

Thank you for purchasing Panasonic products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

WARNING

- 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.

Note:
This product is not equipped with an automatic interference prevention function. By setting different frequencies, interference can be prevented for up to four units.
For the setting method, refer to <PRO3> in section 12 "PRO MODE".

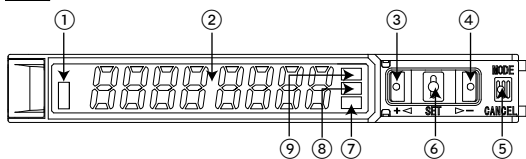
1 Compliance with standards

This product complies with the following standards and regulations.



- For the EU: EMC Directive 2014/30/EC
Contact for CE:
Panasonic Marketing Europe GmbH
Panasonic Testing Center
Winsberggring 15, 22525 Hamburg, Germany

2 Part description

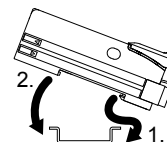


①	Operation indicator for sensing output (orange)	
②	Digital display (green/red)	
③	UP key (+)	Functions: • Teach • Fine adjustment of the threshold value • Select settings
④	DOWN key (-)	
⑤	MODE key	Functions: • Select modes • Cancel
⑥	SET key	Functions: • Teach • Save selected settings
⑦	Mode indicator PRO mode (yellow)	Lights in PRO mode Flashes in normal status during IO-Link communication OFF in normal status without IO-Link communication
⑧	Mode indicator CUST (custom) mode (yellow)	Lights when setting "Light sensitivity setting mode"
⑨	Mode indicator L/D (Light-ON/Dark-ON) mode (yellow)	Lights when setting "Sensing output operation mode"

3 Mounting

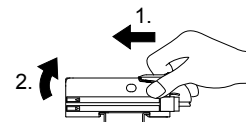
Installation to a DIN rail

1. Attach the railing on the rear of the amplifier to the DIN rail.
2. Push the amplifier in the direction of the arrow as illustrated so that it attaches securely.



Removal from a DIN rail

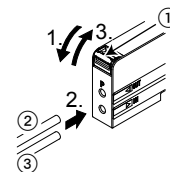
1. Push the amplifier forward.
2. Lift the front part of the amplifier up.



Connecting the fiber cable

- Mount the fiber cables when the power is off.
- The attachments to the fiber cables need to be fitted BEFORE you insert the fibers into the amplifier. For details, refer to the instruction manual enclosed with the fibers.
- Insert the fiber cables slowly into the inlets until they stop. Excessive force may damage the product

1. Snap the fiber lock lever ① down as far as it will go.
2. Insert the fiber cables slowly into the inlets until they stop (see note).
3. Return the fiber lock lever to the original position.

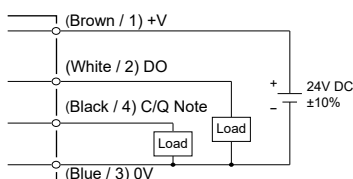


Note:

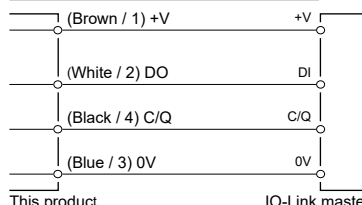
With the coaxial reflective type fiber, insert the single core fiber cable into the inlet for the emitter ② (inlet on the amplifier is labeled "P") and the multi-core fiber cable into the inlet for the receiver ③. If they are inserted the wrong way round, the sensing performance will deteriorate.

4 I/O circuit diagrams

As a general-purpose sensor

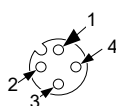


Connected to a IO-Link master



Terminal arrangement of M12 connector

Note: When the product is used as a general-purpose sensor, the IO-Link communication output (C/Q) provides the same output operation as the control output (DO).



Terminal No.	Terminal name
1	+V
2	Control output (DO)
3	0V
4	IO-Link communication (C/Q)

Mounting M12 connector

If the fixed ring loosens, the connector will come off, causing this product to generate a communication error. Before use, check that the fixed ring is not loose.

- Firmly tighten the fixed ring by rotating it.



