

Standard Flat Inductive Proximity Sensors

TL-W

- Front and side facing surface
- IP67
- DC 2-wire and DC 3-wire models



Ordering Information

DC 2-wire Models

| Shape | Sensing distance | Model | |
|-------|------------------|------------------------------|------------------------------|
| | | Output and operating status | |
| | | NO | NC |
| | 5mm | TL-W5MD1^{*1} | TL-W5MD2^{*1} |

*1. Models with different response frequency are available. These model numbers take the form TL-W5MD□5 (e.g., TL-W5MD15)

DC 3-wire Models

| Shape | Sensing distance | Output specifications | Model | | | |
|--------------|------------------|-----------------------|-----------------------------|-----------------|--------------------------------|-------------------------------|
| | | | Output and operating status | | | |
| | | | PNP-NO | PNP-NC | NPN-NO | NPN-NC |
| | 1.5mm | DC 3-wire | TL-W1R5MB1 | --- | TL-W1R5MC1^{*1} | --- |
| | 3mm | | TL-W3MB1 | TL-W3MB2 | TL-W3MC1^{*1} | TL-W3MC2 |
| | 5mm | | TL-W5MB1 | TL-W5MB2 | TL-W5MC1^{*1} | TL-W5MC2 |
| | 20mm | | --- | --- | TL-W20ME1^{*1} | TL-W20ME2^{*1} |
| Shielded | 5mm | DC 3-wire | TL-W5F1 | TL-W5F2 | TL-W5E1 | TL-W5E2 |

*1. Models with different response frequency are available. These model numbers take the form TL-W5MD□5 (e.g., TL-W5MD15)

Rating/Performance

DC 2-wire Models

| Item | Model | TL-W5MD□ |
|---|--------------------|---|
| Sensing distance | | 5 mm \pm 10% |
| Setting distance | | 0 to 4 mm |
| Differential distance | | 10% max. |
| Sensing object | | Ferrous metal(Sensitivity decreases with non-ferrous metals) |
| Standard sensing object | | Iron, 18 x 18 x 1 mm |
| Response frequency | | 0.5 kHz |
| Rated supply voltage (operating voltage) | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. |
| Leakage current | | 0.8 mA max. |
| Control output | Switching capacity | 3 to 100 mA |
| | Residual voltage | 3.3 V max. (under load current of 100 mA with cable length of 2 m) |
| Indicator lamp | | D1 models: Operation indicator (Red LED), Operation set indicator (Green LED) D2 models: Operation indicator (Red LED) |
| Operating status (with sensing object approaching) | | D1 models: NO D2 models: NC |
| Protective circuits | | Surge absorber, short-circuit protection |
| Ambient temperature | | Operating/Storage: -25°C to 70°C (with no icing or condensation) |
| Ambient humidity | | Operating/Storage: 35% to 95%RH (with no condensation) |
| Temperature influence | | \pm 10% max. of sensing distance at 23°C within a temperature range of -25°C and 70°C |
| Voltage influence | | \pm 2.5% max. of Sensing distance within a rated voltage range \pm 15%. |
| Insulation resistance | | 50 M Ω min. (at 500 VDC) between energized parts and case |
| Dielectric strength | | 1,000 VAC for 1 min between energized 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 | | Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions |
| Protective structure | | IEC60529 IP67 |
| Connection method | | Pre-wired models (standard length: 2 m) |
| Weight (Packed state) | | Approx. 45 g |
| Material | Case | Heat-resistant ABS resin |
| | Sensing surface | |
| Accessories | | Instruction manual |

* The response frequencies for DC switching are average values measured under the condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.

