



### Compact, Column-shaped Sensor Capable of Sensing Range Setting

- Ensures the stable detection of a variety of objects regardless of the color, transparency, or material (metallic or non-metallic) of the objects.
- Separated amplifier design allows a sensor head as compact as M18.
- Reflective models with limited sensing zones ensure smooth object detection without being influenced by background objects.
- Incorporates a synchronous selector, thus making it possible to prevent mutual interference when more than one Sensor is closely mounted.
- NPN and PNP open collector outputs are available and connect to the sensor controller through connectors with no wiring effort.
- The Amplifier Unit incorporates an easy-to-use NO/NC (normally open and normally closed contact) selector.



### Ordering Information

#### Sensors

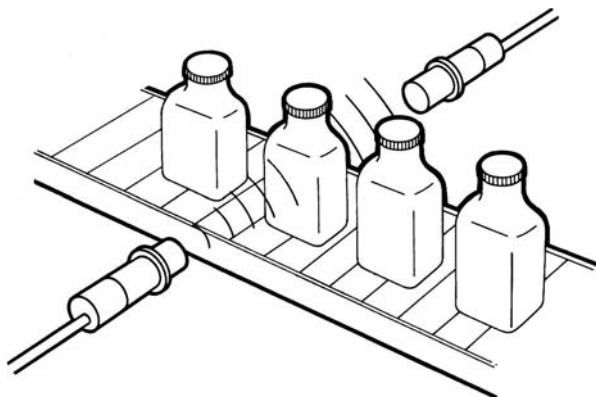
Sensing method	Sensing distance	Model
Through-beam	 50 cm	E4C-TS50
Reflective (convergent reflective)	 10 to 35 cm	E4C-LS35

#### Amplifier Units

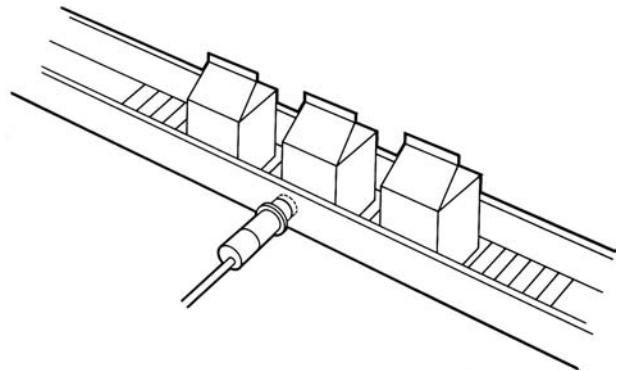
Supply voltage	Model
12 to 24 VDC	E4C-WH4T
12 to 24 VDC	E4C-WH4L

### Application Examples

#### Detection of transparent bottles and containers



#### Detection of milk packages



# Specifications

## ■ Ratings/Characteristics

### Sensors

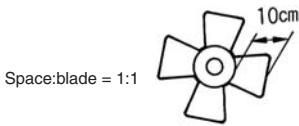
Model		E4C-TS50	E4C-LS35
Item	Sensing method	Through-beam	Reflective
Sensing distance		50 cm	10 to 35 cm (possible to limit the sensing zone within a range between 2 and 25 cm)
Standard sensing object		10 x 10 cm flat plate	4 x 4 cm flat plate
Ultrasonic oscillation frequency		Approx. 270 kHz	
Response frequency		50 Hz	20 Hz
Directional angle (see note 1)		±8° max.	
Indicator		SENSING indicator (red LED)	
Ambient temperature		Operating: -10°C to 55°C (with no icing)	
Ambient humidity		Operating: 35 to 95%	
Vibration resistance		Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions	
Shock resistance		Destruction: 500 m/s <sup>2</sup> (approx. 50G) 3 times each in X, Y, and Z directions	
Degree of protection (see note 2)		IEC IP66	
Cord length		2 m	
Weight		Approx. 300 g (with Emitter and Receiver)	Approx. 150 g
Material	Case	Heat-resistant ABS resin	
	Nut	Polyacetal resin	

- Note:**
1. This is the half-value angle obtainable with a signal of -6 dB.
  2. The enclosure rating indicates the degree of protection of the case, which will depend on the operating condition.