5 List of functions

Function	Setting on main unit	IO-Link communication setting (Note)
Teaching	2-point teaching (SET Key)	Index2
	Limit-teaching (UP Key)	Index2
	Limit-teaching (DOWN Key)	Index2
	Auto teaching (SET Key)	Index2
	Teaching cancel	Index2
Threshold value Setting	Threshold value fine Adjustment	Index60
Key lock function	Set / Release	Index12
Output Operation Setting	Light-ON/Dark-ON	Index61_1
Light sensitivity setting	Light sensitivity select	Index77
Response time setting	Selection from 4-mode	Index66
Timer setting	Timer mode	Index64_1
Timer time setting	Timer time	Index64_2
Shift amount setting	Amount select	Index74_1
Shift threshold value setting	Shift threshold value	Index74_2
Teaching lock setting	Lock ON / OFF	Index85
Setting items in the digital display	Incident light intensity / Displayed in percentage / Peak / bottom value	Index83_1
Time period hold setting	Hold ON / OFF	Index83_2
Setting of digital display turning	Turning ON / OFF	Index82
ECO Setting	FULL / ON / OFF	Index80
Display adjustment setting	Set / Release	Index2
Reset setting	Execution	Index2
Emitting frequency setting	Disabled / Interference prevention/Ambient environment resistance	Index76_1
Emitting frequency (Interference prevention setting)	Selection from 4-mode	Index76_2
Threshold value tracking Cycle setting	Cycle(time)	Index75_1
Threshold value tracking Output Operation Setting	ON / OFF	Index75_2
Threshold value tracking Storage cycle setting	Storage cycle (each time)	Index75_3
Threshold value tracking Algorithm setting	Teaching mode select	Index75_4
Preventive maintenance threshold value 1 setting	—	Index160
Preventive maintenance threshold value 2 setting	—	Index161
Preventive maintenance threshold value detection lag time setting	—	Index162
Operating time	—	Index163
Number of data save operations	—	Index164
Notification Flag Setting	—	Index168
Notification Event Code	—	Index169

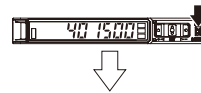
Note: For the IO-Link communication setting, refer to the attached sheet, "Index list".

6 Operation procedure

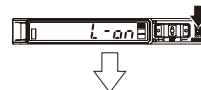
- If you change settings, press the SET key before you turn the power OFF. Otherwise your changes will be lost.
- If settings are configured simultaneously on the main unit side and on the IO-Link communication side, the settings that are applied last will be used.

When you turn the power ON, the amplifier is in RUN mode. Press the MODE key (indicated by black arrow in the illustrations below) to switch from one mode to the next.

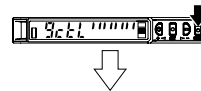
RUN mode



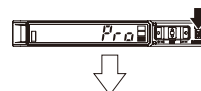
Sensing output operation mode



Light sensitivity setting mode



PRO mode



RUN mode

- Displays the threshold value in green and the incident light intensity in red.
- Used for teaching, making fine adjustments to the threshold values (see page 3), and activating the key lock function (see page 3).
- Select either Light-ON or Dark-ON. The default setting is L-on (Light-ON).
- Refer to sensing output operation mode on page 4 for details.
- Displays the light sensitivity setting and enables its setting
- Refer to light sensitivity setting mode on page 4 for details.
- Used for advanced settings.
- Refer to PRO mode on page 4 for details.

7 Teaching

- Please note that if the threshold values are very close to each other, objects may not be detected reliably.
- Teaching is performed in RUN mode and during IO-Link communication.

There are different teaching methods available. Which teaching method is recommended depends on the sensor type and whether the sensing object is present or not present or moving.

Sensing condition	Recommended teaching method
Sensing object is present and easily detectable.	2-point teaching
Sensing object is very small. Other objects are in the background.	Limit teaching
Production line cannot be stopped and sensing object is moving	Auto teaching

All teaching methods are available for the thru-beam, the mirror reflection type and the reflective type.

2-point teaching

The basic teaching method when the sensing object is present is **2-point teaching**.

Thru-beam type

Specular reflective type

Reflective type

1. Press the SET key when the sensing object is present (system command / Index2: 0x43).

2. Press the SET key when the sensing object is absent (system command / Index2: 0x44).

Display when stable sensing is possible.

Display when stable sensing is not possible.

Limit teaching

When the sensing object is small or there are objects in the background, use this teaching method.

Sensing object is present

Sensing object is not present

1. Press the SET key when the sensing object is present or not present.

2. Use the instructions according to your sensor type:

- Thru-beam type, specular reflective type: Press the UP key to shift the threshold level to a high level (low sensitivity) or press the DOWN key to shift the threshold level to a low level (high sensitivity) (Notes 1, 2).

