

FL7N/M Series DC 3-wire Type Cylindrical Proximity Sensors

FEATURES

An Extensive Lineup That Includes 4mm dia. through to M30 Types, NPN and PNP Output Models Available for Each.


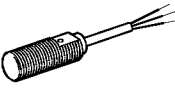
- Compact and space saving.
- Indicator lamp can be confirmed even from the rear side.
- High seal capabilities. (IP67)
- Numerous Variations.
- Enhanced circuit protection. (surge absorption, load short circuit and reverse connection)




[click](#)

ORDER GUIDE



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

Actuation method	Appearance		Sensing distance (mm)	Output operation mode		Catalog listing
	Sensor package style	Dimensions				
High-frequency oscillating type (shielded)	Non-threaded type FL7N 	4dia. × 30	0.8	NPN	N.O.	FL7N-P8A6
					N.C.	FL7N-P8B6
				PNP	N.O.	FL7N-P8D6
		N.C.			FL7N-P8E6	
		6.5dia. × 30		NPN	N.O.	FL7N-1P5A6
					N.C.	FL7N-1P5B6
	PNP		N.O.	FL7N-1P5D6		
		N.C.	FL7N-1P5E6			
	Threaded type FL7M 	M5 × 30	0.8	NPN	N.O.	FL7M-P8A6
					N.C.	FL7M-P8B6
				PNP	N.O.	FL7M-P8D6
					N.C.	FL7M-P8E6
		M8 × 30	1.5	NPN	N.O.	FL7M-1P5A6
					N.C.	FL7M-1P5B6
				PNP	N.O.	FL7M-1P5D6
					N.C.	FL7M-1P5E6
		M12 × 35	2	NPN	N.O.	FL7M-2A6
					N.C.	FL7M-2B6
				PNP	N.O.	FL7M-2D6
					N.C.	FL7M-2E6
M12 × 46 (long-bodied type)	2	NPN	N.O.	FL7M-2A6G		
			N.C.	FL7M-2B6G		
		PNP	N.O.	FL7M-2D6G		
			N.C.	FL7M-2E6G		
M18 × 40	5	NPN	N.O.	FL7M-5A6		
			N.C.	FL7M-5B6		
		PNP	N.O.	FL7M-5D6		
			N.C.	FL7M-5E6		
M30 × 42	10	NPN	N.O.	FL7M-10A6		
			N.C.	FL7M-10B6		
		PNP	N.O.	FL7M-10D6		
			N.C.	FL7M-10E6		

● Connector model

Actuation method	Appearance		Sensing distance (mm)	Output operation mode		Catalog listing
	Sensor package style	Dimensions				
High-frequency oscillating type		M12 × 53	2	NPN	N.O.	FL7M-2A6-CN
					N.C.	FL7M-2B6-CN
		M18 × 55	5	NPN	N.O.	FL7M-5A6-CN
					N.C.	FL7M-5B6-CN
		M30 × 57	10	NPN	N.O.	FL7M-10A6-CN
					N.C.	FL7M-10B6-CN

OPTIONAL ACCESSORIES (sold separately)

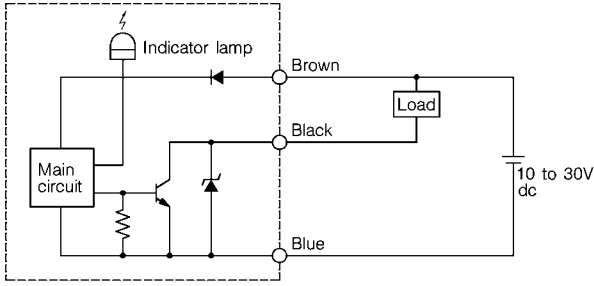
Name	Shape	O.D.	Catalog listing	Name	Shape	O.D.	Catalog listing
Mounting bracket		For M12	FL-PA112	Protective cover		For M12	FL-PA12
		For M18	FL-PA118			For M18	FL-PA18
		For M30	FL-PA130			For M30	FL-PA30

