

GA-311 GH SERIES

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FIBER SENSORS

LASER SENSORS

PHOTOELECTRIC SENSORS

MICRO PHOTOELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

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GA-311/GH


panasonic-electric-works.net/sunx


High-speed response and excellent workability

Suitable for high-speed applications

It has a high performance of 3.3 kHz response frequency. These sensors are ideal for sensing objects moving at high speeds.

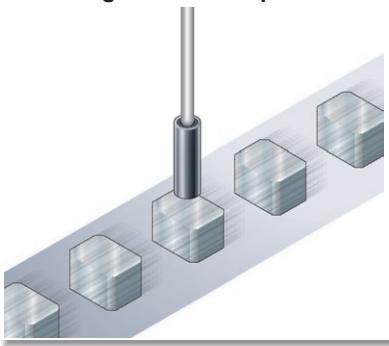
IP67g (JEM) sensor head variations

The lineup includes 5 different models, from an ultra-compact 2.8 mm **0.110 in** diameter type to a spatter-resistant type. Furthermore, all except for the **GH-2SE** are IP67g (JEM) oil-resistant models so that they can be used with confidence even in adverse environments.



APPLICATIONS

Detecting small metal parts



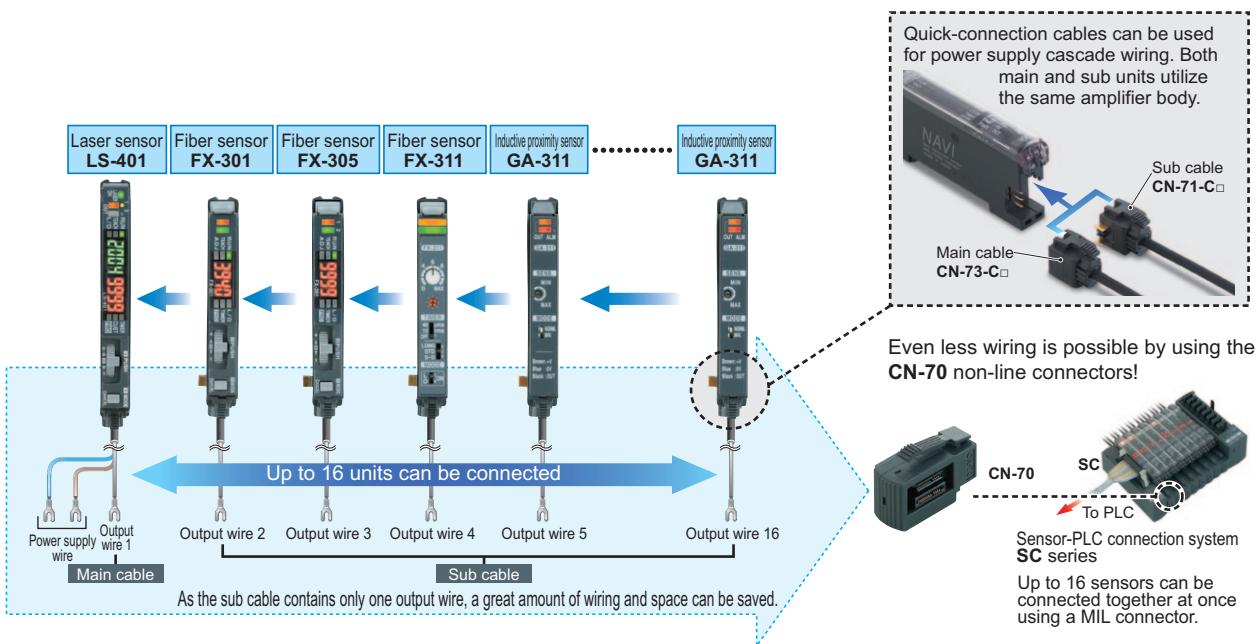
Detecting rotation of a gear



MOUNTING / MAINTENANCE

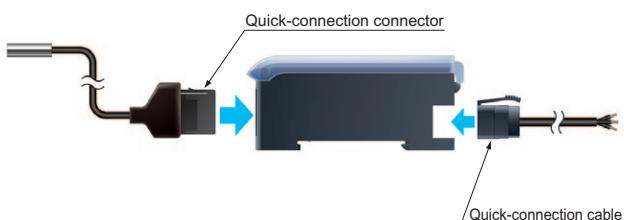
Excellent workability and ease of maintenance

