

## Ultrasonic Long Range

## E4A-3K

Long Sensing Distance of 0.3 to 3 m

- Background suppression for accurate sensing
- Fast alignment troubleshooting with stable operation check function
- Mutual interference protection built in
- Self-contained, no external power supply required



## Ordering Information

Supply voltage	Sensing type	Sensing distance	Part number
12 to 24 VDC	Reflective	0.3 to 3 m	E4A-3K DC12/24
120/240 VAC			E4A-3K AC120/240
100/200 VAC			E4A-3K

## Specifications

### RATINGS/CHARACTERISTICS

Part number		E4A-3K DC12/24	E4A-3K AC120/240	E4A-3K AC100/200
Sensing method		Reflective		
Supply voltage		12-24 VDC, $\pm 10\%$ ripple (p-p) $\pm 10\%$	120/240 VAC, 50/60 Hz, $\pm 10\%$	100/200 VAC, 50/60 Hz, $\pm 10\%$
Power consumption		150 mA max.	Approx. 2.5 VA	Approx. 2.5 VA
Sensing distance		Adjustable between 0.3 and 3 m (selectable ranges of 0.3 to 2 m and 1.3 to 3 m)		
Standard sensing object		100 mm dia., 1.5 m long metal or plastic round pipe		
Minimum sensing object		50 x 50 mm flat plate		
Directional angle		$\pm 25^\circ$		
Ultrasonic oscillation frequency		Approx. 40 kHz		
Response time	Operate	0.25 s		
	Release	0.5 s		
Control output		Contact output : SPDT 3 A at 220 VAC/24 VDC (resistive load)		
Indicators		Operation, red LED		
Ambient operating temperature		$-20^\circ\text{C}$ to $55^\circ\text{C}$ ( $-4^\circ\text{F}$ to $131^\circ\text{F}$ ) with no icing		
Relative humidity		45% to 85%		

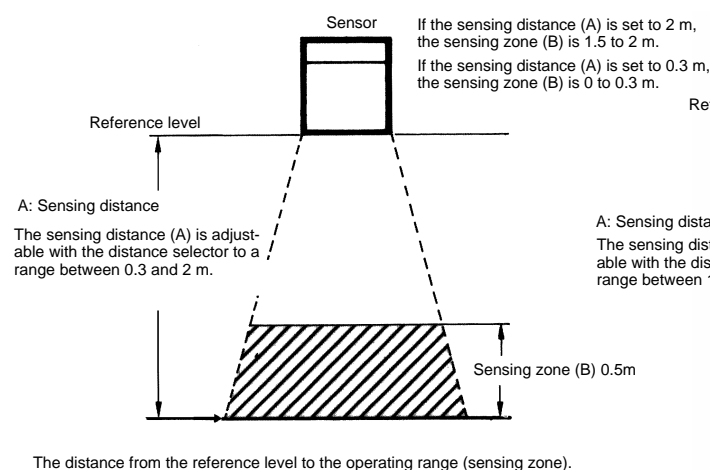
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Specifications Table – continued from previous page

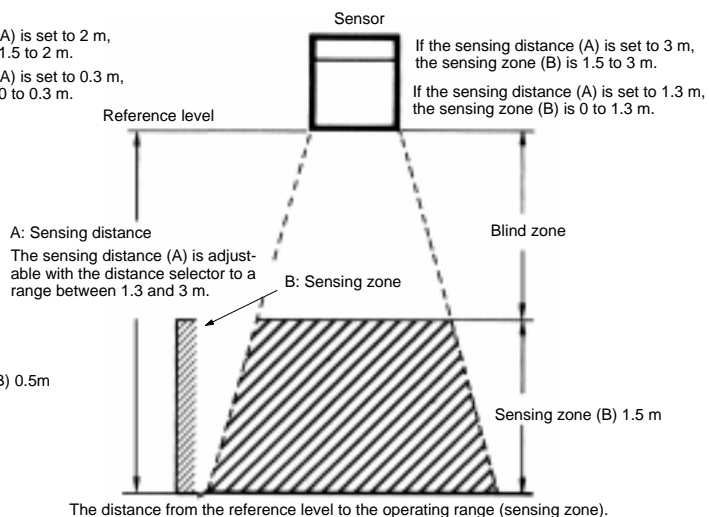
Part number		E4A-3K DC12/24	E4A-3K AC120/240	E4A-3K AC100/200
Insulation resistance		20 MΩ minimum at 500 VDC		
Dielectric strength		1500 VAC, 50/60 Hz for 1 minute		
Vibration resistance		10 to 25 Hz, 1.5-mm double amplitude for 2 hours each in X, Y and Z axes		
Shock resistance		500 m/s <sup>2</sup> (approx. 50 g) 6 times each in X, Y and Z axes		
Life expectance (output relay)	Mechanical	20,000,000 operations minimum		
	Electrical	100,000 operations minimum		
Enclosure rating		IP60		
Approvals	UL, cUL	Recognized, File No. E41515		
Weight		Approx. 600 g with mounting bracket Approx. 500 g without mounting bracket		

