Panasonic
INDUSTRY

Fiber Selection

FT / FD / FR

2022.6

* The contents of this catalog are as of October 2017.
For the latest information, please visit our company website.

Fiber Selection FT / FD / FR

**A full line-up from general use fibers to special fibers.
You can select the most suitable fibers.**

Fiber Selection Guide

Choose by model

Thru-beam type

Model No.	Page	
	Sensing range Specifications	Dimensions
FT-140	P.15	P.63
FT-30	P.14	
FT-31	P.15	
FT-31S	P.22	
FT-31W	P.15	
FT-32	P.15	
FT-40	P.14	
FT-42	P.15	
FT-42S	P.22	
FT-42W	P.15	P.64
FT-43		
FT-45X		
FT-A11	P.29	
FT-A11W		
FT-A32		
FT-A32W		
FT-AL05		
FT-E13	P.20 / P.22	
FT-E23		
FT-F93	P.42	
FT-H13-FM2	P.37	P.65
FT-H20-J20-S		
FT-H20-J30-S		
FT-H20-J50-S		
FT-H20-M1		
FT-H20-VJ50-S		
FT-H20-VJ80-S		
FT-H20W-M1		
FT-H30-M1V-S	P.39	
FT-H35-M2	P.37	
FT-H35-M2S6		
FT-HL80Y	P.36	P.66
FT-KS40	P.28	
FT-KV26		
FT-KV26H1		
FT-KV40		
FT-KV40W		
FT-L80Y	P.36	
FT-R31	P.18	
FT-R40	P.15	
FT-R41W	P.18	
FT-R42W		
FT-R43		P.67
FT-R44Y	P.18 / P.34	
FT-R60Y		
FT-S11	P.20	
FT-S20	P.14	
FT-S21	P.20	
FT-S21W		
FT-S22	P.20	
FT-S30	P.14	
FT-S31W	P.20	P.68
FT-S32		
FT-V23	P.22	
FT-V24W		
FT-V25		
FT-V30		
FT-V40	P.20	

Model No.	Page	
	Sensing range Specifications	Dimensions
FT-V80Y	P.36	P.68
FT-Z20HBW	P.24	
FT-Z20W		
FT-Z30	P.24	P.69
FT-Z30E		
FT-Z30EW		
FT-Z30H		
FT-Z30HW		
FT-Z30W		
FT-Z40HBW		
FT-Z40W		
FT-Z802Y	P.24 / P.36	

Retroreflective type

Model No.	Page	
	Sensing range Specifications	Dimensions
FR-KZ22E	P.28 / P.32	P.70
FR-KZ50E		
FR-KZ50H		
FR-Z50HW		

Reflective type

Model No.	Page	
	Sensing range Specifications	Dimensions
FD-30	P.14	P.71
FD-31	P.16	
FD-31W		
FD-32G	P.16 / P.26 / P.27	
FD-32GX		
FD-34G	P.16	
FD-40	P.14	
FD-41	P.16	
FD-41S	P.22	
FD-41SW		
FD-41W	P.16	P.72
FD-42G	P.16 / P.26 / P.27	
FD-42GW		
FD-60	P.14	
FD-61	P.16	
FD-61G		
FD-61S	P.22	
FD-61W	P.16	P.73
FD-62		
FD-64X		
FD-A16	P.30	
FD-AL11		
FD-E13	P.20 / P.22	
FD-E23		
FD-EG30	P.16 / P.26 / P.27	
FD-EG30S	P.22	P.74
FD-EG31	P.16 / P.26 / P.27	
FD-F4	P.42	
FD-F41		
FD-F41Y		
FD-F71		
FD-F8Y		
FD-FA93		
FD-H13-FM2	P.38	P.75
FD-H18-L31		
FD-H20-21		
FD-H20-M1		
FD-H25-L43		
FD-H25-L45		
FD-H30-KZ1V-S	P.39	P.76

Model No.	Page	
	Sensing range Specifications	Dimensions
FD-H30-L32	P.38	P.76
FD-H30-L32V-S	P.39	
FD-H35-20S	P.38	
FD-H35-M2		
FD-H35-M2S6		
FD-HF40Y	P.42	
FD-L10	P.31	P.77
FD-L11		
FD-L12W		
FD-L20H		
FD-L21		
FD-L21W		
FD-L22A		
FD-L23		
FD-L30A		
FD-L31A		
FD-L32H		P.78
FD-R31G	P.18 / P.26 / P.27	
FD-R32EG		
FD-R33EG		
FD-R34EG		
FD-R41	P.18	
FD-R60	P.16	
FD-R61Y	P.18 / P.34	
FD-S21	P.20	
FD-S30	P.14	P.79
FD-S31	P.20	
FD-S32		
FD-S32W		
FD-S33GW		
FD-S34G	P.20	
FD-S60Y	P.36	
FD-V30	P.22	P.80
FD-V30W		
FD-V50		
FD-Z20HBW	P.24	
FD-Z20W		
FD-Z40HBW		
FD-Z40W		
FD-Z50HW	P.28	

Fiber Selection Guide

Choose by shape

Threaded Type
- Standard type which is mounted using nuts.

P.15

Square Head Type
- Installed cleanly on the side of a conveyor belt.

P.17

Cylindrical Type
- Has a slender shape that is mounted using set screws.

P.19

Sleeve
- Suitable for sensing in narrow locations and sensing minute objects.

P.21

Flat Type
- Thin and rectangular shape. Installed directly in narrow locations with screws.

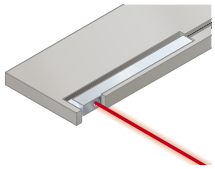
P.23

Choose by beam shape

Small Spot
- Senses minute objects using a spot lens.

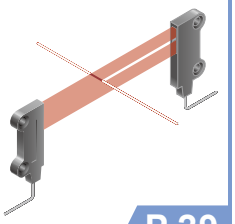
P.25

Narrow Beam
- Not easily affected by surrounding obstacles.



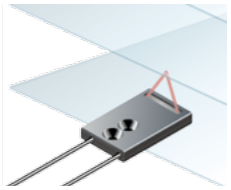
P.28

Wide Beam
- Senses in the beam band without missing a work.



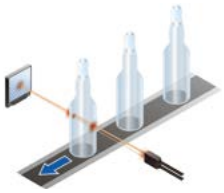
P.29

Convergent Reflective Type
- Senses in the limited range only.



P.31

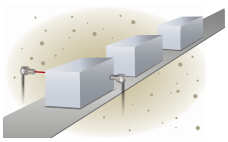
Retroreflective Type
- Ideal for sensing transparent objects



P.32

Choose by environment / performance

Oil-resistant
- Resist to oil by using fluorine resin.



P.33

Chemical-resistant
- Various kinds of liquids can be detected due to the fluorine contained resin case

P.35

Heat-resistant
- Withstands at -60 °C -76 °F to 350 °C 662 °F

P.37

Vacuum-resistant
- Usable in high-temperatures of 300 °C 572 °F and vacuum

P.39

Liquid Leak / Liquid Detection
- Corresponds to various liquid events.

P.41

Choose by quality

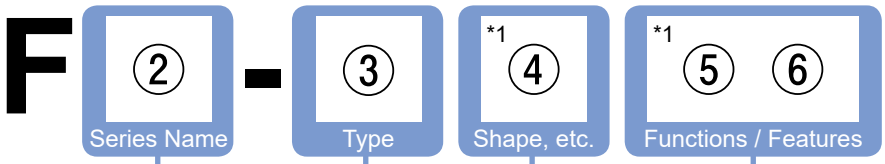
Super Quality
- The variance of beam intensity and beam axis is extremely small.

P.13

Fiber Selection Guide

How to read Model No.

Applies to the fiber in (p.13 to p.42)



*1: Excluding liquid leak / liquid detection fiber

②

Symbol	Details
T	Thru-beam type
D	Reflective type
R	Retroreflective type

⑤

Symbol	Details
None	General-purpose
G	Coaxial reflective
S	Sleeve
H	Top sensing *
E	Side sensing *
HB	Top sensing + Fiber guide system *
A	Alignment

*③ is for Flat type (**Z** and **KZ**) only

⑥

Symbol	Details
None	General-purpose
W	Sharp bending
X	Stainless-jacketed
Y	Oil-resistant or Chemical-resistant

③ ④

Symbol	Details	Lead No.	Details
None	Threaded type	**3**	M3
		4	M4
		6	M6
		14	M14
R	Elbow or square head	**4**	M4
		6	M6
S	Cylindrical type	**1**	ø1 mm
		2	ø1.5 mm
		3	ø2.5 or ø3 mm
KS	Narrow beam	**4**	ø3.7 mm
V	Side-view	**2**	ø2 mm
		3	ø2.5 or ø3 mm
		4	ø4 mm
		5	ø5 mm
KV	Narrow beam / Side-view	**4**	ø4 mm
		2	1.5 × 2 mm
E	Ultra small diameter	**1**	Fiber ø0.125 mm
		2	Fiber ø0.25 mm
EG	Coaxial	**3**	M3
Z	Flat type	**2**	Thickness 2 mm
		3	Thickness 3 mm
		4	Thickness 3.5 mm
		5	Thickness 5.2 mm
KZ	Narrow beam	**2**	Thickness 2.2 mm
		5	Thickness 5.2 mm
A	Wide beam	**3**	Sensing width 32 mm
		1	Sensing width 10 to 19 mm
AL	Array	**1**	Sensing width 11.1 mm
		0	Sensing width 5.5 mm
L	Convergent reflective type	**1**	Sensing range 0 to 10 mm (STD)
		2	Sensing range 11 to 30 mm (STD)
		3	Sensing range 31mm or more (STD)
F	Liquid leak / Liquid detection	*1	

MEMO

Fiber Selection Guide

Earlier Models Comparison Table

(The specification of new fiber may be changed from that of old one. Please confirm the specification before use.)

Thru-beam type

Old fiber Model No.	New fiber Model No.	Page	
		Sensing range Specifications	Dimensions
FT-A30	FT-A32	P.29	P.64
FT-A8	FT-A11		
FT-AFM2	FT-AL05		
FT-AFM2E			
FT-B8	FT-43	P.15	
FT-E12	FT-E13	P.20 / P.22	
FT-E22	FT-E23		
FT-F902	FT-F93	P.42	
FT-FM10L	FT-140	P.15	P.63
FT-FM2	FT-42		
FT-FM2S	FT-42S	P.22	
FT-FM2S4			
FT-K8	FT-KS40	P.28	P.66
FT-KV1	FT-KV26		
FT-KV8	FT-KV40		
FT-NFM2	FT-31	P.15	P.63
FT-NFM2S	FT-31S	P.22	
FT-NFM2S4			
FT-P2	FT-S21	P.20	P.67
FT-P40	FT-31	P.15	P.63
FT-P60	FT-42		
FT-P80			
FT-P81X	FT-45X		P.64
FT-PS1	FT-S11	P.20	P.67
FT-R80	FT-R40	P.15	P.66
FT-SFM2	FT-S32	P.20	P.68
FT-SFM2L			
FT-SFM2SV2	FT-V30	P.22	
FT-SNFM2	FT-S21	P.20	P.67
FT-T80	FT-42	P.15	P.63
FT-V10	FT-V40	P.20	P.68
FT-V22	FT-V23	P.22	
FT-V41	FT-V25		
FT-W4	FT-31	P.15	P.63
	FT-31W		
FT-W8	FT-42		
	FT-42W		
FT-WA30	FT-A32	P.29	P.64
	FT-A32W		
FT-WA8	FT-A11		
	FT-A11W		

Old fiber Model No.	New fiber Model No.	Page	
		Sensing range Specifications	Dimensions
FT-WKV8	FT-KV40	P.28	P.66
	FT-KV40W		
FT-WR80	FT-R41W	P.18	
FT-WR80L	FT-R42W		
FT-WS3	FT-S31W	P.20	P.68
FT-WS4	FT-S21		P.67
	FT-S21W		
FT-WS8	FT-S31W		P.68
FT-WS8L	FT-S32		
FT-WV42	FT-V25	P.22	
	FT-V24W		
FT-WZ4	FT-Z20W	P.24	
FT-WZ4HB	FT-Z20HBW		
FT-WZ7	FT-Z40W		P.69
FT-WZ7HB	FT-Z40HBW		
FT-WZ8	FT-Z30		P.68
	FT-Z30W		P.69
FT-WZ8E	FT-Z30E		
	FT-Z30EW		
FT-WZ8H	FT-Z30H		
	FT-Z30HW		
FT-Z8	FT-Z30		P.68
FT-Z8E	FT-Z30E		P.69
FT-Z8H	FT-Z30H		

Retroreflective type

Old fiber Model No.	New fiber Model No.	Page	
		Sensing range Specifications	Dimensions
FR-KV1	FR-KZ22E	P.28 / P.32	P.70
FR-KZ21	FR-KZ50H		
FR-KZ21E	FR-KZ50E		
FR-WKZ11	FR-Z50HW		

Fiber Selection Guide

Reflective type

Old fiber Model No.	New fiber Model No.	Page	
		Sensing range Specifications	Dimensions
FD-A15	FD-A16	P.30	P.73
FD-AFM2	FD-AL11		
FD-AFM2E			
FD-B8	FD-62	P.16	
FD-E12	FD-E13	P.20 / P.22	
FD-E22	FD-E23		
FD-EG1	FD-EG30	P.16 / P.26 / P.27	
FD-EG2	FD-EG31		P.74
FD-EG3			
FD-EN500S1	FD-EG30S	P.22	
FD-ENM1S1			
FD-F705	FD-F71	P.42	
FD-FA90	FD-FA93		
FD-FM2	FD-61	P.16	P.72
	FD-61G		
FD-FM2S	FD-61S	P.22	
FD-FM2S4			
FD-G4	FD-42G	P.16 / P.26 / P.27	
FD-G6	FD-32G		P.71
FD-G6X	FD-32GX		
FD-L4	FD-L20H	P.31	P.77
FD-L41	FD-L21		
FD-L43	FD-L22A		
FD-L44	FD-L11		
FD-L44S	FD-L10		
FD-L45	FD-L30A		
FD-L45A	FD-L31A		
FD-L46	FD-L32H		P.78
FD-L47	FD-L23		P.77
FD-NFM2	FD-41	P.16	P.71
FD-NFM2S	FD-41S	P.22	
FD-NFM2S4			
FD-P2	FD-S21	P.20	P.78
FD-P40	FD-31	P.16	P.71
FD-P50	FD-S32	P.20	P.79

Old fiber Model No.	New fiber Model No.	Page	
		Sensing range Specifications	Dimensions
FD-P60	FD-41	P.16	P.71
FD-P80	FD-61		P.72
FD-P81X	FD-64X		P.73
FD-R80	FD-R60		P.78
FD-S80	FD-S32	P.20	P.79
FD-SFM2SV2	FD-V50	P.22	P.80
FD-SNFM2	FD-S31	P.20	P.79
FD-T40	FD-31	P.16	P.71
FD-T80	FD-61		P.72
	FD-41		P.71
FD-V41	FD-V30	P.22	P.79
FD-W44	FD-41S		P.71
	FD-41SW		
FD-W8	FD-61	P.16	P.72
	FD-61W		P.73
FD-WG4	FD-42G	P.16 / P.26 / P.27	P.72
	FD-42GW		
FD-WKZ1	FD-Z50HW	P.28	P.80
FD-WL41	FD-L21	P.31	P.77
	FD-L21W		
FD-WL48	FD-L12W		
FD-WS8	FD-S32	P.20	P.79
	FD-S32W		
FD-WSG4	FD-S33GW		
FD-WT4	FD-31	P.16	P.71
	FD-31W		
FD-WT8	FD-41		
	FD-41W		P.72
FD-WV42	FD-V30	P.22	P.79
	FD-V30W		P.80
FD-WZ4	FD-Z20W	P.24	
FD-WZ4HB	FD-Z20HBW		
FD-WZ7	FD-Z40W		
FD-WZ7HB	FD-Z40HBW		

Tough Fiber

Unbreakable! More flexible! ECO!
Conventional 3 types rolled into 1!!

3

Bending-resistant fiber
Bending durability
1 million times

Sharp bending fiber
Bending radius
R2~R1 mm

General purpose fiber
Bending radius
R25mm

in

1

Tough Fiber

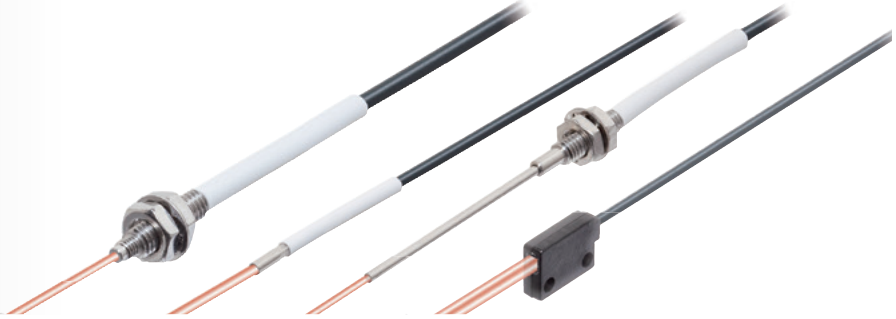
Unbreakable
Bending durability 10 million times (Typical)
Bending conditions Bending radius: R10 mm
Reciprocating bending: 180°

More flexible
Bending radius R2~R4 mm

ECO
Stainless steel fittings are used for the fiber head of all models.
- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength

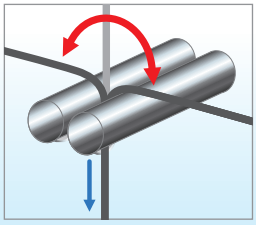
New tough fibers exceed normal optic fibers!

Tough fibers can be used on moving parts, can be bent with precision, and offer high quality for all purposes. They go beyond what was commonly thought to be possible.



Unbreakable

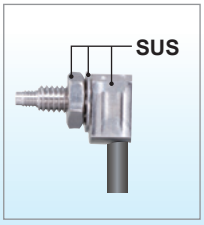
Bending conditions
Bending radius: R10 mm R0.394 in,
Reciprocating bending: 180°



Bending durability
10 million times
(Typical)

ECO

Stainless steel fittings are used for the fiber head of all models.

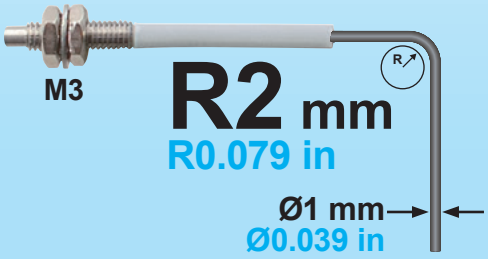


- Clearly conforms to RoHS
- Can be used for secondary batteries
- Improved tightening torque

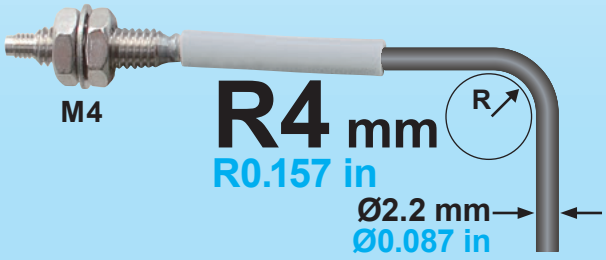
More flexible

R2 to R4 mm R0.079 to R0.157 in

Example: FT-31



Example: FT-42



Reduced the time in selecting fiber and in registrating part numbers

For Designers

High-quality

- High-quality in whichever tough fiber you choose!
- Easy selection!
- Reduces risk of breaking and bending during installation!

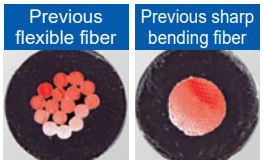
For Buyers

Low Price

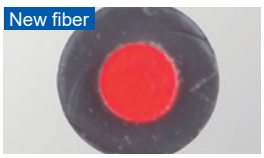
- Cost savings!
- Reduced registration of part numbers!
- Reduced maintenance time in keeping stocks and replacement!

Reduced variation in detection

Beams at the fiber aperture are uniform, leading to stable sensing.



Generally Bending-resistant fibers and sharp bending fibers are composed of multiple fiber cores, often resulting in large variations in light intensity.

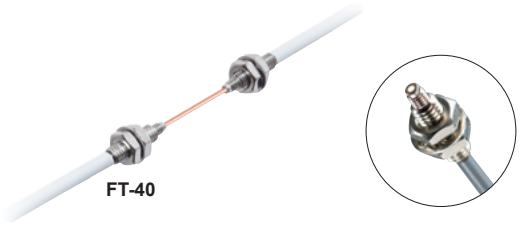


Tough fiber is composed of a single fiber core, achieving uniform light intensity.

- **Uniform and highly accurate sensing**
- **Stable sensing even if the fiber is bent**

Super Quality

- It is a fiber with superior light intensity stability and simple digital management when combined with the **FX-500** series amplifier.
- It offers stable sensing with an extremely small beam axis curvature and gap.



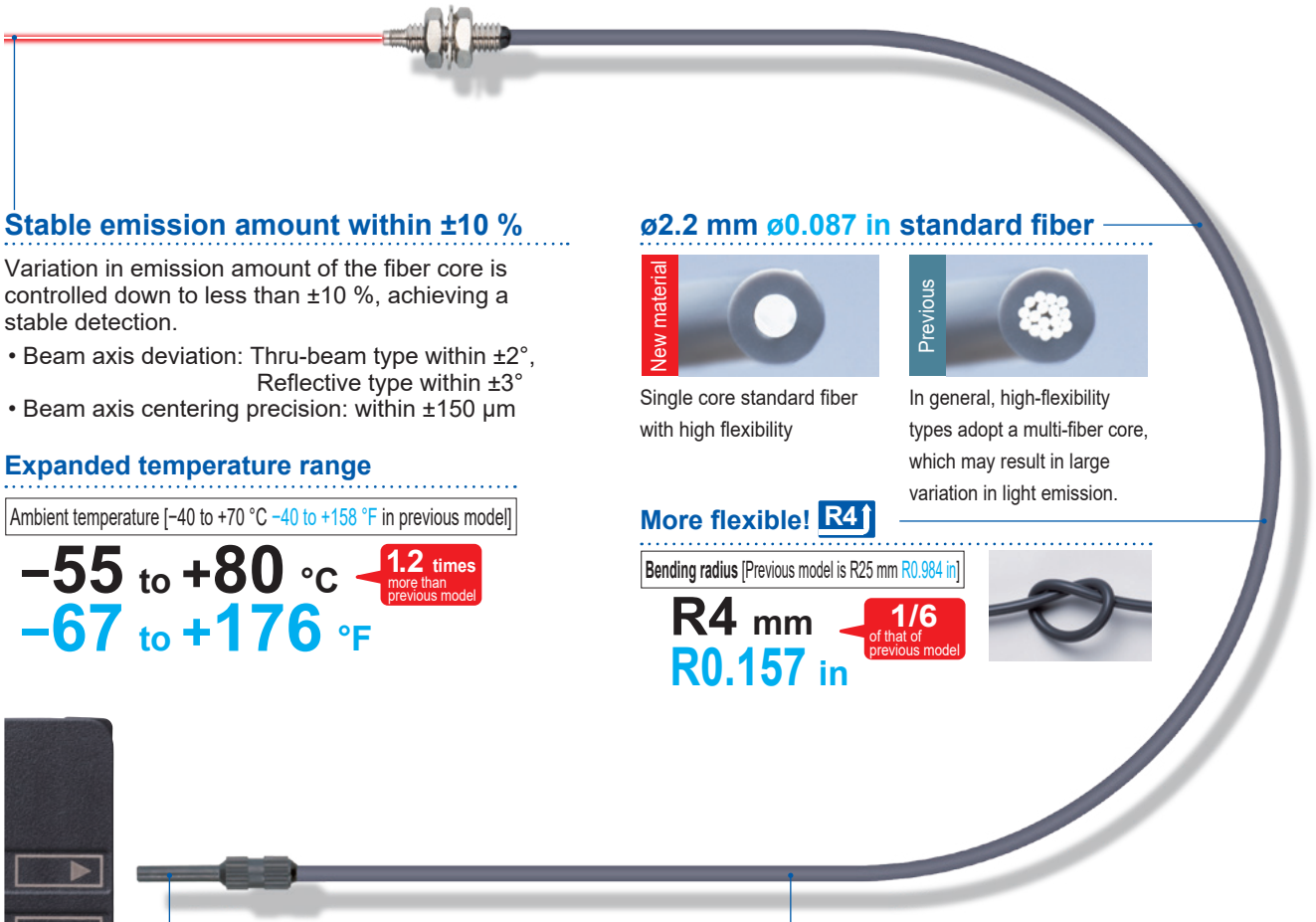
Digital management is simple due to small differences in body.

When connected with the **FX-500** series amplifiers, it has up to 4 times improved stability of incident light intensity compared with traditional fibers. Management is simple even when replacing amplifiers because the digital display shows the approximate value.

Emitter intensity is also stable due to few curvatures and gaps in the beam axis.

Super quality fiber + **FX-500** series

"Stabilized incident light intensities"
even in multiple units



Stable emission amount within ±10 %

Variation in emission amount of the fiber core is controlled down to less than ±10 %, achieving a stable detection.

- Beam axis deviation: Thru-beam type within ±2°, Reflective type within ±3°
- Beam axis centering precision: within ±150 µm

Expanded temperature range

Ambient temperature [−40 to +70 °C −40 to +158 °F in previous model]

−55 to +80 °C
−67 to +176 °F

1.2 times more than previous model

ø2.2 mm ø0.087 in standard fiber

Single core standard fiber with high flexibility

In general, high-flexibility types adopt a multi-fiber core, which may result in large variation in light emission.

More flexible! R4↑

Bending radius [Previous model is R25 mm R0.984 in]

R4 mm
R0.157 in

1/6 of that of previous model

Integrated high-precision plug

The centering precision of the fiber core attached to the inserting plug is doubled. As the insertion precision is increased, the variation among units can be greatly suppressed.

- Centering precision: within ±40 µm

More bendable!

Bending durability [Previous model is 1,000 times]

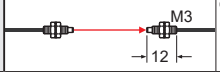
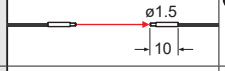
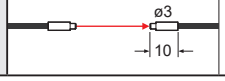
10 million times

10,000 times more than previous model

* Bending conditions
Bending radius: R10 mm R0.394 in,
Reciprocating bending 180°

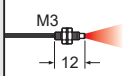
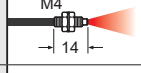
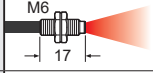
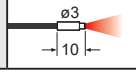
LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length	Sensing range (mm in) FX-500 series	Other modes U-LG LONG FAST H-SP	FX-550 series	Other modes U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.	Dimensions
Threaded	M3		Tough Bending durability **FT-30**	R2	2 m	STD 400 15.748 HYPR 1,350 53.150	810 31.890 650 25.591 210 8.268 75 2.953	STD 570 22.441 HYPR 1,860 73.228	1,240 48.819 830 32.677 340 13.386	135 5.315 400 15.748	ø0.5	150 µm / ±2°	±10 %	IP67	−55 to +80 °C	P.63
	M4		Tough Bending durability **FT-40**	R4		STD 1,200 47.244 HYPR (Note) 3,600 141.732	2,200 86.614 1,700 66.929 530 20.866 190 7.480	STD 1,570 61.811 HYPR 3,600 141.732 (Note)	3,100 122.047 2,200 86.614 960 37.795	320 12.598 870 34.252	ø1					
Cylindrical	ø1.5		Tough Bending durability **FT-S20**	R2		STD 400 15.748 HYPR 1,350 53.150	810 31.890 650 25.591 210 8.268 75 2.953	STD 550 21.654 HYPR 1,760 69.291	1,200 47.244 800 31.496 340 13.386	135 5.315 400 15.748	ø0.5					P.67
	ø3		Tough Bending durability **FT-S30**	R4		STD 1,200 47.244 HYPR (Note) 3,600 141.732	2,200 86.614 1,700 66.929 530 20.866 190 7.480	STD 1,650 64.961 HYPR 3,600 141.732 (Note)	3,100 122.047 2,250 88.583 1,000 39.370	320 12.598 870 34.252	ø1					

Note: The fiber cable length practically limits the sensing range.

Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length	Sensing range (mm in) (Note) FX-500 series	Other modes U-LG LONG FAST H-SP	FX-550 series	Other modes U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis position / Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.	Dimensions
Threaded	M3		Tough Bending durability **FD-30**	R2	2 m	STD 160 6.299 HYPR 600 23.622	330 12.992 250 9.843 80 3.150 25 0.984	STD 210 8.268 HYPR 800 31.496	460 18.110 330 12.992 140 5.512	45 1.772 155 6.102	150 µm / ±3°	±10 %	IP67	−55 to +80 °C	P.71
	M4		Tough Bending durability **FD-40**												
	M6		Tough Bending durability **FD-60**	R4		STD 520 20.472 HYPR 1,550 61.024	900 35.433 740 29.134 260 10.236 90 3.543	STD 750 29.528 HYPR 1,750 68.898	1,300 51.151 970 38.189 420 16.535	140 5.512 420 16.535					P.72
Cylindrical	ø3		Tough Bending durability **FD-S30**			STD 160 6.299 HYPR 600 23.622	330 12.992 250 9.843 80 3.150 25 0.984	STD 220 8.661 HYPR 800 31.496	500 19.685 330 12.992 140 5.512	45 1.772 155 6.102					P.79

Note: The sensing range is specified for white non-glossy paper.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

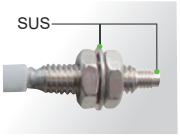
Threaded Type

- It is a standard fiber which is mounted using nuts. It has reasonable pricing while drastically improving flexing performance.
- With the lens installable type, long distance sensing and microscopic object sensing is possible by installing a lens.
- A protective tube and a sturdy stainless jacket type that prevents disconnection are also prepared.

FT-42

Stainless steel fittings are used for the fiber head of all models. ECO

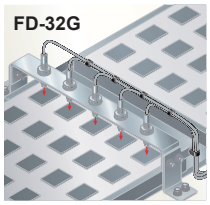
- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength



* Except for **FT-140**

Application

Detecting a presence of a workpiece



<Thru-beam type> FT-31/31W/43/42/42W FT-45X/R40
<Reflective type> FD-31/41/62/61/R60

More user-friendly, high quality fiber

Improved centering accuracy

The beam axis deviation of each unit is kept within ±3° and the beam axis centering accuracy is kept within ±150 µm 0.006 mil.
(Within ±5° and ±90 µm 0.004 mil for ultra small diameter fibers)

- Makes beam axis adjustment easier
- Improves mounting hole machining accuracy
- Improves sensing accuracy

Improved specularity

High precision polishing is accomplished by using the PCTC polishing technique.
The specularity of the end face of the fiber is 5 times greater.

- Light intensity is increased, enabling stable sensing.

LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series STD	FX-500 series HYPR	FX-500 series Other modes U-LG LONG FAST H-SP	FX-550 series STD	FX-550 series HYPR	FX-550 series Other modes U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
Threaded	M3	M3, 12	Tough Bending durability FT-31	R2	2 m	STD 315 12.402	HYPR 1,350 53.150	770 30.315 550 21.654 210 8.268 70 2.756	STD 480 18.898	HYPR 1,580 62.205	1,000 39.370 700 27.559 290 11.417	130 5.118 340 13.386	ø0.5	150 µm / ±2°	IP67	−55 to +80 °C	P.63
		M3, 12	FT-31W	R1		STD 260 10.236	HYPR 990 38.976	590 23.228 440 17.323 150 5.906 53 2.087	STD 420 16.535	HYPR 1,300 51.181	890 35.039 580 22.835 250 9.843	80 3.150 240 9.449		150 µm / ±3°		−40 to +60 °C	
		With lens, M3, 12	Tough Bending durability FT-32	R2		STD 3,000 118.110	HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,600 62.992 580 22.835	STD 3,600 141.732 (Note 2)	HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,900 114.173	1,300 51.181 3,600 141.732	ø1.6	—	IP40	−40 to +70 °C	
	M4	Lens mountable, M4, 15	Bending durability FT-43	R4		STD 1,400 55.118	HYPR (Note 2) 3,600 141.732	2,800 110.236 2,100 82.677 770 30.315 240 9.449	STD 2,200 86.614	HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,100 122.047 1,400 55.118	350 13.780 970 38.189	ø1.5	150 µm / ±2°	IP67	−55 to +80 °C	P.64
		Lens mountable, M4, 15	Tough Bending durability FT-42			STD 1,130 44.488	HYPR (Note 2) 3,600 141.732	2,050 80.709 1,600 62.992 530 20.866 190 7.480	STD 1,470 57.874	HYPR 3,600 141.732 (Note 2)	2,900 114.173 2,100 82.677 890 35.039	300 11.811 800 31.496	ø1				P.63
		Lens mountable, M4, 15	FT-42W	R1		STD 800 31.496	HYPR 3,300 129.921	1,900 74.803 1,400 55.118 490 19.291 160 6.299	STD 1,200 47.244	HYPR 3,600 141.732 (Note 2)	2,600 102.362 1,780 70.079 710 27.953	260 10.236 720 28.346		150 µm / ±3°		−40 to +60 °C	
		Lens mountable, Stainless-jacketed, M4, 20	FT-45X	R4	1 m	STD 1,200 47.244	HYPR (Note 2) 1,600 62.992	1,600 62.992 (Note 2) 1,600 62.992 (Note 2) 630 24.803 200 7.874	STD 1,600 62.992 (Note 2)	HYPR 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2) 1,070 42.126	340 13.386 920 36.220		150 µm / ±2°		−55 to +80 °C	P.64
	Elbow	Lens mountable, 15, M4	Tough Bending durability FT-R40	R4	2 m	STD 930 36.614	HYPR (Note 2) 3,600 141.732	1,750 68.898 1,500 59.055 500 19.685 160 6.299	STD 1,400 55.118	HYPR 3,600 141.732 (Note 2)	2,900 114.173 1,950 76.772 860 33.858	270 10.630 740 29.134					P.66
	M14 Long range	With expansion lens, M14, 40	Tough Bending durability FT-140		10 m	STD (Note 2) 19,600 771.654	HYPR (Note 2) 19,600 771.654	19,600 771.654 (Note 2) 19,600 771.654 (Note 2) 16,000 629.921 6,300 248.031	STD 19,600 771.654 (Note 2)	HYPR 19,600 771.654 (Note 2)	19,600 771.654 (Note 2) 19,600 771.654 (Note 2) 19,600 771.654 (Note 2)	14,000 551.181 19,600 771.654 (Note 2)	ø10	—		−40 to +70 °C	P.63

Notes: 1) Note 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.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Coaxial type FD-□G□ in which high-precision positioning can be achieved.

It is a coaxial fiber that encloses the circumference of the emitter fiber at the center with the receiver fiber. This is suitable for high-precision positioning. It can perform sensing without affecting the approach direction of the work.

Supports spot lenses and zoom lenses!

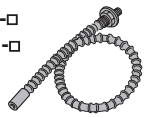
FIBER OPTIONS

Lens (For thru-beam type fiber) ▸P.53~

Lens (For reflective type fiber) ▸P.55

Protective tube ▸P.57

·FTP-□
·FDP-□



LIST OF FIBERS

Reflective type

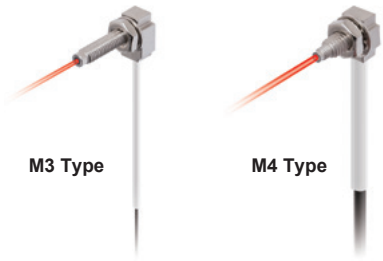
Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
Threaded	M3	M3 12	Tough Bending durability FD-31	R2	2 m	STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984		STD 200 7.874 HYPR 750 29.528	450 17.717 310 12.205 140 5.512		35 1.378 140 5.512	150 µm / ±3°	IP67	−55 to +80 °C	P.71
		M3 12	FD-31W	R1		STD 80 3.150 HYPR 330 12.992	180 7.087 140 5.512 45 1.772 12 0.472		STD 130 5.118 HYPR 480 18.898	310 12.205 190 7.480 80 3.150		15 0.591 60 2.362	—		−40 to +60 °C	
		Coaxial, Lens mountable M3 17	Tough Bending durability FD-32G	R2	2 m	STD 200 7.874 HYPR 650 25.591	380 14.961 270 10.630 95 3.740 27 1.063		STD 320 12.598 HYPR 1,150 45.278	730 28.740 420 16.535 170 6.693		70 2.756 190 7.480	—	IP40	−55 to +80 °C	
		Coaxial, Lens mountable, Stainless-jacketed M3 18	FD-32GX	R2	1 m (Note 3)	STD 200 7.874 HYPR 630 24.803	410 16.142 360 14.173 100 3.937 30 1.181		STD 320 12.598 HYPR 1,350 53.150	730 28.740 490 19.291 180 7.087		75 2.953 210 8.268	—			
		Coaxial, With lens M3 15	Tough Bending durability FD-34G	R2	2 m	STD 90 3.543 HYPR 330 12.992	185 7.283 135 5.305 49 1.929 15 0.591		STD 130 5.118 HYPR 480 18.898	310 12.205 180 7.087 80 3.150		29 1.142 90 3.543	—		−40 to +70 °C	
	Ultra-small diameter	Coaxial, Lens mountable M3 16	FD-EG30	R4	500 mm	STD 48 1.890 HYPR 170 6.693	130 5.118 110 4.331 30 1.181 9 0.354		STD 90 3.543 HYPR 320 12.598	190 7.480 120 4.724 50 1.969		20 0.787 70 2.756	—			P.73
		Coaxial, Lens mountable M3 16	FD-EG31			STD 20 0.787 HYPR 85 3.346	45 1.772 35 1.378 12 0.472 3.5 0.138		STD 35 1.378 HYPR 120 4.724	70 2.756 45 1.772 20 0.787		7 0.276 25 0.984	—		−20 to +60 °C	P.74
	M4	M4 14	Tough Bending durability FD-41	R2	2 m	STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984		STD 200 7.874 HYPR 750 29.528	450 17.717 310 12.205 140 5.512		35 1.378 140 5.512	150 µm / ±3°	IP67	−55 to +80 °C	P.71
		M4 14	FD-41W	R1		STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772		STD 480 18.898 HYPR 1,400 55.118	1,000 39.370 680 26.772 270 10.630		80 3.150 230 9.055	—		−40 to +60 °C	P.72
		Coaxial, Lens mountable M4 25	Tough Bending durability FD-42G	R2		STD 200 7.874 HYPR 650 25.591	380 14.961 270 10.630 95 3.740 27 1.063		STD 320 12.598 HYPR 1,150 45.278	730 28.740 420 16.535 170 6.693		70 2.756 190 7.480	—	IP40	−55 to +80 °C	P.72
		Coaxial, Lens mountable M4 25	FD-42GW	R1		STD 150 5.906 HYPR 670 26.378	340 13.386 280 11.024 90 3.543 25 0.984		STD 210 8.268 HYPR 950 37.402	540 21.260 330 12.992 130 5.118		45 1.772 140 5.512	—		−40 to +60 °C	
	M6	M6 17	Bending durability FD-62	R4		STD 520 20.472 HYPR 1,500 59.055	1,000 39.370 940 37.008 340 13.386 110 4.331		STD 880 34.646 HYPR 1,950 76.772	1,450 57.087 1,140 44.882 550 21.654		170 6.693 450 17.717	150 µm / ±3°	IP67	−55 to +80 °C	P.73
		M6 17	Tough Bending durability FD-61			STD 450 17.717 HYPR 1,400 55.118	840 33.071 670 26.378 200 7.874 70 2.756		STD 620 24.409 HYPR 1,630 64.173	1,180 46.457 870 34.252 380 14.961		120 4.724 410 16.142				P.72
		M6 17	FD-61W	R1		STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772		STD 480 18.898 HYPR 1,400 55.118	1,000 39.370 680 26.772 270 10.630		80 3.150 230 9.055	—		−40 to +60 °C	P.73
		Coaxial M6 17	Tough Bending durability FD-61G	R4		STD 420 16.535 HYPR 1,100 43.307	800 31.496 650 25.591 200 7.874 60 2.362		STD 600 23.622 HYPR 1,350 53.150	1,200 47.244 850 33.465 350 13.780		120 4.724 350 13.780	—	IP40		P.72
		Stainless-jacketed M6 22	FD-64X	R4	1 m	STD 280 11.024 HYPR 670 26.378	500 19.685 410 16.142 160 6.299 50 1.969		STD 410 16.142 HYPR 1,200 47.244	700 27.559 590 23.228 230 9.055		75 2.953 220 8.661	—		−55 to +80 °C	P.73
	Elbow	15 M6	Tough Bending durability FD-R60	R4	2 m	STD 290 11.417 HYPR 1,100 43.307	600 23.622 550 21.654 190 7.480 65 2.559		STD 500 19.685 HYPR 1,450 57.087	1,150 45.276 800 31.496 350 13.780		110 4.331 240 9.449	150 µm / ±3°	IP67		P.78

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

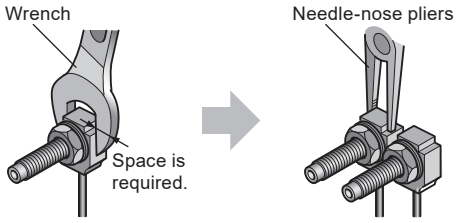
Square Head Type

- Compact, space-saving design brings clean installation on the side of a conveyor belt. Fiber can be installed at a minimum pitch using needle-nose pliers.
- As for lens compatible type fiber head, sensing range becomes longer when a lens is attached to the thru-beam type fiber, spot detection is achieved in case of the reflective type.
- A lens equipped type fiber head is also available.



Compact, space-saving

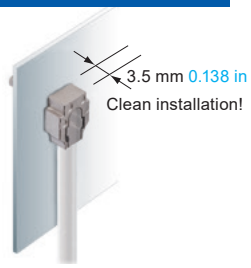
Fiber can be installed at a minimum pitch of M3: 6.5 mm 0.256 in or M4: 8.5 mm 0.335 in using needle-nose pliers.



Compact installation

Square head fiber heads can be installed cleanly on the side of a conveyor belt. The design makes it less likely for tools and other objects to catch on the fiber cable during installation.

FT-R□ / FD-R□



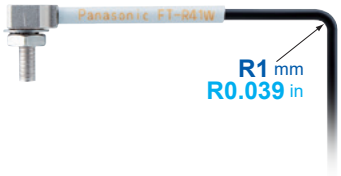
Standard fiber

Introducing square R1 mm (R0.039 in) (sharp bending) fiber

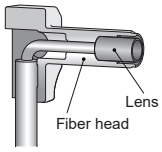
FT-R41W/R42W

We now offer a sharp bending fiber featuring a low level of light fluctuations, even when bent at R1 mm R0.039 in. It is also available with a lens capable of long-range sensing.

FT-R41W **FT-R42W**



FT-R42W (With lens)



- Resistant to dust and particulate matter.
- Tip dimensions can be shortened.

Three optional lenses for reflective type fiber are available. Perfect for chip component detection applications.

FX-MR7/MR8/MR9

Finest spot lens FX-MR7

About 3 times more light received (compared to convertional models)

Since there is a large difference in the amount of light received in applications such as direction detection, it is easy to set a threshold that will allow stable detection. Additionally, these products offer an S/N ratio that is 1.3 times better than previous models.

Typical FX-501 performance (STD mode)

	White	Black
FX-MR7 + FD-R33EG	3,200 digits	1,030 digits
FX-MR6 (convertional models) **+ FD-R33EG**	1,000 digits	435 digits

Zoom lens FX-MR8

Variable spot diameter

Spot diameters ranging from ø0.4 to ø3.5 mm ø0.016 to ø0.138 in can be achieved by combining the lens with a variety of fibers.

Parallel light lens FX-MR9

Long-range parallel light

Depending on the fiber with which it is used, this lens creates parallel light with a spot diameter of approximately ø4 mm ø0.157 in at a sensing range of 0 to 30 mm 0 to 1.181 in.

All models

Tightening torque 5 times (compared to convertional models)

The standard aluminum body has been changed to stainless steel (SUS303) to reduce the likelihood of damage from over-tightening.

Standard lens outer diameter of ø4.3 mm ø0.169 in

Use of the same mounting hardware across the product line means less inventory and lower costs.

LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (Fiber Core) (mm)	Protection	Ambient temp.	Dimensions
Square head	M3	W5.5 × H8 × D16	Tough Bending durability **FT-R31**	R2	2 m	STD 270 10.630 HYPR 1,000 39.370	580 22.835 440 17.323 160 6.299 55 2.165		STD 510 20.079 HYPR 1,670 65.748	1,120 44.094 700 27.559 310 12.205		100 3.937 340 13.386	ø0.5	IP67	−55 to +80 °C	P.66
	M4	Lens mountable W7 × H9 × D13.5	Tough Bending durability **FT-R43**	R4		STD 720 28.346 HYPR 3,000 118.110	1,600 62.992 1,100 43.307 430 16.929 130 5.118		STD 1,250 49.213 HYPR 3,600 141.732 (Note 2)	2,650 104.331 1,750 68.898 750 29.528		210 8.268 640 25.197	ø1			P.67
		Lens mountable (**FX-LE2**) W7 × H9 × D13.9	**FT-R41W**	R1		STD 800 31.496 HYPR 3,200 125.984	1,800 70.866 1,400 55.118 460 18.110 150 5.906		STD 1,300 51.181 HYPR 3,600 141.732 (Note 2)	2,900 114.173 1,850 72.835 800 31.496		250 9.843 710 27.953		IP40	−40 to +60 °C	P.66
		With expansion lens W7 × H9 × D14.4	**FT-R42W**			STD 2,200 86.614 HYPR (Note2) 3,600 141.732	3,600 141.732 (Note 2) 3,500 137.795 1,300 51.181 460 18.110		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,800 110.236		510 20.079 2,000 78.740	ø2.2			
	Oil-resistant	Cable-protection type Lens mountable W7 × H9.5 × D15.5	Tough Bending durability **FT-R44Y**	R4		STD 720 28.346 HYPR 3,000 118.110	1,600 62.992 1,100 43.307 430 16.929 130 5.118		STD 1,300 51.181 HYPR 3,600 141.732 (Note 2)	2,900 114.173 1,800 70.866 800 31.496		210 8.268 640 25.197	ø1	IP67 (Note 3)	−55 to +80 °C	P.67
	M6 Oil-resistant	Full-protection type W10 × H11 × D21.2	Tough Bending durability **FT-R60Y**			STD 2,100 82.677 HYPR (Note2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,260 49.606 400 15.748		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,900 74.803		690 27.165 1,890 74.409	ø3.5	IP68G		

Notes: 1) Note 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.
3) The fiber part is oil-resistant.

