





Space-Saving Sensors for a Wide Range of Applications

- Switches loads up to 200 mA
- Easy to install DC 2-wire models reduce wiring
- DC 3-wire models available with high-flexibility robotic cable
- DC types include mounting brackets






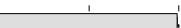
Ordering Information

■ DC 2-WIRE MODELS

| Type | Sensing distance | Output form | Part number |
|---|---|-------------|------------------|
| Unshielded  |  7 mm (0.28 in) | NO | TL-N7MD1 |
| | | NC | TL-N7MD2 |
| |  12 mm (0.47 in) | NO | TL-N12MD1 |
| | | NC | TL-N12MD2 |
| |  20 mm (0.79 in) | NO | TL-N20MD1 |
| | | NC | TL-N20MD2 |

Note: Models that are different in response frequency are available for the prevention of mutual interference. Add a "5" to the end of the part numbers above (e.g. TL-N7MD15).

■ DC 3-wire and AC 2-wire Models

| Type | Sensing distance | Output form | Part number | | |
|--|---|---|-------------|---------------------------------------|---------------------------------------|
| Unshielded Rectangular  |  5 mm (0.20 in) | DC 3-wire | NPN NO | TL-N5ME1 (See Notes 2 and 3.) | |
| | | | NPN NC | TL-N5ME2 (See Notes 2 and 3.) | |
| | | AC 2-wire | NO | TL-N5MY1 | |
| | | | NC | TL-N5MY2 | |
| | |  10 mm (0.39 in) | DC 3-wire | NPN NO | TL-N10ME1 (See Notes 2 and 3.) |
| | | | | NPN NC | TL-N10ME2 (See Notes 2 and 3.) |
| | AC 2-wire | | NO | TL-N10MY1 | |
| | | | NC | TL-N10MY2 | |
| |  20 mm (0.79 in) | DC 3-wire | NPN NO | TL-N20ME1 (See Notes 2 and 3.) | |
| | | | NPN NC | TL-N20ME2 (See Notes 2 and 3.) | |
| | | AC 2-wire | NO | TL-N20MY1 | |
| | | | NC | TL-N20MY2 | |

Note: 1. Models that are different in response frequency are available for the prevention of mutual interference. Add "5" to the end of the part numbers above (e.g. TL-N5ME15).

2. Each of these models has a cable with a standard length of 5 m.

3. Each of these models with a robotic cable is available and classified with the suffix "R" added to the model number (e.g., TL-N5ME1-R).

■ ACCESSORIES

| Description | Part number | |
|---|--------------------------------|-----------------|
| Mounting brackets (supplied with DC sensors; order separately for AC sensors) | Fits TL-N5 and TL-N7 sensors | Y92E-C5 |
| | Fits TL-N10 and TL-N12 sensors | Y92E-C10 |
| | Fits TL-N20 sensors | Y92E-C20 |

Specifications

■ RATINGS/CHARACTERISTICS

TL-N□MD DC 2-wire Models

| Item | TL-N7MD□ | TL-N12MD□ | TL-N20MD□ |
|--|--|---|--|
| Supply voltage (operating voltage range) | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | |
| Leakage current | 0.8 mA max. | | |
| Sensing object | Ferrous metal (Refer to <i>Engineering Data</i> for non-ferrous metal) | | |
| Sensing distance | 7 mm ±10% (0.28 in) | 12 mm ±10% (0.47 in) | 20 mm ±10% (0.79 in) |
| Sensing distance (standard object) | 0 to 5.6 mm (0.22 in) (iron, 30 x 30 x 1 mm) | 0 to 9.6 mm (0.38 in) (iron, 40 x 40 x 1 mm) | 0 to 16 mm (0.63 in) (iron, 50 x 50 x 1 mm) |
| Differential travel | 10% max. of sensing distance | | |
| Response frequency (See Note.) | 0.5 kHz | | 0.3 kHz |
| Operating status (with sensing object approaching) | D1 models: Load ON D2 models: Load OFF | | |
| Control output (switching capacity) | 3 to 100 mA DC | | |
| Circuit protection | Load short-circuit protection and surge absorber | | |
| Indicator | D1 models: Operation indicator (red LED) and setting indicator (green LED) D2 models: Operation indicator (red LED) | | |
| Ambient temperature | Operating | -25°C to 70°C (-13°F to 158°F) with no icing | |
| Ambient humidity | Operating | 35% to 95% | |
| Temperature influence | ±10% max. of sensing distance at 23°C (73.4°F) in the temperature range of -25°C to 70°C (-13°F to 158°F) | | |
| Voltage influence | ±2.5% max. of sensing distance within a range of ±15% of the rated power supply voltage | | |
| Residual voltage | 3.3 V max. with a load current of 100 mA and a cord length of 2 m (78.7 in) | | |
| Insulation resistance | 50 MΩ min. (at 500 VDC) between current carry parts and case | | |
| Dielectric strength | 1,000 VAC 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 | 1,000 m/s ² (3280.8 ft/sec ²) approx. 100G for 10 times each in X, Y, and Z directions | | |
| Degree of protection | IEC60529 IP67 | | |
| Weight (with 2-m cable) | Approx. 145 g (5.11 oz) | Approx. 170 g (5.99 oz) | Approx. 240 g (8.46 oz) |
| Material | Case | Heat-resistant ABS resin | |
| | Sensing surface | Heat-resistant ABS resin | |

