

Fibers with integrated high-precision plug

IO-Link
SensorsPhotoelectric
SensorsFiber-optic
Sensors

Standard Fibers

Fiber Sensors
Communication
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &
Flow SensorsInductive
Proximity
SensorsMeasurement
SensorsIonizers/
Electrostatic
Sensors

Accessories

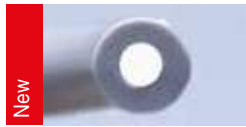
■ Stable light intensity

Optical **fibers** with insertion plug-in achieve a very high quality standard. Through the integrated high-precision plug, the fiber core can be centered to within $\pm 40\mu\text{m}$. Variation in light intensity could thus be reduced to $\pm 10\%$.



■ New fiber core

Now the core consists of only one fiber instead of several single fibers. This design improves sensing stability dramatically because there is no variation in light intensity among individual fibers.



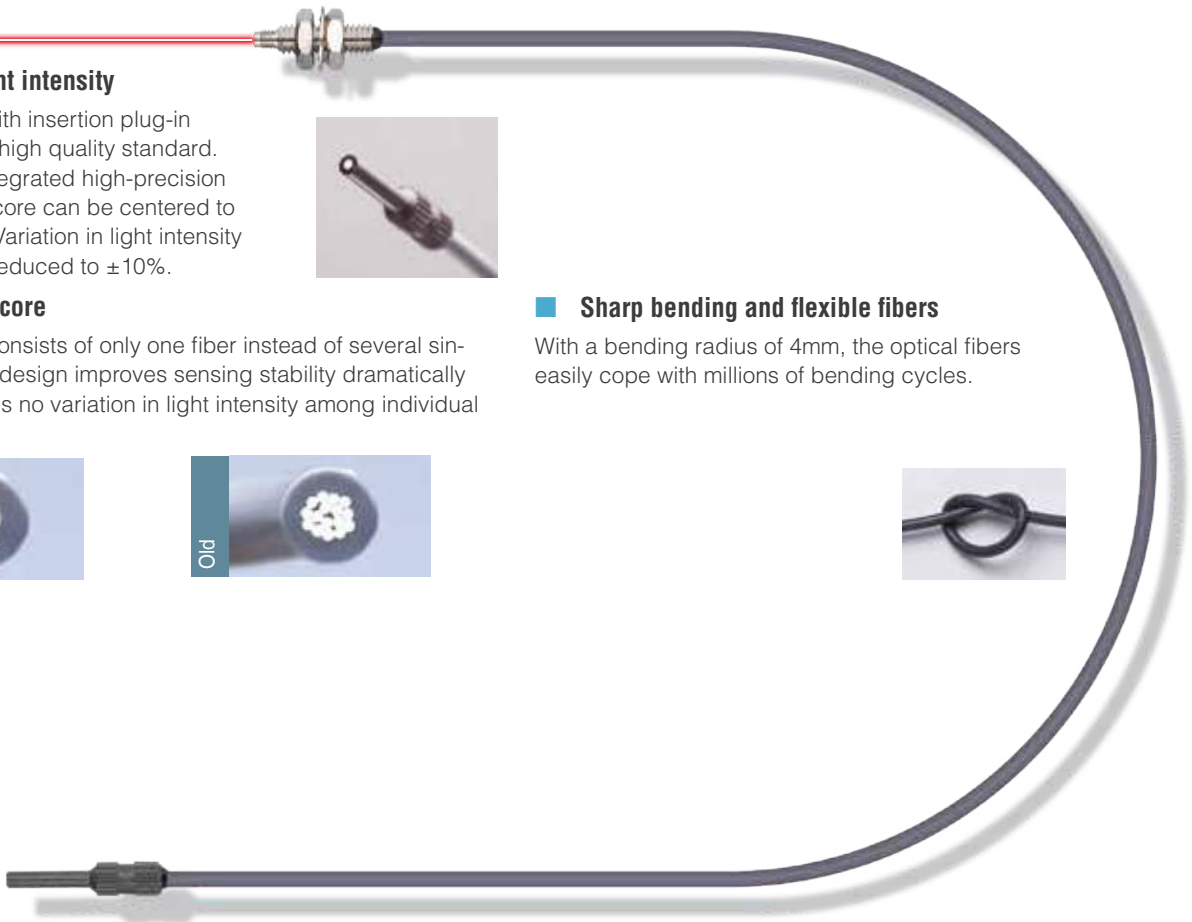
New



Old

■ Sharp bending and flexible fibers

With a bending radius of 4mm, the optical fibers easily cope with millions of bending cycles.