They all have the same form as the **FX-300** series of fiber sensors. The quick-connection cables are also of the same shape, so that fiber sensors and laser sensors can all be used together and less power supply wiring is required.



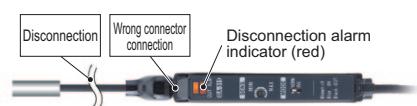
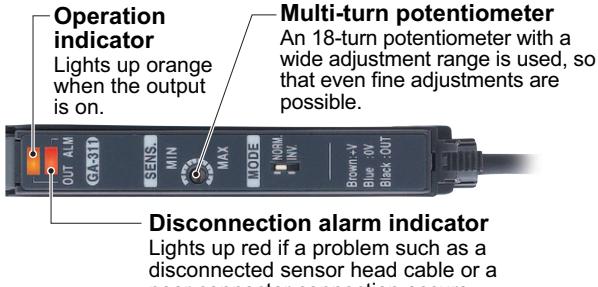
Labor-saving by one-touch connections

The connection between the sensor head and the amplifier is made using a quick-connection connector. Past troublesome wiring connections using a screwdriver are no longer necessary.



FUNCTIONS

Disconnection alarm indicator and operation indicator have been incorporated



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GA-311/GH

ORDER GUIDE

Sensor heads

Type	Appearance (mm in)	Sensing range (Note)	Model No.	Hysteresis
Cylindrical type		1.2 mm 0.047 in (0 to 0.6 mm 0 to 0.024 in) Maximum operation distance Stable sensing range	GH-2SE	0.07 mm 0.0028 in or less
		1.8 mm 0.071 in (0 to 0.8 mm 0 to 0.031 in)	GH-3SE	0.05 mm 0.0020 in or less
		2.4 mm 0.094 in (0 to 1.0 mm 0 to 0.039 in)	GH-5SE	
		4.0 mm 0.157 in (0 to 2.0 mm 0 to 0.079 in)	GH-8SE	0.04 mm 0.0016 in or less
Spatter-resistant type			GH-F8SE	

Note: The stable sensing range represents the sensing range for which the sensor can satisfy all the given specifications with the standard sensing object.

The maximum operation distance represents the maximum distance for which the sensor can detect the standard sensing object at $+20^{\circ}\text{C}$ $+68^{\circ}\text{F}$ constant ambient temperature.

Usage within the stable sensing range is recommended for accurate sensing applications.

Amplifier

 Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Appearance	Model No.	Output
Connector type		GA-311	NPN open-collector transistor

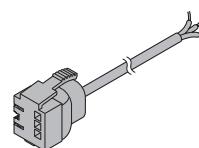
Quick-connection cable

 Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.	Description
Main cable (3-core)	CN-73-C1	Length: 1 m 3.281 ft 0.15 mm ² 3-core cabtyre cable, with connector on one end
	CN-73-C2	Length: 2 m 6.562 ft Cable outer diameter: Ø3.0 mm 0.118 in
	CN-73-C5	Length: 5 m 16.404 ft
Sub cable (1-core)	CN-71-C1	Length: 1 m 3.281 ft 0.15 mm ² 1-core cabtyre cable, with connector on one end
	CN-71-C2	Length: 2 m 6.562 ft Cable outer diameter: Ø3.0 mm 0.118 in
	CN-71-C5	Length: 5 m 16.404 ft

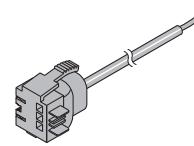
Main cable

- CN-73-C□



Sub cable

- CN-71-C□



End plates

 End plates are not supplied with the amplifier. Please order them separately when the amplifiers are mounted in cascade.

