

Compact Inductive Proximity Sensor Amplifier Built-in

vpe available possibl





GX



High functionality together with robust housing and flexible cable



Miniature

GX-3S

GX-3S is an amplifier built-in inductive proximity sensor having a diameter of just ϕ 3.8 mm ϕ 0.150 in.

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.

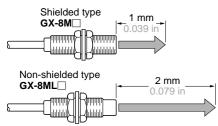
Operation indicator

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

Long sensing range

¢3.8 mm

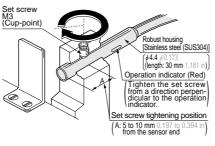
The non-shielded type (GX-8ML has twice the sensing range of the shielded type (**GX-8M**□), although having the same size. Hence, it allows margin against sensing distance variations.



Robust housing

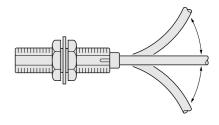
The GX-4S uses a robust stainless steel housing. The tightening torque can be 0.58 N⋅m or less.

Tightening torque: 0.58 N·m or less



Ten times greater bending durability

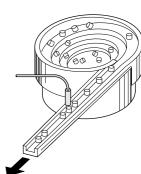
The bending durability of the cable to repeated bending has been increased tenfold by using special alloy cores for the cable.



APPLICATIONS

Sensing screws on cassette Sensing the punch of a die

Counting parts



ORDER GUIDE

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Туре	Appearance (mm in)	Sensing range (Note)	Model No.	Supply voltage	Output	Output operation
	¢3.8 ¢0.150	Maximum operation distance 0.8 mm 0.031 in	GX-3S			Normally open
	30	(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 housing type	0.8 mm 0.031 in	GX-4S	± 10 %	NPN open-collector transistor	Normally open
Non-three	30	(0 to 0.6 mm 0 to 0.024 in)	GX-4SB			Normally closed
Shielded type	¢5.4 ¢0.213 30 1.181	1 mm 0.039 in (0 to 0.8 mm 0 to 0.031 in)	GX-5S	- 10 to 30 V DC - 12 to 24 V DC - ± 10 %		Normally open
Shield			GX-5SB			Normally closed
	M5 30 1.181	0.8 mm 0.031 in (0 to 0.6 mm 0 to 0.024 in)	GX-5M			Normally open
			GX-5MB			Normally closed
Non-shielded type Threaded type	M8 30 1.181	1 mm 0.039 in (0 to 0.8 mm 0 to 0.031 in)	GX-8M			Normally open
			GX-8MB	- 10 to 30 V DC		Normally closed
	MB S	2 mm 0.079 in	GX-8ML			Normally open
Non-srii	30	(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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ORDER GUIDE

GX

Flexible cable type and 5 m 16.404 ft cable length type

Flexible cable type and 5 m 16.404 ft cable length type (standard: 3 m 9.843 ft) are also available.

Table of model Nos.

Туре		Standard	Flexible cable type	5 m 16.404 ft cable length type	Flexible cable & 5 m 16.404 ft cable length type	
		GX-3S	GX-3S-R	GX-3S-C5	GX-3S-R-C5	
		GX-3SB	GX-3SB-R	GX-3SB-C5	GX-3SB-R-C5	
	Non-threaded	GX-4S	GX-4S-R	GX-4S-C5	GX-4S-R-C5	
	type	GX-4SB	GX-4SB-R			
011111		GX-5S	GX-5S-R	GX-5S-C5	GX-5S-R-C5	
Shielded type		GX-5SB	GX-5SB-R	GX-5SB-C5		
		GX-5M	GX-5M-R	GX-5M-C5	GX-5M-R-C5	
		GX-5MB	GX-5MB-R	GX-5MB-C5		
	_	GX-8M	GX-8M-R	GX-8M-C5	GX-8M-R-C5	
	Threaded type –	GX-8MB	GX-8MB-R	GX-8MB-C5	GX-8MB-R-C5	
Non-shielded		GX-8ML		GX-8ML-C5		
type		GX-8MLB		GX-8MLB-C5		

Accessories

Amplifier Built-in

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



• MS-SS3-2 (C bracket for GX-3S type)