Note: Response frequencies are average values measured with identical standard sensing objects, on condition that the space between any adjacent sensing objects was twice the width of a single sensing object and the setting distance was half the maximum sensing distance. Refer to *Precautions* for details.

■ DC 3-WIRE AND AC 2-WIRE MODELS

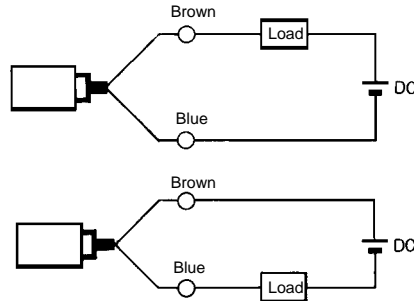
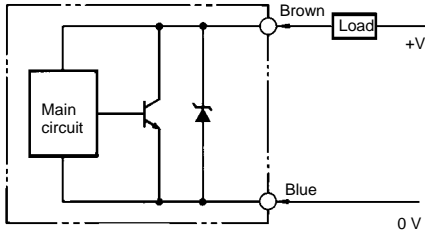
| Item | TL-N5ME□, TL-N5MY□ | TL-N10ME□, TL-N10MY□ | TL-N20ME□, TL-N20MY□ |
|--|--|---|--|
| Supply voltage (operating voltage range) (See Note.) | E models: 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. Y models: 100 to 220 VAC (90 to 250 VAC), 50/60 Hz | | |
| Current consumption | E models: 8 mA at 12 V, 15 mA at 24 V | | |
| Leakage current | Y models: Refer to <i>Engineering Data</i> . | | |
| Sensing object | Ferrous metal (Refer to <i>Engineering Data</i> for non-ferrous metal) | | |
| Sensing distance | 5 mm ±10% (0.20 in) | 10 mm ±10% (0.39 in) | 20 mm ±10% (0.79 in) |
| Setting distance (standard object) | 0 to 4 mm (0.16 in) (iron, 30 x 30 x 1 mm) | 0 to 8 mm (0.31 in) (iron, 40 x 40 x 1 mm) | 0 to 16 mm (0.63 in) (iron, 50 x 50 x 1 mm) |
| Differential travel | 1% to 15% of sensing distance | | |
| Response frequency (See Note.) | E models: 500 Hz Y models: 10 Hz | | E models: 40 Hz Y models: 10 Hz |
| Operating status (with sensing object approaching) | E1 models: L output signal with load ON E2 models: H output signal with load OFF Y1 models: Load ON Y2 models: Load OFF | | |
| Control output (switching capacity) | E models: 100 mA max. at 12 VDC and 200 mA max. at 24 VDC Y models: 10 to 200 mA | | |
| Circuit protection | E models: Reverse connection protection and surge absorber Y models: Surge absorber | | |
| Ambient temperature | Operating | -25°C to 70°C (-13°F to 158°F) with no icing | |
| Ambient humidity | Operating | 35% to 95% | |
| Temperature influence | ±10% max. of sensing distance at 23°C (73.4°F) in the temperature range of -25°C to 70°C (-13°F to 158°F) | | |
| Voltage influence | E models: ±2.5% max. of sensing distance within a range of ±10% of the rated power supply voltage Y models: ±1% max. of sensing distance within a range of ±10% of the rated power supply voltage | | |
| Residual voltage | E models: 1 V max. with a current of 200 mA Y models: Refer to <i>Engineering Data</i> . | | |
| Insulation resistance | 50MΩ min. at 500 VDC between current carry parts and case | | |
| Dielectric strength | DC models: 1,000 VAC, 50/60 Hz for 1 min between current carry parts and case AC models: 2,000 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 (1640.4 ft/sec ²) approx. 50G for 10 times each in X, Y, and Z directions | | |
| Degree of protection | IEC IP67 | | |
| Weight (with 2-m cable) | Approx. 145 g (5.11 oz) | Approx. 170 g (5.99 oz) | Approx. 240 g (8.46 oz) |
| Material | Case | Heat-resistant ABS resin | |
| | Sensing surface | Heat-resistant ABS resin | |

