GX SERIES
Compact Inductive Proximity Sensor

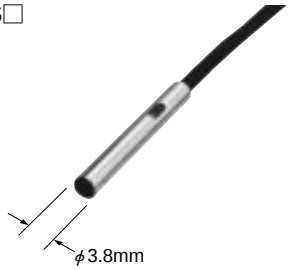
High Functionality Together with Robust Housing and Inflection Resistant Cable

CE Marked
Conforming to EMC Directive

Miniature

GX-3S□ is an amplifier built-in inductive proximity sensor having a diameter of just ϕ3.8mm.

GX-3S□



Various Applications

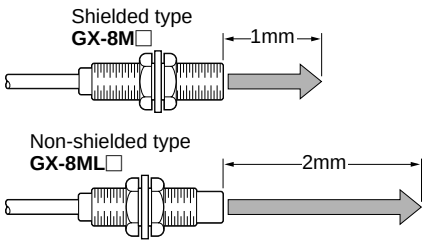
The **GX** series can be used for various applications because of its wide supply voltage range, open-collector transistor output, sufficient output capacity and IP67 protection.

Operation Indicator

All models of the **GX** series are equipped with an operation indicator for easy adjustment and maintenance.

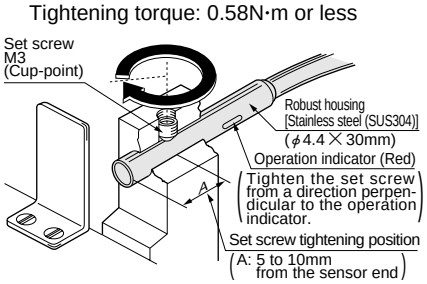
Long Sensing Range

The non-shielded type (**GX-8ML**□) has twice the sensing range of the shielded type (**GX-8M**□), although having the same size. Hence, it allows margin against sensing distance variations.



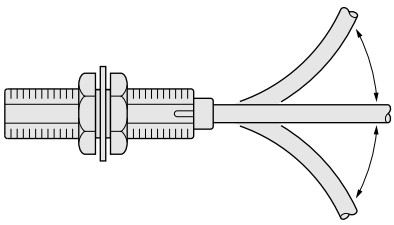
Robust Housing

The **GX-4S** uses a robust stainless steel housing. The tightening torque can be 0.58N·m or less.



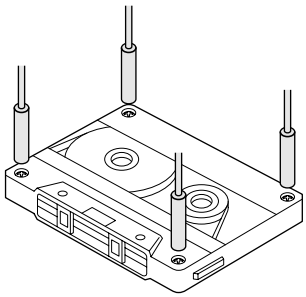
Ten Times Greater Inflection Resistance

The inflection resistance of the cable to repeated bending has been increased tenfold by using special alloy cores for the cable.

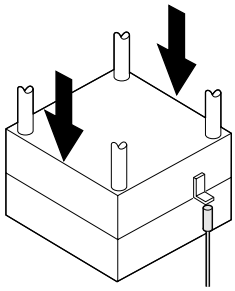


APPLICATIONS

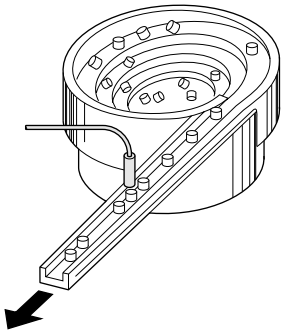
Sensing screws on cassette



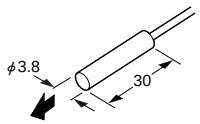
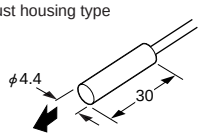
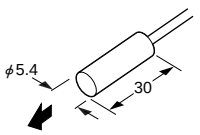
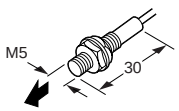
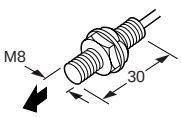
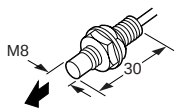
Sensing the punch of a die



