

FL7N/M Series DC 2-wire Type (shielded/unshielded) Cylindrical Proximity Sensors

FEATURES

Rigid Structure, Highly Water-proof DC 2-wire Type with Improved Visibility Indicator Lamps.

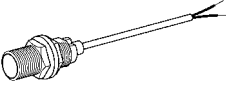
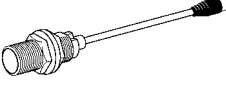

- DC 2-wire reducing wiring costs.
- Stable sensing area displayed by setting indicator.
- Rigid housing allows higher tightening torque.
- Indicator lamp can be confirmed from any direction. (firefly-glow indicator)
- Lowest current consumption: 0.55mA. (shielded type with a firefly-glow indicator)
- High seal capability: IP67G, core leads shielded. (shielded type with a firefly-glow indicator)
- Highest response: 2kHz. (M8 shielded type with a firefly-glow indicator)
- Non-polar DC 2-wire long sensing distance model available.



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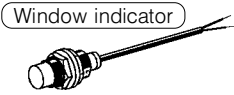
ORDER GUIDE

- Shielded
- General type (threaded)

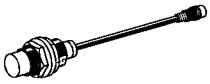
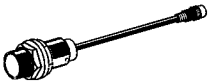
| Appearance | | Sensing distance | Operation mode | Setting indication | Cord characteristics | | Catalog listing |
|--|--|------------------|----------------|--------------------|----------------------|------------------------|------------------------|
| Sensor package style | Dimensions (O.D.) | | | | Oil resistance | | |
| (Fire-fly indicator) Pre-leaded type (cord length 2m)  | M8 | 2mm | N.O. | ○ | ○ | FL7M-2J6HD | |
| | | | N.C. | | ○ | FL7M-2K6H | |
| | M12 | 3mm | N.O. | ○ | ○ | FL7M-3J6HD | |
| | | | | ○ | ○ | FL7M-3J6HDG | |
| | | | N.C. | | ○ | FL7M-3K6H | |
| | | | | | ○ | FL7M-3K6HG | |
| | M18 | 7mm | N.O. | ○ | ○ | FL7M-7J6HD | |
| | | | N.C. | | ○ | FL7M-7K6H | |
| | M30 | 10mm | N.O. | ○ | ○ | FL7M-10J6D | |
| | | | N.C. | | ○ | FL7M-10K6 | |
| | (Fire-fly indicator) Pre-leaded connector type (cord length 30cm)  | M8 | 2mm | N.O. | ○ | ○ | FL7M-2J6HD-CN03 |
| | | | | N.C. | | ○ | FL7M-2K6H-CN03 |
| M12 | | 3mm | N.O. | ○ | ○ | FL7M-3J6HD-CN03 | |
| | | | N.C. | | ○ | FL7M-3K6H-CN03 | |
| M18 | | 7mm | N.O. | ○ | ○ | FL7M-7J6HD-CN03 | |
| | | | N.C. | | ○ | FL7M-7K6H-CN03 | |
| M30 | | 10mm | N.O. | ○ | ○ | FL7M-10J6D-CN03 | |
| | | | N.C. | | ○ | FL7M-10K6-CN03 | |
| (Window indicator) Connector type  | | M12 | 3mm | N.O. | ○ | | FL7M-3J6HD-CN |
| | | | | N.C. | | | FL7M-3K6H-CN |
| | | M18 | 7mm | N.O. | ○ | | FL7M-7J6HD-CN |
| | | | | N.C. | | | FL7M-7K6H-CN |
| | M30 | 10mm | N.O. | ○ | | FL7M-10J6D-CN | |
| | | | N.C. | | | FL7M-10K6-CN | |

● General type (non-threaded)

Pre-leaded type

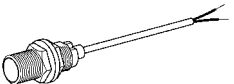
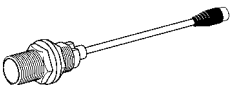
| Appearance | | Sensing distance | Operation mode | Setting indication | Cord characteristics Oil resistance | Catalog listing |
|---|-------------------|------------------|----------------|-----------------------|--|-------------------|
| Sensor package style | Dimensions (O.D.) | | | | | |
|  | 6.5dia. | 2mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7N-2J6HD |
| | | | N.C. | | <input type="radio"/> | FL7N-2K6H |

● Spatter-guarded type (threaded, with a window indicator)

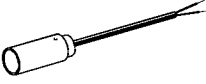


| Appearance | | Sensing distance | Operation mode | Setting indication | Spatter-guarded | Cord characteristics Oil resistance | Catalog listing |
|--|-------------------|------------------|----------------|-----------------------|-----------------------|--|-------------------------|
| Sensor package style | Dimensions (O.D.) | | | | | | |
|  | M12 | 3mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-3J6HW |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-3K6HWE |
| | M18 | 7mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-7J6HW |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-7K6HWE |
| | M30 | 10mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-10J6W |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-10K6WE |
|  | M12 | 3mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-3J6HW-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-3K6HWE-CN03 |
| | M18 | 7mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-7J6HW-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-7K6HWE-CN03 |
| | M30 | 10mm | N.O. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | FL7M-10J6W-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> | FL7M-10K6WE-CN03 |

Note: Black cap for **FL7M-10K6WET-CN**

● Long sensing distance non-polar type (threaded)

| Appearance | | Sensing distance | Operation mode | Setting indication | Cord characteristics Oil resistance | Catalog listing |
|---|-------------------|------------------|----------------|-----------------------|--|------------------------|
| Sensor package style | Dimensions (O.D.) | | | | | |
|  | M12 | 4mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-4W6 |
| | | | | <input type="radio"/> | <input type="radio"/> | FL7M-4Y6 |
| | M18 | 8mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-8W6 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> |
| | M30 | 15mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-15W6 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> |
|  | M12 | 4mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-4W6-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> |
| | M18 | 8mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-8W6-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> |
| | M30 | 15mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-15JW6-CN03 |
| | | | N.C. | | <input type="radio"/> | <input type="radio"/> |

● Unshielded (threaded)

| Appearance | | Sensing distance | Operation mode | Setting indication | Cord characteristics | | Catalog listing |
|--|-------------------|------------------|----------------|-----------------------|-----------------------|-------------------------|-----------------|
| Sensor package style | Dimensions (O.D.) | | | | Oil resistance | | |
| (Fire-fly indicator) Pre-leaded type (cord length 2m)  | M8 | 4mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-4J6ND | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-4K6N | |
| | M12 | 8mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-8J6ND | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-8K6N | |
| | M18 | 14mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-14J6ND | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-14K6N | |
| | M30 | 24mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-24J6ND | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-24K6N | |
| (Fire-fly indicator) Pre-leaded connector type (cord length 30cm)  | M8 | 4mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-4J6ND-CN03 | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-4K6N-CN03 | |
| | M12 | 8mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-8J6ND-CN03 | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-8K6N-CN03 | |
| | M18 | 14mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-14J6ND-CN03 | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-14K6N-CN03 | |
| | M30 | 24mm | N.O. | <input type="radio"/> | <input type="radio"/> | FL7M-24J6ND-CN03 | |
| | | | N.C. | <input type="radio"/> | <input type="radio"/> | FL7M-24K6N-CN03 | |
| (Window indicator) Connector type  | M12 | 8mm | N.O. | <input type="radio"/> | | FL7M-8J6ND-CN | |
| | | | N.C. | | | FL7M-8K6N-CN | |
| | M18 | 14mm | N.O. | <input type="radio"/> | | FL7M-14J6ND-CN | |
| | | | N.C. | | | FL7M-14K6N-CN | |
| | M30 | 24mm | N.O. | <input type="radio"/> | | FL7M-24J6ND-CN | |
| | | | N.C. | | | FL7M-24K6N-CN | |

