

# Smart Laser Amplifier E3NC-LA0

# OMRON

## 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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### PRECAUTIONS ON SAFETY

#### Meanings of Signal Words

**WARNING** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in 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.



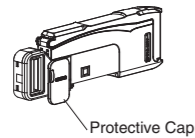
### PRECAUTIONS FOR SAFE USE

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.
  - Locations subject to direct sunlight
  - Locations subject to condensation due to high humidity
  - Locations subject to corrosive gas
  - Locations subject to vibration or mechanical shocks exceeding the rated values
  - Locations subject to exposure to water, oil, chemicals
  - Locations subject to steam
  - Locations subjected to strong magnetic field or electric field
- Do not use the product in environments subject to flammable or explosive gases.
- Do not use the product in 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.
- 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. Use caution when operating or cleaning the product.
- 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.

### PRECAUTIONS FOR CORRECT USE

- Do not miswire such as the polarity of the power supply.
- Be sure to mount the unit to the DIN track until it clicks.
- To prevent electric shock or short circuit, put a protection cap on unused connection power supply terminals.



- Do not apply excessive force (9.8N max.) such as tension, compression or torsion to the connector of the sensor head that is fixed to the amplifier unit.
- Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
- It may take time until the received light intensity and measured value become stable immediately after the power is turned on depending on use environment.
- The product is ready to operate 200 ms after the power supply is turned ON.
- The Mobile Console E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S cannot be connected.
- The mutual interference prevention function does not work when in combination with E3C/E2C/E3X.
- 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.
- Sensor communication unit E3NW can be used. E3X-DRT21-S and E3X-CRT/ECT cannot be used.
- If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke, immediately stop using the product, turn off the power, and consult your dealer.
- Do not use thinner, benzene, acetone, and lamp oil for cleaning.

### Checking the Package Content

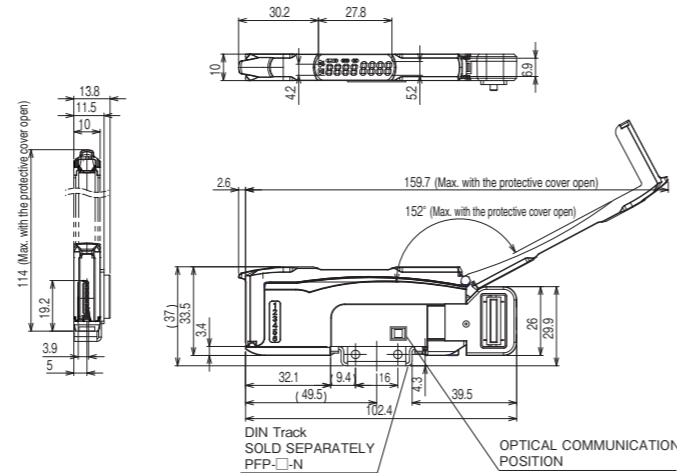
- Amplifier Unit: 1
- Instruction Sheet (this sheet): 1 (Japanese, English and Chinese)

### Compatible Communication Unit (Sold Separately)

E3NW Series Communication Unit, Distribution unit E3NW-DS

## 1 Installation

### 1-1 Dimensions

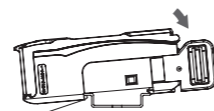


Dimensions in parentheses () indicates the ones with related components. Unit: mm

### 1-2 Mounting the Amplifier Unit

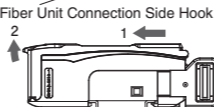
#### Mounting on DIN Track

- Let the hook on the Amplifier Unit's Sensor Head connection side catch the track.
- Push the unit until the hook clicks into place.



