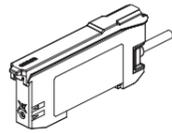


Smart Fiber Amplifier E3X-ZV Series

INSTRUCTION SHEET

Thank you for selecting an OMRON product. This sheet primarily describes precautions required in installing and operating the product.

- A specialist who has the knowledge of electricity must treat the product.
- Please read this manual carefully, and use it correctly after thoroughly understanding the product.
- Please keep this manual properly for future reference whenever it is necessary.



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WARNING Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

Warning Indications

WARNING

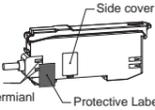
This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purpose.

Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.

Never use the product with an AC power supply. Otherwise, explosion may result.

PRECAUTIONS FOR SAFE USE

- The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.
- Do not install the product in the following locations.
 - (1) Locations subject to direct sunlight
 - (2) Locations subject to condensation due to high humidity
 - (3) Locations to corrosive, flammable or explosive gases
 - (4) Locations to vibration or shocks exceeding the spec
 - (5) Locations subject to exposure to water, oil, chemicals
 - (6) Locations subject to steam
 - (7) Locations subjected to strong magnetic field or electric field
 - (8) In water, rainfall or outdoors
 - (9) Any atmosphere or environment that exceeds the ratings
 - To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
 - High-Voltage lines and power lines must be wired separately from this product. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
 - Please apply the load under rating and connect the load correctly. Do not short the load.
 - Do not use the product if the case is damaged.
 - Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.
 - When setting the sensor, be sure to check safety such as by stopping the equipment.
 - Be sure to turn off the power supply before connecting or disconnecting wires.
 - Do not attempt to disassemble, repair, or modify the product in any way.
 - When disposing of the product, treat it as industrial waste.
 - Do not remove the cover on the side of the case. Otherwise, electric shock or malfunction may result.
 - If you notice any abnormal condition, immediately stop using the product, turn off the power and consult your dealer without doing any operation such as initialization.
 - When using a connector type product, place a protective label (provided with the E3X-CN series) on the power supply connecting terminals that are not used, to prevent electric shock or short circuit.



PRECAUTIONS FOR CORRECT USE

- Be sure to mount the unit to the DIN track and the connector until it clicks.
- The length for the cable extension must be 30 m or less. Be sure to use a cable of at least 0.3 mm² for extension.
- The power voltage must be 24V when connecting amplifier units with extension cable and wire-saving connector.
- Do not apply the forces on the cord exceeding the limits. Do not use the cord while it is pinched or pressed. Pull: 40N; torque: 0.1N·m; bending: 29.4N.
- Do not apply excessive force such as tension, compression or torsion to the amplifier unit with the fiber unit fixed to the amplifier unit.
- Please be aware of the polarity of the power supply to avoid miswiring. If there are input/output lines that are not used, insulate them.
- The product is ready to operate 250 ms after the power supply is turned ON.
- It may take time until the received light intensity become stable immediately after the power on.
- If the unit receives excessive sensor light, the mutual interference prevention function may not work properly, resulting in malfunction of the unit. In such case, increase the threshold.
- Do not use the unit when EEPROM (non-volatile memory) exceeds its writing life (100,000 times). When you perform setting change, threshold change, tuning, zero reset and so on, the setting information is written.
- Use End Plates (PFP-M: separately sold) at the both ends of the grouped Amplifier Units to prevent them from separating due to vibration or other cause.
- Do not use alcohol, thinner, benzene, acetone, and lamp oil for cleaning.

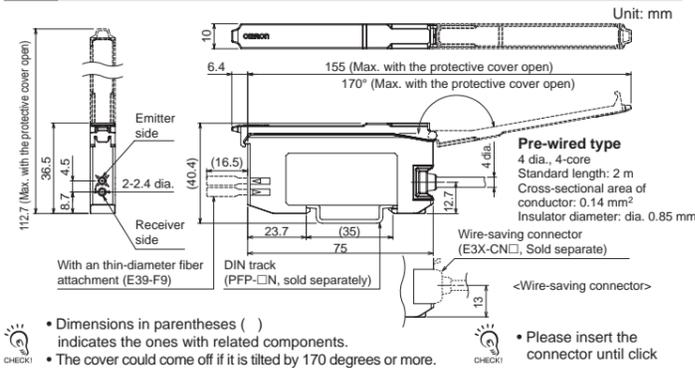
- Please dispose the product with ♻️ on the case in accordance with relevant regulations (laws and regulations)
- The mutual interference prevention function does not work when in combination with series other than E3X-ZV/E3X-MZV series.
- The Communication Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW cannot be connected.
- This product is not equipped with the Auto Power Control (APC) function.
- When being installed with amplifier tightly, connecting up to 16 wire-saving connector is allowed.
- The following notice applies only to products that carry the CE mark.
- NOTICE : In a residential environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Checking the Package Content

