

# Panasonic INSTRUCTION MANUAL

## High-Speed, High-Accuracy Eddy Current Digital Displacement Sensor GP-X Series

MJE-GPXC No.0082-92V

Thank you for purchasing our product. Be sure to read this manual before use in order to ensure the safe and proper operation of this product. Keep this manual at hand for your reference after reading it through. For details, refer to the GP-X Series User's Manual to make settings for use. For the new info of the product and new version of the user's manual, please check our website (<https://panasonic.net/id/pidx/global>).

**WARNING**

This product is to inspect (discriminate/measure) sensing objects. Never use this product for prevention of accidents which damage a human life or properties or for safety maintenance.

### Getting Started

Check the following items before using this product.

#### ● Controller Type(Product Name)

Check the model number on the top of the controller.

#### ● Bundled Items

Make sure that the following items are in the package.

- Controller × 1
- Mounting frame × 1
- Sensor head × 1
- Hexagonal nut × 2 (For GP-X10M, GP-X12ML and GP-X22KL only)
- Toothed washer × 1 (For GP-X10M, GP-X12ML and GP-X22KL only)
- Instruction Manual (This publication) × 1

### Main Specifications

#### ● Sensor head

Type	$\phi 3.8$ mm type	$\phi 5.4$ mm type	$\phi 8$ mm	M10 type	M12 type	$\phi 22$ mm	
Item	Model No.	GP-X3SE	GP-X5SE	GP-X8S	GP-X10M	GP-X12ML	GP-X22KL
Sensing range (Note 2)	0 to 0.8mm	0 to 1mm	0 to 2mm	0 to 5mm	0 to 10mm		
Standard sensing object	Stainless steel (SUS304)/ Iron sheet [Cold rolled carbon steel (SPCC)] 60 x 60 x t 1 mm						
Temperature characteristics(Note 3)	0.07% / F.S. / °C or less						
Protection	IP67 (IEC) , IP67G (Note6)						
Ambient temperature	-10 to +55 °C, Storage: -20 to +70 °C						
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH						
Noise immunity	Power line: 300Vp, 10ms cycle, and 0.5μs pulse width (with noise simulator)						
Voltage withstandability	250V AC for one min. between all supply terminals connected together and enclosure						
Insulation resistance	20MΩ or more, with 250V DC megger between all supply terminals connected together and enclosure						
Vibration resistance	10 to 150 Hz frequency, 0.75mm amplitude, in X, Y and Z directions for two hours each						
Shock resistance	500m/s <sup>2</sup> acceleration (50G approx.) in X, Y and Z directions for five times each						
Material	Enclosure	Stainless steel (SUS303)				Brass (Nickel plated)	
Sensing surface		ABS	PAR	ABS	PA		
Cable protector		—		PP			
Cable	Connector attached high frequency coaxial cable, 3m long (Note 4)						
Cable extension	Extension up to 10m is possible with the optional cable						
Weight (Note 5)		40g approx.	40g approx.	40g approx.	50g approx.	45g approx.	80g approx.

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C.  
 2) The sensing range is specified for the standard sensing object.  
 3) The value represents 20 to 60% of the maximum sensing distance when combining the sensor head and controller.  
 4) For the flexible cable type, please contact our office.  
 5) The given weight of the threaded type sensor head is value including the weight of the nut and toothed lock washer.  
 6) If using the sensor in an environment where cutting oil droplets splatter, the sensor may be deteriorated due to added substances in the oil. Please check the resistivity of the sensor against the cutting oil you are using beforehand.

