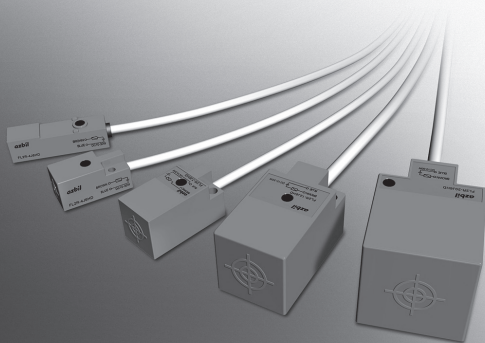


DC2-wire Square Proximity Switches

FL2R/S Series

This DC2-wire Square Proximity switch Can Be Directly Connected to Programmable Controllers and N.C. Units. Wide Range of Models Available.



- **Reduced wiring costs**
- **Stable sensing area displayed by setting indicator (on N.O. output type only)**
- **Wide range of models available (4/7/12/20 mm, top/side, N.O./N.C.)**
- **High-speed response (1.5 kHz at 4 mm, 1 kHz at 7 mm)**
- **Different-frequency types that are only slightly influenced by mutual interference available for all models**
- **High seal capabilities (IP67)**
- **Enhanced circuit protection (surge absorption, loadshort-circuit, reverse connection)**

ORDER GUIDE

● Standard (pre-leaded) model (cord length 1 m)

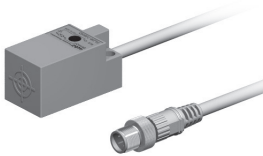
Appearance		Sensing distance	Sensing face	Operation mode	Setting indication	Catalog listing
Switch package style	Dimensions (mm)					
	12 x 12 x 45	4 mm	Top	N.O.	●	FL2S-4J6HD
				N.C.		FL2S-4K6H
			Side	N.O.	●	FL2S-4J6SD
				N.C.		FL2S-4K6S
	15 x 15 x 32	4 mm	Top	N.O.	●	FL2R-4J6HD
				N.C.		FL2R-4K6H
			Side	N.O.	●	FL2R-4J6SD
				N.C.		FL2R-4K6S
	20 x 20 x 38	7 mm	Top	N.O.	●	FL2R-7J6HD
				N.C.		FL2R-7K6H
			Side	N.O.	●	FL2R-7J6SD
				N.C.		FL2R-7K6S
30 x 30 x 52.5	12 mm	Top	N.O.	●	FL2R-12J6HD	
			N.C.		FL2R-12K6H	
		Side	N.O.	●	FL2R-12J6SD	
			N.C.		FL2R-12K6S	
40 x 40 x 53	20 mm	Top	N.O.	●	FL2R-20J6HD	
			N.C.		FL2R-20K6H	
		Side	N.O.	●	FL2R-20J6SD	
			N.C.		FL2R-20K6S	

Note 1: Different-frequency types also available for all models. The catalog number of different-frequency types are appended with the letters "-F".
Example: Different-frequency type of FL2R-4J6HD is expressed as FL2R-4J6HD-F.

"Different-frequency type" is a type having an oscillation frequency different to that of the standard type to reduce the influence of mutual interference. Select this type when mounting two or more proximity switches close to each other.

Note 2: Bend-resistant cord type "-R" are also available. For details, contact your nearest Azbil dealer.

● Pre-leaded connector model (cord length 30 cm)

Appearance		Sensing distance	Sensing face	Operation mode	Setting indication	Catalog listing
Switch package style	Dimensions (mm)					
	12 x 12 x 45	4 mm	Top	N.O.	●	FL2S-4J6HD-CN03
				N.C.		FL2S-4K6H-CN03
			Side	N.O.	●	FL2S-4J6SD-CN03
				N.C.		FL2S-4K6S-CN03
	15 x 15 x 32	4 mm	Top	N.O.	●	FL2R-4J6HD-CN03
				N.C.		FL2R-4K6H-CN03
			Side	N.O.	●	FL2R-4J6SD-CN03
				N.C.		FL2R-4K6S-CN03
	20 x 20 x 38	7 mm	Top	N.O.	●	FL2R-7J6HD-CN03
				N.C.		FL2R-7K6H-CN03
			Side	N.O.	●	FL2R-7J6SD-CN03
				N.C.		FL2R-7K6S-CN03
30 x 30 x 52.5	12 mm	Top	N.O.	●	FL2R-12J6HD-CN03	
			N.C.		FL2R-12K6H-CN03	
		Side	N.O.	●	FL2R-12J6SD-CN03	
			N.C.		FL2R-12K6S-CN03	
40 x 40 x 53	20 mm	Top	N.O.	●	FL2R-20J6HD-CN03	
			N.C.		FL2R-20K6H-CN03	
		Side	N.O.	●	FL2R-20J6SD-CN03	
			N.C.		FL2R-20K6S-CN03	

