OMRON

Ultrasonic 18 mm Cylindrical

E4C

Compact Through-Beam and Reflective Models

- Background suppression
- NPN/PNP output, switch selectable
- Mutual interference protection for multiple units
- DIN-rail mountable remote amplifier

Ordering Information

Description		Part number
Through-beam sensor	50 cm sensing distance	**E4C-TS50**
Reflective sensor	10 to 35 cm sensing distance	**E4C-LS35**
Amplifier for E4C-TS50	12 to 24 VDC supply voltage	**E4C-WH4T**
Amplifier for E4C-LS35		**E4C-WH4L**

■ ACCESSORIES

Description		Part number
Connector between two amplifiers		**E99-C**
Switching power supply	0.25 A, 12 VDC output, 100-240 VAC input	**S82K-00312**
	0.13 A, 24 VDC output, 100-240 VAC input	**S82K-00324**

Specifications

■ RATINGS/CHARACTERISTICS

Sensors

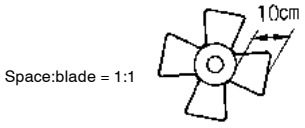
Part number		E4C-TS50	E4C-LS35
Sensing method		Through-beam	Reflective
Sensing distance		50 cm (1.64 ft)	10 to 35 cm (3.94 to 13.78 in); possible to limit the sensing zone within a range between 2 and 25 cm (0.79 to 9.84 in.)
Standard sensing object		10 x 10 cm flat plate	4 x 4 cm flat plate
Ultrasonic oscillation frequency		Approx. 270 kHz	
Directional angle (See Note 1.)		±8° max.	
Indicator		SENSING indicator (red LED)	
Ambient operating temperature		-10°C to 55°C (14°F to 131°F) with no icing	
Relative operating humidity		35 to 95%	
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z axes	
Shock resistance		500 m/s^2 (approx. 50G) 3 times each in X, Y, and Z axes	
Enclosure rating		IEC IP66	
Cable length		2 m	
Weight		Approx. 300 g (with Emitter and Receiver)	Approx. 150 g
Material	Nut	Polyacetal resin	
	Case	Heat-resistant ABS resin	

Note: 1. Obtainable with a signal of -6 dB.

Amplifier Units

Part number	E4C-WH4T	E4C-WH4L
Compatible sensor	E3C-TS50	E3C-LS35
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
Switching frequency (See Note.)	50 Hz	20 Hz
Response time	10 ms ON, 10 ms OFF	25 ms ON, 25 ms OFF
Control output (residual voltage)	100 mA max. (NPN and PNP open collector output at 40 VDC with a residual voltage of 2 V)	
Operation mode	Normally open or normally closed (selectable with a slide switch)	
Ultrasonic speed compensation	Yes	
Indicator	SENSING indicator (red LED) and STABILITY indicator (green LED)	
Ambient operating temperature	-10°C to 55°C (14°F to 131°F) with no icing	
Relative operating humidity	35 to 95%	

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



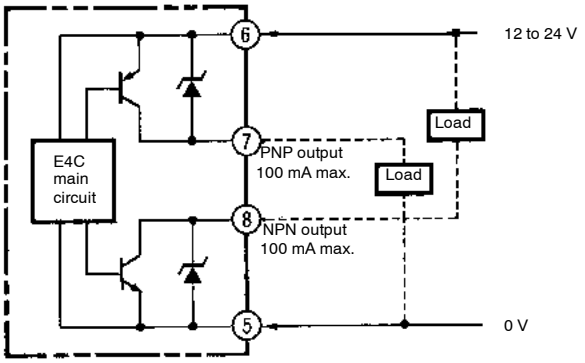
(This table continues on the next page.)