Fibers with
integrated high-
precision plug

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm)			Beam axis dia. (mm)	Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102			
Threaded	M3 	Tough FT-30	R2	2m	STD 400 HYPR 1350	810 650 210 75	135 400	∅0.5	IP67 (IEC)	-55 to +80°C
	M4 	Tough FT-40	R4		STD 1200 HYPR (note) 3600	2200 1700 210 190	320 870	∅1		
Cylindrical	∅1.5 	Tough FT-S20	R2		STD 400 HYPR 1350	810 650 210 75	135 400	∅0.5		
	∅3 	Tough FT-S30	R4		STD 1200 HYPR (note) 3600	2200 1700 30 190	320 870	∅1		

Note: The length of the fiber cable affects the sensing range.

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Threaded	M3 	Tough FD-30	R2	2m	STD 160 HYPR 600	330 250 80	45 155	IP67 (IEC)	-55 to +80°C
	M4 	Tough FD-40			STD 520 HYPR 1550	900 740 260 90	140 420		
	M6 	Tough FD-60	R4		STD 160 HYPR 600	330 250 80 25	45 155		
Cylindrical	∅3 	Tough FD-S30							

Note: The sensing range is specified for white, matt paper.

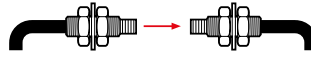
Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

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- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

Fibers with integrated high-precision plug

Threaded fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Protection	Ambient temperature	
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102				
Threaded	M3	Tough FT-31	R2	2m	STD 770 HYPR 550 1350	770 550 210 70	130 340	ø0.5	IP67 (IEC)	-55 to +80°C	
	M4	FT-43	R4		STD 1400 HYPR 770 (note 2) 3600	2800 2100 770 240	350 970				ø1.5
	Elbow	Tough FT-R40	R4		STD 930 HYPR (note 2) 3600	1750 1500 500 160	270 740				
	M4 Square head	FT-R43	R4		STD 720 HYPR 3000	1600 1100 430 130	210 640				ø10
	M14 Long sensing range	Tough FT-140	R4		10m	STD (note 2) 19600 HYPR (note 2) 19600	19600 (note 2) 19600 (note 2) 16000 6300	14000 19600 (note 2)	ø10	IP67 (IEC)	

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 2.) The length of the fiber cable affects the sensing range

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

Reflective type



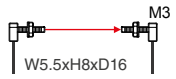

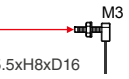




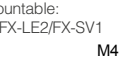
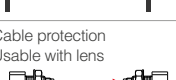
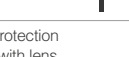

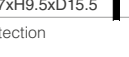
Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Threaded	M3	Tough FD-31	R2	2m	STD 290 HYPR 125 515	290 220 80 25	35 140	IP67 (IEC)	-55 to +80°C
	M3	Tough FD-32G	R2		STD 380 HYPR 200 650	380 270 95 27	70 190		
	Ultra-small diameter	FD-EG30	R4	500mm	STD 130 HYPR 48 170	130 110 30 9	20 70	IP67 (IEC)	-40 to +70°C
Threaded	M4	Tough FD-41	R2	2m	STD 290 HYPR 125 515	290 220 80 25	35 140		
	M4	Tough FD-42G	R2		STD 380 HYPR 200 650	380 270 95 27	70 190	IP40 (IEC)	
	M6	Tough FD-61	R4	2m	STD 840 HYPR 450 1400	840 670 200 70	120 410		IP67 (IEC)
M6	Tough FD-61G	R4	STD 800 HYPR 420 1100		800 650 200 60	120 350	IP40 (IEC)		
Elbow	Tough FD-R60	R4	2m	STD 600 HYPR 290 1100	600 550 190 65	110 240		IP67 (IEC)	-55 to +80°C

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 2.) The sensing range is specified for white, matt paper

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

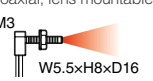

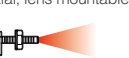

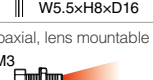
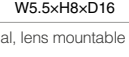
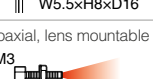
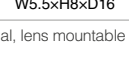



Square head fibers

Thru-beam type (one pair set)

Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis ϕ (mm)	Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102			
Square head	 W5.5xH8xD16	Tough FT-R31	R2	 2m	STD  270 HYPR 1000	580 440 160 55	100 340	ϕ 0.5	IP67 (IEC)	-55 to +80°C
		FT-R41W	R1		STD  800 HYPR 3200	1800 1400 460 150	250 710			
	With lens  W7xH9xD14.4	Tough FT-R42W			R4	STD  2200 HYPR 3600 (note 2)	3600 (note 2) 3500 1300 460	510 2000	ϕ 2.2	IP67 (IEC)
	Lens mountable: FX-LE1/FX-LE2/FX-SV1  W7xH9xD13.5	Tough FT-R43	STD  720 HYPR 3000			1600 1100 430 130	210 640	ϕ 1		
	Cable protection Usable with lens  W7xH9.5xD15.5	Tough FT-R44Y	STD  720 HYPR 3000		1600 1100 430 130	210 640	ϕ 1		IP67 (IEC) (note 3)	-55 to +80°C
	Full protection  W10xH11xD21.2	Tough FT-R60Y	STD  2100 HYPR 3600 (note 2)		3600 (note 2) 3600 (note 2) 1260 400	690 1890		ϕ 3.5		

