SUNX

N W

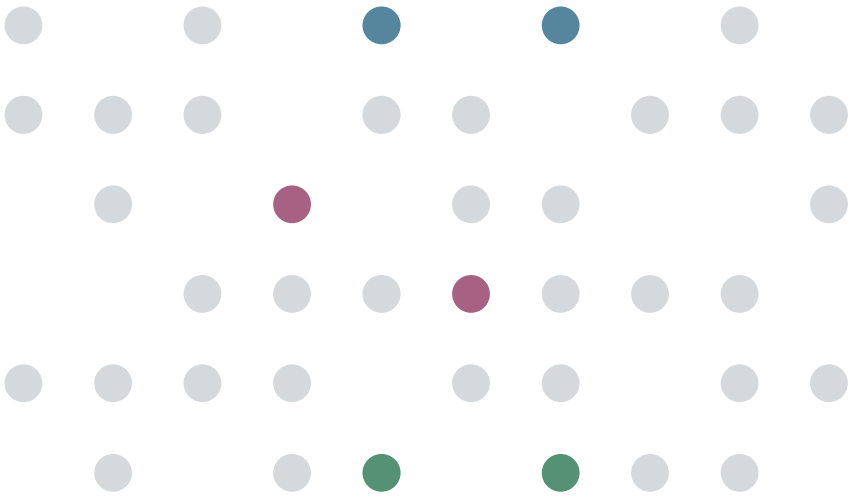
DIGITAL FIBER SENSOR

FX-100 SERIES

CE Conforming to EMC Directive

Welcome to 100

Bringing digital fiber sensors closer



01/2007

New possibilities with digital fi ber 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!

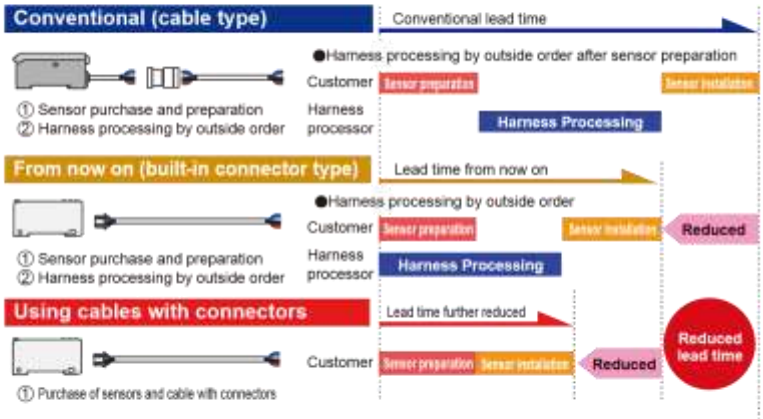
The digital dual-display allows you to check both the threshold value and incident light intensity at the same time, and it also makes the procedures for setting the various values much easier. The threshold values can be adjusted simply by pressing the △ (UP) key or the ▽ (DOWN) key, so that the sensors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

Multipurpose

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** (Genenal purpose)

