SUNX

NEW DIGITAL FIBER SENSOR

FX-100 SERIES

CE Conforming to EMC Directive

Welcome to 100

Bringing digital fiber sensors closer

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New possibilities with digital fiber sensors.
The **FX** series is a round **100** for success.

Easy to read, multipurpose, and at an economical price.

The **FX** series has been designed to be what customers want it to be.

Take a step into the new world that starts with '**100**'.

Easy to read

The digital dual-display shines out in the workplace!

The digital dual-display allows you to check both the threshold value and incident light intensity at the same time, and it also makes the procedures for setting the various values much easier. The threshold values can be adjusted simply by pressing the △ (UP) key or the ▽ (DOWN) key, so that the sensors can be used at the same sensitivity levels as analog control-type sensors. And of course a key lock function is also included.

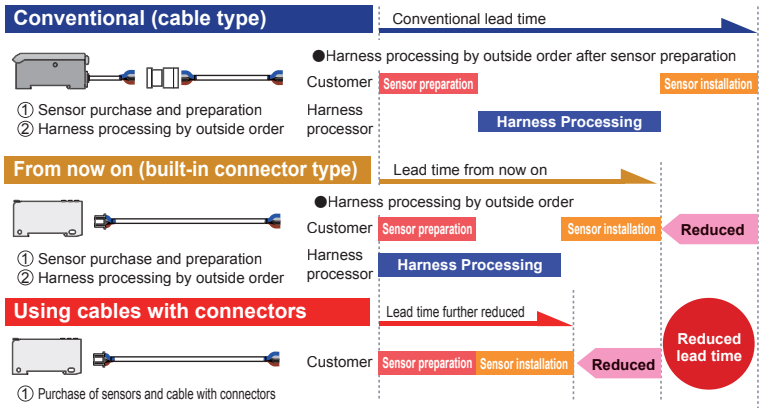


General purpose

Commercially-availabie connectors are used so that lead time and spare part numbers can both be reduced.

The connectors used are commercially-available connectors, so that processing costs and lead time required for carrying out processing after purchase of the sensors can be greatly reduced. The same connection parts as the **DP-100** series of digital pressure sensors and the **PM-64** series of micro photoelectric sensors can be used.

Commercially-available press-fit connectors are used, so that the processing costs for connection cables can be greatly reduced.



SUNX fiber sensor product lineup

Select the best types to suit your application.

- **Digital type**
  - **FX-300** (High function)
  - **FX-410** (Volume setting)
  - **FX-100**
    - **FX-101** (Standard type)
    - **FX-102** (Long sensing range type)
- **Analog control-type**
  - **FX-311** (General purpose)

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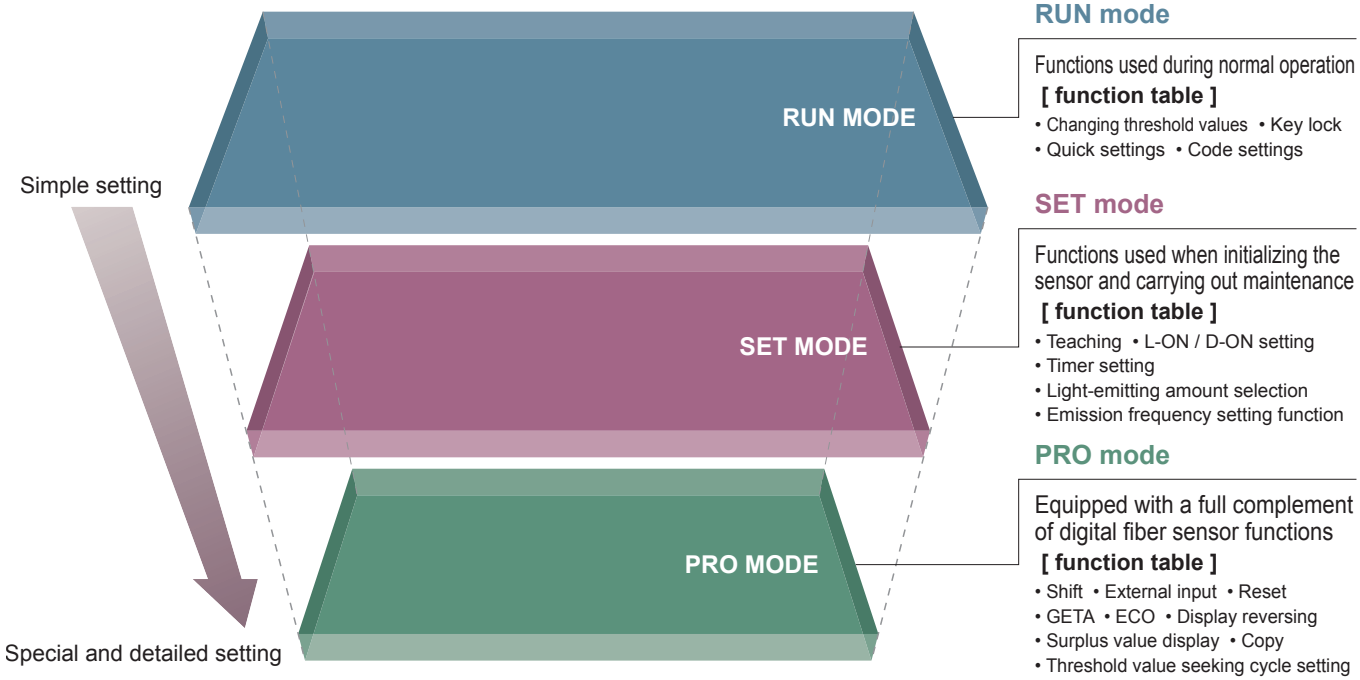


Digital fiber sensor

FX-100 SERIES

Designed in a 3-layer structure to accommodate basic settings through to advanced settings.

Setting details are divided into three levels for clearer operation, so that settings for normal operation are made in 'RUN mode', basic settings are made in 'SET mode', and advanced functions are set in 'PRO mode'. This makes setting operations much easier to understand and carry out.



RUN mode

Functions used during normal operation

[function table]

- Changing threshold values • Key lock
- Quick settings • Code settings

SET mode

Functions used when initializing the sensor and carrying out maintenance

[function table]

- Teaching • L-ON / D-ON setting
- Timer setting
- Light-emitting amount selection
- Emission frequency setting function

PRO mode

Equipped with a full complement of digital fiber sensor functions

[function table]

- Shift • External input • Reset
- GETA • ECO • Display reversing
- Surplus value display • Copy
- Threshold value seeking cycle setting

The same operating system is shared by the widely-acclaimed **DP-100** series of digital pressure sensors. The '**100**' is the indicator for easy handling.



Digital pressure sensor
DP-100 series

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Easy for inexperienced operators to use, and experienced operators will still be satisfied too. Introducing sensors with a full complement of functions to support the needs of your workplace.



RUN MODE **Changing threshold values** **Key lock** **Quick settings** **Code settings**

Quick code input function

For factory operators | For designers

Sensor settings can be made simply by selecting preset values.



Quick setting numbers (summary)

No.	Output operation	Light-emitting amount selection	Timer
-00-	Dark-ON	OFF	None
-01-	Dark-ON	ON	None
-02-	Dark-ON	OFF	OFF-delay 10 ms
-03-	Dark-ON	ON	OFF-delay 10 ms
-10-	Light-ON	ON	ON-delay 40 ms
-11-	Light-ON	OFF	ON-delay 40 ms
-12-	Light-ON	ON	ON-delay 10 ms
-13-	Light-ON	OFF	ON-delay 10 ms



Smooth support via telephone

Confirmation can be carried out smoothly via telephone by simply quoting numbers. This can be of great assistance when dealing with overseas customers.

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SET MODE

Teaching | L-ON / D-ON setting | Timer setting | Light-emitting amount selection | Interference prevention function

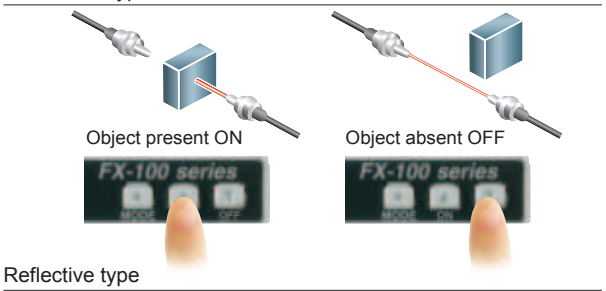
Teaching using ON / OFF buttons

For factory operators

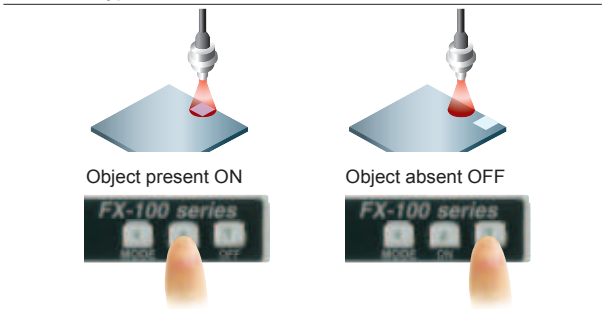
Simply press the ON button when an object is present and OFF when it is not. There is no need to switch settings or make judgments between Light-ON (L_on) and Dark-ON (d_on).

<Setting example>

Thru-beam type



Reflective type



Limit teaching function

This carries out teaching and sets threshold values only when no object is present (when the incident light amount is stable). This is useful when sensing objects if there are other objects in the background and when sensing minute objects. Teaching can also be carried out using external input.

