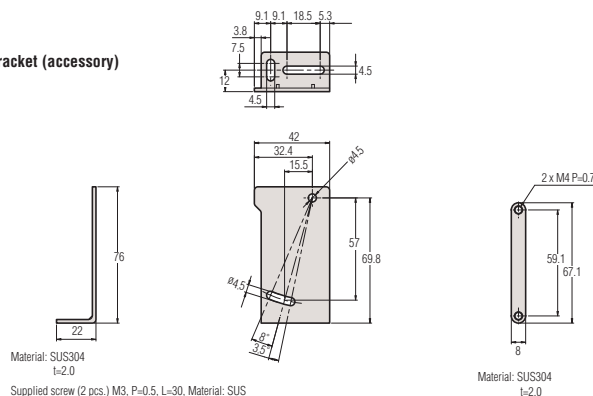


Insulation sheet (accessory)

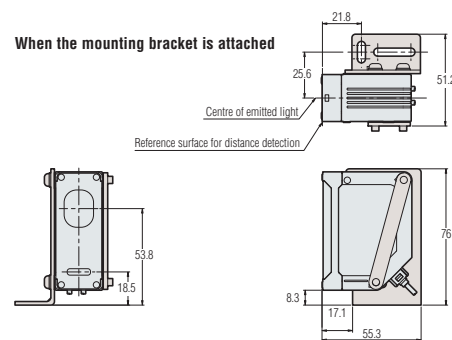
When the insulation sheet is attached



Mounting bracket (accessory)

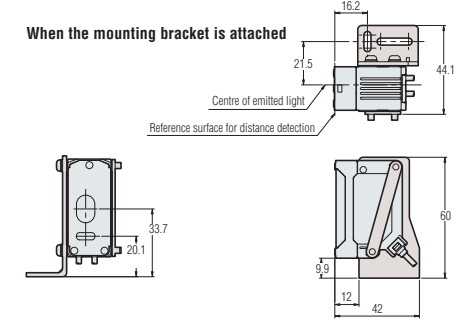
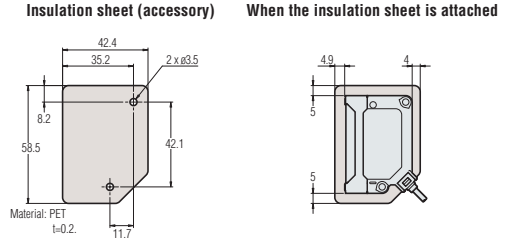
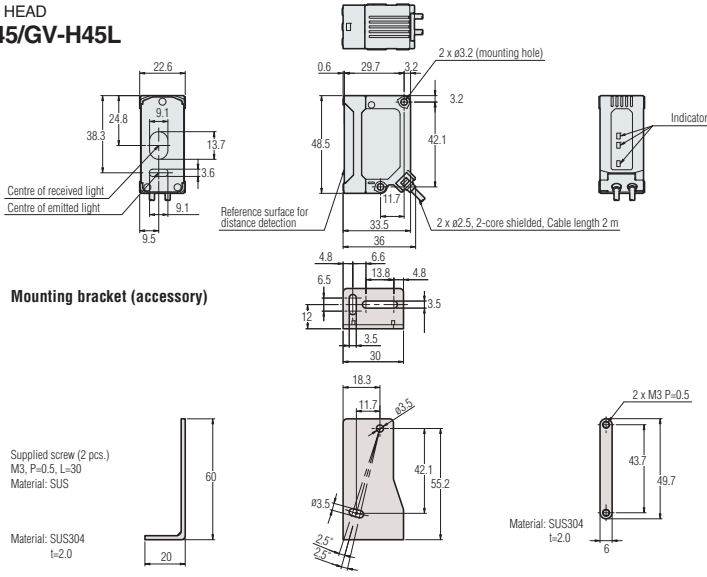


