SUNX

MANUAL SETTING FIBER SENSOR

New

FX-311

Conforming to EMC Directive

Applied for UL Recognition

Sensing New Frontiers

Presenting the ultimate in manual-setting fiber sensors.
Equips volume-control variety of sensors with sensitivity.

FX-311 realizes the ultimate in ease-of-operation. Its operation enables easy and full use of latest technology.

Presenting a product which satisfies professionals using volume control. Besides featuring an operation which makes full use of the latest functions easy, it provides maximum flexibility in dealing with different situations. FX-311 is, indeed, a professional fiber sensor.

Simple Realization of Ultimate in Easy-of-operation

12-turn Potentiometer with Visible Indicator

12-turn potentiometer has been incorporated for fine adjustments. It enables detection of very fine differences.
Moreover, since the pointer of indicator has a red backlight, its position can be confirmed at a glance even in a dark area.

Selectable Timer Period of OFF-delay Timer

FX-311 incorporates an OFF-delay timer. It is useful when the connected device has a slow response time or when small objects are being sensed and the output signal width is small. The timer period can be selected not only 40ms but also 10ms. It is also suitable for increased PLC speeds.

Selectable Between Three Modes According to Application

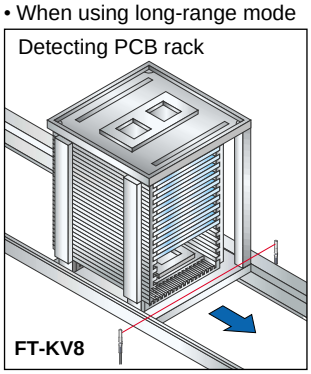
The most suitable sensing mode can be selected according to the application from three different modes with the mode selection switch.

Selectable between three modes

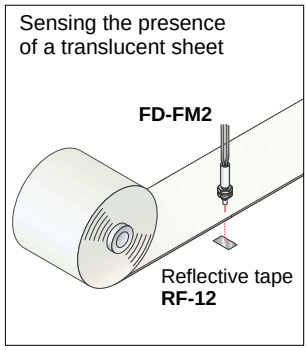
Long-range mode (LONG)	Used in case long distance sensing is required. (Response time: 2ms)
Standard mode (STD)	Used for general sensing application. (Response time: 250 μs)
Reduced intensity mode (S-D)	Since the emitted light amount is restricted in this mode, it is suitable for delicate sensing, such as when the received light is saturated due to too short a sensing distance or when detecting translucent objects, etc. (Response time: 250 μs)

Applications

• When using long-range mode



• When using reduced intensity mode



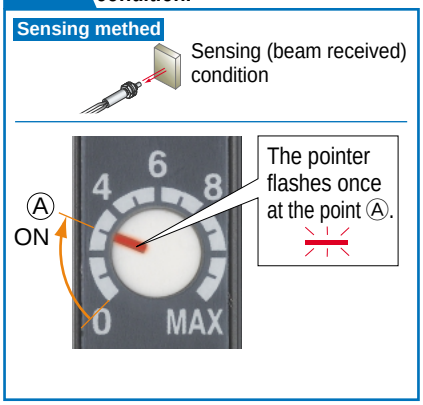
Easy Adjustment with 'Assist Function' for Knowing Optimum Sensitivity

Innovative feature

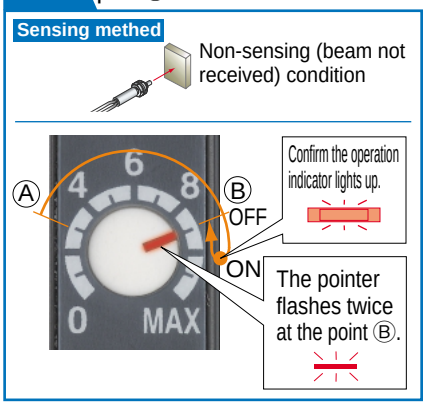
FX-311 has a built-in convenient 'assist function' which indicates the optimum sensitivity position by the rapid flashing of the indicator at the time of sensitivity adjustment. This enables easy and reliable sensitivity adjustment, which is convenient for a narrow sensing range requiring fine tuning.

※In order to make 'assist function' effective, switch the operation selection switch in the order L-ON→D-ON→L-ON .

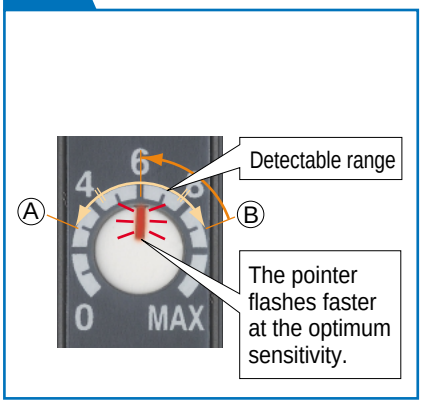
1 **Find the point Ⓐ where the sensor is switched ON in the sensing condition.**



2 **In the non-sensing condition, turn the adjuster until ON state again, turn the adjuster counterclockwise and find the point Ⓑ where it is switched OFF.**



3 **Optimum sensitivity point located.**

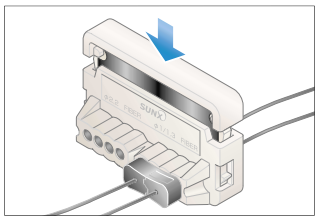


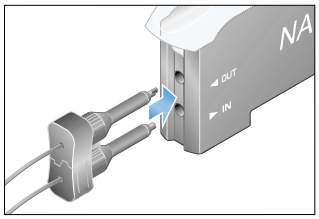
Easy Operation by Using a Convenient, Hand-turned Adjusting Knob of Hand-turned Knob Attached Cover

An optional hand-turned knob attached cover (**FX-AJ1/AJ1P**) is available, which makes a screwdriver unnecessary. On-site adjustment of sensitivity can be done at any time quickly and easily.

Now It's Possible to Simultaneously Cut Two Fibers to the Same Length

Each fiber (with some exceptions) has a newly developed two-in-one fiber attachment (**FX-AT2/AT3/AT4/AT5/AT6**) which enables two fibers to be cut simultaneously to the same length with the new fiber cutter (**FX-CT2**). Also, since the fibers can be attached to the amplifier while being fixed in position in the two-in-one fiber attachment, sensitivity changes due to variation in the amount of fiber insertion do not occur.





Innovative product based on FX-301 design concepts. Advanced manual setting fiber sensor.

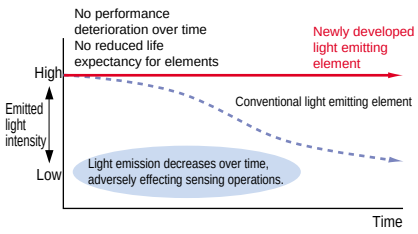
The original SUNX optical technology developed for the FX-301 digital fiber sensor, including its benefits of simple maintenance, reduced wiring and easy installation, is taken a step further with FX-311.
FX-311 incorporates technology to handle every major concern and deliver superior performance for a variety of on-site requirements.

