Cylindrical Compact Inductive Proximity Sensor Amplifier Built-in

GX SERIES

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> GX-F/H GXL

GL GX-U/GX-FU/ GX-N Related Information

■ Glossary of terms...... P.1386~











Robust enclosure and flexible cable types are also available

VARIETIES

Miniature

GX-3S□

Robust housing

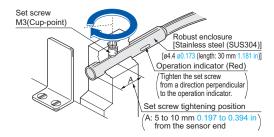
GX-4S

GX-3S□ is an amplifier built-in inductive proximity sensor having a diameter of just ø3.8 mm ø0.150 in.



The **GX-4S**□ uses a robust stainless steel enclosure. The tightening torque can be 0.58 N·m or less. (2 times compared with conventional models)

Tightening torque: 0.58 N·m or less

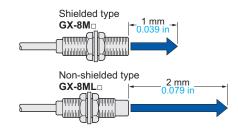


BASIC PERFORMANCE

Long sensing range

GX-8ML□

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



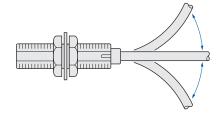
ENVIRONMENTAL RESISTANCE

Ten times greater bending durability

(Compared with conventional models)

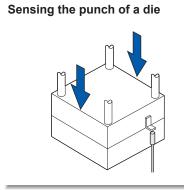
GX-□-R

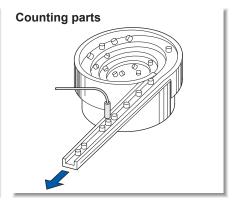
The bending durability of the cable to repeated bending has been increased tenfold by using special alloy cores for the cable.



APPLICATIONS

Sensing screws on cassette





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GX

ORDER GUIDE

			_	T		T	
Ту	Type Appearance (mm in)		Sensing range (Note)	Sensing range (Note) Model No.		Output	Output operation
		ø3.8 ø0.150	Maximum operation distance 0.8 mm 0.031 in	GX-3S			Normally open
		30 1.181	(0 to 0.6 mm 0 to 0.024 in) Stable sensing range	GX-3SB	12 to 24 V DC		Normally closed
	Non-threaded type	Robust enclosure type	0.8 mm 0.031 in	GX-4S	±10 %	NPN open-collector transistor	Normally open
	Non-threa	30 1.181	(0 to 0.6 mm 0 to 0.024 in)	GX-4SB			Normally closed
Shielded type		ø5.4 ø0.213 30 1.181	1 mm 0.039 in	GX-5S	40.4.00.44.00		Normally open
Shielde			(0 to 0.8 mm 0 to 0.031 in)	GX-5SB	10 to 30 V DC		Normally closed
		M5 30 1.181	0.8 mm 0.031 in (0 to 0.6 mm 0 to 0.024 in)	GX-5M	12 to 24 V DC ±10 %		Normally open
				GX-5MB			Normally closed
	ed type	M8 2 mm 0.079	1 mm 0.039 in	GX-8M	- 10 to 30 V DC		Normally open
	Thread		(0 to 0.8 mm 0 to 0.031 in)	GX-8MB			Normally closed
Non-shielded type			2 mm 0.079 in	GX-8ML	10 10 30 4 DC		Normally open
Non-shie			(0 to 1.6 mm 0 to 0.063 in)	GX-8MLB			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.

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Flexible cable type

Flexible cable type is also available for shielded type. When ordering this type, suffix "-R" to the model No. (e.g.) Flexible cable type of **GX-3S** is "**GX-3S-R**".

5 m 16.404 ft cable length type

5~m 16.404~ft cable length type (standard: 3~m 9.843~ft) is also available. (excluding GX-4SB) When ordering this type, suffix "-C5" to the model No. (e.g.) 5~m 16.404~ft cable length type of GX-3S is "GX-3S-C5".

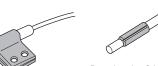
Refer to table below for 5 m 16.404 ft cable length type of flexible cable type sensor.

· Table of model Nos.