Specifications Table - continued from previous page

Part number		E4C-WH4T	E4C-WH4L
Temperature influence		±30% max. of sensing distance at 20°C (68°F) in the temperature range of -10°C and 55°C (14°F to 131°F)	±10% max. of sensing distance at 20°C (68°F) in the temperature range of -10°C and 55°C (14°F to 131°F)
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		10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions	
Shock resistance		500 m/s^2 (approx. 50G) 3 times each in X, Y, and Z directions	
Enclosure rating		IEC IP40	
Approvals	UL, cUL	Recognized, File No. E41515 when used with Class 2 power service	
Weight		Approx. 110 g	

Operation

■ OUTPUT CIRCUIT



■ AMPLIFIER UNITS

Indicators

- STABILITY Indicator (Green)

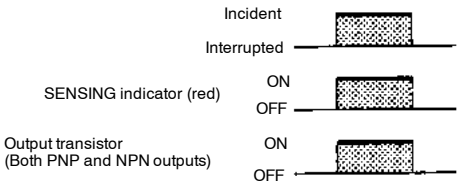
When this indicator is lit, the ultrasonic input into the Receiver is sufficient, or its interruption small enough, to ensure the smooth operation of the E4C. Do not operate the E4C when this indicator is not lit.

- SENSING Indicator (Red)

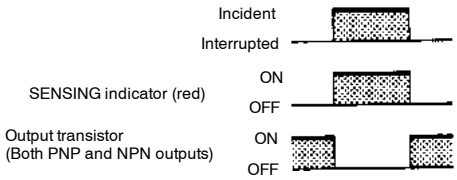
When this indicator is lit, the Receiver has ultrasonic input.

■ OPERATION SELECTOR (H1/H2)

Signal received-output ON (H1)

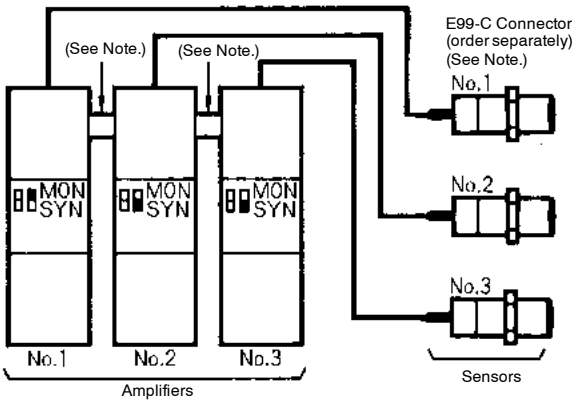


Signal received-output OFF (H2)



■ 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. In "MON" mode, the amplifier generates a pulse. In "SYN" mode, the pulse is inhibited.



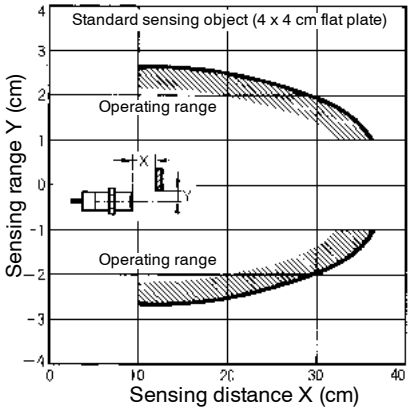
Note: The load in operation is connected to the output circuit of the E4C.

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 space between adjacent Sensors to suppress mutual interference. Refer to *Sensitivity Adjuster Position vs. Parallel Movement Characteristics* in *Engineering Data*.

Engineering Data

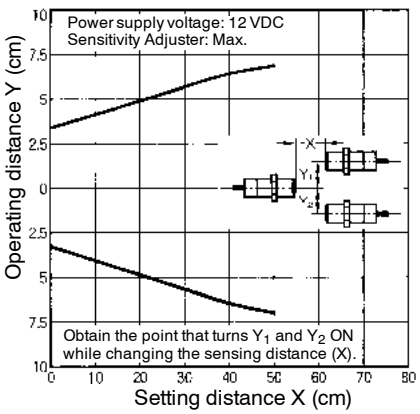
■ SENSING RANGE (TYPICAL)

E4C-LS35



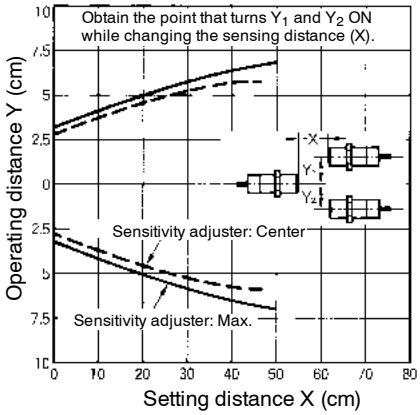
■ PARALLEL MOVEMENT CHARACTERISTICS (TYPICAL)