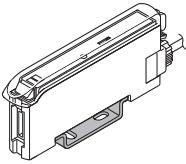
Appearance	Model No.	Description
	MS-DIN-E	When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates clamp amplifiers into place on both sides. Make sure to use end plates when cascading multiple amplifiers together. 2 pcs. per set

■ OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	MS-DIN-2	Mounting bracket for amplifier
Sensor head mounting bracket	MS-SS3	Mounting bracket for GH-3SE
	MS-SS5	Mounting bracket for GH-5SE
	MS-SS8	Mounting bracket for GH-8SE

Amplifier mounting bracket

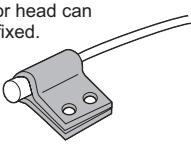
- **MS-DIN-2**



Sensor head mounting bracket

- **MS-SS□**

The sensor head can be easily fixed.



■ SPECIFICATIONS

Sensor heads

Item	Model No.	Cylindrical type				Spatter-resistant type							
		GH-2SE	GH-3SE	GH-5SE	GH-8SE								
Applicable amplifier		GA-311											
Stable sensing range (Note 2)	0 to 0.6 mm 0 to 0.024 in	0 to 0.8 mm 0 to 0.031 in	0 to 1.0 mm 0 to 0.039 in		0 to 2.0 mm 0 to 0.079 in								
Max. operation distance (Note 2)	1.2 mm 0.047 in	1.8 mm 0.071 in	2.4 mm 0.094 in		4.0 mm 0.157 in								
Standard sensing object	Iron sheet 5 × 5 × t 1 mm 0.197 × 0.197 × t 0.039 in			Iron sheet 10 × 10 × t 1 mm 0.394 × 0.394 × t 0.039 in									
Hysteresis (Note 3)	0.07 mm 0.003 in or less	0.05 mm 0.002 in or less		0.04 mm 0.002 in or less									
Repeatability (Note 3)	Along sensing axis, perpendicular to sensing axis: 1 µm 0.039 mil or less												
Environmental resistance	Protection	IP50 (IEC)	IP67 (IEC), IP67g (JEM)										
	Ambient temperature	-10 to +60 °C 14 to +140 °F , Storage: -20 to +70 °C -4 to +158 °F											
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH											
	Vibration resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each											
	Shock resistance	500 m/s ² acceleration (50 G approx.) in X, Y and Z directions for five times each											
Temperature characteristics (Note 4)	Within ±7 %	Within ±5 %	Within ±4 %										
Material	Enclosure: Stainless steel (SUS303) Sensing part: PVC	Enclosure: Stainless steel (SUS303) Sensing part: ABS	Enclosure: Stainless steel (SUS303) Sensing part: PAR	Enclosure: Stainless steel (SUS303) Sensing part: ABS	Enclosure: Stainless steel (SUS303) Sensing part: Fluorine resin								
Cable (Note 5)	Oil-resistant [Spatter-resistant type: Spatter-resistant cable (Sheath: Fluorine resin)] high-frequency coaxial cable, 3 m 9.843 ft long, with a connector at the end												
Weight	Net weight: 15 g approx. Gross weight: 30 g approx.	Net weight: 35 g approx. Gross weight: 45 g approx.		Net weight: 40 g approx. Gross weight: 55 g approx.	Net weight: 55 g approx. Gross weight: 70 g approx.								

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.

2) The stable sensing range represents the sensing range for which the sensor can satisfy all the given specifications with the standard sensing object.

The maximum operation distance represents the maximum distance for which the sensor can detect the standard sensing object at +20 °C **+68 °F** constant ambient temperature.

Usage within the stable sensing range is recommended for accurate sensing applications.

3) The hysteresis and the repeatability are specified for the standard sensing object within the stable sensing range.

4) The value represents the variation in the operation distance, that has been set within the stable sensing range at +20 °C **+68 °F**, for an ambient temperature drift from 0 to +55 °C **+32 to +131 °F**. (Values are for sensor head only.)

