

Digital Fiber Sensor FX-500 SERIES

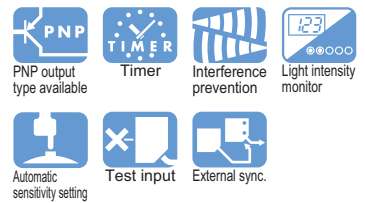
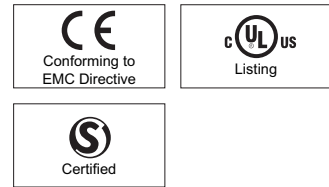
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- PHOTOELECTRIC SENSORS
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Related Information



panasonic-electric-works.net/sunx



At the industry's leading edge

High stability! Decrease the variation among fiber sensors

When the **FX-500** series is used together with our super quality fiber, the incident light intensity variation among units is decreased to only 1/4 of that of conventional models. By being close to absolute values instead of modified digital values, changes in detection that could not be found in the past can now be monitored.

Super quality fiber

+

FX-500 series

Previous amplifier

	Threshold value	Incident light intensity
①	350	755
②	700	1386
③	500	987
④	800	1593

Large variation in incident light intensity.

Requires setting different threshold values for each sensor.

Digital control is essentially achieved

Stability of the incident light intensity is improved by 4 times*. Values of incident light intensity stay close together even after replacing an amplifier.

* Using a small diameter fiber (fiber core ø0.5 mm ø0.020 in). If using a standard fiber (fiber core ø1.0 mm ø0.039 in), the variation will be double of that of conventional models.

1/4 incident light intensity variation [from previous]

Incident light intensities are stable.

Can control by using just one threshold value.

	Threshold value	Incident light intensity
①	500	1020
②	500	1086
③	500	1037
④	500	1093

- Selection Guide
- Fibers
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- FX-100
- FX-300
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- FX-311
- FX-301-F7/ FX-301-F

A quality that surpassed standard fiber! Introducing super quality fiber

New fibers developed using a new manufacturing method adopted by our own factory along with a persistent quality control system.

Stable emission intensity $\pm 10\%$

Variation in emission intensity of the fiber core is controlled down to less than $\pm 10\%$, achieving a stable detection.

Expanded temperature range

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

-55 to $+80$ °C
 -67 to $+176$ °F

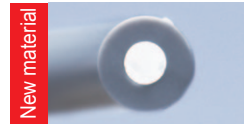
1.2 times more than previous

Integrated high-precision plug

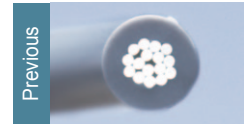
The centering precision of the fiber core attached to the inserting plug is doubled. As the insertion precision is increased, the variation among units can be greatly suppressed.



$\phi 2.2$ mm $\phi 0.087$ 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 is R25 mm R0.984 in]

R4 mm
R0.157 in

1/6 of that of previous



More bendable!

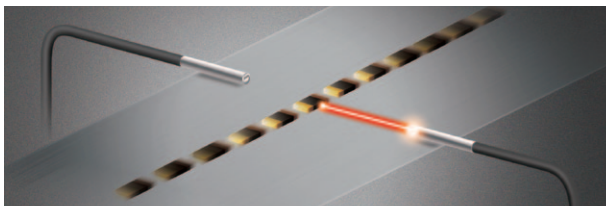
Bending durability [Previous is 1,000 times]

10 million times

10,000 times more than previous

Max. 25 μ s response time

FX-500 with its ultra high response time improves productivity.



Performing minute object detection when using a small diameter fiber is now possible with a high response time and longer sensing range.

Hyper **HYPR mode** incorporated

FX-500 in combination with small diameter fibers which can handle challenging detections, allows super long sensing range.



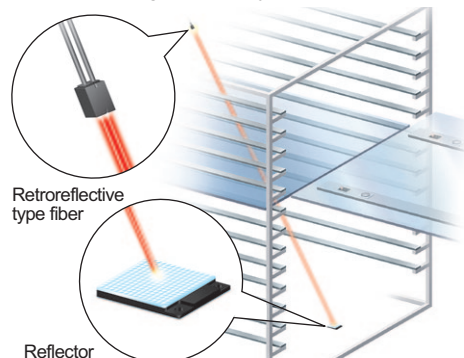
Note: When using **FD-NFM2**.

*As of September 2010, investigated by Panasonic Electric Works SUNX.

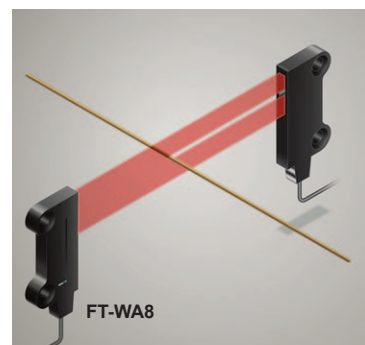
A different accuracy! Sharp detection with suppressed hysteresis

FX-500 with its accurate detection catches fractional difference in light intensity, fulfilling high precision and low-hysteresis applications.

- Long range detection of small objects with small difference in light intensity **H-02 mode**



- Highly accurate detection while avoiding saturation **H-01 mode**



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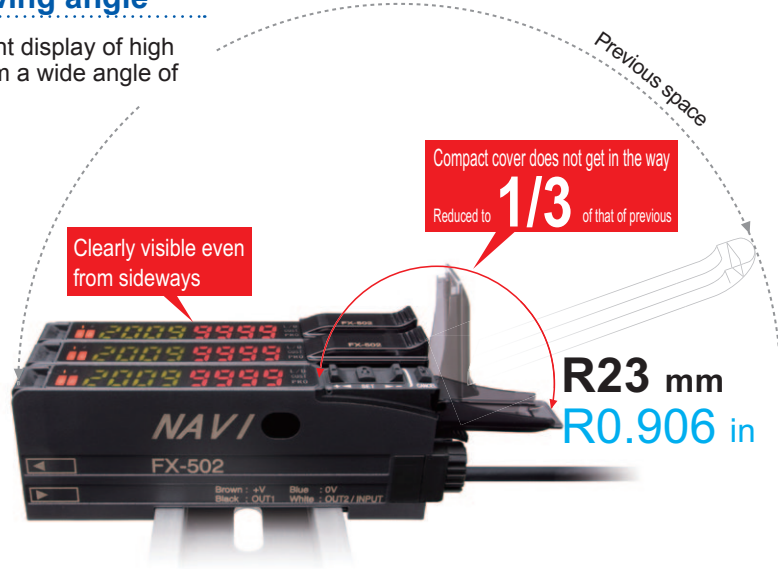
FX-410

FX-311

FX-301-F7/ FX-301-F

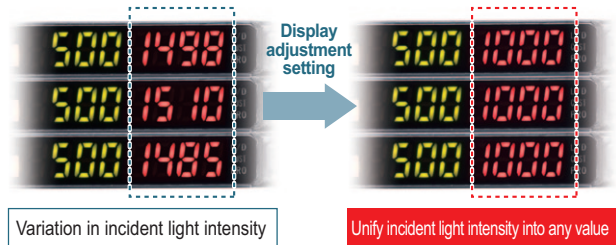
Flat display with wide viewing angle

The large and high-contrast 7-segment display of high luminance provides clear visibility from a wide angle of view.



Resolves variation in incident light intensity display Display adjustment setting

Even if there is no problem in detection, the variation in display may make it difficult for an operator to verify proper operation. By using the display adjustment setting, random values can be adjusted, and the visual variation can be resolved to help define proper operation in an operation manual.



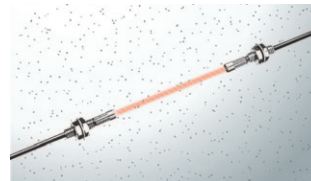
Stable detection over long and short periods Stabilized emission intensity

The “four-chemical emitting element” was first incorporated in the conventional model **FX-300** to maintain a stable level of light emission and has now become an industry standard. **FX-500** series continues to adopt the same emitting element as well as the “APC (Auto Power Control) circuit” which improves stability in short periods such as when the power is turned on.

Saves maintenance time Threshold tracking function

This function seeks changes in the light emitting amount resulting from changes in the environment over long periods (such as dust levels), so that the incident light intensity can be checked at desired intervals and the threshold values can be reset automatically.

Detect drops in light intensity (e.g. used in dusty environment)



Self-diagnosis can be used with the threshold tracking function for added effectiveness.

Suitable for preventative maintenance Self-diagnosis output FX-502(P) / FX-505(P)-C2

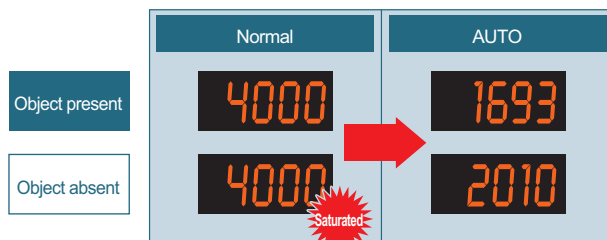
FX-502(P) / 505(P)-C2 can set Output 2 as self-diagnosis output. When Output 1’s threshold value teaching is carried out, Output 2 is set concurrently with the setting randomly shifted by the amount of surplus of threshold value.

Stable detection while being eco-friendly Emission power & gain setting

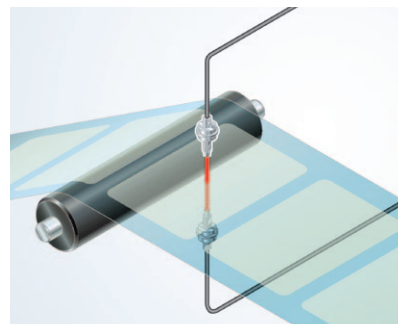


For cases when the incident light intensity saturates the receiver, the light intensity can be attenuated to the optimal level by AUTO without changing the response time. This allows for stable detection while maintaining an optimal S/N ratio and saves energy by controlling the emitting electric current.

Detecting a transparent sheet



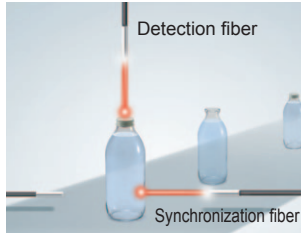
Auto mode (AUTO) and 3-level manual mode (3 levels: H / M / L [adjustable]) are incorporated.