Utilizes the Most Advanced Optical Technology Offered by SUNX

Long Life and Stable Operational Settings Assure Dependable Performance

Newly developed

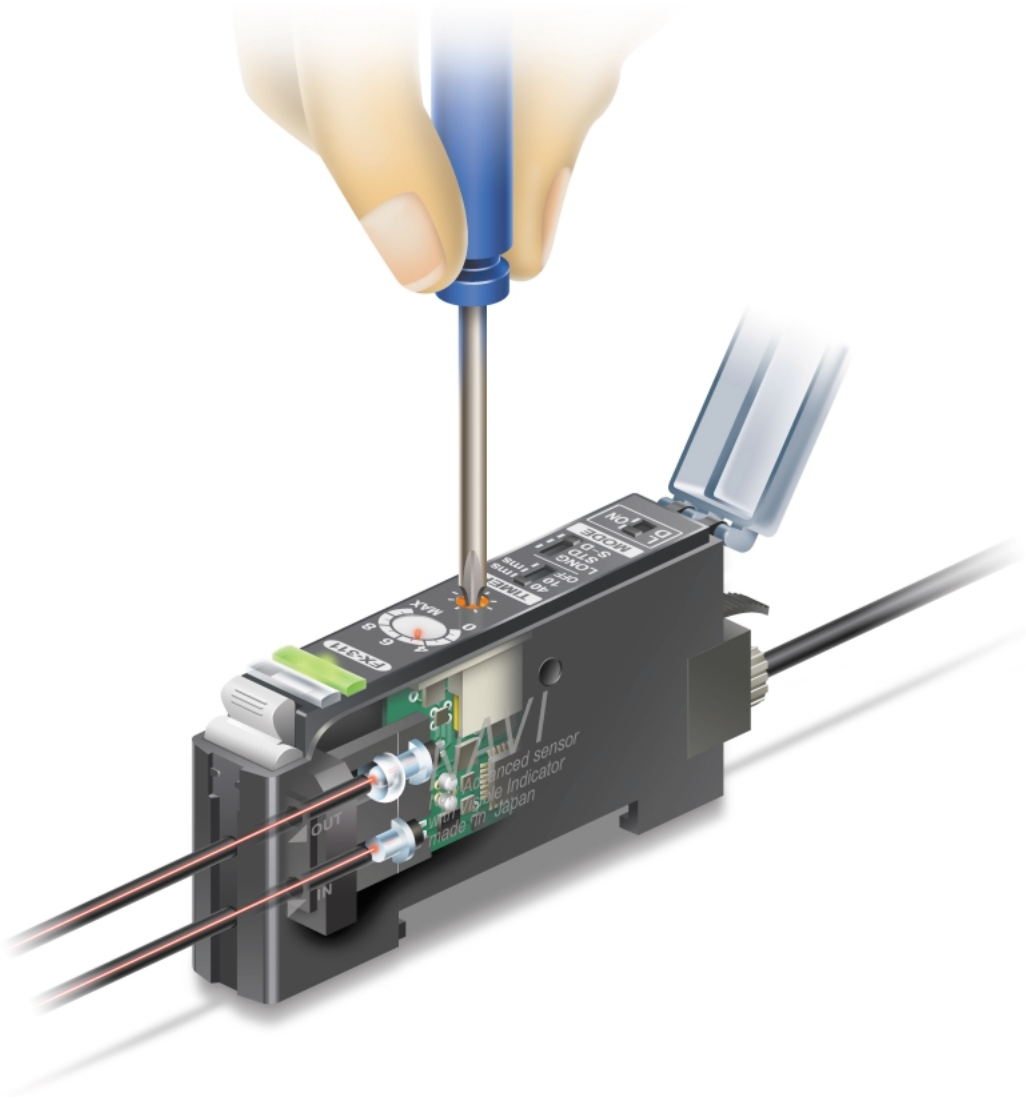
The light-emitting elements of conventional fiber sensors are affected by temperature and long-term use, changing their emission over time and requiring sensitivity readjustment. **FX-311** uses the newly developed 'LED using four chemical elements', a new LED first used in **FX-301**. This emitter greatly reduces adverse influences on emission performance, resulting in stable operation that almost never needs adjustment.



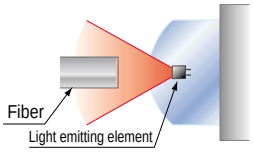
Long-range Sensing Made Possible with Built-in Optical Lens

Innovative feafure

The new developed optical 'double coupling lens' has been incorporated directly into the fiber sensor itself. This lens maximizes the light emission efficiency, resulting in a tremendous improvement in the sensing range. Sensing ranges with small diameter fiber and ultra-small diameter fiber, which have become very popular in recent years due to the miniaturization of chip components, have been increased by 50% over previous values achieved with other amplifiers.

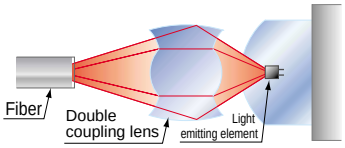


■Conventional fiber sensor system (without lens)



Low efficiency due to the diffusion and loss of emitted light.

■FX-311 (built-in double coupling lens)

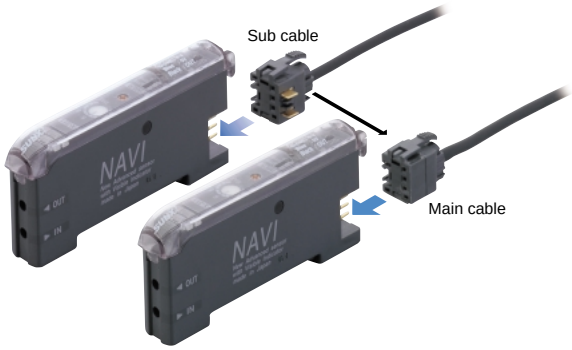


The light emission efficiency is increased tremendously, as light is now collected and focused into the fiber by the lens.

Specially Designed for Flexible Use and Simple Operation

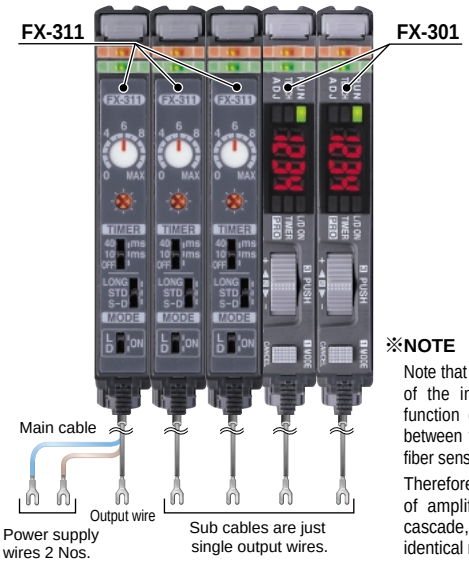
Maintenance Made Easy with Quick-connection Cables

Both main and sub units utilize the same amplifier body. This feature allows for easy mounting in the side-by-side configuration, because main and sub unit functions are distinguished only by the proper use of 3-core main cable for the main unit and 1-core sub cable for each sub unit. Moreover, due to the utilization of the same main body for both main and sub units, inventory management and maintenance, is simplified.



Side-by-side Connection with FX-301 Is also Possible for Wide-saving and Quick Installation

Each sub cable is a single output wire, reducing wiring and simplifying installation. Quick-connection cables are the same type as used on the **FX-301**, facilitating side-by-side connection. Further, the connectors are slide type, allowing removal without shifting amplifier positions. This eliminates the need to provide extra maintenance space around the amplifiers.

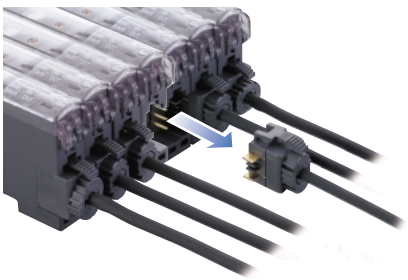


※NOTE

Note that settings other than that of the interference prevention function cannot be transmitted between this product and digital fiber sensor **FX-301(P)**.

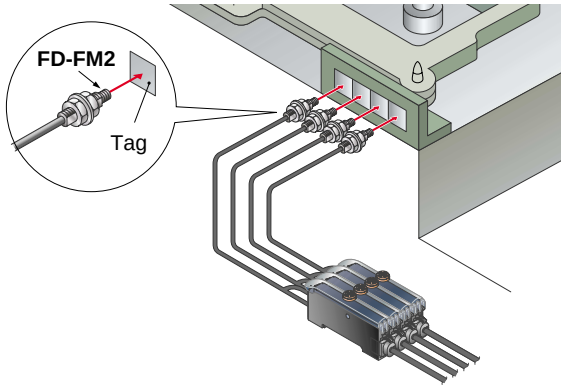
Therefore, in case both models of amplifiers are mounted in cascade, make sure to mount identical models together.

Sliding connectors are easy to insert and remove



Close Mounting Is Possible for up to Four Fiber Heads

If amplifiers are mounted side-by-side in cascade, the optical communication function automatically sets different emission timing for the amplifiers, at the time of switching on the power supply. Up to four fiber heads can be mounted closely, without mutual interference. **FX-301** units can also be used in these configurations.



ORDER GUIDE

Amplifiers

Please order the quick-connection cable separatebly.

Appearance	Model No.	Emitting element	Output
	**FX-311**	Red LED	NPN open-collector transistor
	FX-311P		PNP open-collector transistor

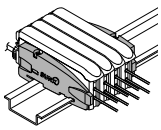
Quick-connection cables

Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.	Description	
Main cable	**CN-73-C1**	Length: 1m 3.281ft	0.2mm^2 3-core cabtyre cable, with connector on one end Cable outer diameter: ϕ3.8mm ϕ0.15in
	CN-73-C2	Length: 2m 6.562ft	
	CN-73-C5	Length: 5m 16.404ft	
Sub cable	**CN-71-C1**	Length: 1m 3.281ft	0.2mm^2 1-core cabtyre cable, with connector on one end Cable outer diameter: ϕ3.8mm ϕ0.15in
	CN-71-C2	Length: 2m 6.562ft	
	CN-71-C5	Length: 5m 16.404ft	

End plates

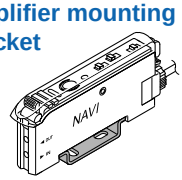
End plates are not supplied with the amplifier. Please order it separately when the amplifiers are mounted in cascade.