5) The length of the sensor head cable cannot be changed.

SPECIFICATIONS

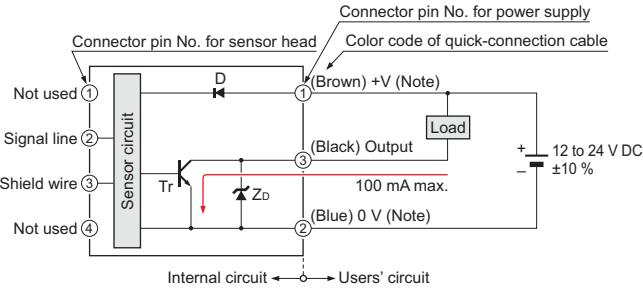
Amplifier

Model No.	GA-311
Item	
Applicable sensor head	GH-□SE
Supply voltage	12 to 24 V DC $\pm 10\%$ Ripple P-P 10 % or less
Current consumption	25 mA or less
Output	<p>NPN open-collector transistor</p> <ul style="list-style-type: none"> Maximum sink current: 100 mA (50 mA, if five, or more, amplifiers are connected in cascade.) Applied voltage: 30 V DC or less (between sensing output and 0 V) Residual voltage: 1 V or less [at 100 mA (at 50 mA, if five, or more, amplifiers are connected in cascade) sink current.]
Output operation	Switchable either Normally open or Normally closed
Short-circuit protection	Incorporated
Max. response frequency	3.3 kHz
Operation indicator	Orange LED (lights up when the output is ON)
Disconnection alarm indicator	Red LED (lights up when the sensor head cable is disconnected or misconnected)
Sensitivity adjuster	18-turn potentiometer
Environmental resistance	<p>Ambient temperature: -10 to $+60^\circ\text{C}$ $+14$ to $+140^\circ\text{F}$ (If 4 to 7 units are connected in cascade: -10 to $+50^\circ\text{C}$ $+14$ to $+122^\circ\text{F}$, if 8 to 16 units are connected in cascade: -10 to $+45^\circ\text{C}$ $+14$ to $+113^\circ\text{F}$) (No dew condensation or icing allowed), Storage: -20 to $+70^\circ\text{C}$ -4 to $+158^\circ\text{F}$</p> <p>Ambient humidity: 35 to 85 % RH, Storage: 35 to 85 % RH</p> <p>Voltage withstandability: 1,000 V AC for one min. between all supply terminals connected together and enclosure</p> <p>Insulation resistance: 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure</p> <p>Vibration resistance: 10 to 150 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each</p> <p>Shock resistance: 100 m/s2 acceleration (10 G approx.) in X, Y and Z directions for three times each</p>
Temperature characteristics (Note 2)	Within $\pm 5\%$
Material	Enclosure: PBT, Cover: Polycarbonate
Connecting method	Connector (Note 3)
Cable length	Total length up to 100 m 328.084 ft (if 5 to 8 units are connected in cascade: 50 m 164.042 ft, if 9 to 16 units are connected in cascade: 20 m 65.617 ft) is possible with 0.3 mm 2 , or more, cable.
Weight	Net weight: 15 g approx., Gross weight: 40 g approx.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of $+23^\circ\text{C}$ $+73.4^\circ\text{F}$.
 2) The value of the temperature characteristics gives the variation in the operation distance, that has been set within the stable sensing range at $+20^\circ\text{C}$ $+68^\circ\text{F}$, for an ambient temperature drift from 0 to $+55^\circ\text{C}$ $+32$ to $+131^\circ\text{F}$. (Value is for amplifier only.)
 3) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
 Main cable (3-core): CN-73-C1 (cable length 1 m 3.281 ft), CN-73-C2 (cable length 2 m 6.562 ft), CN-73-C5 (cable length 5 m 16.404 ft)
 Sub cable (1-core): CN-71-C1 (cable length 1 m 3.281 ft), CN-71-C2 (cable length 2 m 6.562 ft), CN-71-C5 (cable length 5 m 16.404 ft)

I/O CIRCUIT AND WIRING DIAGRAMS

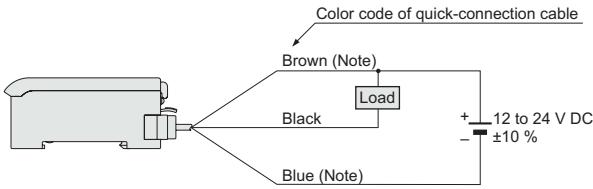
I/O circuit diagram



Note: The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.

