OMRON

Model **E3X-DA-N SERIES**

**OPICAL FIBER PHOTOELECTRIC SWITCH (DIGITAL LEVEL INDICATION)**

# INSTRUCTION SHEET

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

Before operating the product, read the sheet thoroughly to acquire sufficient knowledge of the product. For your convenience, keep the sheet at your disposal.


TRACEABILITY INFORMATION:
Representative in EU:
Omron Europe B.V.
Wegalaan 67-69
2132 JD Hoofddorp,
The Netherlands

Manufacturer:
Omron Corporation,
Sensing Devices Division H.Q.
Industrial Sensors Division & Application Sensors Division
Shiokoji Horikawa,
Shimogyo-ku, Kyoto 600-8530 JAPAN


The following notice applies only to products that carry the CE mark:
Notice:
This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.



1171369-0A

## PRECAUTIONS FOR SAFE USE

1) Do not use the sensor in explosive or ignition gas.
2) Do not use the sensor in the water.
3) Never disassemble, repair nor tamper with the sensor.
4) Do not apply excess voltage and current over rating.
5) Do not wire improperly such as reversing polarity.
6) Connect the load correctly.
7) Do not short-circuit the load.

## PRECAUTIONS FOR CORRECT USE

1) The E32-TC and E32-DC optical fibers consist of methacrylate resin. Do not use them near organic solvents and other adverse materials.
2) There are some cases where the photoelectric switch cable is unavoidably wired in a tube or duct together with a noisy or power line. This causes an induction, possibly resulting in malfunction or damage. In principal, the cable should be wired separately or shielded.
3) For extending wires, use a cable 0.3mm$^2$ min., and 100m max. in length. When using the cable as a Korea's S-mark certified product, use the cable of less than 10m in length.
4) Do not exceed the following force values applied to the cable. Tensile 80 N max., torque : 0.1 N•m max., pressure : 20 N max., flexure : 3 kg max.
5) Operation after the power is turned on.
   The E3X-DA will begin sensing no later than 200ms after the power is turned on. If the load and the E3X-DA connect to different power supply, the E3X-DA must be always turned on first.
6) EEPROM write errors
   If a write error (output indicator : flashing) occurs during teaching due to a power failure or noise from static electricity, execute the teaching again using the button on the main unit.
7) When using the sensor, protective cover must be put on the sensor.

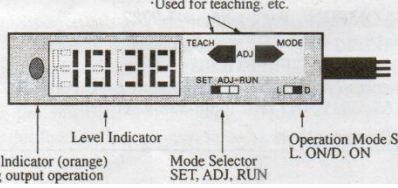
## ■ RATINGS/PERFORMANCE AMPLIFIER UNIT

| Connecting type | | Prewire type | | | | | | Connector type (*) | | | | | M8 conector |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type (E3X-) | NPN | DA11-N | DA21-N | DA11V | DAB11-N | DAG11-N | DAH11-N | DA6 | DA7 | DAB6 | DAG6 | DAH6 | DA14V |
| | PNP | DA41-N | DA51-N | DA41V | DAB41-N | DAG41-N | DAH41-N | DA8 | DA9 | DAB8 | DAG8 | DAH8 | DA44V |
| Monitor output | | None | Have | None | None | None | None | None | Have | None | None | None | None |
| | | 1 to 5V (Output impedance 47Ω, Load resistance more than 10kΩ.) | | | | | | | | | | | |
| Light source | | Red LED | | | Blue LED | Green LED | Infrared LED | Red LED | | | Blue LED | Green LED | Infrared LED | Red LED |
| Supply voltage | | 12 to 24V DC ±10% ripple 10% max. | | | | | | | | | | | |
| Power consumption (**) | | Normal position : Power consumption 960mW (Supply voltage 24V Current consumption 40mA)<br>Ecological mode : Power consumption 720mW (Supply voltage 24V Current consumption 30mA)<br>Digital display OFF : Power consumption 600mW (Supply voltage 24V Current consumption 25mA) | | | | | | | | | | | |
| Control output | | Open collector 26.4V DC max., 50mA max.<br>Residual Voltage : 1V DC max., Off-state current : 0.5mA max. | | | | | | | | | | | |
| Timer function | | 0~200ms | | | | | | | | | | | |

