Digital CMOS Laser Sensor
GV Series

Super-small digital laser optic sensors
• Space-saving super small sizes
• Easy mounting supported by the visible laser spot
• JIS: Class 1 / IEC: Class 1 / FDA: Class 1
• Wire-saving structure

Compact lasers can be mounted almost anywhere
• Long-range detection available up to 50 m [164']
• Easy mounting supported by the visible laser spot
• 15 head variations
• Wire-saving structure

High power lasers for precision detection

High-speed, high-accuracy CCD Laser Displacement Sensors
• Ultra-high speed 50 kHz
• High accuracy
• Wide measuring range 9 to 1000 mm [0.35” to 39.37”]
• Various types of measuring heads

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

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**Newly developed GV CMOS Measurement principle**

- Stable detection
- High-speed response

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

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

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

* 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

- 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.

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.

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

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

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

The CMOS light receiving position changes
The distance changes
The workpiece is judged as present
“Output ON”

<<< Detection example 2 >>>
Rough workpiece

2 peaks appear on the waveform
The light receiving pattern changes
The workpiece is judged as present
“Output ON”

<<< Detection example 3 >>>
Round workpiece

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

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.

<<< 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.
### Specifications

#### SENSOR HEAD

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Configuration</th>
<th>Detection distance</th>
<th>Display</th>
<th>Display resolution</th>
<th>Detectable step change</th>
</tr>
</thead>
<tbody>
<tr>
<td>GV-H45/GV-H45L</td>
<td>Short-range</td>
<td>250 mA  2.5 mm 1.7&quot;</td>
<td>20 to 45 mm 0.79&quot; to 1.17&quot;</td>
<td>250 to 0</td>
<td>1 digit (Approx. 0.1 mm 0.004&quot;)</td>
<td>0.5 mm 0.02&quot;</td>
</tr>
<tr>
<td>GV-H130/GV-H130L</td>
<td>Middle-range</td>
<td>55 mm 5.12&quot;</td>
<td>55 to 130 mm 2.17&quot; to 5.12&quot;</td>
<td>750 to 0</td>
<td>2 digits (Approx. 0.2 mm 0.008&quot;)</td>
<td>1 mm 0.04&quot;</td>
</tr>
<tr>
<td>GV-H450/GV-H450L</td>
<td>Long-range</td>
<td>160 mm 6.34&quot;</td>
<td>160 to 450 mm 6.30&quot; to 17.72&quot;</td>
<td>290 to 0</td>
<td>1 digit (Approx. 1 mm 0.04&quot;)</td>
<td>3 mm 0.12&quot;</td>
</tr>
<tr>
<td>GV-H1000/GV-H1000L</td>
<td>Ultra long-range type</td>
<td>200 mm 7.87&quot;</td>
<td>200 to 1000mm 7.87&quot; to 39.37&quot;</td>
<td>800 to 0</td>
<td>5 digit (Approx. 5 mm 0.2&quot;)</td>
<td>705 mm 27.7&quot; (Detection distance 200 to 800 mm 7.87&quot; to 31.5&quot;) 30 mm 1.18&quot; (Detection distance 800 to 1000 mm 31.5&quot; to 39.37&quot;)</td>
</tr>
</tbody>
</table>

#### SENSOR AMPLIFIER

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Configuration</th>
<th>Operation status indicators</th>
<th>Display indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>GV-21</td>
<td>DIN mounting</td>
<td>NPN</td>
<td>Control output: Red LED / Laser radiation emission indicator: Green LED</td>
<td>Plc etc.</td>
</tr>
<tr>
<td>GV-22</td>
<td>Expansion unit</td>
<td>PNP</td>
<td>Control output: Red LED / Laser radiation emission indicator: Green LED</td>
<td>Other: Green LED</td>
</tr>
</tbody>
</table>

#### OPTICAL (sold separately)

<table>
<thead>
<tr>
<th>Model</th>
<th>Rear mounting</th>
<th>Rear mounting</th>
<th>Rear mounting</th>
<th>Future for housing the DIN amplifier</th>
<th>End unit (2 units in a set)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP-801</td>
<td>for GV-H45(L)</td>
<td>for GV-H130(L)</td>
<td>for GV-H450(L)/GV-H1000(L)</td>
<td>OP-76877</td>
<td>OP-26751</td>
</tr>
</tbody>
</table>

#### AMPLIFIER UNIT

<table>
<thead>
<tr>
<th>Amplifier Type</th>
<th>Main unit</th>
<th>Expansion unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN output</td>
<td>GV-21</td>
<td>GV-22</td>
</tr>
<tr>
<td>PNP output</td>
<td>GV-21P</td>
<td>GV-22P</td>
</tr>
</tbody>
</table>