Light-emitting amount selection function

For designers

If the light receiving level becomes saturated when sensing over short distances or when sensing transparent objects or minute objects, the light emitting amount can be adjusted so that stable sensing can be provided without needing to change the response time.

Emission frequency setting function

For factory operators

(**FX-101**□ : Interference prevention for up to 3 units
FX-102□ : Interference prevention for up to 4 units)

The emission frequencies can be set separately for each unit in order to avoid interference. The emitted light flashes while setting is in progress, so that you can see at a glance which fiber sensor is currently being set. In addition, this interference prevention is not done by using optical communication. This means that there is no need to place the amplifiers close together like there was before, and so the amplifiers can be set up apart from each other.

※When the emission frequencies are changed, the response times will also change.



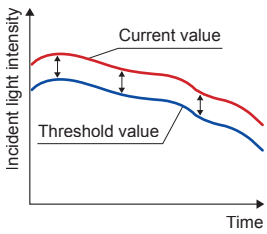
PRO MODE

Shift | External input | Threshold value seeking cycle setting | GETA | ECO | Display reversing | Surplus value display | Copy | Reset

Threshold value seeking cycle setting function

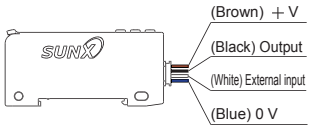
For factory operators

This function seeks changes in the light emitting amount resulting from changes in the environment over long periods (such as dust levels), so that the incident light intensity can be checked at desired intervals and the threshold values can be reset automatically.



External input function

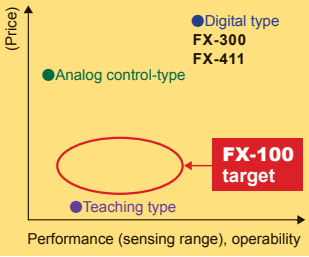
Settings such as emission halt, limit / auto teaching and ECO settings can be carried out via external input.



External input lines are equipped as standard

The functions and performance of a digital fiber sensor at an easily-affordable price!

SUNX digital-type sensors have never been more accessible than this. And they are ideal as replacement products for analog control types and teaching types also.



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■ORDER GUIDE

Amplifiers

Type	Appearance	Model No.	Emitting element	Output
Standard type, M8 plug-in connector type		**FX-101** (Note 2)	Red LED	NPN open-collector transistor
Standard type, M8 plug-in connector type		**FX-101-Z** (Note 3)		NPN open-collector transistor
Standard type, M8 plug-in connector type		**FX-101P** (Note 2)		PNP open-collector transistor
Standard type, M8 plug-in connector type		**FX-101P-Z** (Note 3)		PNP open-collector transistor
Standard type, Cable set (Note 1)		**FX-101-CC2**		NPN open-collector transistor
Standard type, Cable set (Note 1)		**FX-101P-CC2**		PNP open-collector collector transistor
Long sensing range type, M8 plug-in connector type		**FX-102** (Note 2)		NPN open-collector transistor
Long sensing range type, M8 plug-in connector type		**FX-102-Z** (Note 3)		NPN open-collector transistor
Long sensing range type, M8 plug-in connector type		**FX-102P** (Note 2)		PNP open-collector transistor
Long sensing range type, M8 plug-in connector type		**FX-102P-Z** (Note 3)		PNP open-collector transistor
Long sensing range type, Cable set (Note 1)		**FX-102-CC2**		NPN open-collector transistor
Long sensing range type, Cable set (Note 1)		**FX-102P-CC2**		PNP open-collector transistor

Notes: 1) The connector attached cable **CN-14A-C2** is supplied with the amplifier.
2) Make sure to use the optional connector attached cable **CN-14A-C□** or the connector **CN-14A**.
3) Make sure to use the optional M8 connector attached cable **CN-24A-C□**.

Accessory

• **CN-14A-C2**
(Connector attached cable 2 m 6.562 ft)
※Only include cable set type



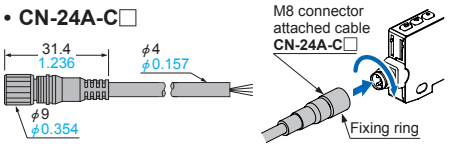
■OPTIONS

Designation	Model No.	Description	
Connector attached cable	**CN-14A-C1**	1 m 3.281 ft	0.02 mm² 4-core cabtyre cable with connector on one end Cable outer diameter: ϕ3.7 mm ϕ0.146 in
	CN-14A-C2 (Note)	2 m 6.562 ft	
	CN-14A-C3	3 m 9.843 ft	
	CN-14A-C5	5 m 16.404 ft	
M8 connector attached cable	**CN-24A-C2**	2 m 6.562 ft	For M8 plug-in connector type The connector on one end Cable outer diameter: ϕ4 mm ϕ0.157 in
	CN-24A-C5	5 m 16.404 ft	
Connector	**CN-14A**	Set of 10 housings and 40 contacts	
Protection cover	**FC-FX-1**	This protects the operating surfaces.	
Amplifier mounting bracket	**MS-DIN-4**	Mounting bracket for amplifier	
End plates	**MS-DIN-E**	When it moves depending on the way it is installed on a DIN rail, these end plates ensure that all amplifiers are mounted together in a secure and fully connected manner. Two pcs. per set	

Note: The connector attached cable **CN-14A-C2** is supplied with the cable set type **FX-10□(P)-CC2**.

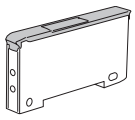
M8 connector attached cable

• **CN-24A-C□**



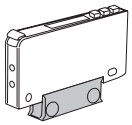
Protection cover

• **FC-FX-1**



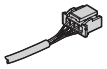
Amplifier mounting bracket

• **MS-DIN-4**



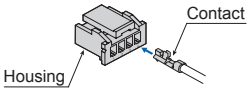
Connector attached cable

• **CN-14A-C□**



Connector

• **CN-14A**



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■SPECIFICATIONS

Item \ Type		Standard type		Long sensing range type	
			Cable set		Cable set
Model No.	NPN output	**FX-101** (**-Z**) (Note 4)	**FX-101-CC2**	**FX-102** (**-Z**) (Note 4)	**FX-102-CC2**
	PNP output	**FX-101P** (**-Z**) (Note 4)	**FX-101P-CC2**	**FX-102P** (**-Z**) (Note 4)	**FX-102P-CC2**
Supply voltage		12 to 24 V DC ± 10 % Ripple P-P 10 % or less			
Power consumption		Normal operation: 720 mW or less (Current consumption 30 mA or less at 24 V supply voltage) ECO mode: 600 mW or less (Current consumption 25 mA or less at 24 V supply voltage)			
Output		<NPN output type> NPN open-collector transistor • Maximum sink current:100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between output and + V) • Residual voltage: 1.5 V or less (at 100 mA source current)	
	Output operation	Selectable either Light-ON or Dark-ON, at SET mode			
	Short-circuit protection	Incorporated			
External input		<NPN output type> NPN non-contact input • Signal condition High: + 8 V to + V DC or Open Low: 0 to + 2 V DC (Source current 0.5 mA or less) • Input impedance: 10 kΩ approx.		<PNP output type> PNP non-contact input • Signal condition High: + 4 V to + V DC (Sink current 0.5 to 3 mA) Low: 0 to + 0.6 V DC or Open • Input impedance: 10 kΩ approx.	
Response time		Emission frequency 0: 250 μs or less Emission frequency 1: 450 μs or less Emission frequency 2: 500 μs or less Emission frequency 3: 600 μs or less		Emission frequency 1: 2.5 ms or less Emission frequency 2: 2.8 ms or less Emission frequency 3: 3.2 ms or less Emission frequency 4: 5.0 ms or less	
Sensitivity setting		2-level teaching / Limit teaching / Full-auto teaching			
Operation indicator		Orange LED (lights up when the output is ON)			
Digital display		4 digits (green) + 4 digits (red) LCD display			
Fine sensitivity adjustment function		Incorporated			
Timer function		ON-delay / OFF-delay timer, switchable either effective or ineffective. [Timer period:1 ms, 5 ms, 10 ms, 20 ms, 40 ms, 50 ms, 100 ms, 500 ms, 1,000 ms]			
Light emitting amount selection function		Incorporated / Switchable either effective or ineffective			
Interference prevention function		Incorporated Emission frequency selection method (Note 2) (Functions at emission frequency 1, 2 or 3)		Incorporated Emission frequency selection method (Note 2) (Functions at emission frequency 1, 2 , 3 or 4)	
Environmental resistance	Ambient temperature	− 10 to + 55 °C + 14 to + 131 °F (If 4 to 7 units are mounted close together: − 10 to + 50 °C + 14 to + 122 °F, if 8 to 16 units are : − 10 to + 45 °C + 14 to + 113 °F) (No dew condensation or icing allowed), Storage: − 20 to + 70 °C − 4 to + 158 °F			
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH			
	Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face			
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure (Note 3)			
	Insulation resistance	20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure (Note 3)			
	Vibration resistance	10 to 150 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y and Z directions for two hours each			
	Shock resistance	98 m/s² acceleration (10 G approx.) in X, Y and Z directions for five times each			
Emitting element (modulated)		Red LED (Peak emission wavelength : 632 nm)			
Material		Enclosure: Polycarbonate, Key switch: Polycarbonate, Fiber lock lever: PBT			
Connecting method		Connector (Note 4)			
Cable extension		Total length up to 100 m 328.084 ft is possible with 0.3 mm², or more, cable.			
Weight		Net weight: 15 g approx. Gross weight: 35 g approx.	Net weight: 15 g approx. Gross weight: 75 g approx.	Net weight: 15 g approx. Gross weight: 35 g approx.	Net weight: 15 g approx. Gross weight: 75 g approx.
Accessory		———	**CN-14A-C2** (Connector attached cable, 2 m 6.562 ft long):1pc.	———	**CN-14A-C2** (Connector attached cable, 2 m 6.562 ft long):1pc.

