Flat Inductive Proximity Sensor

TL-W

CSM_TL-W_DS_E_7_1

Standard Flat Sensors in Many Different Variations

- Only 6 mm thick yet provides a sensing distance of 3 mm (TL-W3MC1).
- Aluminum die-cast models also available.

⚠ Be sure to read *Safety Precautions* on page 7.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

Sensors [Refer to *Dimensions* on page 8.]

DC 2-Wire Models

Appearance	Sensing distance	Model	
		Operation mode	
		NO	NC
Unshielded	5 mm	TL-W5MD1 2M *1 *2	TL-W5MD2 2M *2

DC 3-Wire Models

Appearance	Sensing distance	Output configuration	Model	
			Operation mode	
			NO	NC
Unshielded	1.5 mm	DC 3-wire, NPN	TL-W1R5MC1 2M *1 *2	---
	3 mm		TL-W3MC1 2M *1 *2	TL-W3MC2 2M *1 *2
	5 mm		TL-W5MC1 2M *1 *2	TL-W5MC2 2M *2
	20 mm		TL-W20ME1 2M *1	TL-W20ME2 2M *1
Shielded	5 mm	DC 3-wire, NPN	TL-W5E1 2M	TL-W5E2 2M
		DC 3-wire, PNP	TL-W5F1 2M	TL-W5F2 2M

*1. Models with a different frequency are also available to prevent mutual interference. The model numbers are TL-W□M□□5 (e.g., TL-W5MD15).
*2. Models with PNP outputs are also available. Ask your OMRON representative for details.

Ratings and Specifications

DC 2-Wire Models

Item		Model	TL-W5MD□
Sensing distance			5 mm ±10%
Set distance			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 *Engineering Data* on page 5.)
Standard sensing object			Iron, 18 × 18 × 1 mm
Response frequency *1			500 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. (under load current of 100 mA with cable length of 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 6 for details.
Protection circuits			Load short-circuit protection, Surge suppressor
Ambient temperature range			Operating/Storage: –25 to 70°C (with no icing or condensation) *2
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^2 3 times each in X, Y, and Z directions
Degree of protection			IEC 60529 IP67, in-house standards: oil-resistant *2
Connection method			Pre-wired Models (Standard cable length: 2 m)
Weight (packed state)			Approx. 80 g
Materials	Case		Heat-resistant ABS
	Sensing surface		
Accessories			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. For environments that require oil resistance, the upper limit of the ambient operating temperature range is 40°C.

DC 3-Wire Models

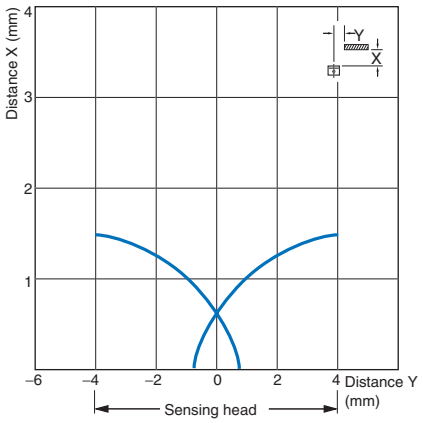
Item \ Model		TL-W1R5MC1	TL-W3MC□	TL-W5MC□	TL-W5E1, TL-W5E2 TL-W5F1, TL-W5F2	TL-W20ME1 TL-W20ME2
Sensing distance		1.5 mm ±10%	3 mm ±10%	5 mm ±10%		20 mm ±10%
Set distance		0 to 1.2 mm	0 to 2.4 mm	0 to 4 mm		0 to 16 mm
Differential travel		10% max. of sensing distance				1% to 15% of sensing distance
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 5.)				
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, 12 × 12 × 1 mm	Iron, 18 × 18 × 1 mm		Iron, 50 × 50 × 1 mm
Response frequency		1 kHz min.	600 Hz min.	500 Hz min.	300 Hz min.	40 Hz min.
Power 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), ripple (p-p): 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.	15 mA max. at 24 VDC (no-load)	8 mA at 12 VDC, 15 mA at 24 VDC
Control output	**Load current**	NPN open collector 100 mA max. at 30 VDC max.		NPN open collector 50 mA max. at 12 VDC (30 VDC max.) 100 mA max. at 24 VDC (30 VDC max.)	200 mA	100 mA max. at 12 VDC 200 mA max. at 24 VDC
	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)
Indicators		Detection indicator (red)				
Operation mode (with sensing object approaching)		NO	C1 Models: NO C2/B2 Models: NC		E1/F1 Models: NO E2/F2 Models: NC	
		Refer to the timing charts under *I/O Circuit Diagrams* on page 6 for details.				
Protection circuits		Reverse polarity 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 ±10% range		±2.5% max. of sensing distance at rated voltage in the rated voltage ±20% range	±2.5% max. of sensing distance at rated voltage in the rated voltage ±10% range	
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case				
Dielectric strength		1,000 VAC, 50/60 Hz for 1 minute 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 3 times each in X, Y, and Z directions				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. 70 g		Approx. 80 g	Approx. 100 g	Approx. 210 g
Materials	**Case**	Heat-resistant ABS			Aluminum die-cast	Heat-resistant ABS
	Sensing surface	Heat-resistant ABS				
Accessories		Mounting Bracket, Instruction manual		Instruction manual		

