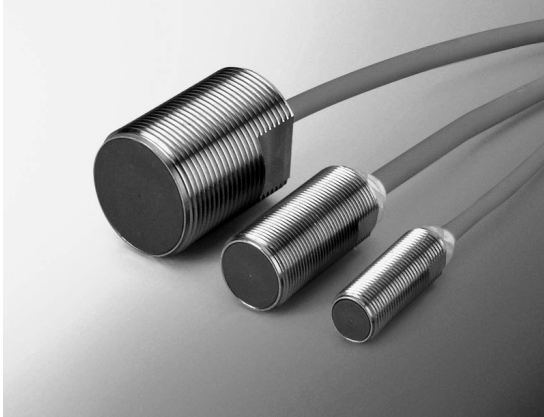


FL7M-A Series

Detects workpieces reliably even if aluminum or cast iron chips accumulate on the sensing head.



- DC 2-wire proximity sensors can be directly connected to programmable controllers and N.C. units. This reduces wiring costs
- Stable sensing area is displayed by setting indicator
(green/red LED, N.C. lights up red)
- Firefly indicator lamp can be checked even from the rear
- Tough IP67 seal
- Certified EN-compliant



CLICK

ORDER GUIDE

Main unit

Exterior Appearance		Size (O.D.)	Sensing distance	Operation mode	Setting indicator	Oil resistant cable	Catalog listing
	M12	2mm	N.O.	●	●	FL7M-2J6AD	
			N.C.	●	●	FL7M-2K6A	
	M18	4mm	N.O.	●	●	FL7M-4J6AD	
			N.C.	●	●	FL7M-4K6A	
	M30	8mm	N.O.	●	●	FL7M-8J6AD	
			N.C.	●	●	FL7M-8K6A	
	M12	2mm	N.O.	●	●	FL7M-2J6AD-CN03	
			N.C.	●	●	FL7M-2K6A-CN03	
	M18	4mm	N.O.	●	●	FL7M-4J6AD-CN03	
			N.C.	●	●	FL7M-4K6A-CN03	
	M30	8mm	N.O.	●	●	FL7M-8J6AD-CN03	
			N.C.	●	●	FL7M-8K6A-CN03	

Accessories (sold separately)

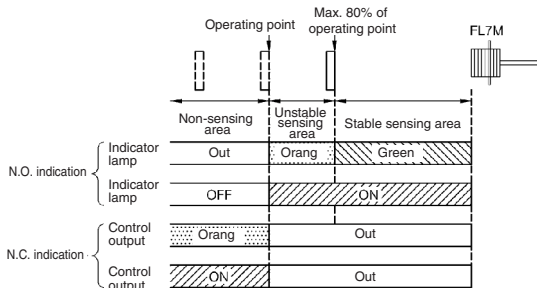
Name	Appearance	O.D.	Catalog listing
Mounting bracket		For M12	FL-PA112
		For M18	FL-PA118
		For M30	FL-PA130
Protective cover		For M12	FL-PA12
		For M18	FL-PA18
		For M30	FL-PA30
Spatter-guarded protective cover		For M8	FL-PA08W
		For M12	FL-PA12W
		For M18	FL-PA18W
		For M30	FL-PA30W