Note: The E models (DC switching type) can be used with a full-wave rectification power of 24 VDC ±10%.

Operation

OUTPUT CIRCUITS

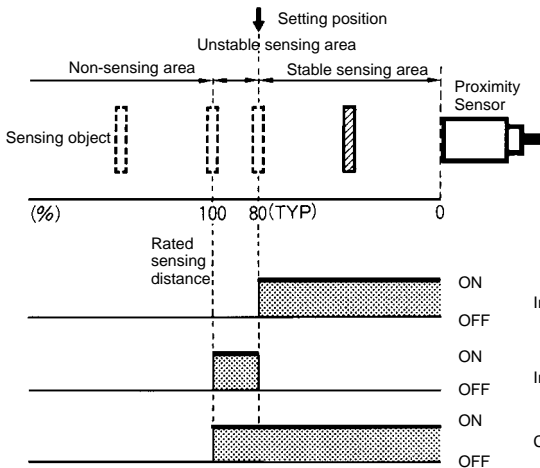
DC 2-wire Models



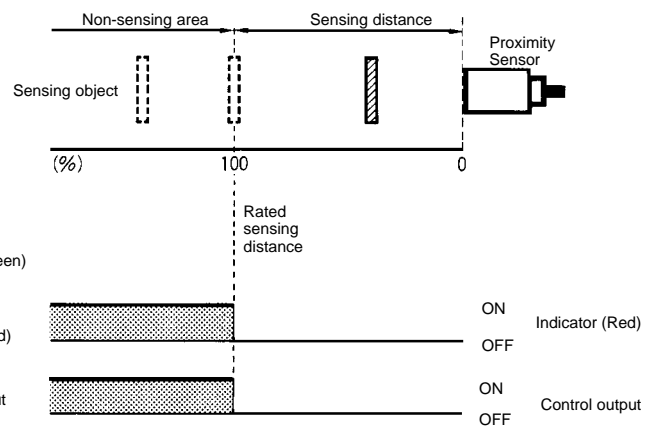
Note: The load can be connected in two ways as shown in the above diagrams.

TIMING CHARTS

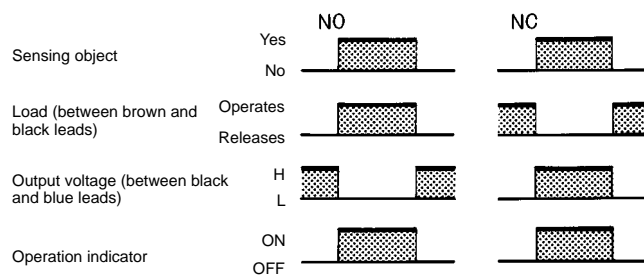
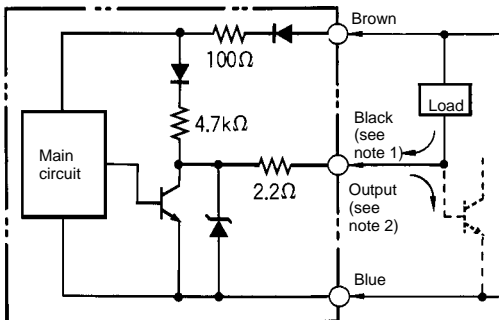
Normally Open Model



Normally Closed Model

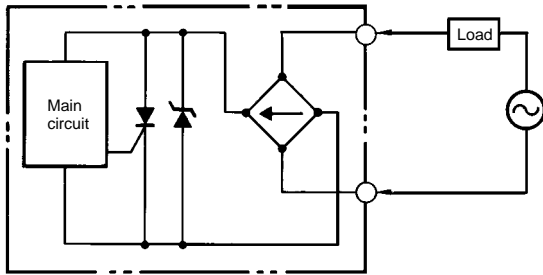


DC 3-wire Models



Note: 1. 200 mA max. (load current)
2. When a transistor is connected.