* For environments that require oil resistance, the upper limit of the ambient operating temperature range is 40°C.

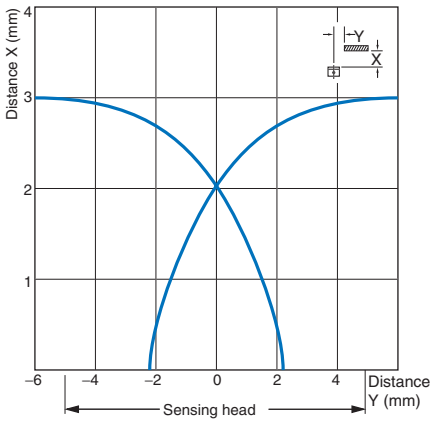
Engineering Data (Reference Value)

Sensing Area

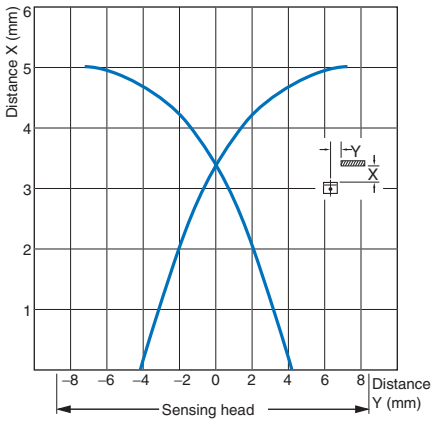
TL-W1R5MC1



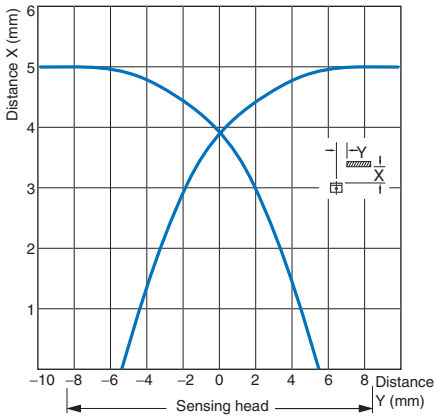
TL-W3MC1



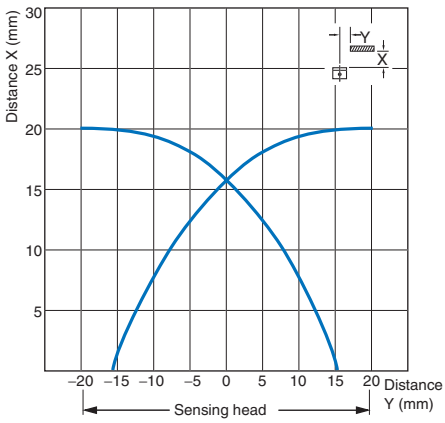
TL-W5MC1/-W5MD□



TL-W5E/-W5F

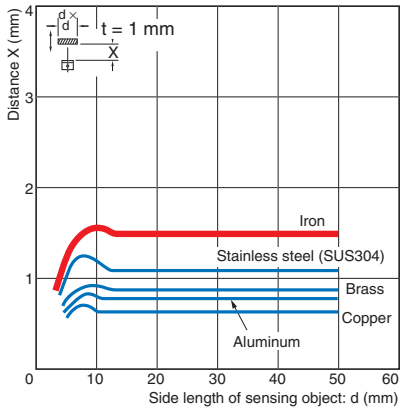


TL-W20□

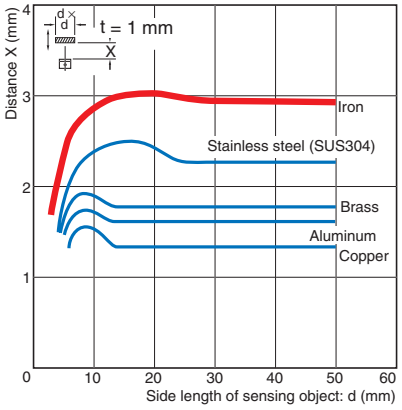


Influence of Sensing Object Size and Material

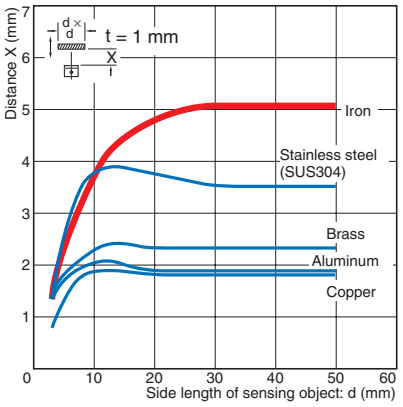
TL-W1R5MC1



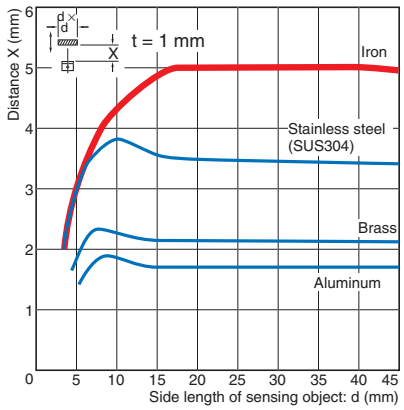
