OMRON

Ultrasonic Proximity Sensor | E4C

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

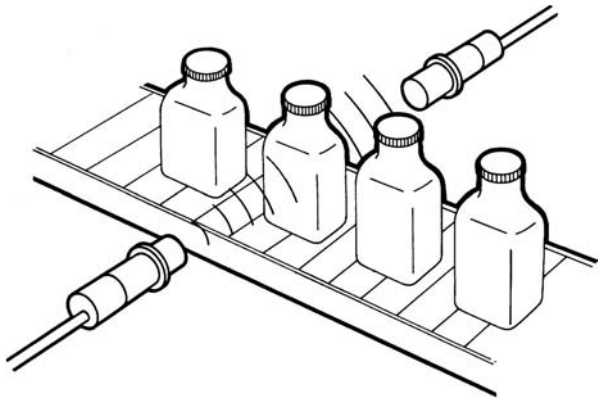
Sensing method	Sensing distance	Model
Through-beam	50 cm	E4C-TS50
Reflective (convergent reflective)	10 to 35 cm	E4C-LS35

Amplifier Units

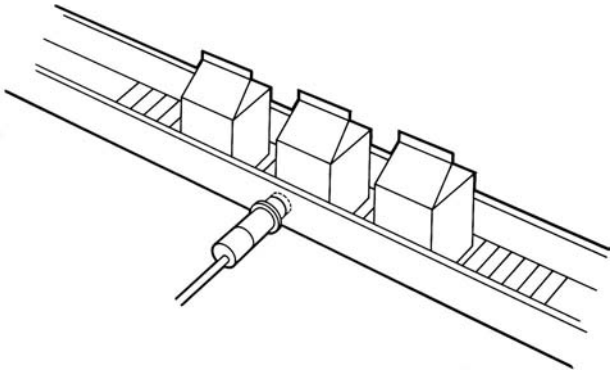
Supply voltage	Model
12 to 24 VDC	E4C-WH4T
12 to 24 VDC	E4C-WH4L

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^2 (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.

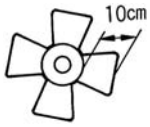
2. The enclosure rating indicates the degree of protection of the case, which will depend on the operating condition.

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^2 (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.

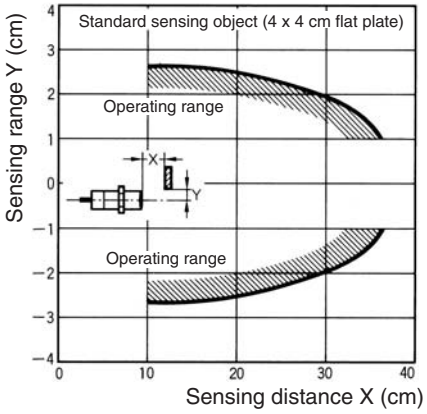
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Engineering Data

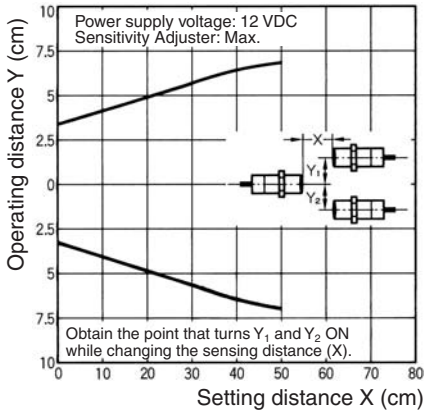
Sensing Range (Typical)

E4C-LS35



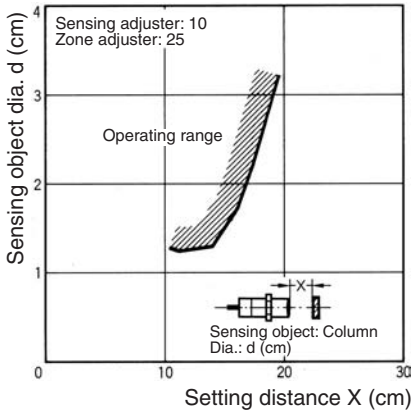
Parallel Movement Characteristics (Typical)