#### ● Controller

Item	Model No.	NPN output	GP-XC3SE	GP-XC5SE	GP-XC8S	GP-XC10M	GP-XC12ML	GP-XC22KL
Item	PNP output	GP-XC3SE-P	GP-XC5SE-P	GP-XC8S-P	GP-XC10M-P	GP-XC12ML-P	GP-XC22KL-P	
Supply voltage	24V DC $\pm$ 10% Ripple P-P 10% or less							
Current consumption	150mA or less							
Analog voltage output (Note 4)	<ul style="list-style-type: none"> <li>• Output voltage: <math>\approx</math> 5 to +5V (Note 5)</li> <li>• Output impedance: 100 <math>\Omega</math> approx.</li> </ul>							
Response time	0.075ms (Fastest)							
Resolution (Note 2)	0.04% F.S. (64 times average)				0.02% F.S. (64 times average processing)			
Linearity (Note 2)	Within $\pm$ 0.3% F.S.							
Temperature (Note 3) characteristic	0.07% / F.S. / °C or less							
Comparison output	<ul style="list-style-type: none"> <li>&lt;NPN output type&gt;</li> <li>NPN open-collector transistor</li> <li>Maximum sink current: 100mA</li> <li>Applied voltage: 30V DC or less</li> </ul>				<ul style="list-style-type: none"> <li>&lt;PNP output type&gt;</li> <li>PNP open-collector transistor</li> <li>Maximum source current: 100mA</li> <li>Applied voltage: 30V DC or less</li> </ul>			
Alarm output	(between output and 0V)							
Strobe output	<ul style="list-style-type: none"> <li>• Residual voltage: 1.6V or less</li> <li>(at 100mA sink current)</li> </ul>							
Short-circuit protection	Incorporated							
External input	<ul style="list-style-type: none"> <li>&lt;NPN output type&gt;</li> <li>Photo coupler input</li> <li>Input current: 9mA or less</li> <li>Operating voltage: ON voltage 17V or more (between +24V and input)</li> <li>OFF voltage 4V or less (between +24V and input)</li> <li>Input impedance: 5k <math>\Omega</math> approx.</li> </ul>				<ul style="list-style-type: none"> <li>&lt;PNP output type&gt;</li> <li>Photo coupler input</li> <li>Input current: 9mA or less</li> <li>Operating voltage: ON voltage 17V or more (between 0V and input)</li> <li>OFF voltage 4V or less (between 0V and input)</li> <li>Input impedance: 5k <math>\Omega</math> approx.</li> </ul>			
Sampling frequency	40kHz (25 $\mu$ s)							
Zero-set setting method	Push button setting/External input setting							
MODE	Orange LED (lights up in mode status)							
HI	Orange LED (lights up when the upper value is exceeded)							
GO	Green LED (lights up when within the upper and lower limit value)							
LO	Orange LED (lights up when less than the lower limit value)							
TIMING	Green LED (lights up as per the external or internal trigger timing)							
Upper line digital indicator part	5 digit orange LED (display of numerical values out of the upper and lower limit value)							
Lower line digital indicator part	5 digit green LED (display of numerical values within the upper and lower limit value)							

Set model No.	NPN output	GP-XC3SE	GP-XC5SE	GP-XC8S	GP-XC10M	GP-XC12ML	GP-XC22KL
Item	PNP output	GP-XC3SE-P	GP-XC5SE-P	GP-XC8S-P	GP-XC10M-P	GP-XC12ML-P	GP-XC22KL-P
Ambient temperature	0 to +50°C (No dew condensation), Storage: 0 to +50°C						
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH						
Noise immunity	Power supply line: 1,000Vp, 10ms cycle, 0.5μs pulse width Radiation: 300Vp, 10ms cycle, 0.5μs pulse width (with noise simulator)						
Vibration resistance	10 to 55Hz frequency, 0.75mm amplitude in X, Y and Z directions for two hours each						
Shock resistance	100m/s <sup>2</sup> acceleration (10G approx.) in X, Y and Z directions five times each						
Grounding method	Floating earth						
Material	Enclosure: Polycarbonate						
Weight	120g approx.						
Accessory	ATA4811 (Controller mounting bracket): 1 set						

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C.  
 2) This value was obtained at a constant +25 °C.  
 3) The value is in the range from 20 to 60% of the maximum detection distance with a combination of sensor head and controller.  
 4) When using the BCD output unit GP-XBCD, the analog voltage output of a controller becomes invalid.  
 5) Adjusted to a 0 and +5V factory setting.

### 2 Precautions

#### Connection

- The GP-X series is configured to satisfy the specification with the combination of the sensor head and the controller. Use the sensor head and controller in combination without fail; with other combinations, not only may the specifications may not be satisfied but also failure may result.
- Turn the controller off before mounting or removing the sensor head and controller.
- Note that the cables will be damaged if they are pulled.

