

Smart Laser Amplifier

E3NC-LA 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.



© OMRON Corporation 2012 All Rights Reserved. (2/3)

PRECAUTIONS ON SAFETY

● Meanings of Signal Words

CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

● Warning Indications

PRECAUTIONS

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.

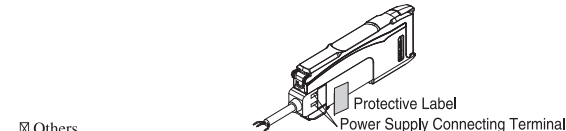


PRECAUTIONS FOR SAFE USE

- The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.
- Installation Environment**
 - Do not use the product in environments subject to flammable or explosive gases.
 - 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 in any atmosphere or environment that exceeds the ratings.
 - Do not use the product in environments subject to exposure to water, oil, chemicals, etc.
 - 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.
 - Power Supply and Wiring**
 - Do not impose voltage exceeding the rated voltage: 10 to 30 VDC, including 10% ripple (p-p).
 - Do not apply voltages or currents that exceed the rated ranges.
 - When supplying power to the product, make sure that the polarity of the power is correct, and do not connect to an AC power supply.
 - Do not miswire such as the polarity of the power supply.
 - Do not apply any load exceeding the ratings.
 - Connect the load correctly.
 - Do not short both ends of the load.
 - Do not short-circuit the open collector output load.
 - 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.
 - Installation**
 - Do not install the product in locations subjected to strong magnetic field or electric field.
 - Others**
 - Do not attempt to disassemble, repair, or modify the product in any way.
 - Do not use the product if the case is damaged.
 - When disposing of the product, treat it as industrial waste.
 - When setting the sensor, be sure to check safety such as by stopping the equipment.

PRECAUTIONS FOR CORRECT USE

- Installation Location**
 - 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
- Power Supply and Wiring**
 - The product may require some time after it is turned ON to ensure a stable light reception intensity, depending on the operational environment.
 - Output pulses may occur when the power supply is turned OFF. Turn OFF the power supply to the load or load line first.
 - The product is ready to operate 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, turn ON the power supply to the product first.
 - Make sure that the power supply is turned OFF before connecting, separating or adding Amplifier Units.
 - Use an extension cable with a minimum thickness of 0.3 mm² and less than 100 m long.
- Installation**
 - Do not apply the forces on the cord exceeding the following limits:
 - Pull: 40N; torque: 0.1N·m; pressure: 20N; bending: 3 kg
 - Do not pull or twist the connector at an excessive force when it is fixed to the Amplifier Unit. (within 9.8N)
- Connection**
 - The Mobile Console E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S cannot be connected.
 - The E3C, E2C, E3X-NA and E3X-SD cannot be connected.
 - The E3X-DA-N, E3X-HD and E3X-DA-S/MDA cannot be connected.
 - The Communication Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW-DS cannot be connected.
 - When using a connector type product, place a protective label (provided with the E3X-CN22, E3X-CN21) on the power supply connecting terminals that are not used, to prevent electric shock or short circuit.



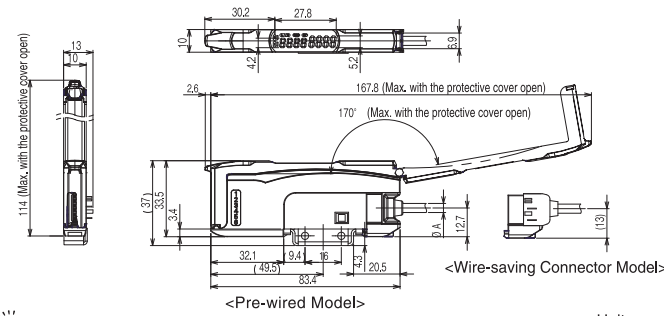
- Others**
 - Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
 - Do not use thinner, benzene, acetone, and lamp oil for cleaning.