- Amplifier Unit: 1
- Instruction Sheet, Compliance sheet

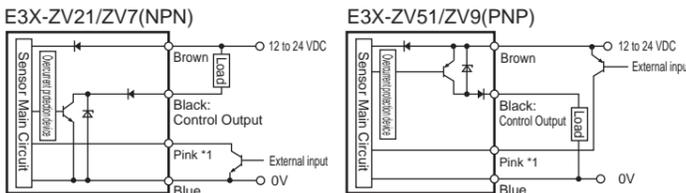
1 Installation

1-1 Dimensions



- Dimensions in parentheses () indicates the ones with related components.
- The cover could come off if it is tilted by 170 degrees or more.
- Please insert the connector until click

1-2 Input / Output Circuit Diagram



*1 For ZV7/ZV9, this will be orange.

1-3 Mounting the Amplifier Unit

Mounting on DIN Track

1. Let the hook on the Amplifier Unit's Fiber Unit connection side catch the track.
2. Push the unit until the hook clicks into place.

- DIN track (PFP-□) is sold separately.
- If there is vibration or when connecting, please use an end plate (PFP-M)

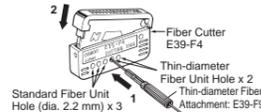
Removing from DIN Track

1. Push the unit in the direction 1.
2. Lift the unit in the direction of arrow 2 while performing step 1.

1-4 Mounting Fiber Unit

Use Fiber Cutter

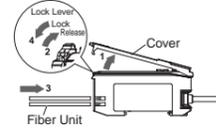
1. Insert a Fiber Unit (which can be freely cut) into a fiber cutter hole as necessary. (Do not use a hole which has been used once.)
2. Press down the blade at a single stroke to cut the Fiber Unit.



Mount Fiber Unit

1. Open the cover.
2. Raise the lock lever. (Release)
3. Insert the Fiber Unit in the fiber unit hole until the Fiber Unit stops at the bottom.
4. Return the lock lever to the original position and fix the Fiber Unit. (Lock)

- To mount the thin-diameter Fiber Unit, an attachment (E39-F9) is required. (The attachment is included with the applicable Fiber Unit.)
- In the case of a coaxial reflective Fiber Unit, insert the single-core Fiber Unit (⊙) with a white line into the upper hole (Emitter side) and the multi-core Fiber Unit (⊕) into the lower hole (Receiver side).



1-5 Ratings and Specifications

Model	E3X-ZV21	E3X-ZV51	E3X-ZV7	E3X-ZV9
Control Input/Output	1 output (NPN) +1 input *1	1 output (PNP) +1 input *1	1 output (NPN) +1 input *1	1 output (PNP) +1 input *1
Connection Method	Pre-wired Type		Wire-saving connector *2	
Light Source (Wavelength)	Red 4-element LED (625 nm)			
Power Supply Voltage	12 to 24 VDC ±10%, ripple (p-p) 10% max.			
Power Consumption	Normal mode: 720 mW max. (Power supply voltage 24 V: Current consumption 30 mA max. / Power supply voltage 12 V: Current consumption 60 mA max.) Eco function ON: 530 mW max. (Power supply voltage 24 V: Current consumption 22 mA max. / Power supply voltage 12 V: Current consumption 44 mA max.) Eco function Standby: 390 mW max. (Power supply voltage 24 V: Current consumption 16 mA max. / Power supply voltage 12 V: Current consumption 32 mA max.)			
Control Output	Load power supply voltage: 26.4 VDC, open collector output type (NPN or PNP output differs depending on the type.) Load current: 100 mA max. (Residual voltage: Load current less than 10 mA: 1 V max., load current 10 to 100 mA: 2 V max.) Off-state current: 0.1 mA max.			
Protection Circuit	Power supply reverse polarity protection, output short-circuit protection and output reverse polarity protection			
Response Time (Operation / Recovery)	Super High-speed Mode (SHS): 50 μs High-speed Mode (HS): 250 μs *3 Standard Mode (STND): 1 ms *4 Giga Power Mode (GIGA): 16 ms			
Mutual Interference Prevention Function	Emission cycle setting switching type (up to 4 units)			
Ambient Illumination	Illumination intensity Incandescent lamp: 20,000 lx max. / Sunlight: 30,000 lx max.			
Ambient Temperature Range	Operating: -25°C to 55°C Storage: -30°C to 70°C (with no icing or condensation)			
Ambient Humidity Range	Operating and storage: 35 to 85% (with no icing or condensation)			
Vibration Resistance	10 to 55 Hz with a 1.5 mm double amplitude for 2 hrs each in X, Y and Z directions			
Shock Resistance	500 m/s ² , for 3 times each in X, Y and Z directions			
Weight (Packed State / Sensor)	Approx. 95g/Approx.65g		Approx. 45g/Approx.20g	
Materials	Case and cover: Polycarbonate (PC), Cable: PVC			