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

SPECIFICATIONS

Non-threaded type

\mathbb{N}							Shielde	ed type					
	Туре			Flexible	e cable			Flexible	e cable			Flexib	le cable
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
Max. opera	tion distance (Note 1)			0.	8 mm 0.03	31 in ±15	%				1 mm 0.03	9 in ±15	%
Stable sen	sing range (Note 1)			0	to 0.6 mm	0 to 0.024	in				0 to 0.8 mn	n 0 to 0.03	1 in
Standard s	ensing object		Iron s	sheet 5 $ imes$ 5	i×t1mm	0.197×0.	197×t 0.0	139 in		Iron sheet 6	i×6×t1mm	0.236×0.23	6×t 0.039 in
Hysteresis						15 %	or less of o	peration dis	stance				
Repeatabil	lity			20	0 μm 0.78	7 mil or les	s				8 μm 0.31	5 mil or le	SS
Supply vol	tage		12	to 24 V DC	C±10%	Ripple P-F	9 10 % or le	ess		10 to 30	VDC Rip	ple P-P 10) % or less
Current co	nsumption						15 mA	or less					
Output								• Maxir • Applie	al voltage: 1.5 V	rrent: 200 i 0 V DC or le petween out or less (at 200	ess put and 0 V)		
Utiliza	tion category						DC-12 c	or DC-13		1			
Outpu	t operation		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										Incorp	orated	
Max. respo	onse frequency	1 kHz					1.5 kHz						
Operation	indicator	Red LED (lights up when the output is ON)											
Polluti	on degree					3	(Industrial	environmer	nt)				
Protec	ction	IP67					(IEC)	:C)					
8 Ambie	ent temperature	-25 to + 70 °C - 13 to + 158 °F, Storage: $-25 to + 80 °C - 13 to$					— 13 to -	⊢176 °F					
Ambie	ent humidity	35 to 95 % RH, Storage: 35 to 95 % RH					35 to 85 % RH, Storage: 35 to 95 % RH						
EMC		EN 50081-2, EN 50082-2, EN 60947-5-2											
Voltag	e withstandability	500 V AC for one min. between all supply terminals connected together and enclosure											
Ambie Ambie EMC Voltag	tion resistance	$5\ \text{M}\Omega,$ or more, with 250 V DC megger between all supply terminals connected together and enclosure					$50\ \text{M}\Omega,$ or more, with 500 V DC megger between all supply terminals connected together and enclosure						
ш Vibrati	ion resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each											
Shock	Shock resistance		200 m/s ² acceleration (20 G approx.) in X, Y and Z directions for ten times each			300 m/s ² acceleration (30 G approx.) in X, Y and Z directions for ten times each							
Sensing rang	Temperature characteristics			erature rang + 20 °C +		+ 70 °C -	- 13 to + 15	58 °F: Withi	$n\pm 20\%$		emperature range · of sensing range a		
variation	Voltage characteristics		Within	± 2 % for ±	± 10 % fluc	ctuation of	the supply	voltage			2.5 % for a 2.5 %	± 15 % flu	ctuation of
Material			Enclo	sure: Stain	less steel	(SUS304),	Resin part	: TPX			osure: Bras n part: ABS		lated)
Cable		0.08 mm ² 3 heat and col cabtyre ca 9.843 ft long	ld resistant able, 3 m	oil and hea	able, 3 m	heat and c	3-core oil, old resistant able, 3 m g	0.1 mm ² 3-c oil and hea cabtyre ca 9.843 ft long	at resistant able, 3 m	heat and c	3-core oil, old resistant cable, 3 m	oil and he	-coreflexible eatresistan cable, 3 r g
Cable exte	ension			Extensio	on up to to	tal 100 m 3	328.084 ft i s	s possible v	with 0.3 mi	m ² , or more	e, cable.		
Weight					30 g a	ipprox.					55 g a	approx.	
Accessorie	25	MS-SS3 (S MS-SS3-2		unting brack et): 1 pc.	ket): 1 pc.					MS-SS5	(Sensor mo	ounting bra	cket): 1 pc

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 varies depending on the ambient temperature. Refer to 'I/O CIRCUIT AND WIRING DIAGRAMS' (p.749) for details.

