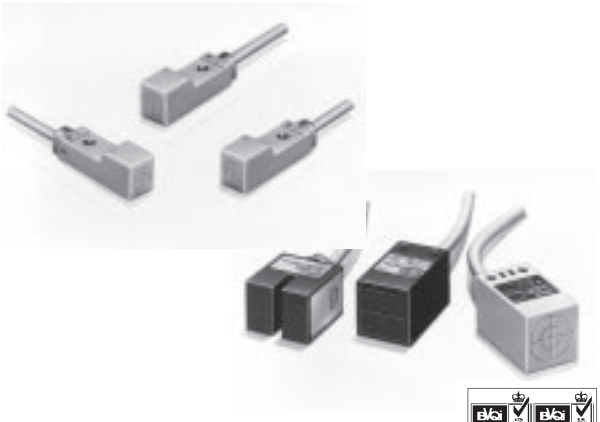
OMRON

Inductive Proximity Sensor

TL-Q/TL-G

Subminiature Sensor Ideal for Narrow Mounting Space

- Grooved TL-G3D is ideal for high-speed pulse generator and high-speed revolution control.
- TL-Q2 and TL-Q5 save mounting space and are convenient for incorporation into miniature controllers, office equipment, etc.



ISO9001and14001 Approved
OMRON Corporation, Ayabe Factory, Sensing Components and Systems

Ordering Information

Shape	Sensing distance	Output		Model	Approval
Rectangular	2 mm	DC 3-wire	NO	TL-Q2MC1 (see note 1)	CE
	5 mm	DC 2-wire	NO	TL-Q5MD1 (see note 1)	CE
			NC	TL-Q5MD2 (see note 1)	CE
		DC 3-wire	NO	TL-Q5MC1 (see note 2)	CE
			NC	TL-Q5MC2 (see note 2)	CE
Grooved	7.5 mm		NO	TL-G3D-3	---

Note: 1. Models different in response frequency are available. These model numbers take the form of TL-Q□M□□5 (e.g., TL-Q5MD15).
2. The model with a robot cord has a model number ending with the suffix R (e.g., TL-Q5MC1-R).