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced by 20% depending upon how the fiber is cut
 - 2.) The length of the fiber cable affects the sensing range
 - 3.) The fiber cable is oil-resistant

Reflective type

Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Beam axis ϕ (mm)	Degree of protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102			
Square head	 W5.5xH8xD16	Tough FD-R31G	R2	 2m	STD  170 HYPR 530	310 260 85 27	45 150	Emitter ϕ 0.5	IP40	-55 to +80°C
		FD-R32EG	R4		STD  45 HYPR 170	110 92 30 9	20 68			
	Coaxial, lens mountable  W5.5xH8xD16	FT-R34EG			STD  138 HYPR 130	90 70 23 7	17 60	Emitter ϕ 0.175	-20 to +60°C	
	Coaxial, lens mountable  W5.5xH8xD16	FD-R33EG			STD  119 HYPR 84	44 33 11 3	7 22	Emitter ϕ 0.125		
	M4  W7xH9xD13.5	Tough FD-R41	R2		 2m	STD  210 HYPR 710	430 320 100 34	60 170	ϕ 0.75	IP67
Cable protection  W10xH11xD15.5	Tough FD-R61Y	R4	TD  280 HYPR 990	610 435 160 50		85 185	-	IP67 (note 3)		

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced by 20% depending upon how the fiber is cut
 - 2.) The length of the fiber cable affects the sensing range
 - 3.) The fiber cable is oil-resistant

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

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- Square head fibers

Cylindrical fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Protection	Ambient temperature	
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102				
Cylinder	 $\varnothing 1$	Tough FT-S11		500mm	STD 90 HYPR 350	210 160 60 19	40 90	$\varnothing 0.25$	IP67 (IEC)	-55 to +80°C	
	 $\varnothing 1.5$	Tough FT-S21	R2	2m	STD 315 HYPR 1350	770 550 210 70	130 340	$\varnothing 0.5$			
	 $\varnothing 1.5$	FT-S21W	R1		STD 260 HYPR 990	590 440 150 53	80 240	$\varnothing 0.25$	-40 to +60°C		
	 $\varnothing 2.5$	FT-S32	R10	STD 310 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 1800 600	1100 3000	$\varnothing 2$	IP40 (IEC)	-40 to +70°C		
	 $\varnothing 3$	FT-S31W	R1	STD 800 HYPR 3300	1900 1400 490 160	260 720	$\varnothing 1$	-40 to +60°C			
	Ultra-small diameter	 $\varnothing 0.25$ $\varnothing 3$	Tough FT-E13		1m	STD 15 HYPR 52	30 24 8 2	6 19	$\varnothing 0.125$	IP67 (IEC)	-40 to +70°C
		 $\varnothing 0.4$ $\varnothing 3$	Tough FT-E23	R2	STD 75 HYPR 270	160 125 42 13	22 80	$\varnothing 0.25$			
	Side sensing	 $\varnothing 4$	Tough FT-V40	R4	2m	STD 3500 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 2400 850	1000 3100	$\varnothing 2.5$	IP50 (IEC)	-40 to +60°C

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 2.) The length of the fiber cable affects the sensing range

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Cylindrical	 $\varnothing 1.5$	Tough FD-S21	R2	1m	STD 80 HYPR 190	130 110 37 11	25 70	IP40 (IEC)	-55 to +80°C
	 $\varnothing 3$	Tough FD-S32	R4	2m	STD 420 HYPR 1200	790 660 220 75	120 345	IP67 (IEC)	
	 $\varnothing 3$	FD-S32W	R1		STD 270 HYPR 900	630 430 150 45	80 230		-40 to +60°C
	 $\varnothing 3$	Tough FD-S31	R2	STD 125 HYPR 515	290 220 80 25	35 140	-55 to +80°C		
	 $\varnothing 3$	FD-S33GW	R1	STD 150 HYPR 670	340 280 90 25	45 140	IP40 (IEC)	-40 to +60°C	
	Oil-resistant	 $\varnothing 5.5$	Tough FD-S60Y	R4	STD 320 HYPR 600	590 420 200 75	140 300	IP68G	-40 to +70°C
Ultra-small diameter	 $\varnothing 1.5$ $\varnothing 0.48$	FD-E13	R4	1m	STD 12 HYPR 50	29 25 7 2	5 15	IP40 (IEC)	-40 to +60°C
	 $\varnothing 3$ $\varnothing 0.63$	FD-E23			STD 55 HYPR 170	120 80 30 9	20 70		