Appearance	Model No.	Description
	**MS-DIN-E**	When connecting multiple amplifiers, these end plates ensure that all amplifiers are mounted together in a secure and fully connected manner. Two Nos. per set

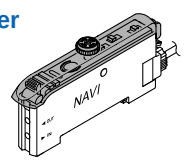
OPTIONS

Designation	Model No.	Description	
Amplifier mounting bracket	**MS-DIN-2**	Mounting bracket for amplifier	
Hand-turned knob attached cover	**FX-AJ1**	For NPN output type	Hand-turned knob allows easy adjustment of sensor sensitivity.
	FX-AJ1P	For PNP output type	
Fiber sensor amplifier protection seal	**FX-MB1**	10 sets of 2 communication window seals and 1 connector seal Communication window seal: It prevents malfunction due to transmission signal from another amplifier, as well as, prevents effect on another amplifier. Connector seal: It prevents contact of any metal, etc., with the pins of the quick-connection cable.	

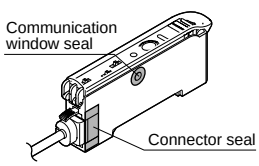
Amplifier mounting bracket



Hand-turned knob attached cover



Fiber sensor amplifier protection seal



ORDER GUIDE

General use fibers [Thru-beam type (one pair set)]

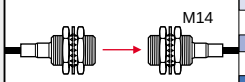
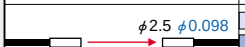
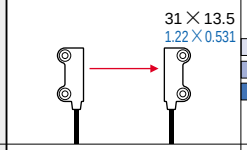
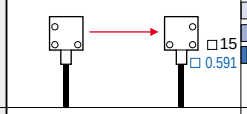
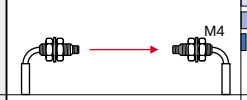
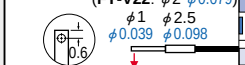
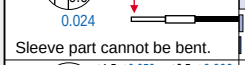
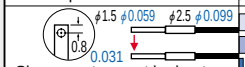
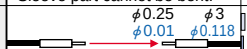
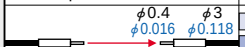
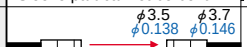
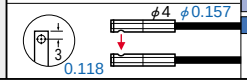
Type	Shape of fiber head (mm) (in)	Sensing range (Note 1) ☐: LONG ☐: STD ■: S-D	Min. sensing object (under the optimum condition (Note 3))	Features	Fiber cable length ✂: Free-cut	Allowble bending radius	Model No.
Standard (Long sensing range)	Lens mountable M4	1,100mm 43.307in 530mm 20.866in 180mm 7.087in	ϕ0.04mm ϕ0.002in opaque object	• 1.5 times approx. the sensing range as standard type	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-B8**
Standard	Lens mountable M4	780mm 30.709in 400mm 15.748in 130mm 5.118in	ϕ0.03mm ϕ0.001in opaque object	• Free-cut type	✂ 2m 6.562ft		**FT-FM2**
Standard	With sleeve M4 ϕ1.48 ϕ0.058						**FT-FM2S** With sleeve 90mm 3.543in
Standard	With sleeve M4 ϕ1.48 ϕ0.058						**FT-FM2S4** With sleeve 40mm 1.575in
Standard	ϕ2.5 ϕ0.098						**FT-SFM2**
Economy (Long sensing range)	M4	1,000mm 39.37in 480mm 18.898in 168mm 6.614in	ϕ0.03mm ϕ0.001in opaque object	• Low price & free-cut	✂ 2m 6.562ft (Note 2)		**FT-NB8**
Economy (Long sensing range)	M4	700mm 27.559in 360mm 14.173in 126mm 4.961in	ϕ0.03mm ϕ0.001in opaque object				**FT-N8**
Small fiber head	Lens mountable M3	780mm 30.709in 400mm 15.748in 130mm 5.118in	ϕ0.03mm ϕ0.001in opaque object	• Miniature head but having the same sensing range as the standard type fiber	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-T80**
Small diameter	M3	270mm 10.63in 140mm 5.512in 49mm 1.929in	ϕ0.025mm ϕ0.001in opaque object	• Suitable for detection in a congested equipment • Free-cut type	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-NFM2**
Small diameter	With sleeve M3 ϕ0.88 ϕ0.035						**FT-NFM2S** With sleeve 90mm 3.543in
Small diameter	With sleeve M3 ϕ0.88 ϕ0.035						**FT-NFM2S4** With sleeve 40mm 1.575in
Small diameter	ϕ1.5 ϕ0.059						**FT-SNFM2**
Sharp bend Standard	Lens mountable M4	570mm 22.441in 290mm 11.417in 100mm 3.937in	ϕ0.03mm ϕ0.001in opaque object	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm R0.039in or more.	✂ 2m 6.562ft	R1mm R0.039in or more	**FT-W8**
Sharp bend Standard	ϕ2.5 ϕ0.098						**FT-WS8**
Sharp bend Small diameter	M3	160mm 6.299in 80mm 3.15in 28mm 1.102in	ϕ0.02mm ϕ0.001in opaque object				**FT-W4**
Sharp bend Small diameter	ϕ1.5 ϕ0.059						**FT-WS4**
Sharp bend With lens	ϕ3 ϕ0.118	1,200mm 47.244in 600mm 23.622in 210mm 8.268in	ϕ0.02mm ϕ0.001in opaque object				**FT-WS8L**
Flexible	Front sensing 12×3 39.37×9.843	800mm 31.496in 400mm 15.748in 140mm 5.512in	ϕ0.03mm ϕ0.001in opaque object	• Installs with M2 screws, allowing easy beam axis alignment • Allowable bending radius: R4mm R0.157in or more • Bending durability: one million times or more (at R10mm R0.349in)	✂ 2m 6.562ft	R4mm R0.157in or more	New **FT-Z8**
Flexible	Side sensing 12×8 39.37×26.247	1,600mm 62.992in 800mm 31.496in 280mm 11.024in	ϕ0.03mm ϕ0.001in opaque object				New **FT-Z8E**
Flexible	Top sensing 8×12 26.247×39.37	2,700mm 106.299in 1,400mm 55.118in 490mm 19.291in	ϕ0.03mm ϕ0.001in opaque object				New **FT-Z8H**
Flexible	Lens mountable M4	650mm 25.591in 320mm 12.598in 110mm 4.331in	ϕ0.04mm ϕ0.002in opaque object	• Allowable bending radius: R4mm R0.157in or more • Bending durability: one million times or more (at R4mm R0.157in, **FT-P80**: at R10mm R0.394in)	✂ 2m 6.562ft		**FT-P80**
Flexible	Small diameter M3	**250mm** 9.843in **100mm** 3.937in 35mm 1.378in	ϕ0.02mm ϕ0.001in opaque object				**FT-P40**
Flexible	Small diameter ϕ1.5 ϕ0.059	280mm 11.024in 120mm 4.724in 42mm 1.654in	ϕ0.02mm ϕ0.001in opaque object		1m 3.281ft		**FT-P2**

Notes: 1) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.
2) Fiber cutter is not supplied as accessory along with standard (economy) fibers. Please order it separately.

3) The optimum condition is the condition when the sensitivity is set so that the output just changes to light incident operation in the object absent condition.

ORDER GUIDE

Special use fibers [Thru-beam type (one pair set)]

Type	Shape of fiber head (mm) (in)	Sensing range (Note 1) [□: LONG, □: STD, □: S-D]	Min. sensing object [under the optimum condition (Note 2)]	Features	Fiber cable length ✂: Free-cut	Allowble bending radius	Model No.
Long sensing range with lens		19,500mm 767.715in 14,000mm 551.18in 3,800mm 149.606in	ϕ0.4mm ϕ0.016in opaque object	• Large lenses on the fiber heads increase the sensing range significantly. • Fiber cable length 10m 32.808ft each	✂10m 32.808ft	R25mm R0.984in or more	**FT-FM10L**
		1,600mm 62.992in 800mm 31.496in 280mm 11.024in	ϕ0.02mm ϕ0.001in opaque object	• Long sensing range with small fiber heads of ϕ2.5mm ϕ0.099in	✂ 2m 6.562ft		**FT-SFM2L**
Wide beam		3,000mm 118.11in 1,500mm 59.055in 520mm 20.472in	ϕ0.02mm ϕ0.001in opaque object	• The wide beam detects an object at any place within the range. • Long-distance detection is possible.	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-A8**
Array	Top sensing 	650mm 25.591in 330mm 12.992in 115mm 4.528in	Horizontal: ϕ0.025mm ϕ0.001in opaque object Vertical: ϕ0.45mm ϕ0.018in opaque object	• The wide beam detects an object at any place within the range.	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-AFM2**
	Side sensing 	590mm 23.228in 290mm 11.417in 100mm 3.937in	Horizontal: ϕ0.025mm ϕ0.001in opaque object Vertical: ϕ0.45mm ϕ0.018in opaque object				**FT-AFM2E**
Elbow	Lens mountable 	530mm 20.866in 230mm 9.055in 80mm 3.15in	ϕ0.04mm ϕ0.002in opaque object	• The fiber head is bent at a right angle with 5mm 0.197in bending radius.	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-R80**
Side-view	Small diameter (**FT-V22**: ϕ2 ϕ0.079) 	390mm 15.354in 180mm 7.087in 63mm 2.48in	ϕ0.02mm ϕ0.001in opaque object	• The side-view sensing enables it to be used in a small space.	1m 3.281ft	R25mm R0.984in or more	**FT-V22**
	Sleeve part cannot be bent. 	175mm 6.89in 80mm 3.15in 27mm 1.063in	ϕ0.02mm ϕ0.001in opaque object		✂ 2m 6.562ft		**FT-V41**
	Sleeve part cannot be bent. 	400mm 15.748in 200mm 7.874in 70mm 2.756in	ϕ0.02mm ϕ0.001in opaque object				**FT-SFM2SV2**
Ultra-small diameter	 Sleeve part cannot be bent.	18mm 0.709in 10mm 0.394in 3mm 0.118in	ϕ0.02mm ϕ0.001in opaque object	• Ultra-small diameter heads, very narrow beam ϕ0.125mm ϕ0.005in	500mm 19.685in	R5mm R0.197in or more	New **FT-E12**
	 Sleeve part cannot be bent.	80mm 3.15in 50mm 1.969in 15mm 0.591in	ϕ0.02mm ϕ0.001in opaque object	• Ultra-small diameter heads, very narrow beam ϕ0.25mm ϕ0.01in	1m 3.281ft		New **FT-E22**
Narrow beam		2,000mm 78.74in 1,000mm 39.37in 350mm 13.78in	ϕ0.06mm ϕ0.002in opaque object	• Aperture angle 2° • Laser beam equivalent detection	✂ 2m 6.562ft	R25mm R0.984in or more	**FT-K8**
				• Aperture angle 2° • Side-view type			**FT-KV8**