Symbols ... D : Reverse supply polarity protection diode
 ZD: Surge absorption zener diode
 Tr : NPN output transistor

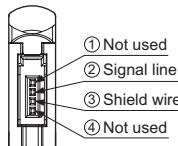
Wiring diagram



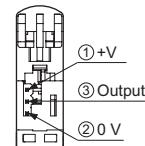
Note: The quick-connection sub cable does not have brown lead wire and blue lead wire.

Connector pin position

Connector for sensor head



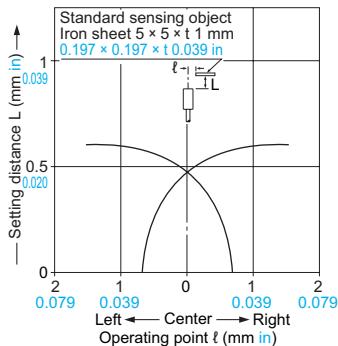
Connector for power supply



SENSING CHARACTERISTICS (TYPICAL)

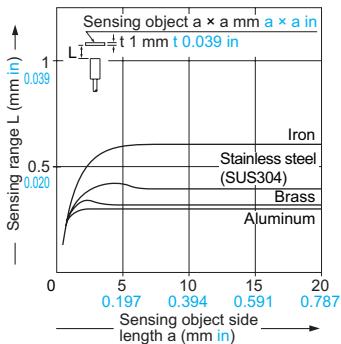
GH-2SE

Sensing field



The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 0.6 mm 0.024 in.

Correlation between sensing object size and sensing range

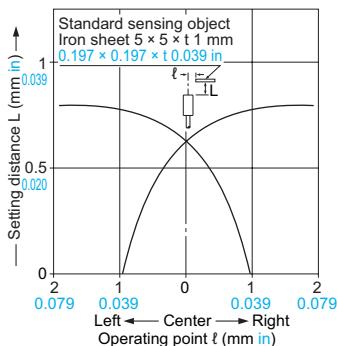


As the sensing object size becomes smaller than the standard size (iron sheet $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$), the sensing range shortens as shown in the left figure.

The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 0.6 mm 0.024 in.

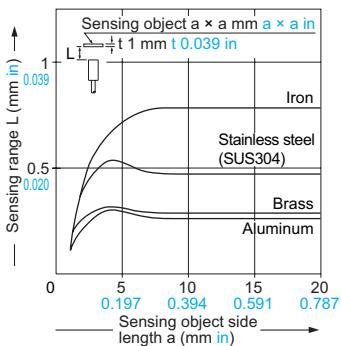
GH-3SE

Sensing field



The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 0.8 mm 0.031 in.

Correlation between sensing object size and sensing range

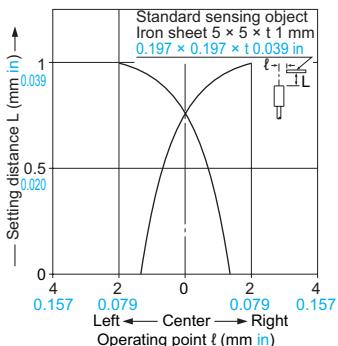


As the sensing object size becomes smaller than the standard size (iron sheet $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$), the sensing range shortens as shown in the left figure.

The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 0.8 mm 0.031 in.

