



NEW DIGITAL FIBER SENSOR

FX-100_{SERIES}



Welcome to 100

Bringing digital fiber sensors closer



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.

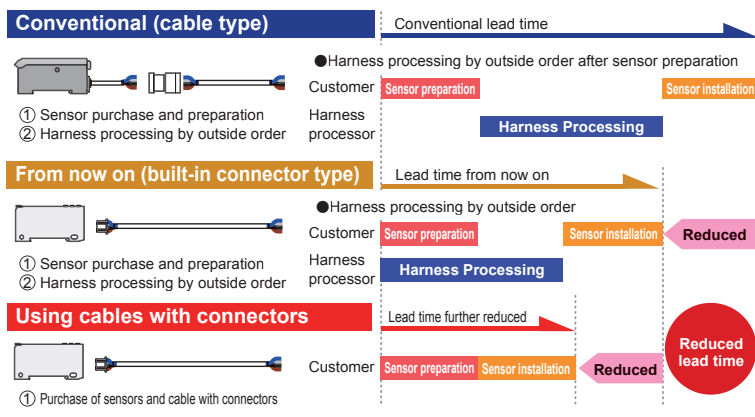


General purpose

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

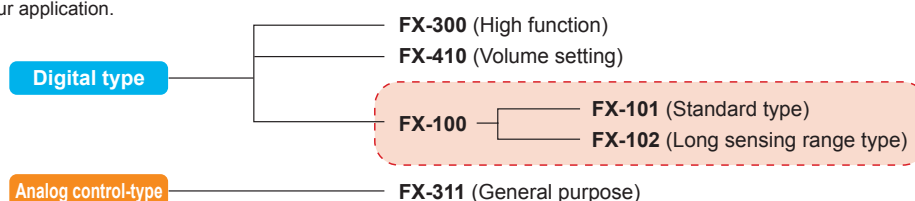
The connectors used are commercially-available connectors, so that processing costs and lead time required for carrying out processing after purchase of the sensors can be greatly reduced. The same connection parts as the **DP-100** series of digital pressure sensors and the **PM-64** series of micro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

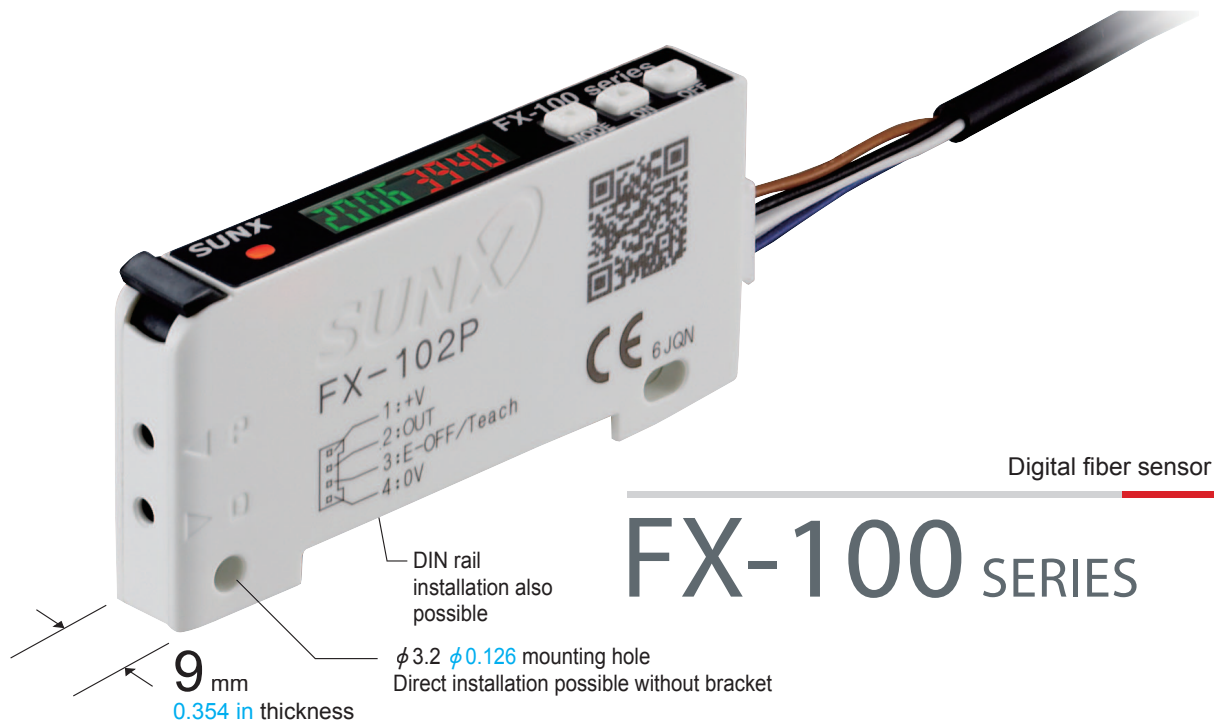
Commercially-available press-fit connectors are used, so that the processing costs for connection cables can be greatly reduced.



