

# TL-N/TL-Q

## A Wealth of Models for All Types of Applications

- Easy installation, high-speed pulse generator, high-speed rotation control, and more.
- Direct mounted to metal (-N Models).
- A wealth of models ideal for limit control, counting control, and other applications (-N Models).



Be sure to read *Safety Precautions* on page 9.

## Ordering Information

**Sensors** [Refer to *Dimensions* on page 10.]

### DC 2-Wire Models

Appearance	Sensing distance			Model	
				Operation mode	
				NO	NC
Unshielded 	17 × 17	5 mm		TL-Q5MD1 2M	TL-Q5MD2 2M
	25 × 25	7 mm		TL-N7MD1 2M	TL-N7MD2 2M
	30 × 30	12 mm		TL-N12MD1 2M	TL-N12MD2 2M
	40 × 40	20 mm		TL-N20MD1 2M	TL-N20MD2 2M

Note: Models with a different frequency are available to prevent mutual interference. The model numbers are TL-N□MD□5 and TL-Q5MD□5 (e.g., TL-N7MD15).

### DC 3-Wire and AC 2-Wire Models

Appearance	Sensing distance			Output configuration	Model	
					Operation mode	
					NO	NC
Unshielded 	8 × 9	2 mm	DC 3-wire, NPN	TL-Q2MC1 2M	—	
	17 × 17	5 mm		TL-Q5MC1 2M *2	TL-Q5MC2 2M	
	25 × 25	5 mm	DC 3-wire, NPN	TL-N5ME1 2M *1 *2	TL-N5ME2 2M *1	
			AC 2-wire	TL-N5MY1 2M	TL-N5MY2 2M	
	30 × 30	10 mm	DC 3-wire, NPN	TL-N10ME1 2M *1 *2	TL-N10ME2 2M *1	
			AC 2-wire	TL-N10MY1 2M	TL-N10MY2 2M	
	40 × 40	20 mm	DC 3-wire, NPN	TL-N20ME1 2M *1 *2	TL-N20ME2 2M	
			AC 2-wire	TL-N20MY1 2M	TL-N20MY2 2M	

Note: Models with a different frequency are available to prevent mutual interference. Models numbers for Sensors with different frequencies are TL-□□M□□5 (example: TL-N5ME15).

\*1. Models are also available with 5-m cables. Add the cable length to the model number (example: TL-N5ME1 5M).

\*2. Models with robotics cables are also available. Add -R to the end of the model number (example: TL-N5ME1-R).

## Accessories (Order Separately)

**Mounting Brackets** A Mounting Bracket is provided with the Sensor depending on the model number. Check the column for the applicable Sensor.  
**[Refer to Dimensions on page 11.]**

Type	Model	Applicable Sensors	
		Provided with these Sensors	Order separately
Mounting Brackets	Y92E-C5	TL-N5ME□, TL-N7MD□	TL-N5MY□
	Y92E-C10	TL-N10ME□, TL-N12MD□	TL-N10MY□
	Y92E-C20	TL-N20ME□, TL-N20MD□	TL-N20MY□
Mounting Brackets for Conduits	Y92E-N5C15	---	TL-N5ME□, TL-N5MY□
	Y92E-N10C15	---	TL-N10ME□, TL-N10MY□