E4C-TS50



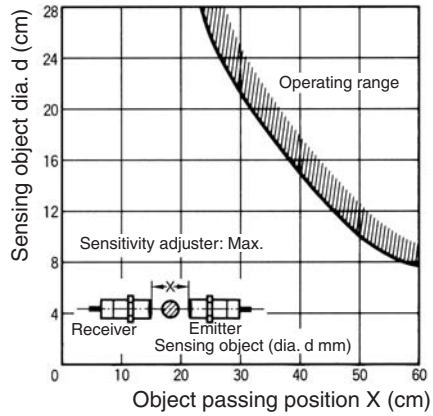
Operating Distance vs. Sensing Object Size (Typical)

E4C-LS35

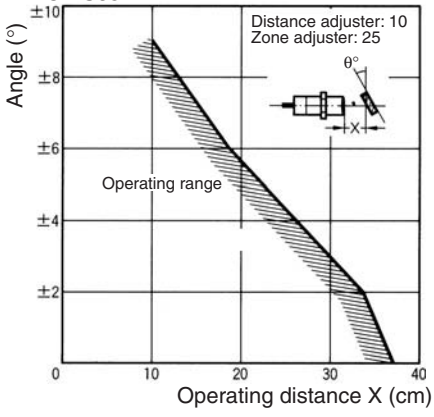


Operating Distance vs. Sensing Object Angle (Typical)

E4C-TS50

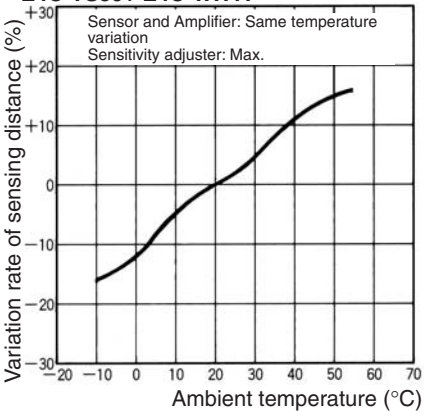


E4C-LS35

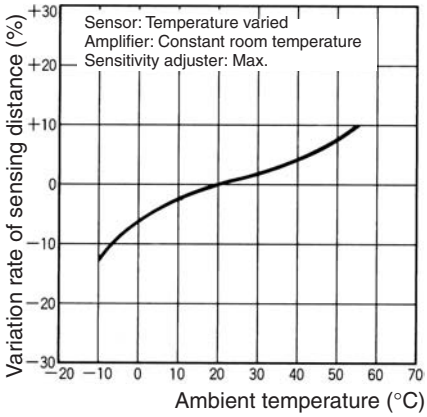


Ambient Temperature vs. Variation Rate of Sensing Distance (Typical)

