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TLQ5MC152M

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Rectangular Standard Proximity Sensor

TL-N/TL-Q/TL-G

CSM_TL-N_TL-Q_TL-G_DS_E_9_1

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.

CE (excluding TL-G)

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
	Grooved	7.5 mm	DC 3-wire, NPN	TL-G3D-3 1M	—

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 *12*.]

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 *Engineering Data* 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/O Circuit Diagrams* 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/s² 3 times each in X, Y, and Z directions	Destruction: 1,000 m/s² 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□	TL-G3D-3
Sensing distance		2 mm ±15%	5 mm ±10%	7.5±0.5mm
Set distance		0 to 1.5 mm	0 to 4 mm	10 mm
Differential travel		10% max. of sensing distance		
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 6.)		
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, 15 × 15 × 1 mm	Iron, 10 × 5 × 0.5mm
Response time		---	2 ms max.	1 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.		12 to 24 VDC, ripple (p-p): 5% max.
Current consumption		15 mA max. at 24 VDC (no-load)	10 mA max. at 24 VDC	2 mA max. at 24 VDC (no-load)
Control output	Load current	NPN open collector 100 mA max. at 30 VDC max.	NPN open collector 50 mA max. at 30 VDC max.	NPN transistor output 20 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)	---
Indicators		Detection indicator (red)		---
Operation mode (with sensing object approaching)		NO	C1 Models: NO C2 Models: NC	NO
		Refer to the timing charts under *I/O Circuit Diagrams* on page 7 for details.		
Protection circuits		Reverse polarity protection, Surge suppressor		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	±10% max. of sensing distance at 23°C in the temperature range of −10 to 55°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^2 10 times each in X, Y, and Z directions	Destruction: 200 m/s^2 10 times each in X, Y, and Z directions	
Degree of protection		IEC 60529 IP67, in-house standards: oil-resistant	IEC IP67	IEC IP66
Connection method		Pre-wired Models (Standard cable length: 2 m)		Pre-wired Models (Standard cable length: 1m)
Weight (packed state)		Approx. 30 g	Approx. 60 g	Approx. 30 g
Materials	Case	Heat-resistant ABS		PPO, etc. (Refer to page 11)
	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.

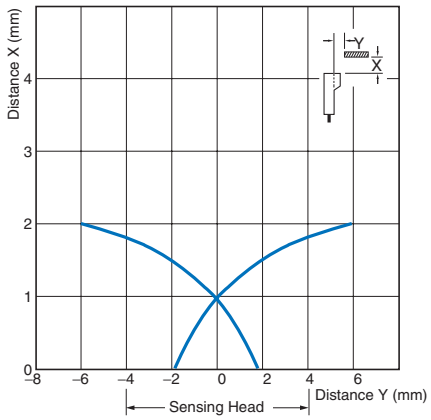
Item / Model		TL-N5ME□, TL-N5MY□	TL-N10ME□, TL-N10MY□	TL-N20ME□, TL-N20MY□
Sensing distance		5 mm ±10%	10 mm ±10%	20 mm ±10%
Set distance		0 to 4 mm	0 to 8 mm	0 to 16 mm
Differential travel		15% max. of sensing distance		
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* 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 *Engineering Data* 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 *Engineering Data* 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/O Circuit Diagrams* 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^2 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.

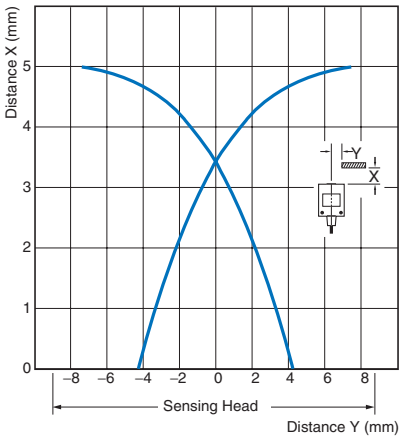
Engineering Data (Typical)