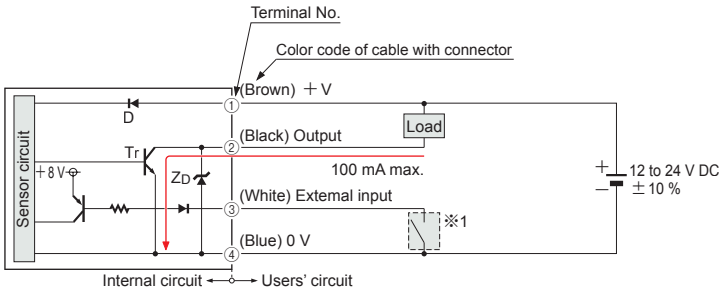
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature + 23 °C + 73.4 °F.
2) When using the interference prevention function, set the emission frequencies for the amplifiers to be covered by the interference prevention function to different frequency values.
However, the interference prevention function does not operate at emission frequency 0 (factory default setting) for the **FX-101**(**P**)(**-Z**) / **FX-101**(**P**)**-CC2**.
3) The voltage withstandability and the insulation resistance values given in the above table are for the amplifier only.
4) Connector attached cable **CN-14A-C2** is not attached to the models that have no '**-CC2**' at the end of the model Nos.
Make sure to use the optional connector attached cable **CN-14A-C**□ or the connector **CN-14A**.
Model Nos. having the suffix '**-Z**' are M8 plug-in connector type. Make sure to use the optional M8 plug-in connector cable **CN-24A-C**□.

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■I/O CIRCUIT AND WIRING DIAGRAMS

FX-10□(-Z/-CC2) — NPN output type

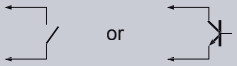
I/O circuit diagram



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

※1

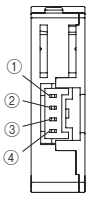
Non-voltage contact or NPN open-collector transistor



High (＋8 V to ＋V DC or open): Ineffective
Low [(0 to ＋2 V DC (source current 0.5 mA or less)] : Effective

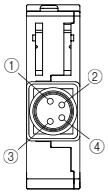
Terminal arrangement diagram

Connector type



Terminal No.	Function
①	＋V
②	Output
③	External input
④	0 V

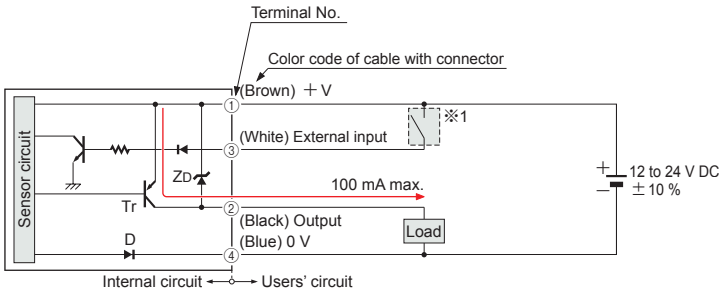
M8 plug-in connector type



Terminal No.	Function
①	＋V
②	Output
③	External input
④	0 V

FX-10□P(-Z/-CC2) — PNP output type

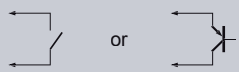
I/O circuit diagram



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

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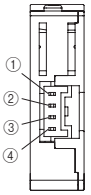
Non-voltage contact or PNP open-collector transistor



High [＋4 V to ＋V DC (sink current 0.5 to 3 mA)]: Effective
Low (0 to ＋0.6 V DC or open): Ineffective

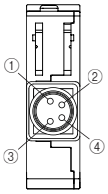
Terminal arrangement diagram

Connector type



Terminal No.	Function
①	＋V
②	Output
③	External input
④	0 V

M8 plug-in connector type



Terminal No.	Function
①	＋V
②	Output
③	External input
④	0 V

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note) Standard type **FX-101**□	Sensing range (mm in)(Note) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Threaded type / M4	Lens mountable M4	400 15.748	1,150 45.276	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FT-B8**
	Lens mountable M4					**FT-FM2**
	Sleeve 90 mm 3.543 in M4 ϕ1.48 ϕ0.058	300 11.811	800 31.496		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FT-FM2S**
	Sleeve 40 mm 1.575 in M4 ϕ1.48 ϕ0.058					**FT-FM2S4**
	Lens mountable M4	260 10.236	650 25.591		R1 mm R0.039 in	**FT-W8**
	Lens mountable M4	230 9.055	650 25.591		R4 mm R0.157 in Flexible	**FT-P80**
	Lens mountable M4 Tough flexible	260 10.236	800 31.496	1 m 3.281 ft	R10 mm R0.394 in	**FT-P81X**
	Lens mountable M4	130 5.118	300 11.811	✂ 2 m 6.562 ft	R4 mm R0.157 in Flexible	**FT-P60**
Nut type	M4 W7 × H9 × D13.9 W0.276 × H0.354 × D0.547	215 8.465	570 22.441	✂ 2 m 6.562 ft	R1 mm R0.039 in	NEW **FT-WR80**
	With lens M4 W7 × H9 × D14.6 W0.276 × H0.354 × D0.575	430 16.929	1,150 45.276			NEW **FT-WR80L**
Elbow	Lens mountable M4	180 7.087	430 16.929	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FT-R80**
M3	Lens mountable (except **FX-LE2**) M3	300 11.811	800 31.496	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FT-T80**
	M3					**FT-NFM2**
	Sleeve 90 mm 3.543 in M3 ϕ0.88 ϕ0.035	130 5.118	280 11.024		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FT-NFM2S**
	Sleeve 40 mm 1.575 in M3 ϕ0.88 ϕ0.035					**FT-NFM2S4**
	M3	80 3.150	220 8.661		R1 mm R0.039 in	**FT-W4**
	M3	80 3.150	240 9.449		R4 mm R0.157 in Flexible	**FT-P40**
Long sensing range	With lens M14	9,300 366.141	15,000 590.550	✂ 10 m 32.808 ft	R25 mm R0.984 in	**FT-FM10L**

Note: 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.

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note) Standard type FX-101□	Sensing range (mm in)(Note) Long sensing range type FX-102□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Cylindrical type, ϕ3 ϕ0.118	With lens • Long sensing range ϕ3 ϕ0.118	600 23.622	1,500 59.055	2 m 6.562 ft	R1 mm R0.039 in	FT-WS8L
Cylindrical type, ϕ3 ϕ0.118	ϕ3 ϕ0.118	150 5.906	600 23.622	2 m 6.562 ft	R1 mm R0.039 in	FT-WS3
Cylindrical type, ϕ2.5 ϕ0.098	With lens • Long sensing range ϕ2.5 ϕ0.098	760 29.921	2,400 94.488	2 m 6.562 ft	R25 mm R0.984 in	FT-SFM2L
Cylindrical type, ϕ2.5 ϕ0.098	ϕ2.5 ϕ0.098	300 11.811	800 31.496	2 m 6.562 ft	R25 mm R0.984 in	FT-SFM2
Cylindrical type, ϕ2.5 ϕ0.098	ϕ2.5 ϕ0.098	260 10.236	650 25.591	2 m 6.562 ft	R1 mm R0.039 in	FT-WS8
Cylindrical type, ϕ1.5 ϕ0.059	ϕ1.5 ϕ0.059	130 5.118	280 11.024	2 m 6.562 ft	R25 mm R0.984 in	FT-SNFM2
Cylindrical type, ϕ1.5 ϕ0.059	ϕ1.5 ϕ0.059	80 3.150	220 8.661	2 m 6.562 ft	R1 mm R0.039 in	FT-WS4
Cylindrical type, ϕ1.5 ϕ0.059	ϕ1.5 ϕ0.059	120 4.724	330 12.992	1 m 3.281 ft	R4 mm R0.157 in Flexible	FT-P2
Cylindrical type, ϕ1 ϕ0.039	ϕ1 ϕ0.039	40 1.575	90 3.543	500 mm 19.685 in	R4 mm R0.157 in Flexible	FT-PS1
Ultra-small diameter	Beam diameter ϕ0.125 mm ϕ0.005 in, ϕ0.25 ϕ0.010 ϕ3 ϕ0.118; Sleeve part cannot be bent.	6 0.236	19 0.748	500 mm 19.685 in	R5 mm R0.197 in	FT-E12
Ultra-small diameter	Beam diameter ϕ0.25 mm ϕ0.010 in, ϕ0.4 ϕ0.016 ϕ3 ϕ0.118; Sleeve part cannot be bent.	15 0.591	60 2.362	1 m 3.281 ft	R5 mm R0.197 in	FT-E22
Side-view	ϕ4 ϕ0.157; 3 0.118	1,000 39.370	2,350 92.520	2 m 6.562 ft	R25 mm R0.984 in	FT-V10
Side-view	ϕ1.5 ϕ0.059; 0.8 0.031; ϕ2.5 ϕ0.098; Sleeve part cannot be bent.	180 7.087	470 18.504	2 m 6.562 ft	R25 mm R0.984 in	FT-SFM2SV2
Side-view	ϕ1 ϕ0.039; 0.6 0.024; ϕ2 ϕ0.079; Sleeve part cannot be bent.	140 5.512	380 14.961	1 m 3.281 ft	R25 mm R0.984 in	FT-V22
Side-view	ϕ1 ϕ0.039; 0.6 0.024; ϕ2.5 ϕ0.098; Sleeve part cannot be bent.	40 1.575	120 4.724	2 m 6.562 ft	R25 mm R0.984 in	FT-V41
Side-view	ϕ1 ϕ0.039; 1 0.039; ϕ2 ϕ0.079; Sleeve part cannot be bent.	30 1.181	80 3.150	2 m 6.562 ft	R1 mm R0.039 in	FT-WV42

Note: 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.