*1. The details regarding input are as follows.

	Contact input (Relay, Switch)	Contactless input (Transistor)	Input time
NPN	ON: Short-circuited to 0 V (Outflow current: 1 mA or less) OFF: Opened or short-circuited to Vcc	ON: 1.5 V or less (Outflow current: 1 mA or less) OFF: Vcc -1.5V to Vcc (Leakage current: 0.1 mA or less)	ON: 100 ms or more OFF: 100 ms or more
PNP	ON: Short-circuited to Vcc (Sink current: 3 mA or less) OFF: Opened or short-circuited to 0 V	ON: Vcc -1.5V to Vcc (Sink current: 3 mA or less) OFF: 1.5 V or less (Leakage current: 0.1 mA or less)	

*2. One of the E3X-CN11 (bus-connector with 3 wires) E3X-CN12 (sub-connector with 1 wire)

*3. Mutual interference prevention function in the Response Time Priority Mode: 2 units: 350 μs; 3 units: 400 μs / In the Unit Number Priority Mode: 4 units: 700 μs

*4. Mutual interference prevention function in the Unit Number Priority Mode: 4 units: 1.6 ms

2 Basic Settings

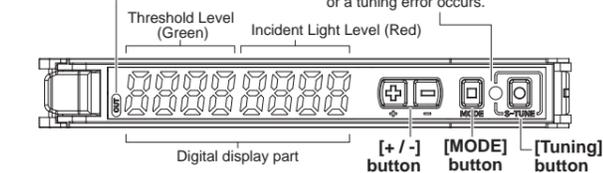
2-1 Names of Each Part

[Output Indicator: Orange]

Indicates the status of control output.
When ON: Lit up / When OFF: Put out

[Smart Tuning Indicator: Green]

Lit up after normal completion of Smart Tuning.
Put out when the detection function is changed or a tuning error occurs.



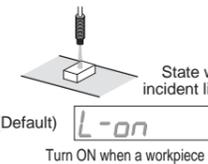
2-2 Basic Settings

Selection of Light ON (L-ON) or Dark ON (D-ON).

Output switching

1. Hold the [MODE] button for 3 seconds or longer to enter the SET Mode.
2. Press the [+/-] button to select the following item.

In the case of diffuse reflection type or limited reflection type



In the case of through-beam type or regressive reflection type



3. Press the [MODE] button for 3 seconds or longer to return to the Detection Mode.

Adjustment of Threshold Level

Minute Adjustment of Threshold Level

Set the threshold level in the Detection Mode.

Press the [+/-] button to adjust the threshold level.

Hold the key for high-speed level adjustment.



2-3 Initialization

Initializing Settings

Setting Reset

Initialize all settings to the factory-set defaults.

1. Hold the [MODE] button for 3 seconds or longer to enter the SET Mode.
2. Press the [MODE] button twice. Display: rSt no
3. Press the [+/-] button once. Display: rSt YES Initialization selected
4. Press the [MODE] button once. Display: i n i t o P Initialization completed

Settings can also be initialized by pressing the MODE button for 7 seconds or longer in the Detection Mode.
Contents saved by User Save Function are not cleared by the setting initialization.

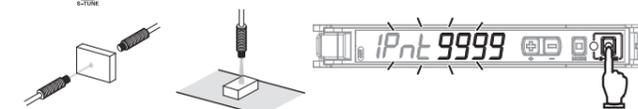
2-4 Basic Smart Tuning Method

Adjust the received light intensity and the threshold to appropriate values through Smart Tuning.