Туре		Standard	Flexible cable of 5 m 16.404 ft cable length type		
		GX-3S	GX-3S-R-C5		
	type	GX-3SB	GX-3SB-R-C5		
	aded	GX-4S	GX-4S-R-C5		
	Non-threaded	GX-4SB			
Shielded	Non-	GX-5S	GX-5S-R-C5		
type		GX-5SB			
	be	GX-5M	GX-5M-R-C5		
	ed ty	GX-5MB			
	Threaded type	GX-8M	GX-8M-R-C5		
	Th	GX-8MB	GX-8MB-R-C5		

Accessories

- MS-SS3 (Sensor mounting bracket for GX-3S type)
- MS-SS3-2 (C bracket for GX-3S type)
- MS-SS5 (Sensor mounting bracket for GX-5S type)
- MS-SS3
- MS-SS5



• MS-SS3-2

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

SPECIFICATIONS

Non-threaded type

		Type					1	Shield	ed type		1				
		.,,,,,			Flexible	e cable		1		e cable				e cable	
Item	<u> </u>	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	
Мах.	operati	ion distance (Note 2)			0	0.0 mm	31 in ±15 %	6				1 mm 0.03	39 in ±15 %)	
Stab	le sens	sing range (Note 2)			0	to 0.6 mm	0 to 0.024	in			0	to 0.8 mm	0 to 0.031	in	
Stan	dard se	ensing object		Iron	sheet 5 × 5	5 × t 1 mm	0.197 × 0.	197 × t 0.0	39 in		Iron sheet 6	6 × 6 × t 1 mm	0.236 × 0.23	6 × t 0.039 in	
Hyst	eresis					15 % or les	ss of opera	tion distan	ce (with sta	indard sens	sing object	i)			
Rep	eatabili	ty			2	20 μm 0.78	7 mil or les	S				8 μm 0.31	5 mil or less	3	
Supp	oly volta	age		12	2 to 24 V D	C ±10 %	Ripple P-P	10 % or le	SS		10 to 30	V DC Rip	ple P-P 10	% or less	
Curr	ent con	sumption						15 mA	or less						
Output			NPN open-collector transistor • Maximum sink current: 50 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 0.4 V or less (at 50 mA sink current) NPN open-collector transistor • Maximum sink current: 200 mA (N • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less (at 200 mA sink current) • Residual voltage: 1.5 V or less (at 200 mA sink current) 0.4 V or less (at 50 mA sink current)					or less ut and 0 V less ink current							
	Utilizat	tion category		DC-12 or DC-13											
	Output	t 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.	respoi	nse frequency				1 k	Hz					1.5	kHz		
Оре	ration in	ndicator	Red LED (lights up when the output is ON)												
	Pollution	on degree	3 (Industrial environment)												
	Protec	tion	IP67 (IEC)												
ance	Ambie	nt temperature			-25	-25 to + 70 °C −13 to +158 °F, Storage: -25 to +80 °C -				–13 to +176 °F					
esist	Ambie	nt humidity			35 to 95 9	% RH, Sto	rage: 35 to	95 % RH			35 to 85	% RH, Sto	H, Storage: 35 to 95 % RH		
ıtalı	EMC							EN 609	947-5-2						
nme	Voltag	e withstandability			500 V AC f	for one min	. between	all supply t	erminals co	onnected to	together and enclosure				
Environmental resistance	Insulat	tion resistance		5 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure											
_	Vibrati	on 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	200 m/s	s² accelera	tion (20 G a	approx.) in	X, Y and Z	directions	for ten time	es each		² accelerati d Z directio			
Sens	sing	Temperature characteristics			perature rar 20 °C +68		+70 °C -1	3 to +158 °	F: Within ±	20 % of		it temperature ra hin ±15 % of se			
	ition \	Voltage characteristics		Withir	n ±2 % for ±	£10 % fluct	uation of th	ne supply v	oltage		the sup	±2.5 % for a			
Mate	erial		Enclosure: Stainless steel (SUS304), Resin part: TPX				Enclosure: Brass (Nickel plated) Resin part: ABS								
Cabl	е		and cold res	istant cabtyre	0.1 mm ² 3-col and heat resis cable, 3 m 9.8	stant cabtyre		istant cabtyre		stant cabtyre		sistant cabtyre		stant cabtyre	
Cabl	e exter	nsion			Extensi	on up to to	otal 100 m	328.084 ft i	s possible	with 0.3 mr	m², or more	e, cable.			
Weig	ght				N	et weight:	30 g appro	X.			١	Net weight:	55 g appro	X.	
Acce	essories	S		(Sensor mo 2 (C bracke	unting brack t): 1 pc.	ket): 1 pc.					MS-SS5	(Sensor mo	ounting brace	cket): 1 pc.	

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 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.

3) The maximum sink current voice depositions on 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.

3) The maximum sink current varies depending on the ambient temperature. Refer to "I/O CIRCUIT AND WIRING DIAGRAMS" for details.