SPECIFICATIONS

- Shielded
- General type

| Catalog listing | | FL7M-2□6H□ | FL7M-3□6H□ | FL7M-7□6H□ | FL7M-10□6□ |
|--------------------------------|-----------|--|--|---|---|
| Actuation method | | High-frequency oscillation type | | | |
| Rated sensing distance | | 2±0.2mm | 3±0.3mm | 7±0.7mm | 10 ⁺² ₋₁ mm |
| Usable sensing distance | | 0 to 1.4mm | 0 to 2.1mm | 0 to 4.9mm | 0 to 7.0mm |
| Standard target object | | 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 | | | |
| Rated supply voltage | | 12/24Vdc | | | |
| Operating voltage range | | 10 to 30Vdc | | | |
| Leakage current | | 0.55mA max. | | | |
| Control output | | Switching current: 3 to 100mA, Voltage drop: 3V max., Output dielectric strength: 30Vdc | | | |
| Operating frequency | | 2kHz | 1.5kHz | 500Hz | |
| Temperature characteristics | | ±10% max. for the range of -25 to +70°C when +25°C is taken as standard temperature in sensing distance (±15% max. for the -2□6H□) | | | |
| Supply voltage characteristics | | ±1% max. with ±15% voltage fluctuation with rated supply voltage as standard voltage in sensing distance | | | |
| Indicator lamps | | N.O. type: Operation indication: Lights (red or green) at output Setting indication: Lights (green) in stable sensing area N.C. type: Operation indication: Goes out (red) in sensing area | | | |
| Operating temperature range | | -25 to +70°C | | | |
| Storage temperature range | | -40 to +85°C | | | |
| Insulation resistance | | 50MΩ min. (by 500Vdc megger) | | | |
| Dielectric strength | | 1,000Vac, 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 | | IP67G | | | |
| Weight | | Approx. 50g Main unit with 2m pre-leaded cable | Approx. 60g Main unit with 2m pre-leaded cable | Approx. 130g Main unit with 2m pre-leaded cable | Approx. 230g Main unit with 2m pre-leaded cable |
| Circuit protection | | Surge absorption, load short-circuit protection, reverse connection protection circuit | | | |
| Wiring method | | Pre-leaded connector, pre-leaded | | | |
| Material | Sensor | Case | SUS | Ni-plated brass | |
| | | Sensing face | PBT | | |
| | Connector | Housing | -CN03: polyester elastomer | | |
| | | Holder | Glass-lined polyester resin | | |
| | | Contact | Gold-plated brass | | |

- Installation Instructions No.: CP-UM-5110E

• Non-threaded type/spatter-guarded type

| Catalog listing | | FL7□-2□6H□ | FL7M-3□6HW□ | FL7M-7□6HW□ | FL7M-10□6W□ |
|--------------------------------|-----------|--|--|---|---|
| Actuation method | | High-frequency oscillation type | | | |
| Rated sensing distance | | 2±0.2mm | 3±0.3mm | 7±0.7mm | 10±1mm |
| Usable sensing distance | | 0 to 1.4mm | 0 to 2.1mm | 0 to 4.9mm | 0 to 7.0mm |
| Standard target object | | 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 | | | |
| Rated supply voltage | | 12/24Vdc | | | |
| Operating voltage range | | 10 to 30Vdc | | | |
| Leakage current | | 0.55mA max. | | | |
| Control output | | Switching current: 3 to 100mA Voltage drop: 3.0V max. Output dielectric strength: 30Vdc | | | |
| Operating frequency | | 1kHz | 1,500Hz | 500Hz | 500Hz |
| Temperature characteristics | | ±10% max. for the range of -25 to +70°C when +25°C is taken as standard temperature in sensing distance (±15% max. for the -2□6H□) | | | |
| Supply voltage characteristics | | ±1% max. with ±15% voltage fluctuation with rated supply voltage as standard voltage in sensing distance | | | |
| Indicator lamps | | N.O. type: Operation indication: Lights (orange or green) at output Setting indication: Lights (green) in stable sensing area N.C. type: Operation indication: Goes out (orange) in sensing area | | | |
| Operating temperature range | | -25 to +70°C | | | |
| Storage temperature range | | -40 to +85°C | | | |
| Insulation resistance | | 50MΩ min. (by 500Vdc megger) | | | |
| Dielectric strength | | 1,000Vac, 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 | | 980m/s ² 10 times in X, Y and Z directions | | | |
| Protection | | IP67 (IEC standard), IP67G (JAM standard) | | | |
| Weight | | Approx. 50g Main unit with 2m pre-leaded cable | Approx. 60g Main unit with 2m pre-leaded cable | Approx. 130g Main unit with 2m pre-leaded cable | Approx. 230g Main unit with 2m pre-leaded cable |
| Circuit protection | | Surge absorption, load short-circuit protection, reverse connection protection circuit | | | |
| Wiring method | | Connector, pre-leaded connector, pre-leaded | | | |
| Material | Sensor | Case | SUS | Ni-plated brass, W type: Ni-plated brass, fluorine resin coated | |
| | | Sensing face | PBT, W type: fluorine resin | | |
| | Connector | Housing | -CN03: polyester elastomer | | |
| | | Holder | Glass-lined polyester resin | | |
| | | Contact | Gold-plated brass | | |

• Long sensing distance non-polar type

| Catalog listing | | FL7M-4□6 | FL7M-8□6 | FL7M-15□6 |
|--------------------------------|-----------|--|-----------------------------|---------------------------|
| Actuation method | | High-frequency oscillation type (shielded) | | |
| Rated sensing distance | | 4 ± 0.4mm | 8 ± 0.8mm | 15 ± 1.5mm |
| Usable sensing distance | | 0 to 3.2mm | 0 to 6.4mm | 0 to 12mm |
| Standard target object | | 12 × 12mm, 1mm thick iron | 18 × 18mm, 1mm thick iron | 30 × 30mm, 1mm thick iron |
| Differential travel | | 15% max. of sensing distance | | |
| Rated supply voltage | | 12/24Vdc | | |
| Operating voltage range | | 10 to 30Vdc | | |
| Leakage current | | 0.55mA max. | | |
| Output operational mode | | DC 2-wire type, transistor output | | |
| Control output | | Switching current: 3 to 100mA, Voltage drop: 5.0V max. (swoting current: 100mA, cord length: 2mm) Output dielectric strength: 30Vdc | | |
| Operating frequency | | 1,000Hz | 500Hz | 300Hz |
| Temperature characteristics | | ±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 | | N.O. type: Operation indication: Lights (orange or green) at output Setting indication: Lights (green) in stable sensing area N.C. type: Operation indication: Goes out (orange) in sensing area | | |
| Operating temperature range | | -25 to +70°C | | |
| Storage temperature range | | -40 to +85°C | | |
| Insulation resistance | | 50MΩ min. (by 500Vdc megger) | | |
| Dielectric strength | | 1,000Vac, 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 | | 980m/s ² 10 times in X, Y and Z directions | | |
| Protection | | IP67 (IEC standard), IP67G (JAM standard) | | |
| Weight | | Approx. 60g | Approx. 130g | Approx. 230g |
| Circuit protection | | Surge absorption, load short-circuit protection, reverse connection protection circuit | | |
| Wiring method | | Pre-leaded connector, pre-leaded | | |
| Material | Sensor | Case | Ni-plated brass | |
| | | Sensing face | PBT | |
| | | Bush | Nylon | |
| | | Cord protector | Elastomer | |
| | Connector | Housing | Polyester elastomer | |
| | | Holder | Glass-lined polyester resin | |
| Contact | | Gold-plated brass | | |

• Installation Instructions No.: CP-UM-5291E

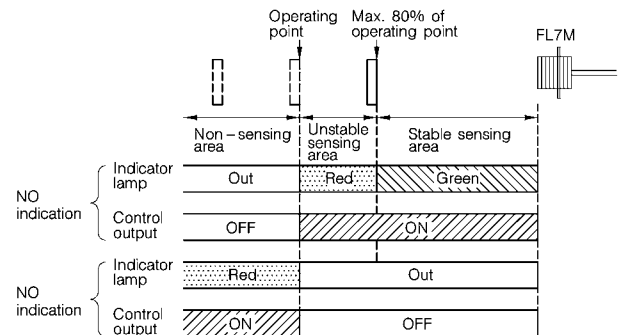
● Unshielded

| Catalog listing | FL7M-4□6N□ | FL7M-8□6N□ | FL7M-14□6N□ | FL7M-24□6N□ |
|--------------------------------|--|--|--|---|
| Actuation method | High-frequency oscillation type (unshielded) | | | |
| Rated sensing distance | 4 ± 0.4mm | 8 ± 0.8mm | 14 ± 1.4mm | 24 ± 2.4mm |
| Usable sensing distance | 0 to 2.8mm | 0 to 5.6mm | 0 to 9.8mm | 0 to 16.8mm |
| Standard target object | 20×20mm, 1mm thick iron | 30×30mm, 1mm thick iron | 30×30mm, 1mm thick iron | 54×54mm, 1mm thick iron |
| Differential travel | 15% max. of sensing distance | | | |
| Rated supply voltage | 12/24Vdc | | | |
| Operating voltage range | 10 to 30Vdc | | | |
| Leakage current | 1.0mA max. | | | |
| Control output | Switching current: 4 to 100mA, Voltage drop: 3.3V max., Output dielectric strength: 30Vdc | | | |
| Operating frequency | 800Hz | 600Hz | 400Hz | 100Hz |
| Temperature characteristics | ± 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 | N.O. type: Operation indication: Lights (red or green) at output Setting indication: Lights (green) in stable sensing area N.C. type: Operation indication: Goes out (red) in sensing area | | | |
| Operating temperature range | -25 to +70°C | | | |
| Storage temperature range | -40 to +85°C | | | |
| Insulation resistance | 50MΩ min. (by 500Vdc megger) | | | |
| Dielectric strength | 1,000Vac, 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 | Approx. 50g Main unit with 2m pre-leaded cable | Approx. 60g Main unit with 2m pre-leaded cable | Approx. 80g Main unit with 2m pre-leaded cable | Approx. 190g Main unit with 2m pre-leaded cable |
| Circuit protection | Surge absorption, load short-circuit protection, reverse connection protection circuit | | | |
| Wiring method | Connector, pre-leaded connector, pre-leaded | | | |
| Material | Sensor | Case | SUS | |
| | | Sensing face | Ni-plated brass | |
| | Connector | Housing | PBT | |
| | | Holder | -CN: Ni-plated brass, -CN03: polyester elastomer | |
| | | Contact | Glass-lined polyester resin | |
| | Contact | Gold-plated brass | | |

• Installation Instructions No.: CP-UM-3108E

ABOUT SETTING INDICATION

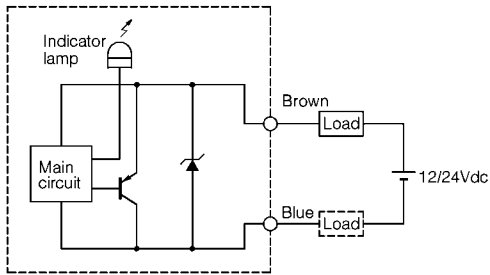
The proximity sensor can detect objects reliably by bringing the proximity sensor close to the target object and setting the sensor at the position (N.O. indication) where the indicator lamp changes from red to green.