SPECIFICATIONS

Catalog listing	FL7M-2J6AD(-CN03), FL7M-2K6A(-CN03)	FL7M-4J6AD(-CN03), FL7M-4K6A(-CN03)	FL7M-8J6AD(-CN03), FL7M-8K6A(-CN03)
Actuation method	High-frequency oscillation (shielded)		
Rated sensing distance	2 ± 0.2mm	4 ± 0.4mm	8 ± 0.8mm
Usable sensing distance	0 to 1.4mm	0 to 2.8mm	0 to 5.6mm
Standard target object	12 x 12 x 1mm iron	30 x 30 x 1mm iron	54 x 54 x 1mm iron
Differential travel	20% max. of sensing distance		
Rated supply voltage	12/24Vdc		
Operating voltage range	10 to 30Vdc		
Leakage current	0.55mA max.		
Output operation mode	J :N.O., K :N.C.		
Control output	Switching current 3 to 100mA, voltage drop 3V max., output dielectric strength 30Vdc		
Operating frequency	500Hz	100Hz	60Hz
Temperature drift	± 10% max. for the -25 to +70°C range	± 10% max. of sensing distance for the 0 to +50°C range, or ± 20% for the -25°C to +70°C range when 25°C is taken as standard temperature	
Supply voltage drift	± 2.5% max. of sensing distance with ± 15% voltage fluctuation, taking rated supply voltage as standard voltage		
Indicator lamps	N.O. type: Operation indication: lights (orange or green) at output ON Setting indication: lights (green) in stable sensing area N.C. type: Operation indication: orange light goes out in sensing area		
Operating temperature	-25 to +70°C		
Storage temperature	-25 to +70°C		
Operating humidity	35 to 95% RH max.		
Insulation resistance	50MΩmin. (at 500Vdc)		
Dielectric strength	1000Vac, 50/60Hz for 1 minute		
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, 2 hrs each in X, Y and Z directions		
Shock resistance	490m/s ² 10 times each in X, Y and Z directions		
Protective structure	IP67G		
Weight (preleaded type)	Approx. 60g	Approx. 130g	Approx. 250g
Circuit protection	Surge absorption, load short-circuit protection, reverse connection protection		
Wiring method	Preleaded, preleaded connector		
Material	Sensor	Case	Ni-plated brass
		Sensing face	PBT
	Connector	Housing	Polyester elastomer
		Holder	Glass-lined polyester resin
		Contact	Gold-plated brass

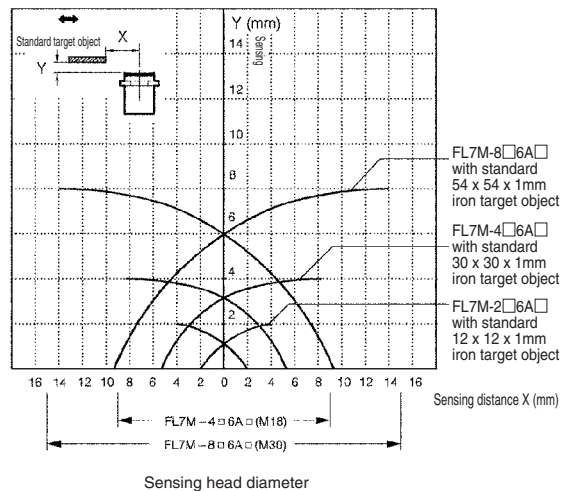
USING THE SETTING INDICATOR

The proximity sensor can be set up to detect objects reliably by bringing the sensor progressively closer to the target object and installing the sensor at the point where the indicator lamp (N.O. indication) changes from red to green.

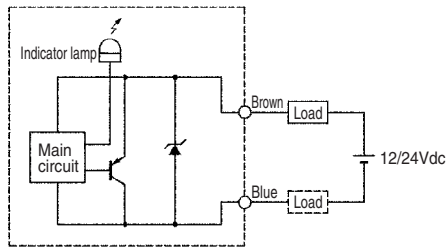


*When the target object is made of a different material (such as aluminum, copper or stainless steel) from the standard target object (iron), the distance at which the indicator lamp changes color is shorter than the 80% maximum.

SENSING AREA (typical)



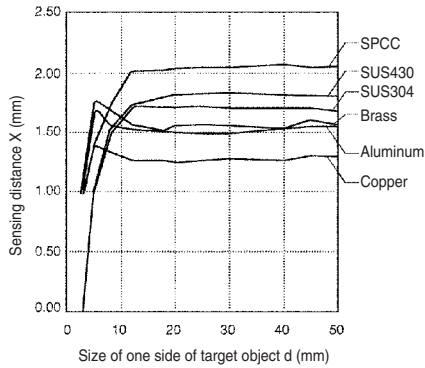
WIRING DIAGRAM



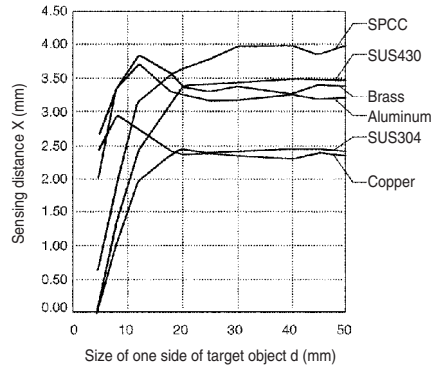
The load can be connected to either side of the power supply.