SPECIFICATIONS

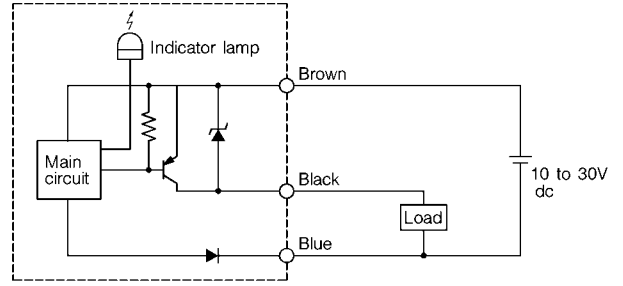
Item	Catalog listing	FL7N-P8□6 FL7M-P8□6	FL7N-1P5□6 FL7M-1P5□6	FL7M-2□6□ (-CN)	FL7M-5□6□ (-CN)	FL7M-10□6□ (-CN)
Actuation method	High-frequency oscillation type (shielded)					
Rated supply voltage	12/24Vdc					
Rated sensing distance	0.8 ^{+0.16} _{-0.08} mm	1.5 ^{+0.3} _{-0.15} mm	2 ^{+0.2} _{-0.1} mm	5 ^{+1.0} _{-0.5} mm	10 ^{+2.0} _{-1.0} mm	
Usable sensing distance	0 to 0.6mm	0 to 1.1mm	0 to 1.4mm	0 to 3.5mm	0 to 7mm	
Standard target object	5 × 5mm, 1mm thick iron	8 × 8mm, 1mm thick iron	12 × 12mm, 1mm thick iron	18 × 18mm, 1mm thick iron	30 × 30mm, 1mm thick iron	
Differential travel	15% max. of sensing distance			10% max. of sensing distance		
Operating voltage range	10 to 30Vdc					
Current consumption	25mA max. (24Vdc)		15mA max. (24Vdc)			
Control output	Switching current: 100mA max., voltage drop: 1V max., output dielectric strength: 30Vdc					
Operating frequency	1kHz	600Hz			100Hz	
Temperature characteristics	+20 to -10% max. for the range of -10 to +60°C when +25°C is taken as standard temperature in sensing distance	±15% 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 +70°C when +25°C is taken as standard temperature in sensing distance		
Supply voltage characteristics	±1% max. with ±15% 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)	Approx. 30g	Approx. 50g	Approx. 60g	Approx. 140g	Approx. 240g	
Circuit protection	Surge absorption, reverse connection protection circuit		Surge absorption, load short-circuit protection, reverse connection protection circuit			
Wiring method	Pre-leaded		Pre-leaded		Connector, pre-leaded	
Material	Sensor	Case	Ni-plated brass			Ni-plated brass
		Sensing face	PBT			PBT
	Connector	Housing	-		-CN: Ni-plated brass	
		Holder	-		Glass-lined polyester resin	
		Contact	-		Gold-plated brass	

WIRING DIAGRAMS

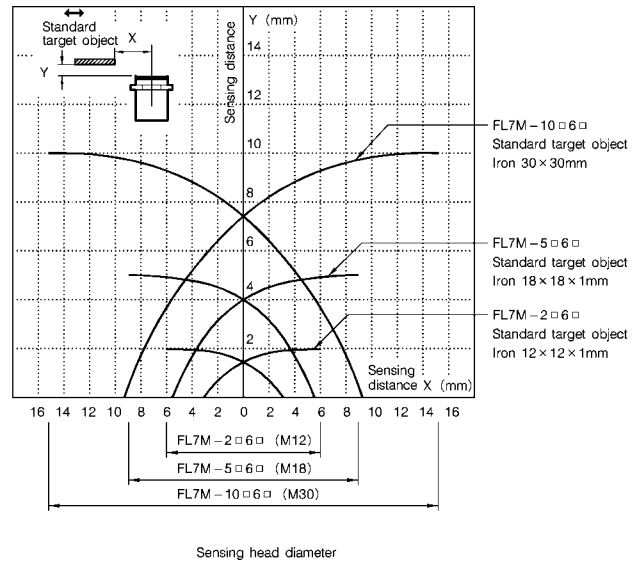
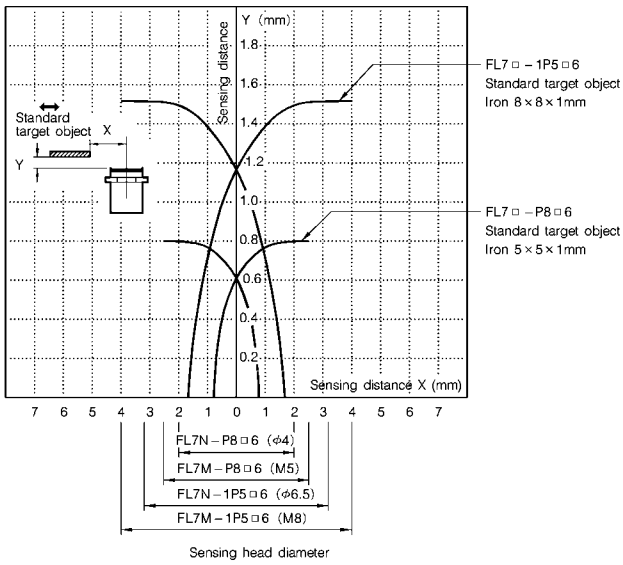
● NPN output type