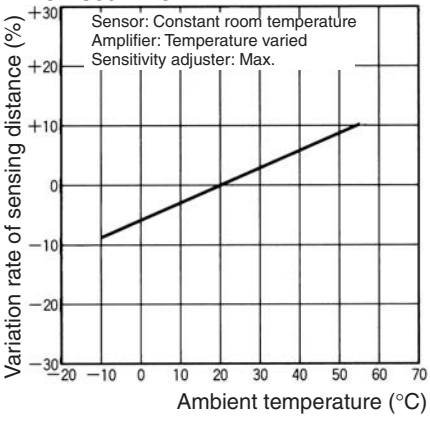
E4C-TS50+ E4C-WH4T



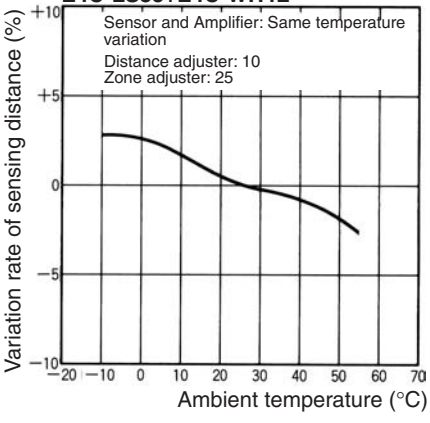
E4C-TS50+E4C-WH4T



E4C-TS50+E4C-WH4T

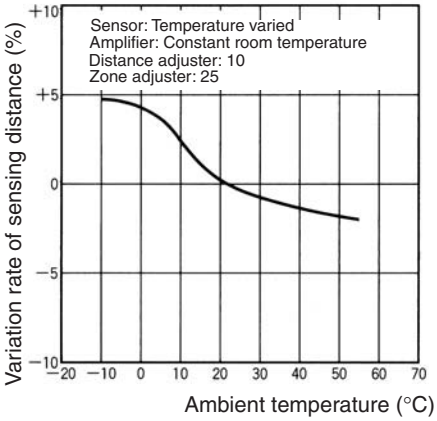


E4C-LS35+E4C-WH4L

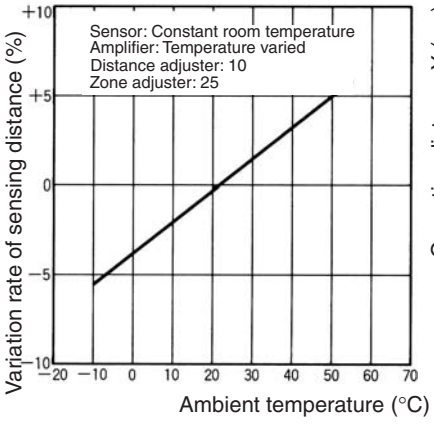


Sensitivity Adjuster Position vs. Parallel Movement Characteristics

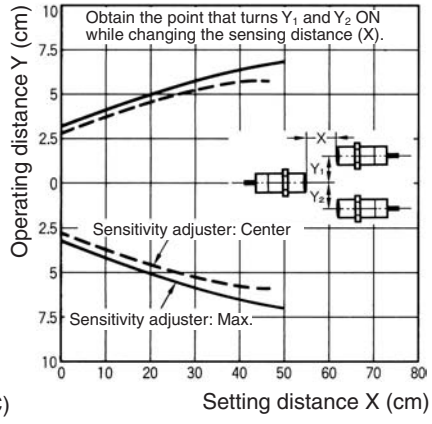
E4C-LS35+E4C-WH4L



E4C-LS35+E4C-WH4L



E4C-TS50+E4C-WH-4T



■ Amplifier Units

Indicators

• STABILITY Indicator (Green)

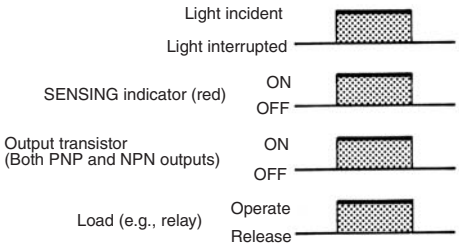
When this indicator is lit, the ultrasonic input into the Receiver is sufficient, or its interruption small enough, to ensure the smooth operation of the E4C. Do not operate the E4C when this indicator is not lit.

• SENSING Indicator (Red)

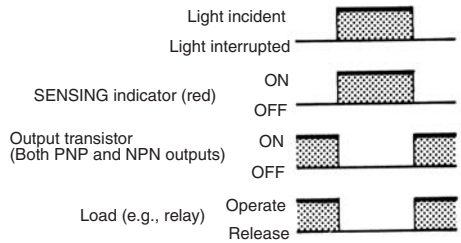
When this indicator is lit, the Receiver has ultrasonic input.

Operation Selector (H1/H2)

Incident-ON (H1)



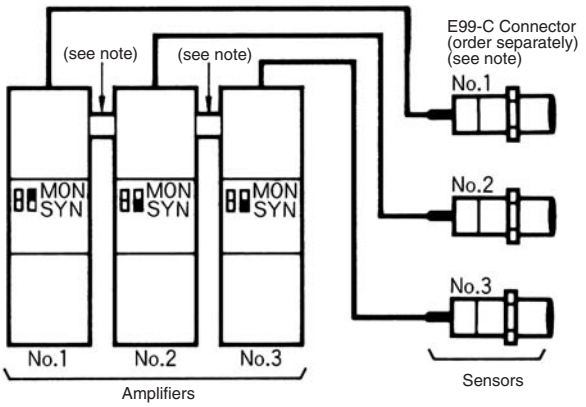
Incident-OFF (H2)



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.



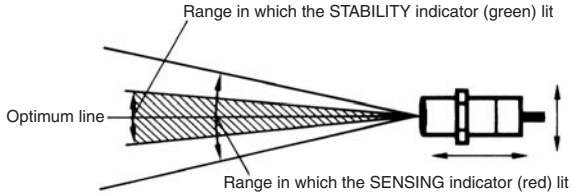
Note: The E99-C Connector will be most effective if the E4C is a reflective model although the E99-C Connector is required by both the reflective and through-beam models. When using through-beam models, however, be sure to maintain enough between adjacent Sensors to suppress mutual interference. Refer 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.