TL-W3MC1



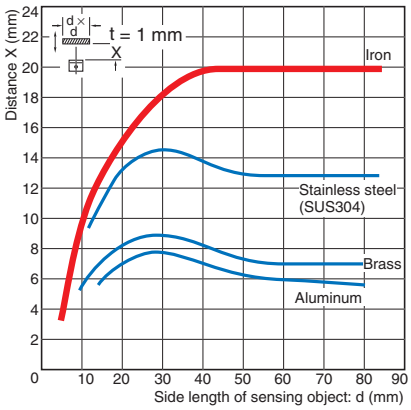
TL-W5MC1



TL-W5E□/-W5F□/-W5MD□

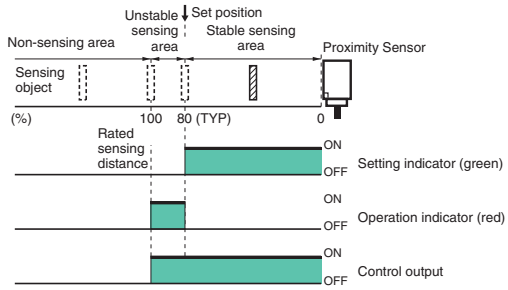
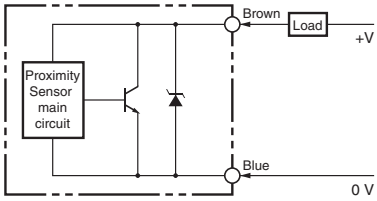
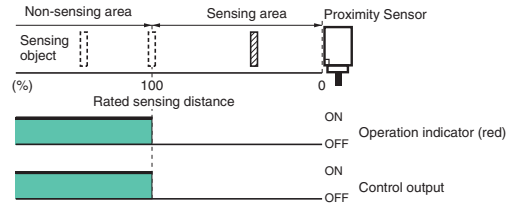


TL-W20□

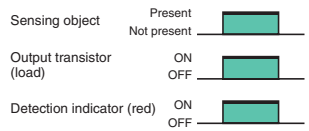
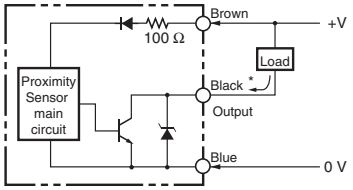
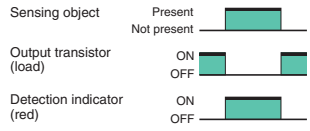
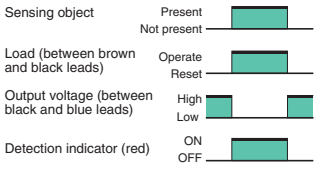
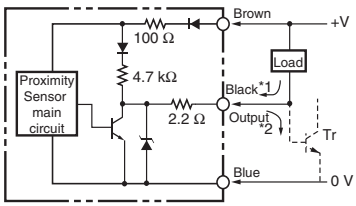
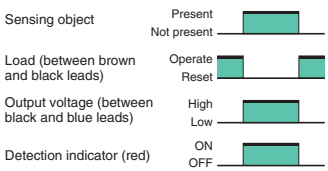
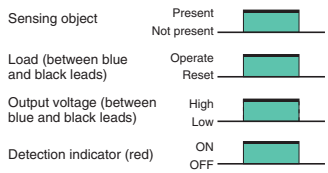
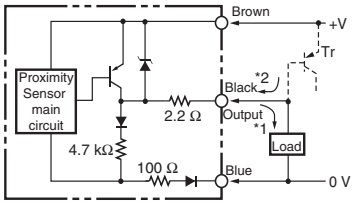
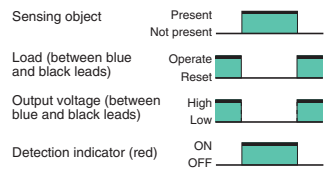