Sensing Area

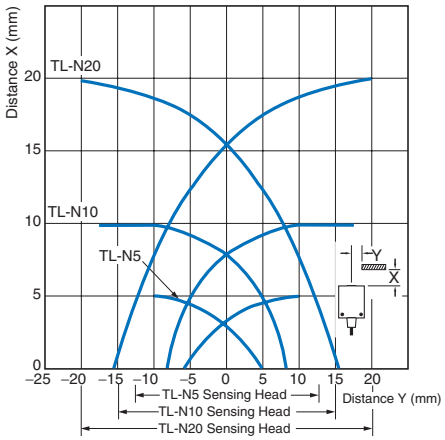
TL-Q2MC1



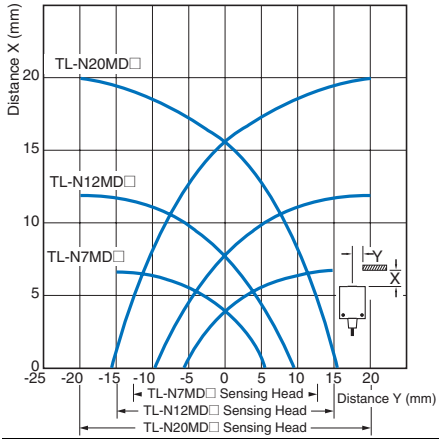
TL-Q5M□□



TL-N□ME□
TL-N□MY□

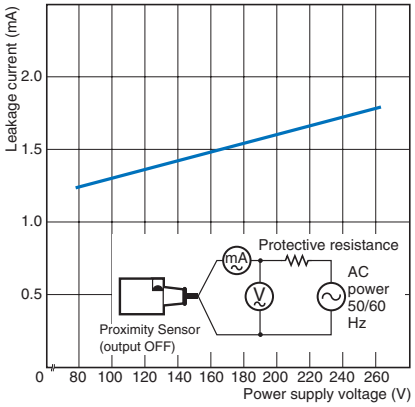


TL-N□MD□



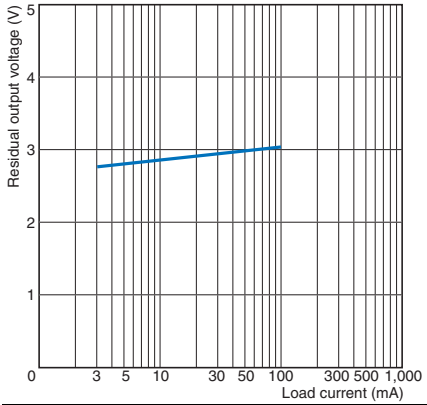
Leakage Current

TL-N□MY

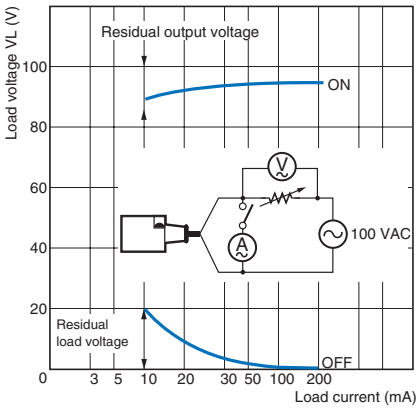


Residual Output Voltage

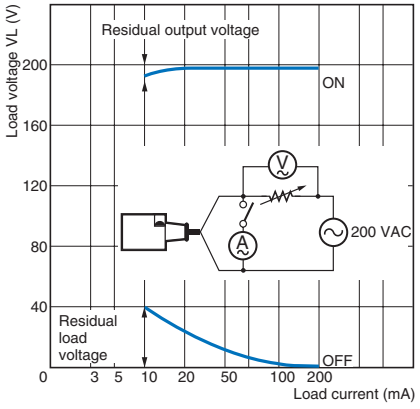
TL-N□MD



TL-N□MY at 100 VAC

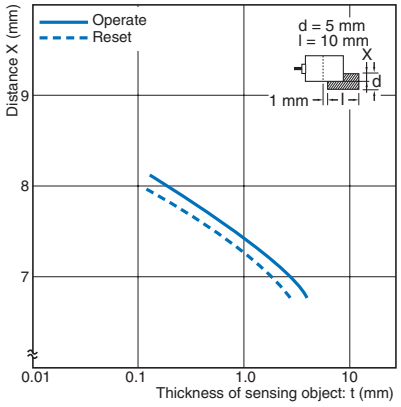


TL-N□MY at 200 VAC



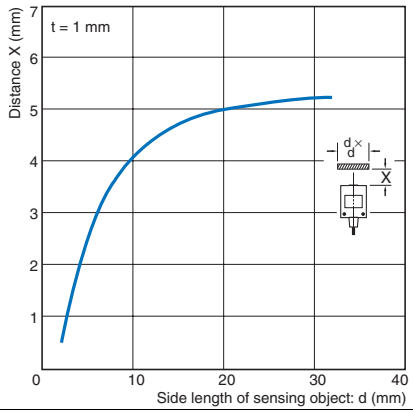
Thickness of Sensing Object vs. Sensing Distance