SUNX

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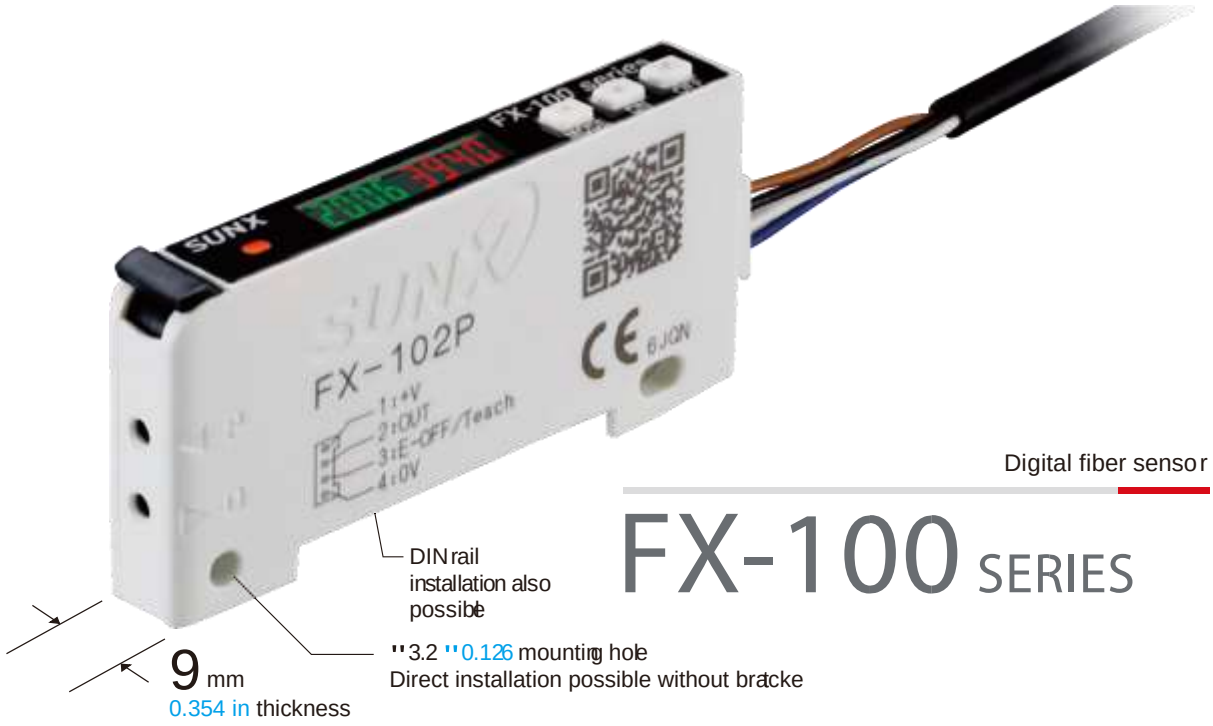
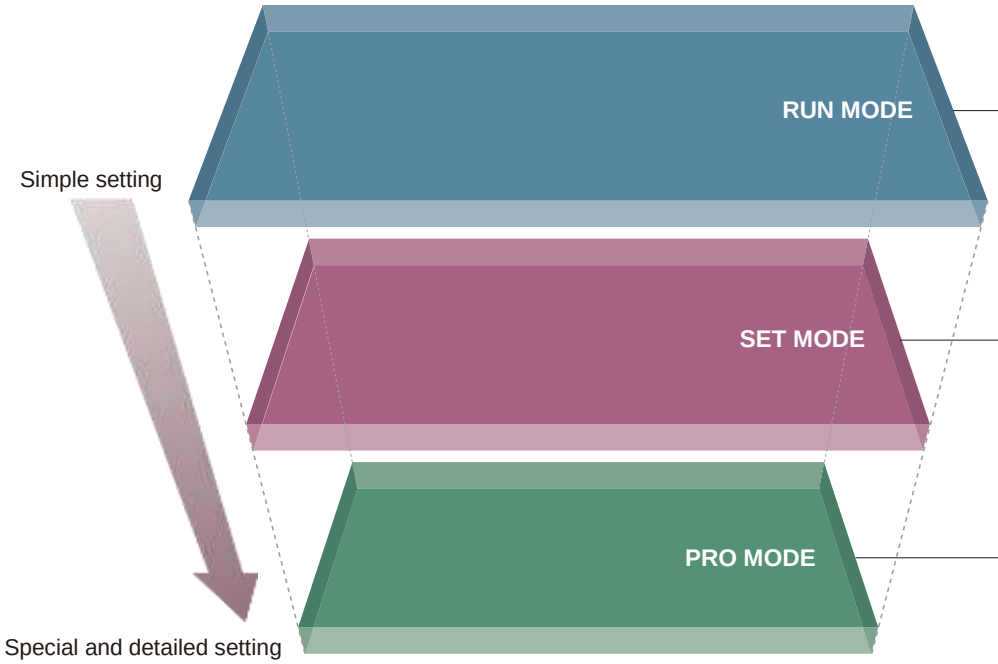


Digital fiber sensor

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 initially setting 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

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.

For factory operators For designers

Quick setting numbers (summary)

No.	Output operation	Light-emitting amount selection	Timer

Quick code input function

Sensor settings can be made simply by selecting preset values.

-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

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

Teaching using ON / OFF buttons

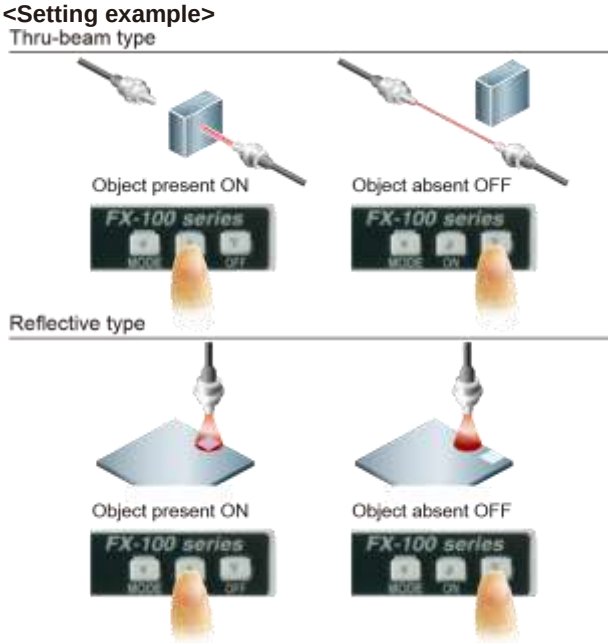
For factory operator

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).

Light-emitting amount selection function

Fo desig

<Setting example>



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.

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

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 fl ashes 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 amplifi ers close together like there was before, and so the amplifi ers can be set up apart from each other.

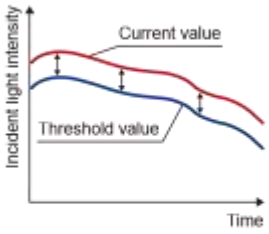
mWhen the emission frequencies are changed, the response times will also change.

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

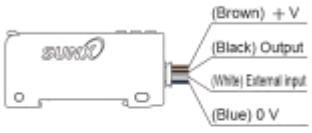
For factory operators

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.