Checking the Package Content

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

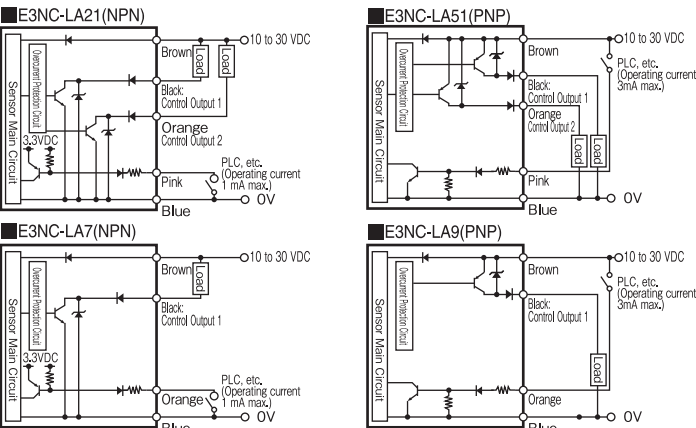
1 Installation

1-1 Dimensions



Dimensions in parentheses () indicates the ones with related components. Unit: mm. The cover could come off if it is tilted by 170 degrees or more.

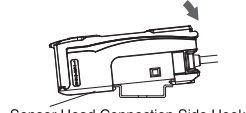
1-2 Input/Output Circuit Diagram



1-3 Mounting the Amplifier Unit

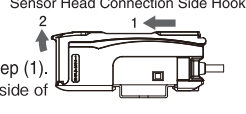
■ Mounting on DIN Track

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



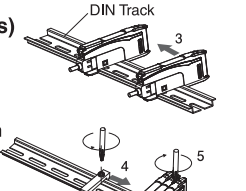
■ Removing from DIN Track

- Push the unit in the direction 1.
- Lift the unit in the direction of arrow 2 while performing step (1). Refer to "1-2. Input/Output Circuit Diagram" or check the side of the unit for wire color and role indications.



■ Joining Amplifier Units (Connector Type Models)

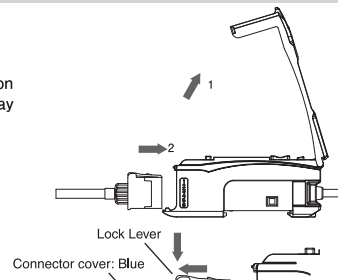
- Mount the Amplifier Units one at a time onto the DIN track. Insert the connector until it clicks. (Arrow 3)
- Use End Plates (PFP-M: separately sold) at both ends of the grouped Amplifier Units to prevent them from separating due to vibration or other cause. (Arrow 4)
- Tighten the screw on the End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



Up to 30 Amplifier Units can be joined.

1-4 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. To remove it, press and hold the lock lever then pull the sensor head out.

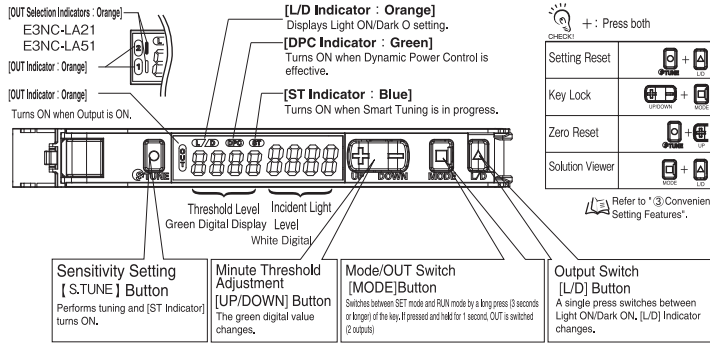


Fix the sensor head with M3 screws. Apply tightening torque of 0.5Nm for fixing.

- 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

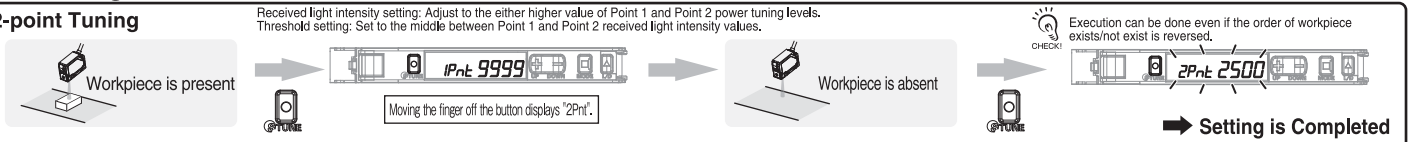
2-1 Setting and Display Overview



2-4 Smart Tuning [Easy Sensitivity Setting]