(*) Applied connector
For E3X-DA※6/DA※8: Both E3X-CN11(Main conector 3 cores) and E3X-CN12 (Extension conector 1core) are available.
For E3X-DA※7/DA※9: Both E3X-CN21(Main conector 4 cores) and E3X-CN22 (Extension conector 2 cores) are available.

(**) The Ecological mode and the Digital display OFF mode can be set from extra mobaile console "E3X-MC11" only.

## ■ NOMENCLATURE




## ■ OPERATION PROCEDURE

### 1. Standard procedures···setting each mode (SET/ADJ/RUN)

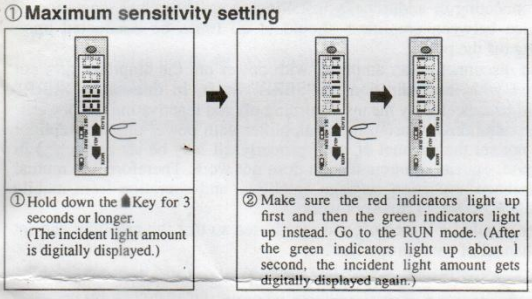
| | switch | Setting & operation | Display |
|---|---|---|---|
| SET mode | SET / ADJ / RUN | 1.Teaching the automatic sensitivity level.<br>①Maximum sensitvity setting<br>②One-point (without work) teaching<br>③Two-point (with/without work) teaching<br>④Pin-point (to settle Position) teaching<br>TEACH: Press the TEACH key<br>2. Setting procedures<br>MODE: Press the MODE key to select function<br>TEACH: Press the TEACH key to set up procedures<br>Refer to subsection 6 「Setting procedures」. | Digital display shows incident light amount |
| ADJ mode | SET / ADJ / RUN | 1. Sensitivity adjustment<br>TEACH: By pressing TEACH key, the sensitivity level gets higher. ( the threshold level gets lower.)<br>MODE: By pressing MODE key, the sensitivity level gets lower. ( the threshold level gets higher.)<br>Refer to subsection 2.2 「Adjustment the sensitivity level」.<br>Refer to subsection 4 「Swiching the display type」 as to the display. | Digital display shows threshold ~~level and percentage~~ allowance. Analog display shows light amount and threshold level.<br>Threshold level / Allowance / Analog display |
| RUN mode | SET / ADJ / RUN | 1. Detection<br>*It's possible to do without any key.<br>2. Swiching the display type<br>① Digitally displayed<br>② Digitally displayed in percentage<br>③ Analog display in bars<br>MODE: Pressing Mode key to swich. Refer to subsection 4 「Swiching the display type」<br>3. Zero reset<br>TEACH: Pressing TEACH key to reset display.<br>Refer to subsection 5 「Resetting display」 | Digital display shows light amount and percentage allowance. Analog display shows light amount and threshold level.<br>Light amount / Allowance / Analog display |

### 2. Sensitivity Setting

### 2. 1 Teaching the automatic sensitivity level.

(1)Set the mode selector to the SET position.

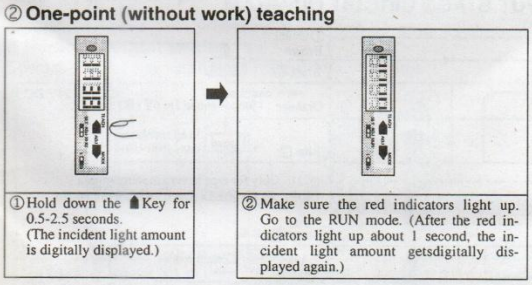
**① Maximum sensitivity setting**



① Hold down the Key for 3 seconds or longer. (The incident light amount is digitally displayed.)