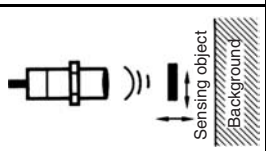
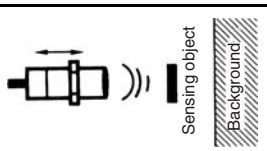
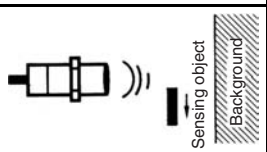
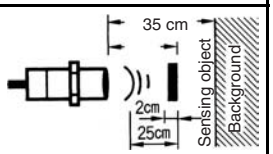
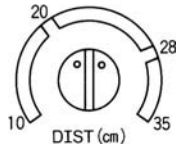
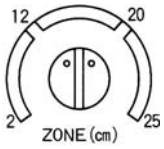
Pass the sensing object through the sensing range and adjust the sensitivity so that the SENSING indicator turns ON and OFF according the presence or absence of the sensing object while the STABILITY indicator is lit continuously.

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.

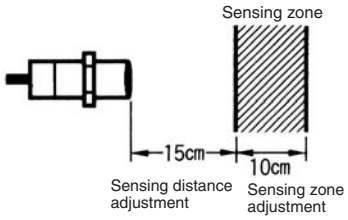
Step	1	2	3	4
Sensing				
Distance adjuster **Zone adjuster**		---	---	
Adjustment procedure	Place the sensing object at the sensing position and turn the distance adjuster clockwise gradually until both the SENSING and STABILITY indicators are lit. (See note 2)	Move the Emitter and Receiver vertically 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).

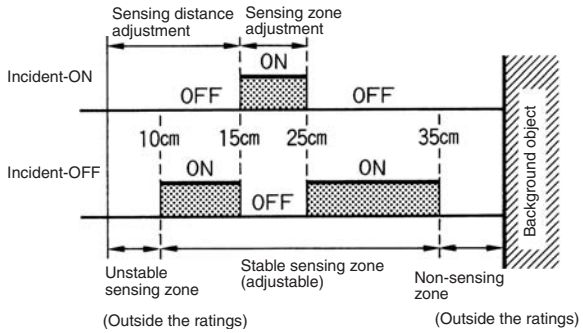
Sensing Zone Setting Example



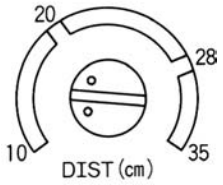
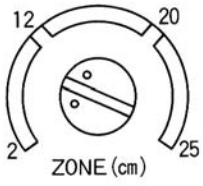
Note: Make the settings as shown above to set a sensing zone of 10 cm with a sensing distance adjustment of 15 cm.

Relationship between Incident-ON and Incident-OFF

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

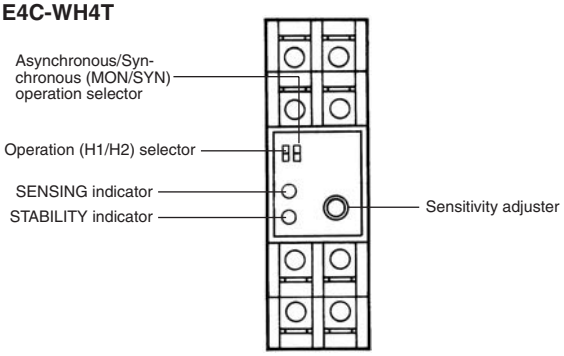


Note: Set the zone within a distance of 10 to 35 cm from the Sensor. Therefore, if the distance adjuster is set to 30 cm and zone adjuster is set to 20 cm, the sensing zone will be 5 cm from a point 30 cm away from the Sensor.

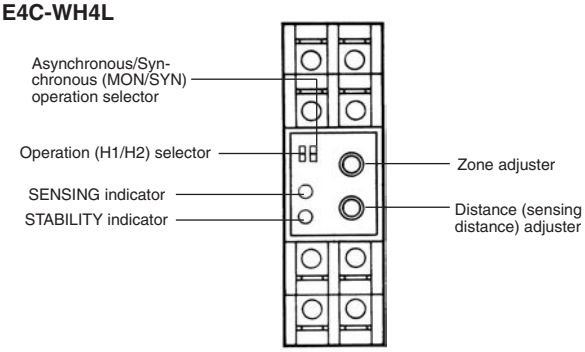
Step	1	2
Distance adjuster and zone adjuster		
Adjustment procedure	Set the distance adjuster to 15 cm	Set the zone adjuster to 10 cm.

