

**Sensor with an Adjustable Sensing Distance of 0.3 to 3 m Under Stable Operation without Background Interference**

- Ensures a stable operating range with minimal side-lobe areas.
- Built-in unstable operation check function allows easy adjustment to a proper mounting direction.
- Mono-block construction with a sensor, power supply, and terminals ensures easy wiring.
- Incorporates synchronous selector and reference pulse I/O terminals ideal for parallel-operation use without mutual interference.

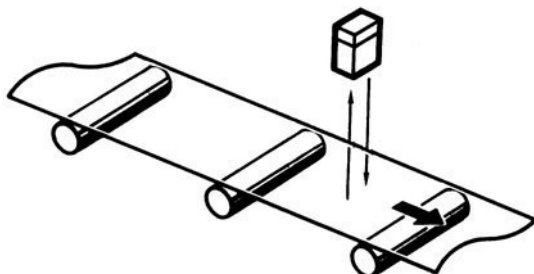


## Ordering Information

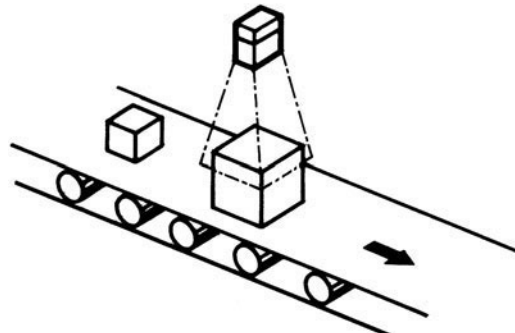
Sensing method		Reflective
Model	for AC	E4A-3K
	for DC	E4A-3K DC12-24

## Application Examples

**Detection of cellophane, glass, and photosensitive paper**



**Detection of objects on conveyors or discrimination of object heights**



# Specifications

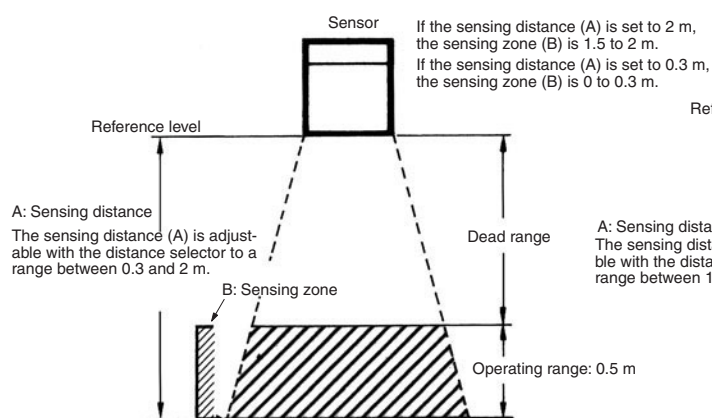
## ■ Ratings/Characteristics

<b>Supply voltage</b>		100, 110, 200, and 220 VAC $\pm$ 10% at 50/60 Hz (see note)
<b>Power consumption</b>		Approx. 2.5 VA
<b>Sensing distance</b>		Adjustable between 0.3 and 3 m (selectable ranges of 0.3 and 2 m or 1.3 and 3 m)
<b>Standard sensing object</b>		100-mm dia., 1.5-m-long metal or plastic round pipe
<b>Minimum sensing object</b>		50 x 50 mm flat plate
<b>Ultrasonic oscillation frequency</b>		Approx. 40 kHz
<b>Directional angle</b>		Half-value angle: 25°
<b>Response time</b>		Operate time: 0.25 s; release time: 0.5 s
<b>Control output</b>		Contact output: SPDT 3 A at 220 VAC, cos dia.=1 or 3 A at 24 VDC, cos dia.=1
<b>Ambient temperature</b>		Operating: -20°C to 55°C (with no icing)
<b>Ambient humidity</b>		Operating: 45% to 85%
<b>Insulation resistance</b>		20 M $\Omega$ min. (at 500 VDC)
<b>Dielectric strength</b>		1,500 VAC, 50/60 Hz for 1 min
<b>Vibration resistance</b>		Destruction: 10 to 25 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions
<b>Shock resistance</b>		Destruction: 500 m/s <sup>2</sup> (approx. 50G) 3 times each in $\pm$ X, $\pm$ Y, and $\pm$ Z directions
<b>Life expectancy (output relay)</b>	<b>Mechanical</b>	20,000,000 operations min.
	<b>Electrical</b>	100,000 operations min.
<b>Enclosure rating</b>		IEC IP60
<b>Weight</b>		Approx. 500 g without Mounting Bracket Approx. 600 g with Mounting Bracket