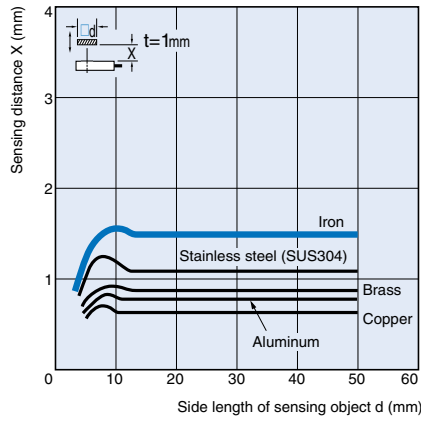
DC 3-wire Models

| Model | | TL-W1R5M□1 | TL-W3M□□ | TL-W5M□□ | TL-W5E□/F□ | TL-W20ME□ |
|--|--------------------|--|------------------------------|---|---|---|
| Sensing distance | | 1.5 mm ±10% | 3 mm ±10% | 5 mm ±10% | | 20 mm ±10% |
| Setting distance | | 0 to 1.2 mm | 0 to 2.4 mm | 0 to 4 mm | | 0 to 16 mm |
| Differential distance | | 10% max. | | | | 1% to 15% of sensing distance |
| Sensing object | | Ferrous metal (refer to Engineering Data for non-ferrous metal on page E-55) | | | | |
| Standard sensing object | | Iron, 8 x 8 x 1 mm | Iron, 12 x 12 x 1 mm | Iron, 18 x 18 x 1 mm | | Iron, 50 x 50 x 1 mm |
| Response frequency | | 1 kHz min. | 600 Hz min. | 500 Hz min. | 300 Hz min. | 40 Hz min. |
| Power supply (Operating voltage range) | | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. | | | 10 to 30 VDC with a ripple (p-p) of 20% max. | 12 to 24 VDC (10 to 30 VDC) ripple (p-p): 10% max. |
| Current consumption | | 15 mA max. at 24 VDC (no-load) | | 10 mA max. | 15mA max. at 24 VDC (no-load) | 8 mA at 12 VDC, 15 mA at 24 VDC |
| Control output | Switching capacity | NPN open collector 100 mA max. (30 VDC max.) | | NPN open collector 12 VDC 50 mA max. (30 VDC max.) 24 VDC 100 mA max. (30 VDC max.) | 200 mA | 12 VDC 100mA max., 24 VDC 200 mA max. |
| | Residual voltage | 1 V max. (under load current of 100 mA with cable length of 2 m) | | 1 V max. (under load current of 50 mA with cable length of 2 m) | 2 V max. (under load current of 200 mA with cable length of 2 m) | 1 V max. (under load current of 200 mA with cable length of 2 m) |
| Indicator lamp | | Detection indicator (red LED) | | | | |
| Operating status (with sensing object approaching) | | NO | C1 models: NO C2 type: NC | E1 models, F1 models: NO E2 models, F2 models: NC | | |
| Protective circuits | | Reverse connection protection, surge absorber | | | | |
| Ambient temperature | | Operating/Storage: -25°C to 70°C (with no icing or condensation) | | | | |
| Ambient humidity | | Operating/Storage: 35% to 95%RH (with no condensation) | | | | |
| Temperature influence | | ±10% max. of sensing distance at 23°C within the temperature range of -25°C and 70°C | | | | |
| Voltage influence | | ±2.5% max. of sensing distance within a range of ±10% of rated power supply voltage | | ±2.5% max. of sensing distance within a range of ±20% of rated power supply voltage | ±2.5% max. of sensing distance within a range of ±10% of rated power supply voltage | |
| Insulation resistance | | 50 MΩ min. (at 500 VDC) between energized parts and case | | | | |
| Dielectric strength | | 1000 VAC 50/60 Hz for 1 min between energized part 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 | | Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions | | | | Destruction: 500 m/s ² for 10 times each in X, Y, and Z directions |
| Protective structure | | IEC60529 IP67 | | | | |
| Connection method | | Pre-wired models (standard length: 2 m) | | | | |
| Weight (Packed state) | | 30 g | Approx. 45 g | | Approx. 70 g | Approx. 180 g |
| Material | Case | Heat-resistant ABS resin | | | Diecast aluminum | Heat-resistant ABS resin |
| | Sensing surface | Heat-resistant ABS resin | | | | |
| Accessories | | Mounting bracket, instruction manual | | Instruction manual | | |

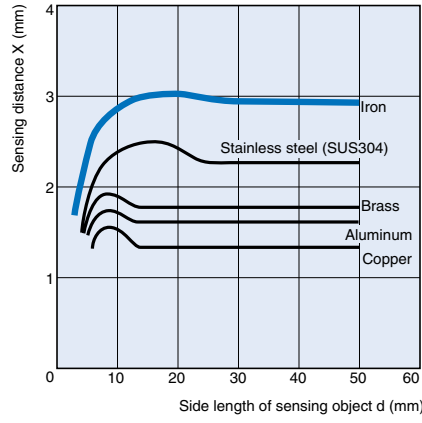
Characteristic data (typical)

