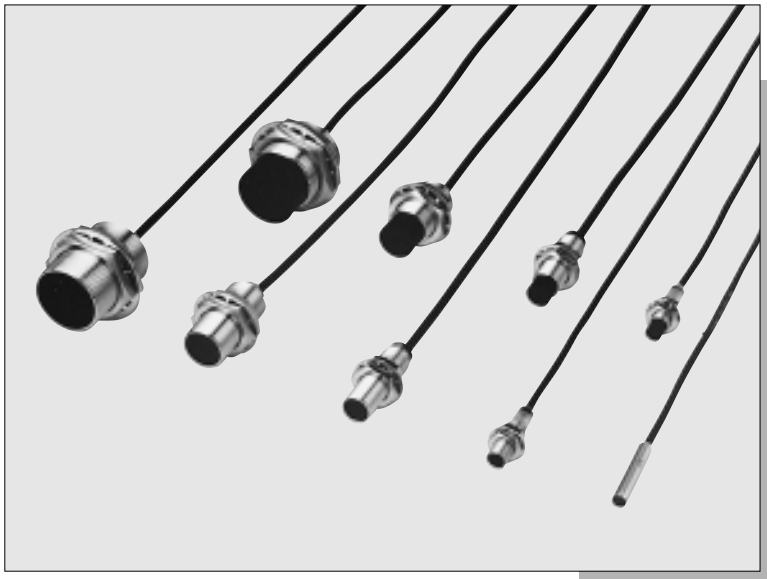
GX-U SERIES

DC 2-wire Cylindrical Inductive Proximity Sensor

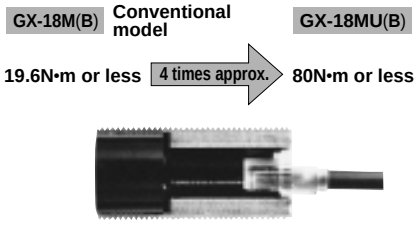


High Performance
&
Ease of Use

CE Marked
Conforming to EMC Directive

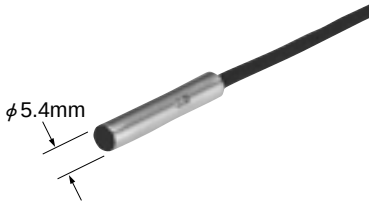
Robust in Tightening

The tightening torque has been improved to approx. four times greater than that of conventional models because of its thick case. As the sensor can be securely tightened, it does not get loose due to vibration or shock.



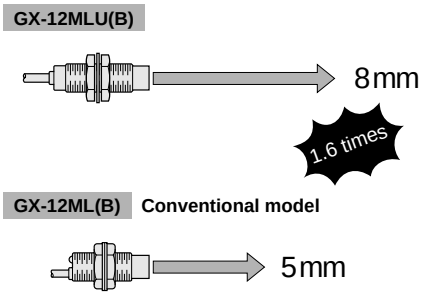
Compact Size: ϕ5.4mm

GX-5SU(B) is just 5.4mm in diameter, the smallest in existing DC two-wire sensors. It saves you space.



Long Sensing Range

The **GX-U** series features 1.6 times longer sensing range than conventional models. As it can be mounted at a sufficient distance from the object, there is no fear of the sensor and the object colliding.

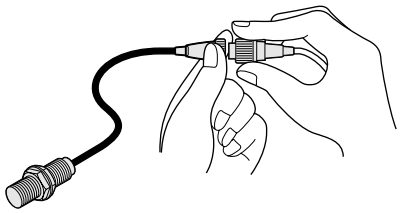


2-color Indicator

The normally open type is equipped with a 2-color indicator.
(The normally closed type has the operation indicator instead.)
The operation is easily observable from any direction because the entire sensor tail lights up.

Simple Wiring

The wiring cost is considerably reduced as it is DC 2-wire type.
Further, each of **GX-12MU(B)**, **GX-18MU(B)**, **GX-30MU(B)** is available as a pigtailed model (300mm long cable with attached connector) that makes replacement easy and quick.

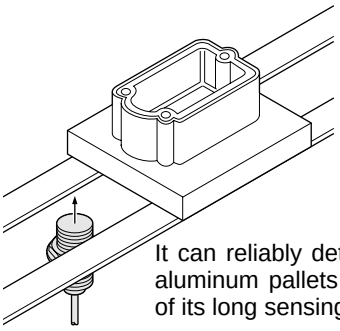


Spatter-resistant Type Available

As the enclosure is entirely coated by fluorine resin, the sensor can be safely used at a place where welding spatters fly around.
Both the pigtail cable and the mating cable are also spatter-resistant.

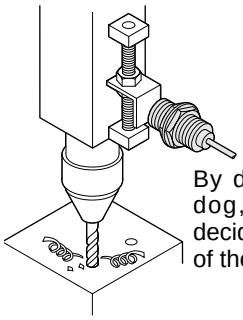
APPLICATIONS

Detecting traveling aluminum pallets



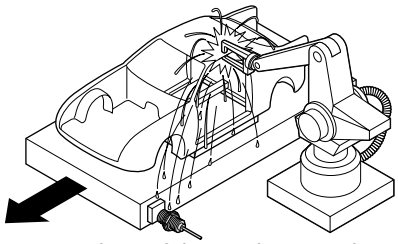
It can reliably detect even aluminum pallets because of its long sensing range.

Controlling depth of drilling



By detecting the dog, the sensor decides the depth of the drilled hole.

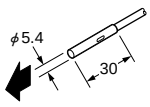
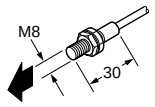
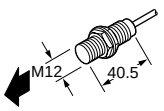
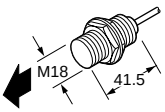
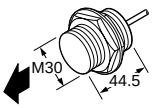
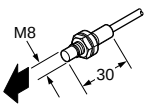
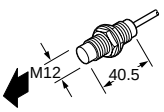
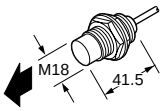
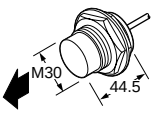
Positioning object at welding station (**GX-F□U-J** only)



It can be safely used even where welding sparks (spatter) fly around.