When the mounting bracket is attached

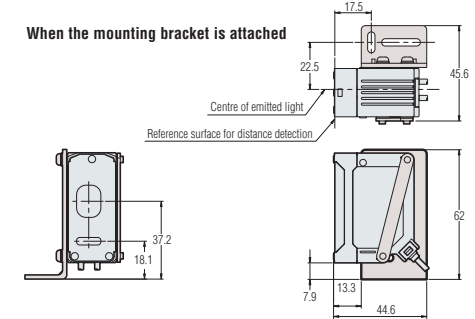
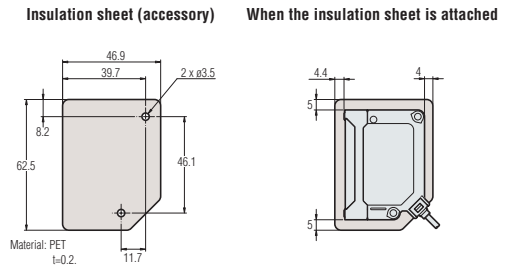
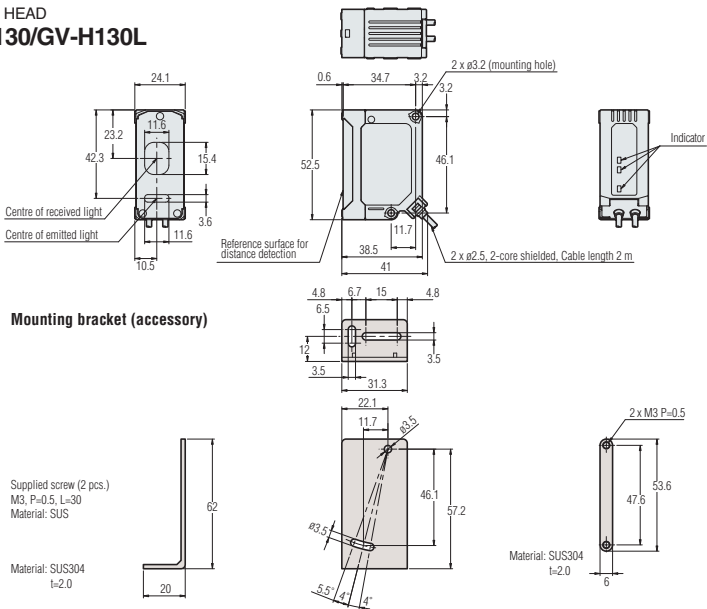


Dimensions

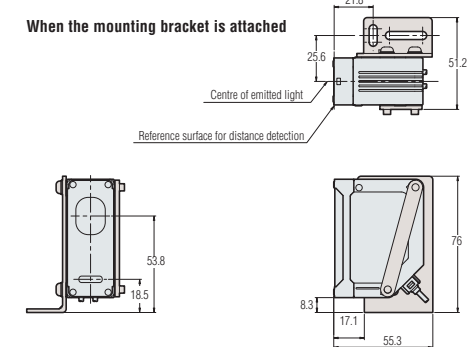
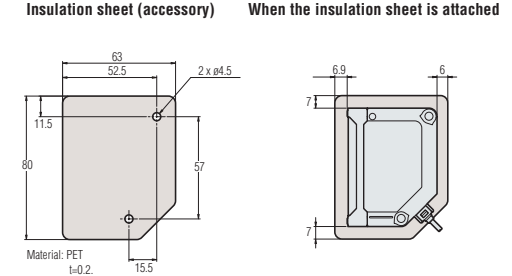
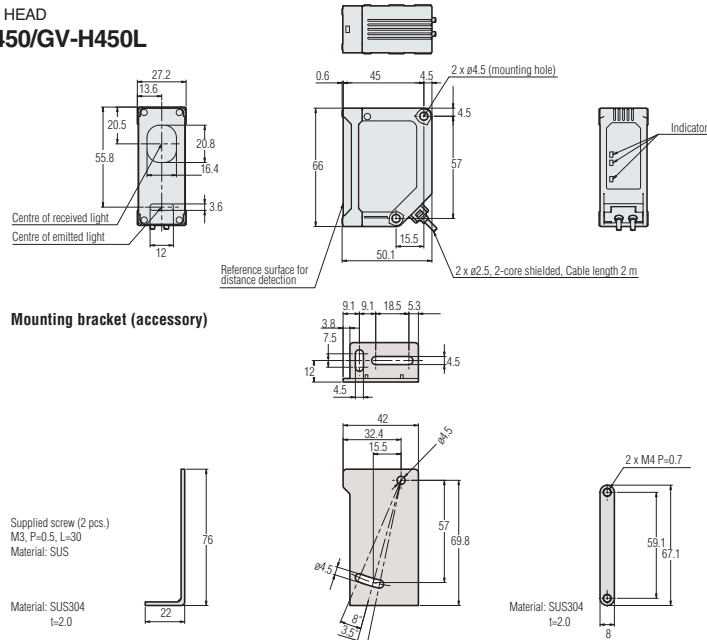
SENSOR HEAD GV-H45/GV-H45L