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

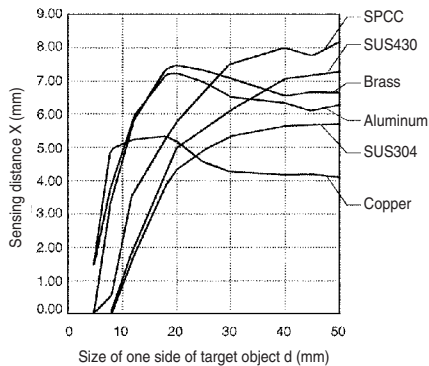
● FL7M-2□6A□



● FL7M-4□6A□

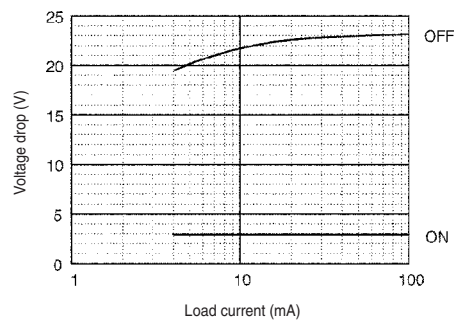


● FL7M-8□6A□

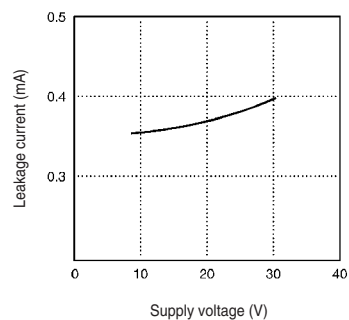


VOLTAGE DROP CHARACTERISTICS (typical)

● 24Vdc



LEAKAGE CURRENT CHARACTERISTICS (typical)

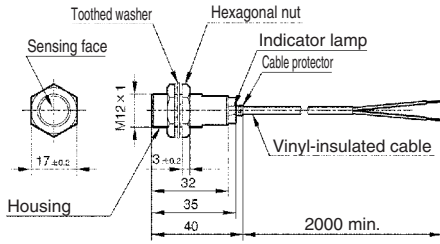


EXTERNAL DIMENSIONS

(unit: mm)

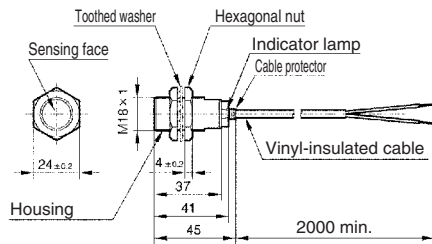
● Prelead type

FL7M-2□6A□



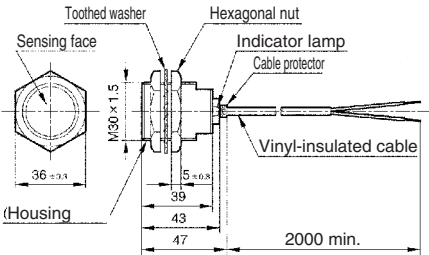
Vinyl-insulated cable (oil-resistant: 0.3mm², 27/0.12 dia., 2-core), dia. 4.1.
Cap color: blue.

FL7M-4□6A□



Vinyl-insulated cable (oil-resistant: 0.5mm², 20/0.18 dia., 2-core), dia. 5.7.
Cap color: blue.