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.

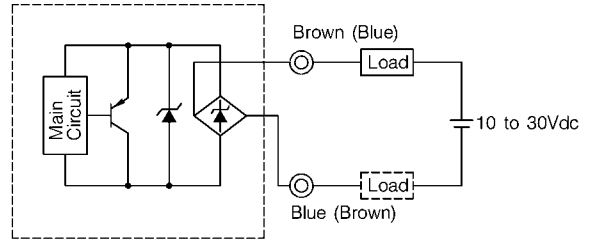
WIRING DIAGRAM

• General/spatter-guarded/unshielded types



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

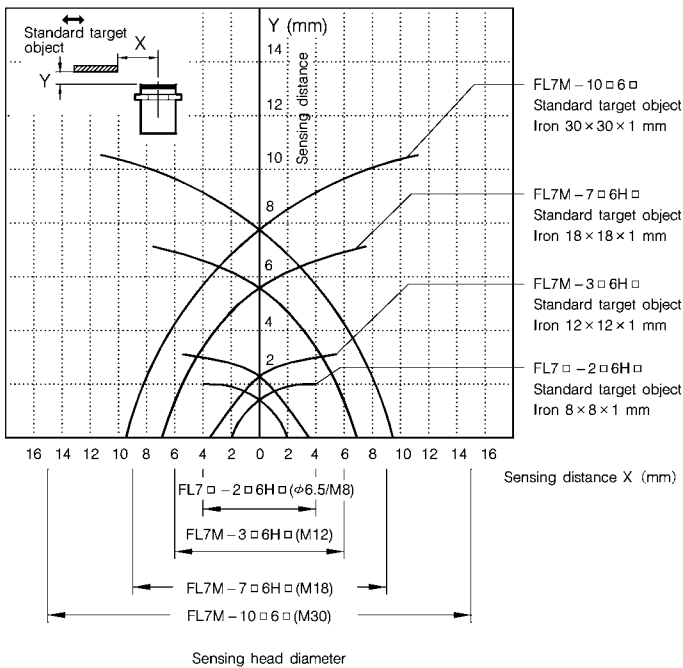
• Long sensing distance non-polar type



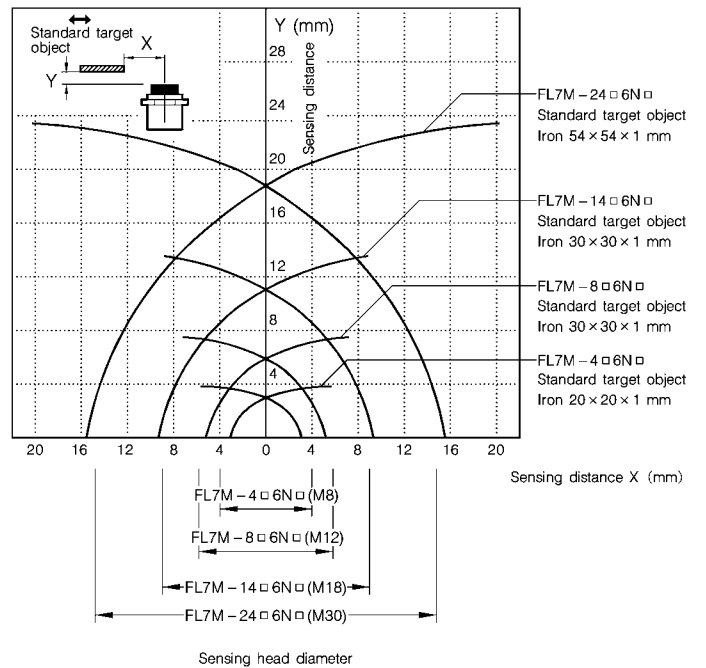
Note: The load can be connected to either of the power supplies.

SENSING AREA DIAGRAMS (typical examples)

• Shielded



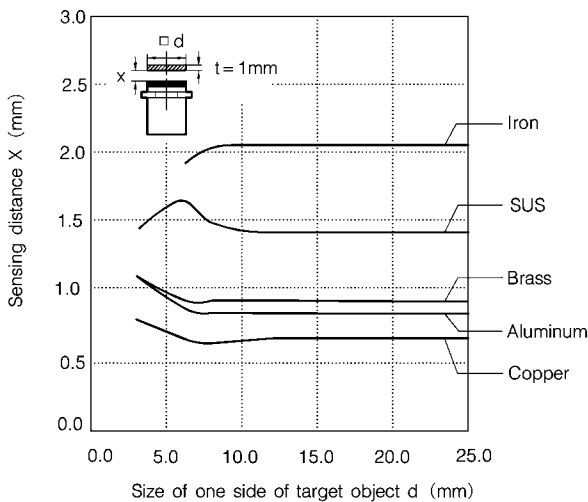
• Unshielded



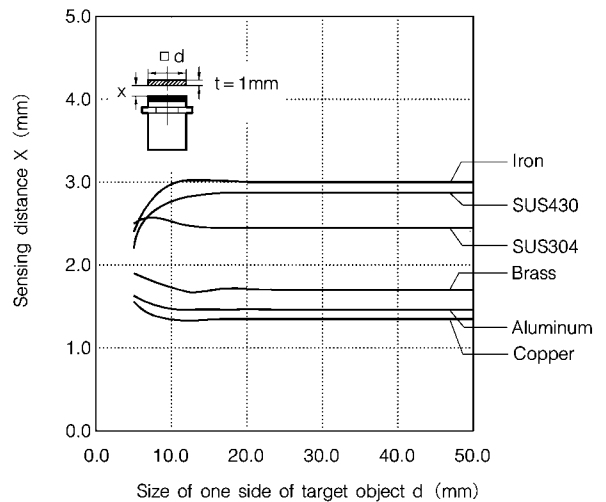
SENSING DISTANCE ACCORDING TO MATERIAL & SIZE OF OBJECT (typical examples)

