


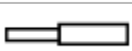
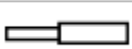




Diffuse-Reflective Fiber Optics

The FD series of diffuse-reflective fiber optics is a wide-ranging family of sensing heads that are suitable for use in all SUNX fiber amplifiers. Fiber types include standard, high flexibility, special use, and environmentally resistant. Each type is broken down further to include various configurations such as side-view, fixed-focus, ultra-small diameter, high precision, and wide beam.

Model Name	Model Pic	Type	Fiber Length (mm)	Bending Radius (mm)	Sensing Range (mm)
Sort ▲ ▼		Sort ▲ ▼	Sort ▲ ▼	Sort ▲ ▼	Sort ▲ ▼
FD-B8		M6 Threaded Type	2000	25	600
FD-FM2		Coaxial M6 Threaded Type	2000	25	410
FD-G4		Coaxial M4 Threaded Type Lens Mountable	2000	25	150
FD-S80		3mm Cylindrical Type	2000	25	370
FD-SNFM2		2.5mm Cylindrical Type	2000	25	140



FX-305 / FX-301 (Red LED type) sensing range (Note 1)

Retroreflective type



The FX-305 and FX-301(-HS) have different sensing modes.
 FX-305: H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)
 FX-301(-HS): S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 2, 3)	■ : U-LG ■ : FAST ■ : LONG ■ : H-SP ■ : STDF ■ : S-D	Min. sensing object (Note 4)	Fiber cable length : Free-cut	Bending radius	Model No.
Sharp bending	 W8.5 X H5.2 X D15 W0.374 X H0.205 X D0.591 W80 X H30 X D0.5 W1.181 X H1.181 X D0.020	 100 to 910 3.937 to 35.827 100 to 730 3.937 to 28.740 100 to 600 3.937 to 23.622 100 to 520 3.937 to 20.472	 100 to 460 3.937 to 18.110	φ0.3 mm φ0.012 in opaque object	 2 m 6.562 ft	 R1 mm R0.039 in	FR-WKZ11
		200 7.874 200 7.874 200 7.874 200 7.874	200 7.874 200 7.874 200 7.874	Horizontal: φ5.5 mm φ0.217 in opaque object Vertical: φ0.06 mm φ0.0024 in opaque object	 2 m 6.562 ft	 R10 mm R0.394 in	FR-KZ21 FR-KZ21E
Water mapping	 W7.5 X H2.2 X D11.2 W0.295 X H0.087 X D0.441 W4 X H2 X D21.5 W0.157 X H0.079 X D0.846	 15 to 370 0.591 to 14.567 15 to 330 0.591 to 12.992 15 to 240 0.591 to 9.449 15 to 210 0.591 to 8.268	 15 to 170 0.591 to 6.693 15 to 80 0.591 to 3.150 15 to 90 0.591 to 3.543	φ0.12 mm φ0.005 in opaque object	 2 m 6.562 ft	 R10 mm R0.394 in	FR-KV1

- Notes: 1) Please contact our office for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.
 2) Please take care that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 The sensing range of **FR-WKZ11** is specified for the **RF-13**. The sensing range of **FR-KZ21**, **FR-KZ21E** and **FR-KV1** is specified for the attached reflector.
 3) The sensing range of **FR-WKZ11** is the possible setting range for the reflector or reflective tape. The fiber can detect an object less than 100 mm 3.937 in away.
 However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.
 The sensing range of **FR-KZ21(E)** is the possible setting range for the reflector. However, if setting the fiber to detect objects passing within 0 to 20 mm 0 to 0.787 in from the fiber head, unstable detection may result.
 The sensing range of **FR-KV1** is the possible setting range for the reflector. The fiber can detect an object less than 15 mm 0.591 in away.
 4) The minimum sensing object size is the value for red LED type.
 The optimum condition is the condition when the sensitivity is set so that the sensing output just changes to light incident operation in the object absent condition.