Specifications

■ Ratings/Characteristics

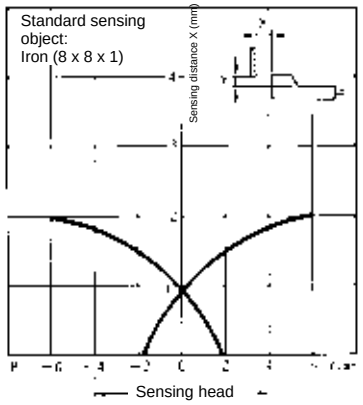
Item		TL-Q2MC1	TL-Q5MD□	TL-Q5MC□	TL-G3D-3
Supply voltage (operating voltage range)		12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.	12 to 24 VDC (10 to 30 VDC)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.	12 to 24 VDC, ripple (p-p): 5% max.
Current consumption		15 mA max. at 24 VDC with no load	---	10 mA max. at 24 VDC	2 mA max. at 24 VDC with no load
Leakage current		---	0.8 mA max.	---	---
Sensing object		Ferrous metal (refer to *Engineering Data* for non-ferrous metals)			Ferrous metal
Sensing distance		2 mm ±15%	5 mm ±10%		7.5 ±0.5 mm
Sensing distance (standard object)		0 to 1.5 mm (iron, 8 x 8 x 1 mm)	0 to 4 mm (iron, 18 x 18 x 1 mm)	0 to 4 mm (iron, 15 x 15 x 1 mm)	10 mm (iron, 10 x 5 x 0.5 mm)
Differential travel		10% max. of sensing distance			
Response time		---		2.0 ms max.	1 ms max.
Response frequency (see note)		0.5 kHz			
Operating status (with sensing object approaching)		Load ON	D1 models: Load ON D2 models: Load OFF Refer to *Timing Charts*.	C1 models: Load ON C2 models: Load OFF	Load ON
Control output (switching capacity)		NPN open collector, 100 mA max. at 30 VDC	3 to 100 mA DC	NPN open collector, 50 mA max. at 30 VDC	NPN transistor output, 20 mA max.
Circuit protection		Reverse connection protection and surge absorber	Load short-circuiting protection and surge absorber	Reverse connection protection and surge absorber	Surge absorber
Indicator		Detection indicator	D1 models: Output indicator (red) and setting indicator (green) D2 models: Output indicator (red)	Detection indicator	---
Ambient temperature		Operating: –10°C to 60°C (with no icing)	Operating: –25°C to 70°C (with no icing)		
Ambient humidity		Operating: 35% to 95%			
Temperature influence		±10% max. of sensing distance at 23°C in the temperature range of –10°C to 60°C	±10% max. of sensing distance at 23°C in the temperature range of –25°C to 70°C	±20% max. of sensing distance at 23°C in the temperature range of –25°C to 70°C	±10% max. of sensing distance at 23°C in the temperature range of –10°C to 55°C
Voltage influence		±2.5% max. of sensing distance within a range of ±10% of the rated power supply voltage	±2.5% max. of sensing distance within a range of ±15% of the rated power supply voltage	±2.5% max. of sensing distance within a range of ±10% of the rated power supply voltage	
Residual voltage		1.0 V max. with a load current of 100 mA and a cord length of 2 m	3.3 V max. with a load current of 100 mA and a cord length of 2 m	1.0 V max. with a load current of 50 mA and a cord length of 2 m	---
Insulation resistance		50 MΩ min. (at 500 VDC) between current carry parts and case		5 MΩ min. (at 500 VDC) between current carry parts and case	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min between current carry parts and case		500 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		1,000 m/s^2 (approx. 100G) for 10 times each in X, Y, and Z directions	500 m/s^2 (approx. 50G) for 3 times each in X, Y, and Z directions	200 m/s^2 (approx. 20G) for 10 times each in X, Y, and Z directions	
Degree of protection		IEC60529 IP67			IEC IP66
Weight		Approx. 30 g (with 2-m cord)	Approx. 45 g (with 2-m cord)	Approx. 60 g (with 2-m cord)	Approx. 30 g (with 1-m cord)
Material	**Case**	Heat-resistant ABS resin			PPO
	Sensing surface	Heat-resistant ABS resin			PPO

Note: The response frequencies of the DC switching components are average values obtained by measuring in sequence a line-up of standard sensing objects. 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.

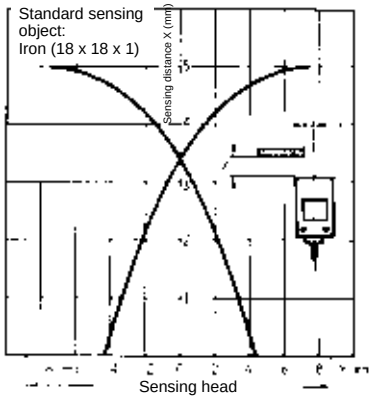
Engineering Data

Operating Range (Typical)

TL-Q2 (Rectangular Model)

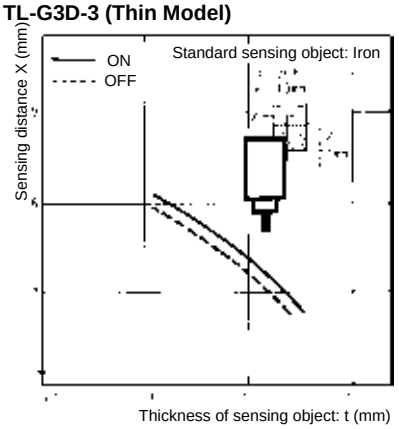


TL-Q5M□□ (Rectangular Model)