ORDER GUIDE

Standard type

Type		Appearance (mm)	Sensing range (Note)	Model No.	Output operation
Shielded type	Non-threaded type		1.5mm ◄— Maximum operation distance (0 to 1.2mm) ◄— Stable sensing range	**GX-5SU**	Normally open
				GX-5SUB	Normally closed
	Threaded type		2mm (0 to 1.6mm)	**GX-8MU**	Normally open
				GX-8MUB	Normally closed
			3mm (0 to 2.4mm)	**GX-12MU**	Normally open
				GX-12MUB	Normally closed
			7mm (0 to 5.6mm)	**GX-18MU**	Normally open
				GX-18MUB	Normally closed
			10mm (0 to 8mm)	**GX-30MU**	Normally open
				GX-30MUB	Normally closed
Non-shielded type	Threaded type		4mm (0 to 3.2mm)	**GX-8MLU**	Normally open
				GX-8MLUB	Normally closed
			8mm (0 to 6.4mm)	**GX-12MLU**	Normally open
				GX-12MLUB	Normally closed
			15mm (0 to 12mm)	**GX-18MLU**	Normally open
				GX-18MLUB	Normally closed
			22mm (0 to 17.6mm)	**GX-30MLU**	Normally open
				GX-30MLUB	Normally closed

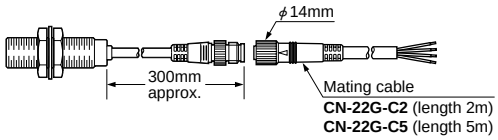
Note: The maximum operation distance stands for the maximum distance for which the sensor can detect the standard sensing object.
The stable sensing range stands for the sensing range for which the sensor can stably detect the standard sensing object even if there is an ambient temperature drift and/or supply voltage fluctuation.

GX-U

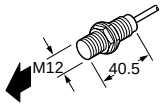
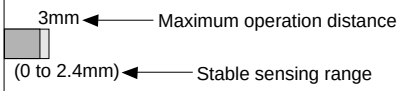
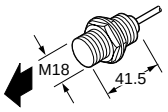
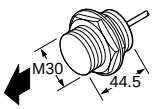
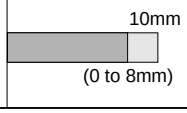
ORDER GUIDE

Pigtailed type

Pigtailed sensors are optionally available. [Standard type is cable type. However, there are no pigtail options for **GX-5SU**(**B**), **GX-8MU**(**B**), or **GX-8MLU**(**B**).]
When ordering this type, add suffix .'**-J**' to the model No.
(e.g.) The pigtail type of **GX-12MLUB** is '**GX-12MLUB-J**'.



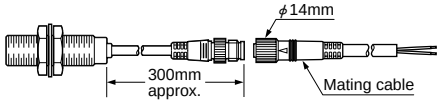
Spatter-resistant type

Type		Appearance (mm)	Sensing range (Note)	Model No.	Output operation
Shielded type	Threaded type			**GX-F12MU-J**	Normally open
				**GX-F18MU-J**	
				**GX-F30MU-J**	

Note: The maximum operation distance stands for the maximum distance for which the sensor can detect the standard sensing object.
The stable sensing range stands for the sensing range for which the sensor can stably detect the standard sensing object even if there is an ambient temperature drift and/or supply voltage fluctuation.

• Mating cable

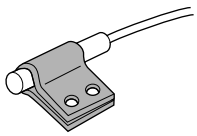
Model No.	Description	
CN-22G-C2	Length: 2m	0.3mm^2 2-core flame-resistant, spatter-resistant cable (outer dia ϕ3.6mm) with connector at one end
CN-22G-C5	Length: 5m	



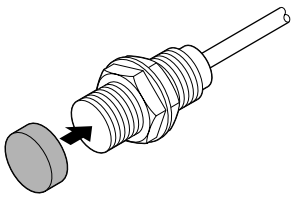
OPTIONS

Designation	Model No.	Description	
Sensor mounting bracket	**MS-SS5**	For **GX-5SU**(**B**)	The sensor is easily mounted with this bracket.
Protection cover	**MS-H12**	For **GX-12MU**(**B**)	It protects the sensing surface from welding sparks (spatter), etc.
	MS-H18	For **GX-18MU**(**B**)	
	MS-H30	For **GX-30MU**(**B**)	