- Thru-beam type, specular reflective type: Press the UP key to shift the threshold level to a high level (low sensitivity) or press the DOWN key to shift the threshold level to a low level (high sensitivity) (Notes 1, 2).
- Reflective type: Press the DOWN key to shift the threshold level to a high level (low sensitivity) or press the UP key to shift the threshold level to a low level (high sensitivity) (Notes 1, 2).

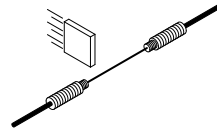
Display when stable sensing is possible.

Display when stable sensing is not possible.

Notes:

- The shift value of approx. 15% is an initial value. Display of the shift value can be changed to percentage [approx. 0 to 999% (unit 1 %)] or incident light intensity [0 to 9999 (unit 1)].
For setting the shift amount, refer to <PRO1> in section 12 "PRO MODE".
- At the time of limit teaching. UP key (System command / Index2: 0x4B)
DOWN key (System command / Index2: 0x4C)

Auto teaching



When the sensing object is moving, use this teaching method.

- Press and hold the SET key for a long time
- Run the sensing object on the production line and hold down the SET key (system command / Index2: 0x47).
- The display shows *Auto* in green. When the sensing object has passed through, release the SET key (system command / Index2: 0x48).

Display when stable sensing is possible.

Display when stable sensing is not possible.

8 Threshold value fine adjustment function

- The fine adjustment of the threshold value can be set in RUN mode and during IO-Link communication.

- Press the UP key to increase the threshold value
- Press the DOWN key to decrease the threshold value
- Press the SET key to save the threshold value.
- The value has been saved. If you do not press the SET key, the value will be saved automatically after 2 seconds.

9 Key lock function

The key lock function protects settings from being changed inadvertently. The function can also be activated via IO-Link communication. When the key lock function is activated and you press any of the keys, the digital display shows *Loc on*.

Activating the key lock function

- Press the SET and the MODE key together for 3 seconds or longer.

The digital display changes to show the key lock function has been activated.

Then the digital display returns to show the current values.

Deactivating the key lock function

- Press the SET and the MODE key together for 3 seconds or longer.

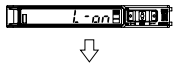
The digital display changes to show the key lock function is active.

The digital display changes to show the key lock function has been turned off.

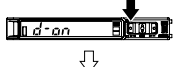
Then the digital display returns to show the current values.

10 Sensing output operation mode (L/D)

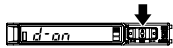
When the mode indicator L/D (yellow) is ON, you can switch from Light-ON mode to Dark-ON mode and vice versa (also during IO-Link communication).



1. Press the MODE key. The L/D indicator lights up and the current mode setting is displayed.



2. Press the UP key to select Dark-ON mode or the DOWN key to select Light-ON mode.



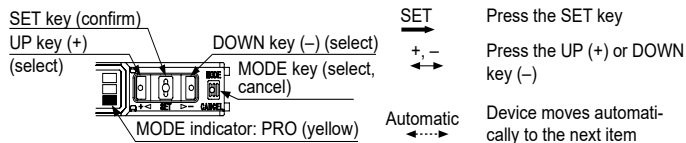
3. Press the SET key to save the setting.

