

Fiber Selection
FT / FD / FR

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			
FT-43	P.15		
FT-45X			
FT-A11		P.64	
FT-A11W			
FT-A32	P.29		
FT-A32W			
FT-AL05			
FT-E13	P.20 / P.22		
FT-E23			
FT-F93	P.42		
FT-H13-FM2			P.65
FT-H20-J20-S			
FT-H20-J30-S			
FT-H20-J50-S	P.37		
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		
FT-KS40		P.66	
FT-KV26			
FT-KV26H1	P.28		
FT-KV40			
FT-KV40W			
FT-L80Y	P.36		
FT-R31	P.18		
FT-R40	P.15		
FT-R41W			
FT-R42W	P.18		
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		P.68	
FT-S22	P.20		
FT-S30	P.14		
FT-S31W			
FT-S32	P.20		
FT-V23			
FT-V24W	P.22		
FT-V25			
FT-V30			
FT-V40	P.20		

Retroreflective type

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

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





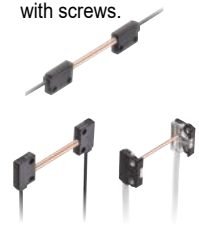
Reflective type

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


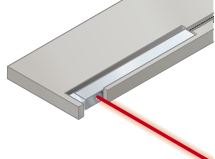
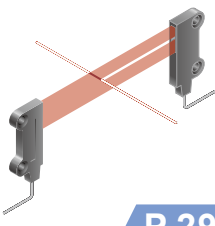
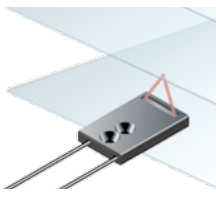
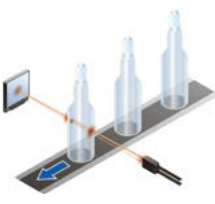
Model No.	Page	
	Sensing range Specifications	Dimensions
FD-H30-L32	P.38	P.76
FD-H30-L32V-S	P.39	
FD-H35-20S		
FD-H35-M2	P.38	
FD-H35-M2S6		P.77
FD-HF40Y	P.42	
FD-L10		
FD-L11		
FD-L12W		
FD-L20H		
FD-L21		
FD-L21W	P.31	
FD-L22A		
FD-L23		
FD-L30A		
FD-L31A		
FD-L32H		
FD-R31G		
FD-R32EG	P.18 / P.26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

Fiber Selection Guide

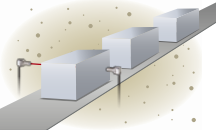




Choose by shape

<p>Threaded Type</p> <ul style="list-style-type: none"> Standard type which is mounted using nuts.  <p>P.15</p>	<p>Square Head Type</p> <ul style="list-style-type: none"> Installed cleanly on the side of a conveyor belt.  <p>P.17</p>	<p>Cylindrical Type</p> <ul style="list-style-type: none"> Has a slender shape that is mounted using set screws.  <p>P.19</p>	<p>Sleeve</p> <ul style="list-style-type: none"> Suitable for sensing in narrow locations and sensing minute objects.  <p>P.21</p>	<p>Flat Type</p> <ul style="list-style-type: none"> Thin and rectangular shape. Installed directly in narrow locations with screws.  <p>P.23</p>
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Choose by beam shape

<p>Small Spot</p> <ul style="list-style-type: none"> Senses minute objects using a spot lens.  <p>P.25</p>	<p>Narrow Beam</p> <ul style="list-style-type: none"> Not easily affected by surrounding obstacles.  <p>P.28</p>	<p>Wide Beam</p> <ul style="list-style-type: none"> Senses in the beam band without missing a work.  <p>P.29</p>	<p>Convergent Reflective Type</p> <ul style="list-style-type: none"> Senses in the limited range only.  <p>P.31</p>	<p>Retroreflective Type</p> <ul style="list-style-type: none"> Ideal for sensing transparent objects  <p>P.32</p>
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Choose by environment / performance

<p>Oil-resistant</p> <ul style="list-style-type: none"> Resist to oil by using fluorine resin.  <p>P.33</p>	<p>Chemical-resistant</p> <ul style="list-style-type: none"> Various kinds of liquids can be detected due to the fluorine contained resin case  <p>P.35</p>	<p>Heat-resistant</p> <ul style="list-style-type: none"> Withstands at -60 °C -76 °F to 350 °C 662 °F  <p>P.37</p>	<p>Vacuum-resistant</p> <ul style="list-style-type: none"> Usable in high-temperatures of 300 °C 572 °F and vacuum  <p>P.39</p>	<p>Liquid Leak / Liquid Detection</p> <ul style="list-style-type: none"> Corresponds to various liquid events.  <p>P.41</p>
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Choose by quality

Super Quality

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

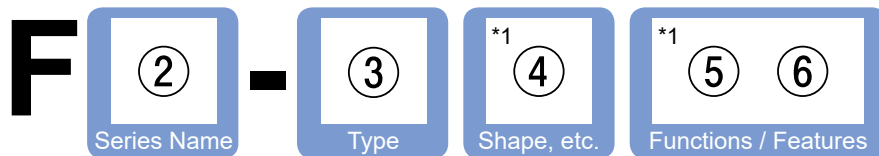


P.13

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

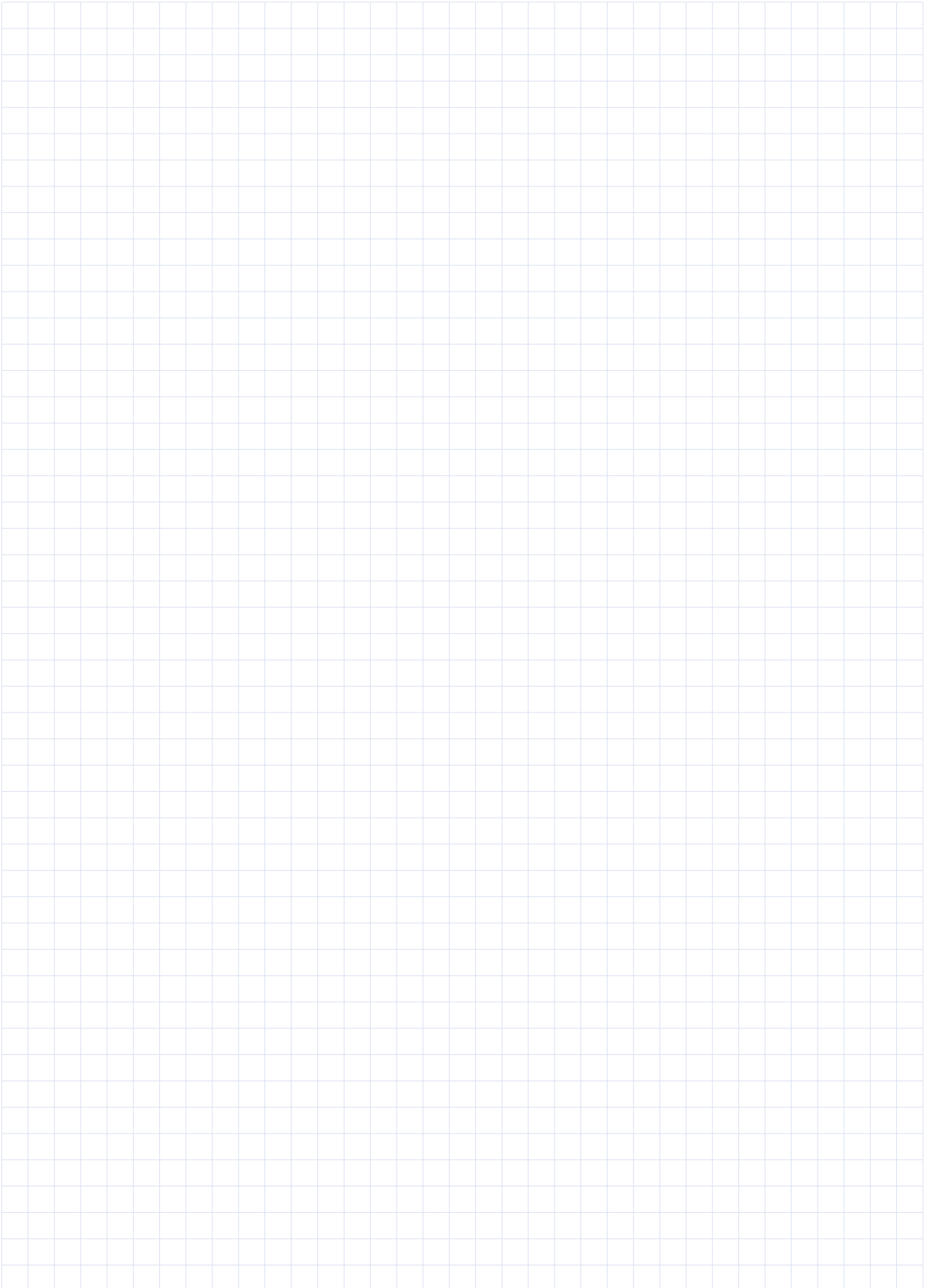
*③ is for Flat type (**Z** and **KZ**) only

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
		2	ø2 mm
V	Side-view	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
		2	Thickness 2.2 mm
KZ	Narrow beam	5	Thickness 5.2 mm
		3	Sensing width 32 mm
A	Wide beam	1	Sensing width 10 to 19 mm
		1	Sensing width 11.1 mm
AL	Array	0	Sensing width 5.5 mm
		1	Sensing range 0 to 10 mm (STD)
		2	Sensing range 11 to 30 mm (STD)
L	Convergent reflective type	3	Sensing range 31mm or more (STD)
		1	Sensing range 0 to 10 mm (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	P.63
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	P.66
FT-FM2S4			
FT-K8	FT-KS40	P.28	P.63
FT-KV1	FT-KV26		
FT-KV8	FT-KV40		
FT-NFM2	FT-31	P.15	P.67
FT-NFM2S	FT-31S	P.22	
FT-NFM2S4			
FT-P2	FT-S21	P.20	
FT-P40	FT-31	P.15	P.63
FT-P60	FT-42		
FT-P80			
FT-P81X	FT-45X		
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	P.67
FT-SNFM2	FT-S21	P.20	
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.22
FT-WS8L	FT-S32		
FT-WV42	FT-V25	P.22	P.69
	FT-V24W		
FT-WZ4	FT-Z20W	P.24	P.69
FT-WZ4HB	FT-Z20HBW		
FT-WZ7	FT-Z40W		
FT-WZ7HB	FT-Z40HBW		
FT-WZ8	FT-Z30	P.24	P.68
	FT-Z30W		
FT-WZ8E	FT-Z30E	P.24	P.69
	FT-Z30EW		
FT-WZ8H	FT-Z30H	P.24	P.69
	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	P.74	
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			
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		P.71
FD-G6	FD-32G			
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			
FD-L47	FD-L23			
FD-L47	FD-L23			
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
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	P.20	P.79
FD-WS8	FD-S32		
	FD-S32W		
FD-WSG4	FD-S33GW	P.16	P.71
FD-WT4	FD-31		
	FD-31W		
FD-WT8	FD-41	P.22	P.72
	FD-41W		
FD-WV42	FD-V30	P.22	P.79
	FD-V30W		
FD-WZ4	FD-Z20W	P.24	P.80
FD-WZ4HB	FD-Z20HBW		
FD-WZ7	FD-Z40W		
FD-WZ7HB	FD-Z40HBW		

Tough Fiber

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

Bending-resistant fiber
Bending durability

1 million times

Sharp bending fiber
Bending radius

R2~R1 mm

General purpose fiber
Bending radius

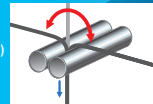
R25 mm

in

Tough Fiber

Unbreakable

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

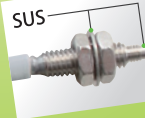


More flexible

Bending radius **R2~R4** mm



ECO

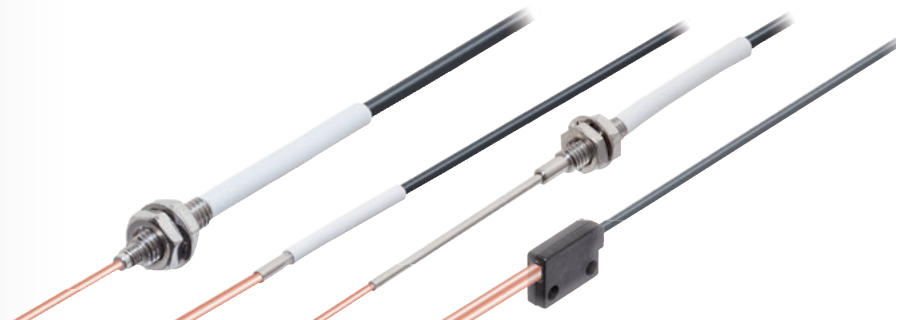


Stainless steel fittings are used for the fiber head of all models.

- 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.

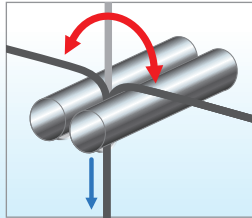


Unbreakable

Bending conditions

Bending radius: R10 mm **R0.394 in**,

Reciprocating bending: 180°

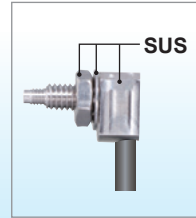


Bending durability

10 million times
(Typical)

ECO

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

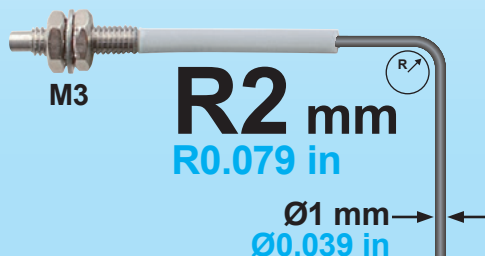


- Clearly conforms to RoHS
- Can be used for secondary batteries
- Improved tightening torque

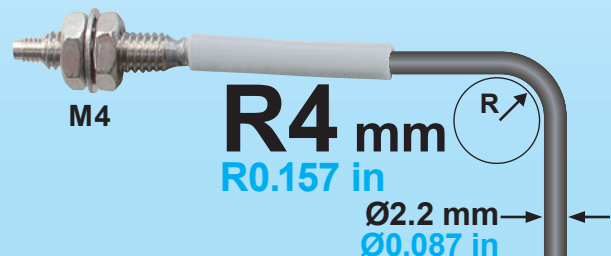
More flexible

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

Example: FT-31



Example: FT-42



Reduced the time in selecting fiber and in registering 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.

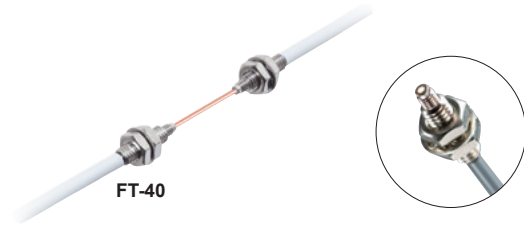


Tough fiber is composed of a single fiber core, achieving uniform light intensity.

- 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.

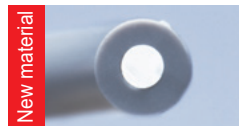
- Beam axis deviation: Thru-beam type within ±2°, Reflective type within ±3°
- Beam axis centering precision: within ±150 μm

Expanded temperature range

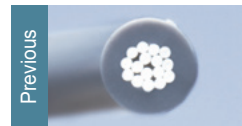
Ambient temperature [-40 to +70 °C -40 to +158 °F in previous model]

-55 to +80 °C 1.2 times more than previous model
-67 to +176 °F

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 1/6 of that of previous model
R0.157 in



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°

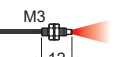
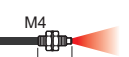

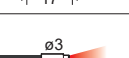
LIST OF FIBERS

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length	Sensing range (mm in)					Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.	Dimensions
					FX-500 series	U-LG LONG FAST H-SP	FX-550 series	U-LG LONG FAST	FX-101 (Upper value) / FX-102 (Lower value)						
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	±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						
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					
	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)					Beam axis position / Inclination of beam axis	Optical transmission loss	Protection	Ambient temp.	Dimensions			
					FX-500 series	U-LG LONG FAST H-SP	FX-550 series	U-LG LONG FAST	FX-101 (Upper value) / FX-102 (Lower value)								
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			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		
	M6 	Tough (Bending durability) FD-60	R4		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								
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.

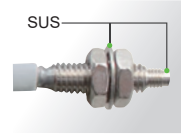
Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: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

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

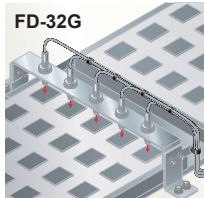
- Clearly conforms to RoHS
- Can be used for secondary battery
- Improved mounting strength



* Except for FT-140

Application

Detecting a presence of a workpiece



FT-42

<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 $\pm 3^\circ$ and the beam axis centering accuracy is kept within $\pm 150 \mu\text{m}$ **0.006 mil**. (Within $\pm 5^\circ$ and $\pm 90 \mu\text{m}$ **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)						Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions	
					FX-500 series	Other modes		FX-550 series	Other modes							FX-101 (Upper value) FX-102 (Lower value)
						U-LG LONG FAST H-SP	U-LG LONG FAST		U-LG LONG FAST	U-LG LONG FAST						
Threaded	M3	Tough FT-31	R2	2 m	STD 315 12.402	770 30.315	STD 480 18.898	1,000 39.370	130 5.118	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$	P.63			
		HYPR 1,350 53.150	210 8.268		HYPR 1,580 62.205	700 27.559	340 13.386	150 μm / $\pm 3^\circ$								
	FT-31W	R1	STD 260 10.236		590 23.228	STD 420 16.535	890 35.039		80 3.150	150 μm / $\pm 3^\circ$	IP40	-40 to +60 $^\circ\text{C}$				
	HYPR 990 38.976	150 5.906	HYPR 1,300 51.181		580 22.835	240 9.449	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$							
	Tough FT-32	R2	STD 3,000 118.110		3,600 141.732 (Note 2)	STD 3,600 141.732 (Note 2)				3,600 141.732 (Note 2)	1,300 51.181	150 μm / $\pm 2^\circ$		IP67	-55 to +80 $^\circ\text{C}$	
	HYPR 3,600 141.732	1,600 62.992	HYPR 3,600 141.732 (Note 2)		2,900 114.173	3,600 141.732	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$							
M4	Lens mountable	Tough FT-43	R4	2 m	STD 1,400 55.118	2,800 110.236				STD 2,200 86.614	3,600 141.732 (Note 2)	350 13.780	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$	P.64
		HYPR 3,600 141.732	2,100 82.677		HYPR 3,600 141.732 (Note 2)	3,100 122.047	970 38.189									
	Lens mountable	Tough FT-42	R4		STD 1,130 44.488	2,050 80.709	STD 1,470 57.874	2,900 114.173	300 11.811	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$				
	HYPR 3,600 141.732	530 20.866	HYPR 3,600 141.732 (Note 2)		2,100 82.677	800 31.496										
	Lens mountable	Tough FT-42W	R1		STD 800 31.496	1,900 74.803	STD 1,200 47.244	2,600 102.362	260 10.236	150 μm / $\pm 3^\circ$	IP67	-40 to +60 $^\circ\text{C}$				
	HYPR 3,300 129.921	160 6.299	HYPR 3,600 141.732 (Note 2)		1,780 70.079	720 28.346										
Lens mountable, Stainless-jacketed	Tough FT-45X	R4	STD 1,200 47.244	1,600 62.992 (Note 2)	STD 1,600 62.992 (Note 2)	1,600 62.992 (Note 2)	340 13.386	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$						
HYPR 1,600 62.992	630 24.803	HYPR 1,600 62.992 (Note 2)	1,070 42.126	920 36.220												
Elbow	Lens mountable	Tough FT-R40	R4	2 m	STD 930 36.614	1,750 68.898	STD 1,400 55.118	2,900 114.173	270 10.630	150 μm / $\pm 2^\circ$	IP67	-55 to +80 $^\circ\text{C}$	P.66			
	HYPR 3,600 141.732	500 19.685	HYPR 3,600 141.732 (Note 2)		1,950 76.772	740 29.134										
M14 Long range	With expansion lens	Tough FT-140	R4	10 m	STD 19,600 771.654 (Note 2)	19,600 771.654 (Note 2)	STD 19,600 771.654 (Note 2)	19,600 771.654 (Note 2)	14,000 551.181	150 μm / $\pm 2^\circ$	IP67	-40 to +70 $^\circ\text{C}$	P.63			
					HYPR 19,600 771.654 (Note 2)	6,300 248.031	HYPR 19,600 771.654 (Note 2)	19,600 771.654 (Note 2)	19,600 771.654 (Note 2)							

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.
 : 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.

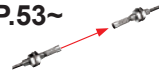


Supports spot lenses and zoom lenses!

FIBER OPTIONS

Lens

(For thru-beam type fiber)
▶ P.53~



Lens

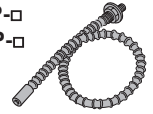
(For reflective type fiber)
▶ P.55



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 (mm) Free-cut	Sensing range (mm in) (Note 1, 2)						Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions		
					FX-500 series		Other modes	FX-550 series		Other modes					FX-101 (Upper value) FX-102 (Lower value)	
M3		Tough FD-31	R2	Free-cut	STD 290 11.417 125 4.921 HYPR 220 8.661 80 3.150 25 0.984 515 20.276	290 11.417 220 8.661 80 3.150 45 1.772 25 0.984	STD 200 7.874 HYPR 140 5.512 750 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			
		FD-31W	R1		2 m	STD 180 7.087 140 5.512 HYPR 45 1.772 12 0.472 330 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	
		Tough FD-32G	R2		1 m	STD 380 14.961 270 10.630 HYPR 95 3.740 27 1.063 650 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				—	-55 to +80 °C	
		FD-32GX	R2		1 m (Note 3)	STD 410 16.142 360 14.173 HYPR 100 3.937 30 1.181 630 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				—	-55 to +80 °C	
		Tough FD-34G	R2		2 m	STD 185 7.283 135 5.305 HYPR 49 1.929 15 0.591 330 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				—	IP40	-40 to +70 °C
Ultra-small diameter		FD-EG30	R4	500 mm	STD 110 4.331 HYPR 30 1.181 9 0.354 170 6.693	130 5.118 110 4.331 30 1.181 9 0.354	STD 320 12.598 HYPR 1,150 45.278	190 7.480 120 4.724 50 1.969	20 0.787 70 2.756	—	-20 to +60 °C	P.74				
		FD-EG31	R4		STD 45 1.772 35 1.378 HYPR 12 0.472 3.5 0.138	45 1.772 35 1.378 12 0.472 3.5 0.138	STD 70 2.756 HYPR 45 1.772 20 0.787	7 0.276 25 0.984	—	-20 to +60 °C	P.74					
Threaded		Tough FD-41	R2	Free-cut	STD 290 11.417 125 4.921 HYPR 220 8.661 80 3.150 25 0.984 515 20.276	290 11.417 220 8.661 80 3.150 45 1.772 25 0.984	STD 200 7.874 HYPR 140 5.512 750 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			
		FD-41W	R1		2 m	STD 630 24.803 430 16.929 HYPR 150 5.906 45 1.772 900 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
		Tough FD-42G	R2		1 m	STD 380 14.961 270 10.630 HYPR 95 3.740 27 1.063 650 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				—	-55 to +80 °C	P.72
		FD-42GW	R1		1 m	STD 340 13.386 280 11.024 HYPR 90 3.543 25 0.984 670 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	P.72
M6		FD-62	R4	2 m	STD 1,000 39.370 940 37.008 HYPR 340 13.386 110 4.331 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			
		Tough FD-61	R4		STD 840 33.071 670 26.378 HYPR 200 7.874 70 2.756 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	—				-40 to +60 °C	P.72	
		FD-61W	R1		2 m	STD 630 24.803 430 16.929 HYPR 150 5.906 45 1.772 900 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
		Tough FD-61G	R4		1 m	STD 800 31.496 650 25.591 HYPR 200 7.874 60 2.362 1,100 43.307	800 31.496 650 25.591 200 7.874 60 2.362	STD 800 31.496 HYPR 1,350 53.150	1,200 47.244 850 33.465 350 13.780	120 4.724 350 13.780				—	-55 to +80 °C	P.72
		FD-64X	R4		1 m	STD 500 19.685 410 16.142 HYPR 160 6.299 50 1.969 670 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		Tough FD-R60	R4	2 m	STD 600 23.622 550 21.654 HYPR 190 7.480 65 2.559 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	-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 allowable cutting range is 700 mm 27.559 in from the end that the amplifier inserted.

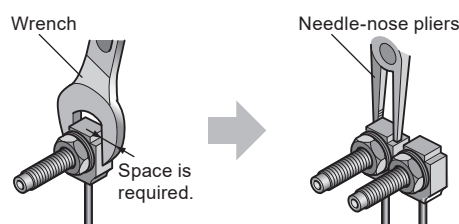
Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm R0.394 in, reciprocating bending: 180°) and more flexible (bending radius: R4 mm R0.157 in or less) features.
Bending durability : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: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



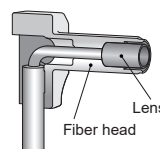
Introducing square R1 mm (R0.039 in) (sharp bending) fiber

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 conventional 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 (conventional models) + FD-R33EG	1,000 digits	435 digits

Zoom lens FX-MR8

Variable spot diameter

Spot diameters ranging from $\varnothing 0.4$ to $\varnothing 3.5$ mm **$\varnothing 0.016$ to $\varnothing 0.138$ 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 $\varnothing 4$ mm **$\varnothing 0.157$ in** at a sensing range of 0 to 30 mm **0 to 1.181 in**.



All models

Tightening torque 5 times (compared to conventional 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 $\varnothing 4.3$ mm **$\varnothing 0.169$ 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)					Beam axis dia. (Fiber Core) (mm)	Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes				
Square head	 M3 W5.5 x H8 x D16	Tough (Bending durability)	R2	2 m	STD 270 10.630 HYPR 1,000 39.370	580 22.835 440 17.323 160 6.299 55 2.165	510 20.079 HYPR 1,670 65.748	1,120 44.094 700 27.559 310 12.205	100 3.937 340 13.386	∅0.5	IP67	-55 to +80 °C	P.66
		Tough (Bending durability)	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	∅1	IP40	-40 to +60 °C	P.66
	 M4 W7 x H9 x D13.5 Lens mountable	Tough (Bending durability)	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	∅2.2			
		 M4 W7 x H9 x D13.9 Lens mountable (FX-LE2)	Tough (Bending durability)		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	∅1	IP68G
	 M4 W7 x H9 x D14.4 With expansion lens		Tough (Bending durability)		R4	STD 2,100 82.677 HYPR (Note 2) 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	∅3.5		
		 M6 W10 x H11 x D21.2 Full-protection type	Tough (Bending durability)		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		∅1	IP67 (Note 3)
 M6 W10 x H11 x D21.2 Cable-protection type Lens mountable	Tough (Bending durability)		R4	STD 2,100 82.677 HYPR (Note 2) 3,600 141.732	3,600 141.732 (Note 2) 3,600 141.732 (Note 2) 1,260 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	∅3.5	IP68G	-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 fiber cable length practically limits the sensing range.
 3) The fiber part is oil-resistant.

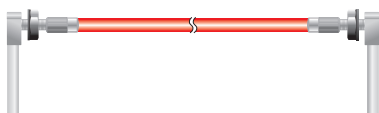
Reflective type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)					Beam axis dia. (Fiber Core) (mm)	Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes				
Square head	 M3 W5.5 x H8 x D16 Coaxial, Lens mountable	Tough (Bending durability)	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 ∅0.5	IP40	-55 to +80 °C	P.78
		Tough (Bending durability)	R4		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 ∅0.25			
	 M3 W5.5 x H8 x D16 Coaxial, Lens mountable	Tough (Bending durability)	R4		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 ∅0.175	IP40	-20 to +60 °C	P.78
		Tough (Bending durability)	R4		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 ∅0.125			
	 M4 W7 x H9 x D13.5 Coaxial, Lens mountable	Tough (Bending durability)	R2		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	∅0.75	IP67	-55 to +80 °C	P.78
 M6 W10 x H11 x D15.5 Cable-protection type	Tough (Bending durability)	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 $\varnothing 0.25$ mm $\varnothing 0.010$ in tips.



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

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

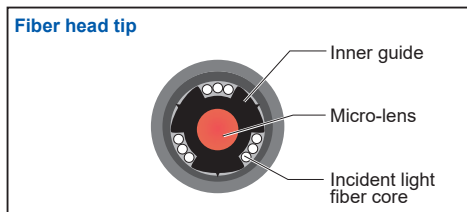
Stainless steel fittings are used for the fiber head of all models. 

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

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

Micro-lens and inner guide structure

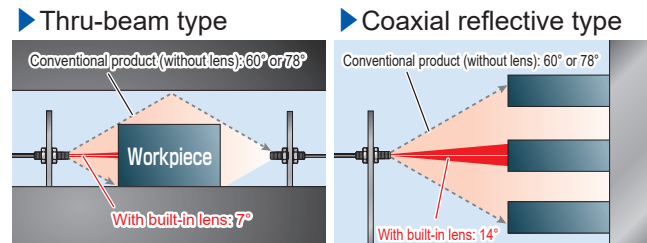
The built-in micro-lens has achieved the small head size. The compact head with the built-in lens measures only 1.5 mm 0.059 in diameter. Furthermore, the reflective type has an inner guide for a uniform layout of fiber cores to reduce the variation in the amount of light received.



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.



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)						Beam axis dia. (mm)	Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST					
Cylindrical		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	0.25	-	IP67	-55 to +80 °C	P.67	
		Tough (Bending durability) FT-S21			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						
		FT-S21W	R1	2 m	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	0.5	150 μm / ±3°	IP40	-40 to +60 °C	P.68	
		Tough (Bending durability) FT-S22			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						
		FT-S32	R10	2 m	STD 3,100 122.047 HYPR 3,600 141.732	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) 3,000 118.110	1,100 43.307 3,000 118.110	0.2	-	IP40	-40 to +70 °C	P.68	
		Tough (Bending durability)	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								
	Ultra-small diameter		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	0.125	-	IP67	-40 to +70 °C	P.64
			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					
	Side-view		Tough (Bending durability) FT-V40	R4	2 m	STD 3,500 137.795 HYPR 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) 3,000 122.047	1,000 39.370 3,100 122.047	0.25	-	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)						Beam axis position / Inclination of beam axis	Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST				
Cylindrical		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	
		Tough (Bending durability) FD-S32			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					
		FD-S32W	R1	2 m	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	-	IP67	-40 to +60 °C	P.79	
		Tough (Bending durability) FD-S31	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						
		FD-S33GW	R1	2 m	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	P.73	
		Tough (Bending durability) FD-S34G	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						
	Ultra-small diameter		FD-E13	R4	1 m	STD 12 0.472 HYPR 150 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
			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				

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°).

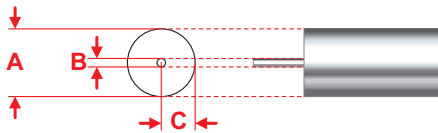
Sleeve

- 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 = $\pm 0.09 \text{ mm } \pm 0.004 \text{ in}$

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

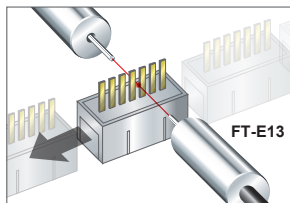
Example: FT-E13

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.

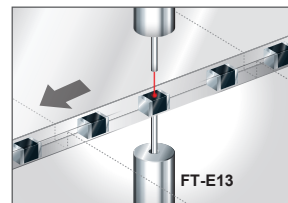
Minute sensing only possible with ultra small fiber

Detection of fine-pitch connector pins



Ultra-small diameter fiber with $\phi 0.125 \text{ mm } \phi 0.005 \text{ in}$ beam axis is able to detect the insertion or bending of fine-pitch connector pins.

Detection of tiny chips

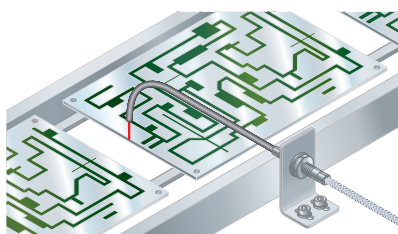


Fiber can be installed with only the $\phi 0.25 \text{ mm } \phi 0.010 \text{ in}$ sleeve close to the minute section.

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

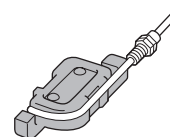
Application



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)					Beam axis dia. (mm)	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)
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)		STD 1,130 44.488 HYPR 3,600 141.732 (Note 3)	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						
Cylindrical	Ultra-small diameter ø3 Narrow beam ø0.125mm Sleeve part cannot be bent.	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	IP67	-40 to +70 °C	P.64		
		Tough (Bending durability) FT-E23			STD 175 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						
	Side-view ø2	Sleeve part cannot be bent.	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
			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				
	Side-view ø2.5	Sleeve part cannot be bent.	Tough (Bending durability) FT-V24W		R1	2 m	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	ø0.5	IP30	-40 to +60 °C	P.68
			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 3)	1,950 76.772 1,300 51.181 550 21.654	180 7.087 480 18.898				

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)					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)
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)		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					
		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					
	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					
Cylindrical	Ultra-small diameter ø1.5 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		
		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					
	Side-view ø3	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
			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			
	Side-view ø5	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	IP30	-55 to +80 °C	P.80	

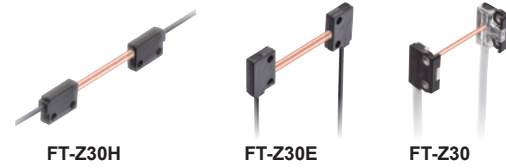
Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
2) The sensing range is specified for white non-glossy paper. 3) Bending radius of sleeve part is R10 mm R0.394 in or more.

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°).