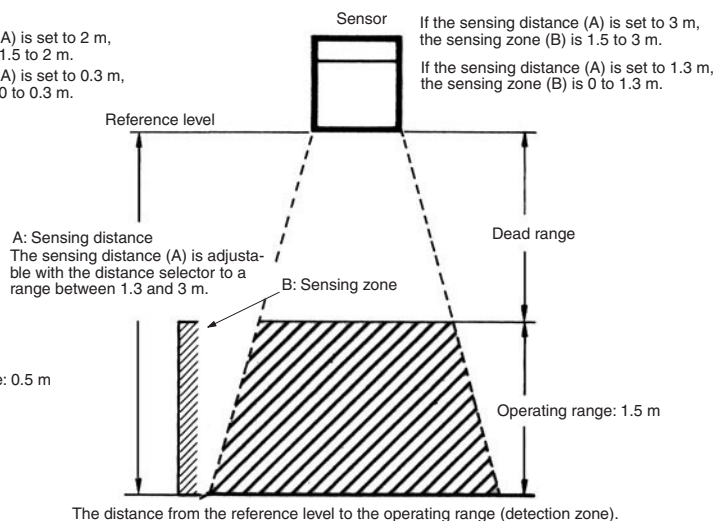
**Note:** Models operating at 12 to 24 VDC are available. Specify the supply voltage when ordering.

## ■ Operating and Dead Ranges

### 1. Distance Selector Set to a Range Between 0.3 and 2 m



### 2. Distance Selector Set to a Range Between 1.3 and 3 m



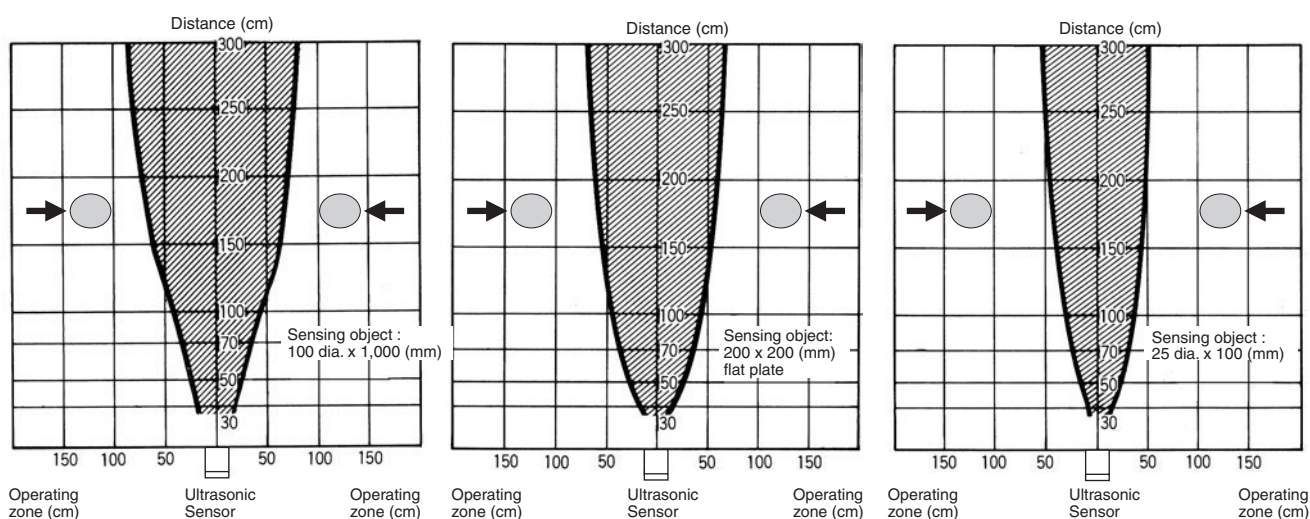
An object may be detected due to multiple reflection if the object is in the dead range, in which case however, the detection of the object will not be stable. Therefore, do not attempt to use the E4A-3K to detect an object in the dead range by making use of multiple reflection.