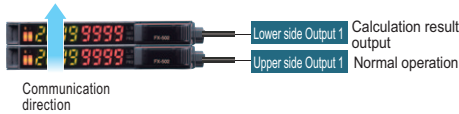
Built-in logic functions No PLC necessary saving material and programming costs

Logical calculation functions

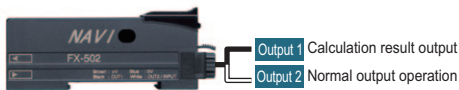
Three logical calculations (AND, OR, XOR), are selectable using Output 1 of multiple **FX-500** series amplifiers. A PLC is not required which helps to reduce material and programming and costs.



Calculation of two neighboring amplifiers



Calculation of two outputs in one amplifier **FX-502(P) / 505(P)-C2**

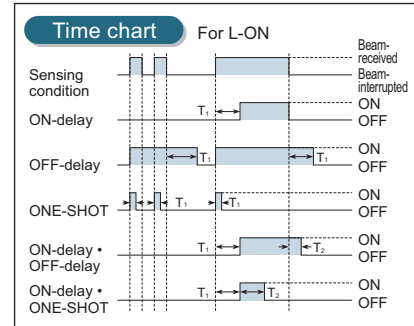


Calculation of one amplifier and external input **FX-502(P) / 505(P)-C2**



Equipped with 5 types timers

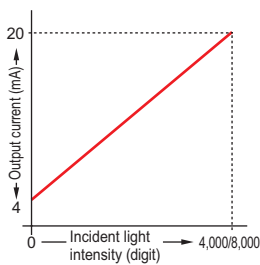
A wide variety of timer control operations can be carried out by these fiber sensors alone.



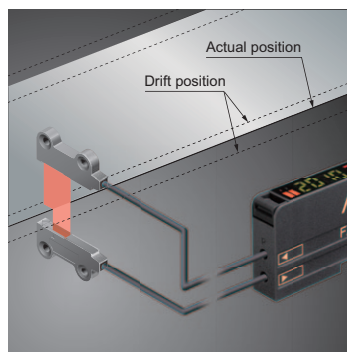
Timer period: 0.05 ms to 32 s
Output 1 has ON-delay • OFF-delay and ON-delay • ONE-SHOT timers.

Analog control is possible Analog output cable type **FX-505(P)-C2**

A 4 to 20 mA analog output represents the digital value of incident light intensity.



Edge tracking of film or sheet



Drifting path can be tracked as the light intensity changes.

Smooth setup changes by 8 data banks

The number of data banks used for saving the setup conditions of the amplifier is increased to eight. Setup conditions can be saved and loaded to make setup changes easy at worksite that manufactures multiple models.

Remote control improves work efficiency by external input **FX-502(P) FX-505(P)-C2**

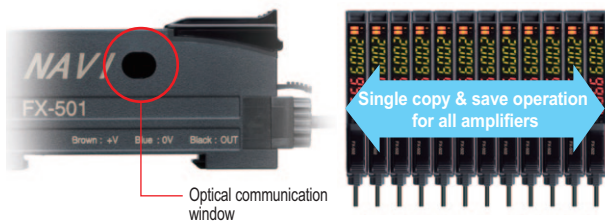
Work efficiency can be improved by operating via a PLC output or other external signal.

Functions operable by external input

Full-auto / Limit / 2-point teaching	Display adjustment setting
Data bank load / save	Logical calculation (self-unit only)
Emission halt	Copying function lock (self-unit only)

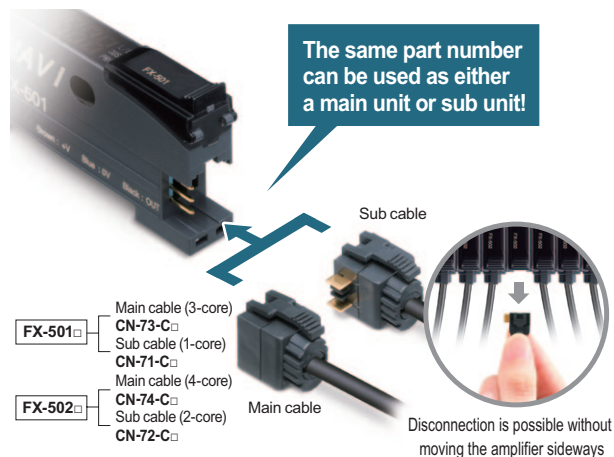
An optical communication function allows sensors to be adjusted simultaneously

The optical communication function allows the data that is currently set to be copied and saved all at once for all amplifiers connected together from the right side. This greatly reduces troublesome setup tasks and makes setup much smoother.



No need to specify a main unit or sub unit

All **FX-500** amplifiers can be used as either a main unit or a sub unit. Just use a main cable or a sub cable to distinguish the two. This reduces the costs of inventory management.



- FX-501**
 - CN-73-C
 - Sub cable (1-core)
 - CN-71-C
- FX-502**
 - Main cable (4-core)
 - CN-74-C
 - Sub cable (2-core)
 - CN-72-C

Disconnection is possible without moving the amplifier sideways

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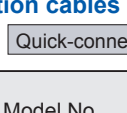
FX-410

FX-311

FX-301-F7/ FX-301-F

ORDER GUIDE

Amplifiers Quick-connection cable is not supplied with **FX-501(P)** and **FX-502(P)**. Please order it separately.

Type	Appearance	Model No.	Emitting element	Output	External input
Standard type		FX-501	Red LED	NPN open-collector transistor	—
		FX-501P		PNP open-collector transistor	
2-output type		FX-502		NPN open-collector transistor 2 outputs	Incorporated (Switchable with Output 2)
		FX-502P		PNP open-collector transistor 2 outputs	
Cable type		FX-505-C2		NPN open-collector transistor 2 outputs analog output	Incorporated
		FX-505P-C2		PNP open-collector transistor 2 outputs analog output	

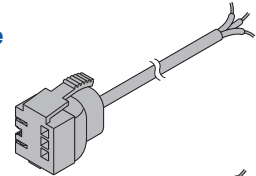
Quick-connection cables

For FX-501(P) Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.	Description	
Main cable (3-core)	CN-73-C1	Length: 1 m 3.281 ft	0.15 mm ² 3-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in
	CN-73-C2	Length: 2 m 6.562 ft	
	CN-73-C5	Length: 5 m 16.404 ft	
Sub cable (1-core)	CN-71-C1	Length: 1 m 3.281 ft	0.15 mm ² 1-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in Connectable to a main cable up to 15 cables.
	CN-71-C2	Length: 2 m 6.562 ft	
	CN-71-C5	Length: 5 m 16.404 ft	

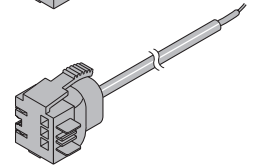
Main cable

- **CN-73-C□**



Sub cable

- **CN-71-C□**

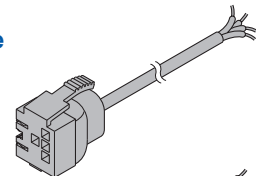


For FX-502(P) Quick-connection cable is not supplied with the amplifier. Please order it separately.

Type	Model No.	Description	
Main cable (4-core)	CN-74-C1	Length: 1 m 3.281 ft	0.15 mm ² 4-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in
	CN-74-C2	Length: 2 m 6.562 ft	
	CN-74-C5	Length: 5 m 16.404 ft	
Sub cable (2-core)	CN-72-C1	Length: 1 m 3.281 ft	0.15 mm ² 2-core cabtyre cable, with connector on one end Cable outer diameter: ø3.0 mm ø0.118 in Connectable to a main cable up to 15 cables.
	CN-72-C2	Length: 2 m 6.562 ft	
	CN-72-C5	Length: 5 m 16.404 ft	

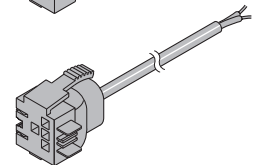
Main cable

- **CN-74-C□**

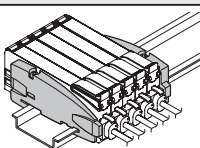


Sub cable

- **CN-72-C□**



End plates End plates are not supplied with the amplifier. Please order them separately when the amplifiers are mounted in cascade.

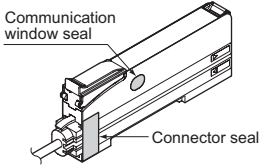
Appearance	Model No.	Description
	MS-DIN-E	When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates clamp amplifiers into place on both sides. Make sure to use end plates when cascading multiple amplifiers together. Two pcs. per set

OPTIONS

Designation	Model No.	Description
Amplifier mounting bracket	MS-DIN-2	Mounting bracket for amplifier

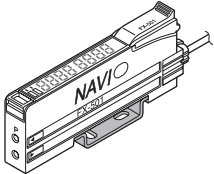
Accessory

- **FX-MB1** (Amplifier protection seal)
10 sets of 2 communication window seals and 1 connector seal



Amplifier mounting bracket

- **MS-DIN-2**



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LIST OF SUPER QUALITY FIBERS

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)			U-LG LONG FAST	Beam axis dia. (mm in)	Specifications	Model No.	Dimensions
		■ : HYPR	■ : STD	■ : H-SP					
Threaded	M4	3,600 (Note) 141.732	1,200 47.244	190 7.480	U-LG: 2,200 86.614 LONG: 1,700 66.929 FAST: 530 20.866	ø1 ø0.039	2 m 6.562 ft	FT-40	P.90
	M3	1,350 53.150	400 15.748	75 2.953	U-LG: 810 31.890 LONG: 650 25.591 FAST: 210 8.268	ø0.5 ø0.020	R4 mm R0.157 in 10 million Times	FT-30	P.90
Cylindrical	ø3 ø0.118	3,600 (Note) 141.732	1,200 47.244	190 7.480	U-LG: 2,200 86.614 LONG: 1,700 66.929 FAST: 530 20.866	ø1 ø0.039	-55 to +80 °C -67 to +176 °F	FT-S30	P.94
	ø1.5 ø0.059	1,350 53.150	400 15.748	75 2.953	U-LG: 810 31.890 LONG: 650 25.591 FAST: 210 8.268	ø0.5 ø0.020	±10 % 150 μm/±2 °	FT-S20	P.94