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Amplifier Built-in

GX-U/FU

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SPECIFICATIONS

Threaded type

GX

1	\sim		-	Type Flexible cable			ed type				Non-shielded type			
				Flexible	e cable			Flexible	e cable					
Iter	n 🔪	\setminus	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-8MLE	
Max	Max. operation distance (Note 1)				0.8 mm 0.03	31 in ± 15 %			1 mm 0.039	9 in ± 15 %		2 mm 0.07	'9 in ± 15 %	
Sta	ble sensi	ing rai	nge (Note 1)		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 ir	
Sta	ndard se	nsing	object	Iron sheet 5	×5×t1mm	0.197×0.197	7 imest 0.039 in	Iron sheet 8	\times 8 \times t1mm	0.315×0.315	5 imest 0.039 in	lron sheet 12×12×t1 n	nm 0.472 × 0.472 × t 0.039 i	
Hys	teresis			15 %	6 or less of o	peration dista	ance			10 % or less	of operation	distance		
Rep	peatability	у			20 μm 0.78	7 mil or less			8 μm 0.315	5 mil or less		40 µm 1.57	75 mil or less	
Sup	ply volta	ige		12 to 24 V	DC ± 10 %	Ripple P-P 1	0 % or less		10 to 3	0 V DC Ripp	ole P-P 10 %	or less		
Cur	rent cons	sumpt	ion					15 mA	or less					
Out	Output			 Maximu Applied volume 	al voltage: 0.4	nt: 50 mA or less (between output and 0V) • Applied voltage: 30 V DC or less (between output an					ent)			
	Utilizatio	on cat	egory					DC-12 c	or DC-13					
	Output	opera	tion	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open	Normally closed	
	Short-ci	ircuit p	protection							Incorp	orated			
Max	k. respon	ise fre	quency				1 k	kHz				500 Hz		
Ope	Operation indicator					Red LED	LED (lights up when the output is ON)							
	Pollution	n deg	ree		3 (Industrial					ustrial environment)				
	Protecti	ion						IP67 (IEC)						
é	Ambien	t temp	perature			-25 to + 70	°C − 13 to -	+ 158 °F , Sto	rage: - 25 to	•+80°C −1	3 to + 176 °F	-		
resistance	Ambien	t hum	idity	35 to 9	5 % RH, Stor	rage: 35 to 98	5 % RH	35 to 85 % RH, Storage: 35 to 95 % RH						
	EMC						EN 500	81-2, EN 500	082-2, EN 60	947-5-2				
ental	Voltage	withs	tandability		500	V AC for one	min. betwee	n all supply t	erminals con	nected togeth	er and enclo	sure		
Environmental	Insulatio	on res	istance	$5 M\Omega$, or more, with 250 V DC megger between all supply terminals connected together and enclosure $50 M\Omega$, or more, with 500 V DC megger between all terminals connected together and enclosure						ipply				
ш	Vibratio	n resi	stance		10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each					urs each				
	Shock r	esista	ince	200 m/s ² acceleration (20 G approx.) in X, Y and Z directions for ten times each			300 m/s ² acceleration (30 G approx.) in X, Y and Z directions for ten times each				300 m/s ² acceleration (30 G approx.) in X, Y and Z directions for three times each			
	sing range		perature acteristics			- 25 to + 70 ℃ - t + 20 ℃ + 68 °I		°F: Over ambient temperature range $-25 \text{ to } + 70 \text{ °C} - Within + \frac{15}{10} \%$ of sensing range at $+20 \text{ °C} + 68 \text{ °F}$			°C — 13 to − 88 °F	+ 158 °F:		
varia	ation	Volta char	age acteristics	supply v	oltage	0 % fluctuatic		Within ±2.5 % for ±15 % fluctuation of the supply voltage					tage	
Mat	erial				closure: Bras sin part: TPX	ss (Nickel pla (ted)	Enclosure: Brass (Nickel plated) Resin part: ABS				ed)		
Cable			0.08 mm ² 3-0 and cold resi cable, 3 m 9.	stant cabtyre	oil and hea	core flexible, at resistant able, 3 m g	heat and co	able, 3 m	0.15 mm ² 3- oil and hea cabtyre ca 9.843 ft long	at resistant	heat and c	3-core, oil old resistan able, 3 m g		
Cab	ole extens	sion		E	xtension up	to total 100 m	n 328.084 ft i	is possible with 0.3 mm ² , or more, cable.			Extension up to total 100 m 328.084 ft is possible with 0.14 mm ² , or more, cable.			
Wei	ight (Note	e 3)			30 g a	ipprox.				60 g a	pprox.			
Acc	essories			Nut: 2 pcs. Toothed lock v	vasher: 1 pc.	Nut: 2 pcs. Toothed lock w	vasher: 2 pcs.	Nut: 2 pcs. Toothed lock	washer: 1 pc.	Nut: 2 pcs. Toothed lock w	vasher: 2 pcs.	Nut: 2 pcs. Toothed lock	washer: 1 pc.	