## Ratings and Specifications

### DC 2-Wire Models

Item	Model	TL-Q5MD□	TL-N7MD□	TL-N12MD□	TL-N20MD□
Sensing distance		5 mm ±10%	7 mm ±10%	12 mm ±10%	20 mm ±10%
Set distance		0 to 4 mm	0 to 5.6 mm	0 to 9.6 mm	0 to 16 mm
Differential travel		10% max. of sensing distance			
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to <i>Engineering Data</i> on page 5.)			
Standard sensing object		Iron, 18 × 18 × 1 mm	Iron, 30 × 30 × 1 mm	Iron, 40 × 40 × 1 mm	Iron, 50 × 50 × 1 mm
Response frequency *		500 Hz			300 Hz
Power supply voltage (operating voltage range)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.			
Leakage current		0.8 mA max.			
Control output	Load current	3 to 100 mA			
	Residual voltage	3.3 V max. (Load current: 100 mA, Cable length: 2 m)			
Indicators		D1 Models: Operation indicator (red), Setting indicator (green) D2 Models: Operation indicator (red)			
Operation mode (with sensing object approaching)		D1 Models: NO D2 Models: NC Refer to the timing charts under <i>I/O Circuit Diagrams</i> on page 7 for details.			
Protection circuits		Load short-circuit protection, Surge suppressor			
Ambient temperature range		Operating/Storage: -25 to 70°C (with no icing or condensation)			
Ambient humidity range		Operating/Storage: 35% to 95% (with no condensation)			
Temperature influence		±10% max. of sensing distance at 23°C in the temperature range of -25 to 70°C			
Voltage influence		±2.5% max. of sensing distance at rated voltage in the rated voltage ±15% range			
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case			
Dielectric strength		1,000 VAC for 1 min between current-carrying 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> 3 times each in X, Y, and Z directions	Destruction: 1,000 m/s <sup>2</sup> 10 times each in X, Y, and Z directions		
Degree of protection		IEC 60529 IP67, in-house standards: oil-resistant			
Connection method		Pre-wired Models (Standard cable length: 2 m)			
Weight (packed state)		Approx. 45 g	Approx. 145 g	Approx. 170 g	Approx. 240 g
Materials	Case	Heat-resistant ABS			
	Sensing surface				
Accessories		Instruction manual	Mounting Bracket, Mounting phillips screws (M4 × 25), Instruction manual	Mounting Bracket, Mounting phillips screws (M4 × 30), Instruction manual	Mounting Bracket, Mounting phillips screws (M5 × 40), Instruction manual

\* The response frequency is an average value.

Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

DC 3-Wire Models

Item	Model	TL-Q2MC1	TL-Q5MC□
Sensing distance		2 mm ±15%	5 mm ±10%
Set distance		0 to 1.5 mm	0 to 4 mm
Differential travel		10% max. of sensing distance	
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to <i>Engineering Data</i> on page 6.)	
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, 15 × 15 × 1 mm
Response time		---	2 ms max.
Response frequency *		500 Hz	
Power supply voltage (operating voltage range)		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. at 24 VDC
Control output	Load current	NPN open collector 100 mA max. at 30 VDC max.	NPN open collector 50 mA max. at 30 VDC 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)
Indicators		Detection indicator (red)	
Operation mode (with sensing object approaching)		NO	C1 Models: NO C2 Models: NC
		Refer to the timing charts under <i>DC 3-Wire Models</i> on page 8 for details.	
Protection circuits		Reverse polarity protection, Surge suppressor	
Ambient temperature range		Operating/Storage: -10 to 60°C (with no icing or condensation)	Operating/Storage: -25 to 70°C (with no icing or condensation)
Ambient humidity range		Operating/Storage: 35% to 95% (with no condensation)	
Temperature influence		±10% max. of sensing distance at 23°C in the temperature range of -10 to 60°C	±20% max. of sensing distance at 23°C in the temperature range of -25 to 70°C
Voltage influence		±2.5% max. of sensing distance at rated voltage in rated voltage ±10% range	
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case	5 MΩ min. (at 500 VDC) between current-carrying parts and case
Dielectric strength		1,000 VAC for 1 min between current-carrying parts and case	500 VAC, 50/60 Hz for 1 min between current-carrying 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: 1,000 m/s <sup>2</sup> 10 times each in X, Y, and Z directions	Destruction: 200 m/s <sup>2</sup> 10 times each in X, Y, and Z directions
Degree of protection		IEC 60529 IP67, in-house standards: oil-resistant	IEC IP67
Connection method		Pre-wired Models (Standard cable length: 2 m)	
Weight (packed state)		Approx. 30 g	Approx. 60 g
Materials	Case	Heat-resistant ABS	
	Sensing surface		
Accessories		Instruction manual	---

\* The response frequency is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