② Make sure the red indicators light up first and then the green indicators light up instead. Go to the RUN mode. (After the green indicators light up about 1 second, the incident light amount gets digitally displayed again.)

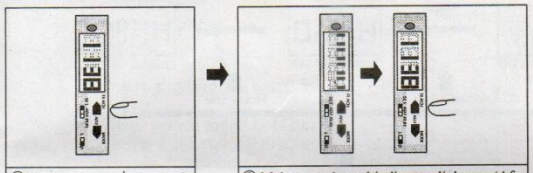
**② One-point (without work) teaching**



① Hold down the Key for 0.5-2.5 seconds. (The incident light amount is digitally displayed.)

② Make sure the red indicators light up. Go to the RUN mode. (After the red indicators light up about 1 second, the incident light amount getsdigitally displayed again.)

### ③ Two-point (with/without work) teaching

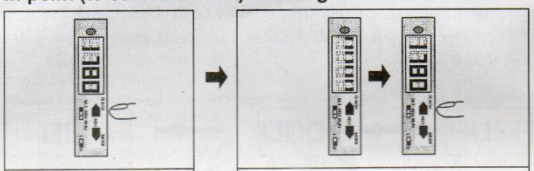


① Place the work in position and hold down ▲Key button for 0.5-2.5 seconds. (The incident light amount is digitally displayed.)

② Make sure the red indicators light up. (After the red indicators light up about 1 second, the incident light amount gets digitally displayed again.) Move the work off position, and hold down ▲Key again for 0.5-2.5 seconds.

| OK | NG |
|---|---|
|  | Flashing  |
| ③Make sure the green indicators light up. Go to the RUN mode. (After the green indicators light up about 1 second, the incident light amount gets digitally displayed again.) | ③Make sure the red indicators blink. Reposition the work and change the setting distance. Take the above steps ① and ② again. (After the indicators blink 3 times, the incident light amount gets digitally displayed again.) |

### ④ Pin-point (to settle Position) teaching



① Hold down ▲Key without work for 0.5～2.5 seconds. (The incident light amount is digitally displayed.)

② Make sure the red indicators light up. (After the red indicators light up about 1 second, the incident light amount gets digitally displayed again.) Place the work and Hold down the ▲Key for 3 seconds or longer.

| OK | NG |
|---|---|
|  | Flashing  |
| ③Make sure the green indicators light up. Go to the RUN mode. (After the green indicators light up about 1 second, the incident light amount gets digitally displayed again.) | ③The red indicators are blinking. Replace the work, set distance, do it agin from ①. (After red indi-cators are blinking 3 times, the incident light amount gets digitally displayed again.) |

### 2. 2 Adjustment the sensitivity level (manual adjustment).

(1)Set the mode selector to the ADJ position.

(2)Press ▲▼ key to adjust the sensitivity level.

▲ By pressing TEACH key, the sensitivity level gets higher. (the threshold level gets lower.) Hold down the key to change the number faster.

▼ By pressing MODE key, the sensitivity level gets lower. (the threshold level gets higher.) Hold down the key to change the number faster.

*It's possible to adjust the sensitivity without teaching.

*During adjustment the sensitivity, sensor is working.

### 3. To make detection

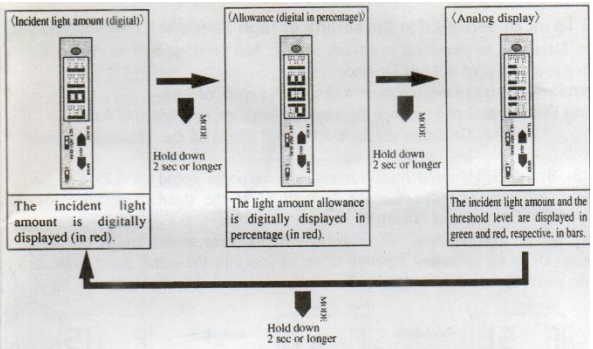
(1)Set the mode selector to the RUN position.

