### Smart Fiber Amplifier

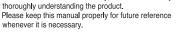
# OMRON

# E3X-MZV 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
- Please keep this manual properly for future reference





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ndicates a potentially hazardous situation which, if not avoided, WARNING 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.



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
- Do not install the product in the following locations.

  (I) 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 exceding the spec

  (5) Locations subject to exposure to water, oil, chemicals (6) Locations subject to steam

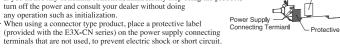
  (7) Locations subject to strong magnetic field or electric field (8) In water, rainfail or outdoors

  (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 High-Voltage lines and power lines must be wired separately from this product. Wiring them together or
- 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 disco
- 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



### 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; pressure: 20N; 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 aviode miswiring.

- 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 alcohole, thinner, benzine, acetone, and lamp oli for cleaning.
- Please dispose the product with 2 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 The mutual interference pre 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.

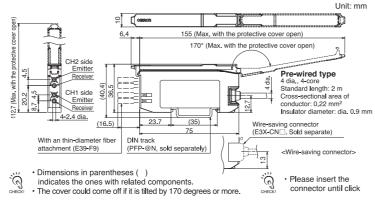
  NOTICE: In a residential environment, this product may cause radio interfernce, in which case the user may be
- required to take adequate measures

### **Checking the Package Content**

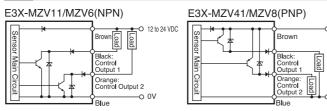
• Amplifier Unit: 1 • Instruction Sheet, Compliance sheet

# Installation

### 1-1 Dimensions



## 1-2 Input / Output Circuit Diagram



## 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-□N) is sold separately. If there is vibration or when connecting Please use an end plate (PFP-M)

### ■ Removing from DIN Track

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

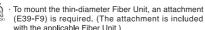


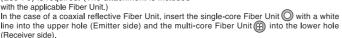
#### Use Fiber Cutter

- 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

- Open the cove
- 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)





E3X-MZV11 E3X-MZV41 E3X-MZV6 E3X-MZV8

# 1-5 Ratings and Specifications

Control Output	2 outputs (NPN)	2 output (PNP)	2 output (NPN)	2 output (PNP)
Connection Method	Pre-wired Type Wire-saving connector *1		tor *1	
Light Source (Wavelength)	Red 4-element LED (625 nm)			
Power Supply Voltage	12 to 24 VDC ±10%, ripple (p-p) 10% max.			
	Normal mode: 820 mW max. (Power supply voltage 24 V: Current consumption			
Power Consumption	35 mA max. / Power supply voltage 12 V: Current consumption 69 mA max.)			
	Eco function ON: 600 mW max. (Power supply voltage 24 V: Current consumption			
	25 mA max. / Power supply voltage 12 V: Current consumption 50 mA max.)			
	Load power supply voltage: 26.4 VDC, open collector output type			
	(NPN or PNP output differs depending on the type.)			
Control Output	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			
Frotection Circuit	output reverse polarity protection			
	Super High-speed Mode (SHS): 100 μs			
Response Time	High-speed Mode (HS): 250 μs *2			
(Operation / Recovery) Standard Mode (STND): 1 ms *3 Giga Power Mode (GIGA): 16 ms				
Mutual Interference Prevention Function	Emission cycle setting switching type *4			
Ambient Illumination	Illumination intensity Incandescent lamp: 20,000 lx max. / Sunlight: 30,000 lx max			
Ambient Temperature	Operating: -25°C to 55°C			
Range	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/s², for 3 times each in X, Y and Z directions			
Weight (Packed State / Sensor)	Approx. 100 g / App		Approx. 45g/Approx	.20g
Materia <b>l</b> s	Case and cover: Po	lycarbonate (PC), Ca	able: PVC	

\*1. One of the E3X-CN21 (bus-connector with 4 wires) E3X-CN22 (sub-connector with 2 wires)
\*2. When using Mutual interference prevention function: 700 µs
\*3. When using Mutual interference prevention function: 1.6 ms
\*4. Up to 2 units for E3X-MZV. Or, up to 2 units for E3X-ZV (the Unit Number Priority Mode), and 1 unit for E3X-MZV.

# 2 Basic Settings

Setting/operation/tuning is possible for CH1/CH2 individually. CH1/2 individual setting Select which CH to be targeted first

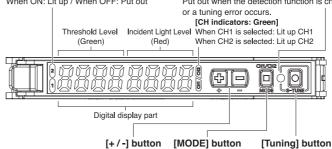
CH common setting It is a common setting/operation for CH1/CH2.