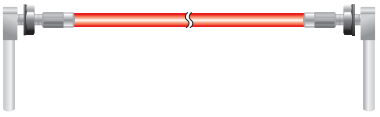
Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (Fiber Core) (mm)	Protection	Ambient temp.	Dimensions
Square head	M3	Coaxial, Lens mountable W5.5 × H8 × D16	Tough Bending durability **FD-R31G**	R2	2 m	STD 170 6.693 HYPR 530 20.866	310 12.205 260 10.236 85 3.346 27 1.063		STD 290 11.417 HYPR 900 35.433	600 23.622 400 15.748 160 6.299		45 1.772 150 5.906	Emitter ø0.5	IP40	−55 to +80 °C	P.78
		Coaxial, Lens mountable W5.5 × H8 × D16	**FD-R32EG**	R4	500 mm	STD 45 1.772 HYPR 170 6.693	110 4.331 92 3.622 30 1.181 9 0.354		STD 80 3.150 HYPR 290 11.417	180 7.087 110 4.331 45 1.772		20 0.787 68 2.677	Emitter ø0.25		−40 to +70 °C	
		Coaxial, Lens mountable W5.5 × H8 × D16	**FD-R34EG**			STD 38 1.496 HYPR 130 5.118	90 3.543 70 2.756 23 0.906 7 0.276		STD 70 2.756 HYPR 250 9.843	140 5.512 90 3.543 40 1.575		17 0.669 60 2.362	Emitter ø0.175		−20 to +60 °C	
		Coaxial, Lens mountable W5.5 × H8 × D16	**FD-R33EG**			STD 19 0.748 HYPR 84 3.307	44 1.732 33 1.299 11 0.433 3 0.118		STD 30 1.181 HYPR 110 4.331	65 2.559 40 1.575 18 0.709		7 0.276 22 0.866	Emitter ø0.125			
	M4	W7 × H9 × D13.5	Tough Bending durability **FD-R41**	R2	2 m	STD 210 8.268 HYPR 710 27.953	430 16.929 320 12.598 100 3.937 34 1.339		STD 340 13.386 HYPR 1,150 45.276	750 29.528 450 17.716 190 7.480		60 2.362 170 6.693	ø0.75	IP67	−55 to +80 °C	
	M6 Oil-resistant	Cable-protection type W10 × H11 × D15.5	Tough Bending durability **FD-R61Y**	R4		STD 280 11.024 HYPR 990 38.976	610 24.016 435 17.126 160 6.299 50 1.969		STD 450 17.717 HYPR 1,350 53.150	1,000 39.370 650 25.591 250 9.843		85 3.346 185 7.283	—	IP67 (Note 3)		

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The fiber part is oil-resistant.

FIBER OPTIONS

Lens (For thru-beam type fiber) ▸P.53~



Lens (For reflective type fiber) ▸P.55

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Cylindrical Type

- Has a slender shape which can be mounted in narrow locations using set screws.
- Line up that includes ultra-thin fibers with ø0.25 mm ø0.010 in tips.

FT-S32

FD-S31

<Thru-beam type> FT-S21/S21W/S31W <Reflective type> FD-S32/S31

- User-friendly, high quality fiber
- Improved centering accuracy and specularity

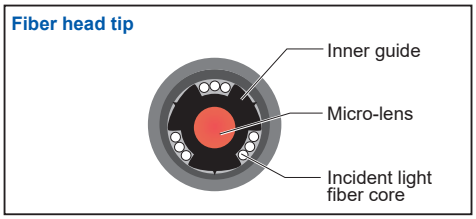
Stainless steel fittings are used for the fiber head of all models. ECO

- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength

FT-S22 / FD-S34G Tough fiber with built-in lens

Micro-lens and inner guide structure

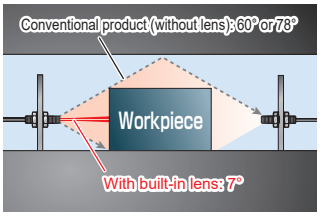
The built-in micro-lens has achieved the small head size. The compact head with the built-in lens measures only 1.5 mm 0.059 in in diameter.
Furthermore, the reflective type has an inner guide for a uniform layout of fiber cores to reduce the variation in the amount of light received.



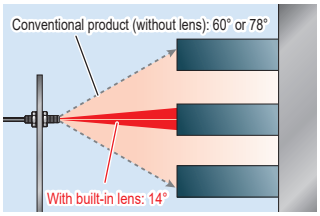
Aperture angle of 7°!
Narrow aperture angle reduces scattered light!

The narrow aperture angle of 7° (coaxial reflective type: 14°) minimizes the scattering of light and ensures stable detection even when installed in a narrow space.

▶Thru-beam type



▶Coaxial reflective type



Refer to p.15~ for threaded type tough fibers with built-in lens **FT-32** and **FD-34G**.

LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
Cylindrical	ø1	ø1 6	Tough Bending durability FT-S11	R2	500 mm	STD 90 3.543 HYPR 350 13.780	210 8.268 160 6.299 60 2.362 19 0.748		STD 130 5.118 HYPR 400 15.748	280 11.024 180 7.867 80 3.145		40 1.575 90 3.543	ø0.25	—	IP67	−55 to +80 °C	P.67
	ø1·5	ø1.5 10	Tough Bending durability FT-S21	R2	2 m	STD 315 12.402 HYPR 1,350 53.150	770 30.315 550 21.654 210 8.268 70 2.756		STD 450 17.717 HYPR 1,600 62.992	1,000 39.370 670 26.378 280 11.024		130 5.118 340 13.386	ø0.5	150 µm / ±2°			
		ø1.5 10	FT-S21W	R1		STD 260 10.236 HYPR 990 38.976	590 23.228 440 17.323 150 5.906 53 2.087		STD 400 15.748 HYPR 1,650 64.961	850 33.465 580 22.835 240 9.449		80 3.150 240 9.449		150 µm / ±3°		−40 to +60 °C	
		With lens ø1.5 8	Tough Bending durability FT-S22	R1		STD 450 17.717 HYPR 1,500 59.055	920 36.220 730 28.740 250 9.843 90 3.543		STD 870 34.252 HYPR 2,900 114.173	1,900 74.803 1,200 47.244 530 20.866		230 9.055 560 22.047	ø0.7	—	IP40	−40 to +70 °C	
	ø2·5	With lens, Long sensing range ø2.5 8	Bending durability FT-S32	R10		STD 3,100 122.047 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,800 70.866 600 23.622		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,000 118.110		1,100 43.307 3,000 118.110	ø2	—			P.68
	ø3	ø3 10	FT-S31W	R1		STD 800 31.496 HYPR 3,300 129.921	1,900 74.803 1,400 55.118 490 19.291 160 6.299		STD 1,100 43.307 HYPR 3,600 141.732 (Note 2)	2,450 96.457 1,600 62.992 650 25.591		260 10.236 720 28.346	ø1	150 µm / ±3°	IP67	−40 to +60 °C	
	Ultra-small diameter ø3	Narrow beam ø0.125mm ø0.25 ø3 Sleeve part cannot be bent. 5 15	Tough Bending durability FT-E13	R2	1 m	STD 15 0.591 HYPR 52 2.047	30 1.181 24 0.945 8 0.315 2 0.079		STD 21 0.827 HYPR 68 2.677	45 1.772 30 1.181 12 0.472		6 0.236 19 0.748	ø0.125	—		−40 to +70 °C	P.64
		Narrow beam ø0.25mm ø0.4 ø3 Sleeve part cannot be bent. 5 15	Tough Bending durability FT-E23			STD 75 2.953 HYPR 270 10.630	160 6.299 125 4.921 42 1.654 13 0.512		STD 120 4.724 HYPR 355 13.976	250 9.843 165 6.496 70 2.756		22 0.866 80 3.150	ø0.25	—			
	Side-view ø4	ø4 3 25	Tough Bending durability FT-V40	R4	2 m	STD 3,500 137.795 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,400 94.488 850 33.465		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)		1,000 39.370 3,100 122.047	ø2.5	—	IP50	−40 to +60 °C	P.68

Notes: 1) Note 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.

Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
Cylindrical	ø1·5	ø1.5 10	Tough Bending durability FD-S21	R2	1 m	STD 80 3.150 HYPR 190 7.480	130 5.118 110 4.331 37 1.457 11 0.433		STD 85 3.346 HYPR 175 6.890	130 5.118 110 4.331 50 1.969		25 0.984 70 2.756	—	IP40	−55 to +80 °C	P.78
	ø3	ø3 15	Tough Bending durability FD-S32	R4	2 m	STD 420 16.535 HYPR 1,200 47.244	790 31.102 660 25.984 220 8.661 75 2.953		STD 600 23.622 HYPR 1,600 62.992	1,200 42.244 900 35.433 350 13.780		120 4.724 345 13.583	150 µm / ±3°	IP67		P.79
		ø3 15	FD-S32W	R1		STD 270 10.630 HYPR 900 35.433	630 24.803 430 16.929 150 5.906 45 1.772		STD 450 17.717 HYPR 1,400 55.118	1,000 39.370 650 25.591 250 9.843		80 3.150 230 9.055	—		−40 to +60 °C	
		ø3 10	Tough Bending durability FD-S31	R2		STD 125 4.921 HYPR 515 20.276	290 11.417 220 8.661 80 3.150 25 0.984		STD 200 7.874 HYPR 700 27.559	450 17.717 300 11.811 130 5.118		35 1.378 140 5.512	150 µm / ±3°		−55 to +80 °C	
		Coaxial ø3 15	FD-S33GW	R1		STD 150 5.906 HYPR 670 26.378	340 13.386 280 11.024 90 3.543 25 0.984		STD 240 9.449 HYPR 880 34.646	550 21.654 370 14.567 150 5.906		45 1.772 140 5.512	—	IP40	−40 to +60 °C	
		Coaxial, With lens ø3 15	Tough Bending durability FD-S34G	R2		STD 90 3.543 HYPR 330 12.992	185 7.283 135 5.305 49 1.929 15 0.591		STD 130 5.118 HYPR 480 18.898	310 12.205 180 7.187 80 3.150		29 1.142 90 3.543	—		−40 to +70 °C	
	Ultra-small diameter ø1·5	ø1.5 ø0.48 15 3 Sleeve part cannot be bent.	FD-E13	R4	1 m	STD 12 0.472 HYPR 50 1.969	29 1.142 25 0.984 7 0.276 2 0.079		STD 23 0.906 HYPR 75 2.953	50 1.969 30 1.181 12 0.472		5 0.197 15 0.591	—		−40 to +60 °C	P.73
	Ultra-small diameter ø3	Coaxial ø3 ø0.63 15 15 Sleeve part cannot be bent.	FD-E23			STD 55 2.165 HYPR 170 6.693	120 4.724 80 3.150 30 1.181 9 0.354		STD 80 3.150 HYPR 290 11.417	170 6.693 105 4.134 45 1.772		20 0.787 70 2.756	—		−40 to +70 °C	

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

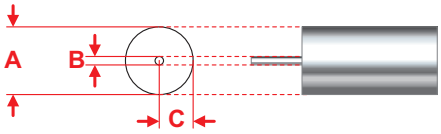
Sleeve

- It is suitable for sensing in narrow locations and sensing minute objects because the fiber tip is a thin sleeve.
- The 40 mm 1.575 in sleeve type can be bent in any direction.

<Thru-beam type> FT-E13 / FT-E23 Ultra-small diameter fiber

Centering accuracy of 1/10 mm or less

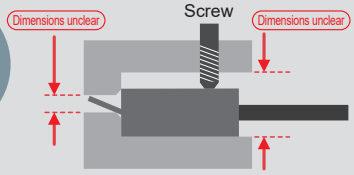
Ultra-small diameter fibers with a compact head ensure precision centering accuracy* to stably detect minute parts.



* Tolerance of A + Tolerance of B + Tolerance of C = ±0.09 mm ±0.004 in

Dimensions UNCLEAR

Previous general fiber

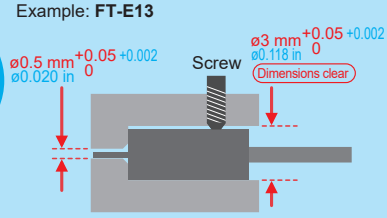


Extra clearance needs to be added when designing and machining the mounting hole due to unclear dimensions.
As a result, mounting variation increases and the beam axis deviates, resulting in a decrease in sensing accuracy or causing the sleeve to bend or break.

Dimensions CLEAR

Example: **FT-E13**

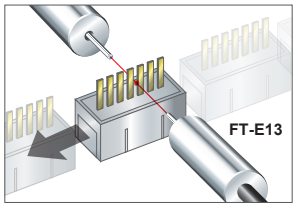
New standard fiber



Highly accurate design and machining are possible due to clear mounting hole dimensions. As a result, mounting variation is minimal, improving sensing accuracy. In addition to this, as the beam axis alignment is not affected when the fiber is changed, readjustment is not necessary.

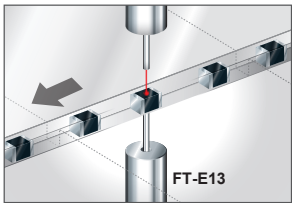
Minute sensing only possible with ultra small fiber

Detection of fine-pitch connector pins



Ultra-small diameter fiber with ø0.125 mm ø0.005 in beam axis is able to detect the insertion or bending of fine-pitch connector pins.

Detection of tiny chips

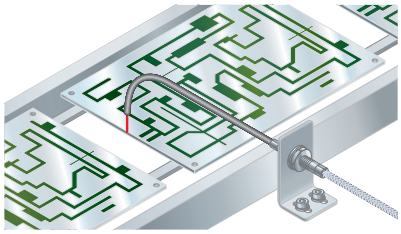


Fiber can be installed with only the ø0.25 mm ø0.010 in sleeve close to the minute section.

Stainless steel fittings are used for the fiber head of all models. ECO

- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength

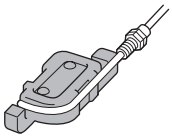
Application



FIBER OPTION

Fiber bender

·**FB-1**



The fiber bender bends the sleeve part of the fiber head at the proper radius.

Note: Do not bend the sleeve part of any side-view type fiber or ultra-small diameter head type fiber.

LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
Threaded	M3	Sleeve 40mm M3 ø0.88 10	Tough Bending durability **FT-31S**	R2 (Note 2)	✂ 2 m	STD 315 12.402 HYPR 1,220 48.031		740 29.134 550 21.654 195 7.677 63 2.480	STD 480 18.898 HYPR 1,580 62.205		1,000 39.370 700 27.559 290 11.417	130 5.118 340 13.386	ø0.5	IP67	−55 to +80 °C	P.63
	M4	Sleeve 40mm M4 ø1.48 12	Tough Bending durability **FT-42S**	R4 (Note 2)	✂ 2 m	STD 1,130 44.488 HYPR (Note 3) 3,600 141.732		2,050 80.709 1,600 62.992 530 20.866 190 7.480	STD 1,470 57.874 HYPR 3,600 141.732 (Note 3)		2,900 114.173 2,100 82.677 890 35.039	300 11.811 800 31.496	ø1			
Cylindrical	Ultra-small diameter ø3	Narrow beam ø0.125mm ø0.25 ø3 Sleeve part cannot be bent. 5 15	Tough Bending durability **FT-E13**	R2	✂ 1 m	STD 15 0.591 HYPR 52 2.047		30 1.181 24 0.945 8 0.315 2 0.079	STD 21 0.827 HYPR 68 2.677		45 1.772 30 1.181 12 0.472	6 0.236 19 0.748	ø0.125		−40 to +70 °C	P.64
		Narrow beam ø0.25mm ø0.4 ø3 Sleeve part cannot be bent. 5 15	Tough Bending durability **FT-E23**			STD 75 2.953 HYPR 270 10.630		160 6.299 125 4.921 42 1.654 13 0.512	STD 120 4.724 HYPR 355 13.976		250 9.843 165 6.496 70 2.756	22 0.866 80 3.150	ø0.25			
	Side-view ø2	Sleeve part cannot be bent. ø1 ø2 20 15	Tough Bending durability **FT-V23**	R4	✂ 2 m	STD 450 17.717 HYPR 1,800 70.866		1,000 39.370 880 34.646 280 11.024 90 3.543	STD 750 29.528 HYPR 2,400 94.488		1,600 62.992 1,050 41.339 450 17.717	160 6.299 400 15.748	ø0.75	IP30	−55 to +80 °C	P.68
		Sleeve part cannot be bent. ø1 ø2 15 15	Tough Bending durability **FT-V25**	R2		STD 240 9.449 HYPR 900 35.433		550 21.654 480 18.898 140 5.512 45 1.772	STD 450 17.717 HYPR 1,400 55.118		950 37.402 630 24.803 280 11.024	95 3.740 260 10.236	ø0.5			
		Sleeve part cannot be bent. ø1 ø2 15 15	**FT-V24W**	R1		STD 110 4.331 HYPR 380 14.961		230 9.055 200 7.874 60 2.362 20 0.787	STD 160 6.299 HYPR 500 19.685		350 13.780 220 8.661 95 3.740	35 1.378 90 3.543			−40 to +60 °C	
	ø2.5	Sleeve part cannot be bent. ø1.5 ø2.5 1.3 20 15	Tough Bending durability **FT-V30**	R4		STD 680 26.772 HYPR 2,200 86.614		1,200 47.244 1,000 39.370 340 13.386 100 3.937	STD 950 37.402 HYPR 3,600 141.732 (Note 2)		1,950 76.772 1,300 51.181 550 21.654	180 7.087 480 18.898	ø1.0		−55 to +80 °C	

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) Bending radius of sleeve part is R10 mm R0.394 in or more. 3) The fiber cable length practically limits the sensing range.

Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Threaded	Ultra-small diameter M3	Sleeve 15 mm M3 ø0.8 15 Sleeve part cannot be bent.	**FD-EG30S**	R4	1 m	STD 50 1.969 HYPR 170 6.693		110 4.331 80 3.150 30 1.181 9 0.354	STD 90 3.543 HYPR 320 12.598		190 7.480 120 4.724 50 1.969	20 0.787 70 2.756	IP40	−40 to +70 °C	P.74
	M4	Sleeve 40 mm M4 ø1.48 12	Tough Bending durability **FD-41S**	R2 (Note 3)	✂ 2 m	STD 125 4.921 HYPR 515 20.276		290 11.417 220 8.661 80 3.150 25 0.984	STD 200 7.874 HYPR 750 29.528		450 17.717 310 12.205 140 5.512	35 1.378 140 5.512	IP67	−55 to +80 °C	P.71
		Sleeve 40 mm M4 ø1.48 12	**FD-41SW**	R1 (Note 3)		STD 80 3.150 HYPR 330 12.992		180 7.087 140 5.512 45 1.772 12 0.472	STD 130 5.118 HYPR 480 18.898		310 12.205 190 7.480 80 3.150	15 0.591 60 2.362		−40 to +60 °C	
	M6	Sleeve 40 mm M6 ø2.5 15	Tough Bending durability **FD-61S**	R4 (Note 3)		STD 420 16.535 HYPR 1,200 47.244		790 31.102 660 25.984 220 8.661 75 2.953	STD 650 25.591 HYPR 1,900 74.803		1,300 51.181 900 35.433 400 15.748	130 5.118 360 14.173		−55 to +80 °C	P.72
Cylindrical	Ultra-small diameter ø1.5	ø1.5 ø0.48 15 3 Sleeve part cannot be bent.	**FD-E13**	R4	1 m	STD 12 0.472 HYPR 50 1.969		29 1.142 25 0.984 7 0.276 2 0.079	STD 23 0.906 HYPR 75 2.953		50 1.969 30 1.181 12 0.472	5 0.197 15 0.591	IP40	−40 to +60 °C	P.73
	ø3	Coaxial ø3 ø0.63 15 5 Sleeve part cannot be bent.	**FD-E23**			STD 55 2.165 HYPR 170 6.693		120 4.724 80 3.150 30 1.181 9 0.354	STD 80 3.150 HYPR 290 11.417		170 6.693 105 4.134 45 1.772	20 0.787 70 2.756		−40 to +70 °C	
	Side-view ø3	Small diameter 15 15 ø3 ø1.5 2 Sleeve part cannot be bent.	Tough Bending durability **FD-V30**	R2	✂ 2 m	STD 65 2.559 HYPR 240 9.449		130 5.118 120 4.724 35 1.378 14 0.551	STD 90 3.243 HYPR 430 16.929		210 8.268 145 5.709 65 2.559	25 0.984 75 2.953	IP30	−55 to +80 °C	P.79
		15 15 ø3 ø1.5 2 Sleeve part cannot be bent.	**FD-V30W**	R1		STD 20 0.787 HYPR 80 3.150		40 1.575 30 1.181 10 0.394 2 0.079	STD 30 1.181 HYPR 120 4.724		65 2.559 37 1.457 16 0.630	6 0.236 20 0.787		−40 to +60 °C	P.80
	ø5	15 20 ø5 ø2 2.3 Sleeve part cannot be bent.	Tough Bending durability **FD-V50**	R4		STD 120 4.724 HYPR 370 14.567		220 8.661 210 8.268 75 2.953 25 0.984	STD 180 7.087 HYPR 530 20.866		400 15.748 240 9.449 110 4.331	40 1.575 100 3.937		−55 to +80 °C	

Notes: 1) Note 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 sensing range is specified for white non-glossy paper. 3) Bending radius of sleeve part is R10 mm R0.394 in or more.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Flat Type

Since it has a thin, rectangular shape, it can be installed in narrow locations. It is also a fiber with good workability and can be mounted directly with screws.

FT-Z30H

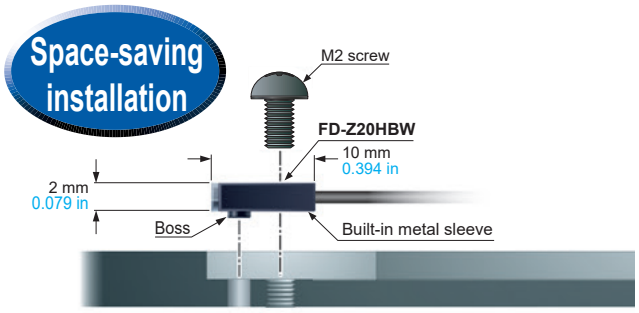
FT-Z30E

FT-Z30

Supplied with a boss that allows for a single mount point

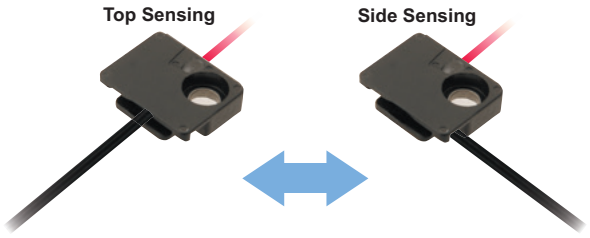
The fiber can be fastened with either a single M2 or M3 screw, and all mounting holes are reinforced with a metal sleeve for durability against excess tightening torque.

- Models that use a M2 screw
  FT-Z20W, FT-Z20HBW, FD-Z20W, FD-Z20HBW
- Models that use a M3 screw
  FT-Z40W, FT-Z40HBW, FD-Z40W, FD-Z40HBW



Fiber guide provides additional space savings

FT-Z□HBW and **FD-Z□HBW** are equipped with a fiber guide feature. Top sensing and side sensing can be selected with one head.



LIST OF FIBERS

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
Flat	Top sensing W3 × H8 × D12	Tough Bending durability **FT-Z30H**	R2	2 m	STD 3,500 137.795 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,600 102.362 810 31.890	STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,400 55.118 3,200 125.984	2 × 3	IP40	−40 to +60 °C	P.69
	Top sensing W3 × H8 × D12	**FT-Z30HW**	R1												
	Side sensing W3 × H12 × D8	Tough Bending durability **FT-Z30E**	R2		STD 3,500 137.795 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,400 94.488 740 29.134	STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,200 47.244 3,200 125.984						
	Side sensing W3 × H12 × D8	**FT-Z30EW**	R1		STD 3,400 133.858 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,000 78.740 630 24.803	STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,400 55.118 2,600 102.362						
	Front sensing W8.5 × H12 × D3	Tough Bending durability **FT-Z30**	R2		STD 2,100 82.677 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,200 47.244 410 16.142	STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 2,200 86.614	710 27.953 2,300 90.551	ø2			P.68
	Front sensing W8.5 × H12 × D3	**FT-Z30W**			STD 1,500 59.055 HYPR (Note 2) 3,600 141.732	3,300 129.921 3,200 125.984 1,000 39.370 280 11.024	STD 2,800 110.236 HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,700 66.929	540 21.260 1,800 70.866				P.69
With boss	Front sensing W10 × H7 × D2	**FT-Z20W**		1 m	STD 620 24.409 HYPR (Note 2) 1,600 62.992	1,500 59.055 1,100 43.307 420 16.535 130 5.118	STD 1,100 43.307 HYPR 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2) 650 25.591	280 11.024 730 28.740	ø1.5			P.68
	Fiber guide type W2 × H10 × D10	**FT-Z20HBW**	R1		STD 260 10.236 HYPR 1,100 43.307	670 26.378 570 22.441 180 7.087 55 2.165	STD 450 17.717 HYPR 1,600 62.992 (Note 2)	1,000 39.370 650 25.591 280 11.024	100 3.937 320 12.598	ø0.5	IP67		
	Front sensing W14 × H7 × D3.5	**FT-Z40W**		2 m	STD 1,500 59.055 HYPR (Note 2) 3,600 141.732	3,300 129.921 2,300 90.551 900 35.433 290 11.417	STD 2,000 78.740 HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 2,800 110.236 1,200 47.244	410 16.142 1,200 47.244	ø1.5	IP40		P.69
	Fiber guide type W3.5 × H14 × D11	**FT-Z40HBW**			STD 800 31.496 HYPR 3,300 129.921	1,900 74.803 1,400 55.118 490 19.291 160 6.299	STD 1,300 51.181 HYPR 3,600 141.732 (Note 2)	2,700 106.299 1,850 72.835 750 29.528	260 10.236 720 28.346	ø1	IP67		
Chemical-resistant	Easy mounting, Rectangular head SEMI S2 compliant (Note 3) Metal-free W7 × H15 × D13	Tough Bending durability **FT-Z802Y**	R4		STD 3,100 122.047 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,900 74.803 470 18.504	STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	520 20.472 3,100 122.047	ø3.7	IP68G	0 to +60 °C	

Notes: 1) Note 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.
3) The design takes into account the environmental testing required by SEMI S2. To ensure that the final system complies with the standards, you must design and use it in accordance with relevant standards, regulations, and regulations.

Reflective type

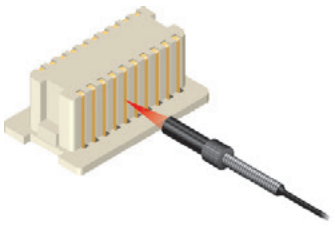
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Flat With boss	Front sensing W10 × H7 × D2	**FD-Z20W**	R1	1 m	STD 1 to 65 0.039 to 2.559 HYPR 260 10.236	150 5.906 130 5.118 2 to 45 0.079 to 1.772 5 to 13 0.197 to 0.512	STD 130 5.118 HYPR 450 17.717	290 11.417 190 7.480 80 3.150	2 to 32 0.079 to 1.260 1 to 80 0.039 to 3.150	IP40	−40 to +60 °C	P.80
	Fiber guide type W2 × H10 × D10	**FD-Z20HBW**			STD 2 to 85 0.079 to 3.346 HYPR 1 to 340 0.039 to 13.386	1 to 210 0.039 to 8.268 1 to 180 0.039 to 7.087 2 to 55 0.079 to 2.165 3 to 15 0.118 to 0.591	STD 170 6.693 HYPR 550 21.254	370 14.567 240 9.449 100 3.937	2 to 30 0.079 to 1.181 1 to 90 0.039 to 3.543	IP67		
	Front sensing W14 × H7 × D3.5	**FD-Z40W**		2 m	STD 190 7.480 HYPR 790 31.102	440 17.323 390 15.354 1 to 120 0.039 to 4.724 2 to 35 0.079 to 1.378	STD 390 15.254 HYPR 1,500 59.155	950 37.402 510 20.079 230 9.055	1 to 74 0.039 to 2.913 200 7.874	IP40		
	Fiber guide type W3.5 × H14 × D11	**FD-Z40HBW**			STD 260 10.236 HYPR 760 29.921	540 21.260 470 18.504 1 to 160 0.039 to 6.299 2 to 50 0.079 to 1.969	STD 480 18.898 HYPR 1,350 53.150	1,000 39.370 680 26.772 270 10.630	1 to 90 0.039 to 3.543 0.5 to 240 0.020 to 9.449	IP67		

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

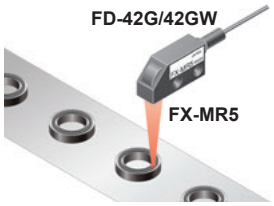
Small Spot

Sensing of minute objects can be performed by combining the fiber and spot lens. The spot diameter can also be changed.



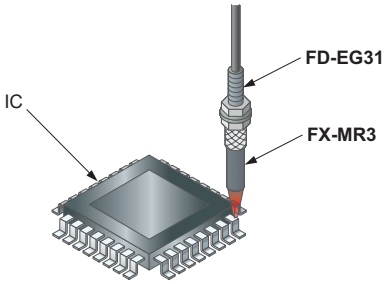
Applications

Packing detection

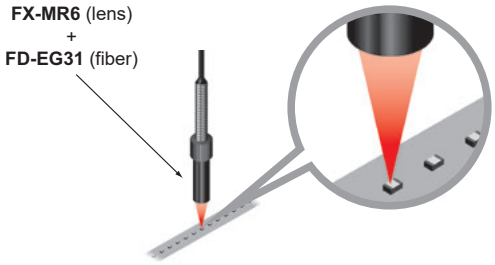


Because it's a side-view type, it can be mounted even in narrow spaces.

Number of IC pins checking



Discrimination of 0603 chip direction



Three optional lenses for reflective type fiber are available. Perfect for chip component detection applications.

FX-MR7/MR8/MR9

Finest spot lens FX-MR7

About 3 times more light received (compared to convertional models)

Since there is a large difference in the amount of light received in applications such as direction detection, it is easy to set a threshold that will allow stable detection. Additionally, these products offer an S/N ratio that is 1.3 times better than previous models.

Typical FX-501 performance (STD mode)

	White	Black
FX-MR7 + FD-R33EG	3,200 digits	1,030 digits
FX-MR6 (convertional models) **+ FD-R33EG**	1,000 digits	435 digits

Zoom lens FX-MR8

Variable spot diameter

Spot diameters ranging from ø0.4 to ø3.5 mm ø0.016 to ø0.138 in can be achieved by combining the lens with a variety of fibers.

Parallel light lens FX-MR9

Long-range parallel light

Depending on the fiber with which it is used, this lens creates parallel light with a spot diameter of approximately ø4 mm ø0.157 in at a sensing range of 0 to 30 mm 0 to 1.181 in.

All models

Tightening torque 5 times (compared to convertional models)

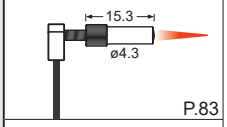
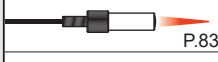
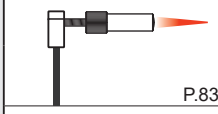
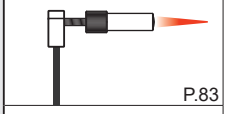
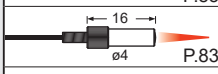
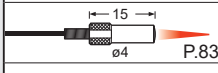
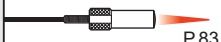
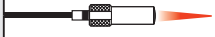
The standard aluminum body has been changed to stainless steel (SUS303) to reduce the likelihood of damage from over-tightening.

Standard lens outer diameter of ø4.3 mm ø0.169 in

Use of the same mounting hardware across the product line means less inventory and lower costs.

LIST OF FIBERS

High precision fiber & spot lens

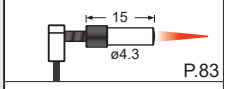
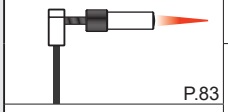
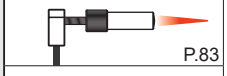
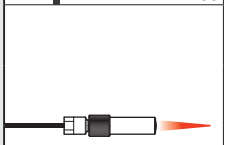
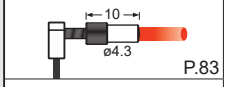
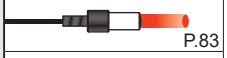
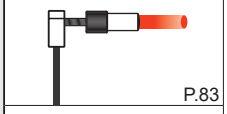
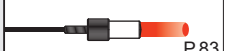
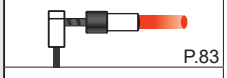
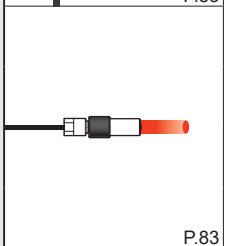
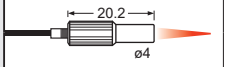
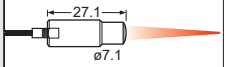
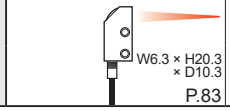
Designation	Shape of head (mm) / Dimensions of lens	Spot diameter (mm in) (Note 1)	Distance to focal point (mm in) (Note 1)	Lens		Applicable fibers					
				Model No.	Ambient temp.	Model No.	Fiber cable length ✂: Free-cut (Note 2)	Bending radius (mm)	Protection	Ambient temp.	Dimensions
Finest spot lens	 P.83	ø0.1 ø0.004 approx.	7±0.5 0.276 ±0.020	FX-MR7	−55 to +70 °C	FD-R33EG	500 mm	R4	IP40	−20 to +60 °C	P.78
	 P.83					FD-EG31					P.74
	 P.83	ø0.15 ø0.006 approx.				FD-R34EG					P.78
		ø0.2 ø0.008 approx.				FD-R32EG				−40 to +70 °C	
	P.83					FD-EG30					P.73
	 P.83	ø0.4 ø0.016 approx.				Tough Bending durability FD-R31G		R2		−55 to +80 °C	P.78
	P.83					Tough Bending durability FD-42G	✂ 2 m				P.72
						FD-42GW		R1		−40 to +60 °C	
						Tough Bending durability FD-32G		R2		−55 to +80 °C	P.71
						FD-32GX	✂ 1 m (Note 3)				
	 P.83	ø0.1 ø0.004	7±0.5 0.276 ±0.020	FX-MR6 (Note 4)	−20 to +60 °C	FD-EG31	500 mm	R4		−20 to +60 °C	P.74
	P.83	ø0.2 ø0.008				FD-EG30				−40 to +70 °C	P.73
	P.83	ø0.4 ø0.016				Tough Bending durability FD-42G	✂ 2 m	R2		−55 to +80 °C	P.72
						FD-42GW		R1		−40 to +60 °C	
						Tough Bending durability FD-32G		R2		−55 to +80 °C	P.71
						FD-32GX	✂ 1 m (Note 3)				
	 P.83	ø0.15 ø0.006	7.5±0.5 0.295 ±0.020	FX-MR3 (Note 4)	−40 to +70 °C	FD-EG31	500 mm	R4		−20 to +60 °C	P.74
	 P.83	ø0.3 ø0.012				FD-EG30				−40 to +70 °C	P.73
	 P.83	ø0.5 ø0.020				Tough Bending durability FD-42G	✂ 2 m	R2		−55 to +80 °C	P.72
						FD-42GW		R1		−40 to +60 °C	
						Tough Bending durability FD-32G		R2		−55 to +80 °C	P.71
						FD-32GX	✂ 1 m (Note 3)				

Notes: 1) Spot diameter, distance to focal point and sensing range are specified for **FX-500** / **FX-550** / **FX-100** series.
2) Note 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.
4) Finest spot lenses **FX-MR6** / **FX-MR3** are used with **FD-R33EG** / **FD-R34EG** / **FD-R32EG** / **FD-R31G** as well. Please refer to our website for more details.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

LIST OF FIBERS

High precision fiber & spot lens

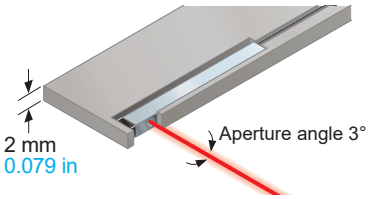
Designation	Shape of head (mm) / Dimensions of lens	Spot diameter (mm in) (Note 1)	Distance to focal point (mm in) (Note 1)	Lens: Model No.	Lens: Ambient temp.	Applicable fibers: Model No.	Fiber cable length ✂: Free-cut (Note 2)	Bending radius (mm)	Protection	Ambient temp.	Dimensions
Zoom lens	 P.83	ø0.4 to ø2.0 ø0.016 to ø0.079 approx.	10 to 30 0.394 to 1.181	FX-MR8	−55 to +70 °C	FD-R33EG	500 mm	R4	IP40	−20 to +60 °C	P.78
	P.83					FD-EG31					P.74
	 P.83	ø0.4 to ø2.2 ø0.016 to ø0.087 approx.				FD-R34EG					P.78
		ø0.5 to ø2.5 ø0.020 to ø0.098 approx.				FD-R32EG				−40 to +70 °C	
	P.83					FD-EG30					P.73
	 P.83	ø0.8 to ø3.5 ø0.031 to ø0.138 approx.				Tough Bending durability FD-R31G				−55 to +80 °C	P.78
	 P.83					Tough Bending durability FD-32G	✂ 2 m	R2			P.71
						Tough Bending durability FD-32GX	✂ 1 m (Note 3)				
Parallel light lens	 P.83	ø4.0 ø0.016 approx.	0 to 30 0 to 1.1181	FX-MR9	−55 to +70 °C	FD-R33EG	500 mm	R4		−20 to +60 °C	P.78
	 P.83					FD-EG31					P.74
	 P.83					FD-R34EG					P.78
						FD-R32EG				−40 to +70 °C	
	 P.83					FD-EG30					P.73
	 P.83					Tough Bending durability FD-R31G		R2		−55 to +80 °C	P.78
	 P.83					Tough Bending durability FD-42G	✂ 2 m				P.72
						FD-42GW		R1		−40 to +60 °C	
						Tough Bending durability FD-32G		R2		−55 to +80 °C	P.71
						Tough Bending durability FD-32GX	✂ 1 m (Note 3)				
Pinpoint spot lens	 P.82	ø0.5 ø0.020	Distance to focal point 6±1 0.236 ±0.039	FX-MR1	−40 to +70 °C	Tough Bending durability FD-42G		R2		−55 to +80 °C	P.72
						FD-42GW		R1		−40 to +60 °C	
Zoom lens	 P.82	ø0.7 to ø2.0 ø0.028 to ø0.079	Distance to focal point 18.5 to 43 0.728 to 1.693 approx.	FX-MR2	−40 to +70 °C	Tough Bending durability FD-42G	✂ 2 m	R2		−55 to +80 °C	
						FD-42GW		R1		−40 to +60 °C	
Zoom lens (Side-view type)	 P.83	ø0.5 to ø3.0 ø0.020 to ø0.118	Distance to focal point 13 to 30 0.512 to 1.181 approx.	FX-MR5	−40 to +60 °C	Tough Bending durability FD-42G		R2		−55 to +80 °C	
						FD-42GW		R1		−40 to +60 °C	

Notes: 1) Spot diameter, distance to focal point and sensing range are specified for **FX-500** / **FX-550** / **FX-100** series.
2) Note 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.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Narrow Beam

Since the beam is narrow, it has a feature by which it is not easily affected by surrounding obstacles even in long distances.

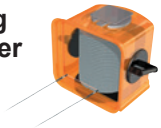


Applications

Detection of a transparent tube

FR-KZ50H

Mapping of a wafer



FT-KV40
FT-KV40W

LIST OF FIBERS

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Inclination of beam axis	Protection	Ambient temp.	Dimensions
Narrow beam Side-view	Aperture angle 2° ø3.5 ø3.7 20	Tough Bending durability **FT-KS40**	R2	2 m	STD (Note 2) 3,600 141.732 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,200 47.244		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)		2,200 86.614 3,600 141.732 (Note 2)	ø2.2	—	IP40	−40 to +80 °C	P.66
	Aperture angle 2° ø4 25	Tough Bending durability **FT-KV40**			STD (Note 2) 3,600 141.732 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,200 47.244		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)		2,200 86.614 3,600 141.732 (Note 2)	ø2.5	±0.8°	IP30	−40 to +80 °C	
	Aperture angle 2° ø4 25	**FT-KV40W**	R1		STD (Note 2) 3,600 141.732 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,100 122.047 940 37.008		STD 3,600 141.732 (Note 2) HYPR 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 3,600 141.732 (Note 2)						−40 to +60 °C	
	Aperture angle 3° 1.5 × 2 20	Tough Bending durability **FT-KV26**	R2		STD 710 27.953 HYPR 2,500 98.425	1,600 62.992 1,200 47.244 440 17.323 160 6.299		STD 1,100 43.307 HYPR 3,600 141.732 (Note 2)	2,300 90.551 1,600 62.992 650 25.591		135 5.315 560 22.047	ø1	X ±1° Z ±0.5°		−40 to +80 °C	
	Aperture angle 3° 1.5 × 2 20	**FT-KV26H1**	R10		STD 630 24.803 HYPR 2,200 86.614	1,430 56.299 1,070 42.126 390 15.354 135 5.315		STD 1,000 39.370 HYPR 3,600 141.732 (Note 2)	1,900 74.803 1,400 55.118 650 25.591		160 6.299 500 19.685				−40 to +105 °C	

Retroreflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 3) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
With polarizing filter	W5.2 × H9.5 × D16 W30 × H30 × D0.5	**FR-Z50HW**	R1	2 m	STD 100 to 990 3.937 to 38.976 HYPR 100 to 1,900 3.937 to 74.803	100 to 1,400 3.937 to 55.118 100 to 1,200 3.937 to 47.244 100 to 780 3.937 to 30.709 100 to 490 3.937 to 19.291		STD 100 to 1,150 3.937 to 45.278 HYPR 100 to 2,250 3.937 to 88.583	100 to 1,800 3.937 to 70.866 100 to 1,400 3.937 to 55.118 100 to 950 3.937 to 37.402		100 to 550 3.937 to 21.654 100 to 830 3.937 to 32.677	IP40	−25 to +55 °C	P.70
Ultra-narrow beam	W7.5 × H2.2 × D11.2 Aperture angle 3° (emitter) W4 × H2 × D21.5	Tough Bending durability **FR-KZ22E**			STD 15 to 310 0.591 to 12.205 HYPR 15 to 570 0.591 to 22.441	15 to 460 0.591 to 18.110 15 to 410 0.591 to 16.142 15 to 220 0.591 to 8.661 15 to 100 0.591 to 3.937		STD 15 to 540 0.591 to 21.260 HYPR 15 to 800 0.591 to 31.496	15 to 700 0.591 to 27.559 15 to 600 0.591 to 23.622 15 to 400 0.591 to 15.748		15 to 200 0.591 to 7.874 15 to 360 0.591 to 14.173	IP30	−40 to +60 °C	
Narrow beam Top sensing	W5.2 × H9.5 × D21 W10.6 × H28 × D10.1	Tough Bending durability **FR-KZ50H**	R2		STD 20 to 300 0.787 to 11.811 HYPR 20 to 1,000 0.787 to 39.370	20 to 800 0.787 to 31.496 20 to 400 0.787 to 15.748 20 to 200 0.787 to 7.874 20 to 200 0.787 to 7.874		STD 20 to 400 0.787 to 15.748 HYPR 20 to 1,600 0.787 to 62.992	20 to 1,300 0.787 to 51.181 20 to 500 0.787 to 19.685 20 to 350 0.787 to 13.780		20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780			
Side sensing	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1	Tough Bending durability **FR-KZ50E**												

Reflective type

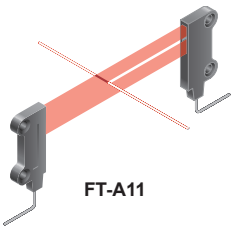
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 4) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Long range	W5.2 × H9.5 × D16	**FD-Z50HW**	R1	2 m	STD 10 to 650 0.394 to 25.591 HYPR 10 to 2,500 0.394 to 98.425	10 to 1,100 0.394 to 43.307 10 to 1,000 0.394 to 39.370 10 to 410 0.394 to 16.142 15 to 130 0.591 to 5.118		STD 10 to 950 0.394 to 37.402 HYPR 10 to 3,700 0.394 to 154.669	10 to 2,100 0.394 to 82.677 10 to 1,300 0.394 to 51.181 10 to 590 0.394 to 23.228		10 to 200 0.394 to 7.874 10 to 530 0.394 to 20.866	IP40	−40 to +60 °C	P.80

Notes: 1) Note 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.
3) The sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector. Refer to p.32 or p.47 for the sensing range when **FR-Z50HW** is used in combination with a reflector (optional).
4) The sensing range is specified for white non-glossy paper.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

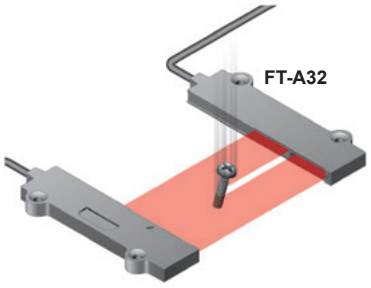
Wide Beam

Senses a workpiece with indefinite shape or position in the wide beam without missing. It can also be used to discriminate shape.