Counting parts



ORDER GUIDE

Type		Appearance (mm)	Sensing range (Note 1)	Model No. (Note 2)	Supply voltage	Output operation
Shielded type	Non-threaded type		Maximum operation distance 0.8mm (0 to 0.6mm) Stable sensing range	GX-3S	12 to 24V DC ±10%	Normally open
				GX-3SB		Normally closed
				GX-3S-R		Normally open
				GX-3SB-R		Normally closed
		Robust housing type 	0.8mm (0 to 0.6mm)	GX-4S		Normally open
				GX-4SB		Normally closed
				GX-4S-R		Normally open
				GX-4SB-R		Normally closed
			1mm (0 to 0.8mm)	GX-5S	10 to 30V DC	Normally open
				GX-5SB		Normally closed
				GX-5S-R		Normally open
				GX-5SB-R		Normally closed
	Threaded type		0.8mm (0 to 0.6mm)	GX-5M	12 to 24V DC ±10%	Normally open
				GX-5MB		Normally closed
				GX-5M-R		Normally open
				GX-5MB-R		Normally closed
			1mm (0 to 0.8mm)	GX-8M	10 to 30V DC	Normally open
				GX-8MB		Normally closed
				GX-8M-R		Normally open
				GX-8MB-R		Normally closed
Non-shielded type			2mm (0 to 1.6mm)	GX-8ML		Normally open
				GX-8MLB		Normally closed

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) The suffix '**-R**' at the end of the model No. specifies the inflection resistant cable type.

GX

SPECIFICATIONS

Non-threaded type

Item \ Model No.		GX-3S	GX-3SB	GX-3S-R	GX-3SB-R	GX-4S	GX-4SB	GX-4S-R	GX-4SB-R	GX-5S	GX-5SB	GX-5S-R	GX-5SB-R
Type		Shielded type											
				Inflection resistant cable				Inflection resistant cable				Inflection resistant cable	
Max. operation distance (Note 1)		0.8mm ± 15%								1mm ± 15%			
Stable sensing range (Note 1)		0 to 0.6mm								0 to 0.8mm			
Standard sensing object		Iron sheet 5 × 5 × t1mm								Iron sheet 6 × 6 × t1mm			
Hysteresis		15% or less of operation distance											
Repeatability		20 μm or less								8 μm or less			
Supply voltage		12 to 24V DC ± 10% Ripple P-P 10% or less								10 to 30V DC Ripple P-P 10% or less			
Current consumption		15mA or less											
Output		NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 0.4V or less (at 50mA sink current)								NPN open-collector transistor • Maximum sink current: 200mA (Note 2) • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1.5V or less (at 200mA sink current) 0.4V or less (at 50mA sink current)			
	Utilization category	DC-12 or DC-13											
	Output operation	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed
	Short-circuit protection	———								Incorporated			
Max. response frequency		1kHz								1.5kHz			
Operation indicator		Red LED (lights up when the output is ON)											
Environmental resistance	Pollution degree	3 (Industrial environment)											
	Protection	IP67 (IEC)											
	Ambient temperature	− 25 to + 70°C, Storage: − 25 to + 80°C											
	Ambient humidity	35 to 95% RH, Storage: 35 to 95% RH								35 to 85% RH, Storage: 35 to 95% RH			
	EMC	Emission: EN50081-2, Immunity: EN50082-2											
	Voltage withstandability	500V AC for one min. between all supply terminals connected together and enclosure											
	Insulation resistance	5MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure								50MΩ, or more, with 500V 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	200m/s² acceleration (20G approx.) in X, Y and Z directions for ten times each								300m/s² acceleration (30G approx.) in X, Y and Z directions for ten times each			
Sensing range variation	Temperature characteristics	Over ambient temperature range − 25 to + 70°C: within ± 20% of sensing range at 20°C								Over ambient temperature range − 25 to + 70°C: within ± 15% of sensing range at 20°C			
	Voltage characteristics	Within ± 2% for ± 10% fluctuation of the supply voltage								Within ± 2.5% for ± 15% fluctuation of the supply voltage			
Material		Enclosure: Stainless steel (SUS304), Resin part: TPX								Enclosure: Brass (Nickel plated) Resin part: ABS			
Cable		0.08mm² 3-core oil, heat and cold resistant cabtyre cable, 3m long		0.1mm² 3-core inflection, oil and heat resistant cabtyre cable, 3m long		0.08mm² 3-core oil, heat and cold resistant cabtyre cable, 3m long		0.1mm² 3-core inflection, oil and heat resistant cabtyre cable, 3m long		0.14mm² 3-core oil, heat and cold resistant cabtyre cable, 3m long		0.15mm² 3-core inflection, oil and heat resistant cabtyre cable, 3m long	
Cable extension		Extension up to total 100m is possible with 0.3mm², or more, cable.											
Weight		30g approx.								55g approx.			
Accessories		**MS-SS3** (Sensor mounting bracket): 1 No. **MS-SS3-2** (C bracket): 1 No.				———				**MS-SS5** (Sensor mounting bracket): 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) The maximum sink current depends on the ambient temperature. Refer to **'I/O CIRCUIT AND WIRING DIAGRAMS'** for details.