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Thru-beam type (one pair set)



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1) Standard type FX-101□	Sensing range (mm in)(Note 1) Long sensing range type FX-102□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Rectangular	Compact	Easy mounting • Top sensing W3×H8×D12 W0.118×H0.315×D0.472	1,200 47.244	2,800 110.236	2 m 6.562 ft	R1 mm R0.039 in	FT-WZ8H
			1,400 55.118	3,100 122.047		R4 mm R0.157 in Flexible	FT-Z8H
		Easy mounting • Side sensing W3×H12×D8 W0.118×H0.472×D0.315	700 27.559	2,100 82.677		R1 mm R0.039 in	FT-WZ8E
			800 31.496	1,850 72.835		R4 mm R0.157 in Flexible	FT-Z8E
		Easy mounting • Front sensing W8.5×H12×D3 W0.335×H0.472×D0.118	330 12.992	950 37.402		R1 mm R0.039 in	FT-WZ8
			360 14.173	1,000 39.370		R4 mm R0.157 in Flexible	FT-Z8
		Front sensing W10×H7×D2 W0.394×H0.276×D0.079	230 9.055	670 26.378	1 m 3.281 ft	R1 mm R0.039 in	NEW FT-WZ4
		Fiber bending type W2×H10×D10 W0.079×H0.394×D0.394	80 3.150	230 9.055			NEW FT-WZ4HB
		Front sensing W14×H7×D3.5 W0.551×H0.276×D0.138	330 12.992	1,000 39.370	2 m 6.562 ft		NEW FT-WZ7
		Fiber bending type W3.5×H14×D11 W0.138×H0.551×D0.433	190 7.480	580 22.835			NEW FT-WZ7HB
Special	Narrow beam	ϕ3.5 ϕ0.138 / ϕ3.7 ϕ0.146	1,000 39.370	3,000 118.110	2 m 6.562 ft	R25 mm R0.984 in	FT-K8
		Side-view type with small light dispersion ϕ4 ϕ0.157 0.118	700 27.559	2,200 86.614		R1 mm R0.039 in	FT-WKV8
			1,000 39.370	3,000 118.110		R25 mm R0.984 in	FT-KV8
		W2×H1.5×D20 W0.079×H0.059×D0.787 0.079	135 5.315	500 19.685		R10 mm R0.394 in	FT-KV1
	Wide beam	Wide area sensing Sensing width 32 mm 1.260 in W5×H69×D20 W0.197×H2.717×D0.787	(Note 2) 3,500 137.795	(Note 2) 3,500 137.795	2 m 6.562 ft	R1 mm R0.039 in	FT-WA30
						R10 mm R0.394 in	FT-A30
		Wide area sensing Sensing width 11 mm 0.433 in W4.2×H31×D13.5 W0.165×H1.220×D0.531	1,500 59.055	(Note 2) 3,500 137.795		R1 mm R0.039 in	FT-WA8
						R10 mm R0.394 in	FT-A8
	Array	Top sensing W5×H15×D15 W0.197×H0.591×D0.591	280 11.024	720 28.346	2 m 6.562 ft	R25 mm R0.984 in	FT-AFM2
		Side sensing W5×H15×D15 W0.197×H0.591×D0.591	240 9.449	670 26.378			FT-AFM2E

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 fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long.

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■LIST OF FIBERS

Thru-beam type (one pair set)



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1) Standard type **FX-101**□	Sensing range (mm in)(Note 1) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Special	Heat-resistant	350 °C 662 °F Lens mountable M4	170 6.693	490 19.291	2 m 6.562 ft	R25 mm R0.984 in	**FT-H35-M2**
		350 °C 662 °F Sleeve 60 mm 2.362 in M4 ϕ2.1 ϕ0.083				Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FT-H35-M2S6**
		Allows flexible wiring 200 °C 392 °F Lens mountable M4	100 3.937	300 11.811	1 m 3.281 ft	R10 mm R0.394 in	**FT-H20W-M1**
		200 °C 392 °F Lens mountable M4	210 8.268	540 21.260	1 m 3.281 ft	R25 mm R0.984 in	**FT-H20-M1**
		130 °C 266 °F Lens mountable (**FX-LE2** only) M4	250 9.843	700 27.559	✂ 2 m 6.562 ft		**FT-H13-FM2**
	Heat-resistant • Joint	Lens mountable (**FX-LE1**) M4	135 5.315	420 16.535	✂ 200 mm 7.874 in (Note 2)	Heat-resistant side fiber R18 mm R0.709 in (Note 3)	NEW **FT-H20-J20-S** (Note 4)
					✂ 300 mm 11.811 in (Note 2)		NEW **FT-H20-J30-S** (Note 4)
					✂ 500 mm 19.685 in (Note 2)		NEW **FT-H20-J50-S** (Note 4)
		Side-view ϕ3.8 ϕ0.150 ϕ4 ϕ0.157	150 5.906	500 19.685	✂ 500 mm 19.685 in (Note 2)		NEW **FT-H20-VJ50-S** (Note 4)
					✂ 800 mm 31.496 in (Note 2)		NEW **FT-H20-VJ80-S** (Note 4)
	Chemical-resistant	Easy mounting • Rectangular head SEMI S2 compliant W7 × H15 × D13 W0.276 × H0.591 × D0.512	520 20.472	3,100 122.047	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FT-Z802Y**
		ϕ5.5 ϕ0.217	1,100 43.307	2,600 102.362	✂ 2 m 6.562 ft (Note 5)	R30 mm R1.181 in	**FT-L80Y**
		Side-view ϕ5.5 ϕ0.217	340 13.386	800 31.496			**FT-V80Y**
	Vacuum-resistant	300 °C 572 °F Lens mountable (**FV-LE1/SV2** only) M4	110 4.331	280 11.024	1 m 3.281 ft	R18 mm R0.709 in	**FT-H30-M1V-S** (Note 6)

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) This is the fiber length (fixed length) for heat-resistant side fibers. The ordinary-temperature side fibers are free-cut to 2 m 6.562 ft.
3) The ordinary-temperature side fiber is R25 mm R0.984 in or more.
4) Heat-resistant joint fibers and ordinary-temperature side fibers (**FT-FM2**) are sold as a set. Please refer to 'Heat-resistant joint fiber catalog' for details.
5) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.
6) Sold as a set comprising vacuum-resistant type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**). Please refer to 'Vacuum-resistant fiber catalog' for details.

Model No. when ordering heat-resistant joint fibers individually as replacement parts

- **FT-H20-J20** (one pair set)
- **FT-H20-J30** (one pair set)
- **FT-H20-J50** (one pair set)
- **FT-H20-VJ50** (one pair set)
- **FT-H20-VJ80** (one pair set)

Model No. when ordering vacuum-resistant fibers individually as replacement parts

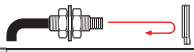
- Vacuum-resistant type fiber **FT-H30-M1V** (one pair set)
- Photo-terminal **FV-BR1** (one pair set)
- Fiber at atmospheric side **FT-J8** (one pair set)

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Retroreflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type FX-101□	Sensing range (mm in)(Note 1, 2) Long sensing range type FX-102□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Sharp bending With polarizing filters	W9.5×H5.2×D15 W0.374×H0.205×D0.591 W30×H30×D0.5 W1.181×H1.181×D0.020	100 to 550 3.937 to 21.654	100 to 830 3.937 to 32.677	✂ 2 m 6.562 ft	R1 mm R0.039 in	**FR-WKZ11**
Narrow beam Top sensing	W9.5×H5.2×D21 W0.374×H0.205×D0.827 W10.6×H28×D10.1 W0.417×H1.102×D0.398	200 7.874	200 7.874	✂ 2 m 6.562 ft	R10 mm R0.394 in	**FR-KZ21**
Narrow beam Side sensing	W9.5×H25×D5.2 W0.374×H0.984×D0.205 W10.6×H28×D10.1 W0.417×H1.102×D0.398					**FR-KZ21E**
Wafer mapping	W7.5×H2.2×D11.2 W0.295×H0.087×D0.441 W4×H2×D21.5 W0.157×H0.079×D0.846	15 to 200 0.591 to 7.874	15 to 360 0.591 to 14.173	✂ 2 m 6.562 ft	R10 mm R0.394 in	**FR-KV1**

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.
The sensing range of **FR-WKZ11** is specified for the **RF-13**. The sensing range of **FR-KZ21**, **FR-KZ21E** and **FR-KV1** is specified for the attached reflector.
The sensing ranges when using in combination with the **FR-WKZ11** reflector (optional) are given in the below table.