SUNX fiber sensor product lineup

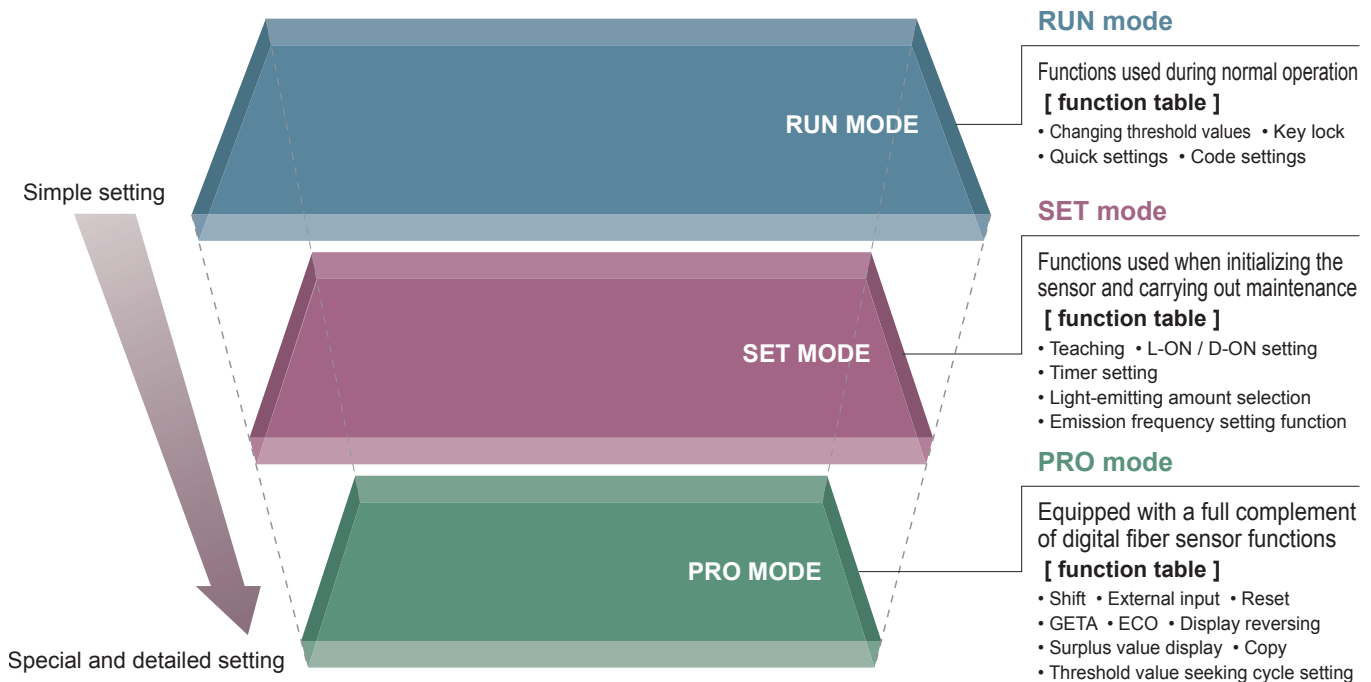
Select the best types to suit your application.





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.



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

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.



R U N M O D E

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.

SET MODE

Teaching

L-ON / D-ON setting

Timer setting

Light-emitting amount selection

Interference prevention function

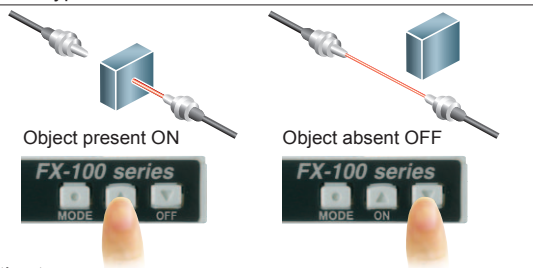
Teaching using ON / OFF buttons

For factory operators

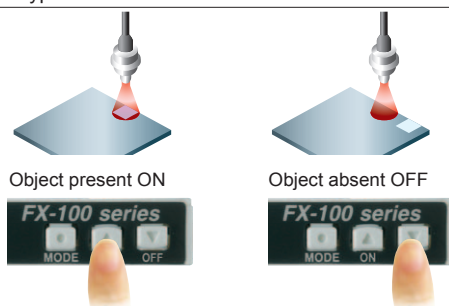
Simply press the ON button when an object is present and OFF when it is not. There is no need to switch settings or make judgments between Light-ON (*L-on*) and Dark-ON (*d-on*).

<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

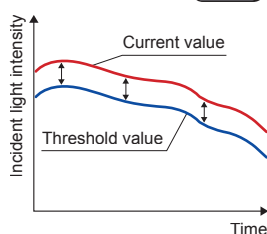
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Reset

Threshold value seeking cycle setting function

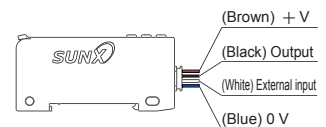
For factory operators

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

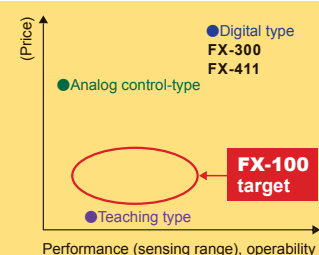
Settings such as emission halt, limit / auto teaching and ECO settings can be carried out via external input.



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.



Type	Appearance	Model No.	Emitting element	Output	
Standard type		FX-101 (Note 2)	Red LED	NPN open-collector transistor	
		FX-101-Z (Note 3)		NPN open-collector transistor	
		FX-101P (Note 2)		PNP open-collector transistor	
		FX-101P-Z (Note 3)		PNP open-collector transistor	
Long sensing range type		FX-101-CC2		NPN open-collector transistor	
		FX-101P-CC2		PNP open-collector collector transistor	
		FX-102 (Note 2)		NPN open-collector transistor	
		FX-102-Z (Note 3)		NPN open-collector transistor	
		FX-102P (Note 2)		PNP open-collector transistor	
		FX-102P-Z (Note 3)		PNP open-collector transistor	
		FX-102-CC2		NPN open-collector transistor	
		FX-102P-CC2		PNP open-collector transistor	

- **CN-14A-C2**
 (Connector attached)
 (cable 2 m 6.562 ft)

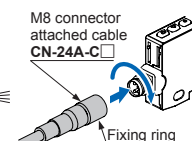
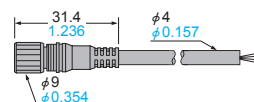
※Only include cable set type



■ OPTIONS

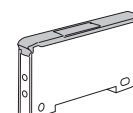
M8 connector attached cable

- CN-24A-C ☐



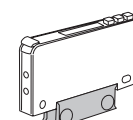
Protection cover

- FC-FX-1



Amplifier mounting bracket

- MS-DIN-4



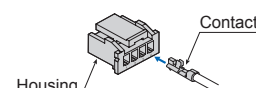
Connector attached cable

- CN-14A-C ☐



Connector

- CN-14A



5

SPECIFICATIONS

		Type	Standard type		Long sensing range type	
				Cable set		Cable set
Item	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.	