FX-305 / FX-301 (Red LED type) sensing range (Note 1)

Reflective type



The FX-305 and FX-301(-HS) have different sensing modes.
 FX-305: H-SP, FAST, STD, STDF, LONG, U-LG (no S-D mode)
 FX-301(-HS): S-D, H-SP, FAST, STD, LONG (no STDF or U-LG mode)

Type	Shape of fiber head (mm in)	Sensing range (mm in)(Note 2, 3)	■ : U-LG ■ : FAST ■ : LONG ■ : H-SP ■ : STDF ■ : S-D	Min. sensing object (Note 4)	Fiber cable length : Free-cut	Bending radius	Model No.
Threaded type	 M6	 600 23.622 480 18.898 280 11.024 220 8.661	 160 6.299 85 3.346 75 2.953	φ0.02 mm φ0.0008 in gold wire	 2 m 6.562 ft	R25 mm R0.984 in	FD-B8
		 Coaxial M6	 410 16.142 310 12.205 200 7.874 140 5.512				 100 3.937 55 2.165 47 1.850
	 M6 Sleeve 90 mm 3.543 in φ2.5 φ0.098	 370 14.567 270 10.630	 85 3.346 45 1.772			R25 mm R0.984 in Sleeve R10 mm R0.394 in	FD-FM2S
		 M6 Sleeve 40 mm 1.575 in φ2.5 φ0.098	 170 6.693 110 4.331				 39 1.535
	 M6	 250 9.843 190 7.480 110 4.331 90 3.543	 60 2.362 25 0.984 32 1.260			 R1 mm R0.039 in	FD-W8
		 M6	 300 11.811 220 8.661 130 5.118 100 3.937				 70 2.756 30 1.181 35 1.378
	 M6 Tough flexible	 270 10.630 185 7.283 100 3.937 80 3.150	 60 2.362 30 1.181 35 1.378			 R10 mm R0.394 in	FD-P81X
		 Elbow M6	 240 9.449 185 7.283 110 4.331 85 3.346				 60 2.362 25 0.984 30 1.181

- Notes: 1) Refer to p.27 for the sensing ranges for the **FX-301-HS** in H-SP mode and for the **FX-301B/G/H**.
 2) The sensing range is specified for white non-glossy paper [400 × 400 mm 15.748 × 15.748 in] as the object.
 3) Please take care that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.
 4) The minimum sensing object size is the value for red LED type at maximum sensitivity.
 Note that the corresponding setting distance is different from the rated sensing distance.

LIST OF SENSING RANGE FOR FX-301(P)-HS · FX-301B/G/H

Sensing range for ultra high-speed type FX-301(P)-HS in H-SP mode (35 μs)(Typical model)

	Fiber model No.	Sensing range (mm in) (Note)		Fiber model No.	Sensing range (mm in) (Note)
Thru-beam type	FT-B8	160 6.299	Reflective type	FD-B8	60 2.362
	FT-FM2	120 4.724		FD-FM2	35 1.378
	FT-NFM2	40 1.575		FD-NFM2	14 0.551
	FT-E12	2 0.079		FD-E12	1 0.039
	FT-E22	10 0.394		FD-E22	5 0.197

Note: The sensing ranges are in H-SP mode. The sensing ranges in FAST, STD, S-D and LONG modes are the same as for the FX-301. (Refer to p.18~)

Sensing range for FX-301B/G/H (Typical model)

(mm in)

		Thru-beam type										
		FT-B8	FT-FM2	FT-NFM2	FT-V10	FT-W8	FT-Z8	FT-P80	FT-A30	FT-A8	FT-E12	FT-E22
FX-301B	LONG	220 8.661	150 5.906	50 1.969	400 15.748	90 3.543	120 4.724	130 5.118	2,400 94.488	600 23.622	3 0.118	14 0.551
	STD	110 4.331	75 2.953	25 0.984	200 7.874	45 1.772	60 2.362	65 2.559	1,200 47.244	300 11.811	2 0.079	7 0.276
	FAST	75 2.953	40 1.575	16 0.630	130 5.118	30 1.181	40 1.575	45 1.772	700 27.559	220 8.661	1 0.039	4 0.157
FX-301G	LONG	110 4.331	70 2.756	24 0.945	200 7.874	56 2.205	60 2.362	70 2.756	1,200 47.244	300 11.811	1 0.039	6 0.236
	STD	55 2.165	35 1.378	12 0.472	100 3.937	28 1.102	30 1.181	35 1.378	600 23.622	150 5.906	—	3 0.118
	FAST	40 1.575	24 0.945	8 0.315	65 2.559	20 0.787	22 0.866	25 0.984	350 13.780	110 4.331	—	2 0.079
FX-301H (Note)	LONG	100 3.937	50 1.969	16 0.630	150 5.906	42 1.654	46 1.811	56 2.205	800 31.496	220 8.661	4 0.157	10 0.394
	STD	50 1.969	25 0.984	8 0.315	75 2.953	21 0.827	23 0.906	28 1.102	400 15.748	110 4.331	2 0.079	5 0.197
	FAST	30 1.181	18 0.709	5 0.197	40 1.575	15 0.591	16 0.630	20 0.787	240 9.449	80 3.150	1.5 0.059	3 0.118