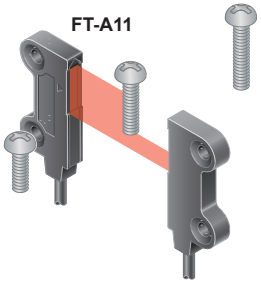


Applications

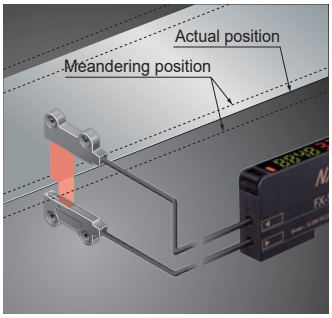
Sensing tiny moving objects



Inspecting screw height



Control the amount of meandering



Confirming presence of slit mask

LIST OF FIBERS

Thru-beam type (one pair set)

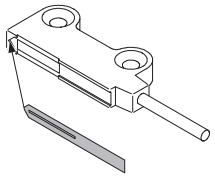
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
Wide beam	Sensing width 32mm W5 × H69 × D20	Tough Bending durability **FT-A32** (Note 2)	R2	2 m	STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 2,100 82.677		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		3,600 141.732 (Note 3) 3,600 141.732 (Note 3)	3.2 × 32	IP40	−40 to +60 °C	P.64
	Allows flexible wiring Sensing width 32mm W5 × H69 × D20	**FT-A32W** (Note 2)	R1		STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,000 118.110		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)					−40 to +55 °C	
	Sensing width 11mm W4.2 × H31 × D13.5	Tough Bending durability **FT-A11** (Note 2)	R2		STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,100 43.307		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		1,900 74.803 3,600 141.732 (Note 3)	2.2 × 11		−40 to +70 °C	
	Allows flexible wiring Sensing width 11mm W4.2 × H31 × D13.5	**FT-A11W** (Note 2)	R1		STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,300 51.181		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		1,700 66.929 3,400 133.858			−40 to +55 °C	
Array	Sensing width 5.5mm W5 × H15 × D15	Tough Bending durability **FT-AL05**	R2		STD 860 33.858 HYPR 2,300 90.551	1,550 61.024 1,500 59.055 500 19.685 170 6.693		STD 1,150 45.276 HYPR 3,600 141.732 (Note 3)	2,350 92.520 1,600 62.992 660 25.984		250 9.843 660 25.984	0.25 × 5.5		−55 to +80 °C	

Notes: 1) Note 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 slit musk (accessory) is sold separately. Refer to the next page.
3) The fiber cable length practically limits the sensing range.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Accessories

- **FX-SL1** (one pair set) Slit mask for **FT-A11 / FT-A11W**, slit size: 0.5 × 12 mm 0.020 × 0.472 in
- **FX-SL2** (one pair set) Slit mask for **FT-A11 / FT-A11W**, slit size: 1 × 12 mm 0.039 × 0.472 in
- **FX-SL3** (one pair set) Slit mask for **FT-A32 / FT-A32W**, slit size: 0.5 × 33 mm 0.020 × 1.299 in



LIST OF FIBERS

Reflective type

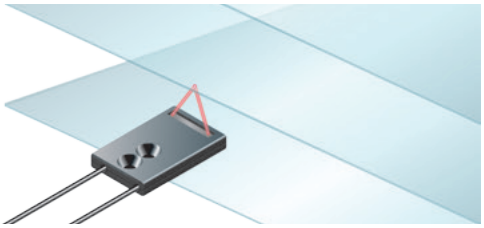
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2)					Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	**FX-550** series	Other modes / U-LG LONG FAST	**FX-101** (Upper value) **FX-102** (Lower value)		
Wide beam	W7 × H15 × D30	Tough Bending durability **FD-A16**	R4	✂ 2 m	STD 200 7.874 HYPR Cannot use	200 7.874 200 7.874 140 5.512 75 2.953	STD 350 13.780 HYPR —	— 350 13.780 250 9.843	120 4.724 240 9.449	IP40	−40 to +60 °C	P.73
Array	W5 × H20 × D20	Tough Bending durability **FD-AL11**	R2		STD 320 12.598 HYPR 670 26.378	530 20.866 510 20.079 180 7.087 50 1.969	STD 450 17.717 HYPR 1,300 51.181	1,000 39.370 700 27.559 320 12.598	100 3.937 285 11.220		−55 to +80 °C	

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

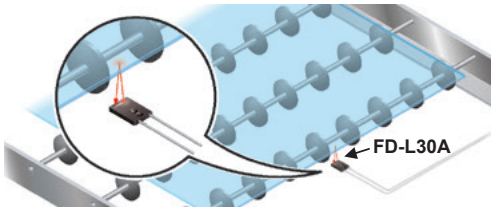
Convergent Reflective Type

It is a fiber in which the sensing distance is limited to a specific range so it is not easily affected by the background. It is effective when a workpiece is accumulated or when the background is near.

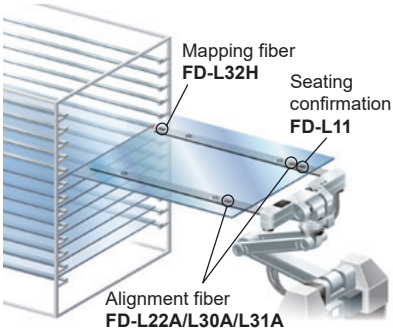


Applications

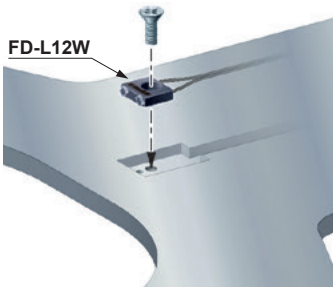
Detecting a passing glass



LCD transportation



Mounting in handling arms



LIST OF FIBERS

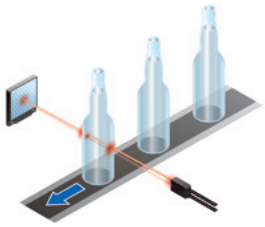
Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	FX-500 series: Other modes	FX-500 series: U-LG LONG FAST H-SP	FX-550 series	FX-550 series: Other modes	FX-550 series: U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Glass substrate detection	Mapping W25 × H7.3 × D30	Bending durability FD-L32H	R4	✂ 4 m	STD 0 to 56 0 to 2.205 HYPR 0 to 110 0 to 4.331	0 to 87 0 to 3.425 0 to 74 0 to 2.913 1 to 38 0.039 to 1.496	Cannot use	STD 0 to 65 0 to 2.559 HYPR 0 to 100 0 to 3.397	0 to 90 0 to 3.543 0 to 75 0 to 2.953 0 to 50 0 to 1.969	16 to 30 0.630 to 1.181 0 to 50 0 to 1.969	IP40	−40 to +60 °C	P.78
	Alignment W20 × H29 × D3.8	Tough Bending durability FD-L30A	R2	✂ 3 m	STD 0 to 43 0 to 1.693 HYPR 0 to 43 0 to 1.693	0 to 43 0 to 1.693 0 to 43 0 to 1.693 0 to 42 0 to 1.654 0 to 29 0 to 1.142		STD 0 to 52 0 to 2.047 HYPR 0 to 72 0 to 2.835	0 to 68 0 to 2.677 0 to 62 0 to 2.441 0 to 46 0 to1.811	0 to 40 0 to 1.575 0 to 50 0 to 1.969		0 to +70 °C	P.77
	Alignment W23.5 × H29 × D4.5	Tough Bending durability FD-L31A	R4		STD 4 to 33 0.157 to 1.299 HYPR 3 to 35 0.118 to 1.378	4 to 33 0.157 to 1.299 4 to 33 0.157 to 1.299 4 to 32 0.157 to 1.260 5 to 25 0.197 to 0.984		STD 3 to 42 0.118 to 1.654 HYPR 0 to 50 0 to 1.967	2 to 43 0.079 to 1.693 3 to 42 0.118 to 1.654 3 to 40 0.118 to 1.575	5 to 30 0.197 to 1.181 4 to 33 0.157 to 1.299			
	Alignment W17 × H29 × D3.8	Tough Bending durability FD-L22A	R2	✂ 2 m	STD 0 to 24 0 to 0.945 HYPR 0 to 31 0 to 1.220	0 to 28 0 to 1.102 0 to 27 0 to 1.063 0 to 24 0 to 0.945 0 to 18 0 to 0.709		STD 0 to 34 0 to1.339 HYPR 0 to 35 0 to 1.378	0 to 35 0 to 1.378 0 to 35 0 to 1.378 0 to 32 0 to 1.260	0 to 19 0 to 0.748 0 to 25 0 to 0.984			
	Seating confirmation W18 × H29 × D3.8	Tough Bending durability FD-L23		✂ 3 m	STD 0 to 29 0 to 1.142 HYPR 0 to 30 0 to 1.181	0 to 30 0 to 1.181 0 to 30 0 to 1.181 0 to 28 0 to 1.102 1.5 to 24 0.059 to 0.945		STD 0 to 34 0 to1.339 HYPR 0 to 34 0 to1.339	0 to 34 0 to 1.339 0 to 34 0 to 1.339 0 to 32 0 to 1.260	0 to 28 0 to 1.102 0 to 30 0 to 1.181		−20 to +70 °C	
	Seating confirmation W12 × H19 × D3	Tough Bending durability FD-L11	R4	✂ 2 m	STD 0 to 9.5 0 to 0.374 HYPR 0 to 11.5 0 to 0.453	0 to 10.5 0 to 0.413 0 to 10 0 to 0.394 0 to 9 0 to 0.354 0 to 8 0 to 0.315		STD 0 to 13 0 to 0.512 HYPR 0 to 14 0 to 0.551	0 to 13 0 to 0.512 0 to 13 0 to 0.512 0 to 12 0 to 0.472	0 to 8 0 to 0.315 0 to 9 0 to 0.354		−40 to +60 °C	
	Seating confirmation W12 × H19 × D3	Tough Bending durability FD-L10			STD 0 to 5 0 to 0.197 HYPR 0 to 6 0 to 0.236	0 to 5.5 0 to 0.217 0 to 5.5 0 to 0.217 0 to 4.5 0 to 0.177 0 to 4 0 to 0.157		STD 0 to 5 0 to 0.197 HYPR 0 to 6 0 to 0.236	0 to 5.5 0 to 0.217 0 to 5.5 0 to 0.217 0 to 5 0 to 0.197	0 to 4.5 0 to 0.177 0 to 5.5 0 to 0.217			
	W24 × H21 × D4	Tough Bending durability FD-L21	R2		STD 1.5 to 16 0.059 to 0.630 HYPR 1 to 19 0.039 to 0.748	1 to 18 0.039 to 0.709 1 to 18 0.039 to 0.709 2 to 15 0.079 to 0.591 3 to 12 0.118 to 0.472		STD 1 to 19 0.039 to 0.748 HYPR 1 to 20 0.039 to 0.787	1 to 20 0.039 to 0.787 1 to 19 0.039 to 0.748 2 to 18 0.079 to 0.709	3 to 15 0.118 to 0.591 1.5 to 16 0.059 to 0.630			
	W24 × H21 × D4	FD-L21W	R1		STD 3 to 14 0.118 to 0.551 HYPR 1.5 to 15 0.059 to 0.591	2 to 15 0.079 to 0.591 2 to 15 0.079 to 0.591 4 to 14 0.157 to 0.551 6.5 to 10 0.256 to 0.394		STD 2 to 18 0.079 to 0.709 HYPR 1 to 19 0.039 to 0.748	1 to 19 0.039 to 0.748 2 to 18 0.079 to 0.709 3 to 17 0.118 to 0.669	7 to 12 0.276 to 0.472 3 to 14 0.118 to 0.551			
General purpose	W6 × H18 × D14	Tough Bending durability FD-L20H	R2		STD 23 0.906 HYPR 45 1.772	0 to 35 0 to 1.378 0 to 32 0 to 1.260 2 to 15 0.079 to 0.591 5 to 9 0.197 to 0.354		STD 0 to 33 0 to 1.229 HYPR 0 to 65 0 to 2.559	0 to 50 0 to 1.969 0 to 40 0 to 1.575 0 to 25 0 to 0.984	5 to 15 0.197 to 0.591 1 to 30 0.039 to 1.181		−40 to +70 °C	
Ultra-small	W7.2 × H7.5 × D2	FD-L12W	R1	✂ 1 m	STD 8 0.315 HYPR 14 0.551	0 to 12.5 0 to 0.492 0 to 12 0 to 0.472 0.5 to 7 0.020 to 0.276 0.5 to 4 0.020 to 0.157		STD 0 to 12 0 to 0.472 HYPR 0 to 17 0 to 0.669	0 to 16 0 to 0.630 0 to 15 0 to 0.591 0 to 10 0 to 0.394	1 to 4.5 0.039 to 0.177 0.5 to 7 0.020 to 0.276	IP30	−40 to +60 °C	

Notes: 1) Note 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 sensing range is specified for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in (**FD-L32H**: R edge, **FD-L21** and **FD-L21W**: t2 mm t0.079 in) (**FD-L20H**: white non-glossy paper, **FD-L10**: silicon wafers 100 × 100 mm 3.937 × 3.937 in).

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

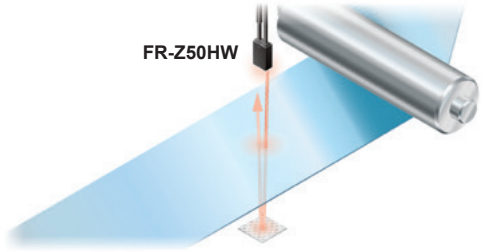
Retroreflective Type



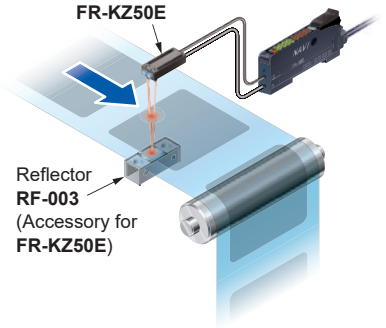
Compared with the thru-beam type, it is easier to arrange the fibers since one side is a reflector. Sensing transparent objects is also its advantage.

Applications

Detecting transparent film



Detecting transparent seals on transparent sheet



LIST OF FIBERS

Retroreflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	FX-500 series Other modes	FX-500 series U-LG LONG FAST H-SP	FX-550 series	FX-550 series Other modes	FX-550 series U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
With polarizing filters	W5.2 × H9.5 × D16 W30 × H30 × D0.5	**FR-Z50HW**	R1	2 m	STD 100 to 990 3.937 to 38.976 HYPR 100 to 1,900 3.937 to 74.803		100 to 1,400 3.937 to 55.118 100 to 1,200 3.937 to 47.244 100 to 780 3.937 to 30.709 100 to 490 3.937 to 19.291	STD 100 to 1,150 3.937 to 45.276 HYPR 100 to 2,250 3.937 to 88.583		100 to 1,800 3.937 to 70.866 100 to 1,400 3.937 to 55.118 100 to 950 3.937 to 37.402	100 to 550 3.937 to 21.654 100 to 830 3.937 to 32.677	IP40	−25 to +55 °C	P.70
Ultra-narrow beam	W7.5 × H2.2 × D11.2 Aperture angle 3° (emitter) W4 × H2 × D21.5	Tough Bending durability **FR-KZ22E**			STD 15 to 310 0.591 to 12.205 HYPR 15 to 570 0.591 to 22.441		15 to 460 0.591 to 18.110 15 to 410 0.591 to 16.142 15 to 220 0.591 to 8.661 15 to 100 0.591 to 3.937	STD 15 to 540 0.591 to 21.260 HYPR 15 to 800 0.591 to 31.496		15 to 700 0.591 to 27.559 15 to 600 0.591 to 23.622 15 to 400 0.591 to 15.748	15 to 200 0.591 to 7.874 15 to 360 0.591 to 14.173	IP30	−40 to +60 °C	
Narrow beam Top sensing	W5.2 × H9.5 × D21 W10.6 × H28 × D10.1	Tough Bending durability **FR-KZ50H**	R2		STD 20 to 300 0.787 to 11.811 HYPR 20 to 1,000 0.787 to 39.370		20 to 800 0.787 to 31.496 20 to 400 0.787 to 15.748 20 to 200 0.787 to 7.874 20 to 200 0.787 to 7.874	STD 20 to 400 0.787 to 15.748 HYPR 20 to 1,600 0.787 to 62.992		20 to 1,300 0.787 to 51.181 20 to 500 0.787 to 19.685 20 to 350 0.787 to 13.780	20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780			
Narrow beam Side sensing	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1	Tough Bending durability **FR-KZ50E**												

Notes: 1) Note 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 sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector.

Sensing range when FR-Z50HW is used in combination with a reflector (optional)

Reflector model No.	Sensing range (mm in) FX-500 series HYPR	U-LG	LONG	STD	FAST	H-SP	FX-550 series HYPR	U-LG	LONG	STD	FAST	FX-101	FX-102
RF-230	100 to 19,000 3.937 to 748.030	100 to 8,000 3.937 to 314.960	100 to 5,000 3.937 to 196.850	100 to 3,600 3.937 to 141.732	100 to 2,900 3.937 to 114.173	100 to 1,400 3.937 to 55.118	100 to 20,000 3.937 to 78.402	100 to 11,000 3.937 to 433.071	100 to 7,000 3.937 to 275.591	100 to 5,000 3.937 to 196.850	100 to 3,500 3.937 to 137.795	100 to 2,400 3.937 to 94.488	100 to 5,000 3.937 to 196.850
RF-220	100 to 8,000 3.937 to 314.960	100 to 4,700 3.937 to 185.039	100 to 3,500 3.937 to 137.795	100 to 3,000 3.937 to 118.110	100 to 1,800 3.937 to 70.866	100 to 830 3.937 to 32.677	100 to 10,000 3.937 to 393.701	100 to 6,500 3.937 to 255.906	100 to 4,500 3.937 to 177.165	100 to 3,500 3.937 to 137.795	100 to 2,500 3.937 to 98.425	100 to 1,300 3.937 to 51.181	100 to 2,600 3.937 to 102.362
RF-210	100 to 5,500 3.937 to 216.535	100 to 2,700 3.937 to 106.299	100 to 2,400 3.937 to 94.488	100 to 1,500 3.937 to 59.055	100 to 1,200 3.937 to 47.244	100 to 530 3.937 to 20.866	100 to 7,000 3.937 to 275.591	100 to 4,000 3.937 to 157.480	100 to 3,600 3.937 to 141.732	100 to 2,800 3.937 to 110.236	100 to 2,100 3.937 to 82.677	100 to 980 3.937 to 38.583	100 to 1,300 3.937 to 51.181

Note: The sensing range is the possible setting range for the reflector. The fiber can detect an object less than 100 mm 3.937 in. 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.

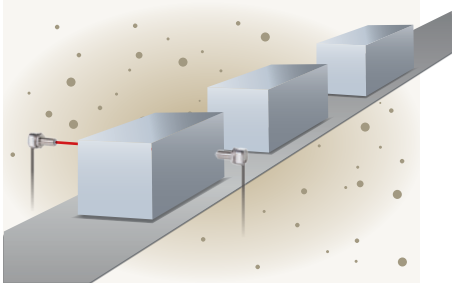
FIBER OPTION

Reflectors (for FR-Z50HW) ▸P.57

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Oil-resistant

- The fiber core will not harden or break, even in environments where oil is present.
- Resist to oil by using fluorine resin.

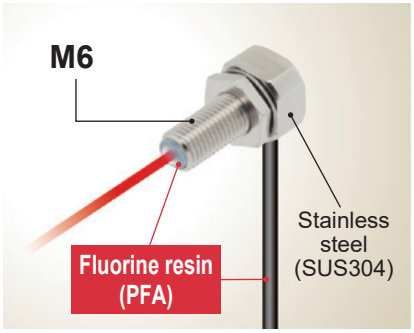


<Thru-beam type> Full-protection type IP68G rating

FT-R60Y

High environmental resistance

The head, nut, and washer are made from rust-resistant stainless steel (SUS304). The unbreakable tough fiber with high durability is covered in a fluorine resin tube. The fiber head is also covered with a fluorine resin component, achieving a high level of environmental resistance.



Less susceptibility to oil adhesion thanks to fluorine resin

Fibers deliver stable detection, since the sensing part is sealed with fluorine resin, which does not allow oil penetration. Additionally, the detection part features a convex design made of fluorine resin, achieving lower friction than glass.

Resistant to oil and coolant

The fiber head and fiber cable are connected by the “fastening and caulking” method without using adhesives. This method eliminates concerns that adhesives will absorb moisture in high-humidity environments and damage the fiber. The enclosure achieves IP68G protection, so the fiber can be installed around metal processing machines shrouded in the oil mist.

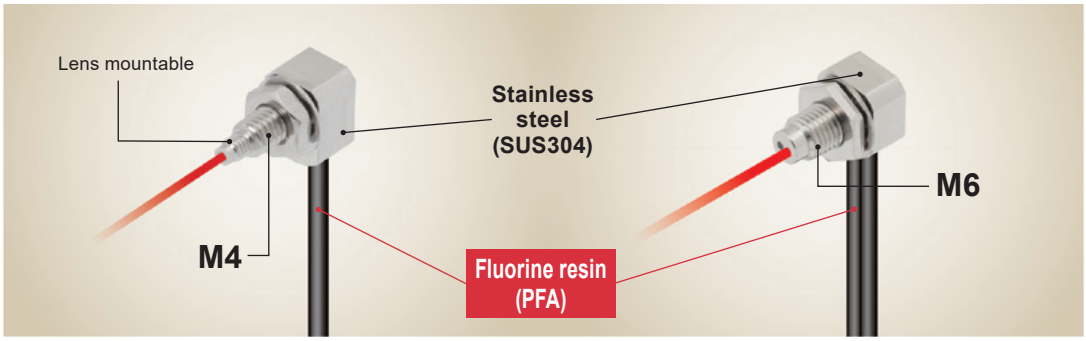
Test oil	Product
Lubricating oil	Velocite Oil No. 3
Non-water-soluble cutting oil	Yushiron Cut Abas KZ201
	Yushiron Cut UH75
Water-soluble cutting oil	Syntilo 9954 (10% diluted)
	Yushiroken S50N (2% diluted)
Alcohol-based neutral detergent	Super Teepol

* Yushiron and Yushiroken are registered trademarks of Yushiro Chemical Industry Co., Ltd.

Cable-protection type IP67 rating

FT-R44Y / FD-R61Y

FT-R44Y (Square head type M4 / thru-beam type) **FD-R61Y** (Square head type M6 / reflective type)



Even stronger than tough fiber

The tough fiber has been reinforced by covering it with a fluorine resin tube so that it can be used even in harsh environments where oils and solvents are used. The fiber cable will not harden or break, even if it is splashed with oil.

IP67 rating

The head, nut, and washer are made from rust-resistant stainless steel (SUS304).

LIST OF FIBERS

Thru-beam type (one pair set)

Type			Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
Oil-resistant	Square head type	M6	Full-protection type W10 × H11 × D21.2	Tough Bending durability **FT-R60Y**	R4	✂: 2 m	STD 2,100 82.677 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,260 49.606 400 15.748		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,900 74.803		690 27.165 1,890 74.409	ø3.5	IP68G	−55 to +80 °C	P.67
		M4	Cable-protection type Lens mountable W7 × H9.5 × D15.5	Tough Bending durability **FT-R44Y**			STD 720 28.346 HYPR 3,000 118.110	1,600 62.992 1,100 43.307 430 16.929 130 5.118		STD 1,300 51.181 HYPR 3,600 141.732 (Note 3)	2,900 114.173 1,800 70.866 800 31.496		210 8.268 640 25.197	ø1	IP67 (Note 4)		

Reflective type

Type			Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Oil-resistant	Square head type	M6	Cable-protection type W10 × H11 × D15.5	Tough Bending durability **FD-R61Y**	R4	✂: 2 m	STD 280 11.024 HYPR 990 38.976	610 24.016 435 17.126 160 6.299 50 1.969		STD 450 17.717 HYPR 1,350 53.150	1,000 39.370 650 25.591 250 9.843		85 3.346 185 7.283	IP67 (Note 4)	−55 to +80 °C	P.78

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The fiber cable length practically limits the sensing range.
4) The fiber part is oil-resistant.

Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

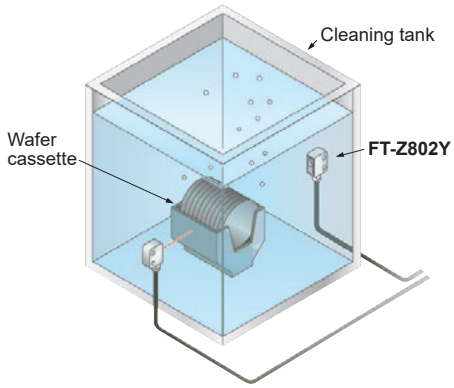
Chemical-resistant

- Metal-free design
- With the case and fiber sheath made of PFA, the fiber can be used with various types of chemical liquids.

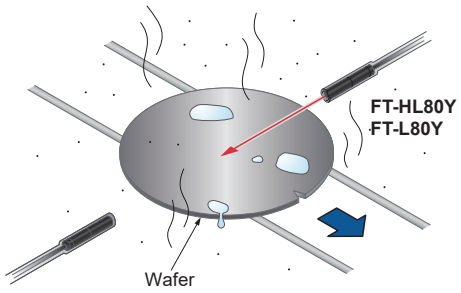
<Thru-beam type> Full-protection type Metal-free IP68G rating FT-HL80Y / FT-L80Y / FT-V80Y / FT-Z802Y

Applications

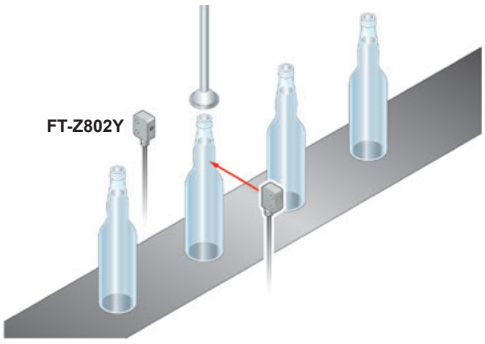
Detecting wafer cassette in cleaning tank



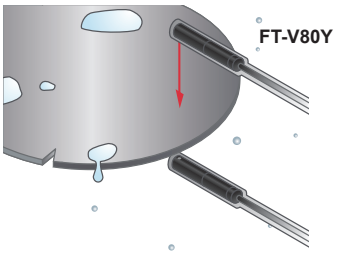
Sensing a wafer in corrosive environment



Detecting a container at a chemical piller



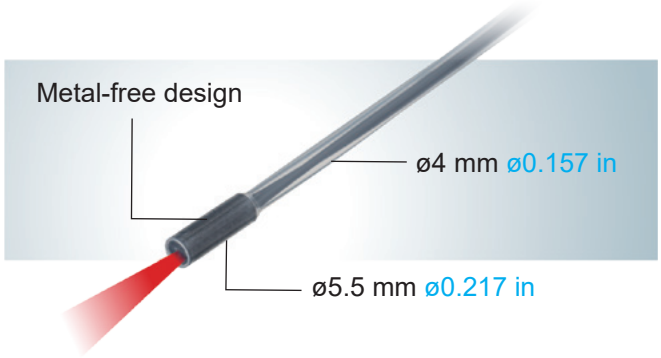
Sensing a wafer in corrosive environment



<Reflective type> Full-protection type Metal-free IP68G rating FD-S60Y

Metal-free design

Since no metal components are used, there is no need to worry about metal contamination, even if the protective tube is damaged. It is ideal for use in applications such as semiconductor front-end equipment where a clean environment is required.

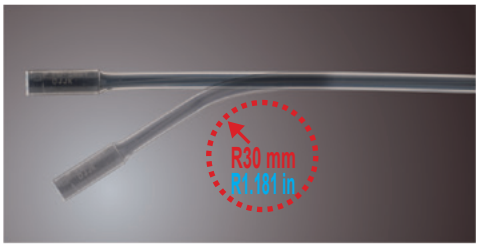


Detection in long range and narrow view

A built-in lens achieves narrow-view detection with an aperture angle of 30 degrees.

Improved tip flexibility

The protective tube features a bending radius of R30 mm R1.181 in, which improved the cable arrangement compared to previous (R40 mm R1.575 in) designs.



LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
Chemical-resistant	Flat type	Easy mounting • Rectangular head SEMI S2 compliant (Note 5) Metal-free W7 × H15 × D13	Tough Bending durability **FT-Z802Y**	R4	2 m	STD 3,100 122.047 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,900 74.803 470 18.504		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		520 20.472 3,100 122.047	ø3.7	IP68G	0 to +60 °C	P.69
	Cylindrical type	Heat-resistant 115 °C Metal-free ø5.5 (25)	**FT-HL80Y**	R30	2 m (Note 4)	STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 2,300 90.551 740 29.134		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		990 38.976 2,340 92.126			−40 to +115 °C	P.66
		Metal-free ø5.5 (25)	**FT-L80Y**			STD (Note 3) 3,600 141.732 HYPR (Note 3) 3,600 141.732	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 2,800 110.236 920 36.220		STD 3,600 141.732 (Note 3) HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 3,600 141.732 (Note 3)		1,100 43.307 2,600 102.362			−40 to +70 °C	
		Side-view Metal-free ø5.5 (25)	**FT-V80Y**			STD 1,300 51.181 HYPR (Note 3) 3,600 141.732	2,800 110.236 2,200 86.614 800 31.496 240 9.449		STD 2,200 86.614 HYPR 3,600 141.732 (Note 3)	3,600 141.732 (Note 3) 3,600 141.732 (Note 3) 1,400 55.118		340 13.386 800 31.496	ø2.8			P.68

Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Protection	Ambient temp.	Dimensions
Chemical-resistant	Cylindrical type	Metal-free ø5.5 (16)	Tough Bending durability **FD-S60Y**	Protective tube R30 mm Fiber R4	2 m (Note 4)	STD 320 12.598 HYPR 600 23.622	590 23.228 420 16.535 200 7.874 75 2.953		STD 450 17.717 HYPR —	700 27.559 550 21.654 380 14.961		140 5.512 300 11.811	IP68G	−40 to +70 °C	P.79

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The fiber cable length practically limits the sensing range.
4) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.
5) The design takes into account the environmental testing required by SEMI S2. To ensure that the final system complies with the standards, you must design and use it in accordance with relevant standards, regulations, and regulations.

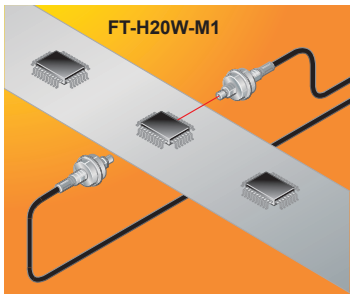
Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

Heat-resistant

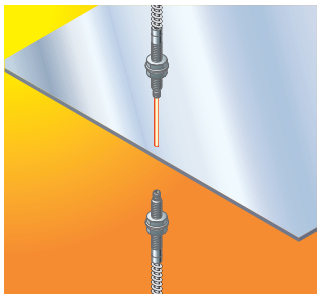
- It can be used under environments of -60 to +350 °C -76 to +662 °F.
- A joint type for wider workability is also available.

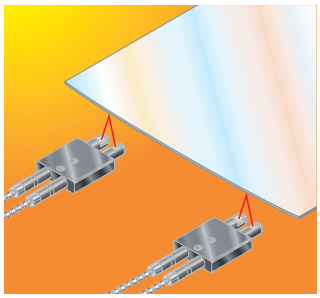
Applications

IC detection within a high temperature handler



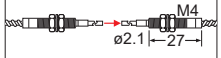
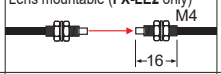
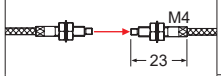
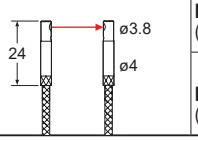
Detecting glass substrates





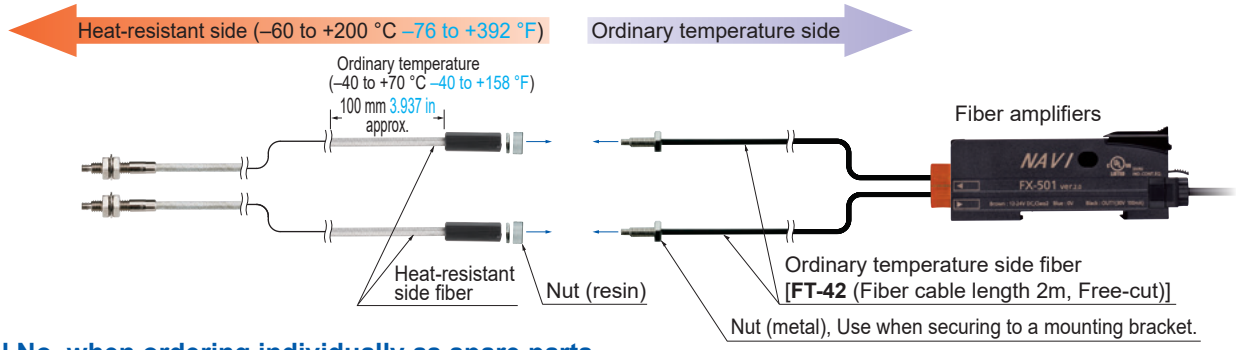
LIST OF FIBERS

Thru-beam type (one pair set)

Type	Heat-resistant temp.	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1) FX-500 series	FX-500 series Other modes: U-LG LONG FAST H-SP	FX-550 series	FX-550 series Other modes: U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Beam axis dia. (mm)	Ambient temp.	Dimensions
Heat-resistant	350 °C	Lens mountable (**FX-LE1/LE2/SV1**)	**FT-H35-M2**	R25	2 m	STD 430 16.929 HYPR 1,200 47.244	880 34.646 670 26.378 250 9.843 80 3.150	STD 1,050 41.339 HYPR 3,600 141.732 (Note 2)	2,300 90.551 1,500 59.055 650 25.591	170 6.693 490 19.291	ø1.2	−60 to +350 °C	P.65
		Sleeve 60 mm 	**FT-H35-M2S6**	Fiber R25 Sleeve R10									
	200 °C	Allows flexible wiring Lens mountable (**FX-LE1/LE2/SV1**)	**FT-H20W-M1**	R10	1 m	STD 470 18.504 HYPR (Note 2) 1,600 62.992	1,000 39.370 840 33.071 300 11.811 90 3.543	STD 730 28.740 HYPR 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,050 41.339 440 17.323	100 3.937 300 11.811	ø0.8	−60 to +200 °C	
		Lens mountable (**FX-LE1/LE2/SV1**)	**FT-H20-M1**	R25		STD 540 21.260 HYPR (Note 2) 1,600 62.992	1,300 51.181 960 37.795 330 12.992 110 4.331	STD 1,000 39.370 HYPR 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2) 600 23.622	210 8.268 540 21.260	ø1.2		
	130 °C	Lens mountable (**FX-LE2** only) 	**FT-H13-FM2**		✂ 2 m	STD 700 27.559 HYPR 3,300 129.921	1,900 74.803 1,300 51.181 410 16.142 140 5.512	STD 1,150 45.276 HYPR 3,600 141.732 (Note 2)	2,700 106.299 1,690 66.535 750 29.528	250 9.843 700 27.559	ø1.5	−60 to +130 °C	
Heat-resistant (joint)	200 °C	Lens mountable (**FX-LE1/LE2/SV1**) 	**FT-H20-J20-S** (Note 5)	Heat-resistant side R18 (Note 4)	✂ 200 mm (Note 3)	STD 470 18.504 HYPR 1,600 62.992	1,000 39.370 790 31.102 300 11.811 90 3.543	STD 860 33.858 HYPR 2,600 102.362	1,800 70.866 1,200 47.244 530 20.866	135 5.315 420 16.535	ø1.2	−60 to +200 °C	
			FT-H20-J30-S (Note 5)		✂ 300 mm (Note 3)								
			FT-H20-J50-S (Note 5)		✂ 500 mm (Note 3)								
		Side-view 	**FT-H20-VJ50-S** (Note 5)			STD 600 23.622 HYPR 2,100 82.677	1,300 51.181 980 38.583 390 15.354 120 4.724	STD 1,000 39.370 HYPR 3,600 141.732 (Note 2)	2,200 86.614 1,400 55.118 620 24.409	150 5.906 500 19.685			
			FT-H20-VJ80-S (Note 5)		✂ 800 mm (Note 3)								

Notes: 1) Note 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.
3) Fiber length (fixed-length) for heat-resistant fiber side. Fiber length for ordinary temperature side is 2 m 6.562 ft (free-cut).
4) Bending-resistant fiber R4 mm R0.157 in or more for ordinary temperature side.
5) Heat-resistant joint fibers and ordinary-temperature fibers (**FT-42**) are sold as a set.

Heat-resistant joint fiber set contents



Model No. when ordering individually as spare parts

- Heat-resistant side fiber one pair set
  FT-H20-J20, **FT-H20-J30**, **FT-H20-J50**, **FT-H20-VJ50**, **FT-H20-VJ80**

- Ordinary temperature side fiber one pair set
  FT-42

LIST OF FIBERS

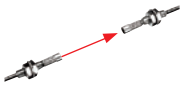
Reflective type

Type		Heat-resistant temp.	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Sensing range (mm in) (Note 1, 2) FX-500 series	FX-500 series Other modes / U-LG LONG FAST H-SP	FX-550 series	FX-550 series Other modes / U-LG LONG FAST	FX-101 (Upper value) FX-102 (Lower value)	Ambient temp.	Dimensions
Heat-resistant	Threaded	350 °C	Coaxial M6 25	**FD-H35-M2**	R25	2 m	STD 260 10.236 HYPR 720 28.346	540 21.260 460 18.110 150 5.906 45 1.772	STD 400 15.748 HYPR 750 29.528	600 23.662 500 19.685 220 8.661	75 2.953 280 11.024	−60 to +350 °C	P.76
			Sleeve 60 mm M6 ø2.8 22	**FD-H35-M2S6**	Fiber R25 Sleeve R10								
			Sleeve 90 mm M4 ø2.1 27	**FD-H35-20S**			STD 260 10.236 HYPR 840 33.071	550 21.654 440 17.323 140 5.512 45 1.772	STD 410 16.142 HYPR 850 33.465	750 29.528 550 21.654 230 9.055	85 3.346 200 7.874		
		200 °C	Coaxial M6 28	**FD-H20-M1**		1 m	STD 330 12.992 HYPR 840 33.071	550 21.654 500 19.685 200 7.874 55 2.165	STD 450 17.717 HYPR 1,350 53.150	1,000 39.370 650 25.591 300 11.811	120 4.724 300 11.811	−60 to +200 °C	P.75
			Coaxial M4 27	**FD-H20-21**			STD 230 9.055 HYPR 770 30.315	500 19.685 380 14.961 130 5.118 45 1.772	STD 450 17.717 HYPR 1,250 49.213	850 33.465 650 25.591 250 9.843	90 3.543 280 11.024		
		130 °C	M6 21	**FD-H13-FM2**		✂ 2 m	STD 350 13.780 HYPR 880 34.646	640 25.197 600 23.622 200 7.874 65 2.559	STD 670 26.378 HYPR 1,650 64.961	1,300 51.181 940 37.008 390 15.354	100 3.937 280 11.024	−60 to +130 °C	
	Glass substrate detection convergent reflective	300 °C	W19 × H27 × D5	**FD-H30-L32**	R25	2 m	STD 0 to 17 0 to 0.669 HYPR 0 to 40 0 to 1.575	0 to 30 0 to 1.181 0 to 25 0 to 0.984 0 to 12 0 to 0.472 1.5 to 6 0.059 to 0.236	STD 0 to 21 0 to 0.827 HYPR 0 to 60 0 to 2.362	0 to 42 0 to 1.654 0 to 25 0 to 0.984 0 to 16 0 to 0.630	2 to 9 0.079 to 0.354 0 to 17 0 to 0.669	−60 to +300 °C	P.76
		250 °C	W21 × H33.2 × D5	**FD-H25-L43**		3 m	STD 1.5 to 26 0.059 to 1.024 HYPR 1 to 31 0.039 to 1.220	1 to 30 0.039 to 1.181 1 to 28 0.039 to 1.102 1.5 to 24 0.059 to 0.945 2 to 18 0.079 to 0.709	STD 1 to 28 0.039 to 1.102 HYPR 1 to 31 0.039 to 1.220	1 to 30 0.039 to1.181 1 to 29 0.039 to1.142 1 to 26 0.039 to1.024	4 to 16 0.157 to 0.630 4 to 23 0.157 to 0.906	−20 to +250 °C (Ordinary temp. side: −20 to +70 °C)	P.75
			W21 × H34.5 × D5	**FD-H25-L45**			STD 5 to 42 0.197 to 1.654 HYPR 4 to 43.5 0.157 to 1.713	4 to 43 0.157 to 1.693 4.5 to 43 0.177 to 1.693 5 to 40 0.197 to 1.575 6.5 to 34 0.256 to 1.339	STD 4 to 48 0.157 to 1.890 HYPR 4 to 51 0.157 to 2.008	4 to 50 0.157 to 1.969 4 to 49 0.157 to 1.929 4 to 44 0.157 to 1.732	7 to 35 0.276 to 1.378 7 to 38 0.276 to 1.496		
		180 °C	W19 × H27 × D5	**FD-H18-L31**		✂ 2 m	STD 0 to 16 0 to 0.630 HYPR 0 to 60 0 to 2.362	0 to 32 0 to 1.260 0 to 24 0 to 0.945 0 to 13 0 to 0.512 2 to 6.5 0.079 to 0.256	STD 0 to 45 0 to 1.772 HYPR 0 to 130 0 to 5.118	0 to 85 0 to 3.346 0 to 60 0 to 2.362 0 to 30 0 to 1.181	0 to 10 0 to 0.394 0 to 25 0 to 0.984	−60 to +180 °C	

Notes: 1) Note 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 sensing range of reflective type is the value for white non-glossy paper (50 × 50 mm 1.969 × 1.969 in glass substrate for **FD-H30-L32** and **FD-H18-L31**, transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in for **FD-H25-L43** and **FD-H25-L45**).

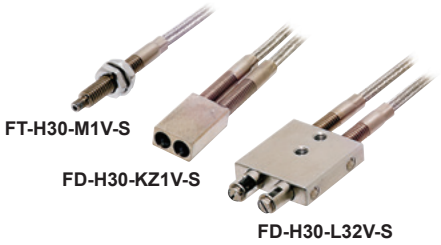
FIBER OPTION

Lens (For thru-beam type fiber) ►P.53~



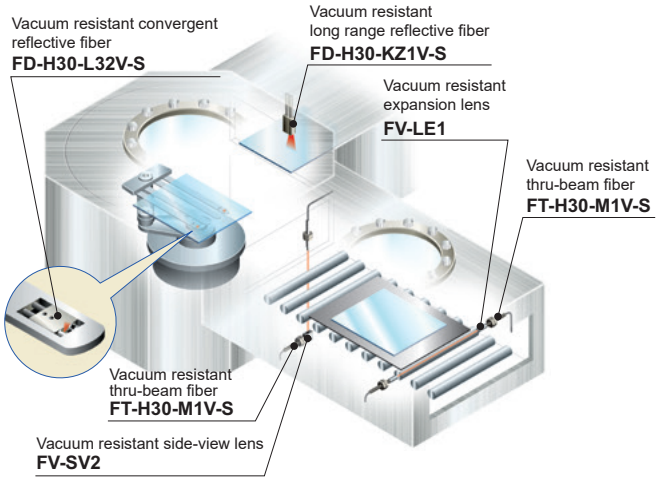
Vacuum-resistant

- Usable in high-temperatures of 300 °C 572 °F vacuum
- The leakage of **FV-BR1** is still less than a very slight 1.33×10^{-10} Pa · m^3/s [He], so that it can be used in vacuums with confidence.



Applications

Detecting an FPD in vacuum chamber



Highly resistant to repeated bending

Because it has a bending durability of over 100,000 times (R20 mm R0.787 in), it is highly resistant to repeated bending and is optimal for mounting on moving robot hand.

LIST OF FIBERS

Thru-beam type (one pair set)

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length	Sensing range (mm in)							Beam axis dia. (mm)	Ambient temp.	Dimensions
						FX-500 series	Other modes	U-LG LONG FAST H-SP	**FX-550** series	Other modes	U-LG LONG FAST	**FX-101** (Upper value) **FX-102** (Lower value)			
Vacuum-resistant	Thru-beam	300 °C Lens mountable (**FV-LE1/SV2**) M4 30	**FT-H30-M1V-S** (Note)	R18	1 m	STD 270 10.630 HYPR 1,000 39.370	590 23.228 470 18.504 160 6.299 55 2.165	STD 400 15.748 HYPR 1,400 55.118	950 37.402 620 24.409 250 9.843	110 4.331 280 11.024	ø1.2	−30 to +300 °C	P.65		

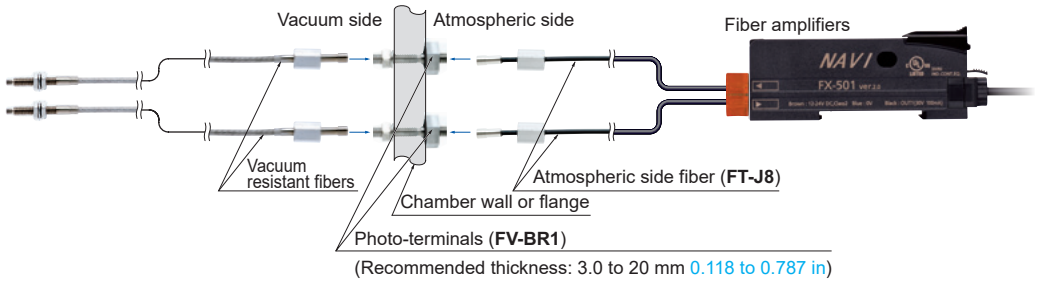
Note: Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

Reflective type

Type		Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length	Sensing range (mm in)(Note 2)						Ambient temp.	Dimensions
						FX-500 series	Other modes	U-LG LONG FAST H-SP	**FX-550** series	Other modes	U-LG LONG FAST	**FX-101** (Upper value) **FX-102** (Lower value)		
Vacuum-resistant	Reflective	300 °C, Rectangular head W9.5 × H5.2 × D15	**FD-H30-KZ1V-S** (Note 1)	R18	1 m	STD 20 to 200 0.787 to 7.874 HYPR 5 to 500 0.197 to 19.685	10 to 340 0.394 to 13.386 15 to 270 0.591 to 10.630 20 to 120 0.787 to 4.724 20 to 45 0.787 to 1.772	STD 20 to 450 0.787 to 17.717 HYPR 5 to 1,500 0.197 to 59.055	10 to 1,000 0.394 to 39.370 15 to 650 0.591 to 25.591 20 to 300 0.787 to 11.811	25 to 80 0.984 to 3.150 10 to 220 0.394 to 8.661	−30 to +300 °C	P.76	
	Convergent reflective	300 °C, Glass substrate detection W19 × H5 × D27	**FD-H30-L32V-S** (Note 1)		3 m	STD 0 to 8 0 to 0.315 HYPR 0 to 18 0 to 0.709	0 to 12 0 to 0.472 0 to 10 0 to 0.394 0 to 5.5 0 to 0.217 1.5 to 3 0.059 to 0.118	STD 0 to 11 0 to 0.433 HYPR 0 to 27 0 to 1.063	0 to 19 0 to 0.748 0 to 13 0 to 0.512 0 to 7.5 0 to 0.295	2.5 to 6.5 0.098 to 0.256 0 to 11 0 to 0.433			

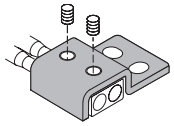
Notes: 1) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).
2) The sensing range is the value for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in.