● PNP output type

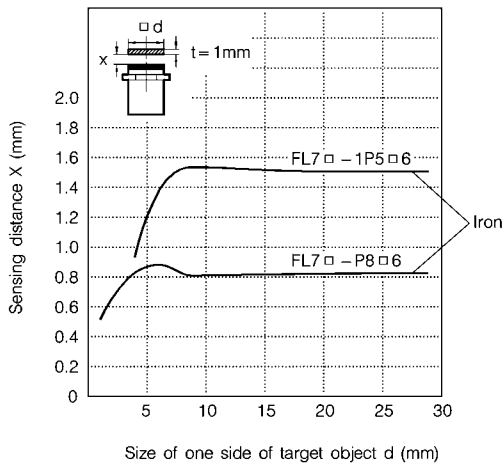


SENSING AREA DIAGRAMS (typical examples)

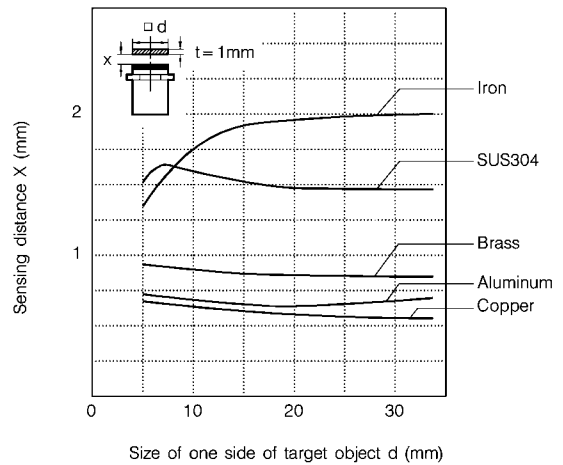


SENSING DISTANCE ACCORDING TO MATERIAL & SIZE OF OBJECT (typical examples)

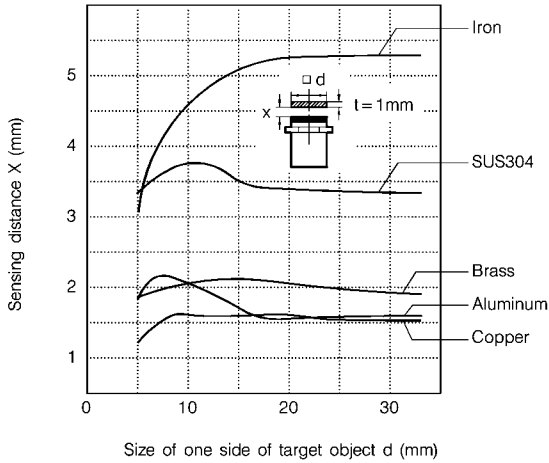
FL7□-(P8□6/1P5□6)