Item	Model	TL-N5ME□, TL-N5MY□	TL-N10ME□, TL-N10MY□	TL-N20ME□, TL-N20MY□
Sensing distance		5 mm ±10%	10 mm ±10%	20 mm ±10%
Set distance		0 to 4 mm	0 to 8 mm	0 to 16 mm
Differential travel		15% max. of sensing distance		
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to <i>Engineering Data</i> on pages 6 and 7.)		
Standard sensing object		Iron, 30 × 30 × 1 mm	Iron, 40 × 40 × 1 mm	Iron, 50 × 50 × 1 mm
Response frequency *1		E Models: 500 Hz Y Models: 10 Hz		E Models: 40 Hz Y Models: 10 Hz
Power supply voltage *2 (operating voltage range)		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 max. at 12 VDC, 15 mA max. at 24 VDC		
Leakage current		Y Models: Refer to <i>Engineering Data</i> on page 5.		
Control output	Load current	E Models: 100 mA max. at 12 VDC, 200 mA max. at 24 VDC Y Models: 10 to 200 mA		
	Residual voltage	E Models: 1 V max. (load current: 200 mA) Y Models: Refer to <i>Engineering Data</i> on page 5.		
Indicators		E Models: Detection indicator (red) Y Models: Operation indicator (red)		
Operation mode (with sensing object approaching)		E1/Y1 Models: NO E2/Y2 Models: NC Refer to the timing charts under <i>I/O Circuit Diagrams</i> on page 8 for details.		
Protection circuits		E Models: Reverse polarity protection, Surge suppressor Y Models: Surge suppressor		
Ambient temperature range		Operating/Storage: -25 to 70°C (with no icing or condensation)		
Ambient humidity range		Operating/Storage: 35% to 95% (with no condensation)		
Temperature influence		±10% max. of sensing distance at 23°C in the temperature range of -25 to 70°C		
Voltage influence		E Models: ±2.5% max. of sensing distance at rated voltage in rated voltage ±10% range Y Models: ±1% max. of sensing distance at rated voltage in rated voltage ±10% range		
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case		
Dielectric strength		E Models: 1,000 VAC, 50/60 Hz for 1 min between current-carrying parts and case Y Models: 2,000 VAC, 50/60 Hz for 1 min between current-carrying 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> 10 times each in X, Y, and Z directions		
Degree of protection		IEC 60529 IP67, in-house standards: oil-resistant		
Connection method		Pre-wired Models (Standard cable length: 2 m)		
Weight (packed state)		Approx. 145 g	Approx. 170 g	Approx. 240 g
Materials	Case	Heat-resistant ABS		
	Sensing surface			
Accessories		E Models: Mounting Bracket, Mounting phillips screws (M4 × 25), Instruction manual Y Models: Instruction manual	E Models: Mounting Bracket, Mounting phillips screws (M4 × 30), Instruction manual Y Models: Instruction manual	E Models: Mounting Bracket, Mounting phillips screws (M5 × 40), Instruction manual Y Models: Instruction manual

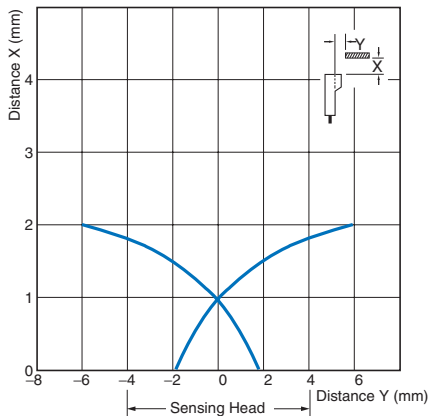
\*1. The response frequency is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

\*2. E Models (DC switching models): A full-wave rectification power supply of 24 VDC ±10% (average value) can be used.

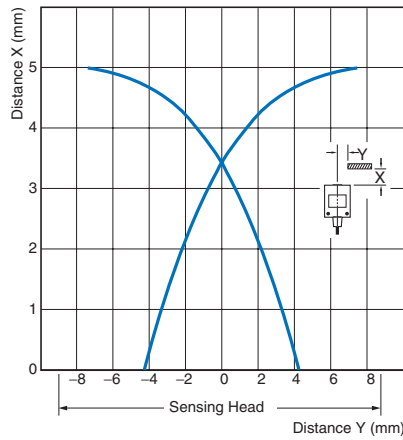
## Engineering Data (Typical)