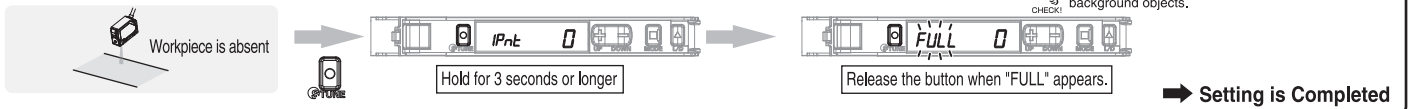
Basic Setting

● 2-point Tuning



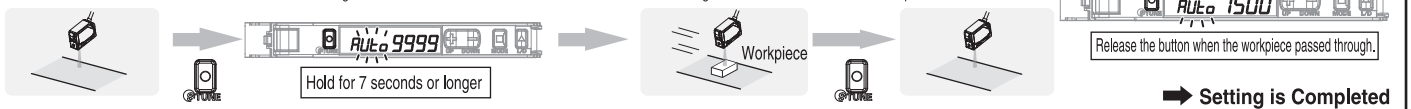
Enhancing Durability of the Head against Dust and Stain

● Maximum Sensitivity Tuning



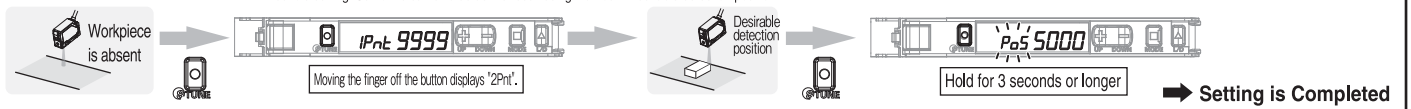
Setting for a Moving Workpiece

● Full Auto Tuning



Setting to Detect by Workpiece Position

● Position Tuning



Detecting a Transparent or Microscopic Object

● Percentage Tuning



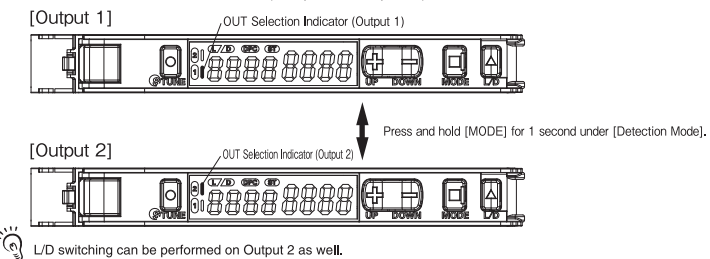
Initializing Light Intensity Changed Due to Dust or Dirt

● Power Tuning

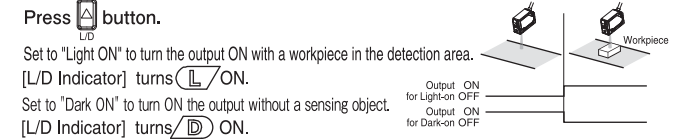


2-5 Output switching (2-output type: E3NC-LA21, E3NC-LA51)

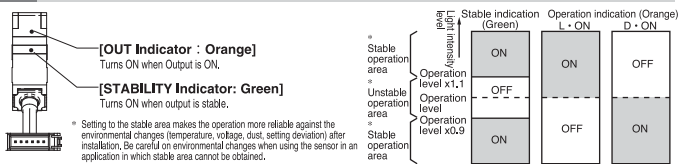
- OUT Selection Indicator switches to switch the settings.
 - Hold the [MODE] button for 1 second in [Measurement Mode].
 - OUT Selection Indicators (Output 1/Output 2) switch.



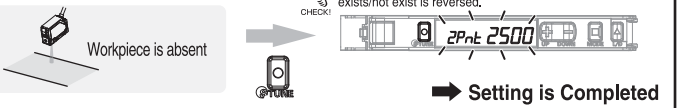
2-2 Switching Control Output



2-3 Sensor Head Display



2-6 Minute Adjustment of Threshold Level



3 Convenient Setting Features

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

● DPC Function
Use of DPC 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 Settings". Disabled in area detection mode.

Initializing Settings

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

Hold both for 3 sec. or longer.