AC 2-wire Models

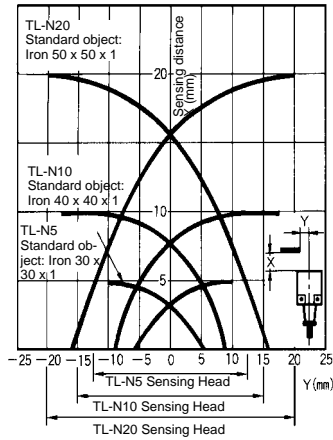


| | | | |
|---------------------|----------|----|----|
| Sensing object | Yes | NO | NC |
| | No | | |
| Load | Operates | | |
| | Releases | | |
| Operation indicator | ON | | |
| | OFF | | |

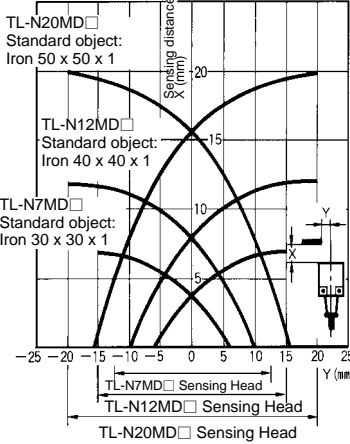
Engineering Data

OPERATING RANGE (TYPICAL)

TL-N□ME, TL-N□MY

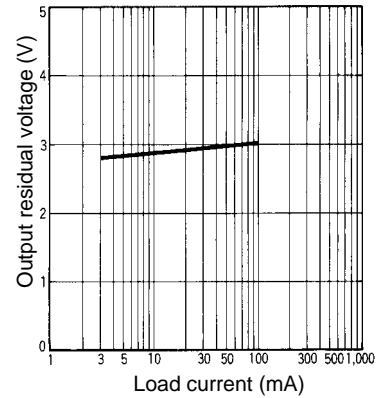


TL-N□MD DC 2-wire Models



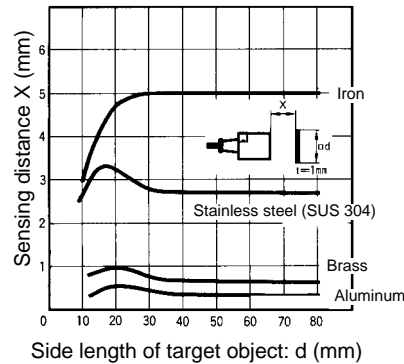
OUTPUT RESIDUAL VOLTAGE CHARACTERISTICS (TYPICAL)

TL-N□MD DC 2-wire Models

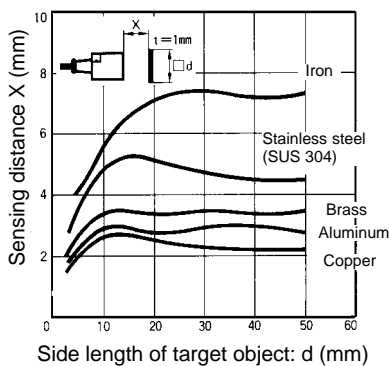


SENSING OBJECT SIZE AND MATERIAL VS. SENSING DISTANCE (TYPICAL)