### Amplifier Units

Model		E4C-WH4T	E4C-WH4L
Item	Sensing method	Through-beam	Reflective
Sensing distance		50 cm	10 to 35 cm
Supply voltage (operating voltage range)		12 to 24 VDC ±10% with a max. ripple ±10% (p-p)	
Current consumption		100 mA max. at 12 VDC	
Differential travel		---	20% max. of rated sensing distance
Response frequency (see note)		50 Hz	20 Hz
Control output (residual voltage)		Terminal output: 100 mA max. (NPN or PNP open collector output at 40 VDC with a residual voltage of 2 V) Connector output: 50 mA max. (photocoupler output)	
Operation mode		Normally open or normally closed (selectable with a slide switch)	
Ultrasonic compensation		Yes	
Indicator		SENSING indicator (red LED) and STABILITY indicator (green LED)	
Ambient temperature		Operating: -10°C to 55°C (with no icing)	
Ambient humidity		Operating: 35 to 95%	
Temperature influence		±30% max. of sensing distance at 20°C in the temperature range of -10°C and 55°C	±10% max. of sensing distance at 20°C in the temperature range of -10°C and 55°C
Voltage influence		±10% max. of sensing distance at a voltage between 90% and 110% of the rated power supply voltage	
Insulation resistance		20 MΩ min. (at 500 VDC) between current carry parts and case	
Dielectric strength		1,000 VAC (50/60 Hz) for 1 min between current carry parts and case	
Vibration resistance		Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions	
Shock resistance		Destruction: 500 m/s <sup>2</sup> (approx. 50G) 3 times each in X, Y, and Z directions	
Degree of protection		IEC IP40	
Weight		Approx. 110 g	

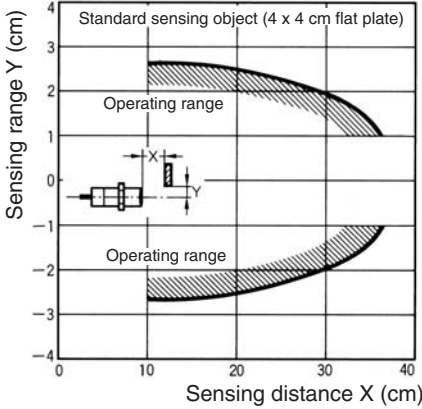
- Note:** The response frequencies are values obtained with the E4C used for detecting the rotating propeller-shaped disc as shown on the right.



# Engineering Data

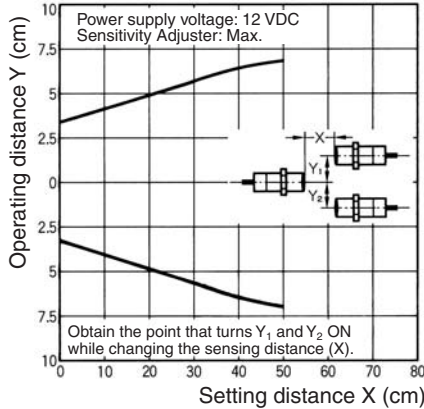
## Sensing Range (Typical)

E4C-LS35



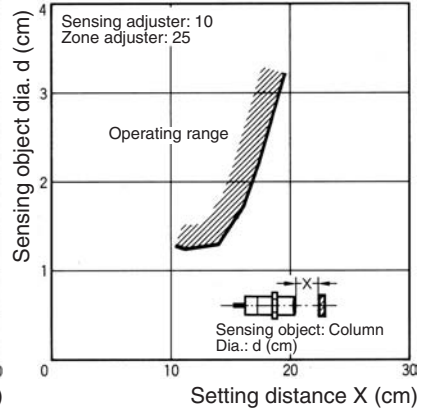
## Parallel Movement Characteristics (Typical)

E4C-TS50



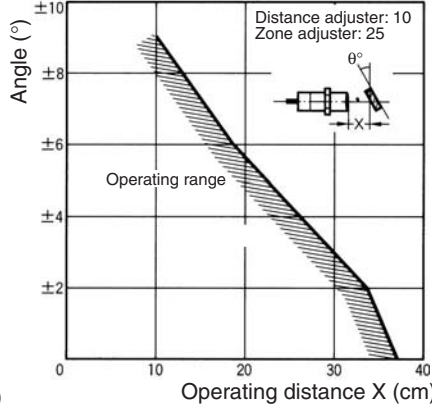
## Operating Distance vs. Sensing Object Size (Typical)