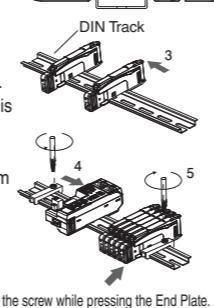
#### Removing from DIN Track

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



#### Joining Amplifier Units

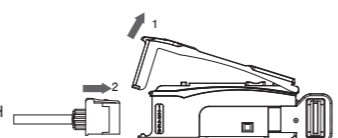
- Mount the Amplifier Units one at a time onto the DIN track. Slide the Amplifier Unit until the communication connector is closely attached. (Arrow 3)
- Use End Plates (PFP-M; separately sold) at the both ends of the grouped Amplifier Units to prevent them from separating due to vibration or other cause. (Arrow 4)
- Tighten the screw on the End Plates using a driver. (Arrow 5)



Up to 30 Amplifier Units can be connected to E3NW Series Communication Unit. Under environments such as vibration, use an End Plate even with a single amplifier unit.

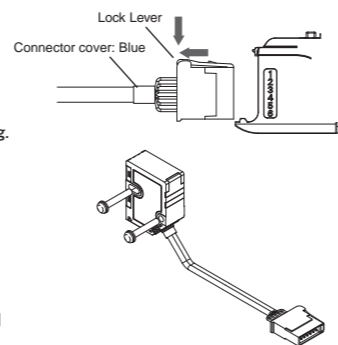
### 1-3 Mounting the sensor head

- Open the protection cover.
- Insert the sensor head, with the lock lever on its connector area facing upward, all the way into the connector port. The color of the connector cover for E3NC-LH is blue. Make sure to avoid misconnection by confirming the cover color in advance. To remove it, press and hold the lock lever then pull the sensor head out.



Fix the sensor head with M3 screws. Apply tightening torque of 0.5N · m for fixing.

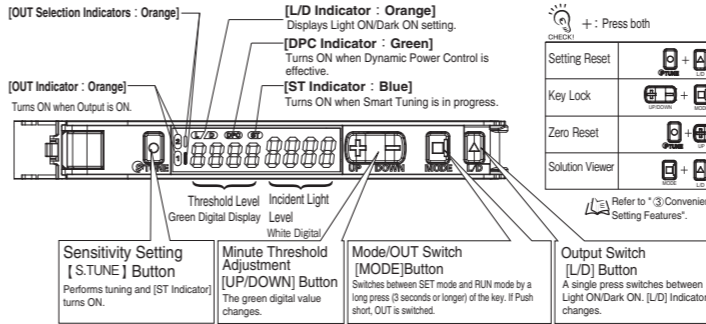
- Do not touch the emitter and receiver areas of the sensor head. A fingerprint may prevent proper measurement. If you accidentally touch it, use a soft cloth to wipe it out.
- Fix the connector area so that it should not be affected by oscillation and impact.



## 2 Settings

For settings with the Communication Unit, refer to the User's Manual that comes with the Communication Unit.