Note 1: Different-frequency types also available for all models. The catalog number of different-frequency types are appended with the letters "-F".

Example: Different-frequency type of FL2R-4J6HD-CN03 is expressed as FL2R-4J6HD-CN03F.

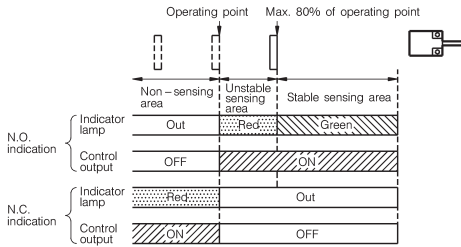
"Different-frequency type" is a type having an oscillation frequency different to that of the standard type to reduce the influence of mutual interference. Select this type when mounting two or more proximity switches close to each other.

SPECIFICATIONS

Catalog listing	FL2S-4□6□ (-CN03) FL2R-4□6□ (-CN03)	FL2R-7□6□ (-CN03)	FL2R-12□6□ (-CN03)	FL2R-20□6□ (-CN03)
Actuation method	High-frequency oscillating type (unshielded)			
Rated supply voltage	12/24 Vdc			
Rated sensing distance	4±0.4 mm	7±0.7 mm	12±1.2 mm	20±2 mm
Usable setting distance	0 to 2.8 mm	0 to 4.9 mm	0 to 8.4 mm	0 to 14 mm
Standard target object	18 x 18 x 1 mm iron	25 x 25 x 1 mm iron	40 x 40 x 1 mm iron	50 x 50 x 1 mm iron
Differential travel	15% max. of sensing distance			
Operating voltage range	10 to 30 Vdc			
Leakage current	1 mA max.			
Control output	Switching current: 4 to 100 mA max. Voltage drop: 3.3V max., Output dielectric strength: 30 Vdc			
Operating frequency	1.5 kHz	1 kHz	800 Hz	300 Hz
Temperature characteristics	10% max. of sensing distance for the -25 to +70° range when taking +25° as standard temperature			
Supply voltage characteristics	1% max. of sensing distance with 15% voltage fluctuation, taking rated supply voltage as standard voltage			
Indicator lamps	N.O. type: Operation indication: lights (red or green) at output ON Setting indication: lights (green) in stable sensing area N.C. type: Operation indication: red light goes out (red) in sensing area			
Operating temperature range	-25 to +70°C			
Storage temperature range	-25 to +70°C			
Storage humidity range	35 to 95% RH			
Insulation resistance	50 MΩ min. (at 500 Vdc)			
Dielectric strength	500 Vac, 50/60 Hz for 1 minute			
Vibration resistance	10 to 55 Hz, 1.5 mm peak-to-peak amplitude, 2 hrs each in X, Y and Z directions			
Shock resistance	490 m/s ² 10 times each in X, Y and Z directions			
Protection	IP67 (IEC standard)			
Weight	Approx. 40 g	Approx. 50 g	Approx. 110 g	Approx. 160 g
Circuit protection	Surge absorption, load short-circuit protection, reverse connection protection			
Wiring method	Pre-leaded connector, pre-leaded			
Case material	ABS resin			
Connector material	Housing	Polyester elastomer		
	Holder	Glass-lined polyester resin		
	Contact	Gold-plated brass		

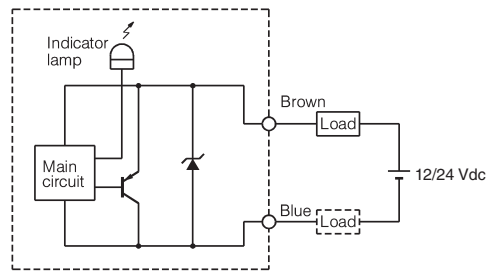
ABOUT SETTING INDICATION

The proximity switch can detect objects reliably by bringing the proximity switch close to the target object and setting the switch at the position where the indicator lamp changes from red to green.