E4C-LS35



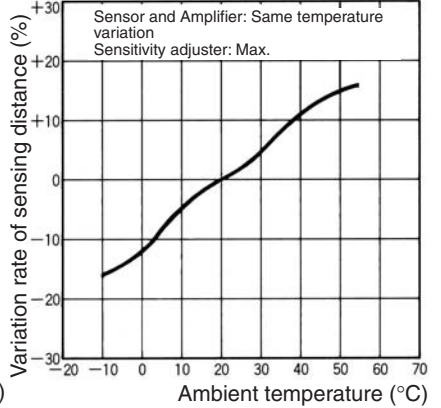
## Operating Distance vs. Sensing Object Angle (Typical)

E4C-LS35

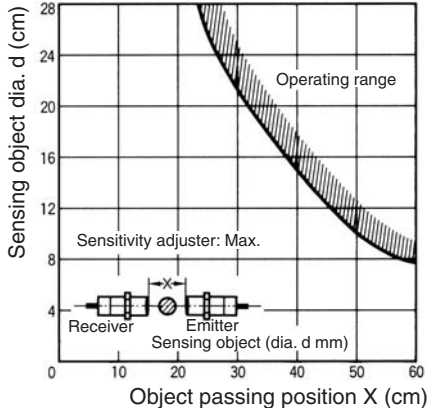


## Ambient Temperature vs. Variation Rate of Sensing Distance (Typical)

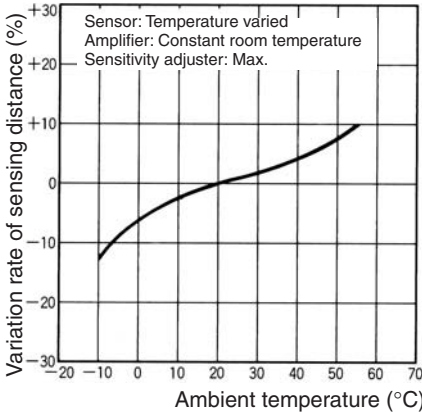
E4C-TS50+ E4C-WH4T



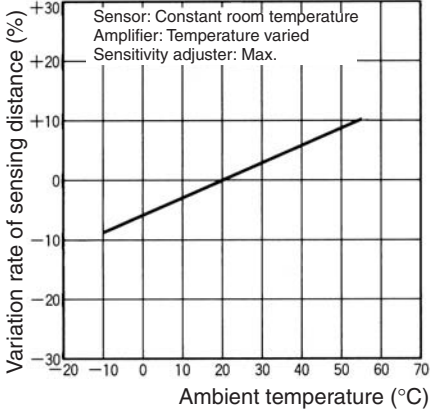
E4C-TS50



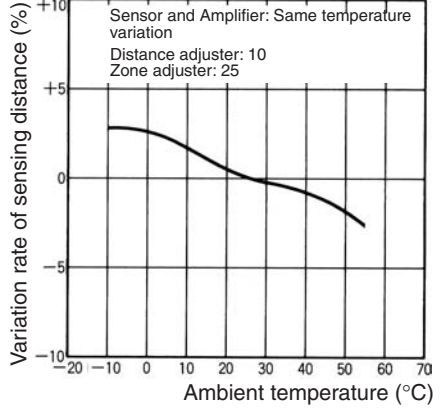
E4C-TS50+E4C-WH4T



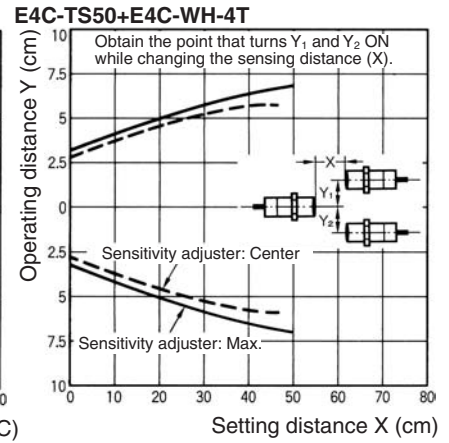
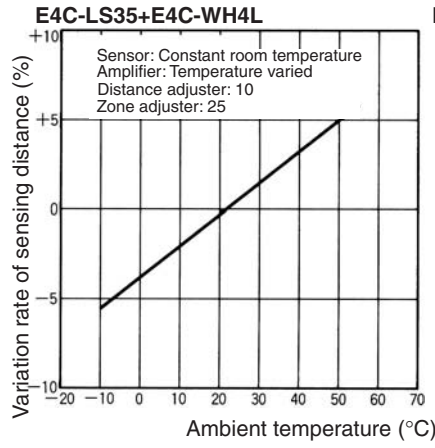
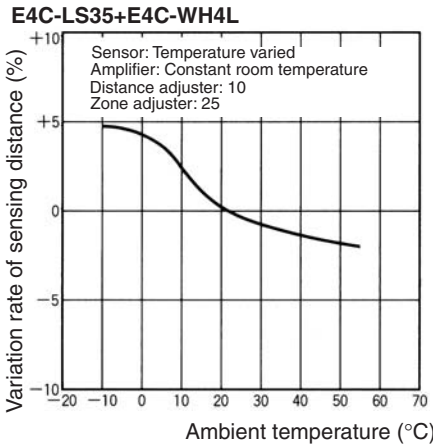
E4C-TS50+E4C-WH4T



E4C-LS35+E4C-WH4L



**Sensitivity Adjuster Position vs. Parallel Movement Characteristics**



**Amplifier Units**

**Indicators**

- STABILITY Indicator (Green)

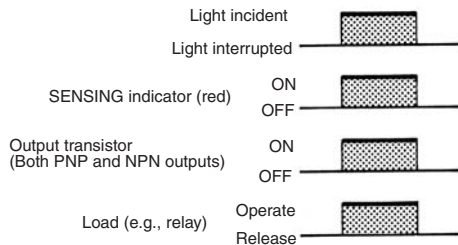
When this indicator is lit, the ultrasonic input into the Receiver is sufficient, or its interruption small enough, to ensure the smooth operation of the E4C. Do not operate the E4C when this indicator is not lit.