Note: Infrared types are easily affected by humidity, so if using them in environments with high humidity or where the humidity fluctuates, please contact our office.

(mm in)

		Reflective type										
		FD-B8	FD-FM2	FD-NFM2	FD-W8	FD-P80	FD-AFM2	FD-G4	FD-EG1	FD-E12	FD-E22	FD-G6X
FX-301B	LONG	80 3.150	46 1.811	16 0.630	23 0.906	40 1.575	40 1.575	22 0.866	6 0.236	2 0.079	6 0.236	22 0.866
	STD	40 1.575	23 0.906	8 0.315	11 0.433	20 0.787	20 0.787	11 0.433	3 0.118	1 0.039	3 0.118	11 0.433
	FAST	26 1.024	15 0.591	5 0.197	8 0.315	13 0.512	13 0.512	8 0.315	2 0.079	—	2 0.079	6 0.236
FX-301G	LONG	42 1.654	24 0.945	8 0.315	14 0.551	20 0.787	18 0.709	12 0.472	3 0.118	1 0.039	3 0.118	12 0.472
	STD	21 0.827	12 0.472	4 0.157	7 0.276	10 0.394	9 0.354	6 0.236	1.5 0.059	—	1.5 0.059	6 0.236
	FAST	14 0.551	8 0.315	2 0.079	4 0.157	7 0.276	5 0.197	4 0.157	1 0.039	—	1 0.039	4 0.157
FX-301H (Note)	LONG	26 1.024	20 0.787	6 0.236	11 0.433	18 0.709	12 0.472	7 0.276	10 0.394	1 0.039	6 0.236	18 0.709
	STD	13 0.512	10 0.394	3 0.118	5.5 0.217	9 0.354	6 0.236	3.5 0.138	5 0.197	—	3 0.118	9 0.354
	FAST	9 0.354	7 0.276	2 0.079	3 0.118	6 0.236	4 0.157	2 0.079	3 0.118	—	2 0.079	5 0.197

Note: Infrared types are easily affected by humidity, so if using them in environments with high humidity or where the humidity fluctuates, please contact our office.

Sensing range when using in combination with FR-WKZ11 reflector (optional)

The sensing ranges are the values for FX-305 / FX-301 infrared types.

(mm in)

RF-230	100 to 3,200 3.937 to 125.984 (LONG), 100 to 2,000 3.937 to 78.740 (STD), 100 to 1,600 3.937 to 62.992 (FAST), 100 to 1,000 3.937 to 39.370 (S-D)
RF-220	100 to 2,400 3.937 to 94.488 (LONG), 100 to 1,300 3.937 to 51.181 (STD), 100 to 1,000 3.937 to 39.370 (FAST), 100 to 600 3.937 to 23.622 (S-D)
RF-210	100 to 1,100 3.937 to 43.307 (LONG), 100 to 700 3.937 to 27.559 (STD), 100 to 550 3.937 to 21.654 (FAST), 100 to 300 3.937 to 11.811 (S-D)

Note: The sensing range indicates the allowable setting range for the reflector. The fiber head can detect objects at distances of 100 mm 3.937 in or less.

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 before use.