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut

Fibers with sleeve

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Beam axis dia. (mm)	Protection	Ambient temperature	
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102				
Threaded	M3 	Tough FT-31S	R2	2m	STD 315 HYPR 1220	740 550 195 63	130 340	ø0.5	IP67 (IEC)	-55 to +80°C	
	M4 	Tough FT-42S	R4 (note 3)		STD 1130 HYPR (note 2) 3600	2050 1600 530 190	300 800				ø1
	Ultra-small 	Tough FT-E23	R2	1m	STD 75 HYPR 270	160 125 42 13	22 80	ø0.25		-40 to +70°C	
	Side sensing ø2		Tough FT-V23	R4	2m	STD 450 HYPR 1800	1000 880 280 90	160 400	ø0.75	IP30 (IEC)	-55 to +80°C
			Tough FT-V25	R2		STD 240 HYPR 900	550 480 140 45	95 260	ø0.5		
			Tough FT-V30	R4		STD 680 HYPR 2200	1200 1000 340 100	180 480	ø1.0		

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range
- 3.) The bending radius of the sleeve is min. 10mm

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Threaded	Ultra-small diameter M3 	FD-EG30S	R4	1m	STD 50 HYPR 170	110 80 30 9	20 70	IP40 (IEC)	-40 to +70°C
	M4 	Tough FD-41S	R2 (note 3)	2m	STD 125 HYPR 515	290 220 80 25	35 140	IP67 (IEC)	-55 to +80°C
	M6 	Tough FD-61S	R4 (note 3)		STD 420 HYPR 1200	790 660 220 75	130 360		
Cylindrical	Ultra-small diameter ø1.5 	FD-E13	R4	1m	STD 12 HYPR 50	29 25 7 2	5 15	IP40 (IEC)	-40 to +60°C
	Side sensing ø3 	Tough FD-V30	R2	2m	STD 65 2559 HYPR 240	130 120 35 14	25 75	IP30 (IEC)	-55 to +80°C
		Tough FD-V50	R4		STD 120 HYPR 370	220 210 75 25	40 100		

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper
- 3.) The bending radius of the sleeve is min. 10mm

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

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Fibers with sleeve

Flat fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Protection	Ambient temperature		
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102					
Flat	Top sensing W3 × H8 × D12	Tough FT-Z30H	R2	2m	STD 3500 HYPR (note 2) 3600	3600 (note 2) 2600 810	1400 3200	2×3	IP40 (IEC)	-40 to +60°C		
	Top sensing W3 × H8 × D12	FT-Z30HW	R1		STD 3500 HYPR (note 2) 3600	3600 (note 2) 2600 810	1400 3200					
	Side sensing W3 × H12 × D8	Tough FT-Z30E	R2		STD 3500 HYPR (note 2) 3600	3600 (note 2) 2400 740	1200 3200					
	Side sensing W3 × H12 × D8	FT-Z30EW	R1		STD 3400 HYPR (note 2) 3600	3600 (note 2) 2000 630	1400 2600					
	Front sensing W8.5 × H12 × D3	Tough FT-Z30	R2		STD 2100 HYPR (note 2) 3600	3600 (note 2) 1200 410	710 2300					
	Front sensing W8.5 × H12 × D3	FT-Z30W			STD 1500 HYPR (note 2) 3600	3300 1000 280	540 1800					
	With boss	Front sensing W10 × H7 × D2	FT-Z20W		R1	1m	STD 530 HYPR (note 2) 1600	1100 900 330 100	230 670		ø1.5	-
		Top sensing W2 × H10 × D10	FT-Z20HBW				STD 260 HYPR 1100	670 570 180 55	100 320		ø0.5	IP67 (IEC)
		Front sensing W14 × H7 × D3.5	FT-Z40W				STD 1400 HYPR (note 2) 3500	3300 2300 890 290	330 1000		ø1.5	-
		Top sensing W3.5 × H14 × D11	FT-Z40HBW				STD 800 HYPR (note 2) 3300	1900 1400 490 160	260 720		ø1	IP67 (IEC)

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 2.) The length of the fiber cable affects the sensing range

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 Fx-102		
Flat	Front sensing W10 × H7 × D2	FD-Z20W	R1	1m	STD 2 to 65 HYPR 1 to 230	1 to 110 1 to 85 3 to 35 5 to 13	2 to 20 1 to 70	-	-40 to +60°C
	Top sensing W2 × H10 × D10	FD-Z20HBW			STD 2 to 85 HYPR 1 to 340	1 to 210 1 to 180 2 to 55 3 to 15	2 to 30 1 to 90	IP67 (IEC)	
	Front sensing W14 × H7 × D3.5	FD-Z40W			STD 110 HYPR 430	230 180 1.5 to 65 3 to 25	1 to 55 160	-	
	Top sensing W3.5 × H14 × D11	FD-Z40HBW			STD 260 HYPR 760	540 470 1 to 160 2 to 50	1 to 90 0.5 to 240	IP67 (IEC)	

Notes:
 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 2.) The sensing range is specified for white, matt paper