Note: The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in)			U-LG LONG FAST	Specifications	Model No.	Dimensions
		■ : HYPR	■ : STD	■ : H-SP				
Threaded	M6	1,550 61.024	520 20.472	90 3.543	U-LG: 900 35.433 LONG: 740 29.134 FAST: 260 10.236	2 m 6.562 ft	FD-60	P.99
	M4	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150	R4 mm R0.157 in 10 million Times	FD-40	P.99
	M3	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150	-55 to +80 °C -67 to +176 °F	FD-30	P.99
Cylindrical	ø3 ø0.118	600 23.622	160 6.299	25 0.984	U-LG: 330 12.992 LONG: 250 9.843 FAST: 80 3.150	±10 % 150 μm/±3 °	FD-S30	P.106

2 m 6.562 ft Fiber cable length/Free-cut R4 mm R0.157 in Allowable bending radius 10 million Times Bending durability -55 to +80 °C -67 to +176 °F Ambient temperature ±10 % Optical transmission 150 μm/±3 ° Beam axis position/Inclination of beam axis

SUPER QUALITY FIBER SPECIFICATIONS

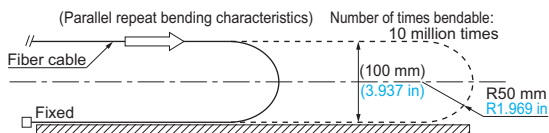
Item	Type	Thru-beam type	Reflective type
	Model No.	FT-40, FT-30, FT-S30, FT-S20	FD-60, FD-40, FD-30, FD-S30
Variation of fiber head		Within ±10 % (Note 2)	
Beam axis precision		Beam axis position: Within ±150 μm, Inclination of beam axis: Within ±2 ° (Note 3) Beam axis position: Within ±150 μm, Inclination of beam axis: Within ±3 ° (Note 3)	
Allowable bending radius		R4 mm R0.157 in or more	
Bending durability		10 million times or more (Note 4)	
Ambient temperature		-55 to +80 °C -67 to +176 °F (No dew condensation or icing allowed) (Note 5), Storage: -55 to +80 °C -67 to +176 °F	
Ambient humidity		35 to 85 % RH (Note 5), Storage: 35 to 85 % RH	
Material	Fiber core	Acrylic	
	Sheath	Polyethylene	
	Fiber head	FT-30/40, FD-40/60: Brass (Nickel plated), FT-S20/S30, FD-30/S30: Stainless steel (SUS303)	
	Plug	ABS	
Accessories		All fibers: FX-AT2 (fiber attachment) 1 pc. Threaded head fibers: Nuts 2 pcs. (Thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (Thru-beam type: 2 pcs.)	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.

2) The value is in standard condition [+23 °C +73.4 °F / 50 % RH, no bending fiber (R50 mm R1.969 in or more)].

3) The value is based on outer shape of fiber head.

4) It has a repeat flexibility as below.



5) The ambient temperatures are the values for dry conditions. The ambient temperatures will vary for environments with high humidity. The ambient temperature for environments with high relative humidity of 85 % RH is -55 to +70 °C -67 to +158 °F. When the ambient humidity is +80 °C +176 °F, the ambient humidity is 35 to 50 % RH.

LIST OF NEW STANDARD FIBERS

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in)		Beam axis dia. (mm in)	Specifications	Model No.	Dimensions
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST				
Threaded	M4	 15 0.591 190 7.480	3,600 (Note) 141.732 1,130 44.488	U-LG : 2,050 LONG : 1,600 FAST : 530 20.866	R4 mm R0.157 in 2 m 6.562 ft 10 million Times -55 to +80 °C -67 to +176 °F 150 μm/±2 ° IP67	FT-42	P.90
	M3	 12 0.472 315 12.402	1,350 53.150	U-LG : 770 LONG : 30.315 FAST : 210 8.268			
Cylindrical	ø1.5 ø0.059 ø1.5 ø0.059 10 0.394	70 2.756	U-LG : 30 LONG : 1.181 FAST : 8 0.315	ø0.125 ø0.005	FT-S21 P.94		
	Beam diameter ø0.125 mm ø0.005 in ø0.25 ø3 ø0.010 ø0.118 Sleeve part cannot be bent. 5 15 0.197 0.591	52 2.047 15 0.591 2 0.079	U-LG : 160 LONG : 6.299 FAST : 42 1.654			ø0.125 ø0.005	FT-E13 P.91
	Ultra small diameter ø0.25 mm ø0.010 in ø0.4 ø3 ø0.016 ø0.118 Sleeve part cannot be bent. 5 15 0.197 0.591	270 10.630 75 2.953 13 0.512	U-LG : 125 LONG : 4.921 FAST : 42 1.654				

Note: The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in)		Specifications	Model No.	Dimensions		
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Threaded	M6	 17 0.669 450 17.717	1,400 55.118	U-LG : 840 LONG : 33.071 FAST : 200 7.874	R4 mm R0.157 in 2 m 6.562 ft 10 million Times -55 to +80 °C -67 to +176 °F 150 μm/±3 ° IP67	FD-61 P.99		
	M4	 14 0.551	515 20.276	U-LG : 290 LONG : 11.417 FAST : 80 3.150			R2 mm R0.079 in	FD-41 P.99
	M3	 12 0.472 125 4.921 25 0.984	125 4.921 25 0.984	U-LG : 220 LONG : 8.661 FAST : 80 3.150				
Cylindrical	ø3 ø0.118 ø3 ø0.118 10 0.394	70 2.756	U-LG : 30 LONG : 1.181 FAST : 8 0.315	ø0.125 ø0.005	FD-S31 P.106			

2 m 6.562 ft Fiber cable length/Free-cut R4 mm R0.157 in Allowable bending radius 10 million Times Bending durability -40 to +70 °C -40 to +158 °F Ambient temperature 150 μm/±3 ° Beam axis position/Inclination of beam axis IP67 Protection

NEW STANDARD FIBER SPECIFICATIONS

Item	Type	Standard		Ultra small diameter
		Thru-beam type	Reflective type	Thru-beam type
Model No.		FT-42, FT-31, FT-S21	FD-61, FD-41, FD-31, FD-S31	FT-E13, FT-E23
Beam axis position (Note 2)		Within ±150 μm		Within ±90 μm
Inclination of beam axis (Note 2)		Within ±2 °		Within ±5 ° (Note 3)
Allowable bending radius		R2 mm R0.079 in or more: FT-31, FT-S21, FT-E13, FT-E23, FD-41, FD-31, FD-S31 R4 mm R0.157 in or more: FT-42, FD-61		
Bending durability		10 million times or more at R10 mm R0.394 in (Note 4)		
Protection		IP67 (IEC)		
Ambient temperature		-55 to +80 °C -67 to +176 °F (No dew condensation or icing allowed) (Note 5), Storage: -55 to +80 °C -67 to +176 °F		-40 to +70 °C -40 to +158 °F (No dew condensation or icing allowed) (Note 5), Storage: -40 to +70 °C -40 to +158 °F
Ambient humidity		35 to 85 % RH (Note 5), Storage: 35 to 85 % RH		35 to 85 % RH, Storage: 35 to 85 % RH
Material	Fiber core	Acrylic		
	Sheath	Polyethylene		
	Fiber head	Stainless steel (SUS303)		Stainless steel (SUS303) (Sleeve: SUS304)
Accessories		All fibers: Fiber attachment 1 set., FX-CT2 (fiber cutter): 1 pc. Threaded head fibers: Nuts 2 pcs. (Thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (Thru-beam type: 2 pcs.)		

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
- 2) The value is based on outer shape of fiber head.
- 3) Be careful when handling the fiber as the sleeve is easily bent.
- 4) When bent back and forth at 180° with 25 g fiber core pulling load (35 g for FT-42 and FD-61)
- 5) The ambient temperatures are the values for dry conditions. The ambient temperatures will vary for environments with high humidity. The ambient temperature for environments with high relative humidity of 85 % RH is -55 to +70 °C -67 to +158 °F (FT-E13/E23: -40 to +60 °C -40 to +140 °F). When the ambient humidity is +80 °C +176 °F, the ambient humidity is 35 to 50 % RH.

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 WIRE-SAVING SYSTEMS
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 UV CURING SYSTEMS

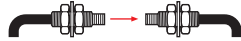
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LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

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Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length (Free-cut)	Bending radius	Ambient temperature	Model No.	Dimensions
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Threaded type	Lens mountable (FX-LE1/LE2/SV1) M4 15 0.591	3,600 (Note 2)	U-LG : 2,400 LONG : 2,100 FAST : 570	ø1.5 ø0.059	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-B8	P.90
		141.732	94.488						
		1,250	82.677						
	Metal-free M4 15 0.591	180	7.087	ø1 ø0.039	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in		FT-FM2	P.91
		3,300	U-LG : 2,000 LONG : 1,550 FAST : 445						
		129.921	78.740						
	Sleeve 90 mm 3.543 in M4 ø1.48 ø0.058 12 0.472	150	5.906	ø1.4 ø0.055	1 m 3.281 ft	R1 mm R0.039 in		FT-W8	P.95
		790	U-LG : 1,800 LONG : 1,400 FAST : 420						
		31.102	70.866						
	Sleeve 40 mm 1.575 in M4 ø1.48 ø0.058 12 0.472	810	31.890	ø1.4 ø0.055	1 m 3.281 ft	R4 mm R0.157 in Flexible		FT-P80	P.93
		160	U-LG : 2,000 LONG : 1,500 FAST : 470						
		6.299	78.740						
	Lens mountable (FX-LE1/LE2/SV1) M4 15 0.591	1,600 (Note 3)	U-LG : 1,600 LONG : 1,600 FAST : 530	ø0.7 ø0.028	2 m 6.562 ft	R4 mm R0.157 in Flexible		FT-P60	P.93
		880	62.992						
		34.646	62.992						
Tough flexible M4 20 0.787	1,200	U-LG : 640 LONG : 560 FAST : 210	ø1 ø0.039	2 m 6.562 ft	R1 mm R0.039 in		FT-WR80	P.96	
	350	25.197							
	2.362	22.047							
Lens mountable (FX-LE1/LE2/SV1) M4 15 0.591	2,600	U-LG : 1,300 LONG : 1,100 FAST : 410	ø2 ø0.079	2 m 6.562 ft	R1 mm R0.039 in		FT-WR80L	P.96	
	660	51.181							
	25.984	43.307							
With lens M4 W7 × H9 × D13.9 W0.276 × H0.354 × D0.547	3,600 (Note 2)	U-LG : 3,600 LONG : 3,300 FAST : 1,300	ø1 ø0.039	2 m 6.562 ft	R25 mm R0.984 in		FT-R80	P.94	
	141.732	141.732							
	86.614	129.921							
Lens mountable (FX-LE1/LE2) M4 14 0.551	3,500	U-LG : 1,750 LONG : 1,100 FAST : 450	ø1 ø0.039	2 m 6.562 ft	R25 mm R0.984 in		FT-T80	P.95	
	137.795	68.898							
	30.709	43.307							
Lens mountable (FX-LE1/SV1) M3 12.5 0.492	3,300	U-LG : 2,000 LONG : 1,550 FAST : 445	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in		FT-NFM2	P.93	
	129.921	78.740							
	43.307	61.024							
M3 15 0.591	1,220	U-LG : 740 LONG : 545 FAST : 192	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in		FT-NFM2	P.93	
	48.031	29.134							
	310	21.457							
		63							
		2.480							