SPECIFICATIONS

Threaded type

Item \ Type	Shielded type								Non-shielded type	
			Inflection resistant cable				Inflection resistant cable			
Model No.	GX-5M	GX-5MB	GX-5M-R	GX-5MB-R	GX-8M	GX-8MB	GX-8M-R	GX-8MB-R	GX-8ML	GX-8MLB
Max. operation distance (Note 1)	0.8mm ± 15%				1mm ± 15%				2mm ± 15%	
Stable sensing range (Note 1)	0 to 0.6mm				0 to 0.8mm				0 to 1.6mm	
Standard sensing object	Iron sheet 5 × 5 × t1mm				Iron sheet 8 × 8 × t1mm				Iron sheet 12 × 12 × t1mm	
Hysteresis	15% or less of operation distance				10% or less of operation distance					
Repeatability	20 μm or less				8 μm or less				40 μm or less	
Supply voltage	12 to 24V DC ± 10% Ripple P-P 10% or less				10 to 30V DC Ripple P-P 10% or less					
Current consumption	15mA or less									
Output	NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 0.4V or less (at 50mA sink current)				NPN open-collector transistor • Maximum sink current: 200mA (Note 2) • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1.5V or less (at 200mA sink current) 0.4V or less (at 50mA sink current)					
Utilization category	DC-12 or DC-13									
Output operation	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed
Short-circuit protection	———				Incorporated					
Max. response frequency	1kHz								500Hz	
Operation indicator	Red LED (lights up when the output is ON)									
Environmental resistance: Pollution degree	3 (Industrial environment)									
Environmental resistance: Protection	IP67 (IEC)									
Environmental resistance: Ambient temperature	− 25 to + 70°C, Storage: − 25 to + 80°C									
Environmental resistance: Ambient humidity	35 to 95% RH, Storage: 35 to 95% RH				35 to 85% RH, Storage: 35 to 95% RH					
Environmental resistance: EMC	Emission: EN50081-2, Immunity: EN50082-2									
Environmental resistance: Voltage withstandability	500V AC for one min. between all supply terminals connected together and enclosure									
Environmental resistance: Insulation resistance	5MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure				50MΩ, or more, with 500V DC megger between all supply terminals connected together and enclosure					
Environmental resistance: Vibration resistance	10 to 55Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each									
Environmental resistance: Shock resistance	200m/s² acceleration (20G approx.) in X, Y and Z directions for ten times each				300m/s² acceleration (30G approx.) in X, Y and Z directions for ten times each				300m/s² acceleration (30G 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 ± 20% of sensing range at 20°C				Over ambient temperature range − 25 to + 70°C: within $^{+15}_{-10}$% of sensing range at 20°C					
Sensing range variation: Voltage characteristics	Within ± 2% for ± 10% fluctuation of the supply voltage				Within ± 2.5% for ± 15% fluctuation of the supply voltage					
Material	Enclosure: Brass (Nickel plated) Resin part: TPX				Enclosure: Brass (Nickel plated) Resin part: ABS					
Cable	0.08mm² 3-core oil, heat and cold resistant cabtyre cable, 3m long		0.1mm² 3-core inflection, oil and heat resistant cabtyre cable, 3m long		0.14mm² 3-core oil, heat and cold resistant cabtyre cable, 3m long		0.15mm² 3-core inflection, oil and heat resistant cabtyre cable, 3m long		0.14mm² 3-core, oil, heat and cold resistant cabtyre cable, 3m long	
Cable extension	Extension up to total 100m is possible with 0.3mm², or more, cable.								Extension up to total 100m is possible with 0.14mm², or more, cable.	
Weight (Note 3)	30g approx.				60g approx.					
Accessories	Nut: 2 Nos. Toothed lock washer: 1 No.		Nut: 2 Nos. Toothed lock washer: 2 Nos.		Nut: 2 Nos. Toothed lock washer: 1 No.		Nut: 2 Nos. Toothed lock washer: 2 Nos.		Nut: 2 Nos. Toothed lock washer: 1 No.	