Reflector \ Amplifier	FX-101□	FX-102□
FR-WKZ11＋RF-210	100 to 700 3.937 to 27.559	100 to 1,100 3.937 to 43.307
FR-WKZ11＋RF-220	100 to 1,300 3.937 to 51.181	100 to 2,600 3.937 to 102.362
FR-WKZ11＋RF-230	100 to 2,000 3.937 to 78.740	100 to 4,000 3.937 to 157.480

2) The sensing range of **FR-WKZ11** is the possible setting range for the reflector or reflective tape. The fiber can detect an object less than 100 mm 3.937 in away. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.
The sensing range of **FR-KZ21(E)** is the possible setting range for the reflector. However, if setting the fiber to detect objects passing within 0 to 20 mm 0 to 0.787 in from the fiber head, unstable detection may result.
The sensing range of **FR-KV1** is the possible setting range for the reflector. The fiber can detect an object less than 15 mm 0.591 in away.

Reflective type



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type FX-101□	Sensing range (mm in)(Note 1, 2) Long sensing range type FX-102□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Threaded type	M6	M6	170 6.693	440 17.323	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FD-B8**
Threaded type	M6	Coaxial M6	100 3.937	410 16.142			**FD-FM2**
Threaded type	M6	Sleeve 90 mm 3.543 in M6 ϕ2.5 ϕ0.098	100 3.937	345 13.583		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FD-FM2S**
Threaded type	M6	Sleeve 40 mm 1.575 in M6 ϕ2.5 ϕ0.098					**FD-FM2S4**
Threaded type	M6	M6	80 3.150	230 9.055		R1 mm R0.039 in	**FD-W8**
Threaded type	M6	M6	90 3.543	200 7.874		R4 mm R0.157 in Flexible	**FD-P80**
Threaded type	M6	M6 Tough flexible	70 2.756	220 8.661	1 m 3.281 ft	R10 mm R0.394 in	**FD-P81X**
Threaded type	Elbow	M6	70 2.756	180 7.087	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FD-R80**

Notes: 1) The sensing range is specified for white non-glossy paper (400×400 mm 15.748×15.748 in) 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.

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Reflective type



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type **FX-101**□	Sensing range (mm in)(Note 1, 2) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Threaded type	M4	M4	110 4.331	345 13.583	2 m 6.562 ft	R25 mm R0.984 in	**FD-T80**
		M4	35 1.378	100 3.937			**FD-NFM2**
		Sleeve 90 mm 3.543 in M4 ϕ1.48 ϕ0.058				Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FD-NFM2S**
		Sleeve 40 mm 1.575 in M4 ϕ1.48 ϕ0.058					**FD-NFM2S4**
		Sleeve 40 mm 1.575 in M4 ϕ1.48 ϕ0.058	15 0.591	40 1.575		Fiber R1 mm R0.039 in Sleeve R10 mm R0.394 in	**FD-W44**
		M4	80 3.150	230 9.055		R1 mm R0.039 in	**FD-WT8**
		Small spot for sensing minute objects Coaxial • Lens mountable	28 1.102	75 2.953		R2 mm R0.079 in	**FD-WG4**
		M4	50 1.969	120 4.724		R25 mm R0.984 in	**FD-G4**
		M4	45 1.772	150 5.906		R4 mm R0.157 in Flexible	**FD-P60**
	M3	Small diameter M3	35 1.378	100 3.937	2 m 6.562 ft	R25 mm R0.984 in	**FD-T40**
		M3	15 0.591	40 1.575		R1 mm R0.039 in	**FD-WT4**
		M3	8 0.315	30 1.181		R4 mm R0.157 in Flexible	**FD-P40**
		Lens mountable (**FX-MR3**, **FX-MR6**) M3 Coaxial	50 1.969	120 4.724		R25 mm R0.984 in	**FD-G6**
		Lens mountable (**FX-MR3**, **FX-MR6**) M3 Coaxial Tough flexible	45 1.772	160 6.299	1 m 3.281 ft (Note 3)	R10 mm R0.394 in	**FD-G6X**
		Coaxial • Lens mountable (**FX-MR3**, **FX-MR6**) M3 High precision	18 0.709	50 1.969	500 mm 19.685 in	R25 mm R0.984 in	**FD-EG1**
		Coaxial • Lens mountable (**FX-MR3**, **FX-MR6**) M3 Light emitting fiber element High precision ϕ0.175 ϕ0.007	10 0.394	30 1.181		R10 mm R0.394 in	**FD-EG2**
		Coaxial • Lens mountable (**FX-MR3**, **FX-MR6**) M3 Light emitting fiber element High precision ϕ0.125 ϕ0.005	7 0.276	22 0.866			**FD-EG3**
		M3 ϕ0.5 ϕ0.020 Sleeve part cannot be bent.	1 0.039	4 0.157		R25 mm R0.984 in	**FD-EN500S1**
		Coaxial M3 ϕ0.8 ϕ0.031 Sleeve part cannot be bent.	15 0.591	48 1.890	1 m 3.281 ft		**FD-ENM1S1**

Notes: 1) The sensing range is specified for white non-glossy paper [200×200 mm 7.874×7.874 in (**FD-T80**, **FD-WT8**: 400×400 mm 15.748×15.748 in, **FD-W44**, **FD-WT4**, **FD-P40**, **FD-G6**, **FD-EG1**, **FD-EG2**, **FD-EG3**, **FD-EN500S1**, **FD-ENM1S1**: 100×100 mm 3.937×3.937 in)] 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 allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Reflective type



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type **FX-101**□	Sensing range (mm in)(Note 1, 2) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Cylindrical type	ϕ3 ϕ0.118	ϕ3 ϕ0.118	100 3.937	345 13.583	2 m 6.562 ft	R25 mm R0.984 in	**FD-S80**
		ϕ3 ϕ0.118	80 3.150	230 9.055		R1 mm R0.039 in	**FD-WS8**
		Coaxial ϕ3 ϕ0.118	28 1.102	75 2.953		R2 mm R0.079 in	**FD-WSG4**
		ϕ3 ϕ0.118	45 1.772	150 5.906		R4 mm R0.157 in Flexible	**FD-P50**
	ϕ2.5 ϕ0.098	ϕ2.5 ϕ0.098	35 1.378	100 3.937	2 m 6.562 ft	R25 mm R0.984 in	**FD-SNFM2**
	ϕ1.5 ϕ0.059	ϕ1.5 ϕ0.059	25 0.984	65 2.559	1 m 3.281 ft	R4 mm R0.157 in Flexible	**FD-P2**
	Ultra-small diameter	ϕ1.5 ϕ0.059 ϕ0.5 ϕ0.020 Sleeve part cannot be bent.	3.5 0.138	13 0.512	1 m 3.281 ft	R10 mm R0.394 in	**FD-E12**
		Coaxial ϕ3 ϕ0.118 ϕ0.65 ϕ0.026 Sleeve part cannot be bent.	16 0.630	45 1.772		R25 mm R0.984 in	**FD-E22**
	Side-view	Small diameter ϕ1.5 ϕ0.059 ϕ3 ϕ0.118 0.7 0.028 Sleeve part cannot be bent.	25 0.984	70 2.756	2 m 6.562 ft	R25 mm R0.984 in	**FD-V41**
		ϕ3 ϕ0.118 ϕ2 ϕ0.079 1 0.039 Sleeve part cannot be bent.	6 0.236	20 0.787		R1 mm R0.039 in	**FD-WV42**
		ϕ5 ϕ0.197 ϕ2 ϕ0.079 0.8 0.031 Sleeve part cannot be bent.	30 1.181	90 3.543		R25 mm R0.984 in	**FD-SFM2SV2**
Rectangular	Convergent reflective type	Glass substrate detection • Mapping W25×H7.3×D30 W0.984×H0.287×D1.181	16 to 30 0.630 to 1.181	12 to 50 0.472 to 1.969	4 m 13.123 ft	R25 mm R0.984 in	**FD-L46**
		Glass substrate detection • Alignment W20×H29×D3.8 W0.787×H1.142×D0.150	0 to 40 0 to 1.575	0 to 50 0 to 1.969	3 m 9.843 ft	R4 mm R0.157 in	**FD-L45**
		Glass substrate detection • Alignment W17×H29×D3.8 W0669×H1.142×D0.150	0 to 19 0 to 0.748	0 to 25 0 to 0.984	2 m 6.562 ft		**FD-L43**
		Glass substrate detection • Seating confirmation W12×H19×D3 W0.472×H0.748×D0.118	0 to 6 0 to 0.236	0 to 8 0 to 0.315	2 m 6.562 ft	R10 mm R0.394 in	**FD-L44**
			0 to 4.5 0 to 0.177	0 to 5.5 0 to 0.217			**FD-L44S**
		Glass substrate detection W24×H21×D4 W0.945×H0.827×D0.157	7 to 12 0.276 to 0.472 (Convergent point 8 0.315)	6 to 13.5 0.236 to 0.531 (Convergent point 8 0.315)	2 m 6.562 ft	R1 mm R0.039 in	**FD-WL41**
			3 to 14 0.118 to 0.551 (Convergent point 8 0.315)	1.5 to 16 0.059 to 0.630 (Convergent point 8 0.315)		R10 mm R0.394 in	**FD-L41**
		W6×H18×D14 W0.236×H0.709×D0.551	5 to 8 0.197 to 0.315 (Convergent point 6 0.236)	1 to 17 0.039 to 0.669 (Convergent point 6 0.236)			**FD-L4**
		W7.2×H7.5×D2 W0.283×H0.295×D0.079	1 to 4.5 0.039 to 0.177	0.5 to 6.5 0.020 to 0.256	1 m 3.281 ft	R1 mm R0.039 in	**FD-WL48**

Notes: 1) The sensing range is specified for white non-glossy paper (**FD-S80**, **FD-WS8**: 400×400 mm 15.748×15.748 in, **FD-WSG4**, **FD-P50**, **FD-SNFM2**, **FD-V41**, **FD-SFM2SV2**: 200×200 mm 7.874×7.874 in, **FD-P2**, **FD-E12**, **FD-E22**, **FD-WV42**, **FD-L4**, **FD-WL48**: 100×100 mm 3.937×3.937 in, **FD-L46**: 100×100×t 0.7 mm 3.937×3.937×t 0.028 in R edge of LCD glass substrates, **FD-L43**, **FD-L44** and **FD-L45:** 100×100×t 0.7 mm 3.937×3.937×t 0.028 in LCD glass substrates, **FD-L44S**: silicon wafers polished surface, **FD-WL41**, **FD-L41**: 100×100×t 2 mm 3.937×3.937×t 0.079 in glass substrates)
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.