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 to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST							
Threaded type	Sleeve 90 mm 3.543 in 	1,220 48.031	U-LG : 740 29.134	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-NFM2S	P.93	
		310 12.205	LONG : 545 21.457							
		63 2.480	FAST : 192 7.559							
		250 9.843	U-LG : 590 23.228							
	Sleeve 40 mm 1.575 in 	650 25.591	LONG : 440 17.323	ø0.6 ø0.024	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-W4	P.95	
		160 6.299	FAST : 150 5.906							
	With lens 	960 37.795	U-LG : 360 14.173	ø0.6 ø0.024	2 m 6.562 ft	R4 mm R0.157 in	Flexible	-40 to +70 °C	FT-P40	P.93
		250 9.843	LONG : 270 10.630							
	Long sensing range 	650 25.591	FAST : 95 3.740	ø10 ø0.394	10 m 32.808 ft	R25 mm R0.984 in	-40 to +158 °F	FT-FM10L	P.91	
		19,600 (Note 2) 771.652	U-LG : 19,600 771.652							
Cylindrical type	With lens • Long sensing range 	3,600 (Note 3) 141.732	U-LG : 3,600 141.732	ø2 ø0.079	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WS8L	P.96	
		3,300 129.921	LONG : 3,500 137.795							
		640 25.197	FAST : 1,700 66.929							
		790 31.102	U-LG : 1,900 74.803							
	With lens • Long sensing range 	3,300 129.921	LONG : 1,400 55.118	ø1 ø0.039	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-WS3	P.96	
		150 5.906	FAST : 460 18.110							
	With lens • Long sensing range 	3,600 (Note 3) 141.732	U-LG : 3,600 141.732	ø2 ø0.079	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-SFM2L	P.94	
		2,600 102.362	LONG : 3,500 137.795							
		440 17.323	FAST : 1,400 55.118							
		790 31.102	U-LG : 2,000 78.740							
With lens • Long sensing range 	3,300 129.921	LONG : 1,550 61.024	ø1 ø0.039	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WS8	P.96		
	150 5.906	FAST : 445 17.520								
With lens • Long sensing range 	3,300 129.921	U-LG : 1,800 70.866	ø1 ø0.039	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-SFM2	P.94		
	790 31.102	LONG : 1,400 55.118								
	140 5.512	FAST : 420 16.535								
	3,300 129.921	U-LG : 1,800 70.866								
With lens • Long sensing range 	1,220 48.031	U-LG : 740 29.134	ø0.5 ø0.020	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-SNFM2	P.95		
	310 12.205	LONG : 545 21.457								
	63 2.480	FAST : 192 7.559								
	250 9.843	U-LG : 590 23.228								
With lens • Long sensing range 	960 37.795	LONG : 440 17.323	ø0.6 ø0.024	1 m 3.281 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WS4	P.96		
	53 2.087	FAST : 150 5.906								
With lens • Long sensing range 	1,200 47.244	U-LG : 770 30.315	ø0.6 ø0.024	1 m 3.281 ft	R4 mm R0.157 in	Flexible	-40 to +70 °C -40 to +158 °F	FT-P2	P.93	
	330 12.992	LONG : 570 22.441								
With lens • Long sensing range 	70 2.756	FAST : 200 7.874	ø0.25 ø0.010	500 mm 19.685 in	R4 mm R0.157 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-PS1	P.93	
	350 13.780	U-LG : 210 8.268								
With lens • Long sensing range 	90 3.543	LONG : 160 6.299	ø0.25 ø0.010	500 mm 19.685 in	R4 mm R0.157 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-PS1	P.93	
	19 0.748	FAST : 60 2.362								

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 to 19,600 mm 771.652 in long.
 3) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.

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LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length	Bending radius	Ambient temperature	Model No.	Dimensions			
		■ : HYPR ■ : STD ■ : H-SP	U/LG LONG FAST									
Cylindrical type	Side-view		3,600 (Note 2) 141.732	U-LG : 3,600 141.732	ø2.5 ø0.098	2 m 6.562 ft	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FT-V10	P.95		
			3,500 137.795	LONG : 3,600 141.732								
			850 33.465	FAST : 2,400 94.488								
			2,200 86.614	U-LG : 1,300 51.181	ø1.1 ø0.043	2 m 6.562 ft	R25 mm R0.984 in	-20 to +70 °C -4 to +158 °F	FT-SFM2SV2	P.94		
			570 22.441	LONG : 1,000 39.370								
			100 3.937	FAST : 360 14.173								
	1,200 47.244	U-LG : 600 23.622	ø0.8 ø0.031	1 m 3.281 ft	R25 mm R0.984 in	-20 to +60 °C -4 to +140 °F	FT-V22	P.95				
	300 11.811	LONG : 490 19.291										
	90 3.543	FAST : 200 7.874										
	790 31.102	U-LG : 450 17.717	ø0.55 ø0.022	2 m 6.562 ft	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FT-V41	P.95				
	200 7.874	LONG : 360 14.173										
	40 1.575	FAST : 130 5.118										
	380 14.961	U-LG : 220 8.661	ø0.5 ø0.020	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WV42	P.96				
	100 3.937	LONG : 170 6.693										
	20 0.787	FAST : 60 2.362										
Rectangular	Compact	Easy mounting • Top sensing W3 × H8 × D12 W0.118 × H0.315 × D0.472	3,600 (Note 2) 141.732	U-LG : 3,600 141.732	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WZ8H	P.97		
				3,300 129.921							LONG : 3,500 137.795	
				630 24.803							FAST : 1,800 70.866	
		Easy mounting • Side sensing W3 × H12 × D8 W0.118 × H0.472 × D0.315	3,600 (Note 2) 141.732	U-LG : 3,600 141.732	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R4 mm R0.157 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-Z8H	P.97	
				2,100 82.677								LONG : 3,300 129.921
				410 16.142								FAST : 1,300 51.181
	Easy mounting • Front sensing W8.5 × H12 × D3 W0.335 × H0.472 × D0.118	3,600 (Note 2) 141.732	U-LG : 3,600 141.732	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R1 mm R0.039 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-WZ8E	P.97		
			3,400 133.858								LONG : 3,600 141.732	
			590 23.228								FAST : 1,850 72.835	
	Compact	Front sensing W8.5 × H12 × D3 W0.335 × H0.472 × D0.118	3,600 (Note 2) 141.732	U-LG : 3,600 141.732	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R4 mm R0.157 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-Z8E	P.97	
				2,000 78.740								LONG : 3,300 129.921
				490 19.291								FAST : 1,300 51.181
Easy mounting • Front sensing W8.5 × H12 × D3 W0.335 × H0.472 × D0.118		3,600 (Note 2) 141.732	U-LG : 3,100 122.047	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R1 mm R0.039 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-WZ8	P.97		
			1,300 51.181								LONG : 2,300 90.551	
			280 11.024								FAST : 830 32.677	
Front sensing W8.5 × H12 × D3 W0.335 × H0.472 × D0.118	3,600 (Note 2) 141.732	U-LG : 2,700 106.299	2.2 × 3 0.087 × 0.118	2 m 6.562 ft	R4 mm R0.157 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-Z8	P.97			
		1,200 47.244								LONG : 2,100 82.677		
		250 9.843								FAST : 750 29.528		
Rectangular	Compact	Front sensing W10 × H7 × D2 W0.394 × H0.276 × D0.079	1,600 (Note 3) 62.992	U-LG : 1,100 43.307	ø1.5 ø0.059	1 m 3.281 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-WZ4	P.96		
				530 20.866							LONG : 900 35.433	
				100 3.937							FAST : 330 12.992	
		Fiber bending type W2 × H10 × D10 W0.079 × H0.394 × D0.394	800 31.496	U-LG : 460 18.110	ø0.5 ø0.020	1 m 3.281 ft	R1 mm R0.039 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-WZ4HB	P.97	
				210 8.268								LONG : 370 14.567
				40 1.575								FAST : 130 5.118
		Front sensing W14 × H7 × D3.5 W0.551 × H0.276 × D0.138	3,500 137.795	U-LG : 3,300 129.921	ø1.5 ø0.059	2 m 6.562 ft	R1 mm R0.039 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-WZ7	P.97	
				1,400 55.118								LONG : 2,300 90.551
				290 11.417								FAST : 890 35.039
		Fiber bending type W3.5 × H14 × D11 W0.138 × H0.551 × D0.433	3,500 137.795	U-LG : 1,700 66.929	ø1 ø0.039	2 m 6.562 ft	R1 mm R0.039 in	Flexible	-40 to +60 °C -40 to +140 °F	FT-WZ7HB	P.97	
				790 31.102								LONG : 1,300 51.181
				160 6.299								FAST : 490 19.291

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 to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