• Shielded

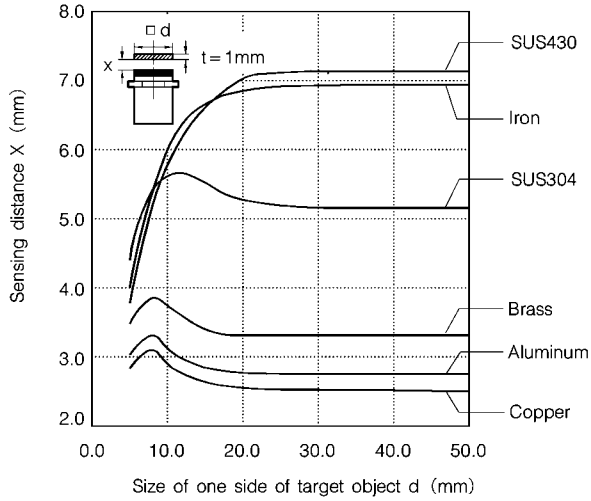
FL7□-2□6H□



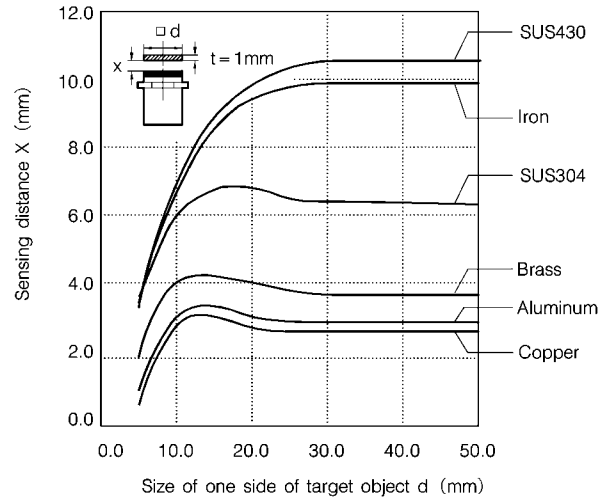
FL7M-3□6H□



FL7M-7□6H□

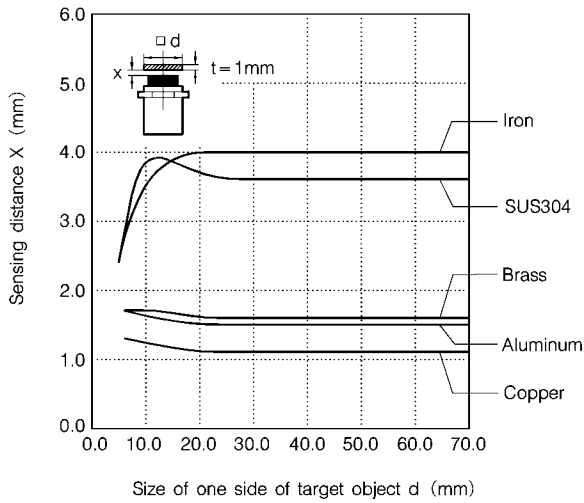


FL7M-10□6□

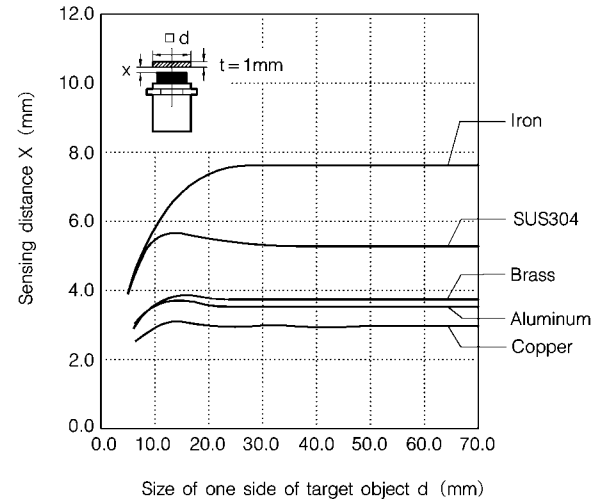


● Unshielded

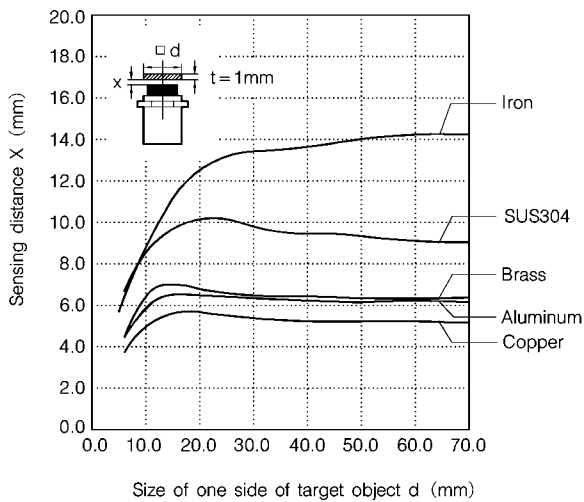
FL7M-4□6N□



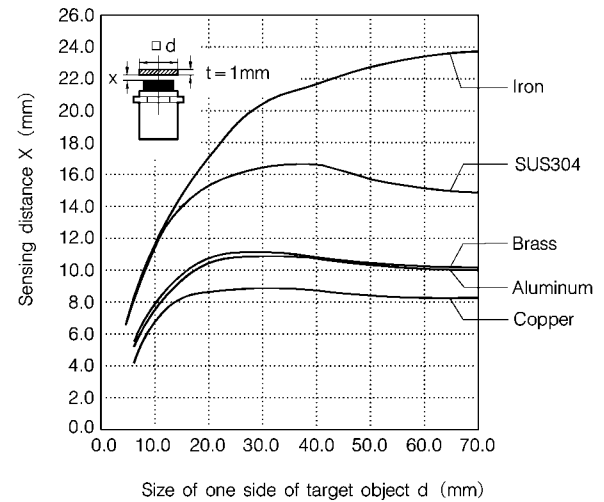
FL7M-8□6N□



FL7M-14□6N□

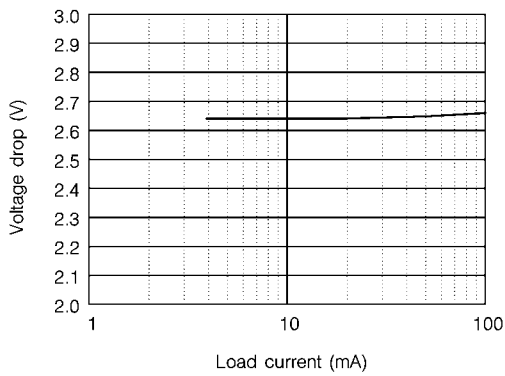


FL7M-24□6N□

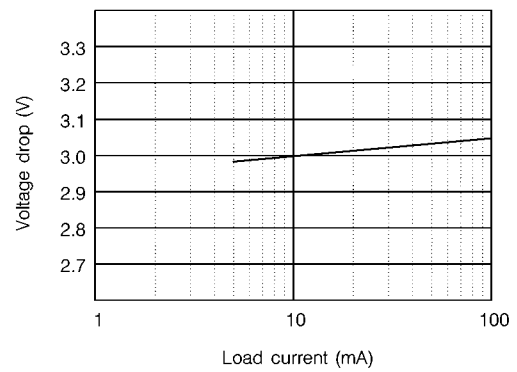


VOLTAGE DROP CHARACTERISTICS (typical examples)

- (With a firefly-glow indicator) shielded
(in 10 to 30Vdc)

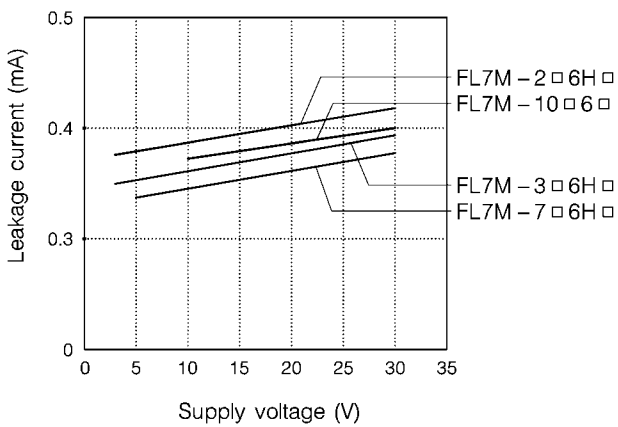


- (With a window indication) shielded/unshielded
(at 24Vdc)

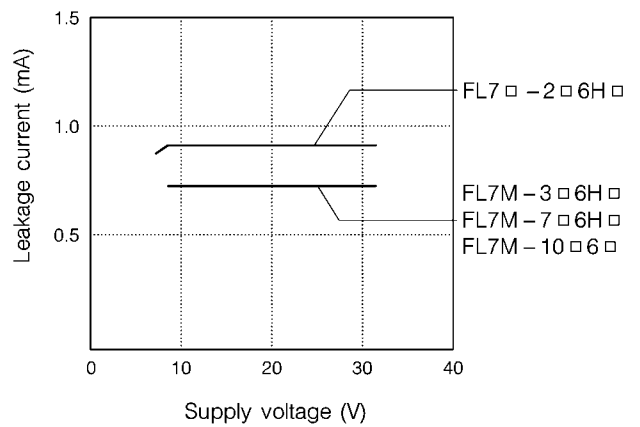


LEAKAGE CURRENT CHARACTERISTICS (typical examples)

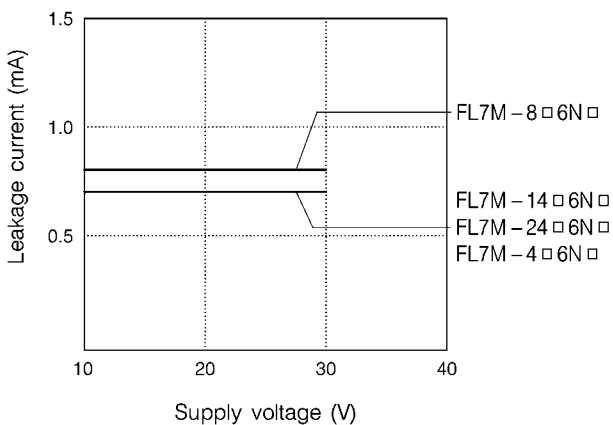
- (With a firefly-glow indicator) shielded and spatter-guarded types



- (With a window indicator) shielded

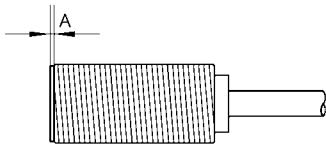


- Unshielded



EXTERNAL DIMENSIONS

Long sensing distance non-polar type sensor has the projection of resin as shown below.