## ■ OPERATING RANGE AND SENSING ZONE

### 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



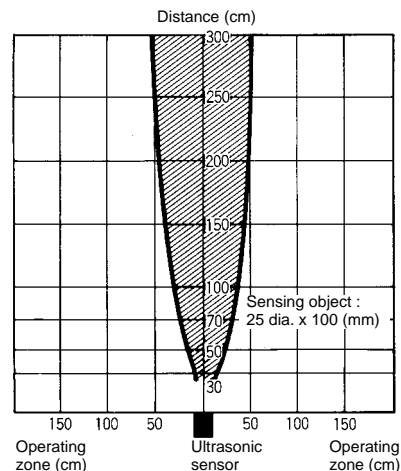
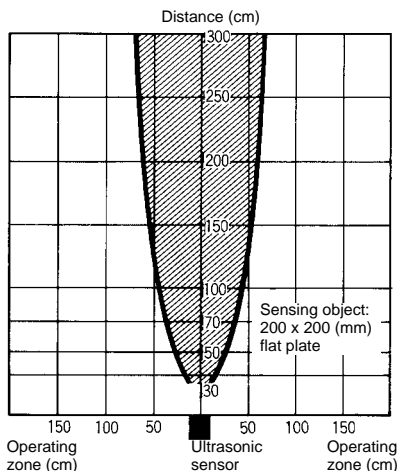
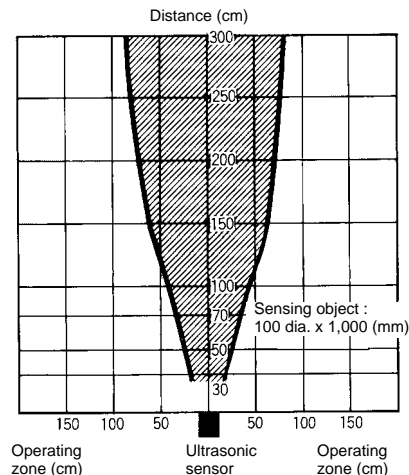
An object may be detected due to multiple reflection if the object is in the blind zone, in which case the detection of the object will not be stable. Therefore, do not attempt to use the E4A-3K to detect an object in the dead range by making use of multiple reflection.

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.

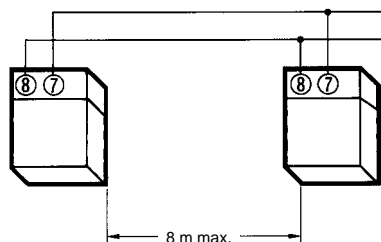
## Engineering Data

### ■ OPERATING ZONE (TYPICAL EXAMPLES)

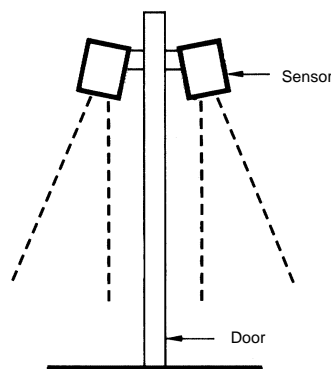
The operating zone is the sensing range of the E4A-3K at the sensing distance with the sensing object moved vertically towards the ultrasonic beam. The operating zone varies with the sensing distance and sensing object.