**Note:** Multiple reflection is a phenomenon caused by an ultrasonic beam reflected several times repeatedly between the sensing object and the Sensor or nearby objects such as the ceiling.

# Engineering Data

## ■ Operating Zone (Typical Examples)

The operating zone is the sensing range of the E4A-3K at the sensing distance with the sensing object moved vertically towards the ultrasonic beam. The operating zone varies with the sensing distance and sensing object.

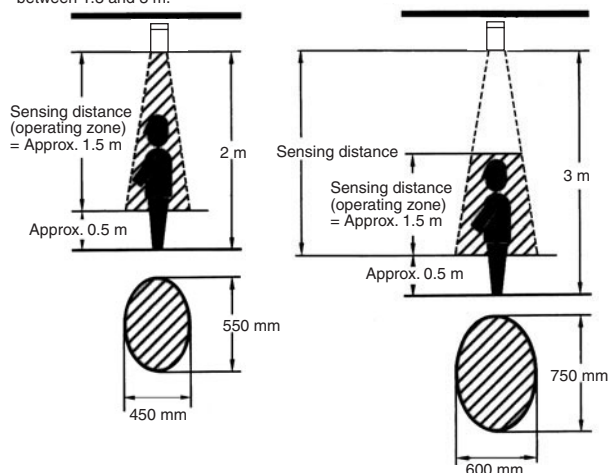


## Reference

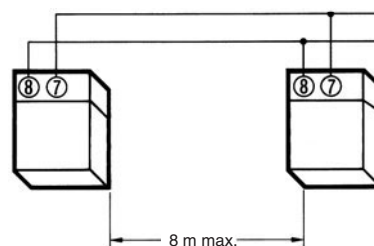
- Each of the following illustrations indicates the operating zone with the E4A-3K mounted to the ceiling for the purpose of detecting the human body. In either case, make sure that the lower limit of the sensing range is approximately 0.5 m above the floor so that the floor will not be detected.

## Typical Example

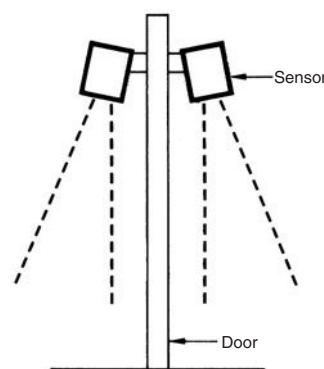
Distance selector set to a range between 1.3 and 3 m.



- If more than one Unit is used within a maximum distance of 8 m, be sure to wire the Units so that the Units will be in synchronous operation. Refer to *External Connections* for details.



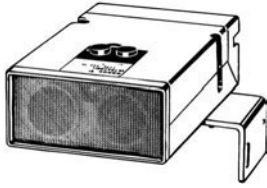
- If there is a door between two Units located for different operating zones as shown in the following illustration, be sure to wire the Units so that the Units will be in synchronous operation.