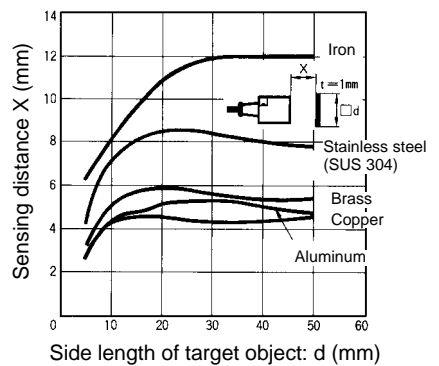
TL-N5



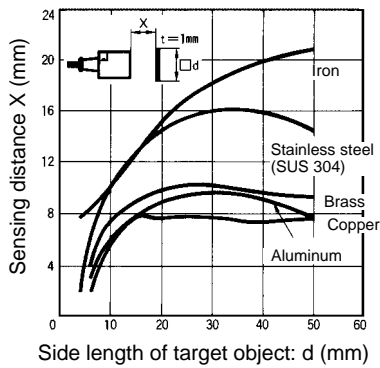
TL-N7MD DC 2-wire Models



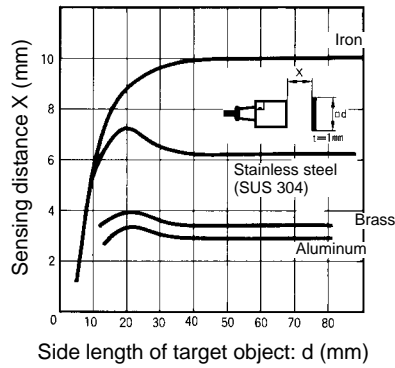
TL-N12MD DC 2-wire Models



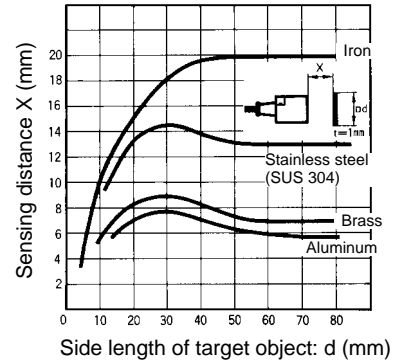
TL-N20MD DC 2-wire Models



TL-N10

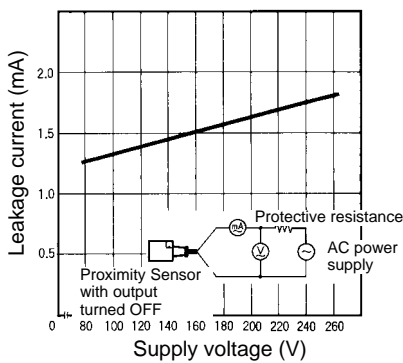


TL-N20



LEAKAGE CURRENT CHARACTERISTICS (TYPICAL)

TL-N□MY

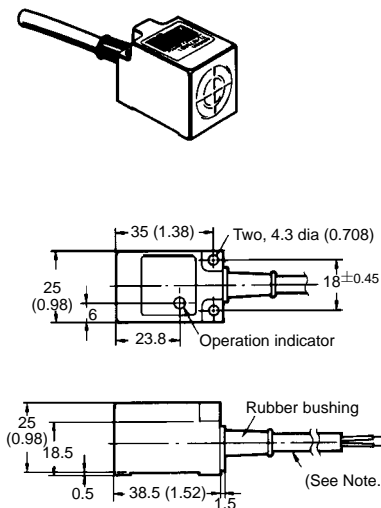


Dimensions

Unit: mm (inch)

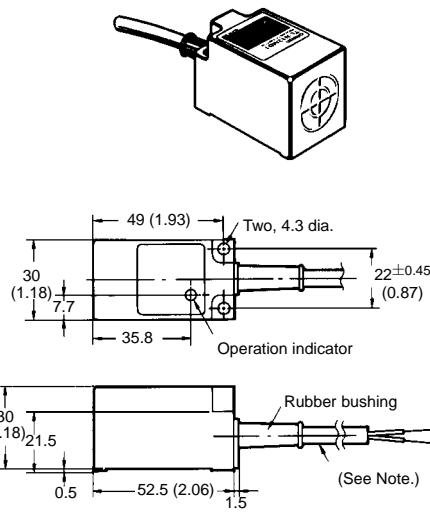
DC 2-WIRE SENSORS

TL-N7MD



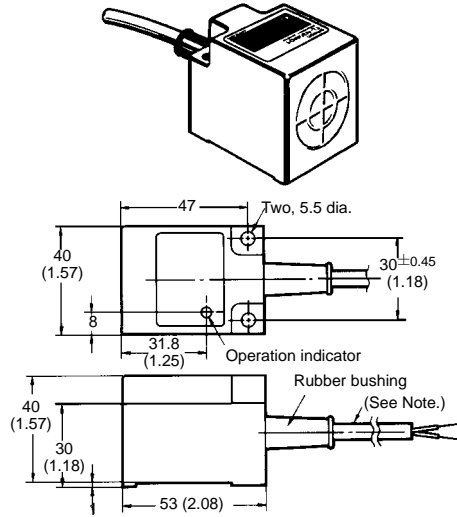
Note: Vinyl-insulated round cable (6 dia., 0.5 mm²), 2 cores; standard length: 2 m