ORDER GUIDE

Amplifi ers

Type		Appearance	Model No.	Emitting element	Output
Standard t ype	M gi connec		**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
	M gi connec		**FX-101P-Z** (Note 3)		PNP open-collector transistor
	Cable t (Note		**FX-101-CC2**		NPN open-collector transistor
			FX-101P-CC2		PNP open-collector collector transistor
Long sensin g range type	M gi connec		**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
	M gi connec		**FX-102P-Z** (Note 3)		PNP open-collector transistor
	Cable t (Note		**FX-102-CC2**		NPN open-collector transistor
			FX-102P-CC2		PNP open-collector transistor

Accessory

• **CN-14A-C2**

Connector attached cable 2 m (

6.562 ft

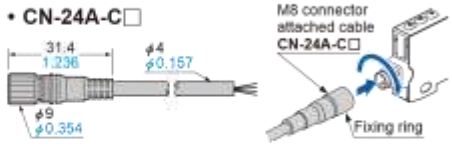
Notes: 1) The connector attached cable (**CN-14A-C2**) is supplied with the amplifi er.
2) Be sure to use the **CN-14A-C** cable with connector (sold separately).
3) Make sure to use the optional M8 connector attached cable **CN-24A-C** given below.

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-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	

M8 connector attached cable

• **CN-24A-C□**



Protection cover

• **FC-FX-1**

Amplifier mounting bracket

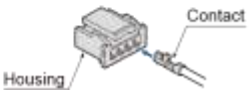
• **MS-DIN-4**

Connector attached cable

• **CN-14A-C□**

Connector

• **CN-14A**



SPECIFICATIONS

Item	Type	Standard type	Cable set	Long sensing range type	Cable set
	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 DC10 % 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 to2 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 toV DC (Sink current 0.5 to 3 mA or less) Low: 0 to0.6 V DC or Open • Input impedance: 10 kΩ approx.	
Response time		Emission frequency 0: 250 !s or less Emission frequency 1: 450 !s or less Emission frequency 2: 500 !s or less Emission frequency 3: 600 !s 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 digitgreen4 digit 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					

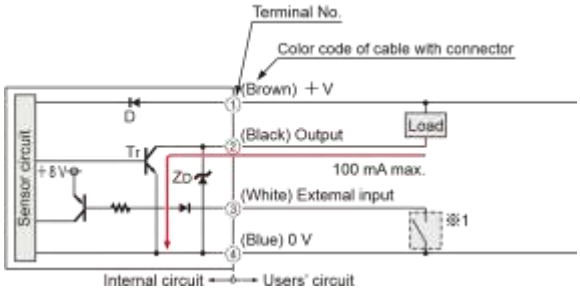
		Incorporated / Switchable either effective or ineffective		
function		Incorporated	Incorporated	
Interference prevention		Selectable emission frequency method (Note 2) (Functions at emission frequency 1, 2 or 3)	Selectable emission frequency method (Note 2) function (Functions at emission frequency 1, 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 ?x 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 fi ve 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		Extension up to total 100 m 328.084 ftis possible with 0.3 mm², or more, cable.		
Weight		Net weight: 15 g approx.	Net weight: 15 g approx.	Net weight: 15 g approx.	Net weight: 15 g approx.
		Gross weight: 35 g approx.	Gross weight: 75 g approx.	Gross weight: 35 g approx.	Gross weight: 75 g approx.
		—	**CN-14A-C2**	—	**CN-14A-C2**
Accessory		(Connector attached cable, 2 m6.562 ftlong):1pc		(Connector attached cable, 2 m 6.562 ftlong):1pc	

Notes: 1) Where measurement conditions have not been specifi ed precisely, the conditions used were ambient temperature 23 C 73.4 F.
2) W hen using the interference prevention function, set the emission frequencies for the amplifi ers 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 amplifi er only.
4) Connector attached cable **CN-14A-C2** is not attached to the models that have no '**-CC2**' at the end of the model names.
Make sure to use the optional cable with connector **CN-14A-C**.
Model Nos. having the suffi x '**-Z**' are M8 plug-in connector type. Make sure to use the optional M8 plug-in connector cable.

I/O CIRCUIT AND WIRING DIAGRAMS

FX-10(-Z/-CC2) — NPN output type

I/O circuit diagram



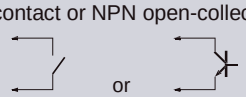
Symbols ... D : Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr : NPN output transistor

Terminal arrangement diagram

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

M8 plug-in connector type

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

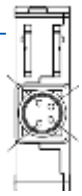
m1

1

2

3

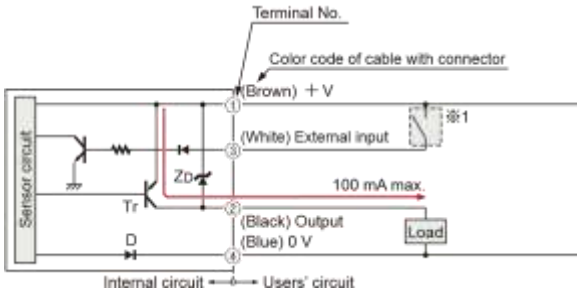
4



FX-10P(-Z/-CC2)

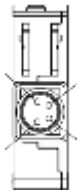
PNP output type

I/O circuit diagram



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

Terminal arrangement diagram

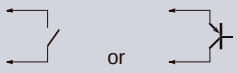


Terminal No.	Function
1	V
2	Output
3	External input
4	0 V

M8 plug-in connector type

m1

Non-voltage contact or PNP open-collector transistor



or

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

1

2

3

4

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

LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) 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 X H9 X D13.9 W0.276 X H0.354 X 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 X H9 X D14.6 W0.276 X H0.354 X 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 fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.

Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

LIST OF FIBERS

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 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
Ultra-small diameter	Beam diameter φ0.25 mm φ0.010 in φ0.4 φ0.016 φ3 0.118 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	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 Sleeve art 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 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 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 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 fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.

LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) 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	230 9.055	670 26.378	1 m 3.281 ft	R1 mm R0.039 in	NEW FT-WZ4
		Fiber bending type	80 3.150	230 9.055			NEW FT-WZ4HB
		Front sensing W14 × H7 × D3.5	330 12.992	1,000 39.370	2 m 6.562 ft		NEW FT-WZ7
		Fiber bending type	190 7.480	580 22.835			NEW FT-WZ7HB
Special	Narrow beam	3.5 ϕ0.138 / 3.7 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 W5 × H69 × D20	3,500 137.795	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 W4.2 × H31 × D13.5	1,500 59.055	3,500 137.795		R1 mm R0.039 in	FT-WA8
						R10 mm R0.394 in	FT-A8
	Array	Top sensing W8 × H15 × D15	280 11.024	600 23.622	2 m 6.562 ft	R25 mm R0.984 in	FT-AFM2
		Side sensing W6 × H15 × D15	240 9.449	670 26.378			FT-AFM2E

LIST OF FIBERS

Notes: 1) Please take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.
2) The fi ber cable length practically limits the sensing range to 3,500 mm137.795 in long.

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
Special / Heat-resistant	350 °C 662 °F Sleeve 60 mm 2.362 in M4 ϕ2.1 0.083	170 6.693	490 19.291	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FT-H35-M2S6
Special / Heat-resistant	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
Special / Heat-resistant	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
Special / Heat-resistant	130 °C 266 °F Lens mountable (FX-LE2 only) M4	250 9.843	700 27.559	✂ 2 m 6.562 ft	R25 mm R0.984 in	FT-H13-FM2
Special / Heat-resistant • Joint	Lens mountable (FX-LE1) M4	135 5.315	420 16.535	✂ 200 mm 7.874 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-J20-S (Note 4)
Special / Heat-resistant • Joint	Lens mountable (FX-LE1) M4	135 5.315	420 16.535	✂ 300 mm 11.811 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-J30-S (Note 4)
Special / Heat-resistant • Joint	Lens mountable (FX-LE1) M4	135 5.315	420 16.535	✂ 500 mm 19.685 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-J50-S (Note 4)
Special / Heat-resistant • Joint	Side-view 3.8 ϕ0.150 4 ϕ0.157	150 5.906	500 19.685	✂ 500 mm 19.685 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-VJ50-S (Note 4)
Special / Heat-resistant • Joint	Side-view 3.8 ϕ0.150 4 ϕ0.157	150 5.906	500 19.685	✂ 800 mm 31.496 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	NEW FT-H20-VJ80-S (Note 4)
Special / 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
Special / Chemical-resistant	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
Special / Chemical-resistant	Side-view ϕ5.5 ϕ0.217	340 13.386	800 31.496	✂ 2 m 6.562 ft (Note 5)	R30 mm R1.181 in	FT-V80Y
Special / 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 fi ber may be reduced by 20 % max. depending upon how the fi ber is cut. 2) This is the fi ber length (fi xed length) for heat-resistant fi bers. The ordinary-temperature fi bers are free-cut to 2 m6.562 ft. 3) The ordinary-temperature side is R25 mm R0.984 inor more.
4) Heat-resistant joint fi bers and ordinary-temperature fi bers (**FT-FM2**) are sold as a set. Please refer to 'Heat-resistant joint fi ber catalog' for details.
5) The allowable cutting range is 500 mm19.685 infrom the end that the amplifi er inserted.
6) Sold as a set comprising vacuum-resistant type fi berphoto-terminal (**FV-BR1**)fi ber at atmospheric side (**FT-J8**). Please refer to 'Vacuum-resistant fi ber catalog' for details.

Model No. when ordering heat-resistant joint fi bers 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)

LIST OF FIBERS

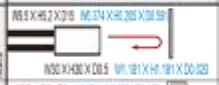
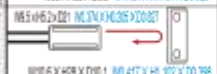
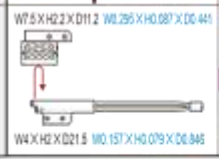
Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

Model No. when ordering vacuum-resistant fi bers 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

Retroreflective type

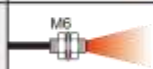
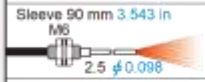
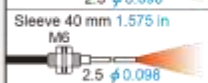
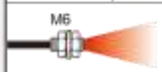
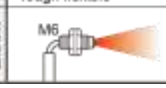
Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 1, 2) Standard type FX-101□	Sensing range (mm in)(Note 1, 2) Long sensing range type FX-102□	Fiber cable length ✂: Free-cut	Bending radius	Model No.
Slug sensing (With polarizing filter)		100 to 550 3.937 to 21.654	100 to 830 3.937 to 32.677	✂ 2 m 6.562 ft	R1 mm R0.039 in	FR-WKZ11
Narrow beam: Top sensing		200 7.874	200 7.874	✂ 2 m 6.562 ft	R10 mm R0.394 in	FR-KZ21
Narrow beam: Side sensing						FR-KZ21E
Wafer mapping		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 refl ector or refl ective tape. The fi ber can detect an object less than 100 mm3.937 inaway. However, note that if there are any white or highly-refl ective surfaces near the fi ber head, refl ected incident light may affect the fi ber head. If this occurs, adjust the threshold value of the amplifi er unit before use.
The sensing range of **FR-KZ21**(**E**) is the possible setting range for the refl ector. However, if setting the fi ber to detect objects passing within 0 to 20 mm 0 to 0.787 in from the fi ber head, unstable detection may result.
The sensing range of **FR-KV1** is the possible setting range for the refl ector. The fi ber can detect an object less than 15 mm 0.591 inaway.