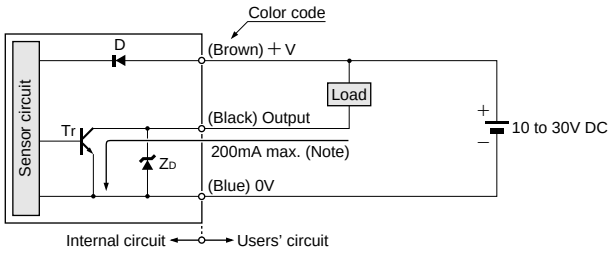
Notes: 1) The maximum operation distance stands for the maximum distance for which the sensor can detect the standard sensing object.
The stable sensing range stands for the sensing range for which the sensor can stably detect the standard sensing object even if there is an ambient temperature drift and/or supply voltage fluctuation.
2) The maximum sink current depends on the ambient temperature. Refer to '**I/O CIRCUIT AND WIRING DIAGRAMS**' for details.
3) The given weight of the threaded type includes the weight of two nuts and one toothed lock washer.

GX

I/O CIRCUIT AND WIRING DIAGRAMS

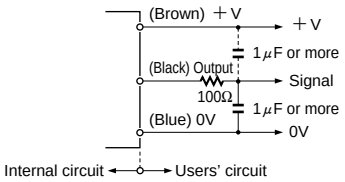
GX-5S□ GX-8M□ GX-8ML□

I/O circuit diagram



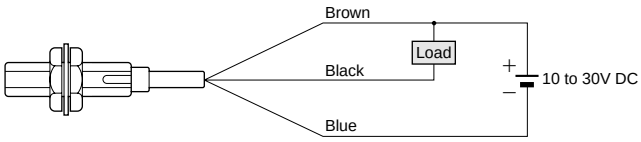
Symbols ... D: Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr : NPN output transistor

• If a capacitor of 1μF or more is connected between 0V and output or between + V and output, connect a 100Ω resistor in series as shown below.

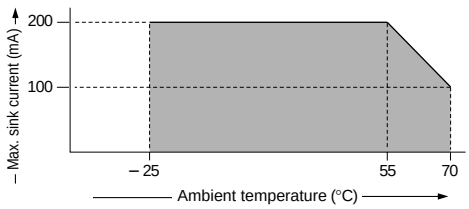


Without the resistor, the short-circuit protection is activated by the charge or discharge current of the capacitor, so that it results in delaying the response whenever the sensor switches. The connected resistor solves this problem.

Wiring diagram

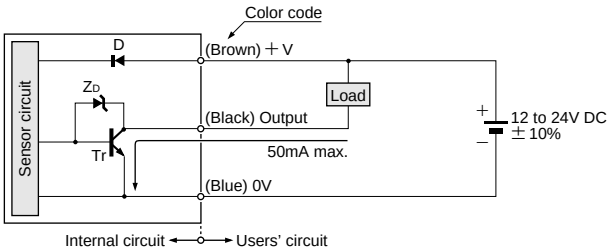


Note: The maximum sink current varies depending on the ambient temperature.



GX-3S□ GX-5M□ GX-4S□

I/O circuit diagram



Symbols ... D: Reverse supply polarity protection diode
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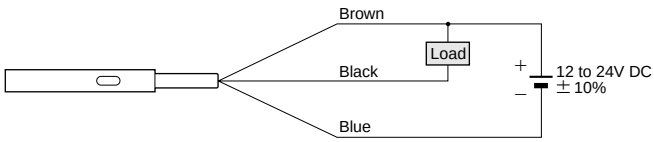
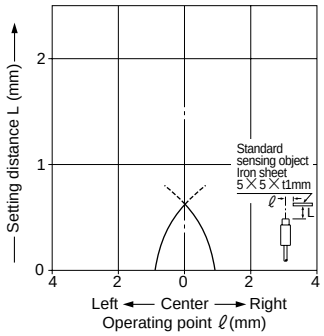
Wiring diagram