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■LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked with light blue in the table.

Reflective type



Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type **FX-101**□	Sensing range (mm in)(Note 1, 2) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Rectangular	Compact	Front sensing W10×H7×D2 W0.394×H0.276×D0.079	2 to 20 0.079 to 0.787	1 to 70 0.039 to 2.756	✂ 1 m 3.281 ft	R1 mm R0.039 in	NEW **FD-WZ4**
		Fiber bending type W2×H10×D10 W0.079×H0.394×D0.394					NEW **FD-WZ4HB**
		Front sensing W14×H7×D3.5 W0.551×H0.276×D0.138	1 to 55 0.039 to 2.165	160 6.299	✂ 2 m 6.562 ft		NEW **FD-WZ7**
		Fiber bending type W3.5×H14×D11 W0.138×H0.551×D0.433	1 to 60 0.039 to 2.362	0.5 to 180 0.020 to 7.087			NEW **FD-WZ7HB**
Special	Long sensing range	Long sensing range • Rectangular head W5.2×H9.5×D15 W0.205×H0.374×D0.591	20 to 180 0.787 to 7.087	20 to 480 0.787 to 18.898	✂ 2 m 6.562 ft	R1 mm R0.039 in	**FD-WKZ1**
	Wide beam	W7×H15×D30 W0.276×H0.591×D1.181	125 4.921	250 9.843	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FD-A15**
	Array	Top sensing W5×H20×D20 W0.197×H0.787×D0.787	105 4.134	285 11.220	✂ 2 m 6.562 ft	R25 mm R0.984 in	**FD-AFM2**
		Side sensing W5×H20×D20 W0.197×H0.787×D0.787	85 3.346	245 9.646			**FD-AFM2E**
	Liquid level sensing	Contact type ϕ6 ϕ0.236	—		✂ 2 m 6.562 ft (Note 3)	Protective tube R40 mm R1.575 in Fiber R15 mm R0.591 in	**FD-F8Y**
		Mountable on pipe • Standard W25×H13×D20 W0.984×H0.512×D0.787	Applicable pipe diameter: Outer dia. ϕ6 to ϕ26 mm ϕ0.236 to ϕ1.024 in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in]		✂ 2 m 6.562 ft	R10 mm R0.394 in	**FD-F41**
		Mountable on pipe • For PFA, wall thickness 1 mm 0.039 in pipe W25×H13×D20 W0.984×H0.512×D0.787	Applicable pipe diameter: Outer dia. ϕ6 to ϕ26 mm ϕ0.236 to ϕ1.024 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in]				**FD-F4**

Notes: 1) The sensing range is specified for white non-glossy paper [200×200 mm 7.874×7.874 in (**FD-WKZ1**, **FD-AFM2**, **FD-AFM2E**: 400×400 mm 15.478×15.478 in)] 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 allowable cutting range is 1,000 mm 39.370 in from the end that the amplifier inserted.

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■LIST OF FIBERS

Reflective type

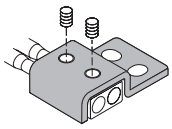


Type		Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type **FX-101**□	Sensing range (mm in)(Note 1, 2) Long sensing range type **FX-102**□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Special	Heat-resistant	350 °C 662 °F • Coaxial M6	75 2.953	280 11.024	2 m 6.562 ft	R25 mm R0.984 in	**FD-H35-M2**
		350 °C 662 °F • Sleeve 60 mm 2.362 in M6 ϕ2.8 ϕ0.110				Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FD-H35-M2S6**
		200 °C 392 °F • Coaxial M6	120 4.724	300 11.811	1 m 3.281 ft	R25 mm R0.984 in	**FD-H20-M1**
		350 °C 662 °F • Sleeve 90 mm 3.543 in M4 ϕ2.1 ϕ0.083	85 3.346	200 7.874		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	**FD-H35-20S**
		200 °C 392 °F • Coaxial M4	90 3.543	280 11.024		R25 mm R0.984 in	**FD-H20-21**
		300 °C 572 °F • Glass substrate detection Convergent reflective type W19 X H27 X D5 W0.748 X H1.063 X D0.197	2 to 9 0.079 to 0.354	0 to 17 0 to 0.669	2 m 6.562 ft		**FD-H30-L32**
		180 °C 356 °F • Glass substrate detection Convergent reflective type W19 X H27 X D5 W0.748 X H1.063 X D0.197	0 to 10 0 to 0.394	0 to 25 0 to 0.984	✂ 2 m 6.562 ft		**FD-H18-L31**
		130 °C 266 °F M6	100 3.937	280 11.024			**FD-H13-FM2**
	Vacuum-resistant	300 °C 572 °F • Rectangular head W9.5 X H5.2 X D15 W0.374 X H0.205 X D0.591	25 to 80 0.984 to 3.150	10 to 220 0.394 to 8.661	1 m 3.281 ft	R18 mm R0.709 in	**FD-H30-KZ1V-S** (Note 3)
		300 °C 572 °F • Glass substrate detection Convergent reflective type W19 X H5 X D27 W0.748 X H0.197 X D1.063	2.5 to 6.5 0.098 to 0.256	0 to 11 0 to 0.433	3 m 9.843 ft		**FD-H30-L32V-S** (Note 3)

Notes: 1) The sensing range is specified for white non-glossy paper [400×400 mm 15.748×15.748 in (**FD-H30-L32**, **FD-H18-L31**: 50×50 mm 1.969×1.969 in glass substrate, **FD-H30-KZ1V-S**, **FD-H30-L32V-S**: 100×100×t 0.7 mm 3.937×3.937×t 0.028 in transparent glass)] 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) Sold as a set comprising vacuum-resistant type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

Model No. when ordering vacuum-resistant fibers individually as replacement parts

- Vacuum-resistant type fiber
  FD-H30-KZ1V
  FD-H30-L32V
- Mounting bracket for **FD-H30-KZ1V**
  MS-FD-2



- Photo-terminal
  FV-BR1 (one pair set)
- Fiber at atmospheric side
  FT-J8 (one pair set)

Accessories (attached with fibers)

RF-003 (**FR-KZ21/KZ21E** exclusive reflector)
RF-13 (Reflective tape)
FX-CT1 (Fiber cutter)
FX-CT2 (Fiber cutter)
FX-AT2 (Attachment for fixed-length fiber, Orange)
FX-AT3 (Attachment for ϕ2.2 mm ϕ0.087 in fiber, Clear orange)
FX-AT4 (Attachment for ϕ1 mm ϕ0.039 in fiber, Black)
FX-AT5 (Attachment for ϕ1.3 mm ϕ0.051 in fiber, Gray)
FX-AT6 (Attachment for ϕ1 mm ϕ0.039 in / ϕ1.3 mm ϕ0.051 in mixed fiber, Black / Gray)

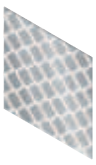
If connecting to a fiber amplifier other than the FX-100 series

Applicable fiber amplifiers: **FX2** / **FX3** series
FX-AT10 (Attachment for ϕ1 mm ϕ0.039 in fiber)
FX-AT13 (Attachment for ϕ1.3 mm ϕ0.051 in fiber)
FX-AT15 (Attachment for ϕ1 mm ϕ0.039 in / ϕ1.3 mm ϕ0.051 in mixed fiber)

- **RF-003**



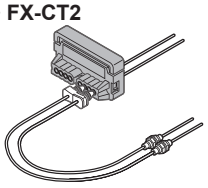
- **RF-13**



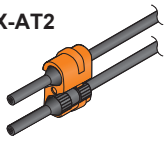
- **FX-CT1**



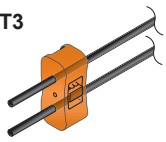
- **FX-CT2**



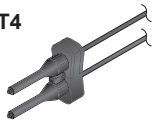
- **FX-AT2**



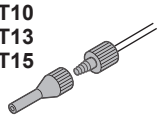
- **FX-AT3**



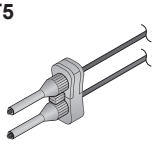
- **FX-AT4**



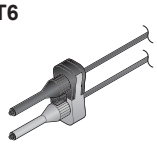
- **FX-AT10**
- **FX-AT13**
- **FX-AT15**



- **FX-AT5**



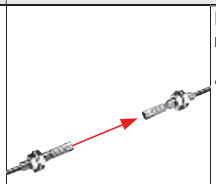
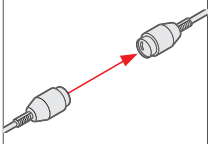
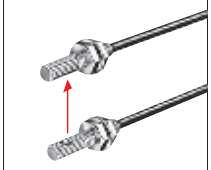
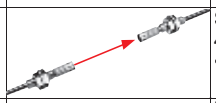
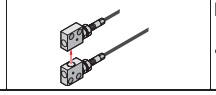
- **FX-AT6**