Sensing Distance vs. Sensing Object

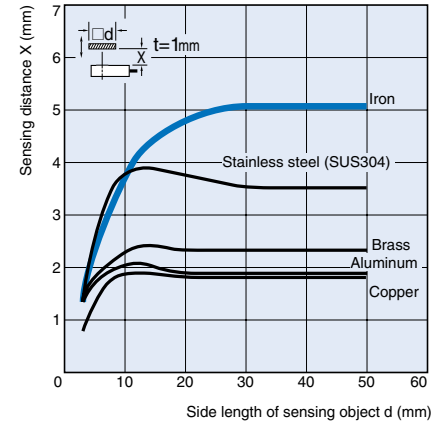
TL-W1R5M□



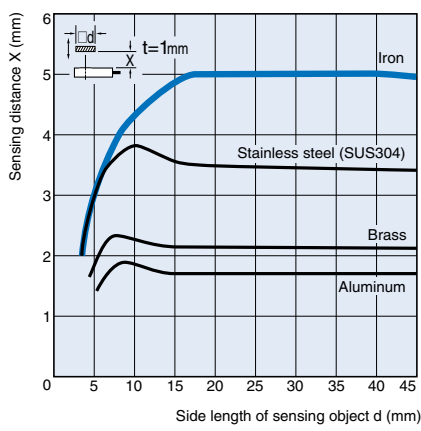
TL-W3M□



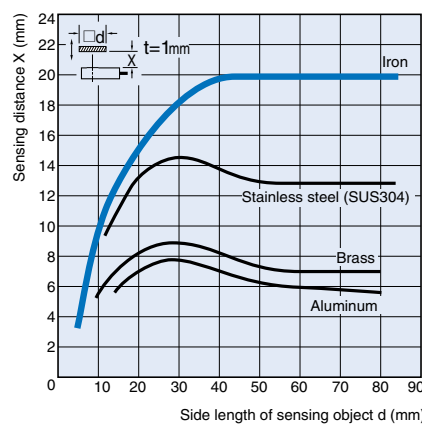
TL-W5MB□/C□



TL-W5E□/-W5F□/-W5MD□



TL-W20□



Output Circuit Diagram

DC 2-wire Models

| Operating status | Model | Timing chart | Output circuit |
|------------------|----------|--|---|
| NO | TL-W5MD1 | <p>Setting position Non-sensing zone Unstable Sensing zone Stable sensing zone Proximity Sensor Sensing object (%) 100 80(TYP) 0 Rated sensing distance</p> <p>ON Setting indicator (green) OFF ON Operation indicator (red) OFF ON Control output OFF</p> | <p>Note: The Load can be connected to either the +V and 0-V side.</p> |
| NC | TL-W5MD2 | <p>Non-sensing zone Sensing zone Proximity Sensor Sensing object (%) 100 0 Rated sensing distance</p> <p>ON Operation indicator (red) OFF ON Control output OFF</p> | <p>Note: The Load can be connected to either the +V and 0-V side.</p> |

DC 3-wire Models

| Operating status | Model | Timing chart | Output circuit |
|------------------|------------------------------------|--|--|
| NO | TL-W1R5M□1 TL-W3M□1 TL-W5M□1 | <p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p> | <p>* Maximum load current: 100 mA</p> |
| NC | TL-W3M□2 TL-W5MC2 | <p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p> | <p>* Maximum load current: 100 mA</p> |
| NO | TL-W1R5B1 TL-W3MB1 TL-W5MB1 | <p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p> | |
| NC | TL-W3MB2 TL-W5MB2 | <p>Sensing object Yes No Output transistor (load) ON OFF Operation indicator (red) ON OFF</p> | |
| NO | TL-W5E1 TL-W20ME1 | <p>Sensing object Yes No Load Operate (between brown and black) Release Output voltage (between blue and black) H L Operation indicator (red) ON OFF</p> | <p>* Maximum load current: 100 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p> |
| NC | TL-W5E2 TL-W20ME2 | <p>Sensing object Yes No Load Operate (between brown and black) Release Output voltage (between blue and black) H L Operation indicator (red) ON OFF</p> | <p>* Maximum load current: 100 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p> |

TL-W

| Operating status | Model | Timing chart | Output circuit |
|------------------|---------|--------------|---|
| NO | TL-W5F1 | | <p>* 1. Maximum load current: 200 mA * 2. Current flows in this direction if the circuit incorporates the transistor.</p> |
| | | | |

Precautions

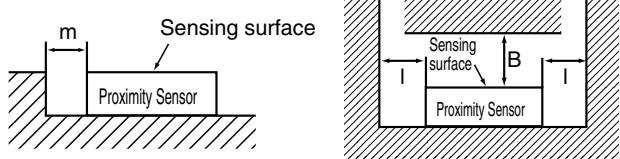
Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance between the Sensor and the surrounding metal as shown in the table below.