TL-G3D-3

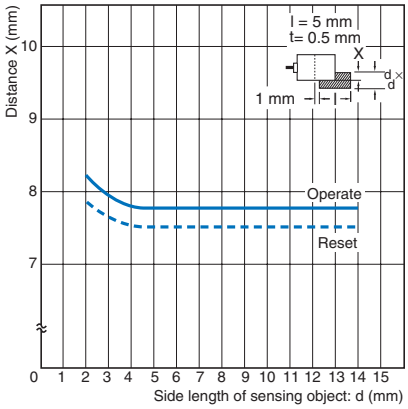


Sensing Object Size vs. Sensing Distance

TL-Q5MC□

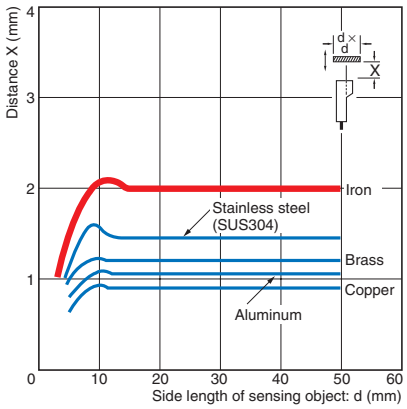


TL-G3D-3

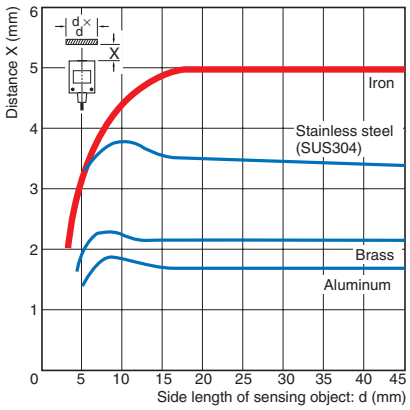


Influence of Sensing Object Size and Material

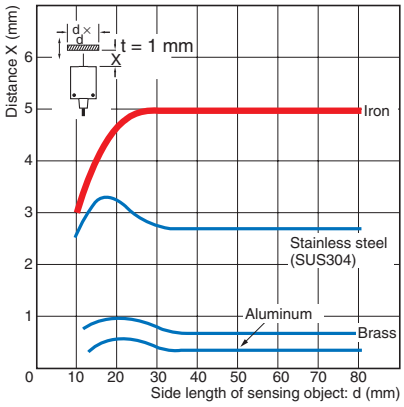
TL-Q2MC1



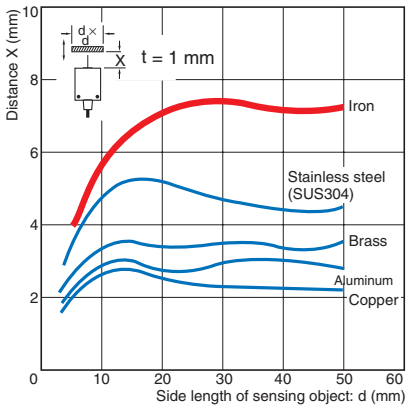
TL-Q5M□□