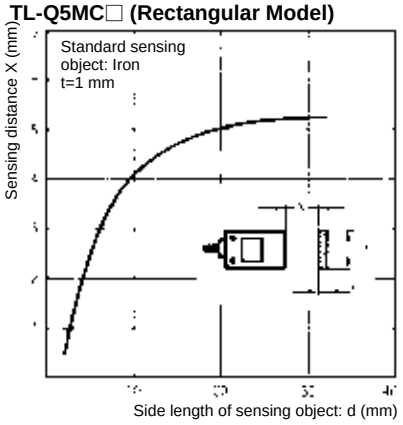


Sensing Object Thickness and Material vs. Sensing Distance (Typical)

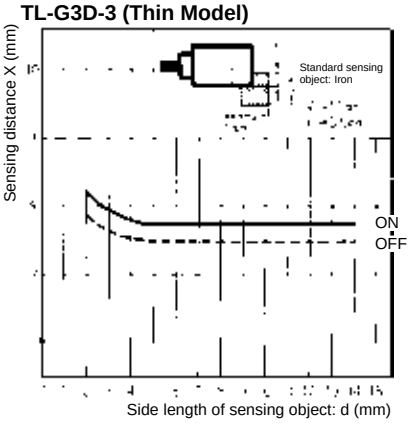
TL-G3D-3 (Thin Model)



TL-Q5MC□ (Rectangular Model)

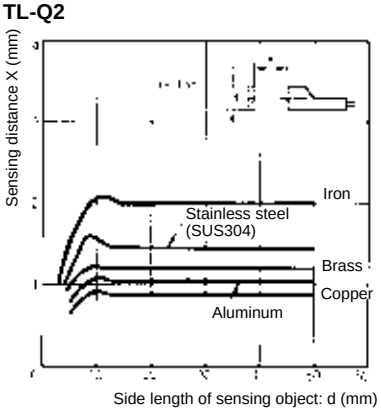


TL-G3D-3 (Thin Model)

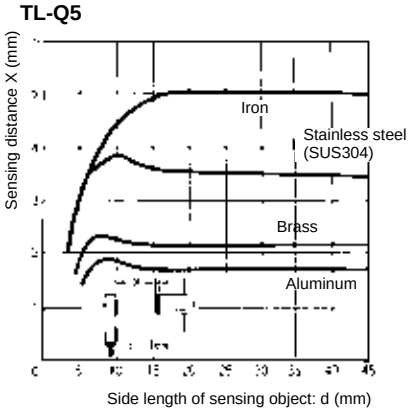


Sensing Object Size and Material vs. Sensing Distance (Typical)