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GX-N

SPECIFICATIONS

Threaded type

		Type				Shielde	ed type				Non shielded type		
Туре				Flexible	e cable	Flexible cable			e cable	Non-shielded type			
Item	1	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 2) 0.8 mm 0.031 in ±15 %				1 mm 0.03	9 in ±15 %	1	2 mm 0.07	79 in ±15 %					
Stab	ole sensir	ng 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 1.6 mm	0 to 0.063 in	
Stan	ndard ser	sing object	Iron sheet 5	× 5 × t 1 mm	0.197 × 0.197	7 × t 0.039 in	Iron sheet 8	3 × 8 × t 1 mm	0.315 × 0.315	5 × t 0.039 in	Iron sheet 12 × 12 × t 1 m	m 0.472 × 0.472 × t 0.039 ii	
Hyst	teresis		1	or less of o				10 % or le	ss of opera	tion distand	tance (with standard sensing object)		
Rep	eatability		2	20 μm 0.78	7 mil or les	S		8 µm 0.31	mil or less	3	40 μm 1.57	'5 mil or less	
Supp	ply voltag	je	12 to 24 V	DC ±10 %	Ripple P-P 1	10 % or less			10 to 30 \	/ DC Rip	ple P-P 10 % or less		
Curr	ent cons	umption						15 mA	or less				
Output			• Ma • Ap	siduaÌ volta	current: 5 je: 30 V DC een output	60 mA C or less and 0V) or less	NPN open-collector transistor • Maximum sink current: 200 mA (Note 3) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less (at 200 mA sink current) 0.4 V or less (at 50 mA sink current)					current)	
	Utilizatio	on category						DC-12 (or DC-13				
	Output o	pperation	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	
	Short-ci	rcuit protection					Incorporated						
Max	. respons	se frequency				1 k	KHz 500 Hz						
Ope	ration inc	licator					Red LED (lights up when the output is ON)						
	Pollution	n degree	3 (Industrial environment)										
	Protection	on						IP67	(IEC)				
e e	Ambien	temperature			- 2	5 to +70 °C	-13 to +1	58 °F, Stor	age: – 25 t	to +80 °C –	13 to +176 °F		
stan	Ambien	humidity	35 to 95 % RH, Storage: 35 to 95 % RH 35 to 85 % RH, Storage: 35 to 95 % RH										
res	EMC						EN 60947-5-2						
enta	Voltage	withstandability	500 V AC for one min. between all supply terminals connected together and enclosure							9			
Environmental resistance	Insulatio	on resistance		ore, with 250 \			$50~\text{M}\Omega,$ or more, with 500 V DC megger between all supply terminals connected together and enclosure						
Ψ	Vibratio	n resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each							each			
	Shock re	esistance		accelerations Z directions					tion (30 G approx.) in 300 m/s² acceleration (30 G approxs for ten times each X, Y and Z directions for three times				
Sens	sing ch	emperature aracteristics		temperature ra in ±20 % of ser			Over ambient temperature range –25 to +70 °C –13 to +158 °F: Within +15 % of sensing range at +20 °C +68 °F						
rang varia	ation Vo	oltage paracteristics	Within ±2 supply vo	2 % for ±10 oltage	% fluctuat	ion of the	Within ±2.5 % for ±15 % fluctuation of the supply voltage						
Mate	erial			sure: Bras part: TPX		lated)	Enclosure: Brass (Nickel plated) Resin part: ABS						
Cabl	le		0.08 mm ² 3-c and cold resi cable, 3 m 9.	stant cabtyre		ore flexible, oil istant cabtyre 843 ft long		core oil, heat sistant cabtyre 1.843 ft long	0.15 mm ² 3-c and heat resist cable, 3 m 9.8		0.14 mm² 3-core, oil resistant cabtyre cal	l, heat and cold ble, 3 m 9.843 ft long	
Cabl	le extens	ion	Extensi	ion up to to	tal 100 m 3	328.084 ft i	is possible with 0.3 mm², or more, cable. Extension up to total 100 m 328.084 possible with 0.14 mm², or more, call						
Weig	ght (Note	4)	N	let weight:	30 g appro	Х.			N	let weight:	60 g approx.		
Accessories Nut: 2 pcs. Toothed lock washer: 1 pc. Toothed lock washer: 1 pc.				Nut: 2 pc:		Nut: 2 pcs	s. washer: 2 pcs.	Nut: 2 pcs. Toothed lock					

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

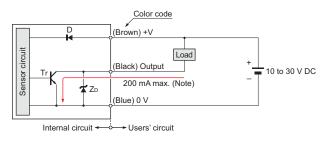
- 2) The maximum operation distance stands for the maximum distance for which the sensor can detect the standard sensing object.