- SENSING Indicator (Red)

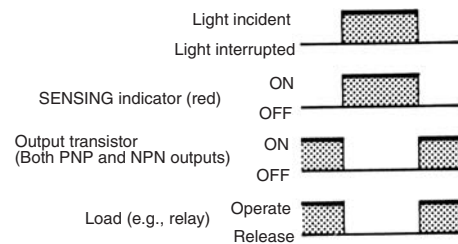
When this indicator is lit, the Receiver has ultrasonic input.

**Operation Selector (H1/H2)**

**Incident-ON (H1)**



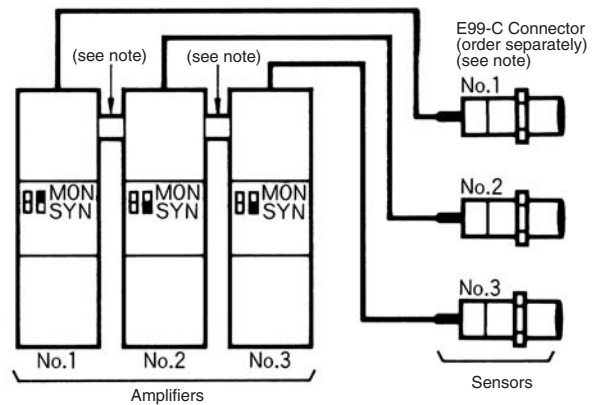
**Incident-OFF (H2)**



**Note:** The load in operation is connected to the output circuit of the E4C.

**Asynchronous/Synchronous (MON/SYN) Switch**

- If more than one Sensor is used in one place, the Sensors need to be in synchronous operation for the prevention of mutual interference. A maximum of four Sensors can be in synchronous operation.
- Connect the DC power supply and Sensor to each Amplifier as usual.
- Use the E99-C (order separately) connector to connect the Sensor to the Amplifier.
- If the case of the connections shown in the following illustration, set the selector of only one Amplifier (No. 1 in the following case) to MON. Set the selector of any other Amplifier to SYN.