# 2-1 Names of Each Part

# [Output 1/2 Indicator: Orange]

When ON: Lit up / When OFF: Put out

[Smart Tuning Indicator: Green] Indicates the status of control output 1 and 2. Lit up after normal completion of Smart Tuning. Put out when the detection function is changed



## 2-2 Basic Settings

## Select which fiber unit to set (selection of CH1 or CH2)

### CH switching

1. Press the D button for shorter than 1 second to select CH1/CH2.

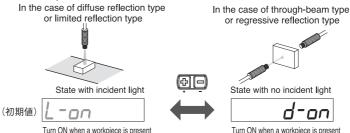




When selecting CH2 

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

- Output switching [CH1/2 individual setting]
- 1. Hold the D button for 3 seconds or longer to enter the SET Mode.
- 2. Press the 🗗 🖻 button to select the following item.



3. Press the Dutton for 3 seconds or longer to return to the Detection Mode.

# Adjustment of Threshold Level

#### Minute Adjustment of Threshold Level CH1/2 individual setting Set the threshold level in the Detection Mode.

Hold the key for high-speed Press the 🗗 🖃 button to adjust the threshold level. level adjustment The threshold level becomes higher. The threshold level becomes lower.



# 2-3 Initialization

## **Initializing Settings** Setting Reset CH common setting

Initialize all settings to the factory-set defaults

1. Hold the button for 3 seconds or longer to enter the SET Mode.

2. Press the D button twice. 3. Press the 🗗 🗖 button once.



4F5 Initialization selected □ Initialization completed

4. Press the 🗖 button once

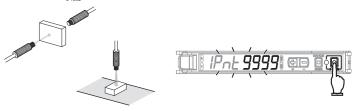
Settings can also be initialized by pressing the MODE button for 7 seconds or longer in the Detection Mode. Contents saved by User Save Function are not cleared by the setting initialization.

# 2-4 Basic Smart Tuning Method

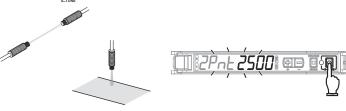
Adjust the received light intensity and the threshold to appropriate values through Smart Tuning.

## Most Basic Setting Method

- 2-point Tuning CH1/2 individual setting
- 1. Press the button with a workpiece in the detection area.



2. Press the 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 CH1/2 individual setting
- 1. Hold the o and o 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 CH1/2 individual setting
- Refer to "S Detailed Settings". 1. Turn ON Percentage Tuning in SET mode.
- 2. Hold the o 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).

# **Convenient Setting Features**

### 3-1 Various Smart Tuning Methods

## When Received Light Intensity Decreases due to Dust or Dirt

Maximum Sensitivity Tuning CH1/2 individual setting

Long-press the 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 [ IPnŁ]→[FULL].

Incident light level setting: The incident level when the button pressed is adjusted to "0". Threshold setting: The value is set to approx. 7% of the incident light level when the button pressed. If the incident light level when the D 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 CH1/2 individual setting

Hold the D button without the presence of a workpiece, and pass the workpiece through while  $[P_{n}E] \rightarrow [FULL] \rightarrow [RUE_{a}]$  is displayed in green digital. (Keep holding the D button while the workpiece passes through, and hold 7 seconds or longer until [ AULa] is displayed in green digital. After the workpiece passes through, release your finger from the D button.)

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

### **Determine Workpiece Position**

Position Tuning CH1/2 individual setting

1. Press the button without a workpiece in the area.

The green digital display changes [ IPnE].

2. Place the workpiece at the desired position and hold the D button for 3 seconds or longer. The green digital display changes  $[2PnE] \rightarrow [Po5]$ .

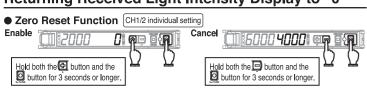
Incident light level setting: The Step 2 incident level is adjusted to half the power tuning level. Threshold setting: Set to the same value as the Step 2 incident level.

# 3-2 Convenient Settings

### **Preventing Malfunction**

● Key Lock Function CH common setting Disables all button operations.
Enable / Cancel (Same procedure)  Hold both the button and the button for 3 seconds or longer.  * Press either of the + or - button.

### Returning Received Light Intensity Display to "0"



The zero reset function is canceled when either of the DPC (ATC) function / differential function / Smart Tuning is performed. When DPC (ATC) function is performed and in the differential setting, the zero reset cannot be performed.

When released, [ Ir5L oFF] is displayed. The threshold also changes accordingly. The lower threshold limit is -1999.

### Stable Detection Describes of Descrived Light Intensity Changed due to Duet or Dirt

For Stable Detection	Regardless of Re	eceived Ligh	it Intensity Changed due to	o Dust or Dirt
● DPC Function (D	ynamic Power	Control)	CH1/2 individual setting	
Use this function v regressive reflection		m type or	Stabilizes the displayed incident level by correcting internal incident level changes.	
Turn on (		Incident Light Level		<ul> <li>Displayed incident light level</li> </ul>
DPC function in SET Mode	Smart Tuning in Detection Mode	Threshold - Level		Incident light level before correction
Set output switchi	ng to D. ON (Dark (	ONI) Whom no	wer tuning ON / OFF setting is	Time

- 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.