### Sensing Area

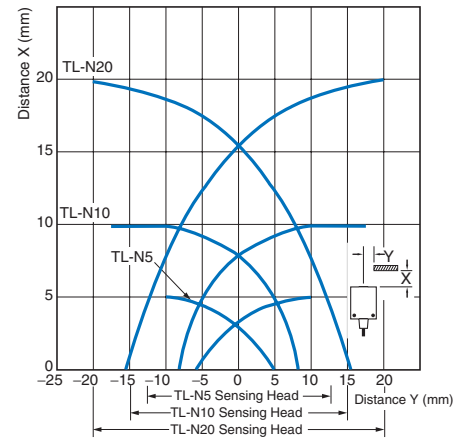
#### TL-Q2MC1



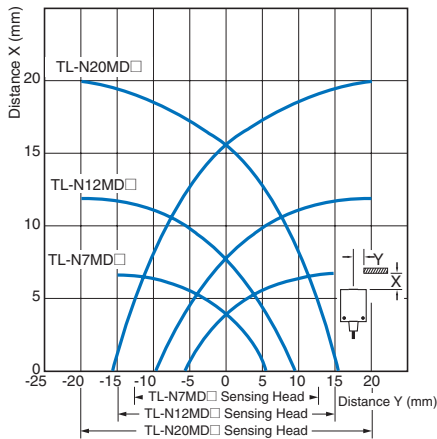
#### TL-Q5M□□



#### TL-N□ME□ TL-N□MY□

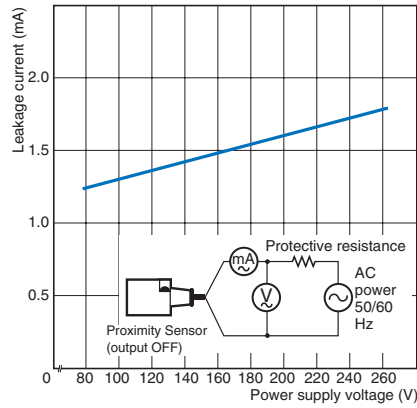


#### TL-N□MD□



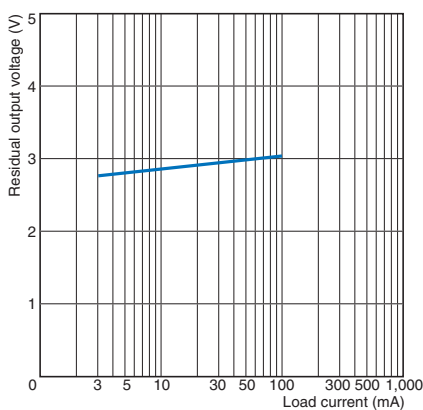
### Leakage Current

#### TL-N□MY

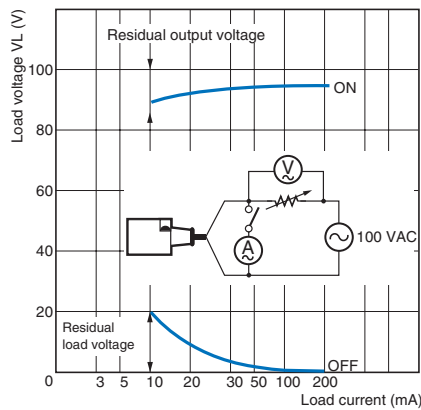


### Residual Output Voltage

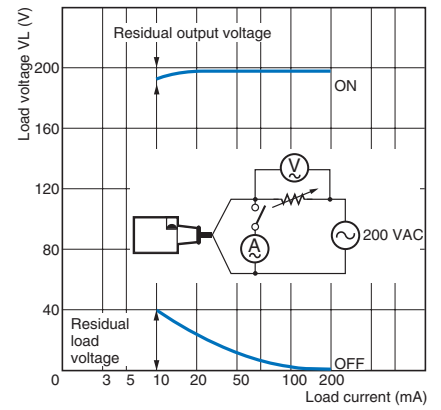
#### TL-N□MD



#### TL-N□MY at 100 VAC

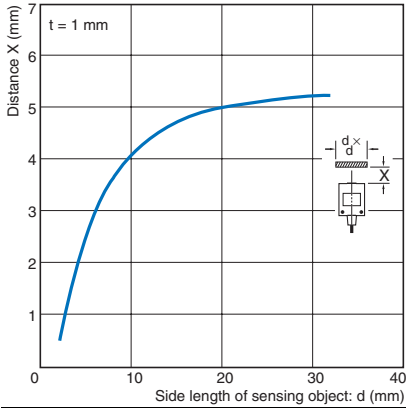


#### TL-N□MY at 200 VAC



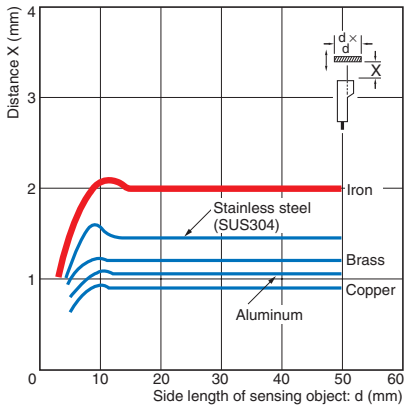
Sensing Object Size vs. Sensing Distance