#### Power Supply

- Wait 15 minutes (or 20 minutes with GP-X3S and GP-X5S) after the power is turned on before operation is started. There may be a variation in the measurements immediately after power-on because the power circuit is not stable.
- There is a muting time of about two seconds after the power is turned on.
- Take care that wrong wiring may damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- Make sure to use an isolation transformer for the DC power supply. If an auto-transformer (single winding transformer) is used, this product or the power supply may get damaged.
- In case a surge is generated in the used power supply, connect a surge absorber to the supply and absorb the surge.

#### Wiring

- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Make sure that the power supply is off while wiring.
- The analog voltage output is incorporated with a short circuit protection circuit. Do not connect it directly to a power supply or a capacitive load.
- Be careful to avoid statically charging connectors during wiring work. A failure may result.
- Use the exclusive extension cable for cable extension of the sensor head. (Overall length: 10m)

#### Environment

- This product has been developed / produced for industrial use only.
- Avoid dust, dirt, and steam.
- Take care that the sensor does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Take care that stress is not directly applied to the cable joint.
- This sensor is for indoor use only.

#### Compatibility

- In case the sensor head is broken, the sensor head replacement is possible with same model. (However, entering a characteristics code (ID code) and calibration are required)

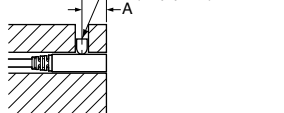
### 3 Mounting Method

Tighten the sensor head to the torque specified below.

#### ● Mounting with set screw

<Column type>

Use an M3, or less, cup-point set screw.  
 Set screw (M3 or smaller)  
 (Cup point)

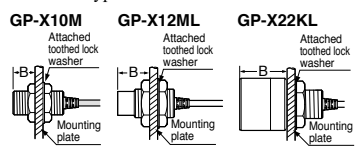


Model	A(mm)	Tightening torque
GP-X3SE	4 to 16	0.1N · m or less
GP-X5SE	5 to 16	0.44N · m or less
GP-X8S		0.58N · m or less

Note: Avoid tightening excessively.

#### ● Mounting with nut

<Screw type>



Model	B(mm)	Tightening torque
GP-X10M	7 or more	9.8N · m or less
GP-X12ML	14 or more	20N · m or less
GP-X22KL	20 or more (Note 1)	20N · m or less

- Notes: 1) In case of without a nut. If a nut is fitted, this value will be 23.5mm or more.  
 2) Mount such that the nuts do not protrude from the thread portion.

- In case the interference prevention function is not used
- If sensor heads are mounted close together without using the interference prevention function, reserve the distance specified below.

In the case of an opposing installation layout

In the case of a parallel installation layout

Model no. of sensor head	A (mm)	B (mm)
GP-X3SE	15	9
GP-X5SE	30	11
GP-X8S	40	15
GP-X10M	40	15
GP-X12ML	170	50
GP-X22KL	200	200

- Distance from surrounding metal
- As metal around the sensor may affect the detection, take care of the following.

<Embedding of the sensor in metal>

Measurement value or analogue voltage output may be changed if the sensor is completely embedded in metal. Keep the minimum distance specified in the table below.

Model	C(mm)	D(mm)
GP-X3SE		$\phi 10$
GP-X5SE		
GP-X8S		$\phi 18$
GP-X10M		$\phi 14$
GP-X12ML		$\phi 50$
GP-X22KL		$\phi 50$

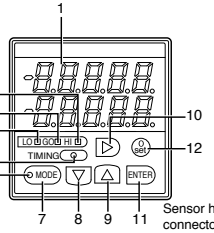
### ● Sensing range

The sensing range is specified for the standard sensing object (Stainless steel/iron). With a metal other than the metals specified in the specifications, multiply with the correction coefficient shown in the table below. Check the effect with the actual machine.

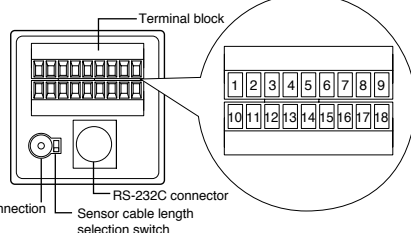
With a metal other than the metals specified in the specifications, multiply with the correction coefficient shown in the table below. Check the effect with the actual machine.