11 Light sensitivity setting mode

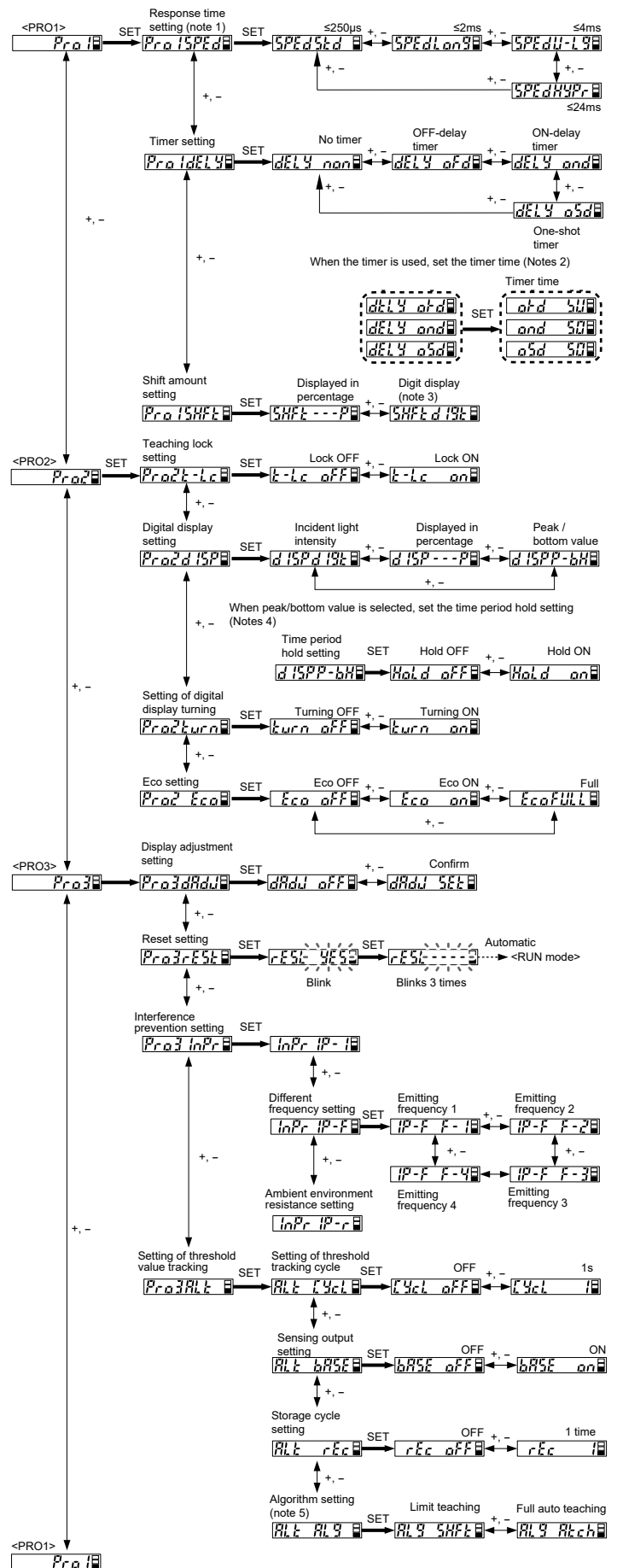
- When the mode indicator CUST. (yellow) lights up, the light sensitivity setting can be displayed (also during the IO-Link communication).
- Press the UP or DOWN key to change the setting.
- Press the SET key to save the setting.

12 PRO mode (PRO)

- When the mode indicator PRO (yellow) is ON, you can scroll through the PRO menu (Pro1 to Pro3) and make advanced settings (also during IO-Link communication).
- If you change settings, press the SET key before you turn the power OFF. Otherwise your changes will be lost.
- If settings are configured simultaneously on the main unit side and on the IO-Link communication side, the settings that are applied last will be used.



Procedure



Notes

- The maximum incident light intensity displayed depends on the selected response time.

Response time	Incident light intensity
STD, H-SP, FAST	Max. 4,000
LONG	Max. 8,000
U-LG, HYPR	Max. 9,999

- When the timer is used, set the timer time.

Timer range	Timer period	Display
1/10ms	Approx. 0.1 – 999.9ms	1 – 9999

- When setting the shift amount using the digit display, the setting range differs depending on the response time, as shown in the table below

Response time	Shift amount
STD, H-SP, FAST	Max. 4,000
LONG	Max. 8,000
U-LG, HYPR	Max. 9,999

- To clear the value, turn off the time period holding function. Turning off the power switch also clears the value.

- If you have selected limit teaching for the changed incident light intensity (Algorithm setting = *SHFT*), note that the shift direction of the threshold differs depending on the combination of the sensing output status and the sensing output operation.

Sensing output status	Sensing output operation	Shift direction
ON	Light-ON	–
ON	Dark-ON	+
OFF	Light-ON	+
OFF	Dark-ON	–

Details on the menu items

Pro1 menu		
Menu item	Default setting	Description
Response time setting	<i>SPEdStt</i>	Set response time.
Timer setting	<i>dEly non</i>	Set operation and delay of the timer.
Timer range setting	<i>ard St</i>	Set the timer range and the timer time (display example with OFF-delay timer)
Shift amount setting	<i>SHFT ---P</i>	Set the shift amount for the threshold value when you execute limit teaching (see “Limit teaching” on page 3).