Notes: 1) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

2) The optimum condition is the condition when the sensitivity is set so that the output just changes to light incident operation in the object absent condition.

ORDER GUIDE

Environment resistant fibers [Thru-beam type (one pair set)]

Type	Shape of fiber head (mm) (in)	Sensing range (Note 1) ☐: LONG ☐: STD ☐: S-D	Min. sensing object [under the optimum condition (Note 2)]	Features	Fiber cable length ✂: Free-cut	Allowble bending radius	Model No.
Heat-resistant	Lens mountable M4 / With sleeve M4 ϕ2.1 ϕ0.083	550mm 21.654in 280mm 11.024in 90mm 3.543in	ϕ0.04mm ϕ0.002in opaque object	• Heat-resistant temp.: 350°C 662°F Cold-resistant temp.: −60°C −76°F	2m 6.562ft	R25mm R0.984in or more	FT-H35-M2 FT-H35-M2S6 With sleeve 60mm 2.362in
Heat-resistant	Lens mountable M4	310mm 12.205in 140mm 5.512in 50mm 1.969in	ϕ0.02mm ϕ0.001in opaque object	• Heat-resistant temp.: 200°C 392°F Cold-resistant temp.: −60°C −76°F	1m 3.281ft 2m 6.562ft	R10mm R0.394in or more	New FT-H20W-M1 New FT-H20W-M2
Heat-resistant	Lens mountable M4	550mm 21.654in 280mm 11.024in 90mm 3.543in	ϕ0.04mm ϕ0.002in opaque object	• Flexible cable with silicone jacket • Heat-resistant temp.: 200°C 392°F Cold-resistant temp.: −60°C −76°F	1m 3.281ft	R25mm R0.984in or more	FT-H20-M1
Heat-resistant	Lens mountable M4	880mm 34.646in 440mm 17.323in 155mm 6.102in	ϕ0.06mm ϕ0.002in opaque object	• Heat-resistant temp.: 130°C 266°F Cold-resistant temp.: −60°C −76°F • Free-cut type	✂ 2m 6.562ft		FT-H13-FM2
Chemical-resistant	ϕ5.5 ϕ0.217	3,500mm 137.795in 1,500mm 59.055in 530mm 20.866in	ϕ0.08mm ϕ0.003in opaque object	• Usable in chemical solvents • Heat-resistant specification (115°C 239°F) • Long sensing range with lens	2m 6.562ft	R30mm R1.181in or more	FT-L8Y
Chemical-resistant	ϕ5.5 ϕ0.217	800mm 31.496in 400mm 15.748in 140mm 5.512in	ϕ0.08mm ϕ0.003in opaque object	• Usable in chemical solvents • Heat-resistant specification (115°C 239°F) • Side-view type			FT-V8Y
Chemical-resistant	13 × 15 0.512 × 0.591	3,500mm 137.795in 1,500mm 59.055in 530mm 20.866in	ϕ4mm ϕ0.157in opaque object	• Usable in chemical solvents • Rectangular head with no beam misalignment	✂ 2m 6.562ft ✂ 5m 16.404ft ✂ 7m 22.966ft	R25mm R0.984in or more	New FT-Z802Y New FT-Z805Y New FT-Z807Y
Vacuum	Lens mountable M4	470mm 18.504in 230mm 9.055in 80mm 3.15in	ϕ0.02mm ϕ0.001in opaque object	• Usable in vacuum chamber • Heat-resistant temp.: 120°C 248°F	1m 3.281ft	R200mm R7.874in or more	FT-6V
Vacuum		220mm 8.661in 100mm 3.937in 35mm 1.378in	ϕ0.02mm ϕ0.001in opaque object		1m 3.281ft	R30mm R1.181in or more	FT-60V

Notes: 1) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

2) The optimum condition is the condition when the sensitivity is set so that the output just changes to light incident operation in the object absent condition.

The vacuum type fiber must be used with the following products as a set.

FT-J6: Fiber at atmospheric side (one pair set)
FV-BR1: Photo-terminal (one pair set)

Semi-standard fibers (Custom-order made)

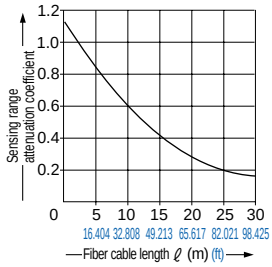
The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol ☆) or the sleeve length (symbol △) from the table below.

Type	Basic model No.	☆Fiber cable length (Unit: m ft)	△Sleeve length (Unit: cm in)
Standard threaded head (free-cut)	FT-FM☆	3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617, 25 82.021, 30 98.425	———
With sleeve	FT-FM☆-S△	2 6.562 (Note), 3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617, 25 82.021, 30 98.425	1 0.394 , 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.15, 9 3.543, 10 3.937, 11 4.331, 12 4.724
With large diameter lens	FT-FM△L	20 65.617, 30 98.425	———
Small diameter threaded head with sleeve (free-cut)	FT-NFM2-S△	———	1 0.394, 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.15, 9 3.543, 10 3.937, 11 4.331, 12 4.724
200°C 392°F heat-resistant	FT-H20-M☆	2 6.562, 3 9.843	———
350°C 662°F heat-resistant	FT-H35-M☆	3 9.843	———

Note: The standard fiber has a 2m 6.562ft fiber cable length and a 4cm 1.575in or 9cm 3.543in sleeve length.

• Correlation between sensing range attenuation coefficient and fiber cable length

Longer the fiber cable, shorter is the sensing range.



ORDER GUIDE

General use fibers [Reflective type]