## 4 Parts name and functions

### ● Operation Panel



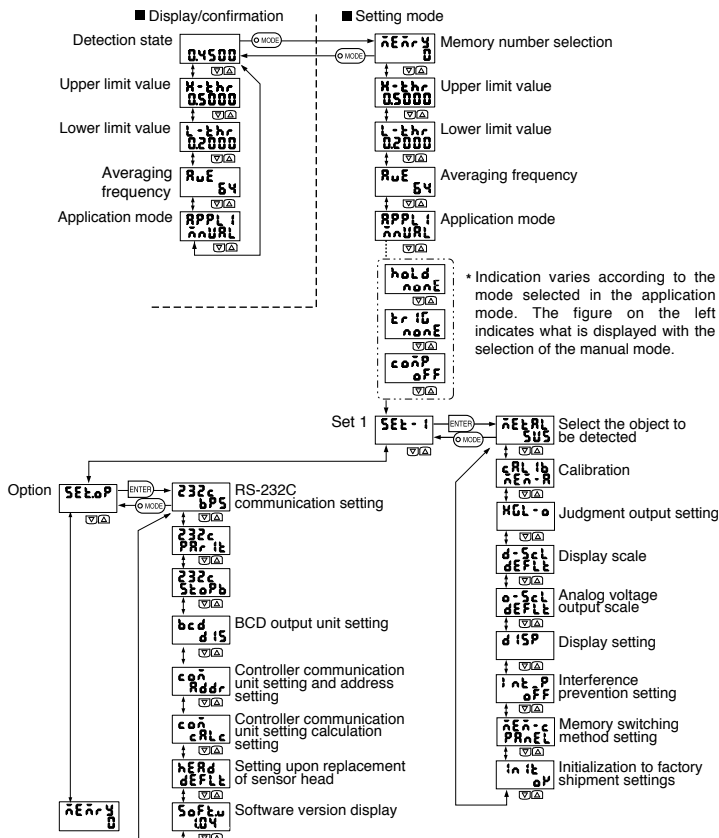
### ● External I/O



No.	Description	Function
1	Digital display (green, orange)	The measurement, calculated value, setting data and so on are displayed. The measurement is displayed in green on the lower line with the GO judgment, while it is displayed in orange on the upper line with the HI or LO judgment.
2	HI indicator (Orange)	Lights up if the measurement is larger the upper limit value.
3	GO indicator (Green)	Lights up if the measurement is between the upper and lower limit values.
4	LO indicator (Orange)	Lights up if the measurement is smaller than the lower limit value.
5	TIMING indicator (Green)	Lights up at the timing of an external or internal trigger.
6	MODE indicator (Orange)	Lights up in the setting mode, while it is not lit during measurement.
7	MODE key	Starts the setting mode. Returns to the original state in the setting mode.
8	DOWN key	Use these keys to select the setting value and setting items.
9	UP key	
10	SHIFT key	Moves among setting digits.
11	ENTER key	Determines the setting item and setting value.
12	0-set key	Resets the controller forcibly to zero (reference position) with the current detection position to shift the display and analog voltage output.

Terminal No.	Indication	Name	Description
1	LO	LO output	A signal is output if the measurement is smaller than the lower limit value.
2	GO	GO output	A signal is output if the measurement is between the upper and lower limit values.
3	HI	HI output	A signal is issued if the measurement is larger than the upper limit value.
4	COM	Common	Common (NPN output type: 0V (PNP output type: 24V))
5	ALARM	Alarm output	A signal is output if an error occurs.
6	STROBE	Strobe output	An internal trigger outputs for measurement interval.
7	INT P OUT	Interference prevention output	A signal is sent to another controller for removal of effects caused by interference.
8	ANA LOG	ANALOG GND	Analog ground
9	OUT	ANALOG VOLTAGE OUTPUT	The measurement is output in an analog voltage.
10	0 SET	Zero setting input	The current detection position is forcibly zeroed (to become a reference position).
11	MEM ORY	1 Memory switch 1 2 Memory switch 2	One among four settings is called up from the internal memory to replace the current setting with it.
13	COM	Common	Common (NPN output type: 0V (PNP output type: 24V))
14	TIMING	Timing input	Measurement begins.
15	RESET	Reset input	Temporarily finishes the holding interval.
16	INT P IN	Interference prevention input	With a signal sent from another controller, effects caused by interference are removed.
17	0V	Power supply 0V	Supply power.
18	24V DC	Power supply 24V DC	