TL-Q5MC

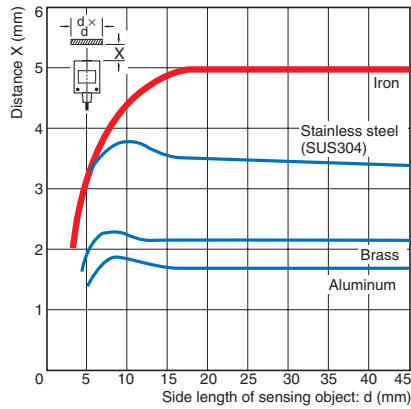


Influence of Sensing Object Size and Material

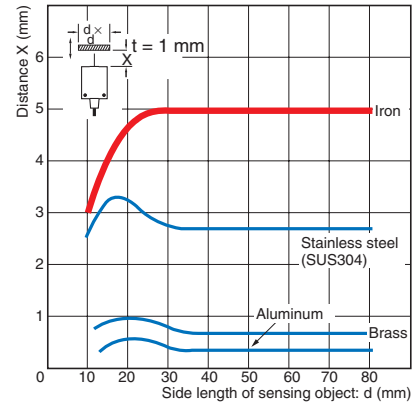
TL-Q2MC1



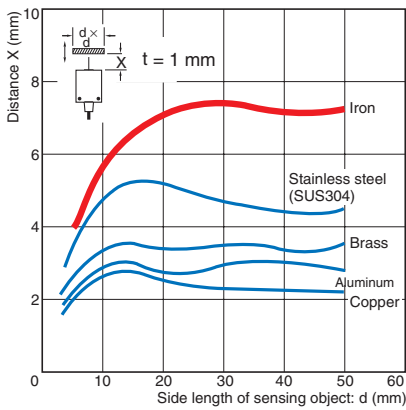
TL-Q5M



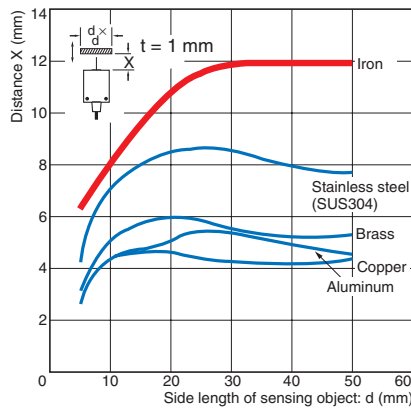
TL-N5



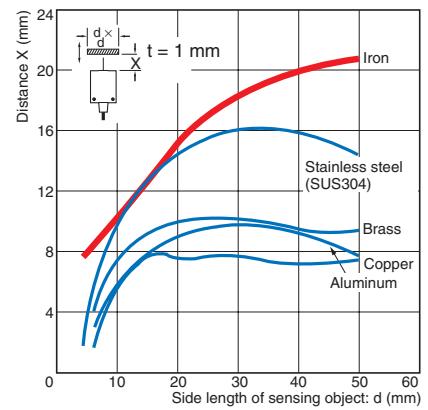
TL-N7MD



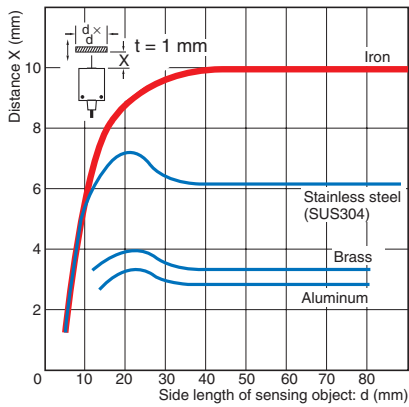
TL-N12MD



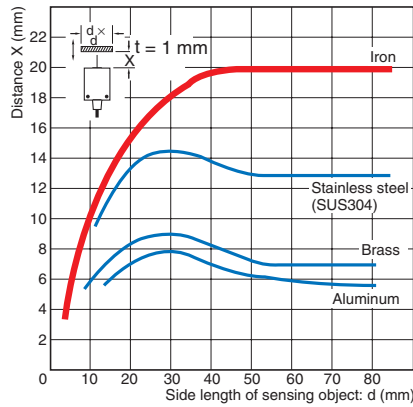
TL-N20MD



## TL-N10□



## TL-N20□



## I/O Circuit Diagrams

### DC 2-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-Q5MD1 TL-N7MD1 TL-N12MD1 TL-N20MD1	<p>Non-sensing area    Unstable sensing area    Stable sensing area</p> <p>Sensing object</p> <p>(%)    100    80 (TYP)    0</p> <p>Rated sensing distance</p> <p>ON Setting indicator (green) OFF</p> <p>ON Operation indicator (red) OFF</p> <p>ON Control output OFF</p>	<p>Note: The load can be connected to either the +V or 0 V side.</p>
NC	TL-Q5MD2 TL-N7MD2 TL-N12MD2 TL-N20MD2	<p>Non-sensing area    Sensing area</p> <p>Sensing object</p> <p>(%)    100    0</p> <p>Rated sensing distance</p> <p>ON Operation indicator (red) OFF</p> <p>ON Control output OFF</p>	

