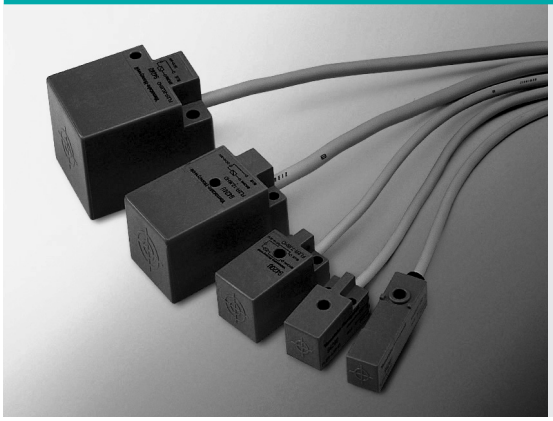
DC 3-wire Square Proximity Sensors

FL2 Series

Relays and Solenoids Can be Switched Directly. (maximum switching current: 200mA)



- **Wide range of models available**
  (4, 7, 12, 20mm, top/side, and N.O./N.C.)
- **Different-frequency types that are only slightly influenced by mutual interference available for all models**
- **High seal capabilities** (IP67)
- **Enhanced circuit protection**
  (surge absorption, load short-circuit, reverse connection)
- **Relays and solenoids can be switched directly**
  (maximum switching current: 200mA)

C PROXIMITY SENSORS
C
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ORDER GUIDE

● **Standard (pre-leaded) model (cord length 2m)**

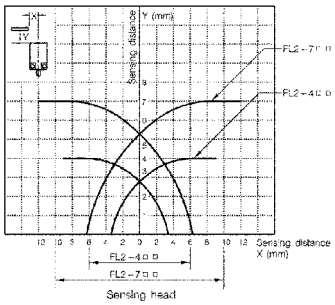
Actuation method	Appearance: Sensor package style	Dimensions	Sensing distance	Sensing face	Output operation mode		Catalog listing
High-frequency oscillating type (unshielded)		12 × 12 × 45	4mm	Top	NPN	N.O.	**FL2-4A6H**
						N.C.	**FL2-4B6H**
					PNP	N.O.	**FL2-4D6H**
						N.C.	**FL2-4E6H**
				Side	NPN	N.O.	**FL2-4A6S**
						N.C.	**FL2-4B6S**
					PNP	N.O.	**FL2-4D6S**
						N.C.	**FL2-4E6S**
		15 × 15 × 32		Top	NPN	N.O.	**FL2-4A6QH**
						N.C.	**FL2-4B6QH**
					PNP	N.O.	**FL2-4D6QH**
						N.C.	**FL2-4E6QH**
				Side	NPN	N.O.	**FL2-4A6QS**
						N.C.	**FL2-4B6QS**
					PNP	N.O.	**FL2-4D6QS**
						N.C.	**FL2-4E6QS**
		20 × 20 × 38	7mm	Top	NPN	N.O.	**FL2-7A6H**
						N.C.	**FL2-7B6H**
					PNP	N.O.	**FL2-7D6H**
						N.C.	**FL2-7E6H**
				Side	NPN	N.O.	**FL2-7A6S**
						N.C.	**FL2-7B6S**
					PNP	N.O.	**FL2-7D6S**
						N.C.	**FL2-7E6S**
		30 × 30 × 52.2	12mm	Top	NPN	N.O.	**FL2-12A6H**
						N.C.	**FL2-12B6H**
				Side	NPN	N.O.	**FL2-12A6S**
						N.C.	**FL2-12B6S**
		40 × 40 × 53	20mm	Top	NPN	N.O.	**FL2-20A6H**
						N.C.	**FL2-20B6H**
				Side	NPN	N.O.	**FL2-20A6S**
						N.C.	**FL2-20B6S**