### Lineup

#### SENSOR AMPLIFIER

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Configuration</th>
<th>Main/ expansion unit</th>
<th>Output mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>GV-21</td>
<td>DIN mounting</td>
<td>NPN</td>
<td>Main unit</td>
<td>NPN</td>
</tr>
<tr>
<td>GV-22</td>
<td>Expansion unit</td>
<td>PNP</td>
<td>Expansion unit</td>
<td>PNP</td>
</tr>
<tr>
<td>GV-21P</td>
<td>Expansion unit</td>
<td>PNP</td>
<td>Expansion unit</td>
<td>PNP</td>
</tr>
<tr>
<td>GV-22P</td>
<td>Expansion unit</td>
<td>PNP</td>
<td>Expansion unit</td>
<td>PNP</td>
</tr>
</tbody>
</table>

#### 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)
- Future for housing the DIN amplifier
- End unit (2 units in a set)

#### Specifications (continued)

**Environmental resistance**

- **Ambient temperature:** -30 to +50°C (-22 to 122°F), No freezing
- **Relative humidity:** 30 to 85% (No condensation)
- **Ambient light:** Sunlight: 10000 lux / 5000 lux / Incandescent lamp: 10000 lux / 2500 lux
- **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: Polyethylene Terephthalate (PET), Display cover: Glass, Cable: PVC
- **Weight:** Approx. 190 g

1. Incandescent lamp: 10000 lux, Sunlight: 5000 lux for GV-H450 (when the response time is set to 10 ms or faster)
2. Incandescent lamp: 2500 lux, Sunlight: 1500 lux for GV-H4100L (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)

#### Technical Details

- **Power voltage:** 90-30 VDC, Ripple (P-P): 10% max. Class 2
- **Power consumption:** 2200 mW max. (at 10 V: 73.8 mV max.)
- **Display indicator:** Dual 7-segment display (Current Value: 3-digit red LED indicator, Preset Value: 3-digit green LED indicator) + 2-color 12-level Bar LED (Red, Green)
- **Environmental resistance:** Operating: Dust and water resistant according to IP67 (IP54 for GV-H450), Non-operating: Dust resistant, Water resistant, 30 mm 1.18", 30 mm 1.18" (with the response time is set to 10 ms or faster)
- **Weight:** Approx. 190 g

1. Including the cable (3 m 9.8')

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**Image:**

- Diagrams showing the connection of the main unit and expansion units
- Diagrams of the main unit and expansion units
- Diagrams of the amplifier display value

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**Table:**

- Details of the detection distance, display, and detectable step change
- Specifications of the sensor type, short-range, middle-range, long-range, and ultra long-range types
- Specifications of the laser class, IEC class, detection distance, displayable range, standard deviation, spot diameter, and material
- Specifications of the power voltage, power consumption, and environmental resistance

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**Graphs:**

- Graphs showing the relationship between detection distance and display values
- Graphs showing the relationship between ambient temperature and relative humidity
- Graphs showing the relationship between vibration and material specification

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**Notes:**

1. Including 2 m 6.6' connector cable (3 m 9.8' cable for GV-H1000)
2. Incandescent lamp: 2500 lux, Sunlight: 1500 lux for GV-H4100L (when the response time is set to 10 ms or faster)
## I/O Circuit Diagram

### Output circuit

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensor Head</th>
<th>Environmental Model</th>
<th>GV-21</th>
<th>GV-21P</th>
<th>GV-22</th>
<th>GV-22P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sensor Amplifier Optional</td>
<td></td>
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<td>(sold separately)</td>
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<tr>
<td>Sensor</td>
<td></td>
<td>Head</td>
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<tr>
<td>Head</td>
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</tbody>
</table>

### Input circuit

*1 Pink: Bank switching input/Shift input/Timing input
*2 Purple: Emission stop input
*3 Black: Control output 1/White: Control output 2

### Dimensions

**GV-H1000/GV-H1000L**

* The power lines (brown and blue) of the expansion unit are common inside through the connector.

*2 The power line (blue) of the main unit and that of the expansion unit are common inside through the connector.

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**Insulation sheet (accessory)**

When the insulation sheet is attached

<p>| | |</p>
<table>
<thead>
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</table>

**When the mounting bracket is attached**

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**Related products**

**High-speed, High-accuracy CCD Laser Displacement Sensors**
- Ultra-high speed 50 kHz
- High accuracy ± 0.02%
- Wide measuring range 9 to 1000 mm 0.35" to 39.37"
- Various types of measuring heads

**LV-S**

Compact lasers can be mounted almost anywhere
- Space-saving super small sizes
- Easy mounting supported by the visible laser spot
- JIS: Class 1/IEC: Class 1/ FDA: Class 1
- Wire-saving structure

**LV-H**

High power lasers for precision detection
- Long-range detection available up to 50 m 164'
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- Wire-saving structure