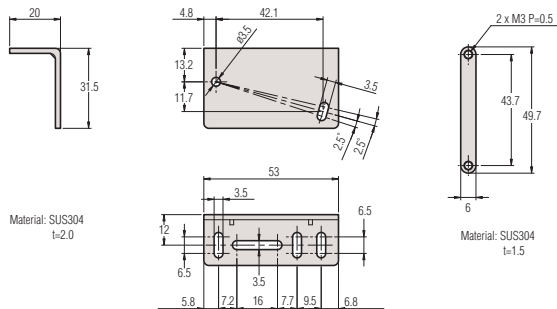
SENSOR HEAD GV-H130/GV-H130L



SENSOR HEAD GV-H450/GV-H450L



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

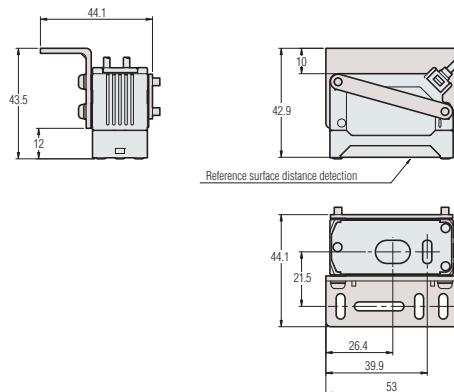


Material: SUS304
t=2.0

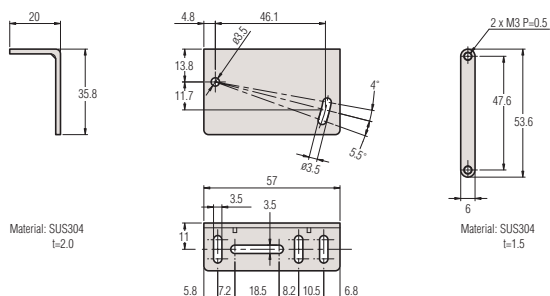
Material: SUS304
t=1.5

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

When the mounting bracket is attached



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

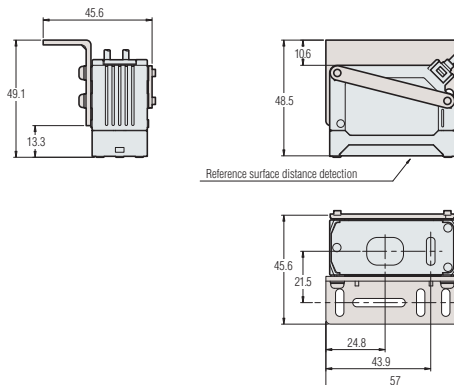


Material: SUS304
t=2.0

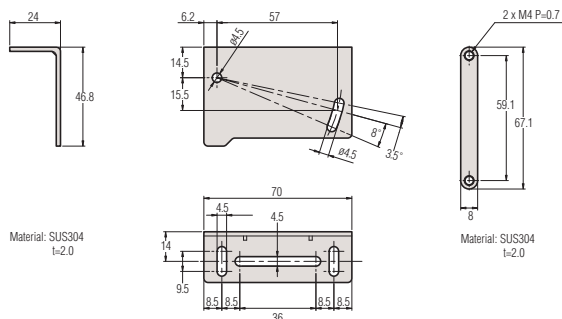
Material: SUS304
t=1.5

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

When the mounting bracket is attached



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

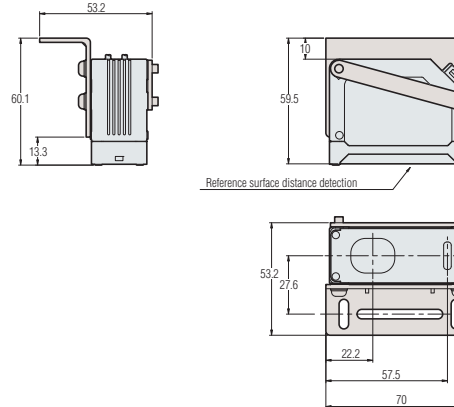


Material: SUS304
t=2.0

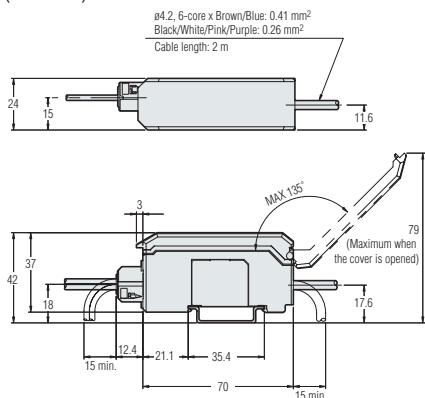
Material: SUS304
t=2.0

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

When the mounting bracket is attached

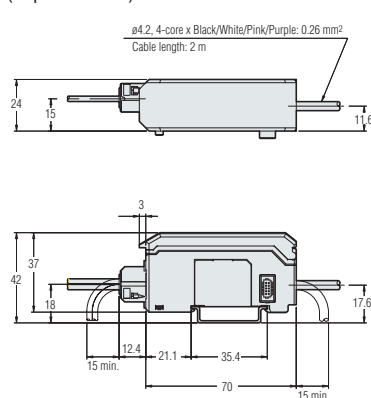


SENSOR AMPLIFIER **GV-21/21P** (Main unit)