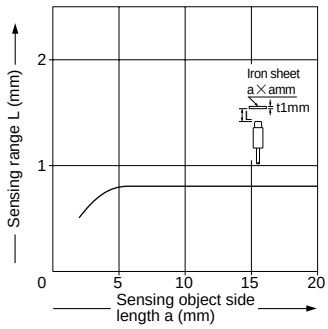
SENSING CHARACTERISTICS (TYPICAL)

GX-3S□ GX-5M□ GX-4S□

Sensing field



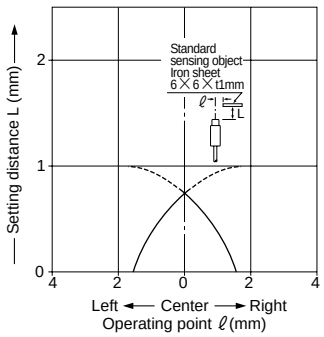
Correlation between sensing object size and sensing range



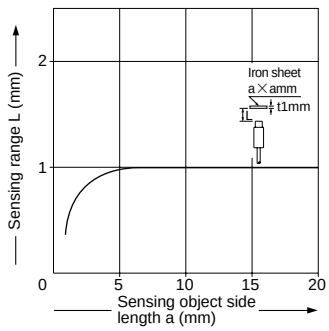
As the sensing object size becomes smaller than the standard size (iron sheet 5×5×t1mm), the sensing range shortens as shown in the left figure.

GX-5S□

Sensing field



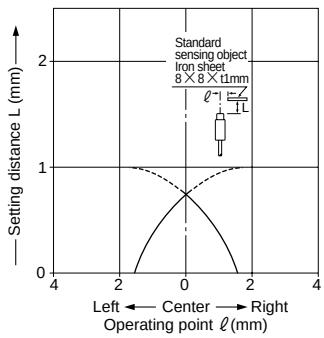
Correlation between sensing object size and sensing range



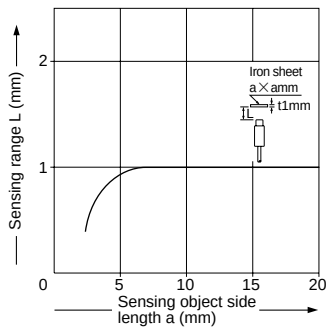
As the sensing object size becomes smaller than the standard size (iron sheet 6×6×t1mm), the sensing range shortens as shown in the left figure.

GX-8M□

Sensing field



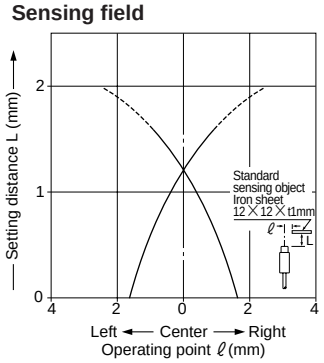
Correlation between sensing object size and sensing range



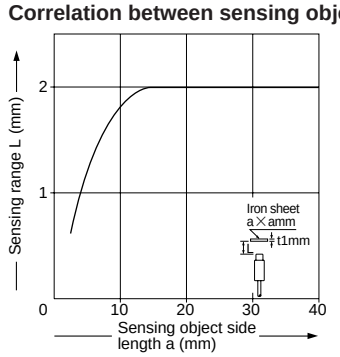
As the sensing object size becomes smaller than the standard size (iron sheet 8×8×t1mm), the sensing range shortens as shown in the left figure.

GX-8ML□

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

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.

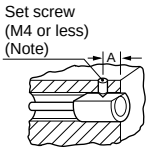
Mounting

• The tightening torque should be as given below.

Mounting with set screw

<Shielded threaded type>

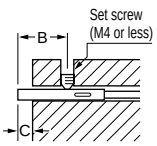
• Tighten the set screw on the flat surface of the sensor without applying excessive force. Make sure to use a set screw with a cup-point end.



Note: To fasten **GX-5M**□, use a M3 or less set screw.