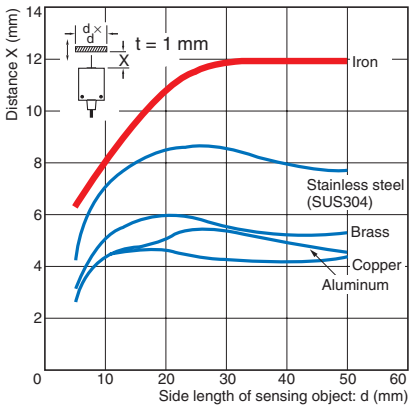
TL-N5□



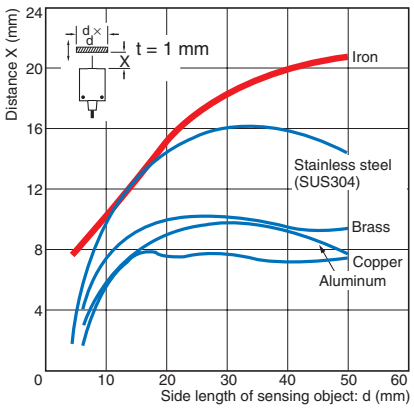
TL-N7MD□



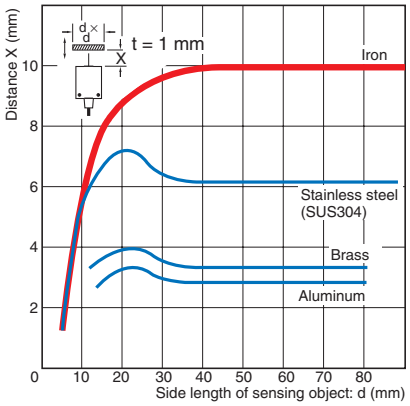
TL-N12MD□



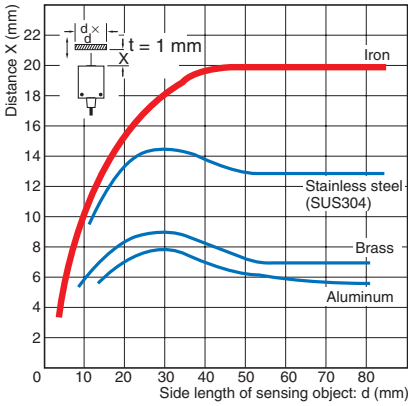
TL-N20MD□



TL-N10□

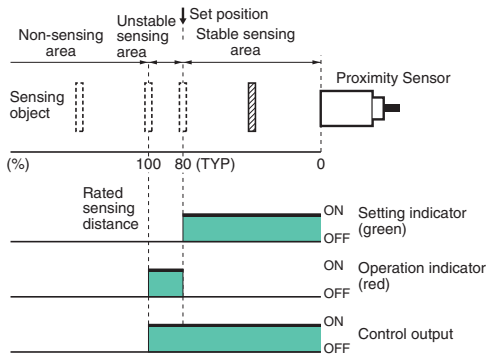
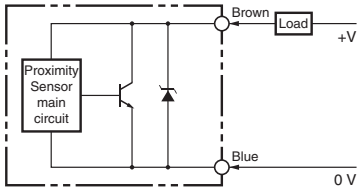
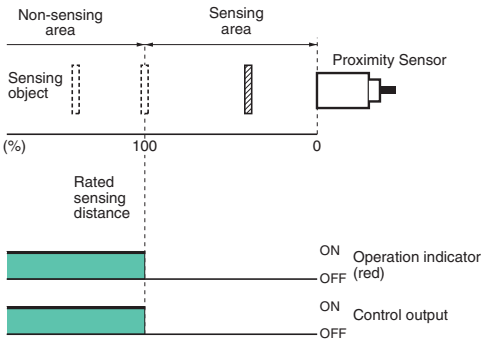