Vacuum-resistant fiber set contents



Model No. when ordering individually as spare parts

- Vacuum resistant fiber
  FT-H30-M1V (one pair set)
  FD-H30-KZ1V
  FD-H30-L32V
- Photo-terminal
  FV-BR1 (one pair set)
- Atmospheric side fiber
  FT-J8 (one pair set)
- Mounting bracket for **FD-H30-KZ1V**(**-S**)
  MS-FD-2



FIBER OPTIONS

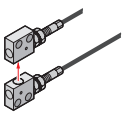
Lens (For thru-beam type fiber)

<table>
<tr><th colspan="2">Designation</th><th>Model No.</th><th></th><th>Description</th></tr>
<tr><td rowspan="2">For thru-beam type fiber</td><td>Vacuum resistant expansion lens (Note 1)</td><td>FV-LE1</td><td> </td><td>Increases the sensing range 4 times or more.
• Ambient temperature: −60 to +350 °C −76 to +662 °F (Note 3)
• Beam axis dia: ø3.6 mm ø0.142 in
Sensing range (mm in) [Lens on both sides] (Note 4)
<table>
<tr><th rowspan="2">Fiber \ Amplifier / Mode</th><th colspan="6">FX-500 series (Upper value)
FX-550 series (Lower value)</th><th colspan="2">FX-100 series</th></tr>
<tr><th>HYPR</th><th>U-LG</th><th>LONG</th><th>STD</th><th>FAST</th><th>H-SP</th><th>FX-101</th><th>FX-102</th></tr>
<tr><td rowspan="2">FT-H30-M1V-S</td><td>3,600
141.732
(Note 2)
3,600
141.732
(Note 2)</td><td>3,600
141.732
(Note 2)
3,600
141.732
(Note 2)</td><td>3,400
133.858

3,600
141.732
(Note 2)</td><td>1,500
59.055

2,500
98.425</td><td>900
35.433

1,650
64.961</td><td>370
14.567

—</td><td rowspan="2">450
17.717</td><td rowspan="2">1,600
62.992</td></tr>
</table></td></tr>
<tr><td>Vacuum resistant side-view lens (Note 1)</td><td>FV-SV2</td><td>  </td><td>Beam axis is bent by 90°.
• Ambient temperature: −60 to +300 °C −76 to +572 °F (Note 3)
• Beam axis dia: ø3.7 mm ø0.146 in
Sensing range (mm in) [Lens on both sides] (Note 4)
<table>
<tr><th rowspan="2">Fiber \ Amplifier / Mode</th><th colspan="6">FX-500 series (Upper value)
FX-550 series (Lower value)</th><th colspan="2">FX-100 series</th></tr>
<tr><th>HYPR</th><th>U-LG</th><th>LONG</th><th>STD</th><th>FAST</th><th>H-SP</th><th>FX-101</th><th>FX-102</th></tr>
<tr><td rowspan="2">FT-H30-M1V-S</td><td>3,600
141.732
(Note 2)
3,600
141.732
(Note 2)</td><td>3,600
141.732
(Note 2)
3,600
141.732
(Note 2)</td><td>3,400
133.858

3,600
141.732
(Note 2)</td><td>1,500
59.055

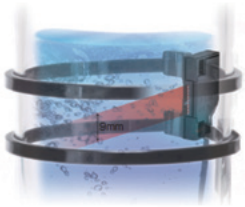
1,800
70.866</td><td>900
35.433

1,100
43.307</td><td>370
14.567

—</td><td rowspan="2">450
17.717</td><td rowspan="2">1,600
62.992</td></tr>
</table></td></tr>
</table>

Notes: 1) Be careful when installing the thru-beam type fiber equipped with the lens, as the beam envelope becomes narrow and alignment is difficult.
2) The fiber cable length practically limits the sensing range.
3) Refer to previous page for the ambient temperature of fibers to be used in combination.
4) The fiber cable length for the **FT-H30-M1V-S** is 1 m 3.281 ft. The sensing ranges in HYPR, U-LG and LONG of **FX-500** / **FX-550** series, in **FX-102** take into account the length of the **FT-J8** atmospheric side fiber.

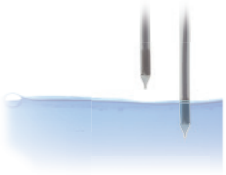
Liquid Leak / Liquid Detection



It corresponds to various liquid events, from the contact (wetted) type to the pipe mounting type, and up to leak detection.

Applications

Detecting liquid level in a tank



Leak detection for use in semiconductor device manufacturing

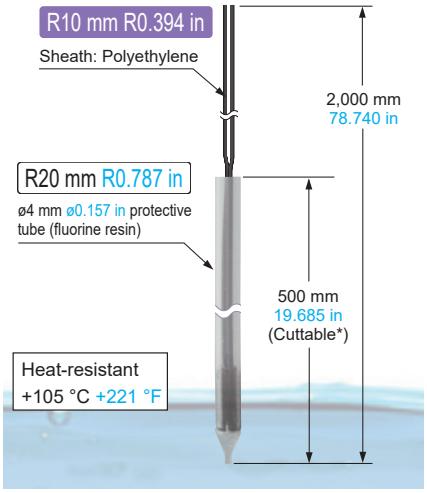
<Contact type liquid level sensing> Full-protection type

Metal-free | IP68G rating

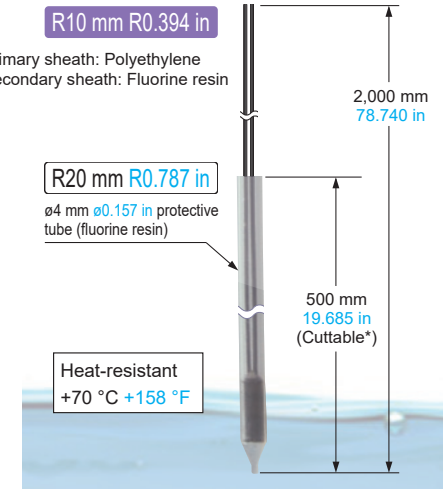
Small diameter type (ø4 mm ø0.157 in)

Bends easily with its small bending radius, protective tube is cuttable and extendable.

FD-HF40Y



FD-F41Y



* The range of 50 mm 1.969 in from the fiber tip cannot be cut. Also, fiber length can be extended using **MS-FX-02Y** (optional).

For detecting the upper limit of liquid surface level, sensor that receives beam when "liquid is absent" is recommended.

The sensor will turn OFF during abnormal conditions (excess fluid, fiber disconnection, etc.)!
Liquid absent: Beam received (Output ON)
Liquid present / fiber is cutoff: Beam not received (Output OFF)

FD-FA93 Strong against air bubbles

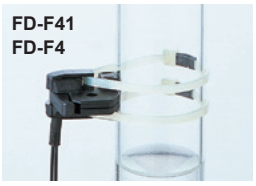
Applicable pipe: Transparent pipe, Outer diameter ø8 mm ø0.315 in or more
(When used with the tying bands: ø8 to ø80 mm ø0.315 to ø3.150 in)

FD-F41

Standard type

FD-F4

For 1 mm 0.039 in thick pipes manufactured by PFA



For detecting the lower limit of liquid surface level, sensor that receives beam when "liquid is present" is recommended.

The sensor will turn OFF during abnormal conditions (insufficient liquid, fiber disconnection, etc.) !
Liquid present: Beam received (Output ON)
Liquid absent / fiber is cutoff: Beam not received (Output OFF)

FT-F93 Thru-beam

LIST OF FIBERS

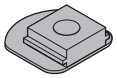
Reflective type / Thru-beam type

Type			Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Description: **FX-500** series (STD mode) / **FX-550** series (STD mode) / **FX-101** **FX-102**	Protection	Ambient temp.	Dimensions
Contact type	Reflective type	Liquid level sensing	Heat resistant 125 °C Fluorine resin coating ø6	**FD-F8Y**	Protective tube R40 Fiber R15	✂ 2 m (Note 1)	ø6 mm ø0.236 in Protective tube: Fluorine resin, length 1,000 mm 39.370 in (not cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received	IP68	−40 to +125 °C	P.74
			Heat resistant 105 °C Fluorine resin coating Metal-free ø4	**FD-HF40Y** (Note 2)	Protective tube R20 Fiber R10	✂ 2 m	ø4 mm ø0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received	IP68G	−40 to +105 °C	P.76
			Heat resistant 70 °C Fluorine resin coating throughout the fiber Metal-free ø4	**FD-F41Y** (Note 2)			ø4 mm ø0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received		−40 to +70 °C	
		Liquid leak detection	SEMI S2 compliant (Note 3) W20 × H30 × D10	Tough Bending durability **FD-F71**	R4	✂ 5 m	Liquid leak detection Leak absent: Beam received, Leak present: Beam not received Compatible amplifier: **FX-500** / **FX-550** series only	IP67	−20 to +60 °C	
Pipe-mountable type	Reflective type	Liquid level sensing	Standard W25 × H13 × D20	**FD-F41**	R10	✂ 2 m	Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in] Liquid absent: Beam received, Liquid present: Beam not received	—	−40 to +100 °C	P.74
			For 1 mm thick PFA pipe W25 × H13 × D20	**FD-F4**			Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in] Liquid absent: Beam received, Liquid present: Beam not received			
		Liquid sensing	Array fiber W6.5 × H28.3 × D17	Tough Bending durability **FD-FA93**	R4		Applicable pipe diameter: Outer dia. ø8 mm ø0.315 in or more transparent pipe (When used with the tying bands: ø8 to ø80 mm ø0.315 to ø3.150 in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam not received	IP40	−40 to +70 °C	
	Thru-beam type		SEMI S2 compliant (Note 3) W23 × H20 × D17	Tough Bending durability **FT-F93**	Protective tube R20 Fiber R2		Applicable pipe diameter: Outer dia. ø3 to ø10 mm ø0.118 to ø0.394 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1 mm 0.012 to 0.039 in] Liquid absent: Beam not received, Liquid present: Beam received Compatible amplifire: **FX-500** / **FX-550** series only		−40 to +60 °C	P.64

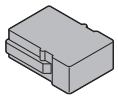
Notes: 1) The allowable cutting range is 1,000 mm 39.370 in from the end that the amplifier inserted.
2) Liquid inflow prevention joint, protective tube extension joint, fiber mounting joint is available.
3) The design takes into account the environmental testing required by SEMI S2. To ensure that the final system complies with the standards, you must design and use it in accordance with relevant standards, regulations, and regulations.

Accessories

- **MS-FD-F7-1**
  (SUS mounting bracket for **FD-F71**)



- **MS-FD-F7-2**
  (PVC mounting bracket for **FD-F71**)



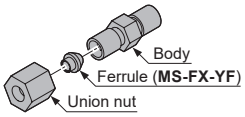
FIBER OPTIONS

Designation	Model No.	Description		
Liquid inflow prevention joint (Note)	**MS-FX-01Y**	Applicable fibers	**FD-HF40Y** **FD-F41Y**	This joint suppresses false operations due to liquid slip-in from the top of the protective tube.
Protective tube extension joint (Note)	**MS-FX-02Y**			The protective tube can be extended.
Fiber mounting joint (Note)	**MS-FX-03Y**			The joint is used for mounting fibers on a tank.

Note: The joint internal ferrule (**MS-FX-YF**) is available as a spare part. A distorted ferrule may result in leakage.

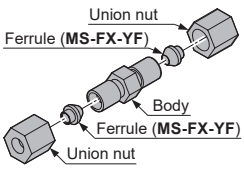
Liquid inflow prevention joint

- **MS-FX-01Y**



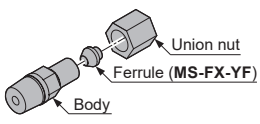
Protective tube extension joint

- **MS-FX-02Y**



Fiber mounting joint

- **MS-FX-03Y**



Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm R0.394 in, reciprocating bending: 180°).

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Thru-beam type (one pair set)

Model No.	Sensing range (mm in) (Note 1) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPER	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FT-140	19,600 771.654 (Note 2) 19,600 771.654 (Note 2)	19,600 771.654 (Note 2) 19,600 771.654 (Note 2)	19,600 771.654 (Note 2) 19,600 771.654 (Note 2)	19,600 771.654 (Note 2) 19,600 771.654 (Note 2)	16,000 629.921 19,600 771.654 (Note 2)	6,300 248.031 —	14,000 551.181	19,600 771.654 (Note 2)	P.63
FT-30	1,350 53.150 1,860 73.228	810 31.890 1,240 48.819	650 25.591 830 32.677	400 15.748 570 22.441	210 8.268 340 13.386	75 2.953 —	135 5.315	400 15.748	P.63
FT-31	1,350 53.150 1,580 62.205	770 30.315 1,000 39.370	550 21.654 700 27.559	315 12.402 480 18.898	210 8.268 290 11.417	70 2.756 —	130 5.118	340 13.386	P.63
FT-31S	1,220 48.031 1,580 62.205	740 29.134 1,000 39.370	550 21.654 700 27.559	315 12.402 480 18.898	195 7.677 290 11.417	63 2.480 —	130 5.118	340 13.386	P.63
FT-31W	990 38.976 1,300 51.181	590 23.228 890 35.039	440 17.323 580 22.835	260 10.236 420 16.535	150 5.906 250 9.843	53 2.087 —	80 3.150	240 9.449	P.63
FT-32	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,000 118.110 3,600 141.732 (Note 2)	1,600 62.992 2,900 114.173	580 22.835 —	1,300 51.181	3,600 141.732 (Note 2)	P.63
FT-40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,200 86.614 3,100 122.047	1,700 66.929 2,200 86.614	1,200 47.244 1,570 61.811	530 20.866 960 37.795	190 7.480 —	320 12.598	870 34.252	P.63
FT-42	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,050 80.709 2,900 114.173	1,600 62.992 2,100 82.677	1,130 44.488 1,470 57.874	530 20.866 890 35.039	190 7.480 —	300 11.811	800 31.496	P.63
FT-42S	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,050 80.709 2,900 114.173	1,600 62.992 2,100 82.677	1,130 44.488 1,470 57.874	530 20.866 890 35.039	190 7.480 —	300 11.811	800 31.496	P.63
FT-42W	3,300 129.921 3,600 141.732 (Note 2)	1,900 74.803 2,600 102.362	1,400 55.118 1,780 70.079	800 31.496 1,200 47.244	490 19.291 710 27.953	160 6.299 —	260 10.236	720 28.346	P.63
FT-43	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,800 110.236 3,600 141.732 (Note 2)	2,100 82.677 3,100 122.047	1,400 55.118 2,200 86.614	770 30.315 1,400 55.118	240 9.449 —	350 13.780	970 38.189	P.64
FT-45X	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,200 47.244 1,600 62.992 (Note 2)	630 24.803 1,070 42.126	200 7.874 —	340 13.386	920 36.220	P.64
FT-A11	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,100 43.307 —	1,900 74.803	3,600 141.732 (Note 2)	P.64
FT-A11W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,300 51.181 —	1,700 66.929	3,400 133.858	P.64
FT-A32	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,100 82.677 —	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	P.64
FT-A32W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,000 118.110 —	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	P.64
FT-AL05	2,300 90.551 3,600 141.732 (Note 2)	1,550 61.024 2,350 92.520	1,500 59.055 1,600 62.992	860 33.858 1,150 45.276	500 19.685 660 25.984	170 6.693 —	250 9.843	660 25.984	P.64
FT-E13	52 2.047 68 2.677	30 1.181 45 1.772	24 0.945 30 1.181	15 0.591 21 0.827	8 0.315 12 0.472	2 0.079 —	6 0.236	19 0.748	P.64
FT-E23	270 10.630 355 13.976	160 6.299 250 9.843	125 4.921 165 6.496	75 2.953 120 4.724	42 1.654 70 2.756	13 0.512 —	22 0.866	80 3.150	P.64
FT-F93	Applicable pipe diameter: Outer dia. ø3 to ø10 mm ø0.118 to ø0.394 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 0.3 to 1 mm 0.012 to 0.039 in] Liquid absent: Beam not received, Liquid present: Beam received Compatible amplifier: **FX-500** / **FX-550** series only								P.64

Notes: 1) Note 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.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Thru-beam type (one pair set)

Model No.	Sensing range (mm in) (Note 1) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPER	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FT-H13-FM2	3,300 129.921 3,600 141.732 (Note 2)	1,900 74.803 2,700 106.299	1,300 51.181 1,690 66.535	700 27.559 1,150 45.276	410 16.142 750 29.528	140 5.512 —	250 9.843	700 27.559	P.65
FT-H20-J20-S (Note 3)	1,600 62.992 2,600 102.362	1,000 39.370 1,800 70.866	790 31.102 1,200 47.244	470 18.504 860 33.858	300 11.811 530 20.866	90 3.543 —	135 5.315	420 16.535	P.65
FT-H20-J30-S (Note 3)	1,600 62.992 2,600 102.362	1,000 39.370 1,800 70.866	790 31.102 1,200 47.244	470 18.504 860 33.858	300 11.811 530 20.866	90 3.543 —	135 5.315	420 16.535	P.65
FT-H20-J50-S (Note 3)	1,600 62.992 2,600 102.362	1,000 39.370 1,800 70.866	790 31.102 1,200 47.244	470 18.504 860 33.858	300 11.811 530 20.866	90 3.543 —	135 5.315	420 16.535	P.65
FT-H20-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,300 51.181 1,600 62.992 (Note 2)	960 37.795 1,600 62.992 (Note 2)	540 21.260 1,000 39.370	330 12.992 600 23.622	110 4.331 —	210 8.268	540 21.260	P.65
FT-H20-VJ50-S (Note 3)	2,100 82.677 3,600 141.732 (Note 2)	1,300 51.181 2,200 86.614	980 38.583 1,400 55.118	600 23.622 1,000 39.370	390 15.354 620 24.409	120 4.724 —	150 5.906	500 19.685	P.65
FT-H20-VJ80-S (Note 3)	2,100 82.677 3,600 141.732 (Note 2)	1,300 51.181 2,200 86.614	980 38.583 1,400 55.118	600 23.622 1,000 39.370	390 15.354 620 24.409	120 4.724 —	150 5.906	500 19.685	P.65
FT-H20W-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,000 39.370 1,600 62.992 (Note 2)	840 33.071 1,050 41.339	470 18.504 730 28.740	300 11.811 440 17.323	90 3.543 —	100 3.937	300 11.811	P.65
FT-H30-M1V-S (Note 4)	1,000 39.370 1,400 55.118	590 23.228 950 37.402	470 18.504 620 24.409	270 10.630 400 15.748	160 6.299 250 9.843	55 2.165 —	110 4.331	280 11.024	P.65
FT-H35-M2	1,200 47.244 3,600 141.732 (Note 2)	880 34.646 2,300 90.551	670 26.378 1,500 59.055	430 16.929 1,050 41.339	250 9.843 650 25.591	80 3.150 —	170 6.693	490 19.291	P.65
FT-H35-M2S6	1,200 47.244 3,600 141.732 (Note 2)	880 34.646 2,300 90.551	670 26.378 1,500 59.055	430 16.929 1,050 41.339	250 9.843 650 25.591	80 3.150 —	170 6.693	490 19.291	P.65
FT-HL80Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,300 90.551 3,600 141.732 (Note 2)	740 29.134 —	990 38.976	2,340 92.126	P.66
FT-KS40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,200 47.244 —	2,200 86.614	3,600 141.732 (Note 2)	P.66
FT-KV26	2,500 98.425 3,600 141.732 (Note 2)	1,600 62.992 2,300 90.551	1,200 47.244 1,600 62.992	710 27.953 1,100 43.307	440 17.323 650 25.591	160 6.299 —	135 5.315	560 22.047	P.66
FT-KV26H1	2,200 86.614 3,600 141.732 (Note 2)	1,430 56.299 1,900 74.803	1,070 42.126 1,400 55.118	630 24.803 1,000 39.370	390 15.354 650 25.591	135 5.315 —	160 6.299	500 19.685	P.66
FT-KV40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,200 47.244 —	2,200 86.614	3,600 141.732 (Note 2)	P.66
FT-KV40W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,100 122.047 3,600 141.732 (Note 2)	940 37.008 —	2,200 86.614	3,600 141.732 (Note 2)	P.66
FT-L80Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,800 110.236 3,600 141.732 (Note 2)	920 36.220 —	1,100 43.307	2,600 102.362	P.66
FT-R31	1,000 39.370 1,670 65.748	580 22.835 1,120 44.094	440 17.323 700 27.559	270 10.630 510 20.079	160 6.299 310 12.205	55 2.165 —	100 3.937	340 13.386	P.66
FT-R40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,750 68.898 2,900 114.173	1,500 59.055 1,950 76.772	930 36.614 1,400 55.118	500 19.685 860 33.858	160 6.299 —	270 10.630	740 29.134	P.66

Notes: 1) Note 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.
3) Heat-resistant joint fibers and ordinary-temperature fibers (**FT-42**) are sold as a set.
4) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Thru-beam type (one pair set)

Model No.	Sensing range (mm in) (Note 1) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPER	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FT-R41W	3,200 125.984 3,600 141.732 (Note 2)	1,800 70.866 2,900 114.173	1,400 55.118 1,850 72.835	800 31.496 1,300 51.181	460 18.110 800 31.496	150 5.906 —	250 9.843	710 27.953	P.66
FT-R42W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,200 86.614 3,600 141.732 (Note 2)	1,300 51.181 2,800 110.236	460 18.110 —	510 20.079	2,000 78.740	P.66
FT-R43	3,000 118.110 3,600 141.732 (Note 2)	1,600 62.992 2,650 104.331	1,100 43.307 1,750 68.898	720 28.346 1,250 49.213	430 16.929 750 29.528	130 5.118 —	210 8.268	640 25.197	P.67
FT-R44Y	3,000 118.110 3,600 141.732 (Note 2)	1,600 62.992 2,900 114.173	1,100 43.307 1,800 70.866	720 28.346 1,300 51.181	430 16.929 800 31.496	130 5.118 —	210 8.268	640 25.197	P.67
FT-R60Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,100 82.677 3,600 141.732 (Note 2)	1,260 49.606 1,900 74.803	400 15.748 —	690 27.165	1,890 74.409	P.67
FT-S11	350 13.780 400 15.748	210 8.268 280 11.024	160 6.299 180 7.087	90 3.543 130 5.118	60 2.362 80 3.150	19 0.748 —	40 1.575	90 3.543	P.67
FT-S20	1,350 53.150 1,760 69.291	810 31.890 1,200 47.244	650 25.591 800 31.496	400 15.748 550 21.654	210 8.268 340 13.386	75 2.953 —	135 5.315	400 15.748	P.67
FT-S21	1,350 53.150 1,600 62.992	770 30.315 1,000 39.370	550 21.654 670 26.378	315 12.402 450 17.717	210 8.268 280 11.024	70 2.756 —	130 5.118	340 13.386	P.67
FT-S21W	990 38.976 1,650 64.961	590 23.228 850 33.465	440 17.323 580 22.835	260 10.236 400 15.748	150 5.906 240 9.449	53 2.087 —	80 3.150	240 9.449	P.67
FT-S22	1,500 59.055 2,900 114.173	920 36.220 1,900 74.803	730 28.740 1,200 47.244	450 17.717 870 34.252	250 9.843 530 20.866	90 3.543 —	230 9.055	560 22.047	P.67
FT-S30	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,200 86.614 3,100 122.047	1,700 66.929 2,250 88.583	1,200 47.244 1,650 64.961	530 20.866 1,000 39.370	190 7.480 —	320 12.598	870 34.252	P.67
FT-S31W	3,300 129.921 3,600 141.732 (Note 2)	1,900 74.803 2,450 96.457	1,400 55.118 1,600 62.992	800 31.496 1,100 43.307	490 19.291 650 25.591	160 6.299 —	260 10.236	720 28.346	P.68
FT-S32	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,100 122.047 3,600 141.732 (Note 2)	1,800 70.866 3,000 118.110	600 23.622 —	1,100 43.307	3,000 118.110	P.68
FT-V23	1,800 70.866 2,400 94.488	1,000 39.370 1,600 62.992	880 34.646 1,050 41.339	450 17.717 750 29.528	280 11.024 450 17.717	90 3.543 —	160 6.299	400 15.748	P.68
FT-V24W	380 14.961 500 19.685	230 9.055 350 13.780	200 7.874 220 8.661	110 4.331 160 6.299	60 2.362 95 3.740	20 0.787 —	35 1.378	90 3.543	P.68
FT-V25	900 35.433 1,400 55.118	550 21.654 950 37.402	480 18.898 630 24.803	240 9.449 450 17.717	140 5.512 280 11.024	45 1.772 —	95 3.740	260 10.236	P.68
FT-V30	2,200 86.614 3,600 141.732 (Note 2)	1,200 47.244 1,950 76.772	1,000 39.370 1,300 51.181	680 26.772 950 37.402	340 13.386 550 21.654	100 3.937 —	180 7.087	480 18.898	P.68
FT-V40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,400 94.488 3,600 141.732 (Note 2)	850 33.465 —	1,000 39.370	3,100 122.047	P.68
FT-V80Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,800 110.236 3,600 141.732 (Note 2)	2,200 86.614 3,600 141.732 (Note 2)	1,300 51.181 2,200 86.614	800 31.496 1,400 55.118	240 9.449 —	340 13.386	800 31.496	P.68
FT-Z20HBW	1,100 43.307 1,600 62.992 (Note 2)	670 26.378 1,000 39.370	570 22.441 650 25.591	260 10.236 450 17.717	180 7.087 280 11.024	55 2.165 —	100 3.937	320 12.598	P.68

Notes: 1) Note 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.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Thru-beam type (one pair set)

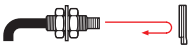
Model No.	Sensing range (mm in) (Note 1) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPER	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FT-Z20W	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,500 59.055 1,600 62.992 (Note 2)	1,100 43.307 1,600 62.992 (Note 2)	620 24.409 1,100 43.307	420 16.535 650 25.591	130 5.118 —	280 11.024	730 28.740	P.68
FT-Z30	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,100 82.677 3,600 141.732 (Note 2)	1,200 47.244 2,200 86.614	410 16.142 —	710 27.953	2,300 90.551	P.68
FT-Z30E	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,400 94.488 3,600 141.732 (Note 2)	740 29.134 —	1,200 47.244	3,200 125.984	P.69
FT-Z30EW	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,400 133.858 3,600 141.732 (Note 2)	2,000 78.740 3,600 141.732 (Note 2)	630 24.803 —	1,400 55.118	2,600 102.362	P.69
FT-Z30H	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,600 102.362 3,600 141.732 (Note 2)	810 31.890 —	1,400 55.118	3,200 125.984	P.69
FT-Z30HW	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,600 102.362 3,600 141.732 (Note 2)	810 31.890 —	1,400 55.118	3,200 125.984	P.69
FT-Z30W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,300 129.921 3,600 141.732 (Note 2)	3,200 125.984 3,600 141.732 (Note 2)	1,500 59.055 2,800 110.236	1,000 39.370 1,700 66.929	280 11.024 —	540 21.260	1,800 70.866	P.69
FT-Z40HBW	3,300 129.921 3,600 141.732 (Note 2)	1,900 74.803 2,700 106.299	1,400 55.118 1,850 72.835	800 31.496 1,300 51.181	490 19.291 750 29.528	160 6.299 —	260 10.236	720 28.346	P.69
FT-Z40W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,300 129.921 3,600 141.732 (Note 2)	2,300 90.551 2,800 110.236	1,500 59.055 2,000 78.740	900 35.433 1,200 47.244	290 11.417 —	410 16.142	1,200 47.244	P.69
FT-Z802Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,100 122.047 3,600 141.732 (Note 2)	1,900 74.803 3,600 141.732 (Note 2)	470 18.504 —	520 20.472	3,100 122.047	P.69

Notes: 1) Note 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.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Retroreflective type



Model No.	Sensing range (mm in) (Note 1, 2)								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPER	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FR-KZ22E	15 to 570 0.591 to 22.441 15 to 800 0.591 to 31.496	15 to 460 0.591 to 18.110 15 to 700 0.591 to 27.559	15 to 410 0.591 to 16.142 15 to 600 0.591 to 23.622	15 to 310 0.591 to 12.205 15 to 540 0.591 to 21.260	15 to 220 0.591 to 8.661 15 to 400 0.591 to 15.748	15 to 100 0.591 to 3.937 —	15 to 200 0.591 to 7.874	15 to 360 0.591 to 14.173	P.70
FR-KZ50E	20 to 1,000 0.787 to 39.370 20 to 1,600 0.787 to 62.992	20 to 800 0.787 to 31.496 20 to 1,300 0.787 to 51.181	20 to 400 0.787 to 15.748 20 to 500 0.787 to 19.685	20 to 300 0.787 to 11.811 20 to 400 0.787 to 15.748	20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780	20 to 200 0.787 to 7.874 —	20 to 200 0.787 to 7.874	20 to 350 0.787 to 13.780	P.70
FR-KZ50H	20 to 1,000 0.787 to 39.370 20 to 1,600 0.787 to 62.992	20 to 800 0.787 to 31.496 20 to 1,300 0.787 to 51.181	20 to 400 0.787 to 15.748 20 to 500 0.787 to 19.685	20 to 300 0.787 to 11.811 20 to 400 0.787 to 15.748	20 to 200 0.787 to 7.874 20 to 350 0.787 to 13.780	20 to 200 0.787 to 7.874 —	20 to 200 0.787 to 7.874	20 to 350 0.787 to 13.780	P.70
FR-Z50HW	100 to 1,900 3.937 to 74.803 100 to 2,250 3.937 to 88.583	100 to 1,400 3.937 to 55.118 100 to 1,800 3.937 to 70.866	100 to 1,200 3.937 to 47.244 100 to 1,400 3.937 to 55.118	100 to 990 3.937 to 38.976 100 to 1,150 3.937 to 45.276	100 to 780 3.937 to 30.709 100 to 950 3.937 to 37.402	100 to 490 3.937 to 19.291 —	100 to 550 3.937 to 21.654	100 to 830 3.937 to 32.677	P.70

Notes: 1) Note 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-KZ22E** is specified for the attached reflector. The sensing range of **FR-KZ50E** and **FR-KZ50H** is specified for the attached reflector **RF-003**. The sensing range of **FR-Z50HW** is specified for the attached reflective tape **RF-13**.
2) The sensing range of retroreflective type is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector. 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.

Sensing range when FR-Z50HW is used in combination with a reflector (optional)

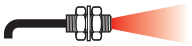
Reflector Model No.	Sensing range (mm in)							
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series	
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**
RF-230	100 to 19,000 3.937 to 748.03 100 to 20,000 3.937 to 787.402	100 to 8,000 3.937 to 314.960 100 to 11,000 3.937 to 433.071	100 to 5,000 3.937 to 196.850 100 to 7,000 3.937 to 275.591	100 to 3,600 3.937 to 141.732 100 to 5,000 3.937 to 196.850	100 to 2,900 3.937 to 114.173 100 to 3,500 3.937 to 137.795	100 to 1,400 3.937 to 55.118 —	100 to 2,400 3.937 to 94.488	100 to 5,000 3.937 to 196.850
RF-220	100 to 8,000 3.937 to 314.960 100 to 10,000 3.937 to 393.701	100 to 4,700 3.937 to 185.039 100 to 6,500 3.937 to 255.906	100 to 3,500 3.937 to 137.795 100 to 4,500 3.937 to 177.165	100 to 3,000 3.937 to 118.110 100 to 3,500 3.937 to 137.795	100 to 1,800 3.937 to 70.866 100 to 2,500 3.937 to 98.425	100 to 830 3.937 to 32.677 —	100 to 1,300 3.937 to 51.181	100 to 2,600 3.937 to 102.362
RF-210	100 to 5,500 3.937 to 216.535 100 to 7,000 3.937 to 275.591	100 to 2,700 3.937 to 106.299 100 to 4,000 3.937 to 157.480	100 to 2,400 3.937 to 94.488 100 to 3,600 3.937 to 141.732	100 to 1,500 3.937 to 59.055 100 to 2,800 3.937 to110.236	100 to 1,200 3.937 to 47.244 100 to 2,100 3.937 to 82.677	100 to 530 3.937 to 20.866 —	100 to 980 3.937 to 38.583	100 to 1,300 3.937 to 51.181

Note: The sensing range is the possible setting range for the reflector. The fiber can detect an object less than 100 mm 3.937 in. 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.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Reflective type



Model No.	Sensing range (mm in) (Note 1, 2) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FD-30	600 23.622 800 31.496	330 12.992 460 18.110	250 9.843 330 12.992	160 6.299 210 8.268	80 3.150 140 5.512	25 0.984 —	45 1.772	155 6.102	P.71
FD-31	515 20.276 750 29.528	290 11.417 450 17.717	220 8.661 310 12.205	125 4.921 200 7.874	80 3.150 140 5.512	25 0.984 —	35 1.378	140 5.512	P.71
FD-31W	330 12.992 480 18.898	180 7.087 310 12.205	140 5.512 190 7.480	80 3.150 130 5.118	45 1.772 80 3.150	12 0.472 —	15 0.591	60 2.362	P.71
FD-32G	650 25.591 1,150 45.276	380 14.961 730 28.740	270 10.630 420 16.535	200 7.874 320 12.598	95 3.740 170 6.693	27 1.063 —	70 2.756	190 7.480	P.71
FD-32GX	630 24.803 1,350 53.150	410 16.142 730 28.740	360 14.173 490 19.291	200 7.874 320 12.598	100 3.937 180 7.087	30 1.181 —	75 2.953	210 8.268	P.71
FD-34G	330 12.992 480 18.898	185 7.283 310 12.205	135 5.305 180 7.087	90 3.543 130 5.118	49 1.929 80 3.150	15 0.591 —	29 1.142	90 3.543	P.71
FD-40	600 23.622 800 31.496	330 12.992 460 18.110	250 9.843 330 12.992	160 6.299 210 8.268	80 3.150 140 5.512	25 0.984 —	45 1.772	155 6.102	P.71
FD-41	515 20.276 750 29.528	290 11.417 450 17.717	220 8.661 310 12.205	125 4.921 200 7.874	80 3.150 140 5.512	25 0.984 —	35 1.378	140 5.512	P.71
FD-41S	515 20.276 750 29.528	290 11.417 450 17.717	220 8.661 310 12.205	125 4.921 200 7.874	80 3.150 140 5.512	25 0.984 —	35 1.378	140 5.512	P.71
FD-41SW	330 12.992 480 18.898	180 7.087 310 12.205	140 5.512 190 7.480	80 3.150 130 5.118	45 1.772 80 3.150	12 0.472 —	15 0.591	60 2.362	P.71
FD-41W	900 35.433 1,400 55.118	630 24.803 1,000 39.370	430 16.929 680 26.772	270 10.630 480 18.898	150 5.906 270 10.630	45 1.772 —	80 3.150	230 9.055	P.72
FD-42G	650 25.591 1,150 45.276	380 14.961 730 28.740	270 10.630 420 16.535	200 7.874 320 12.598	95 3.740 170 6.693	27 1.063 —	70 2.756	190 7.480	P.72
FD-42GW	670 26.378 950 37.402	340 13.386 540 21.260	280 11.024 330 12.992	150 5.906 210 8.268	90 3.543 130 5.118	25 0.984 —	45 1.772	140 5.512	P.72
FD-60	1,550 61.024 1,750 68.898	900 35.433 1,300 51.181	740 29.134 970 38.189	520 20.472 750 29.528	260 10.236 420 16.535	90 3.543 —	140 5.512	420 16.535	P.72
FD-61	1,400 55.118 1,630 64.173	840 33.071 1,180 46.457	670 26.378 870 34.252	450 17.717 620 24.409	200 7.874 380 14.961	70 2.756 —	120 4.724	410 16.142	P.72
FD-61G	1,100 43.307 1,350 53.150	800 31.496 1,200 47.244	650 25.591 850 33.465	420 16.535 600 23.622	200 7.874 350 13.780	60 2.362 —	120 4.724	350 13.780	P.72
FD-61S	1,200 47.244 1,900 74.803	790 31.102 1,300 51.181	660 25.984 900 35.433	420 16.535 650 25.591	220 8.661 400 15.748	75 2.953 —	130 5.118	360 14.173	P.72
FD-61W	900 35.433 1,400 55.118	630 24.803 1,000 39.370	430 16.929 680 26.772	270 10.630 480 18.898	150 5.906 270 10.630	45 1.772 —	80 3.150	230 9.055	P.73

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Reflective type

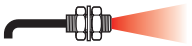
Model No.	Sensing range (mm in) (Note 1, 2) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FD-62	1,500 59.055 1,950 76.772	1,000 39.370 1,450 57.087	940 37.008 1,140 44.882	520 20.472 880 34.646	340 13.386 550 21.654	110 4.331 —	170 6.693	450 17.717	P.73
FD-64X	670 26.378 1,200 47.244	500 19.685 700 27.559	410 16.142 590 23.228	280 11.024 410 16.142	160 6.299 230 9.055	50 1.969 —	75 2.953	220 8.661	P.73
FD-A16	— —	200 7.874 —	200 7.874 350 13.780	200 7.874 350 13.780	140 5.512 250 9.843	75 2.953 —	120 4.724	240 9.449	P.73
FD-AL11	670 26.378 1,300 51.181	530 20.866 1,000 39.370	510 20.079 700 27.560	320 12.598 450 17.717	180 7.087 320 12.598	50 1.969 —	100 3.937	285 11.220	P.73
FD-E13	50 1.969 75 2.953	29 1.142 50 1.969	25 0.984 30 1.181	12 0.472 23 0.906	7 0.276 12 0.472	2 0.079 —	5 0.197	15 0.591	P.73
FD-E23	170 6.693 290 11.417	120 4.724 170 6.693	80 3.150 105 4.134	55 2.165 80 3.150	30 1.181 45 1.772	9 0.354 —	20 0.787	70 2.756	P.73
FD-EG30	170 6.693 320 12.598	130 5.118 190 7.480	110 4.331 120 4.724	48 1.890 90 3.543	30 1.181 50 1.969	9 0.354 —	20 0.787	70 2.756	P.73
FD-EG30S	170 6.693 320 12.598	110 4.331 190 7.480	80 3.150 120 4.724	50 1.969 90 3.543	30 1.181 50 1.969	9 0.354 —	20 0.787	70 2.756	P.74
FD-EG31	85 3.346 120 4.724	45 1.772 70 2.756	35 1.378 45 1.772	20 0.787 35 1.378	12 0.472 20 0.787	3.5 0.138 —	7 0.276	25 0.984	P.74
FD-F4	Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm 0.039 in] Liquid absent: Beam received, Liquid present: Beam not received								P.74
FD-F41	Applicable pipe diameter: Outer dia. ø6 to ø26 mm ø0.236 to ø1.024 in transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm 0.039 to 0.118 in] Liquid absent: Beam received, Liquid present: Beam not received								P.74
FD-F41Y (Note 3)	ø4 mm ø0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received								P.74
FD-F71	Liquid leak detection Leak absent: Beam received, Leak present: Beam not received Compatible amplifier: **FX-500** / **FX-550** series only								P.74
FD-F8Y	ø6 mm ø0.236 in Protective tube: Fluorine resin, length 1,000 mm 39.370 in (not cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received								P.74
FD-FA93	Applicable pipe diameter: Outer dia. ø8 mm ø0.315 in or more transparent pipe (When used with the tying bands: ø8 to ø80 mm ø0.315 to ø3.150 in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam not received								P.74
FD-H13-FM2	880 34.646 1,650 64.961	640 25.197 1,300 51.181	600 23.622 940 37.008	350 13.780 670 26.378	200 7.874 390 15.354	65 2.559 —	100 3.937	280 11.024	P.75
FD-H18-L31	0 to 60 0 to 2.362 0 to 130 0 to 5.118	0 to 32 0 to 1.260 0 to 85 0 to 3.346	0 to 24 0 to 0.945 0 to 60 0 to 2.362	0 to 16 0 to 0.630 0 to 45 0 to 1.772	0 to 13 0 to 0.512 0 to 30 0 to 1.181	2 to 6.5 0.079 to 0.256 —	0 to 10 0 to 0.394	0 to 25 0 to 0.984	P.75
FD-H20-21	770 30.315 1,250 49.213	500 19.685 850 33.465	380 14.961 650 25.591	230 9.055 450 17.717	130 5.118 250 9.843	45 1.772 —	90 3.543	280 11.024	P.75

Notes: 1) Note 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 sensing range is specified for white non-glossy paper (as for **FD-H18-L31** 50 × 50 mm 1.969 × 1.969 in glass substrate).
3) Liquid inflow prevention joint, protective tube extension joint, fiber mounting joint are available. Please refer to p.42 for details.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Reflective type



Model No.	Sensing range (mm in) (Note 1, 2) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FD-H20-M1	840 33.071 1,350 53.150	550 21.654 1,000 39.370	500 19.685 650 25.591	330 12.992 450 17.717	200 7.874 300 11.811	55 2.165 —	120 4.724	300 11.811	P.75
FD-H25-L43 (Note 3)	1 to 31 0.039 to 1.220 1 to 31 0.039 to 1.220	1 to 30 0.039 to 1.181 1 to 30 0.039 to 1.181	1 to 28 0.039 to 1.102 1 to 29 0.039 to 1.142	1.5 to 26 0.059 to 1.024 1 to 28 0.039 to 1.102	1.5 to 24 0.059 to 0.945 1 to 26 0.039 to 1.024	2 to 18 0.079 to 0.709 —	4 to 16 0.157 to 0.630	4 to 23 0.157 to 0.906	P.75
FD-H25-L45 (Note 3)	4 to 43.5 0.157 to 1.713 4 to 51 0.157 to 2.008	4 to 43 0.157 to 1.693 4 to 50 0.157 to 1.969	4.5 to 43 0.177 to 1.693 4 to 49 0.157 to 1.929	5 to 42 0.197 to 1.654 4 to 48 0.157 to 1.890	5 to 40 0.197 to 1.575 4 to 44 0.157 to 1.732	6.5 to 34 0.256 to 1.339 —	7 to 35 0.276 to 1.378	7 to 38 0.276 to 1.496	P.75
FD-H30-KZ1V-S (Note 3, 4)	5 to 500 0.197 to 19.685 5 to 1,500 0.197 to 59.055	10 to 340 0.394 to 13.386 10 to 1,000 0.394 to 39.370	15 to 270 0.591 to 10.630 15 to 650 0.591 to 25.591	20 to 200 0.787 to 7.874 20 to 450 0.787 to 17.717	20 to120 0.787 to 4.724 20 to 300 0.787 to 11.811	20 to 45 0.787 to 1.772 —	25 to 80 0.984 to 3.150	10 to 220 0.394 to 8.661	P.76
FD-H30-L32	0 to 40 0 to 1.575 0 to 60 0 to 2.362	0 to 30 0 to 1.181 0 to 42 0 to 1.654	0 to 25 0 to 0.984 0 to 25 0 to 0.984	0 to 17 0 to 0.669 0 to 21 0 to 0.827	0 to 12 0 to 0.472 0 to 16 0 to 0.630	1.5 to 6 0.059 to 0.236 —	2 to 9 0.079 to 0.354	0 to 17 0 to 0.669	P.76
FD-H30-L32V-S (Note 3, 4)	0 to 18 0 to 0.709 0 to 27 0 to 1.063	0 to 12 0 to 0.472 0 to 19 0 to 0.748	0 to 10 0 to 0.394 0 to 13 0 to 0.512	0 to 8 0 to 0.315 0 to 11 0 to 0.433	0 to 5.5 0 to 0.217 0 to 7.5 0 to 0.295	1.5 to 3 0.059 to 0.118 —	2.5 to 6.5 0.098 to 0.256	0 to11 0 to 0.433	P.76
FD-H35-20S	840 33.071 850 33.465	550 21.654 750 29.528	440 17.323 550 21.654	260 10.236 410 16.142	140 5.512 230 9.055	45 1.772 —	85 3.346	200 7.874	P.76
FD-H35-M2	720 28.346 750 29.528	540 21.260 600 23.622	460 18.110 500 19.685	260 10.236 400 15.748	150 5.906 220 8.661	45 1.772 —	75 2.953	280 11.024	P.76
FD-H35-M2S6	720 28.346 750 29.528	540 21.260 600 23.622	460 18.110 500 19.685	260 10.236 400 15.748	150 5.906 220 8.661	45 1.772 —	75 2.953	280 11.024	P.76
FD-HF40Y (Note 5)	ø4 mm ø0.157 in Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received								P.76
FD-L10 (Note 3)	0 to 6 0 to 0.236 0 to 6 0 to 0.236	0 to 5.5 0 to 0.217 0 to 5.5 0 to 0.217	0 to 5.5 0 to 0.217 0 to 5.5 0 to 0.217	0 to 5 0 to 0.197 0 to 5 0 to 0.197	0 to 4.5 0 to 0.177 0 to 5 0 to 0.197	0 to 4 0 to 0.157 —	0 to 4.5 0 to 0.177	0 to 5.5 0 to 0.217	P.77
FD-L11 (Note 3)	0 to 11.5 0 to 0.453 0 to 14 0 to 0.551	0 to 10.5 0 to 0.413 0 to 13 0 to 0.512	0 to 10 0 to 0.394 0 to 13 0 to 0.512	0 to 9.5 0 to 0.374 0 to 13 0 to 0.512	0 to 9 0 to 0.354 0 to 12 0 to 0.472	0 to 8 0 to 0.315 —	0 to 8 0 to 0.315	0 to 9 0 to 0.354	P.77
FD-L12W (Note 3)	0 to 14 0 to 0.551 0 to 17 0 to 0.669	0 to 12.5 0 to 0.492 0 to 16 0 to 0.630	0 to 12 0 to 0.472 0 to 15 0 to 0.591	0 to 8 0 to 0.315 0 to 12 0 to 0.472	0.5 to 7 0.020 to 0.276 0 to 10 0 to 0.394	0.5 to 4 0.020 to 0.157 —	1 to 4.5 0.039 to 0.177	0.5 to 7 0.020 to 0.276	P.77
FD-L20H	0 to 45 0 to 1.772 0 to 65 0 to 2.559	0 to 35 0 to 1.378 0 to 50 0 to 1.969	0 to 32 0 to 1.260 0 to 40 0 to 1.575	0 to 23 0 to 0.906 0 to 33 0 to 1.299	2 to 15 0.079 to 0.591 0 to 25 0 to 0.984	5 to 9 0.197 to 0.354 —	5 to 15 0.197 to 0.591	1 to 30 0.039 to 1.181	P.77
FD-L21 (Note 3)	1 to 19 0.039 to 0.748 1 to 20 0.039 to 0.787	1 to 18 0.039 to 0.709 1 to 20 0.039 to 0.787	1 to 18 0.039 to 0.709 1 to 19 0.039 to 0.748	1.5 to 16 0.059 to 0.630 1 to 19 0.039 to 0.748	2 to 15 0.079 to 0.591 2 to 18 0.079 to 0.709	3 to 12 0.118 to 0.472 —	3 to 15 0.118 to 0.591	1.5 to 16 0.059 to 0.630	P.77
FD-L21W (Note 3)	1.5 to 15 0.059 to 0.591 1 to 19 0.039 to 0.748	2 to 15 0.079 to 0.591 1 to 19 0.039 to 0.748	2 to 15 0.079 to 0.591 2 to 18 0.079 to 0.709	3 to 14 0.118 to 0.551 2 to 18 0.079 to 0.709	4 to 14 0.158 to 0.551 3 to 17 0.118 to 0.669	6.5 to 10 0.256 to 0.394 —	7 to 12 0.276 to 0.472	3 to 14 0.118 to 0.551	P.77
FD-L22A (Note 3)	0 to 31 0 to 1.220 0 to 35 0 to 1.378	0 to 28 0 to 1.102 0 to 35 0 to 1.378	0 to 27 0 to 1.063 0 to 35 0 to 1.378	0 to 24 0 to 0.945 0 to 34 0 to 1.339	0 to 24 0 to 0.945 0 to 32 0 to 1.260	0 to 18 0 to 0.709 —	0 to 19 0 to 0.748	0 to 25 0 to 0.984	P.77

Notes: 1) Note 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 sensing range is the value for white non-glossy paper (as for **FD-H30-L32** 50 × 50 mm 1.969 × 1.969 in glass substrate).
3) The sensing range is specified for transparent glass 100 × 100 × t0.7 mm 3.937 × 3.937 × t0.028 in (**FD-L21** and **FD-L21W**: t2 mm t0.079 in) [**FD-L10**: silicon wafers 100 × 100 mm 3.937 × 3.937 in].
4) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).
5) Liquid inflow prevention joint, protective tube extension joint, fiber mounting joint are available. Please refer to p.42 for details.