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

Wide beam fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102			
Wide beam	Sensing width 32mm W5 x H69 x D20	Tough FT-A32	R2	2m	STD (note 2) 3600 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 3600 (note 2) 2100	3600 (note 2) 3600 (note 2)	3.2 x 32	IP40 (IEC)	-40 to +60°C
	Sensing width 32mm W5 x H69 x D20	FT-A32W	R1		STD (note 2) 3600 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 3000	3600 (note 2)			-40 to +55°C
	Sensing width 11mm W4.2 x H31 x D13.5	Tough FT-A11	R2		STD (note 2) 3600 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 3600 (note 2) 1100	1900 (note 2) 3600 (note 2)	2.2 x 11	-40 to +70°C	
	Sensing width 11mm W4.2 x H31 x D13.5	FT-A11W	R1		STD (note 2) 3600 HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 3600 (note 2) 1300	1700 3400		-40 to +55°C	
Array	Sensing width 5.5mm W5 x H15 x D15	Tough FT-AL05	R2	STD 860 HYPR 2300	1550 1500 50 170	250 660	0.25 x 5.5		-55 to +80°C	

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Wide beam	W7 x H15 x D30	Tough FD-A16	R4	2m	STD 200 HYPR cannot use	200 140 75	120 240	IP40 (IEC)	-40 to +60°C
Array	W5 x H20 x D20	Tough FD-AL11	R2		STD 320 HYPR 670	530 510 180 50	100 285		-55 to +80°C

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for white, matt paper

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

IO-Link
Sensors

Photoelectric
Sensors

Fiber-optic
Sensors

Standard Fibers

Fiber Sensors
Communication
Units

Mark Sensors

Laser Sensors

Safety Sensors

Pressure &
Flow Sensors

Inductive
Proximity
Sensors

Measurement
Sensors

Ionizers/
Electrostatic
Sensors

Accessories

Wide beam
fibers

Convergent reflective fibers for glass detection

Reflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Glass substrate detection	Side sensing W25 x H7.3 x D30	FD-L32H	R4	4m	STD 0 to 56 HYPR 0 to 110	0 to 87 0 to 74 1 to 38 Cannot use	16 to 30 0 to 50	IP40 (IEC)	-40 to +60°C
	Long sensing range W20 x H29 x D3.8	Tough FD-L30A	R2	3m	STD 0 to 43 HYPR 0 to 43	0 to 43 0 to 43 0 to 42 0 to 29	0 to 40 0 to 50		0 to +70°C
	Long sensing range W23.5 x H29 x D4.5	Tough FD-L31A	R4		STD 4 to 33 HYPR 3 to 35	4 to 33 4 to 33 4 to 32 5 to 25	5 to 30 4 to 33		0 to +70°C
	Long sensing range W17 x H29 x D3.8	Tough FD-L22A	R2	2m	STD 0 to 24 HYPR 0 to 31	0 to 28 0 to 27 0 to 24 0 to 18	0 to 19 0 to 25		0 to +70°C
	Short sensing range W18 x H29 x D3.8	Tough FD-L23		3m	STD 0 to 29 HYPR 0 to 30	0 to 30 0 to 30 0 to 28 1.5 to 24	0 to 28 0 to 30		-20 to +70°C
	Short sensing range W12 x H19 x D3	Tough FD-L11	R4	2m	STD 0 to 9.5 HYPR 0 to 11.5	0 to 10.5 0 to 10 0 to 9 0 to 8	0 to 8 0 to 9		-40 to +60°C
	Short sensing range W12 x H19 x D3	Tough FD-L10			STD 0 to 5 HYPR 0 to 6	0 to 5.5 0 to 5.5 0 to 4.5 0 to 4	0 to 4.5 0 to 5.5		
	Short sensing range W24 x H21 x D4	Tough FD-L21			STD 1.5 to 16 HYPR 1 to 19	1 to 18 1 to 18 2 to 15 3 to 12	3 to 15 1.5 to 16		
	Short sensing range W24 x H21 x D4	FD-L21W	R1	STD 3 to 14 HYPR 1.5 to 15	2 to 15 2 to 15 4 to 14 6.5 to 10	7 to 12 3 to 14	-40 to +70°C		
	Short sensing range W6 x H18 x D14	Tough FD-L20H	R2	STD 23 HYPR 45	35 32 2 to 15 5 to 9	5 to 15 1 to 30			
Ultra-small	 W7.2 x H7.5 x D2	FD-L12W	R1	1m	STD 8 HYPR 14	12.5 12 0.5 to 7 0.5 to 4	1 to 4.5 0.5 to 7	IP30 (IEC)	-40 to +60°C

Notes:

- 1.) The sensing range specified for transparent glass 100x100x0.7mm (FD-L32H: edge, FD-L21 and FD-L21W: 12mm), (FD-L20H: white non-glossy paper, FD-L10: silicon wafers 100x100x2mm)
- 2.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut

Retroreflective type



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Protection	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
With polarizing filter	W5.2 x H9.5 x D16 W30 x H30 x D0.5	FR-Z50HW	R1	2m	STD 100 to 990 HYPR 100 to 1900	100 to 1400 100 to 1200 100 to 780 100 to 490	100 to 550 100 to 830	IP40 (IEC)	-25 to +55°C
Side sensing	W7.5 x H2.2 x D11.2 W4 x H2 x D21.5	Tough FR-KZ22E	R2		STD 15 to 310 HYPR 15 to 570	15 to 460 15 to 410 15 to 220 15 to 100	15 to 200 15 to 360		
Narrow view Top sensing	W5.2 x H9.5 x D21 W10.6 x H28 x D10.1	Tough FR-KZ50H			STD 20 to 300 HYPR 20 to 1000	20 to 800 20 to 400 20 to 200 20 to 200	20 to 200 20 to 350		
Narrow view Side sensing	W9.5 x H25 x D5.2 W28 x H10.6 x D10.1	Tough FR-KZ50E							

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The sensing range is specified for the reflector

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

Heat-resistant fibers

Thru-beam type (one pair set)



Type	Temperature	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Ambient temperature			
						FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102					
Heat-resistant fiber	350°C	Lens mountable: FX-LE1/LE2/SV1 	FT-H35-M2	R25	2m	STD 430 HYPR 1200	880 670 250 80	170 490	ø1.2	-60 to +350°C			
	200°C	Lens mountable: FX-LE1/LE2/SV1 	FT-H20W-M1	R10	1m	STD 470 HYPR (note 2) 1600	1,000 840 300 90	100 300	ø0.8	-60 to +200°C			
	130°C	Lens mountable: FX-LE2 	FT-H13-FM2	R25	 2m	STD 700 HYPR 3300	1900 1300 410 140	250 700	ø1.5	-60 to +130°C			
Heat-resistant (joint)	200°C	Lens mountable: FX-LE1/LE2/SV1 	FT-H20-J20-S (note 5)	Heat resistant R18 (note 4)	 200mm (note 3)	STD 470 HYPR 1600	1000 790 300 90	135 420	ø1.2	-60 to +200°C			
			FT-H20-J30-S (note 5)		 300mm (note 3)								
			FT-H20-J50-S (note 5)		 500mm (note 3)								
		Side sensing 	FT-H20-VJ50-S (note 5)		 800mm (note 3)						STD 600 HYPR 2100	1300 980 390 120	150 500
			FT-H20-VJ80-S (note 5)										

- Notes:
- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
 - 2.) The length of the fiber cable affects the sensing range
 - 3.) The fiber length of the heat-resistant side cannot be cut
 - 4.) Bending radius R=25mm or more
 - 5.) Heat-resistant side and ordinary temperature fiber are sold together as a set

Reflective type



Type	Temperature	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1, 2)			Ambient temperature	
						FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Heat-resistant fiber	Threaded	Coaxial M6 	FD-H35-M2	R25	2m	STD 260 HYPR 720	540 460 150 45	75 280	-60 to +350°C	
		Coaxial M6 	FD-H20-M1		1m	STD 330 HYPR 840	550 500 200 55	120 300	-60 to +200°C	
		M6 	FD-H13-FM2		 2m	STD 350 HYPR 880	640 600 200 65	100 280	-60 to +130°C	
	Glass substrate detection convergent reflective	300°C			FD-H30-L32	2m	STD 17 HYPR 40	30 25 12 1.5 to 6	2 to 9 0 to 17	-60 to +300°C
		250°C			FD-H25-L45	3m	STD 5 to 42 HYPR 4 to 43.5	4 to 43 4.5 to 43 5 to 40 6.5 to 34	7 to 35 7 to 38	(-20 to +250°C Standard fibers -20 to +70°C)
		180°C			FD-H18-L31	 2m	STD 16 HYPR 60	32 24 13 2 to 6.5	0 to 10 0 to 25	-60 to +180°C

- Notes:
- 1.) The sensing range is specified for white, matt paper (50x50mm, glass substrate: FD-H30-L32, FD-H18-L31, clear glass 100x100x0.7mm: FD-H25-L43 and FD-H25-L45)
 - 2.) The length of the fiber cable affects the sensing range

- IO-Link Sensors
- Photoelectric Sensors
- Fiber-optic Sensors
- Standard Fibers
- Fiber Sensors Communication Units
- Mark Sensors
- Laser Sensors
- Safety Sensors
- Pressure & Flow Sensors
- Inductive Proximity Sensors
- Measurement Sensors
- Ionizers / Electrostatic Sensors
- Accessories