Super Quality	Threaded Type	Square Head Type	Cylindrical Type	Sleeve	Flat Type	Small Spot	Narrow Beam	Wide Beam	Convergent Reflective Type	Retroreflective Type	Oil-resistant	Chemical-resistant	Heat-resistant	Vacuum-resistant	Liquid Leak / Liquid Detection
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Flat Type

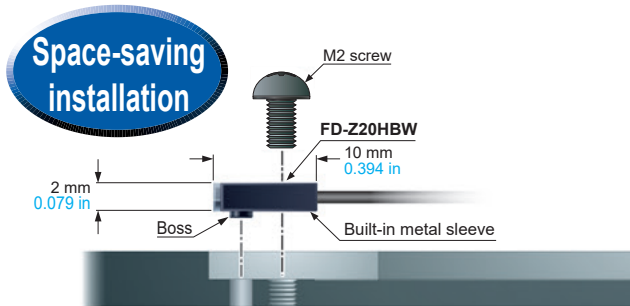
■ Since it has a thin, rectangular shape, it can be installed in narrow locations. It is also a fiber with good workability and can be mounted directly with screws.



Supplied with a boss that allows for a single mount point

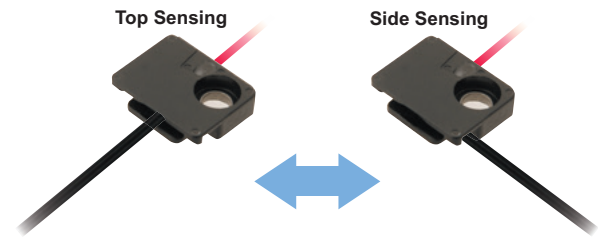
The fiber can be fastened with either a single M2 or M3 screw, and all mounting holes are reinforced with a metal sleeve for durability against excess tightening torque.

- 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)					Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions	
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes					U-LG LONG FAST
Flat	Top sensing W3 × H8 × D12	Tough FT-Z30H	R2	2 m	STD 3,500 137.795	3,600 141.732 3,600 141.732 2,600 102.362 810 31.890	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	1,400 55.118 3,200 125.984	2 × 3	IP40	P.69	
	Top sensing W3 × H8 × D12	FT-Z30HW	R1		HYPR 3,600 141.732	3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	HYPR 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	3,200 125.984				
	Side sensing W3 × H12 × D8	Tough FT-Z30E	R2		STD 3,500 137.795	3,600 141.732 3,600 141.732 2,400 94.488 740 29.134	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	1,200 47.244 3,200 125.984				
	Side sensing W3 × H12 × D8	FT-Z30EW	R1		HYPR 3,600 141.732	3,600 141.732 3,600 141.732 2,000 78.740 630 24.803	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	1,400 55.118 3,600 141.732				
	Front sensing W8.5 × H12 × D3	Tough FT-Z30	R2		STD 2,100 82.677	3,600 141.732 1,200 47.244 410 16.142	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	710 27.953 2,300 90.551				
	Front sensing W8.5 × H12 × D3	FT-Z30W			HYPR 3,600 141.732	3,300 129.921 3,200 125.984 1,000 39.370 280 11.024	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	540 21.260 1,800 70.866				
	Front sensing W10 × H7 × D2	FT-Z20W	R1	1 m	STD 620 24.409	1,500 59.055 1,100 43.307 420 16.535 130 5.118	3,300 129.921 1,100 43.307	STD 1,100 43.307 1,600 62.982	1,600 62.982 1,600 62.982	280 11.024 730 28.740	ø1.5	IP67	P.68	
	Fiber guide type W2 × H10 × D10	FT-Z20HBW			HYPR 1,100 43.307	670 26.378 570 22.441 180 7.087 55 2.165	3,300 129.921 3,300 129.921	STD 3,300 129.921 3,300 129.921	3,300 129.921 3,300 129.921	1,000 39.370 650 25.591 280 11.024				
	Front sensing W14 × H7 × D3.5	FT-Z40W			STD 1,500 59.055	3,300 129.921 2,300 90.551 900 35.433 290 11.417	3,300 129.921 3,300 129.921	STD 3,300 129.921 3,300 129.921	3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732				410 16.142 1,200 47.244
	Fiber guide type W3.5 × H14 × D11	FT-Z40HBW			HYPR 3,600 141.732	1,900 74.803 1,400 55.118 490 19.291 160 6.299	3,300 129.921 3,300 129.921	STD 3,300 129.921 3,300 129.921	3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732				260 10.236 720 28.346
	Chemical-resistant Easy mounting, Rectangular head SEMI S2 compliant (Note 3) Metal-free W7 × H15 × D13	Tough FT-Z802Y	R4	2 m	STD 3,100 122.047	3,600 141.732 3,600 141.732 1,900 74.803 470 18.504	3,600 141.732 3,600 141.732	STD 3,600 141.732 3,600 141.732	3,600 141.732 3,600 141.732	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

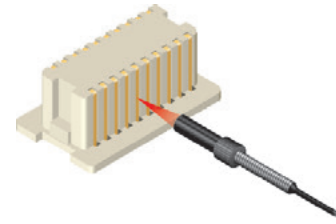
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)					Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes			
Flat	Front sensing W10 × H7 × D2	FD-Z20W	R1	1 m	STD 1 to 65 0.039 to 2.559	150 5.906 130 5.118 2 to 45 0.079 to 1.772 5 to 13 0.197 to 0.512	290 11.417 190 7.480 80 3.150	STD 130 5.118 HYPR 450 17.717	2 to 32 1 to 80 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	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	370 14.567 240 9.449 100 3.937	STD 170 6.693 HYPR 550 21.254	2 to 30 1 to 90 0.079 to 1.181 1 to 90 0.039 to 3.543			
	Front sensing W14 × H7 × D3.5	FD-Z40W	2 m	STD 190 7.480	440 17.323 390 15.354 1 to 120 0.039 to 4.724 2 to 35 0.079 to 1.378	950 37.402 510 20.079 230 9.055	STD 390 15.254 HYPR 1,500 59.155	1 to 74 0.039 to 2.913 200 7.874				
	Fiber guide type W3.5 × H14 × D11	FD-Z40HBW		STD 260 10.236	540 21.260 470 18.504 1 to 160 0.039 to 6.299 2 to 50 0.079 to 1.989	1,000 39.370 680 26.772 270 10.630	STD 480 18.898 HYPR 1,350 53.150	1 to 90 0.039 to 3.543 0.5 to 240 0.020 to 9.449				

- 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°).

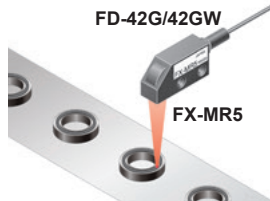
Small Spot

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



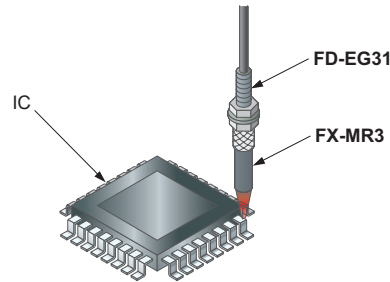
Applications

Packing detection

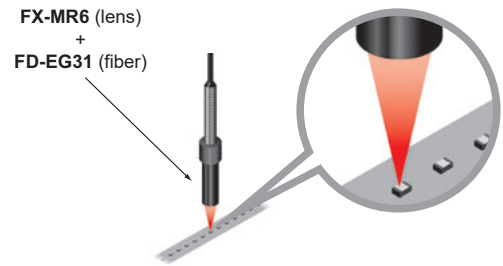


Because it's a side-view type, it can be mounted even in narrow spaces.

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 conventional 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.



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 $\varnothing 4$ mm $\varnothing 0.157$ in at a sensing range of 0 to 30 mm 0 to 1.181 in.



Typical FX-501 performance (STD mode)

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

Zoom lens FX-MR8

Variable spot diameter

Spot diameters ranging from $\varnothing 0.4$ to $\varnothing 3.5$ mm $\varnothing 0.016$ to $\varnothing 0.138$ in can be achieved by combining the lens with a variety of fibers.



All models

Tightening torque 5 times (compared to conventional models)


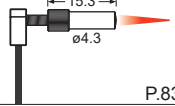

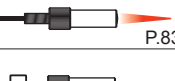










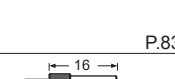


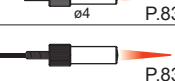








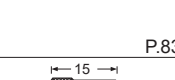
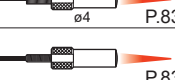





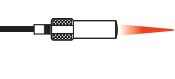






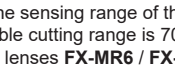


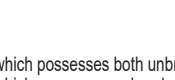


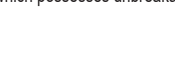





The standard aluminum body has been changed to stainless steel (SUS303) to reduce the likelihood of damage from over-tightening.

Standard lens outer diameter of $\varnothing 4.3$ mm $\varnothing 0.169$ 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

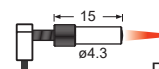
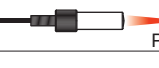

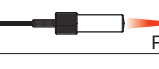



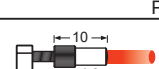
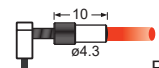
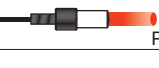

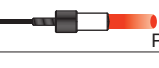



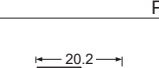
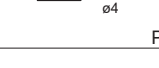
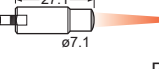
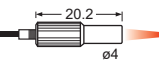


Designation	Shape of head (mm) / Dimensions of lens	Spot diameter (mm in) (Note 1)	Distance to focal point (mm in) (Note 1)	Lens		Applicable fibers															
				Model No.	Ambient temp.	Model No.	Fiber cable length  Free-cut (Note 2)	Bending radius (mm)	Protection	Ambient temp.	Dimensions										
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		IP40	-20 to +60 °C	P.78										
	 P.83	FD-EG31				P.74															
	 P.83	ø0.15 ø0.006 approx.				FD-R34EG					P.78										
	 P.83	ø0.2 ø0.008 approx.				FD-R32EG					-40 to +70 °C	P.73									
	 P.83	FD-EG30				P.73															
	 P.83	ø0.4 ø0.016 approx.				Tough  FD-R31G					2 m		-55 to +80 °C	P.78							
	 P.83					Tough  FD-42G								 2 m		-40 to +60 °C	P.72				
	 P.83					FD-42GW											 1 m (Note 3)		-55 to +80 °C	P.71	
	 P.83					Tough  FD-32G								 1 m (Note 3)		-55 to +80 °C				P.71	
	 P.83					FD-32GX											 1 m (Note 3)		-55 to +80 °C	P.71	
	 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		IP40				-20 to +60 °C	P.74						
	 P.83	ø0.2 ø0.008	FD-EG30				P.73														
	 P.83	ø0.4 ø0.016	Tough  FD-42G				2 m					-55 to +80 °C	P.72								
	 P.83		FD-42GW										 2 m			-40 to +60 °C	P.72				
	 P.83		Tough  FD-32G														 1 m (Note 3)		-55 to +80 °C	P.71	
	 P.83		FD-32GX										 1 m (Note 3)			-55 to +80 °C				P.71	
	 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		IP40	-20 to +60 °C	P.74
	 P.83	ø0.3 ø0.012										FD-EG30	P.73								
	 P.83	ø0.5 ø0.020										Tough  FD-42G	2 m			-55 to +80 °C					P.72
	 P.83											FD-42GW									
 P.83	Tough  FD-32G			 1 m (Note 3)		-55 to +80 °C		P.71													
 P.83	FD-32GX								 1 m (Note 3)			-55 to +80 °C		P.71							

- 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.
 : 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		Applicable fibers													
				Model No.	Ambient temp.	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	FD-R34EG				P.78													
	 P.83	FD-R32EG										-40 to +70 °C	P.73						
	 P.83	FD-EG30				ø0.8 to ø3.5 ø0.031 to ø0.138 approx.	10 to 30 0.394 to 1.181	FX-MR8						-55 to +70 °C	Tough (Bending durability)	500 mm	R4	IP40	-20 to +60 °C
	 P.83	FD-R31G										P.78							
	 P.83	FD-32G											✂ 2 m		R2				
 P.83	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	IP40	-20 to +60 °C	P.78								
	 P.83					FD-EG31						P.74							
	 P.83					FD-R34EG							P.78						
	 P.83					FD-R32EG						-40 to +70 °C		P.73					
	 P.83					FD-EG30	ø0.5 to ø2.5 ø0.020 to ø0.098 approx.	10 to 30 0.394 to 1.181					FX-MR8		-55 to +70 °C	Tough (Bending durability)	500 mm	R4	IP40
	 P.83					FD-R31G						P.78							
	 P.83					FD-42G								✂ 2 m		R2			
 P.83	FD-42GW		R1	-40 to +60 °C	P.71														
 P.83	FD-32G		R2			-55 to +80 °C	P.71												
 P.83	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)		R2		-55 to +80 °C	P.72								
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)	✂ 2 m	R2		-55 to +80 °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)		R2		-55 to +80 °C	P.72								
						Tough (Bending durability)		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.

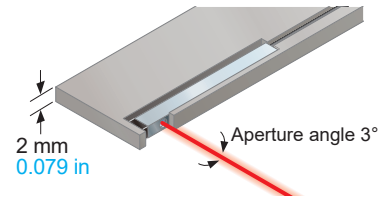
2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

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



Mapping of a wafer



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)						Beam axis dia. (mm)	Inclination of beam axis	Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST					
Narrow beam Side-view	Aperture angle 2° ø3.5 ø3.7 20	Tough (Bending durability) FT-KS40	R2	2 m	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) 1,200 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)	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 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) 1,200 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)	2,200 86.614 3,600 141.732 (Note 2)						
	Aperture angle 2° ø4 25	FT-KV40W	R1		STD 3,600 141.732 (Note 2) HYPR 3,100 122.047	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)	2,200 86.614 3,600 141.732 (Note 2)	ø2.5	±0.8°	IP30	-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	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
	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	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	ø1	X ±1° Z ±0.5°	IP30	-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)						Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST			
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	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	R2		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
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	IP30	-40 to +60 °C		
	Side sensing	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1			Tough (Bending durability) FR-KZ50E	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

Reflective type

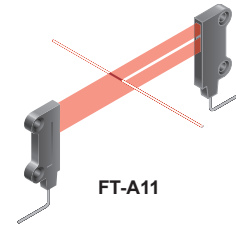
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 4)						Protection	Ambient temp.	Dimensions
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes	U-LG LONG FAST			
Long range	W5.2 × H9.5 × D16	FD-Z50HW	R1	2 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°).

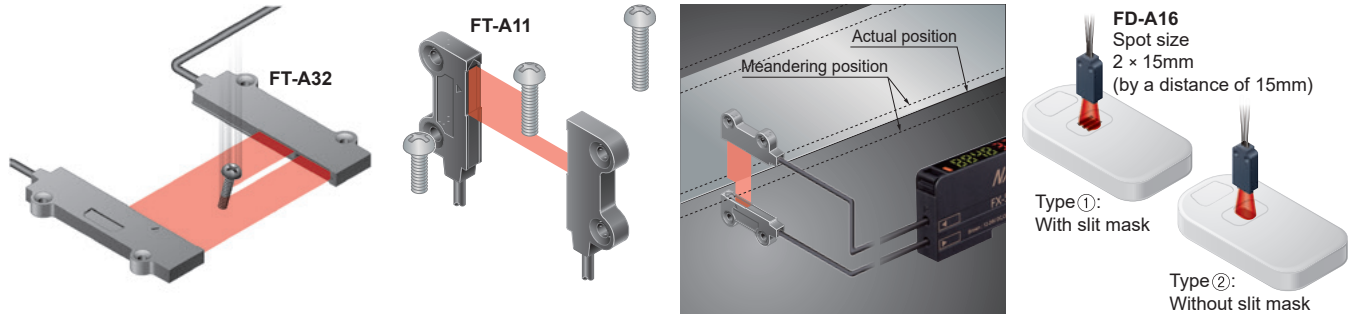
Wide Beam

■ 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)

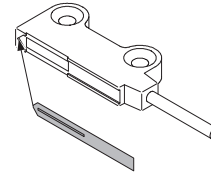
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length (m)	Sensing range (mm in) (Note 1)						Beam axis dia. (mm)	Protection	Ambient temp. (°C)	Dimensions
					FX-500 series		FX-550 series		FX-101 (Upper value) / FX-102 (Lower value)					
					Other modes	U-LG LONG FAST H-SP	Other modes	U-LG LONG FAST						
Wide beam	<p>Sensing width 32mm W5 x H69 x D20</p>	Tough (Bending durability) FT-A32 (Note 2)	R2	2 m	STD (Note 3)	3,600 141.732 (Note 3)	STD (Note 3)	3,600 141.732 (Note 3)	3,600 141.732 (Note 3)	3.2 x 32	IP40	-40 to +60 °C	P.64	
					HYPR (Note 3)	3,600 141.732 (Note 3)	HYPR (Note 3)	3,600 141.732 (Note 3)						
	STD (Note 3)	3,600 141.732 (Note 3)	STD (Note 3)		3,600 141.732 (Note 3)									
	HYPR (Note 3)	3,600 141.732 (Note 3)	HYPR (Note 3)		3,600 141.732 (Note 3)									
<p>Sensing width 32mm W5 x H69 x D20</p>	FT-A32W (Note 2)	R1	STD (Note 3)	3,600 141.732 (Note 3)	STD (Note 3)	3,600 141.732 (Note 3)	3,600 141.732 (Note 3)	3.2 x 32	IP40	-40 to +55 °C				
			HYPR (Note 3)	3,600 141.732 (Note 3)	HYPR (Note 3)	3,600 141.732 (Note 3)								
<p>Sensing width 11mm W4.2 x H31 x D13.5</p>	Tough (Bending durability) FT-A11 (Note 2)	R2	STD (Note 3)	3,600 141.732 (Note 3)	STD (Note 3)	3,600 141.732 (Note 3)	1,900 74.803 (Note 3)	2.2 x 11			IP40	-40 to +70 °C		
			HYPR (Note 3)	3,600 141.732 (Note 3)	HYPR (Note 3)	3,600 141.732 (Note 3)								
<p>Sensing width 11mm W4.2 x H31 x D13.5</p>	FT-A11W (Note 2)	R1	STD (Note 3)	3,600 141.732 (Note 3)	STD (Note 3)	3,600 141.732 (Note 3)	1,700 66.929 (Note 3)	2.2 x 11	IP40	-40 to +55 °C				
			HYPR (Note 3)	3,600 141.732 (Note 3)	HYPR (Note 3)	3,600 141.732 (Note 3)								
Array	<p>Sensing width 5.5mm W5 x H15 x D15</p>	Tough (Bending durability) FT-AL05	R2	STD (Note 3)	860 33.858	STD (Note 3)	2,350 92.520 (Note 3)	250 9.843 (Note 3)			0.25 x 5.5	IP40	-55 to +80 °C	
HYPR (Note 3)	2,300 90.551	HYPR (Note 3)	1,500 59.055 (Note 3)	HYPR (Note 3)	1,600 62.992 (Note 3)	HYPR (Note 3)	660 25.984 (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 slit mask (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°).

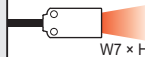

Accessories

- **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

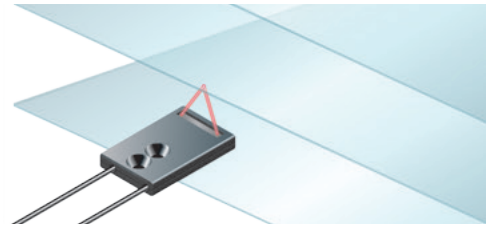
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length Free-cut	Sensing range (mm in) (Note 1, 2)						Protection	Ambient temp.	Dimensions
					FX-500 series		FX-550 series		FX-101 (Upper value) FX-102 (Lower value)				
					Other modes	U-LG LONG FAST H-SP	Other modes	U-LG LONG FAST					
Wide beam	 W7 × H15 × D30	Tough (Bending durability) FD-A16	R4	Free-cut	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	2 m	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	IP40	-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°).

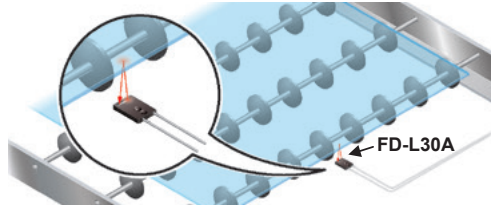
Convergent Reflective Type

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.

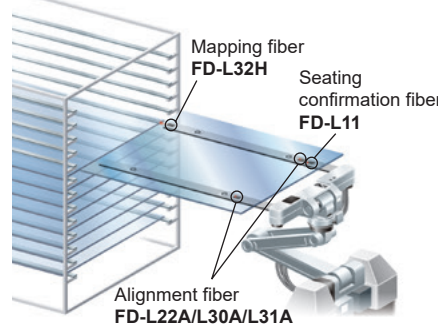


Applications

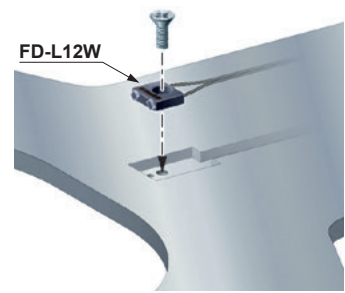
Detecting a passing glass



LCD transportation



Mounting in handling arms



LIST OF FIBERS

Reflective type

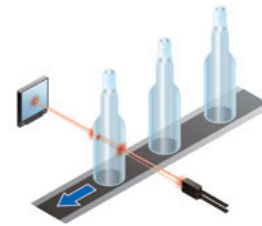
Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length (m)	Sensing range (mm in) (Note 1, 2)					Protection	Ambient temp.	Dimensions	
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes				U-LG LONG FAST
Glass substrate detection	Mapping W25 × H7.3 × D30	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	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 to 1.811	0 to 40 0 to 1.575 0 to 50 0 to 1.969		0 to +70 °C	
	Alignment W23.5 × H29 × D4.5	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	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 to 1.339 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	FD-L23	R2		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 to 1.339 HYPR 0 to 34 0 to 1.339	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	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			
	Seating confirmation W12 × H19 × D3	FD-L10	R4		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			
	Seating confirmation W24 × H21 × D4	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			
	Seating confirmation W24 × H21 × D4	FD-L21W	R1	2 m	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 14 0.118 to 0.551	7 to 12 0.276 to 0.472 3 to 14 0.118 to 0.551			
General purpose W6 × H18 × D14	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 0.079 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°).

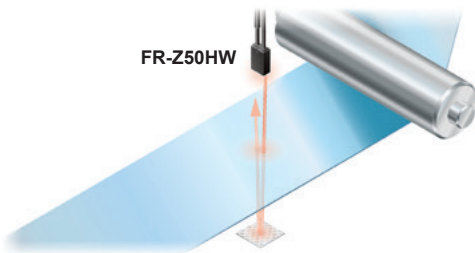
Retroreflective Type

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.

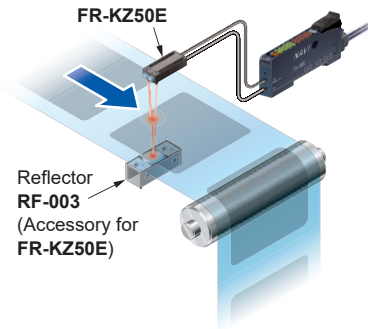


Applications

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)					Protection	Ambient temp.	Dimensions
					FX-500 series		FX-550 series		FX-101 (Upper value) FX-102 (Lower value)			
With polarizing filters	W5.2 × H9.5 × D16 W30 × H30 × D0.5	FR-Z50HW	R1	2 m	STD	100 to 1,400 3.937 to 55.118	STD	100 to 1,800 3.937 to 70.866	100 to 560			
					HYPR	100 to 980 3.937 to 38.976	HYPR	100 to 1,400 3.937 to 55.118	3.937 to 21.654			
Ultra-narrow beam	W7.5 × H2.2 × D11.2 Aperture angle 3° (emitter) W4 × H2 × D21.5	FR-KZ22E	R2	2 m	STD	15 to 310 0.591 to 12.205	STD	15 to 700 0.591 to 27.559	15 to 200			
					HYPR	15 to 570 0.591 to 22.441	HYPR	15 to 600 0.591 to 23.622	0.591 to 7.874			
Narrow beam	W5.2 × H9.5 × D21 W10.6 × H28 × D10.1	FR-KZ50H	R2	2 m	STD	20 to 800 0.787 to 31.496	STD	20 to 1,300 0.787 to 51.181	20 to 200			
					HYPR	20 to 300 0.787 to 11.811	HYPR	20 to 500 0.787 to 19.685	0.787 to 7.874			
Narrow beam	W9.5 × H25 × D5.2 W28 × H10.6 × D10.1	FR-KZ50E	R2	2 m	STD	20 to 1,000 0.787 to 39.370	STD	20 to 1,600 0.787 to 62.992	20 to 350			
					HYPR	20 to 1,000 0.787 to 39.370	HYPR	20 to 200 0.787 to 7.874	0.787 to 13.780			

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-101	FX-102
	FX-500 series						FX-550 series						
	HYPR	U-LG	LONG	STD	FAST	H-SP	HYPR	U-LG	LONG	STD	FAST		
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

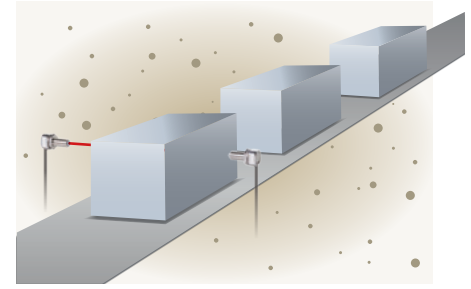
Reflectors (for FR-Z50HW) ▶ P.57



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.

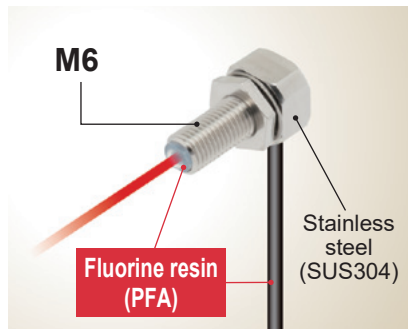


<Thru-beam type> Full-protection type IP68G rating

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

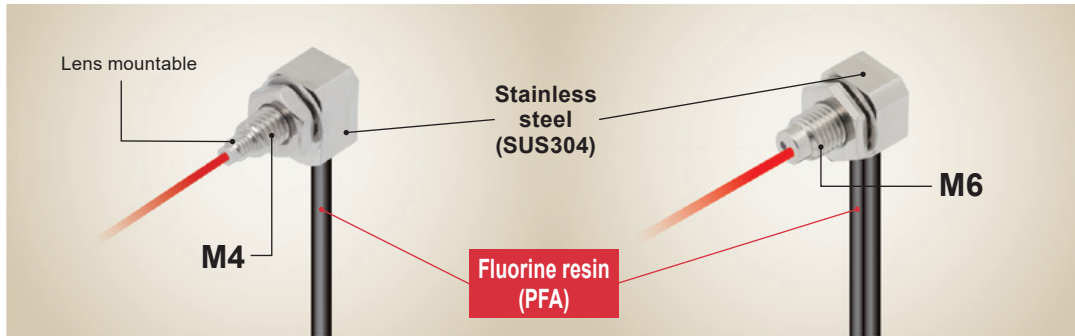
* Yushiron and Yushiroken are registered trademarks of Yushiro Chemical Industry Co., Ltd.

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)					Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions
					FX-500 series		FX-550 series		FX-101 (Upper value) FX-102 (Lower value)				
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	3,600 141.732 (Note 3)	STD 3,600 141.732 (Note 3)	3,600 141.732 (Note 3)	690 27.165	ø3.5	IP68G	-55 to +80 °C	P.67
	Cable-protection type Lens mountable W7 × H9.5 × D15.5	Tough (Bending durability) FT-R44Y			HYPR (Note 3) 3,600 141.732	HYPR 3,600 141.732 (Note 3)	1,890 74.409						
Oil-resistant Square head type M4	Cable-protection type Lens mountable W7 × H9.5 × D15.5	Tough (Bending durability) FT-R44Y	R4	2 m	STD 720 28.346	1,600 62.992	STD 1,300 51.181	2,900 114.173	210 8.268	ø1	IP67 (Note 4)	-55 to +80 °C	P.67
					HYPR 3,000 118.110	1,100 43.307	430 16.929	1,800 70.866	640 25.197				

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		FX-550 series		FX-101 (Upper value) FX-102 (Lower value)			
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	610 24.016	STD 450 17.717	1,000 39.370	85 3.346	IP67 (Note 4)	-55 to +80 °C	P.78
				HYPR 990 38.976	435 17.126	HYPR 1,350 53.150	650 25.591	185 7.283				

- 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°).

Super Quality	Threaded Type	Square Head Type	Cylindrical Type	Sleeve	Flat Type	Small Spot	Narrow Beam	Wide Beam	Convergent Reflective Type	Retroreflective Type	Oil-resistant	Chemical-resistant	Heat-resistant	Vacuum-resistant	Liquid Leak / Liquid Detection
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Chemical-resistant

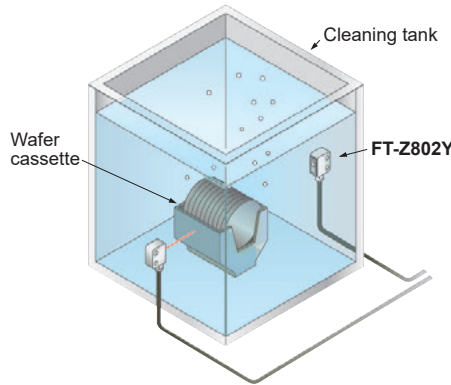
- Metal-free design
- With the case and fiber sheath made of PFA, the fiber can be used with various types of chemical liquids.



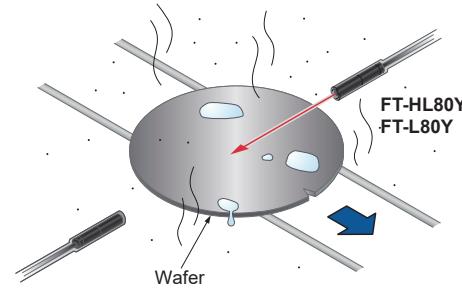
<Thru-beam type> Full-protection type **Metal-free** IP68G rating **FT-HL80Y / FT-L80Y / FT-V80Y / FT-Z802Y**

Applications

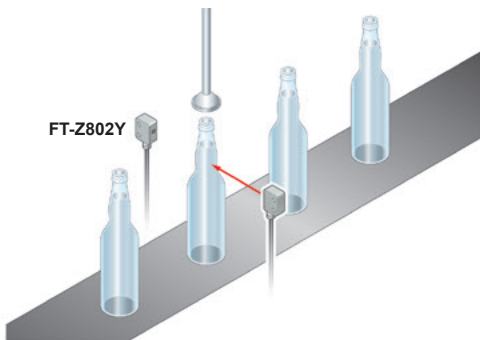
Detecting wafer cassette in cleaning tank



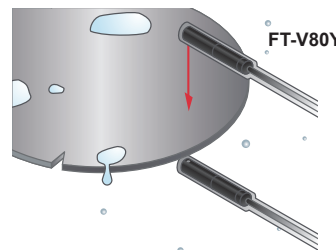
Sensing a wafer in corrosive environment



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

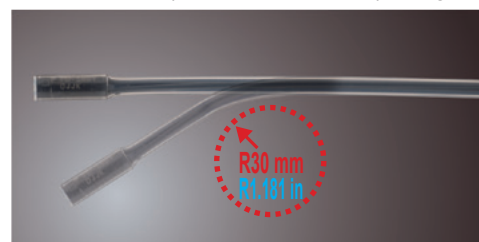
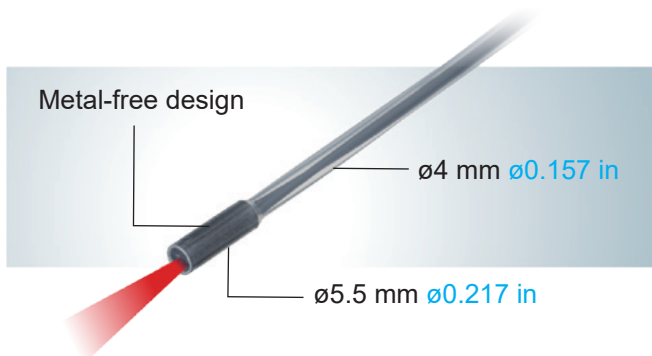
Since no metal components are used, there is no need to worry about metal contamination, even if the protective tube is damaged. It is ideal for use in applications such as semiconductor front-end equipment where a clean environment is required.

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)					Beam axis dia. (mm)	Protection	Ambient temp.	Dimensions	
					FX-500 series	Other modes	U-LG LONG FAST H-SP	FX-550 series	Other modes					U-LG LONG FAST
Chemical-resistant	Flat type Easy mounting • Rectangular head SEMI S2 compliant (Note 5) Metal-free 	Tough (Bending durability) FT-Z802Y	R4	2 m	STD 3,100 122.047 HYPR (Notes 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 	FT-HL80Y	R30	2 m (Note 4)	STD (Note 3) 3,600 141.732 HYPR (Notes 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	ø2.8	IP68G
		Metal-free 	FT-L80Y			STD (Note 3) 3,600 141.732 HYPR (Notes 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	P.68		
		Side-view Metal-free 	FT-V80Y			STD 1,300 51.181 HYPR (Notes 3) 3,600 141.732	2,800 110.236 2,200 86.614 800 31.496 240 9.449	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) 1,400 55.118	340 13.386 800 31.496				

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			
Chemical-resistant Cylindrical type	Metal-free 	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°).