| Catalog listing | "A" distance (mm) |
|-----------------|-------------------|
| FL7M-4□6 | 0.6 |
| FL7M-8□6 | 0.6 |
| FL7M-15□6 | 1.0 |

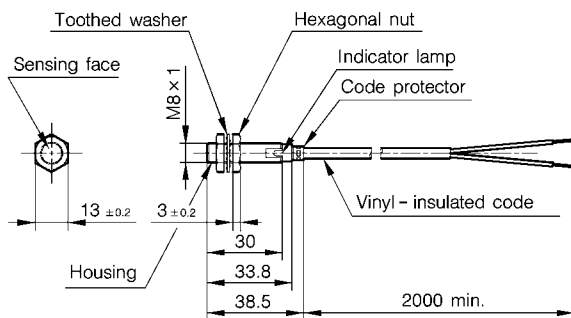
● Shielded

(unit: mm)

• General type/long sensing distance non-polar type (threaded)

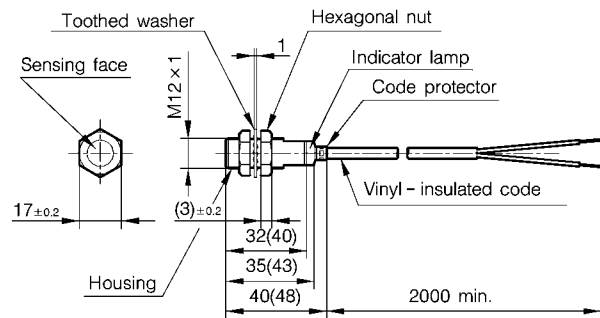
Pre-leaded type

FL7M-2□6H□



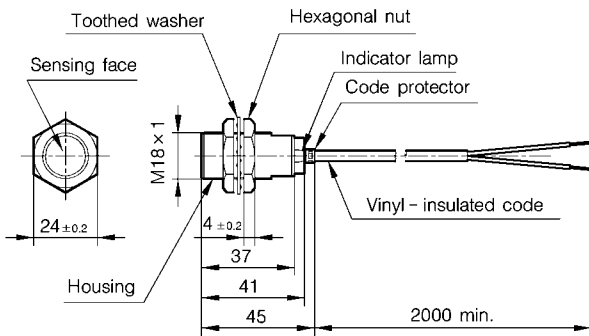
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.1mm dia.
Cap color: blue

FL7M-4□6, FL7M-3□6H□



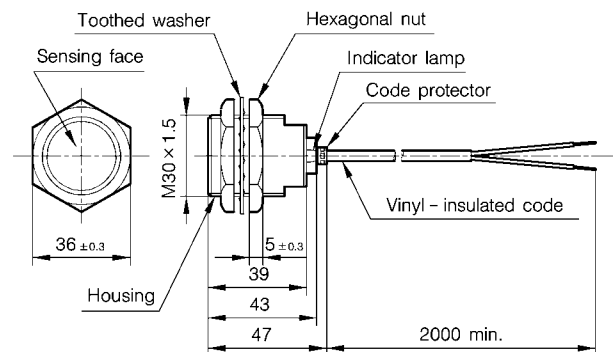
The **FL7M-4□6** has a 0.6mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Numbers in parentheses indicate dimensions for G type. Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.1mm dia.
Cap color: blue

FL7M-8□6, FL7M-7□6H□



The **FL7M-8□6** has a 0.6mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 2-core) 5.7dia.
Cap color: blue

FL7M-15□6, FL7M-10□6

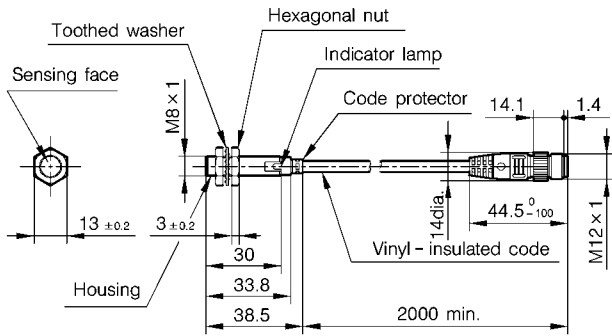


The **FL7M-15□6** has a 1.0mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Vinyl-insulated cord (oil-resistant: 0.5mm², 20/0.18, 2-core) 5.7dia.
Cap color: blue

Pre-leaded connector type

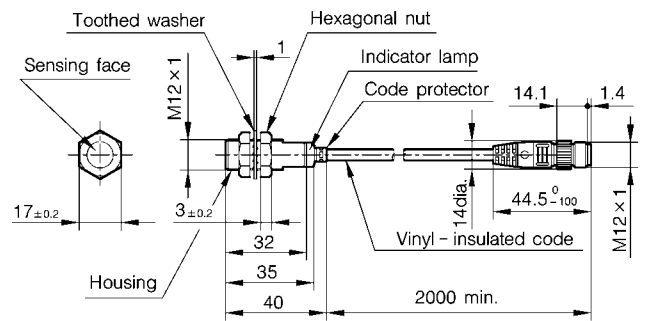
(unit: mm)

FL7M-2□6H□-CN03



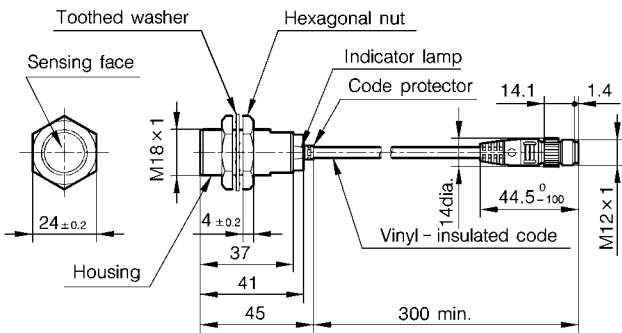
Vinyl-insulated cord (Vibration-resistant, oil-resistant: 0.3mm², 27/0.12, 2-core) 4.1dia.
Cap color: blue

FL7M-4□6-CN03, FL7M-3□6H□-CN03



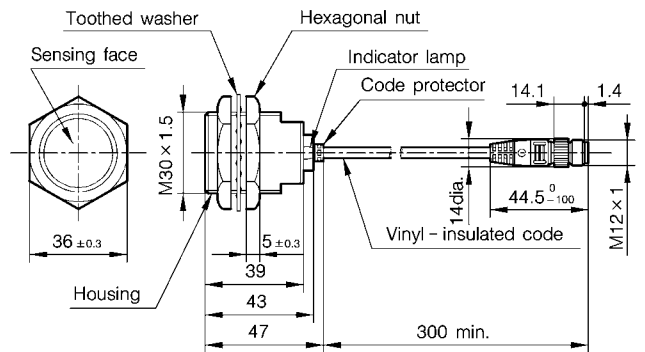
The **FL7M-4□6-CN03** has a 0.6mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Vinyl-insulated cord (Vibration-resistant, oil-resistant: 0.3mm², 27/0.12, 2-core) 4.1dia.
Cap color: blue

FL7M-8□6□-CN03, FL7M-7□6H□-CN03



The **FL7M-8□6□-CN03** has a 0.6mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Vinyl-insulated cord (Vibration-resistant, oil-resistant: 0.5mm², 20/0.18, 2-core) 5.7dia.
Cap color: blue

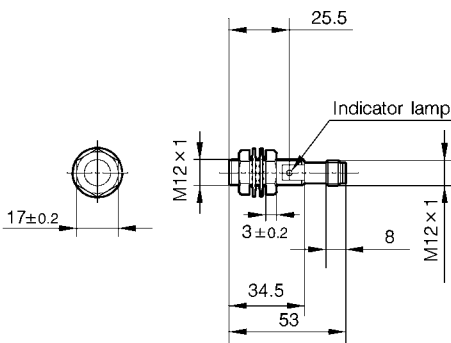
FL7M-15□6□-CN03, FL7M-10□6□-CN03



The **FL7M-15□6□-CN03** has a 1.0mm projection of resin at the sensing face. (The total length is same.) Refer to the previous item.
Vinyl-insulated cord (Vibration-resistant, oil-resistant: 0.5mm², 20/0.18, 2-core) 5.7dia.
Cap color: blue

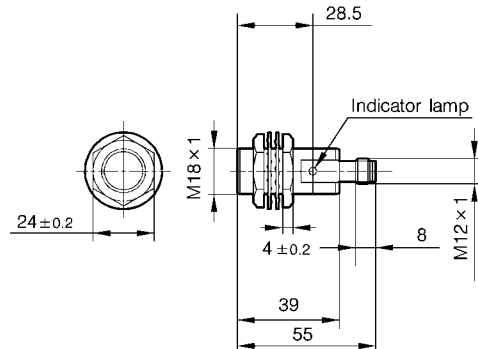
Connectot type (general type only)