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		170 6.693	440 17.323	✂ 2 m 6.562 ft	R25 mm R0.984 in	FD-B8
Threaded type M6		100 3.937	410 16.142			FD-FM2
Threaded type M6		100 3.937	345 13.583		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-FM2S
Threaded type M6						FD-FM2S4
Threaded type M6		80 3.150	230 9.055		R1 mm R0.039 in	FD-W8
Threaded type M6		90 3.543	200 7.874		R4 mm R0.157 in Flexible	FD-P80
Threaded type M6		70 2.756	220 8.661	1 m 3.281 ft	R10 mm R0.394 in	FD-P81X
Elbow M6		70 2.756	180 7.087	✂ 2 m 6.562 ft	R25 mm R0.984 in	FD-R80

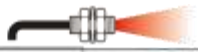
LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

Notes: 1) The sensing range is specifi ed for white non-glossy paper (400400 mm15.74815.748 in) as the object.
2) P lease take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.
Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

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.
Threaded type M4	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 ϕ1.48 ϕ0.058	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 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 M4	28 1.102	75 2.953		R2 mm R0.079 in	FD-WG4
		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
Threaded type 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-EN600S1
	Coaxial M3 ϕ0.8 ϕ0.031 Sleeve part cannot be bent.	15 0.591	48 1.890	1 m 3.281 ft		FD-ENM1S1

LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

Notes: 1) T he sensing range is specifi ed for white non-glossy paper [200200 mm7.8747.874 in(**FD-T80**, **FD-WT8**: 400400 mm 15.74815.748 in, **FD-W44**, **FD-WT4**, **FD-P40**, **FD-G6**, **FD-EG1**, **FD-EG2**, **FD-EG3**, **FD-EN500S1**, **FD-ENM1S1**: 100100 mm 3.9373.937 in)] as the object.
2) P lease take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.
3) The allowable cutting range is 700 mm27.559 infrom the end that the amplifi er inserted.

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.
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
Cylindrical type, 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
Cylindrical type, 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
Cylindrical type, Ultra-small diameter	φ1.5 φ0.059 0.5 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
Cylindrical type, Side-view	Small diameter 1.5 0.059 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
	3 0.118 2 0.079 0.039 Sleeve part cannot be bent.	6 0.236	20 0.787		R1 mm R0.039 in	FD-WV42
	5 0.197 2 0.079 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 X H7.3 X D30 W0.984 X H0.287 X 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 X H29 X D3.8 W0.787 X H1.142 X 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 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-L43
	Glass substrate detection • Seating W12 X H19 X D3 W0.472 X H0.748 X 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 X H21 X D4 W0.945 X H0.827 X 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 X H18 X D14 W0.236 X H0.709 X 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 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

LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

Notes: 1) The sensing range is specified for white non-glossy paper (**FD-S80**, **FD-WS8**: 400400 mm15.74815.748 in, **FD-WSG4**, **FD-P50**, **FD-SNFM2**, **FD-V41**, **FD-SFM2SV2**: 200200 mm7.8747.874 in, **FD-P2**, **FD-E12**, **FD-E22**, **FD-WV42**, **FD-L4**, **FD-WL48**: 100100 mm 3.9373.937 in, **FD-L46**: 100100t 0.7 mm 3.9373.937t 0.028 inR edge of LCD glass substrates, **FD-L43**, **FD-L44** and **FD-L45:** 100100t 0.7 mm 3.9373.937 t 0.028in LCD glass substrates, **FD-L44S**: silicon wafers polished surface, **FD-WL41**, **FD-L41**: 100100t 2 mm 3.9373.937t 0.079 inglass substrates) 2) Please take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.

LIST OF FIBERS

Pliable fi bers (fl exible and sharp bending fi bers) are marked with light blue in the table.

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.
Rectangular	Compact	Front sensing W10 X H7 X D2	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 W2.5 X H10 X D10					NEW FD-WZ4HB
		Front sensing W14 X H7 X D3.5	1 to 55 0.039 to 2.165	160 6.299	2 m 6.562 ft		NEW FD-WZ7
		Fiber bending type W2.5 X H14 X D11	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 X H9.5 X D15	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 D36	125 4.921	250 9.843	2 m 6.562 ft	R25 mm R0.984 in	FD-A15
	Array	Top sensing W5 X H15 X D15	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	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	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	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) T he sensing range is specifi ed for white non-glossy paper [200200 mm 7.8747.874 in (**FD-WKZ1**, **FD-AFM2**, **FD-AFM2E**: 400400 mm 15.47815.478 in)] as the object.
2) Please take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.
3) The allowable cutting range is 1,000 mm39.370 infrom the end that the amplifi er inserted.