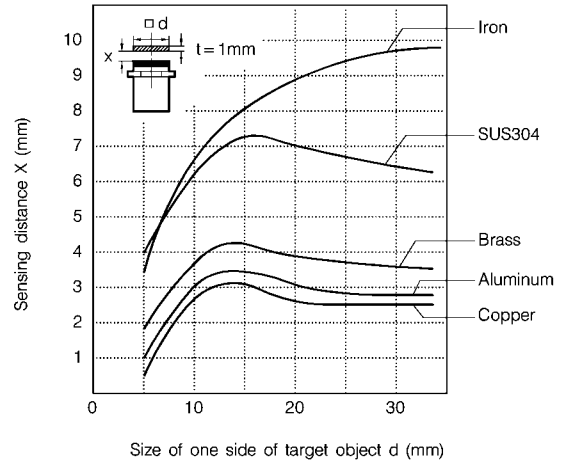
FL7M-2□6□



FL7M-5□6□



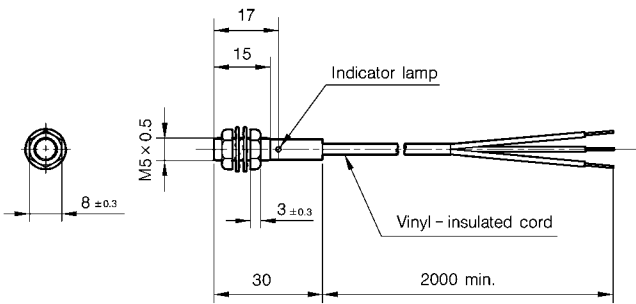
FL7M-10□6□



EXTERNAL DIMENSIONS

● Pre-leaded model

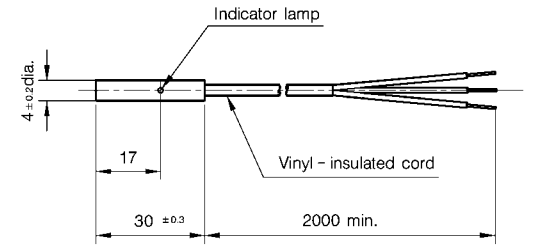
FL7M-P8□6



Vinyl-insulated cord (oil-resistant: 0.18mm², 16/0.12, 3-core) 3mm dia.
Cap color: blue

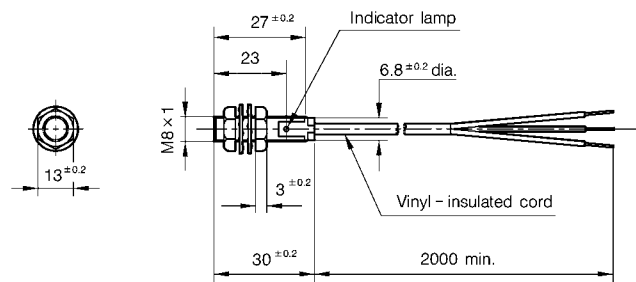
FL7N-P8□6

(unit: mm)



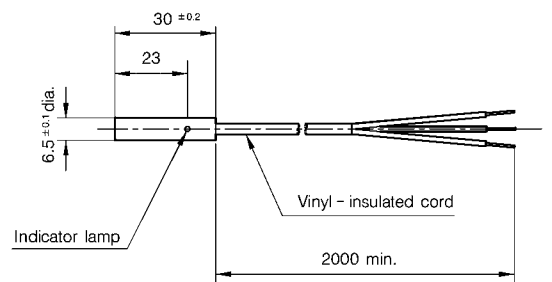
Vinyl-insulated cord (oil-resistant: 0.18mm², 16/0.12, 3-core) 3mm dia.
Cap color: blue

FL7M-1P5□6



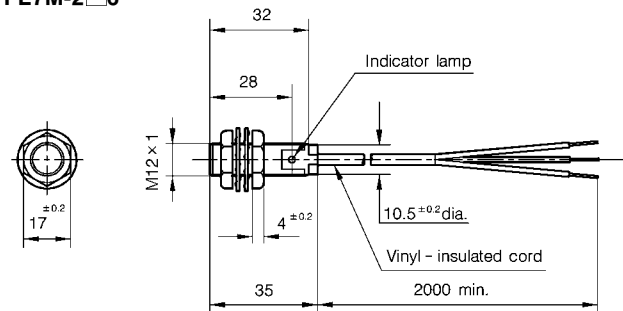
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
Cap color: blue