Front Surface Sensing Type (Not exceeding the sensor head height).

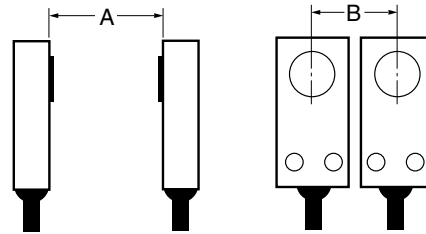


Effects of Surrounding Metal(Unit: mm)

| Model | Length | l | m | n |
|---------------|--------|----|----|-----|
| TL-W1R5M□ | | 2 | 0 | 8 |
| TL-W3M□ | | 3 | | 12 |
| TL-W5MD□ | | 5 | | 20 |
| TL-W5M□ | | | | |
| TL-W20ME□ | | 25 | 16 | 100 |
| TL-W5E□/-W5F□ | | 0 | 0 | 20 |

Mutual Interference

If two or more Sensors are mounted face to face or side by side, keep them separate at the following minimum distance.



Mutual Interference (unit: mm)

| Model | Length | A | B |
|---------------|--------|----------|----------|
| TL-W1R5M□ | | 75 (50) | 120(60) |
| TL-W3MC□ | | 90 (60) | 200(100) |
| TL-W5MD□ | | 120(80) | 60(30) |
| TL-W5MC□ | | | |
| TL-W20ME□ | | 200(100) | 200(100) |
| TL-W5E□/-W5F□ | | 50 | 35 |

Note: The above values in parentheses are applicable when using two sensors with different frequencies.

Installation

- Use M3 flat-head screws to install TL-W1R5M□ and TL-W3M□.
- Ensure that the resin cover should be tightened with a torque according to the following table.

| Model | Tensile strength (torque) |
|------------|---------------------------|
| TL-W1R5MC1 | 0.98 Nm |
| TL-W3MC□ | |
| TL-W5MD□ | |
| TL-W20M□ | 1.5 Nm |

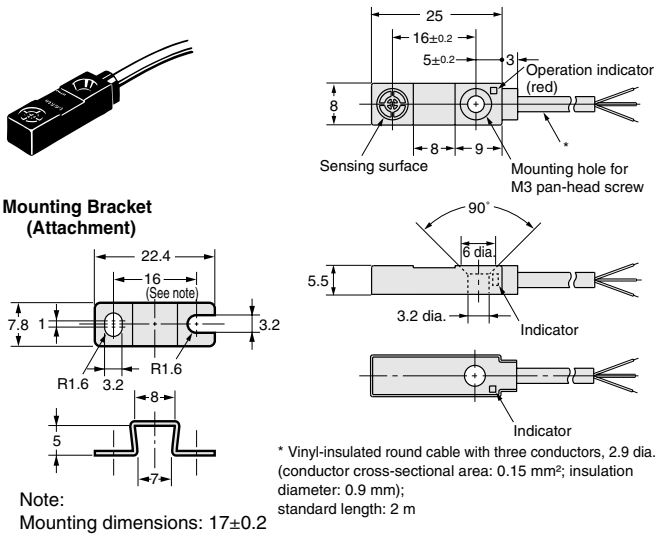
● Adjustment

Power ON

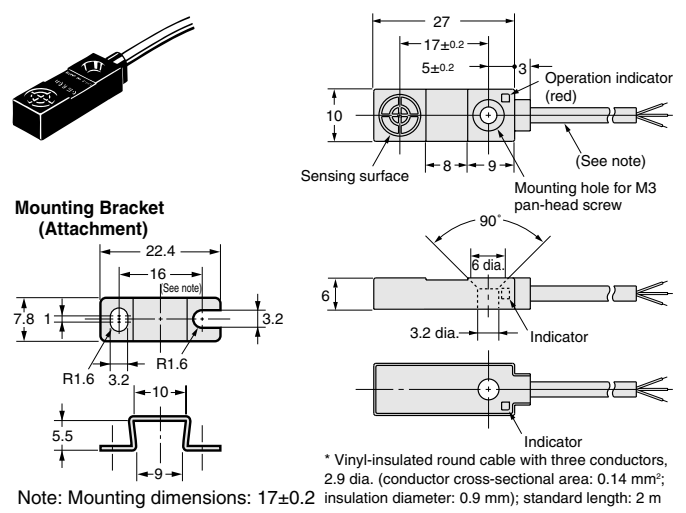
Please note that the power injection AND connection generate an error pulse for approximately 1 ms.