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LIST OF FIBERS

Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length (Free-cut)	Bending radius	Ambient temperature	Model No.	Dimensions	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST							
Narrow beam		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 750 29.528	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 2,700 106.299	ø2.2 ø0.087		R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FT-K8	P.93	
		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 760 29.921	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 2,400 94.488	ø2.5 ø0.098		2 m 6.562 ft	R1 mm R0.039 in	-40 to +55 °C -40 to +131 °F	FT-WKV8	P.96
		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 750 29.528	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 2,700 106.299	ø1 ø0.039			R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FT-KV8	P.93
		2,400 94.488 540 21.260 160 6.299	U-LG : 1,100 43.307 LONG : 850 33.465 FAST : 430 16.929							
Wide beam		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 3,300 129.921	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 3,600 141.732	3.2 × 32 0.126 × 1.260	2 m 6.562 ft	R1 mm R0.039 in	-40 to +55 °C -40 to +131 °F	FT-WA30	P.95	
		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 980 38.583	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 3,300 129.921	2.2 × 11 0.087 × 0.433			R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FT-A30	P.90
		3,600 (Note 2) 141.732 3,500 137.795 1,200 47.244	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 3,300 129.921							
		3,600 (Note 2) 141.732 3,600 (Note 2) 141.732 980 38.583	U-LG : 3,600 141.732 LONG : 3,600 141.732 FAST : 3,300 129.921	FT-A8		P.90				
Array		3,500 137.795 860 33.858 160 6.299	U-LG : 2,000 78.740 LONG : 1,500 59.055 FAST : 490 19.291	0.265 × 5.5 0.010 × 0.217	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FT-AFM2	P.90	
		3,500 137.795 860 33.858 160 6.299	U-LG : 2,000 78.740 LONG : 1,500 59.055 FAST : 490 19.291	U-LG : 2,000 78.740 LONG : 1,500 59.055 FAST : 490 19.291		FT-AFM2E	P.90			
Heat-resistant		1,200 47.244 430 16.929 80 3.150	U-LG : 880 34.646 LONG : 670 26.378 FAST : 250 9.843	ø1.2 ø0.047	2 m 6.562 ft	R25 mm R0.984 in	-60 to +350 °C -76 to +662 °F	FT-H35-M2	P.92	
		1,200 47.244 430 16.929 80 3.150	U-LG : 880 34.646 LONG : 670 26.378 FAST : 250 9.843	U-LG : 880 34.646 LONG : 670 26.378 FAST : 250 9.843		Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	FT-H35-M2S6	P.92		
		1,600 (Note 3) 62.992 470 18.504 90 3.543	U-LG : 1,000 39.370 LONG : 840 33.071 FAST : 300 11.811	ø0.8 ø0.031	1 m 3.281 ft	R10 mm R0.394 in	-60 to +200 °C	FT-H20W-M1	P.92	
		1,600 (Note 3) 62.992 540 21.260 110 4.331	U-LG : 1,300 51.181 LONG : 960 37.795 FAST : 330 12.992	ø1.2 ø0.047		R25 mm R0.984 in	-76 to +392 °F	FT-H20-M1	P.92	
		3,300 129.921 700 27.559 140 5.512	U-LG : 1,900 74.803 LONG : 1,300 51.181 FAST : 410 16.142	ø1.5 ø0.059		2 m 6.562 ft	R25 mm R0.984 in	-60 to +130 °C -76 to +266 °F	FT-H13-FM2	P.91

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 to 3,600 mm 141.732 in long.
 3) The fiber cable length practically limits the sensing range to 1,600 mm 62.992 in long.

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Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

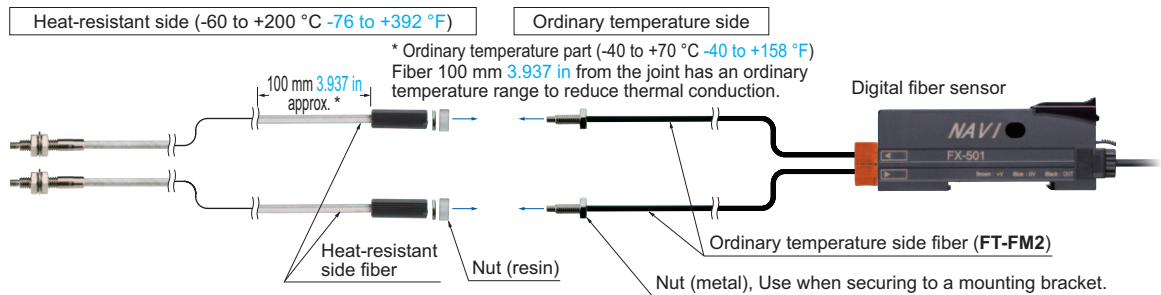
Thru-beam type (one pair set)



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1)		Beam axis dia. (mm in)	Fiber cable length (Free-cut)	Bending radius	Ambient temperature	Model No.	Dimensions								
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST														
Heat-resistant • Joint	Lens mountable (FX-LE1/LE2/SV1)	1,600 62.992	U-LG : 1,000 39.370	ø1.2 ø0.047	200 mm 7.874 in (Note 2)	Heat-resistant fiber R18 mm R0.709 in (Note 3)	-60 to +200 °C -76 to +392 °F	FT-H20-J20-S (Note 4)	P.92								
		470 18.504	LONG : 790 31.102							300 mm 11.811 in (Note 2)	FT-H20-J30-S (Note 4)	P.92					
		90 3.543	FAST : 300 11.811										500 mm 19.685 in (Note 2)	FT-H20-J50-S (Note 4)	P.92		
	Side-view	2,100 82.677	U-LG : 1,300 51.181		500 mm 19.685 in (Note 2)			FT-H20-VJ50-S (Note 4)	P.92								
		600 23.622	LONG : 980 38.583							800 mm 31.496 in (Note 2)	FT-H20-VJ80-S (Note 4)	P.92					
		120 4.724	FAST : 390 15.354														
Special	Easy mounting - Rectangular head SEMI S2 compliant W7 × H15 × D13 W0.276 × H0.591 × D0.512	3,600 (Note 5) 141.732	U-LG : 3,600 141.732	ø3.7 ø0.146	2 m 6.562 ft	R25 mm R0.984 in	0 to +60 °C 32 to +140 °F	FT-Z802Y	P.97								
		3,100 122.047	LONG : 3,600 141.732							470 18.504	FAST : 1,900 74.803						
	Chemical-resistant	115 °C 239 °F	3,600 (Note 5) 141.732		U-LG : 3,600 141.732			ø2.8 ø0.110	2 m 6.562 ft (Note 6)			R30 mm R1.181 in	-40 to +115 °C -40 to +239 °F	FT-HL80Y	P.92		
			740 29.134		LONG : 3,600 141.732					920 36.220	FAST : 2,800 110.236						
		Side-view	3,600 (Note 5) 141.732		U-LG : 2,800 110.236									ø1.2 ø0.047	1 m 3.281 ft	R18 mm R0.709 in	-30 to +300 °C -22 to +572 °F
			1,300 51.181		LONG : 2,200 86.614					240 9.449	FAST : 800 31.496						
Vacuum-resistant	300 °C 572 °F Lens mountable (FV-LE1/SV2 only)	1,000 39.370	U-LG : 590 23.228	ø1.2 ø0.047	1 m 3.281 ft	R18 mm R0.709 in	-30 to +300 °C -22 to +572 °F	FT-H30-M1V-S (Note 7)	P.92								
		270 10.630	LONG : 470 18.504							55 2.165	FAST : 160 6.299						

- 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) This is the fiber length (fixed length) for heat-resistant fibers. The ordinary-temperature fibers are free-cut to 2 m 6.562 ft.
 3) The bending radius for the ordinary-temperature fiber is R25 mm R0.984 in or more.
 4) Heat-resistant joint fibers and ordinary-temperature fibers (FT-FM2) are sold as a set.
 5) The fiber cable length practically limits the sensing range to 3,600 mm 141.732 in long.
 6) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.
 7) Sold as a set comprising vacuum type fiber + photo-terminal (FV-BR1) + fiber at atmospheric side (FT-J8).

Heat-resistant joint fiber set contents



Model No. when ordering individual parts from spare parts

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

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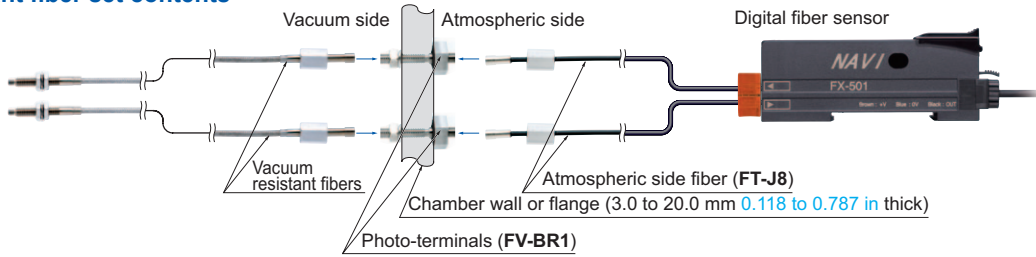
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Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

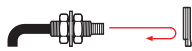
Vacuum-resistant fiber set contents



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

- Vacuum-resistant fiber **FT-H30-M1V** (one pair set)
- Photo-terminal **FV-BR1** (one pair set)
- Fiber at atmospheric side **FT-J8** (one pair set)

Retroreflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂ : Free-cut 2 m 6.562 ft	Bending radius R1 mm R0.039 in	Ambient temperature -25 to +55 °C -13 to +131 °F	Model No.	Dimen- sions
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Sharp bending With polarizing filters	W9.5 × H5.2 × D15 W0.374 × H0.205 × D0.591 W30 × H30 × D0.5 W1.181 × H1.181 × D0.020	100 to 1,900 3.937 to 74.803 100 to 990 3.937 to 38.976	U-LG : 100 to 1,400 3.937 to 55.118 LONG : 100 to 1,200 3.937 to 47.244 FAST : 100 to 780 3.937 to 30.709	✂ 2 m 6.562 ft	R1 mm R0.039 in	-25 to +55 °C -13 to +131 °F	FR-WKZ11	P.98
Narrow beam Top sensing	W9.5 × H5.2 × D21 W0.374 × H0.205 × D0.827 W10.6 × H28 × D10.1 W0.417 × H1.102 × D0.398	20 to 200 0.787 to 7.874	U-LG : 20 to 200 0.787 to 7.874 LONG : 20 to 200 0.787 to 7.874 FAST : 20 to 200 0.787 to 7.874	✂ 2 m 6.562 ft	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FR-KZ21	P.98
	Side sensing	W9.5 × H25 × D5.2 W0.374 × H0.984 × D0.205 W10.6 × H28 × D10.1 W0.417 × H1.102 × D0.398	20 to 200 0.787 to 7.874	U-LG : 20 to 200 0.787 to 7.874 LONG : 20 to 200 0.787 to 7.874 FAST : 20 to 200 0.787 to 7.874	✂ 2 m 6.562 ft	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FR-KZ21E
Wafer mapping	W7.5 × H2.2 × D11.2 W0.295 × H0.087 × D0.441 W4 × H2 × D21.5 W0.157 × H0.079 × D0.846	20 to 530 0.787 to 20.866 20 to 310 0.787 to 12.205 20 to 100 0.787 to 3.937	U-LG : 20 to 460 0.787 to 18.110 LONG : 20 to 410 0.787 to 16.142 FAST : 20 to 220 0.787 to 8.661	✂ 2 m 6.562 ft	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FR-KV1	P.98

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-WKZ11** is specified for the **RF-13**. The sensing range of **FR-KZ21**, **FR-KZ21E** is specified for the attached reflector **RF-003**. The sensing range of **FR-KV1** is specified for the attached reflector.
 Refer to the table below for sensing range when **FR-WKZ11** is used in combination with a reflector (optional).