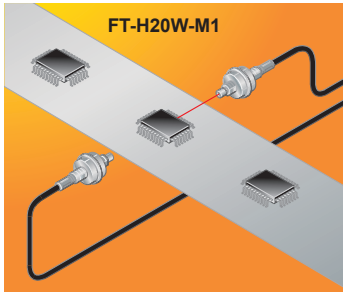
Heat-resistant

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

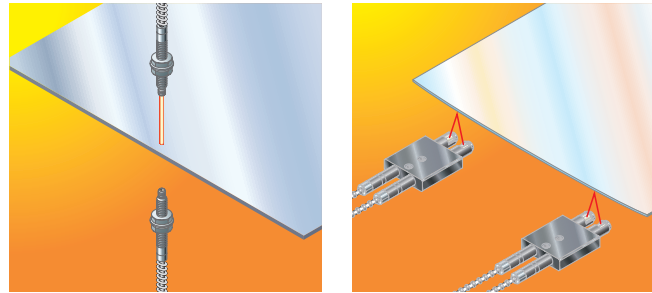


Applications

IC detection within a high temperature handler



Detecting glass substrates



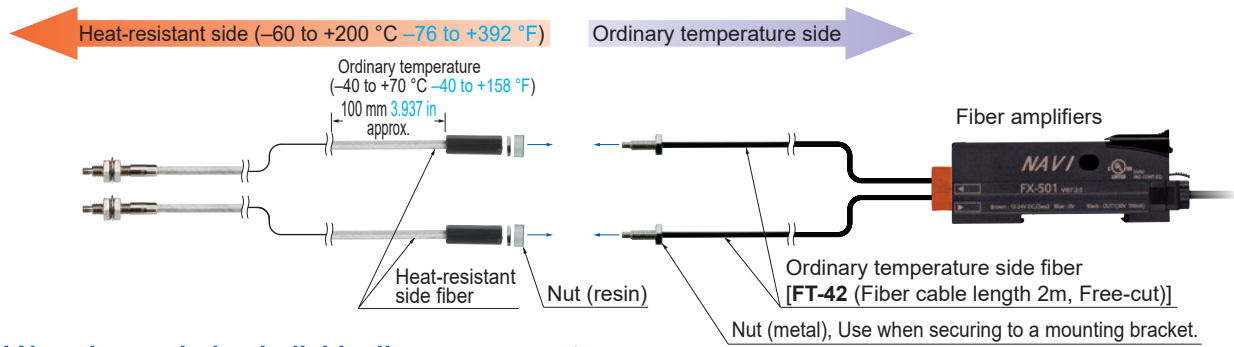
LIST OF FIBERS

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)					Beam axis dia. (mm)	Ambient temp.	Dimensions
						FX-500 series		FX-550 series		FX-101 (Upper value) FX-102 (Lower value)			
Heat-resistant	350 °C	Lens mountable (FX-LE1/LE2/SV1)	FT-H35-M2	R25	2 m	STD 430 16.929	880 34.646	STD 1,050 41.339	2,300 90.551	170 6.693	ø1.2	-60 to +350 °C	P.65
		Sleeve 60 mm	FT-H35-M2S6	Fiber R25 Sleeve R10		HYPR 1,200 47.244	250 9.843	HYPR 3,600 141.732 (Note 2)	1,500 59.055	490 19.291			
	200 °C	Allows flexible wiring Lens mountable (FX-LE1/LE2/SV1)	FT-H20W-M1	R10	1 m	STD 470 18.504	1,000 39.370	STD 730 28.740	1,600 62.992 (Note 2)	100 3.937	ø0.8	-60 to +200 °C	
		Lens mountable (FX-LE1/LE2/SV1)	FT-H20-M1	R25		HYPR (Note 2) 1,600 62.992	840 33.071	1,050 41.339	1,600 62.992 (Note 2)	300 11.811			
130 °C	Lens mountable (FX-LE2 only)	FT-H13-FM2	R25	2 m	STD 540 21.260	1,300 51.181	STD 1,000 39.370	1,600 62.992 (Note 2)	210 8.268	ø1.2	-60 to +130 °C		
	Lens mountable (FX-LE2 only)	FT-H13-FM2	R25		HYPR (Note 2) 1,600 62.992	960 37.795	1,000 39.370	1,600 62.992 (Note 2)	330 12.992			540 21.260	
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	1,000 39.370	STD 860 33.858	1,800 70.866	135 5.315	ø1.2	-60 to +200 °C	
		Lens mountable (FX-LE1/LE2/SV1)	FT-H20-J30-S (Note 5)		300 mm (Note 3)	HYPR 1,600 62.992	790 31.102	1,000 39.370	1,200 47.244	420 16.535			
		Lens mountable (FX-LE1/LE2/SV1)	FT-H20-J50-S (Note 5)		500 mm (Note 3)	STD 600 23.622	1,300 51.181	1,000 39.370	2,200 86.614	150 5.906			
		Side-view	FT-H20-VJ50-S (Note 5)		800 mm (Note 3)	HYPR (Note 2) 2,100 82.677	390 15.354	3,600 141.732 (Note 2)	1,400 55.118	500 19.685			
		Side-view	FT-H20-VJ80-S (Note 5)		800 mm (Note 3)	HYPR (Note 2) 2,100 82.677	120 4.724	3,600 141.732 (Note 2)	620 24.409				

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

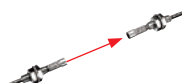
Reflective type

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)					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)	
Heat-resistant	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			
			FD-H35-M2S6	Fiber R25 Sleeve R10											
		Sleeve 60 mm M6 22 ø2.8													
		Sleeve 90 mm M4 27 ø2.1													
		200 °C	Coaxial M6 28	FD-H20-M1	R25	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
				FD-H20-21											
	130 °C	Coaxial M6 21	FD-H13-FM2	R25	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				
			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			
	Glass substrate detection convergent reflective	250 °C	W21 × H33.2 × D5	FD-H25-L43	R25	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 to 1.181 1 to 29 0.039 to 1.142 1 to 26 0.039 to 1.024	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		
				FD-H25-L45											
180 °C		W19 × H27 × D5	FD-H18-L31	R25	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 × 0.7 mm 3.937 × 3.937 × 0.028 in for FD-H25-L43 and FD-H25-L45).

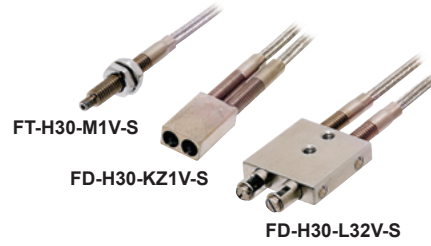
FIBER OPTION

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



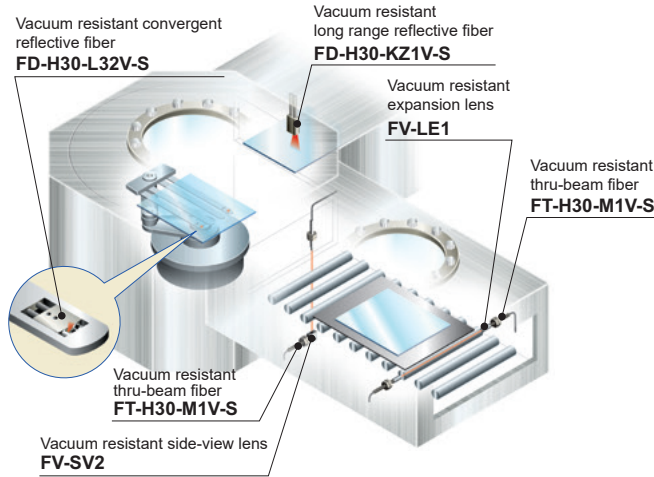
Vacuum-resistant

- 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 · m³/s [He], so that it can be used in vacuums with confidence.



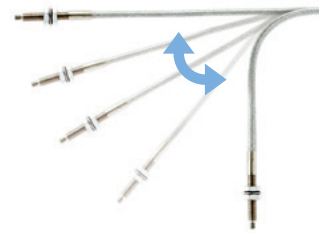
Applications

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		FX-550 series		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 160 6.299 1,000 39.370	Other modes 590 23.228 470 18.504 20 to 120 0.787 to 4.724 20 to 45 0.787 to 1.772	U-LG LONG FAST H-SP	STD 400 15.748 HYPR 250 9.843 1,400 55.118	Other modes 950 37.402 620 24.409 250 9.843	U-LG LONG FAST	110 4.331 280 11.024	ø1.2	-30 to +300 °C	P.65

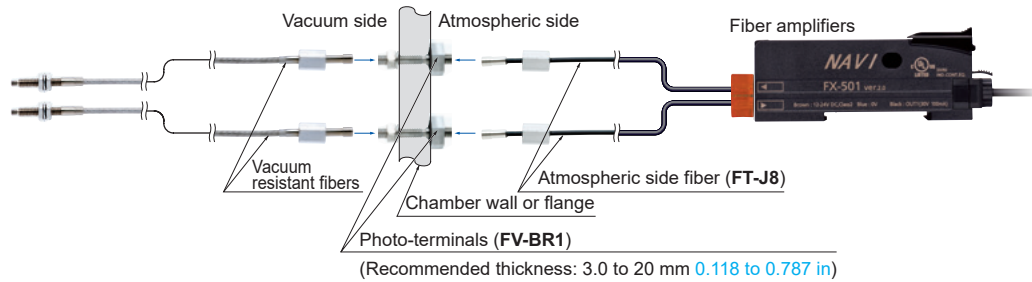
Note: Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

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		FX-550 series		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	Other modes 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	U-LG LONG FAST H-SP	STD 20 to 450 0.787 to 17.717 HYPR 5 to 1,500 0.197 to 59.055	Other modes 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	U-LG LONG FAST	25 to 80 0.984 to 3.150 10 to 220 0.394 to 8.661	-30 to +300 °C	P.76
Vacuum-resistant Convergent reflective	300 °C, Glass substrate detection W19 × H5 × D27	FD-H30-L32V-S (Note 1)	R18	3 m	STD 0 to 8 0 to 0.315 HYPR 0 to 18 0 to 0.709	Other modes 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	U-LG LONG FAST H-SP	STD 0 to 11 0 to 0.433 HYPR 0 to 27 0 to 1.063	Other modes 0 to 19 0 to 0.748 0 to 13 0 to 0.512 0 to 7.5 0 to 0.295	U-LG LONG FAST	2.5 to 6.5 0.098 to 0.256 0 to 11 0 to 0.433	-30 to +300 °C	P.76

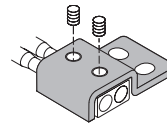
Notes: 1) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).
2) The sensing range is the value for transparent glass 100 × 100 × t0.7 mm **3.937 × 3.937 × t0.028 in**.

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)

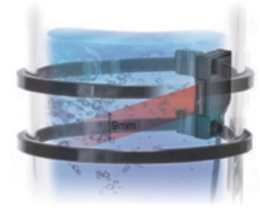
Designation	Model No.	Description																																															
For thru-beam type fiber	Vacuum resistant expansion lens (Note 1)	FV-LE1		Increases the sensing range 4 times or more. • Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam axis dia: ø3.6 mm ø0.142 in Sensing range (mm in) [Lens on both sides] (Note 4)																																													
				<table border="1"> <thead> <tr> <th rowspan="2">Amplifier</th> <th colspan="7">FX-500 series (Upper value)</th> <th colspan="2">FX-100 series</th> </tr> <tr> <th colspan="7">FX-550 series (Lower value)</th> <th>FX-101</th> <th>FX-102</th> </tr> <tr> <th>Fiber</th> <th>Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">FT-H30-M1V-S</td> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858 (Note 2)</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450</td> <td>1,600</td> </tr> <tr> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>2,500 98.425</td> <td>1,650 64.961</td> <td>—</td> <td>17.717</td> <td>62.992</td> </tr> </tbody> </table>	Amplifier	FX-500 series (Upper value)							FX-100 series		FX-550 series (Lower value)							FX-101	FX-102	Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858 (Note 2)	1,500 59.055	900 35.433	370 14.567	450	1,600		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	2,500 98.425	1,650 64.961
Amplifier	FX-500 series (Upper value)							FX-100 series																																									
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For thru-beam type fiber	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 3) • Beam axis dia: ø3.7 mm ø0.146 in Sensing range (mm in) [Lens on both sides] (Note 4)																																													
				<table border="1"> <thead> <tr> <th rowspan="2">Amplifier</th> <th colspan="7">FX-500 series (Upper value)</th> <th colspan="2">FX-100 series</th> </tr> <tr> <th colspan="7">FX-550 series (Lower value)</th> <th>FX-101</th> <th>FX-102</th> </tr> <tr> <th>Fiber</th> <th>Mode</th> <th>HYPR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">FT-H30-M1V-S</td> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,400 133.858 (Note 2)</td> <td>1,500 59.055</td> <td>900 35.433</td> <td>370 14.567</td> <td>450</td> <td>1,600</td> </tr> <tr> <td></td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>3,600 141.732 (Note 2)</td> <td>1,800 70.866</td> <td>1,100 43.307</td> <td>—</td> <td>17.717</td> <td>62.992</td> </tr> </tbody> </table>	Amplifier	FX-500 series (Upper value)							FX-100 series		FX-550 series (Lower value)							FX-101	FX-102	Fiber	Mode	HYPR	U-LG	LONG	STD	FAST	H-SP			FT-H30-M1V-S		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,400 133.858 (Note 2)	1,500 59.055	900 35.433	370 14.567	450	1,600		3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	3,600 141.732 (Note 2)	1,800 70.866	1,100 43.307
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- 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.

Super Quality	Threaded Type	Square Head Type	Cylindrical Type	Sleeve	Flat Type	Small Spot	Narrow Beam	Wide Beam	Convergent Reflective Type	Retroreflective Type	Oil-resistant	Chemical-resistant	Heat-resistant	Vacuum-resistant	Liquid Leak / Liquid Detection
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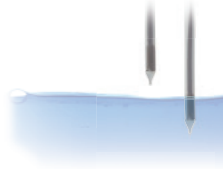
Liquid Leak / Liquid Detection

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

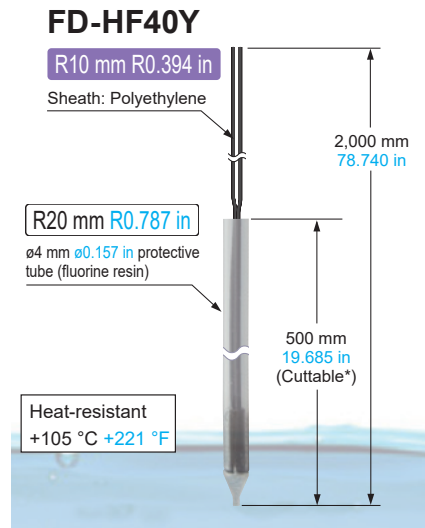


<Contact type liquid level sensing> Full-protection type

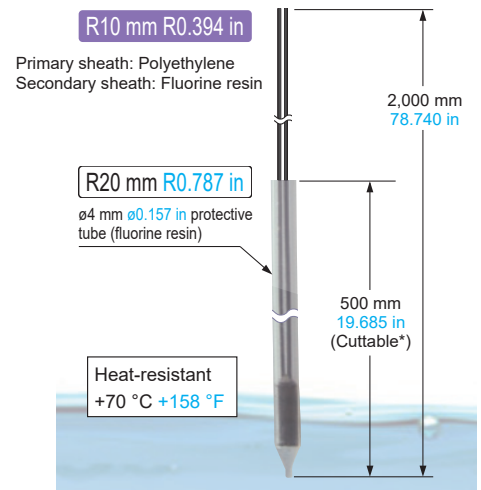
Metal-free IP68G rating

Small diameter type (ø4 mm ø0.157 in)

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



FD-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.

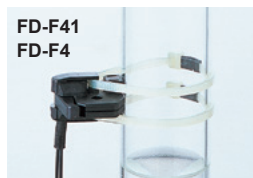
The sensor will turn OFF during abnormal conditions (excess fluid, fiber disconnection, etc.)!
 Liquid absent: Beam received (Output ON)
 Liquid present / fiber is cutoff: Beam not received (Output OFF)

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.

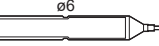
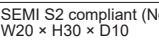
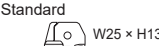

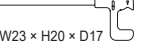
The sensor will turn OFF during abnormal conditions (insufficient liquid, fiber disconnection, etc.)!
 Liquid present: Beam received (Output ON)
 Liquid absent / fiber is cutoff: Beam not received (Output OFF)

FT-F93 Thru-beam



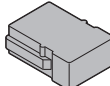
LIST OF FIBERS

Reflective type / Thru-beam type

Type	Shape of fiber head (mm)	Model No.	Bending radius (mm)	Fiber cable length ✂: Free-cut	Description			Protection	Ambient temp.	Dimensions
					FX-500 series (STD mode)	FX-550 series (STD mode)	FX-101 FX-102			
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	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		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	FD-FA93	R4	2 m	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	
	Liquid sensing 	SEMI S2 compliant (Note 3) W23 × H20 × D17 Tough	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 amplifier: 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

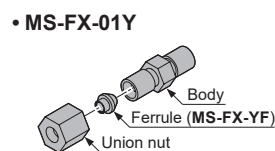
- **MS-FD-F7-1**
(SUS mounting bracket for **FD-F71**) 
- **MS-FD-F7-2**
(PVC mounting bracket for **FD-F71**) 

FIBER OPTIONS

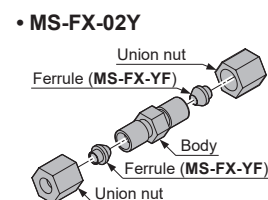
Designation	Model No.	Description	
Liquid inflow prevention joint (Note)	MS-FX-01Y	Applicable fibers FD-HF40Y FD-F41Y	This joint suppresses false operations due to liquid slip-in from the top of the protective tube.
Protective tube extension joint (Note)	MS-FX-02Y		The protective tube can be extended.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

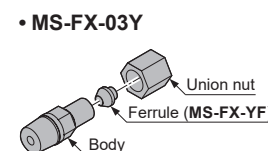
Liquid inflow prevention joint



Protective tube extension joint



Fiber mounting joint

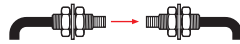


Tough : Refer to a fiber which possesses both unbreakable (bending radius: R10 mm **R0.394 in**, reciprocating bending: 180°) and more flexible (bending radius: R4 mm **R0.157 in** or less) features.
 : Refer to a fiber which possesses unbreakable bending-resistant feature (bending radius: R10 mm **R0.394 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-100 series				
	HYPHER	U-LG	LONG	STD	FAST	H-SP	FX-101	FX-102		
FT-140	19,600	19,600	19,600	19,600	16,000	6,300				P.63
	771.654 (Note 2)	771.654 (Note 2)	771.654 (Note 2)	771.654 (Note 2)	629.921	248.031	14,000	19,600		
	19,600	19,600	19,600	19,600	19,600	—	551.181	771.654 (Note 2)		
FT-30	1,350	810	650	400	210	75				P.63
	53.150	31.890	25.591	15.748	8.268	2.953	135	400		
	1,860	1,240	830	570	340	—	5.315	15.748		
FT-31	1,350	770	550	315	210	70				P.63
	53.150	30.315	21.654	12.402	8.268	2.756	130	340		
	1,580	1,000	700	480	290	—	5.118	13.386		
FT-31S	1,220	740	550	315	195	63				P.63
	48.031	29.134	21.654	12.402	7.677	2.480	130	340		
	1,580	1,000	700	480	290	—	5.118	13.386		
FT-31W	990	590	440	260	150	53				P.63
	38.976	23.228	17.323	10.236	5.906	2.087	80	240		
	1,300	890	580	420	250	—	3.150	9.449		
FT-32	3,600	3,600	3,600	3,000	1,600	580				P.63
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	118.110	62.992	22.835	1,300	3,600		
	3,600	3,600	3,600	3,600	2,900	—	51.181	141.732 (Note 2)		
FT-40	3,600	2,200	1,700	1,200	530	190				P.63
	141.732 (Note 2)	86.614	66.929	47.244	20.866	7.480	320	870		
	3,600	3,100	2,200	1,570	960	—	12.598	34.252		
FT-42	3,600	2,050	1,600	1,130	530	190				P.63
	141.732 (Note 2)	80.709	62.992	44.488	20.866	7.480	300	800		
	3,600	2,900	2,100	1,470	890	—	11.811	31.496		
FT-42S	3,600	2,050	1,600	1,130	530	190				P.63
	141.732 (Note 2)	80.709	62.992	44.488	20.866	7.480	300	800		
	3,600	2,900	2,100	1,470	890	—	11.811	31.496		
FT-42W	3,300	1,900	1,400	800	490	160				P.63
	129.921	74.803	55.118	31.496	19.291	6.299	260	720		
	3,600	2,600	1,780	1,200	710	—	10.236	28.346		
FT-43	3,600	2,800	2,100	1,400	770	240				P.64
	141.732 (Note 2)	110.236	82.677	55.118	30.315	9.449	350	970		
	3,600	3,600	3,100	2,200	1,400	—	13.780	38.189		
FT-45X	1,600	1,600	1,600	1,200	630	200				P.64
	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	47.244	24.803	7.874	340	920		
	1,600	1,600	1,600	1,600	1,070	—	13.386	36.220		
FT-A11	3,600	3,600	3,600	3,600	3,600	1,100				P.64
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	43.307	1,900	3,600		
	3,600	3,600	3,600	3,600	3,600	—	74.803	141.732 (Note 2)		
FT-A11W	3,600	3,600	3,600	3,600	3,600	1,300				P.64
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	51.181	1,700	3,400		
	3,600	3,600	3,600	3,600	3,600	—	66.929	133.858		
FT-A32	3,600	3,600	3,600	3,600	3,600	2,100				P.64
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	82.677	3,600	3,600		
	3,600	3,600	3,600	3,600	3,600	—	141.732 (Note 2)	141.732 (Note 2)		
FT-A32W	3,600	3,600	3,600	3,600	3,600	3,000				P.64
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	118.110	3,600	3,600		
	3,600	3,600	3,600	3,600	3,600	—	141.732 (Note 2)	141.732 (Note 2)		
FT-AL05	2,300	1,550	1,500	860	500	170				P.64
	90.551	61.024	59.055	33.858	19.685	6.693	250	660		
	3,600	2,350	1,600	1,150	660	—	9.843	25.984		
FT-E13	52	30	24	15	8	2				P.64
	2.047	1.181	0.945	0.591	0.315	0.079	6	19		
	68	45	30	21	12	—	0.236	0.748		
FT-E23	270	160	125	75	42	13				P.64
	10.630	6.299	4.921	2.953	1.654	0.512	22	80		
	355	250	165	120	70	—	0.866	3.150		
FT-F93	Applicable pipe diameter: Outer dia. $\phi 3$ to $\phi 10$ mm $\phi 0.118$ to $\phi 0.394$ 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) 

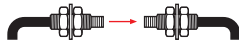
Model No.	Sensing range (mm in) (Note 1) / Description								Dimensions
	FX-500 series (Upper value)						FX-100 series		
	FX-500 series (Lower value)						FX-101	FX-102	
	HYPER	U-LG	LONG	STD	FAST	H-SP			
FT-H13-FM2	3,300 129.921 3,600 141.732 (Note 2)	1,900 74.803 2,700 106.299	1,300 51.181 1,690 66.535	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	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	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).

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

SENSING RANGE

Thru-beam type (one pair set)



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

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-100 series		
	FX-550 series (Lower value)						FX-101	FX-102	
	HYPER	U-LG	LONG	STD	FAST	H-SP			
FT-Z20W	1,600	1,500	1,100	620	420	130			
	62.992 (Note 2)	59.055	43.307	24.409	16.535	5.118	280	730	P.68
	1,600	1,600	1,600	1,100	650	—	11.024	28.740	
62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	43.307	25.591	—	—	—		
FT-Z30	3,600	3,600	3,600	2,100	1,200	410			P.68
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	82.677	47.244	16.142	710	2,300	
	3,600	3,600	3,600	3,600	2,200	—	27.953	90.551	
FT-Z30E	3,600	3,600	3,600	3,500	2,400	740			P.69
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	137.795	94.488	29.134	1,200	3,200	
	3,600	3,600	3,600	3,600	3,600	—	47.244	125.984	
FT-Z30EW	3,600	3,600	3,600	3,400	2,000	630			P.69
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	133.858	78.740	24.803	1,400	2,600	
	3,600	3,600	3,600	3,600	3,600	—	55.118	102.362	
FT-Z30H	3,600	3,600	3,600	3,500	2,600	810			P.69
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	137.795	102.362	31.890	1,400	3,200	
	3,600	3,600	3,600	3,600	3,600	—	55.118	125.984	
FT-Z30HW	3,600	3,600	3,600	3,500	2,600	810			P.69
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	137.795	102.362	31.890	1,400	3,200	
	3,600	3,600	3,600	3,600	3,600	—	55.118	125.984	
FT-Z30W	3,600	3,300	3,200	1,500	1,000	280			P.69
	141.732 (Note 2)	129.921	125.984	59.055	39.370	11.024	540	1,800	
	3,600	3,600	3,600	2,800	1,700	—	21.260	70.866	
FT-Z40HBW	3,300	1,900	1,400	800	490	160			P.69
	129.921	74.803	55.118	31.496	19.291	6.299	260	720	
	3,600	2,700	1,850	1,300	750	—	10.236	28.346	
FT-Z40W	3,600	3,300	2,300	1,500	900	290			P.69
	141.732 (Note 2)	129.921	90.551	59.055	35.433	11.417	410	1,200	
	3,600	3,600	2,800	2,000	1,200	—	16.142	47.244	
FT-Z802Y	3,600	3,600	3,600	3,100	1,900	470			P.69
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	122.047	74.803	18.504	520	3,100	
	3,600	3,600	3,600	3,600	3,600	—	20.472	122.047	

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	15 to 460	15 to 410	15 to 310	15 to 220	15 to 100	15 to 200	15 to 360	P.70
	0.591 to 22.441	0.591 to 18.110	0.591 to 16.142	0.591 to 12.205	0.591 to 8.661	0.591 to 3.937	0.591 to 7.874	0.591 to 14.173	
	15 to 800	15 to 700	15 to 600	15 to 540	15 to 400	—	—	—	
FR-KZ50E	20 to 1,000	20 to 800	20 to 400	20 to 300	20 to 200	20 to 200	20 to 200	20 to 350	P.70
	0.787 to 39.370	0.787 to 31.496	0.787 to 15.748	0.787 to 11.811	0.787 to 7.874	0.787 to 7.874	0.787 to 7.874	0.787 to 13.780	
	20 to 1,600	20 to 1,300	20 to 500	20 to 400	20 to 350	—	—	—	
FR-KZ50H	20 to 1,000	20 to 800	20 to 400	20 to 300	20 to 200	20 to 200	20 to 200	20 to 350	P.70
	0.787 to 39.370	0.787 to 31.496	0.787 to 15.748	0.787 to 11.811	0.787 to 7.874	0.787 to 7.874	0.787 to 7.874	0.787 to 13.780	
	20 to 1,600	20 to 1,300	20 to 500	20 to 400	20 to 350	—	—	—	
FR-Z50HW	100 to 1,900	100 to 1,400	100 to 1,200	100 to 990	100 to 780	100 to 490	100 to 550	100 to 830	P.70
	3.937 to 74.803	3.937 to 55.118	3.937 to 47.244	3.937 to 38.976	3.937 to 30.709	3.937 to 19.291	3.937 to 21.654	3.937 to 32.677	
	100 to 2,250	100 to 1,800	100 to 1,400	100 to 1,150	100 to 950	—	—	—	
	3.937 to 88.583	3.937 to 70.866	3.937 to 55.118	3.937 to 45.276	3.937 to 37.402	—	—	—	

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	100 to 8,000	100 to 5,000	100 to 3,600	100 to 2,900	100 to 1,400	100 to 2,400	100 to 5,000
	3.937 to 748.03	3.937 to 314.960	3.937 to 196.850	3.937 to 141.732	3.937 to 114.173	3.937 to 55.118	3.937 to 94.488	3.937 to 196.850
	100 to 20,000	100 to 11,000	100 to 7,000	100 to 5,000	100 to 3,500	—	—	—
RF-220	100 to 8,000	100 to 4,700	100 to 3,500	100 to 3,000	100 to 1,800	100 to 830	100 to 1,300	100 to 2,600
	3.937 to 314.960	3.937 to 185.039	3.937 to 137.795	3.937 to 118.110	3.937 to 70.866	3.937 to 32.677	3.937 to 51.181	3.937 to 102.362
	100 to 10,000	100 to 6,500	100 to 4,500	100 to 3,500	100 to 2,500	—	—	—
RF-210	100 to 5,500	100 to 2,700	100 to 2,400	100 to 1,500	100 to 1,200	100 to 530	100 to 980	100 to 1,300
	3.937 to 216.535	3.937 to 106.299	3.937 to 94.488	3.937 to 59.055	3.937 to 47.244	3.937 to 20.866	3.937 to 38.583	3.937 to 51.181
	100 to 7,000	100 to 4,000	100 to 3,600	100 to 2,800	100 to 2,100	—	—	—
	3.937 to 275.591	3.937 to 157.480	3.937 to 141.732	3.937 to 110.236	3.937 to 82.677	—	—	—

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-100 series		
	FX-500 series (Lower value)						FX-101	FX-102	
	HYP	U-LG	LONG	STD	FAST	H-SP			
FD-30	600	330	250	160	80	25			
	23.622	12.992	9.843	6.299	3.150	0.984	45	155	P.71
	800	460	330	210	140	—	1.772	6.102	
	31.496	18.110	12.992	8.268	5.512	—			
FD-31	515	290	220	125	80	25			
	20.276	11.417	8.661	4.921	3.150	0.984	35	140	P.71
	750	450	310	200	140	—	1.378	5.512	
	29.528	17.717	12.205	7.874	5.512	—			
FD-31W	330	180	140	80	45	12			
	12.992	7.087	5.512	3.150	1.772	0.472	15	60	P.71
	480	310	190	130	80	—	0.591	2.362	
	18.898	12.205	7.480	5.118	3.150	—			
FD-32G	650	380	270	200	95	27			
	25.591	14.961	10.630	7.874	3.740	1.063	70	190	P.71
	1,150	730	420	320	170	—	2.756	7.480	
	45.276	28.740	16.535	12.598	6.693	—			
FD-32GX	630	410	360	200	100	30			
	24.803	16.142	14.173	7.874	3.937	1.181	75	210	P.71
	1,350	730	490	320	180	—	2.953	8.268	
	53.150	28.740	19.291	12.598	7.087	—			
FD-34G	330	185	135	90	49	15			
	12.992	7.283	5.305	3.543	1.929	0.591	29	90	P.71
	480	310	180	130	80	—	1.142	3.543	
	18.898	12.205	7.087	5.118	3.150	—			
FD-40	600	330	250	160	80	25			
	23.622	12.992	9.843	6.299	3.150	0.984	45	155	P.71
	800	460	330	210	140	—	1.772	6.102	
	31.496	18.110	12.992	8.268	5.512	—			
FD-41	515	290	220	125	80	25			
	20.276	11.417	8.661	4.921	3.150	0.984	35	140	P.71
	750	450	310	200	140	—	1.378	5.512	
	29.528	17.717	12.205	7.874	5.512	—			
FD-41S	515	290	220	125	80	25			
	20.276	11.417	8.661	4.921	3.150	0.984	35	140	P.71
	750	450	310	200	140	—	1.378	5.512	
	29.528	17.717	12.205	7.874	5.512	—			
FD-41SW	330	180	140	80	45	12			
	12.992	7.087	5.512	3.150	1.772	0.472	15	60	P.71
	480	310	190	130	80	—	0.591	2.362	
	18.898	12.205	7.480	5.118	3.150	—			
FD-41W	900	630	430	270	150	45			
	35.433	24.803	16.929	10.630	5.906	1.772	80	230	P.72
	1,400	1,000	680	480	270	—	3.150	9.055	
	55.118	39.370	26.772	18.898	10.630	—			
FD-42G	650	380	270	200	95	27			
	25.591	14.961	10.630	7.874	3.740	1.063	70	190	P.72
	1,150	730	420	320	170	—	2.756	7.480	
	45.276	28.740	16.535	12.598	6.693	—			
FD-42GW	670	340	280	150	90	25			
	26.378	13.386	11.024	5.906	3.543	0.984	45	140	P.72
	950	540	330	210	130	—	1.772	5.512	
	37.402	21.260	12.992	8.268	5.118	—			
FD-60	1,550	900	740	520	260	90			
	61.024	35.433	29.134	20.472	10.236	3.543	140	420	P.72
	1,750	1,300	970	750	420	—	5.512	16.535	
	68.898	51.181	38.189	29.528	16.535	—			
FD-61	1,400	840	670	450	200	70			
	55.118	33.071	26.378	17.717	7.874	2.756	120	410	P.72
	1,630	1,180	870	620	380	—	4.724	16.142	
	64.173	46.457	34.252	24.409	14.961	—			
FD-61G	1,100	800	650	420	200	60			
	43.307	31.496	25.591	16.535	7.874	2.362	120	350	P.72
	1,350	1,200	850	600	350	—	4.724	13.780	
	53.150	47.244	33.465	23.622	13.780	—			
FD-61S	1,200	790	660	420	220	75			
	47.244	31.102	25.984	16.535	8.661	2.953	130	360	P.72
	1,900	1,300	900	650	400	—	5.118	14.173	
	74.803	51.181	35.433	25.591	15.748	—			
FD-61W	900	630	430	270	150	45			
	35.433	24.803	16.929	10.630	5.906	1.772	80	230	P.73
	1,400	1,000	680	480	270	—	3.150	9.055	
	55.118	39.370	26.772	18.898	10.630	—			