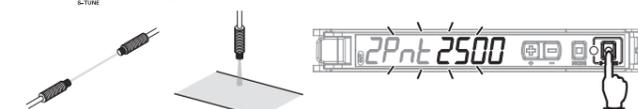
Most Basic Setting Method

2-point Tuning

1. Press the [Tuning] button with a workpiece in the detection area.



2. Press the [Tuning] button again without a workpiece in the detection area.



Incident light level setting: The larger incident level of the Step 1 and 2 values is adjusted to the power tuning level.

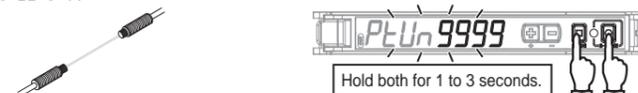
Threshold setting: Set to the middle between the Step 1 and 2 incident light levels.

Step 1 and Step 2 can be reversed.

Making Received Light Intensity Uniform

Power Tuning

1. Hold the [MODE] and [Tuning] buttons for 1 second or longer and release the button when [PtUn] appears.



Incident light level setting: The Step 1 incident level is adjusted to the power tuning level.

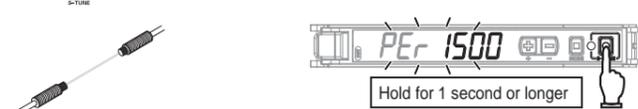
Threshold setting: Not changed. If the value is low, it will be set to the minimum value in which an output is turned ON / OFF correctly.

Perform the procedure with a workpiece in the area for reflective model setting. If the setting is made after position tuning, set both the through-beam model and reflective model with a workpiece. When power tuning ON / OFF setting is OFF, power tuning cannot be performed.

Setting a Threshold with Received Light Intensity Ratio

Percentage Tuning

1. Turn ON Percentage Tuning in SET mode. Refer to "Detailed Settings".
2. Hold the [Tuning] button for 1 second or longer without a workpiece in the area.



Incident light level setting: The Step 2 incident light level is adjusted to the power tuning level.

Threshold setting: Set to [Set received light intensity x Percentage tuning level].

No Smart Tuning other than Power Tuning can be used if Percentage Tuning is set. Set the Percentage tuning level to be below 0 in the case of a through-beam type (Dark ON: D-ON), or to be above 0 in the case of a reflective type (Light ON: L-ON).

3 Convenient Setting Features

3-1 Various Smart Tuning Methods

When Received Light Intensity Decreases due to Dust or Dirt

Maximum Sensitivity Tuning

Long-press the **[S-TUNE]** button for 3 seconds or longer in the presence of a workpiece in the case of through-beam type or without the presence of a workpiece in the case of reflective type, and then take your finger off the button when **[FULL]** is displayed on the green digital display part.

The green digital display changes **[IPnt] → [FULL]**.

Incident light level setting: The incident level when the **[S-TUNE]** button pressed is adjusted to "0".
Threshold setting: The value is set to approx. 7% of the incident light level when the **[S-TUNE]** button pressed.
If the incident light level when the **[S-TUNE]** button pressed is smaller during long distance detection, the minimum value by which an output is correctly turned ON will be set.

Making Adjustment with Passing Workpiece

Full Auto Tuning

Hold the **[S-TUNE]** button without the presence of a workpiece, and pass the workpiece through while **[IPnt] → [FULL] → [Auto]** is displayed in green digital. (Keep holding the **[S-TUNE]** button while the workpiece passes through, and hold 7 seconds or longer until **[Auto]** is displayed in green digital. After the workpiece passes through, release your finger from the **[S-TUNE]** button.)

Incident light level setting: Adjust the max. incident light level while pressing the **[S-TUNE]** button as the power tuning level.
Threshold setting: Set to the middle between max. and min. incident light levels while pressing the **[S-TUNE]** button.

Determine Workpiece Position

Position Tuning

- Press the **[S-TUNE]** button without a workpiece in the area.
The green digital display changes **[IPnt]**.
- Place the workpiece at the desired position and hold the **[S-TUNE]** button for 3 seconds or longer.
The green digital display changes **[ZPnt] → [Po5]**.

Incident light level setting: The Step 2 incident level is adjusted to half the power tuning level.
Threshold setting: Set to the same value as the Step 2 incident level.

3-2 Convenient Settings

Preventing Malfunction

Key Lock Function Disables all button operations.

Enable / Cancel (Same procedure) **[LoC on]**

Hold both the **[+]** button and the **[S-TUNE]** button for 3 seconds or longer.