 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.
- 3) The maximum sink current varies depending on the ambient temperature. Refer to "I/O CIRCUIT AND WIRING DIAGRAMS" for details.
- 4) The given weight of the threaded type includes the weight of two nuts and one toothed lock washer.

I/O CIRCUIT AND WIRING DIAGRAMS

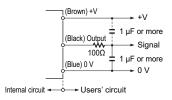
GX-5S_□ GX-8M_□ GX-8ML_□

I/O circuit diagram



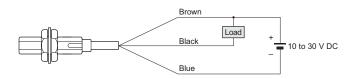
Symbols ... D : Reverse supply polarity protection diode ZD: Surge absorption zener diode Tr : NPN output transistor

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

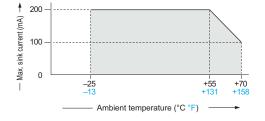


Without the resistor, the short-circuit protection is activated by the charge or discharge current of the capacitor, so that it results in delaying the response whenever the sensor switches. The connected resistor solves this problem.

Wiring diagram

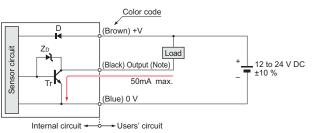


Note: The maximum sink current varies depending on the ambient temperature.



GX-3S GX-4S GX-5M

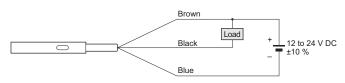
I/O circuit diagram



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

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

Wiring diagram



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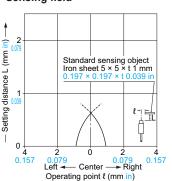
GX-F/H GXL

GL GX-U/GX-FU/ GX-N

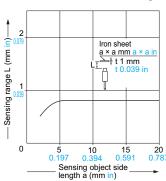
SENSING CHARACTERISTICS (TYPICAL)

GX-3S_□ GX-4S_□ GX-5M_□

Sensing field



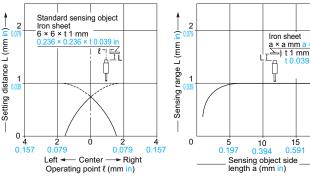
Correlation between sensing object size and sensing range



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

GX-5S□

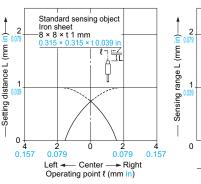
Sensing field



As the sensing object size becomes smaller than the standard size (iron sheet 6 × 6 × t 1 mm $0.236 \times 0.236 \times t$ 0.039 in), the sensing range shortens as shown in the left figure.

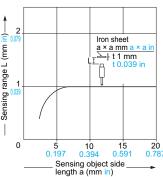
GX-8M□

Sensing field



Correlation between sensing object size and sensing range

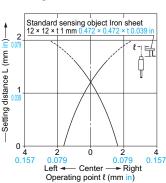
Correlation between sensing object size and sensing range



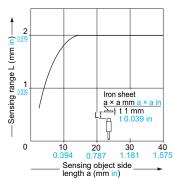
As the sensing object size becomes smaller than the standard size (iron sheet $8 \times 8 \times t$ 1 mm $0.315 \times 0.315 \times t \ 0.039$ in), the sensing range shortens as shown in the left figure.

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 × t 1 mm $0.472 \times 0.472 \times t \ 0.039 \ in$), the sensing range shortens as shown in the left figure.

PRECAUTIONS FOR PROPER USE

Refer to General precautions.

<u>^</u>

 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.

Mounting

• The tightening torque should be as given below.

Mounting with set screw

<Shielded of 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 in)	Tightening torque
GX-5M□	5 to 10 0.197 to 0.394	0.29 N·m
GX-8M□	8 to 22 0.315 to 0.866	0.29 N·m

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



Model No.	B (mm in) C (mm in)		Tightening torque
GX-3S□	5 to 10	3	0.29 N·m
When using the C bracket	0.197 to 0.394	0.118	0.58 N·m
GX-4S□	5 to 10 0.197 to 0.394	3 0.118	0.58 N·m
GX-5S□	8 to 20 0.315 to 0.787	5 0.197	0.29 N·m
GX-8ML□	13 to 22 0.517 to 0.866	10 0.394	0.29 N·m

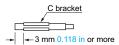
Note: The protrusion should be kept C (mm in) or more to avoid reduction of sensing range.

 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 3 mm 0.118 in or more from the sensor end.



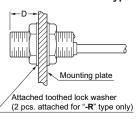
• To fasten the non-shielded threaded type, tighten the set screw on the flat surface of the sensor.