FL7N-1P5□6



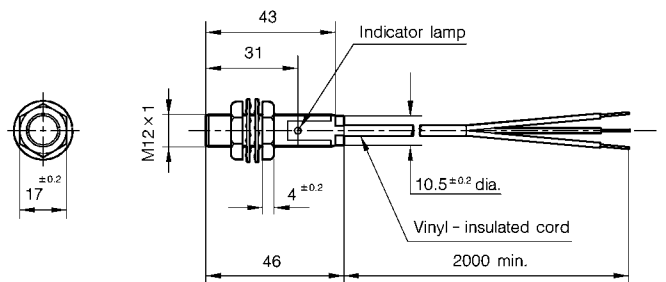
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
Cap color: blue

FL7M-2□6



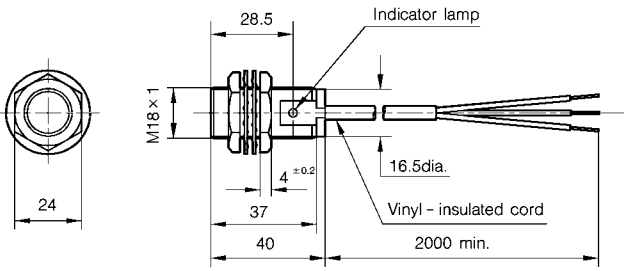
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
Cap color: (standard model: blue)

FL7M-2□6G Long body type



Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 3-core) 4.2mm dia.
Cap color: blue

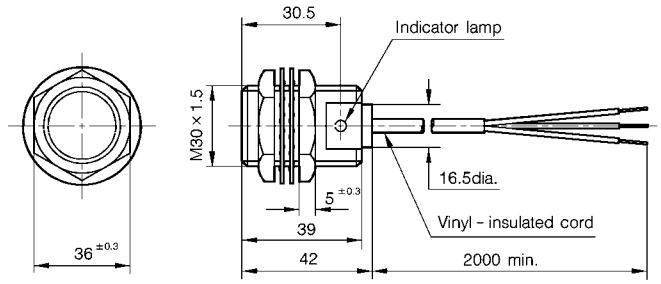
FL7M-5□6



Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 3-core) 5.7mm dia.
Cap color: (standard model: blue)

FL7M-10□6

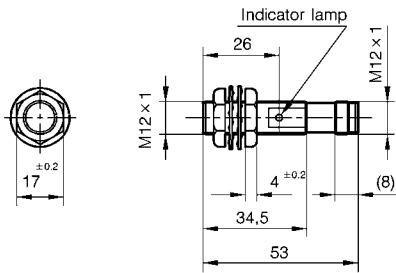
(unit: mm)



Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 3-core) 5.7mm dia.
Cap color: (standard model: blue)

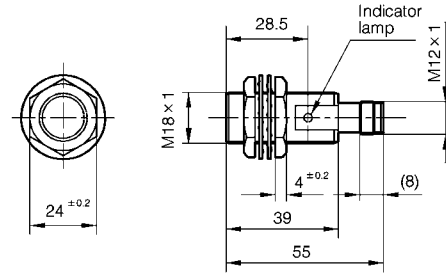
● Connector model

FL7M-2□6-CN



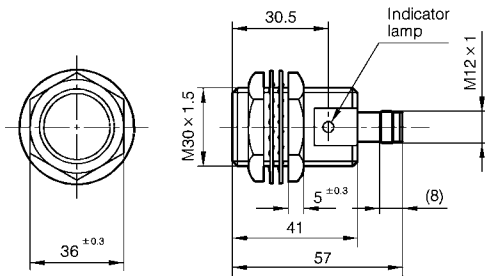
Cap color: blue

FL7N-5□6-CN



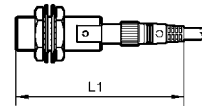
Cap color: blue

FL7M-10□6-CN

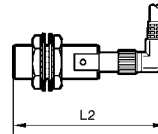


Cap color: blue

(Note)



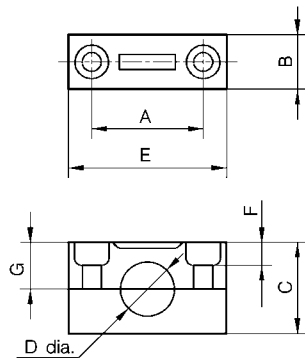
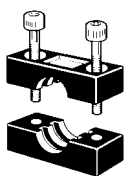
When a straight-type connector is fitted, the dimension L1 is the overall length plus about 30mm.