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-100 series		
	FX-500 series (Lower value)						FX-101	FX-102	
	HYPR	U-LG	LONG	STD	FAST	H-SP			
FD-62	1,500	1,000	940	520	340	110			
	59.055	39.370	37.008	20.472	13.386	4.331	170	450	P.73
	1,950	1,450	1,140	880	550	—	6.693	17.717	
FD-64X	670	500	410	280	160	50			
	26.378	19.685	16.142	11.024	6.299	1.969	75	220	P.73
	1,200	700	590	410	230	—	2.953	8.661	
FD-A16	—	200	200	200	140	75			
	—	7.874	7.874	7.874	5.512	2.953	120	240	P.73
	—	—	350	350	250	—	4.724	9.449	
FD-AL11	670	530	510	320	180	50			
	26.378	20.866	20.079	12.598	7.087	1.969	100	285	P.73
	1,300	1,000	700	450	320	—	3.937	11.220	
FD-E13	50	29	25	12	7	2			
	1.969	1.142	0.984	0.472	0.276	0.079	5	15	P.73
	75	50	30	23	12	—	0.197	0.591	
FD-E23	170	120	80	55	30	9			
	6.693	4.724	3.150	2.165	1.181	0.354	20	70	P.73
	290	170	105	80	45	—	0.787	2.756	
FD-EG30	170	130	110	48	30	9			
	6.693	5.118	4.331	1.890	1.181	0.354	20	70	P.73
	320	190	120	90	50	—	0.787	2.756	
FD-EG30S	170	110	80	50	30	9			
	6.693	4.331	3.150	1.969	1.181	0.354	20	70	P.74
	320	190	120	90	50	—	0.787	2.756	
FD-EG31	85	45	35	20	12	3.5			
	3.346	1.772	1.378	0.787	0.472	0.138	7	25	P.74
	120	70	45	35	20	—	0.276	0.984	
FD-F4	Applicable pipe diameter: Outer dia. $\phi 6$ to $\phi 26$ mm $\phi 0.236$ to $\phi 1.024$ 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
	Applicable pipe diameter: Outer dia. $\phi 6$ to $\phi 26$ mm $\phi 0.236$ to $\phi 1.024$ 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
	$\phi 4$ mm $\phi 0.157$ 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
	$\phi 6$ mm $\phi 0.236$ 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
	Applicable pipe diameter: Outer dia. $\phi 8$ mm $\phi 0.315$ in or more transparent pipe (When used with the tying bands: $\phi 8$ to $\phi 80$ mm $\phi 0.315$ to $\phi 3.150$ in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam not received								P.74
FD-H13-FM2	880	640	600	350	200	65			
	34.646	25.197	23.622	13.780	7.874	2.559	100	280	P.75
	1,650	1,300	940	670	390	—	3.937	11.024	
FD-H18-L31	0 to 60	0 to 32	0 to 24	0 to 16	0 to 13	2 to 6.5			
	0 to 2.362	0 to 1.260	0 to 0.945	0 to 0.630	0 to 0.512	0.079 to 0.256	0 to 10	0 to 25	P.75
	0 to 130	0 to 85	0 to 60	0 to 45	0 to 30	—	0 to 0.394	0 to 0.984	
FD-H20-21	770	500	380	230	130	45			
	30.315	19.685	14.961	9.055	5.118	1.772	90	280	P.75
	1,250	850	650	450	250	—	3.543	11.024	

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-100 series			
	FX-500 series (Lower value)					FX-101	FX-102		
	HYP	U-LG	LONG	STD	FAST	H-SP			
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 to 120 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 to 11 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 × 0.7 mm 3.937 × 3.937 × 0.028 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-100 series			
	FX-500 series (Lower value)					FX-101	FX-102		
	HYPR	U-LG	LONG	STD	FAST	H-SP			
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-100 series		
	FX-550 series (Lower value)						FX-101	FX-102	
	HYPR	U-LG	LONG	STD	FAST	H-SP			
FD-V30	240	130	120	65	35	14			
	9.449	5.118	4.724	2.559	1.378	0.551			
	430	210	145	90	65	—	25	75	P.79
	16.929	8.268	5.709	3.543	2.559	—	0.984	2.953	
FD-V30W	80	40	30	20	10	2			
	3.150	1.575	1.181	0.787	0.394	0.079			
	120	65	37	30	16	—	6	20	P.80
	4.724	2.559	1.457	1.181	0.630	—	0.236	0.787	
FD-V50	370	220	210	120	75	25			
	14.567	8.661	8.268	4.724	2.953	0.984			
	530	400	240	180	110	—	40	100	P.80
	20.866	15.748	9.449	7.087	4.331	—	1.575	3.937	
FD-Z20HBW	1 to 340	1 to 210	1 to 180	2 to 85	2 to 55	3 to 15			
	0.039 to 13.386	0.039 to 8.268	0.039 to 7.087	0.079 to 3.346	0.079 to 2.165	0.118 to 0.591			
	550	370	240	170	100	—	2 to 30	1 to 90	P.80
	21.654	14.567	9.449	6.693	3.937	—	0.079 to 1.181	0.039 to 3.543	
FD-Z20W	260	150	130	1 to 65	2 to 45	5 to 13			
	10.236	5.906	5.118	0.039 to 2.559	0.079 to 1.772	0.197 to 0.512			
	450	290	190	130	80	—	2 to 32	1 to 80	P.80
	17.717	11.417	7.480	5.118	3.150	—	0.079 to 1.260	0.039 to 3.150	
FD-Z40HBW	760	540	470	260	1 to 160	2 to 50			
	29.921	21.260	18.504	10.236	0.039 to 6.299	0.079 to 1.969			
	1,350	1,000	680	480	270	—	1 to 90	0.5 to 240	P.80
	53.150	39.370	26.772	18.898	10.630	—	0.039 to 3.543	0.020 to 9.449	
FD-Z40W	790	440	390	190	1 to 120	2 to 35			
	31.102	17.323	15.354	7.480	0.039 to 4.724	0.079 to 1.378			
	1,500	950	510	390	230	—	1 to 74	200	P.80
	59.055	37.402	20.079	15.354	9.055	—	0.039 to 2.913	7.874	
FD-Z50HW	10 to 2,500	10 to 1,100	10 to 1,000	10 to 650	10 to 410	15 to 130			
	0.394 to 98.425	0.394 to 43.307	0.394 to 39.370	0.394 to 25.591	0.394 to 16.142	0.591 to 5.118			
	10 to 3,700	10 to 2,100	10 to 1,300	10 to 950	10 to 590	—	10 to 200	10 to 530	P.80
	0.394 to 145.669	0.394 to 82.677	0.394 to 51.181	0.394 to 37.402	0.394 to 23.228	—	0.394 to 7.874	0.394 to 20.866	

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	<p>Increases the sensing range by 5 times or more.</p> <p>• Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam dia: ø3.6 mm ø0.142 in</p> <p>Sensing range (mm in) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th rowspan="2">Amplifier</th> <th colspan="6">FX-500 series (Upper value)</th> <th colspan="2">FX-100 series</th> </tr> <tr> <th colspan="6">FX-550 series (Lower value)</th> <th>FX-101</th> <th>FX-102</th> </tr> <tr> <th>Fiber / Mode</th> <th>HYPYR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="3">FT-43</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>1,600</td> <td rowspan="3">2,400</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>62.992</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-42 FT-42W</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,200</td> <td rowspan="3">3,400</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>86.614</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-45X</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,500</td> <td rowspan="3">1,600</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>59.055</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R40</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>1,900</td> <td rowspan="3">3,100</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>74.803</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R43 FT-R44Y</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>1,900</td> <td>670</td> <td rowspan="3">1,300</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>74.803</td> <td>26.378</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H35-M2</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,300</td> <td>1,400</td> <td rowspan="3">2,000</td> <td rowspan="3">3,500</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>129.921</td> <td>55.118</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20W-M1</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>850</td> <td rowspan="3">1,300</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>33.465</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20-M1</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,200</td> <td rowspan="3">1,600</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>47.244</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S</td> <td>3,600</td> <td>3,600</td> <td>3,500</td> <td>2,000</td> <td>1,600</td> <td>500</td> <td rowspan="3">1,000</td> <td rowspan="3">3,500</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>137.795</td> <td>78.740</td> <td>62.992</td> <td>19.685</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> </tbody> </table>	Amplifier	FX-500 series (Upper value)						FX-100 series		FX-550 series (Lower value)						FX-101	FX-102	Fiber / Mode	HYPYR	U-LG	LONG	STD	FAST	H-SP			FT-43	3,600	3,600	3,600	3,600	3,600	1,600	2,400	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	62.992	3,600	3,600	3,600	3,600	3,600	—	FT-42 FT-42W	3,600	3,600	3,600	3,600	3,600	2,200	3,400	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	86.614	3,600	3,600	3,600	3,600	3,600	—	FT-45X	1,600	1,600	1,600	1,600	1,600	1,500	1,600	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	59.055	1,600	1,600	1,600	1,600	1,600	—	FT-R40	3,600	3,600	3,600	3,600	3,600	1,900	3,100	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	74.803	3,600	3,600	3,600	3,600	3,600	—	FT-R43 FT-R44Y	3,600	3,600	3,600	3,600	1,900	670	1,300	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	74.803	26.378	3,600	3,600	3,600	3,600	3,600	—	FT-H35-M2	3,600	3,600	3,600	3,600	3,300	1,400	2,000	3,500	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	129.921	55.118	3,600	3,600	3,600	3,600	3,600	—	FT-H20W-M1	1,600	1,600	1,600	1,600	1,600	850	1,300	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	33.465	1,600	1,600	1,600	1,600	1,600	—	FT-H20-M1	1,600	1,600	1,600	1,600	1,600	1,200	1,600	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	47.244	1,600	1,600	1,600	1,600	1,600	—	FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600	3,600	3,500	2,000	1,600	500	1,000	3,500	141.732 (Note 2)	141.732 (Note 2)	137.795	78.740	62.992	19.685	3,600	3,600	3,600	3,600	3,600	—
		Amplifier		FX-500 series (Upper value)						FX-100 series																																																																																																																																																																																																															
			FX-550 series (Lower value)						FX-101	FX-102																																																																																																																																																																																																															
		Fiber / Mode	HYPYR	U-LG	LONG	STD	FAST	H-SP																																																																																																																																																																																																																	
		FT-43	3,600	3,600	3,600	3,600	3,600	1,600	2,400	3,600																																																																																																																																																																																																															
			141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	62.992																																																																																																																																																																																																																	
			3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																	
		FT-42 FT-42W	3,600	3,600	3,600	3,600	3,600	2,200	3,400	3,600																																																																																																																																																																																																															
			141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	86.614																																																																																																																																																																																																																	
			3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																	
		FT-45X	1,600	1,600	1,600	1,600	1,600	1,500	1,600	1,600																																																																																																																																																																																																															
			62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	59.055																																																																																																																																																																																																																	
1,600	1,600		1,600	1,600	1,600	—																																																																																																																																																																																																																			
FT-R40	3,600	3,600	3,600	3,600	3,600	1,900	3,100	3,600																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	74.803																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-R43 FT-R44Y	3,600	3,600	3,600	3,600	1,900	670	1,300	3,600																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	74.803	26.378																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-H35-M2	3,600	3,600	3,600	3,600	3,300	1,400	2,000	3,500																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	129.921	55.118																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-H20W-M1	1,600	1,600	1,600	1,600	1,600	850	1,300	1,600																																																																																																																																																																																																																	
	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	33.465																																																																																																																																																																																																																			
	1,600	1,600	1,600	1,600	1,600	—																																																																																																																																																																																																																			
FT-H20-M1	1,600	1,600	1,600	1,600	1,600	1,200	1,600	1,600																																																																																																																																																																																																																	
	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	47.244																																																																																																																																																																																																																			
	1,600	1,600	1,600	1,600	1,600	—																																																																																																																																																																																																																			
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600	3,600	3,500	2,000	1,600	500	1,000	3,500																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	137.795	78.740	62.992	19.685																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
Super-expansion lens (Note 1)	FX-LE2	<p>Tremendously increases the sensing range with large diameter lenses.</p> <p>• Ambient temperature: -60 to +350 °C -76 to +662 °F (Note 3) • Beam dia: ø9.8 mm ø0.386 in</p> <p>Sensing range (mm in) [Lens on both sides]</p> <table border="1"> <thead> <tr> <th rowspan="2">Amplifier</th> <th colspan="6">FX-500 series (Upper value)</th> <th colspan="2">FX-100 series</th> </tr> <tr> <th colspan="6">FX-550 series (Lower value)</th> <th>FX-101</th> <th>FX-102</th> </tr> <tr> <th>Fiber / Mode</th> <th>HYPYR</th> <th>U-LG</th> <th>LONG</th> <th>STD</th> <th>FAST</th> <th>H-SP</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="3">FT-43</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,600</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-45X</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td rowspan="3">1,600</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R40</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,600</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R41W FT-R43 FT-R44Y</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,600</td> <td rowspan="3">3,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H35-M2</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,500</td> <td rowspan="3">3,500</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20W-M1 FT-H20-M1</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td rowspan="3">1,600</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H13-FM2</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,500</td> <td rowspan="3">3,500</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td rowspan="3">3,500</td> <td rowspan="3">3,500</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>—</td> </tr> </tbody> </table>	Amplifier	FX-500 series (Upper value)						FX-100 series		FX-550 series (Lower value)						FX-101	FX-102	Fiber / Mode	HYPYR	U-LG	LONG	STD	FAST	H-SP			FT-43	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—	FT-45X	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	1,600	1,600	1,600	1,600	1,600	—	FT-R40	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—	FT-R41W FT-R43 FT-R44Y	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—	FT-H35-M2	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—	FT-H20W-M1 FT-H20-M1	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	1,600	1,600	1,600	1,600	1,600	—	FT-H13-FM2	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—	FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	3,600	3,600	3,600	3,600	3,600	—																					
		Amplifier		FX-500 series (Upper value)						FX-100 series																																																																																																																																																																																																															
			FX-550 series (Lower value)						FX-101	FX-102																																																																																																																																																																																																															
		Fiber / Mode	HYPYR	U-LG	LONG	STD	FAST	H-SP																																																																																																																																																																																																																	
		FT-43	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600																																																																																																																																																																																																															
			141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																	
			3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																	
		FT-45X	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600																																																																																																																																																																																																															
			62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)																																																																																																																																																																																																																	
			1,600	1,600	1,600	1,600	1,600	—																																																																																																																																																																																																																	
		FT-R40	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600																																																																																																																																																																																																															
			141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																	
3,600	3,600		3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-R41W FT-R43 FT-R44Y	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-H35-M2	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-H20W-M1 FT-H20-M1	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600																																																																																																																																																																																																																	
	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)																																																																																																																																																																																																																			
	1,600	1,600	1,600	1,600	1,600	—																																																																																																																																																																																																																			
FT-H13-FM2	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	3,600	3,600	3,600	3,600	3,600	3,600	3,500	3,500																																																																																																																																																																																																																	
	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)																																																																																																																																																																																																																			
	3,600	3,600	3,600	3,600	3,600	—																																																																																																																																																																																																																			

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)

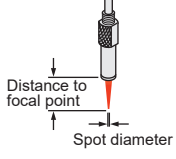
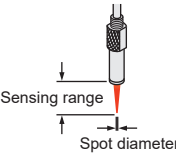
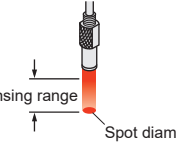

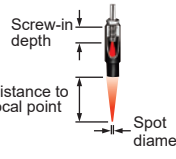
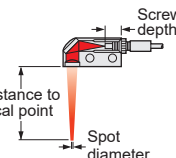
Designation	Model No.	Description																																																																																																																																																																																																																																																																																																																																								
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] <table border="1"> <thead> <tr> <th rowspan="2">Amplifier</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> </thead> <tbody> <tr> <td rowspan="3">Fiber / Mode</td> <td>3,600</td> <td>3,400</td> <td>2,600</td> <td>1,700</td> <td>970</td> <td>310</td> <td rowspan="3">510</td> <td rowspan="3">1,400</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>133.858</td> <td>102.362</td> <td>66.929</td> <td>38.189</td> <td>12.205</td> <td rowspan="2">20.079</td> <td rowspan="2">55.118</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,300</td> <td>1,400</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-43</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>90.551</td> <td>55.118</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,100</td> <td>1,150</td> <td>370</td> <td rowspan="3">500</td> <td rowspan="3">1,700</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>82.677</td> <td>45.276</td> <td>14.567</td> <td rowspan="2">19.685</td> <td rowspan="2">66.929</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,800</td> <td>1,700</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-42</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>110.236</td> <td>66.929</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>3,600</td> <td>3,500</td> <td>2,700</td> <td>1,800</td> <td>990</td> <td>320</td> <td rowspan="3">480</td> <td rowspan="3">1,300</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>137.795</td> <td>106.299</td> <td>70.866</td> <td>38.976</td> <td>12.598</td> <td rowspan="2">18.898</td> <td rowspan="2">51.181</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,300</td> <td>1,400</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-42W</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>90.551</td> <td>55.118</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,400</td> <td>800</td> <td>210</td> <td rowspan="3">540</td> <td rowspan="3">1,600</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>55.118</td> <td>31.496</td> <td>8.268</td> <td rowspan="2">21.260</td> <td rowspan="2">62.992 (Note 2)</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-45X</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>—</td> <td>—</td> </tr> <tr> <td>3,200</td> <td>1,800</td> <td>1,300</td> <td>950</td> <td>510</td> <td>160</td> <td rowspan="3">310</td> <td rowspan="3">930</td> </tr> <tr> <td>125.984</td> <td>70.866</td> <td>51.181</td> <td>37.402</td> <td>20.079</td> <td>6.299</td> <td rowspan="2">12.205</td> <td rowspan="2">36.614</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>2,700</td> <td>1,900</td> <td>1,200</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R43</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>106.299</td> <td>74.803</td> <td>47.244</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>3,200</td> <td>1,800</td> <td>1,300</td> <td>950</td> <td>510</td> <td>160</td> <td rowspan="3">310</td> <td rowspan="3">930</td> </tr> <tr> <td>125.984</td> <td>70.866</td> <td>51.181</td> <td>37.402</td> <td>20.079</td> <td>6.299</td> <td rowspan="2">12.205</td> <td rowspan="2">36.614</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>2,700</td> <td>1,900</td> <td>1,200</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-R44Y</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>125.984</td> <td>86.614</td> <td>55.118</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>3,500</td> <td>1,600</td> <td>1,200</td> <td>780</td> <td>500</td> <td>150</td> <td rowspan="3">280</td> <td rowspan="3">800</td> </tr> <tr> <td>137.795</td> <td>62.992</td> <td>47.244</td> <td>30.709</td> <td>19.685</td> <td>5.906</td> <td rowspan="2">11.024</td> <td rowspan="2">31.496</td> </tr> <tr> <td>3,600</td> <td>2,800</td> <td>1,800</td> <td>1,300</td> <td>750</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H35-M2</td> <td>141.732 (Note 2)</td> <td>110.236</td> <td>70.866</td> <td>51.181</td> <td>29.528</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,500</td> <td>950</td> <td>560</td> <td>190</td> <td rowspan="3">140</td> <td rowspan="3">400</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>59.055</td> <td>37.402</td> <td>22.047</td> <td>7.480</td> <td rowspan="2">5.512</td> <td rowspan="2">15.748</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,250</td> <td>690</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20W-M1</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>49.213</td> <td>27.165</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,300</td> <td>780</td> <td>500</td> <td>150</td> <td rowspan="3">280</td> <td rowspan="3">840</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>51.181</td> <td>30.709</td> <td>19.685</td> <td>5.906</td> <td rowspan="2">11.024</td> <td rowspan="2">33.071</td> </tr> <tr> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>1,600</td> <td>800</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20-M1</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>62.992 (Note 2)</td> <td>31.496</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,600</td> <td>960</td> <td>740</td> <td>450</td> <td>290</td> <td>80</td> <td rowspan="3">150</td> <td rowspan="3">410</td> </tr> <tr> <td>62.992 (Note 2)</td> <td>37.795</td> <td>29.134</td> <td>17.717</td> <td>11.417</td> <td>3.150</td> <td rowspan="2">5.906</td> <td rowspan="2">16.142</td> </tr> <tr> <td>3,600</td> <td>2,400</td> <td>1,500</td> <td>1,100</td> <td>680</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S</td> <td>141.732 (Note 2)</td> <td>94.488</td> <td>59.055</td> <td>43.307</td> <td>26.771</td> <td>—</td> <td>—</td> <td>—</td> </tr> </tbody> </table>	Amplifier	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	Fiber / Mode	3,600	3,400	2,600	1,700	970	310	510	1,400	141.732 (Note 2)	133.858	102.362	66.929	38.189	12.205	20.079	55.118	3,600	3,600	3,600	2,300	1,400	—	FT-43	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	90.551	55.118	—	—	—	3,600	3,600	3,600	2,100	1,150	370	500	1,700	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	82.677	45.276	14.567	19.685	66.929	3,600	3,600	3,600	2,800	1,700	—	FT-42	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	110.236	66.929	—	—	—	3,600	3,500	2,700	1,800	990	320	480	1,300	141.732 (Note 2)	137.795	106.299	70.866	38.976	12.598	18.898	51.181	3,600	3,600	3,600	2,300	1,400	—	FT-42W	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	90.551	55.118	—	—	—	1,600	1,600	1,600	1,400	800	210	540	1,600	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	55.118	31.496	8.268	21.260	62.992 (Note 2)	1,600	1,600	1,600	1,600	1,600	—	FT-45X	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	—	—	3,200	1,800	1,300	950	510	160	310	930	125.984	70.866	51.181	37.402	20.079	6.299	12.205	36.614	3,600	3,600	2,700	1,900	1,200	—	FT-R43	141.732 (Note 2)	141.732 (Note 2)	106.299	74.803	47.244	—	—	—	3,200	1,800	1,300	950	510	160	310	930	125.984	70.866	51.181	37.402	20.079	6.299	12.205	36.614	3,600	3,600	2,700	1,900	1,200	—	FT-R44Y	141.732 (Note 2)	141.732 (Note 2)	125.984	86.614	55.118	—	—	—	3,500	1,600	1,200	780	500	150	280	800	137.795	62.992	47.244	30.709	19.685	5.906	11.024	31.496	3,600	2,800	1,800	1,300	750	—	FT-H35-M2	141.732 (Note 2)	110.236	70.866	51.181	29.528	—	—	—	1,600	1,600	1,500	950	560	190	140	400	62.992 (Note 2)	62.992 (Note 2)	59.055	37.402	22.047	7.480	5.512	15.748	1,600	1,600	1,600	1,250	690	—	FT-H20W-M1	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	49.213	27.165	—	—	—	1,600	1,600	1,300	780	500	150	280	840	62.992 (Note 2)	62.992 (Note 2)	51.181	30.709	19.685	5.906	11.024	33.071	1,600	1,600	1,600	1,600	800	—	FT-H20-M1	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	31.496	—	—	—	1,600	960	740	450	290	80	150	410	62.992 (Note 2)	37.795	29.134	17.717	11.417	3.150	5.906	16.142	3,600	2,400	1,500	1,100	680	—	FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	141.732 (Note 2)	94.488	59.055	43.307	26.771	—	—	—
		Amplifier		FX-500 series (Upper value) FX-550 series (Lower value)						FX-100 series																																																																																																																																																																																																																																																																																																																																
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		Fiber / Mode	3,600	3,400	2,600	1,700	970	310	510	1,400																																																																																																																																																																																																																																																																																																																																
			141.732 (Note 2)	133.858	102.362	66.929	38.189	12.205			20.079	55.118																																																																																																																																																																																																																																																																																																																														
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		FT-43	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	90.551	55.118	—	—	—																																																																																																																																																																																																																																																																																																																																
			3,600	3,600	3,600	2,100	1,150	370	500	1,700																																																																																																																																																																																																																																																																																																																																
			141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	82.677	45.276	14.567			19.685	66.929																																																																																																																																																																																																																																																																																																																														
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		FT-42	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	110.236	66.929	—	—	—																																																																																																																																																																																																																																																																																																																																
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			141.732 (Note 2)	137.795	106.299	70.866	38.976	12.598			18.898	51.181																																																																																																																																																																																																																																																																																																																														
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FT-42W	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	90.551	55.118	—	—	—																																																																																																																																																																																																																																																																																																																																		
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	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	55.118	31.496	8.268			21.260	62.992 (Note 2)																																																																																																																																																																																																																																																																																																																																
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FT-45X	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	—	—																																																																																																																																																																																																																																																																																																																																		
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	125.984	70.866	51.181	37.402	20.079	6.299			12.205	36.614																																																																																																																																																																																																																																																																																																																																
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FT-R43	141.732 (Note 2)	141.732 (Note 2)	106.299	74.803	47.244	—	—	—																																																																																																																																																																																																																																																																																																																																		
	3,200	1,800	1,300	950	510	160	310	930																																																																																																																																																																																																																																																																																																																																		
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FT-R44Y	141.732 (Note 2)	141.732 (Note 2)	125.984	86.614	55.118	—	—	—																																																																																																																																																																																																																																																																																																																																		
	3,500	1,600	1,200	780	500	150	280	800																																																																																																																																																																																																																																																																																																																																		
	137.795	62.992	47.244	30.709	19.685	5.906			11.024	31.496																																																																																																																																																																																																																																																																																																																																
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FT-H35-M2	141.732 (Note 2)	110.236	70.866	51.181	29.528	—	—	—																																																																																																																																																																																																																																																																																																																																		
	1,600	1,600	1,500	950	560	190	140	400																																																																																																																																																																																																																																																																																																																																		
	62.992 (Note 2)	62.992 (Note 2)	59.055	37.402	22.047	7.480			5.512	15.748																																																																																																																																																																																																																																																																																																																																
1,600	1,600	1,600	1,250	690	—																																																																																																																																																																																																																																																																																																																																					
FT-H20W-M1	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	49.213	27.165	—	—	—																																																																																																																																																																																																																																																																																																																																		
	1,600	1,600	1,300	780	500	150	280	840																																																																																																																																																																																																																																																																																																																																		
	62.992 (Note 2)	62.992 (Note 2)	51.181	30.709	19.685	5.906			11.024	33.071																																																																																																																																																																																																																																																																																																																																
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FT-H20-M1	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	62.992 (Note 2)	31.496	—	—	—																																																																																																																																																																																																																																																																																																																																		
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	62.992 (Note 2)	37.795	29.134	17.717	11.417	3.150			5.906	16.142																																																																																																																																																																																																																																																																																																																																
3,600	2,400	1,500	1,100	680	—																																																																																																																																																																																																																																																																																																																																					
FT-H20-J50-S FT-H20-J30-S FT-H20-J20-S	141.732 (Note 2)	94.488	59.055	43.307	26.771	—	—	—																																																																																																																																																																																																																																																																																																																																		
	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) <table border="1"> <thead> <tr> <th rowspan="2">Amplifier</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> </thead> <tbody> <tr> <td rowspan="3">Fiber / Mode</td> <td>3,600</td> <td>3,600</td> <td>3,400</td> <td>1,500</td> <td>900</td> <td>370</td> <td rowspan="3">450</td> <td rowspan="3">1,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>133.858</td> <td>59.055</td> <td>35.433</td> <td>14.567</td> <td rowspan="2">17.717</td> <td rowspan="2">62.992</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>2,500</td> <td>1,650</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H30-M1V-S</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>98.425</td> <td>64.961</td> <td>—</td> <td>—</td> <td>—</td> </tr> </tbody> </table>	Amplifier	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	Fiber / Mode	3,600	3,600	3,400	1,500	900	370	450	1,600	141.732 (Note 2)	141.732 (Note 2)	133.858	59.055	35.433	14.567	17.717	62.992	3,600	3,600	3,600	2,500	1,650	—	FT-H30-M1V-S	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	98.425	64.961	—	—	—																																																																																																																																																																																																																																																																																						
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	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) <table border="1"> <thead> <tr> <th rowspan="2">Amplifier</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> </thead> <tbody> <tr> <td rowspan="3">Fiber / Mode</td> <td>3,600</td> <td>3,600</td> <td>3,400</td> <td>1,500</td> <td>900</td> <td>370</td> <td rowspan="3">450</td> <td rowspan="3">1,600</td> </tr> <tr> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>133.858</td> <td>59.055</td> <td>35.433</td> <td>14.567</td> <td rowspan="2">17.717</td> <td rowspan="2">62.992</td> </tr> <tr> <td>3,600</td> <td>3,600</td> <td>3,600</td> <td>1,800</td> <td>1,100</td> <td>—</td> </tr> <tr> <td rowspan="3">FT-H30-M1V-S</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>141.732 (Note 2)</td> <td>70.866</td> <td>43.307</td> <td>—</td> <td>—</td> <td>—</td> </tr> </tbody> </table>	Amplifier	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	Fiber / Mode	3,600	3,600	3,400	1,500	900	370	450	1,600	141.732 (Note 2)	141.732 (Note 2)	133.858	59.055	35.433	14.567	17.717	62.992	3,600	3,600	3,600	1,800	1,100	—	FT-H30-M1V-S	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	70.866	43.307	—	—	—																																																																																																																																																																																																																																																																																						
			Amplifier		FX-500 series (Upper value) FX-550 series (Lower value)						FX-100 series																																																																																																																																																																																																																																																																																																																															
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Fiber / Mode	3,600	3,600	3,400	1,500	900	370	450	1,600																																																																																																																																																																																																																																																																																																																																		
	141.732 (Note 2)	141.732 (Note 2)	133.858	59.055	35.433	14.567			17.717	62.992																																																																																																																																																																																																																																																																																																																																
	3,600	3,600	3,600	1,800	1,100	—																																																																																																																																																																																																																																																																																																																																				
FT-H30-M1V-S	141.732 (Note 2)	141.732 (Note 2)	141.732 (Note 2)	70.866	43.307	—	—	—																																																																																																																																																																																																																																																																																																																																		

- 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 $\phi 0.1$ mm $\phi 0.004$ 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)																											
	FX-MR6 (Note 2)		Extremely fine spot of $\phi 0.1$ mm $\phi 0.004$ 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)																											
	FX-MR3 (Note 2)		Extremely fine spot of $\phi 0.15$ mm $\phi 0.006$ 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)																											
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)																											
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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)																											
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Pinpoint spot lens	FX-MR1		Pinpoint spot of $\phi 0.5$ mm $\phi 0.020$ in. Enables detection of minute objects or small marks. • Distance to focal point: 6 ± 1 mm 0.236 ± 0.039 in • 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 $\phi 0.7$ to $\phi 2$ mm $\phi 0.028$ to $\phi 0.079$ 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)																											
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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)																											
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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.

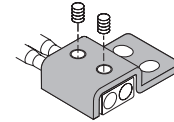
FIBER OPTIONS

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)
- Mounting 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 $\phi 1\text{mm } \phi 0.039\text{ in}$ / $\phi 1.3\text{mm } \phi 0.051\text{ in}$ fiber cable / $\phi 4\text{mm } \phi 0.157\text{ in}$ protective tube)
- **FX-CT4** (Fiber cutter for $\phi 2\text{mm } \phi 0.079\text{ in}$ fiber cable / $\phi 4\text{mm } \phi 0.157\text{ in}$ protective tube)
- **FX-AT2** (Attachment for fixed-length fiber, Orange)
- **FX-AT3** (Attachment for $\phi 2.2\text{ mm } \phi 0.087\text{ in}$ fiber, Clear orange)
- **FX-AT4** (Attachment for $\phi 1\text{ mm } \phi 0.039\text{ in}$ fiber, Black)
- **FX-AT5** (Attachment for $\phi 1.3\text{ mm } \phi 0.051\text{ in}$ fiber, Gray)
- **FX-AT6** (Attachment for $\phi 1\text{ mm } \phi 0.039\text{ in}$ / $\phi 1.3\text{ mm } \phi 0.051\text{ in}$ mixed fiber, Black / Gray)
- **FX-AT4G1** (Gland single for $\phi 1\text{ mm } \phi 0.039\text{ in}$ fiber, Black)
- **FX-AT5G1** (Gland single for $\phi 1.3\text{ mm } \phi 0.051\text{ in}$ fiber, Gray)
- **FX-AT6G1** (Gland single for $\phi 1\text{ mm } \phi 0.039\text{ in}$ / $\phi 1.3\text{ mm } \phi 0.051\text{ in}$ mixed fiber, Black / Gray)
- **FX-SL1** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: $0.5 \times 12\text{ mm } 0.020 \times 0.472\text{ in}$)
- **FX-SL2** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: $1 \times 12\text{ mm } 0.039 \times 0.472\text{ in}$)
- **FX-SL3** (Slit mask for **FT-A11** / **FT-A11W** (one pair set), slit size: $0.5 \times 33\text{ mm } 0.020 \times 1.299\text{ in}$)
- **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



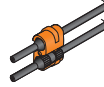
• FX-CT3



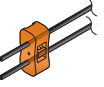
• FX-CT4



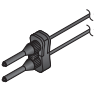
• FX-AT2



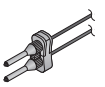
• FX-AT3



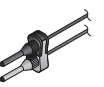
• FX-AT4



• FX-AT5



• FX-AT6



• FX-AT4G1



• FX-AT5G1



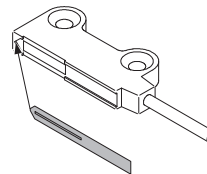
• FX-AT6G1



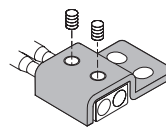
• FX-SL1

• FX-SL2

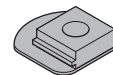
• FX-SL3



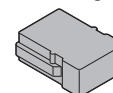
• MS-FD-2



• MS-FD-F7-1

(SUS mounting bracket for **FD-F71**)

• MS-FD-F7-2

(PVC mounting bracket for **FD-F71**)

FIBER OPTIONS

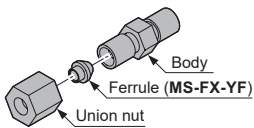
Others

Designation	Model No.	Description			
Protective tube for thru-beam type fiber	FTP-500 (0.5 m 1.640 ft)	For M4 thread	FT-42 FT-42S FT-42W	FT-43 FT-H13-FM2	
	FTP-1000 (1 m 3.281 ft)		For M3 thread	FT-31 FT-31S FT-31W	FD-31 FD-31W
	FTP-1500 (1.5 m 4.921 ft)			For M6 thread	FD-61 FD-61G FD-61S FD-61W
	FTP-N500 (0.5 m 1.640 ft)	For M4 thread			FD-41 FD-41W
	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 M4 thread	FD-41 FD-41W	FD-41S FD-41SW	
	FDP-1000 (1 m 3.281 ft)		For M3 thread	FT-31 FT-31S FT-31W	FD-31 FD-31W
	FDP-1500 (1.5 m 4.921 ft)			For M6 thread	FD-61 FD-61G FD-61S FD-61W
	FDP-N500 (0.5 m 1.640 ft)	For M4 thread			FD-41 FD-41W
	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.			
	RF-220	Refer to p.32 or p.47 for the sensing range of FR-Z50HW to be used in combination.			
	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.