(2)Make detection. (No more procedures)

### 4. Swiching display

(1)Set the mode selector to the RUN position.

(2)To swich display, hold down ▲Key for 2 seconds or longer.




### 5. Zero reset (Swich display to「0」in a flash.)

(1)Set the mode selector to the RUN position.
(Make sure it's the degital light amount.)

(2)To show「0」on the display, hold down the key ▲ for 1 second or longer.
*Each time do this,「0」is on the display.
*The threshold level will sift same time.

(3)Hold down the key ▲ and the key ▼ same time for 1 second or longer to cancel the zero reset. (Return to it's former state.)

### 6. Setting functions

These functions are helpful for the cases below.

- **Detecting a long distance or detecting more quickly (changing the detection function): Detection function setting**
- **Using the off-delay timer: Timer setting**
- **Upgrading the spot recognition in adjusting the optical axis: Flashing setting**
- **Keeping the digital data displayed: Display hold setting**
- **Changing the digital display direction: Display direction setting**
- **Changing output range of the monitor: Set output range of the monitor. (only for type having monitor output)**

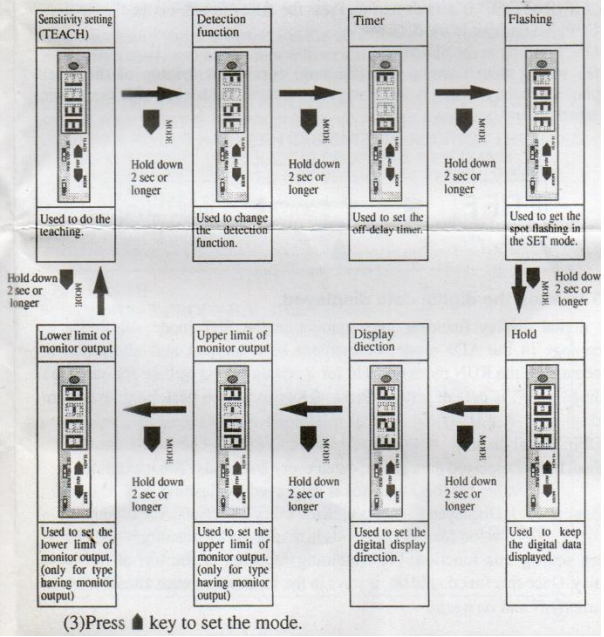
### Setting standard procedures (The following settings can be made.)

① Detection function [STANDARD/LONG DISTANCE/HIGH SPEED]
② Timer [0-200ms (0～20ms : every 1ms 20～200ms : every 5ms)]
③ Flashing [ON/OFF]
④ Hold [OFF/PEAK/BOTTOM]
⑤ Display direction [STANDARD/REVERSE]
⑥ The upper limit of Monitor output [100～4000 (every 100)]
⑦ The lower limit of Monitor output [0～3900 (every 100)]

### 6. 1 Selecting functions

(1)Set the mode selector to the SET position.

(2)Hold down ▼ key for 2 seconds or longer to select a desired functior




(3)Press ▲ key to set the mode.

### 6. 2 To make detection in the setting of High Speed or Long Distance.

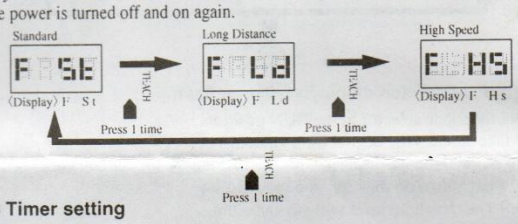
The "Standard" measurement is default setting. Just press ☗ Key to change the setting to High Speed or Long Distance.

·**Standard :** Standard measurement with response speed of 1 ms.