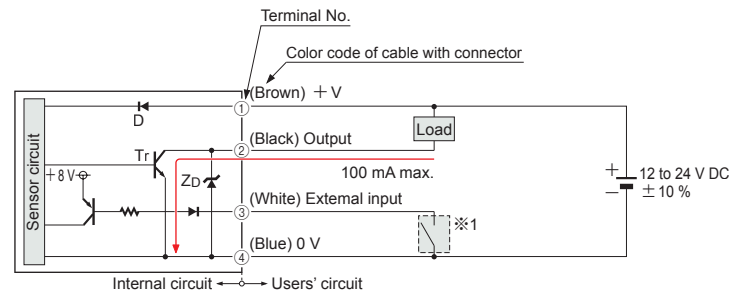
- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were ambient temperature + 23 °C + 73.4 °F.
 2) When using the interference prevention function, set the emission frequencies for the amplifiers to be covered by the interference prevention function to different 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**.

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

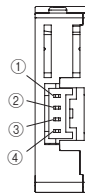
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Non-voltage contact or NPN open-collector transistor

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

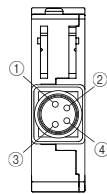
Terminal arrangement diagram

Connector type



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

M8 plug-in connector type

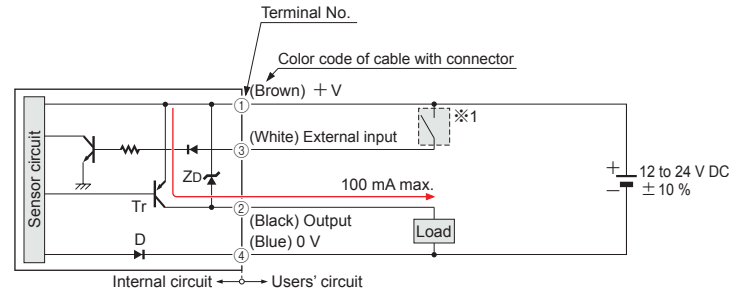


Terminal No.	Function
①	+ V
②	Output
③	External input
④	0 V

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

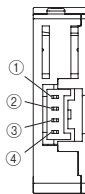
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Non-voltage contact or PNP open-collector transistor

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

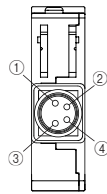
Terminal arrangement diagram

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

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)		Fiber cable length Free-cut	Bending radius	Model No.
		Standard type FX-101	Long sensing range type FX-102			
Thru-beam type	M4	Lens mountable 	400 15.748	1,150 45.276	2 m 6.562 ft	FT-B8
		Lens mountable 				FT-FM2
		Sleeve 90 mm 3.543 in φ 1.48 φ 0.058	300 11.811	800 31.496		FT-FM2S
		Sleeve 40 mm 1.575 in φ 1.48 φ 0.058				FT-FM2S4
		Lens mountable 	260 10.236	650 25.591	1 m 3.281 ft	FT-W8
		Lens mountable 	230 9.055	650 25.591		FT-P80
		Lens mountable 	260 10.236	800 31.496		FT-P81X
		Tough flexible 	130 5.118	300 11.811		FT-P60
	Nut type	Lens mountable W7 × H9 × D13.9 W0.276 × H0.354 × D0.547	215 8.465	570 22.441	2 m 6.562 ft	NEW FT-WR80
		With lens W7 × H9 × D14.6 W0.276 × H0.354 × D0.575	430 16.929	1,150 45.276		NEW FT-WR80L
	Elbow	Lens mountable 	180 7.087	430 16.929	2 m 6.562 ft	FT-R80
	M3	Lens mountable (except FX-LE2) 	300 11.811	800 31.496	2 m 6.562 ft	FT-T80
						FT-NFM2
		Sleeve 90 mm 3.543 in φ 0.88 φ 0.035	130 5.118	280 11.024		FT-NFM2S
		Sleeve 40 mm 1.575 in φ 0.88 φ 0.035				FT-NFM2S4
			80 3.150	220 8.661		FT-W4
			80 3.150	240 9.449		FT-P40
	Long sensing range	With lens 	9,300 366.141	15,000 590.550	10 m 32.808 ft	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.

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)		Fiber cable length Free-cut	Bending radius	Model No.
			Standard type FX-101	Long sensing range type FX-102			
Cylindrical type	$\phi 3$ $\phi 0.118$	With lens • Long sensing range $\phi 3$ $\phi 0.118$	600 23.622	1,500 59.055	 2 m 6.562 ft	 R1 mm R0.039 in	FT-WS8L
		 $\phi 3$ $\phi 0.118$	150 5.906	600 23.622			FT-WS3
	$\phi 2.5$ $\phi 0.098$	With lens • Long sensing range $\phi 2.5$ $\phi 0.098$	760 29.921	2,400 94.488	 2 m 6.562 ft	 R25 mm R0.984 in	FT-SFM2L
		 $\phi 2.5$ $\phi 0.098$	300 11.811	800 31.496			FT-SFM2
		 $\phi 2.5$ $\phi 0.098$	260 10.236	650 25.591		 R1 mm R0.039 in	FT-WS8
	$\phi 1.5$ $\phi 0.059$	 $\phi 1.5$ $\phi 0.059$	130 5.118	280 11.024	 2 m 6.562 ft	 R25 mm R0.984 in	FT-SNFM2
		 $\phi 1.5$ $\phi 0.059$	80 3.150	220 8.661			 R1 mm R0.039 in
		 $\phi 1.5$ $\phi 0.059$	120 4.724	330 12.992	1 m 3.281 ft	 R4 mm R0.157 in Flexible	FT-P2
	$\phi 1$ $\phi 0.039$	 $\phi 1$ $\phi 0.039$	40 1.575	90 3.543	500 mm 19.685 in		FT-PS1
	Ultra-small diameter	Beam diameter $\phi 0.125$ mm $\phi 0.005$ in $\phi 0.25$ $\phi 0.010$ $\phi 0.118$ Sleeve part cannot be bent.	6 0.236	19 0.748	500 mm 19.685 in	 R5 mm R0.197 in	FT-E12
		Beam diameter $\phi 0.25$ mm $\phi 0.010$ in $\phi 0.4$ $\phi 0.016$ $\phi 0.118$ Sleeve part cannot be bent.	15 0.591	60 2.362	1 m 3.281 ft		FT-E22
	Side-view	 $\phi 4$ $\phi 0.157$ 0.118	1,000 39.370	2,350 92.520	 2 m 6.562 ft	 R25 mm R0.984 in	FT-V10
 $\phi 1.5$ $\phi 0.059$ 0.8 0.031		180 7.087	470 18.504	FT-SFM2SV2			
 $\phi 1$ $\phi 0.039$ 0.6 0.024		140 5.512	380 14.961	1 m 3.281 ft	FT-V22		
 $\phi 1$ $\phi 0.039$ 0.6 0.024		40 1.575	120 4.724	 2 m 6.562 ft	FT-V41		
 $\phi 1$ $\phi 0.039$ 0.039		30 1.181	80 3.150		 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.