SPECIFICATIONS

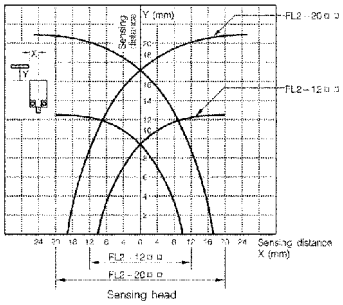
Item \ Catalog listing	**FL2-4□6□** **FL2-4□6Q□**	**FL2-7□6□**	**FL2-12□6□**	**FL2-20□6□**
Actuation method	High-frequency oscillating type (unshielded)			
Rated supply voltage	12/24Vdc			
Rated sensing distance	4±0.4mm	7±0.7mm	12±1.2mm	20±2mm
Usable setting distance	0 to 2.8mm	0 to 4.9mm	0 to 8.4mm	0 to 14mm
Standard target object	18×18mm, 1mm thick iron	25×25mm, 1mm thick iron	40×40mm, 1mm thick iron	50×50mm, 1mm thick iron
Differential travel	10% max. of sensing distance			
Operating voltage range	10 to 30Vdc			
Current consumption (leakage)	15mA max. (24Vdc)			
Output operation mode	A: NPN N.O., B: NPN N.C., D: PNP N.O., E: PNP N.C.			
Control output	Switching current: 200mA max., voltage drop: 1V max., output dielectric strength: 30Vdc			
Response frequency	200Hz	300Hz		50Hz
Hysteresis	0.05mm max.			0.1mm max.
Temperature characteristics	±10% max. for the range of −25 to +70°C when +25°C is taken as standard temperature in sensing distance ±10% max. for the range of −25 to +50°C for **FL2-4□6□/4□6Q□**			
Supply voltage characteristics	±1% max. with ±20% voltage fluctuation with rated supply voltage as standard voltage in sensing distance			
Indicator lamps	Lights (red) when object approaches			
Operating temperature range	−25 to +70°C			
Storage temperature range	−25 to +70°C			
Operating humidity range	35 to 95%RH max.			
Insulation resistance	50MΩ min. (by 500Vac megger)			
Dielectric strength	500Vac, 50/60Hz for 1 minute			
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, 2 hrs in X, Y and Z directions			
Shock resistance	490m/s^2 10 times in X, Y and Z directions			
Protection	IP67 (IEC standard)			
Weight (pre-leaded model)	Approx. 40g	Approx. 50g	Approx. 110g	Approx. 160g
Circuit protection	Surge absorption, load short-circuit protection, reverse connection protection			
Wiring method	Pre-leaded			
Case material	ABS resin			

SENSING AREA DIAGRAM (typical examples)

●FL2-4□□/FL2-7□□

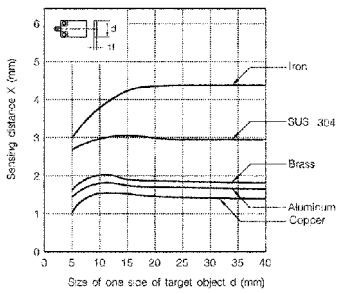


●FL2-12□□/FL2-20□□

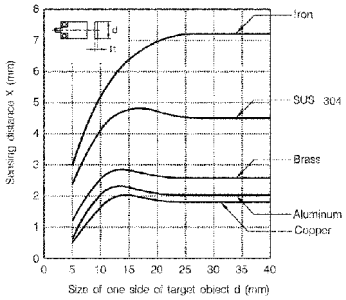


SENSING DISTANCE ACCORDING TO MATERIAL & SIZE OF OBJECT (typical examples)

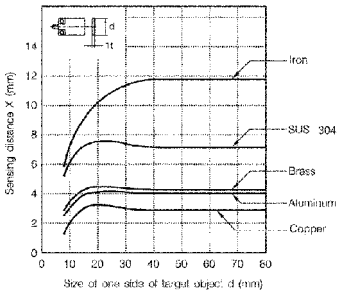
●FL2-4□□



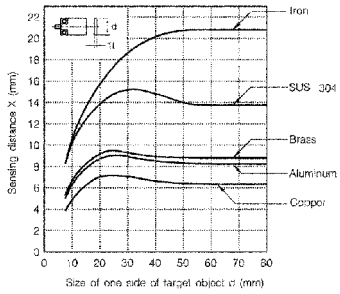
●FL2-7□□



●FL2-12□□



●FL2-20□□

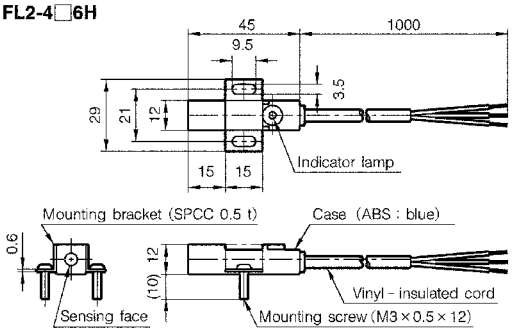


EXTERNAL DIMENSIONS

(unit: mm)