Model No.	Set screw tightening position A (mm)	Tightening torque
GX-5M□	5 to 10	0.29N·m
GX-8M□	8 to 22	0.29N·m

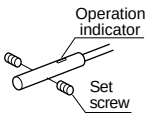
<Non-threaded type and non-shielded threaded type>

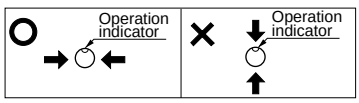


Model No.	B (mm)	C (mm)	Tightening torque
GX-3S□	5 to 10	3	0.29N·m
When using the C bracket			0.58N·m
GX-4S□	5 to 10	3	0.58N·m
GX-5S□	8 to 20	5	0.29N·m
GX-8ML□	13 to 22	10	0.29N·m

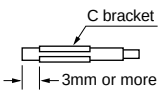
Note: The protrusion should be kept C (mm) or more to avoid reduction of sensing range.

• To fasten **GX-3S**□ and **GX-4S**□, use a M3 or less set screw and tighten it from a direction perpendicular to the operation indicator.





• When using the C bracket, place it on the sensor at a distance of 3mm or more from the sensor end.

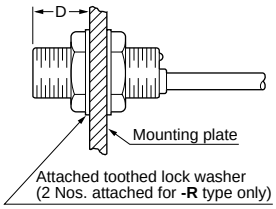


• To fasten the non-shielded threaded type, tighten the set screw on the flat surface of the sensor.

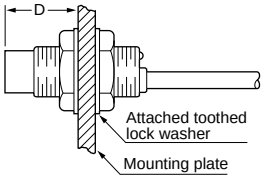
Mounting with nut

• Note that the maximum tightening torque differs according to the location of the nuts.

<Shielded threaded type>



<Non-shielded threaded type>



Model No.	D (mm)	Tightening torque
GX-5M□	2 to 3	0.49N·m
	3 or more	1.47N·m
GX-8M□	3 to 11	1.47N·m
	11 or more	3.43N·m
GX-8ML□	9 to 11	0.98N·m
	11 or more	3.43N·m

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

PRECAUTIONS FOR PROPER USE

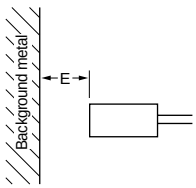
Refer to P.836～ for general precautions.

Distance from surrounding metal

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

Influence of surrounding metal

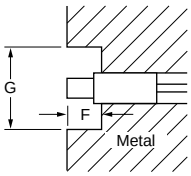
• The surrounding metal will affect the sensing performance. Keep the minimum distance specified in the table below.



Model No.	E (mm)
GX-3S□	3
GX-4S□	3
GX-5S□	4
GX-5M□	3
GX-8M□	4
GX-8ML□	8

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.

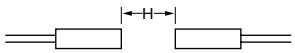


Model No.	F (mm)	G (mm)
GX-3S□	3	ϕ12
GX-4S□	3	ϕ12
GX-5S□	5	ϕ15.4
GX-8ML□	10	ϕ30

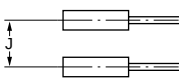
Mutual interference

• 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.	H (mm)	J (mm)
GX-3S□	16	16
GX-4S□	16	16
GX-5S□	20	15
GX-5M□	10	10
GX-8M□	20	15
GX-8ML□	50	30

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

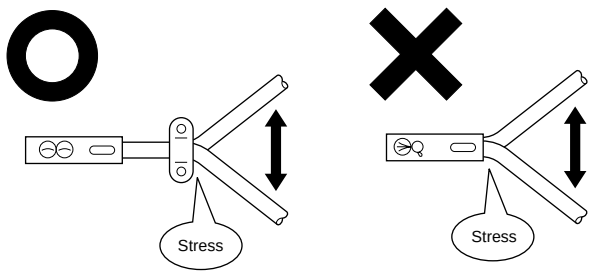
Model No. / Metal	**GX-3S□ GX-4S□**	**GX-5M□**	**GX-5S□ GX-8M□ GX-8ML□**
Iron	1	1	1
Stainless steel (SUS304)	0.65 approx.	0.83 approx.	0.70 approx.
Brass	0.36 approx.	0.61 approx.	0.40 approx.
Aluminum	0.30 approx.	0.58 approx.	0.35 approx.