TL-N20□



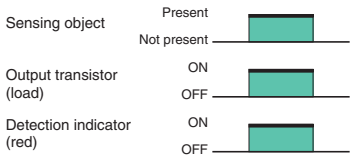
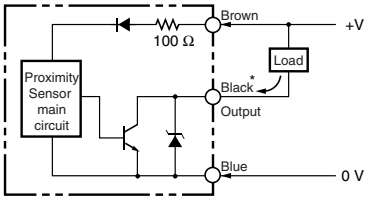
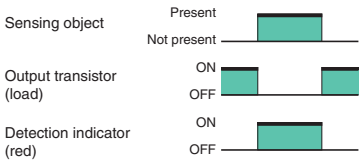
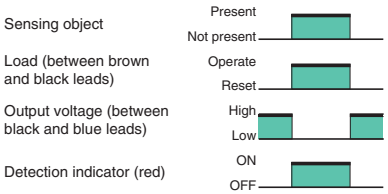
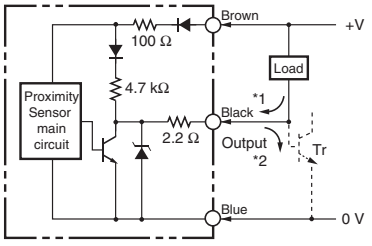
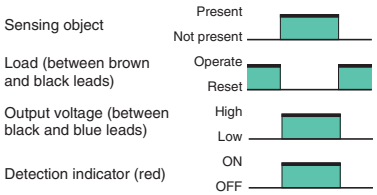
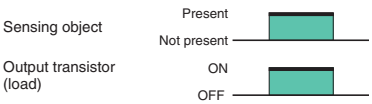
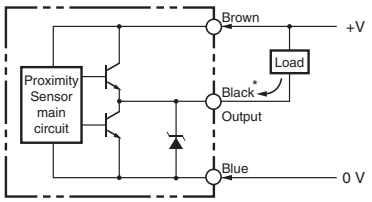
I/O Circuit Diagrams

DC 2-Wire Models

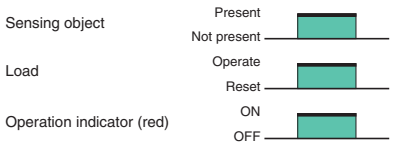
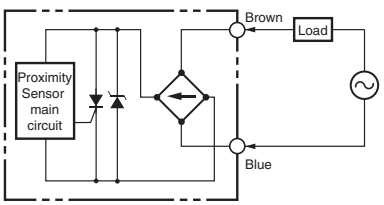
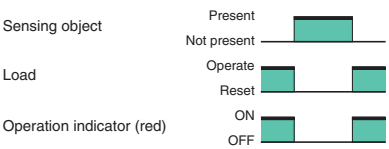
Operation mode	Model	Timing chart	Output circuit
NO	TL-Q5MD1 TL-N7MD1 TL-N12MD1 TL-N20MD1		
NC	TL-Q5MD2 TL-N7MD2 TL-N12MD2 TL-N20MD2		

Note: The load can be connected to either the +V or 0 V side.

DC 3-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-Q2MC1 TL-Q5MC1		 * Load current: 100 mA max., TL-Q2MC1 Load current: 50 mA max., TL-Q5MC1
NC	TL-Q5MC2		
NO	TL-N5ME1 TL-N10ME1 TL-N20ME1		 *1. Load current: 200 mA max. *2. When a transistor is connected.
NC	TL-N5ME2 TL-N10ME2 TL-N20ME2		
Transistor output	TL-G3D-3		 * Load current: 20 mA max.