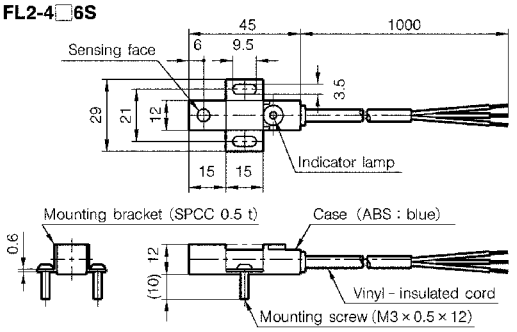
● Standard (pre-leaded) model

FL2-4□6H



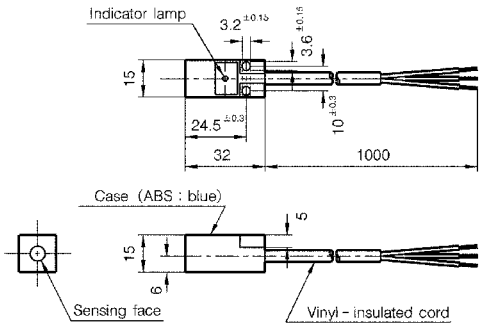
Note; A mounting bracket and two mounting screws and provided.
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-4□6S



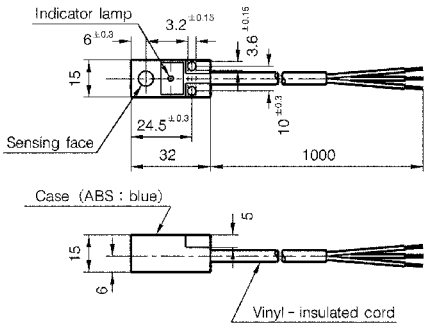
Note; A mounting bracket and two mounting screws and provided.
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-4□6QH



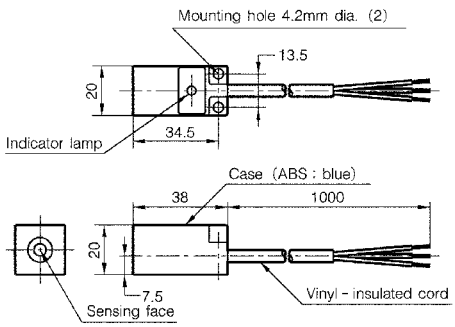
Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-4□6QS



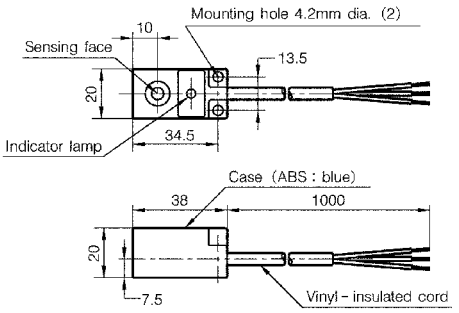
Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-7□6H



Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

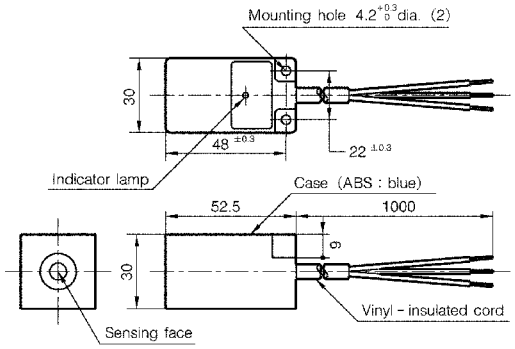
FL2-7□6S



Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
The case color of different-frequency types "**-F**" is green.

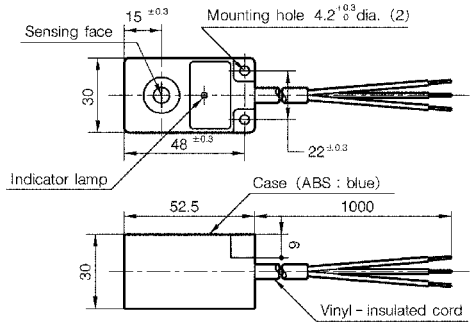
(unit: mm)

FL2-12□6H



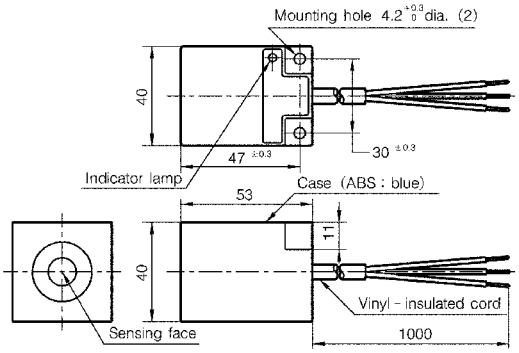
Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 5.7mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-12□6S



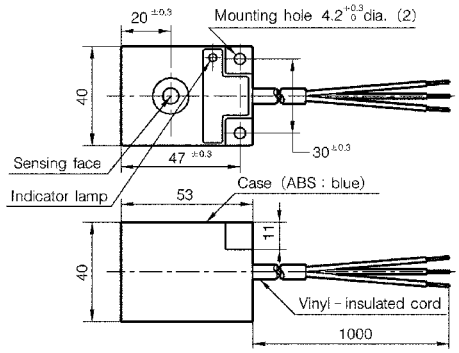
Note; Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 5.7mm dia.
The case color of different-frequency types "**-F**" is green.