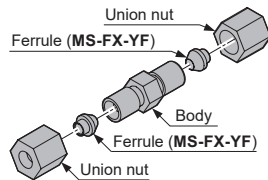
Liquid inflow prevention joint

- MS-FX-01Y



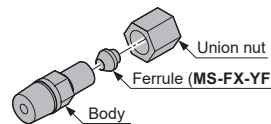
Protective tube extension joint

- MS-FX-02Y



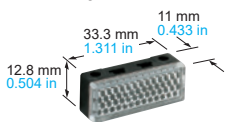
Fiber mounting joint

- MS-FX-03Y



Reflector

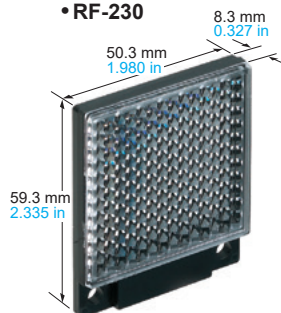
- RF-210



- RF-220

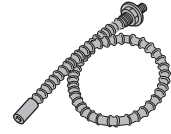


- RF-230



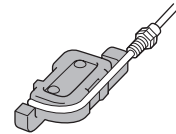
Protective tube

- FTP-□
- FDP-□



Fiber bender

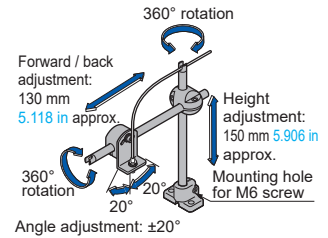
- FB-1



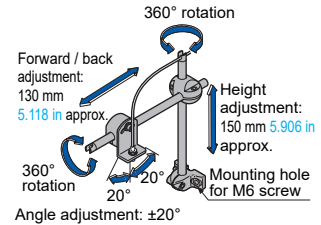
Universal sensor mounting stand

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



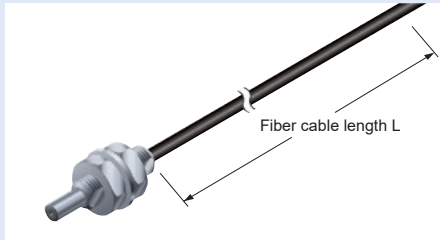
Semi-custom fibers that flexibly meet diverse needs

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

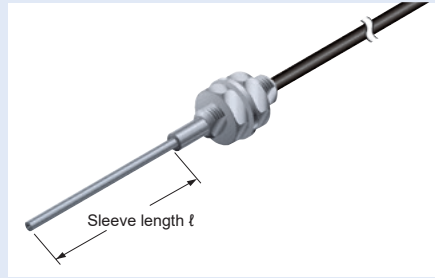
It is possible to extend up to 30 m **98.425 ft** in units of 1 m **3.281 ft**, varying depending on the model. Refer to the table on the next page for applicable models.



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.

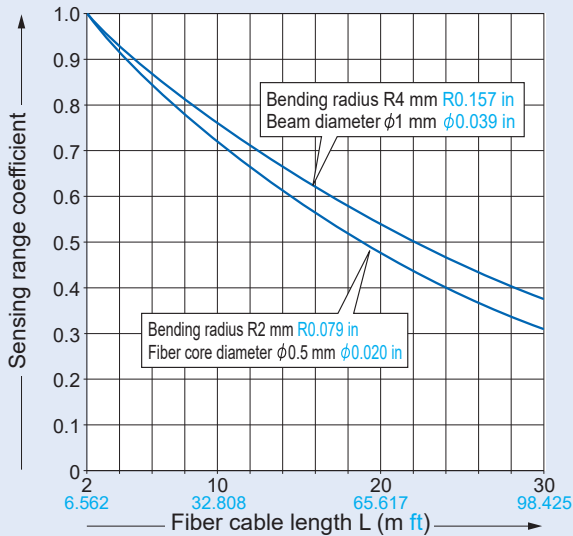


Note : Note that the model number differs from previous models with changed lengths.

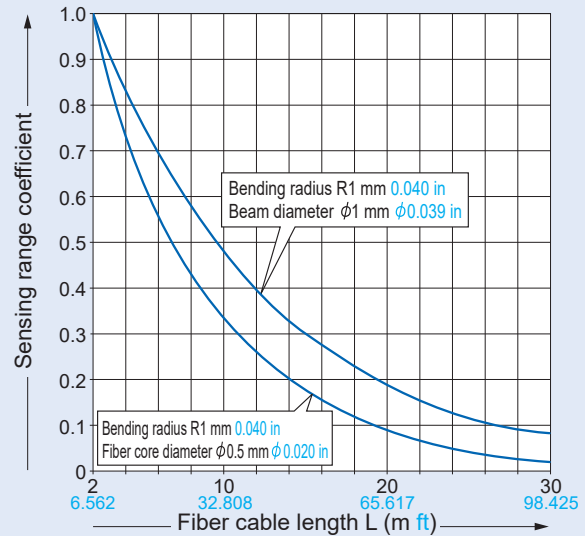
• Attenuation ratio characteristics for fiber cable length and sensing range

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.

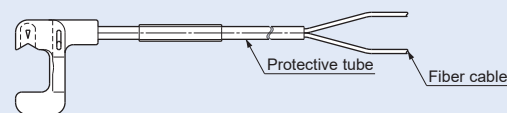
Extended protective tube

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		Applicable fiber length	
				Sensing range (mm in) FX-500 series (STD) (Note)	Sensing range (mm in) FX-550 series (STD) (Note)	Max. (m ft)	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					Applicable fiber length	
	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-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.

Model No.	Basic specifications					Applicable fiber length	
	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 0.591	110 4.331	160 6.299	10 32.808	1 3.281
FT-V25	2 m 6.562 ft ☒	—	15 0.591	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.	Fiber cable length Free-cut	Basic specifications				Applicable fiber length	
		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-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.

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.

DIMENSIONS (Unit: mm in)

Thru-beam type fibers

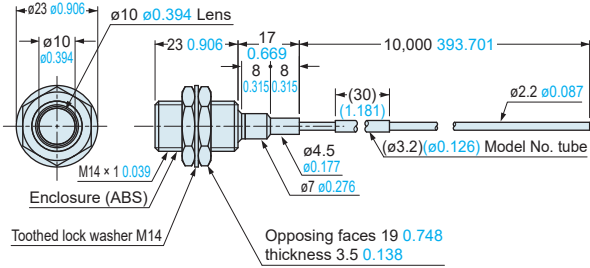


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-140

Free-cut

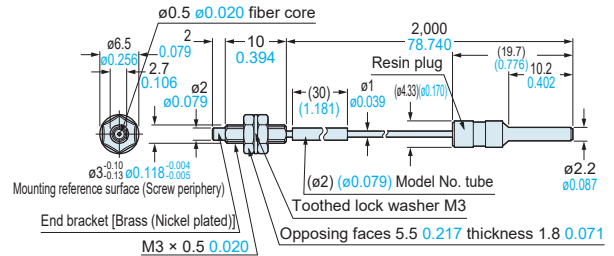
<with FX-AT3>



FT-30

Free-cut

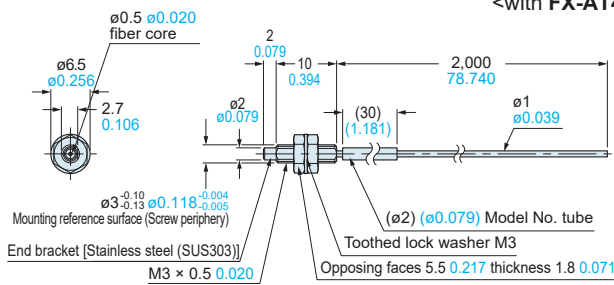
<with FX-AT2>



FT-31

Free-cut

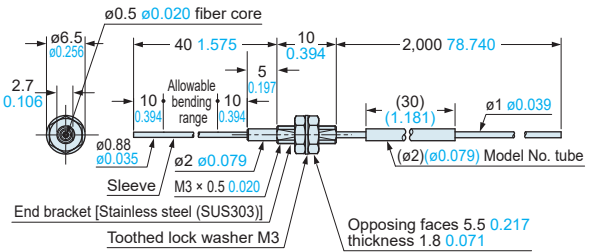
<with FX-AT4>



FT-31S

Free-cut

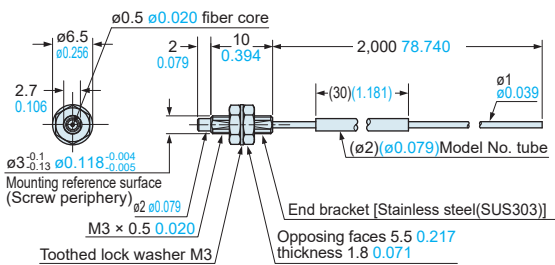
<with FX-AT4>



FT-31W

Free-cut

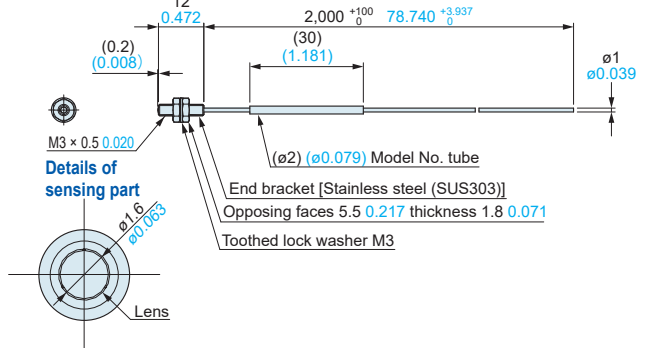
<with FX-AT4>



FT-32

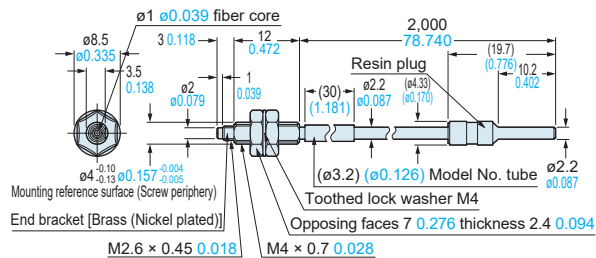
Free-cut

<with FX-AT4>



FT-40

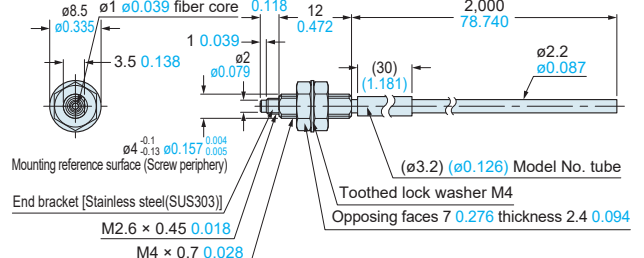
<with FX-AT2>



FT-42

Free-cut

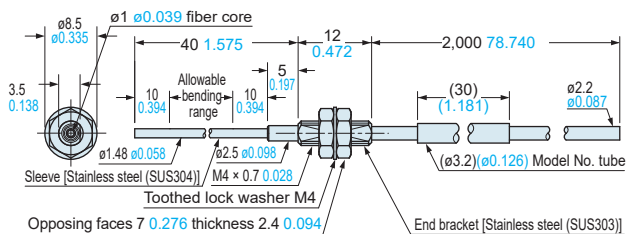
<with FX-AT3>



FT-42S

Free-cut

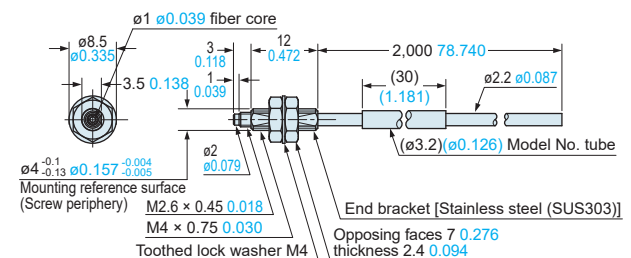
<with FX-AT3>



FT-42W

Free-cut

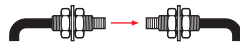
<with FX-AT3>



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.

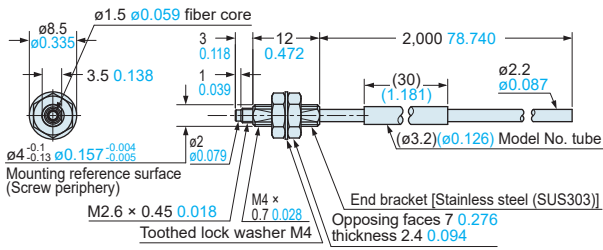
DIMENSIONS (Unit: mm in)

Thru-beam type fibers

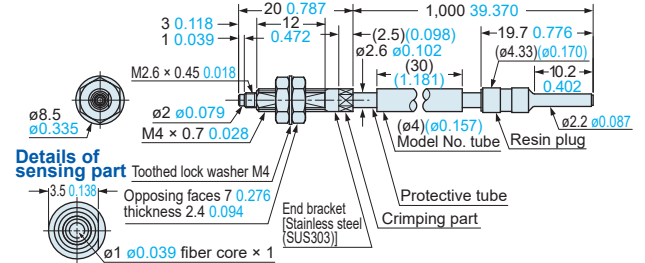


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

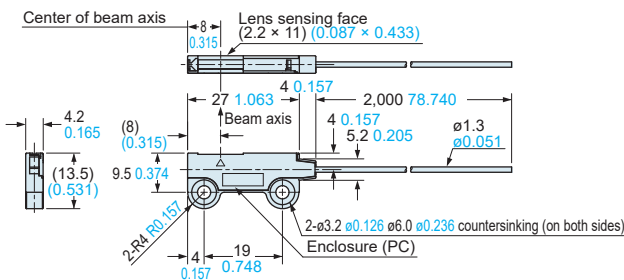
FT-43 Free-cut
<with FX-AT3>



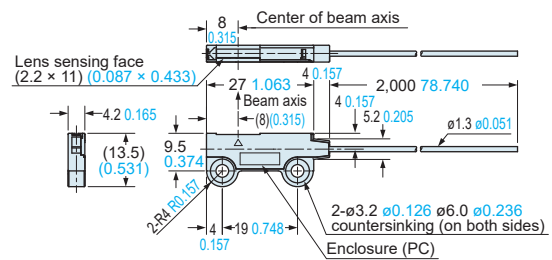
FT-45X Free-cut
<with FX-AT2>



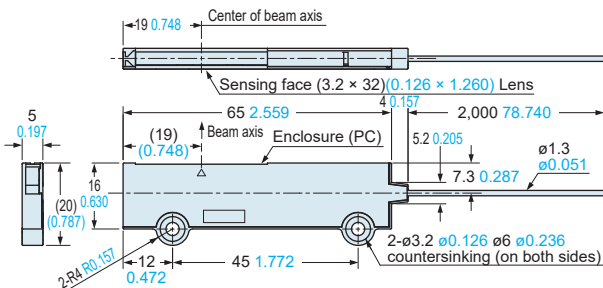
FT-A11 Free-cut
<with FX-AT5>



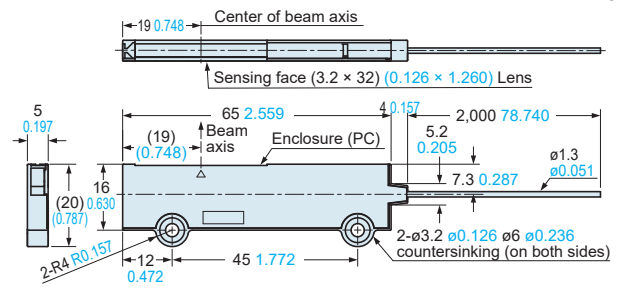
FT-A11W Free-cut
<with FX-AT5>



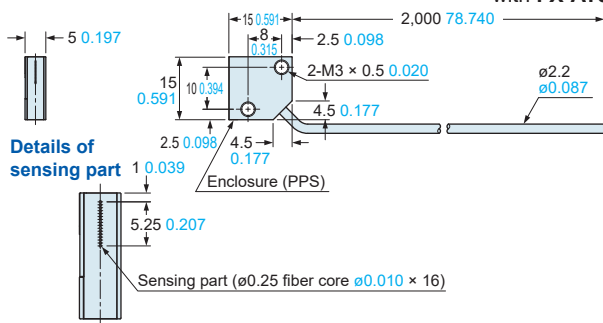
FT-A32 Free-cut
<with FX-AT5>



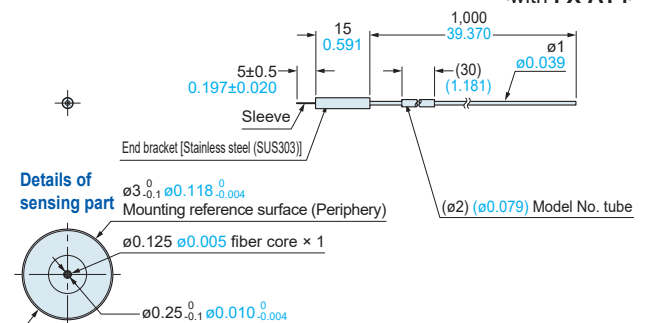
FT-A32W Free-cut
<with FX-AT5>



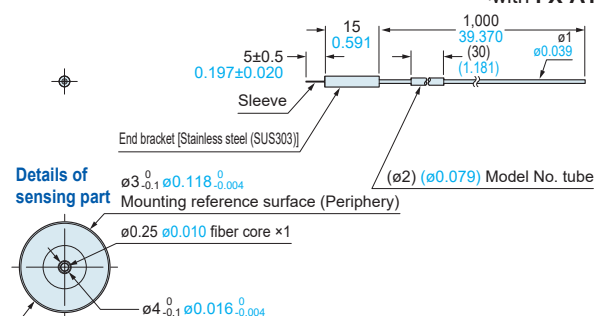
FT-AL05 Free-cut
<with FX-AT3>



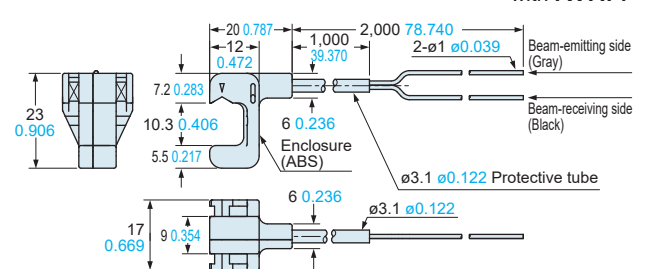
FT-E13 Free-cut
<with FX-AT4>



FT-E23 Free-cut
<with FX-AT4>



FT-F93 Free-cut
<with FX-AT4>



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.

DIMENSIONS (Unit: mm in)

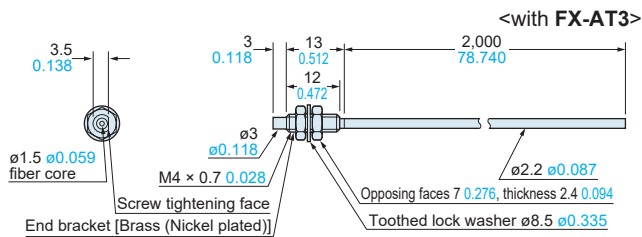
Thru-beam type fibers



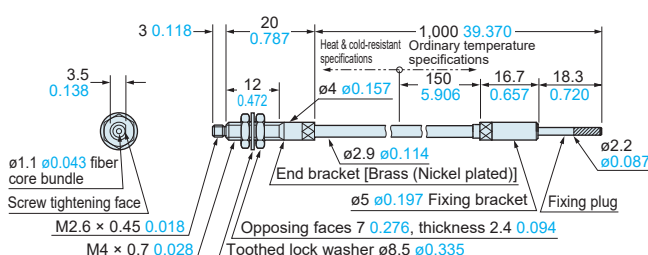
Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-H13-FM2

Free-cut



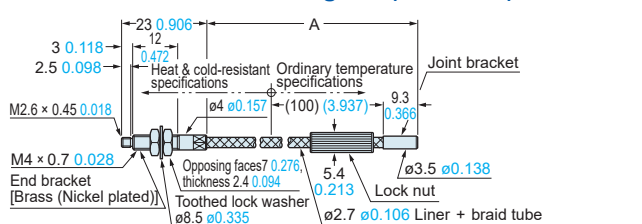
FT-H20-M1



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

Free-cut (Note)

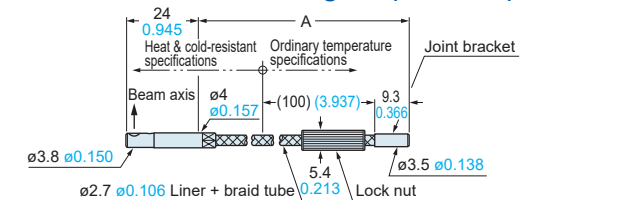
Heat-resistant side unit diagram (side view)



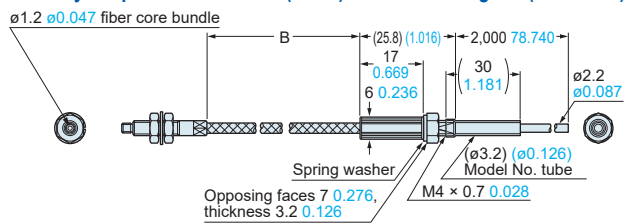
FT-H20-VJ50-S FT-H20-VJ80-S

Free-cut (Note)

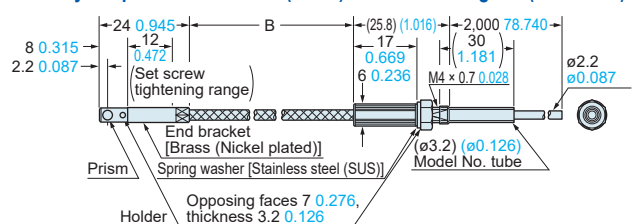
Heat-resistant side unit diagram (side view)



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

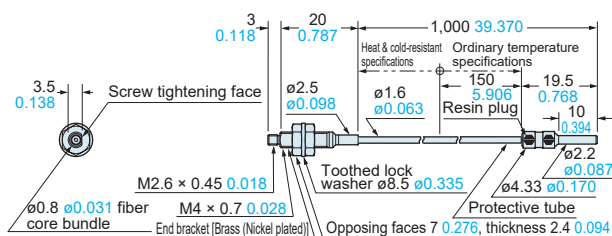
Note: Ordinary temperature side fiber (FT-42) only.

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

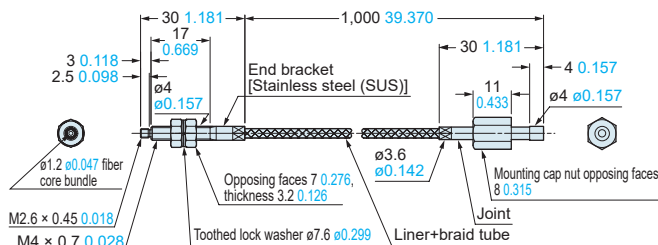
Note: Ordinary temperature side fiber (FT-42) only.

FT-H20W-M1

<with FX-AT2>

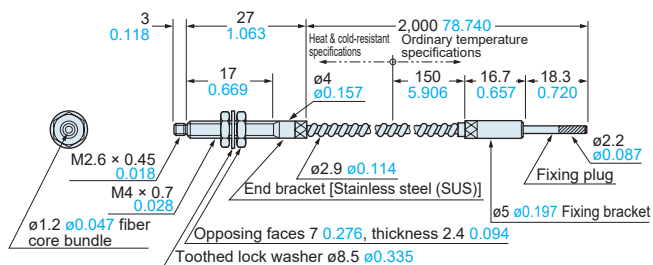


FT-H30-M1V-S

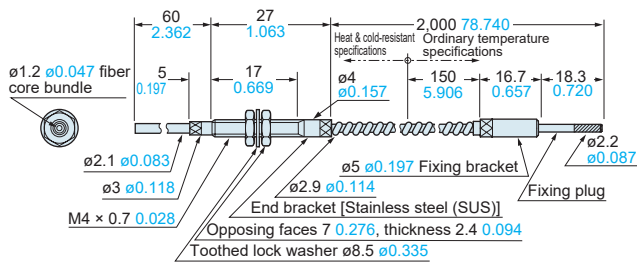


Note: The FT-H30-M1V-S is a set with the FT-H30-M1V, photo-terminal, and atmospheric side fiber. Refer to p.81 for dimensions of the atmospheric side fiber and photo-terminals.

FT-H35-M2



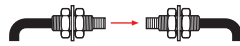
FT-H35-M2S6



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.

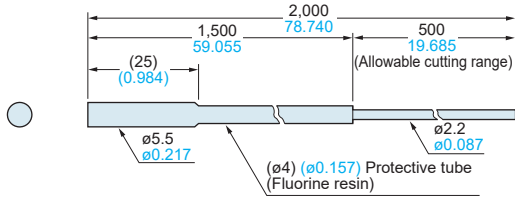
DIMENSIONS (Unit: mm in)

Thru-beam type fibers

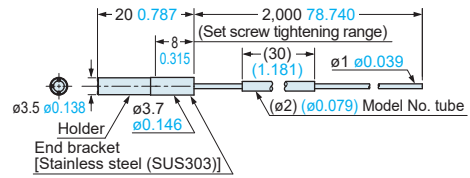


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

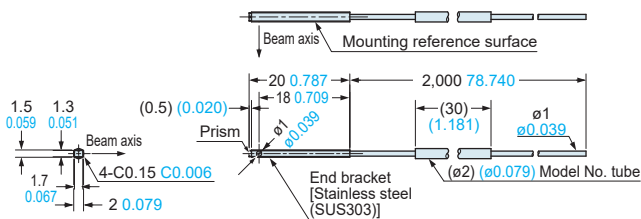
FT-HL80Y Free-cut
<with FX-AT3>



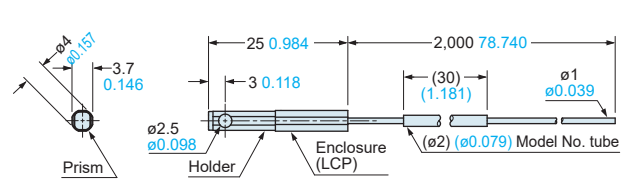
FT-KS40 Free-cut
<with FX-AT4>



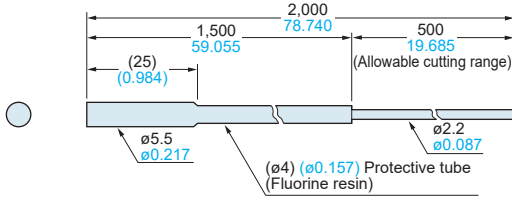
FT-KV26 FT-KV26H1 Free-cut
<with FX-AT4>



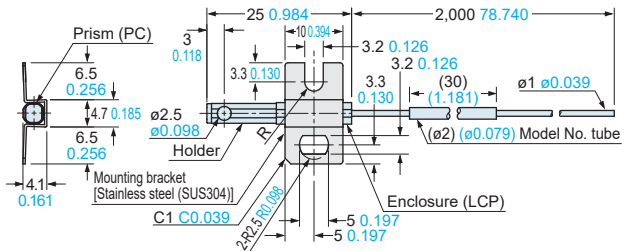
FT-KV40 FT-KV40W Free-cut
<with FX-AT4>



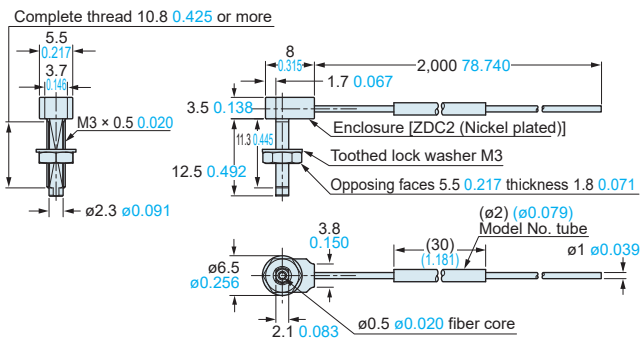
FT-L80Y Free-cut
<with FX-AT3>



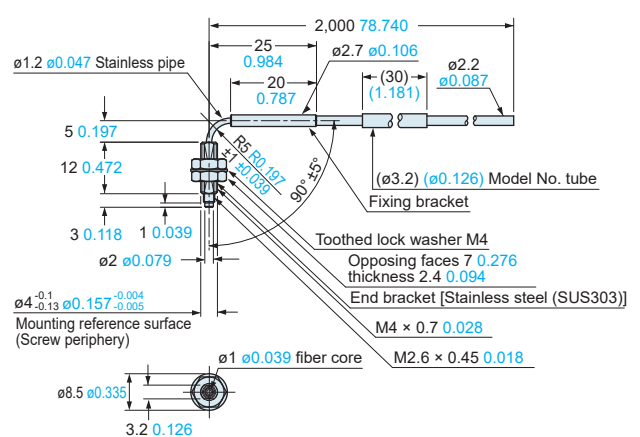
Assembly dimensions with MS-FD-3 (attached mounting bracket)



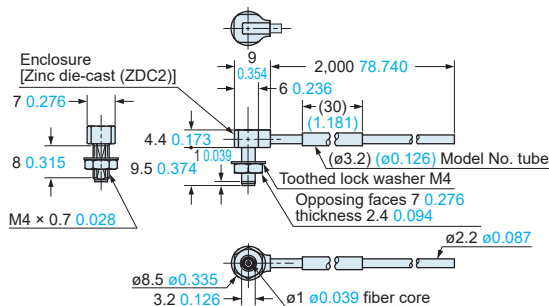
FT-R31 Free-cut
<with FX-AT4>



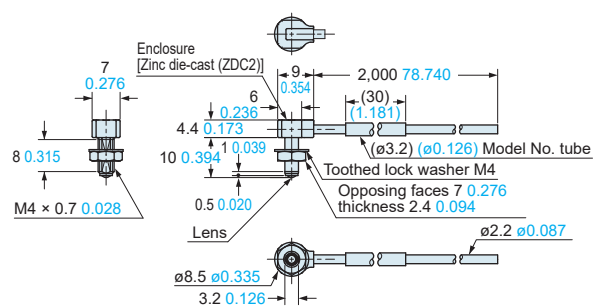
FT-R40 Free-cut
<with FX-AT3>



FT-R41W Free-cut
<with FX-AT3>



FT-R42W Free-cut
<with FX-AT3>



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.