AC 2-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-N5MY1 TL-N10MY1 TL-N20MY1		
NC	TL-N5MY2 TL-N10MY2 TL-N20MY2		

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

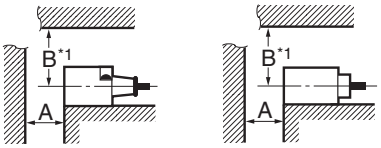
Do not use this product under ambient conditions that exceed the ratings.

● **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.

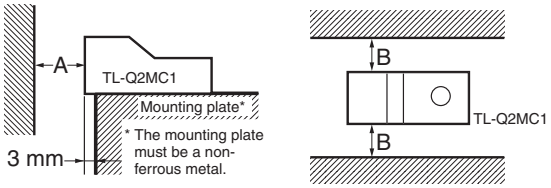
Rectangular Models TL-N*2 TL-Q



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

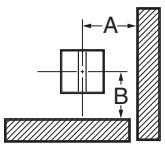
*1. The B dimension applies to the top, right-side, and left-side surfaces.
*2. The values for A or B for the TL-N apply when there is metal on only one side of the sensor. If there is metal on two or more sides, the value must be multiplied by two or more.



Influence of Surrounding Metal (Unit: mm)

Model / Distance	A	B
TL-Q2MC1	12	3

Grooved Model

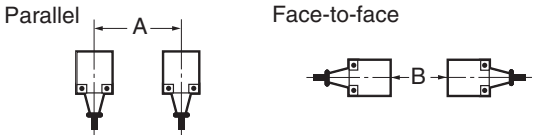


Influence of Surrounding Metal (Unit: mm)

Model / Distance	A	B
TL-G3D-3	11	17

Mutual Interference

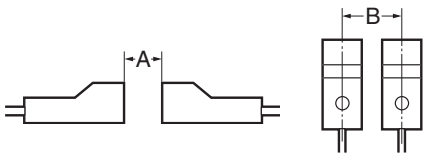
When installing Sensors face-to-face or side-by-side, ensure that the minimum distances given in the following table are maintained.



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.

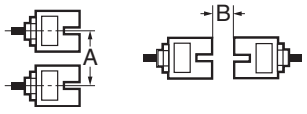


Mutual Interference (Unit: mm)

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

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

Grooved Model

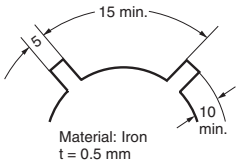


Mutual Interference (Unit: mm)

Model / Distance	A	B
TL-G3D-3	31	25

Designing the Sensing Object for TL-G3D-3 Grooved Model

For high-speed response to a toothed metal plate, the sensing objects must be at least the size of the standard sensing object and there must be sufficient distance between sensing objects. The response frequency for a toothed wheel like the one shown at the right is 1 kHz min. The response frequency will be reduced if the wheel is smaller or the width of the teeth or the distance between the teeth is reduced.



● Mounting

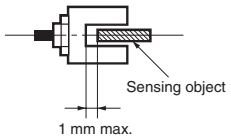
When tightening the mounting screws, do not exceed the torque in the following table.

Model	Torque
TL-Q2MC1	0.59 N·m
TL-Q5M□□	
TL-N□M□□	0.9 to 1.5 N·m
TL-G3D-3	2 N·m

● Adjustment

Sensing Object Passing Position for the TL-G3D-3 Grooved Model

The gap between the sensing object and the bottom of the groove must be 1 mm or less.