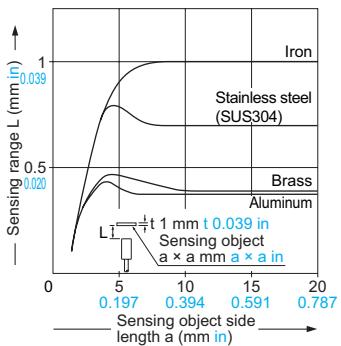
GH-5SE

Sensing field



The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 1.0 mm 0.039 in.

Correlation between sensing object size and sensing range

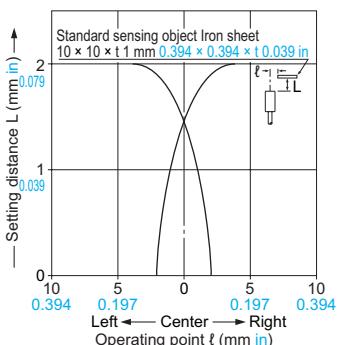


As the sensing object size becomes smaller than the standard size (iron sheet $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$), the sensing range shortens as shown in the left figure.

The graph on the left is plotted with the sensitivity adjusted so as to just detect a $5 \times 5 \times t 1 \text{ mm } 0.197 \times 0.197 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 1.0 mm 0.039 in.

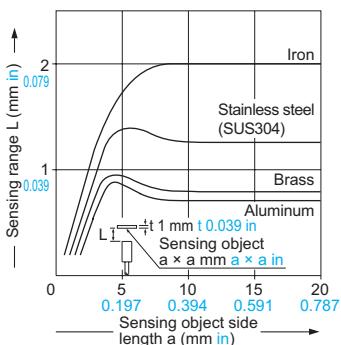
GH-8SE GH-F8SE

Sensing field



The graph on the left is plotted with the sensitivity adjusted so as to just detect a $10 \times 10 \times t 1 \text{ mm } 0.394 \times 0.394 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 2.0 mm 0.079 in.

Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (iron sheet $10 \times 10 \times t 1 \text{ mm } 0.394 \times 0.394 \times t 0.039 \text{ in}$), the sensing range shortens as shown in the left figure.

The graph on the left is plotted with the sensitivity adjusted so as to just detect a $10 \times 10 \times t 1 \text{ mm } 0.394 \times 0.394 \times t 0.039 \text{ in}$ iron sheet placed at a distance of 2.0 mm 0.079 in.

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- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
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- FA COMPONENTS
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- UV CURING SYSTEMS
- Selection Guide
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- Amplifier-separated

FIBER
SENSORSLASER
SENSORSPHOTO-
ELECTRIC
SENSORSMICRO
PHOTO-
ELECTRIC
SENSORSAREA
SENSORSLIGHT
CURTAINSPRESSURE/
FLOW
SENSORSINDUCTIVE
PROXIMITY
SENSORSPARTICULAR
USE
SENSORSSENSOR
OPTIONSSIMPLE
WIRE-SAVING
UNITSWIRE-SAVING
SYSTEMSMEASURE-
MENT
SENSORSSTATIC
CONTROL
DEVICES

ENDOSCOPE

LASER
MARKERSPLC/
TERMINALSHUMAN
MACHINE
INTERFACESENERGY
CONSUMPTION
VISUALIZATION
COMPONENTSFA
COMPONENTSMACHINE
VISION
SYSTEMSUV
CURING
SYSTEMSSelection
GuideAmplifier
Built-in
Amplifier-
separatedGA-311/
GH

PRECAUTIONS FOR PROPER USE

Refer to General precautions.



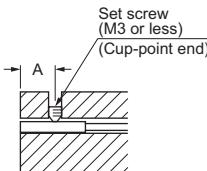
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

- Always be sure to use sensor heads and amplifiers from the same set.
- Do not shorten or lengthen the sensor head cable.

Mounting of the sensor head

How to mount the sensor head

- The tightening torque should be as given below. Make sure to use a set screw with a cup-point end.