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
Special / Heat-resistant	350 °C 662 °F • Sleeve 60 mm 2.362 in M6 2.8 0.110				Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-H35-M2S6
Special / Heat-resistant	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
Special / Heat-resistant	350 °C 662 °F • Sleeve 90 mm 3.543 in M4 2.1 φ0.083	85 3.346	200 7.874		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-H35-20S
Special / Heat-resistant	200 °C 392 °F • Coaxial M4	90 3.543	280 11.024		R25 mm R0.984 in	FD-H20-21
Special / Heat-resistant	300 °C 572 °F • Glass substrate detection Convergent reflective type W16 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
Special / Heat-resistant	180 °C 356 °F • Glass substrate detection Convergent reflective type W16 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			FD-H18-L31
Special / Heat-resistant	130 °C 266 °F M6	100 3.937	280 11.024	2 m 6.562 ft		FD-H13-FM2
Special / 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)
Special / Vacuum-resistant	300 °C 572 °F • Glass substrate detection Convergent reflective type W16 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) T he sensing range is specifi ed for white non-glossy paper [400400 mm15.74815.748 in(**FD-H30-L32**, **FD-H18-L31**: 5050 mm 1.9691.969 in glass substrate, **FD-H30-KZ1V-S**, **FD-H30-L32V-S**: 100100t 0.7 mm 3.9373.937t 0.028 intransparent glass)] as the object.
2) Please take care that the sensing range of the free-cut type fi ber may be reduced by 20 % max. depending upon how the fi ber is cut.

LIST OF FIBERS

3) Sold as a set comprising vacuum-resistant type fi berphoto-terminal (**FV-BR1**)fi ber at atmospheric side (**FT-J8**).

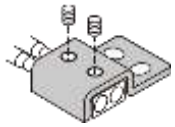
Model No. when ordering vacuum-resistant fi bers individually as replacement parts

• Vacuum-resistant type fiber
FD-H30-KZ1V

• Mounting bracket for **FD-H30-KZ1V**
MS-FD-2

• Photo-terminal
FV-BR1 (one pair set)

FD-H30-
L32V



• Fiber at atmospheric side
FT-J8 (one pair set)

Accessories (attached with fi bers)

RF-003 (**FR-KZ21/KZ21E** exclusive reflector)

• **RF-003**

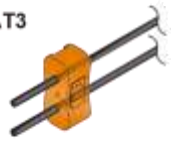
• **RF-13**

• **FX-CT1**

• **FX-CT2**

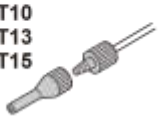
• **FX-AT2**

• **FX-AT3**



• **FX-AT4**

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



• **FX-AT5**

• **FX-AT6**

RF-13 (Reflective tape)
FX-CT1 (Fiber cutter)
FX-CT2 (Fiber cutter)
FX-AT2 (Attachment for fixed-length fiber, Orange)
FX-AT3 (Attachment for "2.2 mm "0.087 in fiber, Clear orange)
FX-AT4 (Attachment for "1 mm "0.039 in fiber, Black)
FX-AT5 (Attachment for "1.3 mm "0.051 in fiber, Gray) **FX-AT6** (Attachment for "1 mm "0.039 in/ "1.3 mm"0.051 inmixed fiber, Black / Gray)

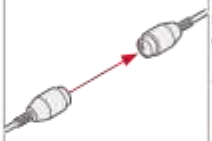
If connecting to a fi ber amplifi er other than the FX-100 series

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

FIBER OPTIONS

Lens (For thru-beam type fiber)

For thru-beam type fiber

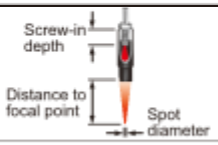
Designation	Model No.		Description	
Expansion lens (Note 1)	FX-LE1		Increases the sensing range by 5 times or more. • Ambient temperature: −60 to +350 °C −76 to +662 °F	**Sensing range (mm) [Lens on both sides]** Amplifier / Fiber: **FX-101□** / **FX-102□** **FT-B8**: 2,200 / 3,500 (Note 2) **FT-FM2, 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-J28-5 FT-H28-J38-5 FT-H28-J50-5: 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]** Amplifier / Fiber: **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-J28-5 FT-H28-J38-5 FT-H28-J50-5: 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]** Amplifier / Fiber: **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-J28-5 FT-H28-J38-5 FT-H28-J50-5: 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)** Amplifier / Fiber: **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)** Amplifier / Fiber: **FX-101□** / **FX-102□** **FT-H30-M1V**: 450 / 1,600

Notes: 1) B e careful when installing the thru-beam type fi ber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is diffi cult. Especially when installing a fi ber with many cores (sharp bending fi bers and heat-resistant glass fi ber), please be sure to use it only after you have adjusted it suffi ciently.
2) The fi ber cable length practically limits the sensing range to 3,500 mm137.795 in long (**FT-H20W-M1**, **FT-P81X** and **FT-H20-M1**: 1,600 mm62.992 in).
3) The fi ber 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 fi ber.