Nomenclature

E4C-WH4T

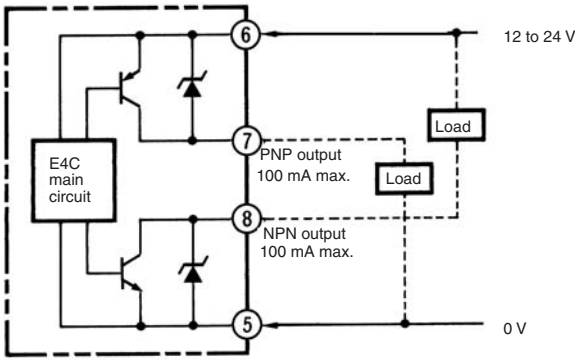


E4C-WH4L



Operation

■ Output Circuit

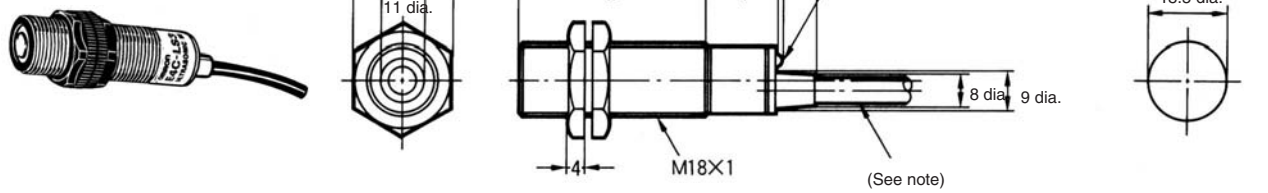


Dimensions

Note: All units are in millimeters unless otherwise indicated.

Sensors

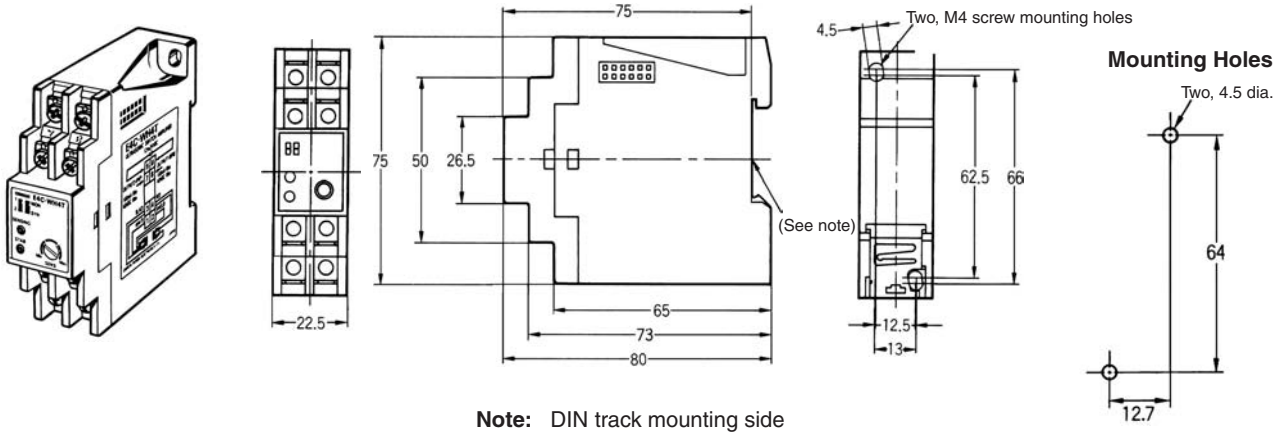
E4C-TS50
E4C-LS35



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)