E4C-TS50



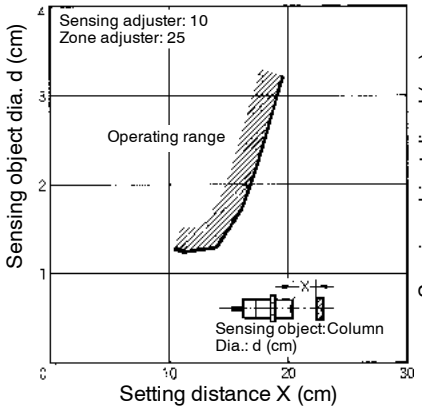
■ SENSITIVITY ADJUSTER POSITION VS. PARALLEL MOVEMENT CHARACTERISTICS

E4C-TS50+E4C-WH-4T

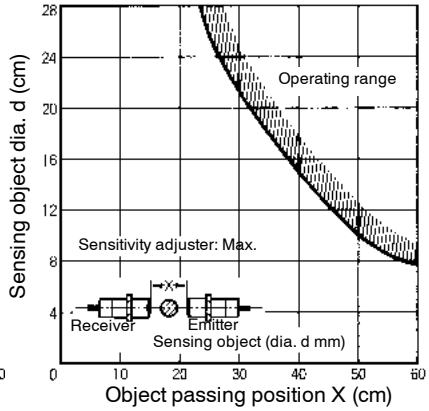


■ OPERATING DISTANCE VS. SENSING OBJECT SIZE (TYPICAL)

E4C-LS35

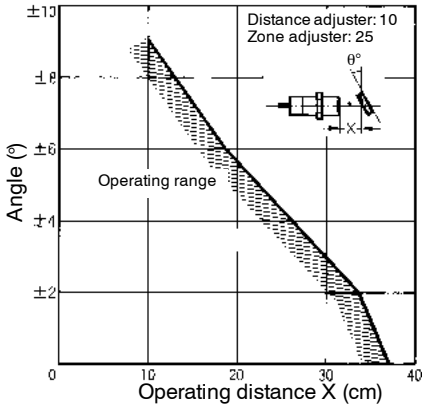


E4C-TS50



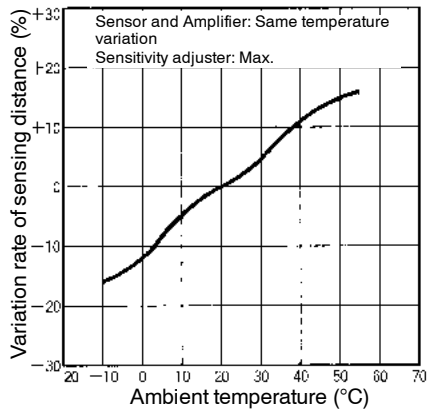
■ OPERATING DISTANCE VS. SENSING OBJECT ANGLE (TYPICAL)

E4C-LS35

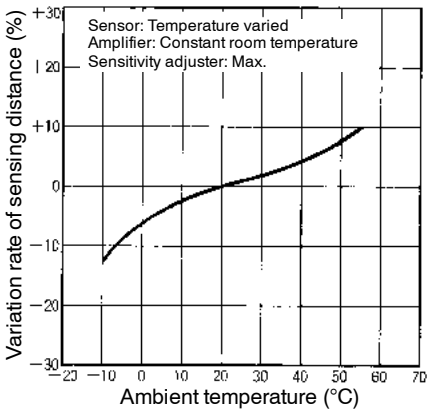


■ AMBIENT TEMPERATURE VS. VARIATION RATE OF SENSING DISTANCE (TYPICAL)