TL-N12MD



Note: Vinyl-insulated round cable (6 dia., 45/0.12), 2 cores; standard length: 2 m

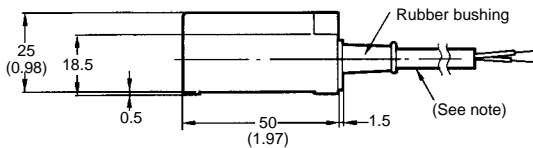
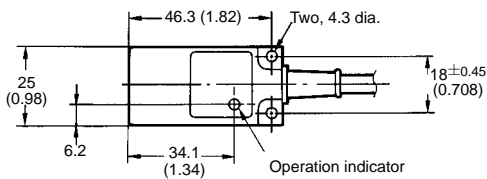
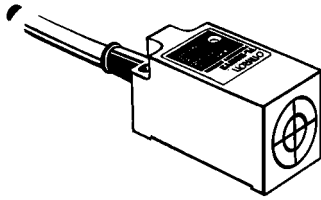
TL-N20MD



Note: Vinyl-insulated round cable (6 dia., 45/0.12), 2 cores; standard length: 2 m

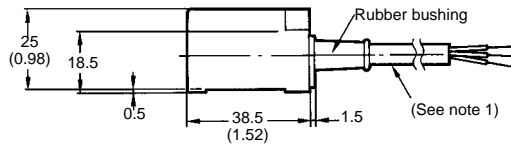
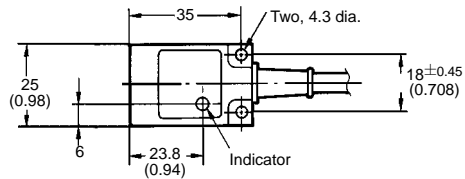
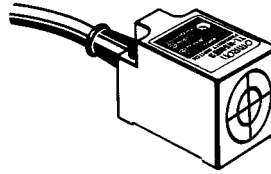
■ DC 3-WIRE AND AC 2-WIRE SENSORS

TL-N5MY



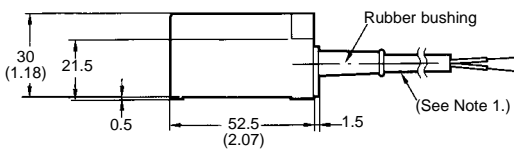
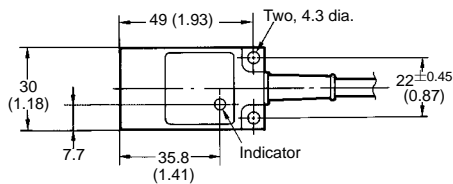
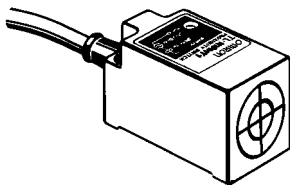
Note: Vinyl-insulated round cable, oil- and vibration-resistant, 0.5 mm², 2 cores, 6 dia.; standard length: 2 m

TL-N5ME



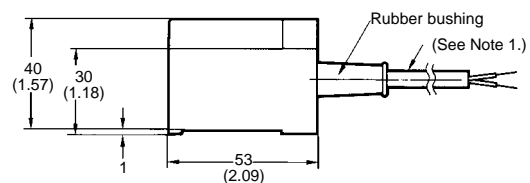
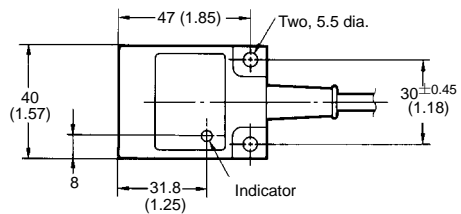
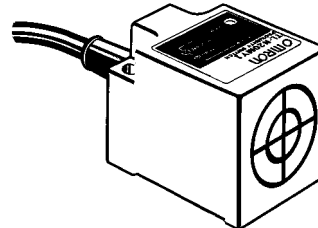
Note: 1. Vinyl-insulated round cable, oil- and vibration-resistant, 0.5 mm², 3 cores, 6 dia.; standard length: 5 m
2. The Y92E-C5 Mounting Bracket is provided with the TL-N5ME.