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Reflective type

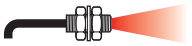
Model No.	Sensing range (mm in) (Note 1, 2) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FD-L23 (Note 3)	0 to 30 0 to 1.181 0 to 34 0 to 1.339	0 to 30 0 to 1.181 0 to 34 0 to 1.339	0 to 30 0 to 1.181 0 to 34 0 to 1.339	0 to 29 0 to 1.142 0 to 34 0 to 1.339	0 to 28 0 to 1.102 0 to 32 0 to 1.260	1.5 to 24 0.059 to 0.945 — —	0 to 28 0 to 1.102	0 to 30 0 to 1.181	P.77
FD-L30A (Note 3)	0 to 43 0 to 1.693 0 to 72 0 to 2.835	0 to 43 0 to 1.693 0 to 68 0 to 2.677	0 to 43 0 to 1.693 0 to 62 0 to 2.441	0 to 43 0 to 1.693 0 to 52 0 to 2.047	0 to 42 0 to 1.654 0 to 46 0 to 1.811	0 to 29 0 to 1.142 — —	0 to 40 0 to 1.575	0 to 50 0 to 1.969	P.77
FD-L31A (Note 3)	3 to 35 0.118 to 1.378 0 to 50 0 to 1.969	4 to 33 0.157 to 1.299 2 to 43 0.079 to 1.693	4 to 33 0.157 to 1.299 3 to 42 0.118 to 1.654	4 to 33 0.157 to 1.299 3 to 42 0.118 to 1.654	4 to 32 0.157 to 1.260 3 to 40 0.118 to 1.575	5 to 25 0.197 to 0.984 — —	5 to 30 0.197 to 1.181	4 to 33 0.157 to 1.299	P.77
FD-L32H (Note 3)	0 to 110 0 to 4.331 0 to 100 0 to 3.937	0 to 87 0 to 3.425 0 to 90 0 to 3.543	0 to 74 0 to 2.913 0 to 75 0 to 2.953	0 to 56 0 to 2.205 0 to 65 0 to 2.559	1 to 38 0.039 to 1.496 0 to 50 0 to 1.969	— — — —	16 to 30 0.630 to 1.181	0 to 50 0 to 1.969	P.78
FD-R31G	530 20.866 900 35.433	310 12.205 600 23.622	260 10.236 400 15.748	170 6.693 290 11.417	85 3.346 160 6.299	27 1.063 — —	45 1.772	150 5.906	P.78
FD-R32EG	170 6.693 290 11.417	110 4.331 180 7.087	92 3.622 110 4.331	45 1.772 80 3.150	30 1.181 45 1.772	9 0.354 — —	20 0.787	68 2.677	P.78
FD-R33EG	84 3.307 110 4.331	44 1.732 65 2.559	33 1.299 40 1.575	19 0.748 30 1.181	11 0.433 18 0.709	3 0.118 — —	7 0.276	22 0.866	P.78
FD-R34EG	130 5.118 250 9.843	90 3.543 140 5.512	70 2.756 90 3.543	38 1.496 70 2.756	23 0.906 40 1.575	7 0.276 — —	17 0.669	60 2.362	P.78
FD-R41	710 27.953 1,150 45.276	430 16.929 750 29.528	320 12.598 450 17.717	210 8.268 340 13.386	100 3.937 190 7.480	34 1.339 — —	60 2.362	170 6.693	P.78
FD-R60	1,100 43.307 1,450 57.087	600 23.622 1,150 45.276	550 21.654 800 31.496	290 11.417 500 19.685	190 7.480 350 13.780	65 2.559 — —	110 4.331	240 9.449	P.78
FD-R61Y	990 38.976 1,350 53.150	610 24.016 1,000 39.370	435 17.126 650 25.591	280 11.024 450 17.717	160 6.299 250 9.843	50 1.969 — —	85 3.346	185 7.283	P.78
FD-S21	190 7.480 175 6.890	130 5.118 130 5.118	110 4.331 110 4.331	80 3.150 85 3.346	37 1.457 50 1.969	11 0.433 — —	25 0.984	70 2.756	P.78
FD-S30	600 23.622 800 31.496	330 12.992 500 19.685	250 9.843 330 12.992	160 6.299 220 8.661	80 3.150 140 5.512	25 0.984 — —	45 1.772	155 6.102	P.79
FD-S31	515 20.276 700 27.559	290 11.417 450 17.717	220 8.661 300 11.811	125 4.921 200 7.874	80 3.150 130 5.118	25 0.984 — —	35 1.378	140 5.512	P.79
FD-S32	1,200 47.244 1,600 62.992	790 31.102 1,200 47.244	660 25.984 900 35.433	420 16.535 600 23.622	220 8.661 350 13.780	75 2.953 — —	120 4.724	345 13.583	P.79
FD-S32W	900 35.433 1,400 55.118	630 24.803 1,000 39.370	430 16.929 650 25.591	270 10.630 450 17.717	150 5.906 250 9.843	45 1.772 — —	80 3.150	230 9.055	P.79
FD-S33GW	670 26.378 880 34.646	340 13.386 550 22.047	280 11.024 370 14.567	150 5.906 240 9.449	90 3.543 150 5.906	25 0.984 — —	45 1.772	140 5.512	P.79
FD-S34G	330 12.992 480 18.898	185 7.283 310 12.205	135 5.305 180 7.087	90 3.543 130 5.118	49 1.929 80 3.150	15 0.591 — —	29 1.142	90 3.543	P.79
FD-S60Y	600 23.622 —	590 23.228 700 27.559	420 16.535 550 21.654	320 12.598 450 17.717	200 7.874 380 14.961	75 2.953 —	140 5.512	300 11.811	P.79

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.
3) The sensing range is specified for transparent glass 100 × 100 × t0.7 mm 3.937× 3.937 × t0.028 in (**FD-L32H**: R edge)

SENSING RANGE

Fibers are listed in alphabetic order.
Refer to p.5~ for details of each fiber.

Reflective type



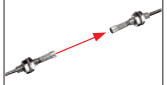
Model No.	Sensing range (mm in) (Note 1, 2) / Description								Dimensions
	FX-500 series (Upper value) **FX-550** series (Lower value)						**FX-100** series		
	HYPR	U-LG	LONG	STD	FAST	H-SP	**FX-101**	**FX-102**	
FD-V30	240 9.449 430 16.929	130 5.118 210 8.268	120 4.724 145 5.709	65 2.559 90 3.543	35 1.378 65 2.559	14 0.551 — —	25 0.984	75 2.953	P.79
FD-V30W	80 3.150 120 4.724	40 1.575 65 2.559	30 1.181 37 1.457	20 0.787 30 1.181	10 0.394 16 0.630	2 0.079 — —	6 0.236	20 0.787	P.80
FD-V50	370 14.567 530 20.866	220 8.661 400 15.748	210 8.268 240 9.449	120 4.724 180 7.087	75 2.953 110 4.331	25 0.984 — —	40 1.575	100 3.937	P.80
FD-Z20HBW	1 to 340 0.039 to 13.386 550 21.654	1 to 210 0.039 t 8.268 370 14.567	1 to 180 0.039 to 7.087 240 9.449	2 to 85 0.079 to 3.346 170 6.693	2 to 55 0.079 to 2.165 100 3.937	3 to 15 0.118 to 0.591 — —	2 to 30 0.079 to 1.181	1 to 90 0.039 to 3.543	P.80
FD-Z20W	260 10.236 450 17.717	150 5.906 290 11.417	130 5.118 190 7.480	1 to 65 0.039 to 2.559 130 5.118	2 to 45 0.079 to 1.772 80 3.150	5 to 13 0.197 to 0.512 — —	2 to 32 0.079 to 1.260	1 to 80 0.039 to 3.150	P.80
FD-Z40HBW	760 29.921 1,350 53.150	540 21.260 1,000 39.370	470 18.504 680 26.772	260 10.236 480 18.898	1 to 160 0.039 to 6.299 270 10.630	2 to 50 0.079 to 1.969 — —	1 to 90 0.039 to 3.543	0.5 to 240 0.020 to 9.449	P.80
FD-Z40W	790 31.102 1,500 59.055	440 17.323 950 37.402	390 15.354 510 20.079	190 7.480 390 15.354	1 to 120 0.039 to 4.724 230 9.055	2 to 35 0.079 to 1.378 — —	1 to 74 0.039 to 2.913	200 7.874	P.80
FD-Z50HW	10 to 2,500 0.394 to 98.425 10 to 3,700 0.394 to 145.669	10 to 1,100 0.394 to 43.307 10 to 2,100 0.394 to 82.677	10 to 1,000 0.394 to 39.370 10 to 1,300 0.394 to 51.181	10 to 650 0.394 to 25.591 10 to 950 0.394 to 37.402	10 to 410 0.394 to 16.142 10 to 590 0.394 to 23.228	15 to 130 0.591 to 5.118 — —	10 to 200 0.394 to 7.874	10 to 530 0.394 to 20.866	P.80

Notes: 1) Note 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 sensing range is specified for white non-glossy paper.

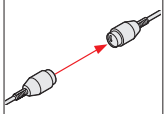
FIBER OPTIONS

Refer to p.81~ for details of lens dimensions.

Lens (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 (Note 3) • Beam dia: ø3.6 mm ø0.142 in Sensing range (mm in) [Lens on both sides]

Fiber \ Amplifier / Mode	FX-500 series (Upper value) FX-550 series (Lower value) HYPR	U-LG	LONG	STD	FAST	H-SP	FX-100 series FX-101	FX-102
FT-43	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,600 62.992 —	2,400 94.488	3,600 141.732 (Note 2)
FT-42 FT-42W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,200 86.614 —	3,400 133.858	3,600 141.732 (Note 2)
FT-45X	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,500 59.055 —	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-R40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,900 74.803 —	3,100 122.047	3,600 141.732 (Note 2)
FT-R43 FT-R44Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	1,900 74.803 3,600 141.732 (Note 2)	670 26.378 —	1,300 51.181	3,600 141.732 (Note 2)
FT-H35-M2	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,300 129.921 3,600 141.732 (Note 2)	1,400 55.118 —	2,000 78.740	3,500 137.795 (Note 2)
FT-H20W-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	850 33.465 —	1,300 51.181	1,600 62.992 (Note 2)
FT-H20-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,200 47.244 —	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,000 78.740 3,600 141.732 (Note 2)	1,600 62.992 3,600 141.732 (Note 2)	500 19.685 —	1,000 39.370	3,500 137.795 (Note 2)

Designation	Model No.		Description
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 (Note 3) • Beam dia: ø9.8 mm ø0.386 in Sensing range (mm in) [Lens on both sides]

Fiber \ Amplifier / Mode	FX-500 series (Upper value) FX-550 series (Lower value) HYPR	U-LG	LONG	STD	FAST	H-SP	FX-100 series FX-101	FX-102
FT-43 FT-42 FT-42W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)
FT-45X	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) —	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-R40	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)
FT-R41W FT-R43 FT-R44Y	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)
FT-H35-M2	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)
FT-H20W-M1 FT-H20-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) —	1,600 62.992 (Note 2)	1,600 62.992 (Note 2)
FT-H13-FM2	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) —	3,500 137.795 (Note 2)	3,500 137.795 (Note 2)

Notes: 1) Be careful sure to use it only after you have adjusted it sufficiently when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult.
2) The fiber cable length practically limits the sensing range.
3) Refer to p.15, p.18, p.34, and p.37 for the ambient temperature of fibers to be used in combination.

FIBER OPTIONS

Refer to p.81~ for details of lens dimensions.

Lens (For thru-beam type fiber)

Side-view lens — FX-SV1

Beam axis is bent by 90°.
• Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 4) • Beam dia: ø2.8 mm ø0.110 in
Sensing range (mm in) [Lens on both sides]

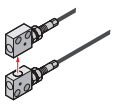
Fiber \ Amplifier / Mode	FX-500 series (Upper value) FX-550 series (Lower value) HYPR	U-LG	LONG	STD	FAST	H-SP	FX-100 series FX-101	FX-102
FT-43	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,400 133.858 3,600 141.732 (Note 2)	2,600 102.362 3,600 141.732 (Note 2)	1,700 66.929 2,300 90.551	970 38.189 1,400 55.118	310 12.205 —	510 20.079	1,400 55.118
FT-42	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	2,100 82.677 2,800 110.236	1,150 45.276 1,700 66.929	370 14.567 —	500 19.685	1,700 66.929
FT-42W	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,500 137.795 3,600 141.732 (Note 2)	2,700 106.299 3,600 141.732 (Note 2)	1,800 70.866 2,300 90.551	990 38.976 1,400 55.118	320 12.598 —	480 18.898	1,300 51.181
FT-45X	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,400 55.118 1,600 62.992 (Note 2)	800 31.496 1,600 62.992 (Note 2)	210 8.268 —	540 21.260	1,600 62.992 (Note 2)
FT-R43	3,200 125.984 3,600 141.732 (Note 2)	1,800 70.866 3,600 141.732 (Note 2)	1,300 51.181 2,700 106.299	950 37.402 1,900 74.803	510 20.079 1,200 47.244	160 6.299 —	310 12.205	930 36.614
FT-R44Y	3,200 125.984 3,600 141.732 (Note 2)	1,800 70.866 3,600 141.732 (Note 2)	1,300 51.181 3,200 125.984	950 37.402 2,200 86.614	510 20.079 1,400 55.118	160 6.299 —	310 12.205	930 36.614
FT-H35-M2	3,500 137.795 3,600 141.732 (Note 2)	1,600 62.992 2,800 110.236	1,200 47.244 1,800 70.866	780 30.709 1,300 51.181	500 19.685 750 29.528	150 5.906 —	280 11.024	800 31.496
FT-H20W-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,500 59.055 1,600 62.992 (Note 2)	950 37.402 1,250 49.213	560 22.047 690 27.165	190 7.480 —	140 5.512	400 15.748
FT-H20-M1	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,600 62.992 (Note 2) 1,600 62.992 (Note 2)	1,300 51.181 1,600 62.992 (Note 2)	780 30.709 1,600 62.992 (Note 2)	500 19.685 800 31.496	150 5.906 —	280 11.024	840 33.071
FT-H20-J50-S **FT-H20-J30-S** **FT-H20-J20-S**	1,600 62.992 (Note 2) 3,600 141.732 (Note 2)	960 37.795 2,400 94.488	740 29.134 1,500 59.055	450 17.717 1,100 43.307	290 11.417 680 26.771	80 3.150 —	150 5.906	410 16.142

Expansion lens for vacuum fiber (Note 1) — FV-LE1

Sensing range increases by 4 times or more.
• Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 4) • Beam dia: ø3.6 mm ø0.142 in
Sensing range (mm in) [Lens on both sides] (Note 3)

Fiber \ Amplifier / Mode	FX-500 series (Upper value) FX-550 series (Lower value) HYPR	U-LG	LONG	STD	FAST	H-SP	FX-100 series FX-101	FX-102
FT-H30-M1V-S	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,400 133.858 3,600 141.732 (Note 2)	1,500 59.055 2,500 98.425	900 35.433 1,650 64.961	370 14.567 —	450 17.717	1,600 62.992

Vacuum-resistant side-view lens (Note 1) — FV-SV2



Beam axis is bent by 90°.
• Ambient temperature: -60 to +300 °C -76 to +572 °F (Note 4) • Beam dia: ø3.7 mm ø0.146 in
Sensing range (mm in) [Lens on both sides] (Note 3)

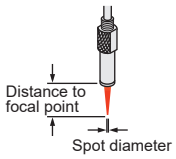
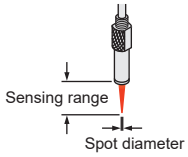
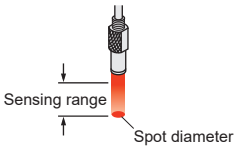
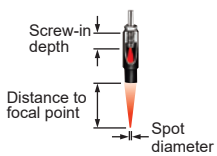
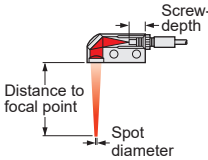
Fiber \ Amplifier / Mode	FX-500 series (Upper value) FX-550 series (Lower value) HYPR	U-LG	LONG	STD	FAST	H-SP	FX-100 series FX-101	FX-102
FT-H30-M1V-S	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,600 141.732 (Note 2) 3,600 141.732 (Note 2)	3,400 133.858 3,600 141.732 (Note 2)	1,500 59.055 1,800 70.866	900 35.433 1,100 43.307	370 14.567 —	450 17.717	1,600 62.992

Notes: 1) Be careful sure to use it only after you have adjusted it sufficiently when installing the thru-beam type fiber equipped with the expansion lens, as the beam envelope becomes narrow and alignment is difficult.
2) The fiber cable length practically limits the sensing range.
3) The fiber cable length for the **FT-H30-M1V-S** is 1 m 3.281 ft. The sensing ranges in HYPR, U-LG and LONG of **FX-500** / **FX-550** series and in **FX-102** are specified considering the length of the **FT-J8** atmospheric side fiber.
4) Refer to p.15, p.18, p.34, p.37 and p.39 for the ambient temperature of fibers to be used in combination.

FIBER OPTIONS

Refer to p.81~ for details of lens dimensions.

Lens (For reflective type fiber)

Designation	Model No.	Description
Finest spot lens	**FX-MR7**	Extremely fine spot of ø0.1 mm ø0.004 in approx. achieved. • Applicable fibers: **FD-R33EG**, **FD-EG31**, **FD-R34EG**, **FD-R32EG**, **FD-EG30**, **FD-R31G**, **FD-42G**, **FD-42GW**, **FD-32G**, **FD-32GX** • Ambient temperature: -55 to +70 °C +67 to +158 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series Fiber model No. / Distance to focal point / Spot diameter **FD-R33EG**, **FD-EG31**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.1 mm approx. ø0.004 in approx. **FD-R34EG**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.15 mm approx. ø0.006 in approx. **FD-R32EG**, **FD-EG30**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.2 mm approx. ø0.008 in approx. **FD-R31G**, **FD-42G/42GW**, **FD-32G/32GX**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.4 mm approx. ø0.016 in approx.
	FX-MR6 (Note 2)	 Extremely fine spot of ø0.1 mm ø0.004 in approx. achieved. • Applicable fibers: **FD-EG31**, **FD-EG30**, **FD-42G**, **FD-42GW**, **FD-32G**, **FD-32GX** • Ambient temperature: -20 to +60 °C -4 to +140 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series **FD-EG31**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.1 mm approx. ø0.004 in approx. **FD-EG30**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.2 mm approx. ø0.008 in approx. **FD-42G/42GW**, **FD-32G/32GX**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.4 mm approx. ø0.016 in approx.
	FX-MR3 (Note 2)	Extremely fine spot of ø0.15 mm ø0.006 in approx. achieved. • Applicable fibers: **FD-EG31**, **FD-EG30**, **FD-42G**, **FD-42GW**, **FD-32G**, **FD-32GX** • Ambient temperature: -40 to +70 °C -40 to +158 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series **FD-EG31**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.15 mm approx. ø0.006 in approx. **FD-EG30**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.3 mm approx. ø0.012 in approx. **FD-42G/42GW**, **FD-32G/32GX**: 7 ±0.5 mm 0.276 ±0.020 in / ø0.5 mm approx. ø0.020 in approx.
Zoom lens	**FX-MR8**	 The spot diameter is adjustable according to how much the fiber is screwed in. • Applicable fibers: **FD-R33EG**, **FD-EG31**, **FD-R34EG**, **FD-R32EG**, **FD-EG30**, **FD-R31G**, **FD-32G**, **FD-32GX** • Ambient temperature: -55 to +70 °C +67 to +158 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series **FD-R33EG**, **FD-EG31**: 10 to 30 mm 0.394 to 1.181 in / ø0.4 to ø2.0 mm approx. ø0.016 to ø0.079 in approx. **FD-R34EG**: 10 to 30 mm 0.394 to 1.181 in / ø0.4 to ø2.2 mm approx. ø0.016 to ø0.087 in approx. **FD-R32EG**, **FD-EG30**: 10 to 30 mm 0.394 to 1.181 in / ø0.5 to ø2.5 mm approx. ø0.020 to ø0.098 in approx. **FD-R31G**, **FD-32G/32GX**: 10 to 30 mm 0.394 to 1.181 in / ø0.8 to ø3.5 mm approx. ø0.031 to ø0.138 in approx.
Parallel light lens	**FX-MR9**	 Long-range parallel light • Applicable fibers: **FD-R33EG**, **FD-EG31**, **FD-R34EG**, **FD-R32EG**, **FD-EG30**, **FD-R31G**, **FD-42G**, **FD-42GW**, **FD-32G**, **FD-32GX** • Ambient temperature: -55 to +70 °C +67 to +158 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series **FD-R33EG**, **FD-EG31**: 0 to 30 mm 0.394 to 1.181 in / ø4.0 mm approx. ø0.157 in approx. **FD-R34EG**: 0 to 30 mm 0.394 to 1.181 in / ø4.0 mm approx. ø0.157 in approx. **FD-R32EG**, **FD-EG30**: 0 to 30 mm 0.394 to 1.181 in / ø4.0 mm approx. ø0.157 in approx. **FD-R31G**, **FD-42G/42GW**, **FD-32G/32GX**: 0 to 30 mm 0.394 to 1.181 in / ø4.0 mm approx. ø0.157 in approx.
Pinpoint spot lens	**FX-MR1**	 Pinpoint spot of ø0.5 mm ø0.020 in. Enables detection of minute objects or small marks. • Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in • Applicable fibers: **FD-42G**, **FD-42GW** • Ambient temperature: -40 to +70 °C -40 to +158 °F (Note 1)
Zoom lens	**FX-MR2**	 The spot diameter is adjustable from ø0.7 to ø2 mm ø0.028 to ø0.079 in according to how much the fiber is screwed in. • Applicable fibers: **FD-42G**, **FD-42GW** • Ambient temperature:-40 to +70 °C -40 to +158 °F (Note 1) • Accessory: **MS-EX3** (mounting bracket) Sensing range for **FX-500 / FX-550 / FX-100** series Screw-in depth / Distance to focal point / Spot diameter 7 mm 0.276 in / 18.5 mm approx. 0.728 in approx. / ø0.7 mm ø0.028 in 12 mm 0.472 in / 27 mm approx. 1.063 in approx. / ø1.2 mm ø0.047 in 14 mm 0.551 in / 43 mm approx. 1.693 in approx. / ø2.0 mm ø0.079 in
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-42G**, **FD-42GW** • Ambient temperature: -40 to +60 °C -40 to +140 °F (Note 1) Sensing range for **FX-500 / FX-550 / FX-100** series Screw-in depth / Distance to focal point / Spot diameter 8 mm 0.315 in / 13 mm approx. 0.512 in approx. / ø0.5 mm ø0.020 in 10 mm 0.394 in / 15 mm approx. 0.591 in approx. / ø0.8 mm ø0.031 in 14 mm 0.551 in / 30 mm approx. 1.181 in approx / ø3.0 mm ø0.118 in

Notes: 1) Refer to p.16, p.18, p.26 and p.27 for the ambient temperature of fibers to be used in combination.
2) Finest spot lenses **FX-MR6** / **FX-MR3** are used with **FD-R33EG** / **FD-R34EG** / **FD-R32EG** / **FD-R31G** as well. Please refer to our website for more details.

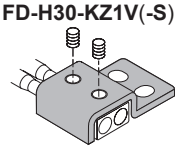
FIBER OPTIONS

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

- Heat-resistant side fiber
  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)
- Ordinary temperature side fiber
  FT-42 (one pair set)

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

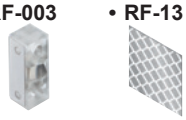
- Vacuum-resistant fiber
  FT-H30-M1V (one pair set)
  FD-H30-KZ1V
  FD-H30-L32V
- Photo-terminal
  FV-BR1 (one pair set)
- Fiber at atmospheric side
  FT-J8 (one pair set)
- Mouting bracket for **FD-H30-KZ1V**(**-S**)
  MS-FD-2



Model No. when ordering accessories additionally

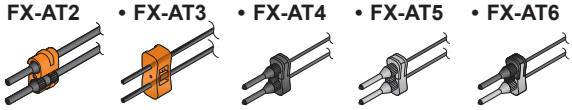
- **RF-003** (Reflector for **FR-KZ50E/KZ50H**)
- **RF-13** (Reflective tape for **FR-Z50HW**)
- **FX-CT2** (Fiber cutter)
- **FX-CT3** (Fiber cutter for ø1mm ø0.039 in / ø1.3mm ø0.051 in fiber cable / ø4mm ø0.157 in protective tube)
- **FX-CT4** (Fiber cutter for ø2mm ø0.079 in fiber cable / ø4mm ø0.157 in protective tube)
- **FX-AT2** (Attachment for fixed-length fiber, Orange)
- **FX-AT3** (Attachment for ø2.2 mm ø0.087 in fiber, Clear orange)
- **FX-AT4** (Attachment for ø1 mm ø0.039 in fiber, Black)
- **FX-AT5** (Attachment for ø1.3 mm ø0.051 in fiber, Gray)
- **FX-AT6** (Attachment for ø1 mm ø0.039 in / ø1.3 mm ø0.051 in mixed fiber, Black / Gray)
- **FX-AT4G1** (Gland single for ø1 mm ø0.039 in fiber, Black)
- **FX-AT5G1** (Gland single for ø1.3 mm ø0.051 in fiber, Gray)
- **FX-AT6G1** (Gland single for ø1 mm ø0.039 in / ø1.3 mm ø0.051 in mixed fiber, Black / Gray)
- **FX-SL1** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: 0.5 × 12 mm 0.020 × 0.472 in)
- **FX-SL2** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: 1 × 12 mm 0.039 × 0.472 in)
- **FX-SL3** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: 0.5 × 33 mm 0.020 × 1.299 in)
- **MS-FD-2** (Fiber mounting bracket)
- **MS-FD-F7-1** (SUS mounting bracket for **FD-F71**)
- **MS-FD-F7-2** (PVC mounting bracket for **FD-F71**)

- **RF-003**
- **RF-13**



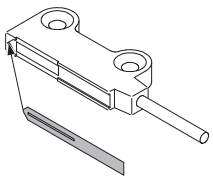
- **FX-CT2**
- **FX-CT3**
- **FX-CT4**

- **FX-AT2**
- **FX-AT3**
- **FX-AT4**
- **FX-AT5**
- **FX-AT6**

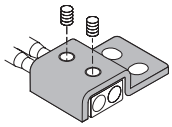


- **FX-AT4G1**
- **FX-AT5G1**
- **FX-AT6G1**

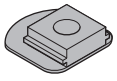
- **FX-SL1**
- **FX-SL2**
- **FX-SL3**



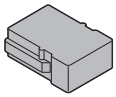
- **MS-FD-2**



- **MS-FD-F7-1**
  (SUS mounting bracket for **FD-F71**)



- **MS-FD-F7-2**
  (PVC mounting bracket for **FD-F71**)



FIBER OPTIONS

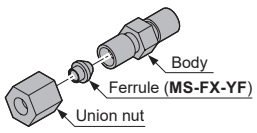
Others

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-42** **FT-42S** **FT-42W**	**FT-43** **FT-H13-FM2**	The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-1000 (1 m 3.281 ft)					
	FTP-1500 (1.5 m 4.921 ft)					
	FTP-N500 (0.5 m 1.640 ft)	For M3 thread		**FT-31** **FT-31S** **FT-31W**	**FD-31** **FD-31W**	
	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-61** **FD-61G** **FD-61S** **FD-61W**	**FD-62** **FD-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-41** **FD-41W**	**FD-41S** **FD-41SW**	
	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	**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				
Liquid inflow prevention joint (Note 2)	**MS-FX-01Y**	Applicable fibers	**FD-HF40Y** **FD-F41Y**		This joint suppresses false operations due to liquid slip-in from the top of the protective tube.	
Protective tube extension joint (Note 2)	**MS-FX-02Y**				The protective tube can be extended.	
Fiber mounting joint (Note 2)	**MS-FX-03Y**				The joint is used for mounting fibers on a tank.	
Single core holder	**FX-AT15A**	The incident light intensity may vary when using a multi-core fiber or a thin type sharp bending fiber. This holder suppresses the variation in the incident light intensity. (Brown)				
Reflector	**RF-210**	Used with **FR-Z50HW**. Refer to p.32 or p.47 for the sensing range of **FR-Z50HW** to be used in combination.				
	RF-220					
	RF-230					

Notes: 1) Do not bend the sleeve part of any side-view type fiber or ultra-small diameter head type fiber.
2) The joint internal ferrule (**MS-FX-YF**) is available as a spare part. A distorted ferrule may result in leakage.

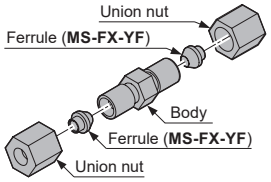
Liquid inflow prevention joint

• **MS-FX-01Y**



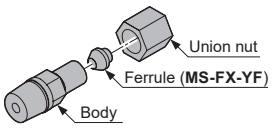
Protective tube extension joint

• **MS-FX-02Y**



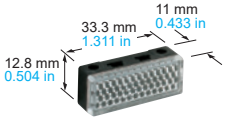
Fiber mounting joint

• **MS-FX-03Y**



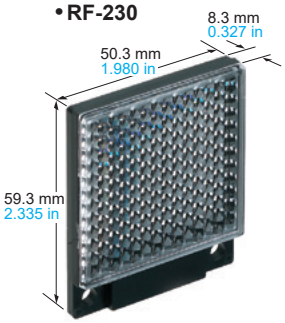
Reflector

• **RF-210**



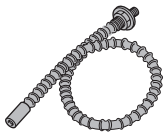
• **RF-220**

• **RF-230**



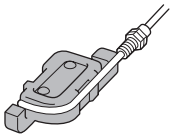
Protective tube

• **FTP-□**
• **FDP-□**



Fiber bender

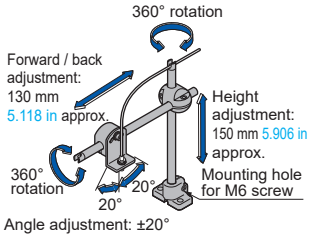
• **FB-1**



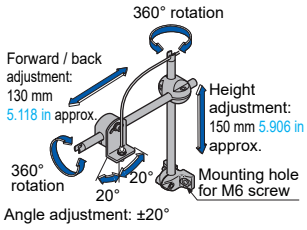
Universal sensor mounting stand

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

• **MS-AJ1-F**



• **MS-AJ2-F**



Single core holder

• **FX-AT15A**

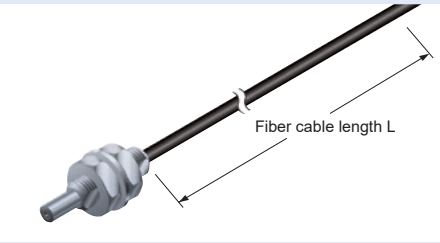
Semi-custom fibers that flexibly meet diverse needs

Guide to interchanging fiber length and sleeve length

Custom-ordered products are available with different fiber lengths and sleeve lengths in order to respond quickly to different requirements.
Contact us more information.

Fiber length change

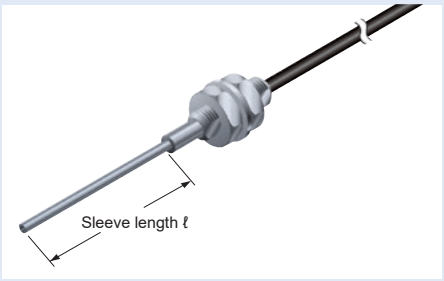
It is possible to extend up to 30 m 98.425 ft in units of 1 m 3.281 ft, varying depending on the model. Refer to the table on the next page for applicable models.



Note : Note that the model number differs from previous models with changed lengths.

Sleeve length change

Extension is possible up to 120 mm 4.724 in in units of 10 mm 0.394 in. Applicable models are sleeve extension-type models indicated by ▲ in the table on the next page.

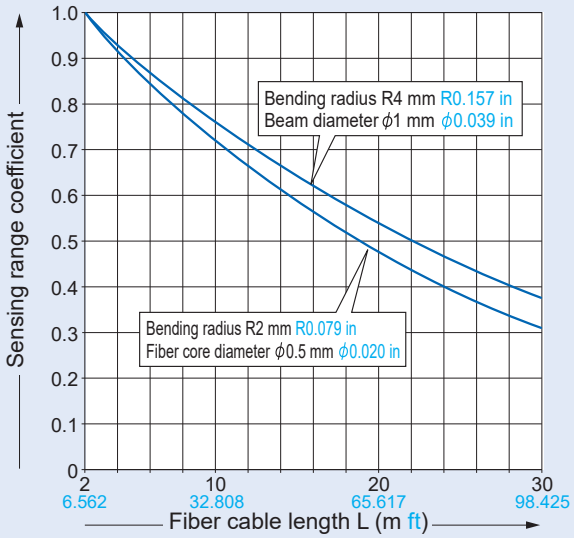


Note : Note that the model number differs from previous models with changed lengths.

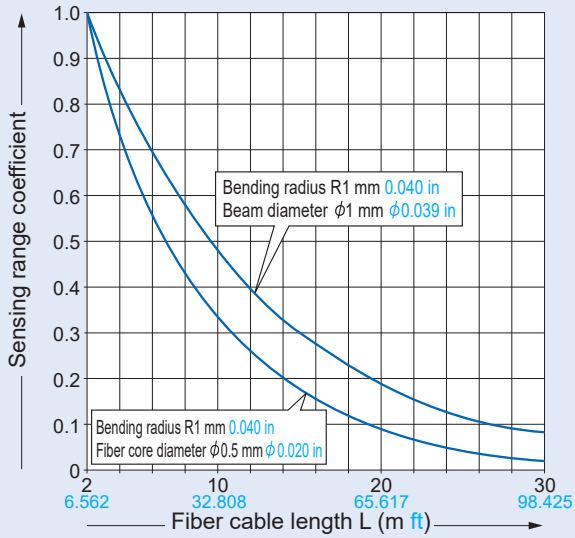
- **Attenuation ratio characteristics for fiber cable length and sensing range**

Note that the longer the fiber cable length, the shorter the sensing range.

Typical example: Bending radius R4 mm R0.157 in / R2 mm R0.079 in (Tough fiber)



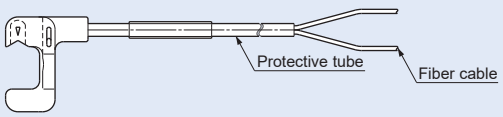
Typical example: Bending radius R1 mm R0.040 in (Sharp bending fiber **FT-□W / FD-□W**)



Note: Because infrared types are easily affected by humidity, please ask assistance when using them in a humid environment or in an environment with varying humidity.

Extended protective tube

The chemical-resistant cover and stainless jacket can be extended in accordance with the fiber cable length.
Applicable models are indicated in the table as follows.
★: Models which can have extended protective tube (fluorine resin)
☆: Models which can have extended stainless jacket sheath



Applicable models

Retroreflective type

Model No.	Fiber cable length ✂ : Free-cut	Protective tube length	Sleeve length (mm in)	Basic specifications: Sensing range (mm in) **FX-500** series (STD) (Note)	Basic specifications: Sensing range (mm in) **FX-550** series (STD) (Note)	Applicable fiber length: Max. (m ft)	Applicable fiber length: Unit (m ft)
FR-KZ22E	2 m 6.562 ft ✂	—	—	15 to 310 0.591 to 12.205	15 to 540 0.591 to 21.260	10 32.808	1 3.281
FR-KZ50E	2 m 6.562 ft ✂	—	—	20 to 300 0.787 to 11.811	20 to 400 0.787 to 15.748	10 32.808	1 3.281
FR-KZ50H	2 m 6.562 ft ✂	—	—	20 to 300 0.787 to 11.811	20 to 400 0.787 to 15.748	10 32.808	1 3.281
FR-Z50HW	2 m 6.562 ft ✂	—	—	100 to 990 3.937 to 38.976	100 to 1,150 3.937 to 45.276	30 98.425	1 3.281

Note: Note that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.

Semi-custom fibers that flexibly meet diverse needs

Guide to interchanging fiber length and sleeve length

Applicable models

Thru-beam type

Model No.	Basic specifications: Fiber cable length ✂ : Free-cut	Protective tube length	Sleeve length (mm in)	Sensing range (mm in) **FX-500** series (STD) (Note 1)	Sensing range (mm in) **FX-550** series (STD) (Note 1)	Applicable fiber length: Max. (m ft)	Unit (m ft)
FT-140	10 m 32.808 ft ✂	—	—	19,600 771.654 (Note2)	19,600 771.654 (Note2)	30 98.425	1 3.281
FT-30	2 m 6.562 ft	—	—	400 15.748	570 22.441	10 32.808	0.1 0.328
FT-31	2 m 6.562 ft ✂	—	—	315 12.402	480 18.898	30 98.425	1 3.281
▲FT-31S	2 m 6.562 ft ✂	—	40 1.575 (Note 3)	315 12.402	480 18.898	30 98.425	1 3.281
FT-31W	2 m 6.562 ft ✂	—	—	260 11.024	420 16.535	20 65.617	1 3.281
FT-32	2 m 6.562 ft ✂	—	—	3,000 118.110	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-40	2 m 6.562 ft	—	—	1,200 47.244	1,570 61.811	10 32.808	0.1 0.328
FT-42	2 m 6.562 ft ✂	—	—	1,130 44.488	1,470 57.874	30 98.425	1 3.281
▲FT-42S	2 m 6.562 ft ✂	—	40 1.575 (Note 3)	1,130 44.488	1,470 57.874	30 98.425	1 3.281
FT-42W	2 m 6.562 ft ✂	—	—	800 31.496	1,200 47.244	20 65.617	1 3.281
FT-43	2 m 6.562 ft ✂	—	—	1,400 55.118	2,200 86.614	30 98.425	1 3.281
FT-45X	1 m 3.281 ft	—	—	1,200 47.244	1,600 62.992 (Note2)	10 32.808	0.5 1.640
FT-A11	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
FT-A11W	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
FT-A32	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
FT-A32W	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
FT-AL05	2 m 6.562 ft ✂	—	—	860 33.858	1,150 45.276	20 65.617	1 3.281
FT-E13	1 m 3.281 ft ✂	—	5 0.197	15 0.591	21 0.827	10 32.808	0.5 1.640
FT-E23	1 m 3.281 ft ✂	—	5 0.197	75 2.953	120 4.724	10 32.808	0.5 1.640
★FT-F93	2 m 6.562 ft ✂	1 m 3.281 ft (Note 4)	—	—	—	25 82.021	1 3.281
FT-H13-FM2	2 m 6.562 ft ✂	—	—	700 27.559	1,150 45.276	20 65.617	1 3.281
FT-H20-J50-S	500 mm 19.685 in ✂ (Note 5)	—	—	470 18.504	860 33.858	6.5 21.325	0.1 0.328
FT-H20-M1	1 m 3.281 ft	—	—	540 21.260	1,000 39.370	6.5 21.325	0.1 0.328
FT-H20-VJ80-S	800 mm 31.496 in ✂ (Note 5)	—	—	600 23.622	1,000 39.370	6.5 21.325	0.1 0.328
FT-H20W-M1	1 m 3.281 ft	—	—	470 18.504	730 28.740	6.5 21.325	0.1 0.328
FT-H30-M1V-S	1 m 3.281 ft	—	—	270 10.630	400 15.748	6.5 21.325	0.1 0.328
FT-H35-M2	2 m 6.562 ft	—	—	430 16.929	1,050 41.339	6.5 21.325	0.1 0.328
FT-H35-M2S6	2 m 6.562 ft	—	55 2.165	430 16.929	1,050 41.339	6.5 21.325	0.1 0.328
★FT-HL80Y	2 m 6.562 ft ✂ (Note 6)	1.5 m 4.921 ft (Note 4)	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-J8	2 m 6.562 ft ✂	—	—	—	—	30 98.425	1 3.281
FT-KS40	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
FT-KV26	2 m 6.562 ft ✂	—	—	710 27.953	1,100 43.307	10 32.808	1 3.281
FT-KV26H1	2 m 6.562 ft ✂	—	—	630 24.803	1,000 39.370	10 32.808	1 3.281
FT-KV40	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281

▲: Models which can have extended sleeve
★: Models which can have extended protective tube (fluorine resin)
☆: Models which can have extended stainless jacket sheath

Notes: 1) Note 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.
3) Applicable sleeve length is from 10 to 120 mm 0.394 to 4.724 in and in units of 10 mm 0.394 in.
4) Applicable protective tube length is up to 10 m 32.808 ft and in units of 0.5 m 1.640 ft.
5) Fiber length (fixed-length) for heat-resistant fiber side. Fiber length for ordinary temperature side is 2 m 6.562 ft (free-cut).
6) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

Basic specifications						Applicable fiber length	
Model No.	Fiber cable length ✂ : Free-cut	Protective tube length	Sleeve length (mm in)	Sensing range (mm in) **FX-500** series (STD) (Note 1)	Sensing range (mm in) **FX-550** series (STD) (Note 1)	Max. (m ft)	Unit (m ft)
FT-KV40W	2 m 6.562 ft ✂	—	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	10 32.808	1 3.281
★**FT-L80Y**	2 m 6.562 ft ✂ (Note 4)	1.5 m 4.921 ft (Note 3)	—	3,600 141.732 (Note2)	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-R31	2 m 6.562 ft ✂	—	—	270 10.630	510 20.079	30 98.425	1 3.281
FT-R40	2 m 6.562 ft ✂	—	—	930 36.614	1,400 55.118	30 98.425	1 3.281
FT-R41W	2 m 6.562 ft ✂	—	—	800 31.496	1,300 51.181	20 65.617	1 3.281
FT-R42W	2 m 6.562 ft ✂	—	—	2,200 86.614	3,600 141.732 (Note2)	20 65.617	1 3.281
FT-R43	2 m 6.562 ft ✂	—	—	720 28.346	1,250 49.213	30 98.425	1 3.281
FT-R44Y	2 m 6.562 ft ✂	—	—	720 28.346	1,300 51.181	30 98.425	1 3.281
FT-R60Y	2 m 6.562 ft ✂	—	—	2,100 82.677	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-S11	500 mm 19.685 in	—	—	90 3.543	130 5.118	30 98.425	1 3.281
FT-S20	2 m 6.562 ft	—	—	400 15.748	550 21.654	10 32.808	0.1 0.328
FT-S21	2 m 6.562 ft ✂	—	—	315 12.402	450 17.717	30 98.425	1 3.281
FT-S21W	2 m 6.562 ft ✂	—	—	260 10.236	400 15.748	20 65.617	1 3.281
FT-S22	2 m 6.562 ft ✂	—	—	450 17.717	870 34.252	30 98.425	1 3.281
FT-S30	2 m 6.562 ft	—	—	1,200 47.244	1,650 64.961	10 32.808	0.1 0.328
FT-S31W	2 m 6.562 ft ✂	—	—	800 31.496	1,100 43.307	20 65.617	1 3.281
FT-S32	2 m 6.562 ft ✂	—	—	3,100 122.047	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-V23	2 m 6.562 ft ✂	—	20 0.787	450 17.717	750 29.528	30 98.425	1 3.281
FT-V24W	2 m 6.562 ft ✂	—	15 0591	110 4.331	160 6.299	10 32.808	1 3.281
FT-V25	2 m 6.562 ft ✂	—	15 0591	240 9.449	450 17.717	30 98.425	1 3.281
FT-V30	2 m 6.562 ft ✂	—	20 0.787	680 26.772	950 37.402	30 98.425	1 3.281
FT-V40	2 m 6.562 ft ✂	—	—	3,500 137.795	3,600 141.732 (Note2)	30 98.425	1 3.281
★**FT-V80Y**	2 m 6.562 ft ✂ (Note 4)	1.5 m 4.921 ft (Note 3)	—	1,300 51.181	2,200 86.614	30 98.425	1 3.281
FT-Z20HBW	1 m 3.281 ft ✂	—	—	260 10.236	450 17.717	20 65.617	1 3.281
FT-Z20W	1 m 3.281 ft ✂	—	—	620 24.236	1,100 43.307	20 65.617	1 3.281
FT-Z30	2 m 6.562 ft ✂	—	—	2,100 82.677	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-Z30E	2 m 6.562 ft ✂	—	—	3,500 137.795	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-Z30EW	2 m 6.562 ft ✂	—	—	3,400 133.858	3,600 141.732 (Note2)	20 65.617	1 3.281
FT-Z30H	2 m 6.562 ft ✂	—	—	3,500 137.795	3,600 141.732 (Note2)	30 98.425	1 3.281
FT-Z30HW	2 m 6.562 ft ✂	—	—	3,500 137.795	3,600 141.732 (Note2)	20 65.617	1 3.281
FT-Z30W	2 m 6.562 ft ✂	—	—	1,500 59.055	2,800 110.236	20 65.617	1 3.281
FT-Z40HBW	2 m 6.562 ft ✂	—	—	800 31.496	1,300 51.181	20 65.617	1 3.281
FT-Z40W	2 m 6.562 ft ✂	—	—	1,500 59.055	2,000 78.740	20 65.617	1 3.281
FT-Z802Y	2 m 6.562 ft ✂	—	—	3,100 122.047	3,600 141.732 (Note2)	30 98.425	1 3.281

▲: Models which can have extended sleeve
★: Models which can have extended protective tube (fluorine resin)
☆: Models which can have extended stainless jacket sheath
Notes: 1) Note 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.
3) Applicable protective tube length is up to 10 m 32.808 ft and in units of 0.5 m 1.640 ft.
4) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