·**Long Distance :** Long-distance measurement with response speed of 4 ms. Detection distance about 1.3 times of the standard distance (diffuse fiber in use).

·**High Speed:** High-speed measurement with response speed of 0.25 ms. Detection distance about one-third of the standard distance (diffuse fiber in use).

When setting this function, "F" (Function) is displayed at the top of the level display. Once the detection function is set, it stays in the same status even after the power is turned off and on again.

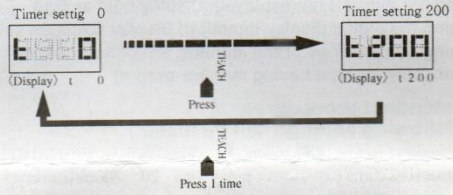



### 6. 3 Timer setting

Set the off-delay timer by ☗ Key. The timer is preset in the range of 0-200 ms as follows. (The timer off is default setting.)

| The range of timer setting | Increment |
|---|---|
| 0～20ms | 1ms |
| 20～200ms | 5ms |

When setting this function, "t" (Timer) appears at the top of the level display. The timer setting is digitally shown in the level display. Once off-delay timer is set, it stays in the same status even after the power is turned off and on again.




### 6. 4 Get the light spot brightly in adjusting the optical axis.

This function is available in the SET mode only. In the following cases, flashing starts and stops itself 10 minutes later. (If any of the following cases occurs again even after an automatic stop, flashing restarts.)

·When "FLASHING ON" is preset.

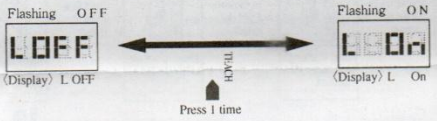
·When the SET mode is changed to any other mode in the "FLASHING ON" state and SET mode is set again.

"FLASHING OFF" is default setting. Press the ☗ Key to turn on the flashing.

·OFF: No flashing in the SET mode

·ON: Flashing in the SET mode

When setting this function, "L" (flashing) appears at the top of the level display. Once the flashing is set, it stays in the same status even after the power is turned off and on again.




### 6. 5 To keep the digital data displayed.

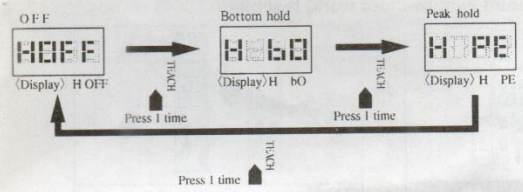
The digital display (incident light amount in the SET mode, allowance in percentage in the ADJ mode, or incident light amount and allowance in percentage in the RUN mode) is held for a certain period of time for easy data reading. "OFF" is default setting. Press ☗ Key to set the peak hold or bottom hold.

·OFF: Usual display

·Peak hold: Displayed data gets updated every 2 seconds. The maximum value for the 2 seconds is displayed by flashing.

·Bottom hold: Displayed data gets updated every 2 seconds. The minimum value for the 2 seconds is displayed by flashing.

When setting this function, "H" (Holding) appears at the top of the level display. Once this function is set, it stays in the same status even after the power is turned off and on again.




### 6. 6 To set the digital display other direction.

"STANDARD" is default setting. Press ☗ Key to make the reverse setting.

·Standard: Normal display direction

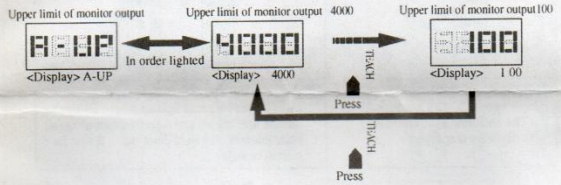
·Reverse: Reverse display direction

When setting this function, "d" (display) appears at the top of the level display. Once this function is set, it stays in the same status even after the power is turned off and on again.