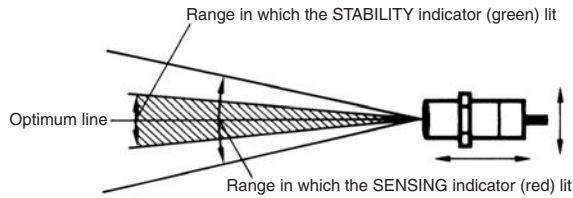
**Note:** The E99-C Connector will be most effective if the E4C is a reflective model although the E99-C Connector is required by both the reflective and through-beam models. When using through-beam models, however, be sure to maintain enough between adjacent Sensors to suppress mutual interference. Refer to *Sensitivity Adjuster Position vs. Parallel Movement Characteristics* in *Engineering Data*.

## ■ Sensitivity/Zone Adjustments

### E4C-TS50 and E4C-WH4T Through-beam Models

Set the SENSITIVITY adjuster of the Receiver to maximum.

Move the Emitter and Receiver vertically and horizontally until the SENSING indicator of the Receiver is lit and secure the Emitter and Receiver at the midpoint of the range within which the STABILITY indicator is lit.



Pass the sensing object through the sensing range and adjust the sensitivity so that the SENSING indicator turns ON and OFF according to the presence or absence of the sensing object while the STABILITY indicator is lit continuously.

If the STABILITY indicator is not lit while the Sensor is in operation, this may indicate a possible operational error. Check or readjust the sensitivity.

If the Emitter and Receiver are set at a distance shorter than the rated sensing distance, reduce the sensitivity to within the range in which the STABILITY indicator is lit. This will increase the immunity of the Sensor against noise.

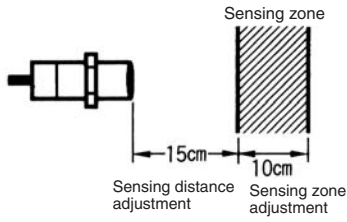
### E4C-LS35 and E4C-WH4L Convergent Reflective Model

Locate the Sensor so that both the STABILITY and SENSING indicators will be lit when the sensing object is placed at the sensing position, and the STABILITY indicator will be lit and the SENSING indicator will turn OFF when the sensing object is removed.

Step	1	2	3	4
<b>Sensing</b>				
<b>Distance adjuster</b> <b>Zone adjuster</b>		---	---	
<b>Adjustment procedure</b>	Place the sensing object at the sensing position and turn the distance adjuster clockwise gradually until both the SENSING and STABILITY indicators are lit. (See note 2)	Move the Emitter and Receiver vertically and horizontally and secure the Emitter and Receiver at the midpoint of the range within which the STABILITY indicator is lit.	Remove the sensing object and check that the SENSING indicator is OFF and the STABILITY indicator is continuously lit.	The sensing zone can be set within a range of 2 to 25 cm with the zone adjuster.

- Note:**
1. If the STABILITY indicator is not lit while the Sensor is in operation, this indicates a possible operational error. Check or readjust the sensitivity.
  2. The sensing distance is adjustable within a range of 10 to 35 cm with the distance adjuster.
  3. Adjust the sensing zone within the sensing distance adjustable range (i.e., 10 to 35 cm).