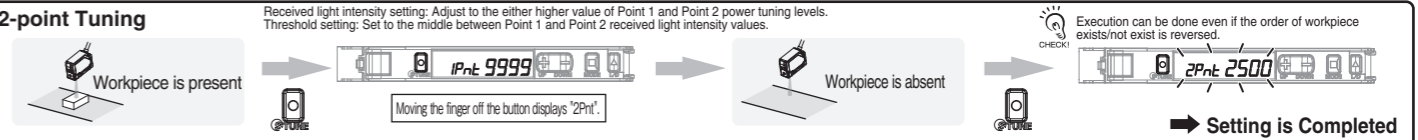
### 2-1 Setting and Display Overview



### 2-4 Smart Tuning [Easy Sensitivity Setting]

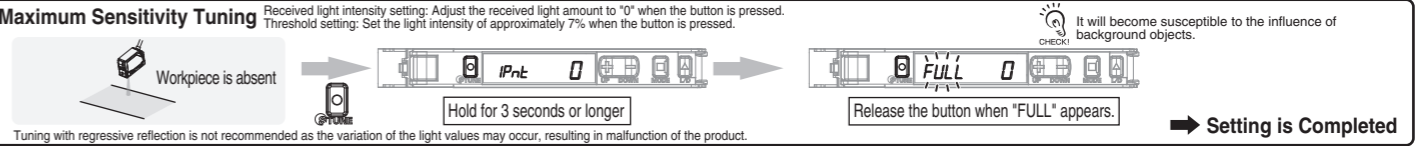
#### Basic Setting

##### 2-point Tuning



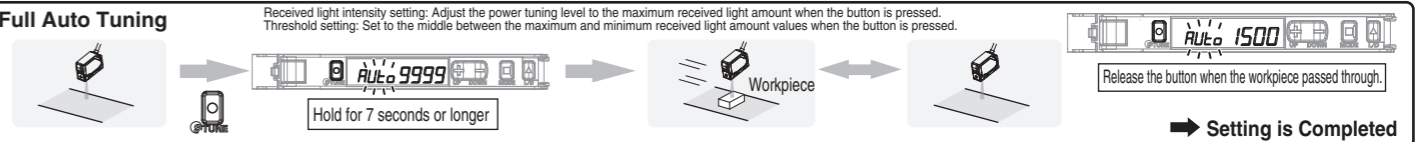
#### Enhancing Durability of the Head against Dust and Stain

##### Maximum Sensitivity Tuning



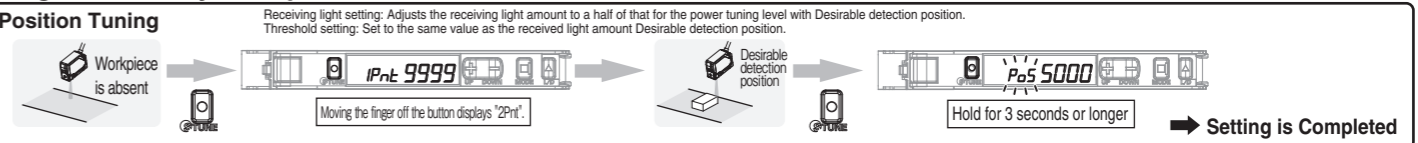
#### Setting for a Moving Workpiece

##### Full Auto Tuning



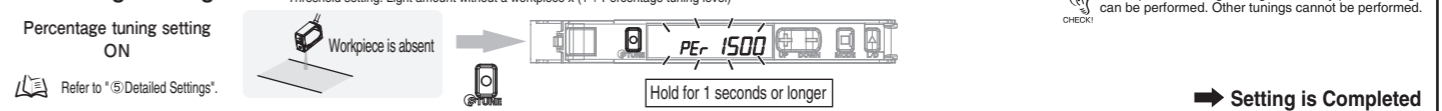
#### Setting to Detect by Workpiece Position

##### Position Tuning



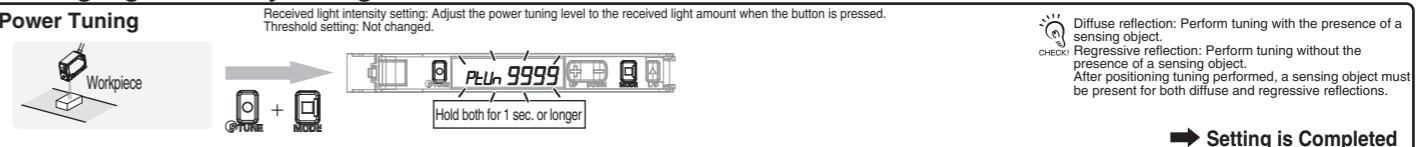
#### Detecting a Transparent or Microscopic Object

##### Percentage Tuning



#### Initializing Light Intensity Changed Due to Dust or Dirt

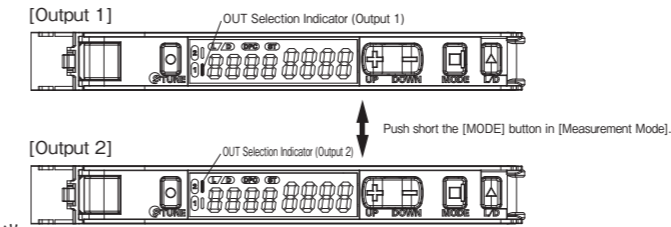
##### Power Tuning



### 2-5 Output switching

#### OUT Selection Indicator switches to switch the settings.

- Push short the [MODE] button in [Measurement Mode].
- OUT Selection Indicators (Output 1/Output 2) switch.