## 5 Operation System

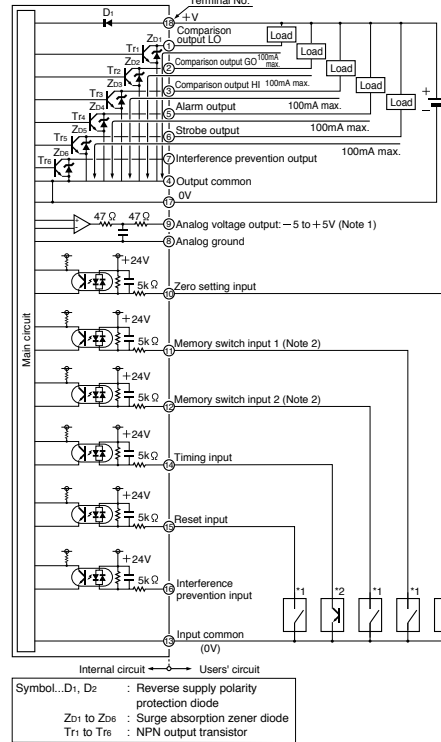


Correction coefficient table

Sensor head	GP-X3SE, GP-X5SE GP-X8S, GP-X10M GP-X12ML, GP-X22KL
Metal	
Stainless steel (SUS304), iron	1
Aluminum	0.5 approx.

## 6 I/O Circuit

### ■ NPN Type (GP-XC□S, GP-XC□M□, GP-XC□KL)

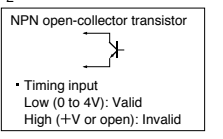
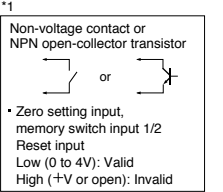


Notes: 1) Devices connected to the analog voltage output (terminal No. ⑧ and ⑨) must have 1MΩ or larger input impedance.  
2) To perform memory switching by means of an external terminal, select "Ext" as the memory switching method. For details, refer to section "4.8 Memory Switching Method Setting".

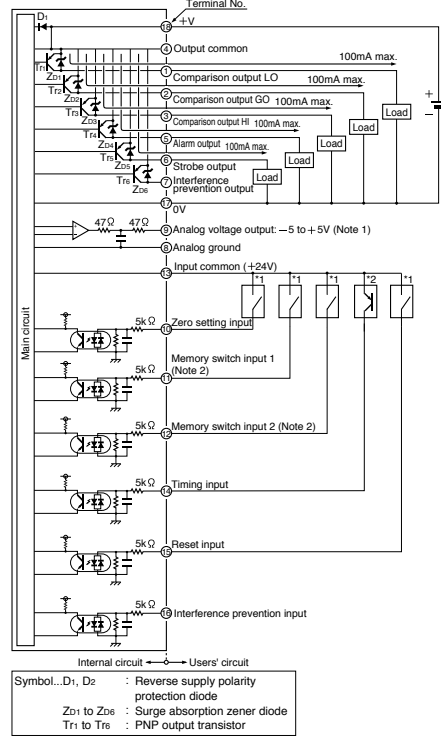
### • Memory switching input (Note 2)

Memory No.	Memory switch 1	Memory switch 2
0	High	High
1	Low	High
2	High	Low
3	Low	Low

Low: 0 to +4V, High: +V or open



### ■ PNP Type (GP-XC□S-P, GP-XC□M□-P, GP-XC□KL-P)

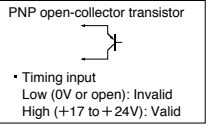
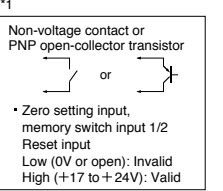


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2) To perform memory switching by means of an external terminal, select "Ext" as the memory switching method. For details, refer to section "4.8 Memory Switching Method Setting".

### • Memory switching input (Note 2)

Memory No.	Memory switch 1	Memory switch 2
0	Low	Low
1	High	Low
2	Low	High
3	High	High

Low: 0V or open, High: +17 to +24V



## 7 Operating Conditions for Compliance with CE Marking / UKCA Marking

When using as a product in conformity with EMC Directive (2014/30/EU) / EMC Regulation (2016/1091), observe the following requirements and conditions.

- The controller must be connected within 10m of the power supply.
- The Signal cable connected to the controller must be shorter than 30m.
- A ferrite clamp must be mounted within 10mm of the base of the single connector of the cable (GP-XBCC3) for the BCD output unit.

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