When an angle-type connector is fitted, the dimension L2 becomes the overall length plus 20mm.

MOUNTING BRACKET (sold separately)

Mounting brackets are made of polyacetal resin.
Two screws and two washers are provided for each bracket.
(unit: mm)



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

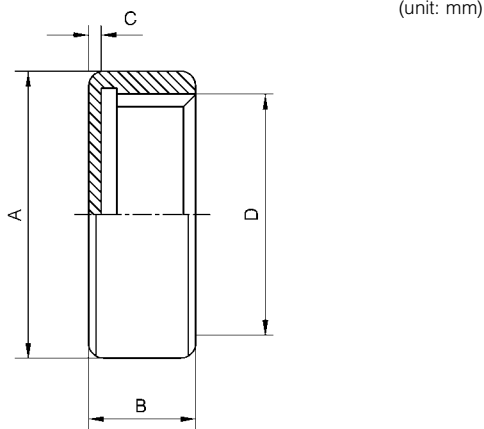
Catalog listing	Dimensions (mm)							Screw dimensions	
	A	B	C	D	E	F	G	Diameter	Neck
FL-PA112	25	12	20	12	36	6	9.5	M4	25
FL-PA118	30/32	15	30	18	45	7.5	14.5	M5	35
FL-PA130	40/45	15	50	30	60	10	24.5	M5	55

● Allowable tightening strength of bracket

Catalog listing	Allowable tightening strength (N-m)	Remarks
FL-PA112	0.98	M4 screw used
FL-PA118	1.5	M5 screw used
FL-PA130	1.5	M5 screw used

PROTECTIVE COVER (sold separately)

Protective covers (material: polyacetal resin) are available for shielded models. Select a model according to the sensor's external dimensions.

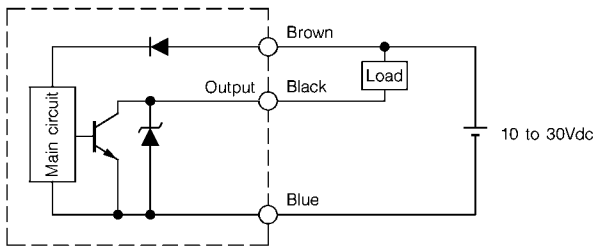


Catalog listing	Dimensions (mm)			
	A	B	C	D
FL-PA12	14dia.	5	$0.5^{+0.2}_{-0.1}$	M12 × 1
FL-PA18	21dia.	6	$0.5^{±0.2}$	M18 × 1
FL-PA30	33dia.	8	$1.5^{±0.2}$	M30 × 1.5