I/O Circuit Diagrams

DC 2-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-W5MD1		 Note: The load can be connected to either the +V or 0 V side.
NC	TL-W5MD2		

DC 3-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	TL-W1R5MC1 TL-W3MC1 TL-W5MC1		 * Load current: 100 mA max.
NC	TL-W3MC2 TL-W5MC2		
NO	TL-W5E1 TL-W20ME1		 *1. Load current: 200 mA max. *2. When a transistor is connected.
NC	TL-W5E2 TL-W20ME2		
NO	TL-W5F1		 *1. Load current: 200 mA max. *2. When a transistor is connected.
NC	TL-W5F2		

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.

Precautions for Correct Use

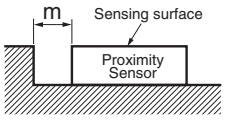
Do not use this product under ambient conditions that exceed the ratings.

● Design

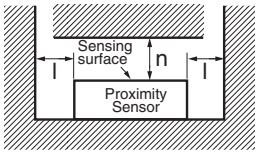
Influence of Surrounding Metal

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.

Metal on a Single Side (Not Exceeding the Height of the Sensor Surface)



Metals on Both Sides and in Front of the Sensor

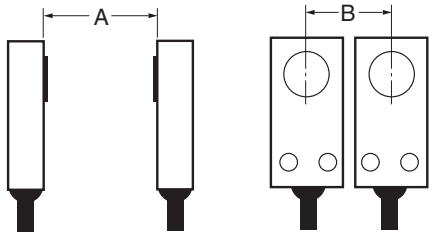


Influence of Surrounding Metal (Unit: mm)

Model / Distance	l	m	n
TL-W1R5MC1	2	0	8
TL-W3MC□	3		12
TL-W5MD□	5		20
TL-W5MC1			
TL-W20ME□	25	16	100
TL-W5E□/-W5F□	0	0	20

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-W1R5MC1	75 (50)	25 (8) *
TL-W3MC□	90 (60)	30 (10) *
TL-W5MD□	120 (80)	60 (30)
TL-W5MC1□		
TL-W20ME□	200 (100)	200 (100)
TL-W5E□/-W5F□	50	35

Note: Values in parentheses apply to Sensors operating at different frequencies.

* Mutual interference will not occur for close-proximity mounting if models with different frequencies are used together.

● Mounting

- Use M3 flat-head screws to mount the TL-W1R5MC1 and TL-W3MC1.
- Do not exceed the torque in the following table when tightening the resin cover screws.

Model	Torque
TL-W1R5MC1	0.98 N·m
TL-W3MC□	
TL-W5MD□	
TL-W20M□	1.5 N·m

● Adjustment

Turning ON the Power

An error pulse will occur (approximately 1 ms) if adjustments are made when turning ON the power or making AND connections.

Applicable e-CON Connector Models and Manufacturers

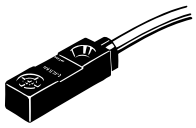
The companies and model number of e-CON connections that can be used with Sensor cables are listed in the following table. Confirm applicability when purchasing e-CON connectors for connection to Pre-wired Sensors.

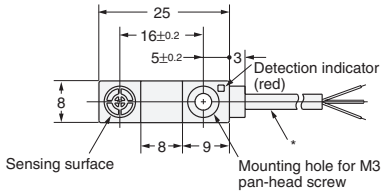
Model	Applicable e-CON Connector	Manufacturer
TL-W1R5□/-W3□	XN2A-1470 Cable Plug Connector	OMRON

Dimensions

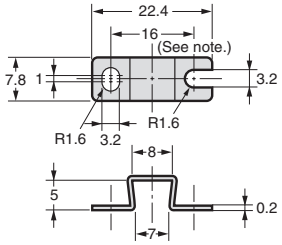
(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

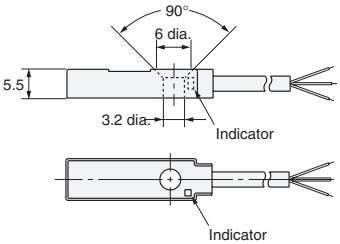
TL-W1R5MC1





Mounting Bracket (Attachment)