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)		Fiber cable length Free-cut	Bending radius	Model No.
		Standard type FX-101	Long sensing range type FX-102			
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	1 m 3.281 ft	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		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		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 	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 	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	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.

LIST OF FIBERS

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1)		Fiber cable length : Free-cut	Bending radius	Model No.
		Standard type FX-101	Long sensing range type FX-102			
Heat-resistant	350 °C 662 °F Lens mountable M4					FT-H35-M2
	350 °C 662 °F Sleeve 60 mm 2.362 in M4 φ 2.1 φ 0.083	170 6.693	490 19.291	2 m 6.562 ft	R25 mm R0.984 in Fiber R25 mm 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
	Lens mountable (FX-LE1) M4	135 5.315	420 16.535	200 mm 7.874 in (Note 2)		NEW FT-H20-J20-S (Note 4)
Special Heat-resistant • Joint	Side-view φ 3.8 φ 0.150 φ 4 φ 0.157	150 5.906	500 19.685	300 mm 11.811 in (Note 2)		NEW FT-H20-J30-S (Note 4)
				500 mm 19.685 in (Note 2)	Heat-resistant side fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-J50-S (Note 4)
				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
	φ 5.5 φ 0.217 	1,100 43.307	2,600 102.362	2 m 6.562 ft (Note 5)	R30 mm R1.181 in	FT-L80Y
	Side-view φ 5.5 φ 0.217 	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)

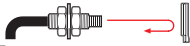
Model No. when ordering vacuum-resistant fibers individually as replacement parts

- 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)

LIST OF FIBERS

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

Retroreflective type



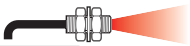
Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2)		Fiber cable length ✂️: Free-cut	Bending radius	Model No.
		Standard type FX-101□	Long sensing range type FX-102□			
Sharp bending With polarizing filters	W9.5×H5.2×D15 W0.374×H0.205×D0.591 W30×H30×D0.5 W1.181×H1.181×D0.020	100 to 550 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
	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)		Fiber cable length ✂️: Free-cut	Bending radius	Model No.
		Standard type FX-101□	Long sensing range type FX-102□			
Threaded type	M6	170 6.693	440 17.323	2 m 6.562 ft	R25 mm R0.984 in	FD-B8
	Coaxial M6	100 3.937	410 16.142			FD-FM2
	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
	Sleeve 40 mm 1.575 in M6 φ2.5 φ0.098					FD-FM2S4
	M6	80 3.150	230 9.055	1 m 3.281 ft	R1 mm R0.039 in	FD-W8
	M6	90 3.543	200 7.874		R4 mm R0.157 in Flexible	FD-P80
	M6	70 2.756	220 8.661		R10 mm R0.394 in	FD-P81X
	Tough flexible					
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.

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)		Fiber cable length ✂: Free-cut	Bending radius	Model No.
		Standard type FX-101□	Long sensing range type FX-102□			
Threaded type	M4	110 4.331	345 13.583	2 m 6.562 ft	R25 mm R0.984 in	FD-T80
	M4					FD-NFM2
	Sleeve 90 mm 3.543 in M4	35 1.378	100 3.937		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-NFM2S
	Sleeve 40 mm 1.575 in M4					FD-NFM2S4
	Sleeve 40 mm 1.575 in M4	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
	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) Coaxial	50 1.969	120 4.724		R25 mm R0.984 in	FD-G6
	Lens mountable (FX-MR3, FX-MR6) 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) 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) Light emitting fiber element High precision $\phi 0.175 \phi 0.007$	10 0.394	30 1.181			FD-EG2
	Coaxial • Lens mountable (FX-MR3, FX-MR6) Light emitting fiber element High precision $\phi 0.125 \phi 0.005$	7 0.276	22 0.866		R10 mm R0.394 in	FD-EG3
	M3 $\phi 0.5 \phi 0.020$ Sleeve part cannot be bent.	1 0.039	4 0.157		R25 mm R0.984 in	FD-EN500S1
	Coaxial M3 $\phi 0.8 \phi 0.031$ 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.

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)		Fiber cable length : Free-cut	Bending radius	Model No.
		Standard type FX-101	Long sensing range type FX-102			
Cylindrical type	$\phi 3 \phi 0.118$ 	100 3.937	345 13.583	2 m 6.562 ft	R25 mm R0.984 in	FD-S80
		80 3.150	230 9.055		R1 mm R0.039 in	FD-WS8
		Coaxial $\phi 3 \phi 0.118$	75 2.953		R2 mm R0.079 in	FD-WSG4
		45 1.772	150 5.906		R4 mm R0.157 in Flexible	FD-P50
	$\phi 2.5 \phi 0.098$ 	35 1.378	100 3.937	2 m 6.562 ft	R25 mm R0.984 in	FD-SNFM2
	$\phi 1.5 \phi 0.059$ 	25 0.984	65 2.559	1 m 3.281 ft	R4 mm R0.157 in Flexible	FD-P2
	Ultra-small diameter $\phi 1.5 \phi 0.059$ $\phi 0.5 \phi 0.020$ 	3.5 0.138	13 0.512	1 m 3.281 ft	R10 mm R0.394 in	FD-E12
		Sleeve part cannot be bent. Coaxial $\phi 3 \phi 0.118$	45 1.772		R25 mm R0.984 in	FD-E22
		$\phi 0.65 \phi 0.026$ Sleeve part cannot be bent.				
	Side-view 	Small diameter $\phi 1.5 \phi 0.059$ $\phi 3 \phi 0.118$ Sleeve part cannot be bent.	70 2.756	2 m 6.562 ft	R25 mm R0.984 in	FD-V41
		$\phi 0.118 \phi 0.079$ Sleeve part cannot be bent.	20 0.787		R1 mm R0.039 in	FD-WV42
		$\phi 0.197 \phi 0.079$ Sleeve part cannot be bent.	90 3.543		R25 mm R0.984 in	FD-SFM2SV2
Rectangular	Glass substrate detection • Mapping 	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
		W25 X H7.3 X D30 W0.984 X H0.287 X D1.181		3 m 9.843 ft		FD-L45
		Glass substrate detection • Alignment W20 X H29 X D3.8 W0.787 X H1.142 X D0.150	0 to 50 0 to 1.969		R4 mm R0.157 in	FD-L43
	Glass substrate detection • Alignment W17 X H29 X D3.8 W0.669 X H1.142 X D0.150	0 to 19 0 to 0.748	0 to 25 0 to 0.984	2 m 6.562 ft		FD-L44
		Glass substrate detection • Seating confirmation 	0 to 8 0 to 0.315	2 m 6.562 ft	R10 mm R0.394 in	FD-L44S
		W12 X H19 X D3 W0.472 X H0.748 X D0.118	0 to 5.5 0 to 0.217			
	Glass substrate detection 	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
		W24 X H21 X D4 W0.945 X H0.827 X D0.157	1.5 to 16 0.059 to 0.630 (Convergent point 8 0.315)		R10 mm R0.394 in	FD-L41
		W6 X H18 X D14 W0.236 X H0.709 X D0.551	1 to 17 0.039 to 0.669 (Convergent point 6 0.236)			FD-L4
	W7.2 X H7.5 X D2 W0.283 X H0.295 X 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