Semi-custom fibers that flexibly meet diverse needs

Guide to interchanging fiber length and sleeve length

Applicable models

Reflective type

Model No.	Basic specifications: Fiber cable length ✂: Free-cut	Protective tube length	Sleeve length (mm in)	Sensing range (mm in) **FX-500** series (STD) (Note 1)	Sensing range (mm in) **FX-550** series (STD) (Note 1)	Applicable fiber length: Max. (m ft)	Unit (m ft)
FD-30	2 m 6.562 ft	—	—	160 6.299	210 8.268	10 32.808	0.1 0.328
FD-31	2 m 6.562 ft ✂	—	—	125 4.922	200 7.874	30 98.425	1 3.281
FD-31W	2 m 6.562 ft ✂	—	—	80 3.150	130 5.118	20 65.617	1 3.281
FD-32G	2 m 6.562 ft ✂	—	—	200 7.874	320 12.598	30 98.425	1 3.281
☆**FD-32GX**	1 m 3.281 ft ✂	300 mm 11.811 in (Note 3)	—	200 7.874	320 12.598	30 98.425	1 3.281
FD-34G	2 m 6.562 ft ✂	—	—	90 3.543	130 5.118	30 98.425	1 3.281
FD-40	2 m 6.562 ft	—	—	160 6.299	210 8.268	10 32.808	0.1 0.328
FD-41	2 m 6.562 ft ✂	—	—	125 4.921	200 7.874	30 98.425	1 3.281
▲**FD-41S**	2 m 6.562 ft ✂	—	40 1.575 (Note 2)	125 4.921	200 7.874	30 98.425	1 3.281
▲**FD-41SW**	2 m 6.562 ft ✂	—	40 1.575 (Note 2)	80 3.150	130 5.118	20 65.617	1 3.281
FD-41W	2 m 6.562 ft ✂	—	—	270 10.630	480 18.898	20 65.617	1 3.281
FD-42G	2 m 6.562 ft ✂	—	—	200 7.874	320 12.598	30 98.425	1 3.281
FD-42GW	2 m 6.562 ft ✂	—	—	150 5.906	210 8.268	20 65.617	1 3.281
FD-60	2 m 6.562 ft ✂	—	—	520 20.472	750 29.528	10 32.808	0.1 0.328
FD-61	2 m 6.562 ft ✂	—	—	450 17.717	620 24.409	30 98.425	1 3.281
FD-61G	2 m 6.562 ft ✂	—	—	420 16.535	600 23.622	30 98.425	1 3.281
▲**FD-61S**	2 m 6.562 ft ✂	—	40 1.575 (Note 2)	420 16.535	650 25.591	30 98.425	1 3.281
FD-61W	2 m 6.562 ft ✂	—	—	270 10.630	480 18.898	20 65.617	1 3.281
FD-62	2 m 6.562 ft ✂	—	—	520 20.472	880 34.646	30 98.425	1 3.281
FD-64X	1 m 3.281 ft	—	—	280 11.024	410 16.142	10 32.808	0.5 1.640
FD-A16	2 m 6.562 ft ✂	—	—	200 7.874	350 13.780	30 98.425	1 3.281
FD-AL11	2 m 6.562 ft ✂	—	—	320 12.598	450 17.717	20 65.617	1 3.281
FD-E13	1 m 3.281 ft	—	3 0.118	12 0.472	23 0.906	3 9.843	0.1 0.328
FD-E23	1 m 3.281 ft	—	5 0.197	55 2.165	80 3.150	3 9.843	0.1 0.328
FD-EG30	500 mm 19.685 in	—	—	48 1.890	90 3.543	3 9.843	0.1 0.328
FD-EG30S	1 m 3.281 ft	—	15 0.591	50 1.969	90 3.543	3 9.843	0.1 0.328
FD-EG31	500 mm 19.685 in	—	—	20 0.787	35 1.378	3 9.843	0.1 0.328
FD-F4	2 m 6.562 ft ✂	—	—	—	—	10 32.808	1 3.281
FD-F41	2 m 6.562 ft ✂	—	—	—	—	10 32.808	1 3.281
FD-F41Y	2 m 6.562 ft ✂	500 mm 19.685 in	—	—	—	5 16.404	1 3.281
★**FD-F71**	5 m 16.404 ft ✂	3 m 9.843ft (Note 3)	—	—	—	25 82.021	1 3.281
FD-FA93	2 m 6.562 ft ✂	—	—	—	—	10 32.808	1 3.281
FD-H13-FM2	2 m 6.562 ft ✂	—	—	350 13.780	670 26.378	20 65.617	1 3.281
FD-H18-L31	2 m 6.562 ft ✂	—	—	0 to 16 0 to 0.630	0 to 45 0 to 1.772	5 16.404	1 3.281
FD-H20-21	1 m 3.281 ft	—	—	230 9.055	450 17.717	6.5 21.325	0.1 0.328
FD-H20-M1	1 m 3.281 ft	—	—	330 12.992	450 17.717	6.5 21.325	0.1 0.328
FD-H25-L43	3 m 9.843 ft	—	—	1.5 to 26 0.059 to 1.024	1 to 28 0.039 to 1.102	5 16.404	0.1 0.328
FD-H25-L45	3 m 9.843 ft	—	—	5 to 42 0.197 to 1.654	4 to 48 0.517 to 1.890	5 16.404	0.1 0.328
FD-H30-KZ1V-S	1 m 3.281 ft	—	—	20 to 200 0.787 to 7.874	20 to 450 0.787 to 17.717	6.5 21.325	0.1 0.328
FD-H30-L32	2 m 6.562 ft	—	—	0 to 17 0 to 0.670	0 to 21 0 to 0.827	5 16.404	1 3.281

▲: Models which can have extended sleeve
★: Models which can have extended protective tube (fluorine resin)
☆: Models which can have extended stainless jacket sheath

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.
2) Applicable sleeve length is from 10 to 120 mm 0.394 to 4.724 in and in units of 10 mm 0.394 in.
3) Applicable protective tube length is up to 10 m 32.808 ft and in units of 0.5 m 1.640 ft. (however, **FD-32GX** is in units of 0.1 m 0.328 ft.)
4) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

Basic specifications						Applicable fiber length	
Model No.	Fiber cable length ✂: Free-cut	Protective tube length	Sleeve length (mm in)	Sensing range (mm in) **FX-500** series (STD) (Note 1)	Sensing range (mm in) **FX-550** series (STD) (Note 1)	Max. (m ft)	Unit (m ft)
FD-H30-L32V-S	3 m 9.843 ft	—	—	0 to 8 0 to 0.315	0 to 11 0 to 0.433	5 16.404	0.1 0.328
FD-H35-20S	1 m 3.281 ft	—	90 3.543	260 10.236	410 16.142	6.5 21.325	0.1 0.328
FD-H35-M2	2 m 6.562 ft	—	—	260 10.236	400 15.748	6.5 21.325	0.1 0.328
FD-H35-M2S6	2 m 6.562 ft	—	55 2.165	260 10.236	400 15.748	6.5 21.325	0.1 0.328
FD-HF40Y	2 m 6.562 ft ✂	500 mm 19.685 in	—	—	—	5 16.404	1 3.281
FD-L10	2 m 6.562 ft ✂	—	—	0 to 5 0 to 0.197	0 to 5 0 to 0.197	5 16.404	1 3.281
FD-L11	2 m 6.562 ft ✂	—	—	0 to 9.5 0 to 0.374	0 to 13 0 to 0.512	5 16.404	1 3.281
FD-L12W	1 m 3.281 ft ✂	—	—	0 to 8 0 to 0.315	0 to 12 0 to 0.472	5 16.404	1 3.281
FD-L20H	2 m 6.562 ft ✂	—	—	0 to 23 0 to 0.906	0 to 33 0 to 1.299	5 16.404	1 3.281
FD-L21	2 m 6.562 ft ✂	—	—	1.5 to 16 0.059 to 0.630	1 to 19 0.039 to 0.748	5 16.404	1 3.281
FD-L21W	2 m 6.562 ft ✂	—	—	3 to 14 0.118 to 0.551	2 to 18 0.079 to 0.709	5 16.404	1 3.281
FD-L22A	2 m 6.562 ft ✂	—	—	0 to 24 0 to 0.945	0 to 34 0 to 1.339	5 16.404	1 3.281
FD-L23	3 m 9.843 ft ✂	—	—	0 to 29 0 to 1.142	0 to 34 0 to 1.339	5 16.404	1 3.281
FD-L30A	3 m 9.843 ft ✂	—	—	0 to 43 0 to 1.693	0 to 52 0 to 2.047	5 16.404	1 3.281
FD-L31A	3 m 9.843 ft ✂	—	—	4 to 33 0.157 to 0.299	3 to 42 0.118 to 1.654	5 16.404	1 3.281
FD-L32H	4 m 13.123 ft ✂	—	—	0 to 56 0 to 2.205	0 to 65 0 to 2.559	5 16.404	1 3.281
FD-R31G	2 m 6.562 ft ✂	—	—	170 6.693	290 11.417	30 98.425	1 3.281
FD-R32EG	500 mm 19.685 in	—	—	45 1.772	80 3.150	3 9.843	0.1 0.328
FD-R33EG	500 mm 19.685 in	—	—	19 0.748	30 1.181	3 9.843	0.1 0.328
FD-R34EG	500 mm 19.685 in	—	—	38 1.496	70 2.756	3 9.843	0.1 0.328
FD-R41	2 m 6.562 ft ✂	—	—	210 8.268	340 13.386	30 98.425	1 3.281
FD-R60	2 m 6.562 ft ✂	—	—	290 11.417	500 19.685	30 98.425	1 3.281
FD-R61Y	2 m 6.562 ft ✂	—	—	280 11.124	450 17.717	30 98.425	1 3.281
FD-S21	1 m 3.281 ft	—	—	80 3.150	85 3.346	20 65.617	1 3.281
FD-S30	2 m 6.562 ft	—	—	160 6.299	220 8.661	10 32.808	0.1 0.328
FD-S31	2 m 6.562 ft ✂	—	—	125 4.921	200 7.874	30 98.425	1 3.281
FD-S32	2 m 6.562 ft ✂	—	—	420 16.535	600 23.622	30 98.425	1 3.281
FD-S32W	2 m 6.562 ft ✂	—	—	270 10.630	450 17.717	20 65.617	1 3.281
FD-S33GW	2 m 6.562 ft ✂	—	—	150 5.906	240 9.449	20 65.617	1 3.281
FD-S34G	2 m 6.562 ft ✂	—	—	90 3.543	130 5.118	30 98.425	1 3.281
FD-S60Y	2 m 6.562 ft ✂ (Note 3)	1.5 m 4.921 ft (Note 2)	—	320 12.598	450 17.717	30 98.425	1 3.281
FD-V30	2 m 6.562 ft ✂	—	15 0.591	65 2.559	90 3.543	30 98.425	1 3.281
FD-V30W	2 m 6.562 ft ✂	—	15 0.591	20 0.787	30 1.181	10 32.808	1 3.281
FD-V50	2 m 6.562 ft ✂	—	20 0.787	120 4.724	180 7.087	30 98.425	1 3.281
FD-Z20HBW	1 m 3.281 ft ✂	—	—	2 to 85 0.079 to 3.346	170 6.693	20 65.617	1 3.281
FD-Z20W	1 m 3.281 ft ✂	—	—	1 to 65 0.039 to 2.559	130 5.118	20 65.617	1 3.281
FD-Z40HBW	2 m 6.562 ft ✂	—	—	260 10.236	480 18.898	20 65.617	1 3.281
FD-Z40W	2 m 6.562 ft ✂	—	—	190 7.480	390 15.354	20 65.617	1 3.281
FD-Z50HW	2 m 6.562 ft ✂	—	—	10 to 650 0.394 to 25.591	10 to 950 0.394 to 37.402	20 65.617	1 3.281

▲: Models which can have extended sleeve
★: Models which can have extended protective tube (fluorine resin)
☆: Models which can have extended stainless jacket sheath

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20% max. depending upon how the fiber is cut.
2) Applicable protective tube length is up to 10 m 32.808 ft and in units of 0.5 m 1.640 ft.
3) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

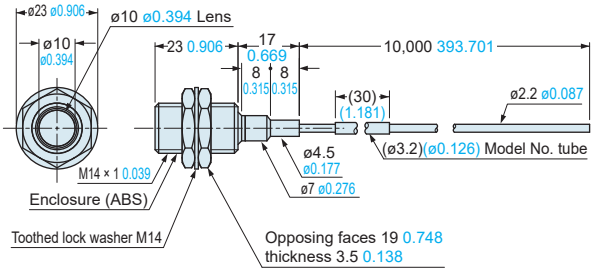
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-140

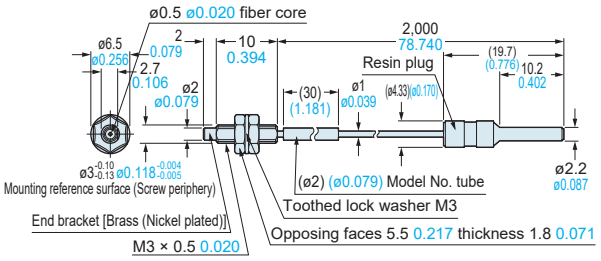
Free-cut

<with **FX-AT3**>



FT-30

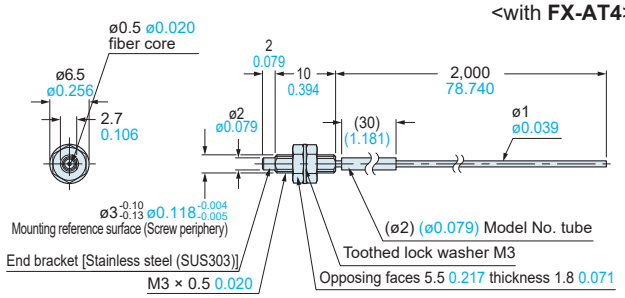
<with **FX-AT2**>



FT-31

Free-cut

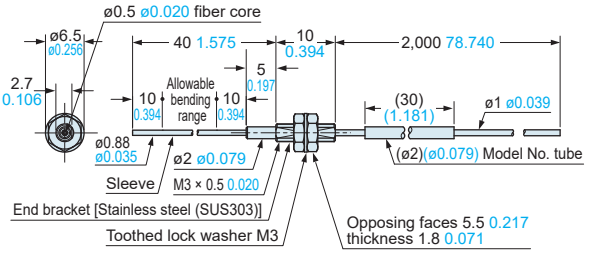
<with **FX-AT4**>



FT-31S

Free-cut

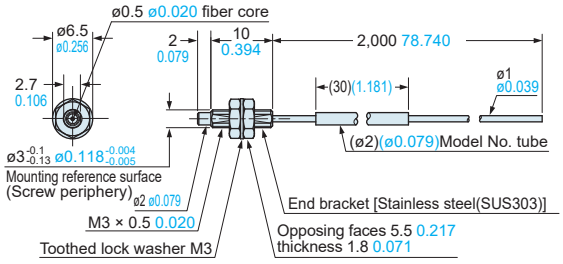
<with **FX-AT4**>



FT-31W

Free-cut

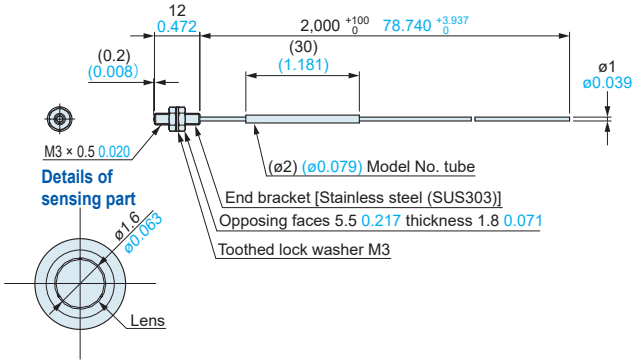
<with **FX-AT4**>



FT-32

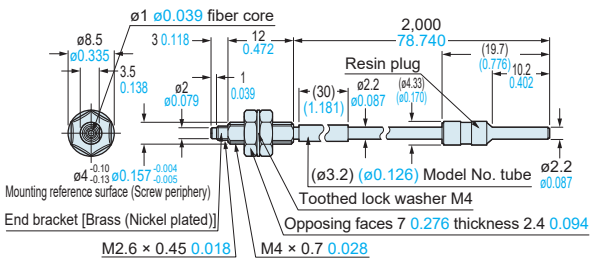
Free-cut

<with **FX-AT4**>



FT-40

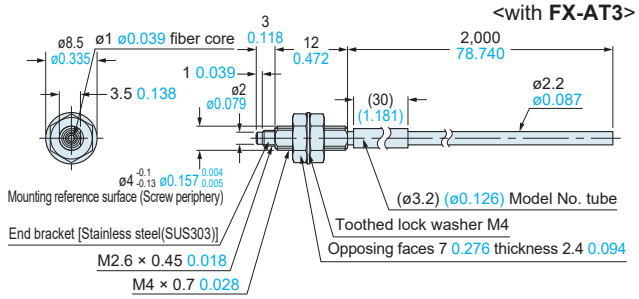
<with **FX-AT2**>



FT-42

Free-cut

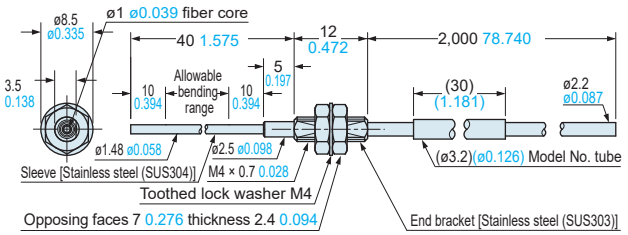
<with **FX-AT3**>



FT-42S

Free-cut

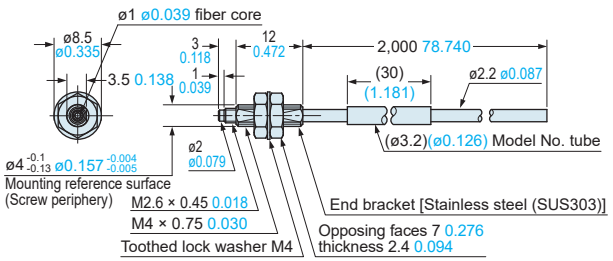
<with **FX-AT3**>



FT-42W

Free-cut

<with **FX-AT3**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

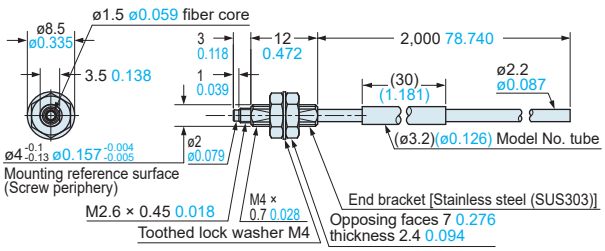
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-43

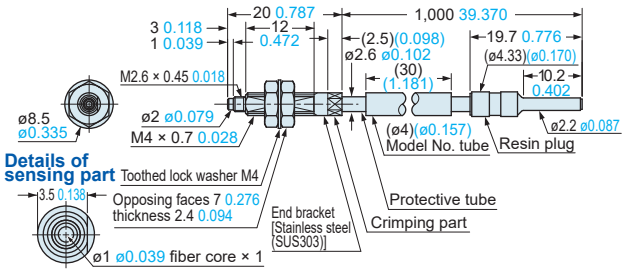
Free-cut

<with **FX-AT3**>



FT-45X

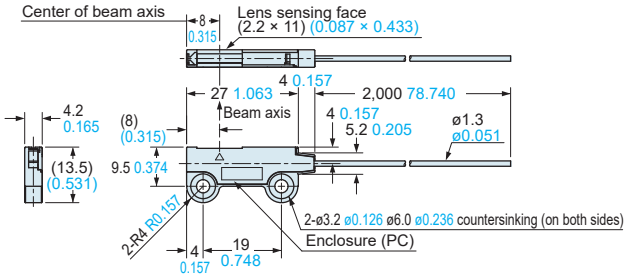
<with **FX-AT2**>



FT-A11

Free-cut

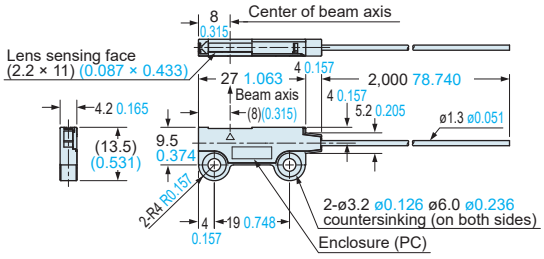
<with **FX-AT5**>



FT-A11W

Free-cut

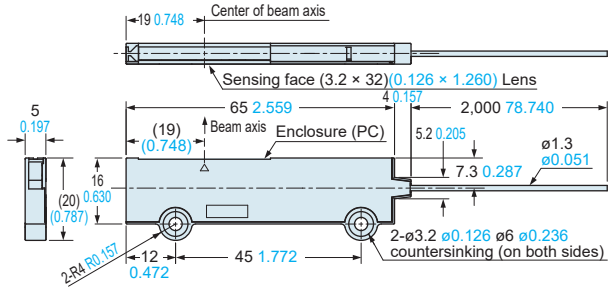
<with **FX-AT5**>



FT-A32

Free-cut

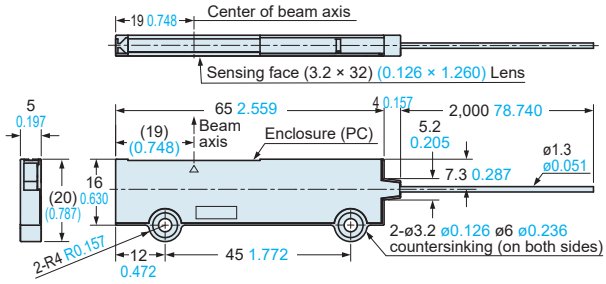
<with **FX-AT5**>



FT-A32W

Free-cut

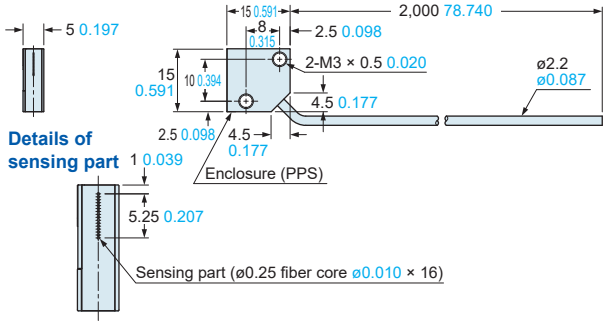
<with **FX-AT5**>



FT-AL05

Free-cut

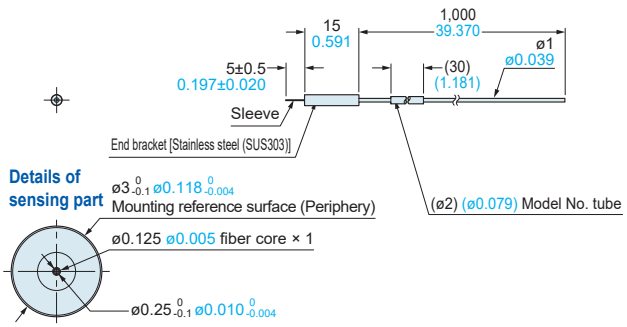
<with **FX-AT3**>



FT-E13

Free-cut

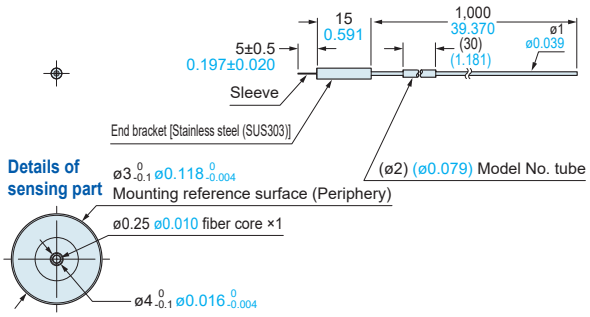
<with **FX-AT4**>



FT-E23

Free-cut

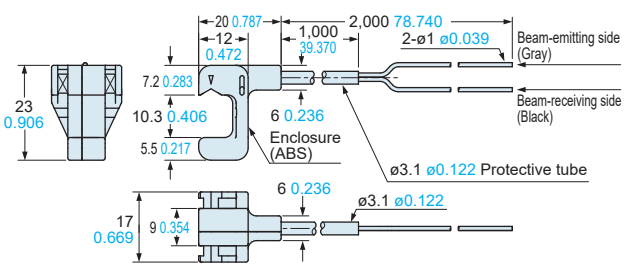
<with **FX-AT4**>



FT-F93

Free-cut

<with **FX-AT4**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

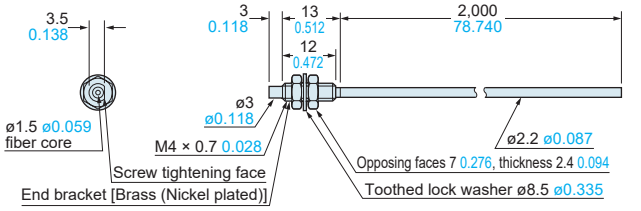
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

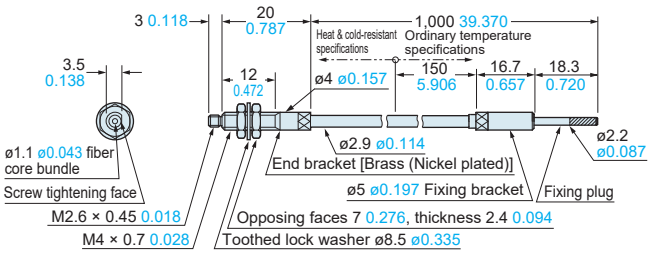
FT-H13-FM2

Free-cut

<with **FX-AT3**>



FT-H20-M1

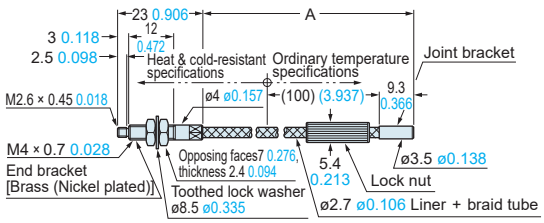


FT-H20-J20-S FT-H20-J30-S FT-H20-J50-S

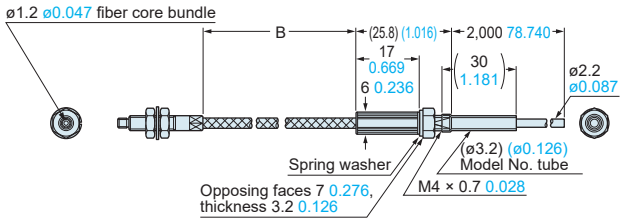
Free-cut (Note)

<with **FX-AT3**>

Heat-resistant side unit diagram (side view)



Ordinary temperature side fiber (FT-42) connection diagram (front view)



Model No.	A	B
FT-H20-J20-S	200 $^{+25}_{0}$ 7.874 $^{+0.984}_{0}$	185 $^{+30}_{0}$ 7.284 $^{+1.181}_{0}$
FT-H20-J30-S	300 $^{+25}_{0}$ 11.811 $^{+0.984}_{0}$	285 $^{+30}_{0}$ 11.221 $^{+1.181}_{0}$
FT-H20-J50-S	500 $^{+25}_{0}$ 19.685 $^{+0.984}_{0}$	485 $^{+30}_{0}$ 19.095 $^{+1.181}_{0}$

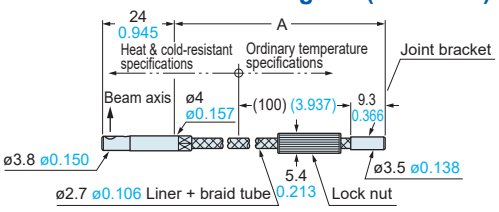
Note: Ordinary temperature side fiber (**FT-42**) only.

FT-H20-VJ50-S FT-H20-VJ80-S

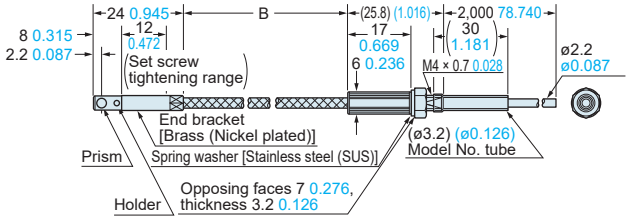
Free-cut (Note)

<with **FX-AT3**>

Heat-resistant side unit diagram (side view)



Ordinary temperature side fiber (FT-42) connection diagram (front view)

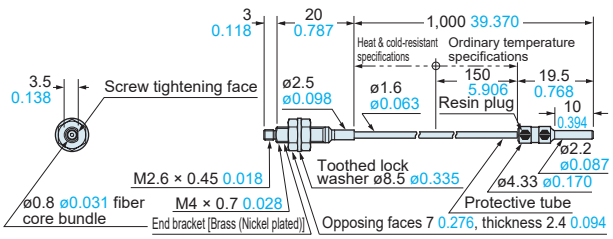


Model No.	A	B
FT-H20-VJ50-S	500 $^{+25}_{0}$ 19.685 $^{+0.984}_{0}$	485 $^{+30}_{0}$ 19.095 $^{+1.181}_{0}$
FT-H20-VJ80-S	800 $^{+50}_{0}$ 31.496 $^{+1.969}_{0}$	785 $^{+55}_{0}$ 30.906 $^{+2.165}_{0}$

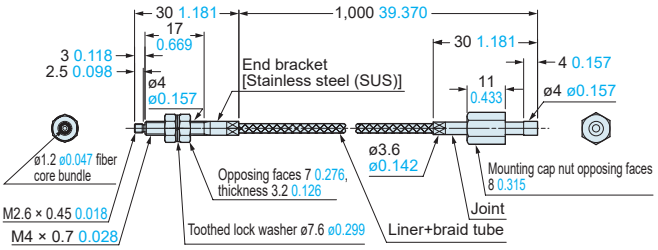
Note: Ordinary temperature side fiber (**FT-42**) only.

FT-H20W-M1

<with **FX-AT2**>

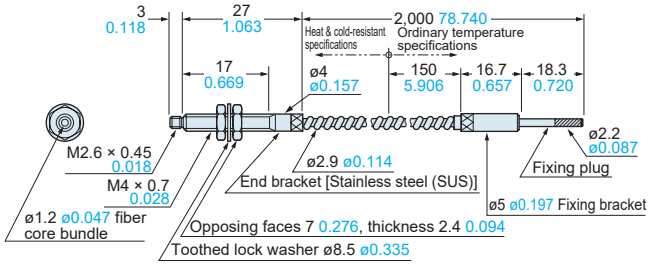


FT-H30-M1V-S

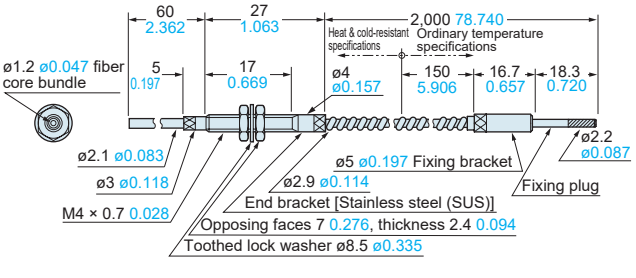


Note: The **FT-H30-M1V-S** is a set with the **FT-H30-M1V**, photo-terminal, and atmospheric side fiber. Refer to p.81 for dimensions of the atmospheric side fiber and photo-terminals.

FT-H35-M2



FT-H35-M2S6



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

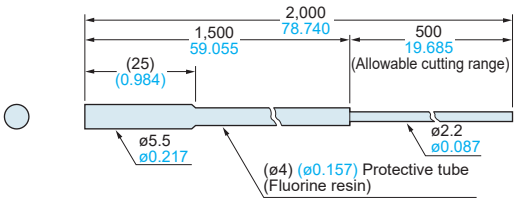
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-HL80Y

Free-cut

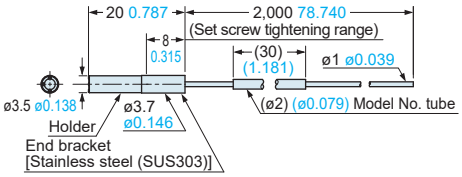
<with **FX-AT3**>



FT-KS40

Free-cut

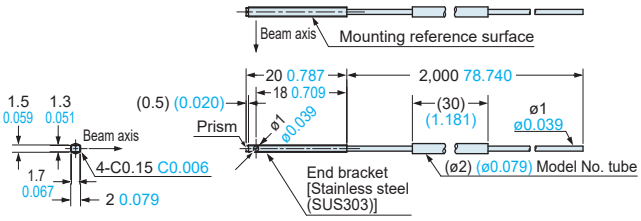
<with **FX-AT4**>



FT-KV26 FT-KV26H1

Free-cut

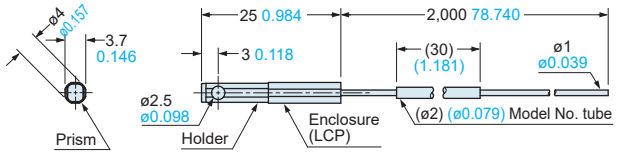
<with **FX-AT4**>



FT-KV40 FT-KV40W

Free-cut

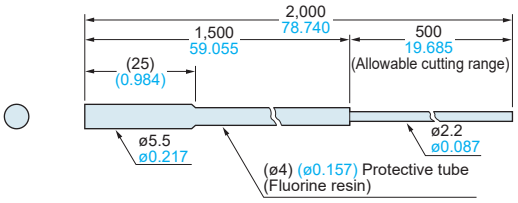
<with **FX-AT4**>



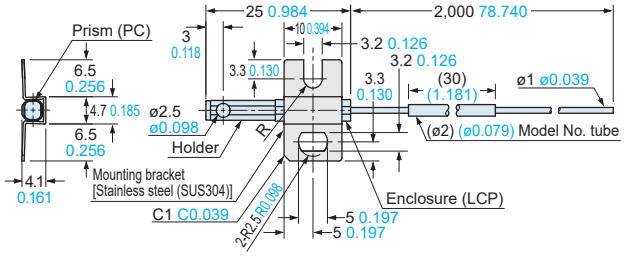
FT-L80Y

Free-cut

<with **FX-AT3**>



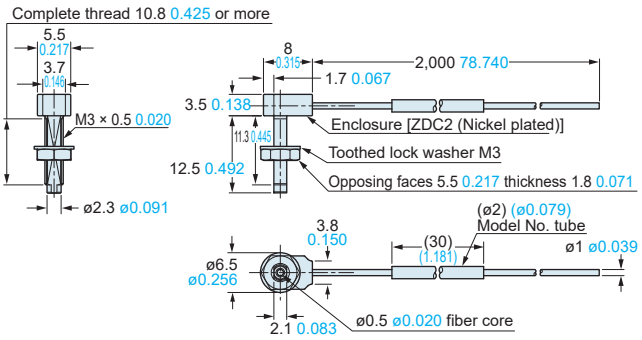
Assembly dimensions with MS-FD-3 (attached mounting bracket)



FT-R31

Free-cut

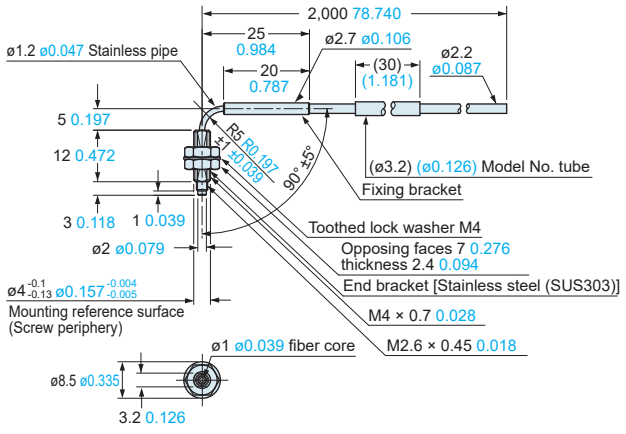
<with **FX-AT4**>



FT-R40

Free-cut

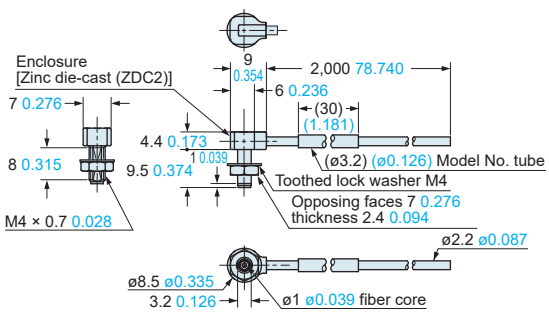
<with **FX-AT3**>



FT-R41W

Free-cut

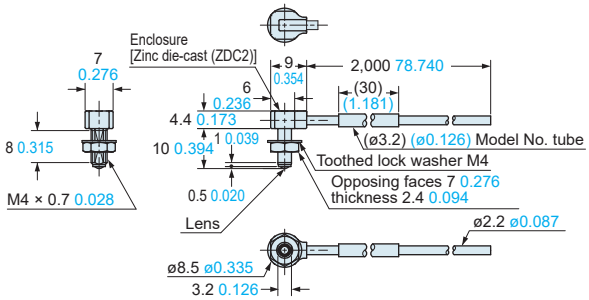
<with **FX-AT3**>



FT-R42W

Free-cut

<with **FX-AT3**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

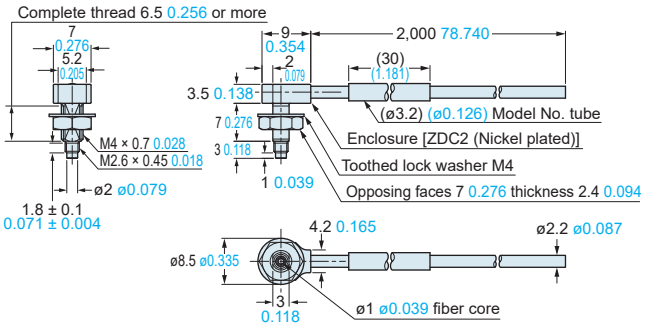
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-R43

Free-cut

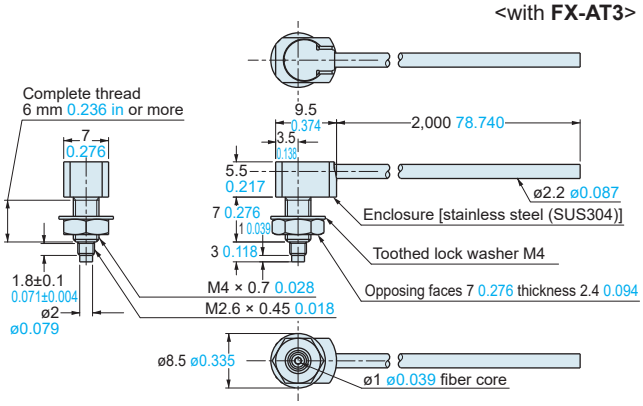
<with **FX-AT3**>



FT-R44Y

Free-cut

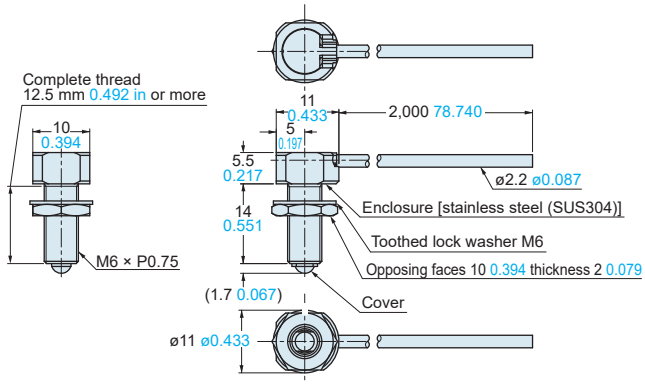
<with **FX-AT3**>



FT-R60Y

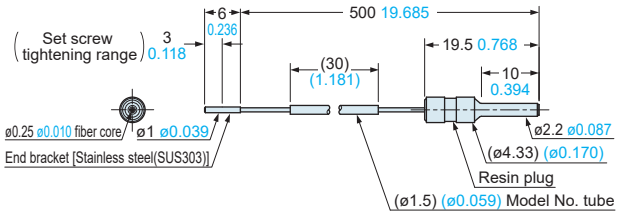
Free-cut

<with **FX-AT3**>



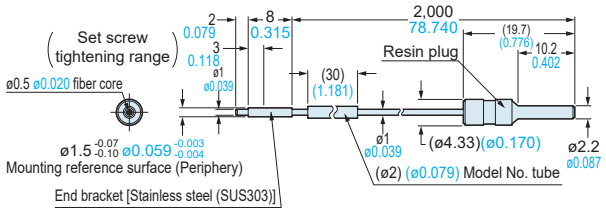
FT-S11

<with **FX-AT2**>



FT-S20

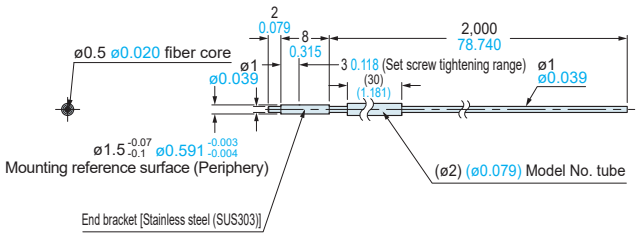
<with **FX-AT2**>



FT-S21

Free-cut

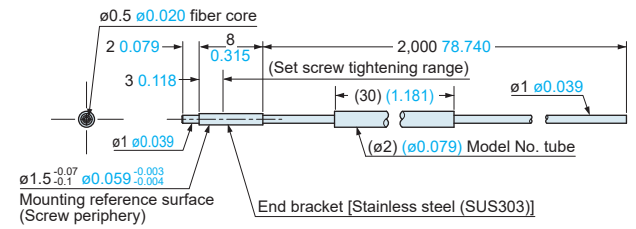
<with **FX-AT4**>



FT-S21W

Free-cut

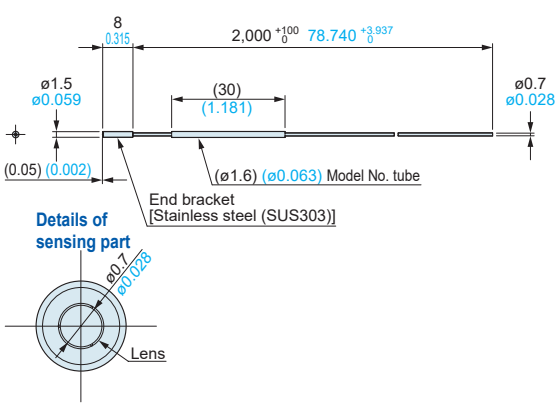
<with **FX-AT4**>



FT-S22

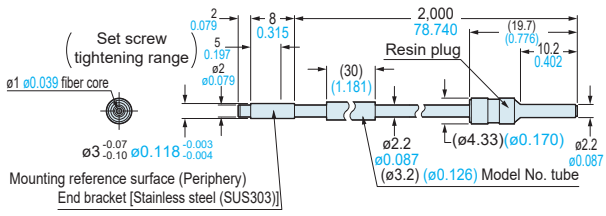
Free-cut

<with **FX-AT7**>



FT-S30

<with **FX-AT2**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

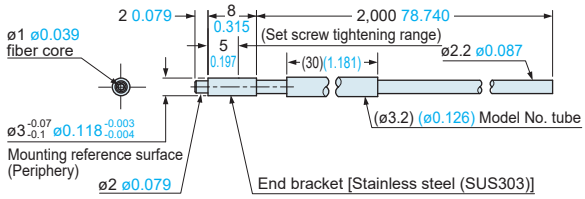
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-S31W

Free-cut

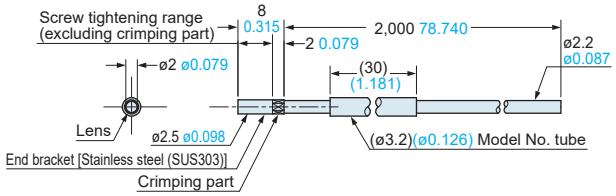
<with **FX-AT3**>



FT-S32

Free-cut

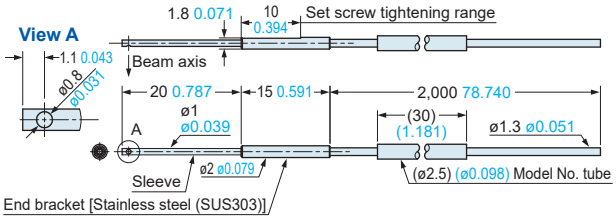
<with **FX-AT3**>



FT-V23

Free-cut

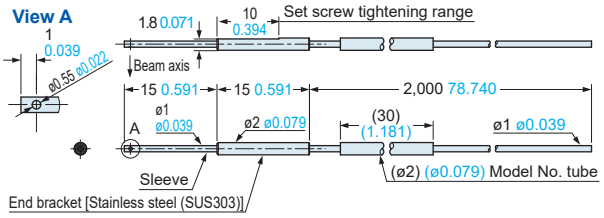
<with **FX-AT5**>



FT-V24W

Free-cut

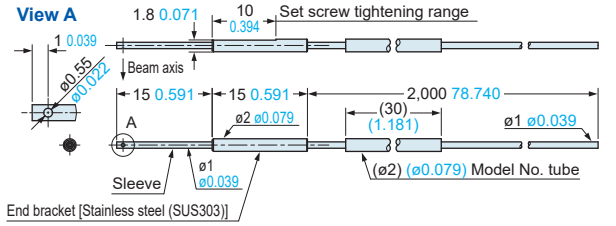
<with **FX-AT4**>



FT-V25

Free-cut

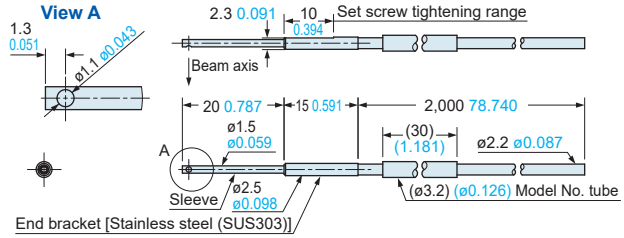
<with **FX-AT4**>



FT-V30

Free-cut

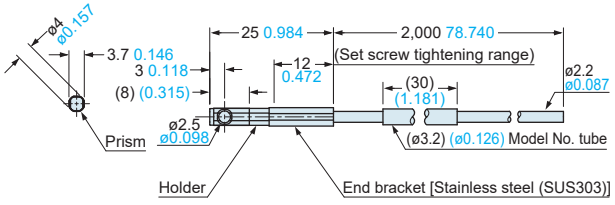
<with **FX-AT3**>



FT-V40

Free-cut

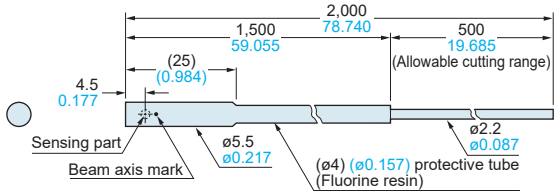
<with **FX-AT3**>



FT-V80Y

Free-cut

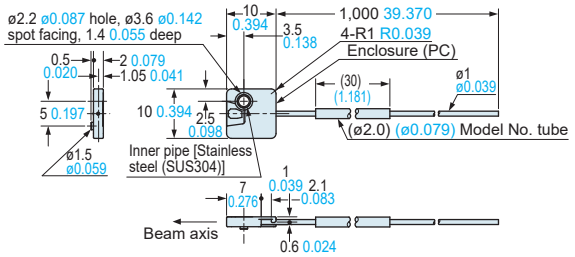
<with **FX-AT3**>



FT-Z20HBW

Free-cut

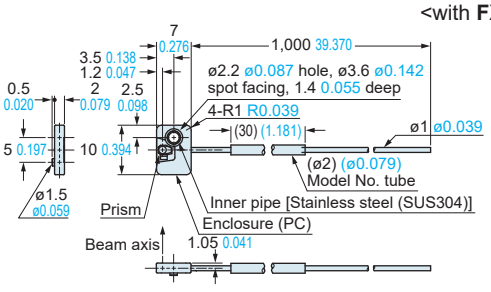
<with **FX-AT4**>



FT-Z20W

Free-cut

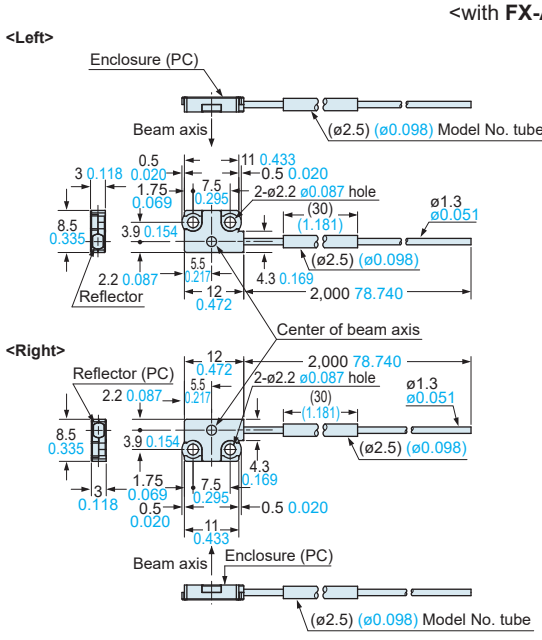
<with **FX-AT4**>



FT-Z30

Free-cut

<with **FX-AT5**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

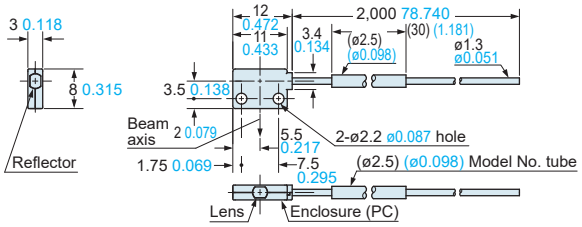
Thru-beam type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-Z30E