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
[SAwE] → [SAwE YES]

User Reset Function
[rSt] → [rSt USER]

Preventing Malfunction

● Key Lock Function Disables all the button operations.
Enable/Cancel (This procedure)

Hold both for 3 sec. or longer. * 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 wiring, connector connection, power supply voltage and power supply capacity again. Refer to "1-2 Input/Output Circuit Diagram" |
| Nothing is shown on the digital indication. | Eco mode is ON. | Turn OFF Eco mode. Refer to "5. Detailed Settings". Refer to "5 Detailed Settings". |
| Sensing/Detection not possible despite the minimum threshold level | Detection set to a small light level mode Dust or dirt influences | Setting GIGA Mode increases emission power and light intensity. 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. Refer to "1-3 Mounting Amplifier Unit" |
| Incident light level displayed in a negative value | The zero reset function is enabled. | Cancel the zero reset function. Refer to "3 Convenient Setting Features" |
| Lost tracking of the settings made | - | Reset the settings. Refer to "3 Convenient Setting Features" |

| Error Name / Display | Cause | Remedy |
|---|--|--|
| DPC Error 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 the original incident light level. Then, perform Smart Tuning. Refer to "2-3 Smart Tuning" |
| Amp EEPROM time-out error E-rE 01 | An error is found in amp setting memory. | Turn ON the power again. Reset the settings if the error is not corrected. Refer to "3 Convenient Setting Features" |
| Amp EEPROM checksum error E-rE 02 | An error is found in amp setting memory. | Turn ON the power again. Reset the settings if the error is not corrected. Refer to "3 Convenient Setting Features" |
| Lock ON LoL on | The key lock function enabled | Cancel the key lock function. Refer to "3 Convenient Setting Features" |
| Load short circuit detection error E-St 4000 | The judgment output line is short circuited. | Turn off the power supply, check whether the output line is short circuited or not, and then turn on the power supply again. |
| Overcurrent protection error E-Hd CUr | Overcurrent is carried to the control output. | Turn OFF the power once and turn ON the power again. |

* The DPC indicator blinks.

Returning Received Light Intensity Display to "0"

● Zero Reset Function
Enable
The threshold also changes accordingly. The lower threshold limit is -1999.

Hold both for 3 sec. or longer.

Cancel
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. x Percent tuning level
LOW: Received light intensity in 3. - Received light intensity in 3. x Percent tuning level

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 to exit SET mode.
- Let the workpiece pass.
- Displays the light intensity (maximum/minimum value) for 0.5 seconds when the workpiece passes.

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.

4-2 Ratings and Specifications

| Model | NPN output PNP output | E3NC-LA21 E3NC-LA51 | E3NC-LA7 E3NC-LA9 |
|--|---|---|----------------------------------|
| Control output | 2 | 1 | 1 |
| External input *1 | 1 | 1 | 1 |
| Connection method | Pre-wired type | Wire-saving connector type | |
| Power supply voltage | 10 to 30 VDC, including ripple (p-p) 10% | | |
| Power consumption*2 | Power supply voltage 24V: Normal mode: 1560mW max.(Power consumption 65mA max.) Power saving ECO: 1200mW max.(Power consumption 50mA max.) Load voltage: 30 VDC max., open collector output type Load voltage: 100 mA max, using single unit, 20 mA max, when four or more units connected (Residual voltage and load current less than 10 mA: 1 V max.) Load current 10 to 100 mA: 2 V max. Off state current | | |
| Control output | Off state current | | |
| Protection circuit | Power supply reverse polarity protection, output short-circuit protection and output incorrect connection protection | | |
| Maximum connectable Units | 30 units | | |
| Number of units for mutual interference prevention*3 | 0 Note: The communication and mutual interference prevention functions are disabled if the SHS mode is selected for detection function. High-speed mode SHS: 2 Standard mode SHS: 2 Sig mode (GB): 4 | | |
| Number of banks | 4 | | |
| Ambient temperature range | Operating: 1 to 2 amplifiers connected: -25° C to 55° C, 3 to 10 amplifiers connected: -25° C to 50° C, 11 to 16 amplifiers connected: -25° C to 45° C, 17 to 30 amplifiers connected: -25° C to 40° C Storage: -30° C to 70° C (with no icing or condensation) | | |
| Ambient humidity range | Operating and storage: 35% to 85% RH (with no condensation) | | |
| Insulation resistance | 20 MΩ min. (at 500 VDC) | | |
| Dielectric strength | 1,000 VAC, 50/60 Hz, 1 minute | | |
| Vibration resistance | 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X and Y directions | | |
| Shock resistance | 500 m/s ² , for 3 times each in X, Y and Z directions | | |
| Weight (packed state/sensor) | Approx. 115 g / Approx. 75 g | | Approx. 60 g / Approx. 20 g |
| Materials | Case and cover: Polycarbonate (PC), Cable: PVC | | |
| *1. Details on inputs are as follows: | | | |
| NPN output | Contact input (Relay or switch) | Non-contact input (Transistor) | Input time |
| PNP output | ON: Short circuit to Vcc (Outflow current: 1 mA max.) OFF: Open or short circuit to Vcc | ON: 1.5 V max. (Outflow current: 1 mA max.) OFF: Vcc-1.5 V to Vcc (Leakage current: 0.1 mA max.) | ON: 2 ms min. OFF: 20 ms min. |
| | ON: Short circuit to Vcc (Sink current: 3mA max.) OFF: Open or short circuit to 0V | ON: Vcc-1.5 V to Vcc (Sink current: 3 mA max.) OFF: 1.5 V max. (Leakage current: 0.1 mA max.) | |
| *2. Power consumption | | | |
| E3NC-LA21 | E3NC-LA51 | E3NC-LA7 | E3NC-LA9 |
| Normal mode: 1650mW max./Power supply voltage 30V: Power consumption 55mA max./ Power supply voltage 10V: Power consumption 115mA max./ Power saving ECO: 1350mW max./Power supply voltage 30V: Power consumption 45mA max./ Power supply voltage 10V: Power consumption 80mA max.) | | | |
| *3. The minimum number of units in the specifications is applied to the mutual interference between different amplifiers such as between fiber and laser. | | | |