DIMENSIONS (Unit: mm in)

Thru-beam type fibers

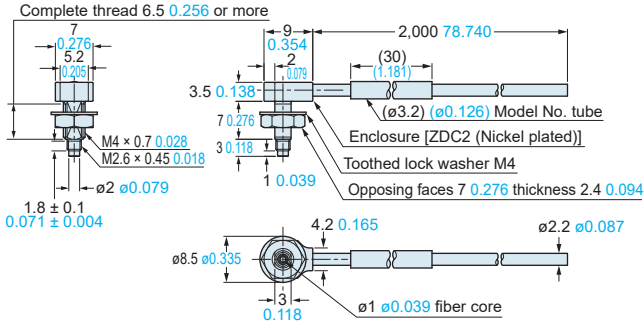


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-R43

Free-cut

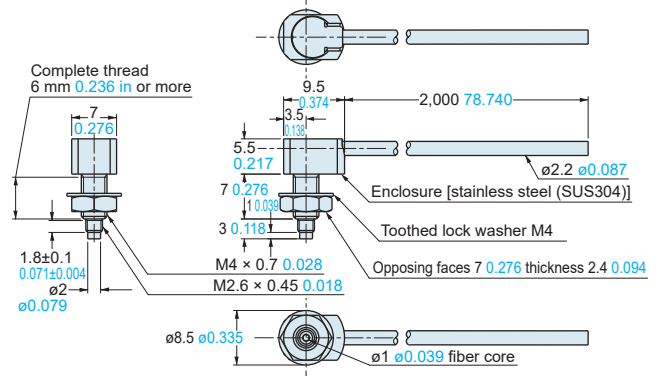
<with FX-AT3>



FT-R44Y

Free-cut

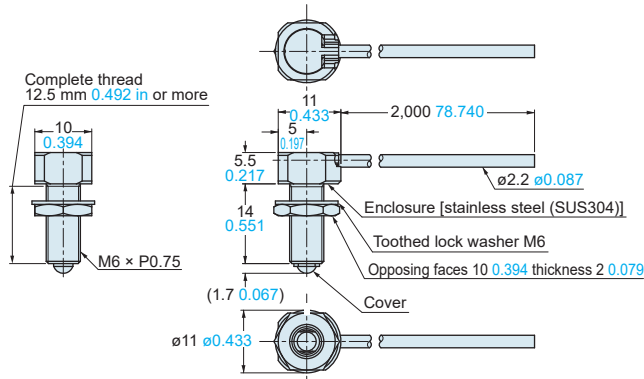
<with FX-AT3>



FT-R60Y

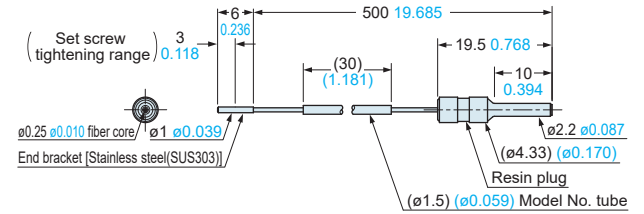
Free-cut

<with FX-AT3>



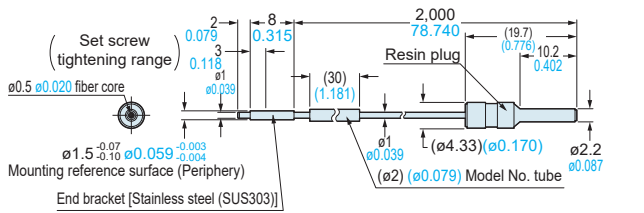
FT-S11

<with FX-AT2>



FT-S20

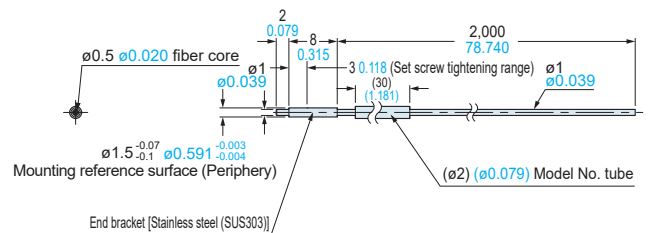
<with FX-AT2>



FT-S21

Free-cut

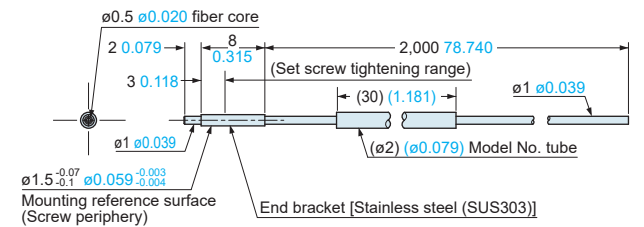
<with FX-AT4>



FT-S21W

Free-cut

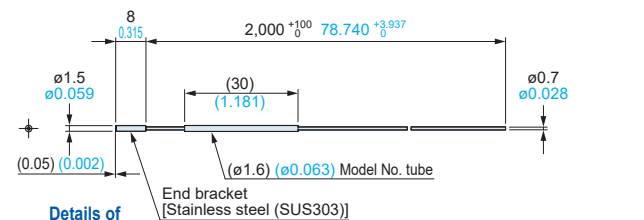
<with FX-AT4>



FT-S22

Free-cut

<with FX-AT7>

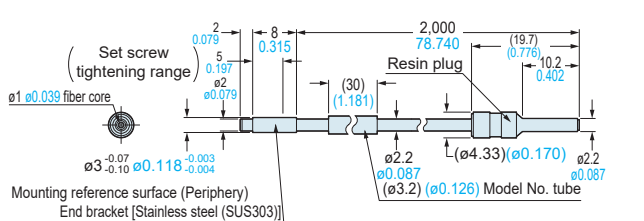


Details of sensing part



FT-S30

<with FX-AT2>



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.

DIMENSIONS (Unit: mm in)

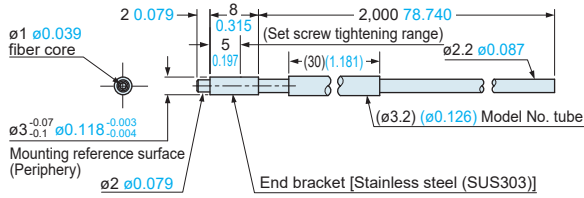
Thru-beam type fibers



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

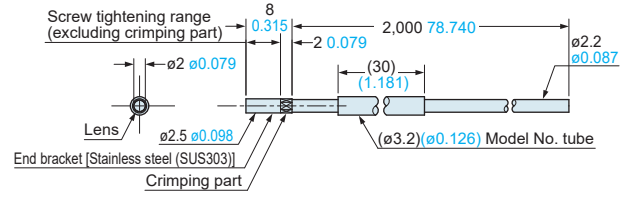
FT-S31W Free-cut

<with FX-AT3>



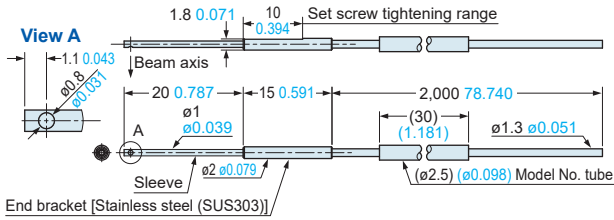
FT-S32 Free-cut

<with FX-AT3>



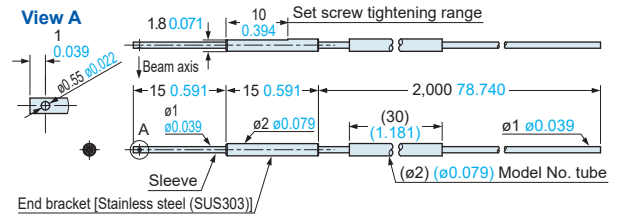
FT-V23 Free-cut

<with FX-AT5>



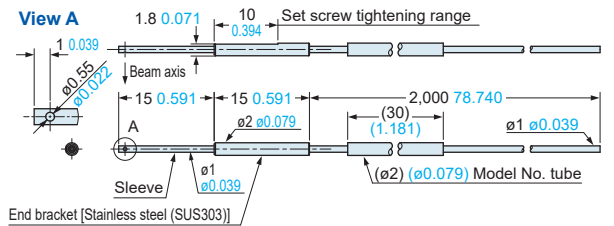
FT-V24W Free-cut

<with FX-AT4>



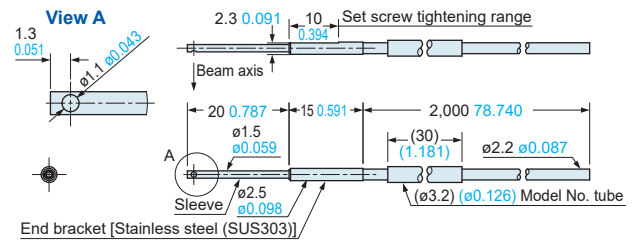
FT-V25 Free-cut

<with FX-AT4>



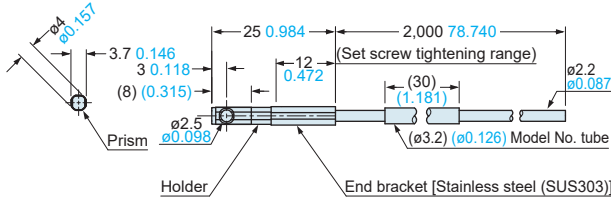
FT-V30 Free-cut

<with FX-AT3>



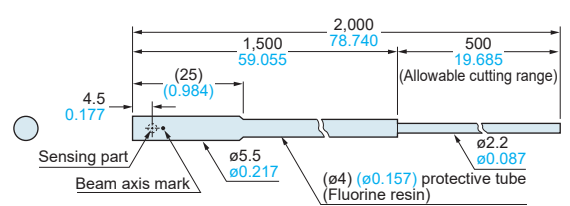
FT-V40 Free-cut

<with FX-AT3>



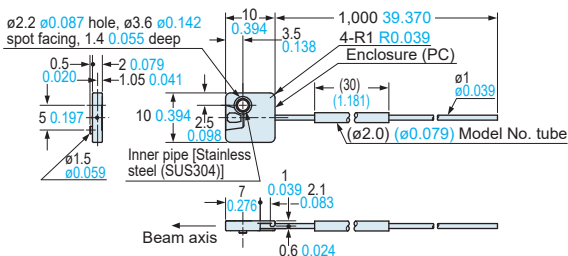
FT-V80Y Free-cut

<with FX-AT3>



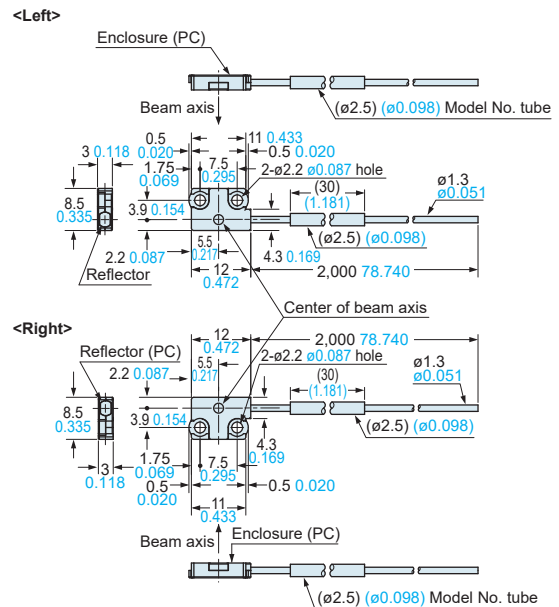
FT-Z20HBW Free-cut

<with FX-AT4>



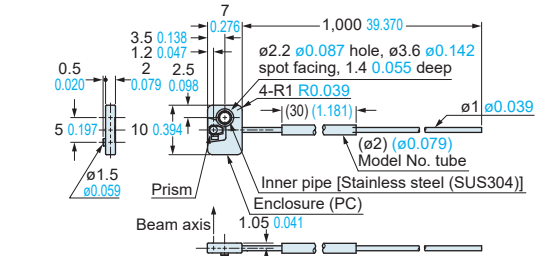
FT-Z30 Free-cut

<with FX-AT5>



FT-Z20W Free-cut

<with FX-AT4>



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.

DIMENSIONS (Unit: mm in)

Thru-beam type fibers

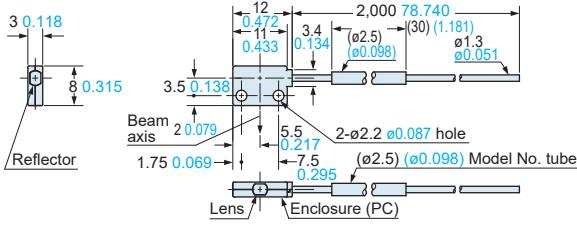


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FT-Z30E

Free-cut

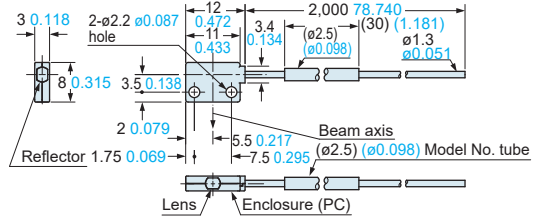
<with FX-AT5>



FT-Z30EW

Free-cut

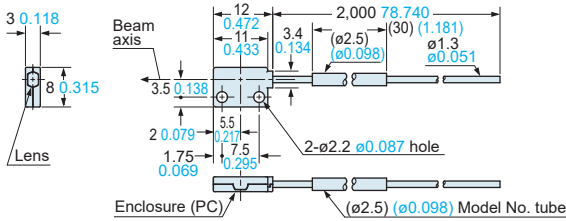
<with FX-AT5>



FT-Z30H

Free-cut

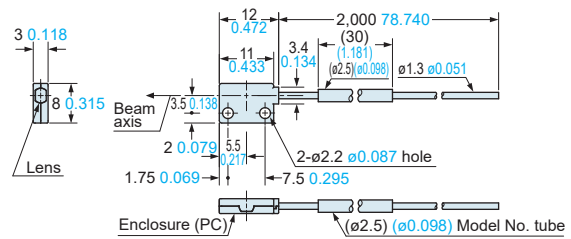
<with FX-AT5>



FT-Z30HW

Free-cut

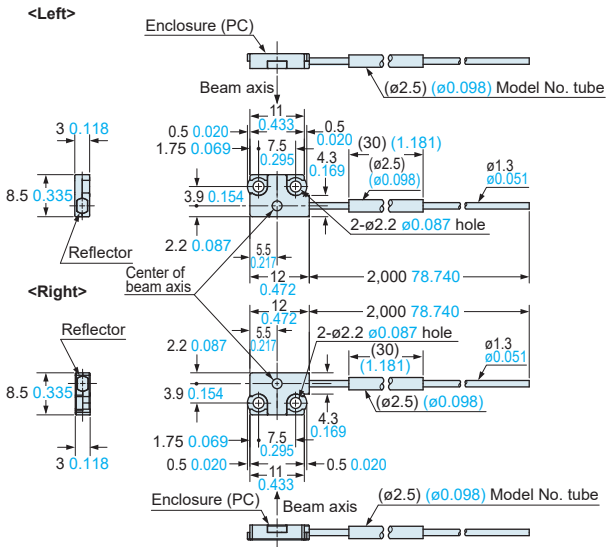
<with FX-AT5>



FT-Z30W

Free-cut

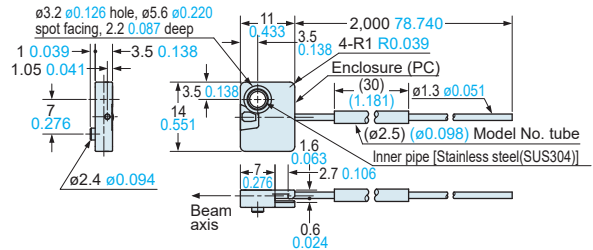
<with FX-AT5>



FT-Z40HBW

Free-cut

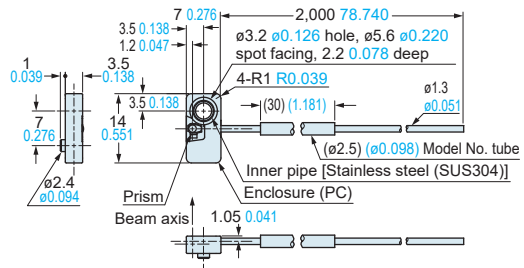
<with FX-AT5>



FT-Z40W

Free-cut

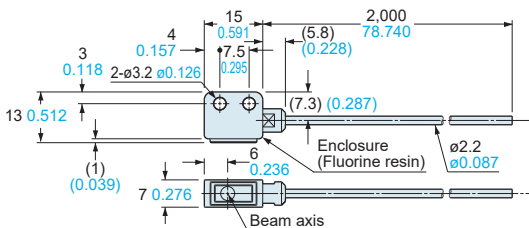
<with FX-AT5>



FT-Z802Y

Free-cut

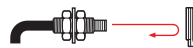
<with FX-AT3>



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.

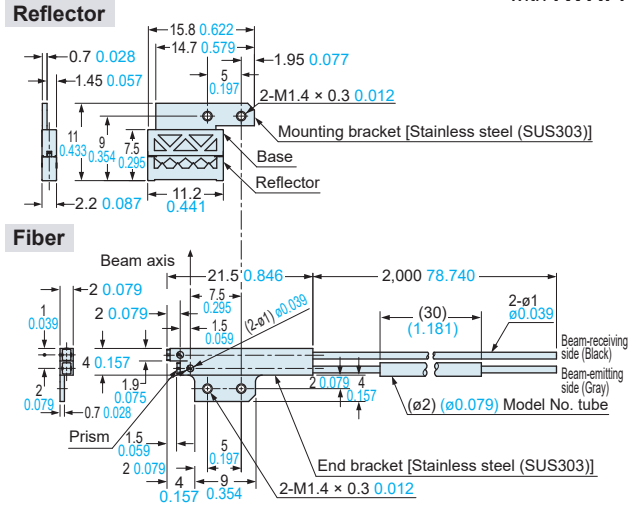
DIMENSIONS (Unit: mm in)

Retroreflective type fibers

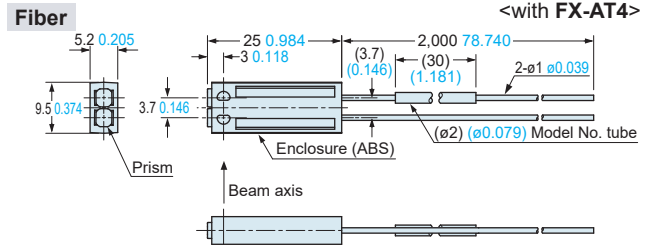


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

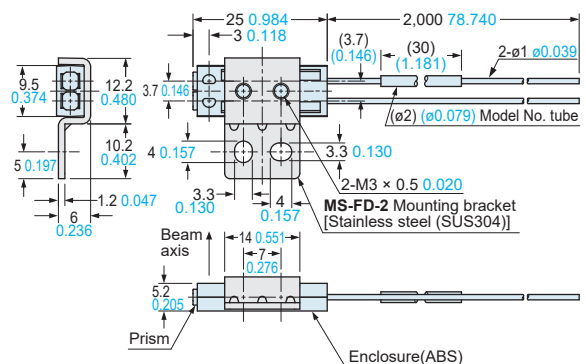
FR-KZ22E Free-cut
<with FX-AT4>



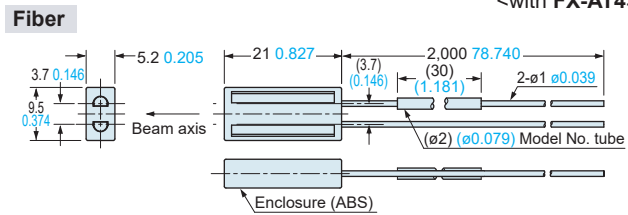
FR-KZ50E Free-cut
<with FX-AT4>



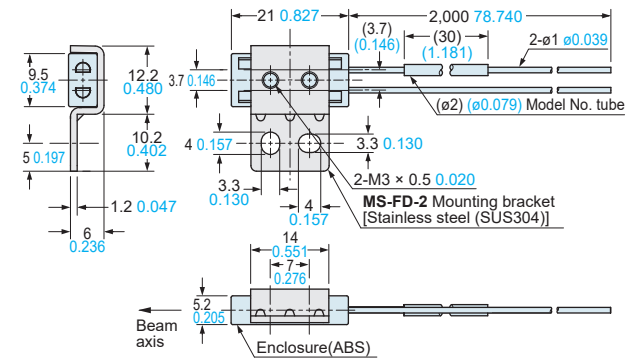
Assembly dimensions with MS-FD-2 (attached mounting bracket)



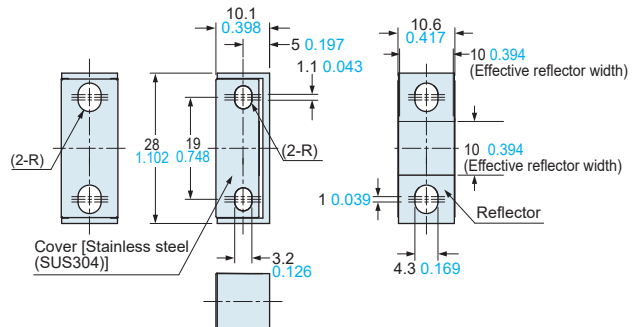
FR-KZ50H Free-cut
<with FX-AT4>



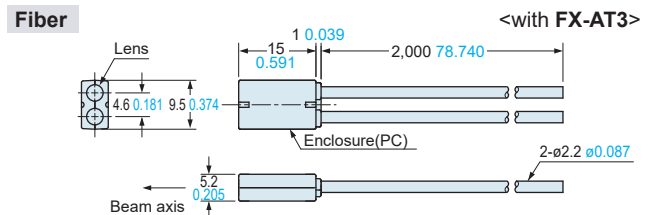
Assembly dimensions with MS-FD-2 (attached mounting bracket)



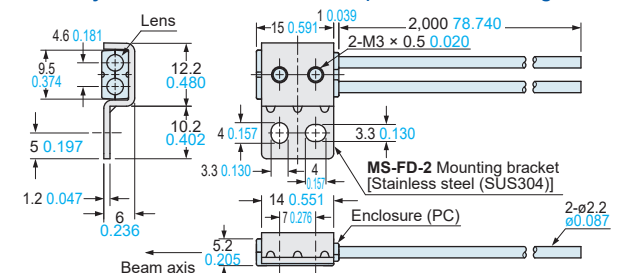
Reflector RF-003 (Accessory for FR-KZ50E)



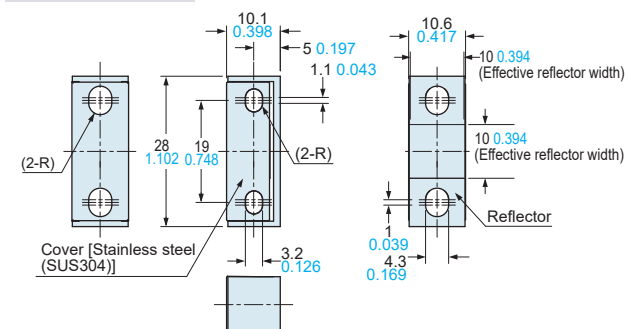
FR-Z50HW Free-cut
<with FX-AT3>



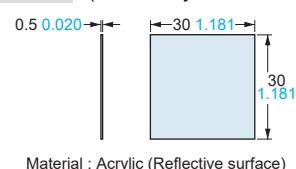
Assembly dimensions with MS-FD-2 (attached mounting bracket)



Reflector RF-003 (Accessory for FR-KZ50H)



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



Material : Acrylic (Reflective surface)

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.

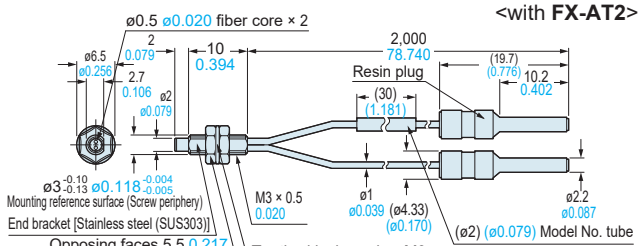
DIMENSIONS (Unit: mm in)

Reflective type fibers



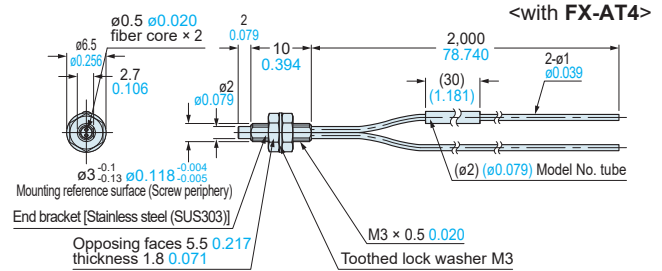
Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-30



FD-31

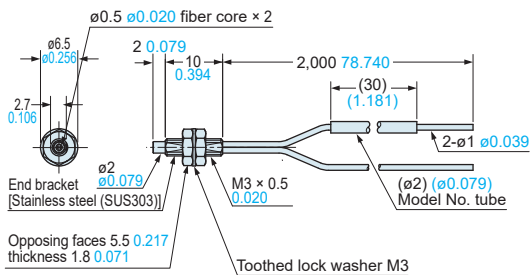
Free-cut



FD-31W

Free-cut

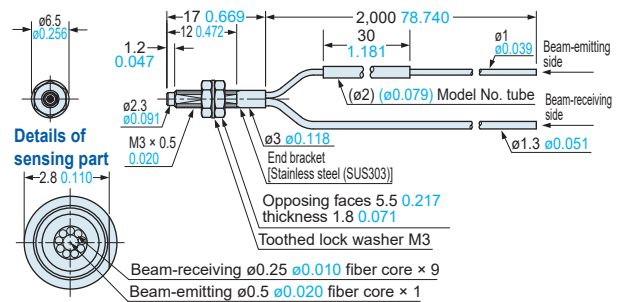
<with FX-AT4>



FD-32G

Free-cut

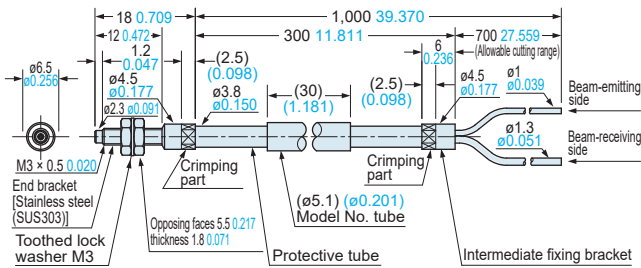
<with FX-AT6>



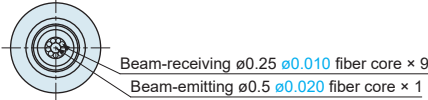
FD-32GX

Free-cut

<with FX-AT6>



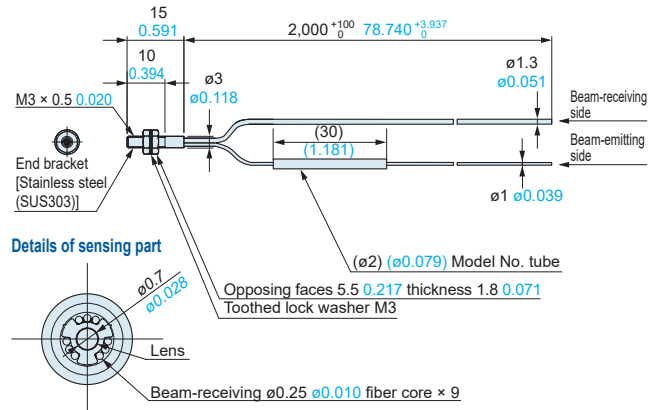
Details of sensing part



FD-34G

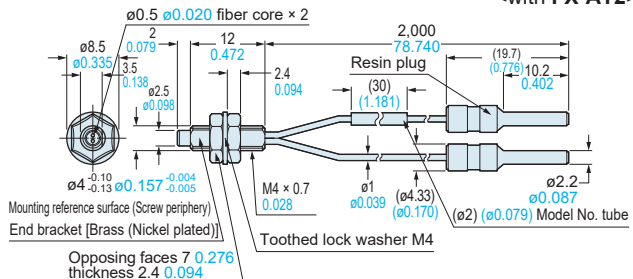
Free-cut

<with FX-AT6>



FD-40

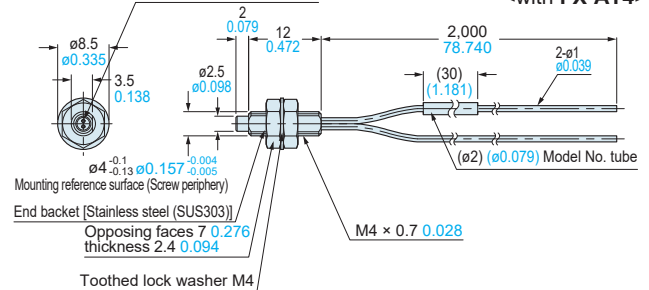
<with FX-AT2>



FD-41

Free-cut

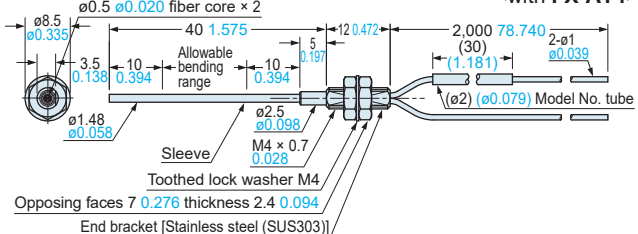
<with FX-AT4>



FD-41S

Free-cut

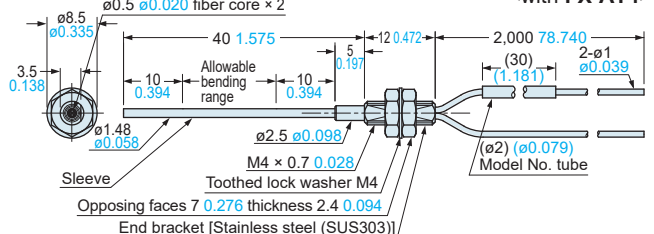
<with FX-AT4>



FD-41SW

Free-cut

<with FX-AT4>



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.

DIMENSIONS (Unit: mm in)

Reflective type fibers

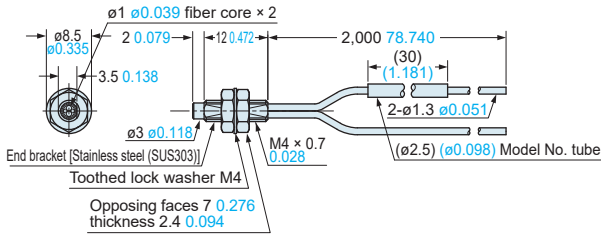


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-41W

Free-cut

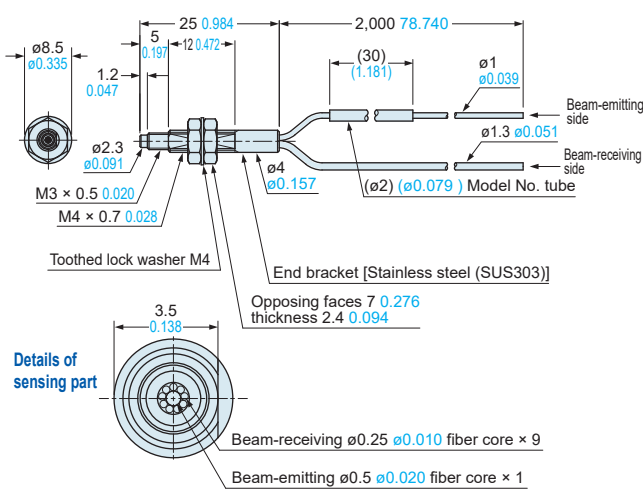
<with FX-AT5>



FD-42G

Free-cut

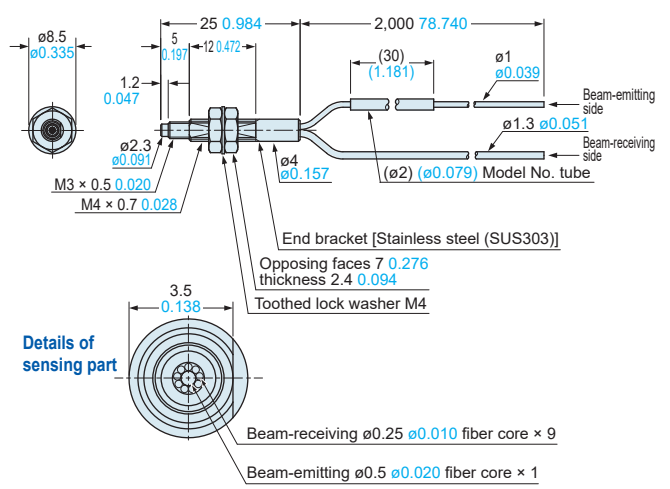
<with FX-AT6>



FD-42GW

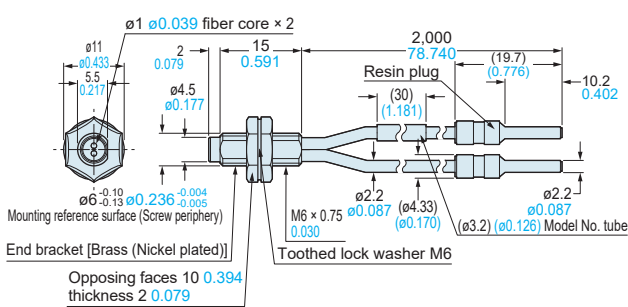
Free-cut

<with FX-AT6>



FD-60

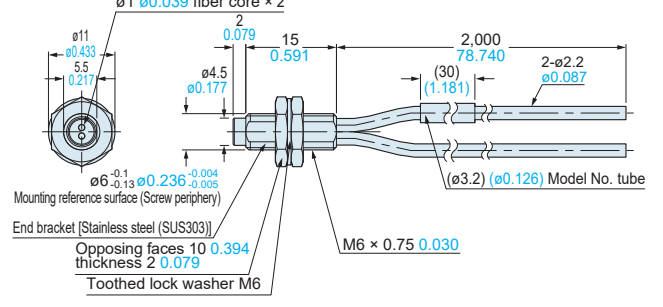
<with FX-AT2>



FD-61

Free-cut

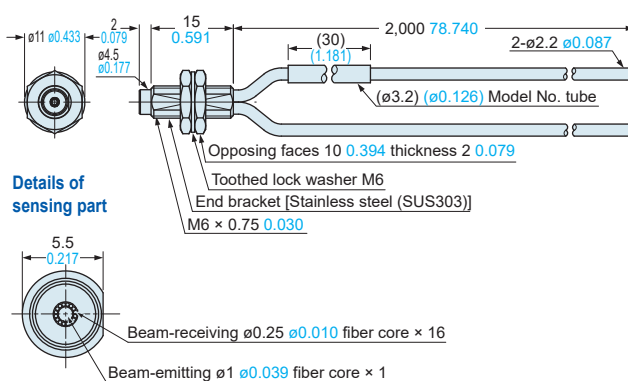
<with FX-AT3>



FD-61G

Free-cut

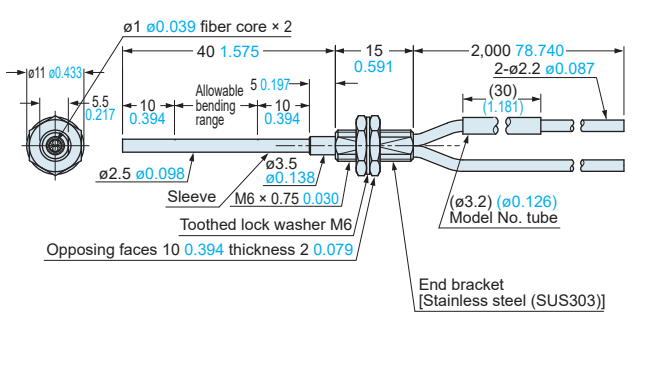
<with FX-AT3>



FD-61S

Free-cut

<with FX-AT3>



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.