Type	Shape of fiber head (mm) (in)	Sensing range (Note 1,2) [□: LONG, □: STD, □: S-D]	Min. sensing object [at the maximum sensitivity (Note 3)]	Features	Fiber cable length ✂: Free-cut	Allowable bending radius	Model No.
Standard (Long sensing range)	M6	480mm 18.898in 220mm 8.661in 75mm 2.953in	ϕ0.02mm ϕ0.001in gold wire	• Long sensing range • Free-cut type	✂ 2m 6.562ft	R25mm R0.984in or more	**FD-B8**
Standard	Coaxial M6	310mm 12.205in 140mm 5.512in 47mm 1.85in	ϕ0.02mm ϕ0.001in gold wire	• As fiber cutting is not required, sensing range will not be reduced.	500mm 19.685in		**FD-5**
				• Free-cut type	✂ 2m 6.562ft		**FD-FM2**
	With sleeve M6 ϕ2.5 ϕ0.098	270mm 10.63in 110mm 4.331in 39mm 1.535in	ϕ0.02mm ϕ0.001in gold wire				**FD-FM2S** With sleeve 90mm 3.543in **FD-FM2S4** With sleeve 40mm 1.575in
Economy	M6	260mm 10.236in 120mm 4.724in 42mm 1.654in	ϕ0.02mm ϕ0.001in gold wire	• Low price & free-cut	✂ 2m 6.562ft (Note 3)		**FD-N8**
	Small diameter M4	75mm 2.953in 38mm 1.496in 13mm 0.512in	ϕ0.02mm ϕ0.001in gold wire				**FD-N4**
Small fiber head	M4	270mm 10.63in 110mm 4.331in 39mm 1.536in	ϕ0.02mm ϕ0.001in gold wire	• Miniature head but having the same sensing range as the standard type fiber	✂ 2m 6.562ft	R25mm R0.984in or more	**FD-T80**
	Small diameter M3	90mm 3.543in 45mm 1.772in 16mm 0.63in	ϕ0.02mm ϕ0.001in gold wire				**FD-T40**
	ϕ3 ϕ0.118	270mm 10.63in 110mm 4.331in 39mm 1.536in	ϕ0.02mm ϕ0.001in gold wire				**FD-S80**
Small diameter	M4	90mm 3.543in 45mm 1.772in 16mm 0.63in	ϕ0.02mm ϕ0.001in gold wire	• Suitable for detection in a congested equipment • Free-cut type	✂ 2m 6.562ft	R25mm R0.984in or more	**FD-NFM2**
	With sleeve M4 ϕ1.48 ϕ0.058						**FD-NFM2S** With sleeve 90mm 3.543in **FD-NFM2S4** With sleeve 40mm 1.575in
	ϕ2.5 ϕ0.098						**FD-SNFM2**
Sharp bend: Standard	M6	190mm 7.48in 90mm 3.543in 32mm 1.26in	ϕ0.02mm ϕ0.001in gold wire	• The fiber can be bent sharply, like an electric wire, to avoid space wastage in installation because of its small allowable bending radius of R1mm R0.039in or more. (**FD-WG4**, **FD-WSG4**: R2mm R0.079in or more Sleeve part of **FD-W44**: R10mm 0.394in or more)	✂ 2m 6.562ft	R1mm R0.039in or more	**FD-W8**
Sharp bend: Small diameter with sleeve	With sleeve M4 ϕ1.48 ϕ0.058	30mm 1.181in 15mm 0.591in 5mm 0.197in	ϕ0.02mm ϕ0.001in gold wire				**FD-W44**
Sharp bend: Small head	M4	190mm 7.48in 90mm 3.543in 32mm 1.26in	ϕ0.02mm ϕ0.001in gold wire				**FD-WT8**
	ϕ3 ϕ0.118						**FD-WS8**
Sharp bend: Small diameter	M3	30mm 1.181in 15mm 0.591in 5mm 0.197in	ϕ0.02mm ϕ0.001in gold wire				**FD-WT4**
Sharp bend: High precision	Lens mountable Coaxial M4	65mm 2.559in 32mm 1.26in 11mm 0.433in	ϕ0.02mm ϕ0.001in gold wire			R2mm R0.079in or more	**FD-WG4**
	Coaxial ϕ3 ϕ0.118						**FD-WSG4**
Flexible	M6	220mm 8.661in 100mm 3.937in 35mm 1.378in	ϕ0.02mm ϕ0.001in gold wire	• Allowable bending radius: R4mm R0.157in or more • Bending durability: one million times or more at R10mm 0.394in, (**FD-P40** or **FD-P2**: at R4mm R0.157in)	✂ 2m 6.562ft	R4mm R0.157in or more	**FD-P80**
	M4	90mm 3.543in 45mm 1.772in 16mm 0.63in	ϕ0.02mm ϕ0.001in gold wire				New **FD-P60**
	ϕ3 ϕ0.118						New **FD-P50**
	Small diameter M3	36mm 1.417in 18mm 0.709in 6mm 0.236in	ϕ0.02mm ϕ0.001in gold wire				**FD-P40**
	Small diameter ϕ1.5 ϕ0.059	50mm 1.969in 25mm 0.984in 9mm 0.354in	ϕ0.02mm ϕ0.001in gold wire		1m 3.281ft		**FD-P2**

Notes: 1) The sensing range is specified for white non-glossy paper [100 X 100mm 3.937 X 3.937in (**FD-B8**, **FD-5**, **FD-FM2**, **FD-FM2S**, **FD-FM2S4**, **FD-N8**, **FD-T80** and **FD-S80**: 400 X 400mm 15.748 X 15.748in, **FD-N4**, **FD-T40**, **FD-NFM2**, **FD-NFM2S**, **FD-NFM2S4**, **FD-SNFM2**, **FD-W8**, **FD-WT8**, **FD-WS8**, **FD-P80**, **FD-P60** and **FD-P50**: 200 X 200mm 7.874 X 7.874in)] as the object.

2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

3) Fiber cutter is not supplied as accessory along with standard (economy) fibers. Please order it separately.

4) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing distance.

ORDER GUIDE

Special use fibers [Reflective type]

Type	Shape of fiber head (mm) (in)	Sensing range (Note 1,2) [□: LONG, □: STD, □: S-D]	Min. sensing object [at the maximum sensitivity (Note 3)]	Features	Fiber cable length [✂: Free-cut]	Allowble bending radius	Model No.
Fixed-focus reflective	18×14 0.709×0.551	2 to18mm 0.079 to 0.709in 4.5 to12mm 0.177 to 0.473in 4.8 to 9.5mm 0.189 to 0.374in (Convergent point: 6mm 0.236in)	ϕ0.02mm ϕ0.001in gold wire	• Detection is not affected by object color.	✂ 2m 6.562ft	R10mm R0.394in or more	**FD-L4**
Glass substrate detection	17×29 0.669×1.142	0 to 20mm 0 to 0.787in	(LCD glass)	• Just 3.8mm 0.15in thick • Glass substrate is reliably detected.		R4mm R0.197in or more	**FD-L43**
Glass substrate detection	24×21 0.9945×0.827	2 to16mm 0.079 to 0.63in 3 to14mm 0.118 to 0.551in 6.5 to11mm 0.256 to 0.433in (Convergent point: 8mm 0.315in)	ϕ0.02mm ϕ0.001in gold wire	• Just 4mm 0.15in thick • Glass substrate is reliably detected.		R10mm R0.394in or more	**FD-L41**
Specular object detection	15×13 0.591×0.512	0.5 to 4mm 0.02 to 0.158in 1 to 3mm 0.039 to 0.118in 1.8 to 2.5mm 0.071 to 0.099in (Convergent point: 2mm 0.079in)		• Just 3mm 0.118in thick • Wafer is reliably detected.			**FD-L42**
High precision	Lens mountable Coaxial M4	110mm 4.331in 55mm 2.165in 19mm 0.748in	ϕ0.02mm ϕ0.001in gold wire	• Precise position sensing with coaxial fiber	✂ 2m 6.562ft	R25mm R0.079in or more	**FD-G4**
High precision	Lens mountable Coaxial-small diameter M3	38mm 1.496in 18mm 0.709in 6mm 0.236in	ϕ0.02mm ϕ0.001in gold wire	• Combination with the **FX-MR3** lens gives an extremely small spot diameter of ϕ0.3mm ϕ0.012in approx.	500mm 19.685in		**FD-EG1**
Array	Top sensing □20 □0.787	220mm 8.661in 110mm 4.331in 39mm 1.536in	ϕ0.02mm ϕ0.001in gold wire	• Its wide beam meets various needs.	✂ 2m 6.562ft		**FD-AFM2**
Array	Side sensing □20 □0.787						**FD-AFM2E**
Elbow	M6	185mm 7.284in 85mm 3.347in 30mm 1.181in	ϕ0.02mm ϕ0.001in gold wire	• The fiber head is bent at a right angle with 5mm 0.197in bending radius at the neck.	✂ 2m 6.562ft		**FD-R80**
Side-view	Small diameter ϕ1.5 ϕ0.059 ϕ3 ϕ0.118 Sleeve part cannot be bent. 0.028	55mm 2.165in 25mm 0.984in 9mm 0.354in	ϕ0.02mm ϕ0.001in gold wire	• The side view sensing enables it to be used in a small space.	✂ 2m 6.562ft		**FD-V41**
Side-view	ϕ2 ϕ0.079 ϕ5 ϕ0.197 Sleeve part cannot be bent. 0.031	100mm 3.937in 45mm 1.772in 16mm 0.63in	ϕ0.02mm ϕ0.001in gold wire				**FD-SFM2SV2**
Ultra-small diameter	ϕ0.5 ϕ0.02 ϕ1.5 ϕ0.059 Sleeve part cannot be bent.	11mm 0.433in 6mm 0.236in 1mm 0.039in	ϕ0.02mm ϕ0.001in gold wire	• Easy fine adjustment of the installation position.	1m 3.281ft	R10mm R0.394in or more	New **FD-E12**
Ultra-small diameter	Coaxial ϕ0.65 ϕ0.026 ϕ3 ϕ0.118 Sleeve part cannot be bent.	45mm 1.772in 23mm 0.906in 7mm 0.276in	ϕ0.02mm ϕ0.001in gold wire	• Precise position sensing with coaxial fiber		R25mm R0.079in or more	New **FD-E22**
Ultra-small diameter	M3 ϕ0.5 ϕ0.02 Sleeve part cannot be bent.	5mm 0.197in 3mm 0.118in Unusable	ϕ0.02mm ϕ0.001in gold wire	• Suitable for detection in a very congested equipment	500mm 19.685in	R25mm R0.079in or more	**FD-EN500S1**
Ultra-small diameter	Coaxial M3 ϕ0.8 ϕ0.031 Sleeve part cannot be bent.	38mm 1.496in 18mm 0.709in 6mm 0.236in	ϕ0.02mm ϕ0.001in gold wire	• Precise position sensing with coaxial fiber	1m 3.281ft	R25mm R0.079in or more	**FD-ENM1S1**
Liquid level sensing	ϕ5 ϕ0.197 ϕ6 ϕ0.236		(Liquid)	• Reduces malfunction due to liquid drop at the tip.	✂ 2m 6.562ft	R25mm R0.079in or more	**FD-F8Y**
Mountable on pipe Standard	25×20 0.984×0.787	Applicable pipe diameter: Outer dia. ϕ6 to ϕ26mm ϕ0.236 to ϕ1.024in transparent pipe (PVC, fluorine resin, PC, acrylic, glass, wall thickness 1 to 3mm 0.039 to 0.118in)	(Liquid)	• Liquid level is reliably detected from outside the pipe.	✂ 2m 6.562ft	R10mm R0.394in or more	**FD-F41**
Mountable on pipe Standard					✂ 5m 16.404ft		**FD-F91**
Mountable on pipe For PFA, wall thickness 1mm 0.039in pipe		Applicable pipe diameter: Outer dia. ϕ6 to ϕ26mm ϕ0.236 to ϕ1.024in transparent pipe (PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1mm 0.039in)			✂ 2m 6.562ft		**FD-F4**
Mountable on pipe For PFA, wall thickness 1mm 0.039in pipe					✂ 5m 16.404ft		**FD-F9**