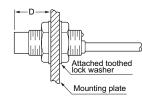
Mounting with nut

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

<Shielded of threaded type>

<Non-shielded of threaded type>

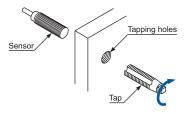




Model No.	D (mm in)	Tightening torque
GX-5M□	2 to 3 0.079 to 0.118	0.49 N·m
GX-5IVI□	3 0.118 or more	1.47 N·m
CV OM-	3 to 11 0.118 to 0.433	1.47 N·m
GX-8M□	11 0.433 or more	3.43 N·m
CV OMI -	9 to 11 0.345 to 0.433	0.98 N·m
GX-8ML□	11 0.433 or more	3.43 N·m

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

The root truncation of the threads with GX-8M□ and GX-8M□ is shallow owing to strengthening of the sensors against tightening.
 When tapping holes on equipment to fix the sensors, the prepared holes must be Ø7.2 mm Ø0.283 in or more.



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GX-F/H

GXL
GL
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GX

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CURING SYSTEMS

GX-F/H GXL GL GX-U/GX-FU/ GX-N

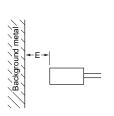
PRECAUTIONS FOR PROPER USE

Distance from surrounding metal

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

Influence of surrounding metal

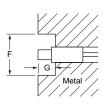
 The surrounding metal will affect the sensing performance. Keep the minimum distance specified in the table below.



Model No.	E (mm in)
GX-3S□	3 0.118
GX-4S□	3 0.118
GX-5S□	4 0.157
GX-5M□	3 0.118
GX-8M□	4 0.157
GX-8ML□	8 0.315

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 in)	G (mm in)
GX-3S□	ø12 ø0.472	3 0.118
GX-4S□	ø12 ø0.472	3 0.118
GX-5S□	ø15.4 ø0.606	5 0.197
GX-8ML□	ø30 ø1.181	10 0.394

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 in)	J (mm in)
GX-3S□	16 0.630	16 0.630
GX-4S□	16 0.630	16 0.630
GX-5S□	20 0.787	15 0.591
GX-5M□	10 0.394	10 0.394
GX-8M□	20 0.787	15 0.591
GX-8ML□	50 1.969	30 1.181

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.	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.	0.7 approx.
Brass	0.36 approx.	0.61 approx.	0.4 approx.
Aluminum	0.30 approx.	0.58 approx.	0.35 approx.

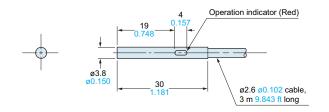
Others

- Do not use during the initial transient time (10 ms) after the power supply is switched on.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.
- GX-3S□, GX-4S□ and GX-5M□ do not incorporate a short-circuit protection circuit at the output. Do not connect them directly to a power supply or a capacitive

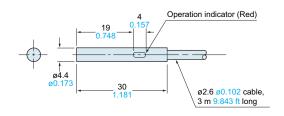
DIMENSIONS (Unit: mm in)

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

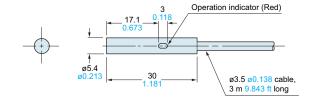
GX-3S□



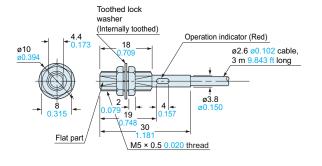
GX-4S_□



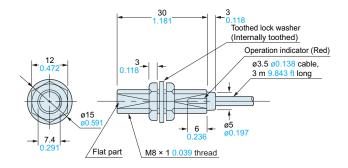
GX-5S□ Sensor



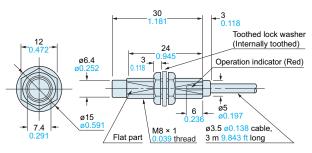
GX-5M□



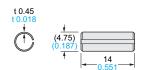
GX-8M□



GX-8ML_□

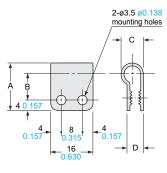


MS-SS3-2 C bracket for **GX-3S**□ (Accessory for **GX-3S**□)



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

MS-SS3 MS-SS5



Model No. Symbol	MS-SS3	MS-SS5
Α	16 0.630	18 0.709
В	9 0.354	10 0.394
С	6.3 0.248	8.3 0.327
D	4.9 0.193	6.1 0.240
Applicable model No.	GX-3S□	GX-5S□

Material: Nylon 66

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GX-F/H GXL GL

GX-U/GX-FU/ GX-N