## DC 3-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-Q2MC1 TL-Q5MC1	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	<p>* Load current: 100 mA max., TL-Q2MC1 Load current: 50 mA max., TL-Q5MC1</p>
NC	TL-Q5MC2	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	
NO	TL-N5ME1 TL-N10ME1 TL-N20ME1	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	<p>*1. Load current: 200 mA max. *2. When a transistor is connected.</p>
NC	TL-N5ME2 TL-N10ME2 TL-N20ME2	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	

## AC 2-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-N5MY1 TL-N10MY1 TL-N20MY1	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	
NC	TL-N5MY2 TL-N10MY2 TL-N20MY2	<p>Sensing object</p> <p>Present </p> <p>Not present </p>	



## Safety Precautions

Refer to *Warranty and Limitations of Liability*.

### ⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



- Do not short-circuit the load, otherwise the Sensor may be damaged.
- Do not supply power to the Sensor with no load, otherwise the Sensor may be damaged.  
Applicable Models: AC 2-Wire Models



### Precautions for Correct Use

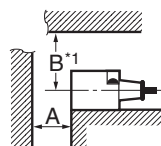
Do not use this product under ambient conditions that exceed the ratings.

#### ● Design

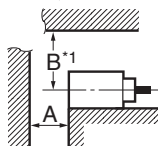
#### Influence of Surrounding Metal

When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.

#### Rectangular Models TL-N\*2



#### TL-Q

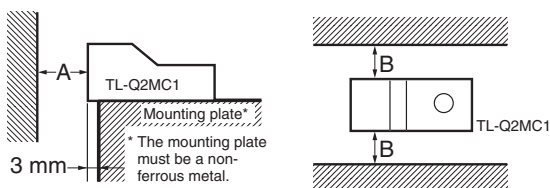


#### Influence of Surrounding Metal (Unit: mm)

Model	Distance	A	B *1
TL-Q5M□□		20	20
TL-N7MD□		40	35
TL-N12MD□		50	40
TL-N20MD□		70	60
TL-N5ME□, TL-N5MY□		20	23
TL-N10ME□, TL-N10MY□		40	30
TL-N20ME□, TL-N20MY□		80	45

\*1. The B dimension applies to the top, right-side, and left-side surfaces.

\*2. The values for A or B for the TL-N apply when there is metal on only one side of the sensor. If there is metal on two or more sides, the value must be multiplied by two or more.



#### Influence of Surrounding Metal (Unit: mm)

Model	Distance	A	B
TL-Q2MC1		12	3

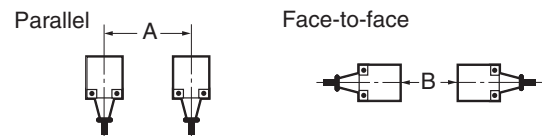
#### ● Mounting

When tightening the mounting screws, do not exceed the torque in the following table.

Model	Torque
TL-Q2MC1	0.59 N·m
TL-Q5M□□	
TL-N□M□□	0.9 to 1.5 N·m

#### Mutual Interference

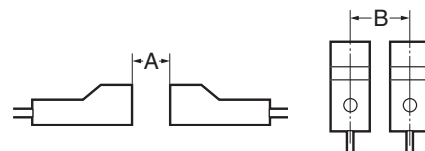
When installing Sensors face-to-face or side-by-side, ensure that the minimum distances given in the following table are maintained.



#### Mutual Interference (Unit: mm)

Model	Distance	A *	B *
TL-Q5MC□		60 (17)	120 (60)
TL-Q5MD□		60 (30)	120 (80)
TL-N7MD□		100 (50)	120 (60)
TL-N12MD□		120 (60)	200 (100)
TL-N20MD□		200 (100)	200 (100)
TL-N5ME□		80 (40)	80 (40)
TL-N5MY□		80 (40)	90 (40)
TL-N10ME□, TL-N10MY□		120 (60)	120 (60)
TL-N20ME□, TL-N20MY□		200 (100)	120 (60)

\* Values in parentheses apply to Sensors operating at different frequencies.