Sensor mounting bracket



Protection cover



SPECIFICATIONS

Standard type

Item \ Type		Shielded type					Non-shielded type			
		Non-threaded type	Threaded type				Threaded type			
Model No.	Normally open	GX-5SU	GX-8MU	GX-12MU	GX-18MU	GX-30MU	GX-8MLU	GX-12MLU	GX-18MLU	GX-30MLU
	Normally closed	GX-5SUB	GX-8MUB	GX-12MUB	GX-18MUB	GX-30MUB	GX-8MLUB	GX-12MLUB	GX-18MLUB	GX-30MLUB
Max. operation distance (Note 1)		1.5mm ± 10%	2mm ± 10%	3mm ± 10%	7mm ± 10%	10mm ± 10%	4mm ± 10%	8mm ± 10%	15mm ± 10%	22mm ± 10%
Stable sensing range (Note 1)		0 to 1.2mm	0 to 1.6mm	0 to 2.4mm	0 to 5.6mm	0 to 8mm	0 to 3.2mm	0 to 6.4mm	0 to 12mm	0 to 17.6mm
Standard sensing object		Iron sheet 6 × 6 × t1mm	Iron sheet 8 × 8 × t1mm	Iron sheet 12 × 12 × t1mm	Iron sheet 18 × 18 × t1mm	Iron sheet 30 × 30 × t1mm	Iron sheet 20 × 20 × t1mm	Iron sheet 30 × 30 × t1mm	Iron sheet 50 × 50 × t1mm	Iron sheet 70 × 70 × t1mm
Hysteresis		20% or less of operation distance								
Supply voltage		12 to 24V DC $^{+10}_{-15}$% Ripple P-P 10% or less								
Current consumption (Note 2)		0.8mA or less								
Output		Non-contact DC 2-wire type • Load current: 3 to 70mA (Note 3) • Residual voltage: 3V or less (Note 4)								
	Utilization category	DC-12 or DC-13								
	Short-circuit protection	Incorporated								
Max. response frequency		1.7kHz	1.2kHz	1.2kHz	500Hz	350Hz	1kHz	650Hz	350Hz	220Hz
Operation indicator		Normally closed type: Orange LED (lights up when the output is ON)								
2-color indicator		Normally open type: Lights up in green under stable sensing condition, lights up in orange under unstable sensing condition								
Environmental resistance	Pollution degree	3 (Industrial environment)								
	Protection	IP67 (IEC), IP67g (JEM)								
	Ambient temperature	− 25 to + 70°C, Storage: − 30 to + 80°C								
	Ambient humidity	45 to 85% RH, Storage: 35 to 95% RH								
	EMC	Emission: EN50081-2, Immunity: EN50082-2								
	Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure								
	Insulation resistance	50MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure								
	Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each								
	Shock resistance	1,000m/s² acceleration (100G approx.) in X, Y and Z directions for three times each								
Sensing range variation	Temperature characteristics	Over ambient temperature range − 25 to + 70°C: within ± 10% of sensing range at 20°C								
	Voltage characteristics	Within ± 2% for ± 10% fluctuation of the supply voltage								
Material		Enclosure: Brass (Nickel plated) [However, SUS303 (stainless steel) for **GX-5SU**(**B**)**, GX-8MU**(**B**) and **GX-8MLU**(**B**)] Sensing parts: Nylon [However, polyalylate for **GX-5SU**(**B**)], Indicator part: Nylon [excluding **GX-5SU**(**B**)]								
Cable		0.3mm² [0.15mm² for **GX-5SU**(**B**), **GX-8MU**(**B**) and **GX-8MLU**(**B**)] 2-core oil, heat and cold resistant cabtyre cable, 2m long								
Cable extension		Extension up to total 50m is possible with 0.3mm², or more, cable.								
Weight (Note 5)		20g approx.	30g approx.	55g approx.	95g approx.	220g approx.	30g approx.	55g approx.	95g approx.	220g approx.
Accessories		Nut: 2 Nos., Toothed lock washer: 1 No.								

Notes: 1) The maximum operation distance stands for the maximum distance for which the sensor can detect the standard sensing object.
The stable sensing range stands for the sensing range for which the sensor can stably detect the standard sensing object even if there is an ambient temperature drift and/or supply voltage fluctuation.
2) It is the leakage current when the output is in the OFF state.
3) The maximum load current varies with the ambient temperature. Refer to **'I/O CIRCUIT AND WIRING DIAGRAMS'** for more details.
4) When the cable is extended, the residual voltage becomes larger.
5) The weight of the threaded type includes the weight of two nuts and one toothed lock washer.

Spatter-resistant type

Item \ Type		Shielded type		
		Threaded type		
Model No.	Normally open	**GX-F12MU-J**	**GX-F18MU-J**	**GX-F30MU-J**
Material		Enclosure: Brass (Fluorine resin coated), Sensing part: Polyalylate (Fluorine resin coated), Indicator part: Polyalylate		
Cable		0.3mm² 2-core spatter-resistant cable, 300mm long with round type connector		
Cable extension		Extension up to total 50m is possible with 0.3mm², or more, cable.		
Weight (Note)		35g approx.	75g approx.	200g approx.
Accessories		Nut: 2 Nos. (Fluorine resin coated), Toothed lock washer: 1 No. (Fluorine resin coated)		

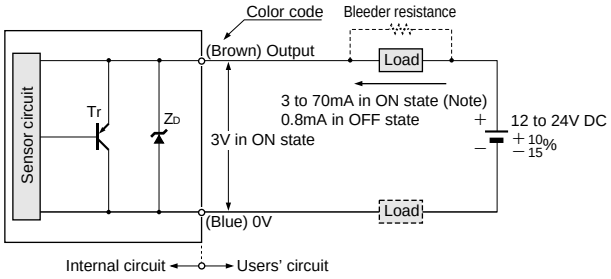
The specifications other than the above-mentioned are indentical to that of the standard type.

Note: The given weight includes the weight of two nuts and one toothed lock washer.

I/O CIRCUIT AND WIRING DIAGRAMS

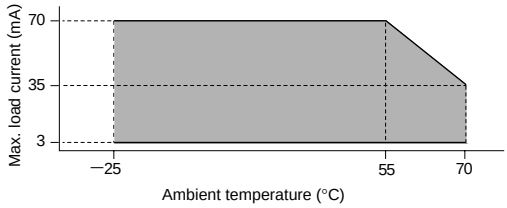
GX-□U(B)

I/O circuit diagram

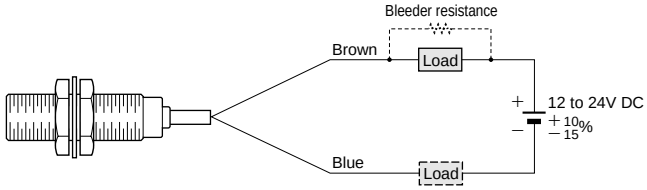


Symbols ... ZD: Surge absorption zener diode
Tr : PNP output transistor

Note: The maximum load current varies depending on the ambient temperature.