Lens (For refl ective type fi ber)

Designation	Model No.	Description
Pinpoint spot lens	**FX-MR1**	Pinpoint spot of "0.5 mm"0.020 in. Enables detection of minute objects or small marks. • Distance to focal point: 61 mm0.236 0.039 in • Applicable fi bers: **FD-WG4**, **FD-G4** lens • Ambient temperature:40 to70 °C 40 to158 °F The spot diameter is adjustable from"0.7 mm **Sensing range for FX-101 (Note)** Screw-in to "2 mm "0.028 in to "0.079 inaccording to Screw-in depth Distance to focal point Spot diameter depth how much the fi ber is screwed in.
Zoom lens	**FX-MR2**	•Applicable fi bers: **FD-WG4**, **FD-G4** 127 mmmm1827 mm approx..5 mm approx.""01.2.7 mm mm Distance to focal point Spot diameter •Ambient temperature:40 to70 °C40 to158 °F 14 mm 43 mm approx "2.0 mm •Accessory: **MS-EX-3** (mounting bracket)
Finest spot lens	**FX-MR3**	Extremely fi ne spot of "0.3 mm"0.012 in **Sensing range for FX-101 (Note)** approx. achieved. Fiber model No. Distance to focal point Spot diameter • **FD-EG**Applicable **1**, **FD-EG**fi bers:**2**, **FD-EG3FD-WG**,**4FD-G6X**, **FD-G4**, **FD-G**, **6** **FD-EGFD-EG3** **2**7.57.500.5.5 mm mm ""00.15.2 mm approx mm approx..

For reflective type fiber



ERS

•Ambient temperature:
40 to70 °C 40 to158 °F

FD-EG1	7.5	0.5 mm "0.3 mm approx.
FD-WG4/G4/G6X/G6	7.5	0.5 mm "0.5 mm approx.

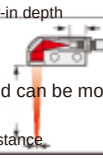
Extremely fi ne spot of "0.1 mm"0.004 in approx. achieved.

Sensing range for FX-101 (Note)

Fiber model No.	Distance to focal point	Spot diameter
FD-EG1	7.5	0.5 mm "0.2 mm approx.
FD-WG4/G4/G6X/G6	7.5	0.5 mm "0.4 mm approx.

Finest spot **FX-MR6** Spot diameter • **FD-EG** Applicable **1**, **FD-EG2** fi bers:, **FD-EG3** **FD-WG**, **4FD-G6X**, **FD-G4**, , **FD-G6** **FD-EG3** **FD-EG2** 7.7.5500..55 mm mm ""0.10.15 mm approx mm approx.

lens



•Ambient temperature:
20 to60 °C 4 to140 °F

FD-EG1	7.5	0.5 mm "0.2 mm approx.
FD-WG4/G4/G6X/G6	7.5	0.5 mm "0.4 mm approx.

(Zoom lens

FX-MR5

FX-MR2 is converted into a side-view type and can be mounted in a very small space. •Applicable fi bers: **FD-WG4**, **FD-G4**

Sensing range for FX-101 (Note)

Screw-in depth	Distance to focal point	Spot diameter S	ide-view)
8 mm	13 mm approx.	"0.5 mm type	
10 mm	15 mm approx.	"0.8 mm point	40 to70 °C 40 to158 °F
14 mm	30 mm approx	"3.0 mm	

Distance to focal

Spot diameter

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

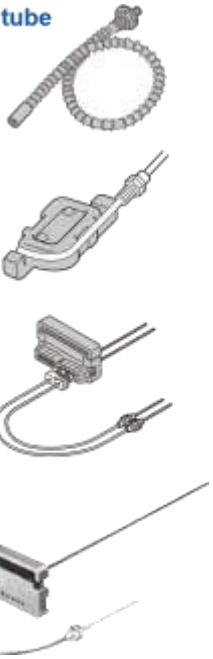
FIBER OPTIONS

Others

Designation	Model No.				
Protective tube (For thru-beam type fiber)	**FTP-500** (0.5 m1.640 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 m1.640 ft)	For M3 thread		**FT-T80 FT-P40 FT-NFM2 FD-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 m1.640 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 m1.640 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 "2.2 mm "0.087 infi ber	**FX-AT3**	This is the attachment for the "2.2 mm"0.087 in fiber. Clear Orange. (Accessory. Does not attach with the **FT-P80** or the **FD-P80**.)			
Attachment for "1 mm "0.039 in fiber	**FX-AT4**	This is the attachment for the"1 mm "0.039 in fiber. Black. (Accessory)			
Attachment for "1.3 mm "0.051 infi ber	**FX-AT5**	This is the attachment for the"1.3 mm"0.051 in fiber. Gray. (Accessory)			
Attachment for "1mm "0.039 in / "1.3 mm "0.051 in mixed fiber	**FX-AT6**	This is the attachment for the "1mm"0.039 in / "1.3 mm"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.

Protective tube



- **FTP-**
- **FDP-**

Fiber bender

- **FB-1**

Fiber cutter

- **FX-CT2**
- **FX-CT1**

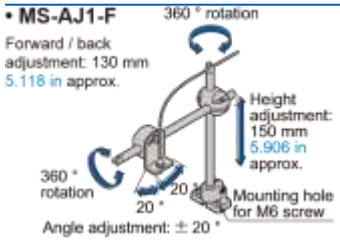
Universal sensor mounting stand

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

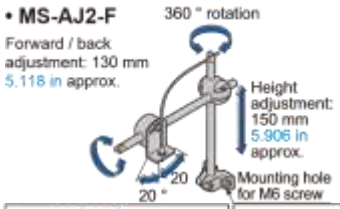
Fiber attachment

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

• **MS-AJ1-F**



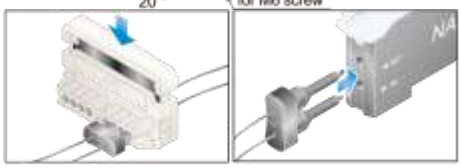
• **MS-AJ2-F**



360 ° rotation

Angle adjustment:20 °

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 fixer-length fiber

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

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

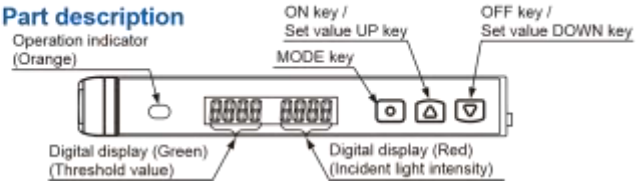
• **FX-AT5**
For ϕ1.3 mm ϕ0.051 in fiber