Notes: 1) The sensing range is specified for white non-glossy paper [100×100mm 3.937×3.937in (**FD-G4**, **FD-AFM2**, **FD-AFM2E**, **FD-R80** and **FD-SFM2SV2**: 200×200mm 0.157×0.157in, **FD-L43**: glass substrate 76×52×t1.1mm 0.197×0.236×t0.043in, **FD-L41**: glass substrate 100×100×t2mm 3.937×3.937×t0.079in)] as the object.

2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

3) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing distance. However, in the case of fixed-focus reflective type, when the sensitivity is at MAX., it is only possible to detect the minimum size of sensing object at a distance of convergent point.

ORDER GUIDE

Environment resistant fibers [Reflective type]

Type	Shape of fiber head (mm) (in)	Sensing range (Note 1,2) □: LONG ▨: STD ■: S-D	Min. sensing object [at the maximum sensitivity (Note 3)]	Features	Fiber cable length ✂: Free-cut	Allowble bending rudius	Model No.
Heat-resistant	Coaxial M6	□ 310mm 12.205in ▨ 140mm 5.512in ■ 47mm 1.85in	ϕ0.02mm ϕ0.01in gold wire	• Heat-resistant temp.: 350°C 662°F Cold-resistant temp.: −60°C −76°F	2m 6.562ft	R25mm 0.984in or more	**FD-H35-M2**
	With sleeve M6 ϕ2.8 ϕ0.11in	□ 310mm 12.205in ▨ 140mm 5.512in ■ 47mm 1.85in	ϕ0.02mm ϕ0.01in gold wire	• Heat-resistant temp.: 350°C 662°F Cold-resistant temp.: −60°C −76°F	2m 6.562ft	R25mm 0.984in or more	**FD-H35-M2S6** With sleeve 60mm 2.362in
	Coaxial M6	□ 310mm 12.205in ▨ 140mm 5.512in ■ 47mm 1.85in	ϕ0.02mm ϕ0.01in gold wire	• Flexible cable with silicone jacket • Heat-resistant temp.: 200°C 392°F Cold-resistant temp.: −60°C −76°F	1m 3.281ft	R25mm 0.984in or more	**FD-H20-M1**
	M6	□ 310mm 12.205in ▨ 140mm 5.512in ■ 47mm 1.85in	ϕ0.02mm ϕ0.01in gold wire	• Heat-resistant temp.: 130°C 266°F Cold-resistant temp.: −60°C −76°F • Free-cut type	✂ 2m 6.562ft	R25mm 0.984in or more	**FD-H13-FM2**
Vacuum	M6	□ 165mm 6.496in ▨ 75mm 2.953in ■ 26mm 1.024in	ϕ0.02mm ϕ0.01in gold wire	• Usable in vacuum chamber • Heat-resistant temp.: 120°C 248°F	1m 3.281ft	R200mm 7.874in or more	**FD-6V**

Notes: 1) The sensing range is specified for white non-glossy paper [400 × 400mm 15.748 × 15.748in (**FD-6V**: 200 × 200mm 7.874 × 7.874in)] as the object.
2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

3) The minimum sensing object is specified for maximum sensitivity. Also, note that the corresponding setting distance is different from the rated sensing distance.

The vacuum type fiber must be used with the following products as a set.

FT-J6: Fiber at atmospheric side (one pair set)
FV-BR1: Photo-terminal (one pair set)

Semi-standard fibers (Custom-order made)

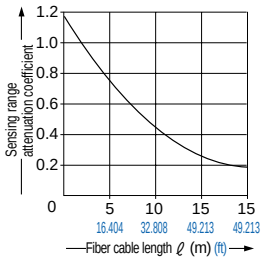
The fiber cable length or sleeve length of the standard fibers can be modified at your request. Select the fiber cable length (symbol ☆) or the sleeve length (symbol △) from the table below.

Type	Basic model No.	☆Fiber cable length (Unit: m ft)	△Sleeve length (Unit: cm in)
Standard threaded head (free-cut)	**FD-FM**☆	3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617	———
With sleeve	**FD-FM**☆**-S**△	2 6.562 (Note), 3 9.843, 4 13.123, 5 16.404, 10 32.808, 15 49.213, 20 65.617	1 0.394 , 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.15, 9 3.543, 10 3.937, 11 4.331, 12 4.724
Small diameter threaded head with sleeve (free-cut)	**FD-NFM2-S**△	———	1 0.394, 2 0.787, 3 1.181, 4 1.575, 5 1.969, 6 2.362, 7 2.756, 8 3.15, 9 3.543, 10 3.937, 11 4.331, 12 4.724
200°C 392°F heat-resistant	**FD-H20-M**☆	2 6.562, 3 9.843	———
350°C 662°F heat-resistant	**FD-H35-M**☆	3 9.843	———

Note: The standard fiber has a 2m 6.562ft fiber cable length and a 4cm 1.575in or 9cm 3.543in sleeve length.

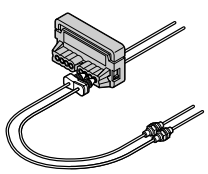
• Correlation between sensing range attenuation coefficient and fiber cable length

Longer the fiber cable, shorter is the sensing range.

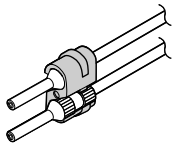


Accessaries (attached with fibers)

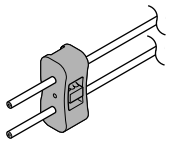
Fiber cutter
• **FX-CT2**



Fiber attachment
• **FX-AT2** (for fixed-length fiber)

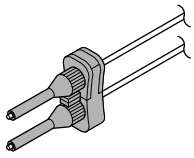


• **FX-AT3** (for ϕ2.2mm ϕ0.087in fiber)



Included from Dec. 2001

• **FX-AT4** (for ϕ1mm ϕ0.039in fiber)
• **FX-AT5** (for ϕ1.3mm ϕ0.051in fiber)
• **FX-AT6** (for ϕ1mm ϕ0.039in and ϕ1.3mm ϕ0.051in fiber)



SPECIFICATIONS

Refer to Fiber Sensor Guide Book or Sensor General Catalog for fiber's specifications.