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

Others

• Do not use during the initial transient time (10ms) 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.
〔Sensors attached with inflection resistant cable are also available. They are identified by the suffix '**-R**' at the end of the model No.〕

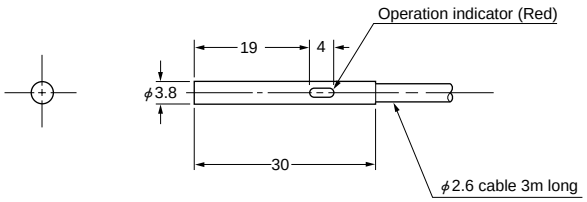


• **GX-3S□**, **GX-4S□** and **GX-5M□** do not incorporate a short-circuit protection at the output. Do not connect them directly to a power supply or a capacitive load.

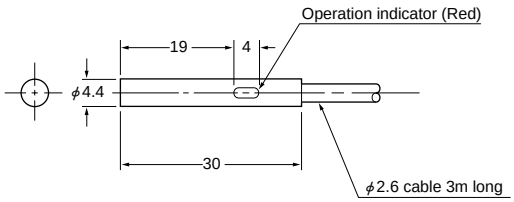
GX

DIMENSIONS (Unit: mm)

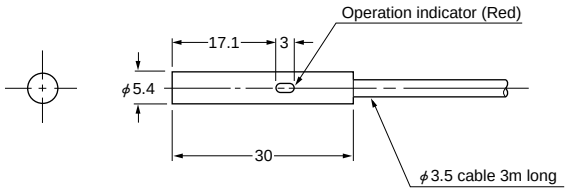
GX-3S□ Sensor



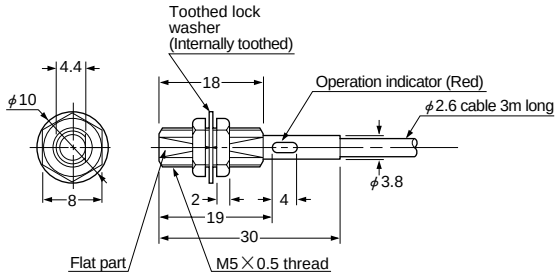
GX-4S□ Sensor



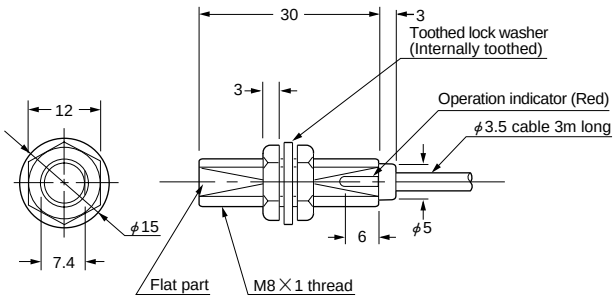
GX-5S□ Sensor



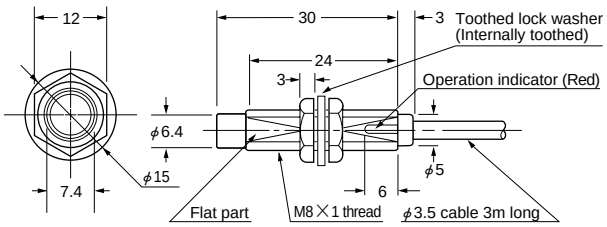
GX-5M□ Sensor



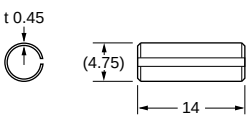
GX-8M□ Sensor



GX-8ML□ Sensor



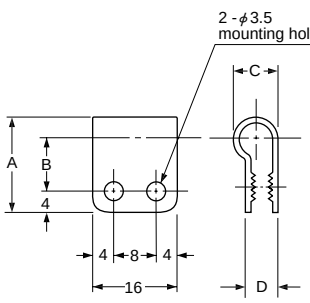
MS-SS3-2 C bracket for GX-3S□ (Accessory)



Note: By using the C bracket, the applicable tightening force can be doubled.

MS-SS3 MS-SS5

Sensor mounting bracket for **GX-3S□** (Accessory)
Sensor mounting bracket for **GX-5S□** (Accessory)



Model No. / Symbol	MS-SS3	MS-SS5
A	16	18
B	9	10
C	6.3	8.3
D	4.9	6.1
Applicable model No.	GX-3S□	GX-5S□

Material: Nylon 66