TL-N10ME/N10MY



Note: 1. Vinyl-insulated round cable, oil- and vibration-resistant, 0.5-mm², 6 dia., 2 cores for TL-N10MY, 3 cores for TL-N10ME.
2. The Y92E-C10 Mounting Bracket is provided with the TL-N10ME□.

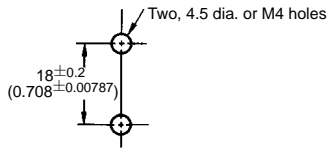
TL-N20ME/N20MY



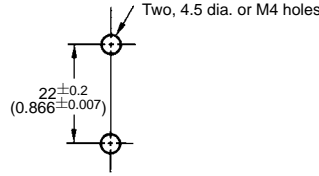
Note: 1. Vinyl-insulated round cable, oil- and vibration-resistant, 0.5-mm², 6 dia., 2 cores for TL-N20MY, 3 cores for TL-N20ME.
2. The Y92E-C20 Mounting Bracket is provided with the TL-N20ME□.

■ MOUNTING HOLES

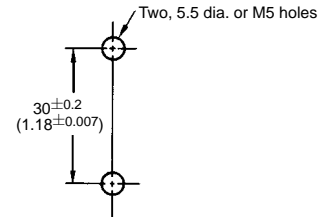
TL-N5ME/N5MY/N7MD



TL-N10ME/N10MY/N12MD



TL-N20ME/N20MY/N20MD

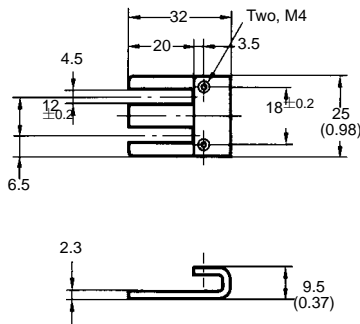


■ MOUNTING BRACKETS

The Mounting Bracket is provided with TL-ME□/D□ DC models. The Mounting Bracket as an optional accessory is available to all models.

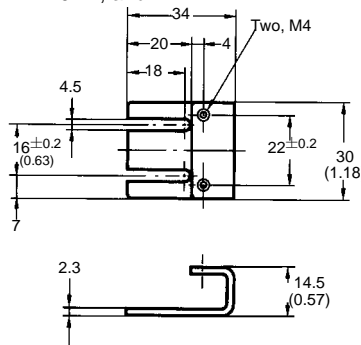
Y92E-C5

Applicable Models: TL-N5ME, TL-N5MY, and TL-N7MD



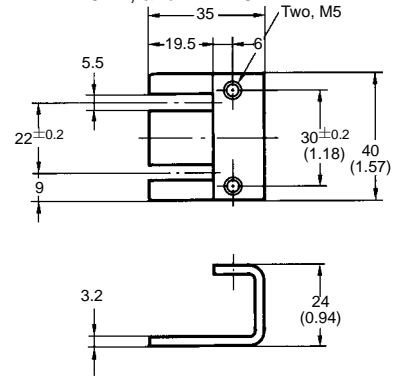
Y92E-C10

Applicable Models: TL-N10ME, TL-N10MY, and TL-N12MD



Y92E-C20

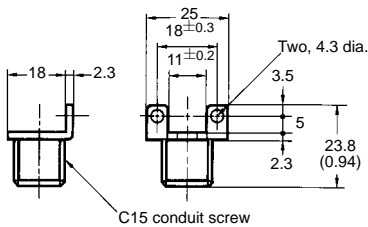
Applicable Models: TL-N20ME, TL-N20MY, and TL-N20MD



■ MOUNTING BRACKETS FOR WIRING CONDUIT USE (SOLD SEPARATELY)

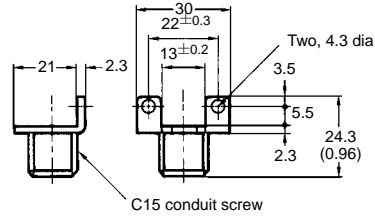
Y92E-N5C15

Applicable Models: TL-N5ME and TL-N5MY



Y92E-N10C15

Applicable Models: TL-N10ME and TL-N10MY



Precautions

■ WARNINGS

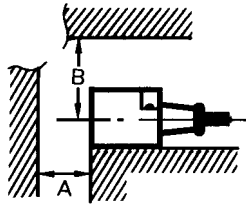
Do not short-circuit the load, to avoid damaging the TL-N.