Wiring diagram

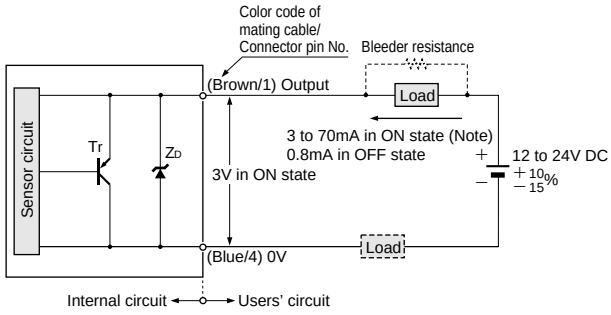


Conditions for the load

1) The load should not be actuated by the leakage current (0.8mA) in the OFF state.
2) The load should be actuated by (supply voltage – 3V) in the ON state.
3) The current in the ON state should be between 3 to 70mA DC.
   [In case the current is less than 3mA, connect a bleeder resistance in parallel to the load so that a current of 3mA, or more, flows.]

GX-F□U-J

I/O circuit diagram



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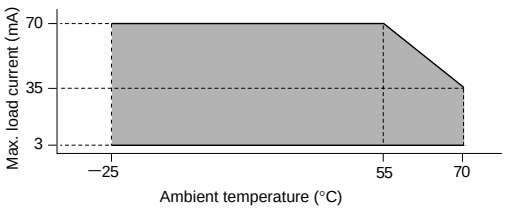
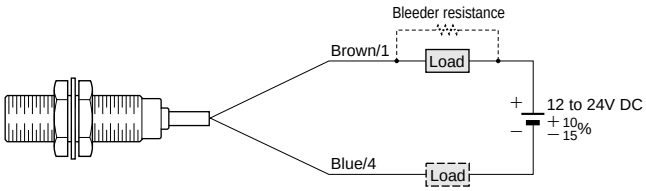


Wiring diagram



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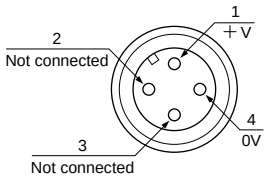
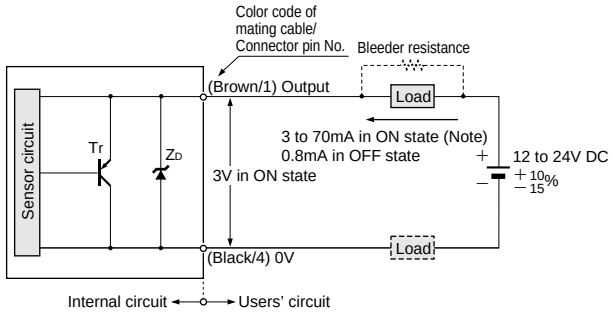
Connector pin position



I/O CIRCUIT AND WIRING DIAGRAMS

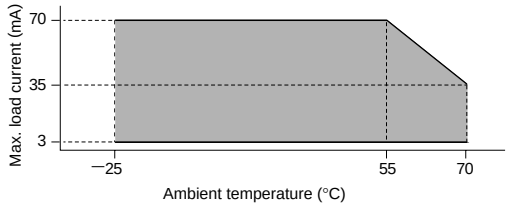
GX-□U(B)-J

I/O circuit diagram

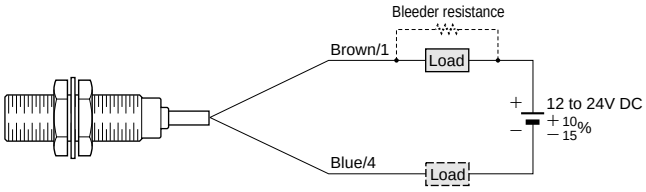


Symbols ... Z_D: Surge absorption zener diode
Tr : PNP output transistor

Note: The maximum load current varies depending on the ambient temperature.



Wiring diagram



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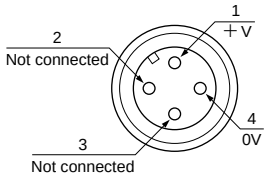
[In case the current is less than 3mA, connect a bleeder resistance in parallel to the load so that a current of 3mA, or more, flows.]

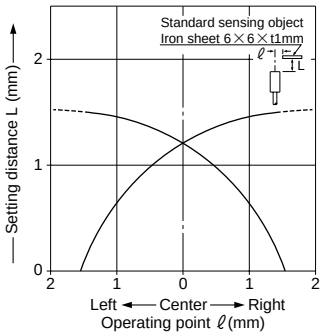
Connector pin position



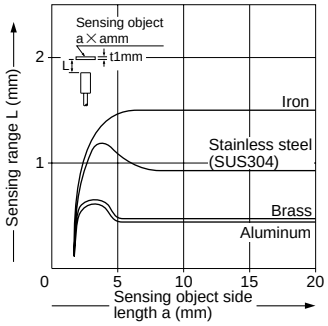
SENSING CHARACTERISTICS (TYPICAL)

GX-5SU
GX-5SUB

Sensing field



Correlation between sensing object size and sensing range

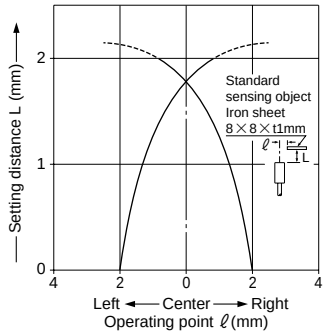


As the sensing object size becomes smaller than the standard size (iron sheet 6×6×t1mm), the sensing range shortens as shown in the left figure.