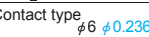
Notes: 1) The sensing range is specified for white non-glossy paper (FD-S80, FD-WS8: 400×400 mm 15.748×15.748 in, FD-WSG4, FD-P50, FD-SNFM2, FD-V41, FD-SFM2SV2: 200×200 mm 7.874×7.874 in, FD-P2, FD-E12, FD-E22, FD-WV42, FD-L4, FD-WL48: 100×100 mm 3.937×3.937 in, FD-L46: 100×100×t 0.7 mm 3.937×3.937×t 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.

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)		Fiber cable length  : Free-cut	Bending radius	Model No.	
			Standard type FX-101 	Long sensing range type FX-102 				
Rectangular	Compact	Front sensing  W10 X H7 X D2 W0.394 X H0.276 X 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	 FD-WZ4	
		Fiber bending type  W2 X H10 X D10 W0.079 X H0.394 X D0.394					 FD-WZ4HB	
		Front sensing  W14 X H7 X D3.5 W0.551 X H0.276 X D0.138	1 to 55 0.039 to 2.165	160 6.299	 2 m 6.562 ft		 FD-WZ7	
		Fiber bending type  W3.5 X H14 X D11 W0.138 X H0.551 X D0.433	1 to 60 0.039 to 2.362	0.5 to 180 0.020 to 7.087			 FD-WZ7HB	
Special	Long sensing range	Long sensing range • Rectangular head  W5.2 X H9.5 X D15 W0.205 X H0.374 X 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 X H15 X D30 W0.276 X H0.591 X D1.181	125 4.921	250 9.843	 2 m 6.562 ft	R25 mm R0.984 in	FD-A15	
	Array	Top sensing  W5 X H20 X D20 W0.197 X H0.787 X D0.787	105 4.134	285 11.220	 2 m 6.562 ft	R25 mm R0.984 in	FD-AFM2	
		Side sensing  W5 X H20 X D20 W0.197 X H0.787 X 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 X H13 X D20 W0.984 X H0.512 X 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 X H13 X D20 W0.984 X H0.512 X 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.

LIST OF FIBERS

Reflective type

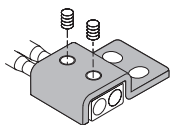


Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2)		Fiber cable length : Free-cut	Bending radius	Model No.
		Standard type FX-101	Long sensing range type FX-102			
Special	Heat-resistant					
	350 °C 662 °F • Coaxial M6	75 2.953	280 11.024	2 m 6.562 ft	R25 mm R0.984 in	FD-H35-M2
	350 °C 662 °F • Sleeve 60 mm 2.362 in M6 $\phi 2.8$ $\phi 0.110$				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 $\phi 2.1$ $\phi 0.083$				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			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	R25 mm R0.984 in	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 • Coaxial M6	100 3.937	280 11.024			FD-H13-FM2
	Vacuum-resistant					
Special	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)



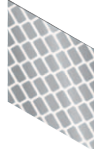
Accessories (attached with fibers)

- 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 $\phi 2.2$ mm $\phi 0.087$ in fiber, Clear orange)
- FX-AT4 (Attachment for $\phi 1$ mm $\phi 0.039$ in fiber, Black)
- FX-AT5 (Attachment for $\phi 1.3$ mm $\phi 0.051$ in fiber, Gray)
- FX-AT6 (Attachment for $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ in mixed fiber, Black / Gray)

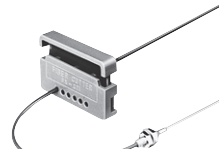
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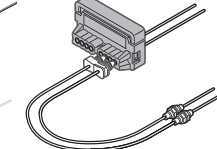
• RF-13



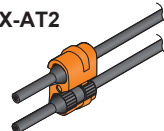
• FX-CT1



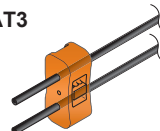
• FX-CT2



• FX-AT2



• FX-AT3

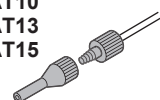


• FX-AT4

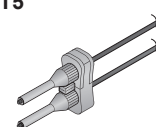


If connecting to a fiber amplifier other than the FX-100 series

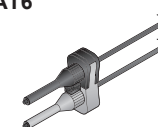
- Applicable fiber amplifiers: FX2 / FX3 series
- FX-AT10 (Attachment for $\phi 1$ mm $\phi 0.039$ in fiber)
- FX-AT13 (Attachment for $\phi 1.3$ mm $\phi 0.051$ in fiber)
- FX-AT15 (Attachment for $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ in mixed fiber)

• FX-AT10
• FX-AT13
• FX-AT15

• FX-AT5

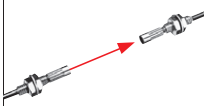
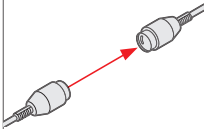
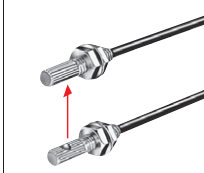
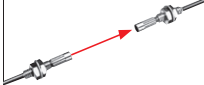
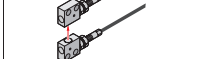