Heat-resistant fibers

Chemical-resistant fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 1)			Beam axis dia. (mm)	Protection	Ambient temperature	
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102				
Chemical-resistant	Oil-resistant Square head M4 Cable-protection type Compatible with lens W7xH9.5xD15.5	FT-R44Y	R4	2m	STD 720	1600 1100 430	210 640	ø1	IP67 (note 4)	-55 bis +80°C	
		FT-R60Y			HYPR 3000						
	Flat SEMI W7 x H15 x D13 	FT-Z802Y	R25		STD 2100	3600 3600 1.260	690 1.890	ø3,5	IP68G		0 to +60°C
		FT-HL80Y	R30		HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 1900 470	520 3100				ø3.7
Cylindrical	Heat-resistant 115°C ø5.5 (25)	FT-HL80Y	R30	2m (note 3)	STD (note 2) 3600	3600 (note 2) 3600 (note 2)	990 2340	ø3.7	IP68G	-40 to +70°C	
		FT-L80Y			HYPR (note 2) 3600	3600 (note 2) 3600 (note 2) 2800 920	1.100 2.600				
	FT-V80Y	STD 1300			2800 2200 800 240	340 800					
	Side sensing metal free ø5.5 (25)	FT-V80Y			HYPR (note 2) 3600						

Notes:

- 1.) The sensing range of the free-cut type fiber may be reduced depending upon how the fiber is cut
- 2.) The length of the fiber cable affects the sensing range
- 3.) The allowable cutting range is 500mm from the end inserted at the amplifier
- 4.) The fiber is oil-resistant

Vacuum-resistant fibers

Thru-beam type (one pair set)



Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm)			Beam axis dia. (mm)	Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102		
Vacuum-resistant Thru-beam type	300°C Lens mountable: FV-LE1/SV2 M4 30	FT-H30-M1V-S (note)	R18	1m	STD 27 HYPR 1000	590 470 160 55	110 280	ø1.2	-30 to +300°C

Note: Sold as a set comprising vacuum type fiber and photo-terminal (FV-BR1)

Reflective type

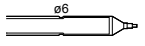

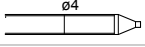

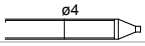
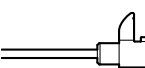




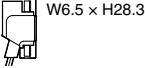
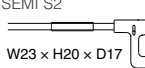


Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Sensing range (mm) (note 2)			Ambient temperature
					FX-500 series	U-LG LONG FAST H-SP	FX-101 FX-102	
Vacuum-resistant	300°C W9.5 x H5.2 x D15	FD-H30-KZ1V-S (note 1)	R18	1m	STD 20 to 200 HYPR 5 to 500	10 to 340 15 to 270 20 to 120 20 to 45	25 to 80 10 to 220	-30 to +300°C
	300°C, Glass substrate detection W19 x H5 x D27	FD-H30-L32V-S (note 1)			3m	STD 8 HYPR 18	12 10 5,5 1.5 to 3	

Notes:

- 1.) Sold as a set comprising vacuum type fiber and photo-terminal (FV-BR1)
- 2.) The sensing range is specified for transparent glass 100x100x0.7mm

Fibers for liquid leak/liquid detection

Type	Shape of fiber head (mm)	Model no.	Bending radius	Fiber cable length	Description	Protection	Ambient temperature
Contact type	Liquid level sensing Heat resistant 125°C Fluorine resin coating 	FD-F8Y	Protective tube R40 Standard fibers R15	 2m (note)	ø6mm Protective tube: Fluorine resin, Length 1m (not cuttable) Liquid surface not contacted: beam received Liquid surface contacted: no beam received	IP68 (IEC)	-40 to +125°C
	Liquid level sensing Heat resistant 105°C Fluorine resin coating 	FD-HF40Y	Protective tube R20 Standard fibers	 2m	ø4mm Protective tube: Fluorine resin, Length 500mm (not cuttable) Liquid surface not contacted: beam received Liquid surface contacted: no beam received	IP67 (IEC)	-40 to +105°C
	Liquid level sensing Heat resistant 70°C Fluorine resin coating 	FD-F41Y	R10				-40 to +70°C
Liquid leak detection 	SEMI S2 W20xH30xD10	Tough FD-F71	Protective tube R20 Standard fibers R4	 5m	Liquid leak detection Leak absent: beam received Leak present: no beam received		-20 to +60°C
Pipe-mountable type	Liquid level sensing Default 	FD-F41	R10	 2m	Applicable pipe diameter: Outer dia.: ø6mm to ø26mm Material: transparent pipe, PFA (fluorine resin, polycarbonate, acrylic, glass) Wall thickness: 1 to 3mm Liquid absent: beam received Liquid present: no beam received	-	-40 to +100°C
	Liquid level sensing For wall thickness 1mm 	FD-F4			Applicable pipe diameter: Outer dia.: ø6mm to ø26mm Material: transparent pipe, PFA (fluorine resin). Wall thickness: 1mm. Liquid absent: beam received Liquid present: no beam received		
	Liquid sensing Mountable on pipe W6.5 x H28.3 x D17 	Tough FD-FA93	R4		Applicable pipe diameter: Outer dia.: ø8mm or more (When used with the tying bands: ø8mm to ø80mm) Material: transparent pipe, PFA (fluorine resin). Liquid absent: beam received Liquid present: no beam received		
Liquid sensing SEMI S2 W23 x H20 x D17 	Tough FT-F93	Protective tube R20 Standard fibers R2	Applicable pipe diameter: Outer dia.: ø3mm to ø10mm Material: transparent pipe, PFA (fluorine resin). Wall thickness: 0.3 to 1mm Liquid absent: beam received Liquid present: no beam received	-40 to +60°C			