Note: When the target object is made of a different material such as aluminum, copper and stainless steel to the standard target object (iron), the setup point where the indicator lamp changes color is shorter than 80% maximum.

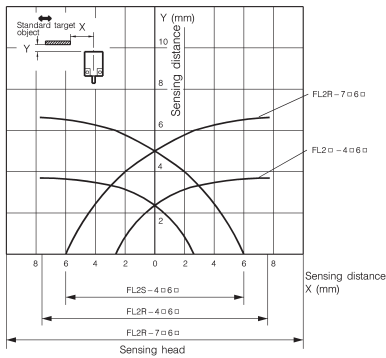
WIRING DIAGRAM



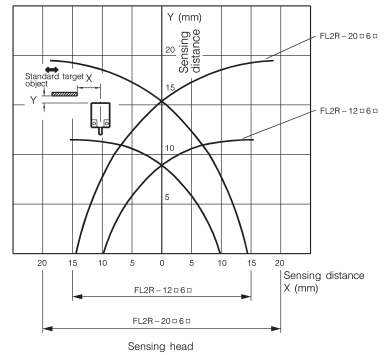
The load can be connected to either of the power supplies.

SENSING AREA DIAGRAM (typical)

FL2□-4□6□/FL2R-7□6□

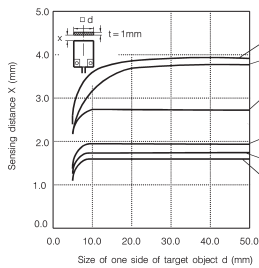


FL2R-12□6□/FL2R-20□6□

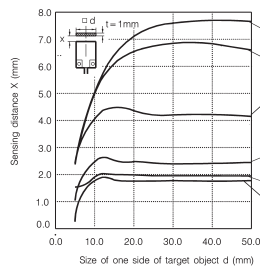


SENSING DISTANCE ACCORDING TO MATERIAL & SIZE OF OBJECT (typical)

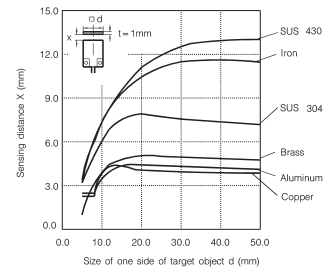
FL2S-4□6□/FL2R-4□6□



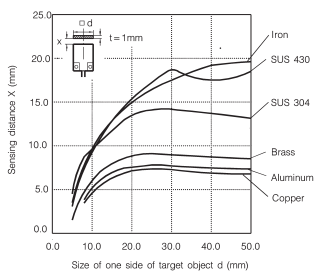
FL2R-7□6□



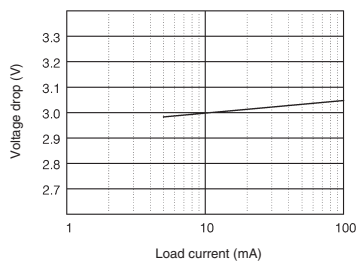
FL2R-12□6□



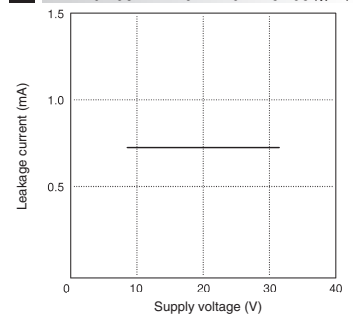
FL2R-20□6□



VOLTAGE DROP CHARACTERISTICS (typical)



LEAKAGE CURRENT CHARACTERISTICS (typical)

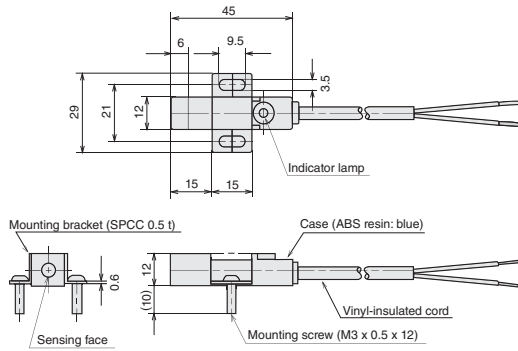


EXTERNAL DIMENSIONS

(unit: mm)