• FX-AT6



FIBER OPTIONS

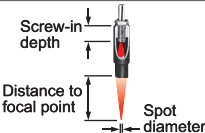
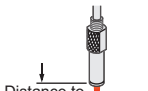
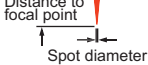
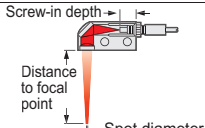
Lens (For thru-beam type fiber)

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	Sensing range (mm) [Lens on both sides] <table><tr><th>Fiber</th><th>Amplifier</th><th>FX-101□</th><th>FX-102□</th></tr><tr><td>FT-B8</td><td></td><td>2,200</td><td>3,500 (Note 2)</td></tr><tr><td>FT-FM2, FT-T80</td><td></td><td>3,000</td><td>3,500 (Note 2)</td></tr><tr><td>FT-R80</td><td></td><td>1,900</td><td>3,500 (Note 2)</td></tr><tr><td>FT-W8</td><td></td><td>3,000</td><td>3,500 (Note 2)</td></tr><tr><td>FT-P80, FT-P60</td><td></td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-P81X</td><td></td><td>1,600 (Note 2)</td><td>1,600 (Note 2)</td></tr><tr><td>FT-H35-M2</td><td></td><td>2,000</td><td>3,500 (Note 2)</td></tr><tr><td>FT-H20W-M1</td><td></td><td>1,300</td><td>1,600 (Note 2)</td></tr><tr><td>FT-H20-M1</td><td></td><td>1,600 (Note 2)</td><td>1,600 (Note 2)</td></tr><tr><td>FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S</td><td></td><td>1,000</td><td>3,500 (Note 2)</td></tr></table>	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)
	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)																																														
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	Sensing range (mm) [Lens on both sides] <table><tr><th>Fiber</th><th>Amplifier</th><th>FX-101□</th><th>FX-102□</th></tr><tr><td>FT-B8, FT-FM2, FT-R80, FT-W8, FT-P80, FT-P60</td><td></td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-P81X</td><td></td><td>1,600 (Note 2)</td><td>1,600 (Note 2)</td></tr><tr><td>FT-H35-M2</td><td></td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-H20W-M1, FT-H20-M1</td><td></td><td>1,600 (Note 2)</td><td>1,600 (Note 2)</td></tr><tr><td>FT-H13-FM2</td><td></td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr><tr><td>FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S</td><td></td><td>3,500 (Note 2)</td><td>3,500 (Note 2)</td></tr></table>	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)																	
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)																																														
Side-view lens	FX-SV1		Beam axis is bent by 90 °. • Ambient temperature: – 60 to +300 °C – 76 to +572 °F	Sensing range (mm) [Lens on both sides] <table><tr><th>Fiber</th><th>Amplifier</th><th>FX-101□</th><th>FX-102□</th></tr><tr><td>FT-B8</td><td></td><td>530</td><td>1,450</td></tr><tr><td>FT-FM2, FT-T80</td><td></td><td>550</td><td>1,700</td></tr><tr><td>FT-W8</td><td></td><td>450</td><td>1,300</td></tr><tr><td>FT-P80</td><td></td><td>420</td><td>1,400</td></tr><tr><td>FT-P60</td><td></td><td>300</td><td>850</td></tr><tr><td>FT-P81X</td><td></td><td>550</td><td>1,700</td></tr><tr><td>FT-H35-M2</td><td></td><td>280</td><td>800</td></tr><tr><td>FT-H20W-M1</td><td></td><td>140</td><td>400</td></tr><tr><td>FT-H20-M1</td><td></td><td>280</td><td>840</td></tr><tr><td>FT-H20-J20-S, FT-H20-J30-S, FT-H20-J50-S</td><td></td><td>150</td><td>410</td></tr></table>	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	
Fiber	Amplifier	FX-101□	FX-102□																																														
FT-B8		530	1,450																																														
FT-FM2, FT-T80		550	1,700																																														
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FT-P80		420	1,400																																														
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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																																														
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	Sensing range (mm) [Lens on both sides] (Note 3) <table><tr><th>Fiber</th><th>Amplifier</th><th>FX-101□</th><th>FX-102□</th></tr><tr><td>FT-H30-M1V</td><td></td><td>450</td><td>1,600</td></tr></table>	Fiber	Amplifier	FX-101□	FX-102□	FT-H30-M1V		450	1,600																																					
Fiber	Amplifier	FX-101□	FX-102□																																														
FT-H30-M1V		450	1,600																																														
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] (Note 3) <table><tr><th>Fiber</th><th>Amplifier</th><th>FX-101□</th><th>FX-102□</th></tr><tr><td>FT-H30-M1V</td><td></td><td>450</td><td>1,600</td></tr></table>	Fiber	Amplifier	FX-101□	FX-102□	FT-H30-M1V		450	1,600																																					
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)