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



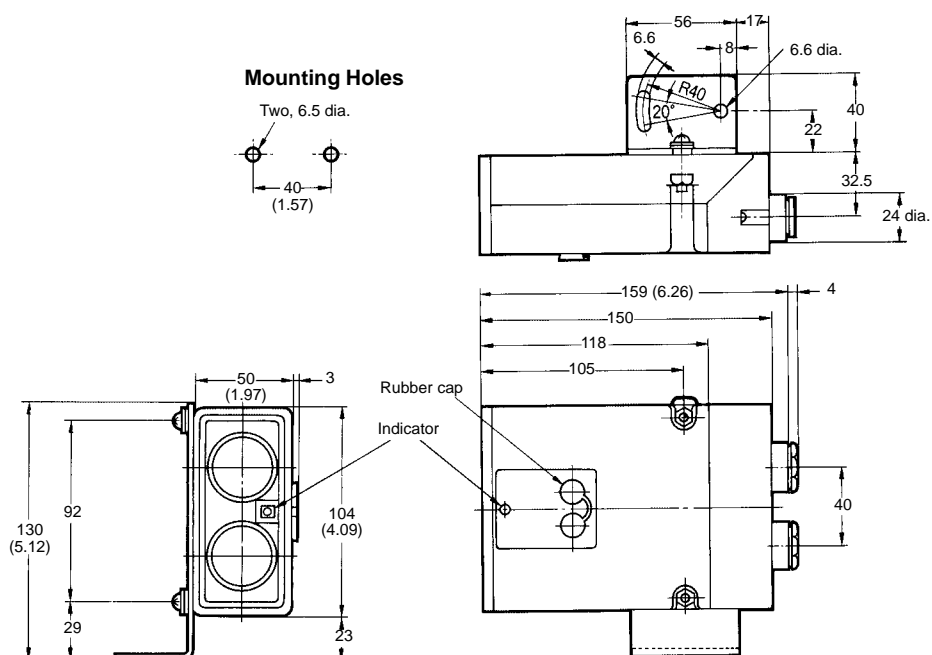
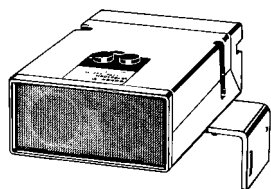
- If there is a door between two Units located for different operating zones as shown in the following illustration, be sure to wire the Units for synchronous operation, or interference may occur when the door opens.



# Dimensions

Unit: mm (inch)

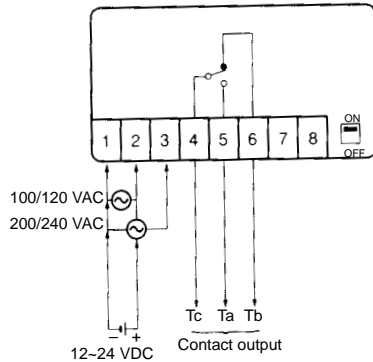
## ■ E4A-3K



## Installation

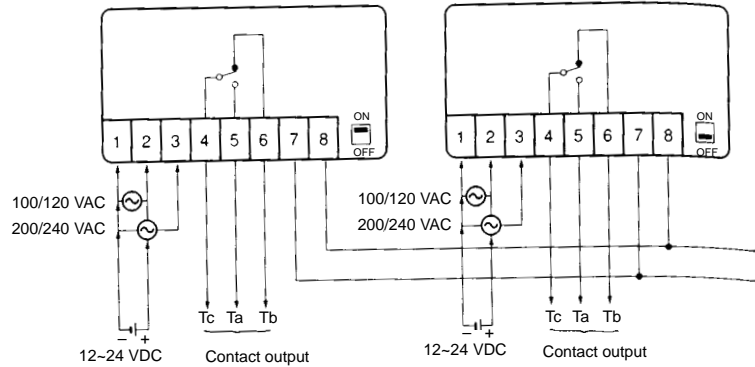
### EXTERNAL CONNECTIONS

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

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

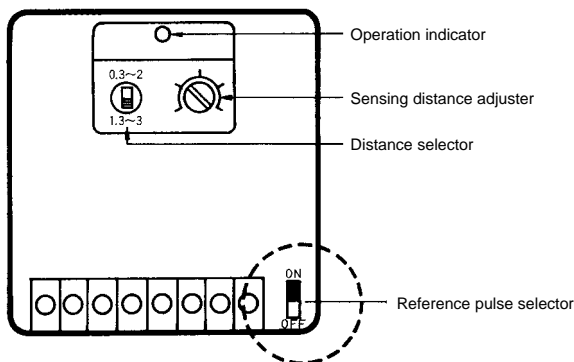


- Note: 1. If the synchronous operation of the E4A-3K is required, set the reference pulse selector of only one Unit to ON. Then connect terminal 7 of all the Units together and do the same for terminal 8.
2. A maximum of 50 sensors can be connected in synchronous operation.
3. Do not wire the lines 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.