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.

- Function Selection** Enabling 6 to 16
Basic setting: FUnC dFLt → Detailed setting: FUnC oPt
- Detection Function** Changing Light Level and Response Time
Response time: HS 500, STND 500, GIGA 6000, SHS 125
Light quantity: 1 reference x1, x7, x1.1
- DPC Function** Stable Detection Regardless of Incident Light Level Change
DPC OFF → DPC ON
- Timer Function** Setting Output Timer (Two outputs are displayed for the two-output type)
Time Off: tOFF → On-delay Timer: on-d, One shot: Shot, On Off-delay Timer: onof
- Power Tuning Level** Changing the Target Incident Light Level (Power Tuning Level)
P-Lu 9999
- BANK Switching** Set values are saved for each configured bank.
bAnk 1, 2, 3, 4
- Power Tuning ON/OFF Setting** To Turn ON/OFF the Light Amount Adjustment at Tuning
PtUn on → PtUn off
- Percentage Tuning** Detecting Transparent or Small Workpiece (Two outputs are displayed for the two-output type)
PEr off → PEr on
- Output 1 Mode** Output mode for the output 1 is changed.
oUt Std → oUt ArER
- Output 2 Mode** Output mode for the output 2 is changed.
oUt1 Std → oUt1 ALrn, oUt1 Err

- External Input** A type of external input is changed.
in OFF → in tUnE, in PtUn, in LoFF, in bAnk, in DrSt
- 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 PEAL
- Inverted Display** Mounting Amplifier in Inverted Direction
rEu off → Normal: 00 n3J, Reverse: 00 n3J
- Eco Function** Saving Power Consumption
ECo off → Eco function OFF, Eco function ON
- Hysteresis width**
Standard setting: HStd 37, Reference value: HUSr 26, User setting: HUSr 37
- Writing to EEPROM of External Input**
inSu on → inSu off

Suitability for Use

THE PRODUCTS CONTAINED IN THIS SHEET ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS 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 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.

| |
|--|
| <p>■ EUROPE OMRON EUROPE B.V. Sensor Business Unit Carl-Benz Str.4, D-71154 Nufringen Germany Phone:49-7032-811-0 Fax: 49-7032-811-199</p> <p>■ NORTH AMERICA OMRON ELECTRONICS LLC One Commerce Drive Schaumburg,IL 60173-5302 U.S.A. Phone:1-847-843-7900 Fax : 1-847-843-7787</p> <p>■ ASIA-PACIFIC OMRON ASIA PACIFIC PTE. LTD. No. 438A Alexandra Road #05-05(Lobby 2), Alexandra Technopark, Singapore 119967 Phone : 65-6835-3011 Fax :65-6835-2711</p> <p>■ CHINA OMRON(CHINA) CO., LTD. Room 2211, Bank of China Tower, 200 Yin Cheng Zhong Road, PuDong New Area, Shanghai, 200120, China Phone : 86-21-5037-2222 Fax :86-21-5037-2200</p> |
|--|

OMRON Corporation
D OCT. 2009