FIBER OPTIONS

Others

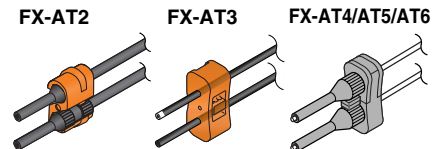
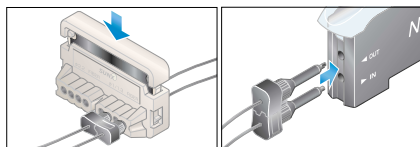
Designation	Model No.	Description	
Protective tube (For thru-beam type fiber)	FTP-500 (0.5 m 1.640 ft)	For M4 thread	Applicable fibers The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FTP-1000 (1 m 3.281 ft)		
	FTP-1500 (1.5 m 4.921 ft)		
	FTP-N500 (0.5 m 1.640 ft)	For M3 thread	
	FTP-N1000 (1 m 3.281 ft)		
	FTP-N1500 (1.5 m 4.921 ft)		
Protective tube (For reflective type fiber)	FDP-500 (0.5 m 1.640 ft)	For M6 thread	Applicable fibers The protective tube, made of non-corrosive stainless steel, protects the inner fiber cable from any external forces.
	FDP-1000 (1 m 3.281 ft)		
	FDP-1500 (1.5 m 4.921 ft)		
	FDP-N500 (0.5 m 1.640 ft)	For M4 thread	
	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)	
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	
Fiber cutter	FX-CT2	The free-cut type fiber can be easily cut.	
	FX-CT1	Accessory. FX-CT1 is attached with the FT-P80 or the FD-P80. The FX-CT2 is provided with fibers other than this.	
Attachment for fixed-length fiber	FX-AT2	This is the attachment for the fixed length fiber. (Accessory)	
Attachment for $\phi 2.2$ mm $\phi 0.087$ in fiber	FX-AT3	This is the attachment for the $\phi 2.2$ mm $\phi 0.087$ in fiber. (Accessory. Does not attach with the FT-P80 or the FD-P80.)	
Attachment for $\phi 1$ mm $\phi 0.039$ in fiber	FX-AT4	This is the attachment for the $\phi 1$ mm $\phi 0.039$ in fiber. (Accessory)	
Attachment for $\phi 1.3$ mm $\phi 0.051$ in fiber	FX-AT5	This is the attachment for the $\phi 1.3$ mm $\phi 0.051$ in fiber. (Accessory)	
Attachment for $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ in mixed fiber	FX-AT6	This is the attachment for the $\phi 1$ mm $\phi 0.039$ in / $\phi 1.3$ mm $\phi 0.051$ in mixed fiber. (Accessory)	

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

Fiber attachment

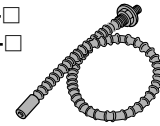
It's possible to simultaneously cut two fibers to the same length

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



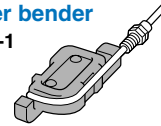
Protective tube

- FTP-□
- FDP-□



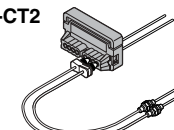
Fiber bender

- FB-1



Fiber cutter

- FX-CT2



- FX-CT1

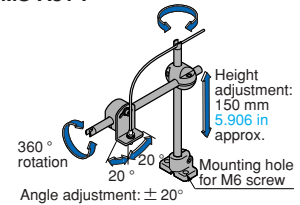


Universal sensor mounting stand

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

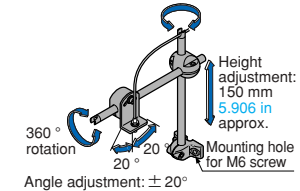
- MS-AJ1-F

360° rotation

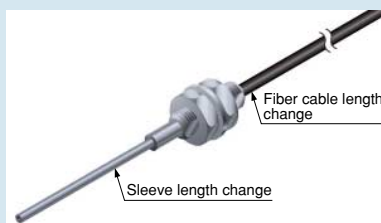


- MS-AJ2-F

360° rotation



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.

Custom-ordered product (Typical)

- Fiber length can be set up to 30 m 98.425 ft in units of 1 m 3.281 ft FT-B8, FT-AFM2 etc.
- Sleeve length can be set up to 12 cm 4.724 in units of 1 cm 0.394 in FT-FM2S4, FD-NFM2S4 etc.

Please contact us.