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 varies depending on the ambient temperature. Refer to 'I/O CIRCUIT AND WIRING DIAGRAMS' (p.749) for details.
3) The given weight of the threaded type includes the weight of two nuts and one toothed lock washer.

Amplifier Built-in

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10 to 30 V DC

I/O CIRCUIT AND WIRING DIAGRAMS

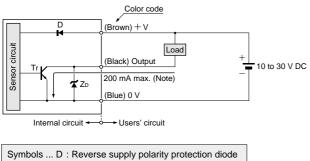
GX-5S GX-8M GX-8M



GX-3S GX-4S

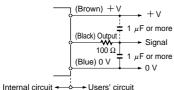
I/O circuit diagram

I/O circuit diagram



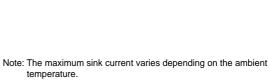
ZD: Surge absorption zener diode Tr : NPN output transistor

• If a capacitor of 1 $\,\mu\text{F}$ or more is connected between 0 V and output or between + V and output, connect a 100 Ω resistor in series as shown below.



GX-5M

Without the resistor, the shortcircuit 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.

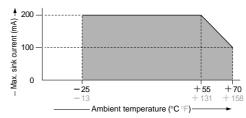


Brown

Black

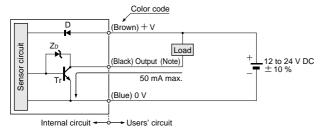
Blue

Load



Wiring diagram

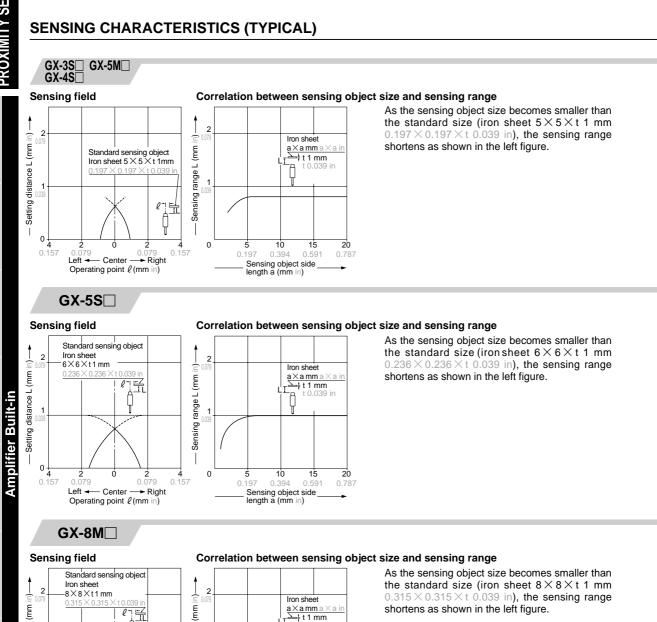
Wiring diagram



Note: 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.

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

Brown Load + 12 to 24 V DC ± 10 % Black Blue



Setting distance L (mm 0 0 | 4 0.157 **2** 0.079 **2** 0.079 Ó

Left 🔫

- Center Operating point ℓ (mm in)

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 $0.315 \times 0.315 \times t$ 0.039 in), the sensing range shortens as shown in the left figure.

Sensing field

GX-8ML

Correlation between sensing object size and sensing range

20

0.787

a×amma> ➡∔t1mm

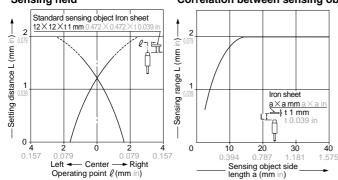
15

7

10

Sensing object side length a (mm in)

0.197



Sensing range L

4 0.157

+ Right

0

As the sensing object size becomes smaller than the standard size (iron sheet $12 \times 12 \times t \ 1 \ mm$ $0.472 \times 0.472 \times t$ 0.039 in), the sensing range shortens as shown in the left figure.

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PRECAUTIONS FOR PROPER USE



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.

Set screw (M4 or les (Note)

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

lote)					
	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		

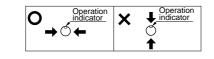
<Non-threaded type and non-shielded threaded type>

Set	screw	Model No.	B (mm in)	C (mm in)	Tightening torque
-B-→ (M4	or less)	GX-3S□	5 to 10 0.197 to 0.394	3 0.118	0.29 N∙m
		When using the C bracket			0.58 N∙m
+ c 4 /////	////,	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

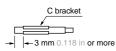
Note: The protrusion should be kept C (mm in) or more to avoid reduction of sensing range

• 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.