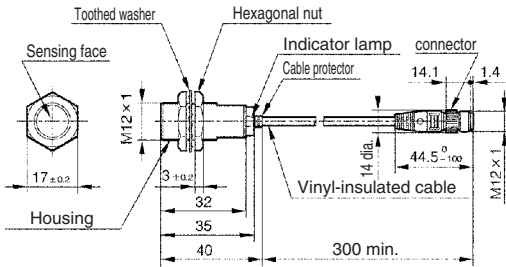
FL7M-8□6A□



Vinyl-insulated cable (oil-resistant: 0.5mm², 20/0.18 dia., 2-core), dia. 5.7.
Cap color: blue.

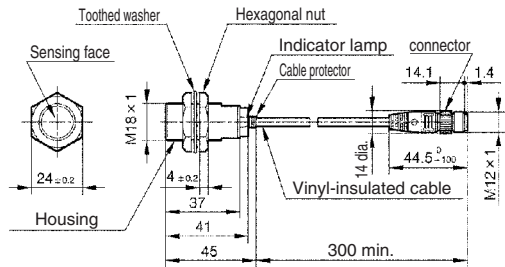
● Prelead Connector type

FL7M-2□6A□-CN03



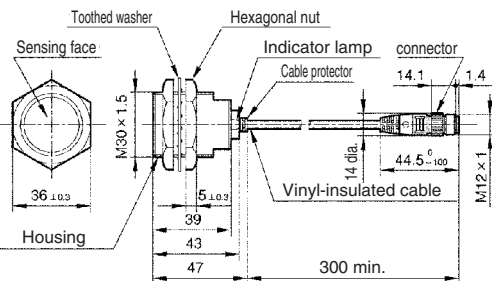
Cap color: blue.

FL7M-4□6A□-CN03



Cap color: blue.

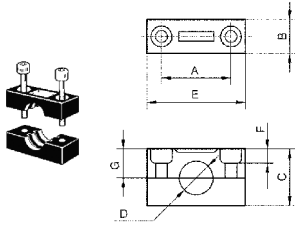
FL7M-8□6A□-CN03



Cap color: blue.

■ MOUNTING BRACKET (sold separately)

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



FL-PA118 and FL-PA130 screw holes are oblong.

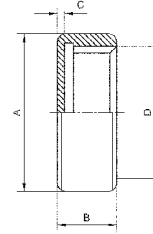
Catalog listing	Dimensions (mm)							Screw size	
	A	B	C	D	E	F	G	Dia.	Neck
FL-PA112	25	12	20	12dia.	36	6	9.5	M4	25
FL-PA118	30/32	15	30	18dia.	45	7.5	14.5	M5	35
FL-PA130	40/45	15	50	30dia.	60	10	24.5	M5	55

Allowable tightening torque of bracket screws

Catalog listing	Max. torque (N·m)
FL-PA112	0.98
FL-PA118	1.5
FL-PA130	1.5

■ PROTECTIVE COVER (sold separately)

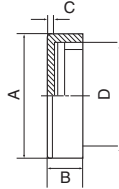
Protective covers made of polyacetal resin are available for shielded models.
Select a model according to the sensor's external dimensions.



Catalog listing	Dimensions (mm)			
	A	B	C	D
FL-PA12	14dia.	5	0.5	M12 x 1
FL-PA18	21dia.	6	0.5	M18 x 1
FL-PA30	33dia.	8	1.5	M30 x 1.5

■ SPATTER-GUARDED PROTECTIVE COVER (sold separately)

Spatter-guarded protective covers made of fluorine resin and designed especially for shielded sensors are available.
Select a model according to the sensor's external dimensions.

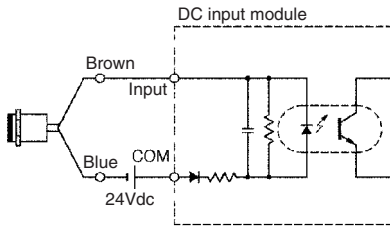


Catalog listing	Dimensions (mm)			
	A	B	C	D
FL-PA08W	10dia.	5	0.5	M8 x 1
FL-PA12W	15dia.	5	0.7	M12 x 1
FL-PA18W	22dia.	6	0.7	M18 x 1
FL-PA30W	34dia.	8	1.5	M30 x 1.5