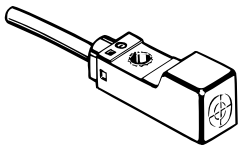


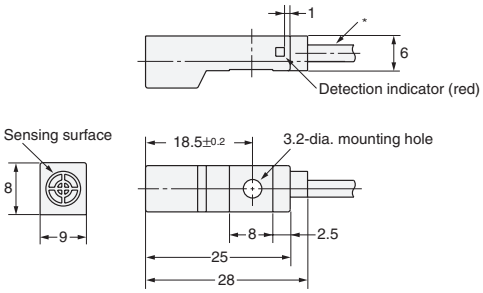
Dimensions

(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Sensors

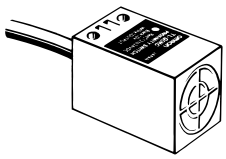
TL-Q2MC1

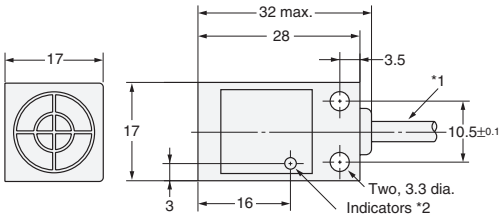




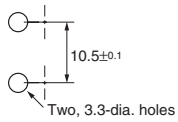
* 2.9-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 mm^2, Insulator diameter: 0.9 mm), Standard length: 2 m

TL-Q5M□□



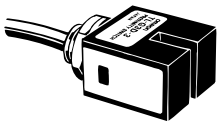


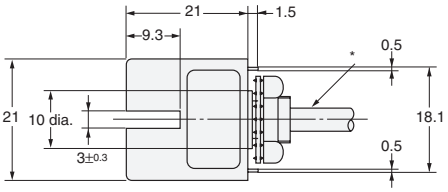
Mounting Hole Dimensions

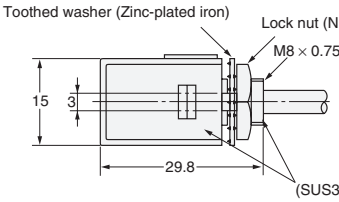


*1. C Models: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.2 mm), Standard length: 2 m
D Models: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.3 mm^2, Insulator diameter: 1.3 mm), Standard length: 2 m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

TL-G3D-3

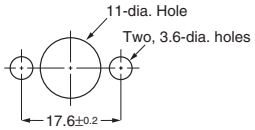




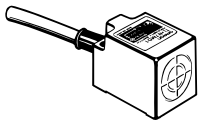


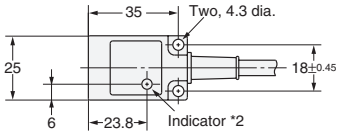
* 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.2 mm), Standard length: 1 m

Mounting Hole Dimensions

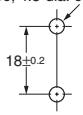


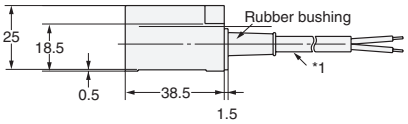
TL-N7MD□, TL-N5ME□





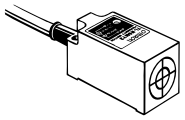
Mounting Hole Dimensions

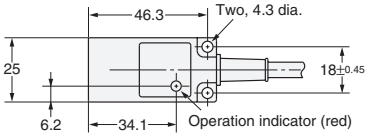




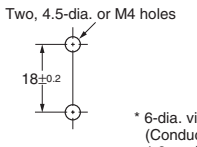
*1. D Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm^2, Insulator diameter: 1.9 mm), Standard length: 2 m
E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm^2, Insulator diameter: 1.9 mm), Standard length: 2 m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

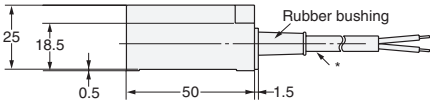
TL-N5MY□





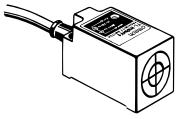
Mounting Hole Dimensions

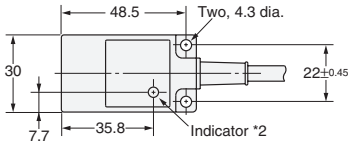




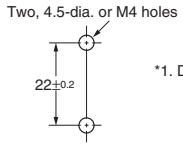
* 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm^2, Insulator diameter: 1.9 mm), Standard length: 2 m