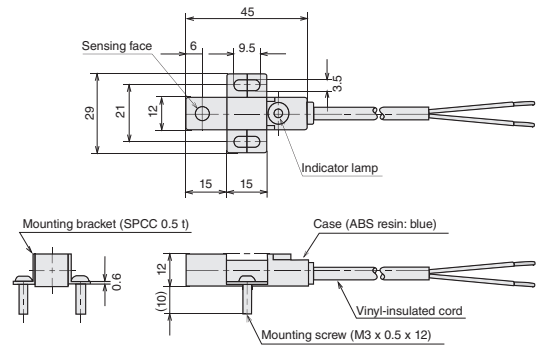
● Standard (pre-leaded) model

FL2S-4□6H□



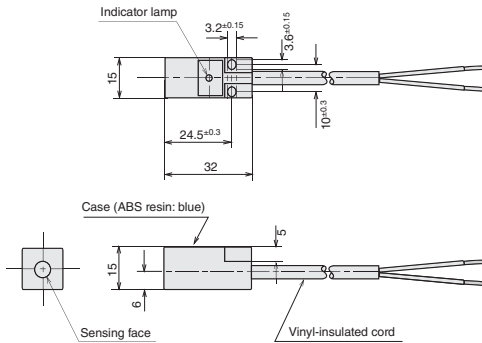
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 Note: A mounting bracket and two mounting screws are provided.
 The case color of different-frequency types "-F" is green.

FL2S-4□6S□



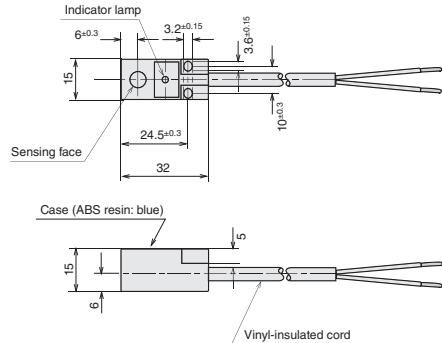
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 Note: A mounting bracket and two mounting screws are provided.
 The case color of different-frequency types "-F" is green.

FL2R-4□6H□



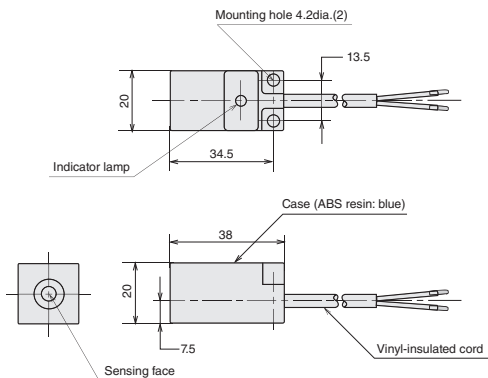
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 The case color of different-frequency types "-F" is green.

FL2R-4□6S□



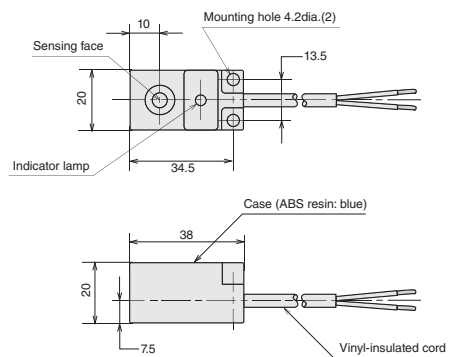
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 The case color of different-frequency types "-F" is green.

FL2R-7□6H□



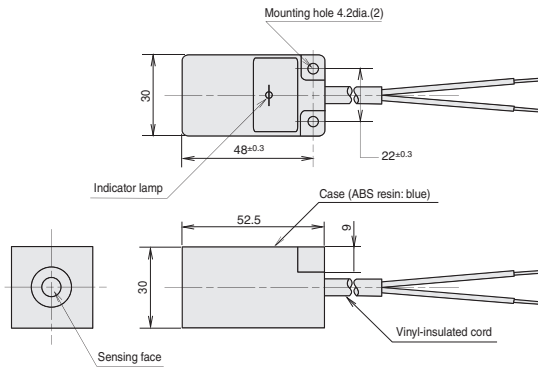
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 The case color of different-frequency types "-F" is green.