#### Mutual Interference (Unit: mm)

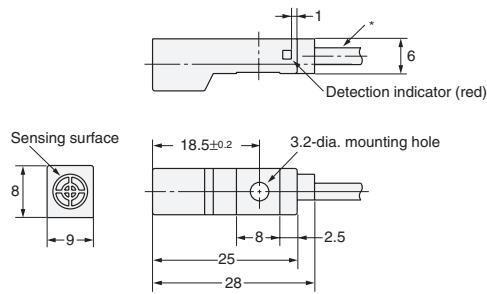
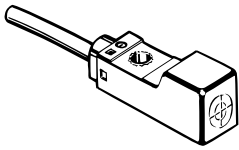
Model	Distance	A *	B *
TL-Q2MC1		90 (45)	30 (8)

\* Values in parentheses apply to Sensors operating at different frequencies.

## Dimensions

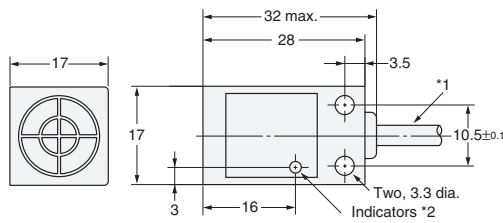
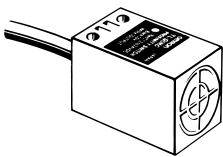
### Sensors

#### TL-Q2MC1

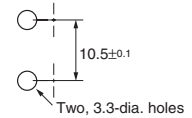


\* 2.9-dia. vinyl-insulated round cable with 3 conductors  
(Conductor cross section: 0.15 mm<sup>2</sup>, Insulator diameter: 0.9 mm), Standard length: 2 m

#### TL-Q5M□□

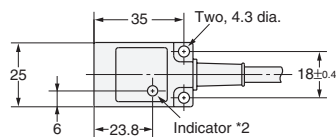
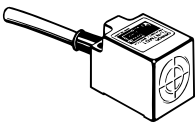


#### Mounting Hole Dimensions



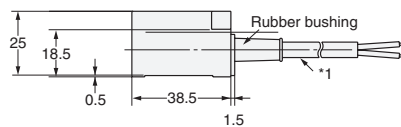
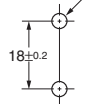
\*1. C Models: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm<sup>2</sup>, Insulator diameter: 1.2 mm), Standard length: 2 m  
D Models: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.3 mm<sup>2</sup>, Insulator diameter: 1.3 mm), Standard length: 2 m  
\*2. C Models: Detection indicator (red)  
D Models: Operation indicator (red), Setting indicator (green)

#### TL-N7MD□, TL-N5ME□



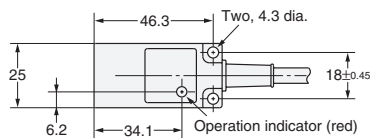
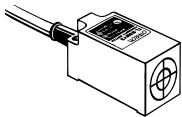
#### Mounting Hole Dimensions

Two, 4.5-dia. or M4 holes



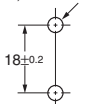
\*1. D Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m  
E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m  
\*2. D1 Models: Operation indicator (red), Setting indicator (green)  
D2 Models: Operation indicator (red)  
E Models: Detection indicator (red)

#### TL-N5MY□

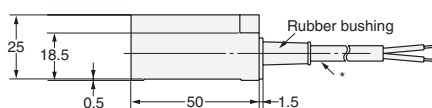


#### Mounting Hole Dimensions

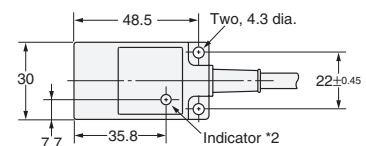
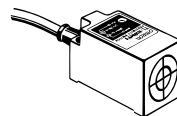
Two, 4.5-dia. or M4 holes



\* 6-dia. vinyl-insulated round cable with 2 conductors  
(Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m