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■FIBER OPTIONS

Lens (For thru-beam type fiber)

Designation		Model No.		Description
For thru-beam type fiber	Expansion lens (Note 1)	**FX-LE1**		Increases the sensing range by 5 times or more. • Ambient temperature: −60 to +350 °C −76 to +662 °F
	Super-expansion lens (Note 1)	**FX-LE2**		Tremendously increases the sensing range with large diameter lenses. • Ambient temperature: −60 to +350 °C −76 to +662 °F
	Side-view lens	**FX-SV1**		Beam axis is bent by 90 °. • Ambient temperature: −60 to +300 °C −76 to +572 °F
	Expansion lens for vacuum-resistant fiber (Note 1)	**FV-LE1**		Sensing range increases by 4 times or more. • Ambient temperature: −40 to +120 °C −40 to +248 °F
	Side-view lens for vacuum-resistant fiber	**FX-SV2**		Beam axis is bent by 90 °. • Ambient temperature: −60 to +300 °C −140 to +572 °F

Sensing range (mm) [Lens on both sides]

Fiber \ Amplifier	FX-101□	FX-102□
FT-B8	2,200	3,500 (Note 2)
FT-FM2, FT-T80	3,000	3,500 (Note 2)
FT-R80	1,900	3,500 (Note 2)
FT-W8	3,000	3,500 (Note 2)
FT-P80, FT-P60	3,500 (Note 2)	3,500 (Note 2)
FT-P81X	1,600 (Note 2)	1,600 (Note 2)
FT-H35-M2	2,000	3,500 (Note 2)
FT-H20W-M1	1,300	1,600 (Note 2)
FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)
FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S	1,000	3,500 (Note 2)

Sensing range (mm) [Lens on both sides]

Fiber \ Amplifier	FX-101□	FX-102□
FT-B8, FT-FM2, FT-R80, FT-W8, FT-P80, FT-P60	3,500 (Note 2)	3,500 (Note 2)
FT-P81X	1,600 (Note 2)	1,600 (Note 2)
FT-H35-M2	3,500 (Note 2)	3,500 (Note 2)
FT-H20W-M1, FT-H20-M1	1,600 (Note 2)	1,600 (Note 2)
FT-H13-FM2	3,500 (Note 2)	3,500 (Note 2)
FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S	3,500 (Note 2)	3,500 (Note 2)

Sensing range (mm) [Lens on both sides]

Fiber \ Amplifier	FX-101□	FX-102□
FT-B8	530	1,450
FT-FM2, FT-T80	550	1,700
FT-W8	450	1,300
FT-P80	420	1,400
FT-P60	300	850
FT-P81X	550	1,700
FT-H35-M2	280	800
FT-H20W-M1	140	400
FT-H20-M1	280	840
FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S	150	410

Sensing range (mm) [Lens on both sides] (Note 3)

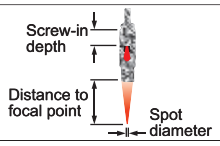
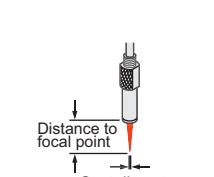
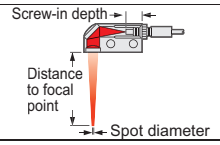
Fiber \ Amplifier	FX-101□	FX-102□
FT-H30-M1V	450	1,600

Sensing range (mm) [Lens on both sides] (Note 3)

Fiber \ Amplifier	FX-101□	FX-102□
FT-H30-M1V	450	1,600

Notes: 1) Be careful when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult. Especially when installing a fiber with many cores (sharp bending fibers and heat-resistant glass fiber), please be sure to use it only after you have adjusted it sufficiently.
2) The fiber cable length practically limits the sensing range to 3,500 mm 137.795 in long (**FT-H20W-M1**, **FT-P81X** and **FT-H20-M1**: 1,600 mm 62.992 in).
3) The fiber cable length for the **FT-H30-M1V** is 1m 3.281 ft. The sensing ranges in **FX-102**□ (long sensing range type) take into account the length of the **FT-J8** atmospheric side fiber.

Lens (For reflective type fiber)

Designation		Model No.		Description
For reflective type fiber	Pinpoint spot lens	**FX-MR1**		Pinpoint spot of ϕ0.5 mm ϕ0.020 in. Enables detection of minute objects or small marks. • Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in • Applicable fibers: **FD-WG4**, **FD-G4** • Ambient temperature: −40 to +70 °C −40 to +158 °F
	Zoom lens	**FX-MR2**		The spot diameter is adjustable from ϕ0.7 mm to ϕ2 mm ϕ0.028 in to ϕ0.079 in according to how much the fiber is screwed in. • Applicable fibers: **FD-WG4**, **FD-G4** • Ambient temperature: −40 to +70 °C −40 to +158 °F • Accessory: **MS-EX-3** (mounting bracket)
	Finest spot lens	**FX-MR3**		Extremely fine spot of ϕ0.3 mm ϕ0.012 in approx. achieved. • Applicable fibers: **FD-WG4**, **FD-G4**, **FD-EG1**, **FD-EG2**, **FD-EG3**, **FD-G6X**, **FD-G6** • Ambient temperature: −40 to +70 °C −40 to +158 °F
	Finest spot lens	**FX-MR6**		Extremely fine spot of ϕ0.1 mm ϕ0.004 in approx. achieved. • Applicable fibers: **FD-WG4**, **FD-G4**, **FD-EG1**, **FD-EG2**, **FD-EG3**, **FD-G6X**, **FD-G6** • Ambient temperature: −20 to +60 °C −4 to +140 °F
	Zoom lens (Side-view type)	**FX-MR5**		**FX-MR2** is converted into a side-view type and can be mounted in a very small space. • Applicable fibers: **FD-WG4**, **FD-G4** • Ambient temperature: −40 to +70 °C −40 to +158 °F

Sensing range for FX-101□ (Note)

Screw-in depth	Distance to focal point	Spot diameter
7 mm	18.5 mm approx.	ϕ0.7 mm
12 mm	27 mm approx.	ϕ1.2 mm
14 mm	43 mm approx	ϕ2.0 mm

Sensing range for FX-101□ (Note)

Fiber model No.	Distance to focal point	Spot diameter
FD-EG3	7.5 ± 0.5 mm	ϕ0.15 mm approx.
FD-EG2	7.5 ± 0.5 mm	ϕ0.2 mm approx.
FD-EG1	7.5 ± 0.5 mm	ϕ0.3 mm approx.
FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	ϕ0.5 mm approx.

Sensing range for FX-101□ (Note)

Fiber model No.	Distance to focal point	Spot diameter
FD-EG3	7.5 ± 0.5 mm	ϕ0.1 mm approx.
FD-EG2	7.5 ± 0.5 mm	ϕ0.15 mm approx.
FD-EG1	7.5 ± 0.5 mm	ϕ0.2 mm approx.
FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	ϕ0.4 mm approx.

Sensing range for FX-101□ (Note)

Screw-in depth	Distance to focal point	Spot diameter
8 mm	13 mm approx.	ϕ0.5 mm
10 mm	15 mm approx.	ϕ0.8 mm
14 mm	30 mm approx	ϕ3.0 mm

Note: The sensing ranges are the values when used in combination with **FX-101**□ (standard type). Please contact our office for details on sensing ranges for other types of amplifier.

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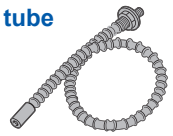
■FIBER OPTIONS

Others

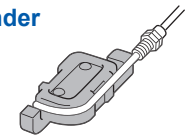
Designation	Model No.	Description			
Protective tube (For thru-beam type fiber)	**FTP-500** (0.5 m 1.640 ft)	For M4 thread	Applicable fibers	**FT-B8 FT-P80 FT-FM2 FT-P60 FT-FM2S FT-FM2S4 FT-H13-FM2**	The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-1000 (1 m 3.281 ft)				
	FTP-1500 (1.5 m 4.921 ft)				
	FTP-N500 (0.5 m 1.640 ft)	For M3 thread		**FT-T80 FT-P40 FT-NFM2 FT-T40 FT-NFM2S FD-P40 FT-NFM2S4**	
	FTP-N1000 (1 m 3.281 ft)				
	FTP-N1500 (1.5 m 4.921 ft)				
Protective tube (For reflective type fiber)	**FDP-500** (0.5 m 1.640 ft)	For M6 thread		**FD-B8 FD-P80 FD-FM2 FT-H13-FM2 FD-FM2S FD-FM2S4**	
	FDP-1000 (1 m 3.281 ft)				
	FDP-1500 (1.5 m 4.921 ft)				
	FDP-N500 (0.5 m 1.640 ft)	For M4 thread		**FD-T80 FD-NFM2 FD-NFM2S FD-NFM2S4**	
	FDP-N1000 (1 m 3.281 ft)				
	FDP-N1500 (1.5 m 4.921 ft)				
Fiber bender	**FB-1**	The fiber bender bends the sleeve part of the fiber head at the proper radius. (Note 1)			
Universal sensor mounting stand (Note 2)	**MS-AJ1-F**	Horizontal mounting type	Mounting stand assembly for fiber (For M3, M4 or M6 threaded head fiber)		
	MS-AJ2-F	Vertical mounting type			
Fiber cutter	**FX-CT2**	The free-cut type fiber can be easily cut. [Accessory. **FX-CT1** is attached with the **FT-P80** or the **FD-P80**. The **FX-CT2** is provided with fibers other than this.]			
	FX-CT1				
Attachment for fixed-length fiber	**FX-AT2**	This is the attachment for the fixed length fiber. Orange. (Accessory)			
Attachment for ϕ2.2 mm ϕ0.087 in fiber	**FX-AT3**	This is the attachment for the ϕ2.2 mm ϕ0.087 in fiber. Clear Orange. (Accessory. Does not attach with the **FT-P80** or the **FD-P80**.)			
Attachment for ϕ1 mm ϕ0.039 in fiber	**FX-AT4**	This is the attachment for the ϕ1 mm ϕ0.039 in fiber. Black. (Accessory)			
Attachment for ϕ1.3 mm ϕ0.051 in fiber	**FX-AT5**	This is the attachment for the ϕ1.3 mm ϕ0.051 in fiber. Gray. (Accessory)			
Attachment for ϕ1 mm ϕ0.039 in / ϕ1.3 mm ϕ0.051 in mixed fiber	**FX-AT6**	This is the attachment for the ϕ1 mm ϕ0.039 in / ϕ1.3 mm ϕ0.051 in mixed fiber. Black / Gray. (Accessory)			