FL7M-3□6H□-CN



Cap color: blue

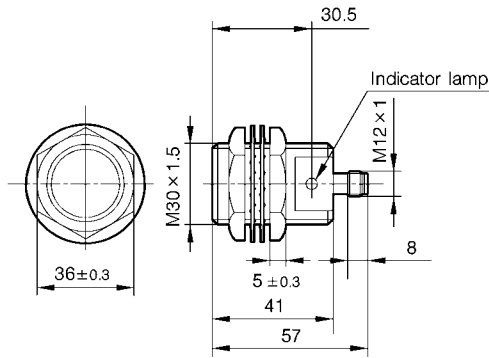
FL7M-7□6H□-CN



Cap color: blue

FL7M-10□6□-CN

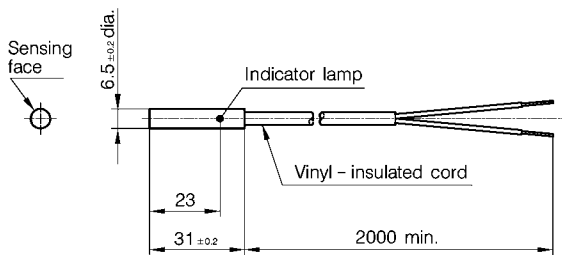
(unit: mm)



Cap color: blue

General type (Non-threaded)

FL7M-2□6H□

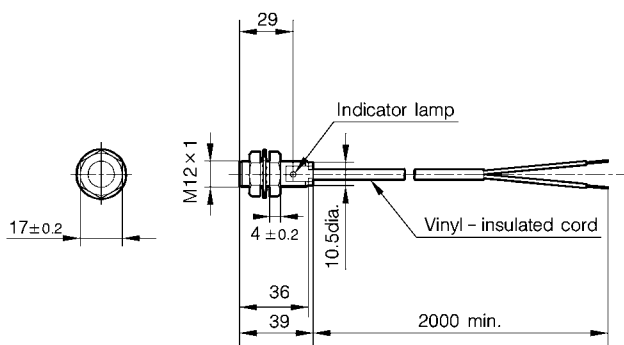


Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.2mm dia.
Cap color: blue

● Spatter-guarded

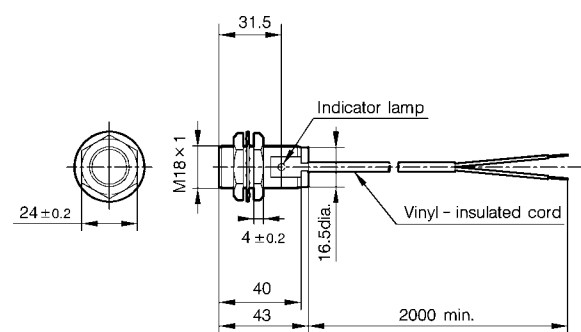
Pre-leaded type

FL7M-3□6HW□-R



Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7dia.
Cap color: white

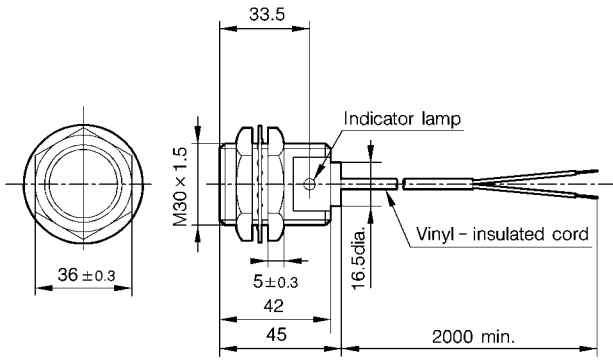
FL7M-7□6HW□-R



Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7dia.
Cap color: white

FL7M-10□6W□-R

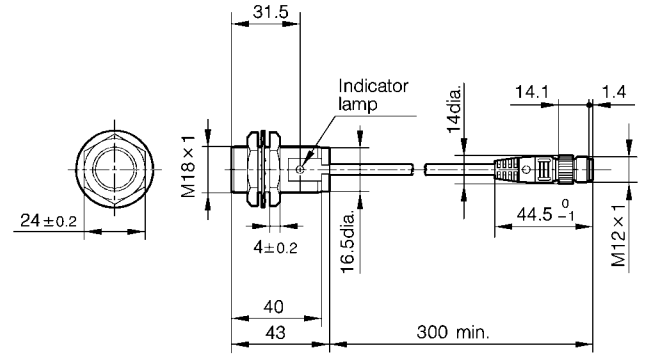
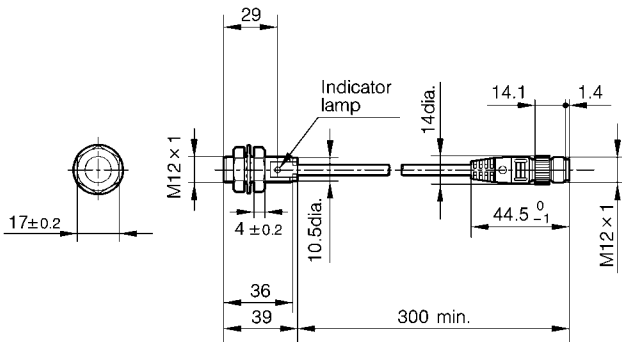
(unit: mm)



Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7 dia.
Cap color: white

Pre-leaded connector type
FL7M-3□6HW□-CN03

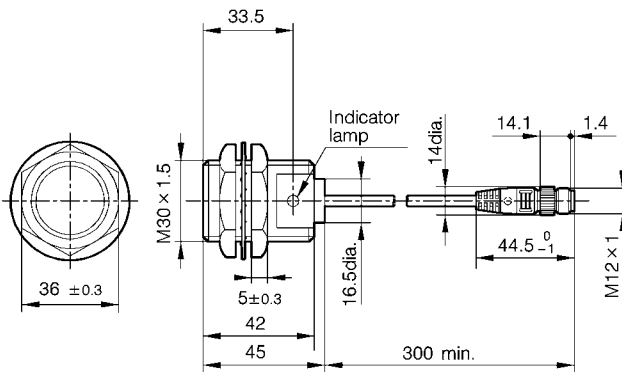
FL7M-7□6HW□-CN03



Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7 dia.
Cap color: white

Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7 dia.
Cap color: white

FL7M-10□6W□-CN03



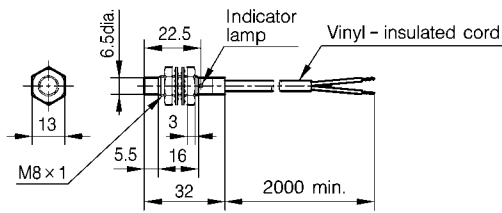
Vinyl-insulated cord (flame-resistant, oil-resistant, bend-resistant: 0.5 mm², 21/0.18, 2-core) 5.7 dia.
Cap color: white

● Unshielded (threaded)

(unit: mm)

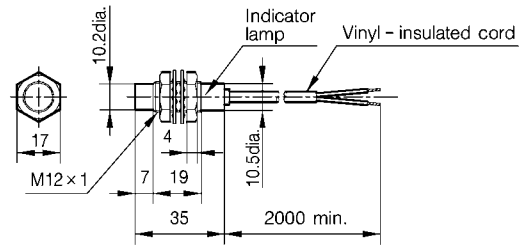
Pre-leaded type

FL7M-4□6N□



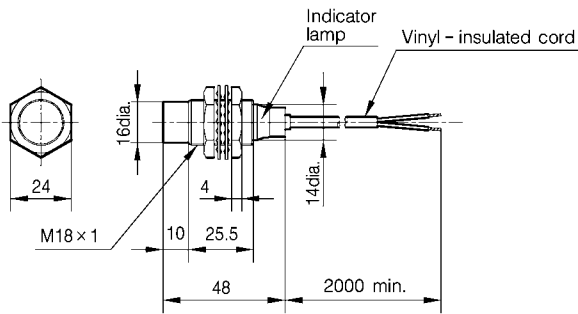
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.2mm dia.
Cap color: blue

FL7M-8□6N□



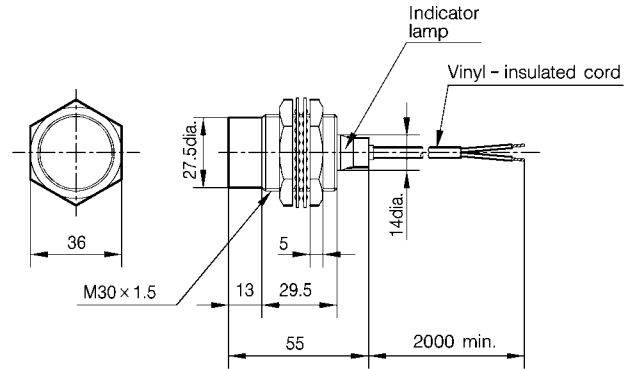
Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.2mm dia.
Cap color: blue