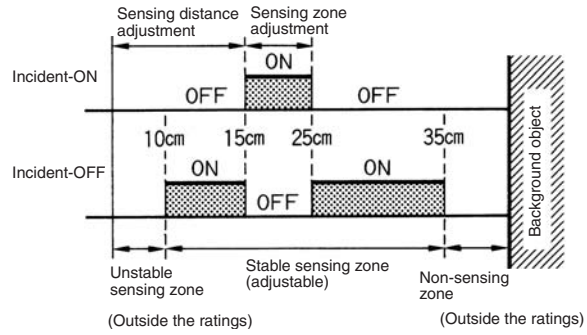
### Sensing Zone Setting Example



**Note:** Make the settings as shown above to set a sensing zone of 10 cm with a sensing distance adjustment of 15 cm.

### Relationship between Incident-ON and Incident-OFF

**Example:** Sensing distance set to 15 cm and zone set to 10 cm

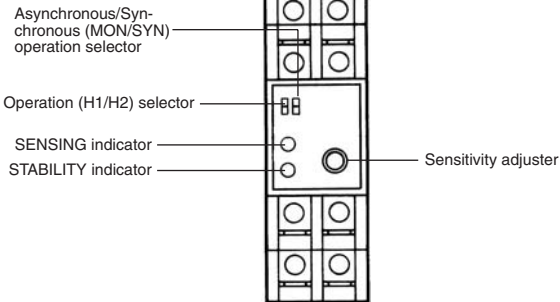


**Note:** Set the zone within a distance of 10 to 35 cm from the Sensor. Therefore, if the distance adjuster is set to 30 cm and zone adjuster is set to 20 cm, the sensing zone will be 5 cm from a point 30 cm away from the Sensor.

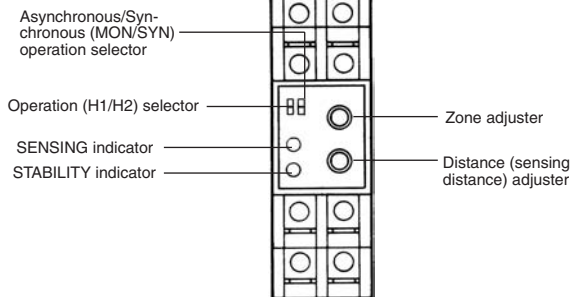
Step	1	2
Distance adjuster and zone adjuster		
Adjustment procedure	Set the distance adjuster to 15 cm	Set the zone adjuster to 10 cm.