TL-Q2



TL-Q5

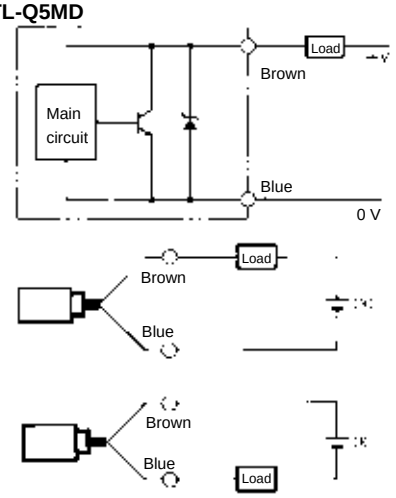


Operation

■ Output Circuits and Timing Charts

DC 2-wire Model

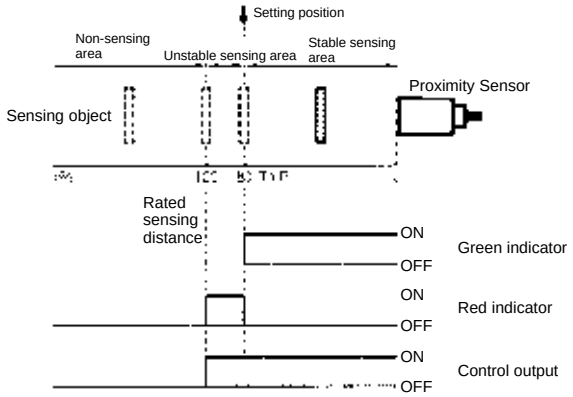
TL-Q5MD



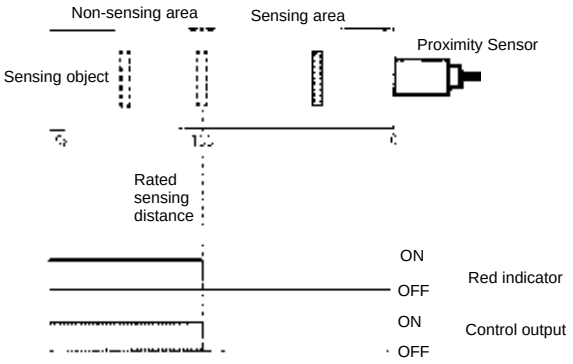
Note: The load can be connected in two ways as shown in the above diagrams.

Timing Charts

Normally Open

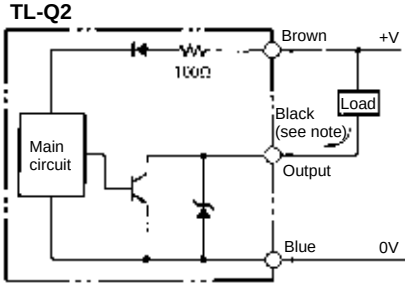


Normally Closed



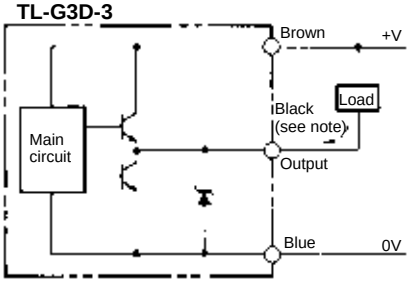
DC 3-wire Models

TL-Q2



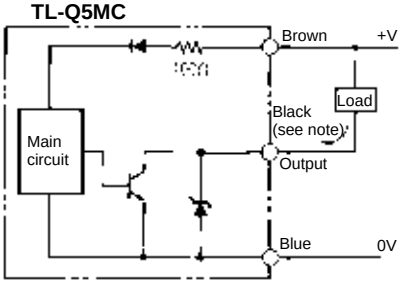
Note: Max. load current: 100 mA

TL-G3D-3

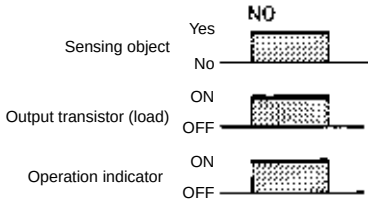


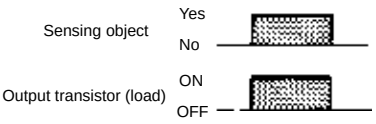
Note: Max. load current: 20 mA

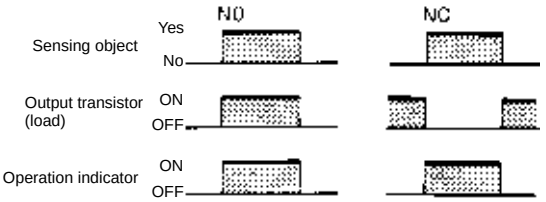
TL-Q5MC



Note: Max. load current: 50 mA





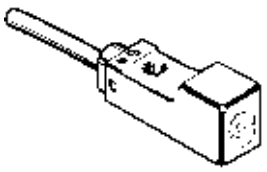


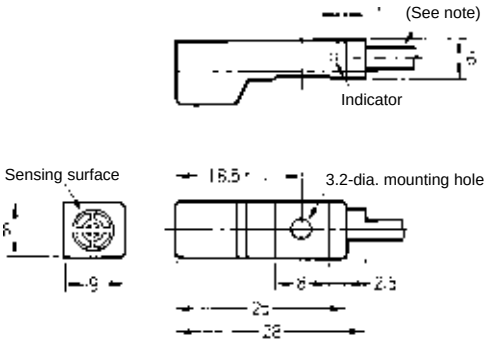
Dimensions

Note: All units are in millimeters unless otherwise indicated.