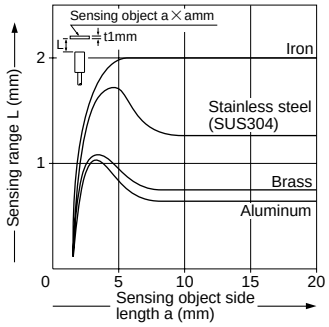
SENSING CHARACTERISTICS (TYPICAL)

GX-8MU GX-8MUB

Sensing field



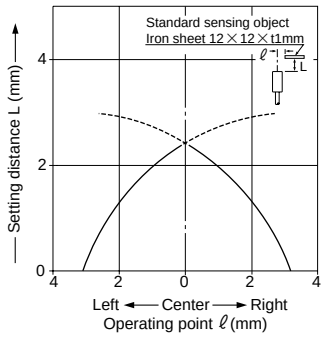
Correlation between sensing object size and sensing range



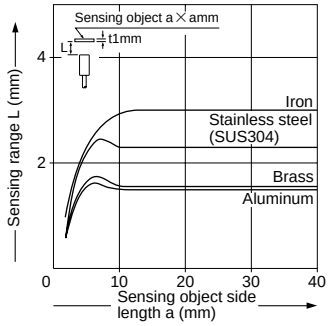
As the sensing object size becomes smaller than the standard size (iron sheet 8×8×t1mm), the sensing range shortens as shown in the left figure.

GX-12MU GX-12MUB GX-F12MU-J

Sensing field



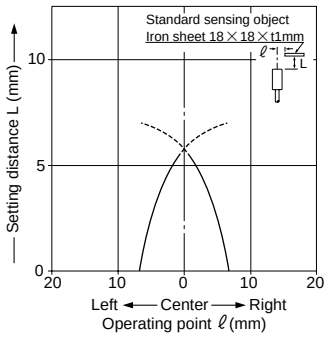
Correlation between sensing object size and sensing range



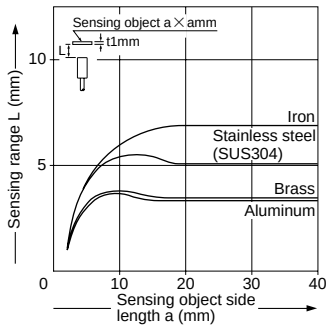
As the sensing object size becomes smaller than the standard size (iron sheet 12×12×t1mm), the sensing range shortens as shown in the left figure.

GX-18MU GX-18MUB GX-F18MU-J

Sensing field



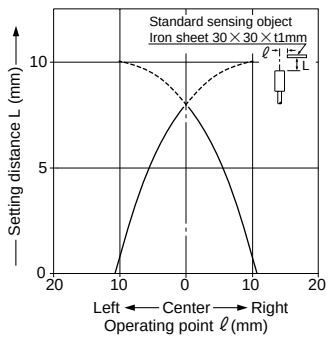
Correlation between sensing object size and sensing range



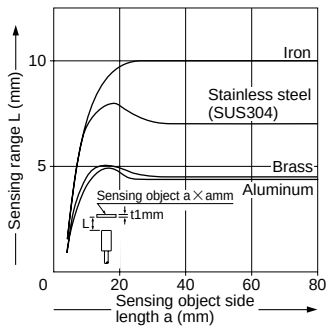
As the sensing object size becomes smaller than the standard size (iron sheet 18×18×t1mm), the sensing range shortens as shown in the left figure.

GX-30MU GX-30MUB GX-F30MU-J

Sensing field



Correlation between sensing object size and sensing range

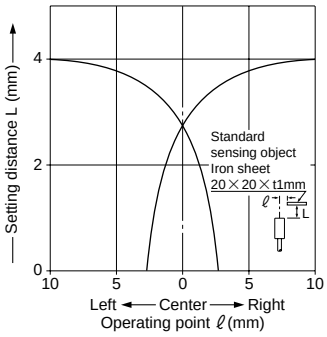


As the sensing object size becomes smaller than the standard size (iron sheet 30×30×t1mm), the sensing range shortens as shown in the left figure.

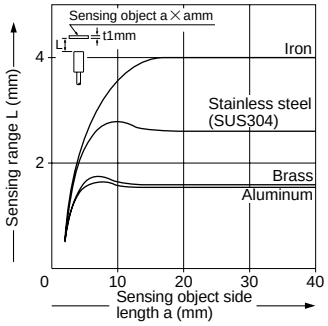
SENSING CHARACTERISTICS (TYPICAL)

GX-8MLU
GX-8MLUB

Sensing field



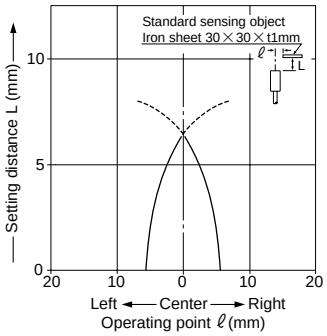
Correlation between sensing object size and sensing range



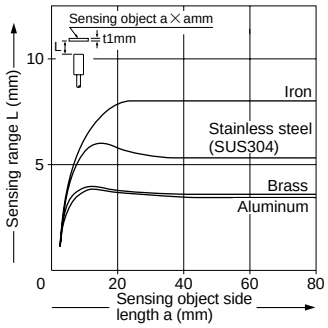
As the sensing object size becomes smaller than the standard size (iron sheet 20×20×t1mm), the sensing range shortens as shown in the left figure.

GX-12MLU
GX-12MLUB

Sensing field



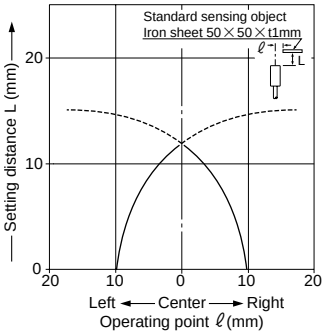
Correlation between sensing object size and sensing range



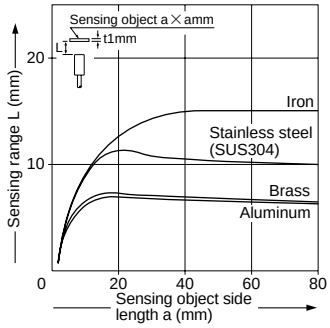
As the sensing object size becomes smaller than the standard size (iron sheet 30×30×t1mm), the sensing range shortens as shown in the left figure.