• **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

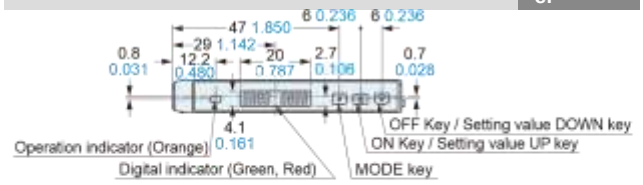


DIMENSIONS (Unit: mm in)

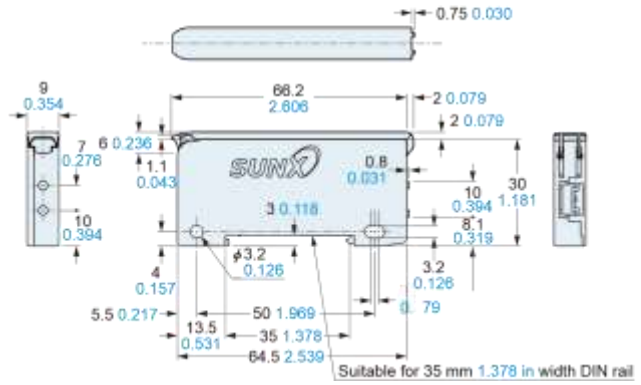
The CAD data in the dimensions can be downloaded from the website: http://www.sunx.jp/

FX-101, FX-102

Amplifier

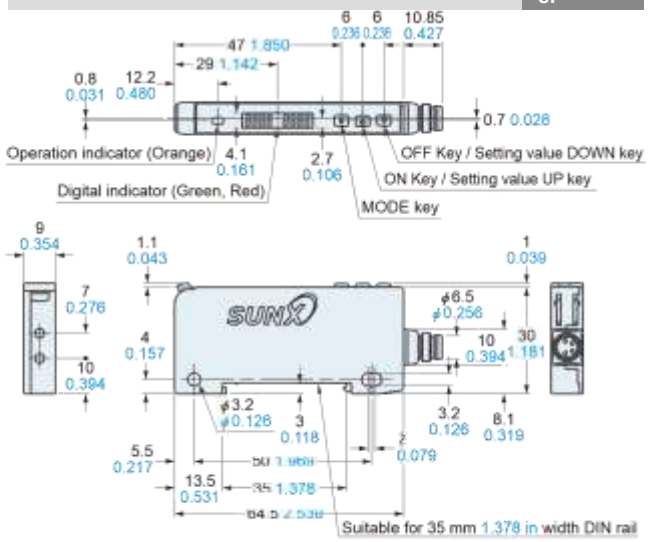


Assembly dimensions with optional protective cover



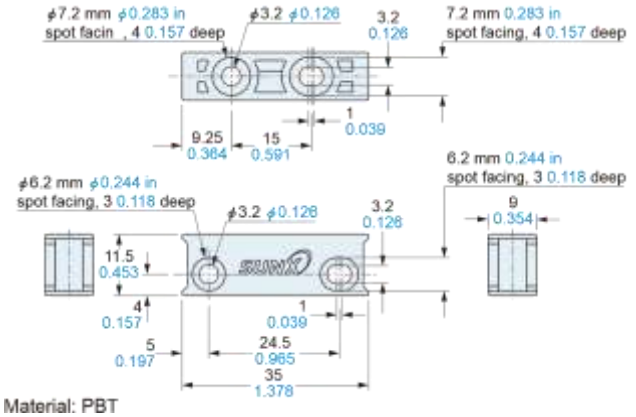
FX-101(P)-Z, FX-102(P)-Z

Amplifier

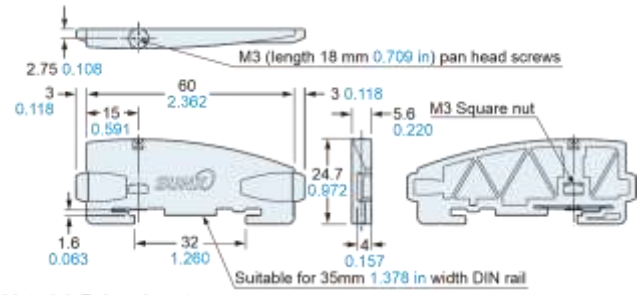


MS-DIN-4	Amplifer mounting bracket (Optional)

MS-DIN-E	End plate (Optional)



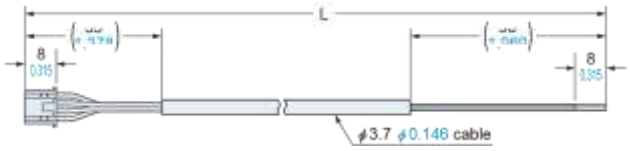
Material: PBT



Material: Polycarbonate

CN-14A-C

Connectorttached cable a (Optional)



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

• Length L

Model No. / Length L (mm in)	
	1,000 39.370
CN-14A-C1	
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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