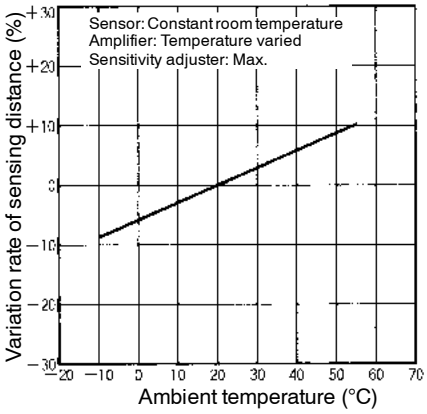
E4C-TS50+ E4C-WH4T



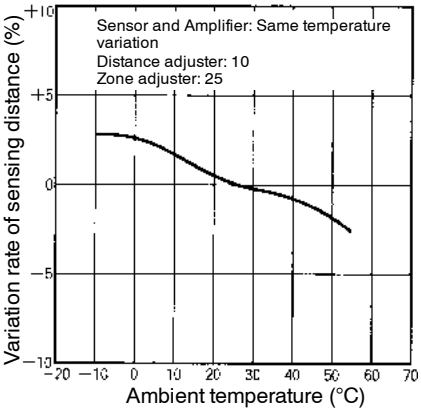
E4C-TS50+E4C-WH4T



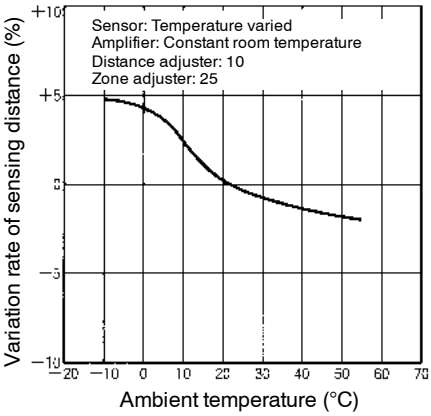
E4C-TS50+E4C-WH4T



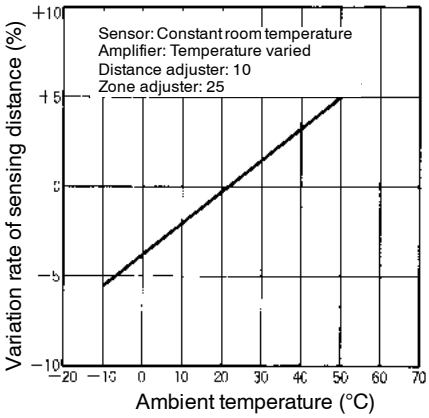
E4C-LS35+E4C-WH4L



E4C-LS35+E4C-WH4L



E4C-LS35+E4C-WH4L

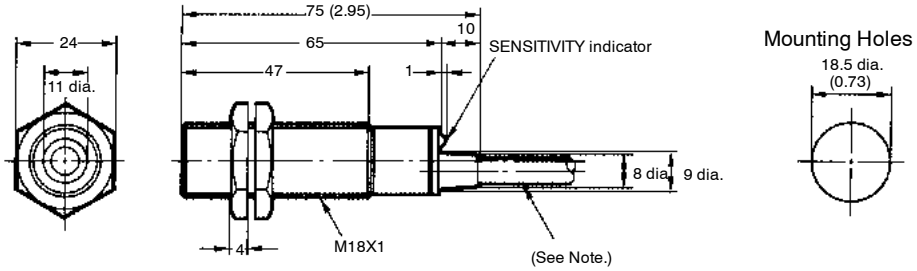


Dimensions

Unit: mm (inch)