For reflective type fiber

Designation	Model No.	Description																
Pinpoint spot lens	FX-MR1		Pinpoint spot of $\phi 0.5$ mm $\phi 0.020$ in. Enables detection of minute objects or small marks. - Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in - Ambient temperature: -40 to $+70$ °C -40 to $+158$ °F - Applicable fibers: FD-WG4, FD-G4															
Zoom lens	FX-MR2		The spot diameter is adjustable from $\phi 0.7$ mm to $\phi 2$ mm $\phi 0.028$ in to $\phi 0.079$ 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) Sensing range for FX-101□ (Note) <table><tr><th>Screw-in depth</th><th>Distance to focal point</th><th>Spot diameter</th></tr><tr><td>7 mm</td><td>18.5 mm approx.</td><td>$\phi 0.7$ mm</td></tr><tr><td>12 mm</td><td>27 mm approx.</td><td>$\phi 1.2$ mm</td></tr><tr><td>14 mm</td><td>43 mm approx.</td><td>$\phi 2.0$ mm</td></tr></table>	Screw-in depth	Distance to focal point	Spot diameter	7 mm	18.5 mm approx.	$\phi 0.7$ mm	12 mm	27 mm approx.	$\phi 1.2$ mm	14 mm	43 mm approx.	$\phi 2.0$ mm			
Screw-in depth	Distance to focal point	Spot diameter																
7 mm	18.5 mm approx.	$\phi 0.7$ mm																
12 mm	27 mm approx.	$\phi 1.2$ mm																
14 mm	43 mm approx.	$\phi 2.0$ mm																
Finest spot lens	FX-MR3		Extremely fine spot of $\phi 0.3$ mm $\phi 0.012$ 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 Sensing range for FX-101□ (Note) <table><tr><th>Fiber model No.</th><th>Distance to focal point</th><th>Spot diameter</th></tr><tr><td>FD-EG3</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.15$ mm approx.</td></tr><tr><td>FD-EG2</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.2$ mm approx.</td></tr><tr><td>FD-EG1</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.3$ mm approx.</td></tr><tr><td>FD-WG4/G4/G6X/G6</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.5$ mm approx.</td></tr></table>	Fiber model No.	Distance to focal point	Spot diameter	FD-EG3	7.5 ± 0.5 mm	$\phi 0.15$ mm approx.	FD-EG2	7.5 ± 0.5 mm	$\phi 0.2$ mm approx.	FD-EG1	7.5 ± 0.5 mm	$\phi 0.3$ mm approx.	FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	$\phi 0.5$ mm approx.
Fiber model No.	Distance to focal point	Spot diameter																
FD-EG3	7.5 ± 0.5 mm	$\phi 0.15$ mm approx.																
FD-EG2	7.5 ± 0.5 mm	$\phi 0.2$ mm approx.																
FD-EG1	7.5 ± 0.5 mm	$\phi 0.3$ mm approx.																
FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	$\phi 0.5$ mm approx.																
Finest spot lens	FX-MR6		Extremely fine spot of $\phi 0.1$ mm $\phi 0.004$ 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 Sensing range for FX-101□ (Note) <table><tr><th>Fiber model No.</th><th>Distance to focal point</th><th>Spot diameter</th></tr><tr><td>FD-EG3</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.1$ mm approx.</td></tr><tr><td>FD-EG2</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.15$ mm approx.</td></tr><tr><td>FD-EG1</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.2$ mm approx.</td></tr><tr><td>FD-WG4/G4/G6X/G6</td><td>7.5 ± 0.5 mm</td><td>$\phi 0.4$ mm approx.</td></tr></table>	Fiber model No.	Distance to focal point	Spot diameter	FD-EG3	7.5 ± 0.5 mm	$\phi 0.1$ mm approx.	FD-EG2	7.5 ± 0.5 mm	$\phi 0.15$ mm approx.	FD-EG1	7.5 ± 0.5 mm	$\phi 0.2$ mm approx.	FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	$\phi 0.4$ mm approx.
Fiber model No.	Distance to focal point	Spot diameter																
FD-EG3	7.5 ± 0.5 mm	$\phi 0.1$ mm approx.																
FD-EG2	7.5 ± 0.5 mm	$\phi 0.15$ mm approx.																
FD-EG1	7.5 ± 0.5 mm	$\phi 0.2$ mm approx.																
FD-WG4/G4/G6X/G6	7.5 ± 0.5 mm	$\phi 0.4$ mm approx.																
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) <table><tr><th>Screw-in depth</th><th>Distance to focal point</th><th>Spot diameter</th></tr><tr><td>8 mm</td><td>13 mm approx.</td><td>$\phi 0.5$ mm</td></tr><tr><td>10 mm</td><td>15 mm approx.</td><td>$\phi 0.8$ mm</td></tr><tr><td>14 mm</td><td>30 mm approx.</td><td>$\phi 3.0$ mm</td></tr></table>	Screw-in depth	Distance to focal point	Spot diameter	8 mm	13 mm approx.	$\phi 0.5$ mm	10 mm	15 mm approx.	$\phi 0.8$ mm	14 mm	30 mm approx.	$\phi 3.0$ mm			
Screw-in depth	Distance to focal point	Spot diameter																
8 mm	13 mm approx.	$\phi 0.5$ mm																
10 mm	15 mm approx.	$\phi 0.8$ mm																
14 mm	30 mm approx.	$\phi 3.0$ 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.

FIBER OPTIONS

Others

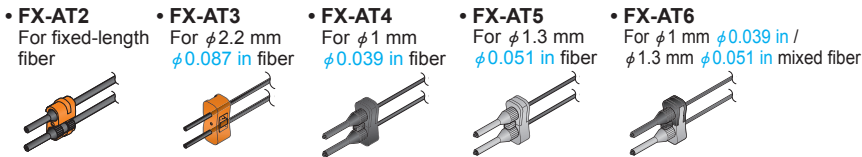
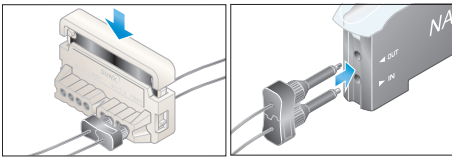
Designation	Model No.	Description				
Protective tube (For thru-beam type fiber)	FTP-500 (0.5 m 1.640 ft)	For M4 thread	Applicable fibers	FT-B8 FT-FM2 FT-FM2S FT-H13-FM2	FT-P80 FT-P60 FT-FM2S4	The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external 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-NFM2 FT-NFM2S FT-NFM2S4	FT-P40 FD-T40 FD-P40	
	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-FM2 FD-FM2S FD-FM2S4	FD-P80 FT-H13-FM2		
	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 $\phi 2.2$ mm $\phi 0.087$ in fiber	FX-AT3	This is the attachment for the $\phi 2.2$ mm $\phi 0.087$ in fiber. Clear Orange. (Accessory. Does not attach with the FT-P80 or the FD-P80.)				
Attachment for $\phi 1$ mm $\phi 0.039$ in fiber	FX-AT4	This is the attachment for the $\phi 1$ mm $\phi 0.039$ in fiber. Black. (Accessory)				
Attachment for $\phi 1.3$ mm $\phi 0.051$ in fiber	FX-AT5	This is the attachment for the $\phi 1.3$ mm $\phi 0.051$ in fiber. Gray. (Accessory)				
Attachment for $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ in mixed fiber	FX-AT6	This is the attachment for the $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ 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.

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.