FL7M-14□6N□



Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.2mm dia.
Cap color: blue

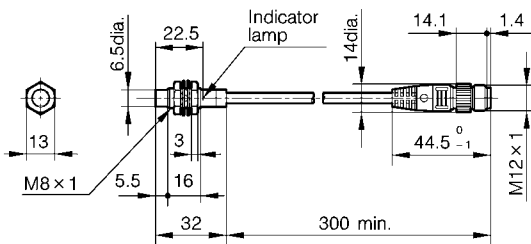
FL7M-24□6N□



Vinyl-insulated cord (oil-resistant: 0.3mm², 27/0.12, 2-core) 4.2mm dia.
Cap color: blue

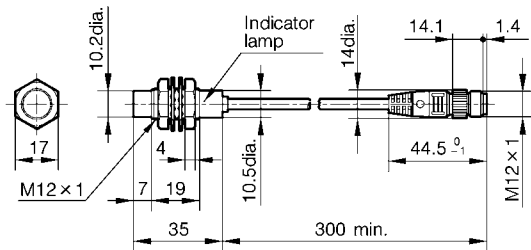
Pre-leaded connector type

FL7M-4□6N□-CN□□



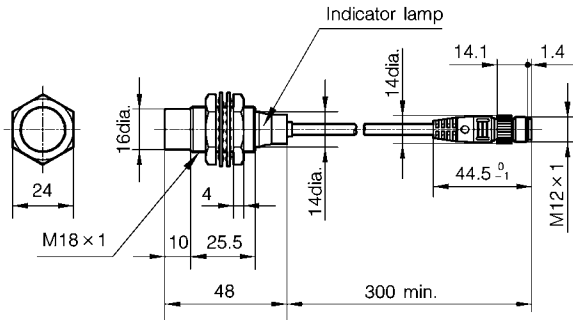
Cap color: blue

FL7M-8□6N□-CN□□



Cap color: blue

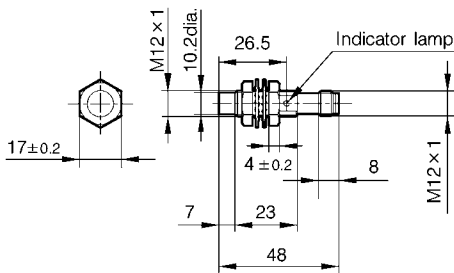
FL7M-14□6N□-CN□□



Cap color: blue

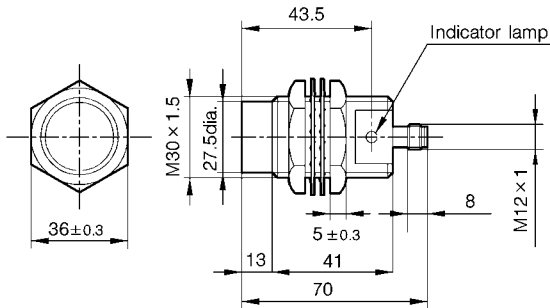
Connector type

FL7M-8□6N□-CN



Cap color: blue

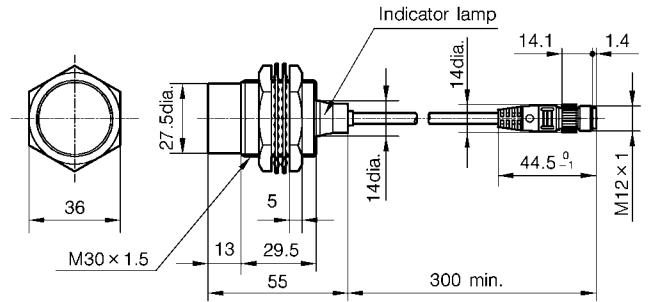
FL7M-24□6N□-CN



Cap color: blue

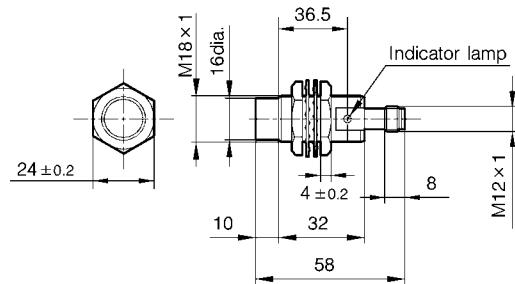
FL7M-24□6N□-CN□□

(unit: mm)



Cap color: blue

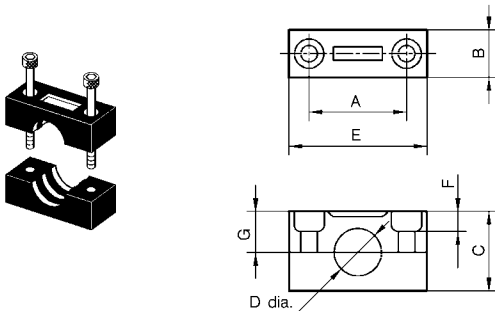
FL7M-14□6N□-CN



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.

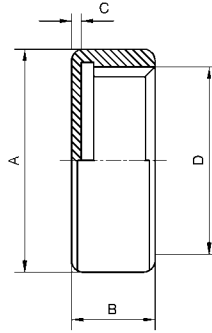
| Catalog listing | Dimensions (mm) | | | | | | | Screw dimensions | |
|-----------------|-----------------|----|----|----|----|-----|------|------------------|------|
| | A | B | C | D | E | F | G | Diameter | Neck |
| FL-PA112 | 25 | 12 | 20 | 12 | 36 | 6 | 9.5 | M4 | 25 |
| FL-PA118 | 30/32 | 15 | 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)

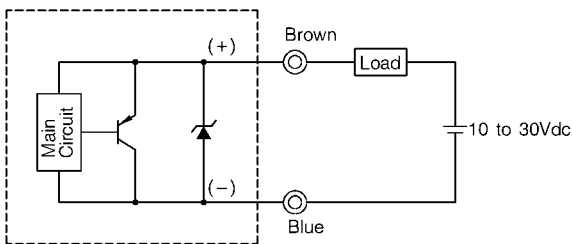
Protective covers (material: poly-acetal resin) are available for shielded models. Select a model according to the sensor's external dimensions.



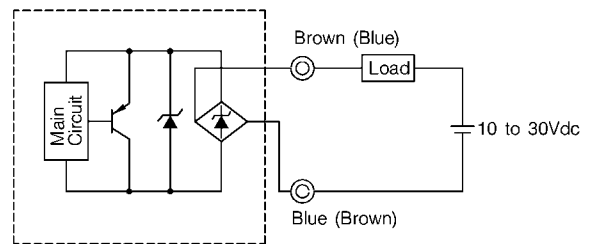
| Catalog listing | Dimensions (mm) | | | |
|-----------------|-----------------|---|---------------------|-----------|
| | A | B | C | D |
| FL-PA12 | 14dia. | 5 | $0.5^{+0.2}_{-0.1}$ | M12 × 1 |
| FL-PA18 | 21dia. | 6 | $0.5^{+0.2}$ | M18 × 1 |
| FL-PA30 | 33dia. | 8 | $1.5^{+0.2}$ | M30 × 1.5 |

WIRING

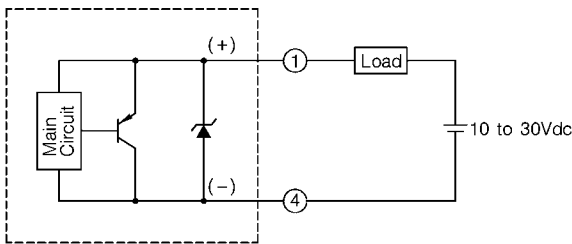
- General type/spatter-guarded type/unshielded type
- Pre-leaded type



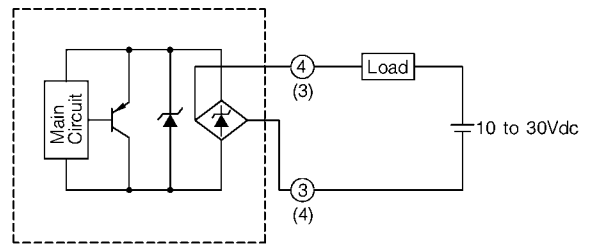
- Long sensing distance non-polar type
- Pre-leaded type



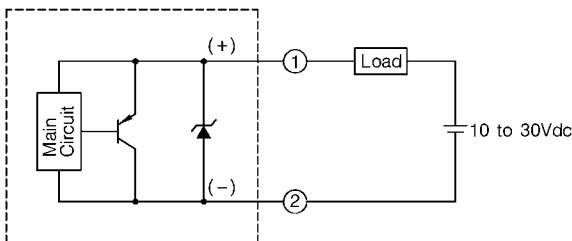
- Pre-leaded connector type (N.O. type)



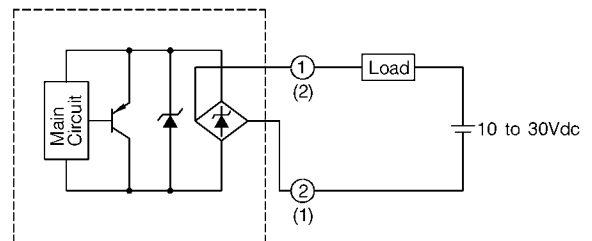
- Pre-leaded connector type (N.O. type)



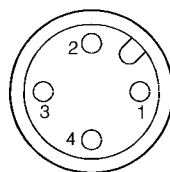
- Preleaded connector type (N.C. type)



- Preleaded connector type (N.C. type)

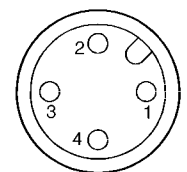


- The load be connected at both poles.
- The load must be used when power is applied to sensors. Combination of short circuit and wrong wiring will cause permanent damage, regardless of short circuit protection.
- LED operates normally during a load short circuit, therefore check the wiring when output is wrong.
- When connecting a connector, fasten tightly by hand.