Free-cut

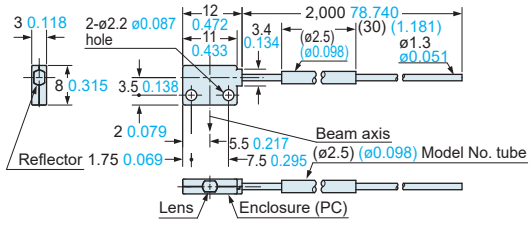
<with **FX-AT5**>



FT-Z30EW

Free-cut

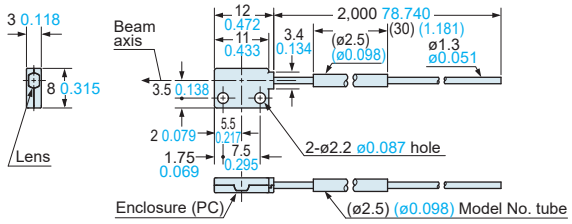
<with **FX-AT5**>



FT-Z30H

Free-cut

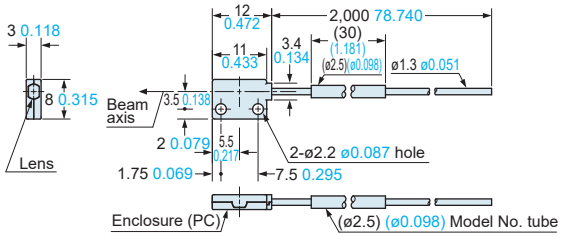
<with **FX-AT5**>



FT-Z30HW

Free-cut

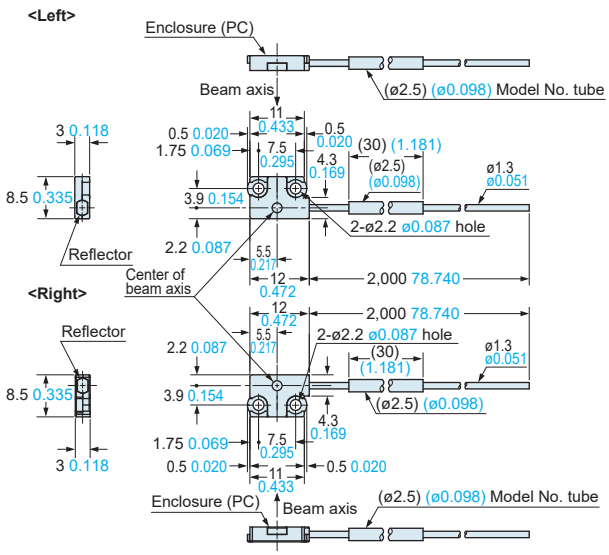
<with **FX-AT5**>



FT-Z30W

Free-cut

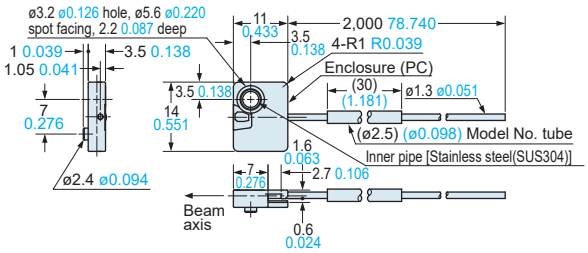
<with **FX-AT5**>



FT-Z40HBW

Free-cut

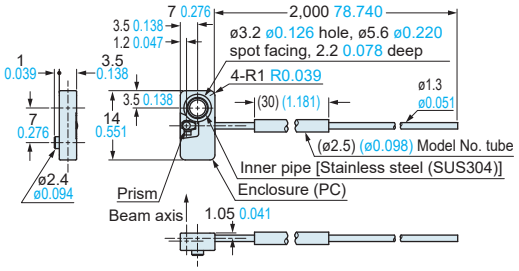
<with **FX-AT5**>



FT-Z40W

Free-cut

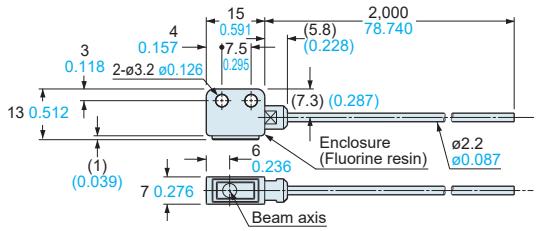
<with **FX-AT5**>



FT-Z802Y

Free-cut

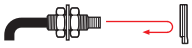
<with **FX-AT3**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

Retroreflective type fibers



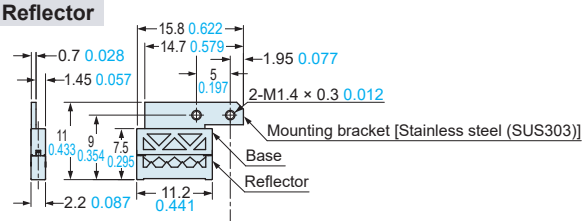
Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FR-KZ22E

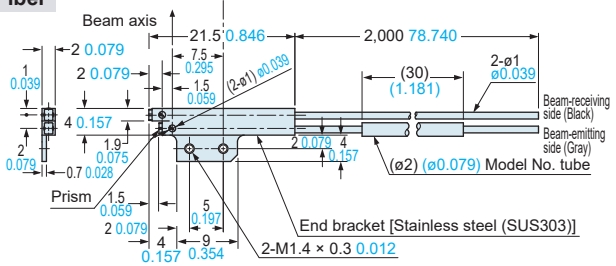
Free-cut

<with **FX-AT4**>

Reflector



Fiber

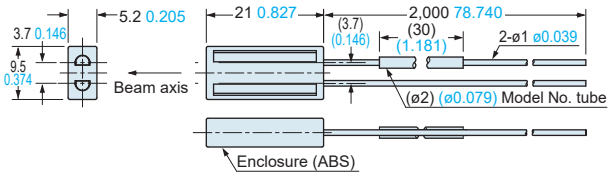


FR-KZ50H

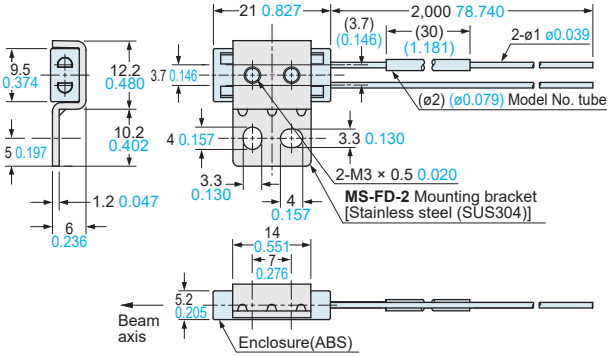
Free-cut

<with **FX-AT4**>

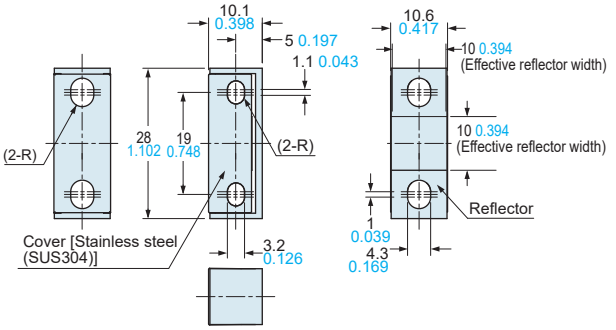
Fiber



Assembly dimensions with MS-FD-2 (attached mounting bracket)



Reflector RF-003 (Accessory for **FR-KZ50H**)

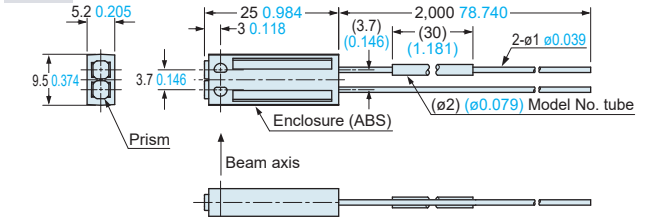


FR-KZ50E

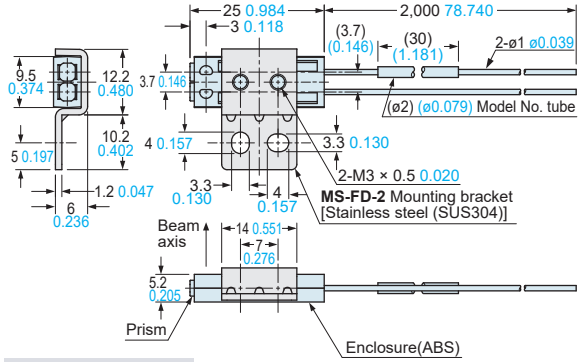
Free-cut

<with **FX-AT4**>

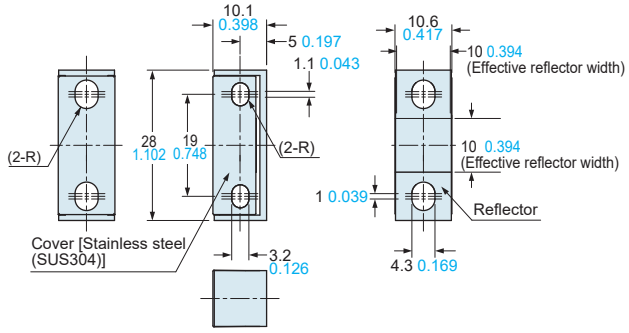
Fiber



Assembly dimensions with MS-FD-2 (attached mounting bracket)



Reflector RF-003 (Accessory for **FR-KZ50E**)

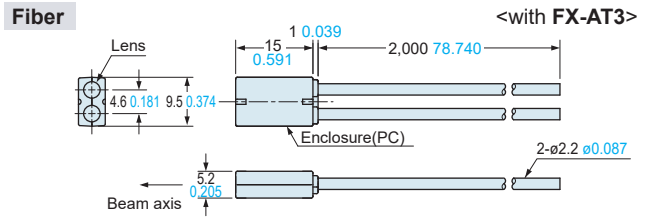


FR-Z50HW

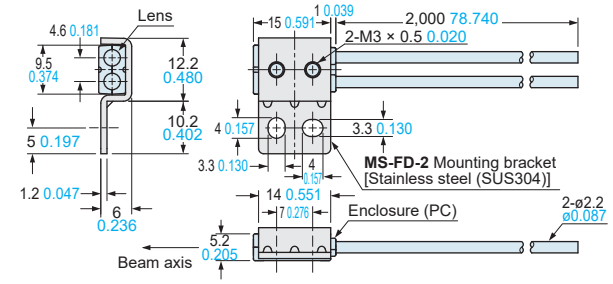
Free-cut

Fiber

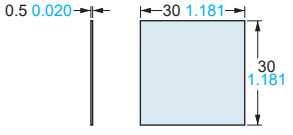
<with **FX-AT3**>



Assembly dimensions with MS-FD-2 (attached mounting bracket)



Reflective tape RF-13 (Accessory for **FR-Z50HW**)



Material : Acrylic (Reflective surface)

DIMENSIONS (Unit: mm in)

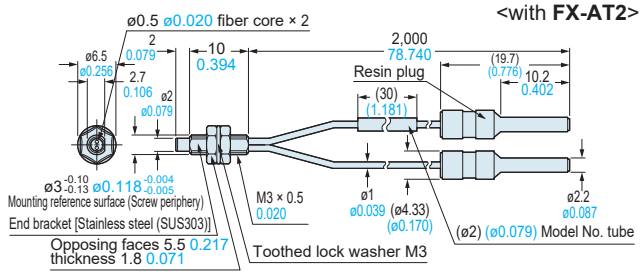
Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-30

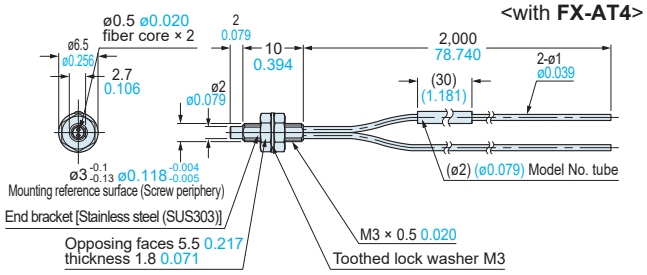
<with **FX-AT2**>



FD-31

Free-cut

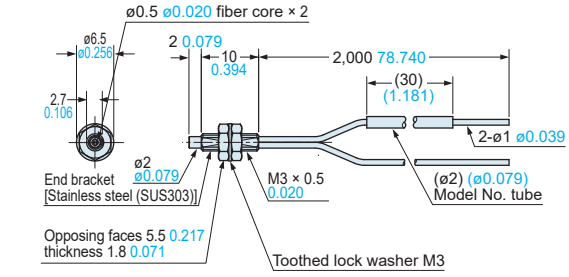
<with **FX-AT4**>



FD-31W

Free-cut

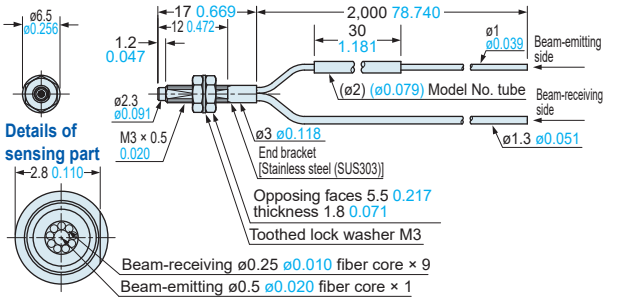
<with **FX-AT4**>



FD-32G

Free-cut

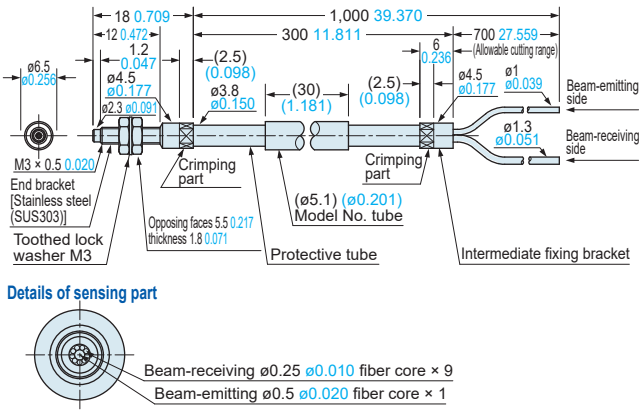
<with **FX-AT6**>



FD-32GX

Free-cut

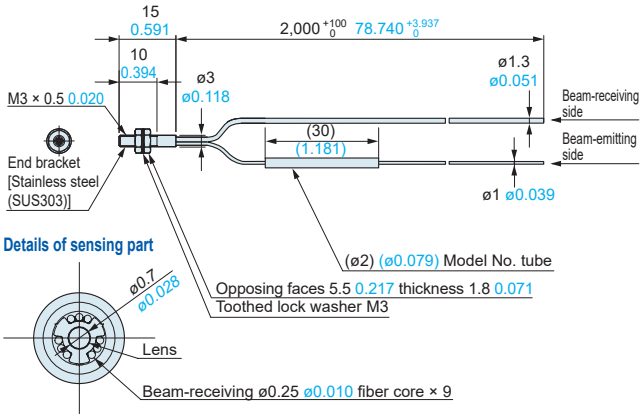
<with **FX-AT6**>



FD-34G

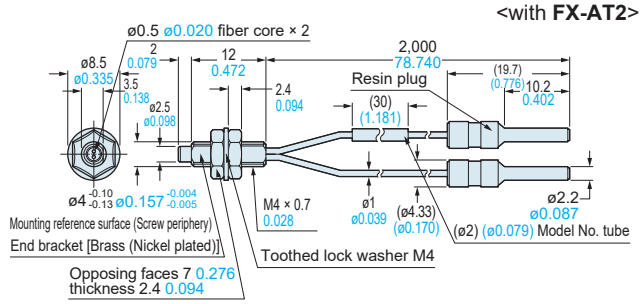
Free-cut

<with **FX-AT6**>



FD-40

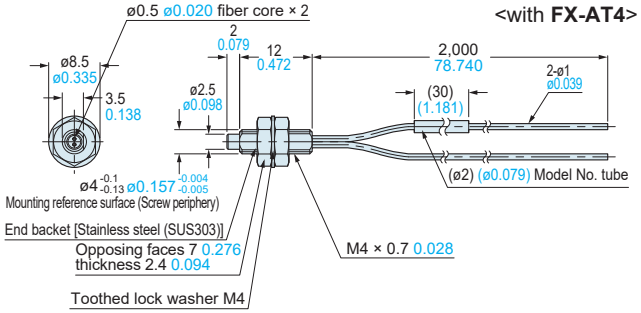
<with **FX-AT2**>



FD-41

Free-cut

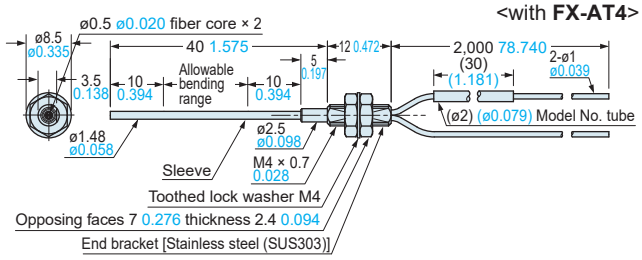
<with **FX-AT4**>



FD-41S

Free-cut

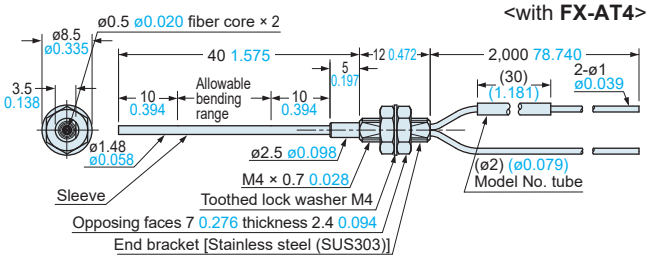
<with **FX-AT4**>



FD-41SW

Free-cut

<with **FX-AT4**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

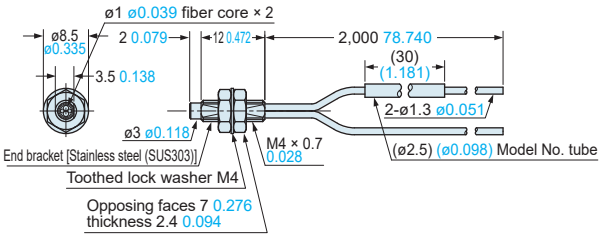
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-41W

Free-cut

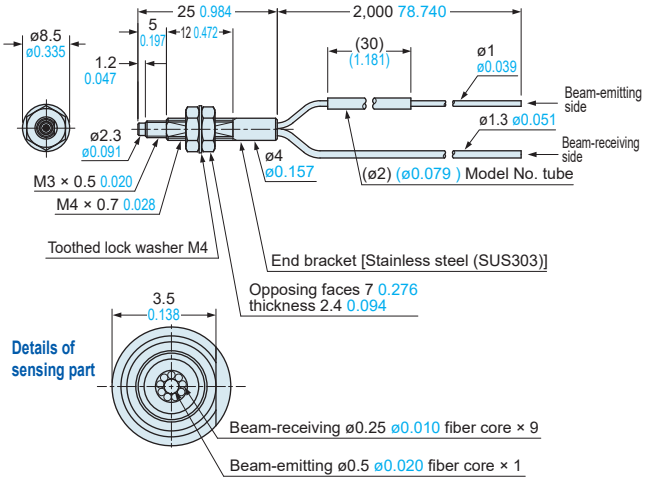
<with **FX-AT5**>



FD-42G

Free-cut

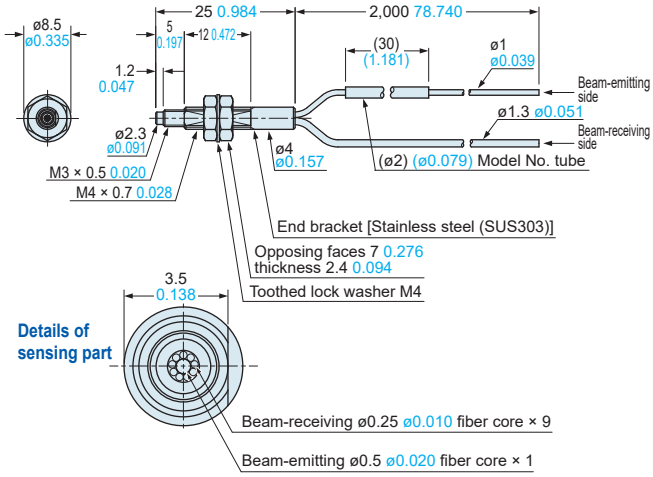
<with **FX-AT6**>



FD-42GW

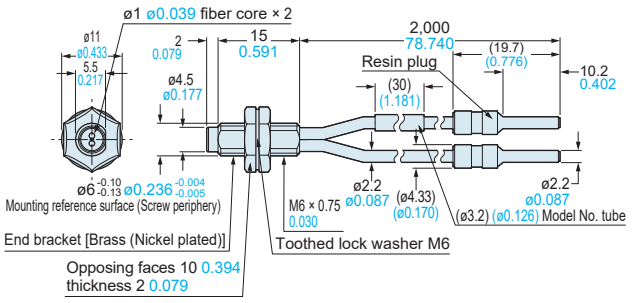
Free-cut

<with **FX-AT6**>



FD-60

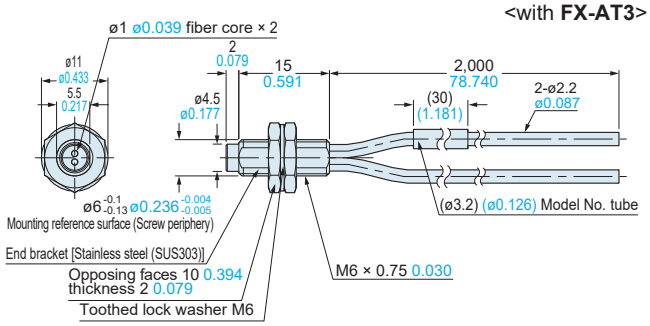
<with **FX-AT2**>



FD-61

Free-cut

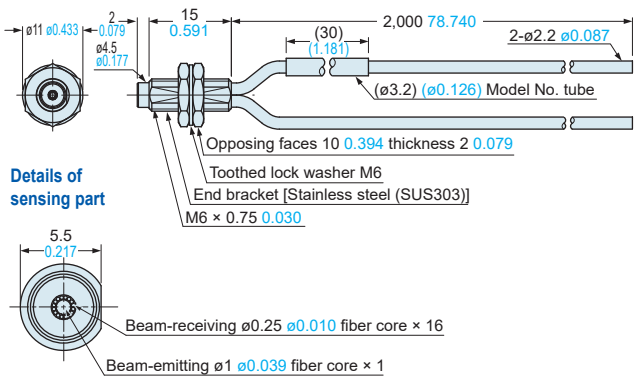
<with **FX-AT3**>



FD-61G

Free-cut

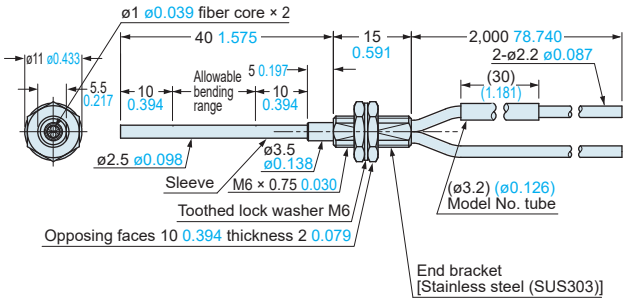
<with **FX-AT3**>



FD-61S

Free-cut

<with **FX-AT3**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

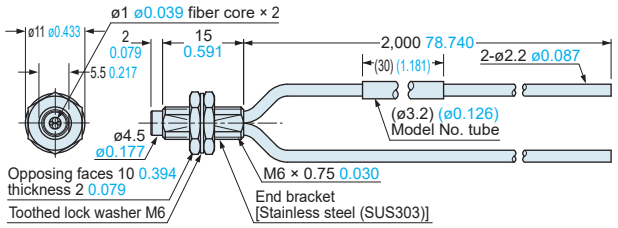
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-61W

Free-cut

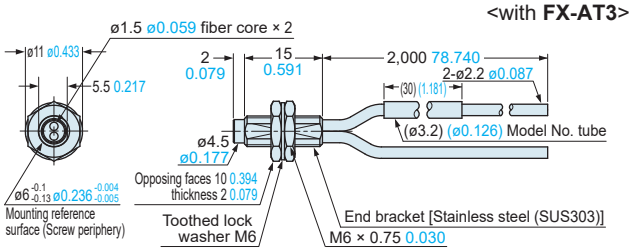
<with **FX-AT3**>



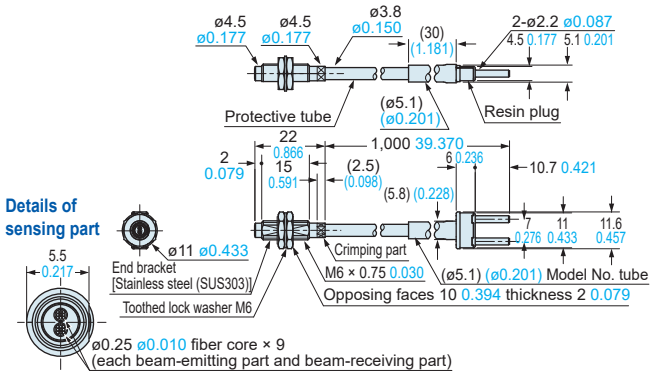
FD-62

Free-cut

<with **FX-AT3**>



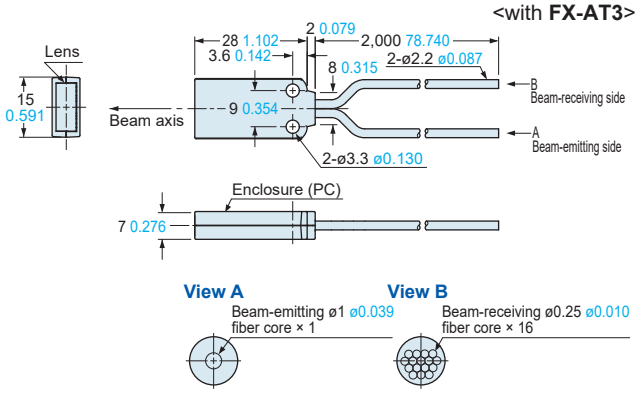
FD-64X



FD-A16

Free-cut

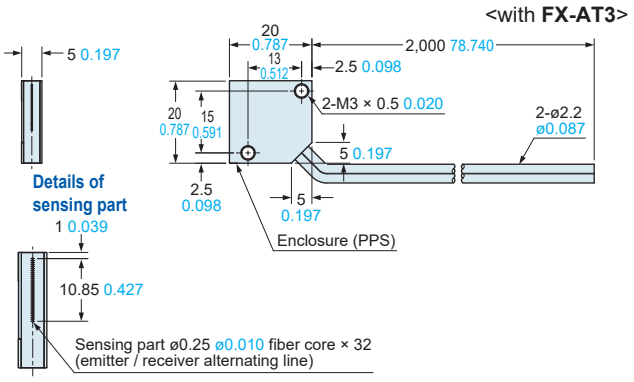
<with **FX-AT3**>



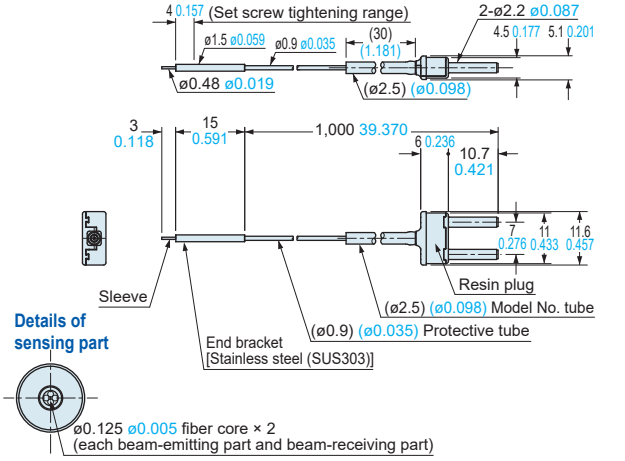
FD-AL11

Free-cut

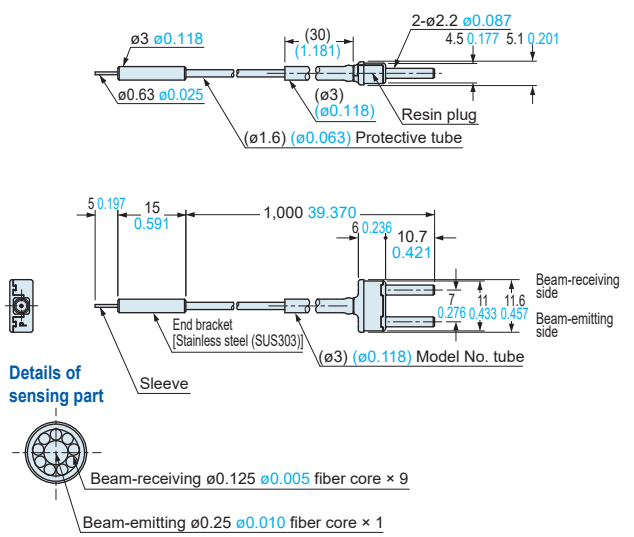
<with **FX-AT3**>



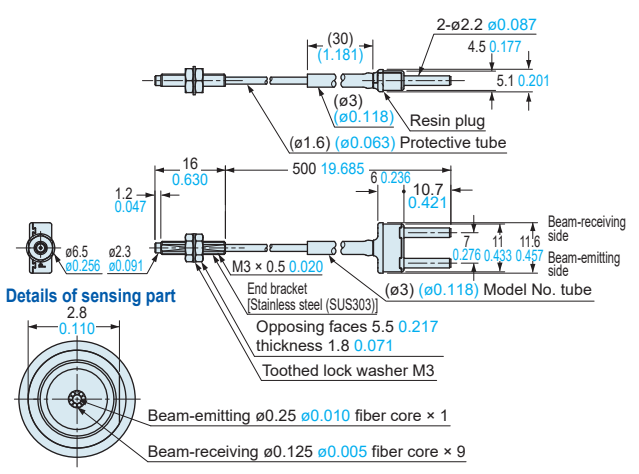
FD-E13



FD-E23



FD-EG30



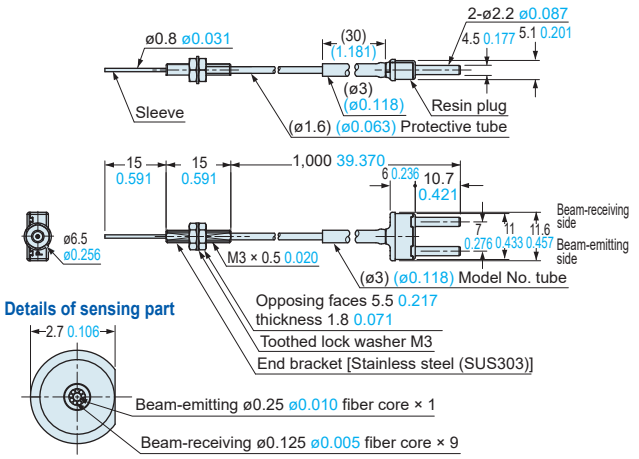
DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

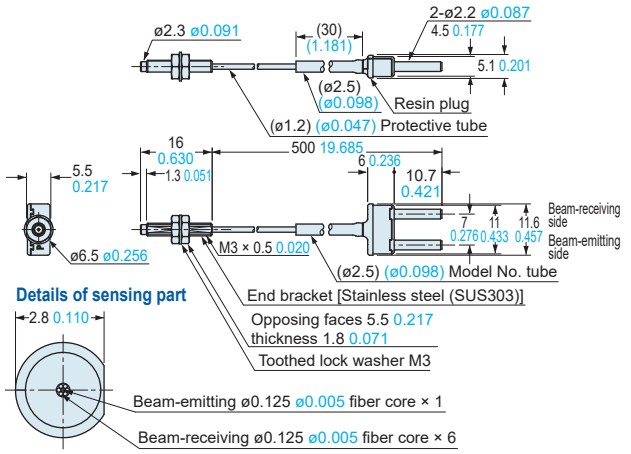
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-EG30S



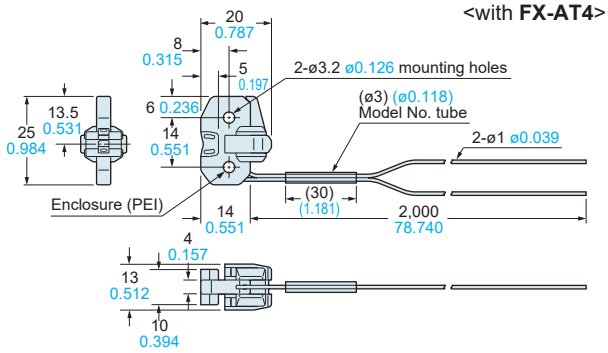
FD-EG31



FD-F4 FD-F41

Free-cut

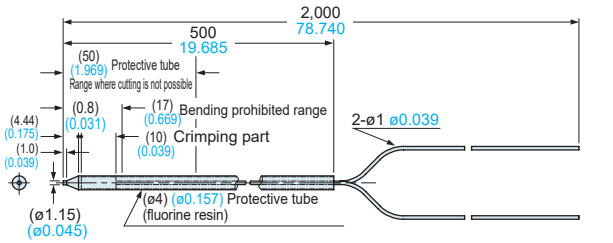
<with **FX-AT4**>



FD-F41Y

Free-cut

<with **FX-AT4**>

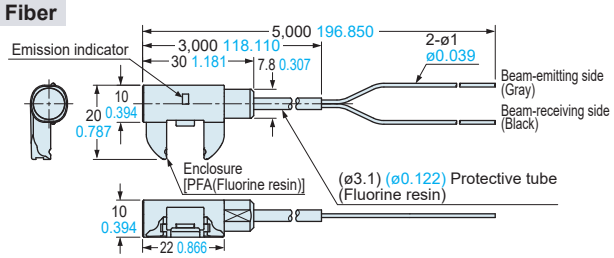


FD-F71

Free-cut

<with **FX-AT4**>

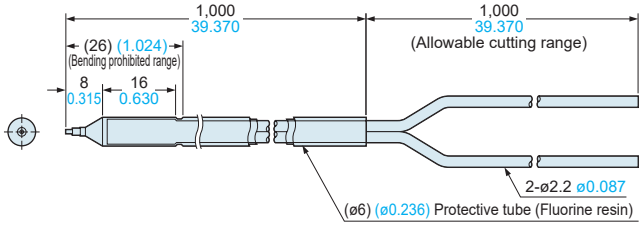
Fiber



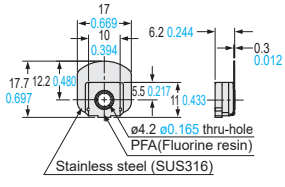
FD-F8Y

Free-cut

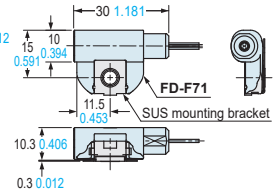
<with **FX-AT3**>



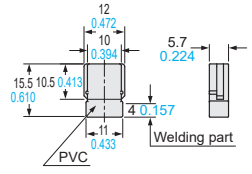
SUS mounting bracket (MS-FD-F7-1)



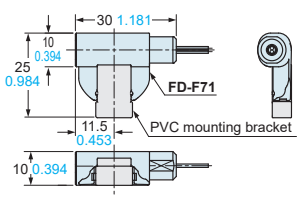
SUS mounting bracket mounting diagram



PVC mounting bracket (MS-FD-F7-2)



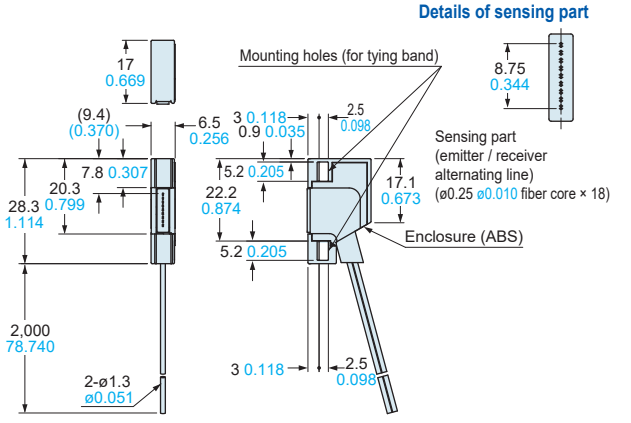
PVC mounting bracket mounting diagram



FD-FA93

Free-cut

<with fiber attachment>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

Reflective type fibers

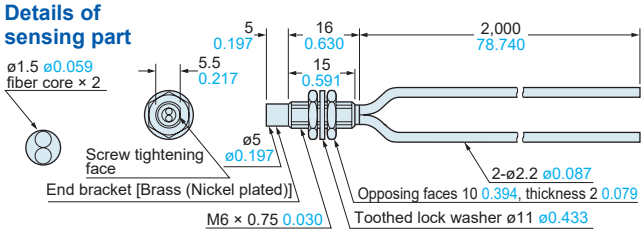
Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-H13-FM2

Free-cut

<with **FX-AT3**>

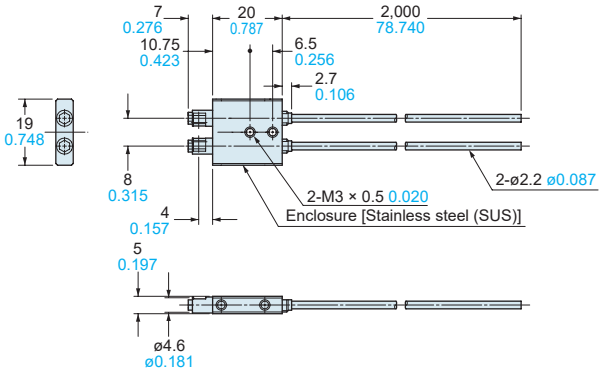
Details of sensing part



FD-H18-L31

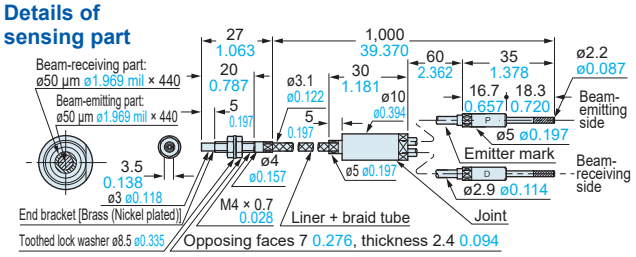
Free-cut

<with **FX-AT3**>



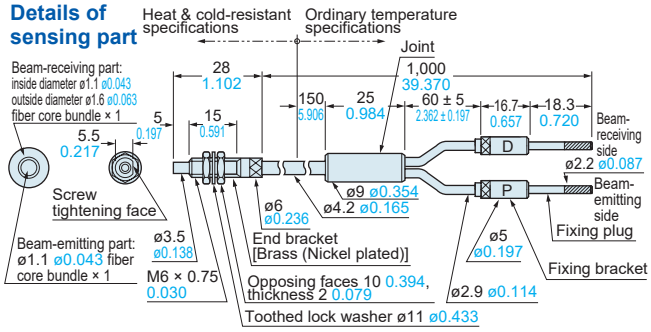
FD-H20-21

Details of sensing part



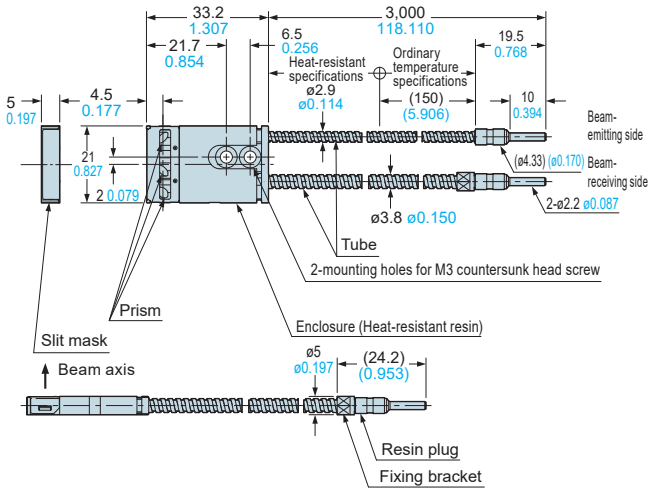
FD-H20-M1

Details of sensing part



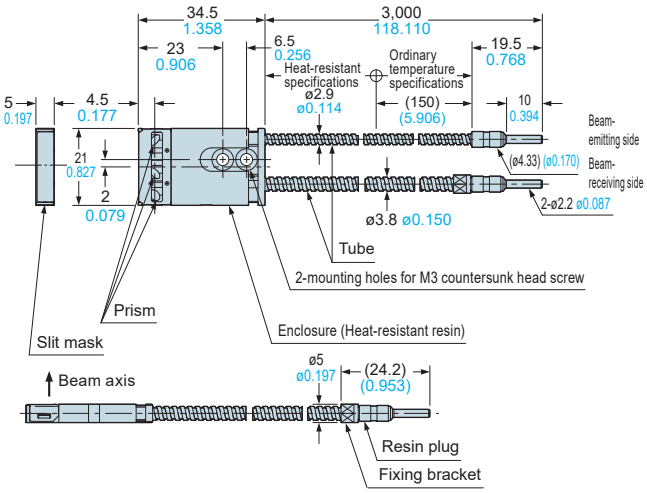
FD-H25-L43

<with **FX-AT2**>



FD-H25-L45

<with **FX-AT2**>



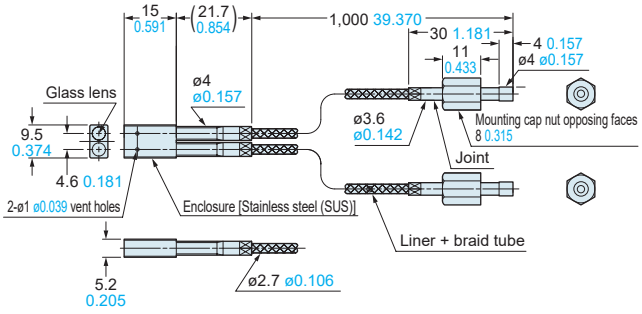
DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

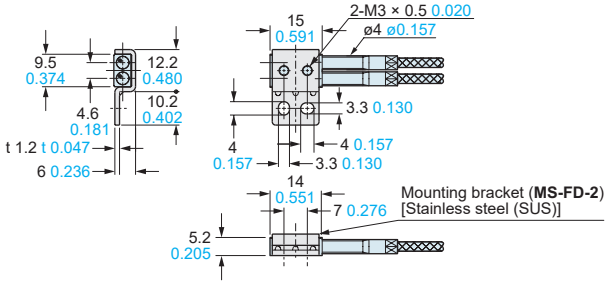
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-H30-KZ1V-S

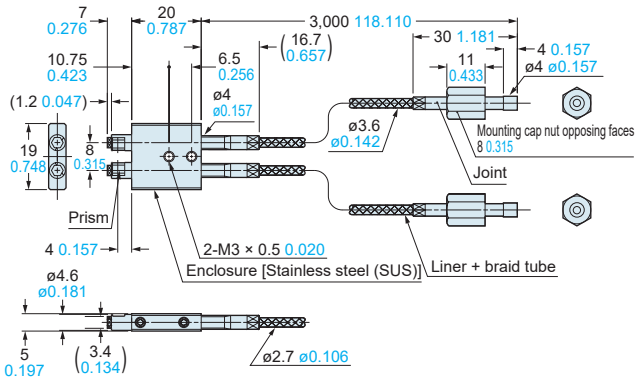


Assembly dimensions with MS-FD-2 (attached mounting bracket)



Note: The **FD-H30-KZ1V-S** is a set with the **FD-H30-KZ1V**, photo-terminal, and atmospheric side fiber. Refer to p.81 for dimensions of the atmospheric side fiber and photo-terminals.