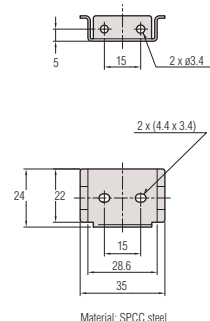
ø4.2, 6-core x Brown/Blue: 0.41 mm²
Black/White/Pink/Purple: 0.26 mm²
Cable length: 2 m

GV-22/22P (Expansion unit)



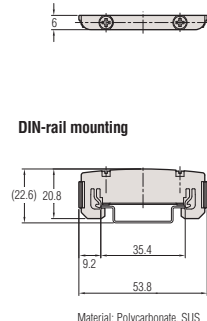
ø4.2, 4-core x Black/White/Pink/Purple: 0.26 mm²
Cable length: 2 m

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



Material: SPOC steel

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



DIN-rail mounting

Material: Polycarbonate, SUS

SENSOR VARIATIONS

AMPLIFIERS

FIBRE OPTIC SENSOR

FS-V30 Series

**Mega Power
Light Beam**



FIBRE OPTIC SENSORS

Tough & Durable



COLOUR DETECTION SENSOR

CZ-V Series

**4 Independent
Outputs**



Environment-proof



HEAVY-DUTY SENSOR

PX Series

**Oil-resistant,
waterproof**



Easy Installation



LASER OPTIC SENSOR

LV-H/LV-S Series

**Long distance
& wide area**



Space saving



Area detection



Laser beam



Please visit: www.keyence.com



SAFETY INFORMATION

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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