Connector pin assignment

- The load be connected at both poles.
- LED operates normally during a load short circuit, therefore check the wiring when output is wrong.
- When connecting a connector, fasten tightly by hand.



Connector pin assignment

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 | 1,500Vdc 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 |
| 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 Coupling: Ni-plated brass O-ring: NBR |

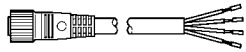
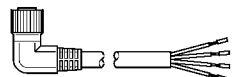
Note 1: Specifications assume Yamatake male/female connectors.

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

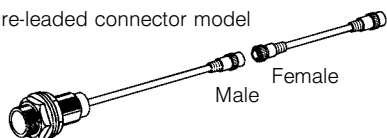
Be sure to use **PA5** Series cord with **VA** connector when connecting a pre-leaded connector or connector sensors.

● PA5 Series cord with VA connector

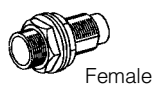
| Shape | Power supply | Cord length | Catalog listing | Lead color |
|---|--------------|-------------|--------------------|-----------------------------------|
|  | dc | 2m | PA5-4ISX2HK | 1-brown, 2-white, 3-blue, 4-black |
| | | 5m | PA5-4ISX5HK | |
|  | | 2m | PA5-4ILX2HK | |
| | | 5m | PA5-4ILX5HK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

PA5 Series cord with **VA** connector

Pre-leaded connector model

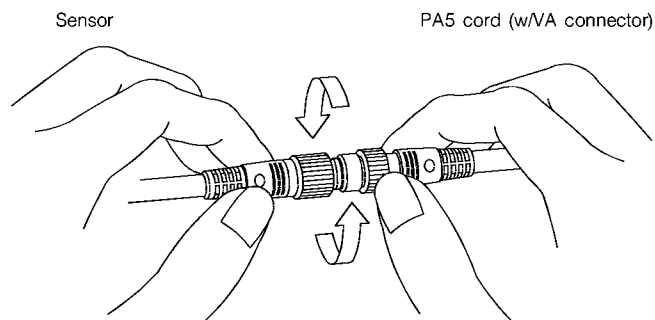


Connector model



● 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.



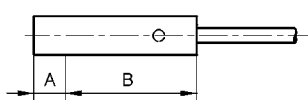
PRECAUTIONS

● Mounting

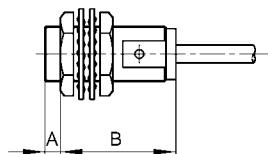
The allowable tightening torque varies according to the distance from the tip of the sensing head.

● Shielded

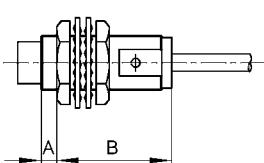
FL7N



FL7M



● Unshielded



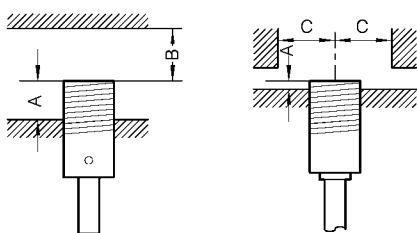
| Catalog listing | | A dimensions (mm) | Allowable tightening torque (N·m) | |
|---|-------------|-------------------|-----------------------------------|------|
| | | | A | B |
| Shielded (with a firefly-glow indicator) | FL7M-2□6□ | 10 | 9 | 12 |
| | FL7M-3□6□ | 10 | 20 | 30 |
| | FL7M-4□6□ | 10 | 20 | 30 |
| | FL7M-7□6□ | 0 | — | 70 |
| | FL7M-8□6□ | 0 | — | 70 |
| | FL7M-10□6□ | 0 | — | 150 |
| | FL7M-15□6□ | 0 | — | 150 |
| Shielded | FL7N-2□6H□ | 8 | Cannot be tightened | 0.3 |
| | FL7M-2□6H□ | 10 | 5.9 | 11.8 |
| | FL7M-3□6H□ | 12 | 11.8 | 19.6 |
| | FL7M-3□6H□ | 12 | 11.8 | 19.6 |
| | FL7M-7□6H□ | 15 | 29.4 | 49 |
| FL7M-10□6□ | 17 | 49 | 147 | |
| Unshielded | FL7M-4□6N□ | 0 | — | 7.8 |
| | FL7M-8□6N□ | 0 | — | 19.6 |
| | FL7M-14□6N□ | 10 | 29.4 | 49 |
| | FL7M-24□6N□ | 12 | 49 | 147 |

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

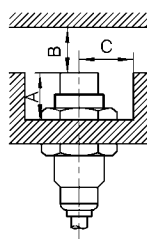
● Influence of surrounding metal

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

● Shielded



● Unshielded



Shaded areas indicate surrounding metal other than the target object.

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

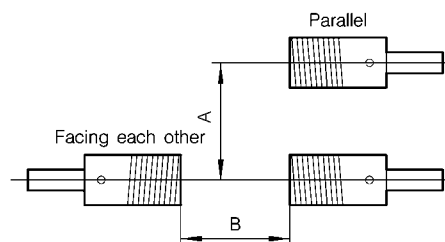
B: Dimension to front iron plate from tip (sensing face) of proximity sensor

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

| | Catalog listing | A (mm) | B (mm) | C (mm) |
|------------|-----------------|--------|--------|--------|
| Shielded | FL7□-2□6H□ | 0 | 8 | 8 |
| | FL7M-3□6H□ | 0 | 8 | 9 |
| | FL7M-4□6□ | 2.5 | 12 | 9 |
| | FL7M-7□6H□ | 0 | 20 | 13.5 |
| | FL7M-8□6□ | 3.5 | 24 | 13.5 |
| | FL7M-10□6□ | 0 | 40 | 22.5 |
| Unshielded | FL7M-4□6N□ | 13 | 8 | 12 |
| | FL7M-8□6N□ | 15 | 20 | 20 |
| | FL7M-14□6N□ | 22 | 40 | 35 |
| | FL7M-24□6N□ | 32 | 90 | 60 |

● 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) |
|------------|-----------------|----------|----------|
| Shielded | FL7□-2□6H□ | 16 | 20 |
| | FL7M-3□6H□ | 20 | 30 |
| | FL7M-4□6□ | 25 | 25 |
| | FL7M-7□6H□ | 35 | 50 |
| | FL7M-8□6□ | 40 | 50 |
| | FL7M-10□6□ | 70 | 100 |
| Unshielded | FL7M-15□6□ | 90 | 110 |
| | FL7M-4□6N□ | 60 | 80 |
| | FL7M-8□6N□ | 100 | 120 |
| | FL7M-14□6N□ | 110(60) | 200(100) |
| | FL7M-24□6N□ | 300(100) | 350(130) |

Numbers in parentheses “()” indicate the distance when different-frequency types are combined.

● **Cautions during series or parallel connection**

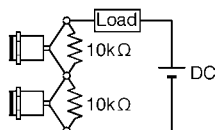
(1) **Series connection (AND connection)**

• 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 provided in parallel to each of the sensors. However, 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.

$$\text{Operation lag} = 40\text{ms} \times (\text{number of series connections} - 1)$$

$$\text{Voltage drop} = \text{voltage drop of single sensor} \times \text{number of series connected sensors}$$

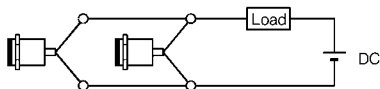


(2) **Parallel connection (OR connection)**

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

$$(\text{Leakage current} = \text{Leakage current of single sensor} \times \text{number of series connected sensors})$$

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



● **Relay loads**

The voltage drop of the **FL7M** Series is 3.3V (shielded T type: 3.5V).

Pay attention to this voltage drop when using a relay load. (With 12Vdc relays, switching is not possible.)

● **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.

● **Influence of leakage current**

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

Take sufficient care when restoring connected loads.

● **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.



RESTRICIONES 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.



Specifications are subject to change without notice.

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