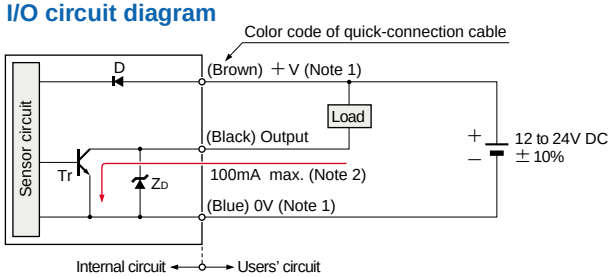
Item \ Type	NPN output	PNP output
Model No.	**FX-311**	**FX-311P**
Supply voltage	12 to 24V DC ± 10% Ripple P-P 10% or less	
Power consumption	840mW or less (Current consumption 35mA or less at 24V supply voltage)	
Output	NPN open-collector transistor • Maximum sink current: 100mA (Note 1) • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1.5V or less [at 100mA (Note 1) sink current]	PNP open-collector transistor • Maximum source current: 100mA (Note 1) • Applied voltage: 30V DC or less (between output and + V) • Residual voltage: 1.5V or less [at 100mA (Note 1) source current]
Utilization category	DC-12 or DC-13	
Output operation	Selectable either Light-ON or Dark-ON, with selection switch	
Short-circuit protection	Incorporated	
Response time	250 μs or less (STD / S-D), 2ms or less (LONG) selectable with selection switch	
Operation indicator	Orange LED (lights up when the output is ON)	
Stability indicator	Green LED (lights up under stable light received condition or stable dark condition)	
Sensitivity adjuster	12-turn potentiometer with indicator (Pointer part: red backlight) (Note 2)	
Timer function	Incorporated with OFF-delay timer, selectable either effective (approx. 10ms or 40ms) or ineffective	
Automatic interference prevention function	Incorporated (Up to 4 sets of fiber heads can be mounted closely.) (Note 3)	
Environmental resistance: Pollution degree	3 (Industrial environment)	
Environmental resistance: Ambient temperature	− 10 to + 55°C + 14 to 131°F (If 4 to 7 units are connected in cascade: − 10 to + 50°C + 14 to 122°F, if 8 to 16 units are connected in cascade: − 10 to + 45°C + 14 to 113°F) (No dew condensation or icing allowed), Storage: − 20 to + 70°C − 4 to 158°F	
Environmental resistance: Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH	
Environmental resistance: Ambient illuminance	Sunlight: 10,000 ℓx at the light-receiving face, Incandescent light: 3,000 ℓx at the light-receiving face	
Environmental resistance: EMC	Emission: EN50081-2, Immunity: EN50082-2	
Environmental resistance: Voltage withstandability	1,000V AC for one min. between all supply terminals connected together and enclosure (Note 4)	
Environmental resistance: Insulation resistance	20MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure (Note 4)	
Environmental resistance: Vibration resistance	10 to 150Hz frequency, 0.75mm 0.03in in amplitude in X, Y and Z directions for two hours each	
Environmental resistance: Shock resistance	98m/s^2 acceleration (10G approx.) in X, Y and Z directions for five times each	
Emitting element	Red LED (modulated)	
Material	Enclosure: Heat-resistant ABS, Case cover: Polycarbonate	
Connecting method	Connector connection (Note 5)	
Cable extension	Extension up to total 100m 328.084ft is possible with 0.3mm^2, or more, cable	
Weight	15g 0.529oz approx.	

Notes: 1) 50mA, if five, or more, amplifiers are connected in cascade.
2) The red backlight of the pointer part lights up more brightly when the power is turned ON and when the sensitivity is adjusted.
3) When the power supply is switched on, the emission timing are automatically set for interference prevention.
4) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.
5) The cable for amplifier connection is not supplied as an accessory. Make sure to use the optional quick-connection cable given below.
Main cable (3-core): **CN-73-C1** (cable length 1m 3.281ft), **CN-73-C2** (cable length 2m 6.562ft), **CN-73-C5** (cable length 5m 16.404ft)
Sub cable (1-core): **CN-71-C1** (cable length 1m 3.281ft), **CN-71-C2** (cable length 2m 6.562ft), **CN-71-C5** (cable length 5m 16.404ft)

I/O CIRCUIT AND WIRING DIAGRAMS

FX-311 NPN output

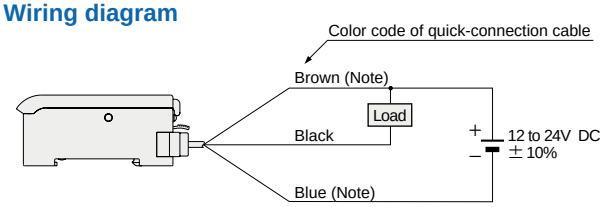
I/O circuit diagram



Notes: 1) The quick-connection sub cable does not have + V (brown) and 0V (blue).
2) 50mA max., if five amplifiers, or more, are connected together.

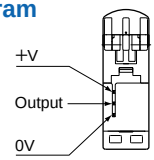
Symbols ... D: Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr: NPN output transistor

Wiring diagram



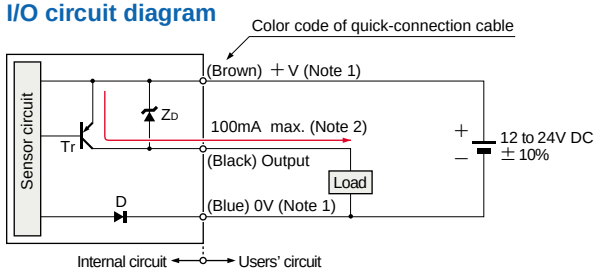
Note: The quick-connection sub cable does not have brown cable and blue cable.

Terminal arrangement diagram



FX-311P PNP output

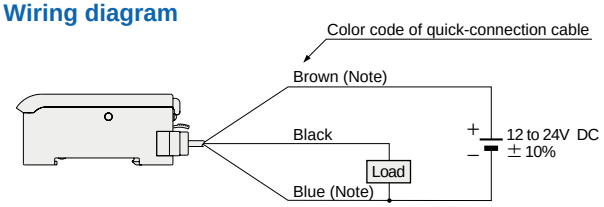
I/O circuit diagram



Notes: 1) The quick-connection sub cable does not have + V (brown) and 0V (blue).
2) 50mA max., if five amplifiers, or more, are connected together.

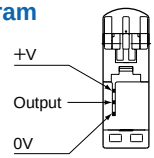
Symbols ... D: Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr: PNP output transistor

Wiring diagram



Note: The quick-connection sub cable does not have brown cable and blue cable.

Terminal arrangement diagram

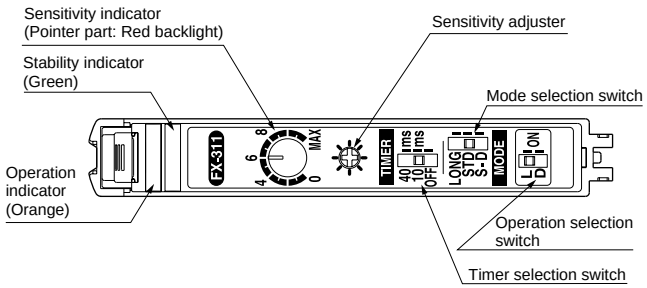


PRECAUTIONS FOR PROPER USE

Refer to Sensor General Catalog for fiber's precautions.

This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Part description



Mode selection switch

- The most suitable sensing mode can be selected according to the application from LONG(long-range), STD (standard) or S-D (reduced intensity).

Mode selection switch	Application	Response time
LONG STD S-D	Used in case long distance sensing is required. (However, the response time is longer than in STD mode.	2ms
LONG STD S-D	Used for general sensing application.	250 μs
LONG STD S-D	Since the emitted light amount is restricted in this mode, it is suitable for delicate sensing, such as when the received light is saturated due to too short a sensing distance or when detecting translucent objects, etc.	

Note: Make sure to carry out sensitivity adjustment after mode setting.

PRECAUTIONS FOR PROPER USE

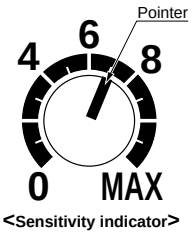
Refer to Sensor General Catalog for fiber's precautions.

Sensitivity adjustment

- Adjust the sensitivity, observing the operation indicator (orange). However, since the condition for lighting up of the indicator depends on the combination of the sensing condition and selected operation for L/D-ON, verify it from the table on the right.
- The sensitivity adjuster is a 12-turn potentiometer. The maximum sensitivity is obtained by turning it fully clockwise.
- The pointer shows the present sensitivity level.

☼ : Lights up ● : Lights off

Sensing condition	Operation	Operation indicator
Light	L-ON(Light ON)	☼
	D-ON(Dark-ON)	●
Dark	L-ON(Light ON)	●
	D-ON(Dark-ON)	☼

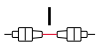
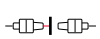
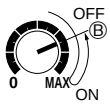
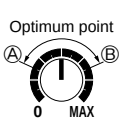


<Sensitivity indicator>

Assist function

- This product incorporates an 'assist function', which helps to easily search the optimum sensitivity position by flashing of the pointer.
  In order to make 'assist function' effective, switch the operation selection switch in the order L-ON (Light-ON) → D-ON (Dark-ON) → L-ON (Light-ON).

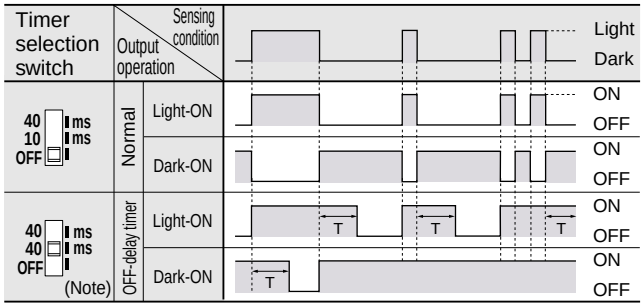
Notes: 1) 'Assist function' cannot be used when adjusting sensitivity for moving objects.
2) 'Assist function' turns off automatically once the sensitivity adjustment has been completed.
3) In case 'assist function' is not to be used, set the operation selection switch to D-ON(Dark-ON) and wait for 2 sec., or more, to make 'assist function' ineffective.