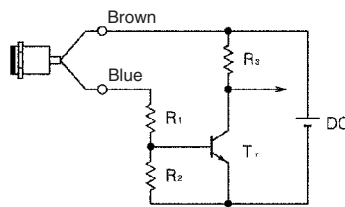
■ WIRING DIAGRAM

● Standard (prelead) type

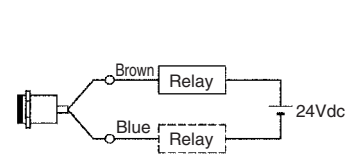
Wiring to programmable controller



Wiring to transistor circuit



Wiring to relay load

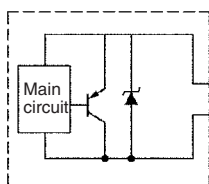


● Connector and prelead connector types (lead colors are for when the PA5 is used).

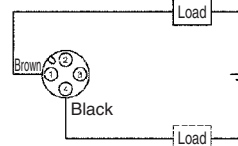
The connectors have four pins. Contacts are laid out as shown below.

Body side

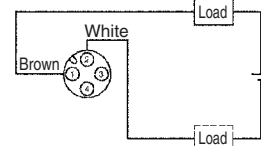
PA5 connector side



N.O. (normally open) type



N.C. (normally closed) type



CONNECTOR SPECIFICATIONS *1

Item	Specifications
Insulation resistance	Max. 100MΩ (by 500Vdc megger)
Dielectric strength	1,500Vac for 1 minute (between contacts, and between contact and connector housing)
Initial contact resistance	Max. 40mΩ (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. 0.8N·m*2
Cable pullout strength	Min. 100 N
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, for 2 hours each in X, Y and Z directions
Impact resistance	300m/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

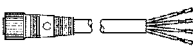
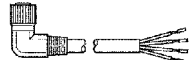
*1: Specifications assume Yamatake male/female connectors.

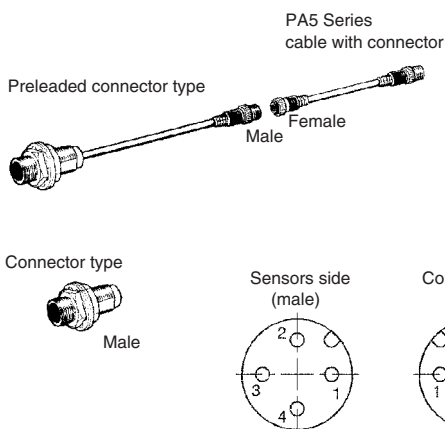
*2: The recommended torque is 0.4 to 0.6N·m. If fastened poorly, the IP67 protection is lost, or looseness occurs. Fasten the connector securely by hand.

CABLE WITH CONNECTOR

Be sure to use PA5 Series cables with connector to connect prelead type connectors and connector type limit switches.

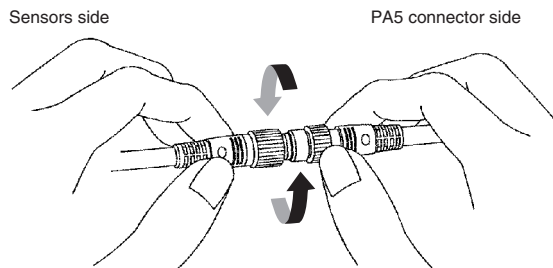
● PA5 Series cable with connector

Shape	Power supply	Cable properties	Cable length	Catalog listing	Lead colors
	DC	Oil-resistant, flexible; UL2464; flame-resistant; EN-compliant	2m	PA5-4ISX2MK-E	1: brown, 2: white, 3: blue, 4: black
			5m	PA5-4ISX5MK-E	1: brown, 2: white, 3: blue, 4: black
			2m	PA5-4ILX2MK-E	1: brown, 2: white, 3: blue, 4: black
			5m	PA5-4ILX5MK-E	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 sensors side.

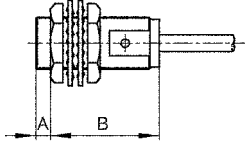


PRECAUTIONS FOR USE

1 Precautions for use

1.1 Mounting

The allowable tightening torque varies according to the distance from the sensing face.