## Nomenclature

#### E4C-WH4T

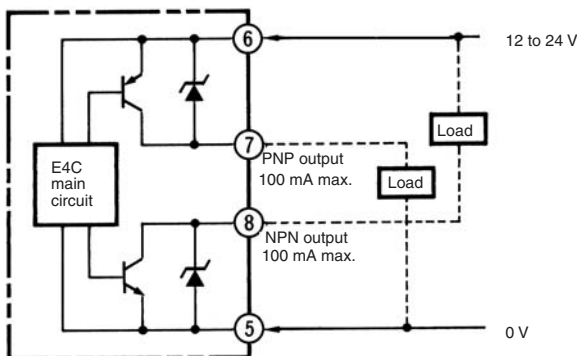


#### E4C-WH4L



## Operation

### Output Circuit

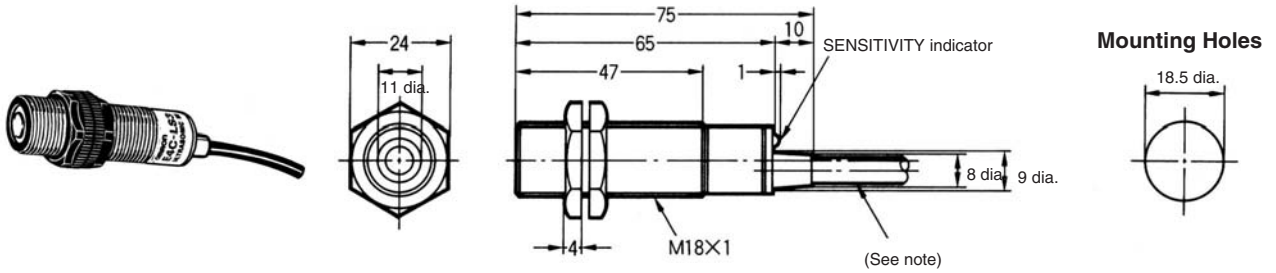


# Dimensions

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

## Sensors

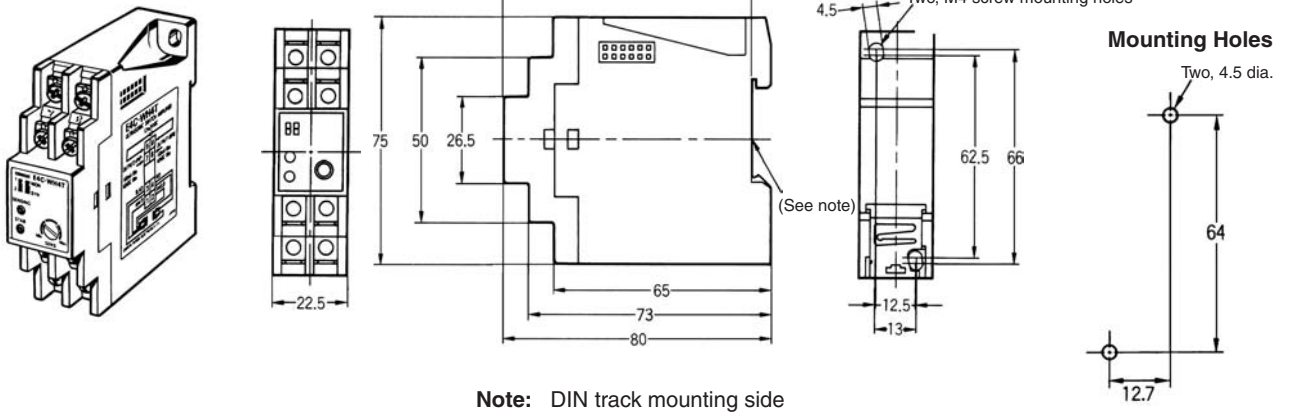
E4C-TS50  
E4C-LS35



**Note:** E4C-TS50R or E4C-LS35: 3-conductor, shielded cord (6 dia., UL2791) with 7/0.25 dia. (standard length: 2 m)  
E4C-TS50S: 2-conductor, shielded cord (6 dia., UL20276) with 7/0.25 dia. (standard length: 2 m)

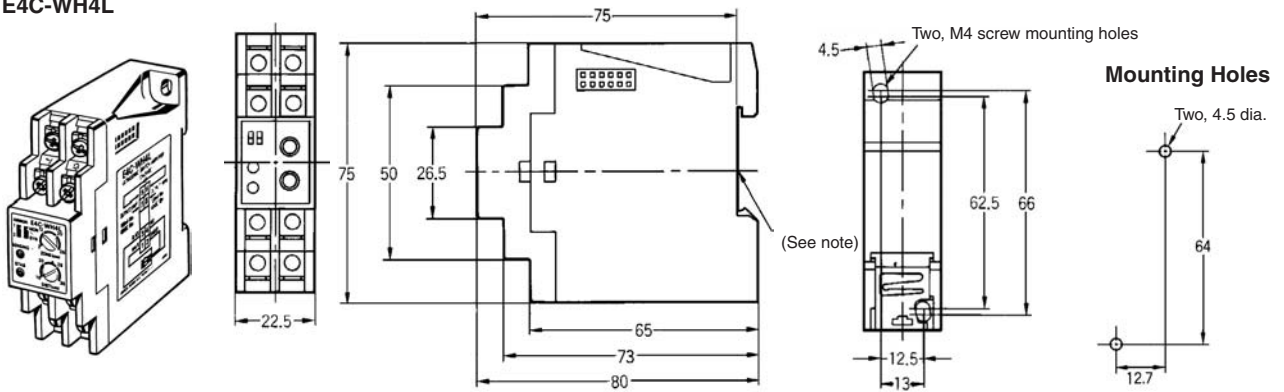
## Amplifier Units

E4C-WH4T



**Note:** DIN track mounting side

E4C-WH4L

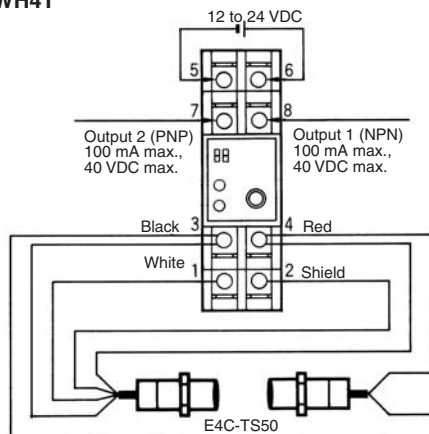


**Note:** DIN track mounting side

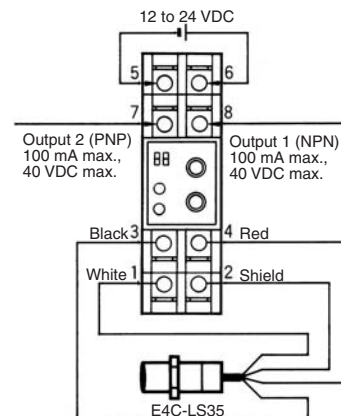
# Installation

## ■ Connections

E4C-WH4T



E4C-WH4L



# Precautions

## ■ Correct Use

### Sensor Mounting Angle

If the E4C 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 E4C 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 E4C by using the nuts provided with the E4C or the mounting holes of the E4C. Refer to *Dimensions* for details.