Pro2 menu		
Menu item	Default setting	Description
Teaching lock setting	<i>t-Lc OFF</i>	Be able to prevent from wrong operation of teaching. <i>OFF</i> The lock is deactivated, teaching can be performed. <i>on</i> The lock is activated, teaching is not possible.
Setting items in the digital display	<i>d1SPd19t</i>	Select what should be displayed in red on the digital display. Choose between the incident light intensity displayed as a percentage or the peak/bottom value.
Peak/bottom hold function setting	<i>Hold OFF</i>	<i>OFF</i> Peak/bottom values are refreshed regularly. <i>on</i> Peak/bottom values are held.
Setting of digital display turning	<i>turn OFF</i>	When you set this parameter to ON, the digital display will be rotated by 180°.
ECO setting	<i>Eca OFF</i>	The power consumption can be lowered. <i>OFF</i> Power consumption is normal. <i>on</i> If no key is pressed for 20s in RUN mode, the digital display turns OFF. <i>FULL</i> If no key is pressed for 20s in RUN mode or the key lock function has been activated, the digital display and all indicators turn OFF.

Pro3 menu								
Menu item	Default setting	Description						
Display adjustment setting	<i>dPdJ OFF</i>	Set the incident light intensity to the target value. When you set the display adjustment while the incident light intensity does not have enough margin, the display shows a blinking <i>Err</i> . <i>OFF</i> Display adjustment OFF <i>St</i> Set the display to 0. This redefines the initially displayed value as zero.						
Reset setting	–	If you select the setting <i>St</i> , the amplifier returns to the factory settings.						
Interference prevention setting	<i>IP- I</i>	<i>IP- I</i> The interference prevention function is disabled. Use up to 4 different emitting frequencies. A maximum of 4 sensor heads can be cascaded per frequency setting. Set this to minimize the effect of ambient environment. <i>IP-r</i> When this setting is set, mutual interference prevention function is disabled. <i>InPr IP- I</i> The response time is as follows when <i>IP-F</i> or <i>IP-r</i> is selected						
		<table border="1"> <thead> <tr> <th>Response time</th> <th><i>IP-F</i></th> <th><i>IP-r</i></th> </tr> </thead> <tbody> <tr> <td></td> <td>F-1: max. 0.8ms, F-2: max. 0.9ms F-3: max. 1.0ms, F-4: max. 1.7ms (Not affected by “<i>Pro1SPEd</i>” setting. (Response time setting))</td> <td>STD: max.500 μs, LONG: max. 4ms, U-LG: max. 8ms, HYPR: max. 48ms (selectable)</td> </tr> </tbody> </table>	Response time	<i>IP-F</i>	<i>IP-r</i>		F-1: max. 0.8ms, F-2: max. 0.9ms F-3: max. 1.0ms, F-4: max. 1.7ms (Not affected by “ <i>Pro1SPEd</i> ” setting. (Response time setting))	STD: max.500 μ s, LONG: max. 4ms, U-LG: max. 8ms, HYPR: max. 48ms (selectable)
Response time	<i>IP-F</i>	<i>IP-r</i>						
	F-1: max. 0.8ms, F-2: max. 0.9ms F-3: max. 1.0ms, F-4: max. 1.7ms (Not affected by “ <i>Pro1SPEd</i> ” setting. (Response time setting))	STD: max.500 μ s, LONG: max. 4ms, U-LG: max. 8ms, HYPR: max. 48ms (selectable)						
Threshold value follow-up cycle	<i>Ucl OFF</i>	The incident light intensity can be monitored for the cycle (1 to 9,999s) specified, for example when variations in incident light intensity are expected. When the threshold value follow-up cycle is set, the threshold value is adjusted according to the shift based on the incident light intensity detected. However, the threshold value is not stored						
Sensing output setting	<i>bPSE OFF</i>	Select whether the threshold value should be followed when the output is OFF or when the output is ON.						
Storage cycle setting	<i>rec on</i>	Select the cycle for storing threshold values in the non-volatile memory. The valid range is 1 to 250 times						
Algorithm setting	<i>Alg SHFT</i>	<i>SHFT</i> When limit teaching is used, the threshold value is modified by the shift amount. The direction of the threshold shift differs depending on the combination of the sensing output status and the sensing output operation, see note (Recommended when using thru-beam-type fiber or specular reflective-type fiber) <i>Alch</i> When auto teaching is used, the threshold value is followed up on the basis of each cycle. (Recommended when using reflective-type fiber)						

Notes

The direction of the threshold shift differs depending on the combination of the sensing output status and the sensing output operation.