Reflector Amplifier	RF-230	RF-220	RF-210
FX-501(P)	100 to 3,600 3.937 to 141.732 (HYPR)	100 to 3,600 3.937 to 141.732 (HYPR)	100 to 2,500 3.937 to 98.425 (HYPR)
FX-502(P)	100 to 3,600 3.937 to 141.732 (U-LG)	100 to 3,000 3.937 to 118.110 (U-LG)	100 to 1,800 3.937 to 70.866 (U-LG)
	100 to 3,600 3.937 to 141.732 (LONG)	100 to 2,700 3.937 to 106.299 (LONG)	100 to 1,600 3.937 to 62.992 (LONG)
	100 to 3,500 3.937 to 137.795 (STD)	100 to 1,900 3.937 to 74.803 (STD)	100 to 1,200 3.937 to 47.244 (STD)
	100 to 2,900 3.937 to 114.173 (FAST)	100 to 1,500 3.937 to 59.055 (FAST)	100 to 960 3.937 to 37.795 (FAST)
	100 to 1,100 3.937 to 43.307 (H-SP)	100 to 900 3.937 to 35.433 (H-SP)	100 to 460 3.937 to 18.110 (H-SP)

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.

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Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂️: Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions		
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST							
Threaded type	M6		1,450 57.087	U-LG : 960 37.795 LONG : 860 33.858 FAST : 330 12.992	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-B8	P.99	
			490 19.291							
			100 3.937							
			1,400 55.118	U-LG : 800 31.496 LONG : 650 25.591 FAST : 200 7.874						
			420 16.535							
			60 2.362							
	Elbow	M6		1,100 43.307	U-LG : 700 27.559 LONG : 540 21.260 FAST : 220 8.661	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-FM2S	P.101
				380 14.961						
		M6		70 2.756						
				870 34.252	U-LG : 560 22.047 LONG : 420 16.535 FAST : 140 5.512	1 m 3.281 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-W8	P.107
			250 9.843							
		M6		820 32.283	U-LG : 610 24.016 LONG : 480 18.898 FAST : 160 6.299	2 m 6.562 ft	R4 mm R0.157 in Flexible	-40 to +70 °C -40 to +158 °F	FD-P80	P.105
				280 11.024						
		M6		55 2.165						
	450 17.717		U-LG : 370 14.567 LONG : 330 12.992 FAST : 160 6.299	1 m 3.281 ft	R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-P81X	P.106		
	270 10.630									
M4	M4		890 35.039	U-LG : 500 19.685 LONG : 370 14.567 FAST : 130 5.118	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-R80	P.106	
			220 8.661							
	M4		40 1.575							
			1,100 43.307	U-LG : 700 27.559 LONG : 540 21.260 FAST : 220 8.661	2 m 6.562 ft	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-T80	P.106	
		380 14.961								
	M4		70 2.756							
			890 35.039	U-LG : 500 19.685 LONG : 370 14.567 FAST : 130 5.118	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-NFM2	P.105	
		220 8.661								
	M4		510 20.079	U-LG : 280 11.024 LONG : 215 8.465 FAST : 70 2.756	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-NFM2S	P.105	
			120 4.724							
M4		22 0.866								
		510 20.079	U-LG : 280 11.024 LONG : 215 8.465 FAST : 70 2.756	2 m 6.562 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-NFM2S4	P.105		
	120 4.724									
M4		330 12.992	U-LG : 180 7.087 LONG : 140 5.512 FAST : 45 1.772	2 m 6.562 ft	Fiber R1 mm R0.039 in Sleeve R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-W44	P.107		
		80 3.150								
M4		12 0.472								
		870 34.252	U-LG : 560 22.047 LONG : 420 16.535 FAST : 140 5.512	2 m 6.562 ft	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WT8	P.107		
	250 9.843									
M4		45 1.772								

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

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.

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Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂ : Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Threaded type	Minute objects can be detected due to the small spot beam. Coaxial • Lens mountable (FX-MR1/MR2/MR3/MR5/MR6) 	590 23.228	U-LG : 340 LONG : 13.386 FAST : 11.024	✂	R2 mm R0.079 in	-40 to +60 °C -40 to +140 °F	FD-WG4	P.107
		150 5.906	280 11.024					
		25 0.984	90 3.543					
	Metal-free • Coaxial 	550 21.654	U-LG : 330 LONG : 12.992 FAST : 10.630	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-G4	P.101
		140 5.512	270 10.630					
		27 1.063	80 3.150					
		490 19.291	U-LG : 250 LONG : 9.843 FAST : 7.480	✂	R4 mm R0.157 in Flexible	-40 to +60 °C -40 to +140 °F	FD-P60	P.105
		120 4.724	190 7.480					
		22 0.866	75 2.953					
	Threaded type	Small diameter 	510 20.079	U-LG : 280 LONG : 11.024 FAST : 8.465	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-T40
120 4.724			215 8.465					
22 0.866			70 2.756					
		330 12.992	U-LG : 180 LONG : 7.087 FAST : 5.512	✂	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WT4	P.107
		80 3.150	140 5.512					
		12 0.472	45 1.772					
		190 7.480	U-LG : 100 LONG : 3.937 FAST : 3.346	✂	R4 mm R0.157 in Flexible	-40 to +70 °C -40 to +158 °F	FD-P40	P.105
		45 1.772	85 3.346					
		7 0.276	20 0.787					
Threaded type		Lens mountable (FX-MR3, FX-MR6) Coaxial 	550 21.654	U-LG : 330 LONG : 12.992 FAST : 10.630	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-G6
	140 5.512		270 10.630					
	27 1.063		80 3.150					
	Tough flexible Lens mountable (FX-MR3, FX-MR6) Coaxial 	630 24.803	U-LG : 370 LONG : 14.567 FAST : 12.205	✂	R10 mm R0.394 in	-40 to +60 °C -40 to +140 °F	FD-G6X	P.102
		170 6.693	310 12.205					
		27 1.063	95 3.740					
	High precision Lens mountable (FX-MR3, FX-MR6) Coaxial 	170 6.693	U-LG : 100 LONG : 3.937 FAST : 3.150	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-EG1	P.100
		40 1.575	80 3.150					
		7.5 0.295	24 0.945					
	High precision Lens mountable (FX-MR3, FX-MR6) Coaxial Light emitting fiber element ø0.175 ø0.007 	130 5.118	U-LG : 100 LONG : 3.937 FAST : 3.150	✂	R10 mm R0.394 in	-20 to +60 °C -4 to +140 °F	FD-EG2	P.100
24 0.945		80 3.150						
3 0.118		19 0.748						
High precision Lens mountable (FX-MR3, FX-MR6) Coaxial Light emitting fiber element ø0.125 ø0.005 	85 3.346	U-LG : 45 LONG : 1.772 FAST : 1.378	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +140 °F	FD-EG3	P.100	
	20 0.787	35 1.378						
	3.5 0.138	12 0.472						
Threaded type	Coaxial 	190 7.480	U-LG : 110 LONG : 4.331 FAST : 3.543	✂	R25 mm R0.984 in	-40 to +60 °C -40 to +158 °F	FD-ENM1S1	P.100
		50 1.969	90 3.543					
		9 0.354	28 1.102					
	Cylindrical type ø3 ø0.118 	1,100 43.307	U-LG : 700 LONG : 27.559 FAST : 21.260	✂	R25 mm R0.984 in	-40 to +70 °C -40 to +158 °F	FD-S80	P.106
		380 14.961	540 21.260					
	Cylindrical type ø3 ø0.118 	960 37.795	U-LG : 550 LONG : 21.654 FAST : 16.142	✂	R1 mm R0.039 in	-40 to +60 °C -40 to +140 °F	FD-WS8	P.107
		250 9.843	410 16.142					
		45 1.772	140 5.512					