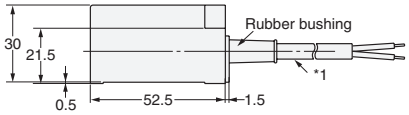
TL-N12MD□, TL-N10ME□, TL-N10MY□





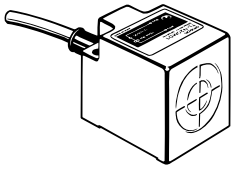
Mounting Hole Dimensions

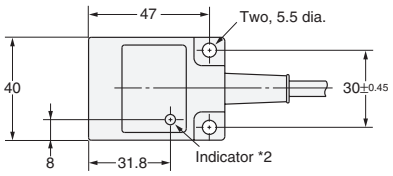


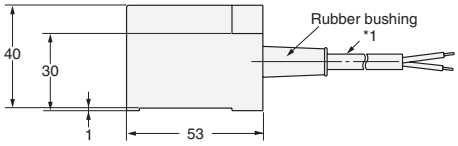


*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm^2, Insulator diameter: 1.9 mm), Standard length: 2 m
E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm^2, Insulator diameter: 1.9 mm), Standard length: 2 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)

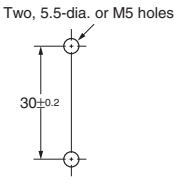
TL-N20MD□, TL-N20ME□, TL-N20MY□







Mounting Hole Dimensions

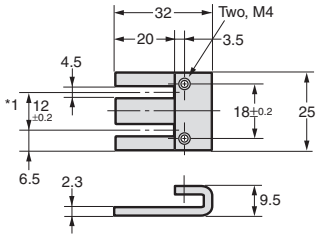


*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m
E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m
*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)

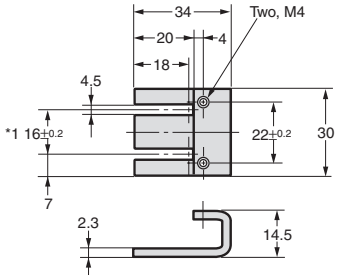
Mounting Bracket

Y92E-C5



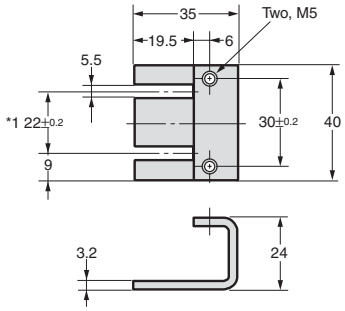
Applicable Models: TL-N5ME□ *2
Applicable Models: TL-N5MY□
Applicable Models: TL-N7MD□ *2
Material: Mounting Bracket: Zinc-plated iron
Mounting phillips Screws: Nickel-plated iron

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

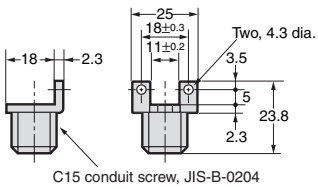


Applicable Models: TL-N20ME□ *2
Applicable Models: TL-N20MY□
Applicable Models: TL-N20MD□ *2
Material: Mounting Bracket: Zinc-plated iron
Mounting phillips Screws: Nickel-plated iron

*1. These are the mounting dimensions of the base of the Mounting Bracket.
*2. Provided with the product.

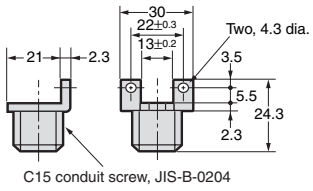
Mounting Brackets for Wiring Conduit Use (Sold Separately)

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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2011.12

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