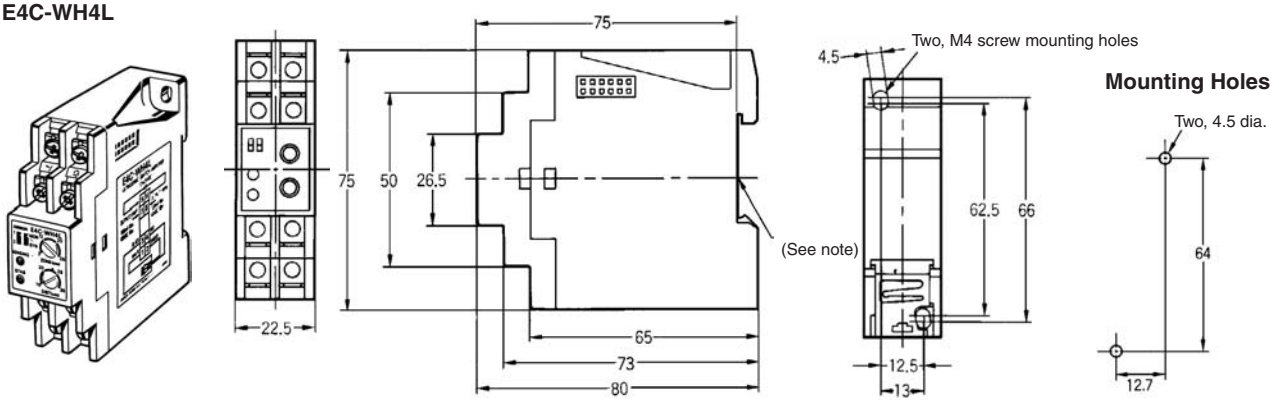
Amplifier Units

E4C-WH4T



Note: DIN track mounting side

E4C-WH4L

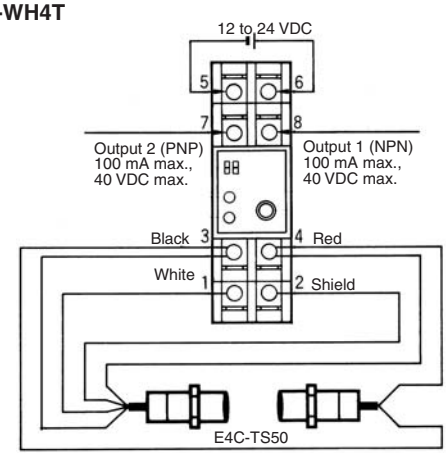


Note: DIN track mounting side

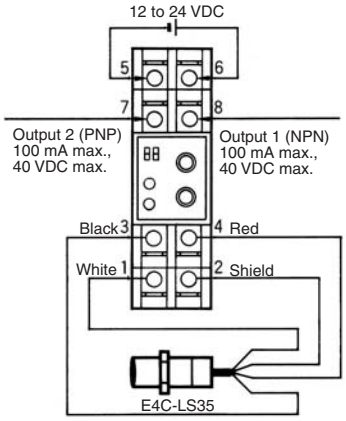
Installation

■ 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.

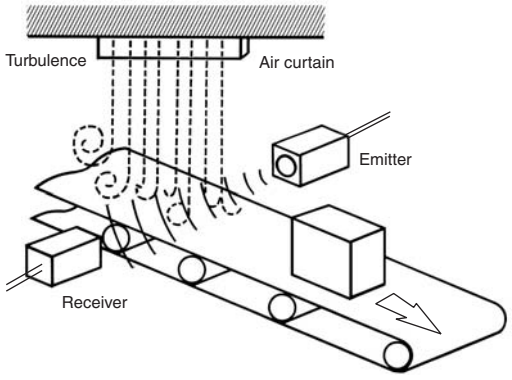
Do not strike the Sensor with any hammer or other object, otherwise the E4C will no longer be water-resistant.

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.

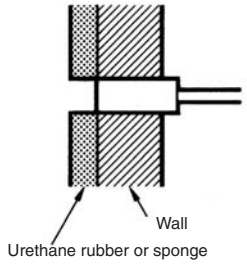
Do not wire the lines of the E4C along with high-tension or power lines in the same conduit or close together, otherwise the E4C may malfunction due to inductive noise.

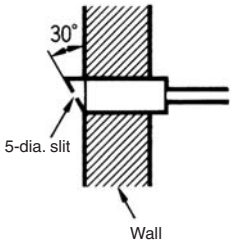
The power supply lines of the Amplifier can be extended up to 100 m provided that the size of the cord is 0.3 dia. or more.

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.

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