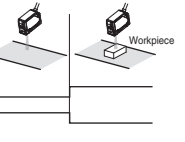


L/D switching can be performed on Output 2 as well. (Refer to 2-2)

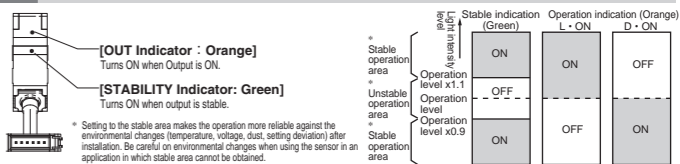
### 2-2 Switching Control Output

Press **LD** button.

Set to "Light ON" to turn the output ON with a workpiece in the detection area. [L/D Indicator] turns ON. Set to "Dark ON" to turn ON the output without a sensing object. [L/D Indicator] turns ON.



### 2-3 Sensor Head Display



### 2-6 Minute Adjustment of Threshold Level

Press **UP/DOWN** button to adjust the threshold level. Hold the key for high-speed level adjustment.

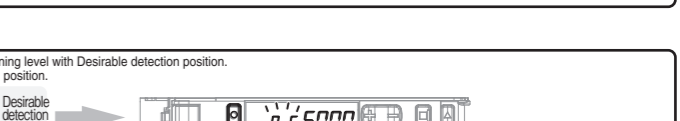


### 2-6 Smart Tuning Error

| Error / Display / Cause  | Error Origin Tuning Type                                 | Remedy   |
|--|--|--|
| Near Error<br>nEr- Err<br>The light level difference between Points 1 and 2 are extremely small. | 2-point Tuning<br>Full Auto Tuning<br>Positioning Tuning | •Change the detection function to the mode of slower response time.<br>•Move the Sensor Head closer to the sensing object. |
| Over Error<br>ouEr Err<br>Incident light level is too high.                                      | All  | •Move the Sensor Head away from the sensing object.  |
| Low Error<br>Lo Err<br>Incident light level is too low.  | Other than maximum sensitivity tuning                    | •Move the Sensor Head closer to the sensing object.  |

### 2-6 Minute Adjustment of Threshold Level

The threshold level becomes higher. The threshold level becomes lower.



### 3 Convenient Setting Features

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

**● DPC Function**  
Use of the DPC function with through-beam model or regressive reflection model is recommended.

The DPC indicator turns ON when the DPC function is effective.

Smart Tuning → Run → SET mode → Select → DPC Function ON

Refer to "2-2 Settings".

When smart tuning is in error/maximum sensitivity tuning is executed/the 1st point of the position tuning is smaller/check area detection mode, the DPC function is disabled.

#### Initializing Settings

**● Setting Reset** Initialize all settings to the factory-set defaults.

#### Saving/Reading Settings

**● User Save Function/User Reset Function** While pressing [S.TUNE], press and hold the [L/D] button for 3 or more seconds.

**User Save Function**  
[S.TUNE] → [L/D] → [SALe YES]

**User Reset Function**  
[S.TUNE] → [L/D] → [rSt USER]

#### Preventing Malfunction

**● Key Lock Function** Disables all the button operations.

Enable/Cancel (The same procedure)

\* Press either of UP/DOWN.

### 4 Maintenance

#### 4-1 Troubleshooting

| Problem   | Cause   | Remedy  |
|---|---|---|
| Nothing is shown on the indication.                                 | No power supplied or the cable broken.                                | Check the connection of the connector between the Communication Unit and Amplifier.                                 |
| Nothing is shown on the digital indication.                         | Eco mode is ON.   | Turn OFF Eco mode.<br>Refer to "5 Detailed Settings".   |
| Sensing/Detection not possible despite the minimum threshold level. | Detection set to a small light level mode<br>Dust or dirt influences. | Setting GIGA Mode increases emission power and light intensity.<br>Refer to "5 Detailed Settings".                  |
| The operation indicator blinking.                                   | Mutual interference or other reason.                                  | Check the Amplifier Units mounted in a group and turn ON the power again.<br>Refer to "1-2 Mounting Amplifier Unit" |
| Incident light level displayed in a negative value.                 | The zero reset function is enabled.                                   | Cancel the zero reset function.<br>Refer to "3 Convenient Setting Features"   |
| Laser is not emitted.<br>[LoFF] appears in the display.             | Is an LD-OFF command sent from the Communication Unit?                | Check whether the LD-OFF command is sent from the Communication Unit.   |
| Lost tracking of the settings made.                                 | -   | Reset the settings.<br>Refer to "3 Convenient Setting Features"   |

For information on troubleshooting with Communication Unit, refer to the User's Manual provided with the Communication Unit.