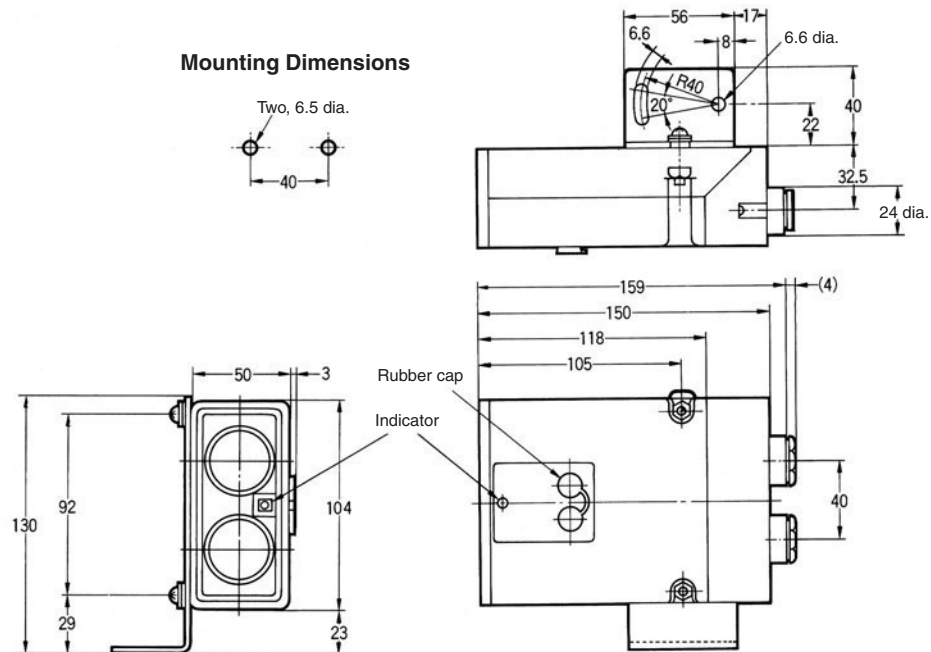
## Dimensions

**Note:** All units are in millimeters unless otherwise indicated.

### E4A-3K



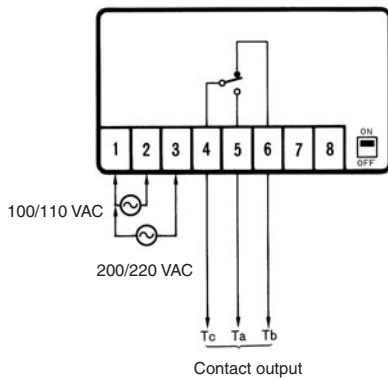
#### Mounting Dimensions



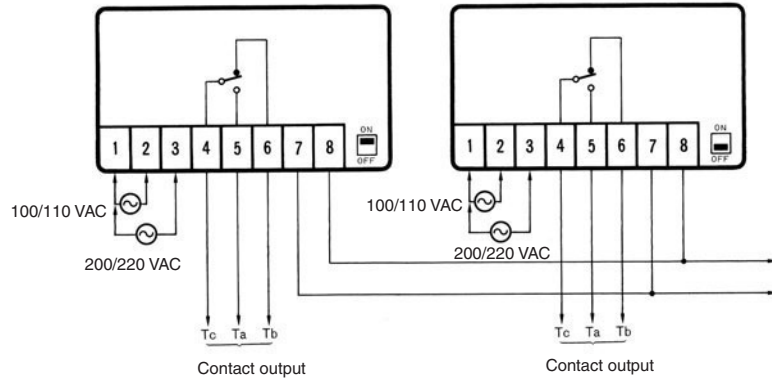
## Installation

### ■ External Connections

#### Example of Connections of the E4A-3K in Asynchronous Operation



#### Example of Connections of the E4A-3K in Synchronous Operation



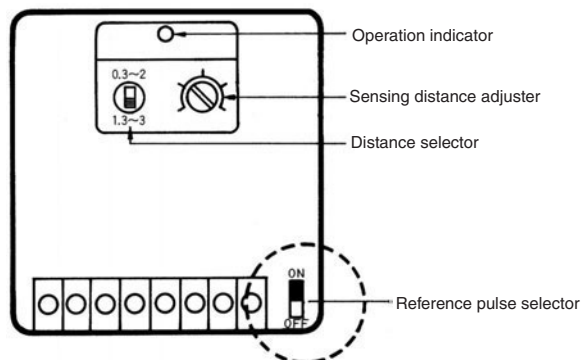
**Note:** 1. If the synchronous operation of the E4A-3K is not required, set the reference pulse selector to ON. Keep terminals 7 and 8 open.  
2. Use a cable with an external diameter of 10 mm max. for wiring.

**Note:** 1. If the synchronous operation of the E4A-3K is required, set the reference pulse selector of only one Unit to ON. Then connect terminal 7 of all the Units together and do the same for terminal 8.  
2. A maximum of 50 Units can be connected in synchronous operation.  
3. Do not wire the lines for synchronous operation use (i.e., wires connecting to terminals 7 and 8) alongside power lines in the same conduit.  
4. Use a shielded cable with an external diameter of 10 mm max. for wiring.  
5. Make sure that all the Units in synchronous operation are turned on, otherwise none of the Units will operate.