TL-Q2

Rectangular Model

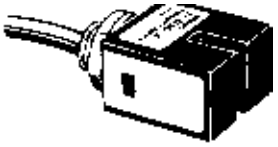


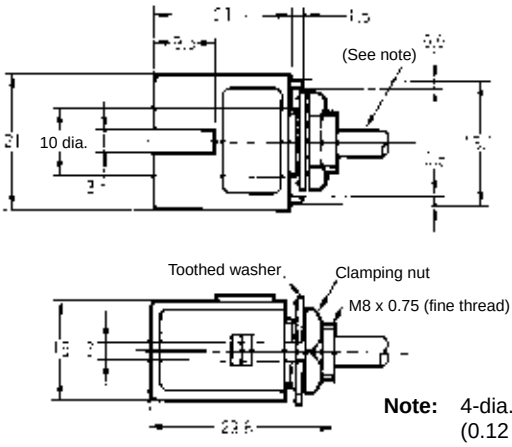


Note: 2.9-dia. vinyl-insulated round cord with 3 cores (0.12 dia. x 13); standard length: 2 m

TL-G3D-3

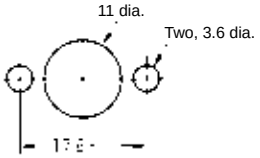
Thin Model





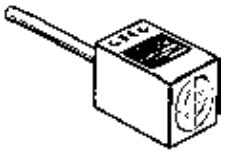
Note: 4-dia. vinyl-insulated round cord, 3 cores (0.12 dia. x 18); standard length: 1 m

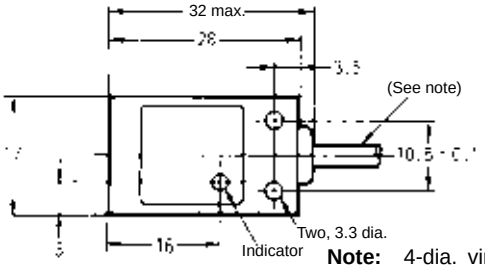
Mounting Dimensions



TL-Q5M

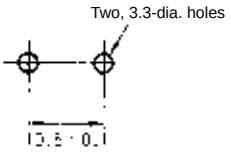
Rectangular Model





Note: 4-dia. vinyl-insulated round cord, 0.2 dia. x 3 cores, 0.3 dia. x 2 cores; standard length: 2 m

Mounting Dimensions



Precautions

Correct Use

Mounting

Do not tighten any mounting screw with a torque exceeding the maximum tightening torque described in the table to the right.

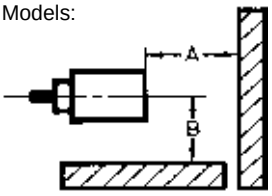
Model	Tightening torque
TL-Q2M□□	6 kgf • cm (0.59 N • m)
TL-Q5M□□	6 kgf • cm (0.59 N • m)
TL-G3D-3	20 kgf • cm (2 N • m)

Effects of Surrounding Metals and Mutual Interference

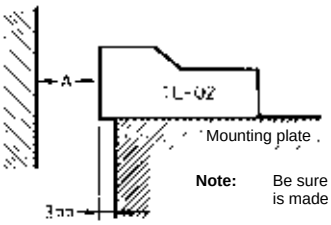
Be sure to keep at least the following distances between the Sensor and the surrounding metal objects.

Effects of Surrounding Metals

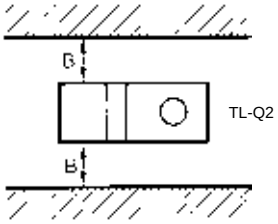
Rectangular Models:



Model	A (mm)	B (mm)
TL-Q5M	20	20

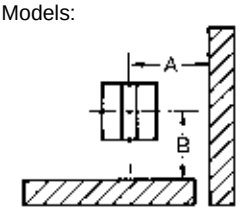


Note: Be sure that the mounting plate is made of non-ferrous metal.