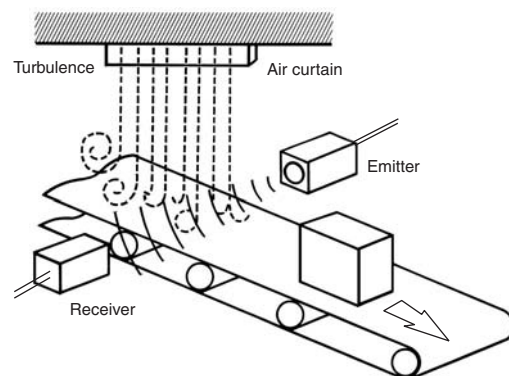
Do not strike the Sensor with any hammer or other object, otherwise the E4C will no longer be water-resistant.

If the E4C is not mounted securely, the E4C 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 E4C at a temperature exceeding the rated range or outdoors, otherwise the reliability and life of the E4C will decrease.

The Ultrasonic Reflective Sensor utilizes the air as a beam transmission media. Do not use the E4C 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 E4C may malfunction.



The jetting sound of air nozzles includes noise of a wide frequency range, which will affect the operation of the E4C. Do not use an air nozzle near the E4C.

The sensing distance of the E4C 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.



## Mutual Interference

If more than one Unit is closely mounted together or used in a narrow space, the mutual interference of the Sensors will result. To prevent this, set the MON/SYN selector to SYN and check that no mutual interference results.

## Connections

The cord length between the Sensor and Amplifier can be a maximum of 20 m provided that the cord is a three-conductor, shielded cord (6 dia., UL2791) with 7/0.25 dia. If the Emitter is the E4C-TS50S, however, use a two-conductor, non-shielded cord (6 dia. UL20276) with 7/0.25 dia.

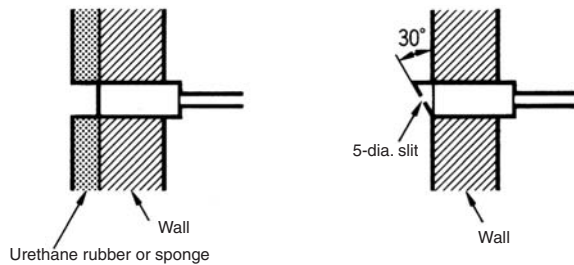
Do not wire the lines of the E4C along with high-tension or power lines in the same conduit or close together, otherwise the E4C may malfunction due to inductive noise.

The power supply lines of the Amplifier can be extended up to 100 m provided that the size of the cord is 0.3 dia. or more.

## Others

Be sure not to turn the sensitivity adjuster excessively. If the sensitivity adjuster is turned exceeding the permissible range, no sensitivity adjustment will be possible again.

Take the measures shown in the following illustrations if multiple reflection results.



The sensing distance will be, however, reduced to half (i.e., 10 to 17 cm) if the slit is used.

If the sensing zone is set to a small value (i.e., a few centimeters) on the E4C reflective model, the E4C may require a warming-up time of 3 minutes or more after the E4C is turned ON.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

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

**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 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 product.

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 PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## 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 product 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 product.

### DIMENSIONS AND WEIGHTS

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

### ERRORS AND OMISSIONS

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

### 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.

### PROGRAMMABLE PRODUCTS

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

### COPYRIGHT AND COPY PERMISSION

This catalog shall not be copied for sales or promotions without permission.

This catalog is protected by copyright and is intended solely for use in conjunction with the product. Please notify us before copying or reproducing this catalog in any manner, for any other purpose. If copying or transmitting this catalog to another, please copy or transmit it in its entirety.