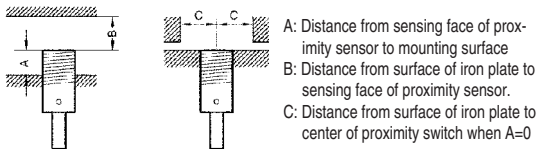


Catalog listing	Length A (mm)	Max. tightening torque (N·m)	
		A	B
FL7M-2□6A□	10	20	30
FL7M-4□6A□	0	—	70
FL7M-8□6A□	0	—	150

Note: The table shows the allowable tightening torque when toothed washers (provided) are used.

1.2 Influence of surrounding metal

Metal other than the target object surrounding the sensor may influence operating characteristics. Leave space between the sensor and surrounding metal as shown below.

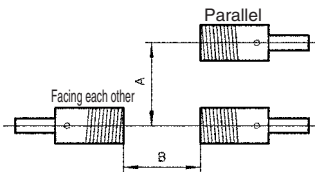


Shaded areas indicate surrounding metal other than the target object.

Catalog listing	A(mm)	B(mm)	C(mm)
FL7M-2□6A□	0	6	9.0
FL7M-4□6A□	0	20	13.5
FL7M-8□6A□	0	40	22.5

1.3 Mutual interference prevention

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



Catalog listing	A(mm)	B(mm)
FL7M-2□6A□	20	30
FL7M-4□6A□	35	50
FL7M-8□6A□	70	100

1.4 Cautions for series or parallel connection

(1) Series connection (AND switching circuit)

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

Operation lag = 40ms X (No. of sensors in series - 1)

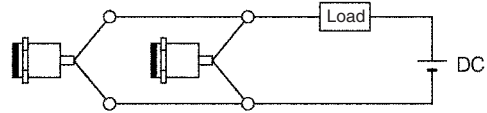
Voltage drop = Voltage drop of single sensor X No. of sensors in series

(2) Parallel connection (OR switching circuit)

If two or more proximity sensors are connected in parallel, total leakage current increases according to the following formula, and may result in the load not turning OFF.

(Leakage current = Leakage current of single sensor x No. of sensors in parallel)

When two or more sensors in parallel turn ON, one (or more) of their operating indicators may not light up. This is normal.



1.5 Relay loads

The voltage drop of FL7M-A sensors is 3V. Pay attention to this voltage drop when using a relay load. (With 12Vdc relays, switching is not possible.)

1.6 Operation upon power ON

After the power is turned ON, it takes at most 40ms until the proximity sensor is ready for sensing. If the load and the proximity sensor use different power supplies, be sure to turn the proximity sensor ON before turning the load ON.

1.7 Influence of leakage current

A minimal current flows as leakage current for operating the circuits even when the proximity sensor is OFF. Keep this in mind when turning off connected loads.

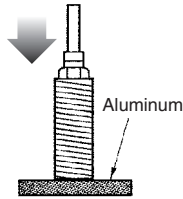
1.8 Minimum cable bend radius (R)

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

2 ALUMINUM CHIPS AND CAST IRON CHIPS

Generally, even if aluminum and cast iron chips are attached to or pressing against the sensing face, no signal is output. Take care, however, because under the conditions described below, a signal may sometimes be output.

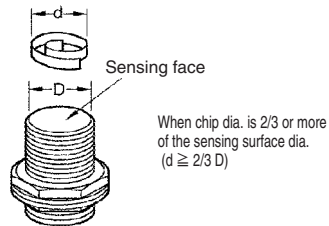
2.1 FL7M-2□6A□



Length of one side of aluminum chip	FL7M-2J6AD
0.1mm max.	OFF
0.5mm approx	OFF
2mm max.	OFF or ON
4mm min.	ON

2.2 FL7M-4□6A□, FL7M-8□6A□

(1) Chip size (d) x size of sensing face (D)



Catalog listing	Dimensions	D(mm)
FL7M-4J6AD, FL7M-4K6A		16
FL7M-8J6AD, FL7M-8K6A		28

(2) When chips are pressed against sensing face