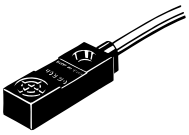


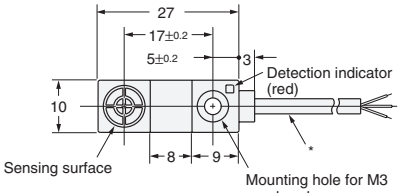


* 2.9-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.14 mm^2, Insulator diameter: 0.9 mm), Standard length: 2 m

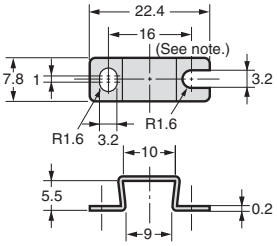
Note: Mounting hole dimension: 17 ±0.2.
Material: Stainless steel (SUS304)

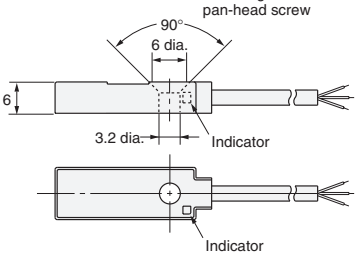
TL-W3MC□





Mounting Bracket (Attachment)

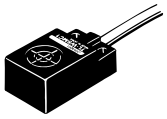


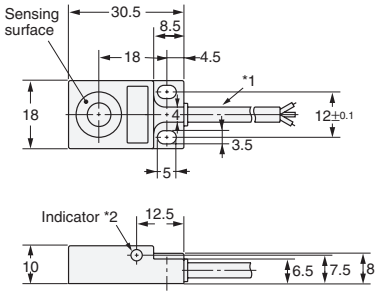


* 2.9-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.14 mm^2, Insulator diameter: 0.9 mm), Standard length: 2 m

Note: Mounting hole dimension: 17 ±0.20.
Material: Stainless steel (SUS304)

TL-W5MC□
TL-W5MD□

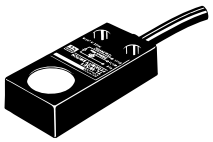




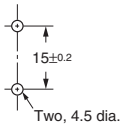
*1. TL-W5MC1
4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.2 mm), Standard length: 2 m
TL-W5MD□
4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.3 mm^2, Insulation diameter: 1.3 mm), Standard length: 2 m

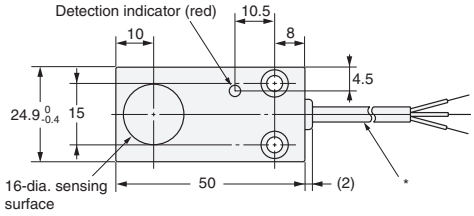
*2. C Models: Detection indicator (red)
D Models: Operation indicator (red), Setting indicator (green)

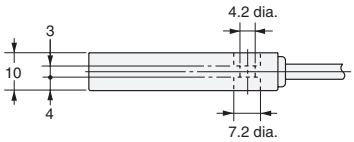
TL-W5E□
TL-W5F□



Mounting Hole Dimensions

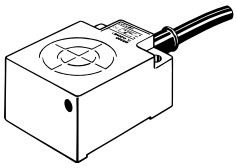


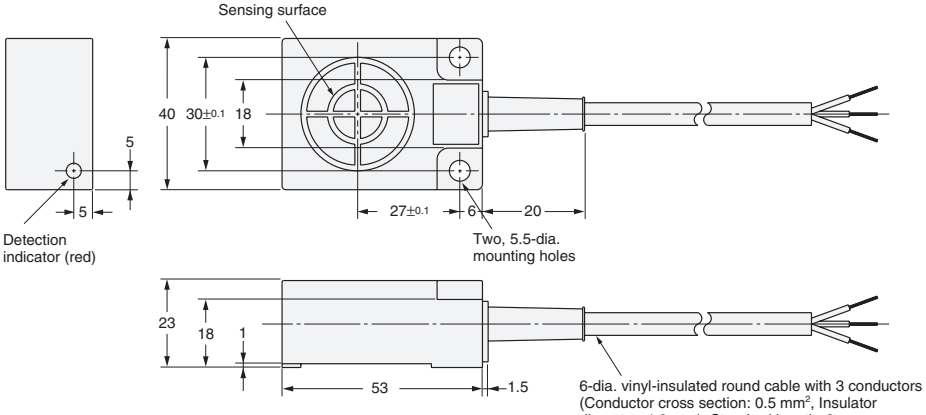




* 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.2 mm), Standard length: 2 m

TL-W20ME□





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

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2012.12

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