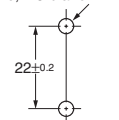


#### TL-N12MD□, TL-N10ME□, TL-N10MY□

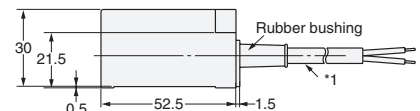


#### Mounting Hole Dimensions

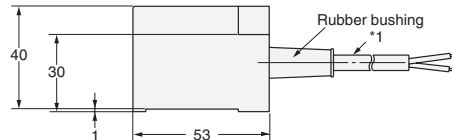
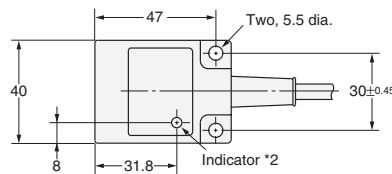
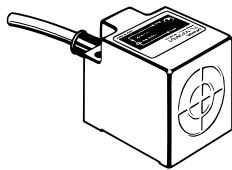
Two, 4.5-dia. or M4 holes



\*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors  
(Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m  
E Models: 6-dia. vinyl-insulated round cable with 3 conductors  
(Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m  
\*2. D1 Models: Operation indicator (red) and Setting indicator (green)  
D2 Models: Operation indicator (red)  
E Models: Detection indicator (red)  
Y Models: Operation indicator (red)

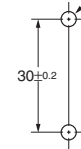


## TL-N20MD□, TL-N20ME□, TL-N20MY□



### Mounting Hole Dimensions

Two, 5.5-dia. or M5 holes

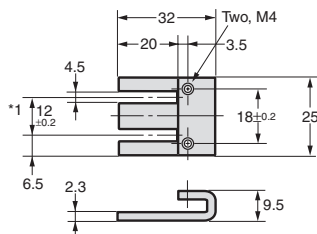


- \*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m  
E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm<sup>2</sup>, Insulator diameter: 1.9 mm), Standard length: 2 m
- \*2. D1 Models: Operation indicator (red) and Setting indicator (green)  
D2 Models: Operation indicator (red)  
E Models: Detection indicator (red)  
Y Models: Operation indicator (red)

## Accessories (Order Separately)

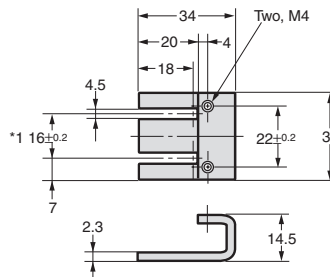
### Mounting Bracket

#### Y92E-C5



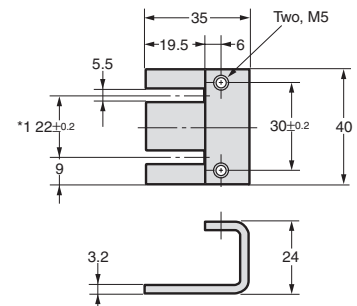
Applicable Models: TL-N5ME□ \*2  
Applicable Models: TL-N5MY□  
Applicable Models: TL-N7MD□ \*2  
Material: Mounting Bracket: Zinc-plated iron  
Mounting phillips Screws: Nickel-plated iron

#### Y92E-C10



Applicable Models: TL-N10ME□ \*2  
Applicable Models: TL-N10MY□  
Applicable Models: TL-N12MD□ \*2  
Material: Mounting Bracket: Zinc-plated iron  
Mounting phillips Screws: Nickel-plated iron

#### Y92E-C20



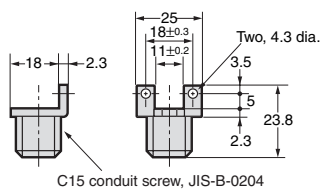
Applicable Models: TL-N20ME□ \*2  
Applicable Models: TL-N20MY□  
Applicable Models: TL-N20MD□ \*2  
Material: Mounting Bracket: Zinc-plated iron  
Mounting phillips Screws: Nickel-plated iron

\*1. These are the mounting dimensions of the base of the Mounting Bracket.

\*2. Provided with the product.

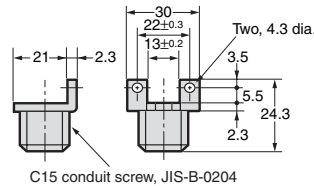
### Mounting Brackets for Wiring Conduit Use (Sold Separately)

#### Y92E-N5C15



Applicable Models: TL-N5ME□  
Applicable Models: TL-N5MY□  
Applicable Models: TL-N7MD□  
Material: Zinc-plated iron

#### Y92E-N10C15



Applicable Models: TL-N10ME□  
Applicable Models: TL-N10MY□  
Applicable Models: TL-N12MD□  
Material: Zinc-plated iron

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2012.1

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