Model	A (mm)	B (mm)
TL-Q2	12	3

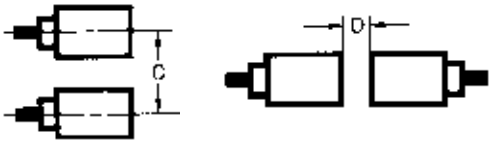
Thin Models:



Model	A (mm)	B (mm)
TL-G3D-3	11	17

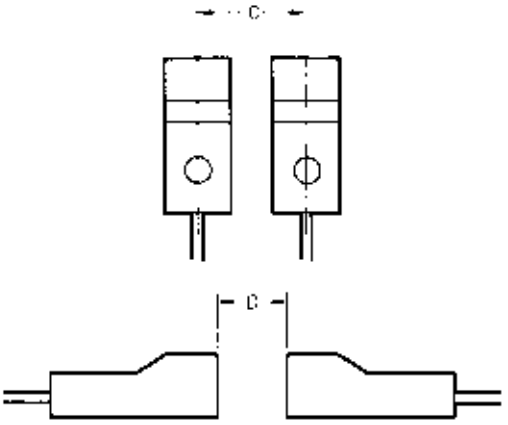
Parallel or Face-to-face Mounting

Rectangular Models:



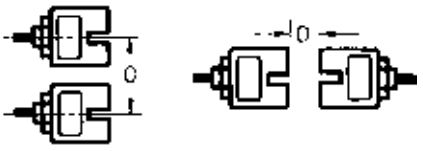
Model	C (mm)	D (mm)
TL-Q5MC	60 (17)	120 (60)
TL-Q5MD	60 (30)	120 (80)

Note: Figures in parentheses will apply if the Sensors in use are different to each other in response frequency.



Model	C (mm)	D (mm)
TL-Q2	30 (8)	90 (45)

Thin Models:

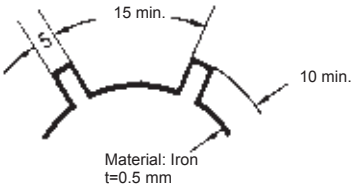


Model	C (mm)	D (mm)
TL-G3D-3	31	25

Sensing Objects (TL-G3D-3 Thin Model)

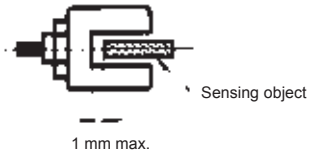
If the TL-G3D-3 is in high-speed response operation with a toothed metal plate, be sure that the sensing object size is as large as or larger than the standard object size and that the sensing objects are separated enough from one another.

The response frequency obtainable when the following toothed metal plate is used will be 1 kHz or higher. If the metal plate is smaller with shorter teeth and narrow adjacent space, the response frequency will decrease.



Sensing Position (TL-G3D-3 Thin Model)

Be sure that the distance between the bottom of the groove and the sensing object is 1 mm or less.



Sensing Object Material (TL-Q Rectangular Model)

The sensing distance decreases with non-ferrous metal. Refer to *Sensing Object Size and Material vs. Sensing Distance (Typical)* in *Engineering Data*. If the sensing object is a metal foil that is as thin or thinner than 0.01 mm, there will be little difference in sensing distance between the metal foil and ferrous metal. If the sensing object is, however, extremely thin (e.g., metal-coating film) or not conductive, the sensing object will not be detected.

TL-Q5 Rectangular Model

Metal Plating Influence (Reference Value):
The following percentage values indicate decreases or increases in sensing distance on the basis of the sensing object with no metal plating as 100%.

Metal plating type and thickness	Material
	Iron
No metal plating	100
Zn5 to 15 µm	90 to 120
Cd5 to 15 µm	100 to 110
Ag5 to 15 µm	60 to 90
Cu10 to 20 µm	70 to 95
Cu5 to 15 µm	---
Cu (5 to 10 µm) + Ni (10 to 20 µm)	75 to 95
Cu (5 to 10 µm) + Ni (10 µm) + Cr (0.3 µm)	75 to 95

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