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

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Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length	Bending radius	Ambient temperature	Model No.	Dimensions					
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST										
Cylindrical type	Coaxial ø3 ø0.118 	■ : 590 ■ : 150 ■ : 25	23.228 5.906 0.984	U-LG : 340 LONG : 280 FAST : 90	2 m 6.562 ft 	-40 to +60 °C -40 to +140 °F	FD-WSG4	P.107					
		■ : 490 ■ : 120 ■ : 22	19.291 4.724 0.866	U-LG : 250 LONG : 190 FAST : 75					R2 mm R0.079 in	FD-P50	P.105		
		■ : 510 ■ : 120 ■ : 22	20.079 4.724 0.866	U-LG : 280 LONG : 215 FAST : 70			R25 mm R0.984 in	FD-SNFM2	P.106				
		■ : 260 ■ : 80 ■ : 20	10.236 3.150 0.787	U-LG : 170 LONG : 140 FAST : 55			R4 mm R0.157 in			FD-P2	P.105		
		Ultra-small diameter ø1.5 ø0.059 	■ : 45 ■ : 12 ■ : 2	1.772 0.472 0.079			U-LG : 25 LONG : 22 FAST : 7	1 m 3.281 ft	-40 to +70 °C -40 to +158 °F			FD-E12	P.100
		Coaxial ø3 ø0.118 ø0.026 	■ : 210 ■ : 55 ■ : 11	8.268 2.165 0.433			U-LG : 130 LONG : 110 FAST : 32			R25 mm R0.984 in	FD-E22		
	Side-view	Small diameter ø1.5 ø0.059 ø0.020 	■ : 260 ■ : 65 ■ : 14	10.236 2.559 0.551	U-LG : 140 LONG : 110 FAST : 35	2 m 6.562 ft 	-40 to +60 °C -40 to +140 °F	FD-V41	P.106				
		Small diameter ø1.5 ø0.059 ø0.020 	■ : 60 ■ : 16 ■ : 2	2.362 0.630 0.079	U-LG : 35 LONG : 25 FAST : 8					R25 mm R0.984 in	FD-WV42	P.108	
		Small diameter ø1.5 ø0.059 ø0.020 	■ : 370 ■ : 120 ■ : 25	14.567 4.724 0.984	U-LG : 250 LONG : 210 FAST : 75			R25 mm R0.984 in	FD-SFM2SV2	P.106			
		Small diameter ø1.5 ø0.059 ø0.020 	■ : 1 ■ : 1 Cannot use	0.039 to 4.331 0.039 to 2.205	U-LG : 1 to 87 LONG : 1 to 74 FAST : 1 to 38			4 m 13.123 ft 			-40 to +60 °C -40 to +140 °F	FD-L46	P.105
		Small diameter ø1.5 ø0.059 ø0.020 	■ : 43 ■ : 40 ■ : 24	1.693 1.575 0.945	U-LG : 43 LONG : 43 FAST : 40				R25 mm R0.984 in	FD-L45			
		Small diameter ø1.5 ø0.059 ø0.020 	■ : 3 ■ : 4 ■ : 5	0.118 to 2.008 0.157 to 1.732 0.197 to 1.496	U-LG : 4 to 47 LONG : 4 to 46 FAST : 4 to 42			3 m 9.843 ft 	0 to +70 °C 32 to +158 °F		FD-L45A	P.105	
Small diameter ø1.5 ø0.059 ø0.020 	■ : 31 ■ : 24 ■ : 18	1.220 0.945 0.709	U-LG : 25 LONG : 24 FAST : 24	R25 mm R0.984 in	FD-L43	P.104							
Small diameter ø1.5 ø0.059 ø0.020 	■ : 30 ■ : 1.181 ■ : 29 ■ : 1.142 ■ : 1.5 to 24	0.059 to 0.945	U-LG : 30 LONG : 30 FAST : 28	3 m 9.843 ft 			-20 to +70 °C -4 to +158 °F	FD-L47	P.105				
Rectangular	Convergent reflective type 	Glass substrate detection • Mapping W25 × H7.3 × D30 W0.984 × H0.287 × D1.181	■ : 1 to 110 ■ : 1 to 56 Cannot use	0.039 to 4.331 0.039 to 2.205	U-LG : 1 to 87 LONG : 1 to 74 FAST : 1 to 38	4 m 13.123 ft 				-40 to +60 °C -40 to +140 °F	FD-L46	P.105	
		Glass substrate detection • Alignment W20 × H29 × D3.8 W0.787 × H1.142 × D0.150	■ : 43 ■ : 40 ■ : 24	1.693 1.575 0.945	U-LG : 43 LONG : 43 FAST : 40		3 m 9.843 ft 	R4 mm R0.157 in	FD-L45				P.104
		Glass substrate detection • Alignment W23.5 × H29 × D4.5 W0.925 × H1.142 × D0.177	■ : 3 to 51 ■ : 4 to 44 ■ : 5 to 38	0.118 to 2.008 0.157 to 1.732 0.197 to 1.496	U-LG : 4 to 47 LONG : 4 to 46 FAST : 4 to 42								
		Glass substrate detection • Alignment W17 × H29 × D3.8 W0.669 × H1.142 × D0.150	■ : 31 ■ : 24 ■ : 18	1.220 0.945 0.709	U-LG : 25 LONG : 24 FAST : 24		3 m 9.843 ft 	R4 mm R0.157 in	FD-L43				P.104
		Glass substrate detection • Seating confirmation W18 × H29 × D3.8 W0.709 × H1.142 × D0.150	■ : 30 ■ : 1.181 ■ : 29 ■ : 1.142 ■ : 1.5 to 24	0.059 to 0.945	U-LG : 30 LONG : 30 FAST : 28								

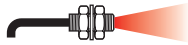
Notes: 1) The sensing range is specified for white non-glossy paper (FD-L46: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in R edge of LCD glass substrates, FD-L45, FD-L45A, FD-L43 and FD-L47: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass) as the object.
2) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

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Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Rectangular	Glass substrate detection • Seating confirmation W12 × H19 × D3 W0.472 × H0.748 × D0.118	■ 11.5 ■ 0.453 ■ 9.5 ■ 0.374 ■ 8 ■ 0.315	U-LG : 10.5 LONG : 10 FAST : 9 0.413 0.394 0.354	✂	R10 mm R0.394 in	-40 to +60 °C	FD-L44	P.104	
		■ 6 ■ 0.236 ■ 5 ■ 0.197 ■ 4 ■ 0.157	U-LG : 5.5 LONG : 5.5 FAST : 4.5 0.217 0.217 0.177				FD-L44S	P.104	
	Glass substrate detection W24 × H21 × D4 W0.945 × H0.827 × D0.157	■ 1.5 to 15 ■ 0.059 to 0.591 ■ 2.5 to 14 ■ 0.098 to 0.551 ■ 6.5 to 10 ■ 0.256 to 0.394	U-LG : 2 to 14.5 LONG : 2 to 14.5 FAST : 5.5 to 13.5 0.079 to 0.571 0.079 to 0.571 0.217 to 0.531	✂	R1 mm R0.039 in	-40 to +140 °F	FD-WL41	P.107	
		■ 1 to 19 ■ 0.039 to 0.748 ■ 1.5 to 16 ■ 0.059 to 0.630 ■ 8 to 11 ■ 0.315 to 0.433	U-LG : 1 to 18 LONG : 1.5 to 16 FAST : 3 to 15 0.039 to 0.709 0.059 to 0.630 0.118 to 0.591	✂	R10 mm R0.394 in	-40 to +70 °C	FD-L41	P.104	
	 W6 × H18 × D14 W0.236 × H0.709 × D0.551	■ 21.5 ■ 0.846 ■ 15.5 ■ 0.610 ■ 5 to 7.5 ■ 0.197 to 0.295	U-LG : 19.5 LONG : 18.5 FAST : 3 to 13 0.768 0.728 0.512	✂	R1 mm R0.039 in	-40 to +158 °F	FD-L4	P.104	
		■ 16 ■ 0.630 ■ 7.5 ■ 0.295 ■ 0.5 to 4 ■ 0.020 to 0.157	U-LG : 12.5 LONG : 11.5 FAST : 0.5 to 6 0.492 0.453 0.236	✂	R1 mm R0.039 in	-20 to +60 °C	FD-WL48	P.107	
	Small	Front sensing W10 × H7 × D2 W0.394 × H0.276 × D0.079	■ 1 to 230 ■ 0.039 to 9.055 ■ 2 to 65 ■ 0.079 to 2.559 ■ 5 to 13 ■ 0.197 to 0.512	U-LG : 1 to 110 LONG : 1 to 85 FAST : 3 to 35 0.039 to 4.331 0.039 to 3.346 1.18 to 1.378	✂	R1 mm R0.039 in	-40 to +60 °C	FD-WZ4	P.108
		Fiber bending type W2 × H10 × D10 W0.079 × H0.394 × D0.394	■ 1 to 190 ■ 0.039 to 7.480 ■ 2.5 to 65 ■ 0.098 to 2.559 ■ 3 to 11 ■ 0.118 to 0.433	U-LG : 1 to 130 LONG : 1 to 90 FAST : 2.5 to 40 0.039 to 5.118 0.039 to 3.543 0.098 to 1.575	✂	R1 mm R0.039 in	-40 to +140 °F	FD-WZ4HB	P.108
		Front sensing W14 × H7 × D3.5 W0.551 × H0.276 × D0.138	■ 430 ■ 16.929 ■ 110 ■ 4.331 ■ 3 to 25 ■ 0.118 to 0.984	U-LG : 230 LONG : 180 FAST : 1.5 to 65 9.055 7.087 0.059 to 2.559	✂	R1 mm R0.039 in	-40 to +60 °C	FD-WZ7	P.108
		Fiber bending type W3.5 × H14 × D11 W0.138 × H0.551 × D0.433	■ 0.5 to 560 ■ 0.020 to 22.047 ■ 1 to 150 ■ 0.039 to 5.906 ■ 2.5 to 30 ■ 0.098 to 1.181	U-LG : 0.5 to 320 LONG : 0.5 to 270 FAST : 1 to 90 0.020 to 12.598 0.020 to 10.630 0.039 to 3.543	✂	R1 mm R0.039 in	-40 to +140 °F	FD-WZ7HB	P.108
Special	Long sensing range • Rectangular head W5.2 × H9.5 × D15 W0.205 × H0.374 × D0.591	■ 20 to 1,700 ■ 0.787 to 66.929 ■ 20 to 490 ■ 0.787 to 19.291 ■ 20 to 100 ■ 0.787 to 3.937	U-LG : 20 to 1,000 LONG : 20 to 820 FAST : 20 to 310 0.787 to 39.370 0.787 to 32.283 12.205	✂	R1 mm R0.039 in	-40 to +60 °C	FD-WKZ1	P.107	
	Wide beam W7 × H15 × D30 W0.276 × H0.591 × D1.181	■ 200 ■ 7.874 ■ 200 ■ 7.874 ■ 75 ■ 2.953	U-LG : 200 LONG : 200 FAST : 140 7.874 7.874 5.512	✂	R25 mm R0.984 in	-40 to +140 °F	FD-A15	P.99	
	Top sensing W5 × H20 × D20 W0.197 × H0.787 × D0.787	■ 660 ■ 25.984 ■ 280 ■ 11.024 ■ 50 ■ 1.969	U-LG : 510 LONG : 430 FAST : 160 20.079 16.929 6.299	✂	R25 mm R0.984 in	-40 to +70 °C	FD-AFM2	P.99	
	Side sensing W5 × H20 × D20 W0.197 × H0.787 × D0.787	■ 50 ■ 1.969	FAST : 160 6.299	✂	R25 mm R0.984 in	-40 to +158 °F	FD-AFM2E	P.99	

Notes: 1) The sensing range is specified for white non-glossy paper (FD-L44, FD-WL41 and FD-L41: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass, FD-L44S: silicon wafers polished surface) as the object.
 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.

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Pliable fibers (flexible and sharp bending fibers) are marked in light blue in the table.