### 6. 7 Focusing output range of the monitor. (only for type having monitor output)

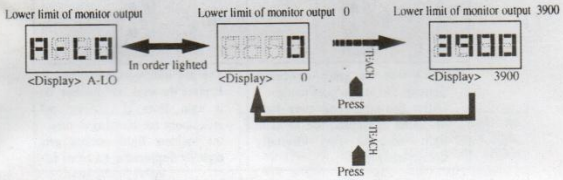
Monitor output (1～5V) can set any two poitnts and narrow range to control and inprove the precision of it.

(1)Set the upper limit. If the light amount is more than this, monitor output will be 5V. Setting this function, 「A-UP」(Analog UPper) and established amount is digitally displayed by turns. Pressing ☗ key to set this. The range is from 100 to 4000, it can be set every 100. (4000 is default setting.)




(2)Set the lower limit. If the light amount is less than this, monitor output will be 1V. Setting this function, 「A-LO」(Analog LOwer) and established amount is digitally displayed by turns. Pressing key to set this. The range is from 0 to 3900, it can be set every 100. (0 is default setting.)

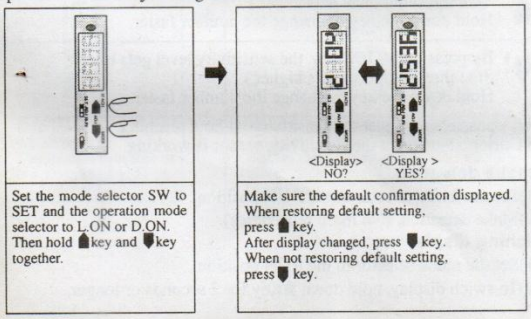
The lower limit can not be set more than the upper limit.




(3)Once this function is set, it stays in the same status even after the power is turned off and on again.

### 6. 8 Restore default setting

Special SW and key setting can restore default setting.



## ■Precautions for use

(1) Mounting of the amplifier unit

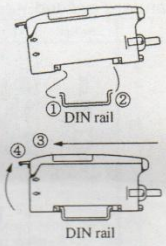
**·Using the DIN rail**

Mounting

①Engage the front slot of the amplifier on to the DIN rail.

②Push the back slot on to the DIN rail.

Note: Engage the front slot ① first, otherwise it may cause deterioration of mechanical strength.




Removing

·Push forward③and raise the front slot④.

**·Connecting connecotor type amplifier**

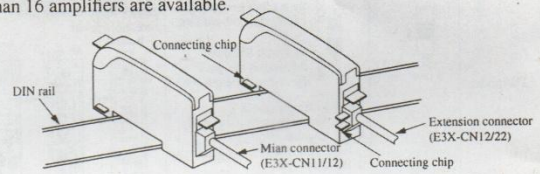
①Mounting each amplifier (leave a space), using the DIN rail.

②Slide the amplifier unit to set the chip on the pointed end and the chip on the connector. Make sure to get adhere them until the sound of click is heard.

③If it can't get adhere by vibrations, use extra End plate (Type PFP-M) to do. Make sure to cut the chip of the pointed end of the amplifier. See section (2)

To remove it, follow the procedure backward. Do not remove without sliding amplifier, or it damages the amplifier.

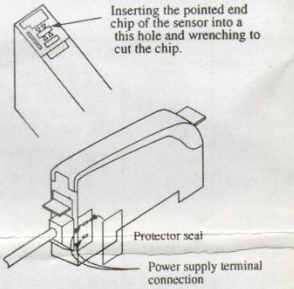
Less than 16 amplifiers are available.




(2) Chip of the connector type

There is a chip on the pointed end of the connector type to connect amplifier.

If it's unnecessary, wrench the chip by nippers or the hole on the back of the amplifier.




(3)To protect from electric shock by Power supply terminal connection or short-circuit, put the protector seal (accessory of the E3X-CN series) on the terminal of the outermost amplifier or single use amplifier.