Note: The allowable cutting range is 500mm from the end inserted at the amplifier

Tough High flexibility: min. bending radius of 4mm, 10 mio. bending cycles (@ radius 10mm)

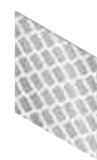
Accessories

- **RF-003** (Reflector for **FR-KZ21/KZ21E**)
- **RF-13** (Reflective tape for reflective type)
- **FX-CT1** (Fiber cutter)
- **FX-CT2** (Fiber cutter)
- **FX-CT3** (Fiber cutter)
- **FX-AT2** (Attachment for fixed-length fiber, Orange)
- **FX-AT3** (Attachment for ø2.2mm fiber, Clear orange)
- **FX-AT4** (Attachment for ø1mm fiber, Black)
- **FX-AT5** (Attachment for ø1.3mm fiber, Gray)
- **FX-AT6** (Attachment for ø1mm / ø1.3mm fiber, Black/Gray)

RF-003



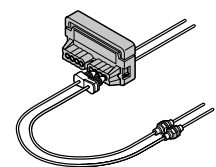
RF-13



FX-CT1



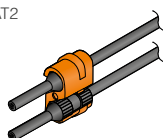
FX-CT2



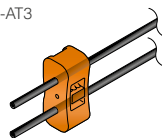
FX-CT3



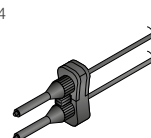
FX-AT2



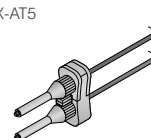
FX-AT3



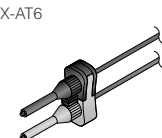
FX-AT4



FX-AT5


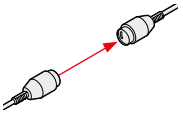





FX-AT6



Lens


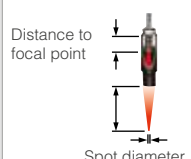
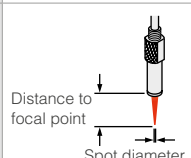
Thru-beam type fiber

Model no.	Picture	Description	Applicable fibers
FX-LE1		Expansion lens increases the sensing range by 5 times or more, ambient temperature: -60 to +350°C (note 1, 2)	FT-43, FT-42, FT-42W, FT-45X, FT-R40, FT-R43, FT-H35-M2, FT-H20W-M1, FT-H20-M1, FT-H20-J50-S, FT-H20-J30-S, FT-H20-J20-S
FX-LE2		Expansion lens increases the sensing range by 6 times or more, ambient temperature: -60 to +350°C (note 1, 2)	
FX-SV1		Side-view lens, beam axis is bent by 90°, ambient temperature: -60 to +300°C (note 1, 2)	
FV-LE1		Expansion lens for vacuum fiber increases the sensing range by 4 times or more, ambient temperature: -60 to +350°C (note 1, 2)	FT-H30-M1V-S
FV-SV2		Vacuum resistant side-view lens, beam axis is bent by 90°, ambient temperature: -60 to +300°C (note 1, 2)	

Notes:

- 1.) Consider the ambient temperature of the fibers to be used in combination
- 2.) Please test the functionality after mounting the lenses

Reflective type fiber

Model no.	Picture	Description	Applicable fibers
FX-MR1		Pinpoint spot lens, distance to focal point 6±1mm, spot diameter Ø 0.5mm, ambient temperature -40 to +70°C (note 1, 2)	FD-42G, FD-42GW
FX-MR2		Zoom lens, screw-in depth (7-14mm), distance to focal point (18.5- 43mm), spot diameter Ø 0.7-2mm, ambient temperature: -40 to +60°C (note 1, 2)	
FX-MR3		Extremely fine spot, distance to focal point: 7.5±0.5mm, spot diameter: FD-EG31 Ø 0.15mm/ FD-EG30 Ø 0.3mm/ FD-42G, FD-42WG, FD-32G, FD-32GX Ø 0.5, ambient temperature: -40 to +70°C (note 1, 2)	FD-EG31, FD-EG30, FD-42G, FD-42GW, FD-32G, FD-32GX

Notes:

- 1.) Consider the ambient temperature of the fibers to be used in combination
- 2.) Please test the functionality after mounting the lenses