* Press either of the **[+]** or **[-]** button.

Returning Received Light Intensity Display to "0"

Zero Reset Function

Enable **[2000 0]** Cancel **[6000 4000]**

Hold both the **[+]** button and the **[S-TUNE]** button for 3 seconds or longer.

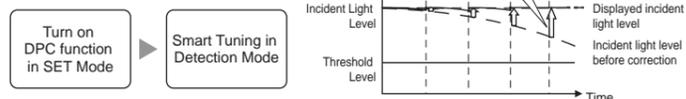
Hold both the **[+]** button and the **[S-TUNE]** button for 3 seconds or longer.

The zero reset function is canceled when either of the DPC function / differential function / Smart Tuning is performed. When DPC (ATC) function or the differential output modes are performed, the zero reset cannot be performed.

For Stable Detection Regardless of Received Light Intensity Changed due to Dust or Dirt

DPC Function (Dynamic Power Control)

Use this function with through-beam type or regressive reflection type.



Turn on DPC function in SET Mode → Smart Tuning in Detection Mode

Set output switching to D-ON (Dark ON). When power tuning ON / OFF setting is OFF, Smart Tuning is in error or maximum sensitivity tuning is executed, the DPC function is disabled. DPC function does not work depending on the setting. When the Smart Tuning indicator is lit up and the DPC function is set to ON, the DPC function works.

If the threshold level must be changed according to the change in the received light intensity, the ATC Function (Active Threshold Control) can be used instead. (Make the ratio of the received light intensity to the threshold level constant.) The ATC function is enabled when the DPC function is set to ATC in the SET Mode and the Smart Tuning is executed in the Detection Mode. Other restrictions conform to those for the DPC function.

4 Maintenance

4-1 Troubleshooting

Troubleshooting

Problem	Cause	Remedy
Nothing is shown on the indication.	No power supplied or the cable broken	Check the wiring, connector connection, power supply voltage and power supply capacity again. *1
Nothing is shown on the digital indication.	Eco mode is ON.	Turn OFF Eco mode. *2
The segment of the fourth digit of the threshold value lights in sequence and "5b5" is displayed when the button is pressed	Standby is selected for Eco Function and the external input signal is enabled.	Disable the external input signal and turn OFF Eco mode. *2
Sensing / Detection not possible despite the minimum threshold level	Detection distance for Fiber Head is insufficient, Fiber Head is not deeply inserted, or dust, dirt or Emission Level Adjustment Function has caused this trouble.	Install a Fiber Head, or check the insertion into the fiber amplifier again. Furthermore, try to set to GIGA Mode or Emission Level Adjustment Function. *2
The OUT indicator blinking	Affected by mutual interference or size or passing speed of workpiece.	When multiple Fiber Heads are installed, check the setting for mutual interference prevention. *2 Furthermore, try setting of GIGA Power Mode when the received light intensity is insufficient, or try settings such as OFF-delay Timer for prevention of output chattering. *2
Incident light level displayed in a negative value	The zero reset function is enabled.	Cancel the zero reset function. *3
Lost tracking of the settings made	-	Reset the settings. *4
The light intensity level display changes.	Affected by dust or dirt, temperature change, vibration, etc.	The receiving light intensity display is stabilized using the DPC function. *3
The Smart Tuning indicator does not light up	A tuning error has occur or a cause of the error has not been resolved. Alternatively, Power tuning ON / OFF setting is OFF.	Check the description of tuning error, take corrective action, and then perform Smart Tuning again. *5 Alternatively, reset the settings and then perform Smart Tuning again. *4
The incident light level at which the output turns ON and turns OFF is different.	To prevent output chattering, hysteresis is set automatically.	If this difference in detection is large, the margin of detection may be low. Review the installation and response time of the Fiber Head, and perform Smart Tuning again. *5

*1. Refer to "1-2 Input / Output Circuit Diagram" *2. Refer to "10 Detailed Settings" *3. Refer to "3-2 Convenient Settings" *4. Refer to "2-3 Initialization" *5. Refer to "2-4 Basic Tuning Method", "3-1 Various Tuning Methods"