■ SENSORS

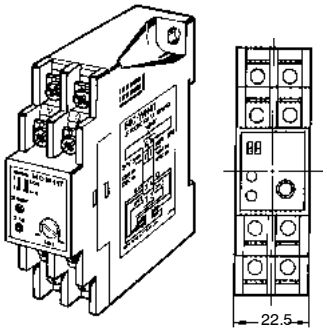
E4C-TS50
E4C-LS35

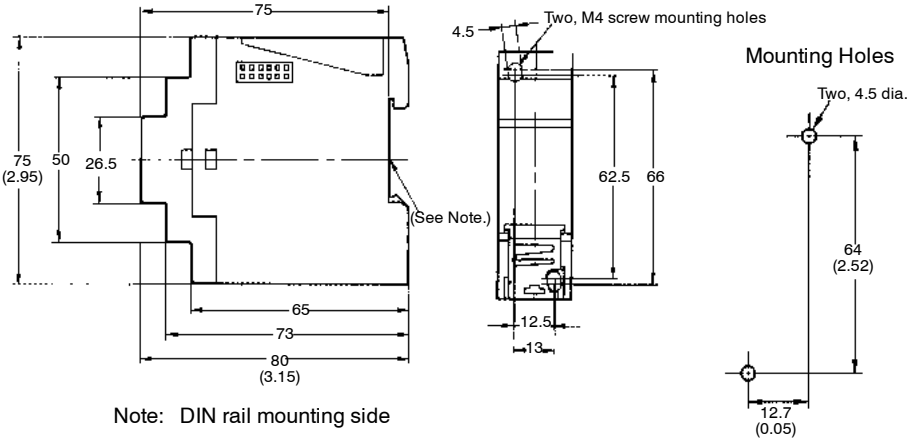


Note: E4C-TS50R or E4C-LS35: 3-conductor, shielded cable (6 dia., UL2791) with 7/0.25 dia. (standard length: 2 m)
E4C-TS50S: 2-conductor, shielded cable (6 dia., UL20276) with 7/0.25 dia. (standard length: 2 m)

■ AMPLIFIER UNITS

E4C-WH4T and E4C-WH4L

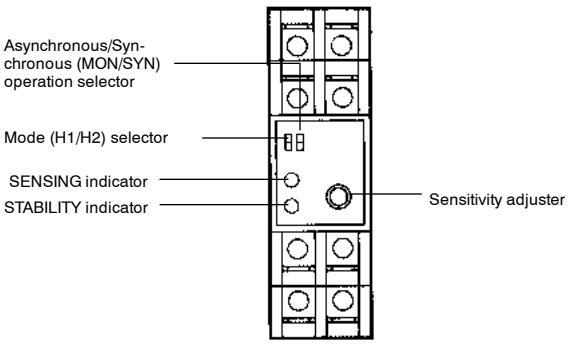




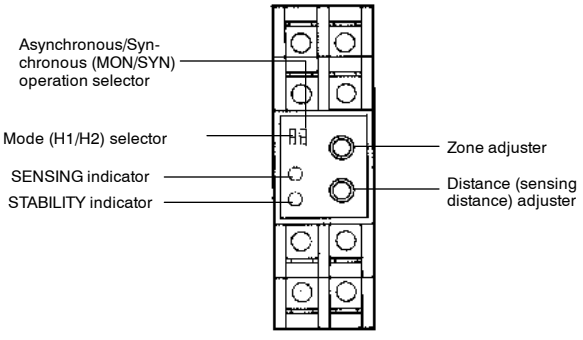
Note: DIN rail mounting side

Nomenclature

E4C-WH4T



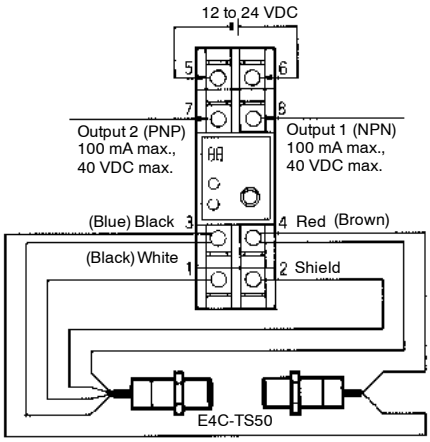
E4C-WH4L



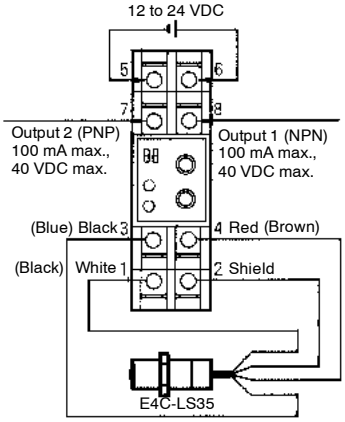
Installation

■ CONNECTIONS

E4C-WH4T



E4C-WH4L

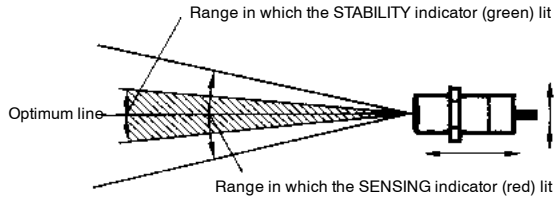


■ SENSITIVITY/ZONE ADJUSTMENTS

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.