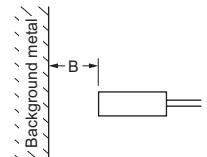


Model No.	Tightening torque	A (mm in)
GH-2SE	0.17N·m	3 0.118 or more
GH-3SE	0.17N·m	4 0.157 or more
GH-5SE	0.78N·m	5 0.197 or more
GH-8SE GH-F8SE	0.59N·m	5 0.197 or more

Note: Do not tighten excessively.

Distance from surrounding metal

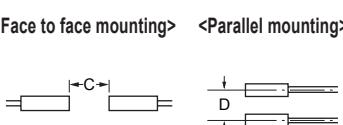
- If there is a metal near the sensor head, it may affect the sensing performance. Keep the minimum distance specified in the table below.



Model No.	B (mm in)
GH-2SE	3 0.118
GH-3SE	4 0.157
GH-5SE	5 0.197
GH-8SE GH-F8SE	9 0.354

Mutual interference

- When two or more sensors are installed in parallel or face to face, keep the minimum separation distance specified below to avoid mutual interference.



Model No.	C (mm in)	D (mm in)
GH-2SE	15 0.591	10 0.394
GH-3SE	20 0.787	15 0.591
GH-5SE	25 0.984	20 0.787
GH-8SE GH-F8SE	40 1.575	26 1.024

Sensing range

- The sensing range is specified for the standard sensing object. With a non-ferrous metal, the sensing range is obtained by multiplying with the correction coefficient specified below. Further, the sensing range also changes if the sensing object is smaller than the standard sensing object or if the sensing object is plated.

Correction coefficient

Model No.	GH-2SE	GH-3SE	GH-5SE	GH-8SE GH-F8SE
Iron	1	1	1	1
Stainless steel (SUS304)	0.68 approx.	0.55 approx.	0.69 approx.	0.64 approx.
Brass	0.53 approx.	0.35 approx.	0.41 approx.	0.37 approx.
Aluminum	0.51 approx.	0.33 approx.	0.39 approx.	0.32 approx.

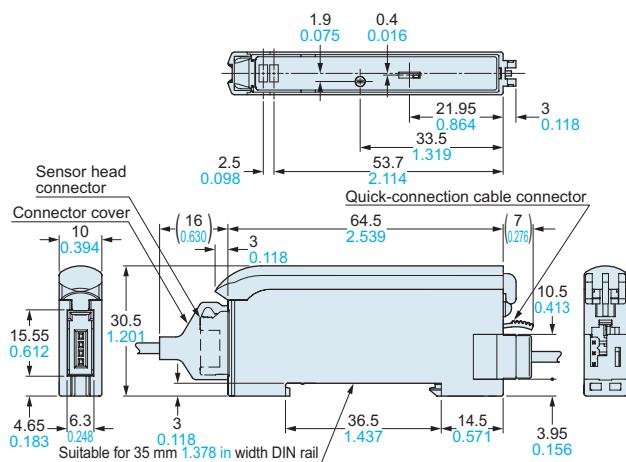
Others

- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Do not use the sensor at places having intense vibrations, as this can cause malfunction.
- Make sure that stress by forcible bend or pulling is not applied directly to the cable joint of the sensor head.

DIMENSIONS (Unit: mm in)

GA-311

Amplifier



Note: The front view shows the sensor head connector and quick-connection cable attached.

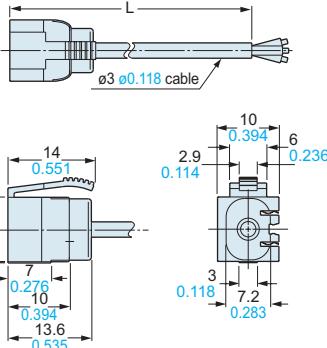
The top view is without the sensor head connector, quick-connection cable and the cover.