Step	Sensing method: Reflective type	Sensing method: Thru-beam type	Operation	Sensitivity indicator
①	★Make sure that the operation selection switch is set to L-ON (Light-ON). In case 'assist function' is to be used, switch the operation selection switch in the order of L-ON (Light-ON) → D-ON (Dark-ON) → L-ON(Light-ON).		Turn the sensitivity adjuster fully counterclockwise. (Minimum sensitivity)	
②	 Beam received	 Beam received	In the beam received condition, slowly turn the adjuster clockwise and find the point Ⓐ where the sensor is switched ON. The pointer flashes once at the point Ⓐ. (Note 1)	
③	 Beam not received	 Beam not received	In the beam not received condition, slowly turn the adjuster further clockwise until the sensor goes into the ON state again. Once it is switched on, turn the adjuster counterclockwise a little and find the point Ⓑ where it is switched OFF. The pointer flashes twice at the point Ⓑ. (Note 2) (If the sensor does not go into the ON state, MAX is the point Ⓑ.)	
④	———	———	Turn the adjuster towards the point Ⓐ from the point Ⓑ slowly. The pointer starts flashing when it approaches the optimum sensitivity point and flashes faster at the optimum sensitivity point for 3 sec. This point is the optimum sensitivity point. (Note 2)	
⑤	Select either L-ON (Light-ON) or D-ON(Dark-ON) according to your application.			

Notes: 1) When 'assist function' is not used, the pointer does not flash.
2) When 'assist function' is not used, the middle point of Ⓐ and Ⓑ is regarded as the optimum sensitivity point.
3) In order to protect the mechanism, the sensitivity adjuster idles when over turned, which may result in a backlash of 1 to 2 divisions.
4) Depending upon the sensing conditions, stable sensing may be possible at a position which is slightly shifted from the optimum sensitivity point.
5) Do not move or bend the fiber cable after the sensitivity adjustment. Detection may become unstable.

Timer function

- This product incorporates OFF-delay timer function. The timer period can be selected as either 10ms. approx. or 40ms. approx. with the timer selection switch. Since the output is extended by a fixed period, it is useful when the connected device has a slow response time or when small objects are being sensed and the output signal width is small.



Note: The diagram shows the case when 10ms time period is selected.
Timer period T: 10ms approx. (when set to 10ms)
40ms approx. (when set to 40ms)

Interference prevention function

- This product incorporates an automatic interference prevention function. If the amplifiers are mounted in cascade, since a different emission timing is automatically set for up to 4 amplifiers, up to 4 sets of fiber heads can be mounted closely.
  Further, even if the amplifiers are mounted closely along with digital fiber sensor **FX-301**(**P**), the interference prevention function works. However, in case both models of amplifiers are mounted in cascade, mount identical models together.

Wiring

- Make sure to carry out the wiring in the power supply off condition.
- Verify that the supply voltage variation is within the rating.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the sensor may get burnt or damaged.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Take care that short-circuit or wrong wiring of the load may burn or damage the sensor.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Ensure that an isolation transformer is utilized for the DC power supply. If an autotransformer is utilized, the main amplifier or power supply may be damaged.
- Make sure to use the optional quick-connection cable for the connection of the amplifier. Extension up to total 100m is possible with 0.3mm^2, or more, cable. However, in order to reduce noise, make the wiring as short as possible.

Others

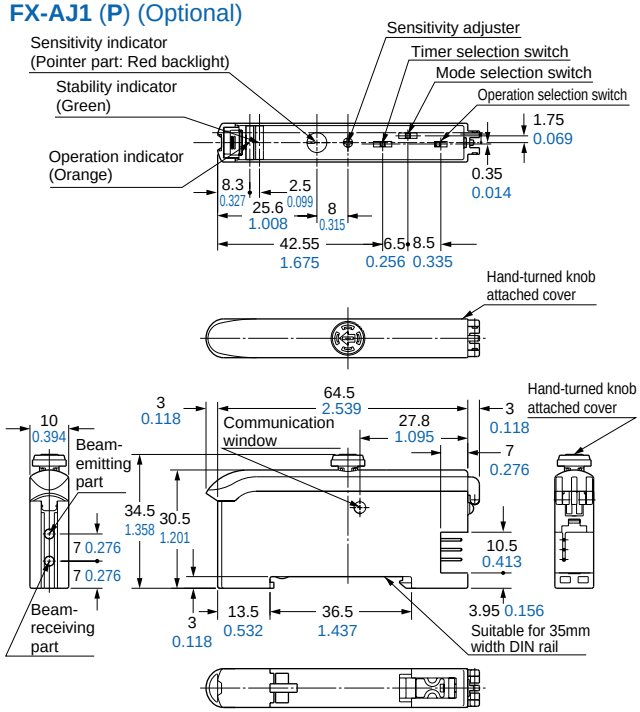
- Do not use during the initial transient time (0.5 sec. approx.) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- This sensor is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Take care that the product does not come in direct contact with organic solvents, such as, thinner, etc.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

DIMENSIONS (Unit: mm in)

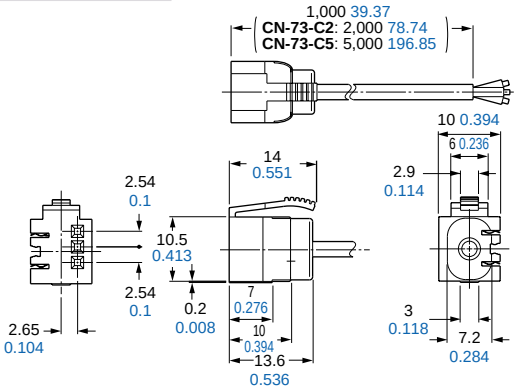
Refer to Fiber Sensor Guide Book or Sensor General Catalog for fiber's dimentions.

FX-311 FX-311P Amplifier

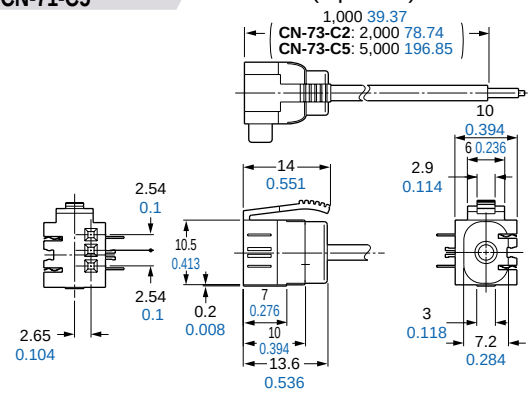
Mounting drawing with a hand-turned knob attached cover
FX-AJ1 (**P**) (Optional)



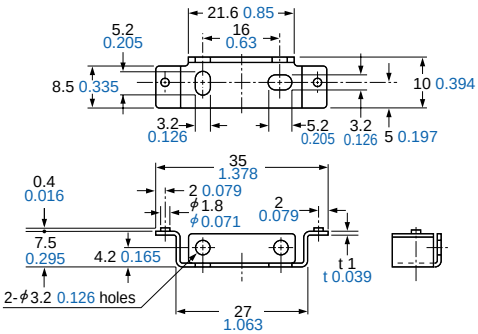
CN-73-C1 CN-73-C2 CN-73-C5 Main cable (Optional)



CN-71-C1 CN-71-C2 CN-71-C5 Sub cable (Optional)

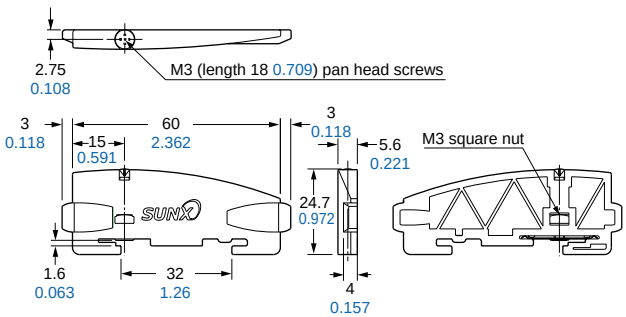


MS-DIN-2 Amplifier mounting bracket (Optional)



Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

MS-DIN-E End plate (Optional)



Material: Polycarbonate

All information is subject to change without prior notice.

SUNX Sensing the Future

http://www.sunx.co.jp/

SUNX Limited
2431-1 Ushiyama-cho, Kasugai-shi, Aichi,
486-0901, Japan
Phone: +81-(0)568-33-7211
FAX: +81-(0)568-33-2631

Overseas Sales Dept.
Phone: +81-(0)568-33-7861
FAX: +81-(0)568-33-8591

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