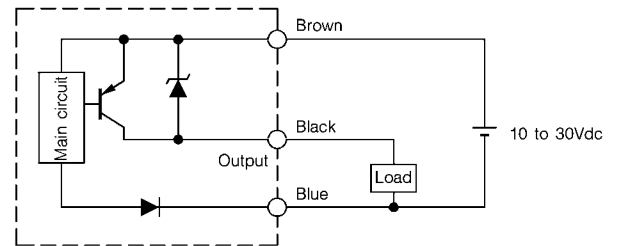
WIRING

• Standard (pre-leaded) model

NPN type

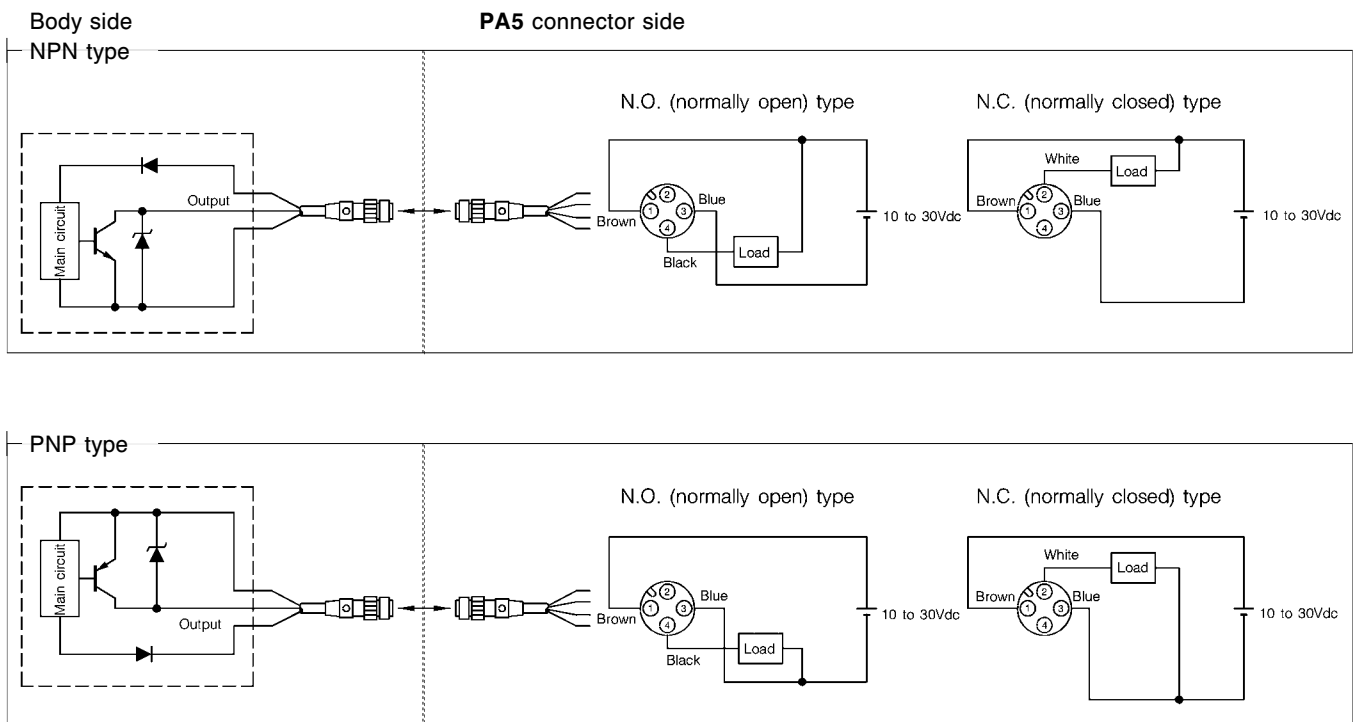


PNP type



• Pre-leaded connector model (Lead colors are for when the PA5 is used.)

The connectors have four pins. Contacts are laid out as follows:



CONNECTOR SPECIFICATIONS Note 1

Item	Specifications
Operating voltage/current	5Vac/dc 5mA min., 125Vac/dc, 3A max.
Insulation resistance	100M Ω min. (by 500Vdc megger)
Dielectric strength	1,500Vac for 1 minute (across contacts, and contacts and connector housing)
Initial contact resistance	40m Ω max. (excluding code conductor-intrinsic when energized by 3A on a male-female contact combination)
Connector withstand stress	0.4 to 4.0N (per contact)
Number of connector insertions	50 times
Connector tightening strength	0.8N-m min. (Note 2)
Cord pullout strength	100N min.
Vibration resistance	10 to 55Hz, 1.5mm peak-to-peak amplitude, 2 hrs in X, Y and Z directions
Shock resistance	300m/s ² , 3 times in X, Y and Z directions
Protection	IP67 (Panel mounting connectors are IP65.)
Operating temperature range	-10 to +70°C
Storage temperature range	-20 to +80°C
Operating humidity range	95%RH max.
Material	Contact: gold-plated brass Contact holder: glass-lined polyester resin Housing: polyester elastomer (Panel mounting connector housing: Aluminum) Coupling: Ni-plated brass O-ring: NBR

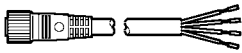
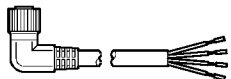
Note 1: Specifications assume Yamatake male/female connectors.

Note 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.