(4)Disconnecting or additionally installing an amplifier while the power is turned on:

a. This amplifier sets the channel of itself via. optical communication between the next located amplifiers each other at the time the power is turned on.

b. Disconnecting or additionally installing an amplifier and separation of distance between amplifiers should at all times be conducted upon turning off the power.

c. When disconneting an amplifier with power on, the amplifier gets not worked with the indication of "SERR" on it. In this case, "SERR" should be canceled by means of turning off and reactivating the power.

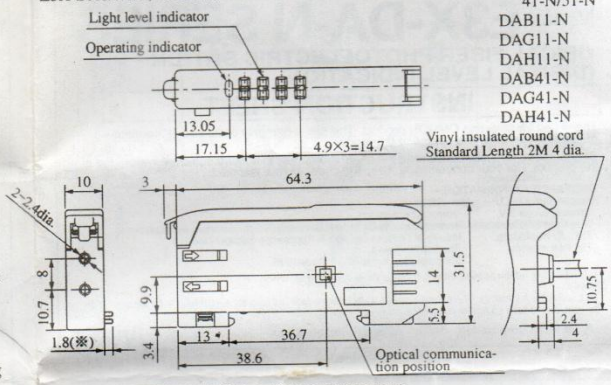
d. When additionally installing an amplifier with power on, the amplifier dose not set the channel of itself properly. (It may be set as "1ch".) In this case, optical communication dose not work. Therefore, the mutual interference protection between amplifiers and operation from mobile console E3X-MC11 dose not work.

Power should be turned off and reactivated so that the amplifier can set the channel of itself properly.

## ■OUTLINE DRAWING

·E3X-DA6/7/8/9, DAB6/8,DAG6/8,DAH6/8

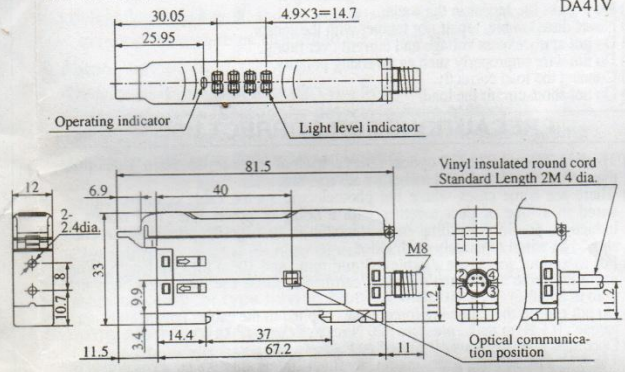
·E3X-DA11-N/21-N/41-N/51-N
DAB11-N
DAG11-N
DAH11-N
DAB41-N
DAG41-N
DAH41-N




(※) Only for E3X-DA 6 / 7 / 8 / 9, DAB6/8,DAG6/8,DAH6/8

·E3X-DA14V/44V

·E3X-DA11V
DA41V




## 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.

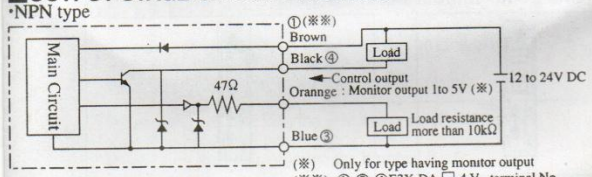
Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.
Know and observe all prohibitions of use applicable to this product.

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.

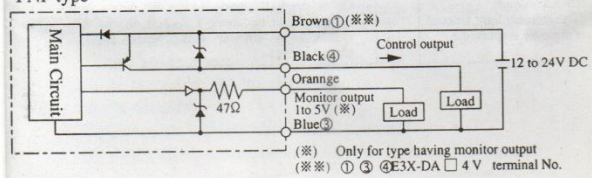
## ■OUTPUT STAGE CIRCUIT DIAGRAM

·NPN type




(※) Only for type having monitor output
(※※) ① ③ ④E3X-DA □ 4 V terminal No.

·PNP type




(※) Only for type having monitor output
(※※) ① ③ ④E3X-DA □ 4 V terminal No.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