Error Display

Error Name / Display	Cause	Remedy
Load Short Circuit Detection Error [E-St]	Over current flowing to the control output.	Check wiring and connector connection again. *1
Lock ON [LoC on]	The key lock function enabled	Cancel the key lock function. *2
DPC Error [dPC Err]	The incident light level has deteriorated due to dust or dirt. Or DPC/ATC does not work.	Wipe the dust off the Fiber Unit detection surface or other relevant areas and recover the original incident light level. Then, perform Smart Tuning. *3 Or check the settings again. *2
ATC Error [ATC Err]	-	-
EEPROM Error [E-nE *]	Failed internal data read / out	Turn ON the power again. If the error is not corrected, Hold the [S-TUNE] button for 3 seconds or longer → Push the [S-TUNE] button twice → Push the [+] button once → Push the [S-TUNE] button once, and reset settings. If the error remains, the error is caused by memory failure such as rewrite count exceeded. Please replace the amplifier unit.

*1. Refer to "1-2 Input / Output Circuit Diagram", 1-5 Ratings and Specifications" *2. Refer to "3-2 Convenient Settings" *3. Refer to "2-4 Basic Tuning Method", "3-1 Various Tuning Methods"

Tuning Error

Error Name / Display	Cause	Remedy
Near Error [nEAR Err]	The light level difference between Points 1 and 2 is extremely small.	Change the detection function to the mode of slower response time. Narrow the distance between emitter and receiver. (Through-beam model) Move the Fiber Head closer to the sensing object. (Reflection model)
Low Error [Lo Err]	Incident light level is too low.	Widen the distance between emitter and receiver. (Through-beam model) Move the Fiber Head away from the sensing object. (Reflection model) Use a thin-diameter Fiber.
Over Error [ouEr Err]	Incident light level is too high.	Widen the distance between emitter and receiver. (Through-beam model) Move the Fiber Head away from the sensing object. (Reflection model) Use a thin-diameter Fiber.
Percentage Tuning Error [PEr Err]	Incident light level is too high or low.	Make the distance between emitter and receiver closer. (Through-beam model) Check the Light ON (L-ON) or Dark ON (D-ON) and the percentage tuning level of the output settings again.

5 Detailed Settings

Hold **[MODE]** button for 3 seconds or longer to enter SET mode. SET mode provides the following function settings. Contents on the leftmost side of each item (thick-frame parts) are factory defaults.

Press and hold the **[MODE]** button for 3 seconds or longer in the setting mode to switch to the detection mode.

- Output Switching** Switching between Light ON (L-ON) and Dark ON (D-ON)
L-on → d-on
- Detection Function** Changing Light Level and Response Time (Incident Light Level Example)
HS High-speed Mode: HS 100, STND Standard Mode: STnd 100, GIGA Giga Mode: GIGA 800, SHS Super High-speed Mode: SHS 24
Response time: HS 250µs, STND 1ms, GIGA 16ms, SHS 50µs
Light quantity 1 (reference): x1, x8, x0.24
- Setting Initialization** Initializing all settings to factory-set defaults
rst no → rst YES → ini t ok
- Selection of EASY / PRO Mode** Changing settings of 5 to 16
EASY → Pro
- Delay Timer Function** Setting Output Timer
dELy toFF → dELy off d → dELy on d → dELy SHot
- Power Tuning ON / OFF Setting** To Turn ON / OFF the Light Amount Adjustment at Smart Tuning
PtUn on → PtUn Pon → PtUn off
- Power Tuning Level** Changing the Target Incident Light Level (Power Tuning Level)
P-Lu 9999
- Percentage Tuning** Detecting Transparent or Microscopic object
PEr off → PEr on
- DPC Function** Stable Detection Regardless of Incident Light Level Change
dPC off → dPC on → dPC ATC
- Mutual Interference Prevention Function** Installing multiple Fiber Heads next to each other
FrE9 off → FrE9 on → FrE9 FASt
- Output Mode** Changing Output Mode
out St d → out d: F1 → out d: F2 → out d: F3 → out d: F4 → out d: F5

- External input** Changing the type of external input
Input OFF → in off → in tUnE → in PtUn
- Emission Level Adjustment Function** Increasing / decreasing emission power
L 100 9999 → Emission Level
- Digital Display** Changing Digital Display in RUN Mode for Specific Purpose
di SP St d → di SP PEr → di SP P-b → di SP bAr → di SP FrE9 → di SP PEr d
- Inverted Display** Mounting Amplifier in Inverted Direction The display reverses.
Normal → Reverse
- Eco Function** Saving Power Consumption
Eco off → Eco on → Eco Stby
- User Save / Reset Functions** Saving / Reading Settings
USER no → USER SAve → USER rSt

Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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