GX-18MLU
GX-18MLUB

Sensing field



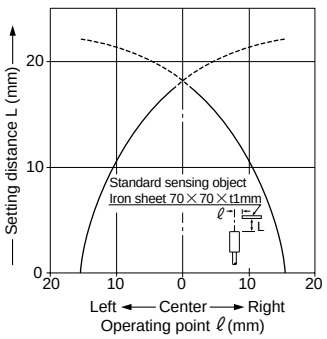
Correlation between sensing object size and sensing range



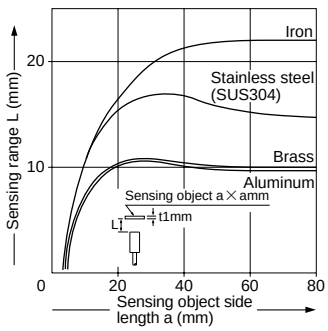
As the sensing object size becomes smaller than the standard size (iron sheet 50×50×t1mm), the sensing range shortens as shown in the left figure.

GX-30MLU
GX-30MLUB

Sensing field



Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (iron sheet 70×70×t1mm), the sensing range shortens as shown in the left figure.

GX-U

PRECAUTIONS FOR PROPER USE

Refer to P.836～ for general precautions.

This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

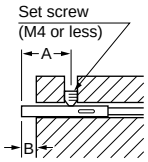
Mounting

• The tightening torque should be under the value given below.

Mounting with a set screw

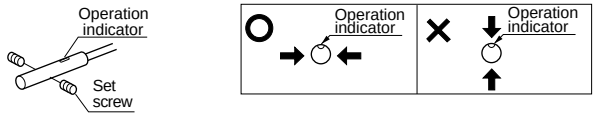
• Tighten with the cup-point of a set screw (M4 or less).

<Non-threaded type>



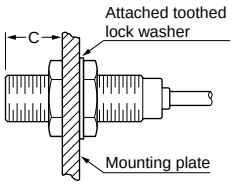
Model No.	A(mm)	B(mm)	Tightening torque
GX-5SU(B)	5 to 30	3	0.78N·m

• Do not fix on the operation indicator or opposite to it.

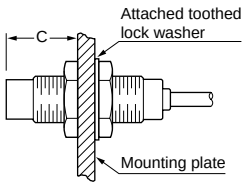


Mounting with nut

<Shielded threaded type>



<Non-shielded threaded type>



Model No.	Dimension C (mm)	Tightening torque
GX-8MU(B)	3 to 10.3	5.9N·m
	10.3 or more	11.8N·m
GX-12MU(B) **GX-F12MU-J**	3.5 to 13.5	10N·m
	13.5 or more	20N·m
GX-18MU(B) **GX-F18MU-J**	4 to 18	45N·m
	18 or more	80N·m
GX-30MU(B) **GX-F30MU-J**	5 to 21	80N·m
	21 or more	180N·m
GX-8MLU(B)	12 or more	11.8N·m
GX-12MLU(B)	15 or more	20N·m
GX-18MLU(B)	25 or more	80N·m
GX-30MLU(B)	30 or more	180N·m

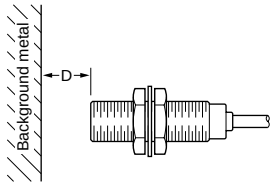
Note: Mount such that the nuts do not protrude from the threaded portion.

Distance from surrounding metal

• As metal around the sensor may affect the sensing performance, pay attention to the following points.

Influence of surrounding metal

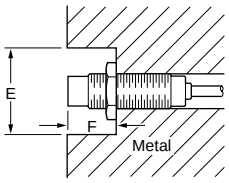
• The surrounding metal will affect the sensing performance. Keep the minimum distance specified in the table below.



Model No.	D(mm)
GX-5SU(B)	4.5
GX-8MU(B)	4.5
GX-12MU(B) **GX-F12MU-J**	8
GX-18MU(B) **GX-F18MU-J**	20
GX-30MU(B) **GX-F30MU-J**	40
GX-8MLU(B)	8
GX-12MLU(B)	22
GX-18MLU(B)	45
GX-30MLU(B)	75

Embedding of the sensor in metal

• Sensing range may decrease if the sensor is completely embedded in metal. Especially for the non-threaded type and the non-shielded type, keep the minimum distance specified in the table below.



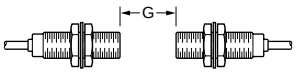
Model No.	E(mm)	F(mm)
GX-5SU(B)	ϕ12	3
GX-8MLU(B)	ϕ24	12
GX-12MLU(B)	ϕ50	15
GX-18MLU(B)	ϕ75	25
GX-30MLU(B)	ϕ105	30

Note: With the non-shielded type, the sensing range may vary depending on the position of the nuts.

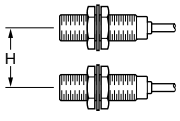
Mutual interference

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

Face to face mounting



Parallel mounting



Model No.	G(mm)	H(mm)
GX-5SU(B)	19	14
GX-8MU(B)	20	15
GX-12MU(B) **GX-F12MU-J**	35	20
GX-18MU(B) **GX-F18MU-J**	70	45
GX-30MU(B) **GX-F30MU-J**	115	70
GX-8MLU(B)	60	45
GX-12MLU(B)	145	95
GX-18MLU(B)	250	165
GX-30MLU(B)	350	250

PRECAUTIONS FOR PROPER USE

Refer to P.836～ for general precautions.

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.

Correction coefficient

Model No. \ Metal	Iron	Stainless steel (SUS304)	Brass	Aluminum
GX-5SU(B)	1	0.63 approx.	0.32 approx.	0.30 approx.
GX-8MU(B)	1	0.59 approx.	0.32 approx.	0.29 approx.
GX-12MU(B) **GX-F12MU-J**	1	0.75 approx.	0.51 approx.	0.49 approx.
GX-18MU(B) **GX-F18MU-J**	1	0.75 approx.	0.50 approx.	0.48 approx.
GX-30MU(B) **GX-F30MU-J**	1	0.69 approx.	0.44 approx.	0.42 approx.
GX-8MLU(B)	1	0.64 approx.	0.38 approx.	0.38 approx.
GX-12MLU(B)	1	0.67 approx.	0.44 approx.	0.43 approx.
GX-18MLU(B)	1	0.68 approx.	0.45 approx.	0.43 approx.
GX-30MLU(B)	1	0.67 approx.	0.44 approx.	0.43 approx.