**● Error Display**

| Error Name / Display                            | Cause  | Remedy   |
|---|--|--|
| DPC Error<br>2000 4000                          | The incident light level has deteriorated due to dust or dirt. | Wipe the dust off the Fiber Unit detection surface or other relevant areas and recover light level. Then, perform Smart Tuning.<br>Refer to "2-4 Smart Tuning" |
| Amp EEPROM time-out error<br>E-rE 01            | Failed internal data read/out.                                 | Turn ON the power again. Reset the settings if the error is not corrected.<br>Refer to "3 Convenient Setting Features"   |
| Amp EEPROM checksum error<br>E-rE 02            | Failed internal data read/out.                                 | Turn ON the power again. Reset the settings if the error is not corrected.<br>Refer to "3 Convenient Setting Features"   |
| Lock ON<br>LoL on                               | The key lock function enabled.                                 | Cancel the key lock function.<br>Refer to "3 Convenient Setting Features"  |
| Load short circuit detection error<br>E-St 4000 | The judgment output line is short circuited.                   | Check the connection of the connector between the Communication Unit and Amplifier.  |
| Overcurrent protection error<br>E-Hd CUr        | Overcurrent is carried to the control output.                  | Check the connection of the connector between the Communication Unit and Amplifier.  |

\* The DPC indicator blinks.

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

**● Zero Reset Function**

Enable: Hold both for 3 sec. or longer → [MODE] → [L/D] → [0]

Cancel: Hold both for 3 sec. or longer → [MODE] → [L/D] → [6000 4000]

The threshold also changes accordingly. The lower threshold limit is -1999.

The zero reset is cancelled when DPC function/smart tuning is executed.

#### For Output When Received Light Intensity is Within the Area

**● Area Detection Mode**

- Select (Setting Mode) - [OUT1 Mode] - [Area Detection Mode]. Pressing the [MODE] button for 3 seconds or longer exits the SET mode.
- Press the [MODE] button in [Measurement Mode] to display "OUT1 HIGH" and "OUT1 LOW". Green digital indicator shows HIGH and LOW.
- Provide Smart Tuning to each of HIGH/LOW thresholds by pressing the [S.TUNE] button.

In tuning by percent, the thresholds are set as follows:  
HIGH: Received light intensity in 3. × Received light intensity in 3. × Absolute value of percent tuning level  
LOW: Received light intensity in 3. × Received light intensity in 3. × Absolute value of percent tuning level

Control output ON for Light-on OFF  
Control output ON for Dark-on OFF

#### Checking Received Light Intensity When Workpiece Passes at High Speed

**● Change finder**

- Select (Setting Mode) -> [Digital Display] to set [diSP CFdr].
- Press the [MODE] button for at least 3 seconds to exit SET mode.
- Let the workpiece pass.
- Displays the light intensity (maximum/minimum value) for 0.5 seconds when the workpiece passes.

The maximum value and minimum value are displayed with Light-ON and Dark-ON respectively.

#### Determining If Workpiece is Detectable

**● Solution Viewer**

- Press both the [MODE] and [L/D] buttons for at least 3 seconds to set to [SoLU on]. To release the setting, press the [MODE] and [L/D] buttons for at least 3 seconds to set to [SoLU off].
- Let the workpiece pass.
- Passing time and light amount difference are displayed.

Passing time (ms or μs) Light amount difference (ms or μs)

### 5 Detailed Settings

Hold [MODE] button for 3 seconds or longer to enter SET mode. The OUT Selection Indicators show items for Output1/Output 2 individually for each output.