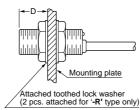
• To fasten the non-shielded threaded type, tighten the set screw on the flat surface of the sensor.

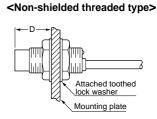
Refer to p.1152~ for general precautions.

Mounting with nut

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

<Shielded threaded type>





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

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

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.

∱ G 	
<u>+</u>	Metal

Model No.	F (mm in)	G (mm in)
GX-3S□	3 0.118	¢12 ¢0.472
GX-4S□	3 0.118	¢12 ¢0.472
GX-5S	5 0.197	φ15.4 φ0.606
GX-8ML	10 0.394	φ30 φ1.181

Mutual interference

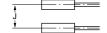
• When two or more sensors are installed in parallel or face to face, keep the minimum separation distance specified below to avoid mutual interference.

Face to face mounting Mc

g	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

Parallel mounting

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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

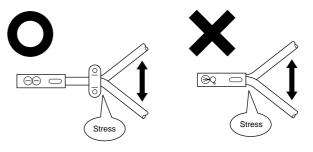
Model No. Metal	GX-3S⊡ GX-4S⊡	GX-5M	GX-5S GX-8M GX-8ML
Iron	1	1	1
Stainless steel (SUS304)	0.65 approx.	0.83 approx.	0.70 approx.
Brass	0.36 approx.	0.61 approx.	0.40 approx.
Aluminum	0.30 approx.	0.58 approx.	0.35 approx.

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

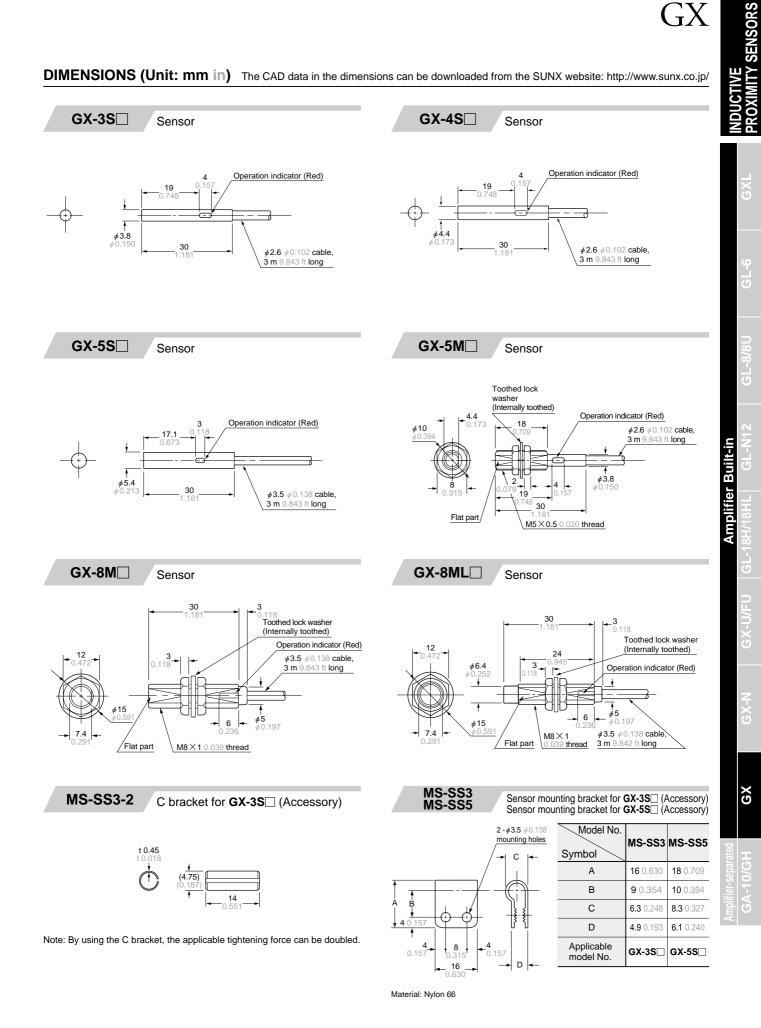
Others

- Do not use during the initial transient time (10 ms) 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 flexible 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.



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