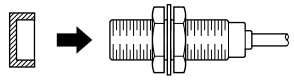
Note: The sensing range also changes if the sensing object is plated.

Protection cover (Optional)

• It protects the sensing surface from welding sparks (spatter), etc.

Mounting method

Protection cover **Sensor**



Material: Fluorine resin

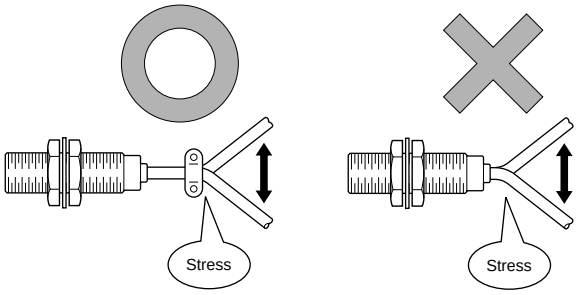
Model No.	Applicable model No.
MS-H12	**GX-12MU(B)**
MS-H18	**GX-18MU(B)**
MS-H30	**GX-30MU(B)**

Note: Mount the protection cover so that there is no gap between it and the sensing surface.

Others

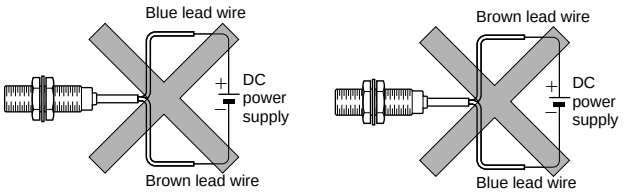
• Do not use during the initial transient time (50ms) after the power supply is switched on.

• When the sensor is mounted on a moving base, stress should not be applied to the sensor cable joint.



Wiring

• The sensor must be connected to a power supply via a load. If the sensor is connected to a power supply without a load, the short-circuit protection makes the sensor inoperable. (The output stays in the OFF state and the indicator does not light up.) In this case, rectify by connecting the power supply via a load. Now, the sensor becomes operable. Further, take care that if the power supply is connected with reverse polarity without a load, the sensor will get damaged.



• For series connection (AND circuit) or parallel connection (OR circuit) of sensors, take care of the following.

Series connection (AND circuit)

When all sensors are in the ON state, the load voltage V_{RL} is given by:

$V_{RL} = V_{CC} - n \times 3(V)$

[Vcc: supply voltage (24V DC max.)
n: number of sensors]

Make sure that the load can work properly at this voltage.

Note: The output is generated normally even if the indicator does not light up properly.

Parallel connection (OR circuit)

When all sensors are in the OFF state, the load leakage current Icc is given by:

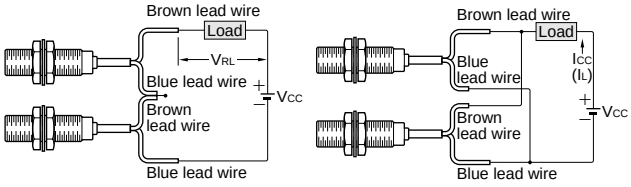
$I_{CC} = n \times 0.8(mA)$ (n: number of sensors)

Make sure that the load can work properly.

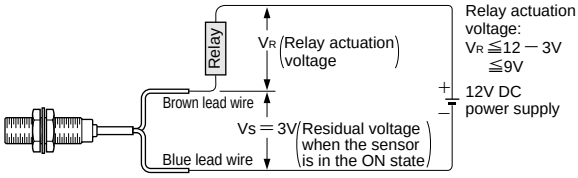
Note: The load current in the ON state is given by:

$$I_L = \frac{Vcc - 3V}{\text{Load resistance}} \ (mA)$$

The load current must be
$3mA \times n \leqq I_L \leqq 70mA$
(n: number of sensors turned ON)

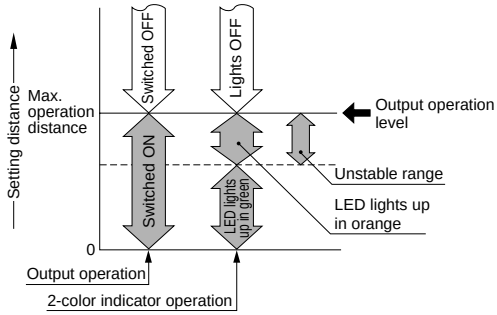


• The residual voltage of the sensor is 3V. Before connecting a relay as the load, take care of its actuation voltage. (Some 12V relays may not be usable.)



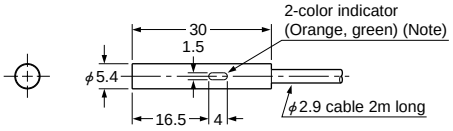
2-color indicator (Normally open type only)

• When the sensing object is in the stable sensing range, the LED lights up in green, and when the sensing object is in the unstable sensing range, the LED lights up in orange. While the LED lights up in green, the sensing is performed stably without being affected by temperature drifts or voltage fluctuations.