SET mode provides the function settings described hereafter. The initial display shown after transition from one function to another represents the factory default.

**1. Function Selection** Enabling 6 to 14

Basic setting: [FuNc dFLt] → Detailed setting: [FuNc oPt]

**2. Detection Function** Changing Incident Light Level and Response Time

| Detection function | HS     | STND | GIGA | SHS   |
|--------------------|--------|------|------|-------|
| Response time      | 250 μs | 1ms  | 16ms | 80 μs |
| Light quantity     | x2     | x8   | x64  | x1    |

HS High-speed Mode, STND Standard Mode, GIGA Giga Mode, SHS Super High-speed Mode

**3. DPC Function** Stable Detection Regardless of Incident Light Level Change

[dPC oFF] → [dPC on]

**4. Timer Function** Setting Output Timer (Two outputs are displayed)

Time Off: [LoFF ---] → [MODE] → [aOFF] → [an-d] → [Shot] → [onaF]

(a) Off-delay Timer: Holds the output ON for a specified time when the detection time is too short.

(b) On-delay Timer: Delays the output ON after detection.

(c) One-shot: Keeps the output ON for a specified time regardless of the workpiece size variations.

(d) ON/OFF-delay Timer: Sets both OFF-delay Timer and On-delay Timer.

**5. Power Tuning Level** Changing the Target Incident Light Level (Power Tuning Level)

Use [MODE] button to set the power tuning level. (0 to 9999 in 1 steps; the initial value: 9999)

[P-Lu 9999]

**6. BANK Switching** Set values are saved for each configured bank.

[bAnk 1] → [bAnk 2] → [bAnk 3] → [bAnk 4]

**7. Power Tuning ON/OFF Setting** To Turn ON/OFF the Light Amount Adjustment at Tuning

[PtUn on] → [PtUn off]

**8. Percentage Tuning** Detecting Transparent or Small Workpiece (Two outputs are displayed)

[PEr oFF] → [PEr on]

Press [MODE] button in [PEr on] menu, then use [UP/DOWN] button to set the percentage tuning level. (-99% to 99% in 1% steps; the initial value: -6%)

**9. Output 1 Mode** Output mode for the output 1 is changed.

[oUt Std] → [oUt ArER]

**10. Output 2 Mode** Output mode for the output 2 is changed.

[oUt Std] → [oUt ALrn] → [oUt Err]

Alarm Output Mode: After pressing the [MODE] button, press the [UP/DOWN] button to set alarm output level. (0 to 01p in 1p steps; the initial value: 50p)  
On-delay of 300ms is applied.  
Error output mode: Output when an error of DPC, system occurs.

**11. Digital Display** Changing Digital Display in RUN Mode for Specific Purpose

[diSP Std] → [diSP PEr] → [diSP P-b] → [diSP bAr] → [diSP CFdr] → [diSP CH] → [diSP PEAR]

(a) Margin of receiving light amount against threshold  
(b) Minimum value of incident light peak and maximum value of incident light bottom  
(c) Bar display  
(d) Peak receiving light amount  
(e) CH number and receiving light amount  
(f) Threshold light intensity when the workpiece passes

**12. Inverted Display** Mounting Amplifier in Inverted Direction

The display reverses. Threshold and light intensity are displayed on green digital and white digital respectively.

[rEu oFF] → [uo r3]

**13. Eco Function** Saving Power Consumption

The indicators (green digital and white digital) turn OFF. They turn ON for approx. 10 seconds and then turn OFF by button operation.

[ECo oFF] → [ECo on]

**14. Hysteresis width** Set the hysteresis width by initial value. Hysteresis width is provided for threshold to prevent the judgment output from becoming unstable near the boundaries.

The hysteresis width can be set by pressing the [MODE] button in the menu of "HUS-" and then pressing the [UP/DOWN] button. (0 to 9999, increments of 1)

Be sure to check the stability of outputs as there is a possibility of chattering.

[HStd 37] → [HUSr 12]

Move to Detection Mode by holding the button for 3 seconds or longer.

#### 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. See also Product catalog for Warranty and Limitation of Liability.

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