## Adjustments

### Reference Pulse Selector Position

If more than one Unit is used at one location, the Units will need to be in synchronous operation to prevent mutual interference. In that case, set the reference pulse selector of only one Unit to ON. Set the reference pulse selector of each Unit to ON if the Units are in asynchronous operation. Refer to *External Connections* for details.



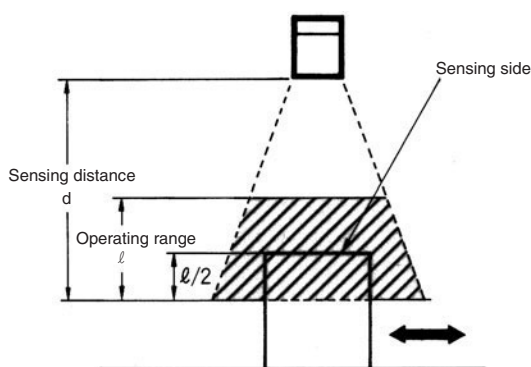
### Sensing Distance Adjustments

Before adjusting the sensing distance, remove the rubber cap from the top of the E4A-3K. Be sure to put on the rubber cap after the sensing distance is adjusted.

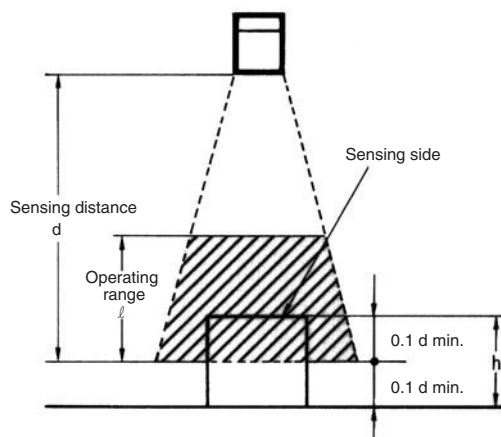
1. Apply a flat-blade screwdriver to the groove of the distance selector to set the distance selector to either a range between 0.3 and 2 m or a range between 1.3 and 3 m according to the desired sensing distance and operating range.
2. To set the sensing distance, first locate a flat plate as a sensing object that is approximately 20-by-20 cm at the desired sensing distance. Then gradually turn the sensing distance adjuster clockwise (i.e., in the direction increasing the sensing distance) until the relay operates. The operation indicator will be lit when the relay operates.

### Standard Sensing Distance Settings

- If the sensing object is moving vertically towards the ultrasonic beam (i.e., the E4A-3K is in normal sensing operation), set the sensing distance so that the sensing side of the object passes through the center of the operating range as shown in the following illustration.

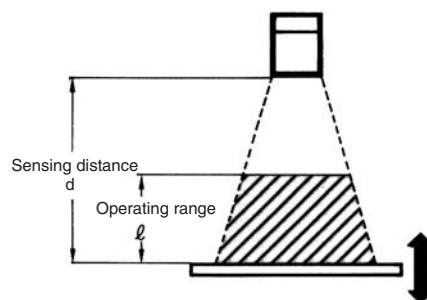


If there is an object, such as a floor, wall, or conveyor, located behind the sensing object, make sure that the distance between the set sensing distance ( $d$ ) and the background object is  $0.1d$  min. Furthermore, make sure that the set sensing distance ( $d$ ) is at least  $0.1d$  closer to the Sensor from the maximum limit of the operating range as shown in the following illustration.



From the above, the minimum height ( $h$ ) of the sensing object is expressed by  $0.2d$ . If the sensing object is comparatively low in height or if the E4A-3K is used for the delicate height discrimination of objects, it will be necessary to set the sensing distance to a small value.