FL2R-7□6S□



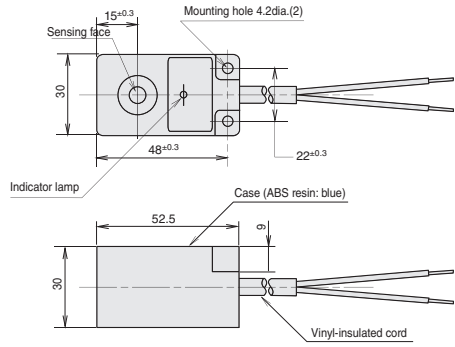
Vinyl-insulated cord (oil-resistant: 0.3 mm², 27/0.12 dia., 2-core) 4.2 mm dia.
 The case color of different-frequency types "-F" is green.

FL2R-12□6H□



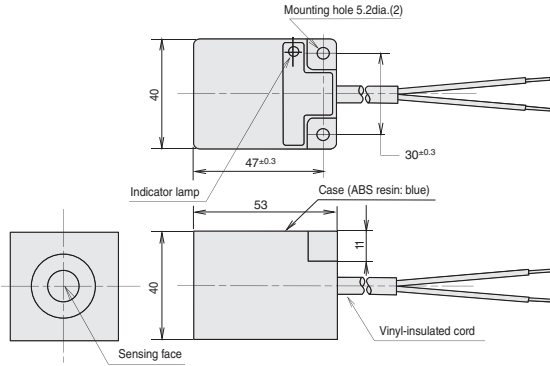
Vinyl-insulated cord (oil-resistant: 0.5 mm², 20/0.18 dia., 2-core) 5.7 mm dia.
The case color of different-frequency types "-F" is green.

FL2R-12□6S□



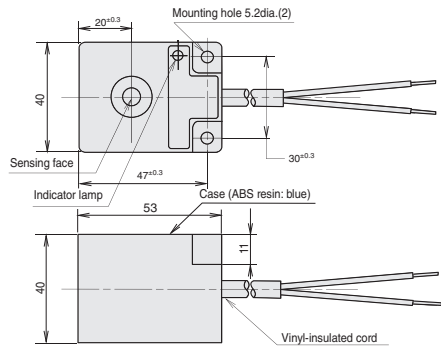
Vinyl-insulated cord (oil-resistant: 0.5 mm², 20/0.18 dia., 2-core) 5.7 mm dia.
The case color of different-frequency types "-F" is green.

FL2R-20□6H□



Vinyl-insulated cord (oil-resistant: 0.5 mm², 20/0.18 dia., 2-core) 5.7 mm dia.
The case color of different-frequency types "-F" is green.

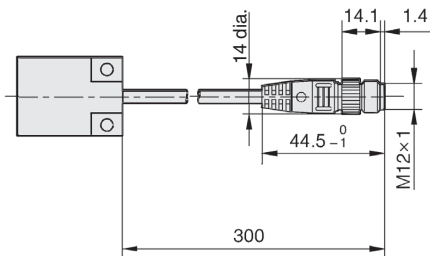
FL2R-20□6S□



Vinyl-insulated cord (oil-resistant: 0.5 mm², 20/0.18 dia., 2-core) 5.7 mm dia.
The case color of different-frequency types "-F" is green.

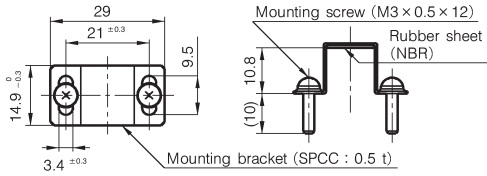
● Pre-leaded connector model (connector external dimensions)

FL2□-□□6□□-CN03

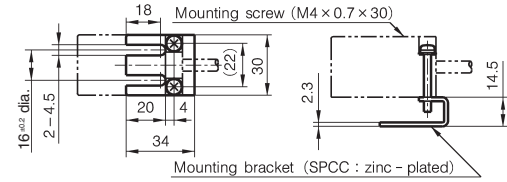


● **Mounting bracket (ordered separately)**

FL2-PA5



FL2-PA12



Catalog listing	Applicable models
FL2-PA5	FL2S-4□6□
FL2-PA12	FL2R-12□6□

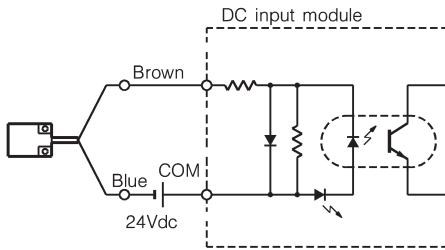
Note: FL2-PA5 is provided with the proximity switch.