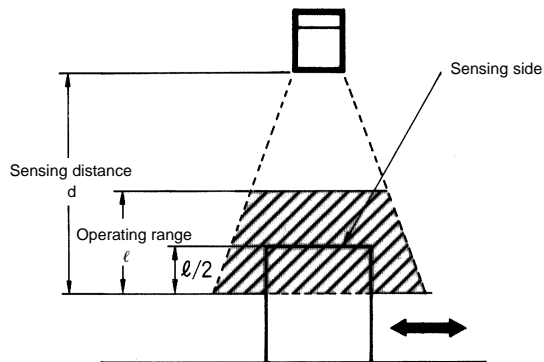
### SENSING DISTANCE ADJUSTMENTS

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.

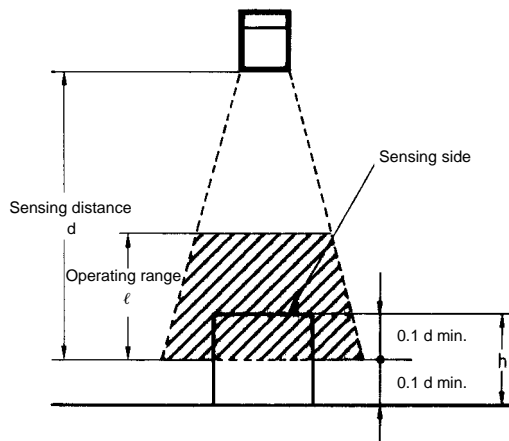
1. Apply a flat-blade screwdriver to the groove of the distance selector to set the distance selector to either a range between 0.3 and 2 m or a range between 1.3 and 3 m according to the desired sensing distance and operating range.
2. To set the sensing distance, first locate a flat plate as a sensing 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 across 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.

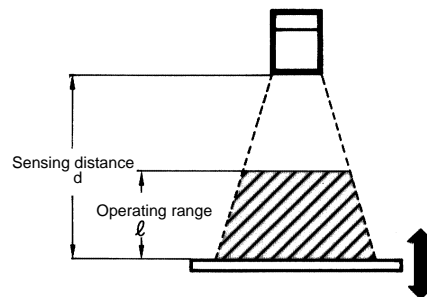


If there is an object, such as a floor, wall, or conveyor, located behind the sensing object, make sure that the distance between the set sensing distance ( $d$ ) and the background object is  $0.1d$  min. Also, make sure that the set sensing distance ( $d$ ) is at least  $0.1d$  closer to the Sensor 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.

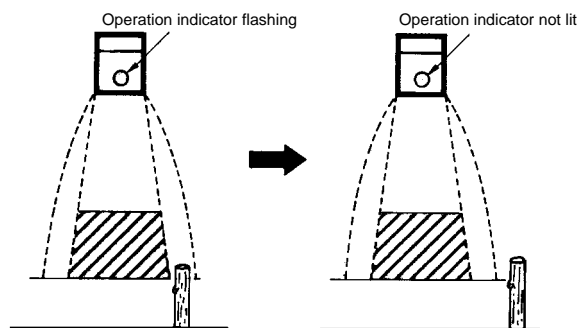
- If the sensing object is moving parallel to the ultrasonic beam for level or height detection, the sensing distance will be the distance required for the sensing object to move.



## 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 operation 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

### ■ 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 peripheral area 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.

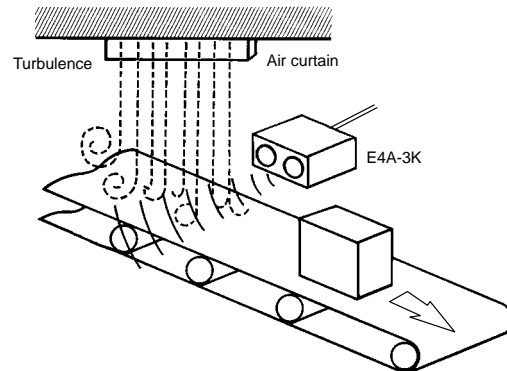
Do not subject the Sensor to heavy impact, shock, or vibration (see *Specifications*) or the E4A-3K will no longer be water-resistant.

If the E4A-3K is not mounted securely, it 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 Sensor utilizes the air as a beam transmission media. Do not use the E4A-3K in places with strong air currents or extreme temperature changes. For example, if there is an 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.

**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

**OMRON**<sup>®</sup>  
**OMRON ELECTRONICS, INC.**  
One East Commerce Drive  
Schaumburg, IL 60173  
**1-800-55-OMRON**

**OMRON CANADA, INC.**  
885 Milner Avenue  
Scarborough, Ontario M1B 5V8  
**416-286-6465**