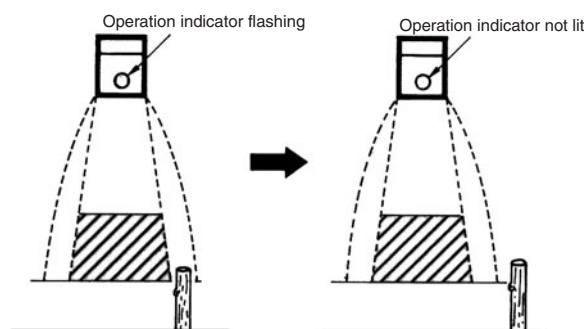
- If the sensing object is moving parallel to the ultrasonic beam for level or height detection, the sensing distance will be the distance required for the sensing object to move.



### Operation Check

After adjusting the sensing distance, check that the E4A-3K operates properly by locating the sensing object within the operating range. Then remove the sensing object and check that the operation indicator is not lit. The operating indicator may be still be lit or flashing after the sensing object is removed. In that case, the E4A-3K may be malfunctioning due to beam reflection from objects outside the operating range or affected by ambient wind or temperature, in which case, eliminate the cause or change the mounting position or direction of the Sensor.

If the mounting position or direction of the Sensor is changed, be sure to check the sensing distance and the operation of the E4A-3K.



# Precautions

## ■ Correct Use

### Sensor Mounting Angle

If the E4A-3K is in level control or distance control of sensing objects, the stability of signal detection will depend on the sensing surface condition of the objects. Considering the repose angle of the objects, mount the E4A-3K so that the ultrasonic beam and the sensing surface of each object meet at right angles to each other.

### Surrounding Objects

Make sure that the Sensor is free from surrounding objects that reflect the ultrasonic beam diffusion, otherwise the Sensor may malfunction. In particular, pay the utmost attention so that no side lobe of the ultrasonic beam will be reflected by such objects.

### Mounting

Securely mount the E4A-3K by using the nuts provided with the E4A-3K or the mounting holes of the E4A-3K. Refer to *Dimensions* for details.

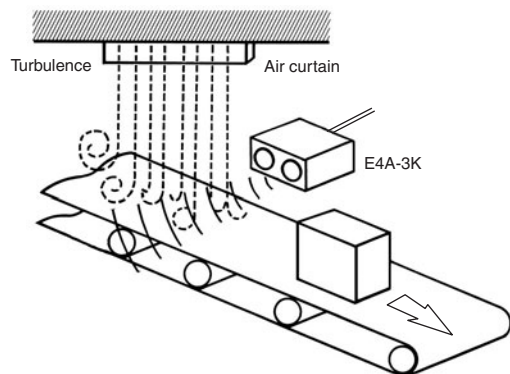
Do not strike the Sensor with any hammer or other object, otherwise the E4A-3K will no longer be water-resistant.

If the E4A-3K is not mounted securely, the E4A-3K may be damaged by vibration or may not detect sensing objects accurately due to a possible change in the mounting position.

### Environmental Conditions

Do not use the E4A-3K at a temperature exceeding the rated range or outdoors, otherwise the reliability and life of the E4A-3K will decrease.

The Ultrasonic Reflective Sensor utilizes the air as a beam transmission media. Do not use the E4A-3K in places with radical convection or extreme local temperature changes. For example, if there is a hot air curtain that causes turbulence within the sensing area, the E4A-3K may malfunction.



The jetting sound of air nozzles includes noise of a wide frequency range, which will affect the operation of the E4A-3K. Do not use an air nozzle near the E4A-3K.

The sensing distance of the E4A-3K will decrease if there is any water drops on the surface of the emitter or receiver.

The reflective model may not detect any objects if there is any object absorbing sound, such as powder and cotton, on the surface of the emitter or receiver.



**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CSM\_E4A-3K\_DS\_E\_3\_1

D064-E1

**In the interest of product improvement, specifications are subject to change without notice.**

## **OMRON Corporation**

**Industrial Automation Company**

**Sensing Devices Division H.Q.**

**Application Sensors Division**

Shiokoji Horikawa, Shimogyo-ku,

Kyoto, 600-8530 Japan

Tel: (81)75-344-7068/Fax: (81)75-344-7107



## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

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

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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 PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2011.9

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

<http://www.ia.omron.com/>

(c)Copyright OMRON Corporation 2011 All Right Reserved.