DIMENSIONS (Unit: mm in)

Reflective type fibers

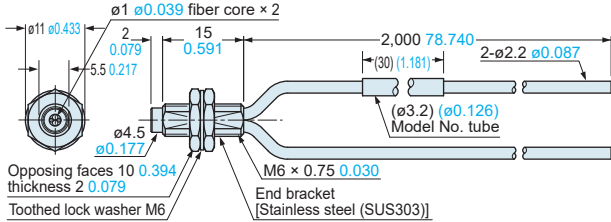


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-61W

Free-cut

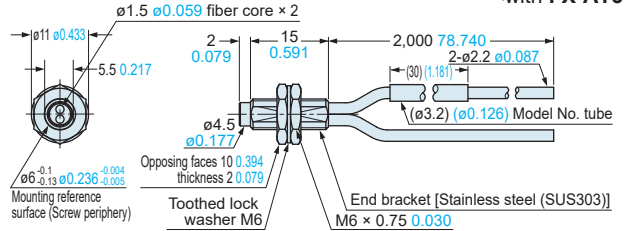
<with FX-AT3>



FD-62

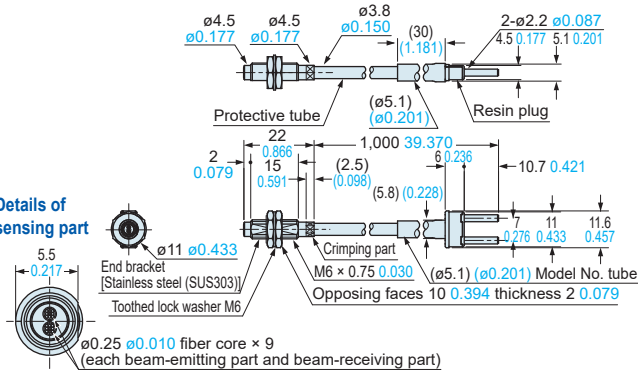
Free-cut

<with FX-AT3>



FD-64X

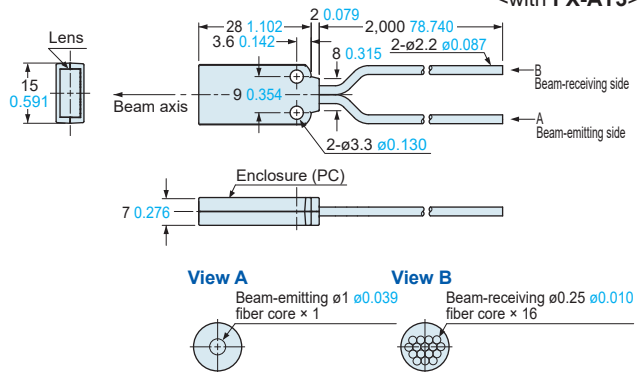
Details of sensing part



FD-A16

Free-cut

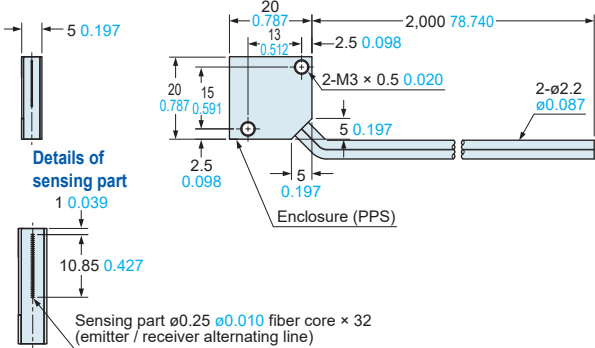
<with FX-AT3>



FD-AL11

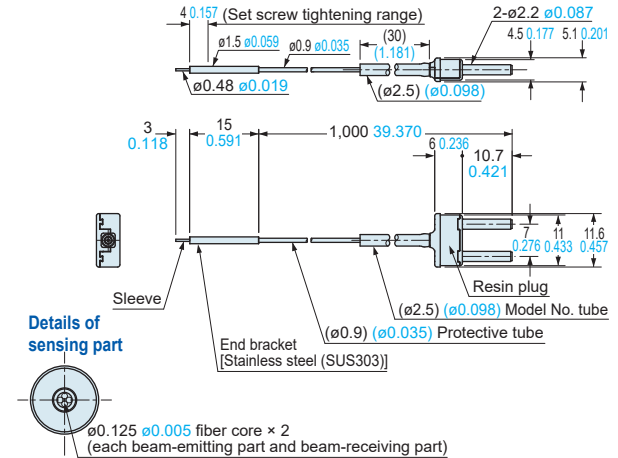
Free-cut

<with FX-AT3>

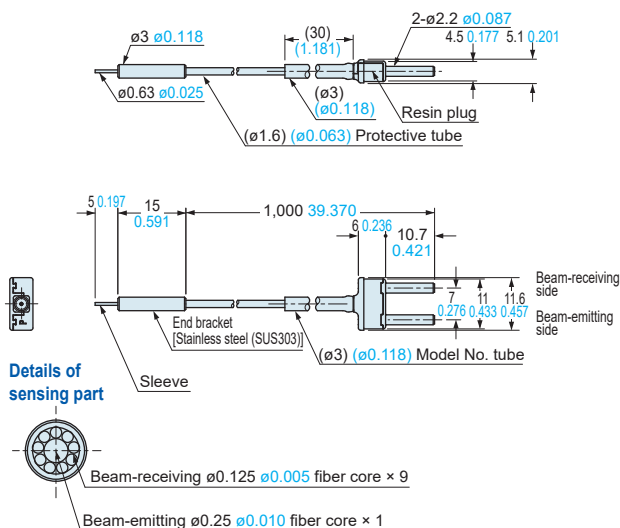


FD-E13

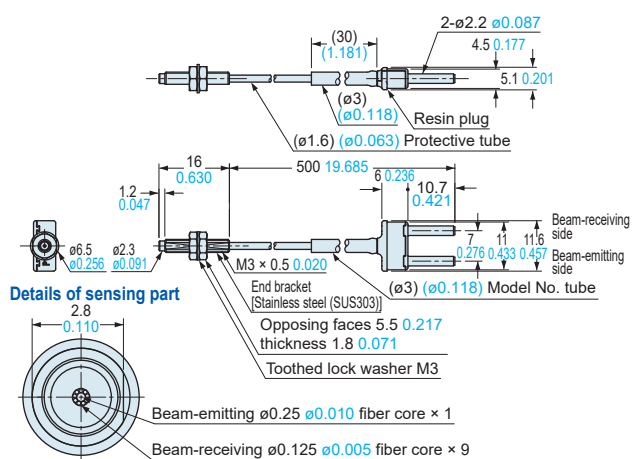
Details of sensing part



FD-E23



FD-EG30



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.

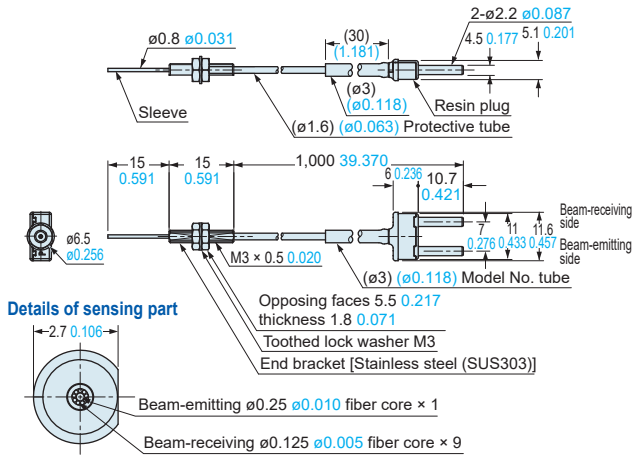
DIMENSIONS (Unit: mm in)

Reflective type fibers

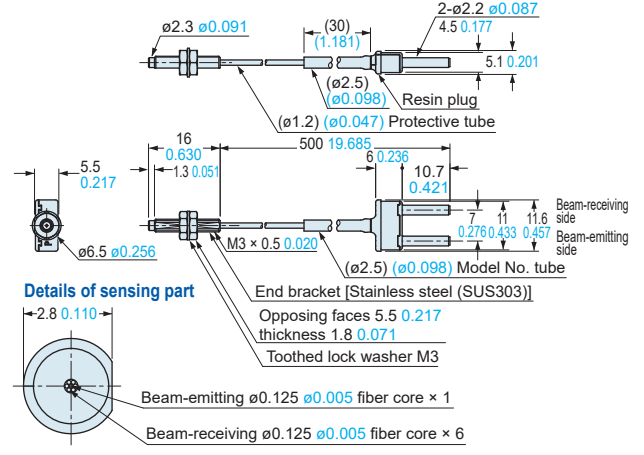


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-EG30S

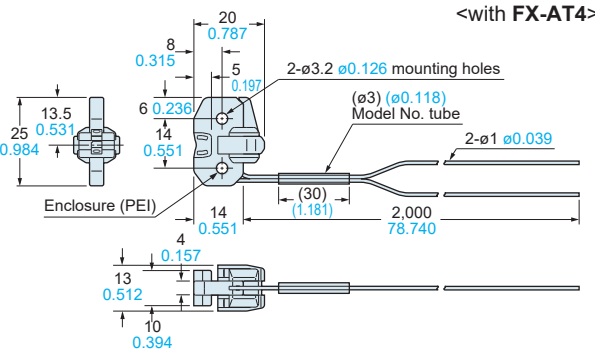


FD-EG31



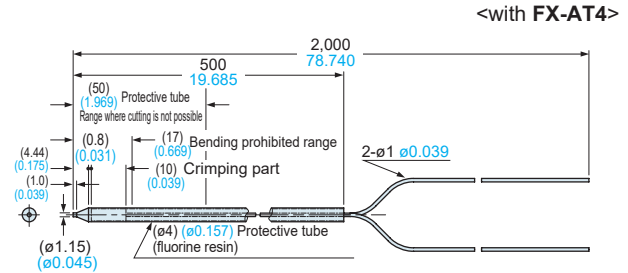
FD-F4 FD-F41

Free-cut



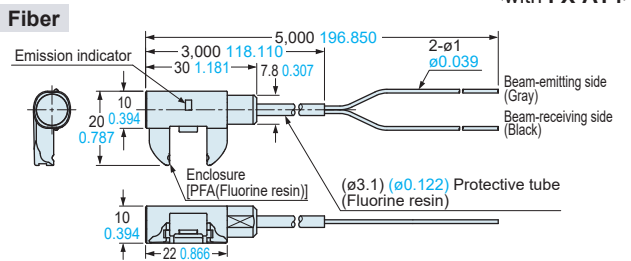
FD-F41Y

Free-cut



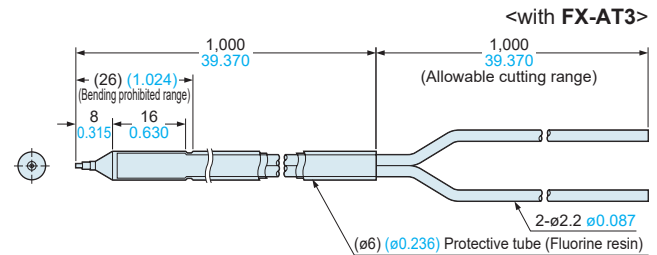
FD-F71

Free-cut



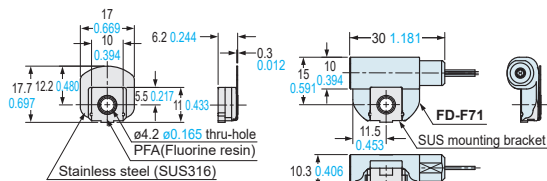
FD-F8Y

Free-cut



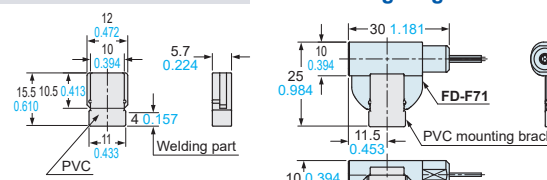
SUS mounting bracket (MS-FD-F7-1)

SUS mounting bracket mounting diagram



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

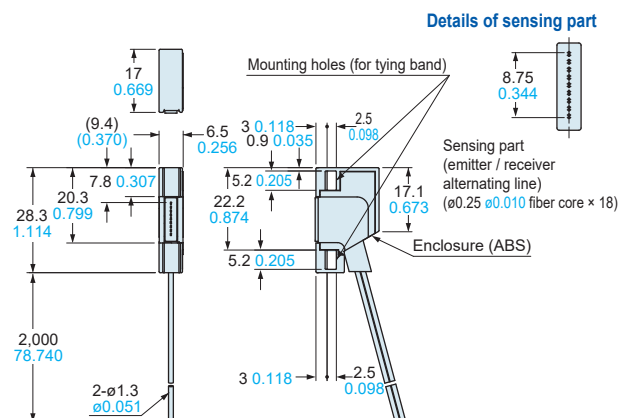
PVC mounting bracket mounting diagram



FD-FA93

Free-cut

<with fiber attachment>



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.

DIMENSIONS (Unit: mm in)

Reflective type fibers



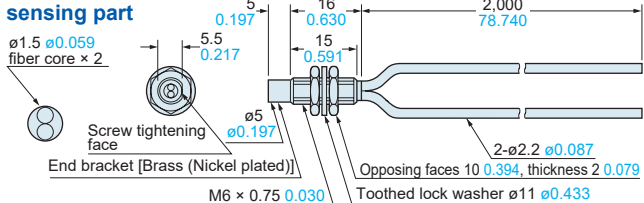
Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-H13-FM2

Free-cut

<with FX-AT3>

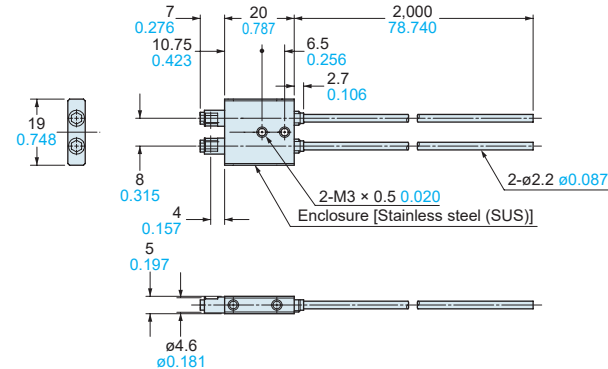
Details of sensing part



FD-H18-L31

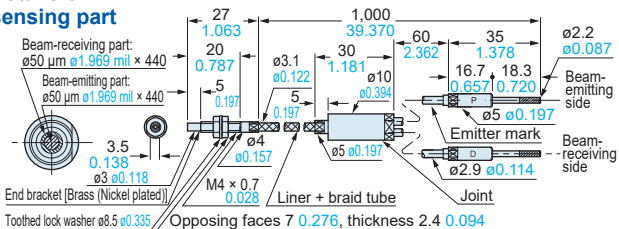
Free-cut

<with FX-AT3>



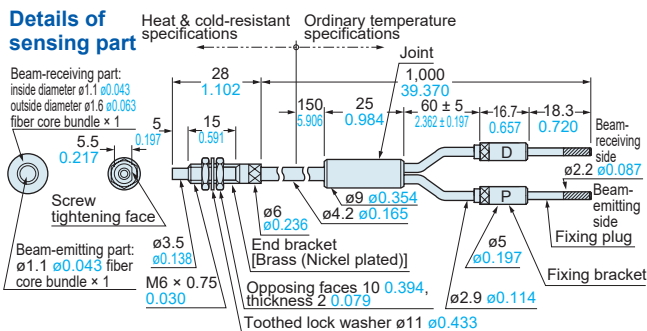
FD-H20-21

Details of sensing part



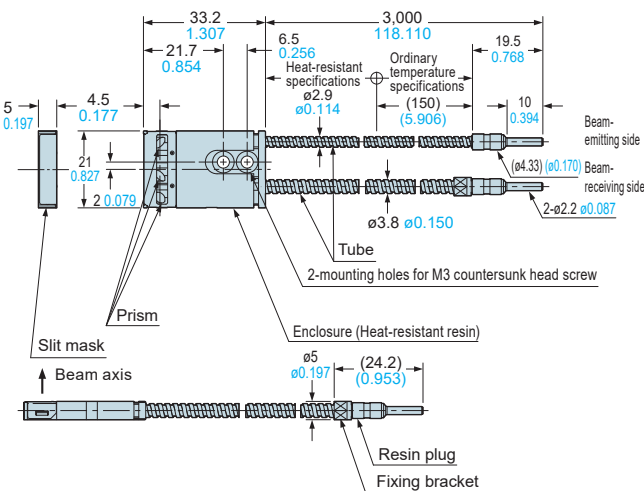
FD-H20-M1

Details of sensing part



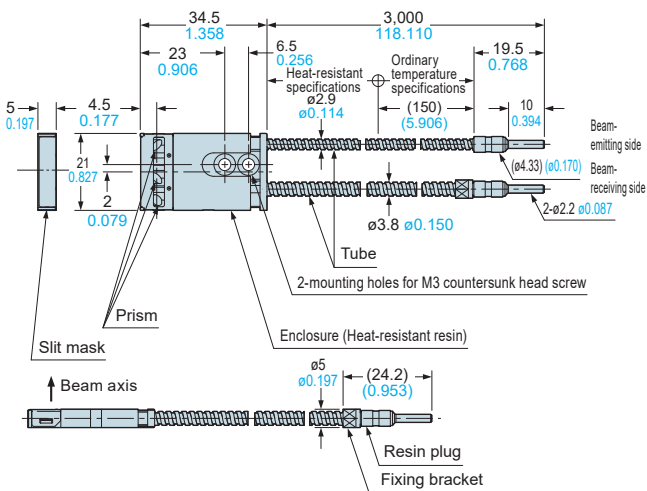
FD-H25-L43

<with FX-AT2>



FD-H25-L45

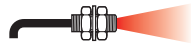
<with FX-AT2>



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.

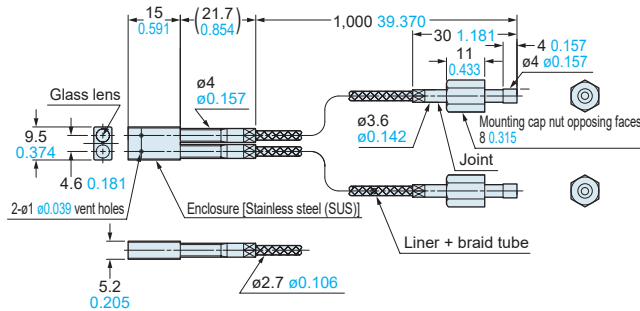
DIMENSIONS (Unit: mm in)

Reflective type fibers

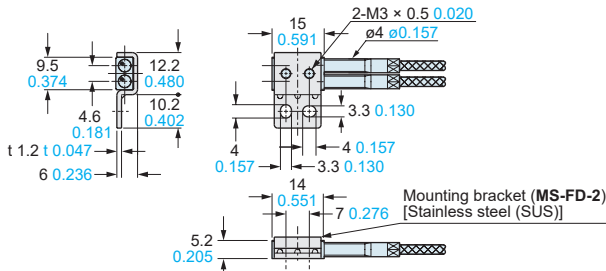


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

FD-H30-KZ1V-S

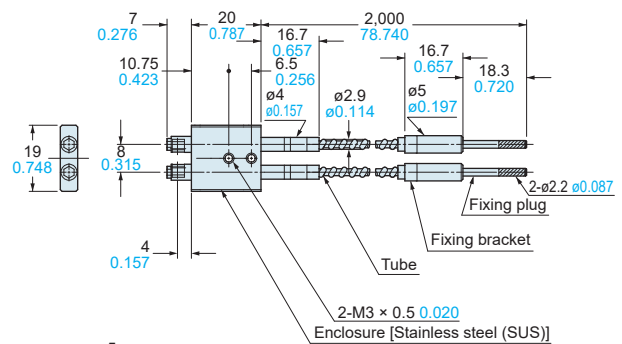


Assembly dimensions with MS-FD-2 (attached mounting bracket)

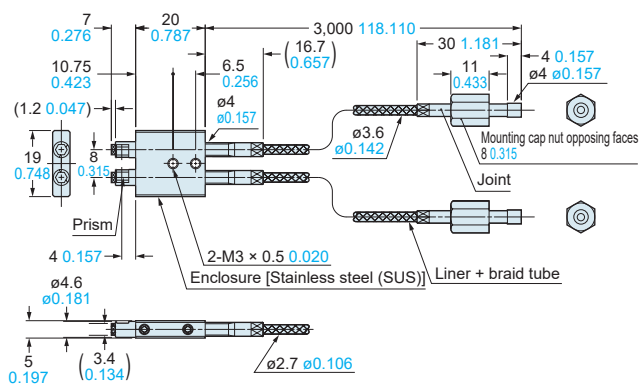


Note: The **FD-H30-KZ1V-S** is a set with the **FD-H30-KZ1V**, photo-terminal, and atmospheric side fiber. Refer to p.81 for dimensions of the atmospheric side fiber and photo-terminals.

FD-H30-L32

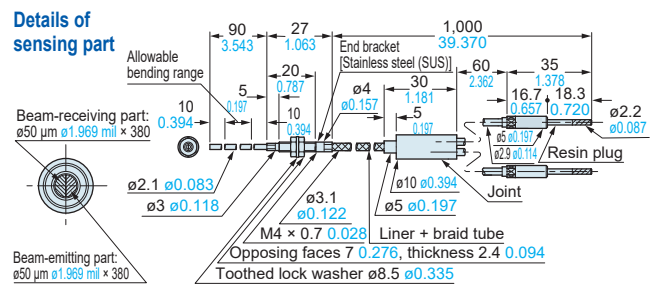


FD-H30-L32V-S

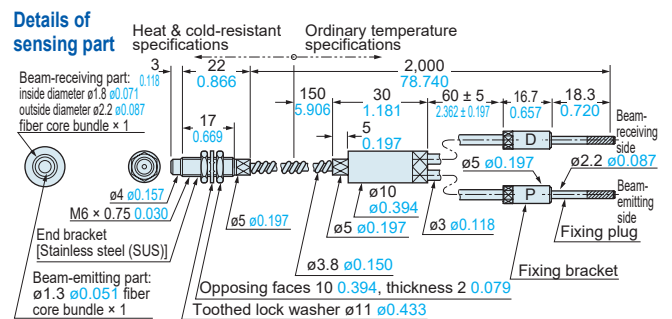


Note: The **FD-H30-L32V-S** is a set with the **FD-H30-L32V**, photo-terminal, and atmospheric side fiber. Refer to P.81 for dimensions of the atmospheric side fiber and photo-terminals.

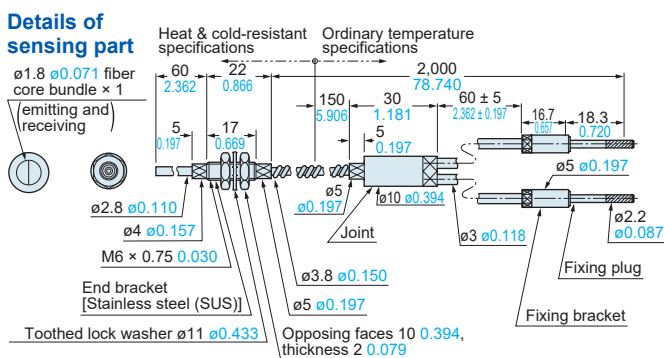
FD-H35-20S



FD-H35-M2



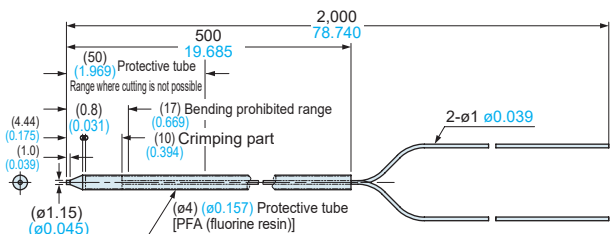
FD-H35-M2S6



FD-HF40Y

Free-cut

<with FX-AT4>



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.

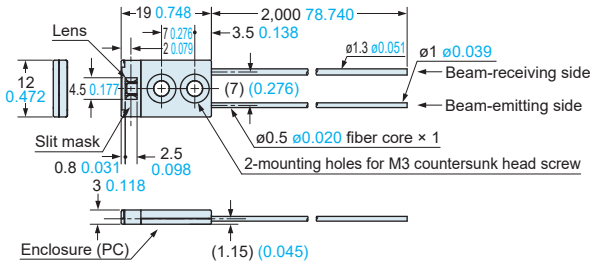
DIMENSIONS (Unit: mm in)

Reflective type fibers

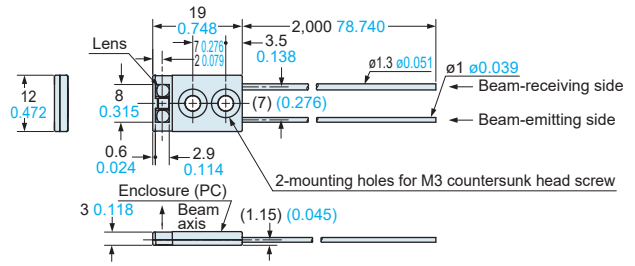


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

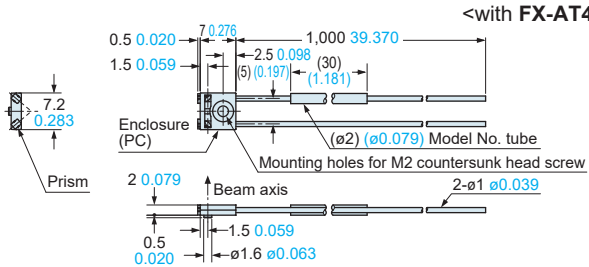
FD-L10 Free-cut <with FX-AT6>



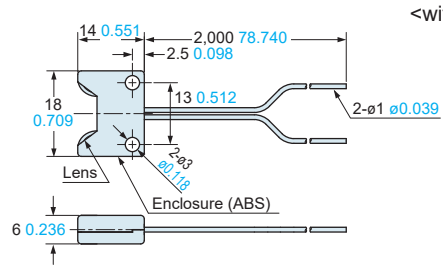
FD-L11 Free-cut <with FX-AT6>



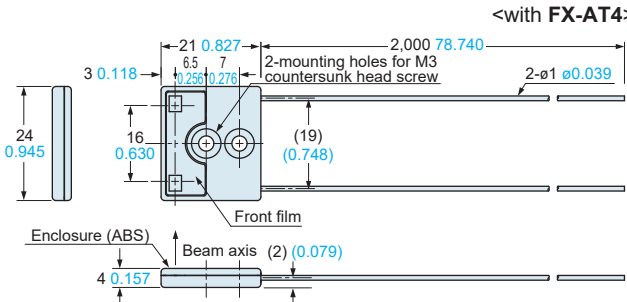
FD-L12W Free-cut <with FX-AT4>



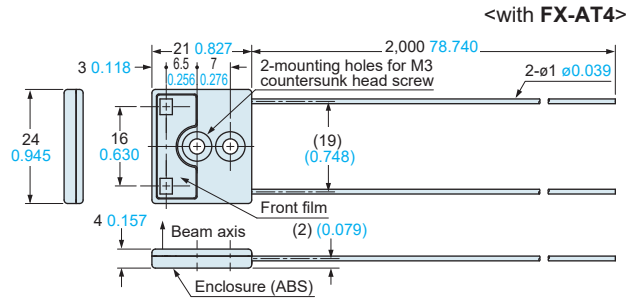
FD-L20H Free-cut <with FX-AT4>



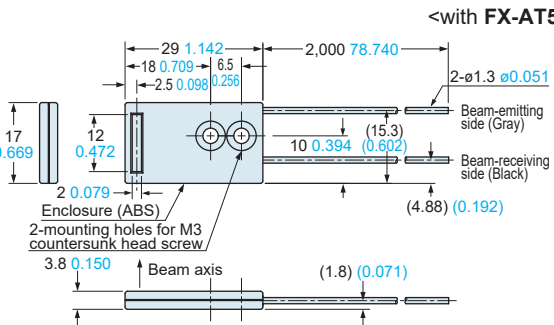
FD-L21 Free-cut <with FX-AT4>



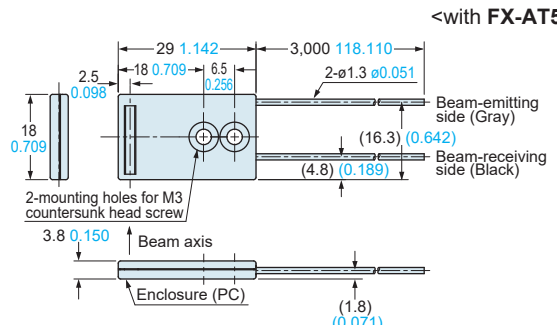
FD-L21W Free-cut <with FX-AT4>



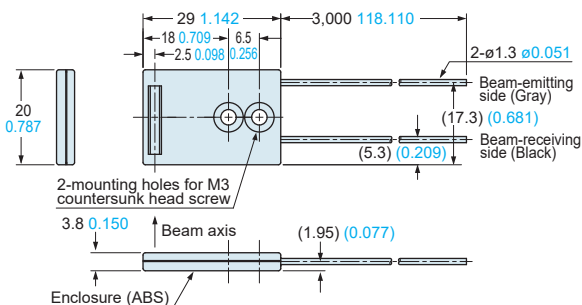
FD-L22A Free-cut <with FX-AT5>



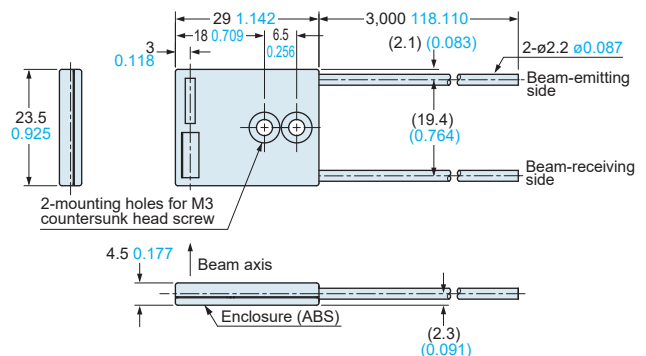
FD-L23 Free-cut <with FX-AT5>



FD-L30A Free-cut <with FX-AT5>



FD-L31A Free-cut <with FX-AT3>



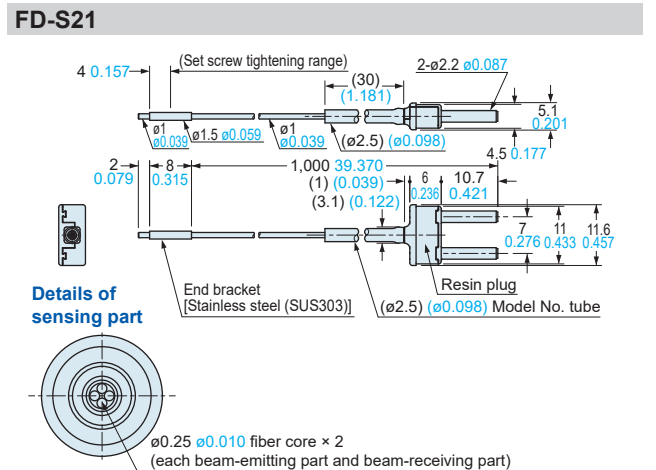
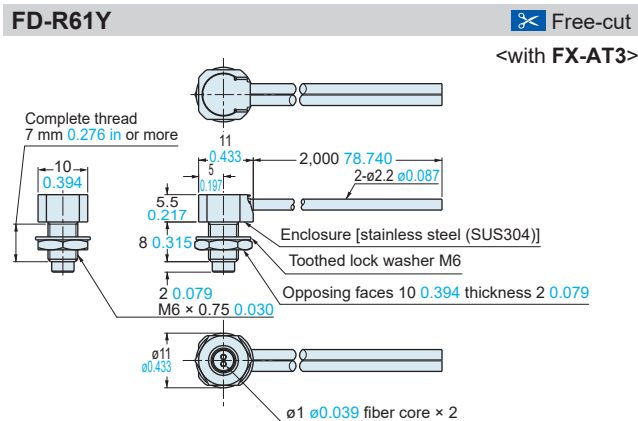
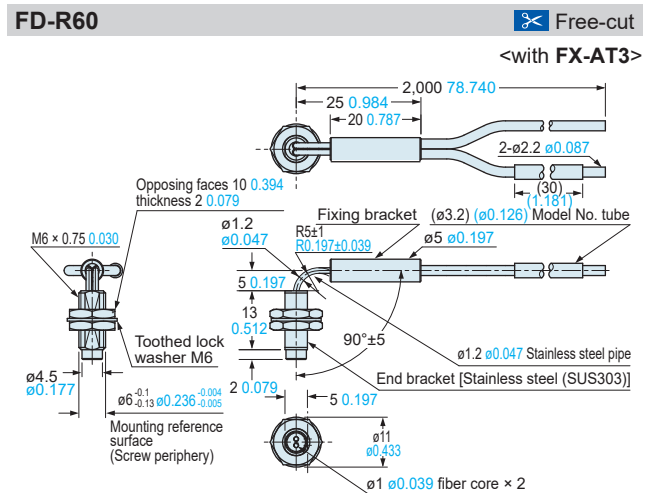
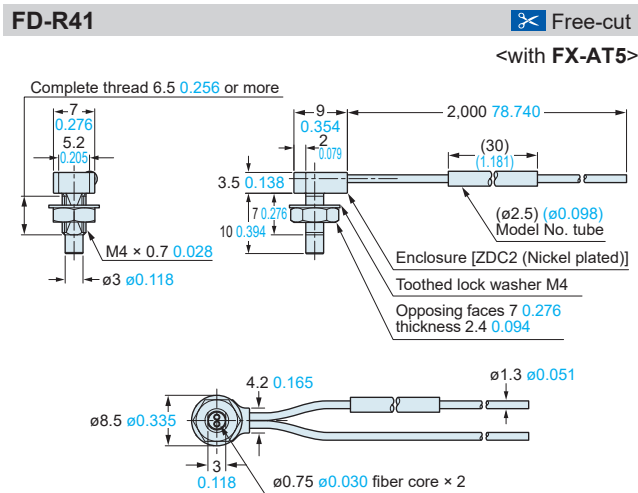
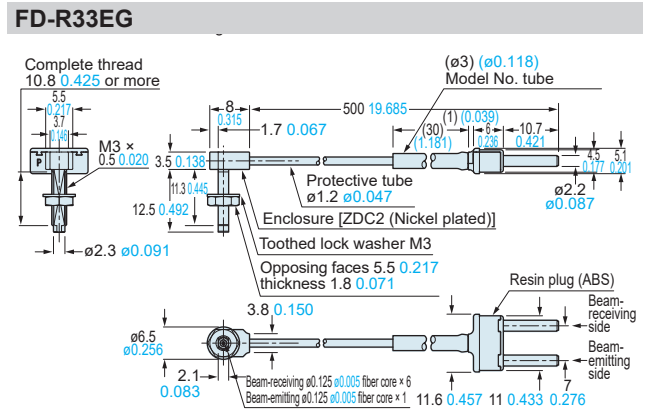
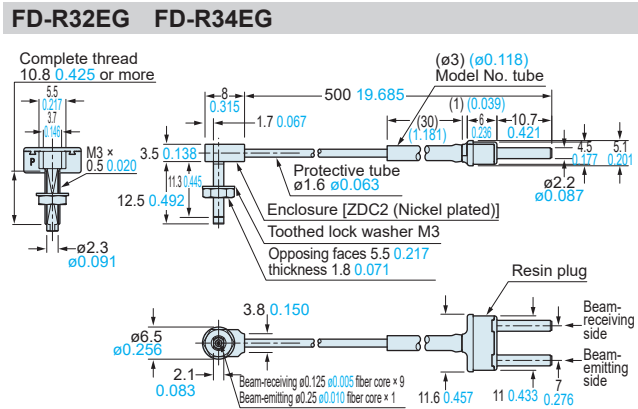
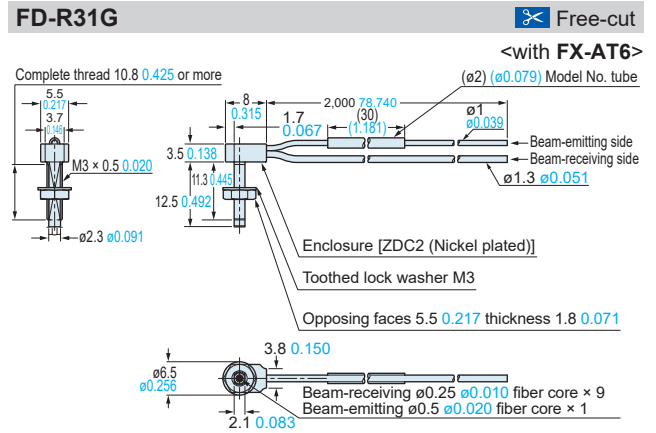
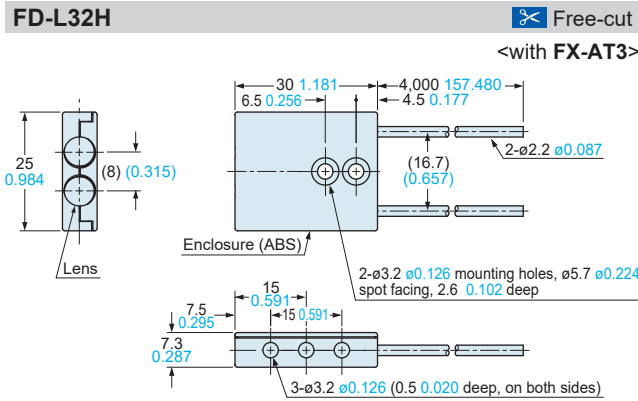
Refer to the **FX-500** series (p.109), **FX-550** series (p.118), **FX-100** series (p.131) for dimensions of the amplifiers.
The CAD data can be downloaded from our website.