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

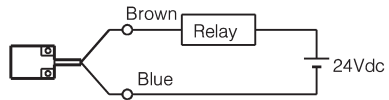
WIRING

● **Standard (pre-leaded) model**

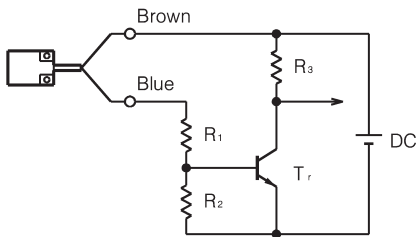
• Wiring to programmable controller



• Wiring to relay load



• Wiring to transistor circuit

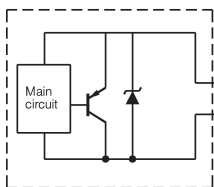


● **Pre-leaded connector model**

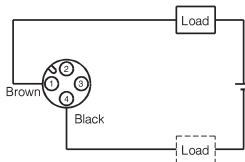
The connectors have four pins. Contacts are laid out as follows. (Lead colors are for when the PA5 is used.)

Body side

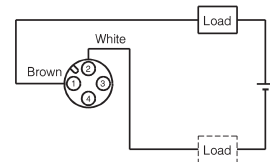
PA5 connector side



N.O. type



N.C. type



CONNECTOR SPECIFICATIONS^{*1}

Item	Specifications
Insulation resistance	Max. 100 MΩ (by 500 Vdc megger)
Dielectric strength	1,500 Vac for 1 minute (between contacts, and between contact and connector housing)
Initial contact resistance	Max. 40 mΩ (with 3A current to connected male and female connectors. Semiconductor lead-specific resistance not included.)
Mating/unmating force	0.4 to 4.0 N per contact
Mating cycles	50
Connector nut tightening torque	Min. 0.8 N·m *2
Cable pullout strength	Min. 100 N
Vibration resistance	10 to 55 Hz, 1.5 mm peak-to-peak amplitude, for 2 hours each in X, Y and Z directions
Impact resistance	300 m/s ² , 3 times each in X, Y and Z directions
Protective structure	IP67
Ambient operating temperature	-10 to +70°C
Ambient storage temperature	-20 to +80°C
Ambient operating humidity	Max. 95% RH
Material	Contacts: Gold-plated brass Contact holder: Glass-lined polyester resin Housing: Polyester elastomer Coupling: Ni-plated brass O-ring: NBR


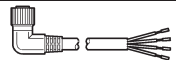
*1: Specifications assume Azbil male/female connectors.

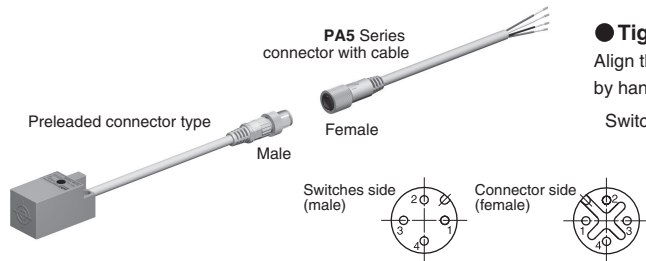
*2: The recommended torque is 0.4 to 0.6 N·m. If fastened poorly, the IP67 protection is lost, or looseness occurs. Fasten the connector securely by hand.

CONNECTOR WITH CABLE

Be sure to use a PA5 Series connector with cable when connecting a preleaded connector or connector-type switch.