# 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
Sensing / Detection not possible despite the minimum threshold level		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. *3
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. "3 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. "3
Incident light level displayed in a negative value	The zero reset function is enabled.	Cancel the zero reset function. *4
Lost tracking of the settings made	-	Reset the settings. *5
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. *4
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. *6 Alternatively, reset the settings and then perform Smart Tuning again. *5

- \*1. Refer to "① 1-2 Input / Output Circuit Diagram" \*2. Refer to "⑤ Detailed Settings"

#### Error Display

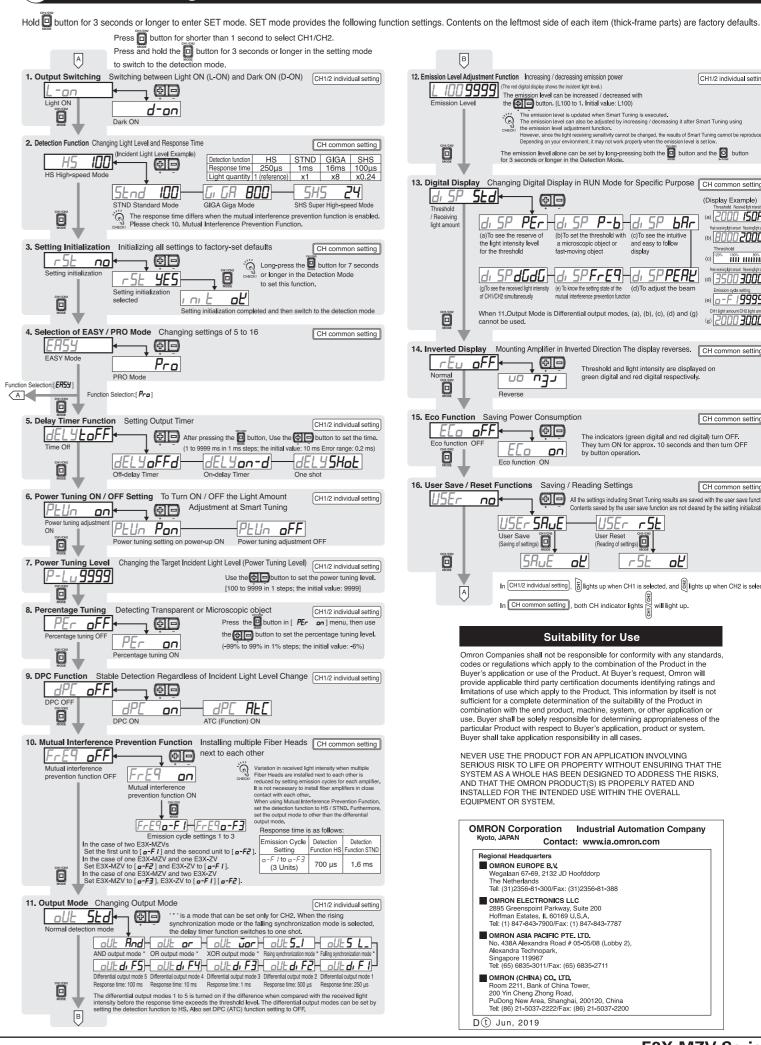
Error Name / Display	Cause	Remedy
Load Short Circuit Detection Error	Over current flowing to the control output.	Check wiring and connector connection again. *1
Lock ON	The key lock function enabled	Cancel the key lock function. *2
ATC Error  ATC Error  ATC Error	The incident light level has deteriorated 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
EEPROM Error  E - TE *  The asterisk * represents a number.	Failed internal data read / out	Turn ON the power again. If the error is not corrected, Hold the □ button for 3 seconds or longer → Push the □ button once → Push the □ 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.

<sup>\*1.</sup> Refer to "0 1-2 Input / Output Circuit Diagram", 1-5 Ratings and Specifications" \*2. Refer to "3 3-2 Convenient Settings" \*3. Refer to "3 2-4 Basic Tuning Method, 3 3-1 Various Tuning Methods"

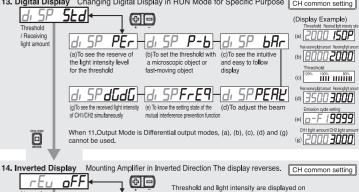
#### Tuning Error

Error Name / Display	Cause	Remedy
Near Error	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	Incident light level is too low.	
Over Error	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)
Percentage Tuning Error	Incident light level is too high or low.	Lise a thin-diameter Fiber     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



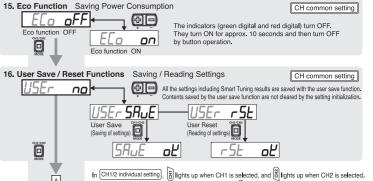




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Threshold and light intensity are displayed on

green digital and red digital respectively.



# Suitability for Use

In CH common setting, both CH indicator lights will light up.

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.