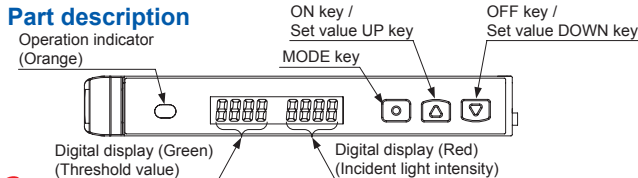


PRECAUTIONS FOR PROPER USE



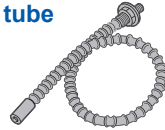
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet regulations and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

Part description



Protective tube

- FTP-□
- FDP-□



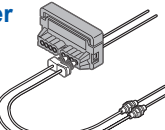
Fiber bender

- FB-1

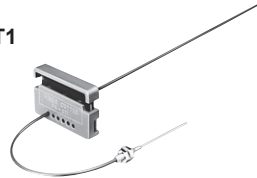


Fiber cutter

- FX-CT2



- FX-CT1

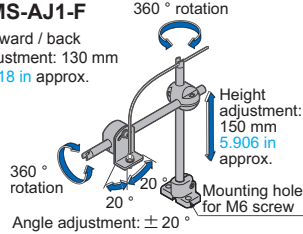


Universal sensor mounting stand

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

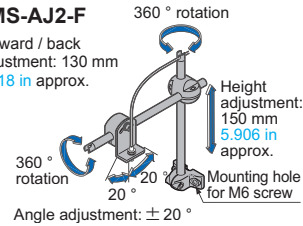
- MS-AJ1-F

Forward / back adjustment: 130 mm
5.118 in approx.



- MS-AJ2-F

Forward / back adjustment: 130 mm
5.118 in approx.

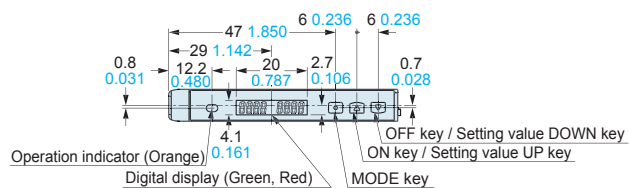


DIMENSIONS (Unit: mm in)

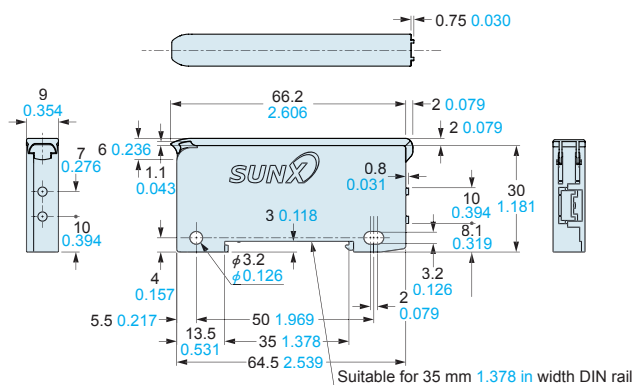
The CAD data in the dimensions can be downloaded from the website: <http://www.sunx.jp/>

FX-101□, FX-102□

Amplifier

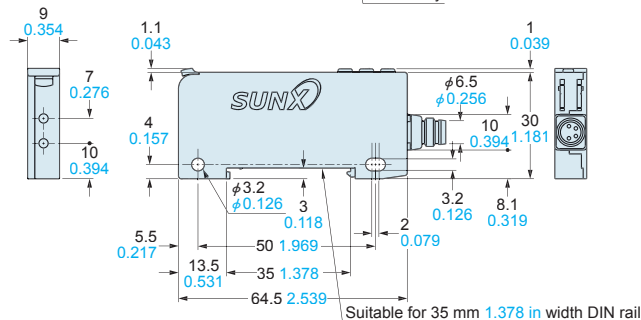
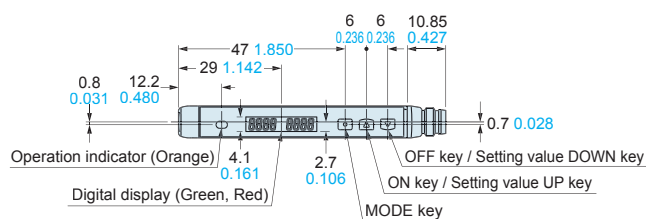


Assembly dimensions with optional protective cover



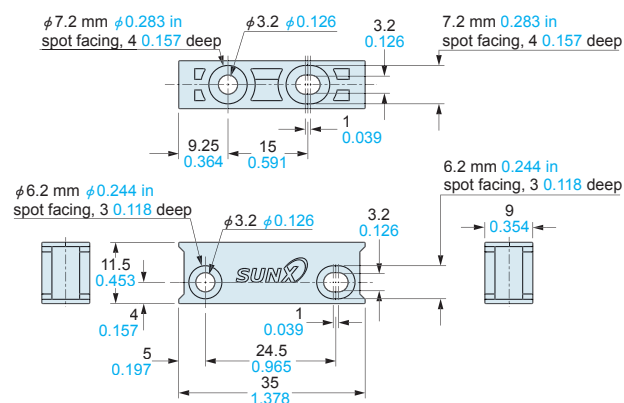
FX-101(P)-Z, FX-102(P)-Z

Amplifier



MS-DIN-4

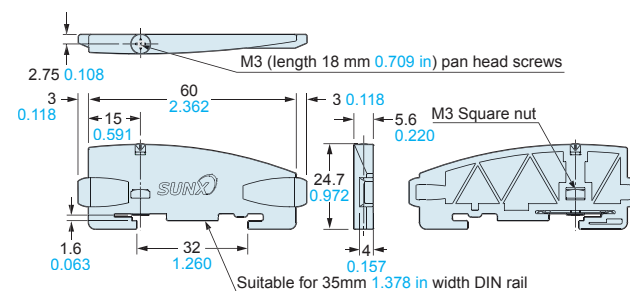
Amplifier mounting bracket (Optional)



Material: PBT

MS-DIN-E

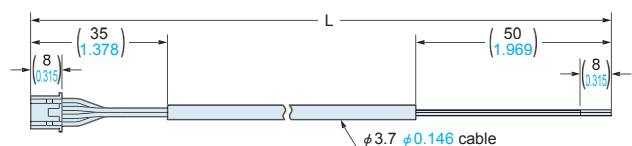
End plate (Optional)



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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