● PA5 Series connector with cable

Shape	Power supply	Cord properties	Cord length	Catalog listing	Lead colors
	DC	Vinyl-insulated cord with high resistance to oil and vibration (UL/NFPA79 CM, CL3)	2 m	PA5-4I SX2SK	1: brown, 2: white, 3: blue, 4: black
			5 m	PA5-4I SX5SK	1: brown, 2: white, 3: blue, 4: black
			2 m	PA5-4I LX2SK	1: brown, 2: white, 3: blue, 4: black
			5 m	PA5-4I LX5SK	1: brown, 2: white, 3: blue, 4: black

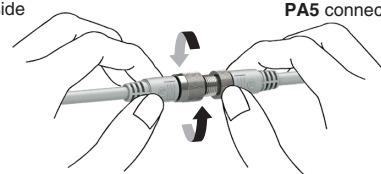


● Tightening the connector

Align the grooves and rotate the fastening nut on the PA5 connector by hand until it fits tightly with the connector on the switches side.

Switches side

PA5 connector side



PRECAUTIONS

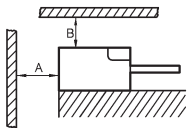
1. Mounting

Tighten the screws to the torque shown below.

Catalog listing	Allowable tightening torque (N-m)	Recommended screw diameter
FL2S-4□6□	0.5	Screw provided
FL2R-4□6□	0.5	M3
FL2R-7□6□	0.5	M4
FL2R-12□6□	0.5	M4
FL2R-20□6□	0.5	M5

2. Influence of surrounding metal

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



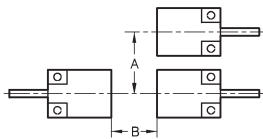
Note: Shaded areas indicate surrounding metal other than the target object.

Catalog listing	A(mm)	B(mm)
FL2S-4□6H	20	10
FL2S-4□6S	10	20
FL2R-4□6H	20	10
FL2R-4□6S	10	20
FL2R-7□6H	30	15
FL2R-7□6S	15	30
FL2R-12□6H	50	25
FL2R-12□6S	25	50
FL2R-20□6H	80	40
FL2R-20□6S	40	80

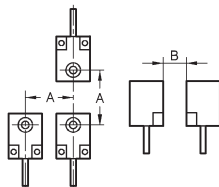
3. Mutual interference prevention

When mounting proximity switches in parallel or facing each other, mutual interference may cause the switch 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.

Front sensing type



Side sensing type



Catalog listing	A(mm)	B(mm)
FL2S-4□6□	30 (15)	40 (20)
FL2R-4□6□	30 (15)	40 (20)
FL2R-7□6□	80 (40)	80 (40)
FL2R-12□6□	120 (60)	120 (60)
FL2R-20□6□	200 (100)	200 (100)

4. Cautions for series or parallel connection

4.1 Series connection (AND connection)

When connecting two or more proximity switches in series, erroneous output (1 to 3 ms) may occur without the rated current being supplied to each of the switches. For this reason, series connection of proximity switches is not recommended. However, if proximity switches must be connected in series, a resistor of 10 kΩ must be provided in parallel to each of the switches. However, note that the maximum leakage current in a series connection will be 3.5 mA. Operation lag also will occur, resulting in increased voltage drop, and the operation indicator lamp will not light.

Operation lag = 40 ms x (number of series connections - 1)

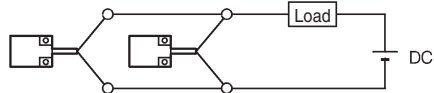
Voltage drop = voltage drop of single x sensor number of series connected switches

4.2 Parallel connection (OR connection)

• When connecting two or more proximity switches in parallel, leakage current increases as follows, and may result in faulty load restore.

(Leakage current = Leakage current of single switch x number of series connected switches)

• When two or more switches turn ON in a parallel connection, one (or some) of the switches may not indicate operation. This is not an abnormality.



5. Relay loads

The voltage drop of the FL2R/S Series is 3.3V. Pay attention to this voltage drop when using a relay load. (With 12 Vdc relays, switching is not possible.)

6. Operation upon power ON

After the power is turned ON, it takes 40 ms or less until the proximity switch is ready for sensing. When the load and the proximity switch use different power supplies, be sure to turn the proximity switch ON before turning the load ON.

7. Influence of leakage current

Minimal current flows as leakage current for operating the circuits even when the proximity switch is OFF.

Take sufficient care when restoring connected loads.

8. 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 30 mm of the cord lead-in port.