Do not supply power to the TL-N with no load, or the TL-N may be damaged.

Applicable Models: AC 2-wire models

■ EFFECTS OF SURROUNDING METALS

When the TL-N is surrounded by metal, keep the following distances as a minimum between the TL-N and the metal. (Refer to the table below.)



Minimum Distances for Surrounding Metals

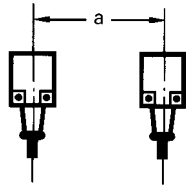
| Distance | TL-N7MD□ | TL-N12MD□ | TL-N20MD□ | TL-N5ME□ TL-N5MY□ | TL-N10ME□ TL-N10MY□ | TL-N20ME□ TL-N20MY□ |
|---------------|-----------------|-----------------|-----------------|----------------------|------------------------|------------------------|
| A (See Note.) | 40 mm (1.57 in) | 50 mm (1.97 in) | 70 mm (2.75 in) | 20 mm (0.79 in) | 40 mm (1.57 in) | 80 mm (3.15 in) |
| B (See Note.) | 35 mm (1.37 in) | 40 mm (1.57 in) | 60 mm (2.36 in) | 23 mm (0.91 in) | 30 mm (1.18 in) | 45 mm (1.77 in) |

Note: The figures are applicable for one metal object, or the figure must be multiplied by the number of metal objects.

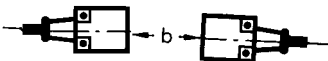
■ MUTUAL INTERFERENCE

When two or more Sensors are mounted face-to-face or side-by-side, keep them separated at the following distances or greater. (Refer to the next two tables.)

Side-by-Side



Face-to-Face



Same Frequency Type

| Distance | TL-N7MD□ | TL-N12MD□ | TL-N20MD□ | TL-N5ME□ | TL-N5MY□ | TL-N10ME□ TL-N10MY□ | TL-N20ME□ TL-N20MY□ |
|----------|---------------------|---------------------|----------------------|--------------------|--------------------|------------------------|------------------------|
| a | 100 mm (3.94 in) | 120 mm (4.72 in) | 200 mm (7.87 in) | 80 mm (3.15 in) | 80 mm (3.15 in) | 120 mm (4.72 in) | 200 mm (7.87 in) |
| b | 120 mm (4.72 in) | 200 mm (7.87 in) | 300 mm (11.81 in) | 80 mm (3.15 in) | 90 mm (3.54 in) | 120 mm (4.72 in) | 200 mm (7.87 in) |

These figures will apply if the Sensors in use are different from each other in response frequency.

Alternate Frequency Type

| Distance | TL-N7MD□ | TL-N12MD□ | TL-N20MD□ | TL-N5ME□ | TL-N5MY□ | TL-N10ME□ TL-N10MY□ | TL-N20ME□ TL-N20MY□ |
|----------|--------------------|---------------------|---------------------|--------------------|--------------------|------------------------|------------------------|
| a | 50 mm (1.97 in) | 60mm (2.36 in) | 100 mm (3.93 in) | 40 mm (1.57 in) | 40 mm (1.57 in) | 60 mm (2.36 in) | 100 mm (3.93 in) |
| b | 60mm (2.36 in) | 100 mm (3.93 in) | 150 mm (5.9 in) | 40 mm (1.57 in) | 40 mm (1.57 in) | 60mm (2.36 in) | 100 mm (3.93 in) |

These figures will apply if the Sensors in use are different from each other in response frequency.

■ MOUNTING

Make sure that each screw is tightened with a torque within a range of 9.3 to 15 kgf • cm (0.9 to 1.5 N • m) 0.66 to 1.11 ft • lbf.

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

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