Dimensions (Unit: mm)

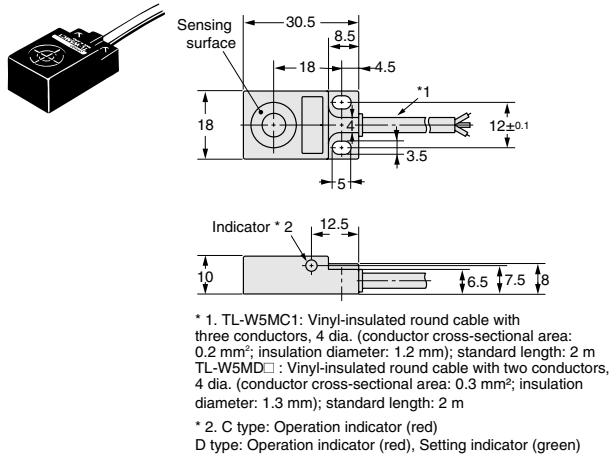
TL-W1R5M□□



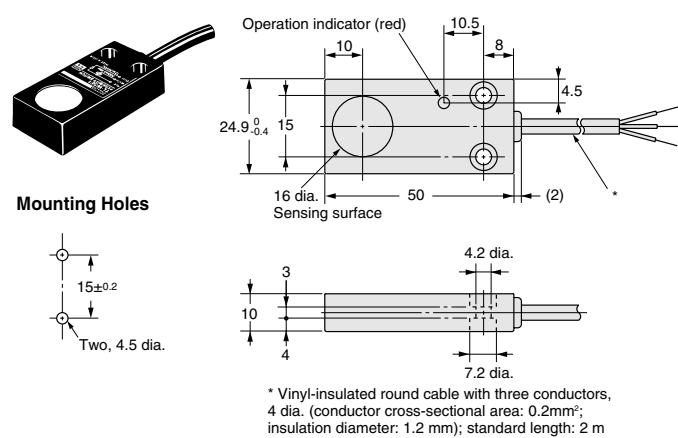
TL-W3M□□



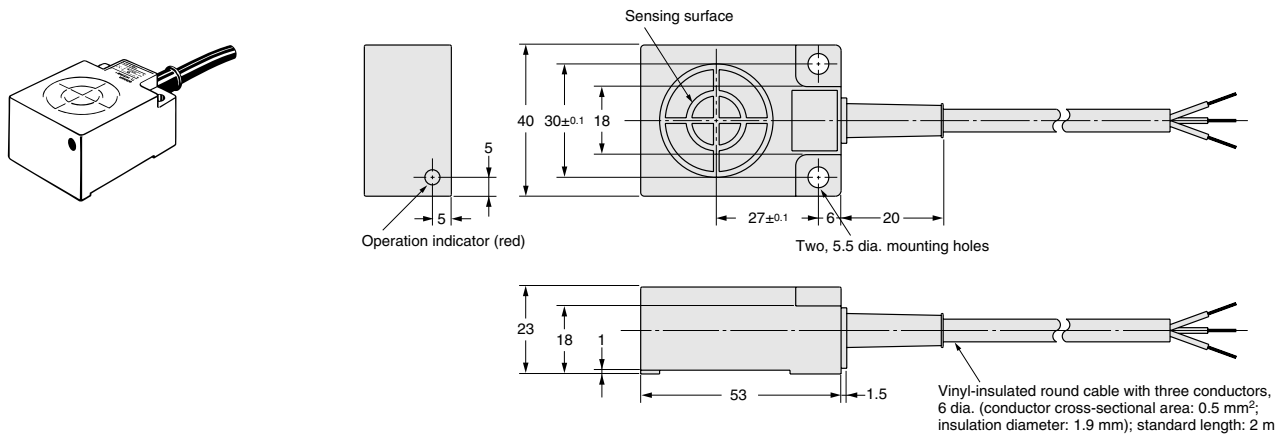
TL-W5M□□



TL-W5E□
TL-W5F□



TL-W20ME□



TL-W

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E221-E2-03-X

In the interest of product improvement, specifications are subject to change without notice.

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