Sensing output status	Sensing output operation	Shift direction
ON	Light-ON	–
ON	Dark-ON	+
OFF	Light-ON	+
OFF	Dark-ON	–

13 Error codes and troubleshooting

The following error codes may appear in the digital display

Error code	Description	Remedy
<i>Er01</i>	The non-volatile memory is broken or reached the end of its working life.	Please contact our office.
<i>Er02</i>	Error writing on the non-volatile memory	
<i>Er11</i>	Load of the sensing output is short-circuited causing an over-current to flow.	Check that all amplifiers are firmly attached and that there is no gap between amplifiers.

14 Cautions

- This product has been developed/produced for industrial use only.
- This product is suitable for indoor use only.
- Make sure to add or remove amplifiers with the power OFF.
- If you apply a voltage exceeding the rated range or if an AC power supply is connected directly, the product may get burnt or damaged.
- Shortcircuiting the load or wrong wiring may burn or damage the product.
- 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.
- Avoid using the product where there are strong magnetic fields as they may prevent the product from working according to the specification.
- Verify that the supply voltage including the ripple 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.
- 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.
- Do not apply stress directly to the sensor cable joint or the fiber cable by forcibly bending or pulling.
- The ultra long response time settings U-LG and HYPR are more likely to be affected by extraneous noise since the sensitivity is higher than with other response times. Test the behavior of the product before use.
- Do not use during the initial transient time after the power supply is switched ON.
- You can extend the cable up to 20m max. with 0.3mm² min. cable. However, in order to reduce noise, make the wiring as short as possible.
- Set the power supply voltage by considering the voltage drop resulting from the conduction resistance of the cable.
- Do not use the product in dusty or dirty places or in places that are exposed to steam.
- Protect the sensor from water, oil, grease, organic solvents such as thinner, etc., strong acid, and alkaline.
- This product cannot be used in an environment containing inflammable or explosive gasses.
- Never disassemble or modify the product.
- This product uses a non-volatile memory. Due to the non-volatile memory's lifetime, do not expect to make settings more than 100 thousand times.

18 Specifications

Type	Discrete wire	M12 Connector
Model number	FX-551L3-P-C2	FX-551L3-P-J
Supply voltage	12 to 24V DC % (+10%/-15%), ripple P-P10% max.	
Power consumption	Normal operation: 960mW max. (current consumption 40mA max. at 24V supply voltage) Eco mode: 720mW max. (current consumption 30mA max. at 24V supply voltage)	
IO-Link communication (C/Q) ¹	IO-Link specification: Ver1.1	
Baud rate	COM3 (230.4kbit/s)	
Process data length	PD: 4byte	
Control output (DO) ²	PNP open-collector transistor <ul style="list-style-type: none"> • Maximum source current: 50mA • Applied voltage: max. 30V DC between sensing output and +V • Residual voltage: max. 2V at maximum source current³ 	
Output operation	Switchable either Light-ON or Dark-ON	
Short-circuit protection	Incorporated	
Response time ⁴	STD: max. 250μs, LONG: max. 2ms, U-LG: max. 4ms, HYPR: max. 24ms selectable	
Interference prevention function	Incorporated Emission frequency selection method (Functions at emission frequency 1, 2, 3 or 4) ⁵	
Ambient environment resistance setting	Incorporated	
Protection	IP40 (IEC)	
Overvoltage category	1	
Degree of pollution	2	
Ambient temperature	-10 to +55°C (no dew condensation or icing allowed) <ul style="list-style-type: none"> • For 4 to 7 units mounted in cascade: -10 to +50°C • For 8 to 16 units mounted in cascade: -10 to +45°C Storage: -20 to +70°C	
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH	
Material	Enclosure: polycarbonate, switch: polyacetal, protective cover: polycarbonate	
Cable	0.2 mm ² 4-core cab tire cable, 2m	0.2 mm ² 4-core cab tire cable with M12 connector, 0.3m
Weight (main body only)	Approx. 55g	Approx. 90g

Notes

1. For the IO-Link communication setting, refer to the attached sheet, "Index List" (IMJE-FXLINEXV1EN 09/2018)
2. When the product is used as a general-purpose sensor, the IO-Link communication output (C/Q) provides the same output operation as the control output (DO).
3. This value is applicable when the cable length is 2m.
4. The response time varies depending on the emission frequency setting. For more details refer to <PRO3> in the section 12 "PRO MODE"
5. When the interference prevention function is used, hysteresis increases. Before using this function, check the detection conditions.
6. Do not use or store in an environment pressurized to atmospheric pressure or higher at an altitude of 0m.
7. The number of units installed is applicable when units are installed close to each other.

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<http://panasonic.net/id/pidsx/global>

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