Reflective type



Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions	
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST						
Liquid level sensing	Heat resistant 125 °C 257 °F Fluorine resin coating 	ø6 mm 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 interrupted	✂ 2 m 6.562 ft (Note 3)	Protective tube R40 mm R1.575 in Fiber R15 mm R0.591 in	-40 to +125 °C -40 to +257 °F	FD-F8Y	P.101	
	Heat resistant 105 °C 221 °F Fluorine resin coating 	ø4 mm 0.157 in	Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted		Protective tube R20 mm R0.787 in Fiber R10 mm R0.394 in	-40 to +105 °C -40 to +221 °F	FD-HF40Y	P.104	
	Heat resistant 70 °C 158 °F Fluorine resin coating throughout the fiber 	ø4 mm 0.157 in	Protective tube: Fluorine resin, length 500 mm 19.685 in (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted		✂ 2 m 6.562 ft	R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-F41Y	P.101
	Mountable on pipe • Standard 	W25 × H13 × D20 W0.984 × H0.512 × D0.787	Applicable pipe diameter: Outer dia. ø6 to ø26 mm 0.236 to 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 interrupted		R10 mm R0.394 in	-40 to +100 °C -40 to +212 °F	FD-F41	P.100	
	Mountable on pipe • For PFA, wall thickness 1 mm 0.039 in pipe 	W25 × H13 × D20 W0.984 × H0.512 × D0.787	Applicable pipe diameter: Outer dia. ø6 to ø26 mm 0.236 to 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 interrupted				FD-F4	P.100	
	Mountable on pipe • Array fiber 	W6.5 × H28.3 × D17 W0.256 × H1.114 × D0.669	Applicable pipe diameter: Outer dia. ø8 mm 0.315 in or more transparent pipe (When used with the tying bands: ø8 to ø80 mm 0.315 to 3.150 in) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam interrupted		✂ 2 m 6.562 ft	R10 mm R0.394 in	-40 to +70 °C -40 to +158 °F	FD-FA90	P.101
Liquid sensing	Mountable on pipe SEMI S2 compliant 	W23 × H20 × D17 W0.906 × H0.787 × D0.669	Applicable pipe diameter: Outer dia. ø3 to ø10 mm 0.118 to 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 received, Liquid present: Beam interrupted		Protective tube R20 mm R0.787 in Fiber R4 mm R0.157 in	-20 to +60 °C -4 to +140 °F	FT-F902	P.91	
	SEMI S2 compliant 	W20 × H30 × D10 W0.787 × H1.181 × D0.394	Liquid leak detection Leak absent: Beam received, Leak present: Beam interrupted	✂ 5 m 16.404 ft (Protective tube: 3 m 9.843 ft.)	Protective tube R20 mm R0.787 in Fiber R4 mm R0.157 in	-20 to +50 °C -4 to +122 °F	FD-F705	P.101	
Heat-resistant	350 °C 662 °F • Coaxial 	720 28.346	U-LG : 540 LONG : 21.260 FAST : 460	2 m 6.562 ft	R25 mm R0.984 in Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-60 to +350 °C -76 to +662 °F	FD-H35-M2	P.104	
	350 °C 662 °F • Sleeve 60 mm 2.362 in 	260 10.236	45 1.772	540 21.654 460 18.110 150 5.906				FD-H35-M2S6	P.104
	200 °C 392 °F • Coaxial 	840 33.071	330 12.992	550 21.654 500 19.685 200 7.874		R25 mm R0.984 in	-60 to +200 °C -76 to +392 °F	FD-H20-M1	P.102
	350 °C 662 °F • Sleeve 90 mm 3.543 in 	840 33.071	260 10.236	550 21.654 440 17.323 140 5.512	1 m 3.281 ft	Fiber R25 mm R0.984 in Sleeve R10 mm R0.394 in	-60 to +350 °C -76 to +662 °F	FD-H35-20S	P.104
	200 °C 392 °F • Coaxial 	770 30.315	230 9.055	500 19.685 380 14.961 130 5.118		R25 mm R0.984 in	-60 to +200 °C -76 to +392 °F	FD-H20-21	P.102
	300 °C 572 °F • Glass substrate detection Convergent reflective type 	40 1.575	17 0.669	30 1.181 25 0.984 12 0.472	2 m 6.562 ft		-60 to +300 °C -76 to +572 °F	FD-H30-L32	P.103

Notes: 1) The sensing range is specified for white non-glossy paper (FD-H30-L32: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass) as the object.

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 1,000 mm 39.370 in from the end that the amplifier inserted.

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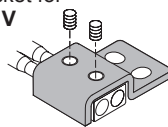


Type	Shape of fiber head (mm in)	Sensing range (mm in) (Note 1) (Note 2)		Fiber cable length ✂: Free-cut	Bending radius	Ambient temperature	Model No.	Dimensions
		■ : HYPR ■ : STD ■ : H-SP	U-LG LONG FAST					
Special	Heat-resistant 250 °C 482 °F • Glass substrate detection Convergent reflective type W21×H33.2×D5 W0.827×H1.307×D0.197	■ : 1 to 31 ■ : 0.039 to 1.220 ■ : 1.5 to 26 ■ : 0.059 to 1.024	U-LG : 1 to 30 LONG : 1 to 28 FAST : 1.5 to 24	3 m 9.843 ft	R25 mm R0.984 in	-20 to +250 °C -4 to +482 °F (Ordinary temperature side: -20 to +70 °C -4 to +158 °F)	FD-H25-L43	P.103
		■ : 2 to 18 ■ : 0.079 to 0.709	U-LG : 1 to 30 LONG : 1 to 28 FAST : 1.5 to 24					
	Heat-resistant 250 °C 482 °F • Glass substrate detection Convergent reflective type W21×H34.5×D5 W0.827×H1.358×D0.197	■ : 4 to 43.5 ■ : 0.157 to 1.713 ■ : 5 to 42 ■ : 0.197 to 1.654 ■ : 6.5 to 34 ■ : 0.256 to 1.339	U-LG : 4 to 43 LONG : 4.5 to 43 FAST : 5 to 40	2 m 6.562 ft	R18 mm R0.709 in	-60 to +180 °C -76 to +356 °F	FD-H18-L31	P.102
		180 °C 356 °F • Glass substrate detection Convergent reflective type W19 × H27 × D5 W0.748 × H1.063 × D0.197	■ : 60 ■ : 2.362 ■ : 16 ■ : 0.630 ■ : 2 to 6.5 ■ : 0.079 to 0.256					
Vacuum-resistant	130 °C 266 °F M6 21 0.827	■ : 880 ■ : 34.646 ■ : 350 ■ : 13.780 ■ : 65 ■ : 2.559	U-LG : 640 LONG : 600 FAST : 200	1 m 3.281 ft	R18 mm R0.709 in	-60 to +130 °C -76 to +266 °F	FD-H13-FM2	P.102
	300 °C 572 °F • Rectangular head W9.5 × H5.2 × D15 W0.374 × H0.205 × D0.591	■ : 5 to 500 ■ : 0.197 to 19.685 ■ : 20 to 200 ■ : 0.787 to 7.874 ■ : 20 to 45 ■ : 0.787 to 1.772	U-LG : 10 to 340 LONG : 15 to 270 FAST : 20 to 120					
	300 °C 572 °F • Glass substrate detection Convergent reflective type W19 × H5 × D27 W0.748 × H0.197 × D1.063	■ : 18 ■ : 0.709 ■ : 8 ■ : 0.315 ■ : 1.5 to 3 ■ : 0.059 to 0.118	U-LG : 12 LONG : 10 FAST : 5.5					

Notes: 1) The sensing range is specified for white non-glossy paper (FD-H25-L43, FD-H25-L45, FD-H18-L31, FD-H30-KZ1V-S, FD-H30-L32V-S: 100 × 100 × t 0.7 mm 3.937 × 3.937 × t 0.028 in transparent glass) as the object.
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) Sold as a set comprising vacuum type fiber + photo-terminal (FV-BR1) + fiber at atmospheric side (FT-J8).

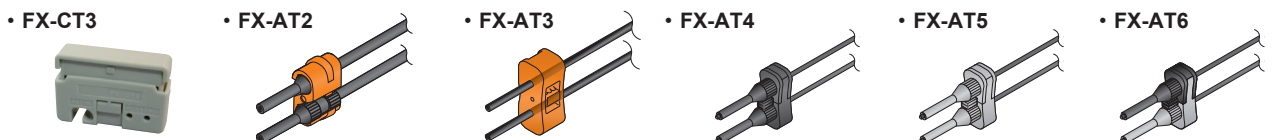
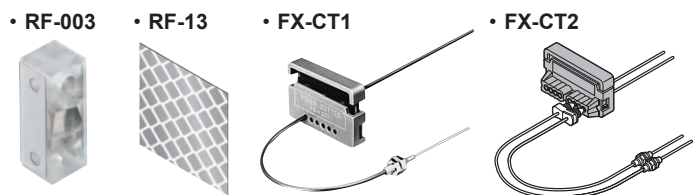
Model No. when ordering vacuum-resistant fibers individually as replacement parts

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



Accessories (attached with fibers)

- RF-003 (FR-KZ21/KZ21E exclusive reflector)
- RF-13 (Reflective tape)
- FX-CT1 (Fiber cutter)
- FX-CT2 (Fiber cutter)
- FX-CT3 (Fiber cutter)
- FX-AT2 (Attachment for fixed-length fiber, Orange)
- FX-AT3 (Attachment for ø2.2 mm ø0.087 in fiber, Clear orange)
- FX-AT4 (Attachment for ø1 mm ø0.039 in fiber, Black)
- FX-AT5 (Attachment for ø1.3 mm ø0.051 in fiber, Gray)
- FX-AT6 (Attachment for ø1 mm ø0.039 in / ø1.3 mm ø0.051 in mixed fiber, Black / Gray)



FIBER SENSORS

LASER SENSORS

PHOTO-ELECTRIC SENSORS

MICRO PHOTO-ELECTRIC SENSORS

AREA SENSORS

LIGHT CURTAINS

PRESSURE / FLOW SENSORS

INDUCTIVE PROXIMITY SENSORS

PARTICULAR USE SENSORS

SENSOR OPTIONS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

Fibers

Amplifiers

FX-500

FX-100

FX-300

FX-410

FX-311

FX-301-F7/
FX-301-F