Notes: 1) Do not bend the sleeve part of any side-view type fiber or ultra-small diameter head type fiber.
2) Refer to the 'Sensor general catalog 2003-2004' or the SUNX website: http://www.sunx.jp/ for universal sensor mounting stand.

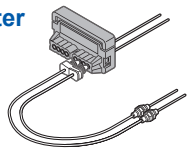
Protective tube
• FTP-□
• FDP-□



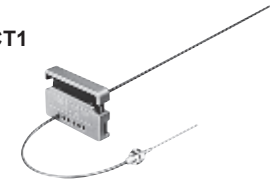
Fiber bender
• FB-1



Fiber cutter
• FX-CT2

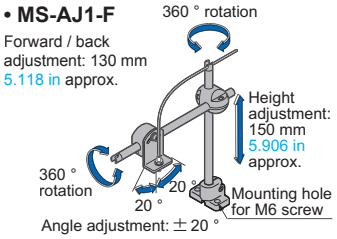


• FX-CT1

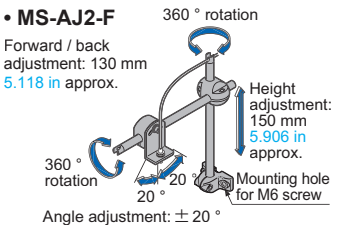


Universal sensor mounting stand
Using the arm which enables adjustment in the horizontal direction, sensing can also be done from above an assembly line.

• MS-AJ1-F

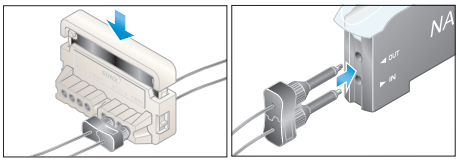


• MS-AJ2-F

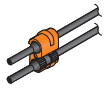


Fiber attachment
It's possible to simultaneously cut two fibers to the same length

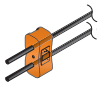
Each fiber (with some exceptions) has a newly developed two-in-one fiber attachment (**FX-AT3/AT4/AT5/AT6**) which enables two fibers to be cut simultaneously to the same length with the new fiber cutter (**FX-CT2**). Also, since the fibers can be attached to the amplifier while being fixed in position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



• **FX-AT2**
For fixed-length fiber



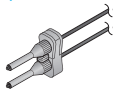
• **FX-AT3**
For ϕ2.2 mm ϕ0.087 in fiber



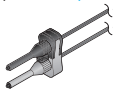
• **FX-AT4**
For ϕ1 mm ϕ0.039 in fiber



• **FX-AT5**
For ϕ1.3 mm ϕ0.051 in fiber



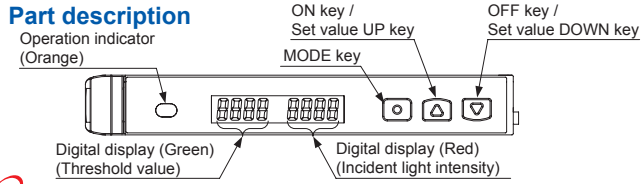
• **FX-AT6**
For ϕ1 mm ϕ0.039 in / ϕ1.3 mm ϕ0.051 in mixed fiber



■PRECAUTIONS FOR PROPER USE

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet regulations and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

Part description

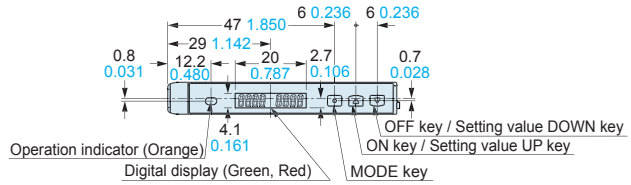


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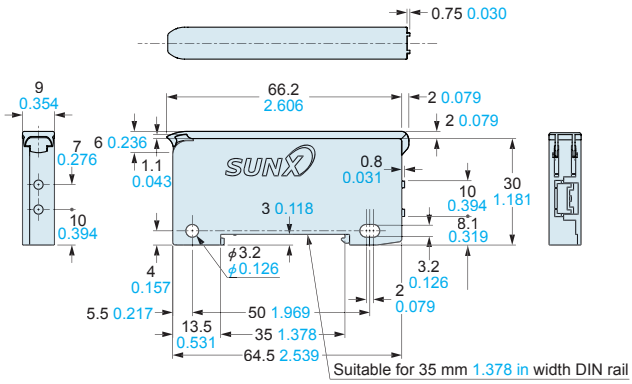
■DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the website: http://www.sunx.jp/

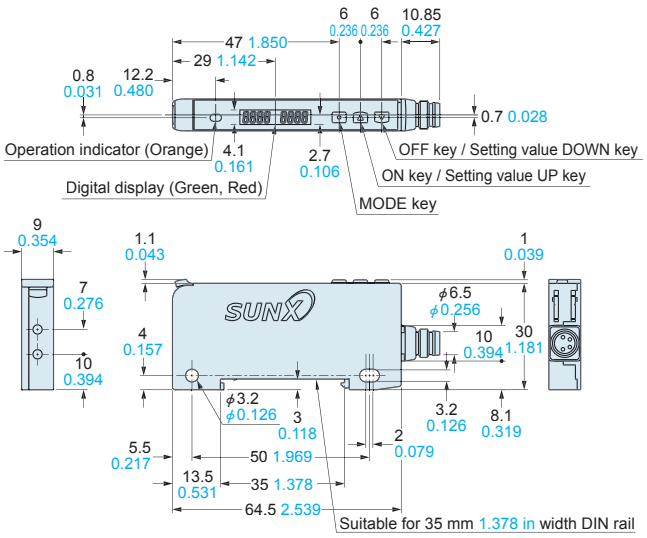
FX-101□, FX-102□ — Amplifier



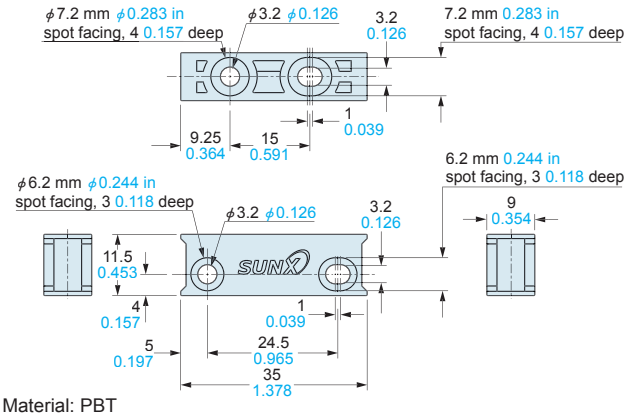
Assembly dimensions with optional protective cover



FX-101(P)-Z, FX-102(P)-Z — Amplifier

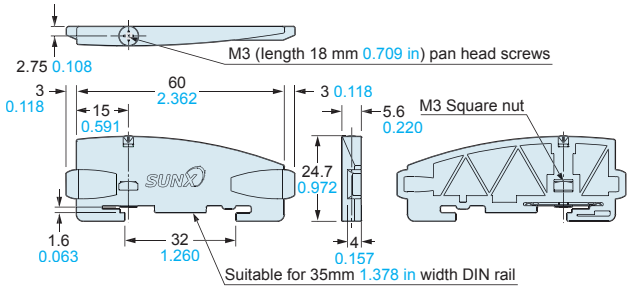


MS-DIN-4 — Amplifer mounting bracket (Optional)



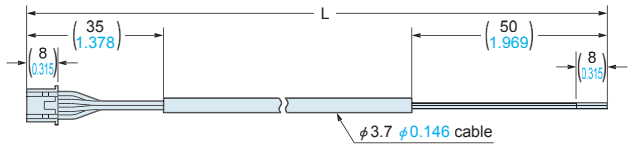
Material: PBT

MS-DIN-E — End plate (Optional)



Material: Polycarbonate

CN-14A-C□ — Connector attached cable (Optional)



CN-14A-C2 is attached **FX-101(P)-CC2** / **FX-102(P)-CC2**

• Length L

Model No.	Length L (mm in)
CN-14A-C1	1,000 39.370
CN-14A-C2	2,000 78.740
CN-14A-C3	3,000 118.110
CN-14A-C5	5,000 196.850

All information is subject to change without prior notice.

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