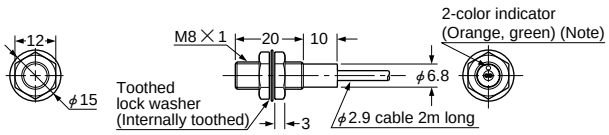
DIMENSIONS (Unit: mm)

GX-5SU GX-5SUB Sensor



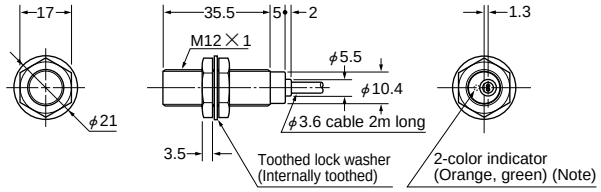
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-8MU GX-8MUB Sensor



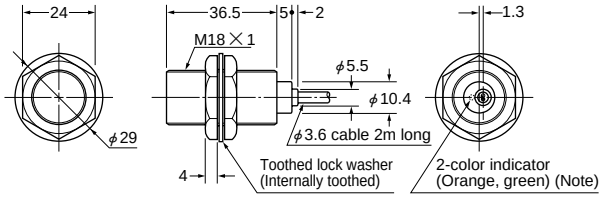
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-12MU GX-12MUB Sensor



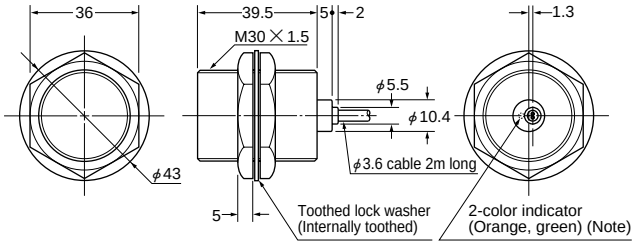
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-18MU GX-18MUB Sensor



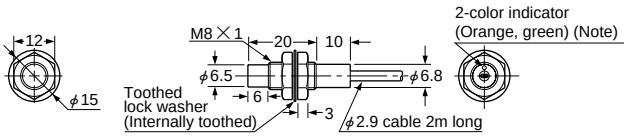
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-30MU GX-30MUB Sensor



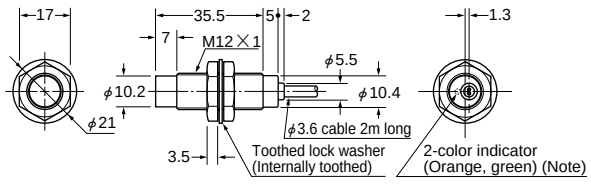
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-8MLU GX-8MLUB Sensor



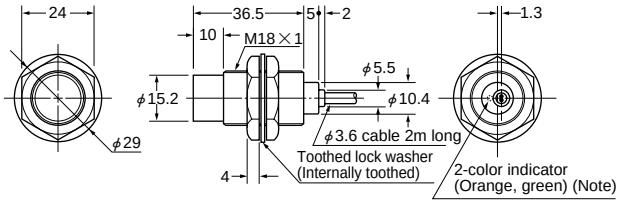
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-12MLU GX-12MLUB Sensor



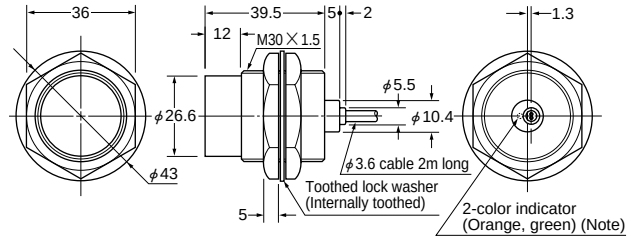
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-18MLU GX-18MLUB Sensor



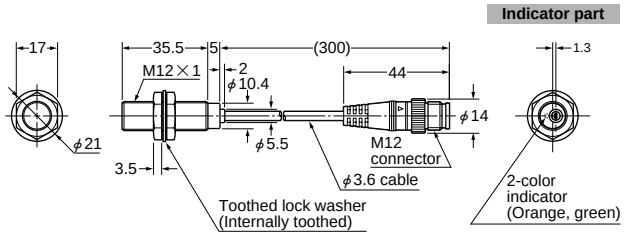
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-30MLU GX-30MLUB Sensor



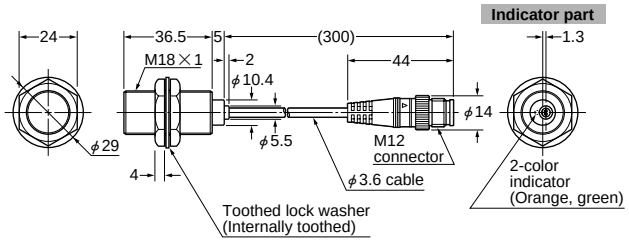
Note: Normally closed type has an operation indicator (orange) instead of the 2-color indicator.

GX-F12MU-J Sensor

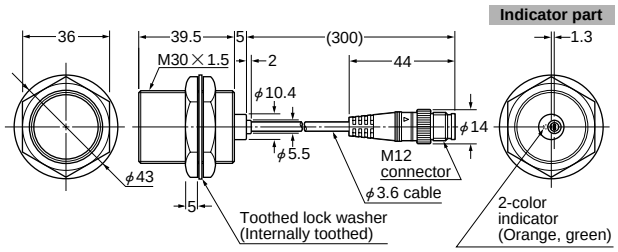


DIMENSIONS (Unit: mm)

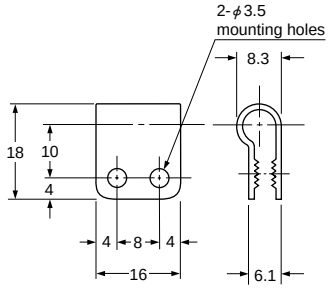
GX-F18MU-J Sensor



GX-F30MU-J Sensor

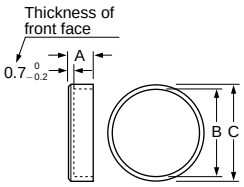


MS-SS5 Sensor mounting bracket for **GX-5SU(B)** (Optional)



Material: Nylon 66

MS-H12 MS-H18 MS-H30 Protection cover (Optional)



Material: Fluorine resin

Model No. \ Symbol	A	B	C	Applicable model No.
MS-H12	5	ϕ11.5	ϕ14	**GX-12MU(B)**
MS-H18	6	ϕ17.5	ϕ20	**GX-18MU(B)**
MS-H30	8	ϕ29.4	ϕ33	**GX-30MU(B)**