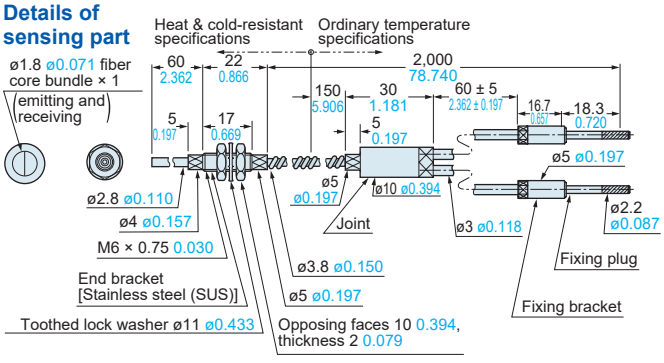
FD-H30-L32V-S



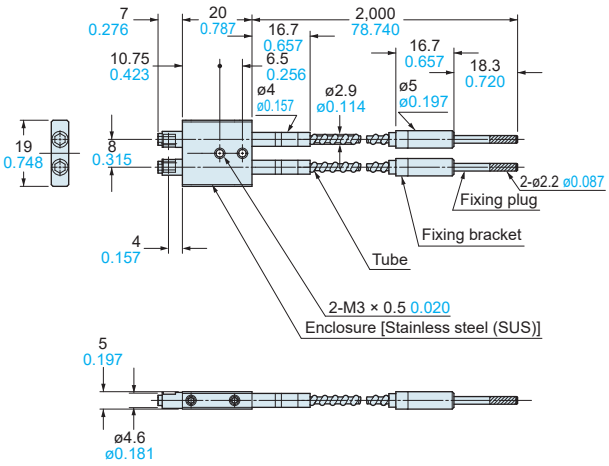
Note: The **FD-H30-L32V-S** is a set with the **FD-H30-L32V**, photo-terminal, and atmospheric side fiber. Refer to P.81 for dimensions of the atmospheric side fiber and photo-terminals.

FD-H35-M2S6

Details of sensing part

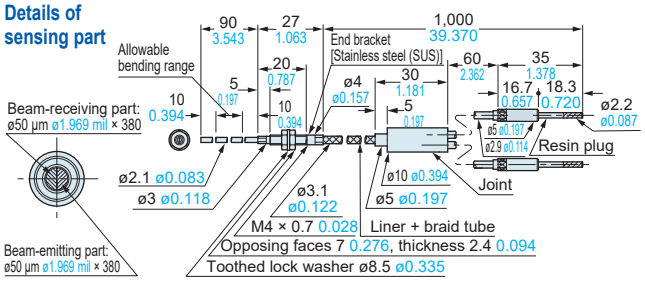


FD-H30-L32



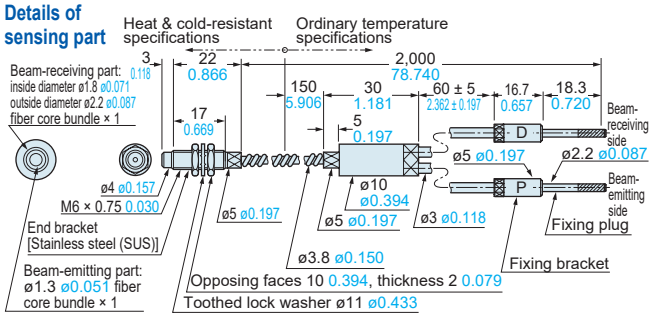
FD-H35-20S

Details of sensing part



FD-H35-M2

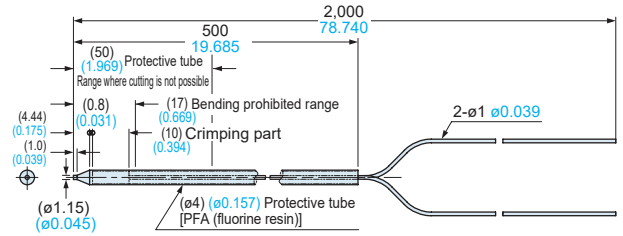
Details of sensing part



FD-HF40Y

Free-cut

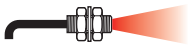
<with **FX-AT4**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

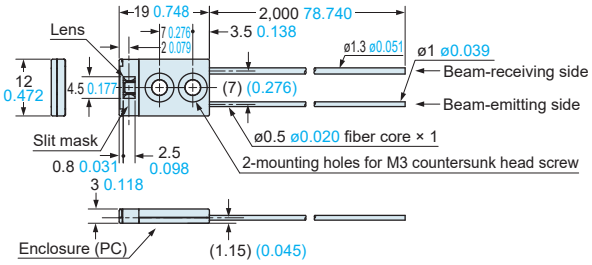
Reflective type fibers



Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

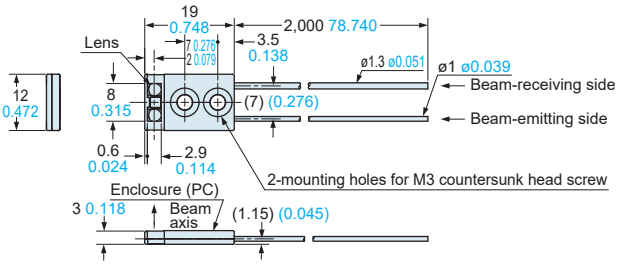
FD-L10 — Free-cut

<with **FX-AT6**>



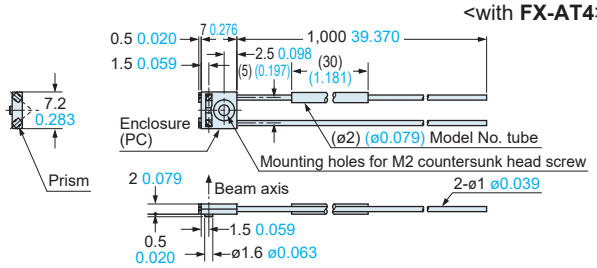
FD-L11 — Free-cut

<with **FX-AT6**>



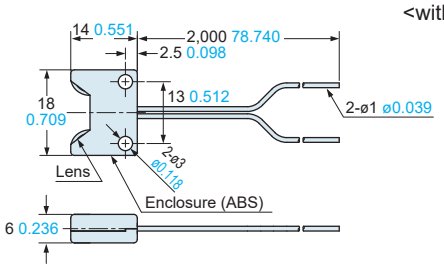
FD-L12W — Free-cut

<with **FX-AT4**>



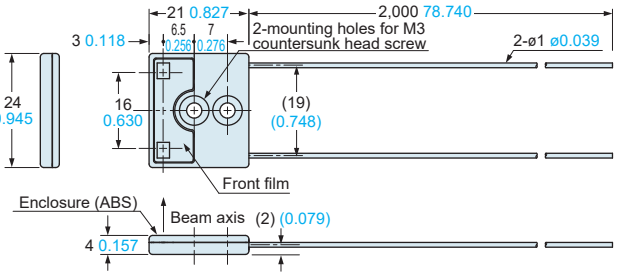
FD-L20H — Free-cut

<with **FX-AT4**>



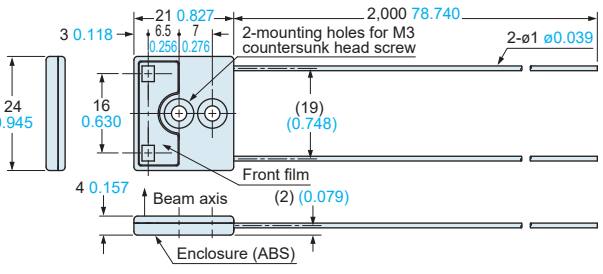
FD-L21 — Free-cut

<with **FX-AT4**>



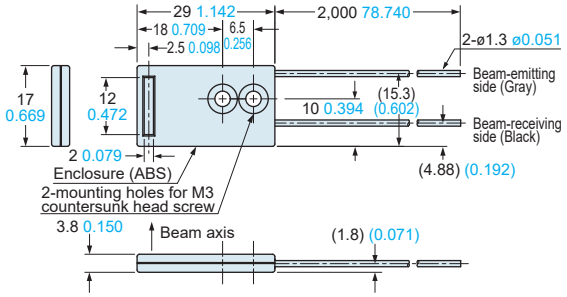
FD-L21W — Free-cut

<with **FX-AT4**>



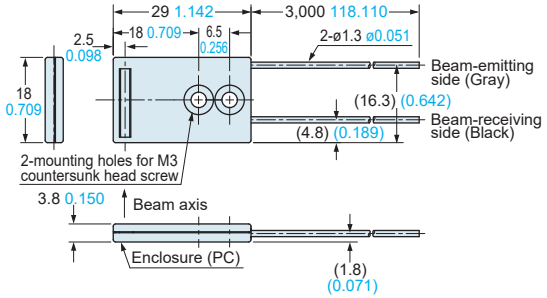
FD-L22A — Free-cut

<with **FX-AT5**>



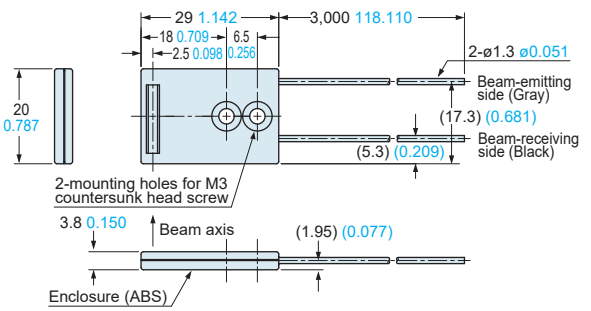
FD-L23 — Free-cut

<with **FX-AT5**>



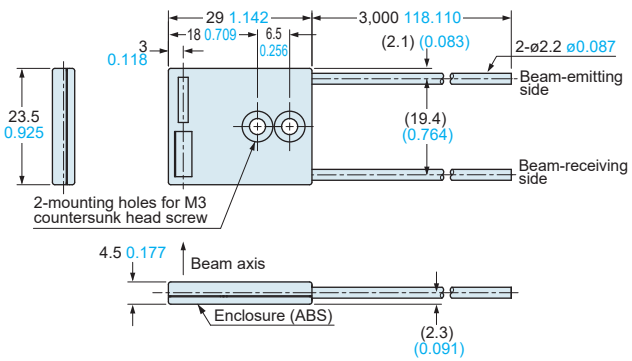
FD-L30A — Free-cut

<with **FX-AT5**>



FD-L31A — Free-cut

<with **FX-AT3**>



DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

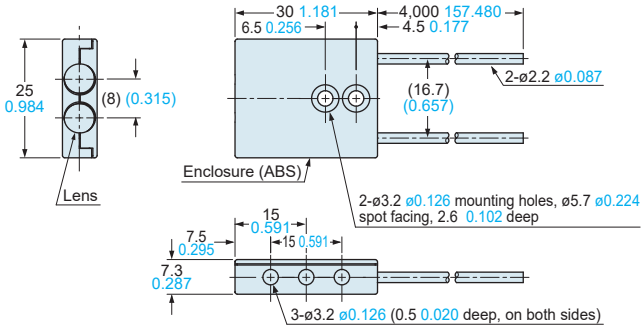
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-L32H

Free-cut

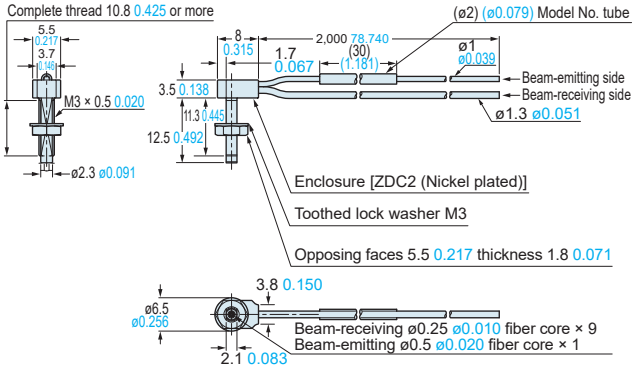
<with **FX-AT3**>



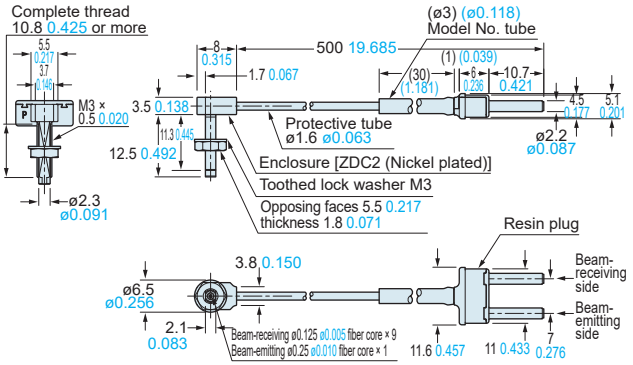
FD-R31G

Free-cut

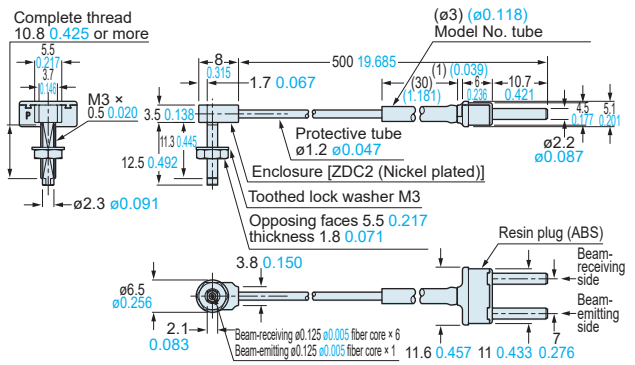
<with **FX-AT6**>



FD-R32EG FD-R34EG



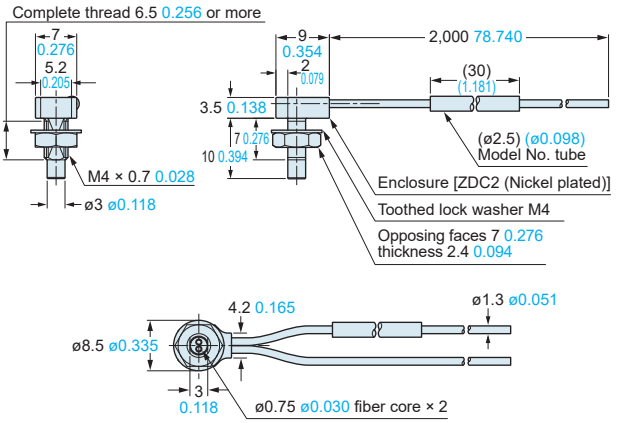
FD-R33EG



FD-R41

Free-cut

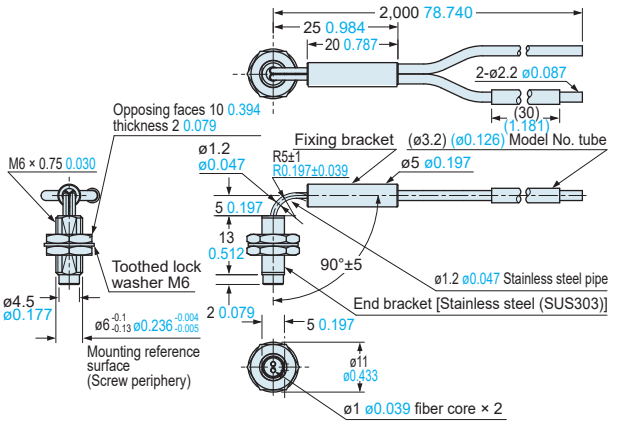
<with **FX-AT5**>



FD-R60

Free-cut

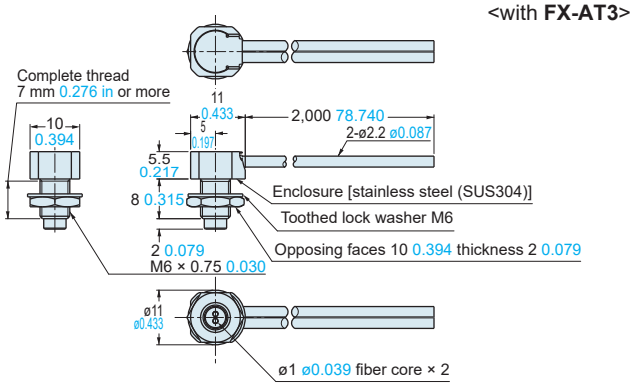
<with **FX-AT3**>



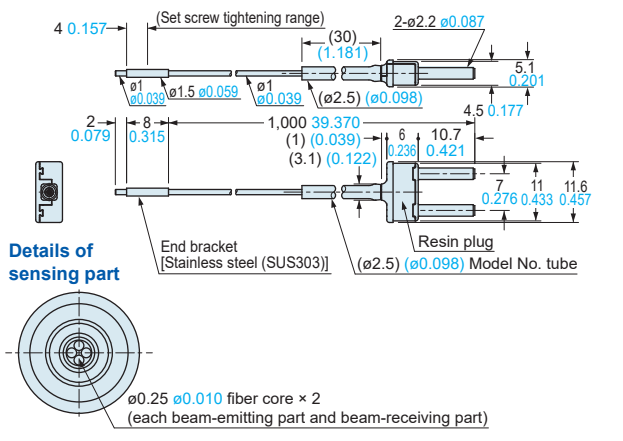
FD-R61Y

Free-cut

<with **FX-AT3**>



FD-S21



DIMENSIONS (Unit: mm in)

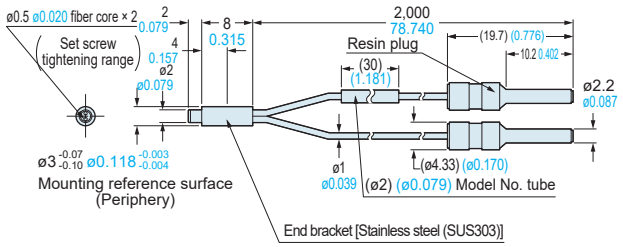
Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

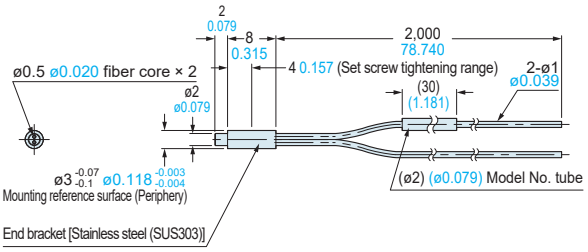
FD-S30

<with **FX-AT2**>



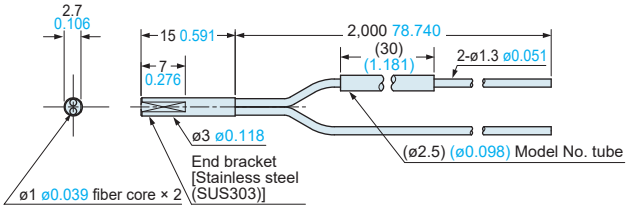
FD-S31 Free-cut

<with **FX-AT4**>



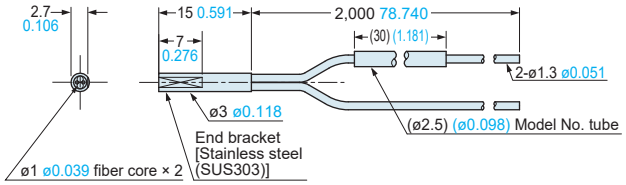
FD-S32 Free-cut

<with **FX-AT5**>



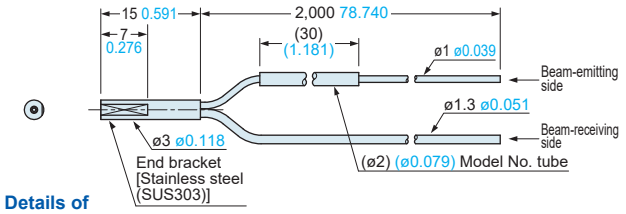
FD-S32W Free-cut

<with **FX-AT5**>

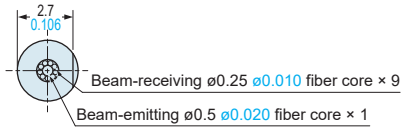


FD-S33GW Free-cut

<with **FX-AT6**>

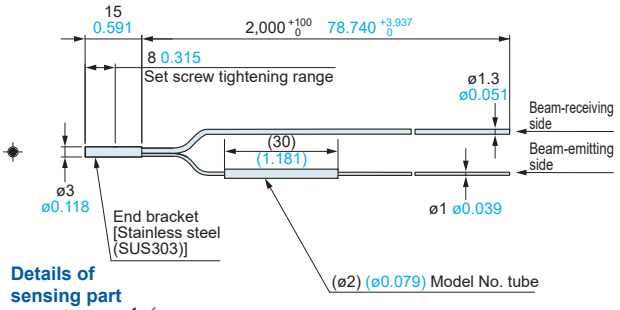


Details of sensing part

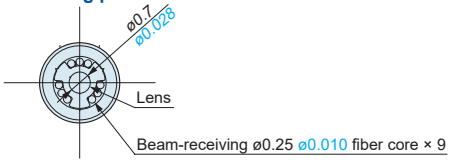


FD-S34G Free-cut

<with **FX-AT6**>

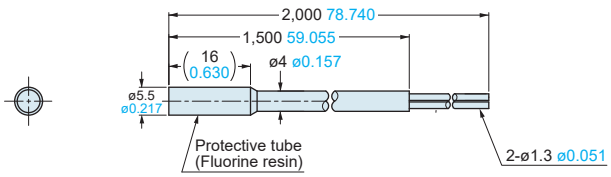


Details of sensing part



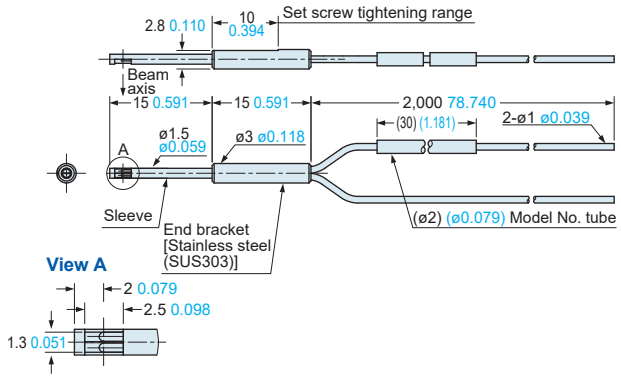
FD-S60Y Free-cut

<with **FX-AT5**>



FD-V30 Free-cut

<with **FX-AT4**>



View A

DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

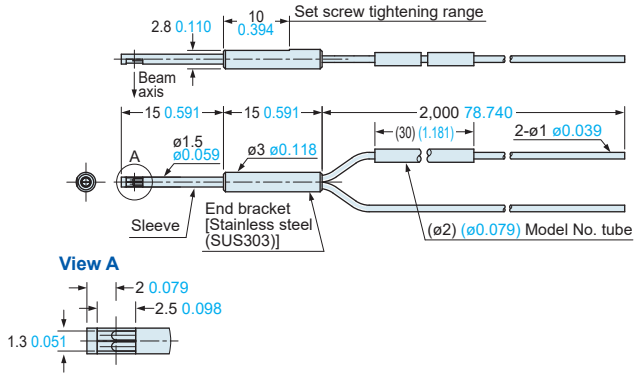
Reflective type fibers

Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-V30W

Free-cut

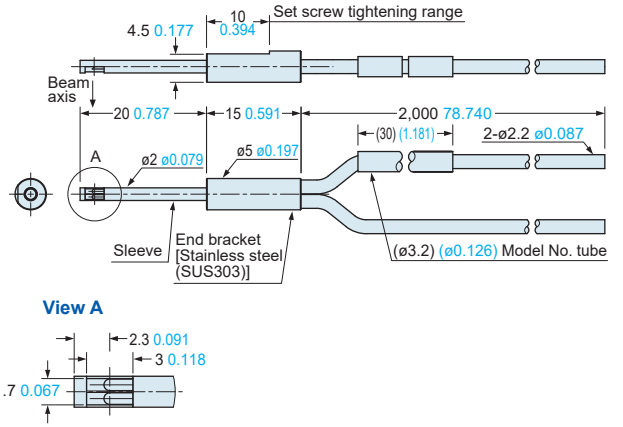
<with **FX-AT4**>



FD-V50

Free-cut

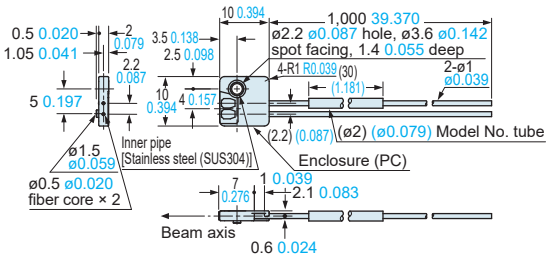
<with **FX-AT3**>



FD-Z20HBW

Free-cut

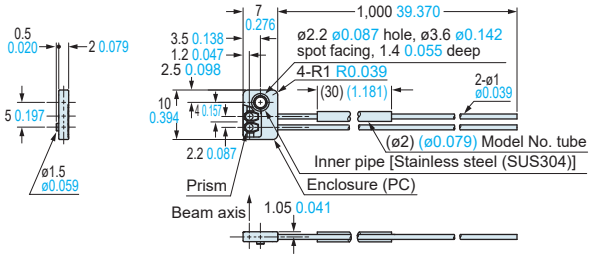
<with **FX-AT4**>



FD-Z20W

Free-cut

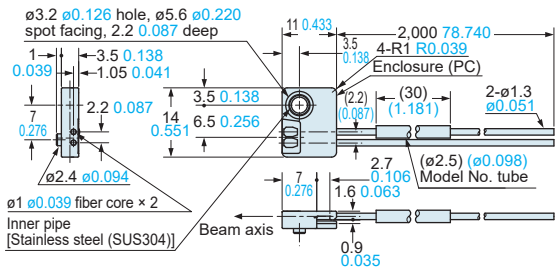
<with **FX-AT4**>



FD-Z40HBW

Free-cut

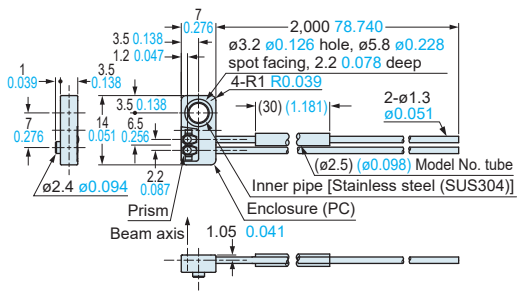
<with **FX-AT5**>



FD-Z40W

Free-cut

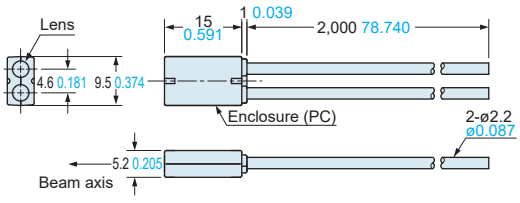
<with **FX-AT5**>



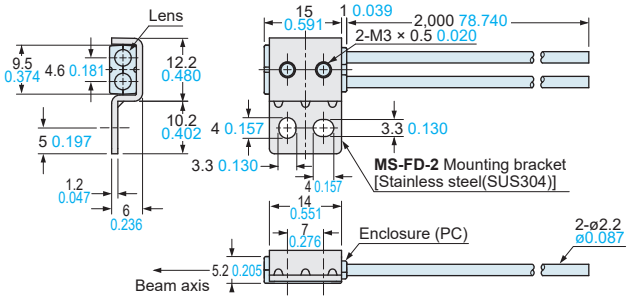
FD-Z50HW

Free-cut

<with **FX-AT3**>



Assembly dimensions with MS-FD-2 (attached mounting bracket)



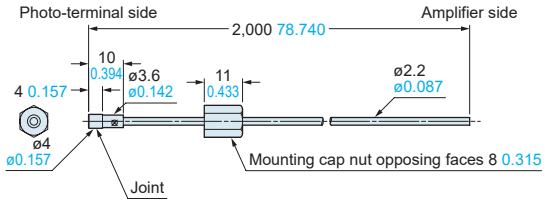
DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

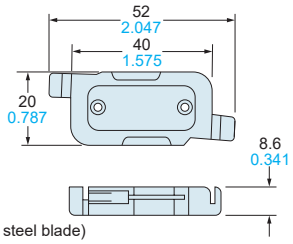
Vacuum-resistant atmospheric side fiber

FT-J8 Free-cut

(Accessory for vacuum-resistant fiber) <with **FX-AT3**>

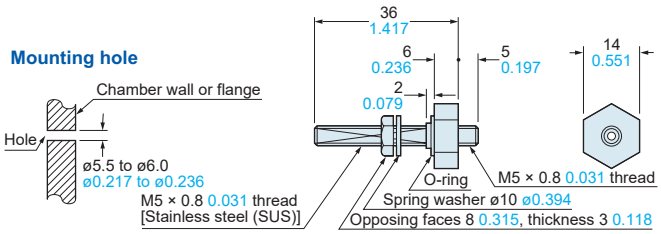


FB-1 Fiber bender (Optional)

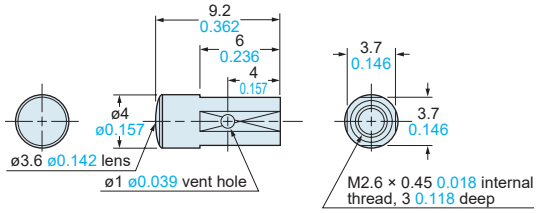


Material: PP (Containing steel blade)

FV-BR1 Photo-terminal (for vacuum-resistant) (with vacuum-resistant fiber)

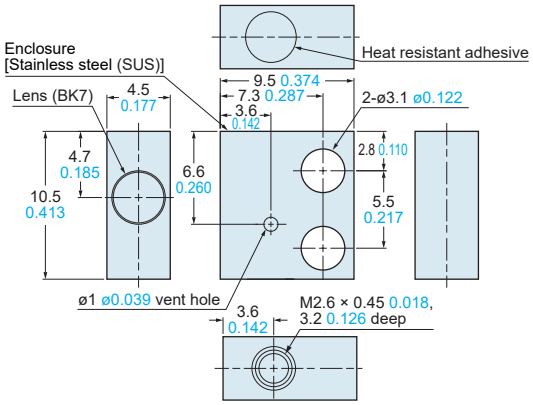


FV-LE1 Vacuum-resistant expansion lens (Optional)



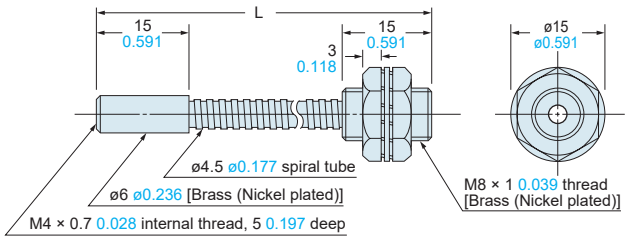
Material: Enclosure...Aluminum alloy (A6061-T6)
Lens.....BK-7

FV-SV2 Vacuum-resistant side-view lens (Optional)

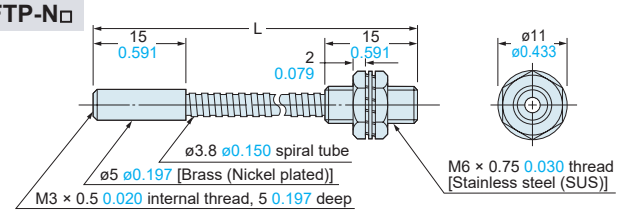


FTP-□ FDP-□ Protective tube (Optional)

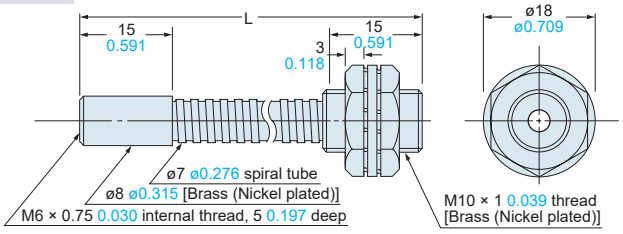
FTP-□ FDP-N□



FTP-N□



FDP-□



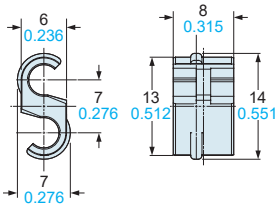
• Length L

Model No.	Length L
FTP-500, **FTP-N500**, **FDP-N500**, **FDP-500**	500^{+10}_{0} $19.685^{+0.394}_{0}$
FTP-1000, **FTP-N1000**, **FDP-N1000**, **FDP-1000**	$1{,}000^{+10}_{0}$ $39.370^{+0.394}_{0}$
FTP-1500, **FTP-N1500**, **FDP-N1500**, **FDP-1500**	$1{,}500^{+10}_{0}$ $59.055^{+0.394}_{0}$

DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

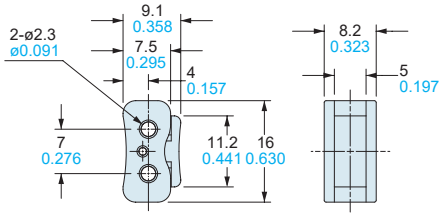
FX-AT2 Attachment for fixed-length fiber (Accessory for fixed-length fiber)



Material: POM

FX-AT3 Attachment for ø2.2 mm ø0.087 in fiber

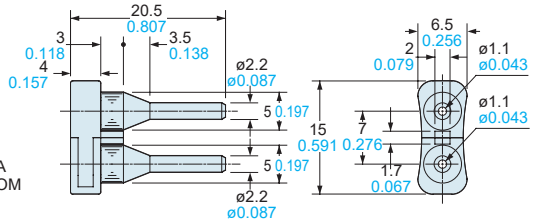
(Accessory for ø2.2 mm ø0.087 in fiber)



Material: Polycarbonate

FX-AT4 Attachment for ø1 mm ø0.039 in fiber

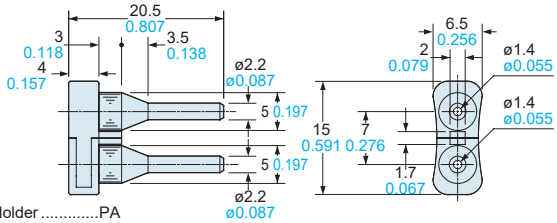
(Accessory for ø1 mm ø0.039 in fiber)



Material:
Holder.....PA
Ground.....POM

FX-AT5 Attachment for ø1.3 mm ø0.051 in fiber

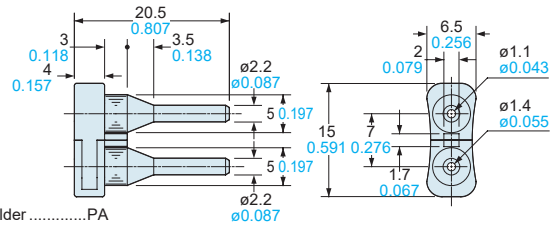
(Accessory for ø1.3 mm ø0.051 in fiber)



Material: Holder.....PA
Ground.....POM

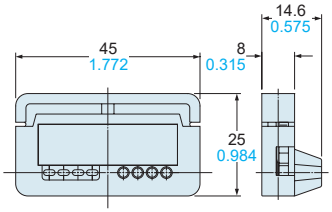
FX-AT6 Attachment for ø1 mm ø0.039 in / ø1.3 mm ø0.051 in mixed fiber

(Accessory for ø1 mm ø0.039 in / ø1.3 mm ø0.051 in mixed fiber)



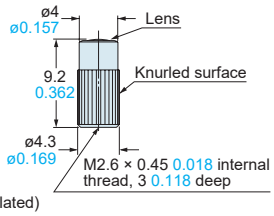
Material: Holder.....PA
Ground.....POM

FX-CT2 Fiber cutter (Accessory for free-cut type fiber)



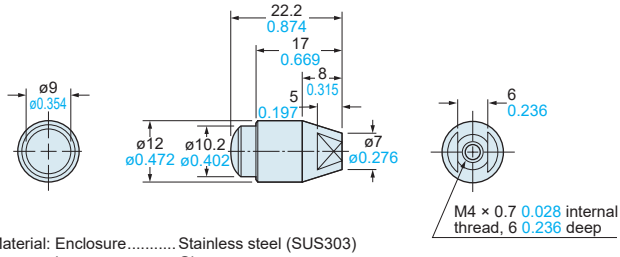
Material: ABS

FX-LE1 Expansion lens (Optional)



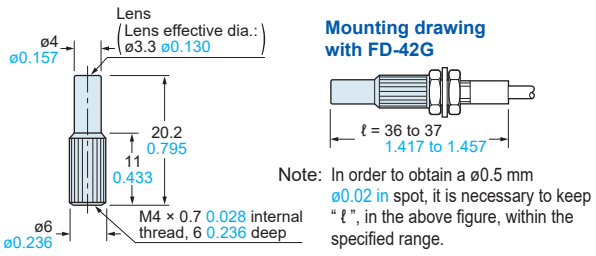
Material: Enclosure.....Brass
(Nickel plated)
Lens.....Glass

FX-LE2 Super-expansion lens (Optional)



Material: Enclosure.....Stainless steel (SUS303)
Lens.....Glass

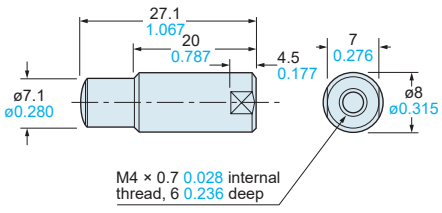
FX-MR1 Pinpoint spot lens (Optional)



Note: In order to obtain a ø0.5 mm ø0.02 in spot, it is necessary to keep "ℓ", in the above figure, within the specified range.

Material: Enclosure.....Aluminum (Black ALMITE)
Lens.....Glass

FX-MR2 Zoom lens (Optional)



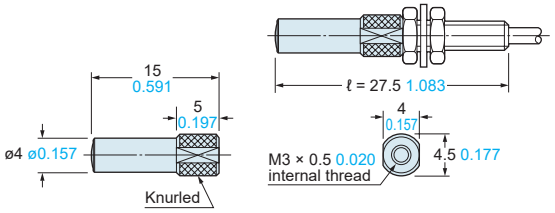
Material: Enclosure.....Aluminum (Black ALMITE)
Lens.....Glass

DIMENSIONS (Unit: mm in)

Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

FX-MR3 — Finest spot lens (Optional)

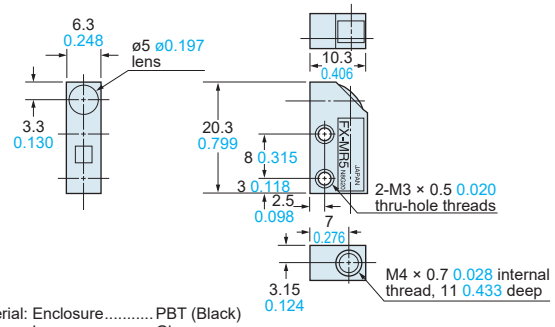
Mounting drawing with FD-EG30



Material: Enclosure..... Aluminum (Black ALMITE)
Lens..... Glass

Note: When inserting the fiber, insert fully till it stops.

FX-MR5 — Zoom lens (Optional)

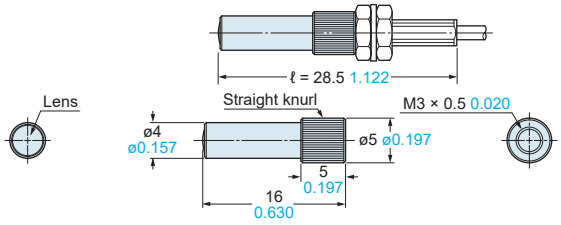


Material: Enclosure..... PBT (Black)
Lens..... Glass

NT-FX-MR5 (exclusive nut) is attached.

FX-MR6 — Finest spot lens (Optional)

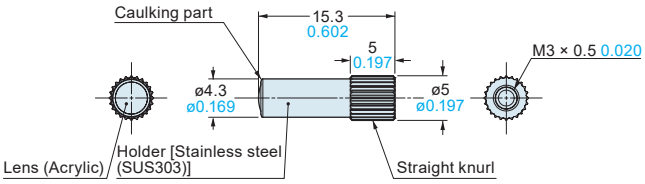
Mounting drawing with FD-EG31



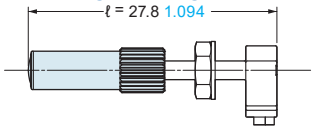
Material: Enclosure..... Aluminum (Black ALMITE)
Lens..... Acrylic

Note: When inserting the fiber, insert fully till it stops.

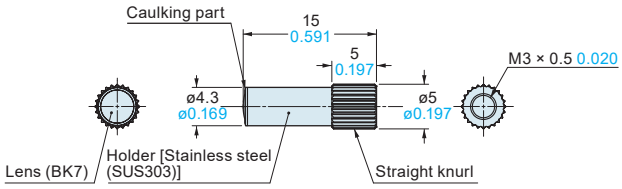
FX-MR7 — Finest spot lens (Optional)



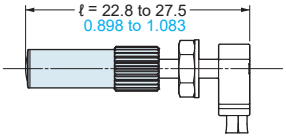
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



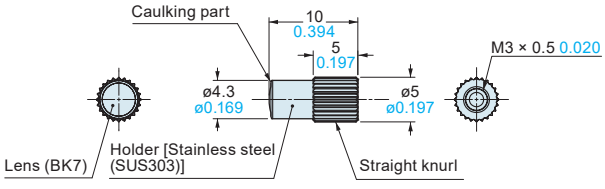
FX-MR8 — Zoom lens (Optional)



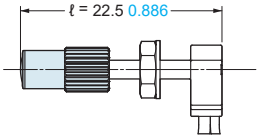
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



FX-MR9 — Parallel light lens (Optional)



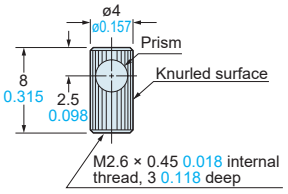
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



DIMENSIONS (Unit: mm in)

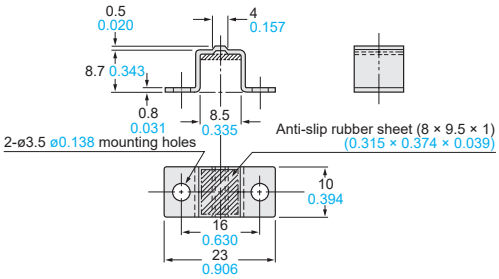
Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

FX-SV1 Side-view lens (Optional)



Material: Enclosure..... Brass (Nickel plated)
Lens..... Glass

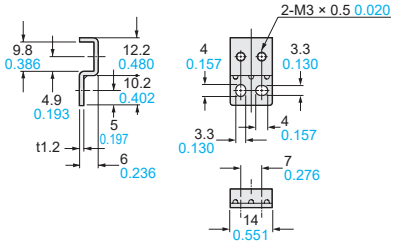
MS-EX3 Mounting bracket for FX-MR2 (Accessory for FX-MR2)



Material: Brass (Nickel plated)

MS-FD-2 Fiber mounting bracket

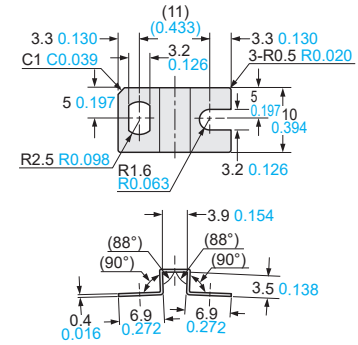
Accessory for **FD-Z50HW**, **FR-KZ50E/KZ50H/Z50HW**, **FD-H30-KZ1V-S**



Material: Stainless steel (SUS304)

MS-FD-3 Fiber mounting bracket

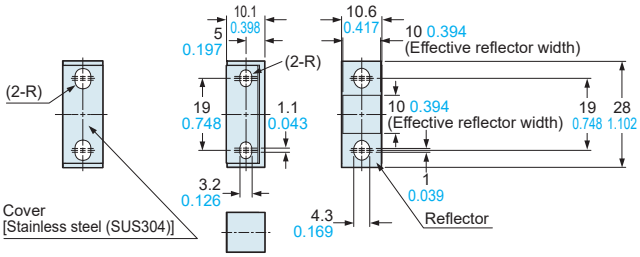
Accessory for **FT-KV40/KV40W**



Material: Stainless steel (SUS304)

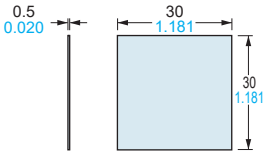
RF-003 Reflector for FR-KZ50E/KZ50H

Accessory for **FR-KZ50E/KZ50H**



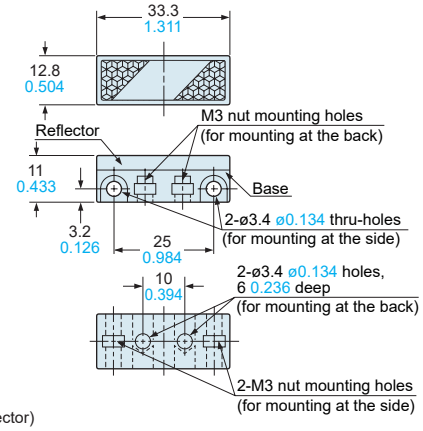
RF-13 Reflective tape for FR-Z50HW

Accessory for **FR-Z50HW**



Material : Acrylic (Reflective surface)

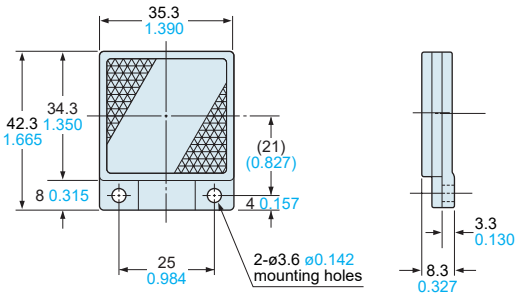
RF-210 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

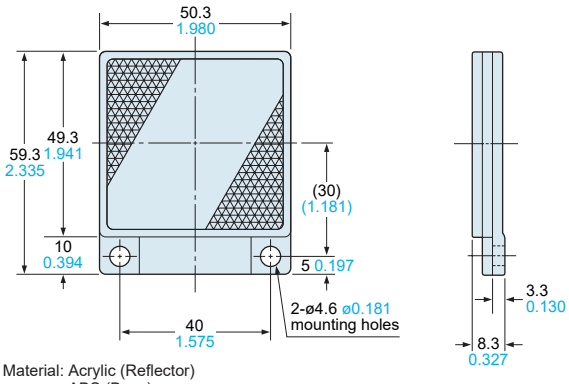
Two M3 (length 8 mm 0.315 in) screws with washers and two nuts are attached.

RF-220 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

RF-230 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

Disclaimer

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