FL2-20□6H



Note; Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 3-core) 5.7mm dia.
The case color of different-frequency types "**-F**" is green.

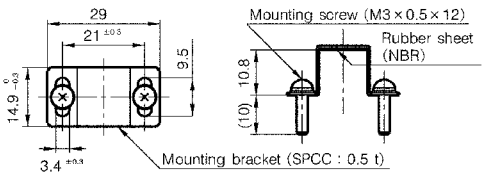
FL2-20□6S



Note; Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 3-core) 5.7mm dia.
The case color of different-frequency types "**-F**" is green.

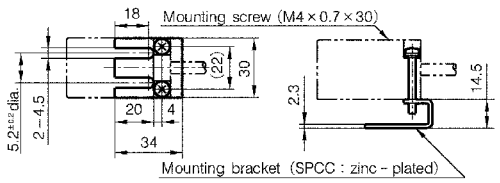
● **Mounting bracket (sold separately)**

FL2-PA5



Mounting brackets are made of iron.
Two screws and two washers are provided for each bracket.

FL2-PA12

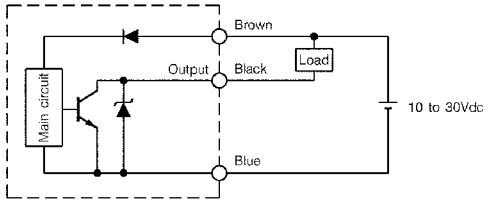


Catalog listing	Applicable models
FL2-PA5	**FL2-4□6□**
FL2-PA12	**FL2-12□6□**

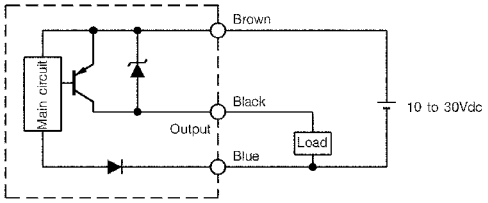
Note: FL2-PA5 is provided with the proximity sensor.

CIRCUIT AND WIRING DIAGRAMS

• DC NPN type



• DC PNP type



PRECAUTIONS

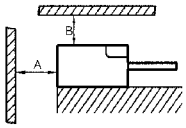
● Mounting

Tighten the screws to the torque shown below.

Catalog listing	Allowable tightening torque (N-m)	Recommended screw diameter
FL2-4□6□	0.5	Screw provided
FL2-4□6Q□	0.5	M3
FL2-7□□□	0.5	M4
FL2-12□□□	0.5	M4
FL2-20□□□	0.5	M5

● Influence of surrounding metal

Metal other than the object surrounding the sensor may influence operating characteristics. Maintain the following space between the sensor and surrounding metal:



Note: Shaded areas indicate surrounding metal other than the target object.

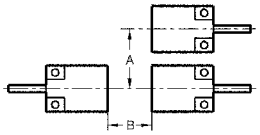
Catalog listing	A (mm)	B (mm)
FL2-4□6H	20	10
FL2-4□6QH		
FL2-4□6S	10	20
FL2-4□6QS		
FL2-7□6H	30	15
FL2-7□6S	15	30
FL2-12□6H	50	25
FL2-12□6S	25	50
FL2-20□6H	80	40
FL2-20□6S	40	80

● Mutual interference prevention

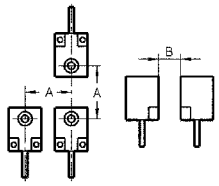
When mounting proximity sensors in parallel or facing each other, mutual interference may cause the sensor to malfunction. Maintain at least the spaces indicated in the figures above.

When standard frequency types and different-frequency types "**-F**" are used alternately in a row, maintain at least the spaces indicated in parentheses "( )" for dimensions A and B in the table below.

Side sensing type



Front sensing type



Catalog listing	A (mm)	B (mm)
FL2-4□6□	30 (15)	40 (20)
FL2-4□6Q□		
FL2-7□6□	80 (40)	80 (40)
FL2-12□6□	120 (60)	120 (60)
FL2-20□6□	200 (100)	200 (100)

● Operation at power ON

After the power is turned ON, it takes 40ms or less until the proximity sensor is ready for sensing.

When the load and the proximity sensor use different power supplies, be sure to turn the proximity sensor ON before turning the load ON.

● Minimum cord bending radius (R)

The minimum bending radius (R) of the cord is 3 times cord diameter, take care not to excessively bend the cord beyond this radius. Also, do not excessively bend the cord within 30mm of the cord lead-in port.