CN-73-C1 CN-73-C2 CN-73-C5

Main cable (Optional)

• Length L

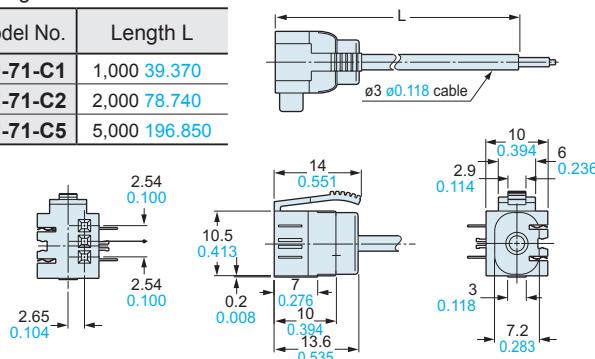
Model No.	Length L
CN-73-C1	1,000 39.370
CN-73-C2	2,000 78.740
CN-73-C5	5,000 196.850

**CN-71-C1 CN-71-C2 CN-71-C5**

Sub cable (Optional)

• Length L

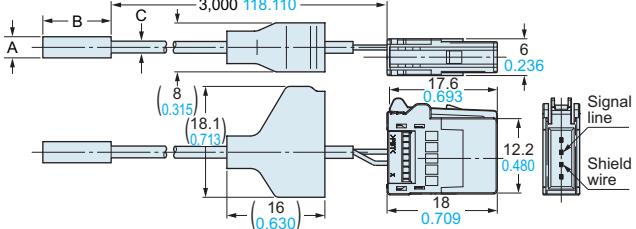
Model No.	Length L
CN-71-C1	1,000 39.370
CN-71-C2	2,000 78.740
CN-71-C5	5,000 196.850



The CAD data in the dimensions can be downloaded from our website.

GH-2SE GH-3SE GH-5SE GH-8SE GH-F8SE

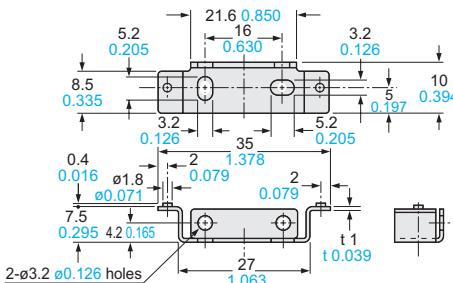
Sensor head



Model No.	A	B	C
GH-2SE	02.8 ø0.110	12 0.472	ø1.6 ø0.063
GH-3SE	03.8 ø0.150	15 0.591	ø2.5 ø0.098
GH-5SE	05.4 ø0.213	15 0.591	ø2.5 ø0.098
GH-8SE	08.0 ø0.315	15 0.591	ø2.5 ø0.098
GH-F8SE	08.0 ø0.315	15 0.591	ø2.65 ø0.104

MS-DIN-2

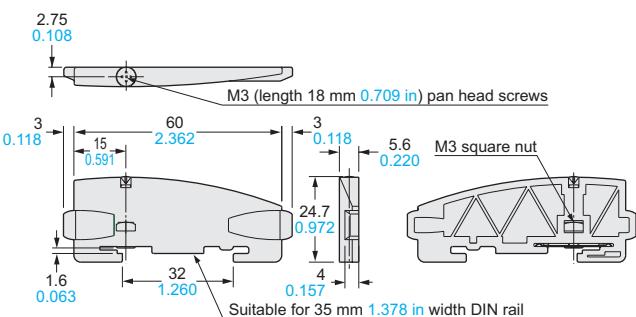
Amplifier mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)

MS-DIN-E

End plate (Optional)



Material: Polycarbonate

MS-SS3 MS-SS5 MS-SS8

Sensor head mounting bracket (Optional)

Model No.	MS-SS3	MS-SS5	MS-SS8
D	16 0.630	18 0.709	20 0.787
E	9 0.354	10 0.394	11 0.433
F	6.3 0.248	8.3 0.327	10.3 0.406
G	4.9 0.193	6.1 0.240	6.5 0.256

Applicable sensor head model No. **GH-3SE** **GH-5SE** **GH-8SE**

FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Amplifier Built-in

Amplifier-separated

GA-311/GH