DIMENSIONS (Unit: mm in)

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.



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.

DIMENSIONS (Unit: mm in)

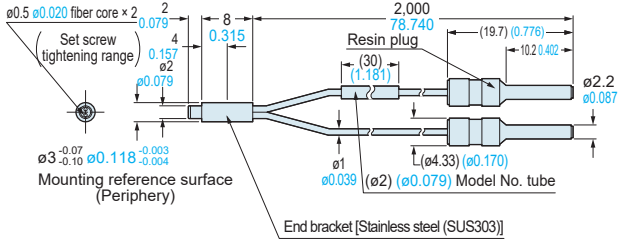
Reflective type fibers



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

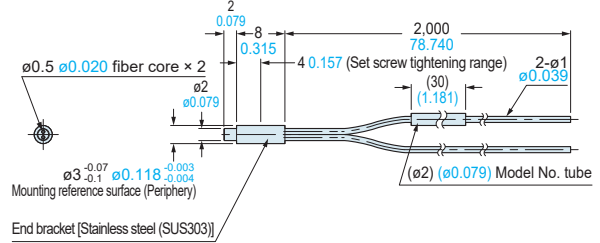
FD-S30

<with FX-AT2>



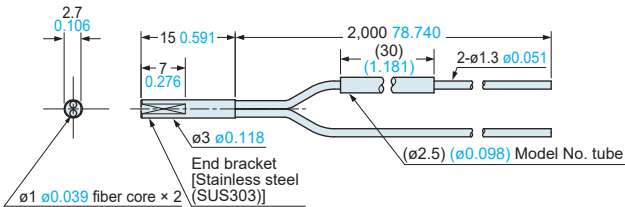
FD-S31

Free-cut <with FX-AT4>



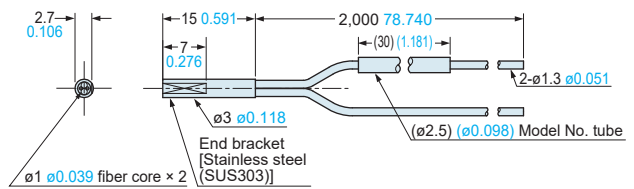
FD-S32

Free-cut <with FX-AT5>



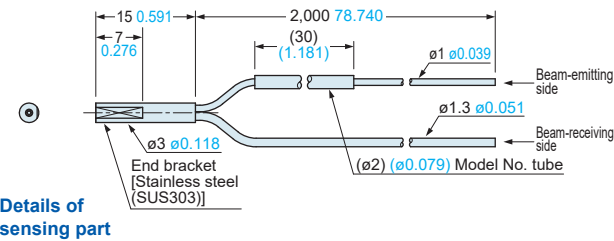
FD-S32W

Free-cut <with FX-AT5>

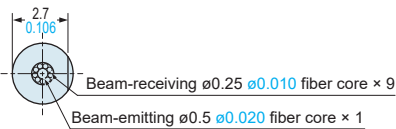


FD-S33GW

Free-cut <with FX-AT6>

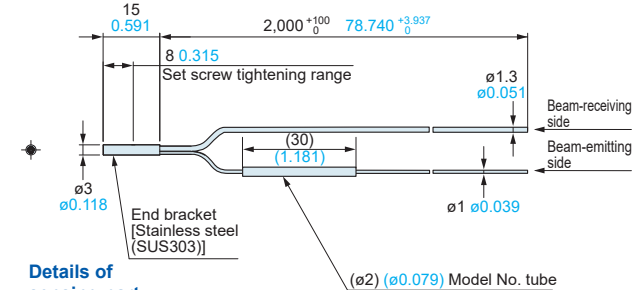


Details of sensing part

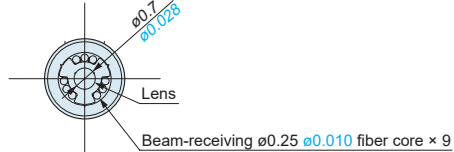


FD-S34G

Free-cut <with FX-AT6>

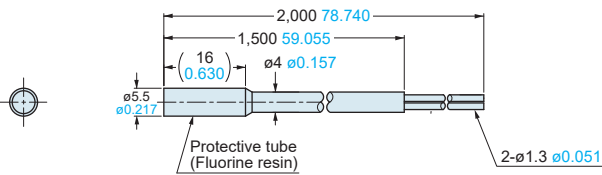


Details of sensing part



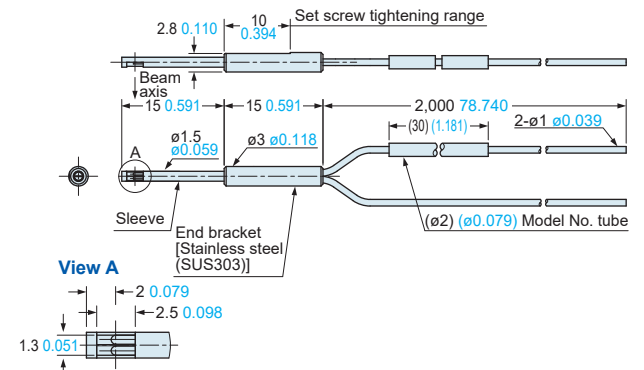
FD-S60Y

Free-cut <with FX-AT5>

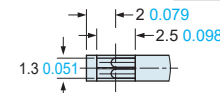


FD-V30

Free-cut <with FX-AT4>



View A



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.

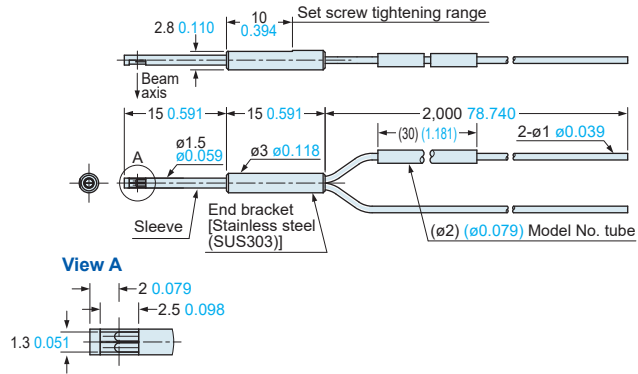
DIMENSIONS (Unit: mm in)

Reflective type fibers

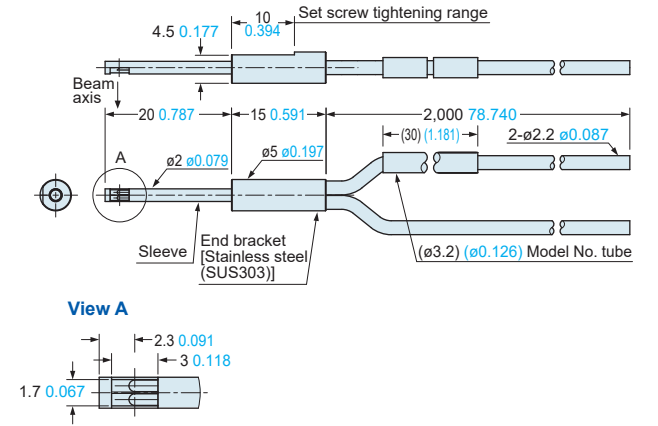


Dimensions are listed in the order of thru-beam type, retroreflective type, and reflective type, and in alphabetic order of the Model No.

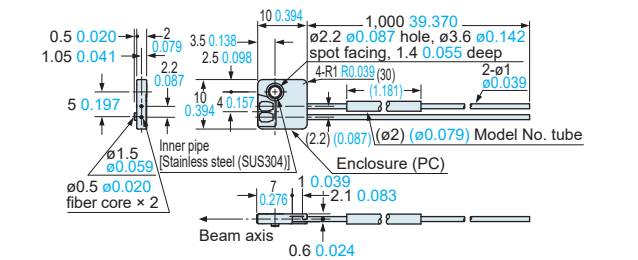
FD-V30W Free-cut
<with FX-AT4>



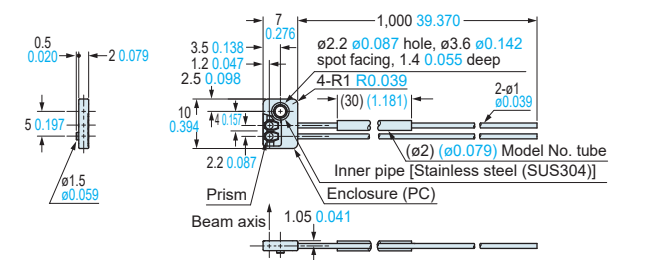
FD-V50 Free-cut
<with FX-AT3>



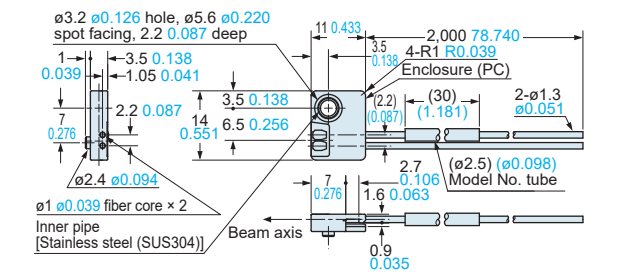
FD-Z20HBW Free-cut
<with FX-AT4>



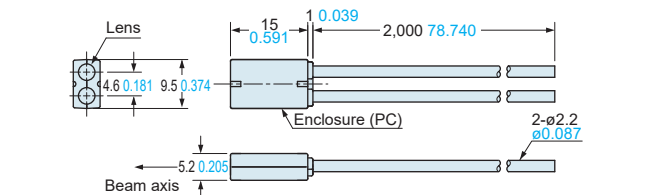
FD-Z20W Free-cut
<with FX-AT4>



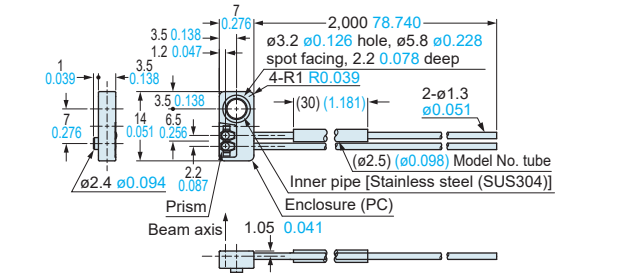
FD-Z40HBW Free-cut
<with FX-AT5>



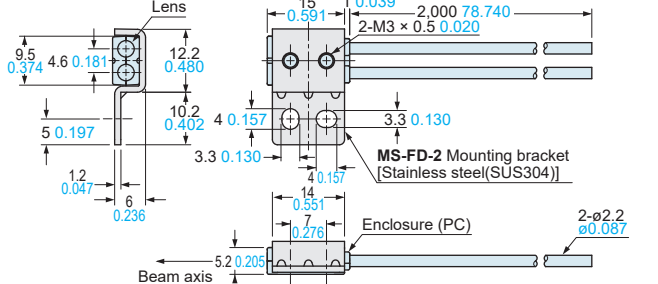
FD-Z50HW Free-cut
<with FX-AT3>



FD-Z40W Free-cut
<with FX-AT5>



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



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.

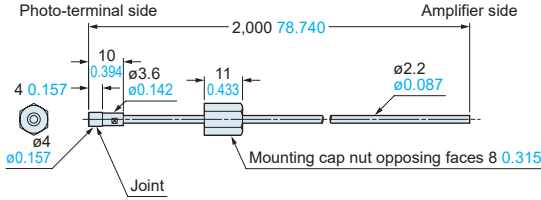
DIMENSIONS (Unit: mm in)

Vacuum-resistant atmospheric side fiber

FT-J8

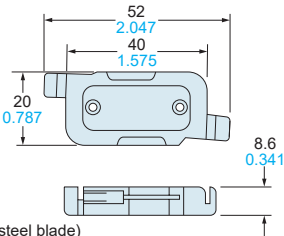
Free-cut

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



FB-1

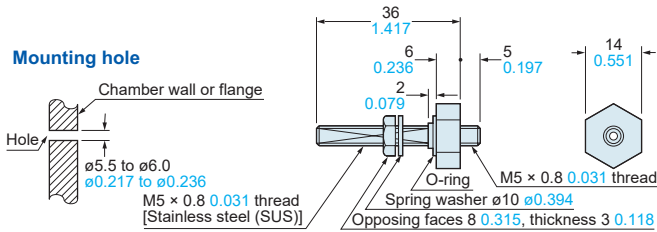
Fiber bender (Optional)



Material: PP (Containing steel blade)

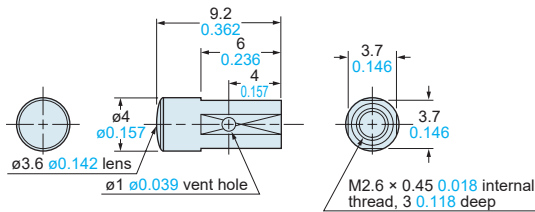
FV-BR1

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



FV-LE1

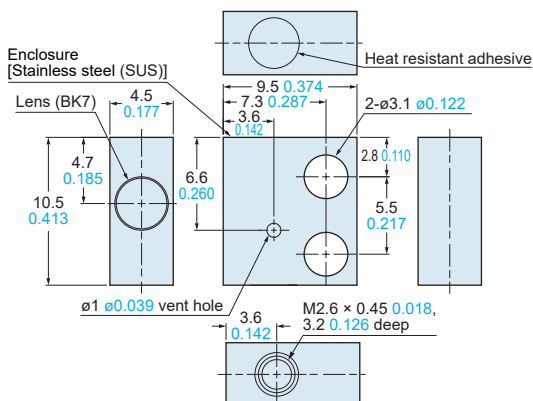
Vacuum-resistant expansion lens (Optional)



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

FV-SV2

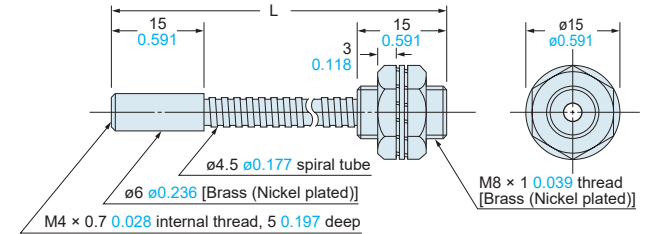
Vacuum-resistant side-view lens (Optional)



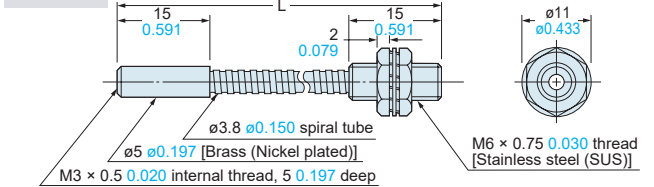
FTP-□ FDP-□

Protective tube (Optional)

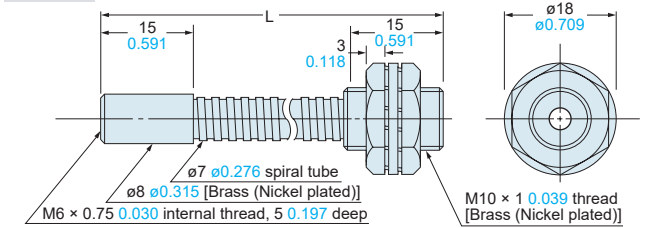
FTP-□ FDP-N□



FTP-N□



FDP-□



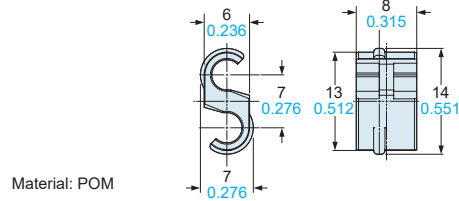
• Length L

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

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.

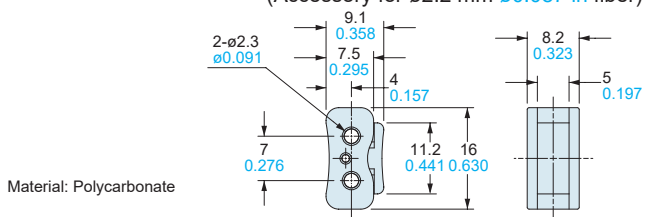
DIMENSIONS (Unit: mm in)

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



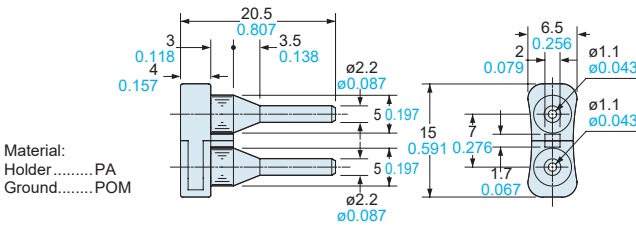
Material: POM

FX-AT3 Attachment for $\varnothing 2.2$ mm $\varnothing 0.087$ in fiber (Accessory for $\varnothing 2.2$ mm $\varnothing 0.087$ in fiber)



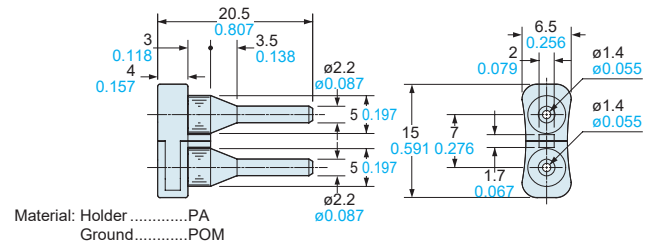
Material: Polycarbonate

FX-AT4 Attachment for $\varnothing 1$ mm $\varnothing 0.039$ in fiber (Accessory for $\varnothing 1$ mm $\varnothing 0.039$ in fiber)



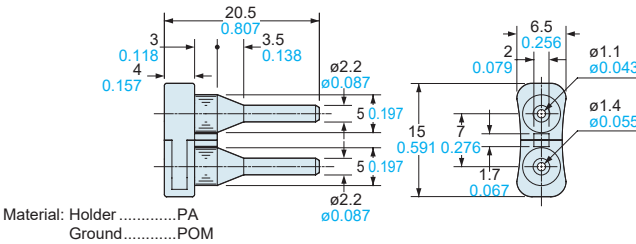
Material: Holder.....PA
Ground.....POM

FX-AT5 Attachment for $\varnothing 1.3$ mm $\varnothing 0.051$ in fiber (Accessory for $\varnothing 1.3$ mm $\varnothing 0.051$ in fiber)



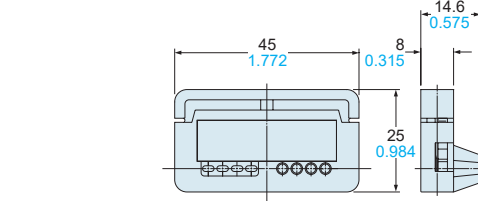
Material: Holder.....PA
Ground.....POM

FX-AT6 Attachment for $\varnothing 1$ mm $\varnothing 0.039$ in / $\varnothing 1.3$ mm $\varnothing 0.051$ in mixed fiber (Accessory for $\varnothing 1$ mm $\varnothing 0.039$ in / $\varnothing 1.3$ mm $\varnothing 0.051$ in mixed fiber)



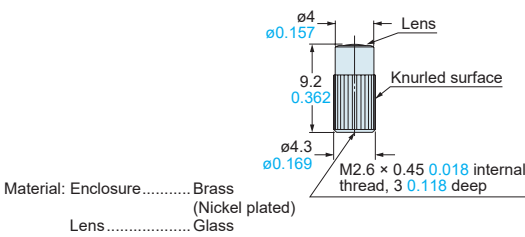
Material: Holder.....PA
Ground.....POM

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



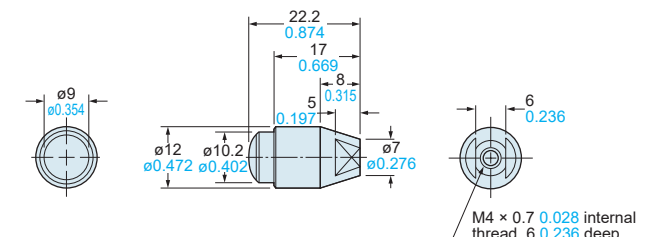
Material: ABS

FX-LE1 Expansion lens (Optional)



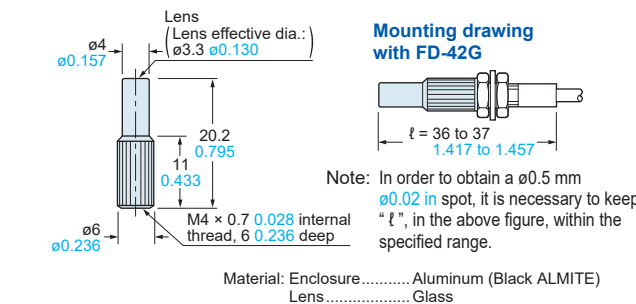
Material: Enclosure.....Brass (Nickel plated)
Lens.....Glass

FX-LE2 Super-expansion lens (Optional)



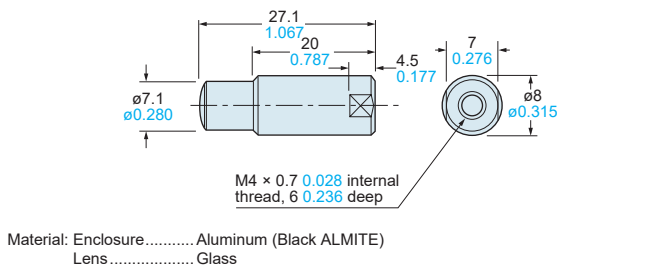
Material: Enclosure.....Stainless steel (SUS303)
Lens.....Glass

FX-MR1 Pinpoint spot lens (Optional)



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

FX-MR2 Zoom lens (Optional)



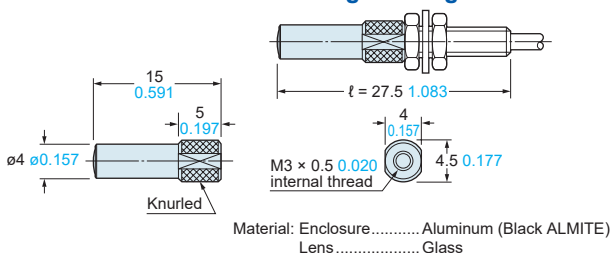
Material: Enclosure.....Aluminum (Black ALMITE)
Lens.....Glass

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.

DIMENSIONS (Unit: mm in)

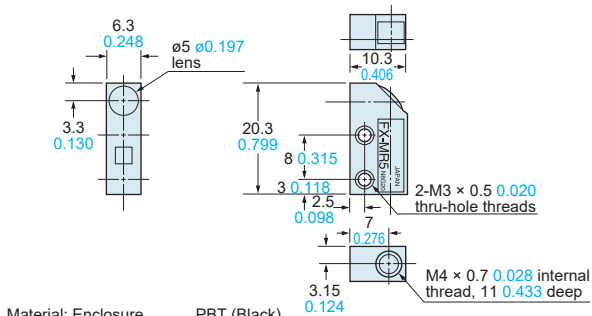
FX-MR3 Finest spot lens (Optional)

Mounting drawing with FD-EG30



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

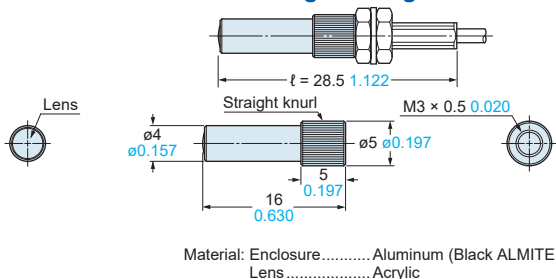
FX-MR5 Zoom lens (Optional)



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

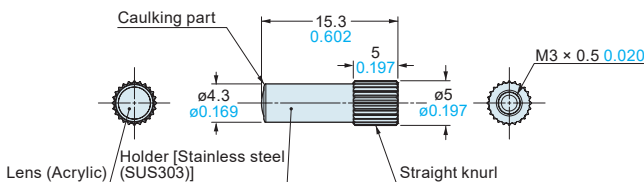
FX-MR6 Finest spot lens (Optional)

Mounting drawing with FD-EG31

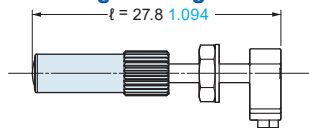


Note: When inserting the fiber, insert fully till it stops.

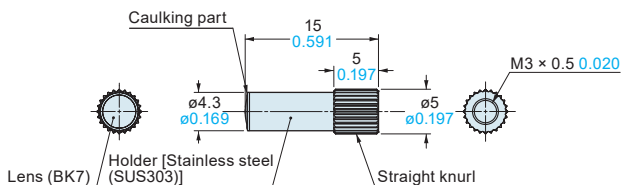
FX-MR7 Finest spot lens (Optional)



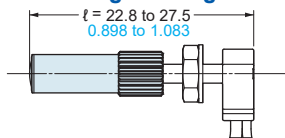
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



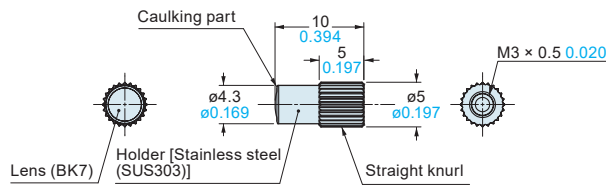
FX-MR8 Zoom lens (Optional)



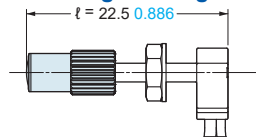
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



FX-MR9 Parallel light lens (Optional)



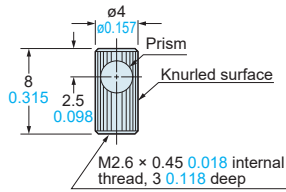
Mounting drawing with FD-R31G/R32EG/R33EG/R34EG



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.

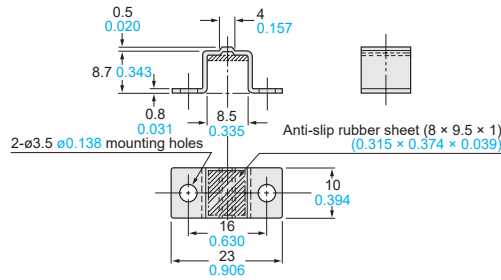
DIMENSIONS (Unit: mm in)

FX-SV1 Side-view lens (Optional)



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

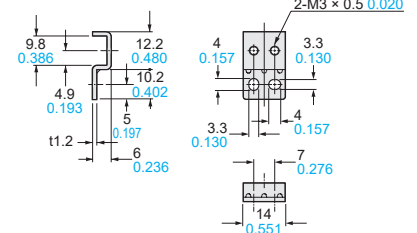
MS-EX3 Mounting bracket for FX-MR2 (Accessory for FX-MR2)



Material: Brass (Nickel plated)

MS-FD-2 Fiber mounting bracket

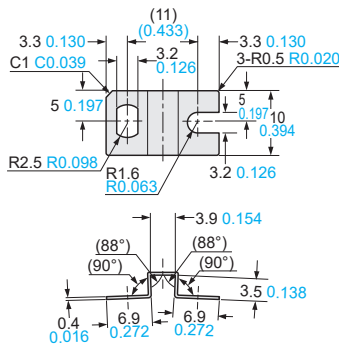
Accessory for FD-Z50HW, FR-KZ50E/KZ50H/Z50HW, FD-H30-KZ1V-S



Material: Stainless steel (SUS304)

MS-FD-3 Fiber mounting bracket

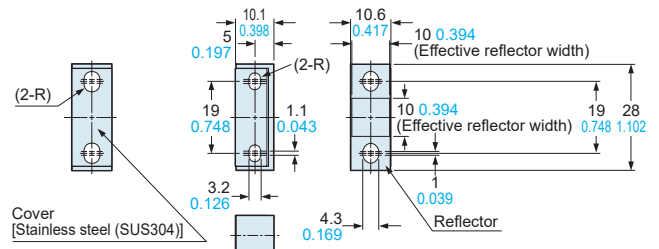
Accessory for FT-KV40/KV40W



Material: Stainless steel (SUS304)

RF-003 Reflector for FR-KZ50E/KZ50H

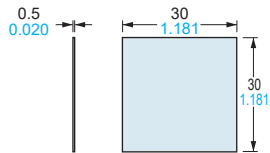
Accessory for FR-KZ50E/KZ50H



Cover [Stainless steel (SUS304)]

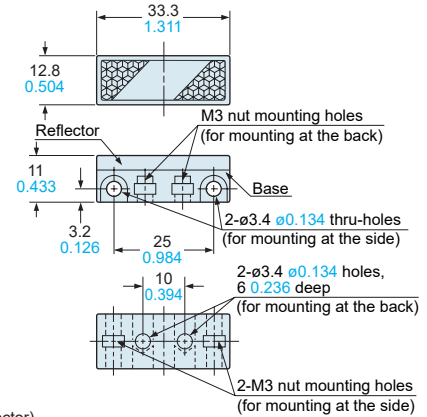
RF-13 Reflective tape for FR-Z50HW

Accessory for FR-Z50HW



Material : Acrylic (Reflective surface)

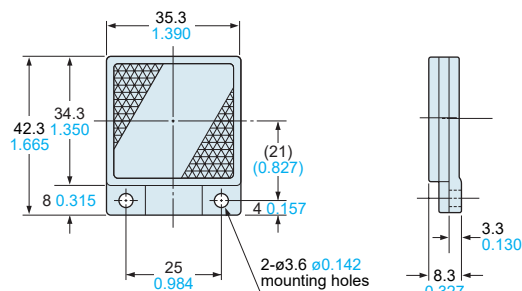
RF-210 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

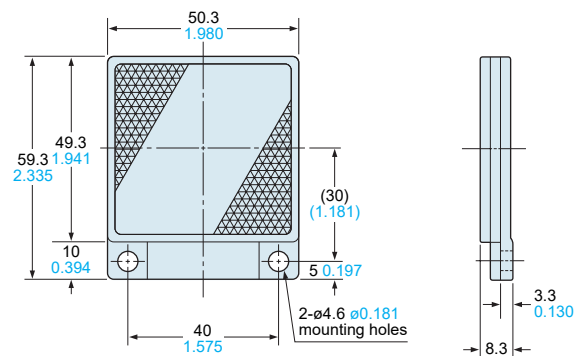
Two M3 (length 8 mm 0.315 in) screws with washers and two nuts are attached.

RF-220 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

RF-230 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

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