CONNECTION CORD WITH CONNECTOR

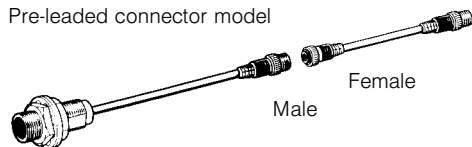
Be sure to use **PA5** Series cord with **VA** connector when connecting a pre-leaded connector or connector sensors.

● PA5 Series cord with VA connector

Shape	Power supply	Cord length	Catalog listing	Lead color
	dc	2m	PA5-4ISX2HK	1-brown, 2-white, 3-blue, 4-black
		5m	PA5-4ISX5HK	
		2m	PA5-4ILX2HK	
		5m	PA5-4ILX5HK	

PA5 Series cord with **VA** connector

Pre-leaded connector model



Female
Male

● Fastening the connector

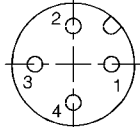
Align the grooves of the connectors and turn the fastening screw of the **VA** connector of the **PA5** cord by hand until it fits tightly with the screw on the sensor side.

Connector model

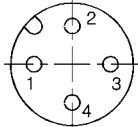


Male

Sensor (male)

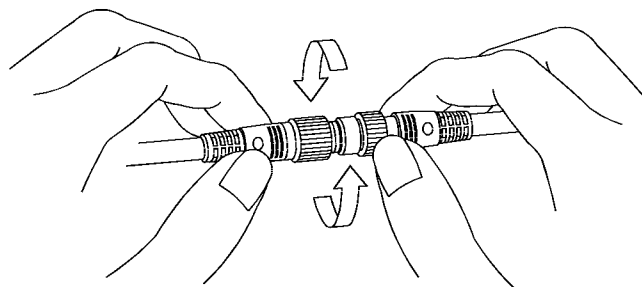


VA connector (female)



Sensor

PA5 cord (w/VA connector)

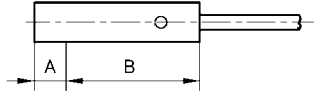


PRECAUTIONS

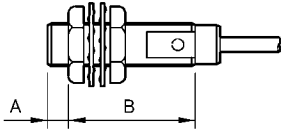
● Mounting

The allowable tightening torque varies according to the distance from the tip of the sensing head.

Without thread



With thread

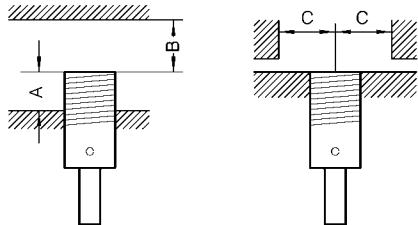


Catalog listing	A dimensions (mm)	Allowable tightening torque (N-m)	
		A	B
FL7N-P8□6	6	Cannot be tightened	0.2
FL7N-1P5□6	8	Cannot be tightened	0.3
FL7M-P8□6	0	1	1
FL7M-1P5□6	10	2	3
FL7M-2□6	12	12	20
FL7M-5□6	15	30	50
FL7M-10□6	17	50	150

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

● Influence of surrounding metal

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



Shaded areas indicate surrounding metal other than the target object.

A: Dimension to tip (sensing face) of proximity sensor from mounting surface

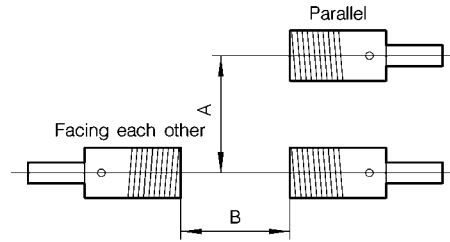
B: Dimension to front iron plate from tip (sensing face) of proximity sensor

C: Dimension to front iron plate of proximity switch when A = 0

Catalog listing	A (mm)	B (mm)	C (mm)
FL7 ^N _M -P8□6	0	2.4	4
FL7 ^N _M -1P5□6	0	4.5	6
FL7M-2□6□	0	8	9
FL7M-5□6□	0	20	13.5
FL7M-10□6□	0	40	22.5

● 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 below.



Catalog listing	A (mm)	B (mm)
FL7 ^N _M -P8□6	15	20
FL7 ^N _M -1P5□6	15	20
FL7M-2□6□	20	20
FL7M-5□6□	35	50
FL7M-10□6□	70	100

● 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.



RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment. Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

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