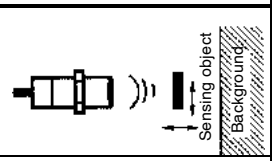
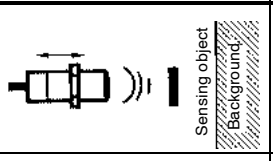
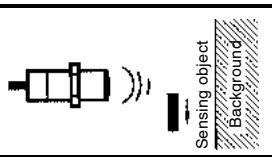
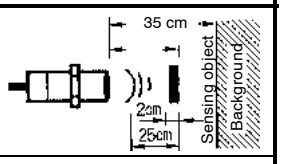
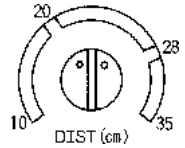
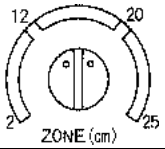
Pass the target object through the sensing range and adjust the sensitivity so that the SENSING indicator turns ON and OFF according the presence or absence of the object while the STABILITY indicator is lit continuously.

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.

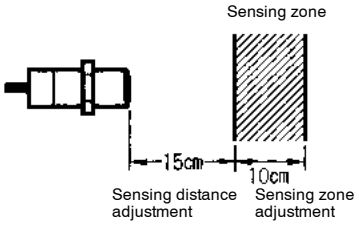
■ E4C-LS35 AND E4C-WH4L CONVERGENT REFLECTIVE MODEL

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).

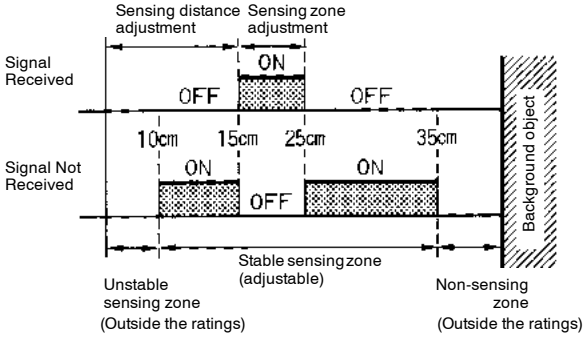
■ SENSING ZONE SETTING EXAMPLE



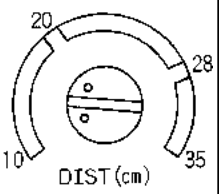
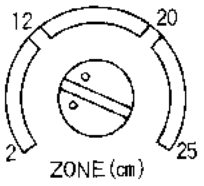
Note: Make the settings as shown above to set a sensing zone of 10 cm with a sensing distance adjustment of 15 cm.

■ SENSING ZONE CHART

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.

Precautions

■ 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, or 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.

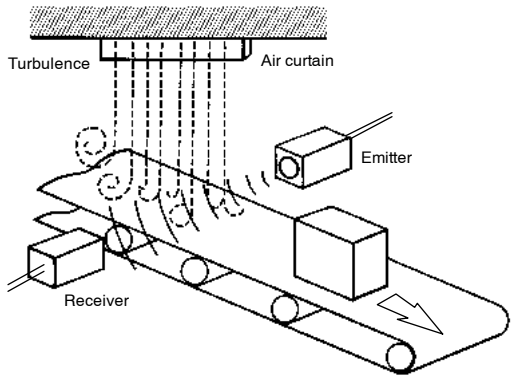
Do not strike the Sensor with any hammer or other object, otherwise the E4C will no longer be water-resistant.

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.

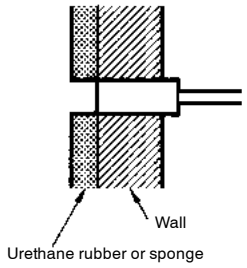
Do not wire the lines of the E4C along with high-tension or power lines in the same conduit or close together, otherwise the E4C may malfunction due to inductive noise.

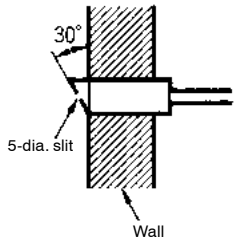
The power supply lines of the Amplifier can be extended up to 100 m provided that the size of the cord is 0.3 dia. or more.

■ ADDITIONAL PRECAUTIONS

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.

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

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